Apache Libcloud Documentation

Release 3.1.0

The Apache Software Foundation

Jun 12, 2020

Contents

Note: Libcloud v3.0.0 dropped support for Python 2.7 and Python 3.4 and now only supports Python >= 3.5.

If you still need to us Libcloud with one of the now unsupported versions, you can do that by using the latest release of Libcloud which still supports those versions (Libcloud v2.8).

Apache Libcloud is a Python library which hides differences between different cloud provider APIs and allows you to manage different cloud resources through a unified and easy to use API.

Resource you can manage with Libcloud are divided in the following categories:

- *Cloud Servers and Block Storage* - services such as Amazon EC2 and Rackspace CloudServers
- *Cloud Object Storage and CDN* - services such as Amazon S3 and Rackspace CloudFiles
- *Load Balancers as a Service* - services such as Amazon Elastic Load Balancer and GoGrid LoadBalancers
- *DNS as a Service* - services such as Amazon Route 53 and Zerigo
- *Container Services* - container virtualization like Docker and Rkt as well as container based services
- *Backup as a Service* - services such as Amazon EBS and OpenStack Freezer

Fig. 1: A subset of supported providers in Libcloud.

Documentation

1.1 Main

1.1.1 Getting Started

Installation (stable version)

Libcloud is available on PyPi. You can install latest stable version using pip:

```
pip install apache-libcloud
```

Installation (development version)

You can install latest development version from our Git repository:

```
pip install -e git+https://git-wip-us.apache.org/repos/asf/libcloud.git@trunk
→#egg=apache-libcloud
```

Upgrading

If you used pip to install the library you can also use it to upgrade it:

```
pip install --upgrade apache-libcloud
```

Using it

This section describes a standard work-flow which you follow when working with any of the Libcloud drivers.

1. Obtain reference to the provider driver

```python
from pprint import pprint

import libcloud

cls = libcloud.get_driver(libcloud.DriverType.COMPUTE, libcloud.DriverType.COMPUTE.
↪RACKSPACE)
```

2. Instantiate the driver with your provider credentials

```python
driver = cls('my username', 'my api key')
```

Keep in mind that some drivers take additional arguments such as `region` and `api_version`.

For more information on which arguments you can pass to your provider driver, see provider-specific documentation and the driver docstrings.

3. Start using the driver

```python
pprint(driver.list_sizes())
pprint(driver.list_nodes())
```

4. Putting it all together

```python
from pprint import pprint

import libcloud

cls = libcloud.get_driver(libcloud.DriverType.COMPUTE, libcloud.DriverType.COMPUTE.
↪RACKSPACE)

driver = cls('my username', 'my api key')

pprint(driver.list_sizes())
pprint(driver.list_nodes())
```

You can find more examples with common patterns which can help you get started on the Compute Examples page.

Where to go from here?

The best thing to do after understanding the basic driver work-flow is to visit the documentation chapter for the API you are interested in (*Compute*, *Object Storage*, *Load Balancer*, *DNS*). Chapter for each API explains some basic terminology and things you need to know to make an effective use of that API.

After you have a good grasp of those basic concepts, you are encouraged to check the driver specific documentation (if available) and usage examples. If the driver specific documentation for the provider you are interested in is not available yet, you are encouraged to check docstrings for that driver.

1.1.2 Supported Providers

This pages lists supported providers and methods for all the APIs.

Compute

Provider Matrix

Provider	Documentation	Provider Constant	Supported Regions
Abiquo		ABIQUO	single region driver
Aliyun ECS	Click	ALIYUN_ECS	single region driver
PCextreme AuroraCompute	Click	AURORACOMPUTE	single region driver
Azure Virtual machines	Click	AZURE	single region driver
Azure Virtual machines	Click	AZURE_ARM	single region driver
Bluebox Blocks		BLUEBOX	single region driver
Brightbox		BRIGHTBOX	single region driver
BSNL	Click	BSNL	single region driver
Cloudscale	Click	CLOUDSCALE	single region driver
CloudSigma (API v2.0)	Click	CLOUDSIGMA	single region driver
CloudStack	Click	CLOUDSTACK	single region driver
Cloudwatt	Click	CLOUDWATT	single region driver
DigitalOcean	Click	DIGITAL_OCEAN	single region driver
DimensionData	Click	DIMENSIONDATA	single region driver
Amazon EC2	Click	EC2	ap-northeast-1, ap-northeast-2, ap-northea
Enomaly Elastic Computing Platform		ECP	single region driver
ElasticHosts		ELASTICHOSTS	single region driver
Eucalyptus		EUCALYPTUS	single region driver
Exoscale	Click	EXOSCALE	single region driver
Gandi	Click	GANDI	single region driver
Google Compute Engine	Click	GCE	single region driver
GiG G8 Node Provider		GIG_G8	single region driver
GoGrid		GOGRID	single region driver
Gridscale	Click	GRIDSCALE	single region driver
HostVirtual		HOSTVIRTUAL	single region driver
Ikoula	Click	IKOULA	single region driver
Indosat	Click	INDOSAT	single region driver
InternetSolutions	Click	INTERNETSOLUTIONS	single region driver
Joyent		JOYENT	single region driver
Kamatera	Click	KAMATERA	single region driver
Kili Public Cloud	Click	KILI	single region driver
KTUCloud		KTUCLOUD	single region driver
kubevirt		KUBEVIRT	single region driver
Libvirt	Click	LIBVIRT	single region driver
Linode		LINODE	single region driver
Maxihost	Click	MAXIHOST	single region driver
MedOne	Click	MEDONE	single region driver
NephoScale		NEPHOSCALE	single region driver
Nimbus	Click	NIMBUS	single region driver
NTTAmerica	Click	NTTA	single region driver
NTTC-CIS	Click	NTTCIS	single region driver
OnApp	Click	ONAPP	single region driver
1and1	Click	ONEANDONE	single region driver
OpenNebula (v3.8)		OPENNEBULA	single region driver
OpenStack	Click	OPENSTACK	single region driver
Outscale INC	Click	OUTSCALE_INC	single region driver
Outscale SAS	Click	OUTSCALE_SAS	single region driver

Provider	Documentation	Provider Constant	Supported Regions
Ovh	Click	OVH	single region driver
Packet	Click	PACKET	single region driver
ProfitBricks		PROFIT_BRICKS	single region driver
Rackspace Cloud (Next Gen)	Click	RACKSPACE	single region driver
Rackspace Cloud (First Gen)		RACKSPACE_FIRST_GEN	single region driver
RimuHosting		RIMUHOSTING	single region driver
Scaleway	Click	SCALEWAY	single region driver
ServerLove		SERVERLOVE	single region driver
skalicloud		SKALICLOUD	single region driver
SoftLayer		SOFTLAYER	single region driver
vCloud		TERREMARK	single region driver
Upcloud	Click	UPCLOUD	single region driver
VCL		VCL	single region driver
vCloud	Click	VCLOUD	single region driver
Voxel VoxCLOUD		VOXEL	single region driver
vps.net		VPSNET	single region driver
Vultr	Click	VULTR	single region driver

Supported Methods (Base compute)

Provider	list nodes	create node	reboot node	destroy node	start node	stop node	li
Abiquo	yes	yes	yes	yes	no	no	y
Aliyun ECS	yes	yes	yes	yes	yes	yes	y
PCextreme AuroraCompute	yes	yes	yes	yes	no	no	y
Azure Virtual machines	yes	yes	yes	yes	no	no	y
Azure Virtual machines	yes	yes	yes	yes	yes	yes	y
Bluebox Blocks	yes	yes	yes	yes	no	no	y
Brightbox	yes	yes	no	yes	no	no	y
BSNL	yes	yes	yes	yes	yes	yes	y
Cloudscale	yes	yes	yes	yes	yes	yes	y
CloudSigma (API v2.0)	yes	yes	no	yes	yes	yes	y
CloudStack	yes	yes	yes	yes	no	no	y
Cloudwatt	yes	yes	yes	yes	yes	yes	y
DigitalOcean	yes	yes	yes	yes	no	no	y
DimensionData	yes	yes	yes	yes	yes	yes	y
Amazon EC2	yes	yes	yes	yes	yes	yes	y
Enomaly Elastic Computing Platform	yes	yes	yes	yes	no	no	y
ElasticHosts	yes	yes	yes	yes	no	no	y
Eucalyptus	yes	yes	yes	yes	yes	yes	y
Exoscale	yes	yes	yes	yes	no	no	y
Gandi	yes	yes	yes	yes	no	no	y
Google Compute Engine	yes	yes	yes	yes	yes	yes	y
GiG G8 Node Provider	yes	yes	yes	yes	yes	yes	y
GoGrid	yes	yes	yes	yes	no	no	y
Gridscale	yes	yes	yes	yes	yes	no	y
HostVirtual	yes	yes	yes	yes	yes	yes	y
Ikoula	yes	yes	yes	yes	no	no	y
Indosat	yes	yes	yes	yes	yes	yes	y

Table 2 – continued from previous page

Provider	list nodes	create node	reboot node	destroy node	start node	stop node	li
InternetSolutions	yes	yes	yes	yes	yes	yes	y
Joyent	yes	yes	yes	yes	yes	yes	y
Kamatera	yes	yes	yes	yes	yes	yes	y
Kili Public Cloud	yes	yes	yes	yes	yes	yes	y
KTUCloud	yes	yes	yes	yes	no	no	y
kubevirt	yes	yes	yes	yes	yes	yes	y
Libvirt	yes	no	yes	yes	yes	yes	n
Linode	yes	yes	yes	yes	yes	yes	y
Maxihost	yes	yes	yes	yes	yes	yes	y
MedOne	yes	yes	yes	yes	yes	yes	y
NephoScale	yes	yes	yes	yes	yes	yes	y
Nimbus	yes	yes	yes	yes	yes	yes	y
NTTAmerica	yes	yes	yes	yes	yes	yes	y
NTTC-CIS	yes	yes	yes	yes	yes	yes	y
OnApp	yes	yes	no	yes	no	no	y
1and1	yes	yes	yes	yes	no	no	y
OpenNebula (v3.8)	yes	yes	yes	yes	no	no	y
OpenStack	yes	no	yes	yes	yes	yes	y
Outscale INC	yes	yes	yes	yes	yes	yes	y
Outscale SAS	yes	yes	yes	yes	yes	yes	y
Ovh	yes	yes	no	yes	no	no	y
Packet	yes	yes	yes	yes	yes	yes	y
ProfitBricks	yes	yes	yes	yes	yes	yes	y
Rackspace Cloud (Next Gen)	yes	yes	yes	yes	yes	yes	y
Rackspace Cloud (First Gen)	yes	yes	yes	yes	yes	yes	y
RimuHosting	yes	yes	yes	yes	no	no	y
Scaleway	yes	yes	yes	yes	no	no	y
ServerLove	yes	yes	yes	yes	no	no	y
skalicloud	yes	yes	yes	yes	no	no	y
SoftLayer	yes	yes	yes	yes	yes	yes	y
vCloud	yes	yes	yes	yes	no	no	y
Upcloud	yes	yes	yes	yes	no	no	y
VCL	yes	yes	no	yes	no	no	y
vCloud	yes	yes	yes	yes	no	no	y
Voxel VoxCLOUD	yes	yes	yes	yes	no	no	y
vps.net	yes	yes	yes	yes	no	no	y
Vultr	yes	yes	yes	yes	no	no	y

Supported Methods (Block Storage)

Provider	list volumes	create volume	destroy volume	attach volume	detach volume	l
Abiquo	no	no	no	no	no	n
Aliyun ECS	yes	yes	yes	yes	yes	y
PCextreme AuroraCompute	yes	yes	yes	yes	yes	n
Azure Virtual machines	yes	yes	yes	yes	yes	n
Azure Virtual machines	yes	yes	yes	yes	yes	y
Bluebox Blocks	no	no	no	no	no	n
Brightbox	no	no	no	no	no	n

Table 3 – continued from previous page

Provider	list volumes	create volume	destroy volume	attach volume	detach volume	l
BSNL	no	no	no	no	no	i
Cloudscale	no	no	no	no	no	i
CloudSigma (API v2.0)	no	no	no	no	no	i
CloudStack	yes	yes	yes	yes	yes	i
Cloudwatt	yes	yes	yes	yes	yes	y
DigitalOcean	yes	yes	yes	yes	yes	y
DimensionData	no	no	no	no	no	i
Amazon EC2	yes	yes	yes	yes	yes	y
Enomaly Elastic Computing Platform	no	no	no	no	no	i
ElasticHosts	no	no	no	no	no	i
Eucalyptus	yes	yes	yes	yes	yes	y
Exoscale	yes	yes	yes	yes	yes	i
Gandi	yes	yes	yes	yes	yes	i
Google Compute Engine	yes	yes	yes	yes	yes	y
GiG G8 Node Provider	yes	yes	yes	yes	yes	i
GoGrid	no	no	no	no	no	i
Gridscale	yes	yes	yes	yes	yes	y
HostVirtual	no	no	no	no	no	i
Ikoula	yes	yes	yes	yes	yes	i
Indosat	no	no	no	no	no	i
InternetSolutions	no	no	no	no	no	i
Joyent	no	no	no	no	no	i
Kamatera	no	no	no	no	no	i
Kili Public Cloud	yes	yes	yes	yes	yes	y
KTUCloud	yes	yes	yes	yes	yes	i
kubevirt	yes	yes	yes	yes	yes	i
Libvirt	no	no	no	no	no	i
Linode	no	no	yes	no	no	i
Maxihost	no	no	no	no	no	i
MedOne	no	no	no	no	no	i
NephoScale	no	no	no	no	no	i
Nimbus	yes	yes	yes	yes	yes	y
NTTAmerica	no	no	no	no	no	i
NTTC-CIS	no	no	no	no	no	i
OnApp	no	no	no	no	no	i
1and1	no	no	no	no	no	i
OpenNebula (v3.8)	yes	yes	yes	yes	yes	i
OpenStack	yes	yes	yes	yes	yes	i
Outscale INC	yes	yes	yes	yes	yes	y
Outscale SAS	yes	yes	yes	yes	yes	y
Ovh	yes	yes	yes	yes	yes	y
Packet	yes	yes	yes	yes	yes	y
ProfitBricks	yes	yes	yes	yes	yes	y
Rackspace Cloud (Next Gen)	yes	yes	yes	yes	yes	y
Rackspace Cloud (First Gen)	yes	yes	yes	yes	yes	i
RimuHosting	no	no	no	no	no	i
Scaleway	yes	yes	yes	no	no	y
ServerLove	no	no	no	no	no	i
skalicloud	no	no	no	no	no	i

Table 3 – continued from previous page

Provider	list volumes	create volume	destroy volume	attach volume	detach volume	l
SoftLayer	no	no	no	no	no	
vCloud	no	no	no	no	no	
Upcloud	no	no	no	no	no	
VCL	no	no	no	no	no	
vCloud	no	no	no	no	no	
Voxel VoxCLOUD	no	no	no	no	no	
vps.net	no	no	no	no	no	
Vultr	no	no	no	no	no	

Supported Methods (Key pair management)

Provider	list key pairs	get key pair	create key pair	import public key from string	import
Abiquo	no	no	no	no	no
Aliyun ECS	no	no	no	no	no
PCextreme AuroraCompute	yes	yes	yes	yes	no
Azure Virtual machines	no	no	no	no	no
Azure Virtual machines	no	no	no	no	no
Bluebox Blocks	no	no	no	no	no
Brightbox	no	no	no	no	no
BSNL	no	no	no	no	no
Cloudscale	no	no	no	no	no
CloudSigma (API v2.0)	no	no	no	no	no
CloudStack	yes	yes	yes	yes	no
Cloudwatt	yes	yes	yes	yes	no
DigitalOcean	yes	yes	yes	no	no
DimensionData	no	no	no	no	no
Amazon EC2	yes	yes	yes	yes	no
Enomaly Elastic Computing Platform	no	no	no	no	no
ElasticHosts	no	no	no	no	no
Eucalyptus	yes	yes	yes	yes	no
Exoscale	yes	yes	yes	yes	no
Gandi	yes	yes	no	yes	no
Google Compute Engine	no	no	no	no	no
GiG G8 Node Provider	no	no	no	no	no
GoGrid	no	no	no	no	no
Gridscale	yes	no	no	yes	no
HostVirtual	no	no	no	no	no
Ikoula	yes	yes	yes	yes	no
Indosat	no	no	no	no	no
InternetSolutions	no	no	no	no	no
Joyent	no	no	no	no	no
Kamatera	no	no	no	no	no
Kili Public Cloud	yes	yes	yes	yes	no
KTUCloud	yes	yes	yes	yes	no
kubevirt	no	no	no	no	no
Libvirt	no	no	no	no	no
Linode	no	no	no	no	no
Maxihost	yes	no	yes	no	no

Table 4 – continued from previous page

Provider	list key pairs	get key pair	create key pair	import public key from string	import
MedOne	no	no	no	no	no
NephoScale	no	no	no	no	no
Nimbus	yes	yes	yes	yes	no
NTTAmerica	no	no	no	no	no
NTTC-CIS	no	no	no	no	no
OnApp	yes	yes	no	yes	no
1and1	no	no	no	no	no
OpenNebula (v3.8)	no	no	no	no	no
OpenStack	no	no	no	no	no
Outscale INC	yes	yes	yes	yes	no
Outscale SAS	yes	yes	yes	yes	no
Ovh	yes	yes	no	yes	no
Packet	yes	no	yes	no	no
ProfitBricks	no	no	no	no	no
Rackspace Cloud (Next Gen)	yes	yes	yes	yes	no
Rackspace Cloud (First Gen)	no	no	no	no	no
RimuHosting	no	no	no	no	no
Scaleway	yes	no	no	yes	no
ServerLove	no	no	no	no	no
skalicloud	no	no	no	no	no
SoftLayer	yes	yes	yes	yes	no
vCloud	no	no	no	no	no
Upcloud	no	no	no	no	no
VCL	no	no	no	no	no
vCloud	no	no	no	no	no
Voxel VoxCLOUD	no	no	no	no	no
vps.net	no	no	no	no	no
Vultr	yes	no	yes	no	no

Load Balancer

Provider Matrix

Provider	Documenta-tion	Provider Constant	Supported Regions	Module	Class Name
Amazon Application Load Balancing		ALB	single region driver	`libcloud. loadbalancer.drivers. alb`	`ApplicationLBDriver`
Aliyun Server Load Balancer		ALIYUN_SLB	single region driver	`libcloud. loadbalancer.drivers. slb`	`SLBDriver`
Brightbox		BRIGHT-BOX	single region driver	`libcloud. loadbalancer.drivers. brightbox`	`BrightboxLBDriver`
CloudStack		CLOUD-STACK	single region driver	`libcloud. loadbalancer.drivers. cloudstack`	`CloudStackLBDriver`
Dimension Data Load Balancer	Click	DIMEN-SION-DATA	single region driver	`libcloud. loadbalancer.drivers. dimensiondata`	`DimensionDataLBDriver`
Amazon Elastic Load Balancing	Click	ELB	single region driver	`libcloud. loadbalancer.drivers. elb`	`ElasticLBDriver`
Google Compute Engine Load Balancer	Click	GCE	single region driver	`libcloud. loadbalancer.drivers. gce`	`GCELBDriver`
GoGrid LB		GOGRID	single region driver	`libcloud. loadbalancer.drivers. gogrid`	`GoGridLBDriver`
Ninefold LB		NINE-FOLD	single region driver	`libcloud. loadbalancer.drivers. ninefold`	`NinefoldLBDriver`
NTTC-CIS Load Balancer	Click	NTTCIS	single region driver	`libcloud. loadbalancer.drivers. nttcis`	`NttCisLBDriver`
Rackspace LB		RACKSPACE	dfw, hkg, iad, lon, ord, syd	`libcloud. loadbalancer.drivers. rackspace`	`RackspaceLBDriver`
Softlayer Load Balancing		SOFT-LAYER	single region driver	`libcloud. loadbalancer.drivers. softlayer`	`SoftlayerLBDriver`

Supported Methods

Provider	create balancer	list balancers	list members	attach member	detach member	attach compute node
Amazon Application Load Balancing	yes	yes	no	no	no	no
Aliyun Server Load Balancer	yes	yes	yes	yes	yes	yes
Brightbox	yes	yes	yes	yes	yes	yes
CloudStack	yes	yes	yes	yes	yes	no
Dimension Data Load Balancer	yes	yes	yes	yes	yes	no
Amazon Elastic Load Balancing	yes	yes	yes	no	yes	yes
Google Compute Engine Load Balancer	yes	yes	yes	yes	yes	yes
GoGrid LB	yes	yes	yes	yes	yes	no
Ninefold LB	yes	yes	yes	yes	yes	no
NTTC-CIS Load Balancer	yes	yes	yes	yes	yes	no
Rackspace LB	yes	yes	yes	yes	yes	no
Softlayer Load Balancing	no	yes	yes	yes	yes	no

Object Storage

Provider Matrix

Provider Documentation		Provider Constant	Supported Regions	Module	Class Name
Aliyun OSS		ALIYUN_OSS	single region driver	libcloud.storage.drivers.oss	OSSStorageDriver
PCextreme AuroraObjects	Click	AURORAOBJECTS	single region driver	libcloud.storage.drivers.auroraobjects	AuroraObjectsStorage
Microsoft Azure (blobs)	Click	AZURE_BLOBS	single region driver	libcloud.storage.drivers.azure_blobs	AzureBlobsStorageDri
Backblaze B2	Click	BACKBLAZE_B2	single region driver	libcloud.storage.drivers.backblaze_b2	BackblazeB2StorageDr
CloudFiles		CLOUDFILES	dfw, hkg, iad, lon, ord, syd	libcloud.storage.drivers.cloudfiles	CloudFilesStorageDri
DigitalOcean Spaces	Click	DIGITALOCEAN_SPACES	single region driver	libcloud.storage.drivers.digitalocean_spaces	DigitalOceanSpacesSt
Google Cloud Storage	Click	GOOGLE_STORAGE	single region driver	libcloud.storage.drivers.google_storage	GoogleStorageDriver
KTUCloud Storage		KTUCLOUD	dfw, hkg, iad, lon, ord, syd	libcloud.storage.drivers.ktucloud	KTUCloudStorageDrive
Local Storage		LOCAL	single region driver	libcloud.storage.drivers.local	LocalStorageDriver
Nimbus.io		NIMBUS	single region driver	libcloud.storage.drivers.nimbus	NimbusStorageDriver
Ninefold		NINEFOLD	single region driver	libcloud.storage.drivers.ninefold	NinefoldStorageDrive
OpenStack Swift	Click	OPENSTACK_SWIFT	dfw, hkg, iad, lon, ord, syd	libcloud.storage.drivers.cloudfiles	OpenStackSwiftStorag
Amazon	Click	S3	ap-northeast-1, ap-northeast-2, ap-northeast-3, ap-south-1, ap-southeast-1, ap-southeast-2, ca-central-1, cn-north-1, cn-	libcloud.storage.	S3StorageDriver

Supported Methods (Main)

Provider	list containers	list objects	create container	delete container	upload object	streamin
Aliyun OSS	yes	yes	yes	yes	yes	yes
PCextreme AuroraObjects	yes	yes	yes	yes	yes	yes
Microsoft Azure (blobs)	yes	yes	yes	yes	yes	yes
Backblaze B2	yes	yes	yes	yes	yes	yes
CloudFiles	yes	yes	yes	yes	yes	yes
DigitalOcean Spaces	yes	yes	yes	yes	yes	yes
Google Cloud Storage	yes	yes	yes	yes	yes	yes
KTUCloud Storage	yes	yes	yes	yes	yes	yes
Local Storage	yes	yes	yes	yes	yes	yes
Nimbus.io	yes	no	yes	no	no	no
Ninefold	yes	yes	yes	yes	yes	yes
OpenStack Swift	yes	yes	yes	yes	yes	yes
Amazon S3	yes	yes	yes	yes	yes	yes
Amazon S3 (ap-northeast-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (ap-northeast-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (ap-northeast-2)	yes	yes	yes	yes	yes	yes
Amazon S3 (ap-south-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (ap-southeast-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (ap-southeast-2)	yes	yes	yes	yes	yes	yes
Amazon S3 (ca-central-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (cn-north-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (cn-northwest-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (eu-central-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (eu-north-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (eu-west-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (eu-west-2)	yes	yes	yes	yes	yes	yes
Ceph RGW	yes	yes	yes	yes	yes	yes
RGW Outscale	yes	yes	yes	yes	yes	yes
Amazon S3 (sa-east-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (us-east-2)	yes	yes	yes	yes	yes	yes
Amazon S3 (us-gov-west-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (us-west-1)	yes	yes	yes	yes	yes	yes
Amazon S3 (us-west-2)	yes	yes	yes	yes	yes	yes

Supported Methods (CDN)

Provider	enable container cdn	enable object cdn	get container cdn URL	get object cdn URL
Aliyun OSS	no	no	no	no
PCextreme AuroraObjects	yes	yes	yes	yes
Microsoft Azure (blobs)	no	no	no	yes
Backblaze B2	no	no	no	no
CloudFiles	yes	no	yes	yes
DigitalOcean Spaces	no	no	no	no
Google Cloud Storage	no	no	no	no
KTUCloud Storage	yes	no	yes	yes
Local Storage	yes	yes	yes	yes

Table 6 – continued from previous page

Provider	enable container cdn	enable object cdn	get container cdn URL	get object cdn URL
Nimbus.io	no	no	no	no
Ninefold	no	yes	no	yes
OpenStack Swift	yes	no	yes	yes
Amazon S3	no	no	no	yes
Amazon S3 (ap-northeast-1)	no	no	no	yes
Amazon S3 (ap-northeast-1)	no	no	no	yes
Amazon S3 (ap-northeast-2)	no	no	no	yes
Amazon S3 (ap-south-1)	no	no	no	yes
Amazon S3 (ap-southeast-1)	no	no	no	yes
Amazon S3 (ap-southeast-2)	no	no	no	yes
Amazon S3 (ca-central-1)	no	no	no	yes
Amazon S3 (cn-north-1)	no	no	no	yes
Amazon S3 (cn-northwest-1)	no	no	no	yes
Amazon S3 (eu-central-1)	no	no	no	yes
Amazon S3 (eu-north-1)	no	no	no	yes
Amazon S3 (eu-west-1)	no	no	no	yes
Amazon S3 (eu-west-2)	no	no	no	yes
Ceph RGW	no	no	no	no
RGW Outscale	no	no	no	no
Amazon S3 (sa-east-1)	no	no	no	yes
Amazon S3 (us-east-2)	no	no	no	yes
Amazon S3 (us-gov-west-1)	no	no	no	yes
Amazon S3 (us-west-1)	no	no	no	yes
Amazon S3 (us-west-2)	no	no	no	yes

Container

Provider Matrix

Provider	Documentation	Provider Constant	Supported Regions	Module	Class Name
Docker	Click	DOCKER	single region driver	`libcloud.container. drivers.docker`	`DockerContainerDriver`
Amazon Elastic Container Service	Click	ECS	single region driver	`libcloud.container. drivers.ecs`	`ElasticContainerDriver`
Google Container Engine	Click	GKE	single region driver	`libcloud.container. drivers.gke`	`GKEContainerDriver`
Joyent Triton	Click	JOYENT	single region driver	`libcloud.container. drivers.joyent`	`JoyentContainerDriver`
Kubernetes	Click	KUBERNETES	single region driver	`libcloud.container. drivers.kubernetes`	`KubernetesContainerDriver`
LXD		LXD	single region driver	`libcloud.container. drivers.lxd`	`LXDContainerDriver`
Rancher	Click	RANCHER	single region driver	`libcloud.container. drivers.rancher`	`RancherContainerDriver`

Supported Methods

Provider	install image	list images	deploy container	get container	start container	stop container	restart container	destroy container	list containers	list locations	create cluster	destroy cluster	list clusters
Docker	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
Amazon Elastic Container Service	no	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes
Google Container Engine	no	no	yes	yes	no	no	no	yes	yes	no	yes	yes	yes
Joyent Triton	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
Kubernetes	no	no	yes	yes	no	no	no	yes	yes	no	yes	yes	yes
LXD	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
Rancher	no	no	yes	yes	yes	yes	no	yes	yes	no	no	no	no

Backup

Provider Matrix

Provider	Documenta-tion	Provider Constant	Supported Regions	Module	Class Name
Dimension Data Backup	Click	DIMEN-SION-DATA	single region driver	`libcloud.backup.drivers.dimensiondata`	`DimensionDataBackupDriver`
Amazon EBS Backup Driver		EBS	single region driver	`libcloud.backup.drivers.ebs`	`EBSBackupDriver`
Google Compute Engine Backup Driver		GCE	single region driver	`libcloud.backup.drivers.gce`	`GCEBackupDriver`

Supported Methods

Provider	get supported target types	list targets	create target	create target from node	create target from storage container	update target	delete target	list recovery points	recover target	recover target out of place	list target jobs	create target job	resume target job	suspend target job	cancel target job
Dimension Data Backup	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Amazon EBS Backup Driver	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Google Compute Engine Backup Driver	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

DNS

Provider Matrix

Provider	Documentation	Provider Constant	Supported Regions	Module	Class Name
AuroraDNS	Click	AURORADNS	single region driver	`libcloud.dns.drivers.auroradns`	`AuroraDNSDriver`
BuddyNS DNS	Click	BUDDYNS	single region driver	`libcloud.dns.drivers.buddyns`	`BuddyNSDNSDriver`
CloudFlare DNS	Click	CLOUDFLARE	single region driver	`libcloud.dns.drivers.cloudflare`	`CloudFlareDNSDriver`
DigitalOcean	Click	DIGITAL_OCEAN	single region driver	`libcloud.dns.drivers.digitalocean`	`DigitalOceanDNSDriver`
DNSimple	Click	DNSIMPLE	single region driver	`libcloud.dns.drivers.dnsimple`	`DNSimpleDNSDriver`
DurableDNS	Click	DURABLEDNS	single region driver	`libcloud.dns.drivers.durabledns`	`DurableDNSDriver`
Gandi DNS		GANDI	single region driver	`libcloud.dns.drivers.gandi`	`GandiDNSDriver`
Gandi LiveDNS		GANDI_LIVE	single region driver	`libcloud.dns.drivers.gandi_live`	`GandiLiveDNSDriver`
GoDaddy DNS	Click	GODADDY	single region driver	`libcloud.dns.drivers.godaddy`	`GoDaddyDNSDriver`
Google DNS	Click	GOOGLE	single region driver	`libcloud.dns.drivers.google`	`GoogleDNSDriver`
Host Virtual DNS	Click	HOSTVIRTUAL	single region driver	`libcloud.dns.drivers.hostvirtual`	`HostVirtualDNSDriver`
Linode DNS		LINODE	single region driver	`libcloud.dns.drivers.linode`	`LinodeDNSDriver`
Liquidweb DNS	Click	LIQUIDWEB	single region driver	`libcloud.dns.drivers.liquidweb`	`LiquidWebDNSDriver`
Luadns	Click	LUADNS	single region driver	`libcloud.dns.drivers.luadns`	`LuadnsDNSDriver`
NFSN DNS	Click	NFSN	single region driver	`libcloud.dns.drivers.nfsn`	`NFSNDNSDriver`
NS1 DNS		NSONE	single region driver	`libcloud.dns.drivers.nsone`	`NsOneDNSDriver`
OnApp	Click	ONAPP	single region driver	`libcloud.dns.drivers.onapp`	`OnAppDNSDriver`
Point DNS	Click	POINTDNS	single region driver	`libcloud.dns.drivers.pointdns`	`PointDNSDriver`
PowerDNS	Click	POWERDNS	single region driver	`libcloud.dns.drivers.powerdns`	`PowerDNSDriver`
Rackspace DNS		RACKSPACE	uk, us	`libcloud.dns.drivers.rackspace`	`RackspaceDNSDriver`
RcodeZero DNS	Click	RCODEZERO	single region driver	`libcloud.dns.drivers.rcodezero`	`RcodeZeroDNSDriver`
Route53 DNS		ROUTE53	single region driver	`libcloud.dns.drivers.route53`	`Route53DNSDriver`
Softlayer DNS		SOFTLAYER	single region driver	`libcloud.dns.drivers.softlayer`	`SoftLayerDNSDriver`
Vultr DNS	Click	VULTR	single region driver	`libcloud.dns.drivers.vultr`	`VultrDNSDriver`
World Wide DNS	Click	WORLDWIDEDNS	single region driver	`libcloud.dns.drivers.worldwidedns`	`WorldWideDNSDriver`
Zerigo DNS		ZERIGO	single region driver	`libcloud.dns.drivers.zerigo`	`ZerigoDNSDriver`

Supported Methods

Provider	list zones	list records	create zone	update zone	create record	update record	delete zone	delete record
AuroraDNS	yes	yes	yes	no	yes	yes	yes	yes
BuddyNS DNS	yes	no	yes	no	no	no	yes	no
CloudFlare DNS	yes	yes	yes	yes	yes	yes	yes	yes
DigitalO-cean	yes	yes	yes	no	yes	yes	yes	yes
DNSimple	yes	yes	yes	no	yes	yes	yes	yes
DurableDNS	yes	yes	yes	yes	yes	yes	yes	yes
Gandi DNS	yes	yes	yes	yes	yes	yes	yes	yes
Gandi LiveDNS	yes	yes	yes	no	yes	yes	no	yes
GoDaddy DNS	yes	yes	no	no	yes	yes	yes	no
Google DNS	yes	yes	yes	no	yes	no	yes	yes
Host Virtual DNS	yes	yes	yes	yes	yes	yes	yes	yes
Linode DNS	yes	yes	yes	yes	yes	yes	yes	yes
Liquidweb DNS	yes	yes	yes	no	yes	yes	yes	yes
Luadns	yes	yes	yes	no	yes	no	yes	yes
NFSN DNS	no	yes	no	no	yes	no	no	yes
NS1 DNS	yes	yes	yes	no	yes	yes	yes	yes
OnApp	yes	yes	yes	no	yes	yes	yes	yes
Point DNS	yes	yes	yes	yes	yes	yes	yes	yes
PowerDNS	yes	yes	yes	no	yes	yes	yes	yes
Rackspace DNS	yes	yes	yes	yes	yes	yes	yes	yes
RcodeZero DNS	yes	yes	yes	yes	yes	yes	yes	yes
Route53 DNS	yes	yes	yes	no	yes	yes	yes	yes
Softlayer DNS	yes	yes	yes	no	yes	yes	yes	yes
Vultr DNS	yes	yes	yes	no	yes	no	yes	yes
World Wide DNS	yes	yes	yes	yes	yes	yes	yes	yes
Zerigo DNS	yes	yes	yes	yes	yes	yes	yes	yes
Zonomi DNS	yes	yes	yes	no	yes	no	yes	yes

1.1.3 Supported Python Versions

Currently Supported Python Versions

Libcloud from v3.0.0 and above supports CPython 3.5, 3.6, 3.7, 3.8 and PyPy 3.

Those are also the versions we continuously run our tests with on Travis CI (https://travis-ci.org/apache/libcloud).

Python 2.7 and Python 3.4

Support for CPython 2.7, CPython 3.4 and PyPy 2 was dropped in Libcloud v3.0.0.

If you still need to use Libcloud with one of those versions, you can use Libcloud v2.8.0 which is the last release which supports those Python versions.

Older Python Versions

Support for Python 2.4 has been dropped in Libcloud 0.4.0, Python 2.5 in 2016 and Python 2.6 and 3.3 in Libcloud 2.3.0 in 2018.

Keep in mind that those Libcloud versions are now very old and out of date and shouldn't be used.

1.1.4 Third Party Drivers

Libcloud includes most of the drivers in its core, but some providers and developers for various reasons decide to release their driver as a separate PyPi package.

This page lists those third party drivers. For documentation and usage examples, please refer to the third party driver documentation (if available).

Keep in mind that those drivers are not part of the core and such we can't guarantee the quality of those drivers.

Compute

Provider	PyPi package	Source code
StratusLab	stratuslab-libcloud-drivers	StratusLab/libcloud-drivers
Snooze		msimonin/snooze-libcloud

DNS

Provider	PyPi package	Source code
DNSMadeEasy	libcloud-dnsmadeeasy	moses-palmer/libcloud-dnsmadeeasy

1.1.5 Compute

The compute component of `libcloud` allows you to manage cloud and virtual servers offered by different providers, more than 20 in total.

In addition to managing the servers this component also allows you to run deployment scripts on newly created servers. Deployment or "bootstrap" scripts allow you to execute arbitrary shell commands. This functionality is usually used to prepare your freshly created server, install your SSH key, and run a configuration management tool (such as Puppet, Chef, or cfengine) on it.

Besides managing cloud and virtual servers, compute component also allows you to manage cloud block storage (not to be confused with cloud object storage) for providers which support it. Block storage management lives under compute API, because it is in most cases tightly coupled with compute resources.

Terminology

Compute

- `Node` - represents a cloud or virtual server.
- `NodeSize` - represents node hardware configuration. Usually this is amount of the available RAM, bandwidth, CPU speed and disk size. Most of the drivers also expose an hourly price (in dollars) for the Node of this size.
- `NodeImage` - represents an operating system image.
- `NodeLocation` - represents a physical location where a server can be.
- `NodeState` - represents a node state. Standard states are: `running`, `rebooting`, `terminated`, `pending`, `stopped`, `suspended`, `paused`, `erro`, `unknown`.

Key Pair Management

- `KeyPair` - represents an SSH key pair object.

Block Storage

- `StorageVolume` - represents a block storage volume
- `VolumeSnapshot` - represents a point in time snapshot of a StorageVolume

Supported Providers

For a list of supported providers see supported providers page.

Pricing

For majority of the compute providers Libcloud provides estimated pricing information which tells users how much it costs per hour to run a `Node` with a specific `NodeSize`.

For more information, please see the pricing page.

Deployment

Libcloud provides deployment functionality which makes bootstrapping a server easier. It allows you to create a server and run shell commands on it once the server has been created.

For more information and examples, please see the deployment page.

SSH key pair management

Compute API also allows you to manage your SSH key pairs.

For more information and examples, please see the key pair management page.

Examples

We have examples of several common patterns.

API Reference

For a full reference of all the classes and methods exposed by the compute API, see this page.

1.1.6 Object Storage

Note: Object Storage API is available in Libcloud 0.5.0 and higher.

Storage API allows you to manage cloud object storage (not to be confused with cloud block storage) and services such as Amazon S3, Rackspace CloudFiles, Google Storage and others.

Besides managing cloud object storage, storage component also exposes simple CDN management functionality.

Terminology

- `Container` - represents a container which can contain multiple objects. You can think of it as a folder on a file system. Difference between container and a folder on file system is that containers cannot be nested. Some APIs and providers (e.g. AWS) refer to it as a Bucket.
- `Object` - represents an object or so called BLOB.

Supported Providers

For a list of supported providers see supported providers page.

Examples

We have examples of several common patterns.

API Reference

For a full reference of all the classes and methods exposed by the storage API, see this page.

1.1.7 Load Balancer

Note: Load Balancer API is available in Libcloud 0.5.0 and higher.

Load Balancer API allows you to manage Load Balancers as a service and services such as Rackspace Cloud Load Balancers, GoGrid Load Balancers and Ninefold Load Balancers.

Terminology

- `LoadBalancer` - represents a load balancer instance.
- `Member` - represents a load balancer member.
- `Algorithm` - represents a load balancing algorithm (round-robin, random, least connections, etc.).

Supported Providers

For a list of supported providers see supported providers page.

Examples

We have examples of several common patterns.

API Reference

For a full reference of all the classes and methods exposed by the loadbalancer API, see this page.

1.1.8 DNS

Note: DNS API is available in Libcloud 0.6.0 and higher.

DNS API allows you to manage DNS as A Service and services such as Zerigo DNS, Rackspace Cloud DNS and others.

Terminology

- `Zone` - Represents a DNS zone or so called domain.
- `Record` - Represents a DNS record. Each record belongs to a Zone and has a `type` and `data` attribute. Value of the `data` attribute depends on the record type. Some record types also require user to associate additional attributes with them. Those additional attributes are stored in the `extra` attribute (dictionary) on the record object. An example include `MX` and `SRV` record type which also contains a priority.
- `RecordType` - Represents a DNS record type (A, AAAA, MX, TXT, SRV, PTR, NS, etc.)
- **Zone Type** - Each zone has a `type` attribute. This attribute represents a zone type. Type can either be `master` (also called primary) or `slave` (also called secondary).

Supported Providers

For a list of supported providers see supported providers page.

Examples

We have examples of several common patterns.

API Reference

For a full reference of all the classes and methods exposed by the DNS API, see this page.

1.1.9 Container

Note: Container API is available in Libcloud 1.0.0-pre1 and higher.

Note: Container API is currently in an EXPERIMENTAL state.

Container API allows users to install and deploy containers onto container based virtualization platforms. This is designed to target both on-premise installations of software like Docker as well as interfacing with Cloud Service Providers that offer Container-as-a-Service APIs.

For a working example of the container driver with cluster support, see the example for Amazon's Elastic Container Service:

```python
from libcloud.container.base import ContainerImage
from libcloud.container.types import Provider
from libcloud.container.providers import get_driver

cls = get_driver(Provider.ECS)

conn = cls(access_id='SDHFISJDIFJSIDFJ',
           secret='THIS_IS)+_MY_SECRET_KEY+I6TVkv68o4H',
           region='ap-southeast-2')

for cluster in conn.list_clusters():
    print(cluster.name)
    if cluster.name == 'default':
        container = conn.deploy_container(
            cluster=cluster,
            name='my-simple-app',
            image=ContainerImage(
                id=None,
                name='simple-app',
                path='simple-app',
                version=None,
                driver=conn
            )
        )
```

For an example of the simple container support, see the Docker example:

```python
from libcloud.container.types import Provider
from libcloud.container.providers import get_driver

cls = get_driver(Provider.DOCKER)

driver = cls(host='https://198.61.239.128', port=4243,
             key_file='key.pem', cert_file='cert.pem')
```

```
image = driver.install_image('tomcat:8.0')
container = driver.deploy_container('tomcat', image)
```

Drivers

Container-as-a-Service providers will implement the *ContainerDriver* class to provide functionality for :

- Listing deployed containers
- Starting, stopping and restarting containers (where supported)
- Destroying containers
- Creating/deploying containers
- Listing container images
- Installing container images (pulling an image from a local copy or remote repository)

Driver base API documentation is found here:

- `ContainerDriver` - A driver for interfacing to a container provider

Simple Container Support

- `ContainerImage` - Represents an image that can be deployed, like an application or an operating system
- `Container` - Represents a deployed container image running on a container host

Cluster Suppport

Cluster support extends on the basic driver functions, but where drivers implement the class-level attribute *supports_clusters* as True clusters may be listed, created and destroyed. When containers are deployed, the target cluster can be specified.

- `ContainerCluster` - Represents a deployed container image running on a container host
- `ClusterLocation` - Represents a location for clusters to be deployed

Bootstrapping Docker with Compute Drivers

The compute and container drivers can be combined using the deployment feature of the compute driver to bootstrap an installation of a container virtualization provider like Docker. Then using the Container driver, you can connect to that API and install images and deploy containers.

Supported Providers

For a list of supported providers see supported providers page.

Examples

We have examples of several common patterns.

API Reference

For a full reference of all the classes and methods exposed by the Container API, see this page.

Utility Classes

There are some utility classes for example, a Docker Hub API client for fetching images and iterating through repositories see this page.

1.1.10 Backup

Note: Backup API is available in Libcloud 1.0.0-pre1 and higher.

Note: This driver is **experimental** - please use to test functionality and develop new driver instances, not for production use.

Backup API allows you to manage Backup as A Service and services such as EBS Snaps, GCE volume snap and dimension data backup.

Terminology

- `BackupTarget` - Represents a backup target, like a Virtual Machine, a folder or a database.
- `BackupTargetRecoveryPoint` - Represents a copy of the data in the target, a recovery point can be recovered to a backup target. An inplace restore is where you recover to the same target and an out-of-place restore is where you recover to another target.
- `BackupTargetJob` - Represents a backup job running on backup target.

Supported Providers

For a list of supported providers see supported providers page.

Examples

We have examples of several common patterns.

API Reference

For a full reference of all the classes and methods exposed by the Backup API, see this page.

1.1.11 Troubleshooting

This page contains various tips which can help you troubleshoot and debug code with interfaces with libcloud.

Debugging

Note: If you are sharing debug output on any public medium such as our IRC channel or an issue tracker using Pastebin, Github Gists or a similar service, make sure to remove your credentials and any other data you consider private from the output.

Libcloud has a special debug mode which when enabled, logs all the outgoing HTTP requests and all the incoming HTTP responses. Output also includes cURL commands which can be used to re-produce the requests.

When this mode is enabled and `paramiko` library is installed (used for deployment), paramiko library log level is set to `DEBUG` which helps with debugging the deployment related issues.

To make the debugging easier, Libcloud will also automatically decompress the response body (if compressed) before logging it.

To enable it, set `LIBCLOUD_DEBUG` environment variable and make it point to a file where the debug output should be saved.

If the API returns JSON or XML in the response body which is not human friendly, you can also set `LIBCLOUD_DEBUG_PRETTY_PRINT_RESPONSE` environment variable which will cause the JSON or XML to be beautified / formated so it's easier for humans to read it. Keep in mind that this only works for non-chunked responses.

Example 1 - Logging output to standard error

Note: Some Linux distributions don't allow /dev/{stderr,stdout} to be opened in append mode which means paramiko logger will return and error that it can't log to that file. In such scenario, it's recommended you specify actual file path and then you can use "tail -F" in another terminal window to view the output in real-time.

If you want the output to be logged to the standard error (on Linux) you can set it to `/dev/stderr`:

```
LIBCLOUD_DEBUG=/dev/stderr python my_script.py
```

Example output:

```
# -------- begin 4431824872 request ----------
curl -i -X GET -H 'Host: s3.amazonaws.com' -H 'X-LC-Request-ID: 4431824872' -H
→'Content-Length: 0' -H 'User-Agent: libcloud/0.6.0-beta1 (Amazon S3 (standard))'
→'https://s3.amazonaws.com:443/?AWSAccessKeyId=foo&Signature=bar'
# -------- begin 4431824872:4431825232 response ----------
HTTP/1.1 200 OK
X-Amz-Id-2: 1234
Server: AmazonS3
Transfer-Encoding: chunked
X-Amz-Request-Id: FFFFFFFFFF
Date: Tue, 01 Nov 2011 22:29:11 GMT
Content-Type: application/xml

171
<?xml version="1.0" encoding="UTF-8"?>
<ListAllMyBucketsResult xmlns="http://s3.amazonaws.com/doc/2006-03-01/"><Owner><ID>
→sada8932dsa8d30i</ID><DisplayName>kami</DisplayName></Owner><Buckets><Bucket><Name>
→test34324323</Name><CreationDate>2011-11-01T22:17:23.000Z</CreationDate></Bucket></
→Buckets></ListAllMyBucketsResult>
```

```
0

# -------- end 4431824872:4431825232 response ---------
```

Example 2 - Making JSON / XML response human friendly

Non-formatted JSON response:

```
LIBCLOUD_DEBUG=/dev/stderr python my_script.py
```

```
# -------- begin 23125648:23160304 response ---------
HTTP/1.1 200 OK
Content-Length: 1572
X-Compute-Request-Id: req-79ab42d8-a959-44eb-8dec-bc9458b2f4b3
Server: nginx/1.4.7
Connection: keep-alive
Date: Sat, 06 Sep 2014 14:13:37 GMT
Content-Type: application/json

{"servers": [{"status": "ACTIVE", "updated": "2014-09-06T14:13:32Z", "hostId":
→"561d56de25c177c422278d7ca5f8b210118348040b12afbad06f278a", "addresses": {"internet-
→routable": [{"OS-EXT-IPS-MAC:mac_addr": "fa:16:3e:3f:c0:a1", "version": 4, "addr":
→"10.100.100.101", "OS-EXT-IPS:type": "fixed"}]}, "links": [{"href": "http://nova/v2/
→d3b31ebfd32744d19d848f3e9c351869/servers/deb35f96-be41-431e-b931-6e615ec720f4", "rel
→": "self"}, {"href": "http://nova/d3b31ebfd32744d19d848f3e9c351869/servers/deb35f96-
→be41-431e-b931-6e615ec720f4", "rel": "bookmark"}], "key_name": null, "image": {"id
→": "e9537ddd-6579-4473-9898-d211ab90f6d3", "links": [{"href": "http://nova/
→d3b31ebfd32744d19d848f3e9c351869/images/e9537ddd-6579-4473-9898-d211ab90f6d3", "rel
→": "bookmark"}]}, "OS-EXT-STS:task_state": null, "OS-EXT-STS:vm_state": "active",
→"OS-SRV-USG:launched_at": "2014-09-06T14:13:32.000000", "flavor": {"id": "90c2a137-
→611b-4dd2-9d65-d4a0b0858531", "links": [{"href": "http://nova/
→d3b31ebfd32744d19d848f3e9c351869/flavors/90c2a137-611b-4dd2-9d65-d4a0b0858531", "rel
→": "bookmark"}]}, "id": "deb35f96-be41-431e-b931-6e615ec720f4", "security_groups": [
→{"name": "default"}], "OS-SRV-USG:terminated_at": null, "OS-EXT-AZ:availability_zone
→": "nova", "user_id": "06dda7c06aa246c88d7775d02bc119ac", "name": "test lc 2",
→"created": "2014-09-06T14:13:12Z", "tenant_id": "d3b31ebfd32744d19d848f3e9c351869",
→"OS-DCF:diskConfig": "MANUAL", "os-extended-volumes:volumes_attached": [],
→"accessIPv4": "", "accessIPv6": "", "progress": 0, "OS-EXT-STS:power_state": 1,
→"config_drive": "", "metadata": {}}]}
# -------- end 23125648:23160304 response ---------
```

Human friendly formatted JSON response:

```
LIBCLOUD_DEBUG=/dev/stderr LIBCLOUD_DEBUG_PRETTY_PRINT_RESPONSE=1 python my_script.py
```

```
# -------- begin 41102928:41133624 response ---------
HTTP/1.1 200 OK
Content-Length: 1572
X-Compute-Request-Id: req-3ce8b047-55cd-4e20-bfeb-b65619696aec
Server: nginx/1.4.7
Connection: keep-alive
Date: Sat, 06 Sep 2014 14:14:38 GMT
Content-Type: application/json
```

```
{
    "servers": [
        {
            "OS-DCF:diskConfig": "MANUAL",
            "OS-EXT-AZ:availability_zone": "nova",
            "OS-EXT-STS:power_state": 1,
            "OS-EXT-STS:task_state": null,
            "OS-EXT-STS:vm_state": "active",
            "OS-SRV-USG:launched_at": "2014-09-06T14:13:32.000000",
            "OS-SRV-USG:terminated_at": null,
            "accessIPv4": "",
            "accessIPv6": "",
            "addresses": {
                "internet-routable": [
                    {
                        "OS-EXT-IPS-MAC:mac_addr": "fa:16:3e:3f:c0:a1",
                        "OS-EXT-IPS:type": "fixed",
                        "addr": "10.100.100.101",
                        "version": 4
                    }
                ]
            },
            "config_drive": "",
            "created": "2014-09-06T14:13:12Z",
            "flavor": {
                "id": "90c2a137-611b-4dd2-9d65-d4a0b0858531",
                "links": [
                    {
                        "href": "http://nova/d3b31ebfd32744d19d848f3e9c351869/flavors/
→90c2a137-611b-4dd2-9d65-d4a0b0858531",
                        "rel": "bookmark"
                    }
                ]
            },
            "hostId": "561d56de25c177c422278d7ca5f8b210118348040b12afbad06f278a",
            "id": "deb35f96-be41-431e-b931-6e615ec720f4",
            "image": {
                "id": "e9537ddd-6579-4473-9898-d211ab90f6d3",
                "links": [
                    {
                        "href": "http://nova/d3b31ebfd32744d19d848f3e9c351869/images/
→e9537ddd-6579-4473-9898-d211ab90f6d3",
                        "rel": "bookmark"
                    }
                ]
            },
            "key_name": null,
            "links": [
                {
                    "href": "http://nova/v2/d3b31ebfd32744d19d848f3e9c351869/servers/
→deb35f96-be41-431e-b931-6e615ec720f4",
                    "rel": "self"
                },
                {
                    "href": "http://nova/d3b31ebfd32744d19d848f3e9c351869/servers/
→deb35f96-be41-431e-b931-6e615ec720f4",
                    "rel": "bookmark"
```

```
                }
            ],
            "metadata": {},
            "name": "test lc 2",
            "os-extended-volumes:volumes_attached": [],
            "progress": 0,
            "security_groups": [
                {
                    "name": "default"
                }
            ],
            "status": "ACTIVE",
            "tenant_id": "d3b31ebfd32744d19d848f3e9c351869",
            "updated": "2014-09-06T14:13:32Z",
            "user_id": "06dda7c06aa246c88d7775d02bc119ac"
        }
    ]
}
# -------- end 41102928:41133624 response ----------
```

Non-formatted XML response:

```
LIBCLOUD_DEBUG=/dev/stderr python my_script.py
```

```
# -------- begin 33145616:33126160 response ----------
HTTP/1.1 200 OK
X-Amzn-Requestid: e84f62d0-368e-11e4-820b-8bf013dc269e
Date: Sun, 07 Sep 2014 13:00:13 GMT
Content-Length: 457
Content-Type: text/xml

<?xml version="1.0"?>
<ListHostedZonesResponse xmlns="https://route53.amazonaws.com/doc/2012-02-29/">
↪<HostedZones><HostedZone><Id>/hostedzone/Z14L0C73CHH1DN</Id><Name>example1.com.</
↪Name><CallerReference>41747982-568E-0DFC-8C11-71C23757C740</CallerReference><Config>
↪<Comment>test</Comment></Config><ResourceRecordSetCount>9</ResourceRecordSetCount></
↪HostedZone></HostedZones><IsTruncated>false</IsTruncated><MaxItems>100</MaxItems></
↪ListHostedZonesResponse>
# -------- end 33145616:33126160 response ----------
```

Human friendly formatted XML response:

```
LIBCLOUD_DEBUG=/dev/stderr LIBCLOUD_DEBUG_PRETTY_PRINT_RESPONSE=1 python my_script.py
```

```
# -------- begin 19444496:19425040 response ----------
HTTP/1.1 200 OK
X-Amzn-Requestid: 01c02441-368f-11e4-b616-9b9bd7509a8f
Date: Sun, 07 Sep 2014 13:00:56 GMT
Content-Length: 457
Content-Type: text/xml

<?xml version="1.0" ?>
<ListHostedZonesResponse xmlns="https://route53.amazonaws.com/doc/2012-02-29/">
    <HostedZones>
        <HostedZone>
            <Id>/hostedzone/Z14L0C73CHH1DN</Id>
```

```
        <Name>example1.com.</Name>
        <CallerReference>41747982-568E-0DFC-8C11-71C23757C740</CallerReference>
        <Config>
            <Comment>test</Comment>
        </Config>
        <ResourceRecordSetCount>9</ResourceRecordSetCount>
    </HostedZone>
</HostedZones>
<IsTruncated>false</IsTruncated>
<MaxItems>100</MaxItems>
</ListHostedZonesResponse>

# -------- end 19444496:19425040 response ----------
```

1.1.12 API Documentation

For automatically generated API documentation of all the modules, please visit this page.

1.1.13 Frequently Asked Questions (FAQ)

Why are the block storage related management methods located in the compute API?

Block storage related management methods are located in the compute API because in most cases block storage API is tightly coupled with the compute API meaning that you can't manage block storage independent of the compute API.

This also makes sense because in most cases you are only interested in attaching or detaching volumes from and to the compute nodes.

What are the extension methods and arguments?

Libcloud acts as a lowest common denominator and exposes a unified base API which allows you to work with many different cloud providers through a single code base.

Being a lowest common denominator by definition means that not all of the functionality offered by different cloud service providers is available through a base API.

Libcloud solves this problem and allows user to access provider specific functionality through a so called extension methods and arguments. Extension methods and arguments are all the methods and arguments which are prefixed with `ex_`.

Extension methods are there for your convenience, but you should be careful when you use them because they make switching or working with multiple providers harder.

How do I test if provider credentials are valid?

Libcloud makes the whole authentication process transparent to the user. As such, the easiest way to check if provider credentials are valid is by instantiating a driver and calling a method which results in an HTTP call.

If the credentials are valid, method will return a result, otherwise `libcloud.common.types.InvalidCredsError` exception will be thrown.

An example of such method is `libcloud.compute.base.NodeDriver.list_nodes()`. Keep in mind that depending on the account state, list_nodes method might return a lot of data.

If you want to avoid unnecessarily fetching a lot of data, you should find a method specific to your provider which issues a request which results in small amount of data being retrieved.

I want do add a new provider driver what should I do?

For now the best thing to do is to look at an existing driver and test cases for examples.

Libcloud currently supports more than 60 different providers. This means we have a broad range of examples of different APIs and authentication methods. APIs range from simple JSON based REST APIs to SOAP APIs. Authentication methods range from simple shared token and digest auth to HMAC signed requests.

I want to add / propose a new API, what should I do?

We are always open to accepting a now top level API as long as it matches the following criteria:

1. API must be indented to manage an online infrastructure oriented Cloud service
2. Similar service is offered by multiple providers
3. It's possible to build a common API on top of services provided by different services

Libcloud can be used with many different providers and acts as a lowest common denominator which makes the last point most important one. Sometimes it doesn't make sense to build a common Libcloud API even if multiple providers offer a similar service. Usually the case is that the APIs are vastly different and there aren't enough common points which would allow us to build a cross-provider API which would still provide enough value to the end user.

If the API matches the criteria defined above, you should send a proposal to our *mailing list* where we can discuss it further. Ideally, the proposal should also contain a prototype of a driver for at least two different providers. This helps us make sure that the API you have designed is not biased towards a single provider.

How do I obtain Libcloud version?

You can obtain currently active Libcloud version by accessing the `libcloud.__version__` variable.

Example #1 (command line):

```
python -c "import libcloud ; print libcloud.__version__"
```

Example #2 (code):

```
import libcloud
libcloud.__version__
```

1.1.14 Changes in Apache Libcloud v2.0

Replacement of httplib with *requests*

Apache Libcloud supports Python 2.6, 2.7 - 3.3 and beyond. To achieve this a package was written within the Libcloud library to create a generic HTTP client for Python 2 and 3. This package has a custom implementation of a certificate store, searching and TLS preference configuration. One of the first errors to greet new users of Libcloud would be "No CA Certificates were found in CA_CERTS_PATH."...

In 2.0 this implementation has been replaced with the *requests* package, and SSL verification should work against any publicly signed HTTPS endpoint by default, without having to provide a CA cert store.

Other changes include:

- Enabling HTTP redirects

- Allowing both global and driver-specific HTTP proxy configuration

- Consolidation of the LibcloudHTTPSConnection and LibcloudHTTPConnection into a single class, Libcloud-Connection

- Support for streaming responses

- Support for mocking HTTP responses without having to mock the Connection class

- 10% typical performance improvement with the use of persistent TCP connections for each driver instance

- Access to the low-level TCP session is no longer available. Access to .read() on a raw connection will bind around *requests* body or iter_content methods.

- Temporary removal of the S3 very-large file support using the custom multi-part APIs. This will be added back in subsequent release candidates.

Allow redirects is enabled by default

HTTP redirects are allowed by default in 2.0. To disable redirects, set this global variable to False.

```python
import libcloud.http
libcloud.http.ALLOW_REDIRECTS = False
```

HTTP/HTTPS Proxies

Enabling a HTTP/HTTPS proxy is still supported and accessed via the driver's connection property or via the 'http_proxy' environment variable. Applying it to a driver will set the proxy for that driver only, using the environment variable will make a global change.

```python
# option 1
import os
os.environ.get('http_proxy', 'http://localhost:8888/')

# option 2
driver.connection.connection.set_http_proxy(proxy_url='http://localhost:8888')
```

Adding support for Python 3.6 and deprecation of Python 3.2

In Apache Libcloud 2.0.0, Python 3.6 is now supported as a primary distribution.

Python 3.2 support has been dropped in this release and users should either upgrade to 3.3 or a newer version of Python.

SSL CA certificates are now bundled with the package

In Apache Libcloud 2.0.0, the Mozilla Trusted Root Store is bundled with the package, as part of the *requests* package bundle. This means that users no longer have to set the path to a CA file either via installing the certifi package, downloading a PEM file or providing a directory in an environment variable. All connections in Libcloud will assume

HTTPS by default, now with 2.0.0, if those HTTPS endpoints have a signed certificate with a trusted CA authority, they will work with Libcloud by default.

Providing a custom client-side certificate, for example for a development server or a HTTPS proxy is still supported given providing a value to *libcloud.security.CA_CERTS_PATH*.

This code example would set a HTTP/HTTPS proxy and use a client-generated certificate to verify.

```python
import os
os.environ.set('http_proxy', 'http://localhost:8888/')

import libcloud.security
libcloud.security.VERIFY_SSL_CERT = True
libcloud.security.CA_CERTS_PATH = '/Users/anthonyshaw/charles.pem'
```

Providing a list of CA trusts is no longer supported

In Apache Libcloud 2.0.0 if you provide a list of more than 1 path or certificate file in *libcloud.security.CA_CERTS_PATH* you will receive a warning and only the first path will be used. This path should be to a .cert or .pem file. The environment variable REQUESTS_CA_BUNDLE can be used to access the requests library's list of trusted CAs.

Performance improvements and introduction of sessions

Each instance of libcloud.common.base.Connection will have a LibcloudConnection instance under the *connection* property. In 1.5.0<, there would be 2 connection class instances, LibcloudHttpConnection and LibcloudHttpsConnection, stored as an instance property *conn_classes*. In 2.0.0 this has been replaced with a single type, `libcloud.common.base.LibcloudHTTPConnection` that handles both HTTP and HTTPS connections.

```python
def test():
    import libcloud
    import libcloud.compute.providers

    d = libcloud.get_driver(libcloud.DriverType.COMPUTE, libcloud.DriverType.COMPUTE.
→DIMENSIONDATA)
    instance = d('anthony', 'mypassword!', 'dd-au')
    instance.list_nodes() # is paged
    instance.list_images() # is paged

if __name__ == '__main__':
    import timeit
    print(timeit.timeit("test()", setup="from __main__ import test", number=5))
```

This simple test shows a 10% performance improvement between Libcloud 1.5.0 and 2.0.0.

Changes to the storage API

Support for Buffered IO Streams

The methods *upload_object_via_stream* now supports *file* objects, *BytesIO*, *StringIO* and generators as the iterator.

```python
with open('my_file_to_upload', 'rb') as iterator:
    obj = driver.upload_object_via_stream(iterator=iterator,
```

(continues on next page)

```
                                    container=containers[0],
                                    object_name='me.jpg',
                                    extra=extra)
```

Other minor changes

- `libcloud.common.base.Connection` will now use *urljoin* to combine the *request_path* and *method* URLs. This means that the URL action will always have a leading slash.
- The underlying connection classes do not assume HTTP if a non-standard port is used. They will use the preference set in the *secure* flag to the initializer of *Connection*.
- The storage download_object_as_stream method no longer buffers out file streams twice.

1.1.15 Registering a third party driver

Driver is considered third party if it's not bundled with a Libcloud release.

To register a third party driver you should use `provider.set_driver()` function from the corresponding component.

`set_driver()` takes the following arguments:

```
set_driver('provider_name', 'path.to.the.module', 'DriverClass')
```

Keep in mind that the *provider_name* needs to be unique and this function needs to be called before using a third party driver.

For example:

```
from libcloud.compute.providers import get_driver
from libcloud.compute.providers import set_driver


set_driver('stratuslab',
           'stratuslab.libcloud.stratuslab_driver',
           'StratusLabNodeDriver')

# Your code which uses the driver.
# For example:
driver = get_driver('stratuslab')
```

An example of an existing third party driver can be found at https://github.com/StratusLab/libcloud-drivers

1.1.16 SSL Certificate Validation in <v2.0

When establishing a secure connection to a cloud provider endpoint, Libcloud verifies server SSL certificate. By default, Libcloud searches paths listed in `libcloud.security.CA_CERTS_PATH` variable for the CA certificate files.

`CA_CERTS_PATH` contains common paths to CA bundle installations on the following platforms:

- `certifi` package on PyPi
- `openssl` package on CentOS / Fedora

- `ca-certificates` package on Debian / Ubuntu / Arch / Gentoo

- `ca_root_nss` port on FreeBSD

- `curl-ca-bundle` port on Mac OS X

- `openssl` and `curl-ca-bundle` homebrew package

If no valid CA certificate files are found, you will see an error message similar to the one below:

```
No CA Certificates were found in CA_CERTS_PATH.
```

The easiest way to resolve this issue is to install *certifi* Python package from PyPi using pip. This package provides curated collection of Root Certificates based on the Mozilla CA bundle. If this package is installed and available, Libcloud will use CA bundle which is bundled by default.

As the list of trusted CA certificates can and does change, you are also encouraged to periodically update this package (`pip install --upgrade certifi` or similar).

If for some reason you want to avoid this behavior, you can set `LIBCLOUD_SSL_USE_CERTIFI` environment variable to `false`. Or even, better provide a direct path to the CA bundle you want to use using `SSL_CERT_FILE` environment variable as shown below.

Windows Users

The CA loading system does not load the Windows Certificate store, since this is not a directory. Windows users should download the following file and place in a directory like %APPDATA%libcloud or somewhere easily accessible. https://raw.githubusercontent.com/bagder/ca-bundle/master/ca-bundle.crt

Then configure this file using one of the 2 methods in *Using a custom CA certificate*

Acquiring CA Certificates

If the above packages are unavailable to you, and you don't wish to roll your own, the makers of cURL provides an excellent resource, generated from Mozilla: http://curl.haxx.se/docs/caextract.html.

Using a custom CA certificate

If you want to use a custom CA certificate file for validating the server certificate, you can do that using two different approaches:

1. Setting `SSL_CERT_FILE` environment variable to point to your CA file

```
SSL_CERT_FILE=/home/user/path-to-your-ca-file.crt python my_script.py
```

2. Setting `libcloud.security.CA_CERTS_PATH` variable in your script to point to your CA file

```python
import libcloud.security
libcloud.security.CA_CERTS_PATH = ['/home/user/path-to-your-ca-file.crt']

# Instantiate and work with the driver here...
```

Adding additional CA certificate to the path

If you want to add an additional CA certificate to the `CA_CERTS_PATH`, you can do this by appending a path to your CA file to the `libcloud.security.CA_CERTS_PATH` list.

For example:

```
import libcloud.security
libcloud.security.CA_CERTS_PATH.append('/home/user/path-to-your-ca-file.crt')

# Instantiate and work with the driver here...
```

Disabling SSL certificate validation

Note: Disabling SSL certificate validations makes you vulnerable to MITM attacks so you are strongly discouraged from doing that. You should only disable it if you are aware of the consequences and you know what you are doing.

To disable SSL certificate validation, set `libcloud.security.VERIFY_SSL_CERT` variable to `False` at the top of your script, before instantiating a driver and interacting with other Libcloud code.

For example:

```
import libcloud.security
libcloud.security.VERIFY_SSL_CERT = False

# Instantiate and work with the driver here...
```

Changing used SSL / TLS version

Note: Linode recently dropped support for TLS v1.0 and it only supports TLS v1.1 and higher. If you are using Linode driver you need to update your code to use TLS v1.1 or TLS v1.2 as shown below.

For compatibility and safety reasons (we also support older Python versions), Libcloud uses TLS v1.0 by default.

If the provier doesn't support this version or if you want to use a different version because of security reasons (you should always use the highest version which is supported by your system and your provider) you can tell Libcloud to use a different version as shown below.

```
import ssl

import libcloud.security
libcloud.security.SSL_VERSION = ssl.PROTOCOL_TLSv1_1
# or
libcloud.security.SSL_VERSION = ssl.PROTOCOL_TLSv1_2

# Instantiate and work with the driver here...
```

Keep in mind that TLS v1.1 and v1.2 is right now only supported in Python >= 3.4 and Python 2.7.9. In addition to that, your system also needs to have a recent version of OpenSSL available.

Another (**unsafe** and **unrecommended**) option is to use `ssl.PROTOCOL_SSLv23` constant which will let client know to pick the highest protocol version which both the client and server support. If this constant is selected, the client will be selecting between SSL v3.0, TLS v1.0, TLS v1.1 and TLS v1.2.

Keep in mind that SSL v3.0 is considered broken and unsafe and using this option can result in a downgrade attack so we strongly recommend **NOT** to use it.

1.1.17 Using an HTTP / HTTPS proxy

Note:

1. Support for HTTP proxies is available in Libcloud v0.16.0 and higher.

2. Support for HTTPS proxies is available in Libcloud v2.5.1-dev and higher.

3. In versions prior to v2.5.1-dev, `driver.connection.set_http_proxy()` method is broken and you need to use `driver.connection.connection.set_http_proxy()` instead.

Libcloud supports using an HTTP / HTTPS proxy for outgoing HTTP and HTTPS requests.

Proxy support has been tested with the following Python versions:

- Python 2.7 / PyPy
- Python 3.4
- Python 3.6
- Python 3.7

You can specify which HTTP(s) proxy to use using one of the approaches described below:

- By setting `http_proxy` / `https_proxy` environment variable (this setting is system / process wide)
- By passing `http_proxy` argument to the `libcloud.common.base.LibcloudConnection` class constructor (this setting is local to the connection instance)
- By calling `libcloud.common.base.LibcloudConnection.set_http_proxy()` method aka `driver.connection.connection.set_http_proxy` (this setting is local to the connection instance)

Known limitations

- Only HTTP basic access authentication proxy authorization method is supported
- If you are using HTTPS proxy you need to configure Libcloud to use CA cert bundle path which is used by the proxy server. See an example below on how to do that.

Examples

This section includes some code examples which show how to use an HTTP(s) proxy with Libcloud.

1. Using `http_proxy` / `htps_proxy` environment variable

By setting `http_proxy` / `https_proxy` environment variable you can specify which proxy to use for all of the outgoing requests for a duration / life-time of the process or a script.

Without authentication (http proxy):

```
http_proxy=http://<proxy hostname>:<proxy port> python my_script.py
```

Without authentication (https proxy):

```
http_proxy=https://<proxy hostname>:<proxy port> python my_script.py
# or
https_proxy=https://<proxy hostname>:<proxy port> python my_script.py
```

With basic auth authentication (http proxy):

```
http_proxy=http://<username>:<password>@<proxy hostname>:<proxy port> python my_
→script.py
```

2. Passing `proxy_url` argument to the connection class constructor

. note:

```
Some drivers don't correctly pass ``proxy_url`` argument to the connection
class and don't support ``proxy_url`` constructor argument.

If you pass this argument to the driver constructor, but it doesn't appear
to be working, it's likely the driver doesn't support this method.

In such scenarios, you are advised to use some other method of setting a
proxy (e.g. by setting an environment variable or by using
:meth:`libcloud.common.base.LibcloudConnection.set_http_proxy` method).
```

By passing `proxy_url` argument to the `libcloud.common.base.Connection` class constructor, you can specify which proxy to use for a particular connection.

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

HTTP_PROXY_URL_NO_AUTH_1 = 'http://<proxy hostname 1>:<proxy port 2>'
HTTPS_PROXY_URL_NO_AUTH_1 = 'https://<proxy hostname 1>:<proxy port 2>'

cls = get_driver(Provider.RACKSPACE)

# 1. Use http proxy
driver = cls('username', 'api key', region='ord',
             proxy_url=HTTP_PROXY_URL_NO_AUTH_1)

# 2. Use https proxy
driver = cls('username', 'api key', region='ord',
             proxy_url=HTTPS_PROXY_URL_NO_AUTH_1)
```

3. Calling `set_http_proxy` method

Calling `set_http_proxy` method allows you to specify which proxy to use for all the outgoing requests which follow `set_http_proxy` method call.

This method also allows you to use a different proxy for each request as shown in the example below.

```python
from pprint import pprint

from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver
```

(continues on next page)

```
HTTP_PROXY_URL_NO_AUTH_1 = 'http://<proxy hostname 1>:<proxy port 2>'
HTTP_PROXY_URL_NO_AUTH_2 = 'http://<proxy hostname 1>:<proxy port 2>'
HTTP_PROXY_URL_BASIC_AUTH = 'http://<user>:<pass>@<proxy hostname>:<port>'

cls = get_driver(Provider.RACKSPACE)
driver = cls('username', 'api key', region='ord')

# Use proxy 1 for this request
driver.connection.connection.set_http_proxy(proxy_url=HTTP_PROXY_URL_NO_AUTH_1)
pprint(driver.list_nodes())

# Use proxy 2 for this request
driver.connection.connection.set_http_proxy(proxy_url=HTTP_PROXY_URL_NO_AUTH_2)
pprint(driver.list_nodes())
```

4. Using an HTTPS proxy

This example shows how to use an HTTPS proxy.

```python
import os.path
from pprint import pprint

from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

import libcloud.security

HTTPS_PROXY_URL_NO_AUTH = 'https://<proxy hostname 1>:<proxy port 2>'

# 1. Use a custom CA bundle which is used by proxy server
# This example uses CA cert bundle used by mitmproxy proxy server
libcloud.security.CA_CERTS_PATH = os.path.expanduser(
    '~/.mitmproxy/mitmproxy-ca-cert.pem')

# User an https proxy for subsequent requests
cls = get_driver(Provider.RACKSPACE)
driver = cls('username', 'api key')

driver.connection.connection.set_http_proxy(proxy_url=HTTPS_PROXY_URL_NO_AUTH)
pprint(driver.list_nodes())
```

To use an HTTPS proxy, you also need to configure Libcloud to use CA cert bundle which is used by the HTTPS proxy server, to verify outgoing https request. If you don't do that, you will see errors similar to the one below:

```
SSLError(1, u'[SSL: CERTIFICATE_VERIFY_FAILED] certificate verify failed
```

Keep in mind that you will also receive a similar error message if you try to use HTTP proxy for HTTPS requests.

1.1.18 Using Libcloud in multi-threaded and async environments

Libcloud's primary task is to communicate with different provider APIs using HTTP. This means most of the work is not CPU intensive, but performing all those HTTP requests includes a lot of waiting which makes the library I/O bound.

Most of the time you want to perform more operations in parallel or just want your code to finish faster (for example starting a lot of servers or periodically polling for node status).

Problems like this are usually solved using threads or async libraries such as Twisted, Tornado or gevent.

This page contains some information and tips about how to use Libcloud in such environments.

Libcloud and thread-safety

Important thing to keep in mind when dealing with threads is thread-safety. Libcloud driver instance is **not** thread safe. This means if you don't want to deal with complex (and usually inefficient) locking the easiest solution is to create a new driver instance inside each thread.

Using Libcloud with gevent

gevent has an ability to monkey patch and replace functions in the Python `socket`, `urllib2`, `httplib` and `time` module with its own functions which don't block.

You need to do two things when you want to use Libcloud with gevent:

- Enable monkey patching

```
from gevent import monkey
monkey.patch_all()
```

- Create a separate driver instance for each Greenlet. This is necessary because a driver instance reuses the same Connection class.

For an example see Efficiently download multiple files using gevent.

Using Libcloud with Twisted

Libcloud has no Twisted support included in the core which means you need to be careful when you use it with Twisted and some other async frameworks.

If you don't use it properly it can block the whole reactor (similar as any other blocking library or a long CPU-intensive task) which means the execution of other pending tasks in the event queue will be blocked.

A simple solution to prevent blocking the reactor is to run Libcloud calls inside a thread. In Twisted this can be achieved using `threads.deferToThread` which runs a provided method inside the Twisted thread pool.

The example below demonstrates how to create a new node inside a thread without blocking the whole reactor.

```python
from __future__ import absolute_import

from pprint import pprint

# pylint: disable=import-error
from twisted.internet import defer, threads, reactor
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver


@defer.inlineCallbacks
def create_node(name):
    node = yield threads.deferToThread(_thread_create_node,
                                       name=name)
```

```python
    pprint(node)
    reactor.stop()


def _thread_create_node(name):
    Driver = get_driver(Provider.RACKSPACE)
    conn = Driver('username', 'api key')
    image = conn.list_images()[0]
    size = conn.list_sizes()[0]
    node = conn.create_node(name=name, image=image, size=size)
    return node


def stop(*args, **kwargs):
    reactor.stop()


d = create_node(name='my-lc-node')
d.addCallback(stop)  # pylint: disable=no-member
d.addErrback(stop)   # pylint: disable=no-member

reactor.run()
```

1.1.19 Working with the object oriented APIs

To make it easier for the end user, Libcloud components expose a fully object-oriented API.

This means that besides the driver object you also work with `NodeImage`, and `NodeSize` object in the compute API, `Container` and `Object` object in the Storage API, `Zone` and `Record` object in the DNS API and so on.

Methods which operate on those resources usually require you to pass in an instance of the resource you want to manipulate or work with and not just an id.

To obtain a reference to this resource, Libcloud providers corresponding get and / or list methods.

A couple of examples are shown below.

Example 1 - listing records for a zone with a known id

```python
from libcloud.dns.providers import get_driver
from libcloud.dns.types import Provider

CREDENTIALS_ZERIGO = ('email', 'api key')
ZONE_ID = 'example.myzone.com'

Cls = get_driver(Provider.ZERIGO)
driver = Cls(*CREDENTIALS_ZERIGO)

zone = driver.get_zone(zone_id=ZONE_ID)
records = driver.list_records(zone=zone)
```

In this example, the `driver.get_zone()` method call results in an HTTP call.

Example 2 - creating an EC2 instance with a known `NodeSize` and `NodeImage` id

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

ACCESS_ID = 'your access id'
SECRET_KEY = 'your secret key'

IMAGE_ID = 'ami-c8052d8d'
SIZE_ID = 't1.micro'

cls = get_driver(Provider.EC2)
driver = cls(ACCESS_ID, SECRET_KEY, region="us-west-1")

# Here we select size and image
sizes = driver.list_sizes()
images = driver.list_images()

size = [s for s in sizes if s.id == SIZE_ID][0]
image = [i for i in images if i.id == IMAGE_ID][0]

node = driver.create_node(name='test-node', image=image, size=size)
```

In this example, both the `driver.list_sizes()` and `driver.list_images()` method calls result in HTTP calls.

As you can see above, most of those getter methods retrieve extra information about the resource from the provider API and result in an HTTP request.

There are some cases when you might not want this:

- You don't care if a resource doesn't exist

- You don't care about the extra attributes

- You want to avoid an extra HTTP request

- You want to avoid holding a reference to the resource object

If that is true for you, you can directly instantiate a resource with a known id. You can see how to do this in the examples below.

Example 1 - listing records for a zone with a known id

```python
from libcloud.dns.base import Zone
from libcloud.dns.providers import get_driver
from libcloud.dns.types import Provider

CREDENTIALS_ZERIGO = ('email', 'api key')
ZONE_ID = 'example.myzone.com'

Cls = get_driver(Provider.ZERIGO)
driver = Cls(*CREDENTIALS_ZERIGO)

zone = Zone(ZONE_ID, domain=None, type=None, ttl=None,
            driver=driver)
records = driver.list_records(zone=zone)
```

Example 2 - creating an EC2 instance with a known `NodeSize` and `NodeImage` id

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver
from libcloud.compute.base import NodeSize, NodeImage

ACCESS_ID = 'your access id'
SECRET_KEY = 'your secret key'

IMAGE_ID = 'ami-c8052d8d'
SIZE_ID = 't1.micro'

cls = get_driver(Provider.EC2)
driver = cls(ACCESS_ID, SECRET_KEY, region="us-west-1")

size = NodeSize(id=SIZE_ID, name=None, ram=None, disk=None, bandwidth=None,
                price=None, driver=driver)
image = NodeImage(id=IMAGE_ID, name=None, driver=driver)

node = driver.create_node(name='test-node', image=image, size=size)
```

Example 3 - creating an EC2 instance with an IAM profile

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

ACCESS_ID = 'your access id'
SECRET_KEY = 'your secret key'
IAM_PROFILE = 'your IAM profile arn or IAM profile name'

IMAGE_ID = 'ami-c8052d8d'
SIZE_ID = 't1.micro'
cls = get_driver(Provider.EC2)
driver = cls(ACCESS_ID, SECRET_KEY, region="us-west-1")

# Here we select size and image
sizes = driver.list_sizes()
images = driver.list_images()

size = [s for s in sizes if s.id == SIZE_ID][0]
image = [i for i in images if i.id == IMAGE_ID][0]

node = driver.create_node(name='test-node', image=image, size=size,
                          ex_iamprofile=IAM_PROFILE)
```

1.2 Developer Information

1.2.1 Developer Information

Type Annotations

Python type annotations / hints for the base Libcloud compute API have been added in v2.8.0.

The goal behind type annotations is to make developer lives easier by introducing optional static typing for Python programs.

This allows you to catch bugs and issues which are related to variable types earlier and faster (aka when you run `mypy` locally either manually or integrated in your editor / IDE and also as part of you CI/CD build pipeline).

An example of how to use type annotations correctly is shown below.

```python
# Licensed to the Apache Software Foundation (ASF) under one or more
# contributor license agreements.  See the NOTICE file distributed with
# this work for additional information regarding copyright ownership.
# The ASF licenses this file to You under the Apache License, Version 2.0
# (the "License"); you may not use this file except in compliance with
# the License.  You may obtain a copy of the License at
#
#      http://www.apache.org/licenses/LICENSE-2.0
#
# Unless required by applicable law or agreed to in writing, software
# distributed under the License is distributed on an "AS IS" BASIS,
# WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
# See the License for the specific language governing permissions and
# limitations under the License.

from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

from libcloud.compute.drivers.ec2 import EC2NodeDriver
from libcloud.compute.drivers.rackspace import RackspaceNodeDriver

from typing import Type, cast

ec2_cls = get_driver(Provider.EC2)
rackspace_cls = get_driver(Provider.RACKSPACE)

# NOTE: If you are using driver methods which are not part of the standard API,
# you need to explicitly cast the driver class reference to the correct class
# for type checking to work correctly
EC2 = cast(Type[EC2NodeDriver], ec2_cls)
Rackspace = cast(Type[RackspaceNodeDriver], rackspace_cls)

drivers = [EC2('access key id', 'secret key', region='us-east-1'),
           Rackspace('username', 'api key', region='iad')]

nodes = []
for driver in drivers:
    nodes.extend(driver.list_nodes())

print(nodes)
# [ <Node: provider=Amazon, status=RUNNING, name=bob, ip=1.2.3.4.5>,
# <Node: provider=Rackspace, status=REBOOT, name=korine, ip=6.7.8.9.10>, ... ]

# grab the node named "test"
node = [n for n in nodes if n.name == 'test'][0]

# reboot "test"
node.reboot()
```

If you reference an invalid object attribute or a method, you would see an error similar to the one beloe when running mypy:

```
...
print(nodes[0].name)
print(nodes[0].invalid)
print(nodes[0].rebbot())
print(nodes[0].reboot(foo='invalid'))
...
```

```
$ mypy --no-incremental example_compute.py
example_compute.py:41: error: "Node" has no attribute "invalid"
example_compute.py:42: error: "Node" has no attribute "rebbot"; maybe "reboot"?
example_compute.py:43: error: Unexpected keyword argument "foo" for "reboot" of "Node"
```

If you are using driver methods which are not part of the Libcloud standard API, you need to use `cast()` method as shown below to cast the driver class to the correct type. If you don't do that, `mypy` will only be aware of the methods which are part of the Libcloud base compute API (aka `BaseNodeDriver` class).

This is needed because of how Libcloud utilizes meta programming for the `get_driver()` and related methods (there is no other way without writing a mypy plugin to achieve that).

Mailing Lists

All of the communication about Libcloud development happens on our mailing lists.

- announce@libcloud.apache.org - Moderated and low volume mailing list which is only used for distributing important project announcements and updates. (announce-archive)

- users@libcloud.apache.org - Mailing list for general talk about Libcloud and other off-topic things (users-archive)

- dev@libcloud.apache.org - General mailing list for developers (dev-archive)

- notifications@libcloud.apache.org - Commits messages and other automatically generated notifications go to this mailing list. Keep in mind that unlike the others, this mailing list is fairly noisy. (notifications-archive, commits-archive)

Archive of old incubator mailing lists:

- incubator-libcloud

- incubator-libcloud-commits

IRC

- #libcloud on Freenode

Issue Tracker

For bug and issue tracking we use Github issues located at https://github.com/apache/libcloud/issues.

Testing

For information how to run the tests and how to generate the test coverage report, please see the Testing page.

Continuous Integration

For continuous integration we use Travis-CI. You can find build reports on the following links:

- https://travis-ci.org/apache/libcloud

Travis-CI builder is also integrated with Github which means that if you open a pull request there, Travis-CI will automatically build it.

If you want to validate the build before raising the PR, Travis-CI can be enabled for personal accounts and branches separately.

Test Coverage

Test coverage report is automatically generated after every push and can be found at https://codecov.io/github/apache/libcloud?branch=trunk.

1.2.2 Development

This page describes Libcloud development process and contains general guidelines and information on how to contribute to the project.

Contributing

We welcome contributions of any kind (ideas, code, tests, documentation, examples, . . .).

If you need help or get stuck at any point during this process, stop by on our IRC channel (*#libcloud on freenode*) and we will do our best to assist you.

Getting started with contributing to Libcloud

General contribution guidelines

- Any non-trivial change must contain tests. For more information, refer to the Testing page.

- All the functions and methods must contain Sphinx docstrings which are used to generate the API documentation. For more information, refer to the *Docstring conventions* section below.

- If you are adding a new feature, make sure to add a corresponding documentation.

Code style guide

- We follow PEP8 Python Style Guide

- Use 4 spaces for a tab

- Use 79 characters in a line

- Make sure edited file doesn't contain any trailing whitespace

- You can verify that your modifications don't break any rules by running the `flake8` script - e.g. `flake8 libcloud/edited_file.py` or `tox -e lint`. Second command will run flake8 on all the files in the repository.

And most importantly, follow the existing style in the file you are editing and **be consistent**.

Git pre-commit hook

To make complying with our style guide easier, we provide a git pre-commit hook which automatically checks modified Python files for violations of our style guide.

You can install it by running following command in the root of the repository checkout:

```
ln -s contrib/pre-commit.sh .git/hooks/pre-commit
```

After you have installed this hook it will automatically check modified Python files for violations before a commit. If a violation is found, commit will be aborted.

Code conventions

This section describes some general code conventions you should follow when writing a Libcloud code.

1. Import ordering

Organize the imports in the following order:

1. Standard library imports

2. Third-party library imports

3. Local library (Libcloud) imports

Each section should be separated with a blank line. For example:

```python
import sys
import base64

import paramiko

from libcloud.compute.base import Node, NodeDriver
from libcloud.compute.providers import Provider
```

2. Function and method ordering

Functions in a module and methods on a class should be organized in the following order:

1. "Public" functions / methods

2. "Private" functions / methods (methods prefixed with an underscore)

3. "Internal" methods (methods prefixed and suffixed with a double underscore)

For example:

```python
class Unicorn(object):
    def __init__(self, name='fluffy'):
        self._name = name

    def make_a_rainbow(self):
        pass

    def _get_rainbow_colors(self):
```

(continues on next page)

```python
        pass

    def __eq__(self, other):
        return self.name == other.name
```

Methods on a driver class should be organized in the following order:

1. Methods which are part of the standard API

2. Extension methods

3. "Private" methods (methods prefixed with an underscore)

4. "Internal" methods (methods prefixed and suffixed with a double underscore)

Methods which perform a similar functionality should be grouped together and defined one after another.

For example:

```python
class MyDriver(object):
    def __init__(self):
        pass

    def list_nodes(self):
        pass

    def list_images(self):
        pass

    def create_node(self):
        pass

    def reboot_node(self):
        pass

    def ex_create_image(self):
        pass

    def _to_nodes(self):
        pass

    def _to_node(self):
        pass

    def _to_images(self):
        pass

    def _to_image(self):
        pass
```

Methods should be ordered this way for the consistency reasons and to make reading and following the generated API documentation easier.

3. Prefer keyword over regular arguments

For better readability and understanding of the code, prefer keyword over regular arguments.

Good:

```
some_method(public_ips=public_ips, private_ips=private_ips)
```

Bad:

```
some_method(public_ips, private_ips)
```

4. Don't abuse **kwargs

You should always explicitly declare arguments in a function or a method signature and only use `**kwargs` and `*args` respectively when there is a valid use case for it.

Using `**kwargs` in many contexts is against Python's "explicit is better than implicit" mantra and makes it for a bad and a confusing API. On top of that, it makes many useful things such as programmatic API introspection hard or impossible.

A use case when it might be valid to use `**kwargs` is a decorator.

Good:

```python
def my_method(self, name, description=None, public_ips=None):
    pass
```

Bad (please avoid):

```python
def my_method(self, name, **kwargs):
    description = kwargs.get('description', None)
    public_ips = kwargs.get('public_ips', None)
```

5. When returning a dictionary, document its structure

Dynamic nature of Python can be very nice and useful, but if (ab)use it in a wrong way it can also make it hard for the API consumer to understand what is going on and what kind of values are being returned.

If you have a function or a method which returns a dictionary, make sure to explicitly document in the docstring which keys the returned dictionary contains.

6. Prefer to use "is not None" when checking if a variable is provided or defined

When checking if a variable is provided or defined, prefer to use `if foo is not None` instead of `if foo`.

If you use `if foo` approach, it's easy to make a mistake when a valid value can also be falsy (e.g. a number `0`).

For example:

```python
class SomeClass(object):
    def some_method(self, domain=None):
        params = {}

        if domain is not None:
            params['Domain'] = domain
```

Docstring conventions

For documenting the API we we use Sphinx and reStructuredText syntax. Docstring conventions to which you should adhere to are described below.

- Docstrings should always be used to describe the purpose of methods, functions, classes, and modules.

- Method docstring should describe all the normal and keyword arguments. You should describe all the available arguments even if you use `*args` and `**kwargs`.

- All parameters must be documented using `:param p:` or `:keyword p:` and `:type p:` annotation.

- `:param p:` `...` - A description of the parameter `p` for a function or method.

- `:keyword p:` `...` - A description of the keyword parameter `p`.

- `:type p:` `...` The expected type of the parameter `p`.

- Return values must be documented using `:return:` and `:rtype` annotation.

- `:return:` `...` A description of return value for a function or method.

- `:rtype:` `...` The type of the return value for a function or method.

- Required keyword arguments must contain `(required)` notation in description. For example: `:keyword image:  OS Image to boot on node. (required)`

- Multiple types are separated with `or` For example: `:type auth:  :class:`.NodeAuthSSHKey` or :class:`.NodeAuthPassword``

- For a description of the container types use the following notation: `<container_type>` of `<objects_type>`. For example: `:rtype:  `list` of :class:`Node``

For more information and examples, please refer to the following links:

- Sphinx Documentation - http://sphinx-doc.org/markup/desc.html#info-field-lists

- Example Libcloud module with documentation - https://github.com/apache/libcloud/blob/trunk/libcloud/compute/base.py

Contribution workflow

1. Start a discussion on our Github repository or on the mailing list

If you are implementing a big feature or a change, start a discussion on the *issue tracker* or the *mailing list* first.

2. Open a new issue on our issue tracker

Go to our issue tracker and open a new issue for your changes there. This issue will be used as an umbrella place for your changes. As such, it will be used to track progress and discuss implementation details.

3. Fork our Github repository

Fork our Github git repository. Your fork will be used to hold your changes.

4. Create a new branch for your changes

For example:

```
git checkout -b <change_name>
```

5. Make your changes

6. Write tests for your changes and make sure all the tests pass

Make sure that all the code you have added or modified has appropriate test coverage. Also make sure all the tests including the existing ones still pass.

Use `libcloud.test.unittest` as the unit testing package to ensure that your tests work with older versions of Python.

For more information on how to write and run tests, please see Testing page.

7. Commit your changes

Commit your changes.

For example:

```
git commit -m "Add a new compute driver for CloudStack based providers."
```

8. Open a pull request with your changes

Go to https://github.com/apache/libcloud/ and open a new pull request with your changes. Your pull request will appear at https://github.com/apache/libcloud/pulls.

9. Wait for the review

Wait for your changes to be reviewed and address any outstanding comments.

Contributing Bigger Changes

If you are contributing a bigger change (e.g. large new feature or a new provider driver) you need to have signed Apache Individual Contributor License Agreement (ICLA) in order to have your patch accepted.

You can find more information on how to sign and file an ICLA on the Apache website.

When filling the form, leave field `preferred Apache id(s)` empty and in the `notify project` field, enter `Libcloud`.

Supporting Multiple Python Versions

Libcloud supports a variety of Python versions so your code also needs to work with all the supported versions. This means that in some cases you will need to include extra code to make sure it works in all the supported versions.

Some examples which show how to handle those cases are described below.

Context Managers

Context managers aren't available in Python 2.5 by default. If you want to use them make sure to put from `__future__ import with_statement` on top of the file where you use them.

Utility functions for cross-version compatibility

You can find a lot of utility functions which make code easier to work with Python 2.x and 3.x in `libcloud.utils.py3` module.

You can find some more information on changes which are involved in making the code work with multiple versions on the following link - Lessons learned while porting Libcloud to Python 3

1.3 Committer Guide

1.3.1 Committer Guide

New committer guidelines

Note: This section outlines steps which need to be completed by new team members and is indented for people who have been voted to join Libcloud project as a committer and / or PMC member. It also assumes you have already filled your ICLA and your Apache account has been created.

First congratulations and welcome to the team!

1. Subscribe to the public mailing lists

If you haven't yet, subscribe to {dev,users,notifications}@libcloud.apache.org mailing lists. Notifications mailing list is especially important because all of Github Issue, Pull Request and build notifications are sent there.

2. Subscribe to the private mailing list

Subscribe to private@libcloud.apache.org by sending an email to private-subscribe@libcloud.apache.org. Keep in mind that this list is private and your subscription needs to be approved by a moderator.

3. Create PyPi account

Creating a PyPi account by going to https://pypi.python.org/pypi?%3Aaction=register_form and send an email to private@libcloud.apache.org requesting to be added as a maintainer to apache-libcloud package. Make sure to select a strong and unique password (`pwgen -s 48 1` is your friend).

After you have registered go to "Your details" page and populate *PGP Key ID* field with your PGP key ID.

4. Link your ASF and Github account

We use Github for managing issues and user contributions (pull requests). As such, you need to link your Github.com account with your ASF account using Gitbox. This way you will get write access to github.com/apache/libcloud repository and you will be able to manage issues and pull request directly through our Github repository.

Merging user contributions

When a pull request with user contribution (changes) has been reviewed and all the criteria for merging has been met (tests and code coverage, Travis build is passing, user signed an ICLA, etc.), you can directly merge those changes into trunk either by using Github web interface or doing it manually on the command line.

It's also important that you update changelog in `CHANGES.rst` file after you merged the changes.

Making a release (for release managers)

This section contains information a release manager should follow when preparing a release.

0. Update committed files

- Make sure `CHANGES` file is up to date
- Make sure `__version__` string in `libcloud/__init__.py` is up to date
- Make sure `version` and `release` in `docs/conf.py` are up to date
- Update constants, pricing and other auto-generated data: `tox -e scrape-ec2-sizes, scrape-ec2-prices`

1. Pre-release check list

- Make sure tests pass on all the supported Python versions (`tox`)
- Remove the `tox` directory with `rm -rf .tox`
- Remove the _secrets_ file with `rm libcloud/test/secrets.py`
- Remove leftover builds from previous releases. `rm -f dist/apache* ; rm -rf apache_libcloud.egg-info`

2. Update Github

- Create a new Github milestone for the release in question (if one doesn't exist yet)
- Update affected issues and pull requests and add the corresponding release milestone to them

3. Creating release artifacts

Note: It's important that you have the latest versions of `setuptools`, `wheel` and `pip` installed to ensure the generated wheel files contain correct metadata.

We have a script that runs the required setup.py commands and then hashes and signs the files. You will need the latest version of `pip` and the `wheel` package. To run it:

```
cd dist
./release.sh -u <yourusername>@apache.org
```

`-u` argument will be used to find a key with a matching email address in your local GPG database.

This should result in a set of `apache-libcloud-${VERSION}.{tar.bz2,tar.gz,zip,whl}{,asc,md5,sha1}` files that are suitable to be uploaded for a release.

Copy the artifacts in another directory, unpack one of them and test it with `tox`.

4. Tagging a release

Tag the tentative release with a `-tentative` postfix.

```
git tag <version> <commit hash>
```

For example:

```
git tag --sign v0.15.0-tentative 105b9610835f99704996d861d613c5a9a8b3f8b1
```

5. Upload the release artifacts and start a [VOTE] thread

Upload all release artifacts including the `whl` files to your people.apache.org space. Then start a [VOTE] thread on the dev@libcloud.apache.org mailing list.

Once the vote has passed tag the release with a new tag, removing the `-tentative` postfix. Upload the release artifacts to Apache servers and Pypi.

For example:

```
git tag --sign v0.15.0 105b9610835f99704996d861d613c5a9a8b3f8b1
```

The commit SHA needs to be the one release artifacts are based on (aka the one people voted on) and the same one you used for the `-tentative` tag.

Keep in mind that it's important that you sign the commit / tag with your GPG key.

6. Uploading release artifacts to Apache servers

- Add release artifacts to the dist SVN repository at https://dist.apache.org/repos/dist/release/libcloud/

  It may take up to a day for the artifacts to be available on all the Apache mirrors, but they should be instantly available at http://www.apache.org/dist/libcloud/.

- If there is more than one old release in the repository, delete rest of the old release and only leave current and previous release there. Old releases are automatically archived and available at https://dist.apache.org/repos/dist/release/libcloud/.

7. Publishing package to PyPi

We have a script that runs uploads the signed Python source files to PyPi. It uses twine, so ensure you have twine available in your path *which twine* before running. Twine can be downloaded from https://pypi.python.org/pypi/twine

```
cd dist
./deploy.sh
```

Once all the files have been uploaded, the page should look similar to the screenshot below.

8. Verifying the release artifact check sums

To verify that nothing went wrong doing the release process, run the `./dist/verify_checksums.sh` script.

This script downloads the release artifacts from the Apache and PyPi server and makes sure that the MD5 check sums of the both files match.

Usage:

```
./dist/verify_checksums.sh <version>
```

For example

```
./dist/verify_checksums.sh apache-libcloud-0.13.2
```

9. Updating doap_libcloud.rdf, __init__.py

Add information about the new release to the `doap_libcloud.rdf` file in the root of the main code repository.

Update `__version__` attribute in `libcloud/__init.py__` file and indicate we are now working on a new release by incrementing a number and adding `-dev` suffix. For example, if version `2.2.1` has been released you would change it from:

```
__version__ = '2.2.1'
```

To:

```
__version__ = '2.2.2-dev'
```

10. Updating website

Check out the website using SVN: `svn co https://svn.apache.org/repos/asf/libcloud/site/trunk`

- Update the front page (`source/index.html` file)
- Update "Downloads" page (`source/downloads.md` file)
- Add a blog entry in the `_posts` directory.

Build the site locally and make sure everything is correct. Check the `README.md` file.

11. Sending announcements

- Send a release announcement to {dev,users}@libcloud.apache.org. If it's a major release also send it to announce@apache.org.
- Send a release announcement to Twitter and Google+

Note: If the release fixes a security vulnerability, you should also send information about a vulnerability to the following full disclosure mailing lists:

- full-disclosure@lists.grok.org.uk
- bugtraq@securityfocus.com

The email you send should also be signed using your GPG key. You can find an example of such announcement on the following url.

If needed, use Apache URL shortening service - http://s.apache.org/

Mailing list email templates

This section includes email templates which can be used when sending out official communication to the mailing lists.

Release voting thread template

This template should be used when starting a voting thread for a new release.

Subject:

```
[VOTE] Release Apache Libcloud <version>
```

Body:

```
This is a voting thread for Libcloud <version>.

<short description and highlights of this release>

Full changelog can be found at <link to the CHANGES file for this release>.

Release artifacts can be found at <link to your Apache space where a release
artifacts can be found>.

KEYS file can found at https://dist.apache.org/repos/dist/release/libcloud/KEYS

Please test the release and post your votes.

+/- 1
[  ]  Release Apache Libcloud <version>

Vote will be opened until <date, it should be at minimum today + 3 days> (or longer,
→if needed).

Thanks,
<name>
```

For example:

Subject:

```
[VOTE] Release Apache Libcloud 0.13.2
```

Body:

```
This is a voting thread for Libcloud 0.13.2.

This is another primarily a bug-fix release. Previous release included a fix for the
→Content-Length bug which didn't fully fix the original issue. It missed out "raw"
→requests which are fixed in this release (LIBCLOUD-396).

This bug could manifest itself while uploading a file with some of the storage
→providers.

Besides this bug fix, it includes a couple of other smaller bug fixes and changes.
→Full change log
can be found at https://git-wip-us.apache.org/repos/asf?p=libcloud.git;a=blob;
→f=CHANGES;h=b7747f777afdeb63bcacf496d1d034f1b3287c31;
→hb=c4b3daae946049652a500a8515929b4cbf14a6b4

Release artifacts can be found at http://people.apache.org/~tomaz/libcloud/.

Please test the release and post your votes.
```

(continues on next page)

```
+/- 1
[  ]  Release Apache Libcloud 0.13.2

Vote will be opened until September 18th, 2013 (or longer, if needed).

Thanks,
Tomaz
```

Release announcement

This template should be used when sending out a release announcement.

Subject:

```
[ANNOUNCE] Apache Libcloud 0.13.1 release
```

Body:

```
Libcloud is a Python library that abstracts away the differences among
multiple cloud provider APIs. It allows users to manage cloud services
(servers, storage, loadbalancers, DNS) offered by many different providers
through a single, unified and easy to use API.

We are pleased to announce the release of Libcloud <version>!

<short description of the release which should include release highlights>

Full change log can be found at <link to CHANGES file for this release>

Download

Libcloud <version> can be downloaded from http://libcloud.apache.org/downloads.html
or installed using pip:

pip install apache-libcloud

Upgrading

If you have installed Libcloud using pip you can also use it to upgrade it:

pip install --upgrade apache-libcloud

Upgrade notes

A page which describes backward incompatible or semi-incompatible
changes and how to preserve the old behavior when this is possible
can be found at http://libcloud.apache.org/upgrade-notes.html.

Documentation

API documentation can be found at http://libcloud.apache.org/apidocs/<version>/.

We also have a new Sphinx documentation which can be found at https://libcloud.apache.
→org/docs/.
```

```
Bugs / Issues

If you find any bug or issue, please report it on our issue tracker
<https://github.com/apache/libcloud/issues>.
Don't forget to attach an example and / or test which reproduces your problem.

Thanks

Thanks to everyone who contributed and made this release possible! Full list of
people who contributed to this release can be found in the CHANGES file
<link to the changes file for this release>.
```

For example:

Subject:

```
[ANNOUNCE] Apache Libcloud 0.13.1 release
```

Body:

```
Libcloud is a Python library that abstracts away the differences among
multiple cloud provider APIs. It allows users to manage cloud services
(servers, storage, loadbalancers, DNS) offered by many different providers
through a single, unified and easy to use API.

We are pleased to announce the release of Libcloud 0.13.1!

This is a bug-fix only release. Among some smaller bugs it also fixes
Content-Length regression which broke create and update operations in
the Bluebox Compute and Azure Storage driver (LIBCLOUD-362, LIBCLOUD-3901).

Full change log can be found at <https://git-wip-us.apache.org/repos/asf?p=libcloud.
→git;a=blob;f=CHANGES;h=ca90c84e296ca82e2206eb86ed7364c588aad503;
→hb=602b6a7a27dca6990a38eb887e1d6615826387d5>

Download

Libcloud 0.13.1 can be downloaded from http://libcloud.apache.org/downloads.html
or installed using pip:

pip install apache-libcloud

Upgrading

If you have installed Libcloud using pip you can also use it to upgrade it:

pip install --upgrade apache-libcloud

Upgrade notes

A page which describes backward incompatible or semi-incompatible
changes and how to preserve the old behavior when this is possible
can be found at http://libcloud.apache.org/upgrade-notes.html.

Documentation
```

```
API documentation can be found at http://libcloud.apache.org/apidocs/0.13.1/.

We also have a new Sphinx documentation which can be found at https://libcloud.apache.
↪org/docs/.
Keep in mind though, that this documentation reflects state in trunk which
includes some backward incompatible changes which aren't present in 0.13.1.
All the examples in the documentation which only work with trunk are clearly marked␣
↪with a note.

Bugs / Issues

If you find any bug or issue, please report it on our issue tracker
<https://github.com/apache/libcloud/issues>.
Don't forget to attach an example and / or test which reproduces your problem.

Thanks

Thanks to everyone who contributed and made this release possible! Full list of
people who contributed to this release can be found in the CHANGES file
<https://git-wip-us.apache.org/repos/asf?p=libcloud.git;a=blob;f=CHANGES;
↪h=ca90c84e296ca82e2206eb86ed7364c588aad503;
↪hb=602b6a7a27dca6990a38eb887e1d6615826387d5>.
```

1.4 Other

1.4.1 Changelog

Changes in Apache Libcloud 3.1.0

Compute

- [GCE] Add latest Ubuntu image families (Ubuntu 20.04) to the driver.

  (GITHUB-1449) [Christopher Lambert - @XN137]

- [DigitalOcean] Add `location` argument to the `list_sizes()` method.

  NOTE: Location filtering is performed on the client. (GITHUB-1455, GITHUB-1456) [RobertH1993]

- Fix `deploy_node()` so an exception is not thrown if any of the output (stdout / stderr) produced by the deployment script contains a non-valid utf-8 character.

  Previously, user would see an error similar to "Failed after 3 tries: 'utf-8' codec can't decode byte 0xc0 in position 37: invalid start byte".

  And now we simply ignore byte sequences which we can't decode and include rest of the output which can be decoded.

  (GITHUB-1459) [Tomaz Muraus - @Kami]

- Add new `timeout` argument to `ScriptDeployment` and `ScriptFileDeployment` class constructor.

  With this argument, user can specify an optional run timeout for that deployment step run. (GITHUB-1445) [Tomaz Muraus - @Kami]

- [GiG G8] Fix retry functionality when creating port forwards and add support for automatically refresing the JWT auth token inside the connection class if it's about to expire in 60 seconds or less. (GITHUB-1465) [Jo De Boeck - @grimpy]

- [Azure ARM] Update `create_node` so an exception is thrown if user passes `ex_use_managed_disks=False`, but doesn't provide a value for the `ex_storage_account` argument. (GITHUB-1448) [@antoinebourayne]

Storage

- [AWS S3] Make sure driver works correctly for objects with ~ in the name.

  Now when sanitizing the object name, we don't url encode ~ character.

  Reported by Michael Militzer - @mmilitzer. (GITHUB-1452, GITHUB-1457) [Tomaz Muraus]

DNS

- [CloudFlare] Update driver to include the whole error chain the thrown exception message field.

  This makes various issues easier to debug since the whole error context is included. [Tomaz Muraus]

- [Gandi Live, CloudFlare, GCE] Add support for managing `CAA` record types.

  When creating a `CAA` record, data field needs to be in the following format:

  `<flags> <tag> <domain name>`

  For example:

  - `0 issue caa.example.com`

  - `0 issuewild caa.example.com`

  - `0 iodef https://example.com/reports`

  (GITHUB-1463, GITHUB-1464) [Tomaz Muraus]

- [Gandi Live] Don't throw if `extra['rrset_ttl']` argument is not passed to the `create_record` method. (GITHUB-1463) [Tomaz Muraus]

Other

- Update `contrib/Dockerfile` which can be used for running tests so it only run tests with Python versions we support. This means dropping support for Python < 3.5 and adding support for Python 3.7 and 3.8.

  Also update it to use a more recent Ubuntu version (18.04) and Python 3 for running tox target. (GITHUB-1451) [Tomaz Muraus - @Kami, HuiFeng Tang - @99Kies]

Changes in Apache Libcloud 3.0.0

Common

- Make sure `auth_user_info` variable on the OpenStack identify connection class is populated when using auth version `3.x_password` and `3.x_oidc_access_token`.

  (GITHUB-1436) [@lln-ijinus, Tomaz Muraus)

- [OpenStack] Update OpenStack identity driver so a custom project can be selected using `domain_name` keyword argument containing a project id.

  Previously this argument value could only contain a project name, now the value will be checked against project name and id.

  (GITHUB-1439) [Miguel Caballer - @micafer]

Compute

- [GCE] Update `create_node()` method so it throws an exception if node location can't be inferred and location is not specified by the user (either by passing `datacenter` constructor argument or by passing `location` argument to the method).

  Reported by Kevin K. - @kbknapp. (GITHUB-1443) [Tomaz Muraus]

- [GCE] Update `ex_get_disktype` method so it works if `zone` argument is not set. (GITHUB-1443) [Tomaz Muraus]

- [GiG G8] Add new driver for GiG G8 provider (https://gig.tech/). (GITHUB-1437) [Jo De Boeck - @grimpy]

- Add new `at_exit_func` argument to `deploy_node()` method. With this argument user can specify which function will be called before exiting with the created node in question if the deploy process has been canceled after the node has been created, but before the method has fully finished.

  This comes handy since it simplifies various cleanup scenarios. (GITHUB-1445) [Tomaz Muraus - @Kami]

- [OpenStack] Fix auto assignment of volume device when using device name `auto` in the `attach_volume` method. (GITHUB-1444) [Joshua Hesketh - @jhesketh]

- [Kamatera] Add new driver for Kamatera provider (https://www.kamatera.com). (GITHUB-1442) [Ori Hoch - @OriHoch]

Storage

- Add new `download_object_range` and `download_object_range_as_stream` methods for downloading part of the object content (aka range downloads) to the base storage API.

  Currently those methods are implemented for the local storage Azure Blobs, CloudFiles, S3 and any other provider driver which is based on the S3 one (such as Google Storage and DigitalOcean Spaces). (GITHUB-1431) [Tomaz Muraus]

- Add type annotations for the base storage API. (GITHUB-1410) [Clemens Wolff - @c-w]

- [Google Storage] Update the driver so it supports service account HMAC credentials.

  There was a bug in the code where we used the user id length check to determine the account type and that code check didn't take service account HMAC credentials (which contain a longer string) into account.

  Reported by Patrick Mézard - pmezard. (GITHUB-1437, GITHUB-1440) [Yoan Tournade - @MonsieurV]

DNS

- Add type annotations for the base DNS API. (GITHUB-1434) [Tomaz Muraus]

Container

- [Kubernetes] Add support for the client certificate and static token based authentication to the driver. (GITHUB-1421) [Tomaz Muraus]

- Add type annotations for the base container API. (GITHUB-1435) [Tomaz Muraus]

Changes in Apache Libcloud v2.8.2

Compute

- Add support for Ed25519 private keys for `deploy_node()` functionality when using paramiko >= 2.2.0. (GITHUB-1445) [Tomaz Muraus - @Kami]

- Fix `deploy_node()` so it correctly propagates an exception is a private key which is used is password protected, but no password is specified.

  Previously it incorrectly tried to retry on such exception. This means the exception would only bubble up after all the retry attempts have been exhausted. (GITHUB-1445) [Tomaz Muraus - @Kami]

- Allow user to specify password for encrypted keys by passing `ssh_key_password` argument to the `deploy_node()` method.

  Previously they (GITHUB-1445) [Tomaz Muraus - @Kami]

- Fix `deploy_node()` so it correctly propagates an exception if invalid or unsupported private key is used.

  Previously it incorrectly tried to retry on such exception. This means the exception would only bubble up after all the retry attempts have been exhausted. (GITHUB-1445) [Tomaz Muraus - @Kami]

- Fix `deploy_node()` method so we don't retry on fatal `SSHCommandTimeoutError` exception (exception which is thrown when a command which is running on remote host times out). (GITHUB-1445) [Tomaz Muraus - @Kami]

- Add new `timeout` argument to `ScriptDeployment` and `ScriptFileDeployment` class constructor.

  With this argument, user can specify an optional run timeout for that deployment step run. (GITHUB-1445) [Tomaz Muraus - @Kami]

- Add new `stdout` and `stderr` attribute to `SSHCommandTimeoutError` class.

  Those attributes contain value of stdout and stderr produced so far. (GITHUB-1445) [Tomaz Muraus - @Kami]

- [OpenStack] Fix auto assignment of volume device when using device name `auto` in the `attach_volume` method. (GITHUB-1444) [Joshua Hesketh - @jhesketh]

Changes in Apache Libcloud v2.8.1

Common

- Fix `LIBCLOUD_DEBUG_PRETTY_PRINT_RESPONSE` functionality and make sure it works correctly under Python 3 when `response.read()` function returns unicode and not bytes.

  (GITHUB-1430) [Tomaz Muraus]

Compute

- [GCE] Fix `list_nodes()` method so it correctly handles pagination and returns all the nodes if there are more than 500 nodes available in total.

  Previously, only first 500 nodes were returned.

  Reported by @TheSushiChef. (GITHUB-1409, GITHUB-1360) [Tomaz Muraus]

- Fix some incorrect type annotations in the base compute API.

  Reported by @dpeschman. (GITHUB-1413) [Tomaz Muraus]

- [OpenStack] Fix error with getting node id in `_to_floating_ip` method when region is not called `nova`. (GITHUB-1411, GITHUB-1412) [Miguel Caballer - @micafer]

- [EC2] Fix `ex_userdata` keyword argument in the `create_node()` method being ignored / not working correctly.

  NOTE: This regression has been inadvertently introduced in v2.8.0. (GITHUB-1426) [Dan Chaffelson - @Chaffelson]

- [EC2] Update `create_volume` method to automatically select first available availability zone if one is not explicitly provided via `location` argument. [Tomaz Muraus]

Storage

- [AWS S3] Fix upload object code so uploaded data MD5 checksum check is not performed at the end of the upload when AWS KMS server side encryption is used.

  If AWS KMS server side object encryption is used, ETag header value in the response doesn't contain data MD5 digest so we can't perform a checksum check.

  Reported by Jonathan Harden - @jfharden. (GITHUB-1401, GITHUB-1406) [Tomaz Muraus - @Kami]

- [Google Storage] Fix a bug when uploading an object would fail and result in 401 "invalid signature" error when object mime type contained mixed casing and when S3 Interoperability authentication method was used.

  Reported by Will Abson - wabson. (GITHUB-1417, GITHUB-1418) [Tomaz Muraus]

- Fix `upload_object_via_stream` method so "Illegal seek" errors which can arise when calculating iterator content hash are ignored. Those errors likely indicate that the underlying file handle / iterator is a pipe which doesn't support seek and that the error is not fatal and we should still proceed.

  Reported by Per Buer - @perbu.

  (GITHUB-1424, GITHUB-1427) [Tomaz Muraus]

DNS

- [Gandi Live] Update the driver and make sure it matches the latest service / API updates. (GITHUB-1416) [Ryan Lee - @zepheiryan]

- [CloudFlare] Fix `export_zone_to_bind_format` method.

  Previously it threw an exception, because `record.extra` dictionary didn't contain `priority` key.

  Reported by James Montgomery - @gh-jamesmontgomery. (GITHUB-1428, GITHUB-1429) [Tomaz Muraus]

Changes in Apache Libcloud 3.0.0-rc1

General

- This release drops support for Python versions older than 3.5.0.

  If you still need to use Libcloud with Python 2.7 or Python 3.4 you can do that by using the latest release which still supported those Python versions (Libcloud v2.8.0). (GITHUB-1377) [Tomaz Muraus]

- Make sure unit tests now also pass on Windows. (GITHUB-1396) [Tomaz Muraus]

Compute

- [VMware vSphere] vSphere driver relies on `pysphere` Python library which doesn't support Python 3 so it has been removed.

  There is an unofficial `pysphere` fork which adds Python 3 support, but it's out of date and not maintained (https://github.com/machalekj/pysphere/tree/2to3). (GITHUB-1377) [Tomaz Muraus]

- [GCE] Fix `ex_list_instancegroups` method so it doesn't throw if `zone` attribute is not present in the response.

  Reported by Kartik Subbarao (@kartiksubbarao) (GITHUB-1346) [Tomaz Muraus]

- [AWS EC2] Add support for creating spot instances by utilizing new `ex_spot` and optionally also `ex_spot_max_price` keyword argument in the `create_node` method. (GITHUB-1398) [Peter Yu - @yukw777]

- Fix some incorrect type annotations in the base compute API.

  Reported by @dpeschman. (GITHUB-1413, GITHUB-1414) [Tomaz Muraus]

- [OpenStack] Fix error with getting node id in `_to_floating_ip` method when region is not called `nova`. (GITHUB-1411, GITHUB-1412) [Miguel Caballer - @micafer]

- [KubeVirt] New KubeVirt driver with initial support for the k8s/KubeVirt add-on. (GITHUB-1394) [Eis D. Zaster - @Eis-D-Z]

Storage

- [AWS S3] Fix upload object code so uploaded data MD5 checksum check is not performed at the end of the upload when AWS KMS server side encryption is used.

  If AWS KMS server side object encryption is used, ETag header value in the response doesn't contain data MD5 digest so we can't perform a checksum check.

  Reported by Jonathan Harden - @jfharden. (GITHUB-1401, GITHUB-1406) [Tomaz Muraus - @Kami]

- [Azure Blobs] Implement chunked upload in the Azure Storage driver.

  Previously, the maximum object size that could be uploaded with the Azure Storage driver was capped at 100 MB: the maximum size that could be uploaded in a single request to Azure. Chunked upload removes this limitation and now enables uploading objects up to Azure's maximum block blob size (~5 TB). The size of the chunks uploaded by the driver can be configured via the `LIBCLOUD_AZURE_UPLOAD_CHUNK_SIZE_MB` environment variable and defaults to 4 MB per chunk. Increasing this number trades-off higher memory usage for a lower number of http requests executed by the driver.

  Reported by @rvolykh. (GITHUB-1399, GITHUB-1400) [Clemens Wolff - @c-w]

- [Azure Blobs] Drop support for uploading PageBlob objects via the Azure Storage driver.

  Previously, both PageBlob and BlockBlob objects could be uploaded via the `upload_object` and `upload_object_via_stream` methods by specifying the `ex_blob_type` and `ex_page_blob_size` arguments. To simplify the API, these options were removed and all uploaded objects are now of BlockBlob type. Passing `ex_blob_type` or `ex_page_blob_size` will now raise a `ValueError`.

  (GITHUB-1400) [Clemens Wolff - @c-w]

- [Common] Add `prefix` argument to `iterate_container_objects` and `list_container_objects` to support object-list filtering in all StorageDriver implementations.

  A lot of the existing storage drivers already implemented the filtering functionality via the `ex_prefix` extension argument so it was decided to promote the argument to be part of the standard Libcloud storage API. For any storage driver that doesn't natively implement filtering the results list, a fall-back was implemented which filters the full object stream on the client side.

  For backward compatibility reasons, the `ex_prefix` argument will still be respected until a next major release. (GITHUB-1397) [Clemens Wolff - @c-w]

- [Azure Blobs] Implement `get_object_cdn_url` for the Azure Storage driver.

  Leveraging Azure storage service shared access signatures, the Azure Storage driver can now be used to generate temporary URLs that grant clients read access to objects. The URLs expire after a certain period of time, either configured via the `ex_expiry` argument or the `LIBCLOUD_AZURE_STORAGE_CDN_URL_EXPIRY_HOURS` environment variable (default: 24 hours).

  Reported by @rvolykh. (GITHUB-1403, GITHUB-1408) [Clemens Wolff - @c-w]

- [Azure Blobs, Aliyun, Local, Ninefold, S3] Ensure upload headers are respected.

  All storage drivers now pass the optional `headers` argument of `upload_object` and `upload_object_via_stream` to the backend object storage systems (previously the argument was silently ignored).

  (GITHUB-1410) [Clemens Wolff - @c-w]

- [AWS S3] Implement `get_object_cdn_url` for the AWS storage driver.

  The AWS storage driver can now be used to generate temporary URLs that grant clients read access to objects. The URLs expire after a certain period of time, either configured via the `ex_expiry` argument or the `LIBCLOUD_S3_STORAGE_CDN_URL_EXPIRY_HOURS` environment variable (default: 24 hours).

  Reported by @rvolykh. (GITHUB-1403) [Aaron Virshup - @avirshup]

DNS

- [Gandi Live] Update the driver and make sure it matches the latest service / API updates. (GITHUB-1416) [Ryan Lee - @zepheiryan]

Container

- [LXD] Add new LXD driver. (GITHUB-1395) [Alexandros Giavaras - @pockerman]

Changes in Apache Libcloud v2.8.0

Common

- Fix a regression with `get_driver()` method not working if `provider` argument value was a string (e.g. using `get_driver('openstack')` instead of `get_driver(Provider.OPENSTACK)`).

  Only officially supported and recommended approach still is to use `Provider.FOO` enum type constant, but since the string notation was unofficially supported in the past, we will still support it until the next major release.

  Reported by @dpeschman. (GITHUB-1391, GITHUB-1390) [Tomaz Muraus]

- Include `py.typed` data file to signal that this package contains type annotations / hints.

  NOTE: At the moment, type annotations are only available for the base compute API. [Tomaz Muraus]

- Fix universal wheel METADATA and ensure conditional dependencies (backports.ssl_match_hostname, typing, enum34) are handled correctly.

  Reported by Adam Terrey (@arterrey). (GITHUB-1392, GITHUB-1393) [Tomaz Muraus]

Compute

- [DigitalOcean] Fix `attach_volume` and `detach_volume` methods. Previously those two methods incorrectly passed volume id instead of volume name to the API. (GITHUB-1380) [@mpempekos]

- [GCE] Add `ex_disk_size` argument to the `create_node` method. (GITHUB-1386, GITHUB-1388) [Peter Yu - @yukw777]

- [VMware vCloud] Various improvements, fixes and additions to the driver. (GITHUB-1373) [OpenText Corporation]

- Update `deploy_node()` method so it now only passes non-deploy node keyword arguments + `auth` argument to the underlying `create_node()` method. Previously it also passed `deploy_node()` specific arguments such as `deploy`, `ssh_username`, `max_tries`, etc. to it.

  Because of that, a lot of the compute drivers which support deploy functionality needed to use `**kwargs` in `create_node()` method signature which made code hard to read and error prone.

  Also update various affected drivers to explicitly declare supported arguments in the `create_node()` method signature (Dummy, Abiquo, Joyent, Bluebox, OpenStack, Gandy, VCL, vCloud, CloudStack, GoGrid HostVirtual, CloudSigma, ElasticStack, RimuHosting, SoftLayer, Voxel, Vpsnet, KTUcloud, BrightBox, ECP, OpenNebula, UPcloud).

  As part of this change, also various issues with invalid argument names were identified and fixed. (GITHUB-1389) [Tomaz Muraus]

- Add MyPy type annotations for `create_node()` and `deploy_node()` method. (GITHUB-1389) [Tomaz Muraus]

- [GCE] Update `deploy_node()` method so it complies with the base compute API and accepts `deploy` argument.

  This method now also takes all the same keyword arguments which original `create_node()` takes. (GITHUB-1387) [Peter Yu - @yukw777, Tomaz Muraus]

- [Common] To make debugging and troubleshooting easier, add `__repr__` and `__str__` method to the `ScriptDeployment` class. [Tomaz Muraus]

- [Common] Add type annotations / hints for rest of the base compute API classes and methods. [Tomaz Muraus]

Storage

- [AWS S3] Make sure `host` driver constructor argument has priority over `region` argument.

  This means if you specify `host` and `region` argument, host won't be inferred from the region, but `host` argument will be used for the actual connection host value. (GITHUB-1384, GITHUB-1383) [@gluap]

Changes in Apache Libcloud v2.7.0

General

- Test code with Python 3.8 and advertise that we also support Python 3.8. (GITHUB-1371, GITHUB-1374) [Tomaz Muraus]

Common

- [OpenStack] Fix OpenStack project scoped token authentication. The driver constructors now accept `ex_tenant_domain_id` argument which tells authentication service which domain id to use for the scoped authentication token. (GITHUB-1367) [kshtsk]

Compute

- Introduce type annotations for the base compute API methods. This means you can now leverage mypy to type check (with some limitations) your code which utilizes Libcloud compute API standard API methods.

  Keep in mind that at this point, type annotations are only available for standard compute API methods. (GITHUB-1306) [Tomaz Muraus]

- [Azure ARM] Fix `attach_volume` method and allow maximum of 64 disks to be added when LUN is not specified. Previously there was a bug and only a maximum of 63 disks could be added. (GITHUB-1372) [Palash Gandhi - @palashgandhi]

- New `start_node` and `stop_node` methods have been added to the base Libcloud compute API NodeDriver class.

  A lot of the existing compute drivers already implemented that functionality via extension methods (`ex_start_node`, `ex_stop_node`) so it was decided to promote those methods to be part of the standard Libcloud compute API and update all the affected drivers.

  For backward compatibility reasons, existing `ex_start` and `ex_stop_node` methods will still work until a next major release.

  (GITHUB-1375, GITHUB-1364) [Tomaz Muraus, @emakarov]

- [GCE] Add new `ex_set_volume_labels` method for managing volume labels to the driver. (GITHUB-1376) [Rob Zimmerman - @zimventures]

- [EC2] Add support for new `inf1.*` instance types. [Tomaz Muraus]

Storage

- [S3] Update S3 driver so a single driver class can be used for different regions.

  Region which is used is controled by the `region` driver constructor argument.

Previously, that driver followed "driver class per region" approach. That approach will be deprecated and removed in a future release.

For more information, please refer to the Upgrade Notes documentation section. (GITHUB-1371) [Tomaz Muras]

- [S3] Add missing `eu-north-1` region to the S3 driver. (GITHUB-1370) [michaelsembwever]

- [S3] Add missing regions (eu-west-3, ap-northeast-3, me-south-1) to the driver. (GITHUB-1371) [Tomaz Muras]

- [S3] Update the driver to throw more user-friendly error message if user is using driver for a region X, but trying to upload / download object to / from a region Y. (GITHUB-1371) [Tomaz Muras]

Changes in Apache Libcloud 2.6.1

Compute

- [Packet] Update `list_sizes` method so it accepts `ex_project_id` argument and works with project API tokens. (GITHUB-1351) [Dimitris Moraitis - @d-mo]

- [GCE] Fix `GCEProject.set_common_instance_metadata` and `GCEproject.set_usage_export_bucket` method. (GITHUB-1354) [Aitor Zabala - @aitorzabala, Tomaz Muraus - @Kami]

- [GCE] Add `sync` / `ex_sync` argument to the `ex_stop_node`, `ex_start_node` and `destroy_node` method. When this argument is set to `False`, method will return immediately without waiting polling and waiting for a long running API operation to finish before returning. For backward compatibility reasons, it defaults to `True`. (GITHUB-1357) [Rob Zimmerman - zimventures]

- [GCE] Update list of image projects and add new `centos-8` and `debian-10` based images. (GITHUB-1358) [Christopher Lambert - XN137]

- [OpenStack v2] Add new `ex_image_ref` argument to the `create_volume` method. This way bootable volumes can be created from specific images. (GITHUB-1363) [Rick van de Loo]

- [OpenStack v2] Update `create_node_method` and allow users to create nodes from bootable volumes without specifying `image` argument. (GITHUB-1362) [Rick van de Loo]

- [AWS] Re-generate and update available EC2 instance sizes and pricing data. [Tomaz Muraus]

Storage

- [Common, S3, GCS] Reuse TCP connections when uploading files (GITHUB-1353) [Quentin Pradet]

Load Balancer

- [AWS] Implement various create methods in the driver. (GITHUB-1349) [Anton Kozyrev - @Irvan]

Changes in Apache Libcloud 2.6.0

General

- [OpenStack] Update OpenStack identity driver so a custom project can be selected using `domain_name` keyword argument. Previously, that wasn't possible and the first project which was returned by the API was always selected. (GITHUB-1293) [Miguel Caballer - @micafer]

- Add new `extra` attribute to the base `NodeLocation` class. (GITHUB-1282) [Dimitris Moraitis - @d-mo]

- Remove various code patterns which were in place for supporting multiple Python versions, including 2.5 and 2.6. Libcloud hasn't supported Python < 2.7 for a while now, so we can remove that code. (GITHUB-1307) [Tomaz Muraus]

- Also run pylint on `libcloud/compute/` directory and fix various pylint violations. (GITHUB-1308) [Tomaz Muraus]

- [OpenStack] Remove unused variable in parse_error (GITHUB-1260) [Rick van de Loo]

- Add support for HTTPS proxies and fix `driver.set_http_proxy()` method.

  HTTPS proxy can be set up by either setting `https_proxy` / `http_proxy` environment variable or by using `driver.connection.connection.set_http_proxy` method.

  For more information, please refer to the documentation - https://libcloud.readthedocs.io/en/latest/other/using-http-proxy.html (GITHUB-1314, GITHUB-1324) [Jim Liu - @hldh214, Tomaz Muraus]

- Fix paramiko debug logging which didn't work when using `LIBCLOUD_DEBUG` environment variable. (GITHUB-1315) [Tomaz Muraaus]

- Update paramiko SSH deployment client so it automatically tries to convert private keys in PEM format with a header which paramiko doesn't recognize into a format which paramiko recognizes.

  NOTE: Paramiko only supports keys in PEM format. This means keys which start with "—-BEGIN <TYPE> PRIVATE KEY——". Keys in PKCS#8 and newer OpenSSH format are not supported.

  For more information, see https://libcloud.readthedocs.io/en/latest/compute/deployment.html#supported-private-ssh-key-types (GITHUB-1314)

- Update Paramiko SSH client to throw a more user-friendly error if a private key file in an unsupported format is used. (GITHUB-1314) [Tomaz Muraus]

- Fix HTTP(s) proxy support in the OpenStack drivers. (GITHUB-1324) [Gabe Van Engel - @gvengel]

- Fix logging connection class so it also works when data type is `bytearray` or `bytes`. (GITHUB-1339) [Tomaz Muraus]

Compute

- [Google Compute Engine] Fix the driver so `list_nodes()` method doesn't throw if there is a node in a `SUSPENDED` state.

  Also update the code so it doesn't crash if an unknown node state which is not defined locally is returned by the API when listing nodes. Such states are now mapped to `UNKNOWN`. (GITHUB-1296, LIBCLOUD-1045)

  Reported by rafa alistair. [Tomaz Muraus]

- [OpenStack] Fix a bug with retrieving floating IP address when a `device_owner` of a port is `compute:None`. (GITHUB-1295) [Miguel Caballer - @micafer]

- [Packet] Add various new extension methods to Packet.net driver (`ex_reinstall_node`, `ex_list_projects`, `ex_get_bgp_config_for_project`, `ex_get_bgp_config`, `ex_list_nodes_for_project`, etc.). (GITHUB-1282) [Dimitris Moraitis - @d-mo]

- [Maxihost] Add new compute driver for Maxihost provider (https://www.maxihost.com/). (GITHUB-1298) [Spyros Tzavaras - @mpempekos]

- [Azure ARM] Add various improvements to the Azure ARM driver: - Add functionality to resize a volume in Azure - Add functionality to update the network profile of a node - Add functionality to update a network interface's properties - Add functionality to check IP address availability (GITHUB-1244) [Palash Gandhi - @palashgandhi]

- [EC2] Allow user to pass arbitrary filters to `list_volumes` method by passing a dictionary with filters as `ex_filters` method argument value. (GITHUB-1300) [Palash Gandhi - @palashgandhi]

- [GCE] Add new `ex_instancegroupmanager_set_autohealingpolicies` method to the GCE driver.

  This method allows user to set the auto healing policies (health check to use and initial delay) on GCE instance group. (GITHUB-1286) [Kenta Morris - @kentamorris]

- [GCE] Update GCE driver to include new operating system images such as Ubuntu 18.04, RHEL 8, etc. (GITHUB-1304) [Christopher Lambert - @XN137]

- [GCE] Add new `ex_resize_volume` method to the driver. (GITHUB-1301) [Palash Gandhi - @palashgandhi]

- [OpenStack] Add various router management methods to the OpenStack driver. (GITHUB-1281) [Miguel Caballer - @micafer]

- [OpenStack] Fix `ex_resize` method. (GITHUB-1311) [Miguel Caballer - @micafer]

- [OpenStack] For consistency, rename `ex_resize` method to `ex_resize_node`. For backward compatibility reasons, leave `ex_resize` alias in place. [Tomaz Muraus]

- [Gridscale] Add new driver for Gridscale provider (https://gridscale.io). (GITHUB-1305, GITHUB-1315) [Sydney Weber - @PrinceSydney]

- [Oneandone] Update Oneandone driver to accomodate latest changes to the API. This means removing deprecated `ex_remove_server_firewall_policy` method and replacing `port_from` and `port_to` argument on the firewall policy with a single `port` attribute. (GITHUB-1230) [Amel Ajdinovic - @aajdinov]

- [DigitalOcean] Update `list_locations` method in the DigitalOcean driver to only returns regions which are available by default. If you want to list all the regions, you need to pass `ex_available=False` argument to the method. (GITHUB-1001) [Markos Gogoulos]

- [EC2] Add new `ex_modify_subnet_attribute` method to the EC2 driver. (GITHUB-1205) [Dan Hunsaker - @danhunsaker]

- [Azure ARM] Add `ex_delete_public_ip` method to the Azure ARM driver. (GITHUB-1318) [Reza Shahriari - redha1419]

- [EC2] Update EC2 driver to throw a more user-friendly exception if a user / developer tries to provide an invalid value type for an item value in the request `params` dictionary.

  Request parameters are sent via query parameters and not via request body, as such, only string values are supported. (GITHUB-1329, GITHUB-1321)

  Reported by James Bednell. [Tomaz Muraus]

- [OpenStack] Add new `ex_remove_security_group_from_node` method. (GITHUB-1331) [Miguel Caballer - @micafer]

- [OpenStack] Fix broken `ex_update_port` method. (GITHUB-1320) [Miguel Caballer - @micafer]

- [Softlayer] Fix a bug with driver incorrectly handling the value of `ex_hourly` argument in the `create_node()` method which caused nodes to always be created with hourly billing, even if this argument was set to `False`. (GITHUB-1334, GITHUB-1335) [@r2ronoha]

- [GCE] Add optional `cpuPlatform` and `minCpuPlatform` attributes to the `node.extra` dictionary. (GITHUB-1342, GITHUB-1343) [@yairshemla]

Storage

- [Azure Blobs] Enable the Azure storage driver to be used with the Azurite Storage Emulator and Azure Blob Storage on IoT Edge. (LIBCLOUD-1037, GITHUB-1278) [Clemens Wolff - @c-w]

- [Azure Blobs] Fix a bug with Azure storage driver works when used against a storage account that was created using `kind=BlobStrage`. This includes updating the minimum API version used / supported by the storage driver from `2012-02-12` to `2014-02-14`. (LIBCLOUD-851, GITHUB-1202, GITHUB-1294) [Clemens Wolff - @c-w, Davis Kirkendall - @daviskirk]

- [Azure Blobs] Increase the maximum size of block blobs that can be created to 100 MB. This includes updating the minimum API version used / supported by the storage driver from `2014-02-14` to `2016-05-31`. (GITHUB-1340) [Clemens Wolff - @c-w]

- [Azure Blobs] Set the minimum required version of requests to `2.5.0` since requests `2.4.0` and earlier exhibit XML parsing errors of Azure Storage responses. (GITHUB-1325, GITHUB-1322) [Clemens Wolff - @c-w]

- [Azure Blobs] Detect bad version of requests that leads to errors in parsing Azure Storage responses. This scenario is known to happen on RHEL 7.6 when requests was installed via yum. (GITHUB-1332, GITHUB-1322) [Clemens Wolff - @c-w]

- [Common, CloudFiles] Fix `upload_object_via_stream` and ensure we start from the beginning when calculating hash for the provided iterator. This way we avoid hash mismatch errors in scenario where provided iterator is already iterated / seeked upon before calculating the hash. (GITHUB-1326) [Gabe Van Engel - @gvengel, Tomaz Muraus]

- [Backblaze B2] Fix a bug with driver not working correctly due to a regression which was inadvertently introduced in one of the previous releases. (GITHUB-1338, GITHUB-1339)

  Reported by Shawn Nock - @nocko. [Tomaz Muraus]

- [Backblaze B2] Fix `upload_object_via_stream` method. (GITHUB-1339) [Tomaz Muraus]

DNS

- [Cloudflare] Re-write the Cloudflare DNS driver to use Cloudflare API v4. (LIBCLOUD-1001, LIBCLOUD-994, GITHUB-1292) [Clemens Wolff - @c-w]

- [Gandi LiveDNS] Add new driver for Gandi LiveDNS service. (GITHUB-1323) [Ryan Lee - @zepheiryan]

- [PowerDNS] Update driver so it works with API v3 and v4. #1328 [@biggosh]

Changes in Apache Libcloud 2.5.0

General

- [NTT CIS] Add loadbalancer and compute drivers for NTT-CIS, rename dimensiondata modules to NTT-CIS. (GITHUB-1250) [Mitch Raful]

- [NTT CIS] Fix loadbalancer docs. (GITHUB-1270) [Mitch Raful]

- Use assertIsNone instead of assertEqual with None in tests (GITHUB-1264) [Ken Dreyer]

- Updating command line arguments to current version in Azure examples. (GITHUB-1273) [mitar]

- [GCE, SoftLayer] Update GCE and Softlayer drivers to utilize crypto primitives from the `cryptography` library instead of deprecated and unmaintained `PyCrypto` library.

  (GITHUB-1280) [Ryan Petrello]

- Fix `libcloud.enable_debug` function so it doesn't leak open file handle and closes the open file when the program exits when a debug mode is used. [Tomaz Muraus]

- Update various drivers (CloudFiles, NTT CIS etc.) so they don't leak open file handles in some situations. [Tomaz Muraus]

Common

- [OpenStack] Handle missing user enabled attribute (GITHUB-1261) [Ken Dreyer]

- [Google Cloud Storage] Handle Interoperability access keys of more than 20 characters. (GITHUB-1272) [Yoan Tournade]

Compute

- [OpenStack] Implement OpenStack_1_1_NodeDriver ex_get_snapshot (GITHUB-1257) [Rick van de Loo]

- [OpenStack] Pagination in various OpenStack_2_NodeDriver methods (GITHUB-1263) [Rick van de Loo]

- [OpenStack] Implement OpenStack_2_NodeDriver ex_create_subnet (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver ex_delete_subnet (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver list_volumes (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver ex_get_volume (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver create_volume (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver destroy_volume (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver ex_list_snapshots (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver create_volume_snapshot (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver destroy_volume_snapshot (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver ex_list_security_groups (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver ex_create_security_group (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver ex_delete_security_group (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver ex_create_security_group_rule (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver ex_delete_security_group_rule (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Implement OpenStack_2_NodeDriver ex_list_floating_ip_pools (LIBCLOUD-874, GITHUB-1242) [Miguel Caballer]

- [OpenStack] Fix parse_error if 'code' not in API response message (GITHUB-1242) [Miguel Caballer]

- [OpenStack] Adapt _to_port function to work with old OpenStack versions (GITHUB-1242) [Miguel Caballer]

- [OpenStack] Use SUSPENDED NodeState in OpenStack driver (GITHUB-1269) [Miguel Caballer]

- [UpCloud] Update documentation for UpCloud driver (LIBCLOUD-1026, GITHUB-1259) [Ilari Mäkelä]

- [NTT CIS] Fix indenting in ex_initiate_drs_failover docstring (GITHUB-1271) [Rick van de Loo]

- [NTT CIS] Change endpoint 'canada' to 'ca' in libcloud/common/nttcis.py (GITHUB-1270) [Mitch Raful]

- [OpenStack] Fix `detach_volume` method so it works with v2 volumes. (GITHUB-1267) [Rick van de Loo]

- [CloudSigma] Fix CloudSigma driver so it correctly handles subscription objects without the `start_time` and / or `end_time` attribute. (GITHUB-1284, LIBCLOUD-1040) [aki-k, Tomaz Muraus]

Storage

- [Azure] Fix `upload_object_via_stream` method so it also works with iterators which don't implement `seek()` method. If the iterator doesn't support seek, entire iterator content will be buffered in memory. (LIBCLOUD-1043, GITHUB-1287) [Clemens Wolff]

- [CloudFiles] Fix `download_object_as_stream` method in the CloudFiles driver. This regression / bug was inadvertently introduced when migrating code to `requests`. (LIBCLOUD-1039, GITHUB-1283) [Matt Seymour]

- [CloudFiles] Fix a bug with `ChunkStreamReader` class and make sure file descriptor is also closed if the iterator isn't fully exhausted or if the iterator is never read from.

  NOTE: This potential open file descriptor leakage only affected code which utilized `ex_multipart_upload_object` method. [Tomaz Muraus]

Container

- [Docker] Improve docstring for RegistryClient (GITHUB-1254) [Ken Dreyer]

DNS

- Add new driver for RcodeZero DNS (GITHUB-1256, LIBCLOUD-1025) [MikeAT]

- [DigitalOcean] Update DigitalOcean driver so it supports `ttl` attribute for `Record` objects. This includes support for specifying a record ttl via `extra['ttl']` attribute when creating and updating a record. (GITHUB-1252 LIBCLOUD-1022) [Kevin Roy]

Storage

- Adds missing docs for param ex_prefix & adds to DummyStore. Add ex_prefix kwarg to the *list_container_objects* methods in the base and dummy classes. (GITHUB-1275) [RichardARPANET]

Changes in Apache Libcloud 2.4.0

- Refuse installation with Python 2.6 and Python 3.3 (support was already dropped in Libcloud 2.3.0)
- Support Python 3.7 (GITHUB-1227, GITHUB-1236) [Andreas Hasenack, Andrew Starr-Bochicchio, Quentin Pradet]
- Cleanup various Python files (GITHUB-1182, GITHUB-1183, GITHUB-1185, GITHUB-1186, GITHUB-1187, GITHUB-1188) [Rémy Léone]
- Allow running tests with http_proxy set (GITHUB-1236) [Andreas Hasenack]

Common

- [OpenStack] Document openstack_connection_kwargs method (GITHUB-1219) [Ken Dreyer]
- [OpenStack] Handle missing user email in OpenStackIdentityUser (GITHUB-1249) [Ken Dreyer]

Compute

- [ARM] Support OS disk size definition on node creation (GITHUB-1196) [Vojta Bartos]
- [Digital Ocean] Support floating IPs (GITHUB-1177) [Rick van de Loo]
- [Digital Ocean] Support attach/detach for floating IPs (GITHUB-1191) [Rick van de Loo]
- [Digital Ocean] Add ex_get_node_details (GITHUB-1221) [Rick van de Loo]
- [Digital Ocean] Add tags extra attribute to create_node (GITHUB-1212) [Nikita Chebykin]
- [Dimension Data] Fix IndexError in list_images (GITHUB-1171) [Adam Friedman]
- [EC2] Add AWS eu-west-3 (Paris) region (GITHUB-1175) [Anthony Monthe]
- [EC2] Add description to ex_authorize_security_group_ingress (GITHUB-1122) [Arturo Noha]
- [EC2] Added script to automatically get EC2 instance sizes (GITHUB-1211) [Anthony Monthe, Quentin Pradet]
- [EC2] Update instance sizes (GITHUB-1238) [Ward Vandewege]
- [EC2] Accept tags when create a snapshot (LIBCLOUD-1014, GITHUB-1240) [Rafael Gonçalves]
- [GCE] Expand Firewall options coverage (LIBCLOUD-960, GITHUB-1144) [maxlip]
- [GCE] Expand network and subnetwork options coverage (LIBCLOUD-985, GITHUB-1181) [maxlip]
- [GCE] Extend ex_create_address to allow internal ip creation (GITHUB-1174) [Jeremy Solarz]
- [GCE] Allow shared VPC in managed instance group creation (GITHUB-1179) [Boris Chazalet]
- [GCE] Support disk_size parameter for boot disk when creating instance (LIBCLOUD-973, GITHUB-1162) [Rahul Paigavan]
- [GCE] Update public image projects list (LIBCLOUD-961, GITHUB-1143) [Sean Marlow]
- [GCE] Fix _find_zone_or_region for >500 instances (GITHUB-1203) [Léo Ferlin-Sutton]

- [GCE] Allow routing_mode=None in ex_create_network (GITHUB-1217) [Daniel Hunsaker]
- [OpenStack] Implement Glance Image API v2 (GITHUB-1151) [Rick van de Loo]
- [OpenStack] Fix spelling in ex_files description (GITHUB-1197) [Ken Dreyer]
- [OpenStack v2] Allow listing image members (GITHUB-1172) [Rick van de Loo]
- [OpenStack v2] Allow creating and accepting image members (GITHUB-1176) [Rick van de Loo]
- [OpenStack v2] Fix image members methods (GITHUB-1190) [Rick van de Loo]
- [OpenStack] Fix API doc for delete_floating_ip (GITHUB-1218) [Ken Dreyer]
- [OpenStack] Implement port attaching/detaching (GITHUB-1225) [Rick van de Loo]
- [OpenStack] Add methods for getting and creating ports (GITHUB-1226) [Alexander Grooff]
- [OpenStack] Add get_user method (GITHUB-1216) [Ken Dreyer]
- [OpenStack] Add ex_list_subnets to OpenStack_2_NodeDriver (GITHUB-1215, LIBCLOUD-604) [Miguel Caballer]
- [OpenStack] The OpenStack_2_NodeDriver uses two connections (GITHUB-1215, LIBCLOUD-997) [Miguel Caballer]
- [OpenStack] The OpenStack_2_NodeDriver /v2.0/networks instead of /os-networks (GITHUB-1215, LIBCLOUD-998) [Miguel Caballer]
- [Scaleway] New Scaleway driver (GITHUB-1121, GITHUB-1220) [Daniel Hunsaker, Nándor István Krácser, Rémy Léone]
- [Scaleway] Update Scaleway default API host (GITHUB-1239) [Rémy Léone]

DNS

- [Google Cloud DNS] Document driver instantiation (GITHUB-1198) [Gareth McFarlane]

Storage

- Update docstring for storage provider class (GITHUB-1201) [Clemens Wolff]
- [Azure Blob Storage] Allow filtering lists by prefix (LIBCLOUD-986, GITHUB-1193) [Joshua Hawkinson]
- [Azure Blob Storage] Update driver documentation (GITHUB-1208) [Clemens Wolff]
- [Azure Blob Storage] Fix upload/download streams (GITHUB-1231) [Michael Perel]
- [Azure Blob Storage] Fix PageBlob headers (GITHUB-1237) [Andreas Hasenack]
- [S3] Guess s3 upload content type (LIBCLOUD-958, GITHUB-1195) [Iuri de Silvio]
- [S3] Add Amazon S3 (cn-northwest-1) Storage Driver (GITHUB-1241) [@yangkang55]

Other

- Fixed spelling in 2.0 changes documentation (GITHUB-1228) [Jimmy Casey]

Changes in Apache Libcloud 2.3.0

- Drop support for Python 2.6 and Python 3.3 They're no longer supported, and the Python ecosystem is starting to drop support: two of our test dependencies no longer support them. [Quentin Pradet]

- Made pytest-runner optional (GITHUB-1167) [Vlad Glagolev]

Common

- Improve warning when CA_CERTS_PATH is incorrectly passed as a list (GITHUB-1118) [Quentin Pradet]

- Cleaned up and corrected third-party drivers documentation (GITHUB-1148) [Daniel Hunsaker]

- Modernized a few Python examples (GITHUB-1164) [Batuhan Osman Taşkaya]

- [OpenStack] Authentify with updated Identity API (LIBCLOUD-965, GITHUB-1145) [Miguel Caballer]

Compute

- Fix "wait_until_running() method so it also works correctly and doesn't append "None" to the addresses list if node has no IP address. (GITHUB-1156, LIBCLOUD-971) [Tobias Paepke]

- [ARM] Fix checking for "location is None" in several functions (LIBCLOUD-926, GITHUB-1098) [Sameh Elsharkawy]

- [ARM] Fix error when using SSH key auth with Python 3 (GITHUB-1098) [Sameh Elsharkawy]

- [ARM] Fix API call on powerOff, understand PAUSED state (GITHUB-1003) [Markos Gogoulos]

- [ARM] Delete VHDs more reliably in destroy_node(), raise exception on unhandled errors (GITHUB-1120) [Lucas Di Pentima]

- [ARM] Fix api version used to list and delete NICs (GITHUB-1128) [Peter Amstutz]

- [ARM] Allow faster list_nodes() with ex_fetch_power_state=False (GITHUB-1126) [Peter Amstutz, Lucas Di Pentima]

- [ARM] Fix delete_old_vhd (GITHUB-1137) [Peter Amstutz, Lucas Di Pentima]

- [ARM] Limit number of retries in destroy_node (GITHUB-1134) [Peter Amstutz, Lucas Di Pentima]

- [ARM] Fix Retry-After header handling (GITHUB-1139) [Lucas Di Pentima]

- [CloudStack] Handle NICs without addresses (GITHUB-1141) [Pierre-Yves Ritschard]

- [CloudStack] Add change size and restore (LIBCLOUD-975, GITHUB-1166) [Mauro Murari]

- [Digital Ocean] Add ex_enable_ipv6 in DigitalOcean_v2 driver (GITHUB-1130) [Rick van de Loo]

- [Digital Ocean] Add support for tags in list_nodes() (LIBCLOUD-967, GITHUB-1149) [Mike Fischer]

- [Digital Ocean] Add rebuild and resize commands (LIBCLOUD-977, GITHUB-1169) [Adam Wight]

- [EC2] Add new x1.16xlarge and x1e.32xlarge instance type. (GITHUB-1101) [Anthony Monthe]

- [EC2] Add AWS EC2 c5 series (GITHUB-1147) [Anthony Monthe]

- [EC2] Add AWS EC2 M5 sizes (GITHUB-1159) [Anthony Monthe]

- [EC2] Update pricing information for EC2 instances. [Tomaz Muraus]

- [EC2] Allow cn-north-1 even without pricing information (LIBCLOUD-954, GITHUB-1127) [Quentin Pradet]

- [EC2] Fix EBS volume encryption (GITHUB-1008) [Sergey Babak]

- [ECS Aliyun] Support modify_security_group_attributes (GITHUB-1157) [Zhang Yiming]

- [GCE] Allow adding labels to images (GITHUB-1138) [Katriel Traum, Eric Johnson]

- [GCE] Allow adding license strings to images (GITHUB-1136) [Katriel Traum, Eric Johnson]

- [GCE] Support GCE node labels. (LIBCLOUD-934, GITHUB-1115) [@maxlip]

- [GCE] Fix *GCEList* pagination. (GITHUB-1095) [Yap Sok Ann]

- [GCE] Allow setting service account in instance templates (LIBCLOUD-947, GITHUB-1108) [Evan Carter]

- [GCE] Add support for private IP addresses in GCE instance creation (LIBCLOUD-944, GITHUB-1107) [Gareth Mcfarlane]

- [GCE] Allow for use of shared network (VPC) and subnetwork (GITHUB-1165) [Boris Chazalet]

- [GCE] Add support for accelerators (LIBCLOUD-963, GITHUB-1163) [Michael Johnson]

- [ProfitBricks] Update driver and add support for the new API v4. (GITHUB-1103) [Nurfet Becirevic]

- [ProfitBricks] Fix list_snapshots() method (GITHUB-1153) [Chad Phillips]

- [UpCloud] New driver for UpCloud (LIBCLOUD-938, GITHUB-1102) [Mika Lackman, Ilari Mäkelä]

- [UpCloud] Use disk size and storage tier also when creating node from template (LIBCLOUD-952, GITHUB-1124) [Mika Lackman]

- [UpCloud] Allow to define hostname and username. (LIBCLOUD-951, LIBCLOUD-953, GITHUB-1123, GITHUB-1125) [Mika Lackman]

- [UpCloud] Add pricing information to list_sizes. (LIBCLOUD-969, GITHUB-1152) [Mika Lackman]

Storage

- Added Digital Ocean Spaces driver (LIBCLOUD-955, GITHUB-1129) [Andrew Starr-Bochicchio]

- [Digital Ocean Spaces] Add support for AMS3 region (GITHUB-1142) [Andrew Starr-Bochicchio]

- [Digital Ocean Spaces] Add support for SGP1 region (GITHUB-1168) [Andrew Starr-Bochicchio]

- Fix a bug / regression which resulted in increased memory consumption when using `download_object` method. This method would store whole object content in memory even though there was no need for that.

  This regression was introduced in 2.0.0 when we moved to using `requests` library. (GITHUB-1132) [Quentin Pradet]

- Fix a regression with hash computation performance and memory usage on object upload inadvertently introduced in 2.0.0 and make it more efficient. (GITHUB-1135) [Quentin Pradet]

Changes in Apache Libcloud 2.2.1

Common

- Fix an issue with installation failing on some operating system and file systems combinations (e.g. ecryptfs layered on top of ext4) which don't support file names longer than 143 characters. (LIBCLOUD-946, GITHUB-1112)

  Reported by Cyrille Verrier. [Tomaz Muraus]

Compute

- [EC2] add g3 instance types [GITHUB-1101] (@zulupro)

- [EC2] add 'end' to ec2 reserved_node [GITHUB-1099] (@xofer)

- Decrease sleep delay (from 1.5 to 0.2 seconds) inside paramiko client which is used to prevent busy waiting while waiting for data on the channel.

  This should cause deploy scripts which produce a lot of output in incremental manner to finish faster. [Tomaz Muraus]

- Fix a regression in the Azure ARM driver which didn't allow custom storage URI suffix to be used with create_node. (GITHUB-1110) [Lucas Di Pentima]

Tests

- Make sure we normalize header values and cast all the numbers to strings in base connection classes used by tests. (LIBCLOUD-945, GITHUB-1111)

  Reported by Erich Eckner. [Tomaz Muraus]

Changes in Apache Libcloud 2.2.0

Compute

- [EC2] add g3 instance types [GITHUB-1101] (@zulupro)

- [EC2] add 'end' to ec2 reserved_node [GITHUB-1099] (@xofer)

Changes in Apache Libcloud 2.2.0

Common

- [GCE] Scrape prices for GCE Australia Region [GITHUB-1085] (Francisco Ros)

Compute

- [ARM] Add option to create static public IP [GITHUB-1091, LIBCLOUD-918] (Aki Ketolainen)

- [SOFTLAYER] Add *get_image* method to class [GITHUB-1066] (Francois Regnoult)

- [ARM] Add Storage support, volumes, snapshots [GITHUB-1087] (Sergey Babak)

Container

- [DOCKER] Fixes to support TLS connection [GITHUB-1067] (johnnyWalnut)

DNS

- [ROUTE53] Fix for TXT and SPF records, when user didn't escapsulate data in quotes, the API would fire error. As reported by @glyph [LIBCLOUD-875, GITHUB-1093] (Anthony Shaw)
- [LINODE] Add priority to the extra dictionary in record instances [GITHUB-1088] (@mete0r)

Load Balancer

- Fixed AWS ALB/ELB driver init method to instantiate nested connection object properly [LIBCLOUD-936, GITHUB-1089] (Anton Kozyrev)

Storage

- [CLOUDFILES] Update OpenStackSwiftConnection to work with auth version 3.0 [GITHUB-1068] (Hakan Carlsson)
- [CLOUDFILES] Add SSL URI support [GITHUB-1076, LIBCLOUD-458] (@ayleph)

Changes in Apache Libcloud 2.1.0

Common

- [AWS] Update prices and fix some region names [GITHUB-1056] (Francisco Ros)
- Fix bug in utils.decorators wrap exception method, used by vsphere driver [GITHUB-1054] (Anthony Shaw)
- Use PyTest as the unit testing runner (Anthony Shaw)
- Use of LXML is now disabled by defalt, use `libcloud.utils.py3.DEFAULT_LXML = True` to reenable. LXML has compatibility issues with a number of drivers and etree is a standard package. [GITHUB-1038] (Anthony Shaw)
- Switch RawResponse class to use content body instead of text body, up to 10x performance improvement for methods like StorageDriver.download_object [GITHUB-1053] (Quentin Pradet)

Compute

- [OPENSTACK] Add support for Nova 2.x and Keystone 3 [GITHUB-1052] (Anthony Shaw)
- [GCE] Add loadBalancingScheme parameter for ex_create_forwarding_rule method in GCE driver. [GITHUB-1079] (@sT331h0rs3)
- [GCE] Fix error codes not being parsed in certain scenarios [GITHUB-1074, LIBCLOUD-925] (micafer)
- [EC2] Fix node's Block Device Mapping was parsed from incorrect mapping. EbsInstanceBlockDevice is different from EbsBlockDevice. [GITHUB-1075] (Gennadiy Stas)
- [GANDI] Fixes the location name in image and instance type classes [GITHUB-1065] (Sayoun)
- [GCE] Fix method for create instance properties, it previously ignored the disk type parameter and defaulted to pd-standard. [GITHUB-1064] (Evan Carter)
- Fix missing return data from EC2 billing product methods [GITHUB-1062] (Alex Misstear)
- Handle [VULTR] API rate limiting [GITHUB-1058] (Francisco Ros)

- Fix Kili driver not correctly fixing the auth version for openstack to 2.0_password [GITHUB-1054] (Anthony Shaw)

- [EC2] Add i3 instance types for AWS [GITHUB-1038] (Stephen Mullins)

- [VULTR] Extend extra dict of Vultr sizes to include additional fields (plan_type and available_locations) [GITHUB-1044] (Francisco Ros)

Container

- New driver for Google Container Engine [GITHUB-1059] (Andy Maheshwari)

- [KUBERNETES] Fix get_container method responding with None [GITHUB-1054] (Anthony Shaw)

- [DOCKER] Fix for start_container method [GITHUB-1049] (@johnnyWalnut)

- [DOCKER] fix add an extra check otherwise list_containers breaks with AttributeError when fromImages is specified [GITHUB-1043] (@johnnyWalnut)

Storage

- [S3] Fix raise in s3.upload_object_via_stream [LIBCLOUD-914, GITHUB-1055] (Quentin Pradet)

Changes in Apache Libcloud 2.0.0

Common

- Fix OpenStack drivers not correctly setting URLs when used with identity API, would default to 127.0.0.1 and service catalog URLs were not adhered to. [GITHUB-1037, LIBCLOUD-912, LIBCLOUD-904] (Anthony Shaw)

- Fix Aliyun ECS, Load balancer and storage adapters when using unicode UTF-8 characters in the names of resources in 2.0.0rc2 < it would fail as a MalformedResponseError, Python 2.7 element tree was raising a unicode error [GITHUB-1032] [GITHUB-994] (Anthony Shaw)

- Refactor the test classes to use the full libcloud.http and libcloud.common.base modules, with Connection, Response all used with requests_mock. This increases our test coverages and catches bugs in drivers' custom parse_body and auth modules [GITHUB-1031] (Anthony Shaw)

- Rename libcloud.httplib_ssl to libcloud.http now that we don't use httplib [GITHUB-1028] (Anthony Shaw)

Compute

- [GOOGLE] Add test to check that can create a GCE volume at a given location [GITHUB-1048] (Francisco Ros)

- [GOOGLE] Fix GCENodeDriver.ex_get_volume() when zone param is of class GCEZone or NodeLocation [GITHUB-1047] (Francisco Ros)

- [GOOGLE] Fix call to GCENodeDriver._ex_populate_volume_dict [GITHUB-1046] (Francisco Ros)

- [ARM] Add support for Azure Cloud Environments as well as Locations [GITHUB-969] (Peter Amstutz)

- [EC2] Add support for ModifyVolume and DescribeVolumesModifications [GITHUB-1036] (Hennadii Stas)

- [ARM] Fix string representation of the VhdImage type and fix listing of Public IP addresses [GITHUB-1035] (Anthony Shaw)

- [GOOGLE] Remove validation checks for guestOsFeatures [GITHUB-1034] (Max Illfelder)

- [VSPHERE] Fix issue with authentication methods crashing [GITHUB-1031] (Anthony Shaw)

- [ARM] Add network security groups to azure ARM [GITHUB-1033] (Joseph Hall)

- [ARM] Add the ability to list resource groups [GITHUB-1032] (Joseph Hall)

- Add 1&1 compute driver [LIBCLOUD-911] [GITHUB-1029] (Jasmin Gacic)

- Fix Azure ARM driver condition for ex_list_publishers where location is specified [GITHUB-1030] (Joseph Hall)

- Added Import Snapshot and Describe Import Snapshot to EC2 compute driver [GITHUB-1023] (Nirzari Iyer)

- Add price_monthly extra param to digitalocean sizes [GITHUB-1021] (Francisco Ros)

- Add aliyun ecs instance join leave security group [GITHUB-992] (Jie Ren)

- Add keypair management to OnApp driver [GITHUB-1018] (Tinu Cleatus)

- Add missing regions in AWS storage and compute drivers [GITHUB-1019] (Alex Misstear)

- Add SR-IOV net support to images in EC2 compute driver [GITHUB-1020] (Alex Misstear)

- Fix - update t2.small image size from 11 CPU to 1 [GITHUB-1022] (Francisco Ros)

- Added Billing Product for image in EC2 compute driver [GITHUB-1024] (Nirzari Iyer)

DNS

- Add OnApp driver [GITHUB-1017] [LIBCLOUD-907] (Tinu Cleatus)

Changes in Apache Libcloud 2.0.0rc2

Common

- Fix LIBCLOUD_DEBUG trying to decompress already decompressed responses [LIBCLOUD-910] (Anthony Shaw)

- Added an integration test API and a test suite for validating functionality without mocking any libcloud subsystems [GITHUB-970] (Anthony Shaw)

- Fix for Linode classes since 2.0x [GITHUB-1026] (Anthony Shaw)

- Fix CertificateConnection not correctly signing requests in 2.0rc1, impacted Azure classic driver, OpenStack and Docker driver [GITHUB-1015] (Anthony Shaw)

- Change Cloudscale to cloudscale.ch. [GITHUB-993] (David Halter)

- Explicitly check if response is None in RawResponse class [GITHUB-1006] [LIBCLOUD-901] (Richard Xia)

Compute

- Outscale SAS doc improvements and logo update [GITHUB-950] (Javier M Mellid)

- [GCE] Allow preemptible instances to be created [GITHUB-954] (John Baublitz)

- Add support for forcing detachment of EBS volumes to EC2 driver [GITHUB-1007] (Sergey Babak)
- Fix Public IP not assigned when creating NIC on Azure ARM [GITHUB-1013] [LIBCLOUD-906] (Simone Ripamonti)
- [ONAPP] Add list images support for OnApp driver [GITHUB-1011] (Tinu Cleatus)
- [EC2] Add r4 instance types for AWS [GITHUB-997] (Jens Deppe)
- [EC2] support for AWS eu-west-2 and ca-central-1 regions [GITHUB-1009] (Marat Komarov)
- [EC2] Add P2 GPU instance types [GITHUB-996] (MJK)
- [EC2] Add method to modify snapshot attribute for EC2 [GITHUB-990] (Sayan Chowdhury)
- [Linode] Add start, stop instance methods and fix incorrect state TERMINATED to STOPPED [GITHUB-986] (Markos Gogoulos)
- [EC2] Add ENA support for EC2 compute images [GITHUB-983] (Alex Misstear)
- [Azure ARM] fix typeerror on ex_list_nics [GITHUB-979] (Choi Jongu)
- [GCE] allow delete instances from managed group [GITHUB-975] (@zacharya19)

Storage

- Reintroduce S3 multipart upload support with signature v4 [GITHUB-1005] [LIBCLOUD-834] (Alex Misstear)

Changes Apache Libcloud 2.0.0rc1

Common

- Fix DEBUG mode, also add support for using io.StringIO as the file handle when calling libcloud.enable_debug. (GITHUB-978, LIBCLOUD-887) [Anthony Shaw]
- Introduction of the requests package as the mechanism for making HTTP requests for all drivers. (GITHUB-928) [Anthony Shaw]
- Fix bug where custom port and secure flag would not get propagated to connection class. (GITHUB-972) [Anthony Shaw]
- Fix bug where custom port would not get propagated to connection. (GITHUB-971) [Anthony Shaw]
- Fix bug where instantiating a connection from URL and then requesting an action with a leading / would lead to a malformed URL. (GITHUB-976) [Anthony Shaw]

Compute

- Fix a bug in profitbricks driver where listing snapshots would request a malformed URL. [GITHUB-976] (Anthony Shaw)
- Fix LIBCLOUD-806 bug where vsphere driver cannot be instantiated. (GITHUB-967) [Anthony Shaw]
- [google compute] Improve performance of list nodes by caching volume information. (GITHUB-813, LIBCLOUD-826) [Tom Melendez]

Changes in Apache Libcloud 1.5.0

Common

- Set Dimension Data compute, backup and load balancer to default to 2.4 API. (GITHUB-961) [Samuel Chong]

Compute

- [azure] New method for accessing rate cards. (GITHUB-957) [Soren L. Hansen]
- [gce] Allow multiple preemptible instances to be created. (GITHUB-954) [John Baublitz]
- [openstack] Add new Connection class to support VOMS proxys to keystone servers. (GITHUB-959) [micafer]
- [outscale] Added support for changed API for describing quotas. (GITHUB-960) [Javier M. Mellid]
- [ec2] Added m4 instances to us-gov and brazil, added m4.16xlarge to all. (GITHUB-964) [Matthew Tyas]
- Add new CloudScale.ch driver (GITHUB-951) [Dave Halter]
- [google compute] Bug fix for ex_create_multiple_nodes Google Cloud disk auto delete. (GITHUB-955) [John Baublitz]
- [google compute] Add "MULTI_IP_SUBNET" guestOsFeatures option. (GITHUB-956) [Max Illfelder]
- [dimensiondata] Added support for 2.4 API, added support for image import, cloning. Add feature for changing NIC VLANs, add feature for changing NIC order for a server. (GITHUB-953) [Samuel Chong]
- [ec2] Add US-EAST2 (Ohio). (GITHUB-946) [Matthew Harris]
- [google compute] Fix to allow multiple node creation with subnets. (GITHUB-949) [John Baublitz]

Container

- [rancher] The scheme (secure) and port no longer need to be explicitly specified, allowing a user to simply copy in the string provided to them from Rancher. (GITHUB-958) [Matthew Ellison]

Changes in Apache Libcloud 1.4.0

Compute

- Introduce new Azure ARM driver. [Peter Amstulz]
- [ec2] Fix the bug that created the node at ecs driver and implement the method for creating public ip. (GITHUB-943) [watermelo]
- [profitbricks] changes to the ProfitBricks compute driver to drop support for the old SOAP api (now end of life) and provide support for v3 of the REST api. (GITHUB-938) [Matt Finucane]
- [cloudsigma] Added Warsaw (waw) region. (GITHUB-942) [Kamil Chmielewski]
- [google compute] List images fix for projects > 500 images. (GITHUB-939) [Scott Crunkleton]
- [ec2] Add st1 and sc1 volume types to valid types. (GITHUB-925) [Sean Goller]
- [digital ocean] add ex_change_kernel in DigitalOcean_v2 driver. (GITHUB-922) [Rick van de Loo]
- [digital ocean] add ex_hard_reboot in DigitalOcean_v2 driver. (GITHUB-920) [Rick van de Loo]
- [openstack] add ex_start_node for the openstack driver. (GITHUB-919) [Rick van de Loo]

- [vultr] Extra Attributes for Node Creation on Vultr. (GITHUB-917) [Fahri Cihan Demirci]

- [vultr] Implement SSH Key Create/Delete Methods for Vultr. (GITHUB-914) [Fahri Cihan Demirci]

- [dimension data] No longer throw error when powering off a node that is already stopped. (GITHUB-912) [Samuel Chong]

- [dimension data] Refactor create_node for MCP2 to support CaaS API 2.3 feature. Can now specify Network Adapter Name for primary and additional NIC. Parameters in create_node function is tailored for MCP2. (GITHUB-902) [Samuel Chong]

- Volume snapshot operations, i.e. creating, listing and deleting volume snapshots, for the Digital Ocean driver. (LIBCLOUD-861, GITHUB-909) [Fahri Cihan Demirci]

- Added snapshot management to OVH compute. (GITHUB-897) [Anthony Monthe]

- [GCE] Support for HTTP(S) proxies with BackendServices. (GITHUB-856) [Tom Melendez]

Container

- [docker] As reported in the corresponding bug, the docker daemon will respond in an install_image call with all the messages produced during the procedure parsed as json docs. In that case the response headers also contain the value 'transfer-encoding':'chunked'. That kind of response can now be parsed properly by the DockerResponse parse_body method. Also, another small change is that previously the id of the new image was marked in the json document as id, but now it's marked as sha256, so the regex used to discover the id has been updated. (GITHUB-918) [Pavlos Tzianos]

Load Balancing

- Introduce AWS Application Load Balancer (ALB) driver. (LIBCLOUD-869, GITHUB-936) [Anton Kozyrev]

- Fix bug where GCE Load balancer supposes that all VMs have public ips. (LIBCLOUD-879, GITHUB-952) [Chris Walker]

Storage

- [s3] Add AP-Southeast2 as region.

- [google] Prevent GCE auth to hide S3 auth. (GITHUB-921) [Quentin Pradet]

- [GCS] Fixed some google_storage.py URL cleaning. (GITHUB-901) [Scott Crunkleton]

Changes in Apache Libcloud 1.3.0

General

- Introduced new base API for instantiating drivers. (GITHUB-822) [Anthony Shaw]

- Added certificate path for SLES12/OpenSUSE12. (GITHUB-884) [Michael Calmer]

- Deprecate DigitalOcean v1 API support in favour of v2 API. (GITHUB-889, GITHUB-892) [Andrew Starr-Bochicchio]

- Deprecate RunAbove cloud drivers in favour of new OVH cloud driver. (GITHUB-891) [Anthony Monthe]

Compute

- Fix reporting function for detailed admin logs in Dimension Data Driver. (GITHUB-898) [Anthony Shaw]

- Added edit firewall functionality to Dimension Data driver. (GITHUB-893) [Samuel Chong]

- Bugfix - Fixed listing nodes issue in Python 3. (LIBCLOUD-858, GITHUB-894) [Fahri Cihan Demirci]

- Added FCU (Flexible Compute Unit) support to the Outscale driver. (GITHUB-890) [Javier M. Mellid]

- [google compute] Add "WINDOWS" guestOsFeatures option. (GITHUB-861) [Max Illfelder]

- When creating volumes on OpenStack with defaults for *location* or *volume_type*, newer OpenStack versions would throw errors. The OpenStack driver will now only post those arguments if non-*NoneType*. (GITHUB-857) [Allard Hoeve]

- When fetching the node details of a non-existing node, OpenStack would raise a *BaseHTTPError* instead of returning *None*, as was intended. Fixed tests and code. (GITHUB-864)

- Added *ex_stop_node* to the OpenStack driver. (GITHUB-865) [Allard Hoeve]

- When creating volume snapshot, the arguments *name* and *description* are truely optional when working with newer OpenStack versions. The OpenStack driver will now only post thost arguments if they are non-*NoneType*. (GITHUB-866) [Allard Hoeve]

- StorageVolumeSnapshot now has an attribute *name* that has the name of the snapshot if the provider supports it. This used to be *.extra['name']*, but that is inconsistent with *Node* and *StorageVolume*. The *extra* dict still holds *name* for backwards compatibility. (GITHUB-867) [Allard Hoeve]

Container

- Introduced new Rancher driver (GITHUB-876) [Mario Loria]

- Fixed bug in Docker util library for fetching images from the docker hub API. API was returning 301 and redirects were not being followed. (GITHUB-862) [Anthony Shaw]

Load Balancer

- Added fetch tags support in elb driver. (GITHUB-848) [Anton Kozyrev]

Storage

- Added storage permissions for Google Cloud Storage. (GITHUB-860) [Scott Crunkleton]

Changes in Apache Libcloud 1.2.1

Backup

- Fix issue enabling backups on Dimension Data driver. (GITHUB-858) [Mark Maglana, Jeff Dunham, Anthony Shaw]

Changes in Apache Libcloud 1.2.0

General

- Fix caching of auth tokens in the Google Compute Engine drivers. Now we make sure that the file is truncated before writing a new token. Not truncating the file would cause issues if the new token is shorted then the existing one which is cached in the file. (GITHUB-844, LIBCLOUD-835) [Paul Tiplady]

Compute

- [gce] Fix image undeprecation in GCE. (GITHUB-852) [Max Illfelder]
- [gce] Added Managed Instance Groups. (GITHUB-842) [Tom Melendez]
- [gce] Allow undeprecation of an image. (GITHUB-851) [Max Illfelder]
- [cloudstack] BUGFIX Values with wildcards failed signature validation. (GITHUB-846) [Ronald van Zantvoot]
- [cloudstack] Added StorageState-Migrating to the cloudstack driver. (GITHUB-847) [Marc-Aurèle Brothier]
- [google compute] Update copy image logic to match create image. (GITHUB-828) [Max Illfelder]
- Removed HD attribute from the Abiquo compute driver to support the 3.4 API. (GITHUB-840) [David Freedman]
- Add image and size details to *list_nodes* response in Dimension Data driver. (GITHUB-832) [Anthony Shaw]
- Add support for changing VM admin password in VMware driver. (GITHUB-833) [Juan Font Alonso]
- Add Barcelona (Spain) region to the Aurora Compute driver. (GITHUB-835) [Wido den Hollander]
- Various improvements in the libvirt driver. (GITHUB-838) [Rene Kjellerup]

Load balancer

- Add support for temporary IAM role credentials (token) to the AWS ELB driver. (GITHUB-843) [Anton Kozyrev]

DNS

- Updated the 'extra' parameter in *update_record()* to be optional in aurora driver. (GITHUB-830) [Wido den Hollander]
- Support for iterating over records and zones in the Aurora DNS driver. (GITHUB-829) [Wido den Hollander]
- Add support for DS, PTR, SSFHFP and TLSA record type to the Aurora DNS driver. (GITHUB-834) [Wido den Hollander]

Container

- Add network mode and labels when creating containers within docker driver. (GITHUB-831) [Jamie Cressey]

Storage

- Fix authentication issue in S3/China region, disabled multipart uploads as not supported by region. (GITHUB-839) [Luke Morfitt]

Changes with Apache Libcloud 1.1.0

General

- Add support for automatic SNI (SSL extension) using the hostname supplied to connect to.

  Note: This functionality is only available in Python 2.7.9 and Python >= 3.2. (LIBCLOUD-827, GITHUB-808) [David Freedman]

Compute

- Add support image guest OS features in GCE driver. (GITHUB-825) [Max Illfelder]

- Added forceCustimization option for vcloud director driver. (GITHUB-824) [Juan Font]

- Add node lookup by UUID for libvirt driver. (GITHUB-823) [Frank Wu]

- Add block storage support to DigitalOcean node driver. (GITHUB-807) [Adam Wolfe Gordon]

- Add SASL auth support to libvirt driver. (GITHUB-809) [Katana-Steel]

- Allow VIPs in Dimension Data driver to bind to any port. (GITHUB-818) [Mark Maglana]

- Add support for deleting a security group to the Aliyun ECS driver. (GITHUB-816) [Heng Wu]

- Add `ex_force_customization` argument to the `ex_deploy_node` in vCloud driver. (GITHUB-824) [Juan Font]

- Add support for listing attributes for a particular security group (`ex_list_security_group_attributes`) to the Aliyun ECS driver. (GITHUB-826) [Heng Wu]

- Add new Mumbai, India region to the EC2 driver. [Tomaz Muraus]

- Add driver for the new AWS cn-north-1 region. (GITHUB-827, LIBCLOUD-820) [Jamie Cressey]

- Fix authentication with temporary IAM role credentials (token) in the EC2 driver. (GITHUB-820) [Alejandro González]

Container

- Fixed API compatibility for Docker Container driver with API 1.24, set driver to use versioned URL for all communication. Backported changes to 1.21 API (GITHUB-821) [Anthony Shaw]

Load Balancer

- Added additional parameters to the Rackspace driver in *list_balancers* for filtering and searching. (GITHUB-803) [João Paulo Raittes]

Changes with Apache Libcloud 1.0.0

General

- Fix a regression with `timeout` argument provided via `_ex_connection_class_kwargs` method being overriden with `None` inside the `BaseDriver` constructor method.

  Reported by Jay Rolette. (GITHUB-755) [Tomaz Muraus, Jay Rolette]

- Fix OpenStack v3 authentication and allow user to provide a custom value for the OpenStack `domain` parameter. Previously only possible value as a default value of `Default`. (GITHUB-744) [Lionel Schaub]

- Add support for authenticating against Keystone and OpenStack based clouds using OpenID Connect tokens. (GITHUB-789) [Miguel Caballer]

Compute

- GCE nodes can be launched in a subnetwork (GITHUB-783) [Lars Larsson]

- Add Subnetworks to GCE driver (GITHUB-780) [Eric Johnson]

- Fix missing pricing data for GCE (LIBCLOUD-713, GITHUB-779) [Eric Johnson]

- Add Image Family support for GCE (GITHUB-778) [Rick Wright]

- Fix a race condition on GCE driver *list_nodes()*- Invoking GCE's *list_nodes()* while some VMs are being shutdown can result in the following *libcloud.common.google.ResourceNotFoundError* exception to be raised. (GITHUB-727) [Lénaïc Huard]

- Allow user to filter nodes by location by adding optional *location* argument to the *list_nodes()* method in the CloudStack driver. (GITHUB-737) [Lionel Schaub]

- Fix OpenStack IP type resolution - make sure IP addresses are correctly categorized and assigned on *private_ips* and *public_ips* Node attribute. (GITHUB-738) [Lionel Schaub]

- Add new *Perth, Australia* and *Manila, Philippines* region to the CloudSigma v2 driver. [Tomaz Muraus]

- Update libvirt driver so it returns false if a non-local libvirt URL is used (right now only local instances are supported). (LIBCLOUD-820, GITHUB-788) [René Kjellerup]

- Update libvirt driver to use *ip neight* command instead of *arp* to retrieve node MAC address if *arp* command is not available or the current user doesn't have permission to use it. (LIBCLOUD-820, GITHUB-788) [René Kjellerup]

- Update `create_volume` method in the CloudStack driver and add `ex_volume_type` argument to it. If this argument is provided, a volume which names matches this argument value will be searched and selected among the available disk offerings. (GITHUB-785) [Greg Bishop]

Storage

- Add support for AWS signature v4 to the Outscale storage driver. (GITHUB-736) [Javier M. Mellid]

- Add new S3 RGW storage driver. (GITHUB-786, GITHUB-792) [Javier M. Mellid]

Loadbalancer

- Update AWS ELB driver to use signature version 4 for authentication. This way, the driver also work with the *eu-central-1* region. (GITHUB-796) [Tobias Paepke]

DNS

- Add BuddyNS driver. (GITHUB-742) [Oltjano Terpollari]

- Added DNSPod driver (https://www.dnspod.com). (GITHUB-787) [Oltjano Terpollari]

Changes with Apache Libcloud 1.0.0-rc2

General

- Fix a bug with consuming stdout and stderr in the paramiko SSH client which would manifest itself under very rare condition when a consumed chunk only contained a single byte or part of a multi byte UTF-8 character. [Lakshmi Kannan, Tomaz Muraus]

- Increase default chunk size from `1024` to `4096` bytes in the paramiko SSH client. This results in smaller number of receive calls on the average. [Tomaz Muraus]

- Fix to Dimension Data API address for Middle-East and Africa (GITHUB-700) [Anthony Shaw]

- Addition of Dimension Data Australia federal government region to dimension data drivers. (GITHUB-700) [Anthony Shaw]

- Throw a more user-friendly exception on "No address associated with hostname". (GITHUB-711, GITHUB-714, LIBCLOUD-803) [Tomaz Muraus, Scott Crunkleton]

- Remove deprecated provider constants with the region in the name and related driver classes (e.g. `EC2_US_EAST`, etc.).

  Those drivers have moved to single provider constant + `region` constructor argument model. [Tomaz Muraus]

- Introduce new *list_regions*‘ class method on the base driver class. This method is to be used with provider drivers which support multiple regions and `region` constructor argument. It allows users to enumerate available / supported regions. [Tomaz Muraus]

Compute

- [dimension data] added support for VMWare tools VM information inside list_nodes responses (GITHUB-734) [Jeff Dunham]

- [ec2] added ex_encrypted and ex_kms_key_id optional parameters to the create volume method (GITHUB-729) [Viktor Ognev]

- [dimension data] added support for managing host anti-affinity rules, added paging support to all supported calls and added support for requesting priority ordering when creating ACL rules (GITHUB-726) [Jeff Dunham]

- [openstack] when creating floating IPs, added pool_id as an optional argument (GITHUB-725) [marko-p]

- [google compute] Added setMachineType method to allow for changing sizes of instances (GITHUB-721) [Eric Johnson]

- [google compute] allow bypassing image search in standard project list (GITHUB-713) [Max Illfelder]

- Add support for requesting a MKS token for accessing the remote console in VMware vCloud driver (GITHUB-706) [Juan Font Alonso]

- Add support in VMware vCloud driver for v5.5 API, with snapshot support (GITHUB-658) [Juan Font Alonso]

- Added support for adding a family to an image on Google Compute Driver (GITHUB-704) [Max Illfelder]

- Deprecated IBM SCE, HP Helion, OpSource, Ninefold and CloudFrames drivers, removed driver code and tests. (GITHUB-701, LIBCLOUD-801) [Anthony Shaw]

- Introduced error messages (*libcloud.compute.deprecated*) for deprecated drivers (GITHUB-701, LIBCLOUD-801) [Anthony Shaw]

- New Compute drivers- BSNL, Indosat, Med-1, NTT-America, Internet Solutions (GITHUB-700) [Anthony Shaw]

- Fix to set default signature version for AWS Seoul region to v4, removed non-supported size (hs1.xlarge) (GITHUB-684) [Geunwoo Shin]

- Support filtering by location in list_nodes for dimension data compute driver fix lack of paging support (GITHUB-691) [Jeff Dunham]

- Support for filtering by IPv4, IPv6, network, network domain, VLAN in Dimension data driver. (GITHUB-694) [Jeff Dunham]

- Added *Node.created_at* which, on supported drivers, contains the datetime the node was first started. (GITHUB-698) [Allard Hoeve] [Rick van de Loo]

- New driver for Aliyun Elastic Compute Service. (LIBCLOUD-802, GITHUB-712) [Sam Song, Heng Wu]

Storage

- Added Outscale storage driver (GITHUB-730) [Javier M. Mellid]

- Improvements to Google Auth for Storage and Compute and MIME bug fix (LIBCLOUD-800, GITHUB-689) [Scott Crunkleton]

- Implement `get_container`, `get_object` and `upload_object_via_stream` methods in the Back-blaze B2 storage driver.

  Note: Backblaze API doesn't upload streaming uploads so when using `upload_object_via_stream` whole file is read and buffered in memory. (GITHUB-696) [Jay jshridha]

- New driver for Aliyun OSS Storage Service. (LIBCLOUD-802, GITHUB-712) [Sam Song]

Loadbalancer

- New driver for Aliyun SLB Loadbalancer Service. (LIBCLOUD-802, GITHUB-712) [Sam Song]

DNS

- Added NearlyFreeSpeech.net (NSFN) driver [Ken Drayer] (GITHUB-733)

- Added Lua DNS driver [Oltjano Terpollari] (GITHUB-732)

- Added NSOne driver [Oltjano Terpollari] (GITHUB-710)

- Fix a bug in the GoDaddy driver - make sure `host` attribute on the connection class is correctly set to the hostname. [Tomaz Muraus]

- Fix handling of `MX` records in the Gandi driver. (GITHUB-718) [Ryan Lee]

Backup

- Dimension Data - added additional testing, fixed bug on client response naming, added support for adding backup clients to a backup enabled node. (GITHUB-692, GITHUB-693, GITHUB-695) [Jeff Dunham]

Changes with Apache Libcloud 1.0.0-pre1

General

- Introduction of container based drivers for Docker, Rkt and Container-as-a-service providers (LIBCLOUD-781, GITHUB-666) [Anthony Shaw]

- Introduce a new `libcloud.backup` API for Backup as a Service projects and products. (GITHUB-621) [Anthony Shaw]

- Also retry failed HTTP(s) requests upon transient "read operation timed out" SSL error. (GITHUB-556, LIBCLOUD-728) [Scott Kruger]

- Throw a more user-friendly exception if a client fails to establish SSL / TLS connection with a server because of an unsupported SSL / TLS version. (GITHUB-682) [Tomaz Muraus]

Compute

- Add ap-northeast-2 region to EC2 driver (South Korea) (GITHUB-681) [Anthony Shaw]

- Added Added volume type to EC2 volume extra to EC2 driver. (GITHUB-680) [Gennadiy Stas]

- Add LazyObject class that provides lazy-loading, see *GCELicense* for usage (LIBCLOUD-786, GITHUB-665) [Scott Crunkleton]

- Added t2.nano instance type to EC2 Compute driver (GITHUB-663) [Anthony Shaw]

- Support for passing the image ID as a string instead of an instance of image when creating nodes in Dimension Data driver. (GITHUB-664) [Anthony Shaw]

DNS

- Add support for 'health checks' in Aurora DNS driver (GITHUB-672) [Wido den Hollander]

- Make sure `ttl` attribute is correctly parsed and added to the `Record extra` dictionary. (GITHUB-675) [Wido den Hollander]

- Improve unit tests of Aurora DNS driver (GITHUB-679) [Wido den Hollander]

Changes with Apache Libcloud 0.20.1

Compute

- [google] Allow for old and new style service account client email address (LIBCLOUD-785) [Hoang Phan]

Changes with Apache Libcloud 0.20.0

General

- Added .editorconfig file for easier editing (GITHUB-625) [Misha Brukman]

- Fix a bug with Libcloud accidentally setting paramiko root logger level to DEBUG (this should only happen if `LIBCLOUD_DEBUG` environment variable is provided).

  Reported by John Bresnahan. (LIBCLOUD-765) [Tomaz Muraus, John Bresnahan]

- Simply travis and tox config (.travis.yml, tox.ini). (GITHUB-608) [Anthony Monthe]

- Fixed Python2.6 unit testing (and Google Cloud Storage tests) (GITHUB-648) [Scott Crunkleton]

Compute

- [google] Allow for old and new style service account client email address (LIBCLOUD-785) [Hoang Phan]

- Minor security improvement for storing cached GCE credentials (LIBCLOUD-718) [Siim Põder]

- Removed DreamHosts Compute Driver, DreamHosts users will now use the OpenStack Node driver since DreamHosts are OpenStack API compliant (GITHUB-655) [Stephano Maffulli]

- Added additional kwargs to the create_node method for Dimension Data driver, allowing the user to specify the RAM and CPU upfront. Added a ex_reconfigure_node method and ex_list_customer_images as well as updating the API to 2.1. (LIBCLOUD-783, GITHUB-656) [Anthony Shaw]

- The EC2 Instance Type updated with correct disk sizes (especially the disk size for the m3 instances), conversion errors between GiB an M[i]B, disk count were the cause. Added instance types - g2.8xlarge and t2.large. (GITHUB-646) [Philipp Hahn]

- Add update node, update VMware tools, add storage, change storage size or speed, remove storage to Dimension Data Driver. (LIBCLOUD-775, GITHUB-644) [Anthony Shaw]

- Include 'service_name' support in _parse_service_catalog_auth_v3 for Openstack Drivers (GITHUB-647) [Steve Gregory]

- Outscale inc & sas driver update (GITHUB-645) [@LordShion]

- Add new *eu-west-2* & *us-east-2* regions to the OUTSCALE_INC & OUTSCALE_SAS drivers. [Filipe Silva /lordshion]

- [google compute] add pricing data update script (GITHUB-464) [Misha Brukman]

- Fix a bug in the `list_volumes` method in the CloudStack driver so it returns an empty list if no volumes are found. (GITHUB-617) [Wido den Hollander]

- Return proper volume state for CloudStack volumes. (GITHUB-615, LIBCLOUD-764) [Wido den Hollander]

- Add support for multiple regions in Aurora compute driver (GITHUB-623) [Wido den Hollander]

- Fix value of `node.extra['ip_addresses']` node attribute in the CloudStack driver. (LIBCLOUD-767, GITHUB-627) [Atsushi Sasaki]

- Make sure that `node.public_ips` attribute in the CloudStack driver doesn't contain duplicated values.. (LIBCLOUD-766, GITHUB-626) [Atsushi Sasaki]

- Allow user to wait for a resource to reach a desired state in the Dimension Data driver by using new `ex_wait_for_state` method. (LIBCLOUD-707, GITHUB-631) [Anthony Shaw]

- Added M4 pricing and instance information to EC2 driver (GITHUB-634) [Benjamin Zaitlen]

- Added C4 instance information to EC2 driver (GITHUB-638) [amitofs]

- Allow location of the datacenter to be supplied in ProfitBricks driver (LIBCLOUD-771, GITHUB-635) [Joel Reymont]

- Reduce redundant API calls in CloudStack driver (LIBCLOUD-590, GITHUB-641) [Atsushi Sasaki]

- Add an additional argument to libcloud.compute.drivers.GCENodeDriver.create_node to allow for creation of preemptible GCE instances (GITHUB-643) [@blawney]

- GoogleStorageDriver can now use either our S3 authentication or other Google Cloud Platform OAuth2 authentication methods. (GITHUB-633) [Scott Crunkleton]

- All NodeState, StorageVolumeState, VolumeSnapshotState and Provider attributes are now strings instead of integers. (GITHUB-624) [Allard Hoeve]

Storage

Loadbalancer

DNS

- **RackSpace driver - New DNS driver methods:**

    - ex_iterate_ptr_records

    - ex_get_ptr_record

    - ex_create_ptr_record

    - ex_update_ptr_record

    - ex_delete_ptr_record

  This should cover all of the functionality offered by the Rackspace DNS API in regards to RDNS. (LIBCLOUD-780, GITHUB-652) [Greg Hill]

- Update `create_record` in the WorldWideDNS driver so it automatically selects a slot if one is not provided by the user via `extra['entry']` argument. (GITHUB-621) [Alejandro Pereira]

- Introduce GoDaddy DNS Driver with examples and documentation. (LIBCLOUD-772, GITHUB-640, LIBCLOUD-778) [Anthony Shaw]

- Add new driver for CloudFlare DNS (https://www.cloudflare.com/dns/). (GITHUB-637) [Tomaz Muraus]

Changes with Apache Libcloud 0.19.0

General

- Update Rackspace AUTH_URL (LIBCLOUD-738) [Brian Curtin]

- Fix `LIBCLOUD_DEBUG` mode so it works on Python 3.x. [Tomaz Muraus]

- Fix Libcloud code so it doesn't throw an exception if simplejson < 2.1.0 is installed. (LIBCLOUD-714, GITHUB-577) [Erik Johnson]

- Fix endpoint URL for DimensionData Asia Pacific region. (GITHUB-585) [Anthony Shaw]

- Document potential time drift issue which could cause authentication in the GCE drivers to fail. (GITHUB-571) [Michal Tekel]

- Update documentation for EC2 - make sure they reflect region changes from 0.14 release. (GITHUB-606) [James Guthrie]

Compute

- Fixed malformed XML requests with Dimension Data driver. (LIBCLOUD-760, GITHUB-610) [Anthony Shaw]

- Update list of scopes for Google Compute Engine driver. (GITHUB-607) [Otto Bretz]

- Allow user to filter VPC by project in the CloudStack driver by passing `project` argument to the `ex_list_vps` method. (GITHUB-516) [Syed Mushtaq Ahmed]

- Add volume management methods and other various improvements and fixes in the RunAbove driver. (GITHUB-561) [Anthony Monthe]

- Add support and update Dimension Data driver to use API v2.0 by default. (LIBCLOUD-736, GITHUB-564) [Anthony Shaw]

- Add new `ex_virtual_network_name` and `ex_network_config` argument to the *create_node'* method in the Azure driver. With those arguments user can now specify which virtual network to use. (GITHUB-569) [Jesaja Everling]

- Fix `create_node` method in the GCE driver calling inexistent method (ex_get_disk instead of ex_get_volume). (GITHUB-574) [Alex Poms]

- Allow user to pass `proxy_url` keyword argument to the VCloud driver constructor. (GITHUB-578) [Daniel Pool]

- Various fixes and improvements in the DimensionData driver (support for creating servers in MCP 1 and 2 data center, performance improvements in the location fetching, etc.). (GITHUB-587, GITHUB-593, LIBCLOUD-750, LIBCLOUD-753) [Anthony Shaw]

- Added `ex_assign_public_ip` argument to `create_node` in the EC2 driver. (GITHUB-590) [Kyle Long]

- Added `ex_terminate_on_shutdown` argument to `create_node` in the EC2 driver. (GITHUB-595) [Kyle Long]

- Various fixes and improvements in the `ex_authorize_security_group_ingress` in the CloudStack driver. (LIBCLOUD-749, GITHUB-580) [Lionel Schaub]

- Add pricing information for Softlayer. (LIBCLOUD-759, GITHUB-603) [David Wilson]

- Standardize VolumeSnapshot states into the `state` attribute. (LIBCLOUD-758, GITHUB-602) [Allard Hoeve]

Storage

- Add support for `sa-east-1` region to the Amazon S3 driver. (GITHUB-562) [Iuri de Silvio]

- Fix handling of binary data in Local storage driver on Python 3. Now the file which is to be written or read from is opened in the binary mode (`b` flag). (LIBCLOUD-725, GITHUB-568) [Torf]

Loadbalancer

- Add a new driver for DimensionData load-balancing service (http://cloud.dimensiondata.com/). (LIBCLOUD-737, GITHUB-567) [Anthony Shaw]

DNS

- Update Google Cloud DNS API from 'v1beta1' to 'v1' (GITHUB-583) [Misha Brukman]

- Add new driver for AuroraDNS service. (GITHUB-562, LIBCLOUD-735) [Wido den Hollander]

- Fix "_to_record" in the Route53 driver - make sure it doesn't throw if the record TTL is not available. [Tomaz Muraus]

- Add new driver for WorldWideDNS service (http://www.worldwidedns.net/home.asp). (GITHUB-566, LIBCLOUD-732) [Alejandro Pereira]

- Add new driver for DNSimple service (https://dnsimple.com/). (GITHUB-575, GITHUB-604, LIBCLOUD-739) [Alejandro Pereira, Patrick Humpal]

- Add new driver for PointDNS service (https://pointhq.com). (GITHUB-576, GITHUB-591, LIBCLOUD-740) [Alejandro Pereira]

- Add new driver for Vultr DNS service (https://www.vultr.com). (GITHUB-579, GITHUB-596, LIBCLOUD-745) [Alejandro Pereira, Janez Troha]

- Add new driver for Liquidweb DNS service (http://www.liquidweb.com/). (GITHUB-581, LIBCLOUD-746) [Oltjano Terpollari, Alejandro Pereira]

- Add new driver for Zonomi DNS hosting service (http://zonomi.com/). (GITHUB-582, LIBCLOUD-747) [Oltjano Terpollari, Alejandro Pereira]

- Add new driver for Durable DNS service (https://durabledns.com/). (GITHUB-588, LIBCLOUD-748) [Oltjano Terpollari, Alejandro Pereira]

Changes with Apache Libcloud 0.18.0

General

- Use native `ssl.match_hostname` functionality when running on Python >= 3.2 and only require `backports.ssl_match_hostname` dependency on Python versions < 3.2. [Tomaz Muraus]

- Add support for AWS Signature version 4.

  Note: Currently only GET HTTP method is supported. (GITHUB-444) [Gertjan Oude Lohuis]

- Fix a bug in the debug mode logging (LIBCLOUD_DEBUG). Logging to the debug file would throw an exception if the text contained non-ascii characters. [Tomaz Muraus]

- Fix a bug with connection code throwing an exception if a port was a unicode type and not a str or int. (GITHUB-533, LIBCLOUD-716) [Avi Weit]

- Update `is_valid_ip_address` function so it also works on Windows. (GITHUB-343, GITHUB-498, LIBCLOUD-601, LIBCLOUD-686) [Nicolas Fraison, Samuel Marks]

- Add support for retrying failed HTTP requests.

  Retrying is off by default and can be enabled by setting `LIBCLOUD_RETRY_FAILED_HTTP_REQUESTS` environment variable. (GITHUB-515, LIBCLOUD-360, LIBCLOUD-709)

- Fix a bug in consuming stdout and stderr strams in Paramiko SSH client. In some cases (like connecting to localhost via SSH), exit_status_ready gets set immediately even before the while loop to consume the streams kicks in. In those cases, we will not have consumed the streams at all. (GITHUB-558) [Lakshmi Kannan]

Compute

- Google Compute now supports paginated lists including filtering. (GITHUB-491) [Lee Verberne]

- OpenStackNodeSize objects now support optional, additional fields that are supported in OpenStack 2.1: *ephemeral_disk*, *swap*, *extra*. (GITHUB-488, LIBCLOUD-682) [Greg Hill]

- StorageVolume objects now have an attribute *state* that holds a state variable that is standardized state across drivers. Drivers that currently support the *state* attribute are OpenStack and EC2. StorageVolume objects returned by drivers that do not support the attribute will have a *state* of *None*. When a provider returns a state that is unknown to the driver, the state will be *UNKNOWN*. Please report such states. A couple of drivers already put state fields in the *extra* fields of StorageVolumes. These fields were kept for backwards-compatibility and for reference. (GITHUB-476) [Allard Hoeve]

- StorageVolume objects on EC2 and OpenStack now have a key called snapshot_id in their extra dicts containing the snapshot ID the volume was based on. (GITHUB-479) [Allard Hoeve]

- OpenStack driver: deprecated ex_create_snapshot and ex_delete_snapshot in favor of create_volume_snapshot and destroy_volume_snapshot. Updated base driver method create_storage_volume argument name to be optional. (GITHUB-478) [Allard Hoeve]

- Add support for creating volumes based on snapshots to EC2 and OS drivers. Also modify signature of base NodeDriver.create_volume to reflect the fact that all drivers expect a StorageSnapshot object as the snapshot argument. (GITHUB-467, LIBCLOUD-672) [Allard Hoeve]

- VolumeSnapshots now have a *created* attribute that is a *datetime* field showing the creation datetime of the snapshot. The field in VolumeSnapshot.extra containing the original string is maintained, so this is a backwards-compatible change. (GITHUB-473) [Allard Hoeve]

- Improve GCE create_node, make sure ex_get_disktype function (GITHUB-448) [Markos Gogoulos]

- GCE driver fix to handle unknown image projects (GITHUB-447) [Markos Gogoulos]

- Allow user to pass `ex_blockdevicemappings` argument to the create_node method in the OpenStack driver. (GITHUB-398, LIBCLOUD-637) [Allard Hoeve]

- Fix `list_volume_snapshots` method in the EC2 driver so it comforms to the base API. (LIBCLOUD-664, GITHUB-451) [Allard Hoeve]

- Add `volumes_attached` attibute to `node.extra` in the OpenStack driver. (LIBCLOUD-668, GITHUB-462) [Allard Hoeve]

- Add the following new methods to the Linode driver: `ex_list_volumes`, `ex_create_volume`, `ex_destroy_volume`. (LIBCLOUD-649, GITHUB-430) [Wojciech Wirkijowski]

- Add `list_volume_snapshots` method to the OpenStack driver. (LIBCLOUD-663, GITHUB-450) [Allard Hoeve]

- Add Site to Site VPN functionality to CloudStack driver. (GITHUB-465) [Avi Nanhkoesingh]

- Add affinity group support to CloudStack driver (LIBCLOUD-671, GITHUB-468) [Mateusz Korszun]

- Add a support for a new AWS Frankfurt, Germany region (`eu-central-1`) to the EC2 driver using AWS Signature v4. (GITHUB-444) [Gertjan Oude Lohuis, Tomaz Muraus]

- Allow Filtering in EC2 list_images() driver (GITHUB-456, LIBCLOUD-667) [Katriel Traum]

- Add ex_list_ip_forwarding_rules() to CloudStack driver (GITHUB-483) [Atsushi Sasaki]

- Add AURORA compute driver (LIBCLOUD-641, GITHUB-477) [Wido den Hollander]

- Update `ex_describe_tags` method in the EC2 driver and allow user to list tags for any supported resource. Previously you could only list tags for a node or a storage volume. (LIBCLOUD-676, GITHUB-482) [John Kinsella]

- Various improvements in the HostVirual driver (code refactoring, support for managing "packages"). (LIBCLOUD-670, GITHUB-472) [Dinesh Bhoopathy]

- Add support for DigitalOcean API v2.0 while maintaining support for the old API v2.0.

  Note: API v2.0 is now used by default. To use the old API v1.0, pass `api_version='1.0'` argument to the driver constructor. (GITHUB-442) [Andrew Starr-Bochicchio]

- Add new `d4.` instance types to the EC2 driver. Also update EC2 pricing data. (GITHUB-490) [Tomaz Muraus]

- Add new driver for Microsft Azure Virtual Machines service. (LIBCLOUD-556, GITHUB-305, GITHUB-499, GITHUB-538) [Michael Bennett, davidcrossland, Richard Conway, Matt Baldwin, Tomaz Muraus]

- Fix VPC lookup method in CloudStack driver (GITHUB-506) [Avi Nanhkoesingh]

- Add new driver for the Dimension Data provider based on the OpSource driver. (LIBCLOUD-698, GITHUB-507, LIBCLOUD-700, GITHUB-513) [Anthony Shaw]

- Add "virtualmachine_id" attribute to the `CloudStackAddress` class in the CloudStack driver. (LIBCLOUD-679, GITHUB-485) [Atsushi Sasaki]

- Allow user to pass filters via arguments to the `ex_list_port_forwarding_rules` in the CloudStack driver. (LIBCLOUD-678, GITHUB-484) [Atsushi Sasaki]

- Fix an issue with `list_nodes` in the CloudSigma driver throwing an exception if a node in the list had a static IP. (LIBCLOUD-707, GITHUB-514) [Chris O'Brien]

- Don't throw an exception if a limit for a particular CloudStack resource is "Unlimited" and not a number. (GITHUB-512) [Syed Mushtaq Ahmed]

- Allow user to pass `ex_config_drive` argument to the `create_node` method in the OpenStack driver. (LIBCLOUD-356, GITHUB-330) [Ryan Parrish]

- Add new driver for Cloudwatt (https://www.cloudwatt.com/en/) provider. (GITHUB-338) [Anthony Monthe]

- Add new driver for Packet (https://www.packet.com/) provider. (LIBCLOUD-703, GITHUB-527) [Aaron Welch]

- Update Azure VM pricing information and add information for new D instance types. (GITHUB-528) [Michael Bennett]

- Add `ex_get_node` and `ex_get_volume` methods to CloudStack driver. (GITHUB-532) [Anthony Monthe]

- Update CloudSigma driver so the "unavailable" and "paused" node state is correctly mapped to "error" and "paused" respectively. (GITHUB-517) [Chris O'Brien]

- Add SSH key pair management methods to the Gandi driver. (GITHUB-534) [Anthony Monthe]

- Add `ex_get_node` and `ex_get_volume` methods to Gandi driver. (GITHUB-534) [Anthony Monthe]

- Add `fault` attribute to the `extra` dictionary of the `Node` instance returned by the OpenStack driver. (LIBCLOUD-730, GITHUB-557) [Nick Fox]

- Add new driver for Onapp IaaS platform. (LIBCLOUD-691, GITHUB-502) [Matthias Wiesner]

- Allow user to inject custom data / script into the Azure node by passing `ex_custom_data` argument to the `create_node` method. (LIBCLOUD-726, GITHUB-554) [David Wilson]

- Add `ex_create_cloud_service` and `ex_destroy_cloud_service` method to the Azure driver. (LIBCLOUD-724, GITHUB-551) [David Wilson]

- Add support for passing user data when creating a DigitalOcean node (`ex_user_data` argument). (LIBCLOUD-731, GITHUB-559) [David Wilson]

- Allow user to specify which arguments are passed to `list_nodes` method which is called inside `wait_until_running` by passing `ex_list_nodes_kwargs` argument to the `wait_until_running` method. (`ex_user_data` argument). (LIBCLOUD-723, GITHUB-548) [David Wilson]

- Allow user to pass `ex_volume_type` argument to the `create_volume` method in the OpennStack driver. (GITHUB-553) [Rico Echwald-Tijsen]

- Add new driver for RunAbove (https://www.runabove.com) provider. (GITHUB-550) [Anthony Monthe]

- Fix a bug with exception being throw inside the CloudStack driver when the provider returned no error message in the body. (GITHUB-555) [Konstantin Skaburskas]

- **Various improvements in the DigitalOcean driver:**

  - Increase page size to API maximum.

  - Add `ex_create_attr` kwarg to `create_node` method.

  - Update all the `list_*` methods to use paginated requests

  - Allow user to specify page size by passing `ex_per_page` argument to the constructor.

  (LIBCLOUD-717, GITHUB-537) [Javier Castillo II]

Storage

- Fix a bug with authentication in the OpenStack Swift driver. (GITHUB-492, LIBCLOUD-635) [Tom Fifield]

- Add AuroraObjects Storage Driver. (GITHUB-540, LIBCLOUD-719) [Wido den Hollander]

Loadbalancer

- Add a new driver for Softlayer load-balancing service (https://www.softlayer.com/load-balancing). (GITHUB-500, LIBCLOUD-688) [Avi Weit]

DNS

- Fix a bug when a ZoneDoesntExist exception was thrown when listing records for a zone which has no records in the HostVirtual driver. (GITHUB-460) [Vanč Levstik]

- Correctly handle MX records priority in the Route53 driver. (GITHUB-469) [Vanč Levstik]

- Allow user to create an A record which points directly to the domain zone name in the Route53 driver. (GITHUB-469) [Vanč Levstik]

- Fix delete_zone method in the HostVirtual driver. (GITHUB-461) [Vanč Levstik]

- Fix parsing of the record name in the HostVirtual driver. (GITHUB-461) [Vanč Levstik]

- Add new driver for DigitalOcean DNS service. (GITHUB-505) [Javier Castillo II]

Changes with Apache Libcloud 0.17.0

General

- Use `match_hostname` function from `backports.ssl_match_hostname` package to verify the SSL certificate hostname instead of relying on our own logic. (GITHUB-374) [Alex Gaynor]

Compute

- Add new *eu-west-2* & *us-east-2* regions to the OUTSCALE_INC & OUTSCALE_SAS drivers. [Filipe Silva /lordshion]

- GCE driver updated to include ex_stop_node() and ex_start_node() methods. (GITHUB-442) [Eric Johnson]

- GCE driver now raises ResourceNotFoundError when the specified image is not found in any image project. Previously, this would return None but now raises the not-found exception instead. This fixes a bug where returning None caused ex_delete_image to raise an AttributeError. (GITHUB-441) [Eric Johnson]

- GCE driver update to support JSON format Service Account files and a PY3 fix from Siim Põder for LIBCLOUD-627. (LIBCLOUD-627, LIBCLOUD-657, GITHUB-438) [Eric Johnson]

- GCE driver fixed for missing param on ex_add_access_config. (GITHUB-435) [Peter Mooshammer]

- GCE driver support for HTTP load-balancer resources. (LIBCLOUD-605, GITHUB-429) [Lee Verberne]

- GCE driver updated to make better use of GCEDiskTypes. (GITHUB-428) [Eric Johnson]

- GCE driver list_images() now returns all non-deprecated images by default. (LIBCLOUD-602, GITHUB-423) [Eric Johnson]

- Improve GCE API coverage for create_node(). (GITHUB-419) [Eric Johnson]

- GCE Licenses added to the GCE driver. (GITHUB-420) [Eric Johnson]

- GCE Projects support common instance metadata and usage export buckets. (GITHUB-409) [Eric Johnson]

- Improvements to TargetPool resource in GCE driver. (GITHUB-414) [Eric Johnson]

- Adding TargetInstances resource to GCE driver. (GITHUB-393) [Eric Johnson]

- Adding DiskTypes resource to GCE driver. (GITHUB-391) [Eric Johnson]

- Fix boot disk auto_delete in GCE driver. (GITHUB-412) [Igor Bogomazov]

- Add Routes to GCE driver. (GITHUB-410) [Eric Johnson]

- Add missing `ubuntu-os-cloud` images to the GCE driver. (LIBCLOUD-632, GITHUB-385) [Borja Martin]

- Add new *us-east-2* and *us-east-3* region to the Joyent driver. (GITHUB-386) [Anthony Monthe]

- Add missing t2. instance types to the us-west-1 region in the EC2 driver. (GITHUB-388) [Matt Lehman]

- Add option to expunge VM on destroy in CloudStack driver. (GITHUB-382) [Roeland Kuipers]

- Add extra attribute in list_images for CloudStack driver. (GITHUB-389) [Loic Lambiel]

- Add `ex_security_group_ids` argument to the create_node method in the EC2 driver. This way users can launch VPC nodes with security groups. (GITHUB-373) [Itxaka Serrano]

- Add description argument to GCE Network. (GITHUB-397) [Eric Johnson]

- GCE: Improve MachineType (size) coverage of GCE API. (GITHUB-396) [Eric Johnson]

- GCE: Improved Images coverage. (GITHUB-395) [Eric Johnson]

- GCE: Support for global IP addresses. (GITHUB-390, GITHUB-394) [Eric Johnson]

- GCE: Add missing snapshot attributes. (GITHUB-401) [Eric Johnson]

- AWS: Set proper disk size in c3.X instance types. (GITHUB-405) [Itxaka Serrano]

- Fix a bug with handling of the `ex_keyname` argument in the Softlayer driver. (GITHUB-416, LIBCLOUD-647) [Dustin Oberloh]

- Update CloudSigma region list (remove Las Vegas, NV region and add new San Jose, CA and Miami, FL region). (GITHUB-417) [Viktor Petersson]

- Add `ex_get_node` method to the Joyent driver. (GITHUB-421) [Anthony Monthe]

- Add support for placement group management to the EC2 driver. (GITHUB-418) [Mikhail Ovsyannikov]

- Add new tok02 region to the Softlayer driver. (GITHUB-436, LIBCLOUD-656) [Dustin Oberloh]

- Add new Honolulu, HI endpoint to the CloudSigma driver. (GITHUB-439) [Stephen D. Spencer]

- Fix a bug with config_drive attribute in the OpenStack driver. New versions of OpenStack now return a boolean and not a string. (GITHUB-433) [quilombo]

- Add support for Abiquo API v3.x, remove support for now obsolete API v2.x. (GITHUB-433, LIBCLOUD-652) [David Freedman]

- Allow rootdisksize parameter in create_node CloudStack driver (GITHUB-440, LIBCLOUD-658) [Loic Lambiel]

Storage

- Allow user to pass `headers` argument to the `upload_object` and `upload_object_via_stream` method.

  This way user can specify CORS headers with the drivers which support that. (GITHUB-403, GITHUB-404) [Peter Schmidt]

- Fix upload_object_via_stream so it works correctly under Python 3.x if user manually passes an iterator to the method.

  Also improve how reading a file in chunks works with drivers which support chunked encoding - always try to fill a chunk with CHUNK_SIZE bytes instead of directly streaming the chunk which iterator returns.

  Previously, if iterator returned 1 byte in one iteration, we would directly send this as a single chunk to the API. (GITHUB-408, LIBCLOUD-639) [Peter Schmidt]

Loadbalancer

- Updates to CloudStack driver. (GITHUB-434) [Jeroen de Korte]

DNS

- New driver for Softlayer DNS service. (GITHUB-413, LIBCLOUD-640) [Vanč Levstik]

- Fix a bug with `ex_create_multi_value_record` method in the Route53 driver only returning a single record. (GITHUB-431, LIBCLOUD-650) [Itxaka Serrano]

Changes with Apache Libcloud 0.16.0

General

- Add new `OpenStackIdentity_3_0_Connection` class for working with OpenStack Identity (Keystone) service API v3. [Tomaz Muraus]

- Add support for prettifying JSON or XML response body which is printed to a file like object when using `LIBCLOUD_DEBUG` environment variable. This option can be enabled by setting `LIBCLOUD_DEBUG_PRETTY_PRINT_RESPONSE` environment variable. [Tomaz Muraus]

- Add support for using an HTTP proxy for outgoing HTTP and HTTPS requests. [Tomaz Muraus, Philip Kershaw]

Compute

- Fix an issue with `LIBCLOUD_DEBUG` not working correctly with the Linode driver. [Tomaz Muraus, Juan Carlos Moreno] (LIBCLOUD-598, GITHUB-342)

- Add new driver for VMware vSphere (http://www.vmware.com/products/vsphere/) based clouds. [Tomaz Muraus]

- Add two new default node states - `NodeState.SUSPENDED` and `NodeState.ERROR`. [Tomaz Muraus]

- Fix to join networks properly in `deploy_node` in the CloudStack driver. (LIBCLOUD-593, GITUHB-336) [Atsushi Sasaki]

- Create `CloudStackFirewallRule` class and corresponding methods. (LIBCLOUD-594, GITHUB-337) [Atsushi Sasaki]

- Add support for SSD disks to Google Compute driver. (GITHUB-339) [Eric Johnson]

- Add utility `get_regions` and `get_service_names` methods to the `OpenStackServiceCatalog` class. [Andrew Mann, Tomaz Muraus]

- Fix a bug in `ex_get_console_output` in the EC2 driver which would cause an exception to be thrown if there was no console output for a particular node.

  Reported by Chris DeRamus. [Tomaz Muraus]

- Add ip_address parameter in CloudStack driver `create_node` method. (GITHUB-346) [Roeland Kuipers]

- Fix `ParamikoSSHClient.run` and `deploy_node` method to work correctly under Python 3. (GITHUB-347) [Eddy Reyes]

- Update OpenStack driver to map more node states to states recognized by Libcloud. [Chris DeRamus]

- Fix a bug with `ex_metadata` argument handling in the Google Compute Engine driver `create_node` method. (LIBCLOUD-544, GITHUB-349, GITHUB-353) [Raphael Theberge]

- Add SSH key pair management methods to the Softlayer driver. (GITHUB-321, GITHUB-354) [Itxaka Serrano]

- Correctly categorize node IP addresses into public and private when dealing with OpenStack floating IPs. [Andrew Mann]

- Add new t2 instance types to the EC2 driver. [Tomaz Muraus]

- Add support for Amazon GovCloud to the EC2 driver (us-gov-west-1 region). [Chris DeRamus]

- Allow user to pass "gp2" for "ex_volume_type" argument to the create_volume method in the EC2 driver.

  Reported by Xavier Barbosa. [Tomaz Muraus, Xavier Barbosa]

- Add new driver for ProfitBricks provider. (LIBCLOUD-589, GITHUB-352) [Matt Baldwin]

- Various improvements and bugs fixes in the GCE driver. For a list, see https://github.com/apache/libcloud/pull/360/commits (GITHUB-360) [Evgeny Egorochkin]

- Allow user to specify virtualization type when registering an EC2 image by passing `virtualization_type` argument to the `ex_register_image` method. (GITHUB-361) [Andy Grimm]

- Add `ex_create_image` method to the GCE driver. (GITHUB-358, LIBCLOUD-611) [Katriel Traum]

- Add some methods to CloudStack driver: create_volume_snapshot, list_snapshots, destroy_volume_snapshot create_snapshot_template, ex_list_os_types) (GITHUB-363, LIBCLOUD-616) [Oleg Suharev]

- Added VPC support and Egress Firewall rule support fo CloudStack (GITHUB-363) [Jeroen de Korte]

- Add additional attributes to the `extra` dictionary of OpenStack StorageVolume object. (GITHUB-366) [Gertjan Oude Lohuis]

- Fix `create_volume` method in the OpenStack driver to return a created volume object (instance of StorageVolume) on success, instead of a boolean indicating operation success. (GITHUB-365) [Gertjan Oude Lohuis]

- Add optional project parameters for ex_list_networks() to CloudStack driver (GITHUB-367, LIBCLOUD-615) [Rene Moser]

- CLOUDSTACK: option to start VM in a STOPPED state (GITHUB-368) [Roeland Kuipers]

- Support "config_drive" in the OpenStack driver. Allow users to pass `ex_config_drive` argument to the `create_node` and `ex_rebuild_node` method. (GITHUB-370) [Nirmal Ranganathan]

- Add support for service scopes to the `create_node` method in the GCE driver. (LIBCLOUD-578, GITHUB-373) [Eric Johnson]

- Update GCE driver to allow for authentication with internal metadata service. (LIBCLOUD-625, LIBCLOUD-276, GITHUB-276) [Eric Johnson]

- Fix a bug in Elasticstack node creation method where it would raise exceptions because of missing data in a response, and also fix pulling the IP from the proper data item. (GITHUB-325) [Michael Bennett]

- Fix a bug which prevented user to connect and instantiate multiple EC2 driver instances for different regions at the same time. (GITHUB-325) [Michael Bennett]

- Add methods in CloudStack driver to manage mutiple nics per vm. (GITHUB-369) [Roeland Kuipers]

- Implements VPC network ACLs for CloudStack driver. (GITHUB-371) [Jeroen de Korte]

Storage

- Fix a bug with CDN requests in the CloudFiles driver. [Tomaz Muraus]

- Fix a bug with not being able to specify meta_data / tags when uploading an object using Google Storage driver. (LIBCLOUD-612, GITHUB-356) [Stefan Friesel]

Loadbalancer

- Allow user to specify session affinity algorithm in the GCE driver by passing `ex_session_affinity` argument to the `create_balancer` method. (LIBCLOUD-595, GITHUB-341) [Lee Verberne, Eric Johnson]

DNS

- Various fixes in the Google DNS driver. (GITHUB-378) [Franck Cuny]

Changes with Apache Libcloud 0.15.1

Compute

- Allow user to limit a list of subnets which are returned by passing `subnet_ids` and `filters` argument to the `ex_list_subnets` method in the EC2 driver. (LIBCLOUD-571, GITHUB-306) [Lior Goikhburg]

- Allow user to limit a list of internet gateways which are returned by passing `gateway_ids` and `filters` argument to the `ex_list_internet_gateways` method in the EC2 driver. (LIBCLOUD-572, GITHUB-307) [Lior Goikhburg]

- Allow user to filter which nodes are returned by passing `ex_filters` argument to the `list_nodes` method in the EC2 driver. (LIBCLOUD-580, GITHUB-320) [Lior Goikhburg]

- Add network_association_id to ex_list_public_ips and CloudstackAddress object (GITHUB-327) [Roeland Kuipers]

- Allow user to specify admin password by passing `ex_admin_pass` argument to the `create_node` method in the Openstack driver. (GITHUB-315) [Marcus Devich]

- Fix a possible race condition in deploy_node which would occur if node is online and can be accessed via SSH, but the SSH key we want to use hasn't been installed yet.

  Previously, we would immediately throw if we can connect, but the SSH key hasn't been installed yet. (GITHUB-331) [David Gay]

- Propagate an exception in `deploy_node` method if user specified an invalid path to the private key file. Previously this exception was silently swallowed and ignored. [Tomaz Muraus]

DNS

- Include a better message in the exception which is thrown when a request in the Rackspace driver ends up in an `ERROR` state. [Tomaz Muraus]

Changes with Apache Libcloud 0.15.0

General

- Use lxml library (if available) for parsing XML. This should substantially reduce parsing time and memory usage for large XML responses (e.g. retrieving all the available images in the EC2 driver). [Andrew Mann]

- Use –head flag instead of -X HEAD when logging curl lines for HEAD requests in debug mode.

  Reported by Brian Metzler. (LIBCLOUD-552) [Tomaz Muraus]

- Fix Python 3 compatibility bugs in the following functions:

  - import_key_pair_from_string in the EC2 driver

  - publickey._to_md5_fingerprint

  - publickey.get_pubkey_ssh2_fingerprint

  (GITHUB-301) [Csaba Hoch]

- Update CA_CERTS_PATH to also look for CA cert bundle which comes with openssl Homebrew formula on OS x (/usr/local/etc/openssl/cert.pem). (GITHUB-309) [Pedro Romano]

- Update Google drivers to allow simultaneous authornization for all the supported Google Services. (GITHUB-302) [Eric Johnson]

Compute

- Fix create_key_pair method which was not returning private key. (LIBCLOUD-566) [Sebastien Goasguen]

- Map "Stopped" node state in the CloudStack driver to NodeState.STOPPED instead of NodeState.TERMINATED, "Stopping" to NodeState.PENDING instead of NodeState.TERMINATED and "Expunging" to NodeState.PENDING instead of NodeState.TERMINATED. (GITHUB-246) [Chris DeRamus, Tomaz Muraus]

- Add ex_create_tags and ex_delete_tags method to the CloudStack driver. (LIBCLOUD-514, GITHUB-248) [Chris DeRamus]

- Add new G2 instances to the EC2 driver. [Tomaz Muraus]

- Add support for multiple API versions to the Eucalyptus driver and allows user to pass "api_version" argument to the driver constructor. (LIBCLOUD-516, GITHUB-249) [Chris DeRamus]

- Map "Powered Off" state in the vCloud driver from "TERMINATED" to "STOPPED". (GITHUB-251) [Ash Berlin]

- Add ex_rename_node method to the DigitalOcean driver. (GITHUB-252) [Rahul Ranjan]

- Improve error parsing in the DigitalOcean driver.

  Reported by Deni Bertovic. [Tomaz Muraus]

- Add extension methods for the VPC internet gateway management to the EC2 driver. (LIBCLOUD-525, GITHUB-255) [Chris DeRamus]

- Add CloudStackProject class to the CloudStack driver and add option to select project and disk offering on node creation. (LIBCLOUD-526, GITHUB-257) [Jim Divine]

- Fix IP address handling in the OpenStack driver. (LIBCLOUD-503, GITHUB-235) [Markos Gogoulos]

- Ad new ex_delete_image and ex_deprecate_image method to the GCE driver. (GITHUB-260) [Franck Cuny]

- Ad new ex_copy_image method to the GCE driver. (GITHUB-258) [Franck Cuny]

- Ad new ex_set_volume_auto_delete method to the GCE driver. (GITHUB-264) [Franck Cuny]

- Add ex_revoke_security_group_ingress method to the CloudStack driver. [Chris DeRamus, Tomaz Muraus]

- Allow user to pass ex_ebs_optimized argument to the create_node method in the EC2 driver. (GITHUB-272) [zerthimon]

- Add "deprecated" attribute to the Node object in the Google Compute Engine driver. (GITHUB-276) [Chris / bassdread]

- Update Softlayer driver to use "fullyQualifiedDomainName" instead of "hostname" attribute for the node name. (GITHUB-280) [RoelVanNyen]

- Allow user to specify target tags using target_tags attribute when creating a firewall rule in the GCE driver. (GITHUB-278) [zerthimon]

- Add new standard API for image management and initial implementation for the EC2 and Rackspace driver. (GITHUB-277) [Matt Lehman]

- Allow user to specify "displayname" attribute when creating a CloudStack node by passing "ex_displayname" argument to the method.

  Also allow "name" argument to be empty (None). This way CloudStack automatically uses Node's UUID for the name. (GITHUB-289) [Jeff Moody]

- Deprecate "key" argument in the SSHClient class in favor of new "key_files" argument.

  Also add a new "key_material" argument. This argument can contain raw string version of a private key.

  Note 1: "key_files" and "key_material" arguments are mutually exclusive. Note 2: "key_material" argument is not supported in the ShellOutSSHClient.

- Use node id attribute instead of the name for the "lconfig" label in the Linode driver. This way the label is never longer than 48 characters. (GITHUB-287) [earthgecko]

- Add a new driver for Outscale SAS and Outscale INC cloud (http://www.outscale.com). (GITHUB-285, GITHUB-293, LIBCLOUD-536, LIBCLOUD-553) [Benoit Canet]

- Add new driver for HP Public Cloud (Helion) available via Provider.HPCLOUD constant. [Tomaz Muraus]

- Allow user to specify availability zone when creating an OpenStack node by passing "ex_availability_zone" argument to the create_node method. Note: This will only work if the OpenStack installation is running availability zones extension. (GITHUB-295, LIBCLOUD-555) [syndicut]

- Allow user to pass filters to ex_list_networks method in the EC2 driver. (GITHUB-294) [zerthimon]

- Allow user to retrieve container images using ex_get_image method in the Google Compute Engine driver. (GITHUB-299, LIBCLOUD-562) [Magnus Andersson]

- Add new driver for Kili public cloud (http://kili.io/) [Tomaz Muraus]

- Add "timeout" argument to the ParamikoSSHClient.run method. If this argument is specified and the command passed to run method doesn't finish in the defined timeout, *SSHCommandTimeoutError* is throw and the connection to the remote server is closed.

  Note #1: If timed out happens, this functionality doesn't guarantee that the underlying command will be stopped / killed. The way it works it simply closes a connect to the remote server. [Tomaz Muraus]

  Note #2: "timeout" argument is only available in the Paramiko SSH client.

- Make "cidrs_ips" argument in the ex_authorize_security_group_egress method in the EC2 driver mandatory. (GITHUB-301) [Csaba Hoch]

- Add extension methods for managing floating IPs (ex_get_floating_ip, ex_create_floating_ip, ex_delete_floating_ip) to the Openstack 1.1 driver. (GITHUB-301) [Csaba Hoch]

- Fix bug in RimuHosting driver which caused driver not to work when the provider returned compressed (gzip'ed) response. (LIBCLOUD-569, GITHUB-303) [amastracci]

- Fix issue with overwriting the server memory values in the RimuHosting driver. (GUTHUB-308) [Dustin Oberloh]

- Add ex_all_tenants argument to the list_nodes method in the OpenStack driver. (GITHUB-312) [LIBCLOUD-575, Zak Estrada]

- Add support for network management for advanced zones (ex_list_network_offerings, ex_create_network, ex_delete_network) in the CloudStack driver. (GITHUB-316) [Roeland Kuipers]

- Add extension methods for routes and route table management to the EC2 driver (ex_list_route_tables, ex_create_route_table, ex_delete_route_table, ex_associate_route_table, ex_dissociate_route_table, ex_replace_route_table_association, ex_create_route, ex_delete_route, ex_replace_route) (LIBCLOUD-574, GITHUB-313) [Lior Goikhburg]

- Fix ex_list_snapshots for HP Helion OpenStack based driver. [Tomaz Muraus]

- Allow user to specify volume type and number of IOPS when creating a new volume in the EC2 driver by passing `ex_volume_type` and `ex_iops` argument to the `create_volume` method. [Tomaz Muraus]

- Fix ex_unpause_node method in the OpenStack driver. (GITHUB-317) [Pablo Orduña]

- Allow user to launch EC2 node in a specific VPC subnet by passing `ex_subnet` argument to the create_node method. (GITHUB-318) [Lior Goikhburg]

Storage

- Fix container name encoding in the iterate_container_objects and get_container_cdn_url method in the Cloud-Files driver. Previously, those methods would throw an exception if user passed in a container name which contained a whitespace.

  Reported by Brian Metzler. (LIBCLOUD-552) [Tomaz MUraus]

- Fix a bug in the OpenStack Swift driver which prevented the driver to work with installations where region names in the service catalog weren't upper case. (LIBCLOUD-576, GITHUB-311) [Zak Estrada]

Load Balancer

- Add extension methods for policy managagement to the ELB driver. (LIBCLOUD-522, GITHUB-253) [Rahul Ranjan]

DNS

- Fix update_record method in the Route56 driver so it works correctly for records with multiple values. [Tomaz Muraus]

- Add ex_create_multi_value_record method to the Route53 driver which allows user to create a record with multiple values with a single call. [Tomaz Muraus]

- Add new driver for Google DNS. (GITHUB-269) [Franck Cuny]

Changes with Apache Libcloud 0.14.1

Compute

- Add new m3.medium and m3.large instance information to the EC2 driver. [Tomaz Muraus]

- Add a new driver for CloudSigma API v2.0. [Tomaz Muraus]

- Add "volume_id" attribute to the Node "extra" dictionary in the EC2 driver. Also fix the value of the "device" extra attribute in the StorageVolume object. (LIBCLOUD-501) [Oleg Suharev]

- Add the following extension methods to the OpenStack driver: ex_pause_node, ex_unpause_node, ex_suspend_node, ex_resume_node. (LIBCLOUD-505, GITHUB-238) [Chris DeRamus]

- Add ex_limits method to the CloudStack driver. (LIBCLOUD-507, GITHUB-240) [Chris DeRamus]

- Add "extra" dictionary to the CloudStackNode object and include more attributes in the "extra" dictionary of the network and volume object. (LIBCLOUD-506, GITHUB-239) [Chris DeRamus]

- Add ex_register_image method to the EC2 driver. (LIBCLOUD-508, GITHUB-241) [Chris DeRamus]

- Add methods for managing volume snapshots to the OpenStack driver. (LIBCLOUD-512, GITHUB-245) [Chris DeRamus]

Load Balancer

- Fix a bug in the ex_targetpool_add_node and ex_targetpool_remove_node method in the GCE driver. [Rick Wright]

Storage

- Allow user to use an internal endpoint in the CloudFiles driver by passing "use_internal_url" argument to the driver constructor. (GITHUB-229, GITHUB-231) [John Obelenus]

DNS

- Add PTR to the supported record types in the Rackspace driver. [Tomaz Muraus]

- Fix Zerigo driver to set Record.name attribute for records which refer to the bare domain to "None" instead of an empty string. [Tomaz Muraus]

- For consistency with other drivers, update Rackspace driver to set Record.name attribute for the records which refer to the bare domain to "None" instead of setting them to FQDN. [Tomaz Muraus]

- Update Rackspace driver to support paginating through zones and records. (GITHUB-230) [Roy Wellington]

- Update Route53 driver so it supports handling records with multiple values (e.g. MX). (LIBCLOUD-504, GITHUB-237) [Chris DeRamus]

- Update Route53 driver to better handle SRV records. [Tomaz Muraus]

- Update Route53 driver, make sure "ttl" attribute in the Record extra dictionary is always an int. [Tomaz Muraus]

Changes with Apache Libcloud 0.14.0

General

- Update API endpoints which are used in the HostVirtual drivers. (LIBCLOUD-489) [Dinesh Bhoopathy]

- Add support for Amazon security token to the Amazon drivers. (LIBCLOUD-498, GITHUB-223) [Noah Kantrowitz]

Compute

- Remove Slicehost driver.

  SliceHost API has been shut down in 2012 so it makes no sense to keep this driver. [Tomaz Muraus]

- Modify drivers for public cloud providers which use HTTP Basic authentication to not allow insecure connections (secure constructor kwarg being set to False) by default.

  This way credentials can't accidentally be sent in plain text over the write.

  Affected drivers: Bluebox, Joyent, NephoScale, OpSource, VPSNet [Tomaz Muraus]

- Remove "public_ip" and "private_ip" property which has been deprecated in 0.7.0 from the Node object. [Tomaz Muraus]

- Move "is_private_ip" and "is_valid_ip_address" function from libcloud.compute.base into libcloud.utils.networking module. [Tomaz Muraus]

- Allow user to pass "url" argument to the CloudStack driver constructor. This argument can be provided instead of "host" and "path" arguments and can contain a full URL to the API endpoint. (LIBCLOUD-430) [Tomaz Muraus]

- Allow user to pass None as a "location" argument to the create_node method. (LIBCLOUD-431) [Tomaz Muraus]

- Refactor CloudStack Connection class so it looks more like other connection classes and user can specify which attributes to send as part of query parameters in the GET request and which inside the body of a POST request. [Tomaz Muraus, Philipp Strube]

- Add a new driver for Exoscale (https://www.exoscale.ch/) provider. [Tomaz Muraus]

- Fix a bug in Abiquo driver which caused the driver to fail if the endpoint URL didn't start with "/api". (LIBCLOUD-447)

  Reported by Igor Ajdisek. [Tomaz Muraus]

- Modify CloudStack driver to correctly throw InvalidCredsError exception if invalid credentials are provided. [Tomaz Muraus]

- Don't throw an exception if a node object is missing an "image" attribute in the list nodes / get node response.

  This could happen if node is in an error state. (LIBCLOUD-455) [Dustin Spicuzza, Tomaz Muraus]

- Update CloudStack driver to better handle errors and throw ProviderError instead of a generic Exception. [Tomaz Muraus]

- Modify ex_list_networks methods in CloudStack driver to not thrown if there are no networks available. [Tomaz Muraus]

- Bump API version used in the EC2 driver from 2010-08-21 to 2013-10-15. (LIBCLOUD-454) [Tomaz Muraus]

- Add ex_get_limits method for retrieving account resource limits to the EC2 driver. [Tomaz Muraus]

- Update us-west-1 region in the EC2 driver to include c3 instance types. Also include pricing information. [Tomaz Muraus]

- For consistency, rename "ex_add_ip_forwarding_rule" method to "ex_create_ip_forwarding_rule". (GITHUB-196) [Oleg Suharev]

- Add support for new "i2" instance types to Amazon EC2 driver. Also update pricing file. (LIBCLOUD-465) [Chris DeRamus]

- Allow user to specify VPC id when creating a security group in the EC2 driver by passing "vpc_id" argument to ex_create_security_group method. (LIBCLOUD-463, GITHUB-201) [Chris DeRamus]

- Add extension methods for managing security group rules (ex_authorize_security_group_ingress, ex_authorize_security_group_egress, ex_revoke_security_group_ingress, ex_revoke_security_group_egress) to the EC2 driver. (LIBCLOUD-466, GITHUB-202) [Chris DeRamus]

- Add extension methods for deleting security groups (ex_delete_security_group, ex_delete_security_group_by_id, ex_delete_security_group_by_name) to the EC2 driver. (LIBCLOUD-464, GITHUB-199) [Chris DeRamus]

- Add extension method for listing reserved instances (ex_list_reserved_nodes) to the EC2 driver. (LIBCLOUD-469, GITHUB-205) [Chris DeRamus]

- Add extension methods for VPC management (ex_list_networks, ex_create_network, ex_delete_network) to the EC2 driver. (LIBCLOUD-467, GITHUB-203) [Chris DeRamus]

- Add extension methods for VPC subnet management (ex_list_subnets, ex_create_subnet, ex_delete_subnet) to the EC2 driver. (LIBCLOUD-468, GITHUB-207) [Chris DeRamus]

- Add ex_get_console_output extension method to the EC2 driver. (LIBCLOUD-471, GITHUB-209) [Chris De-Ramus]

- Include additional provider-specific attributes in the 'extra' dictionary of the StorageVolume class in the EC2 driver. (LIBCLOUD-473, GITHUB-210) [Chris DeRamus]

- Change attribute name in the 'extra' dictionary of EC2 and CloudStack Node object from "keyname" to "key_name". (LIBCLOUD-475) [Oleg Suharev]

- Fix a deployment issue which would some times cause a process to hang if the executed deployment script printed a lot of output to stdout or stderr. [Tomaz Muraus]

- Add additional attributes to the "extra" dictionary of the VolumeSnapshot object in the EC2 driver.

  Also modify create_volume_snapshot method to correctly handle "name" argument. Previous, "name" argument was used as a snapshot description, now it's used as a Tag with a key "Name". (LIBCLOUD-480, GITHUB-214) [Chris DeRamus]

- Store additional attributes (iops, tags, block_device_mapping) in the "extra" dictionary of the NodeImage object in the EC2 driver.

  Also fix ex_image_ids filtering in the list_images method. (LIBCLOUD-481, GITHUB-215) [Chris DeRamus]

- Add extension methods for network interface management (ex_list_network_interfaces, ex_create_network_interface, ex_attach_network_interface_to_node, ex_detach_network_interface, ex_delete_network_interface) to the EC2 driver. (LIBCLOUD-474) [Chris DeRamus]

- Update Google Compute Engine driver to use and work with API v1. (LIBCLOUD-450) [Rick Wright]

- Modify ParamikoSSHClient so that "password" and "key" arguments are not mutually exclusive and both can be provided. (LIBCLOUD-461, GITHUB-194) [Markos Gogoulos]

- Add extension methods for the Elastic IP management to the EC2 driver. Also modify "ex_allocate_address" and "ex_release_address" method to take "domain" argument so it also works with VPC. (LIBCLOUD-470, GITHUB-208, GITHUB-220) [Chris DeRamus]

- Add additional provider specific attributes to the "extra" dictionary of the Node object in the EC2 driver. (LIBCLOUD-493, GITHUB-221) [Chris DeRamus]

- Add ex_copy_image and ex_create_image_from_node method to the EC2 driver. (LIBCLOUD-494, GITHUB-222) [Chris DeRamus]

Storage

- Allow user to specify 'Content-Disposition' header in the CloudFiles driver by passing 'content_disposition' key in the extra dictionary of the upload object methods. (LIBCLOUD-430) [Michael Farrell]

- Fix CloudFiles driver so it references a correct service catalog entry for the CDN endpoint.

  This was broken in the 0.14.0-beta3 release when we migrated all the Rackspace drivers to use auth 2.0 by default. (GITHUB-186) [John Obelenus]

- Update storage drivers to default to "application/octet-stream" Content-Type if none is provided and none can be guessed. (LIBCLOUD-433) [Michael Farrell]

- Fix a bug so you can now upload 0 bytes sized objects using multipart upload in the S3 driver. (LIBCLOUD-490)

  Reported by Noah Kantrowitz. [Tomaz Muraus]

- Update OpenStack Swift driver constructor so it accepts "region", "ex_force_service_type" and "ex_force_service_name" argument. [Tomaz Muraus]

- Deprecate "CLOUDFILES_SWIFT" provider constant in favor of new "OPENSTACK_SWIFT" one. [Tomaz Muraus]

- Add support for setting an ACL when uploading and object. (LIBCLOUD-497, GITHUB-223) [Noah Kantrowitz]

- Modify get_container method to use a more efficient "HEAD" approach instead of calling list_containers + doing late filterting. (LIBCLOUD-498, GITHUB-223) [Noah Kantrowitz]

DNS

- Implement iterate_* methods in the Route53 driver and makes it work correctly if there are more results which can fit on a single page. Previously, only first 100 results were returned. (LIBCLOUD-434) [Chris Clarke]

- Update HostVirtual driver constructor to only take "key" and other valid arguments. Previously it also took "secret" argument which it silently ignored. (LIBCLOUD-483)

  Reported by Andrew Udvare. [Tomaz Muraus]

- Fix list_records method in the HostVirtual driver. (LIBCLOUD-484, GITHUB-218)

  Reported by Andrew Udvare. [Dinesh Bhoopathy]

Changes with Apache Libcloud 0.14.0-beta3

General

- If the file exists, read pricing data from ~/.libcloud/pricing.json by default. If the file doesn't exist, fall back to the old behavior and use pricing data which is bundled with the release. [Tomaz Muraus]

- Add libcloud.pricing.download_pricing_file function for downloading and updating the pricing file. [Tomaz Muraus]

- Fix libcloud.utils.py3.urlquote so it works with unicode strings under Python 2. (LIBCLOUD-429) [Michael Farrell]

Compute

- Refactor Rackspace driver classes and make them easier to use. Now there are two Rackspace provider constants - Provider.RACKSPACE which represents new next-gen OpenStack servers and Provider.RACKSPACE_FIRST_GEN which represents old first-gen cloud servers.

  Note: This change is backward incompatible. For more information on those changes and how to update your code, please visit "Upgrade Notes" documentation page - http://s.apache.org/lc0140un [Tomaz Muraus]

- Deprecate the following EC2 provider constants: EC2_US_EAST, EC2_EU, EC2_EU_WEST, EC2_AP_SOUTHEAST, EC2_AP_NORTHEAST, EC2_US_WEST_OREGON, EC2_SA_EAST, EC2_SA_EAST and replace it with a new EC2 constant. Driver referenced by this new constant now takes a "region" argument which dictates to which region to connect.

  Note: Deprecated constants will continue to work until the next major release. For more information on those changes and how to update your code, please visit "Upgrade Notes" documentation page - http://s.apache.org/lc0140un [Tomaz Muraus]

- Add support for volume related functions to OpenNebula driver. (LIBCLOUD-354) [Emanuele Rocca]

- Add methods for managing storage volumes to the OpenStack driver. (LIBCLOUD-353) [Bernard Kerckenaere]

- Add new driver for Google Compute Engine (LIBCLOUD-266, LIBCLOUD-386) [Rick Wright]

- Fix create_node "features" metadata and update affected drivers. (LIBCLOUD-367) [John Carr]

- Update EC2 driver to accept the auth kwarg (it will accept NodeAuthSSH objects and automatically import a public key that is not already uploaded to the EC2 keyring). (Follow on from LIBCLOUD-367). [John Carr]

- Unify extension argument names for assigning a node to security groups in EC2 and OpenStack driver. Argument in the EC2 driver has been renamed from ex_securitygroup to ex_security_groups. For backward compatibility reasons, old argument will continue to work until the next major release. (LIBCLOUD-375) [Tomaz Muraus]

- Add ex_import_keypair_from_string and ex_import_keypair method to the CloudStack driver. (LIBCLOUD-380) [Sebastien Goasguen]

- Add support for managing floating IP addresses to the OpenStack driver. (LIBCLOUD-382) [Ivan Kusalic]

- Add extension methods for handling port forwarding to the CloudStack driver, rename CloudStackForwardingRule class to CloudStackIPForwardingRule. (LIBCLOUD-348, LIBCLOUD-381) [sebastien goasguen]

- Hook up deploy_node functionality in the CloudStack driver and unify extension arguments for handling security groups. (LIBCLOUD-388) [sebastien goasguen]

- Allow user to pass "args" argument to the ScriptDeployment and ScriptFileDeployment class. This argument tells which command line arguments get passed to the ScriptDeployment script. (LIBCLOUD-394)

  Note: This change is backward incompatible. For more information on how this affects your code and how to update it, visit "Upgrade Notes" documentation page - http://s.apache.org/lc0140un [Tomaz Muraus]

- Allow user to specify IAM profile to use when creating an EC2 node. (LIBCLOUD-403) [Xavier Barbosa]

- Add support for keypair management to the OpenStack driver. (LIBCLOUD-392) [L. Schaub]

- Allow user to specify disk partitioning mode using ex_disk_config argument in the OpenStack based drivers. (LIBCLOUD-402) [Brian Curtin]

- Add new driver for NephoScale provider (http://nephoscale.com/). (LIBCLOUD-404) [Markos Gogoulos]

- Update network related extension methods so they work correctly with both, OpenStack and Rackspace driver. (LIBCLOUD-368) [Tomaz Muraus]

- Add tests for networking functionality in the OpenStack and Rackspace driver. [Tomaz Muraus]

- Allow user to pass all supported extension arguments to ex_rebuild_server method in the OpenStack driver. (LIBCLOUD-408) [Dave King]

- Add pricing information for Rackspace Cloud Sydney region. [Tomaz Muraus]

- Update EC2 instance type map and pricing data. High Storage instances are now also available in Sydney and Singapore region. [Tomaz Muraus]

- Add new methods for managing storage volumes and snapshots to the EC2 driver (list_volumes, list_snapshots, destroy_volume_snapshot, create_volume_snapshot) (LIBCLOUD-409) [Oleg Suharev]

- Add the following new extension methods to EC2 driver: ex_destroy_image, ex_modify_instance_attributes, ex_delete_keypair. (LIBCLOUD-409) [Oleg Suharev]

- Allow user to specify a port range when creating a port forwarding rule. (LIBCLOUD-409) [Oleg Suharev]

- Align Joyent driver with other drivers and deprecate "location" argument in the driver constructor in favor of "region" argument.

  Note: Deprecated argument will continue to work until the next major release. [Tomaz Muraus]

- Deprecate the following ElasticHosts provider constants: ELASTICHOSTS_UK1, ELASTICHOSTS_UK2, ELASTICHOSTS_US1, ELASTICHOSTS_US2, ELASTICHOSTS_US3, ELASTICHOSTS_CA1, ELASTI-CHOSTS_AU1, ELASTICHOSTS_CN1 and replace it with a new ELASTICHOSTS constant. Driver referenced by this new constant now takes a "region" argument which dictates to which region to connect.

  Note: Deprecated constants will continue to work until the next major release. For more information on those changes and how to update your code, please visit "Upgrade Notes" documentation page - http://s.apache.org/lc0140un (LIBCLOUD-383) [Michael Bennett, Tomaz Muraus]

- Add log statements to our ParamikoSSHClient wrapper. This should make debugging deployment issues easier. (LIBCLOUD-414) [Tomaz Muraus]

- Add new "NodeState.STOPPED" node state. Update HostVirtual and EC2 driver to also recognize this new state. (LIBCLOUD-296) [Jayy Vis]

- Add new Hong Kong endpoint to Rackspace driver. [Brian Curtin]

- Fix ex_delete_keypair method in the EC2 driver. (LIBCLOUD-415) [Oleg Suharev]

- Add the following new extension methods for elastic IP management to the EC2 driver: ex_allocate_address, ex_disassociate_address, ex_release_address. (LIBCLOUD-417) [Patrick Armstrong]

- For consistency and accuracy, rename "ex_associate_addresses" method in the EC2 driver to "ex_associate_address_with_node".

  Note: Old method will continue to work until the next major release. [Tomaz Muraus]

- Add new driver for CloudFrames (http://www.cloudfounders.com/CloudFrames) provider. (LIBCLOUD-358) [Bernard Kerckenaere]

- Update default kernel versions which are used when creating a Linode server.

  Old default kernel versions:

    - x86 - 2.6.18.8-x86_64-linode1

    - x86_64 - 2.6.39.1-linode34

  New default kernel versions:

    - x86 - 3.9.3-x86-linode52

    - x86_64 - 3.9.3-x86_64-linode33

  (LIBCLOUD-424) [Tomaz Muraus, Jon Chen]

- Disable cache busting functionality in the OpenStack and Rackspace next-gen driver and enable it only for Rackspace first-gen driver. [Tomaz Muraus]

- Update Google Compute Engine driver to v1beta16. [Rick Wright]

- Modify auth_url variable in the OpenStack drivers so it works more like users would expect it to.

  Previously path specified in the auth_url was ignored and only protocol, hostname and port were used. Now user can provide a full url for the auth_url variable and the path provided in the url is also used. [DaeMyung Kang, Tomaz Muraus]

- Allow user to associate arbitrary key/value pairs with a node by passing "ex_metadata" argument (dictionary) to create_node method in the EC2 driver. Those values are associated with a node using tags functionality. (LIBCLOUD-395) [Ivan Kusalic]

- Add "ex_get_metadata" method to EC2 and OpenStack driver. This method reads metadata dictionary from the Node object. (LIBCLOUD-395) [Ivan Kusalic]

- **Multiple improvements in the Softlayer driver:**

- Map "INITIATING" node state to NodeState.PENDING

- If node is launching remap "halted" state to "pending"

- Add more node sizes

- Add ex_stop_node and ex_start_node method

- Update tests response fixtures

(LIBCLOUD-416) [Markos Gogoulos]

- Modify list_sizes method in the KT UCloud driver to work, even if the item doesn't have 'diskofferingid' attribute. (LIBCLOUD-435) [DaeMyung Kang]

- Add new c3 instance types to the EC2 driver. [Tomaz Muraus]

- Fix an issue with the ex_list_keypairs and ex_list_security_groups method in the CloudStack driver which caused an exception to be thrown if the API returned no keypairs / security groups. (LIBCLOUD-438) [Carlos Reategui, Tomaz Muraus]

- Fix a bug in the OpenStack based drivers with not correctly checking if the auth token has expired before re-using it. (LIBCLOUD-428)

Reported by Michael Farrell. [Tomaz Muraus, Michael Farrell]

Storage

- Deprecate CLOUDFILES_US and CLOUDFILES_UK provider constant and replace it with a new CLOUD-FILES constant. Driver referenced by this new constant takes a "region" keyword argument which can be one of 'ord', 'dfw', 'iad', 'syd', 'lon'.

  Note: Deprecated constants will continue to work until the next major release. For more information on this change, please visit "Upgrade Notes" documentation section - http://s.apache.org/lc0140un [Tomaz Muraus]

- Allow users to filter objects starting with a prefix by passing ex_prefix argument to the list_container_objects method in the S3, Google Storage and CloudFiles driver. (LIBCLOUD-369) [Stefan Friesel]

- Fix an issue with mutating connectionCls.host attribute in the Azure driver. This bug prevented user from having multiple Azure drivers with different keys instantiated at the same time. (LIBCLOUD-399) [Olivier Grisel]

- Add a new driver for KT UCloud based on the OpenStack Swift driver. (LIBCLOUD-431). [DaeMyung Kang]

Load Balancer

- Deprecate RACKSPACE_US and RACKSPACE_UK provider constant and replace it with a new RACKSPACE constant. Driver referenced by this new constant takes a "region" keyword argument which can be one of the following: 'ord', 'dfw', 'iad', 'syd', 'lon'.

  Note: Deprecated constants will continue to work until the next major release. For more information on this change, please visit "Upgrade Notes" documentation section - http://s.apache.org/lc0140un [Tomaz Muraus]

- Add new driver for Google Compute Engine (LIBCLOUD-386) [Rick Wright]

- Add new Hong Kong endpoint to Rackspace driver. [Brian Curtin]

DNS

- Deprecate RACKSPACE_US and RACKSPACE_UK provider constant and replace it with a new RACKSPACE constant. Driver referenced by this new constant takes a "region" keyword argument which can be one of the following: 'us', 'uk'.

  Note: Deprecated constants will continue to work until the next major release. For more information on this change, please visit "Upgrade Notes" documentation section - http://s.apache.org/lc0140un [Tomaz Muraus]

- Use string instead of integer for RecordType ENUM value.

  Note: If you directly use an integer instead of RecordType ENUM class you need to update your code to use the RecordType ENUM otherwise the code won't work. For more information on how to do that, see "Upgrade Notes" documentation section - http://s.apache.org/lc0140un [Tomaz Muraus]

- Add "export_zone_to_bind_format" and export_zone_to_bind_zone_file method which allows users to export Libcloud Zone to BIND zone format. (LIBCLOUD-398) [Tomaz Muraus]

- Update issue with inexistent zone / record handling in the get_zone and get_record method in the Linode driver. Those issues were related to changes in the Linode API. (LIBCLOUD-425) [Jon Chen]

Changes with Apache Libcloud 0.13.3

Compute

- Send "scrub_data" query parameter when destroying a DigitalOcean node. This will cause disk to be scrubbed (overwritten with 0's) when destroying a node. (LIBCLOUD-487)

  Note: This fixes a security issue with a potential leak of data contained on the destroyed node which only affects users of the DigitalOcean driver. (CVE-2013-6480) [Tomaz Muraus]

Changes with Apache Libcloud 0.13.2

General

- Don't sent Content-Length: 0 header with POST and PUT request if "raw" mode is used. This fixes a regression which could cause broken behavior in some storage driver when uploading a file from disk. (LIBCLOUD-396) [Ivan Kusalic]

Compute

- Added Ubuntu Linux 12.04 image to ElasticHost driver image list. (LIBCLOUD-364) [Bob Thompson]
- Update ElasticHosts driver to store drive UUID in the node 'extra' field. (LIBCLOUD-357) [Bob Thompson]

Storage

- Store last_modified timestamp in the Object extra dictionary in the S3 driver. (LIBCLOUD-373) [Stefan Friesel]

Load Balancer

- Expose CloudStack driver directly through the Provider.CLOUDSTACK constant. [Tomaz Muraus]

DNS

- Modify Zerigo driver to include record TTL in the record 'extra' attribute if a record has a TTL set. [Tomaz Muraus]

- Modify values in the Record 'extra' dictionary attribute in the Zerigo DNS driver to be set to None instead of an empty string ('') if a value for the provided key is not set. [Tomaz Muraus]

Changes with Apache Libcloud 0.13.1

General

- Fix a regression introduced in 0.13.0 and make sure to include Content-Length 0 with PUT and POST requests. (LIBCLOUD-362, LIBCLOUD-390) [Tomaz Muraus]

Compute

- Fix a bug in the ElasticHosts driver and check for right HTTP status code when determining drive imaging success. (LIBCLOUD-363) [Bob Thompson]

- Update Opsource driver to include node public ip address (if available). (LIBCLOUD-384) [Michael Bennett]

Storage

- Fix a regression with calling encode_container_name instead of encode_object_name on object name in get_object method. Reported by Ben Meng (LIBCLOUD-366) [Tomaz Muraus]

- Ensure that AWS S3 multipart upload works for small iterators. (LIBCLOUD-378) [Mahendra M]

Changes with Apache Libcloud 0.13.0

General

- Add homebrew curl-ca-bundle path to CA_CERTS_PATH. This will make Libcloud use homebrew curl ca bundle file (if available) for server certificate validation. (LIBCLOUD-324) [Robert Chiniquy]

- Modify OpenStackAuthConnection and change auth_token_expires attribute to be a datetime object instead of a string. [Tomaz Muraus]

- Modify OpenStackAuthConnection to support re-using of the existing auth token if it's still valid instead of re-authenticating on every authenticate() call. [Tomaz Muraus]

- Modify base Connection class to not send Content-Length header if body is not provided. [Tomaz Muraus]

- Add the new error class ProviderError and modify InvalidCredsError to inherit from it. (LIBCLOUD-331) [Jayy Vis]

Misc

- Add unittest2 library dependency for tests and update some tests to use it. [Tomaz Muraus]

Compute

- Fix destroy_node method in the experimental libvirt driver. [Aymen Fitati]

- Add ex_start_node method to the Joyent driver. (LIBCLOUD-319) [rszabo50]

- Fix Python 3 compatibility issue in the ScriptFileDeployment class. (LIBCLOUD-321) [Arfrever Frehtes Taifersar Arahesis]

- Add ex_set_metadata_entry and ex_get_metadata method to the VCloud driver. (LIBCLOUD-318) [Michel Samia]

- Various improvements and bug-fixes in the VCloud driver. (LIBCLOUD-323) [Michel Samia]

- Various bug fixes and improvements in the HostVirtual driver. (LIBCLOUD-249) [Dinesh Bhoopathy]

- Modify list_sizes method in the OpenStack driver to include OpenStackNodeSize object which includes 'vcpus' attribute which holds a number of virtual CPUs for this size. (LIBCLOUD-325) [Carlo]

- For consistency rename "ex_describe_keypairs" method in the EC2 driver to "ex_describe_keypair". [Tomaz Muraus]

- Modify "ex_describe_keypair" method to return key fingerprint in the return value. (LIBCLOUD-326) [Andre Merzky, Tomaz Muraus]

- Populate private_ips attribute in the CloudStack drive when returning a Node object from the create_node method. (LIBCLOUD-329) [Sebastien Goasguen, Tomaz Muraus]

- Allow user to pass extra arguments via "extra_args" argument which are then passed to the "deployVirtualMachine" call in the CloudStack driver create_node method. (LIBCLOUD-330) [Sebastien Goasguen, Tomaz Muraus]

- Update Gandi driver to handle new billing model. (LIBCLOUD-317) [Aymeric Barantal]

- Fix a bug in the Linode driver and remove extra newline which is added when generating a random root password in create_node. (LIBCLOUD-334) [Juan Carlos Moreno]

- Add extension methods for managing keypairs to the CloudStack driver. (LIBCLOUD-333) [sebastien goasguen]

- Add extension methods for managing security groups to the CloudStack driver. (LIBCLOUD-332) [sebastien goasguen]

- Add extension methods for starting and stoping the node to the CloudStack driver. (LIBCLOUD-338) [sebastien goasguen]

- Fix old _wait_until_running method. (LIBCLOUD-339) [Bob Thompson]

- Allow user to override default async task completion timeout by specifying ex_clone_timeout argument. (LIBCLOUD-340) [Michal Galet]

- Fix a bug in the GoGrid driver get_uuid method. (LIBCLOUD-341) [Bob Thompson]

- Fix a bug with deploy_node not respecting 'timeout' kwarg. [Kevin Carter]

- Modify create_node method in CloudStack driver to return an instance of CloudStackNode and add a new "expunging" node state. (LIBCLOUD-345) [sebastien goasguen]

- Update API endpoint hostnames in the ElasticHost driver and use hostnames which return a valid SSL certificate. (LIBCLOUD-346) [Bob Thompson]

- Add ex_list_networks method and missing tests for list_templates to the CloudStack driver. (LIBCLOUD-349) [Philipp Strube]

- Correctly throw InvalidCredsError if user passes invalid credentials to the DigitalOcean driver. [Tomaz Muraus]

Storage

- Fix an issue with double encoding the container name in the CloudFiles driver upload_object method. Also properly encode container and object name used in the HTTP request in the get_container and get_object method. (LIBCLOUD-328) [Tomaz Muraus]

Load Balancer

- Add ex_list_current_usage method to the Rackspace driver.

Changes with Apache Libcloud 0.12.4

Compute

- Fix a regression in Softlayer driver caused by the xmlrpclib changes. (LIBCLOUD-310) [Jason Johnson]

- Allow user to pass alternate ssh usernames to deploy_node (ssh_alternate_usernames kwarg) which are used for authentication if the default one doesn't work. (LIBCLOUD-309) [Chris Psaltis, Tomaz Muraus]

- Fix a bug in EC2 list_locations method - 'name' attribute didn't contain a the right value. [Tomaz Muraus]

- Add new ScriptFileDeployment deployment class which reads deploy script from a file. [Rudolf J Streif]

- Add support for API version 5.1 to the vCloud driver and accept any value which is a multiple of four for ex_vm_memory kwarg in create_node method. (LIBCLOUD-314) [Trevor Powell]

Storage

- Fix a regression with removed ex_force_service_region constructor kwarg in the CloudFiles driver. (LIBCLOUD-260)

Changes with Apache Libcloud 0.12.3

General

- Fix Python 3.x related regressions. (LIBCLOUD-245) Reported by Arfrever Frehtes Taifersar Arahesis. [Tomaz Muraus]

- Fix a regression introduced with recent xmlrpiclib changes which broke all the Gandi.net drivers. (LIBCLOUD-288)

  Reported by Hutson Betts. [Tomaz Muraus]

- Improve deploy code to work correctly if the ssh user doesn't have access to the /root directory.

  Previously the ScriptDeployment script was stored in /root folder by default. Now it's stored in users home directory under filename ~/libcloud_deploymeny_<random>.sh. (LIBCLOUD-302)

  Reported by rotem on #libcloud. [Tomaz Muraus]

Compute

- Improve public and private IP address handling in OpenStack 1.1 driver. Assume every IP address which doesn't have a label "public" or "internet" is private. (LIBCLOUD-297) [Grischa Meyer, Tomaz Muraus]

- Add new driver for DigitalOcean provider - https://www.digitalocean.com/. (LIBCLOUD-304) [Tomaz Muraus]

- Fix a regression in ParamikoSSHClient.run method which caused this methid to only work as expected if you passed an absolute or a relative path to the script to it. (LIBCLOUD-278) [Tomaz Muraus]

DNS

- Allow user to specify 'priority' extra argument when creating a MX or SRV record. [Brian Jinwright, Tomaz Muraus]

Changes with Apache Libcloud 0.12.1

General

- Deprecate LazyList method of iteration over large paginated collections and use a new, more efficient generator based approach which doesn't require the iterator to be pre-exhausted and buffering all of the values in memory.

  Existing list_* methods which previously used LazyList class are preserving the old behavior and new iterate_* methods which use a new generator based approach have been added. (LIBCLOUD-254) [Mahendra M]

- Replace old ENUM style provider constants and replace them with a string version. This change allows users to dynamically register new drivers using a new set_driver method. (LIBCLOUD-255) [Mahendra M]

- Allow user to explicitly specify which CA file is used for verifying the server certificate by setting 'SSL_CERT_FILE' environment variable.

  Note: When this variable is specified, the specified path is the only CA file which is used to verifying the server certificate. (LIBCLOUD-283) [Tomaz Muraus, Erinn Looney-Triggs]

- Add a common module (libcloud.common.xmlrpc) for handling XML-RPC requests using Libcloud http layer.

  Also refactor existing drivers which use xmlrpclib directly (VCL, Gandi, Softlayer) to use this module.

  This change allows drivers to support LIBCLOUD_DEBUG and SSL certificate validation functionality. Previously they have bypassed Libcloud http layer so this functionality was not available. (LIBCLOUD-288) [John Carr]

Compute

- Fix string interpolation bug in __repr__ methods in the IBM SCE driver. (LIBCLOUD-242) [Tomaz Muraus]

- Fix test failures which happened in Python 3.3 due to: - hash randomization - changes in xml.etree module - changes in xmlrpc module (LIBCLOUD-245) [Tomaz Muraus]

- **Improvements and additions in vCloud driver:**

  - Expose generic query method (ex_query)

  - Provide functionality to get and set control access for vApps. This way created vApps can be shared between users/groups or everyone.

  (LIBCLOUD-251) [Michal Galet]

- Update EC2 pricing data to reflect new, lower prices - http://aws.typepad.com/aws/2012/10/new-ec2-second-generation-standard-instances-and-price-reductions-1.html [Tomaz Muraus]

- Update EC2 instance size to reflect new m3 instance types. Also refactor the code to make it easier to maintain. [Tomaz Muraus]

- Add a new driver for HostVirtual (http://www.vr.org) provider. (LIBCLOUD-249) [Dinesh Bhoopathy]

- Fix a bug where a numeric instead of a string value was used for the content-length header in VCloud driver. (LIBCLOUD-256) [Brian DeGeeter, Tomaz Muraus]

- Add a new driver for new Asia Pacific (Sydney) EC2 region. [Tomaz Muraus]

- Add support for managing security groups to the OpenStack driver. This patch adds the following extension methods: - ex_list_security_groups, ex_get_node_security_groups methods - ex_create_security_group, ex_delete_security_group - ex_create_security_group_rule, ex_delete_security_group_rule (LIBCLOUD-253) [L. Schaub]

- Modify ElasticStack driver class to pass 'vnc auto' instead of 'vnc:ip auto' argument to the API when creating a server. It looks like 'vnc:ip' has been replaced with 'vnc'. [Rick Copeland, Tomaz Muraus]

- Add new EC2 instance type - High Storage Eight Extra Large Instance (hs1.8xlarge). [Tomaz Muraus]

- Map 'shutting-down' node state in EC2 driver to UNKNOWN. Previously it was mapped to TERMINATED. (LIBCLOUD-280)

  Note: This change is backward incompatible which means you need to update your code if you rely on the old behavior. [Tomaz Muraus, Marcin Kuzminski]

- Change _wait_until_running method so it supports waiting on multiple nodes and make it public (wait_until_running). (LIBCLOUD-274) [Nick Bailey]

- Add new EC2 instance type - High Memory Cluster Eight Extra Large. (cr1.8xlarge). [Tomaz Muraus]

- Add new driver for Abiquo provider - http://www.abiquo.com (LIBCLOUD-250). [Jaume Devesa]

- Allow user to pass 'ex_blockdevicemappings' kwarg to the EC2 driver 'create_node' method. (LIBCLOUD-282) [Joe Miller, Tomaz Muraus]

- Improve error handling in the Brightbox driver. [Tomaz Muraus]

- Fix the ScriptDeployment step to work correctly if user provides a relative path for the script argument. (LIBCLOUD-278) [Jaume Devesa]

- Fix Softlayer driver and make sure all the code is up to date and works with the latest version of the actual Softlayer deployment (v3). (LIBCLOUD-287) [Kevin McDonald]

- Update EC2 driver, m3 instance types are now available in all the regions except Brazil.

  Also update pricing to reflect new (lower) prices. [Tomaz Muraus]

- Minor improvements in the HostVirtual driver and add new ex_get_node and ex_build_node extension method. (LIBCLOUD-249) [Dinesh Bhoopathy]

- Add ex_destroy_image method to IBM SCE driver. (LIBCLOUD-291) [Perry Zou]

- Add the following new regions to the ElasticHosts driver: sjc-c, syd-v, hkg-e. (LIBCLOUD-293) [Tomaz Muraus]

- Fix create_node in OpenStack driver to work correctly if 'adminPass' attribute is not present in the response. [Gavin McCance, Tomaz Muraus]

- Allow users to filter images returned by the list_images method in the EC2 driver by providing ex_image_ids argument. (LIBCLOUD-294) [Chris Psaltis, Joseph Hall]

- Add support for OpenNebula 3.8. (LIBCLOUD-295) [Guillaume ZITTA]

- Add missing 'deletd' -> terminated mapping to OpenStack driver. (LIBCLOUD-276) [Jayy Vis]

- Fix create_node in OpenStack driver to work correctly if 'adminPass' attribute is not present in the response. (LIBCLOUD-292) [Gavin McCance, Tomaz Muraus]

Storage

- Add a new local storage driver. (LIBCLOUD-252, LIBCLOUD-258, LIBCLOUD-265, LIBCLOUD-273) [Mahendra M]

- Fix a bug which caused the connection to not be closed when using Python 2.6 and calling get_object on an object which doesn't exist in the S3 driver. (LIBCLOUD-257) [John Carr]

- Add a new generator based method for listing / iterating over the containers (iterate_containers). (LIBCLOUD-261) [Mahendra M]

- Add ex_purge_object_from_cdn method to the CloudFiles driver. (LIBCLOUD-267) [Tomaz Muraus]

- Support for multipart uploads and other improvements in the S3 driver so it can more easily be re-used with other implementations (e.g. Google Storage, etc.).

  Also default to a multipart upload when using upload_object_via_stream. This methods is more efficient compared to old approach because it only requires buffering a single multipart chunk (5 MB) in memory. (LIBCLOUD-269) [Mahendra M]

- Add new driver for Windows Azure Storage with support for block and page blobs. (LIBCLOUD-80) [Mahendra M]

DNS

- Update 'if type' checks in the update_record methods to behave correctly if users passes in RecordType.A with a value of 0 - if type is not None. (LIBCLOUD-247) [Tomaz Muraus]

- New driver for HostVirtual provider (www.vr.org). (LIBCLOUD-249) [Dinesh Bhoopathy]

- Finish Amazon Route53 driver. (LIBCLOUD-132) [John Carr]

- Add new driver for Gandi provider (https://www.gandi.net). (LIBCLOUD-281) [John Carr]

Load-Balancer

- Add new driver for AWS Elastic Load Balancing service. (LIBCLOUD-169) [John Carr]

Changes with Apache Libcloud 0.11.4

General

- Fix some of tests failures which happened in Python 3.3 due to randomized dictionary ordering. (LIBCLOUD-245) [Tomaz Muraus]

Compute

- Fix a bug where a numeric instead of a string value was used for the content-length header in VCloud driver. (LIBCLOUD-256) [Brian DeGeeter, Tomaz Muraus]

Storage

- Don't ignore ex_force_service_region argument in the CloudFiles driver. (LIBCLOUD-260) [Dan Di Spaltro]

- Fix a bug which caused the connection to not be closed when using Python 2.6 and calling get_object on an object which doesn't exist in the S3 driver. (LIBCLOUD-257) [John Carr]

DNS

- Update 'if type' checks in the update_record methods to behave correctly if users passes in RecordType.A with a value of 0 - if type is not None. (LIBCLOUD-247) [Tomaz Muraus]

Changes with Apache Libcloud 0.11.3

Storage

- Include 'last_modified' and 'content_type' attribute in the Object 'extra' dictionary when retrieving object using get_object in the S3 driver. Also modify 'meta_data' dictionary to include all the headers prefixed with 'x-amz-meta-'. [Tomaz Muraus]

Changes with Apache Libcloud 0.11.2

General

- Fix a bug with the Libcloud SSL verification code. Code was too strict and didn't allow "-" character in the sub-domain when using a wildcard certificate.

  Note: This is NOT a security vulnerability. (LIBCLOUD-244) [Tomaz Muraus]

Compute

- Add new Rackspace Nova driver for Chicago (ORD) location (LIBCLOUD-234) [Brian McDaniel]

- Add capacity information to Vdc objects and implement power operations. (LIBCLOUD-239) [Michal Galet]

- Allow user to pass 'timeout' argument to the 'deploy_node' method. [Tomaz Muraus]

- Add ex_list_security_groups, ex_authorize_security_group and ex_describe_all_keypairs methods to the EC2 driver. (LIBCLOUD-241, LIBCLOUD-243) [Nick Bailey]

- Add new methods for managing storage volumes and other extenstion methods to the IBM SCE driver. (LIBCLOUD-242) [Sengor Kusturica]

Storage

- Add the following new methods to the CloudFiles driver: ex_set_account_metadata_temp_url_key, ex_get_object_temp_url. (GITHUB-72) [Shawn Smith]

Load-balancer

- Add 'balancer' attribute to the Member instance. This attribute refers to the LoadBalancer instance this member belongs to. [Tomaz Muraus]

Changes with Apache Libcloud 0.11.1

General

- Fix hostname validation in the SSL verification code (CVE-2012-3446).

  Reported by researchers from the University of Texas at Austin (Martin Georgiev, Suman Jana and Vitaly Shmatikov).

Changes with Apache Libcloud 0.11.0

Compute

- Add a timeout of 10 seconds to OpenStackAuthConnection class. (LIBCLOUD-199) [Chris Gilmer]

- Add time.sleep(wait_period) to _ssh_client_connect to prevent busy loops when we immediately can't connect to a server. (LIBCLOUD-197) [Jay Doane]

- Fix a bug with Python 3 support in the following drivers - IBM SCE, - CloudStack - CloudSigma - OpenNebula - VpsNet - EC2 - ElasticStack - vCloud - OpSource - Slicehost - Joyent (LIBCLOUD-204) [Sengor Kusturica, Hutson Betts, Tomaz Muraus]

- Make CloudStack driver more robust and make it work if list_images() call returns no images. (LIBCLOUD-202) [Gabriel Reid]

- Add force_ipv4 argument to _wait_until_running and default it to True. This will make Libcloud ignore IPv6 addresses when using deploy_node. (LIBCLOUD-200) [Jay Doane, Tomaz Muraus]

- Include error text if a CloudStack async job returns an error code. (LIBCLOUD-207) [Gabriel Reid]

- Add extenstion methods for block storage volume management to the CloudStack driver. (LIBCLOUD-208) [Gabriel Reid]

- New driver for KT UCloud (http://home.ucloud.olleh.com/main.kt) based on the CloudStack driver. [DaeMyung Kang]

- Add a standard API and methods for managing storage volumes to the EC2 and CloudStack drivers. Base API consistent of the following methods: create_volume, destroy_volume, attach_volume, detach_volume. (LIBCLOUD-213) [Gabriel Reid]

- Change ex_describe_tags, ex_create_tags and ex_delete_tags methods signature in the EC2 driver. Argument is now called resource (previously it was called node). This methods work with both Node and StorageVolume objects. (LIBCLOUD-213) [Gabriel Reid, Tomaz Muraus]

- Add Rackspace Nova London driver. [Chris Gilmer]

- Fix a bug - If user doesn't pass in 'network_id' argument to the create_node method in the CloudStack driver, don't explicitly define it. (LIBCLOUD-219) [Bruno Mahé, Tomaz Muraus]

- Modify EC2 driver to also return cc2.8xlarge cluster compute instance in the eu-west-1 region. [Tomaz Muraus]

- Add 'auth_user_variable' to the OpenStackAuthConnection class. [Mark Everett]

- Fix a bug with repeated URLs in some requests the vCloud driver. (LIBCLOUD-222) [Michal Galet]

- New Gridspot driver with basic list and destroy functionality. (LIBCLOUD-223) [Amir Elaguizy]

- Add methods for managing storage volumes to the Gandi driver. (LIBCLOUD-225) [Aymeric Barantal]

DNS

- Add support for GEO RecordType to Zerigo driver. (LIBCLOUD-203) [Gary Wilson]

- Fix a bug with Python 3 support in the following drivers (LIBCLOUD-204) - Zerigo [Tomaz Muraus]

- Add support for URL RecordType to Zerigo driver. (LIBCLOUD-209) [Bojan Mihelac]

- Properly handle record creation when user doesn't provider a record name and wants to create a record for the actual domain. Reported by Matt Perry (LIBCLOUD-224) [Tomaz Muraus]

Storage

- Fix a bug with Python 3 support in the following drivers - Atmos - Google Storage - Amazon S3 (LIBCLOUD-204) [Tomaz Muraus]

- Fix a bug in the CloudFiles driver which prevented it to work with accounts which use a non ORD endpoint. (LIBCLOUD-205) [Geoff Greer]

- Fix a bug in the enable_container_cdn method. (LIBCLOUD-206) [Geoff Greer]

- Allow user to specify container CDN TTL when calling container.enable_cd() using ex_ttl keyword argument in the CloudFiles driver. [Tomaz Muraus]

- Add ex_enable_static_website and ex_set_error_page method to the CloudFiles driver. [Tomaz Muraus]

- Propagate kwargs passed to container.download_object() to driver.download_object(). (LIBCLOUD-227) [Benno Rice]

- Fix a bug with not escaping container and object name in the Atmos driver. [Russell Keith-Magee, Benno Rice]

- Fix upload_object_via_stream method in the Atmos driver. (LIBCLOUD-228) [Benno Rice]

- Fix a bug with uploading zero-sized files in the OpenStack Swift / CloudFiles driver. [Tomaz Muraus]

- Fix a bug with content_type and encoding of object and path names in the Atmos driver. [Russell Keith-Magee]

Other

- Unify docstrings formatting in the compute drivers. (LIBCLOUD-229) [Ilgiz Islamgulov]

Changes with Apache Libcloud 0.10.1

General

- Add timeout attribute to base 'Connection' class and pass it to the connection class constructor if Python version is not 2.5. [Chris Gilmer]

Compute

- Update IBM SBC driver so it works with IBM Smart Cloud Enterprise. (LIBCLOUD-195) [Sengor Kusturica]

- Add ex_register_iso method to the CloudStack driver. (LIBCLOUD-196) [Daemian Mack]

- Allow user to specify which IP to use when calling deploy_node. (defaults to 'public_ips'). Previously it only worked with public IP, now user can pass 'private_ips' as an argument and SSH client will try to connect to the node first private IP address. [Jay Doane]

- Fix CloudSigmaLvsNodeDriver connectionCls bug. [Jerry Chen]

- Add 'ex_keyname' argument to the create_node method in the OpenStack driver. (LIBCLOUD-177) [Jay Doane]

- Fix a problem in deploy_node - make it work with providers which don't instantly return created node in the list_node response. Also add __str__ and __repr__ method to DeploymentError so the error message is more useful. (LIBCLOUD-176) [Jouke Waleson, Tomaz Muraus]

- Add 'ssh_key' feature to Brigthbox driver. This way it works with deploy_node. (LIBCLOUD-179) [Neil Wilson]

- Add Joyent compute driver. [Tomaz Muraus]

- Store auth token expire times on the connection class in the attribute called 'auth_token_expires'. (LIBCLOUD-178) [Chris Gilmer, Brad Morgan]

- Add new driver for VCL cloud (http://www.educause.edu/blog/hes8/CloudComputingandtheVirtualCom/167931) (LIBCLOUD-180) [Jason Gionta, Tomaz Muraus]

- **Improve and add new features to Brightbox driver**

    - Update fixtures to represent actual api output

    - Update compute tests to 100% coverage

    - Add userdata and server group extensions to create_node

    - Add ipv6 support to public ip list

    - Improve in line documentation

    - Add lots of api output information to Node and Image 'extra' attributes

    - Allow variable API versions (api_version argument)

    - Allow reverse dns updates for cloud ip extensions

  (LIBCLOUD-184) [Neil Wilson, Tomaz Muraus]

- Add ex_userdata argument to the OpenStack 1.1 driver. (LIBCLOUD-185) [Jay Doane]

- Modify Vmware vCloud driver and implement new features for the vCloud version 1.5. (LIBCLOUD-183) [Michal Galet, Sengor Kusturica]

- Allow user to pass mode argument to SSHClient.put method and default it to 'w'. (LIBCLOUD-188) [Jay Doane]

- Modify SSHKeyDeployment step to use append mode so it doesn't overwrite existing entries in .ssh/authorized_keys. (LIBCLOUD-187) [Jay Doane]

- Modify ParamikoSSHClient to connect to the SSH agent and automatically look for private keys in ~/.ssh if the 'auth' and 'ssh_key' argument is not specified when calling deploy_node. (LIBCLOUD-182) [Tomaz Muraus]

- Add ex_rescue and ex_unrescue method to OpenStack 1.1 driver. (LIBCLOUD-193) [Shawn Smith]

- Include 'password' in the node extra dictionary when calling deploy_node if the password auth is used. [Juan Carlos Moreno]

- Add FileDeployment class to libcloud.compute.deployment module. This can be used as a replacement for ex_files argument if the provider supports deployment functionality. (LIBCLOUD-190) [Jay Doane]

Storage

- Large object upload support for CloudFiles driver

- Add CLOUDFILES_SWIFT driver to connect to OpenStack Swift [Dmitry Russkikh, Roman Bogorodskiy]

Load-balancer

- Don't include 'body_regex' attribute in the Rackspace driver body if body_regex is None or empty string. (LIBCLOUD-186) [Bill Woodward]

- Don't split Load balancer IP addresses into public and private list. Include all the addresses in the 'virtualIps' variable in the extra dictionary (Rackspace driver). (LIBCLOUD-191) [Adam Pickeral]

Changes with Apache Libcloud 0.9.1

General

- Make parsing of the Auth API responses in the OpenStack drivers more flexible and extensible.

  Now, every connection class that inherits from the openstack base connection must implement get_endpoint(), who's job is to return the correct endpoint out of the service catalog.

  Note: The openstack.py base driver no longer works by default with Rackspace nova. The default endpoint parsed from the service catalog is the default compute endpoint for devstack. (LIBCLOUD-151) [Brad Morgan]

- Allow user to pass ex_tenant_name keyword argument to the OpenStack node driver class. This scopes all the endpoints returned by the Auth API endpoint to the provided tenant. (LIBCLOUD-172) [James E. Blair]

- Allow user to specify OpenStack service catalog parameters (service type, name and region). This way base OpenStack driver can be used with different providers without needing to subclass. (LIBCLOUD-173) [James E. Blair]

- Fix a bug with handling compressed responses in the Linode driver. (LIBCLOUD-158) [Ben Agricola]

Compute

- Add new RackspaceNovaBeta and RackspaveNovaDfw driver based on the OpenStack. (LIBCLOUD-151) [Brad Morgan]

- Include 'created' and 'updated' attribute in the OpenStack 1.1 driver. (LIBCLOUD-155) [Chris Gilmer]

- Include 'minRam' and 'minDisk' attribute in the OpenStack 1.1 driver Node extra dictionary. (LIBCLOUD-163) [Chris Gilmer]

- Allow users to use a list of tuples for the query string parameters inside the OpenStack connection classes. This way same key can be specified multiple times (LIBCLOUD-153) [Dave King]

- Allow user to pass 'max_tries' keyword argument to deploy_node method. [Tomaz Muraus]

- Include original exception error message when re-throwing an exception inside _run_deployment_script method. [Tomaz Muraus]

- Add support for ElasticHosts new United States (Los Angeles) and Canada (Toronto) locations. (GITHUB-53) [Jaime Irurzun]

- Add serverId attribute to the NodeImage object extra dictionary in the OpenStack driver. [Mark Everett]

- Add new EC2 instance type - m1.medium. [Tomaz Muraus]

- Allow user to re-use auth tokens and pass 'ex_force_auth_token' keyword argument to the OpenStack driver constructor. (LIBCLOUD-164) [Dave King]

- Add new experimental libvirt driver. [Tomaz Muraus]

- Properly handle OpenStack providers which return public IP addresses under the 'internet' key in the addresses dictionary. [Tomaz Muraus]

- Update create_node in Linode driver and make it return a Node object instead of a list. Reported by Jouke Waleson. (LIBCLOUD-175) [Tomaz Muraus]

Storage

- Don't lowercase special header names in the Amazon S3 storage driver. (LIBCLOUD-149) [Tomaz Muraus]

Load-balancer

- Allow user to specify a condition and weight when adding a member in the Rackspace driver. [Adam Pickeral]

- Add an extension method (ex_balancer_attach_members) for attaching multiple members to a load balancer in the Rackspace driver. (LIBCLOUD-152) [Adam Pickeral]

- Add ex_creaate_balancer method to the Rackspace driver and allow user to pass 'vip' argument to it. (LIBCLOUD-166) [Adam Pickeral]

- Update Rackspace driver to support Auth 2.0. (LIBCLOUD-165) [Dave King]

- Add new ex_create_balancer_access_rule and ex_create_balancer_access_rule_no_poll method to the Rackspace driver. (LIBCLOUD-170) [Dave King]

DNS

- Update Rackspace driver to support Auth 2.0. (LIBCLOUD-165) [Dave King]

Changes with Apache Libcloud 0.8.0

General

- Add 'request_kwargs' argument to the get_poll_request_kwargs method. This argument contains kwargs which were previously used to initiate the poll request. [Mark Everett]

- Add support for handling compressed responses (deflate, gzip). Also send "Accept-Encoding" "gzip,deflate" header with all the requests. [Tomaz Muraus]

- Fix debug module (LIBCLOUD_DEBUG env variable) so it works with Python 3 [Tomaz Muraus]

Compute

- Added support for retrieving OpenNebula v3.2 instance types, OpenNebula v3.0 network Public attribute support, and additional code coverage tests. [Hutson Betts]

- Add implementation for ex_save_image method to the OpenStack 1.1 driver. [Shawn Smith]

- Add support for Amazon new South America (Sao Paulo) location. [Tomaz Muraus]

- Fix a bug in OpenStack driver when 2.0_apikey or 2.0_password 'auth_version' is used. [Tomaz Muraus]

- Current OpenNebula OCCI implementation does not support a proper restart method. Rather it suspends and resumes. Therefore, restart_node has been removed from the OpenNebula driver. [Hutson Betts]

- Enable ex_delete_image method in the OpenStack 1.1 driver. [Shawn Smith]

- Return NodeImage instance in OpenStack 1.1 driver ex_save_image method (LIBCLOUD-138) [Shawn Smith]

- Enable reboot_node method in the OpenNebula 3.2 driver. [Hutson Betts]

- Fix a public_ips Node variable assignment in the Gandi.net driver. [Aymeric Barantal]

- Updated the list of node states for OpenNebula drivers. (LIBCLOUD-148) [Hutson Betts]

Storage

- Propagate extra keyword arguments passed to the Rackspace driver connection class. [Dave King]

Load-balancer

- Add 'extra' attribute to the LoadBalancer object and retrieve all the virtual IP addresses in the Rackspace driver. [Dave King]

- Add list_supported_algorithms() method to the base LoadBalancer class. This method returns a list of supported algorithms by the provider. [Dave King]

- **Update Rackspace driver:**

    - Add two new supported algorithms: WEIGHTED_ROUND_ROBIN, WEIGHTED_LEAST_CONNECTIONS

    - Add ex_list_algorithm_names method

    - Add ex_get_balancer_error_page method

    - Add ex_balancer_access_list method

    - Populate LoadBalancer extra dictionary with more attributes

    - Add support for health monitors and connection throttling

    - Add more balancer states

    - ex_list_protocols_with_default_ports

    [Dave King]

- Propagate extra keyword arguments passed to the Rackspace driver connection class. [Dave King]

- Add 'extra' attribute to the Member object and populate it in the Rackspace driver. [Mark Everett]

- Adds status to the Member object and conditions an 'enum' (Rackspace driver). [Mark Everett]

- Add update_balancer method to the base LoadBalancer class. [Mark Everett]

- Add update_balancer method to the Rackspace driver. [Mark Everett]

- Add created and updated attribute to the LoadBalancer extra dictionary in the Rackspace driver. [Mark Everett]

- Fix protocol name maping in the Rackspace driver. [Bill Woodward]

Changes with Apache Libcloud 0.7.1

General

- Fix a minor bug in debug mode (LIBCLOUD_DEBUG=/dev/stderr) which has been introduced when adding Python 3 compatibility layer. [Paul Querna]

- Update OpenStack Auth API endpoint paths. [Paul Querna]

Changes with Apache Libcloud 0.7.0

General

- Add support for Python 3.x. [Tomaz Muraus]

- Remove old deprecated paths. [Tomaz Muraus]

Compute

- Update CloudSigma Zurich API endpoint address. [Tomaz Muraus]

- Add new US Las Vegas endpoint to CloudSigma driver (types.CLOUDSIGMA_US) [Tomaz Muraus]

- Allow user to specify drive type (hdd, ssd) when creating a CloudSigma server.

  Note 'ssd' drive_type doesn't work with the API yet. [Tomaz Muraus]

- Update OpenStack 1.1 driver to comply with the API specs. Need to make another call to retrieve node name and ip addresses when creating a node, because the first call only returns an id an the password. (GITHUB-40) [Dave King]

- Add ex_node_ids argument to the EC2 driver list_nodes method. (GITHUB-39) [Suvish Vt]

- If OpenStack Auth 2.0 API is used, also parse out tenant id and name and save it on the connection class (conn.tenant['id'], conn.tenant['name']). [Tomaz Muraus]

- Add new "Cluster Compute Eight Extra Large" size to the Amazon EC2 driver. [Tomaz Muraus]

- Add the following extension methods to the EC2 compute driver: ex_describe_all_addresses, ex_associate_addresses, ex_start_node, ex_stop_node. [Suvish Vt]

- Change public_ip and private_ip attribute on the Node object to the public_ips and private_ips since both of the objects are always a list.

  Note: For backward compatibility you can still access public_ip and private_ip attributes, but this will be removed in the next release. [Tomaz Muraus]

- Fix an inconsistency in IBM SBC driver and make sure public_ips and private_ips attributes are a list. [Tomaz Muraus]

- Fix an inconsistency in OpSource driver and make sure public_ips is an empty list ([]), not 'unknown' [Tomaz Muraus]

- Updated support for OpenNebula.org v1.4, v2.x, and v3.x APIs and included additional compute tests validating functionality. (LIBCLOUD-121) [Hutson Betts]

Load-balancer

- Add ex_member_address argument to the Rackspace driver list_balancers method. If this argument is provided, only loadbalancers which have a member with the provided IP address attached are returned. [Tomaz Muraus]

Changes with Apache Libcloud 0.6.2

General

- Fix a bug in PollingConnection class - actually use and don't ignore the poll_interval [Tomaz Muraus]

Compute

- Add support for Auth 2.0 API (keystone) to the OpenStack Auth connection class. [Brad Morgan]
- Add list_locations method to the OpenStack driver and fix some inconsistencies in the OpenStack driver extension method signatures. [Brad Morgan]
- Update Amazon EC2 driver and pricing data to support a new region - US West 2 (Oregon) [Tomaz Muraus]
- Expose 'CLOUDSTACK' provider. This driver can be used with an arbitrary CloudStack installation. [Tomaz Muraus]

Storage

- Update Amazon S3 driver to support a new region - US West 2 (Oregon) [Tomaz Muraus]

DNS

- Increase the default poll interval in the Rackspace driver to 2.5 seconds. [Tomaz Muraus]
- Fix a bug in Rackspace Cloud DNS driver and make sure to throw an exception if an unexpected status code is returned. Reported by "jeblair". [Tomaz Muraus]

Changes with Apache Libcloud 0.6.1

General

- Modify ParamikoSSHClient.connect so it supports authentication using a key file, (LIBCLOUD-116) [Jay Doane]
- User must now explicitly specify a path when using LIBCLOUD_DEBUG environment variable. (LIBCLOUD-95) [daveb, Tomaz Muraus]
- Add new XmlResponse and JsonResponse base class and modify all the driver-specific response classes to inherit from one of those two classes where applicable. [Caio Romão]
- Add new 'PollingConnection' class. This class can work with 'async' APIs. It sends and an initial request and then periodically poll the API until the job has completed or a timeout has been reached. [Tomaz Muraus]

Compute

- Add 24GB size to the GoGrid driver [Roman Bogorodskiy]

- Fix API endpoint URL in the Softlayer driver [Tomaz Muraus]

- Add support for OpenNebula 3.0 API (LIBCLOUD-120) [Hutson Betts]

- Add more attributes to the extra dictionary in the EC2 driver. (GITHUB-31) [Juan Carlos Moreno]

- Fix IP address assignment in the EC2 driver. Don't include "None" in the public_ip and private_ip Node list attribute. [Tomaz Muraus]

- Make deploy_node functionality more robust and don't start deployment if node public_ip attribute is an empty list. [Tomaz Muraus]

- Support SSH key authentication when using deploy_node. [Russell Haering, Tomaz Muraus]

- Enable deploy_node functionality in the EC2 driver using SSH key authentication [Russell Haering, Tomaz Muraus]

- Enable paramiko library debug log level if LIBCLOUD_DEBUG is used and paramiko is installed. [Tomaz Muraus]

- Fix the request signature generation in the base EC2 compute driver. If the endpoint is using a non-standard port (Eucalyptus based installations), append it to the hostname used to generate the signature. [Simon Delamare]

- Add new "unavailable" state to the BrightboxNodeDriver class. [Tim Fletcher]

- Increase a PollingConnection timeout in the CloudStack connection and fix the context dictionary creation in the _async_request method. [Oleg Suharev]

- Fix networks retrieval in the CloudStack driver create_node method. Also only pass 'networkids' field to the API if there are any networks available. [Oleg Suharev, Tomaz Muraus]

- Fix list_nodes in the CloudStack driver. Private IPs aren't always available. [Tomaz Muraus]

Load-baancer

- Add a missing argument to the method call inside LoadBalancer.attach_compute_node and Driver.balancer_attach_compute_node. [Tim Fletcher, Tomaz Muraus]

- Add missing destroy() method to the LoadBalancer class. [Tomaz Muraus]

DNS

- New drivers for Rackspace Cloud DNS (US and UK region) [Tomaz Muraus]

- Add list_record_types() method. This method returns a list of record types supported by the provider. [Tomaz Muraus]

Changes with Apache Libcloud 0.6.0-beta1

General

- All the driver classes now inherit from the BaseDriver class [Tomaz Muraus]

- Prefer simplejson (if available) over json module. (LIBCLOUD-112) [Geoff Greer]

- Update compute demo and change the syntax of test credentials stored in test/secrets.py-dist. (LIBCLOUD-111) [Mike Nerone]

- Enable SSL certificate verification by default and throw an exception if CA certificate files cannot be found. This can be overridden by setting libcloud.security.VERIFY_SSL_CERT_STRICT to False. [Tomaz Muraus]

Compute

- Support for 1.1 API and many other improvements in the OpenStack driver ; LIBCLOUD-83 [Mike Nerone, Paul Querna, Brad Morgan, Tomaz Muraus]

- Add some extra methods to the Gandi.net driver (LIBCLOUD-115) [Aymeric Barantal]

- Add ex_delete_image method to the Rackspace driver. (GITHUB-27) [David Busby]

- Linode driver now supports new 'Japan' location [Jed Smith]

- Rackspace driver now inherits from the OpenStack one instead of doing it vice versa. (LIBCLOUD-110) [Mike Nerone]

- Properly populate NodeImage "details" dictionary in the Rackspace compute driver. (LIBCLOUD-107) [Lucy Mendel]

- Fix a bug in Eucalyptus driver ex_describe_addresses method. [Tomaz Muraus]

- Add the following new extenstion methods to the Rackspace driver: ex_resize, ex_confirm_resize, ex_revert_resize. [Tomaz Muraus]

- Also allow user to pass in Node object to some ex_ methods in the Rackspace compute driver. [Tomaz Muraus]

- Throw an exception in deploy_node if paramiko library is not available [Tomaz Muraus]

- Fix chmod argument value which is passed to the sftpclient.put method; GITHUB-17 [John Carr]

- New driver for Ninefold.com. (LIBCLOUD-98) [Benno Rice]

Storage

- New driver for Google Storage based on the v1.0 / legacy API [Tomaz Muraus]

- New driver for Ninefold.com. (GITHUB-19) [Benno Rice]

- Fix a bug in uploading an object with some versions of Python 2.7 where httplib library doesn't automatically call str() on the header values. [Tomaz Muraus]

- Allow users to upload (create) 0-bytes large (empty) objects [Tomaz Muraus]

Load-balancer

- New driver for Rackspace UK location [Tomaz Muraus]

- New driver for Ninefold.com. (LIBCLOUD-98) [Benno Rice]

DNS

- Drivers for Linode DNS and Zerigo DNS [Tomaz Muraus]

- Brand new DNS API! [Tomaz Muraus]

Changes with Apache Libcloud 0.5.2

Compute

- New driver for serverlove.com and skalicloud.com [Tomaz Muraus]
- Fix node name and tag handling in the Amazon EC2 driver [Wiktor Kolodziej]
- Fix pricing and response handling in the OpenStack driver [Andrey Zhuchkov]
- Fix deploy_node() method and make it more robust [Tomaz Muraus]
- Users can now pass file like objects to ScriptDeployment and SSHKeyDeployment constructor. [Tomaz Muraus]
- Include node tags when calling list_nodes() in the Amazon EC2 driver [Trevor Pounds]
- Properly handle response errors in the Rackspace driver and only throw InvalidCredsError if the returned status code is 401 [Brad Morgan]
- Fix the create_node method in the Nimbus driver and make the "ex_create_tag" method a no-op, because Nimbus doesn't support creating tags. [Tomaz Muraus]

Storage

- Fix handling of the containers with a lot of objects. Now a LazyList object is returned when user calls list_container_objects() method and this object transparently handles pagination. [Danny Clark, Wiktor Kolodziej]

Changes with Apache Libcloud 0.5.0

- Existing APIs directly on the libcloud.* module have been deprecated and will be removed in version 0.6.0. Most methods were moved to the libcloud.compute.* module.
- **Add new libcloud.loadbalancers API, with initial support for:**
    - GoGrid Load Balancers
    - Rackspace Load Balancers

  [Roman Bogorodskiy]
- **Add new libcloud.storage API, with initial support for:**
    - Amazon S3
    - Rackspace CloudFiles

  [Tomaz Muraus]
- **Add new libcloud.compute drivers for:**
    - Bluebox [Christian Paredes]
    - Gandi.net [Aymeric Barantal]
    - Nimbus [David LaBissoniere]
    - OpenStack [Roman Bogorodskiy]
    - Opsource.net [Joe Miller]
- Added "pricing" module and improved pricing handling. [Tomaz Muraus]

- **Updates to the GoGrid compute driver:**

    - Use API version 1.0.

    - Remove sandbox flag.

    - Add ex_list_ips() to list IP addresses assigned to the account.

    - Implement ex_edit_image method which allows changing image attributes like name, description and make image public or private.

  [Roman Bogorodskiy]

- **Updates to the Amazon EC2 compute driver:**

    - When creating a Node, use the name argument to set a Tag with the value. [Tomaz Muraus]

    - Add extension method for modifying node attributes and changing the node size. [Tomaz Muraus]

    - Add support for the new Amazon Region (Tokyo). [Tomaz Muraus]

    - Added ex_create_tags and ex_delete_tags. [Brandon Rhodes]

    - Include node Elastic IP addresses in the node public_ip attribute for the EC2 nodes. [Tomaz Muraus]

    - Use ipAddress and privateIpAddress attribute for the EC 2node public and private ip. [Tomaz Muraus]

    - Add ex_describe_addresses method to the EC2 driver. [Tomaz Muraus]

- **Updates to the Rackspace CloudServers compute driver:**

    - Add ex_rebuild() and ex_get_node_details() [Andrew Klochkov]

    - Expose URI of a Rackspace node to the node meta data. [Paul Querna]

- Minor fixes to get the library and tests working on Python 2.7 and PyPy. [Tomaz Muraus]

Changes with Apache Libcloud 0.4.2 (Released January 18, 2011)

- Fix EC2 create_node to become backward compatible for NodeLocation. [Tomaz Muraus]

- Update code for compatibility with CPython 2.5 [Jerry Chen]

- Implement ex_edit_node method for GoGrid driver which allows changing node attributes like amount of RAM or description. [Roman Bogorodskiy]

- Add ex_set_password and ex_set_server_name to Rackspace driver. [Peter Herndon, Paul Querna]

- Add Hard and Soft reboot methods to Rackspace driver. [Peter Herndon]

- EC2 Driver availability zones, via ex_list_availability_zones; list_locations rewrite to include availability zones [Tomaz Muraus]

- EC2 Driver Idempotency capability in create_node; LIBCLOUD-69 [David LaBissoniere]

- **SSL Certificate Name Verification:**

    - libcloud.security module

    - LibcloudHTTPSConnection, LibcloudHTTPConnection (alias)

    - Emits warning when not verifying, or CA certs not found

- Append ORD1 to available Rackspace location, but keep in the same node as DFW1, because it's not readable or writeable from the API. [Per suggestion of Grig Gheorghiu]

- ex_create_ip_group, ex_list_ip_groups, ex_delete_ip_group, ex_share_ip, ex_unshare_ip, ex_list_ip_addresses additions to Rackspace driver [Andrew Klochkov]

- New driver for CloudSigma. [Tomaz Muraus]

- New driver for Brightbox Cloud. (LIBCLOUD-63) [Tim Fletcher]

- Deployment capability to ElasticHosts [Tomaz Muraus]

- Allow deploy_node to use non-standard SSH username and port [Tomaz Muraus]

- Added Rackspace UK (London) support [Chmouel Boudjnah]

- GoGrid driver: add support for locations, i.e. listing of locations and creation of a node in specified location [Roman Bogorodskiy]

- GoGrid and Rackspace drivers: add ex_save_image() extra call to convert running node to an image [Roman Bogorodskiy]

- GoGrid driver: add support for creating 'sandbox' server and populate isSandbox flag in node's extra information. [Roman Bogorodskiy]

- Add ImportKeyPair and DescribeKeyPair to EC2. (LIBCLOUD-62) [Philip Schwartz]

- Update EC2 driver and test fixtures for new API. [Philip Schwartz]

Changes with Apache Libcloud 0.4.0 [Released October 6, 2010]

- Add create keypair functionality to EC2 Drivers. (LIBCLOUD-57) [Grig Gheorghiu]

- Improve handling of GoGrid accounts with limited access API keys. [Paul Querna]

- New Driver for ElasticHosts. (LIBCLOUD-45) [Tomaz Muraus]

- Use more consistent name for GoGrid driver and use http POST method for 'unsafe' operations [Russell Haering]

- Implement password handling and add deployment support for GoGrid nodes. [Roman Bogorodskiy]

- Fix behavior of GoGrid's create_node to wait for a Node ID. [Roman Bogorodskiy]

- Add ex_create_node_nowait to GoGrid driver if you don't need to wait for a Node ID when creating a node. [Roman Bogorodskiy]

- Removed libcloud.interfaces module. [Paul Querna]

- Removed dependency on zope.interfaces. [Paul Querna]

- RimuHosting moved API endpoint address. [Paul Querna]

- Fix regression and error in GoGrid driver for parsing node objects. [Roman Bogorodskiy]

- Added more test cases for GoGrid driver. (LIBCLOUD-34) [Roman Bogorodskiy, Jerry Chen]

- Fix parsing of Slicehost nodes with multiple Public IP addresses. [Paul Querna]

- Add exit_status to ScriptDeployment. (LIBCLOUD-36) [Paul Querna]

- **Update prices for several drivers.** [Brad Morgan, Paul Querna]

- Update Linode driver to reflect new plan sizes. [Jed Smith]

- **Change default of 'location' in Linode create_node. (LIBCLOUD-41)** [Jed Smith, Steve Steiner]

- Document the Linode driver. [Jed Smith]

- Request a private, LAN IP address at Linode creation. [Jed Smith]

Changes with Apache Libcloud 0.3.1 [Released May 11, 2010]

- **Updates to Apache License blocks to correctly reflect status as an** Apache Project.

- Fix NOTICE file to use 2010 copyright date.

- Improve error messages for when running the test cases without first setting up a secrets.py

Changes with Apache Libcloud 0.3.0 [Tagged May 6, 2010, not released]

- **New Drivers for:**
    - Dreamhost
    - Eucalyptus
    - Enomaly ECP
    - IBM Developer Cloud
    - OpenNebula
    - SoftLayer

- Added new deployment and bootstrap API.

- Improved Voxel driver.

- Added support for Amazon EC2 Asia Pacific (Singapore) Region.

- Improved test coverage for all drivers.

- Add support for multiple security groups in EC2.

- Fixed bug in Rackspace and RimuHosting when using multiple threads.

- Improved debugging and logging of HTTP requests.

- Improved documentation for all classes and methods.

Changes with Apache Libcloud 0.2.0 [Tagged February 2, 2010]

- First public release.

1.4.2 Upgrade Notes

This page describes how to upgrade from a previous version to a new version which contains backward incompatible or semi-incompatible changes and how to preserve the old behavior when this is possible.

Libcloud 3.0.0

- This release drops support for Python versions older than 3.5.0.

  If you still need to use Libcloud with Python 2.7 or Python 3.4 you can do that by using the latest release which still supported those Python versions (Libcloud v2.8.0).

- This release removes VMware vSphere driver which relied on old and unmaintained `pysphere` library which doesn't support Python 3.

- This release removes support for PageBlob objects from the Azure Blobs storage driver. The `ex_blob_type` and `ex_page_blob_size` arguments have been removed from the `upload_object` and `upload_object_via_stream` methods.

- The `ex_prefix` keyword argument in the `iterate_container_objects` and `list_container_objects` methods in all storage drivers has been renamed to `prefix` to indicate the promotion of the argument to the standard storage driver API.

Libcloud 2.8.0

- `deploy_node()` method in the GCE driver has been updated so it complies with the base compute API.

  This means that the method now takes the same argument as the base `deploy_node()` method (`deployment`, `ssh_username`, `ssh_port`, etc.) plus all the keyword arguments which are supported by the `create_node()` method.

- `group_name` keyword argument in the `create_node()` method in the Abiquo driver has been renamed to `ex_group_name` to comply with the convention for naming non-standard arguments (arguments which are not part of the standard compute API).

Libcloud 2.7.0

- AWS S3 driver has moved from "driver class per region" model to "single driver class with `region` constructor argument" model. This means this driver now follows the same approach as other multi region drivers.

  Before:

```python
from libcloud.storage.types import Provider
from libcloud.storage.providers import get_driver

S3_EU_CENTRAL = get_driver(Provider.S3_EU_CENTRAL)
S3_EU_WEST_1 = get_driver(Provider.S3_EU_WEST)

driver_eu_central = S3_EU_CENTRAL('api key', 'api secret')
driver_eu_west_1 = S3_EU_WEST_1('api key', 'api secret')
```

  After:

```python
from libcloud.storage.types import Provider
from libcloud.storage.providers import get_driver

S3 = get_driver(Provider.S3)

driver_eu_central = S3('api key', 'api secret', region='eu-central-1')
driver_eu_west_1 = S3('api key', 'api secret', region='eu-west-1')
```

  For now, old approach will still work, but it will be deprecated and fully removed in a future release. Deprecation and removal will be announced well in advance.

- New `start_node` and `stop_node` methods have been added to the base Libcloud compute API NodeDriver class.

  A lot of the existing compute drivers already implemented that functionality via extension methods (`ex_start_node`, `ex_stop_node`) so it was decided to promote those methods to be part of the standard Libcloud compute API and update all the affected drivers.

  For backward compatibility reasons, existing `ex_start` and `ex_stop_node` methods will still work until a next major release.

If you are relying on code which uses `ex_start` and `ex_stop_node` methods, you are encouraged to update it to utilize new `start_node` and `stop_node` methods since those `ex_` methods are now deprecated and will be removed in a future major release.

Libcloud 1.0.0

- Per-region provider constants and related driver classes which have been deprecated in Libcloud 0.14.0 have now been fully removed.

  Those provider drivers have moved to the single provider constant + `region` constructor argument in Libcloud 0.14.0.

Libcloud 0.20.0

- New optional `ttl` argument has been added to `libcloud.dns.base.Record` class constructor before the existing `extra` argument.

  If you have previously manually instantiated this class and didn't use keyword arguments, you need to update your code to correctly pass arguments to the constructor (you are encouraged to use keyword arguments to avoid such issues in the future).

- All NodeState, StorageVolumeState, VolumeSnapshotState and Provider attributes are now strings instead of integers.

  If you are using the `tostring` and `fromstring` methods of NodeState, you are fine. If you are using NodeState.RUNNING and the like, you are also fine.

  However, if you have previously depended on these being integers, you need to update your code to depend on strings. You should consider starting using the `tostring` and `fromstring` methods as the output of these functions will not change in future versions, while the implementation might.

Libcloud 0.19.0

- The base signature of NodeDriver.create_volume has changed. The snapshot argument is now expected to be a VolumeSnapshot instead of a string. The older signature was never correct for built-in drivers, but custom drivers may break. (GCE accepted strings, names or None and still does. Other drivers did not implement creating volumes from snapshots at all until now.)

- VolumeSnapshots now have a *created* attribute that is a *datetime* field showing the creation datetime of the snapshot. The field in VolumeSnapshot.extra containing the original string is maintained, so this is a backwards-compatible change.

- The OpenStack compute driver methods ex_create_snapshot and ex_delete_snapshot are now deprecated by the standard methods create_volume_snapshot and destroy_volume_snapshot. You should update your code.

- The compute base driver now considers the name argument to create_volume_snapshot to be optional. All official implementations of this methods already considered it optional. You should update any custom drivers if they rely on the name being mandatory.

Libcloud 0.16.0

Changes in the OpenStack authentication and service catalog classes

---

Note: If you are only working with the driver classes and have never dorectly touched the classes mentioned below, then you aren't affected and those changes are fully backward compatible.

To make OpenStack authentication and identity related classes more extensible, easier to main and easier to use, those classes have been refactored. All of the changes are described below.

- New `libcloud.common.openstack_identity` module has been added. This module contains code for working with OpenStack Identity (Keystone) service.

- `OpenStackAuthConnection` class has been removed and replaced with one connection class per Keystone API version (`OpenStackIdentity_1_0_Connection`, `OpenStackIdentity_2_0_Connection`, `OpenStackIdentity_3_0_Connection`).

- New `get_auth_class` method has been added to `OpenStackBaseConnection` class. This method allows you to retrieve an instance of the authentication class which is used with the current connection.

- `OpenStackServiceCatalog` class has been refactored to store parsed catalog entries in a structured format (`OpenStackServiceCatalogEntry` and `OpenStackServiceCatalogEntryEndpoint` class). Previously entries were stored in an unstructured form in a dictionary. All the catalog entries can be retrieved by using `OpenStackServiceCatalog.get_entris` method.

- `ex_force_auth_version` argument in `OpenStackServiceCatalog` constructor method has been renamed to `auth_version`

- `get_regions`, `get_service_types` and `get_service_names` methods on the `OpenStackServiceCatalog` class have been modified to always return the result in the same order (result values are sorted beforehand).

For more information and examples, please refer to the Libcloud now supports OpenStack Identity (Keystone) API v3 blog post.

Libcloud 0.14.1

Fix record name inconsistencies in the Rackspace DNS driver

`Record.name` attribute is now correctly set to `None` for records which refer to the bare domain name. Previously, `Record.name` attribute for such records was set to the domain name.

For example, lets have a look at a record which points to the domain `example.com`.

New `Record.name` attribute value for such record: `None`

Old `Record.name` attribute value for such record: `example.com`

This was done to make the Rackspace driver consistent with the other ones.

Libcloud 0.14.0

To make drivers with multiple regions easier to use, one of the big changes in this version is move away from the old "one class per region" model to a new single class plus `region` argument model.

More information on how this affects existing drivers and your code can be found below.

Default Content-Type is now provided if none is supplied and none can be guessed

In older versions, Libcloud would throw an exception when a content type is not supplied and none can't be automatically detected when uploading an object.

This has changed with the 0.14.0 release. Now if no content type is specified and none can't be detected, a default content type of `application/octet-stream` is used.

If you want to preserve the old behavior, you can set `strict_mode` attribute on the driver object to `True`.

```python
from libcloud.storage.types import Provider
from libcloud.stoage.providers import get_driver

cls = get_driver(Provider.CLOUDFILES)
driver = cls('username', 'api key')

driver.strict_mode = True
```

If you are not using strict mode and you are uploading a binary object, we still encourage you to practice Python's "explicit is better than implicit" mantra and explicitly specify Content-Type of `application/octet-stream`.

SSH Key pair management functionality has been promoted to the base API

SSH key pair management functionality has been promoted to be a part of the base compute API.

As such, the following new classes and methods have been added:

- *libcloud.compute.base.KeyPair*
- *libcloud.compute.base.NodeDriver.list_key_pairs*
- *libcloud.compute.base.NodeDriver.create_key_pair*
- *libcloud.compute.base.NodeDriver.import_key_pair_from_string*
- *libcloud.compute.base.NodeDriver.import_key_pair_from_file*
- *libcloud.compute.base.NodeDriver.delete_key_pair*

Previously, this functionality was available in some of the provider drivers (CloudStack, EC2, OpenStack) via the following extension methods:

- *ex_list_keypairs*
- *ex_create_keypair*
- *ex_import_keypair_from_string*
- *ex_import_keypair*
- *ex_delete_keypair*

Existing extension methods will continue to work until the next major release, but you are strongly encouraged to start using new methods which are now part of the base compute API and are guaranteed to work the same across different providers.

New default kernel versions used when creating Linode servers

Kernel versions which are used by default when creating Linode servers have been updated.

Old default kernel versions:

- x86 (no paravirt-ops) - `2.6.18.8-x86_64-linode1` (#60)

- x86 (paravirt-ops) - `2.6.18.8-x86_64-linode1` (#110)

- x86_64 (no paravirt-ops) - `2.6.39.1-linode34` (#107)

- x86 (paravirt-ops)64 - `2.6.18.8-x86_64-linode1` (#111)

New default kernel versions:

- x86 - `3.9.3-x86-linode52` (#137)

- x86_64 - `3.9.3-x86_64-linode33` (#138)

Those new kernel versions now come with paravirt-ops by default.

If you want to preserve the old behavior, you can pass `ex_kernel` argument to the `create_node` method.

Keep in mind that using old kernels is strongly discouraged since they contain known security holes.

For example:

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls = get_driver(Provider.LINODE)

driver = cls('username', 'api_key')
driver.create_node(..., ex_kernel=110)
```

Addition of new "STOPPED" node state

This version includes a new state called `libcloud.compute.types.NodeState.STOPPED`. This state represents a node which has been stopped and can be started later on (unlike TERMINATED state which represents a node which has been terminated and can't be started later on).

As such, `EC2` and `HostVirual` drivers have also been updated to recognize this new state.

Before addition of this state, nodes in this state were mapped to `NodeState.UNKNOWN`.

Amazon EC2 compute driver changes

Amazon EC2 compute driver has moved to single class plus `region` argument model. As such, the following provider constants have been deprecated:

- `EC2_US_EAST`

- `EC2_US_WEST_OREGON`

- `EC2_EU`

- `EC2_EU_WEST`

- `EC2_AP_SOUTHEAST`

- `EC2_AP_SOUTHEAST2`

- `EC2_AP_NORTHEAST`

- `EC2_SA_EAST`

And replaced with a single constant:

- EC2 - Supported values for the `region` argument are: `us-east-1`, `us-west-1`, `us-west-2`, `eu-west-1`, `ap-southeast-1`, `ap-northeast-1`, `sa-east-1`, `ap-southeast-2`. Default value is `us-east-1`.

List which shows how old classes map to a new `region` argument value:

- `EC2_US_EAST` -> `us-east-1`

- `EC2_US_WEST` -> `us-west-1`

- `EC2_US_WEST_OREGON` -> `us-west-2`

- `EC2_EU` -> `eu-west-1`

- `EC2_EU_WEST` -> `eu-west-1`

- `EC2_AP_SOUTHEAST` -> `ap-southeast-1`

- `EC2_AP_SOUTHEAST2` -> `ap-southeast-2`

- `EC2_AP_NORTHEAST` -> `ap-northeast-1`

- `EC2_SA_EAST` -> `sa-east-1`

Old code:

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls1 = get_driver(Provider.EC2)
cls2 = get_driver(Provider.EC2_EU_WEST)

driver1 = cls('username', 'api_key')
driver2 = cls('username', 'api_key')
```

New code:

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls = get_driver(Provider.EC2)

driver1 = cls('username', 'api_key', region='us-east-1')
driver2 = cls('username', 'api_key', region='eu-west-1')
```

Rackspace compute driver changes

Rackspace compute driver has moved to single class plus `region` argument model. As such, the following provider constants have been **removed**:

- `RACKSPACE`

- `RACKSPACE_UK`

- `RACKSPACE_AU`

- `RACKSPACE_NOVA_ORD`

- `RACKSPACE_NOVA_DFW`

- `RACKSPACE_NOVA_LON`

- `RACKSPACE_NOVA_BETA`

And replaced with two new constants:

- RACKSPACE_FIRST_GEN - Supported values for region argument are: us, uk. Default value is us.
- RACKSPACE - Supported values for the region argument are: dfw, ord, iad, lon, syd, hkg. Default value is dfw.

Besides that, RACKSPACE provider constant now defaults to next-generation OpenStack based servers. Previously it defaulted to first generation cloud servers.

If you want to preserve old behavior and use first-gen drivers you need to use RACKSPACE_FIRST_GEN provider constant.

First generation cloud servers now also use auth 2.0 by default. Previously they used auth 1.0.

Because of the nature of this first-gen to next-gen change, old constants have been fully removed and unlike region changes in other driver, this change is not backward compatible.

List which shows how old, first-gen classes map to a new region argument value:

- RACKSPACE -> us
- RACKSPACE_UK -> uk

List which shows how old, next-gen classes map to a new region argument value:

- RACKSPACE_NOVA_ORD -> ord
- RACKSPACE_NOVA_DFW -> dfw
- RACKSPACE_NOVA_LON -> lon
- RACKSPACE_AU -> syd

More examples which show how to update your code to work with a new version can be found below.

Old code (connecting to a first-gen provider):

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls1 = get_driver(Provider.RACKSPACE) # US regon
cls2 = get_driver(Provider.RACKSPACE_UK) # UK regon

driver1 = cls('username', 'api_key')
driver2 = cls('username', 'api_key')
```

New code (connecting to a first-gen provider):

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls = get_driver(Provider.RACKSPACE_FIRST_GEN)

driver1 = cls('username', 'api_key', region='us')
driver2 = cls('username', 'api_key', region='uk')
```

Old code (connecting to a next-gen provider)

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls1 = get_driver(Provider.RACKSPACE_NOVA_ORD)
```

```
cls2 = get_driver(Provider.RACKSPACE_NOVA_DFW)
cls3 = get_driver(Provider.RACKSPACE_NOVA_LON)

driver1 = cls('username', 'api_key')
driver2 = cls('username', 'api_key')
driver3 = cls('username', 'api_key')
```

New code (connecting to a next-gen provider)

```
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls = get_driver(Provider.RACKSPACE)

driver1 = cls('username', 'api_key', region='ord')
driver2 = cls('username', 'api_key', region='dfw')
driver3 = cls('username', 'api_key', region='lon')
```

CloudStack compute driver changes

CloudStack driver received a lot of changes and additions which will make it more pleasant to use. Backward incompatible changes are listed below:

- `CloudStackForwardingRule` class has been renamed to `CloudStackIPForwardingRule`

- `create_node` method arguments are now more consistent with other drivers. Security groups are now passed as `ex_security_groups`, SSH keypairs are now passed as `ex_keyname` and userdata is now passed as `ex_userdata`.

- For advanced networking zones, multiple networks can now be passed to the `create_node` method instead of a single network id. These networks need to be instances of the `CloudStackNetwork` class.

- The `extra_args` argument of the `create_node` method has been removed. The only arguments accepted are now the defaults `name`, `size`, `image`, `location` plus `ex_keyname`, `ex_userdata`, `ex_security_groups` and `networks`.

Joyent compute driver changes

Joyent driver has been aligned with other drivers and now the constructor takes `region` instead of `location` argument.

For backward compatibility reasons, old argument will continue to work until the next major release.

Old code:

```
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls = get_driver(Provider.JOYENT)

driver = cls('username', 'api_key', location='us-east-1')
```

Old code:

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls = get_driver(Provider.JOYENT)

driver = cls('username', 'api_key', region='us-east-1')
```

ElasticHosts compute driver changes

ElasticHosts compute driver has moved to single class plus `region` argument model. As such, the following provider constants have been deprecated:

- ELASTICHOSTS_UK1
- ELASTICHOSTS_UK1
- ELASTICHOSTS_US1
- ELASTICHOSTS_US2
- ELASTICHOSTS_US3
- ELASTICHOSTS_CA1
- ELASTICHOSTS_AU1
- ELASTICHOSTS_CN1

And replaced with a single constant:

- ELASTICHOSTS - Supported values for the `region` argument are: `lon-p`, `lon-b`, `sat-p`, `lax-p`, `sjc-c`, `tor-p`, `syd-y`, `cn-1` Default value is `sat-p`.

List which shows how old classes map to a new `region` argument value:

- ELASTICHOSTS_UK1 -> `lon-p`
- ELASTICHOSTS_UK1 -> `lon-b`
- ELASTICHOSTS_US1 -> `sat-p`
- ELASTICHOSTS_US2 -> `lax-p`
- ELASTICHOSTS_US3 -> `sjc-c`
- ELASTICHOSTS_CA1 -> `tor-p`
- ELASTICHOSTS_AU1 -> `syd-y`
- ELASTICHOSTS_CN1 -> `cn-1`

Because of this change main driver class has also been renamed from `libcloud.compute.drivers.elastichosts.ElasticHostsBaseNodeDriver` to `libcloud.compute.drivers.elastichosts.ElasticHostsNodeDriver`.

Only users who directly instantiate a driver and don't use recommended `get_driver` method are affected by this change.

Old code:

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls1 = get_driver(Provider.ELASTICHOSTS_UK1)
cls2 = get_driver(Provider.ELASTICHOSTS_US2)

driver1 = cls('username', 'api_key')
driver2 = cls('username', 'api_key')
```

New code:

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls = get_driver(Provider.ELASTICHOSTS)

driver1 = cls('username', 'api_key', region='lon-p')
driver2 = cls('username', 'api_key', region='lax-p')
```

Unification of extension arguments for security group handling in the EC2 driver

To unify extension arguments for handling security groups between drivers, `ex_securitygroup` argument in the EC2 `create_node` method has been renamed to `ex_security_groups`.

For backward compatibility reasons, old argument will continue to work for until a next major release.

CloudFiles Storage driver changes

`CLOUDFILES_US` and `CLOUDFILES_UK` provider constants have been deprecated and a new `CLOUDFILES` constant has been added.

User can now use this single constant and specify which region to use by passing `region` argument to the driver constructor.

Old code:

```python
from libcloud.storage.types import Provider
from libcloud.storage.providers import get_driver

cls1 = get_driver(Provider.CLOUDFILES_US)
cls2 = get_driver(Provider.CLOUDFILES_UK)

driver1 = cls1('username', 'api_key')
driver2 = cls1('username', 'api_key')
```

New code:

```python
from libcloud.compute.types import Provider
from libcloud.compute.providers import get_driver

cls = get_driver(Provider.CLOUDFILES)

driver1 = cls1('username', 'api_key', region='dfw')
driver2 = cls1('username', 'api_key', region='lon')
```

Rackspace DNS driver changes

Rackspace DNS driver has moved to one class plus `region` argument model. As such, the following provider constants have been deprecated:

- `RACKSPACE_US`

- `RACKSPACE_UK`

And replaced with a single constant:

- `RACKSPACE` - Supported values for `region` arguments are `us`, `uk`. Default value is `us`.

Old code:

```python
from libcloud.dns.types import Provider
from libcloud.dns.providers import get_driver

cls1 = get_driver(Provider.RACKSPACE_US)
cls2 = get_driver(Provider.RACKSPACE_UK)

driver1 = cls1('username', 'api_key')
driver2 = cls1('username', 'api_key')
```

New code:

```python
from libcloud.dns.types import Provider
from libcloud.dns.providers import get_driver

cls = get_driver(Provider.RACKSPACE)

driver1 = cls1('username', 'api_key', region='us')
driver2 = cls1('username', 'api_key', region='uk')
```

Rackspace load balancer driver changes

Rackspace loadbalancer driver has moved to one class plus `region` argument model. As such, the following provider constants have been deprecated:

- `RACKSPACE_US`

- `RACKSPACE_UK`

And replaced with a single constant:

- `RACKSPACE` - Supported values for `region` arguments are `dfw`, `ord`, `iad`, `lon`, `syd`, `hkg`. Default value is `dfw`.

Old code:

```python
from libcloud.loadbalancer.types import Provider
from libcloud.loadbalancer.providers import get_driver

cls1 = get_driver(Provider.RACKSPACE_US)
cls2 = get_driver(Provider.RACKSPACE_UK)

driver1 = cls1('username', 'api_key')
driver2 = cls1('username', 'api_key')
```

New code:

```python
from libcloud.loadbalancer.types import Provider
from libcloud.loadbalancer.providers import get_driver

cls = get_driver(Provider.RACKSPACE)

driver1 = cls1('username', 'api_key', region='ord')
driver2 = cls1('username', 'api_key', region='lon')
```

ScriptDeployment and ScriptFileDeployment constructor now takes args argument

`libcloud.compute.deployment.ScriptDeployment` and `libcloud.compute.deployment.ScriptFileDeployment` class constructor now take `args` as a second argument.

Previously this argument was not present and the second argument was `name`.

If you have a code which instantiate those classes directly and passes two or more arguments (not keyword arguments) to the constructor you need to update it to preserve the old behavior.

Old code:

```python
sd = ScriptDeployment('#!/usr/bin/env bash echo "ponies!"', 'ponies.sh')
```

New code:

```python
sd = ScriptDeployment('#!/usr/bin/env bash echo "ponies!"', None,
                      'ponies.sh')
```

Even better (using keyword arguments):

```python
sd = ScriptDeployment(script='#!/usr/bin/env bash echo "ponies!"',
                      name='ponies.sh')
```

Pricing data changes

By default this version of Libcloud tries to read pricing data from the `~/.libcloud/pricing.json` file. If this file doesn't exist, Libcloud falls back to the old behavior and the pricing data is read from the pricing file which is shipped with each release.

For more information, please see using-custom-pricing-file page.

RecordType ENUM value is now a string

`libcloud.dns.types.RecordType` ENUM value used be an integer, but from this version on, it's now a string. This was done to make it simpler and remove unnecessary indirection.

If you use *RecordType* class in your code as recommended, no changes are required, but if you use integer values directly, you need to update your code to use *RecordType* class otherwise it will break.

OK:

```python
# ...
record = driver.create_record(name=www, zone=zone, type=RecordType.A,
                              data='127.0.0.1')
```

Not OK:

```
# ...
record = driver.create_record(name=www, zone=zone, type=0,
                              data='127.0.0.1')
```

Cache busting functionality is now only enabled in Rackspace first-gen driver

Cache busting functionality has been disabled in the Rackspace next-gen driver and all of the OpenStack drivers. It's now only enabled in the Rackspace first-gen driver.

Cache busting functionality works by appending a random query parameter to every GET HTTP request. It was originally added to the Rackspace first-gen driver a long time ago to avoid excessive HTTP caching on the provider side. This excessive caching some times caused list_nodes and other calls to return stale data.

This approach should not be needed with Rackspace next-gen and OpenStack drivers so it has been disabled.

No action is required on the user's side.

libcloud.security.VERIFY_SSL_CERT_STRICT variable has been removed

`libcloud.security.VERIFY_SSL_CERT_STRICT` variable has been introduced in version 0.4.2 when we initially added support for SSL certificate verification. This variable was added to ease the migration from older versions of Libcloud which didn't verify SSL certificates.

In version 0.6.0, this variable has been set to `True` by default and deprecated.

In this release, this variable has been fully removed. For more information on how SSL certificate validation works in Libcloud, see the *SSL Certificate Validation* page.

get_container method changes in the S3 driver

Previously, the `get_container` method in the S3 driver used a very inefficient approach of using `list_containers` + late filterting.

The code was changed to use a more efficient approach which means using a single HTTP `HEAD` request.

The only downside of this approach is that it doesn't return container creation date.

If you need the container creation date, you should use `list_containers` method and do the later filtering yourself.

Libcloud 0.8

- `restart_node` method has been removed from the OpenNebula compute driver, because OpenNebula OCCI implementation does not support a proper restart method.
- `ex_save_image` method in the OpenStack driver now returns a `NodeImage` instance.

For a full list of changes, please see the CHANGES file.

Libcloud 0.7

- For consistency, `public_ip` and `private_ip` attribute on the `Node` object have been renamed to `public_ips` and `private_ips` respectively.

In 0.7 you can still access those attributes using the old way, but this option will be removed in the next major release.

Note: If you have places in your code where you directly instantiate a ``Node`` class, you need to update it.

Old code:

```
node = Node(id='1', name='test node', state=NodeState.PENDING,
            private_ip=['10.0.0.1'], public_ip=['88.77.66.77'],
            driver=driver)
```

Updated code:

```
node = Node(id='1', name='test node', state=NodeState.PENDING,
            private_ips=['10.0.0.1'], public_ips=['88.77.66.77'],
            driver=driver)
```

- Old deprecated paths have been removed. If you still haven't updated your code you need to do it now, otherwise it won't work with 0.7 and future releases.

Below is a list of old paths and their new locations:

- `libcloud.base` -> `libcloud.compute.base`
- `libcloud.deployment` -> `libcloud.compute.deployment`
- `libcloud.drivers.*` -> `libcloud.compute.drivers.*`
- `libcloud.ssh` -> `libcloud.compute.ssh`
- `libcloud.types` -> `libcloud.compute.types`
- `libcloud.providers` -> `libcloud.compute.providers`

In the `contrib/` directory you can also find a simple bash script which can perform a search and replace for you - migrate_paths.py.

For a full list of changes, please see the CHANGES file.

Libcloud 0.6

- SSL certificate verification is now enabled by default and an exception is thrown if CA certificate files cannot be found.

To revert to the old behavior, set `libcloud.security.VERIFY_SSL_CERT_STRICT` variable to `False`:

```
libcloud.security.VERIFY_SSL_CERT_STRICT = False
```

Note: You are strongly discouraged from disabling SSL certificate validation. If you disable it and no CA certificates files are found on the system you are vulnerable to a man-in-the-middle attack

More information on how to acquire and install CA certificate files on different operating systems can be found on *SSL Certificate Validation page*

- OpenStack driver now defaults to using OpenStack 1.1 API.

To preserve the old behavior and use OpenStack 1.0 API, pass `api_version='1.0'` keyword argument to the driver constructor.

For example:

```
Cls = get_provider(Provider.OPENSTACK)
driver = Cls('user_name', 'api_key', False, 'host', 8774, api_version='1.0')
```

- OpenNebula driver now defaults to using OpenNebula 3.0 API

To preserve the old behavior and use OpenNebula 1.4 API, pass `api_version='1.4'` keyword argument to the driver constructor.

For example:

```
Cls = get_provider(Provider.OPENNEBULA)
driver = Cls('key', 'secret', api_version='1.4')
```

For a full list of changes, please see the CHANGES file.

1.4.3 Security

Reporting a vulnerability

Note: Please do **not** report security issues using our public Github instance. Use the private mailing list described below.

If you believe you've found a security issue or a vulnerability, please send a description of it to our private mailing list at security@libcloud.apache.org

You are also encouraged to encrypt this email using PGP. Keys of our developers can be found at https://www.apache.org/dist/libcloud/KEYS.

Once you've submitted an issue, you should receive an acknowledgment from one our of team members in 48 hours or less. If further action is necessary, you may receive additional follow-up emails.

How are vulnerabilities handled?

We follow a standard Apache Software Foundation vulnerability handling process which is described at http://www.apache.org/security/committers.html#vulnerability-handling

Note: Unless noted otherwise, all of the examples and code snippets in the documentation are licensed under the Apache 2.0 license.