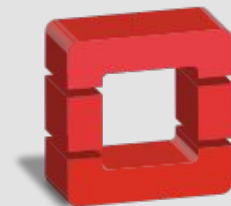




OpenStack Overview

Openstack Administration 101



openstack
CLOUD SOFTWARE

What is OpenStack?

- OpenStack is a **cloud operating system** that controls large pools of compute, storage, and networking resources throughout a datacenter, all managed and provisioned through APIs with common authentication mechanisms.
- A dashboard is also available, giving administrators control while empowering their users to provision resources through a web interface.
- Beyond standard infrastructure-as-a-service functionality, additional components provide orchestration, fault management and service management amongst other services to ensure high availability of user applications.

What is Openstack (2)



OpenStack is a collection of open source software projects that enterprises or cloud providers can use to set up and run their cloud compute and storage infrastructure.

The goal of the project is to build an open source community with independent researchers and private companies, so that they are able to share a common goal of creating a cloud that is simple to deploy, highly scalable and full of rich features

Kurup, L.D., Chandawalla, C., Parekh, Z., Sampat, K.: Comparative study of eucalyptus, open stack and nimbus. Int. J. Soft Comput. Eng. 4(6), 23–27 (2015)

The origin



- **OpenStack was created during the first months of 2010.** Rackspace wanted to rewrite the infrastructure code running its Cloud servers offering, and considered open sourcing the existing Cloud files code. At the same time, Anso Labs (contracting for NASA) had published beta code for Nova, a Python-based “cloud computing fabric controller”.
- Both efforts converged and formed the base for OpenStack. The first Design Summit was held in Austin, TX on July 13-14, 2010, and the project was officially announced at OSCON in Portland, OR, on July 21st, 2010.
- Recognizing the value in what they had created, and that broader participation would lead to faster development and a more versatile project through wide participation, **Rackspace created the OpenStack Foundation as a nonprofit organization to manage the project**, to be governed by broad coalition of companies with similar interests in open cloud infrastructure. Started in 2011, it was September of 2012 when the reigns were officially passed over.

Open Infrastructure Foundation



- Starting from year 2021 the OpenStack Foundation changed its name to **Open Infrastructure Foundation**.
- The announcement, which the foundation made at its virtual developer conference, doesn't exactly come as a surprise. Over the course of the last few years, **the organization started adding new projects that went well beyond the core OpenStack project**, and renamed its conference to the "Open Infrastructure Summit".
- Open Infrastructure Foundation is today supported by dozens of companies that sponsor it*

<https://www.openstack.org/community/supporting-organizations/>



Open Infrastructure
FOUNDATION

The Four Opens



- The **Four Opens** are a set of principles guidelines that were created by the **OpenStack community** as a way to guarantee that the users get all the benefits associated with open source software, including the ability to engage with the community and influence future evolution of the software.
- Under these guidelines, the OpenStack community grew from tens of contributors to thousands, creating one of the top three most active open source projects in the world behind the Linux Kernel and Chromium. The Four Opens were instrumental not only in this success but also in building a thriving, global community.
- OpenInfra Foundation considers The Four Opens the guiding principles in everything we do.

The Four Opens



- **Open Source**

Any software developed under the Four Opens must be released under an open source license.

- **Open Design**

guarantees a transparent and open process for planning and designing the software. It's about letting go of the control of the design of the software and its feature road-map, and accepting that it should be driven by the community.

- **Open Development**

the adoption of transparent and inclusive development processes that enable everyone to participate as an equal on a level playing field.

- **Open Community**

is about ensuring that the community is a cohesive, inclusive, level playing ground where all the voices are heard and anyone can rise to leadership positions.

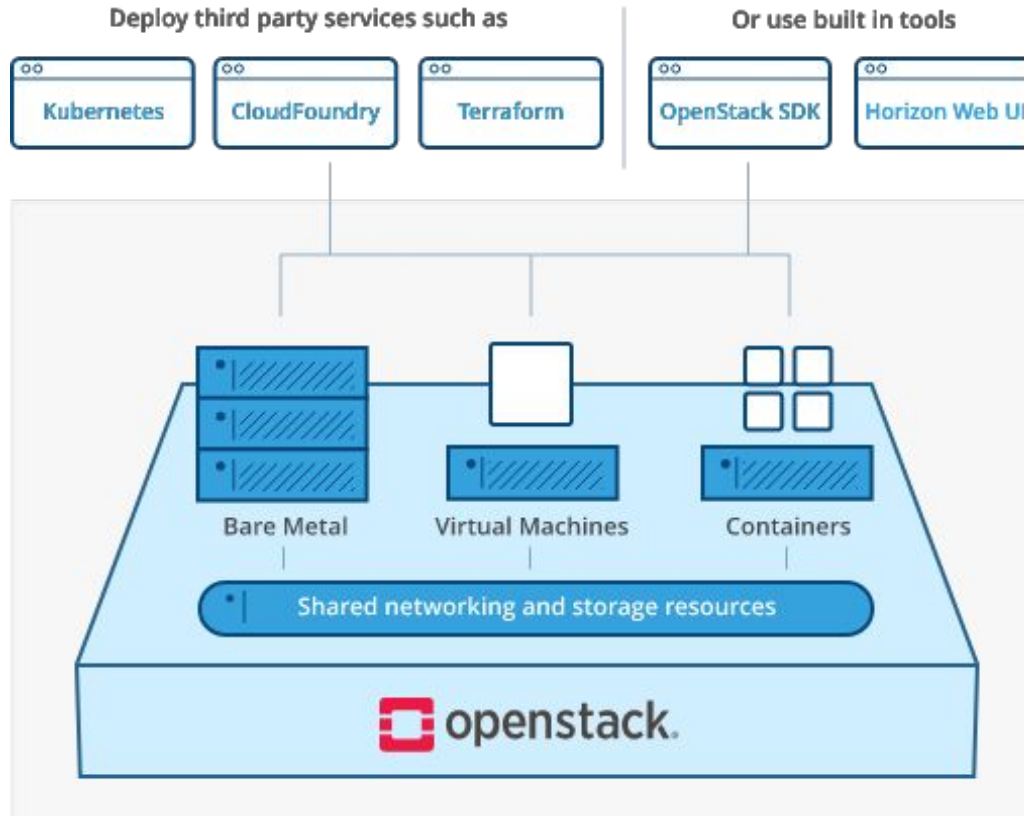
OpenStack Releases

- OpenStack is **developed and released around 6-month cycles**. After the initial release, additional stable point releases will be released in each release series.
- During the planning phase of each release, the community would gather for an OpenStack Design Summit to facilitate developer working sessions and to assemble plans. These Design Summits would coincide with the OpenStack Summit conference.
- Starting with the Pike development cycle the design meetup activity has been separated out into a separate Project Teams Gathering (PTG) event. This was done to avoid the developer distractions caused by presentations and customer meetings that were happening at the OpenStack Summit and to allow the design discussions to happen ahead of the start of the next cycle.



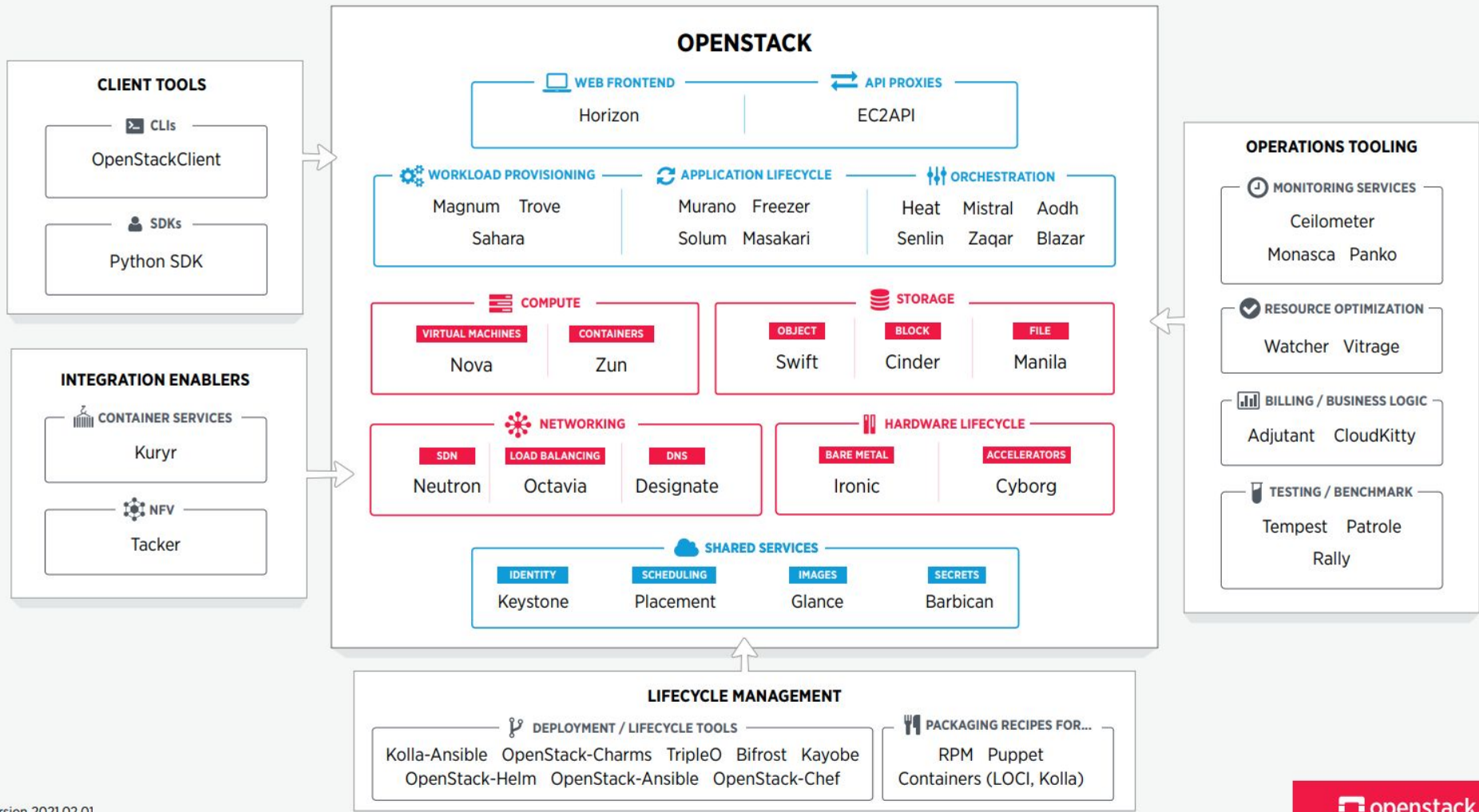
Series	Initial Release Date	Release Number or Version
Stein	10-04-2019 (estimated date)	-
Rocky	30-08-2018	Nova 18.0; Keystone 14.0; Neutron 13.0; Glance 17.0
Queens	28-02-2018	Nova 17.0; Keystone 13.0; Neutron 12.0; Glance 16.0
Pike	30-08-2017	Nova 16.0; Keystone 12.0; Neutron 11.0; Glance 15.0
Ocata	22-02-2017	Nova 15.0; Keystone 11.0; Neutron 10.0; Glance 14.0
Newton	06-10-2016	Nova 14.0; Keystone 10.0; Neutron 9.0; Glance 13.0
Mitaka	07-04-2016	Nova 13.0; Keystone 9.0; Neutron 8.0; Glance 12.0
Liberty	15-10-2015	Nova 12.0; Keystone 8.0; Neutron 7.0; Glance 11.0
Kilo	30-04-2015	2015.1
Juno	16-10-2014	2014.2
Icehouse	17-04-2014	-
Havana	17-10-2013	-
Grizzly	04-04-2013	-
Folsom	27-09-2012	-
Essex	05-04-2012	-
Diablo	22-09-2011	-
Cactus	15-04-2011	-
Bexar	03-02-2011	-

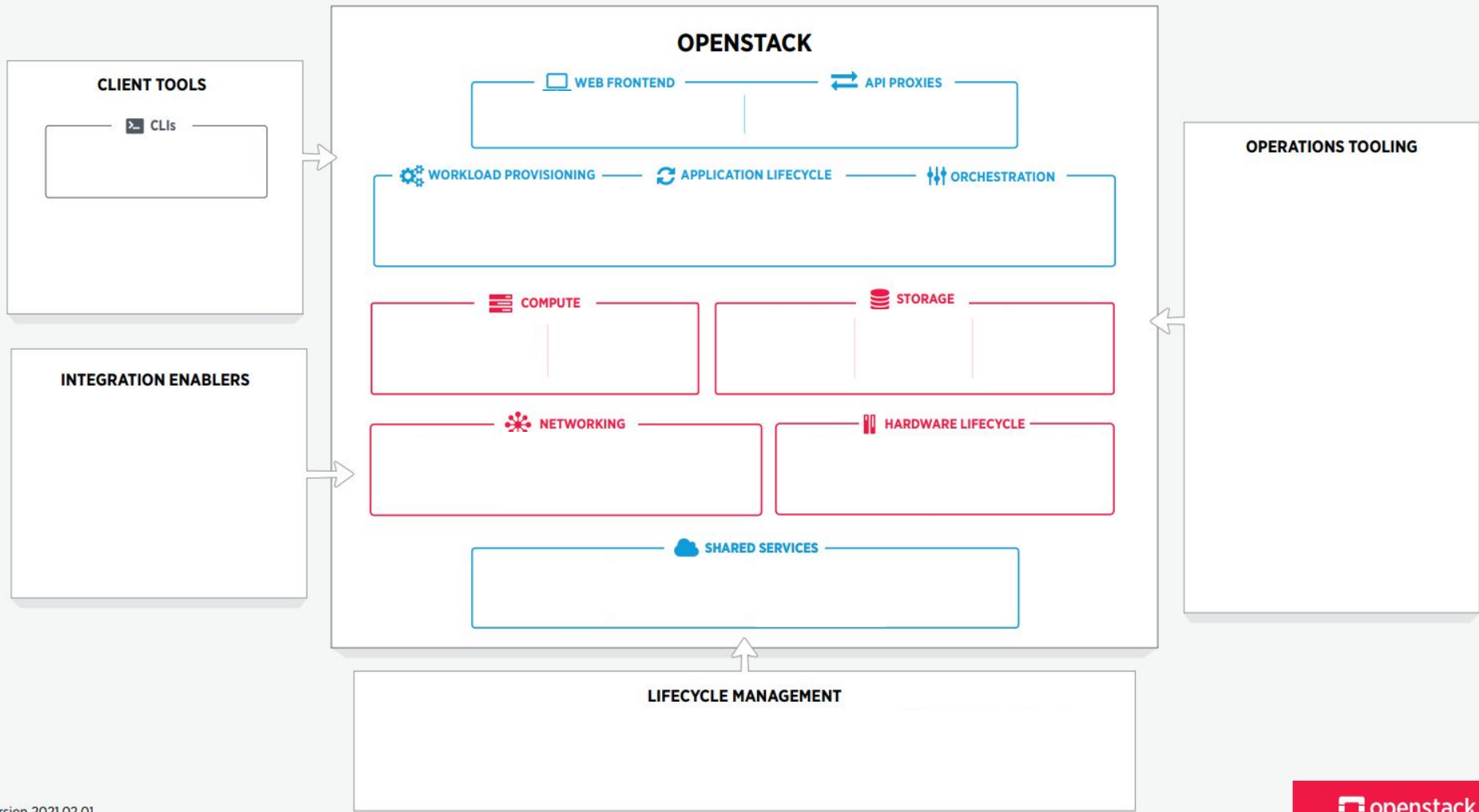
Conceptual design

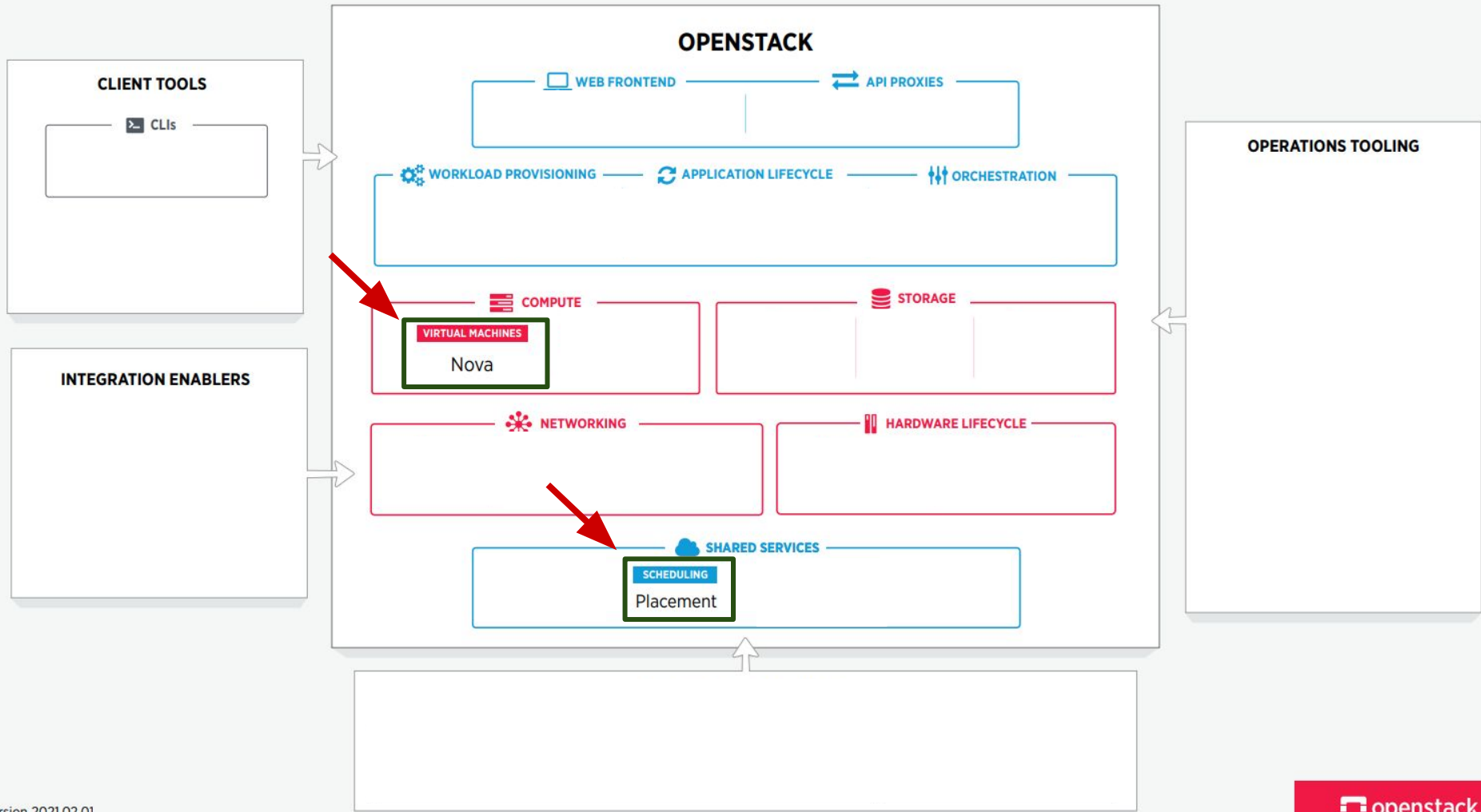


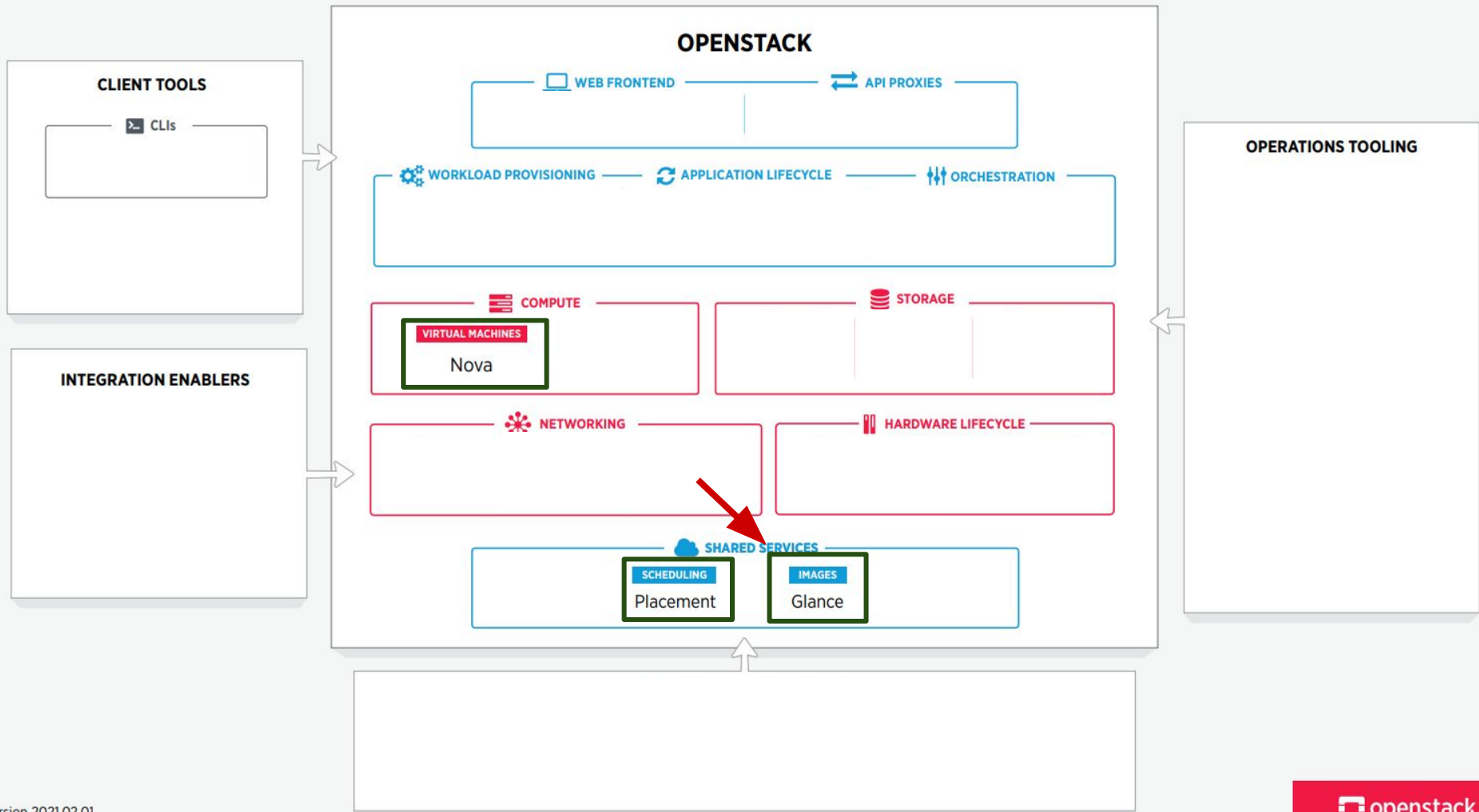
The OpenStack components

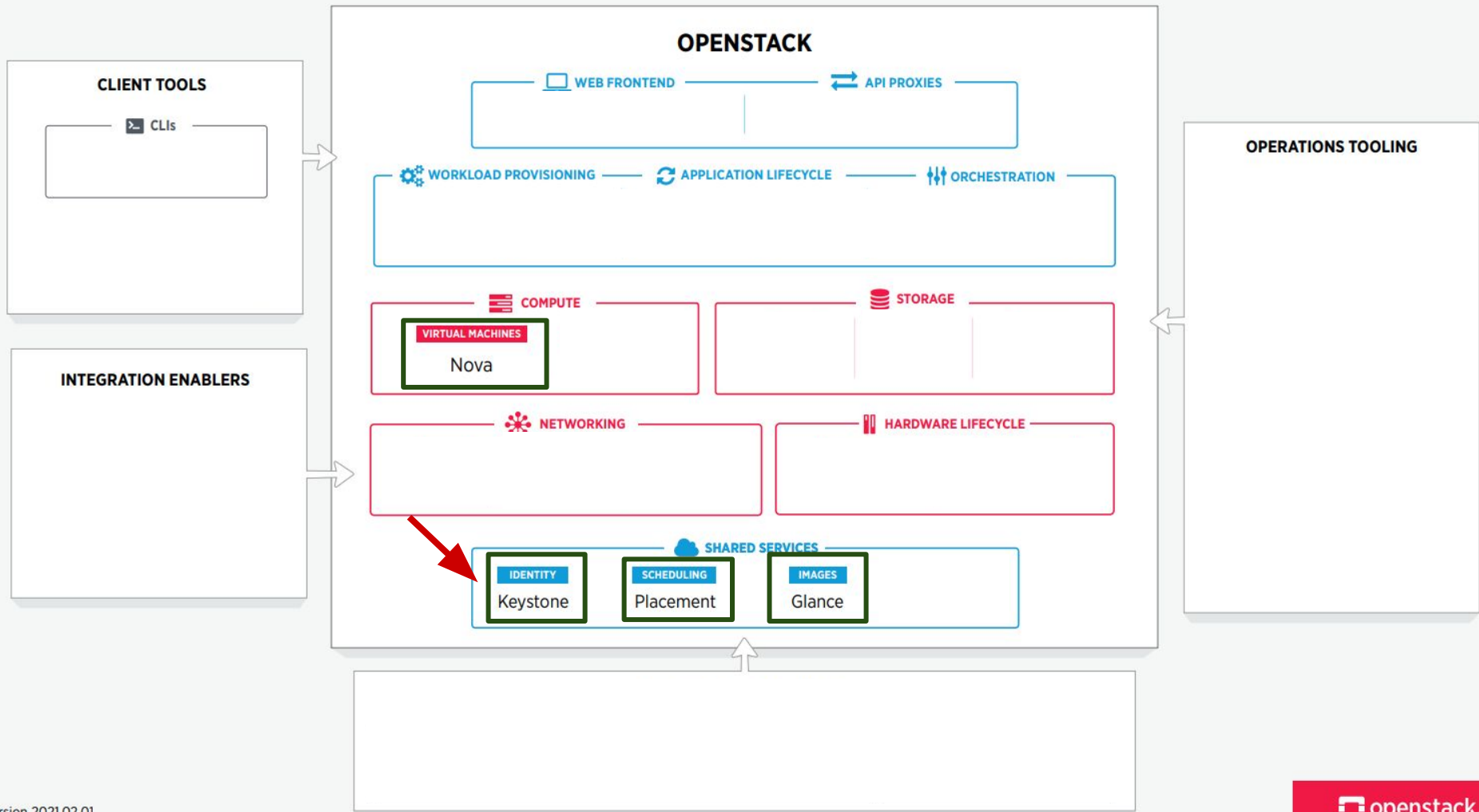
- OpenStack's architecture is made up of numerous open source projects. These projects are used to set up OpenStack's **undercloud** and **overcloud** - used by sys admins and cloud users, respectively. Underclouds contain the core components sys admins need to set up and manage end users' OpenStack environments, known as overclouds.
- The openstack map gives you an “at a glance” view of the openstack landscape to see where those services fit and how they can work together.

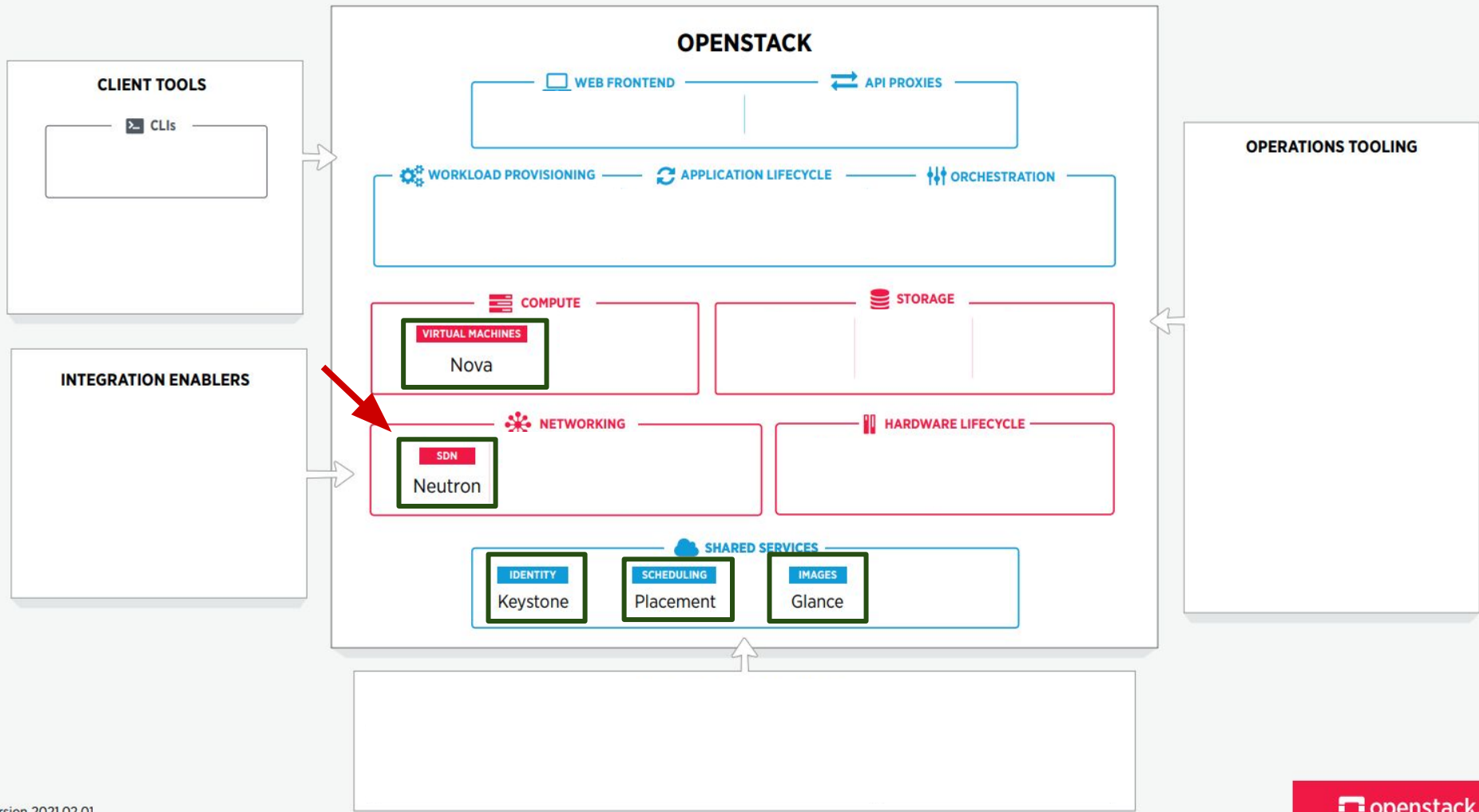


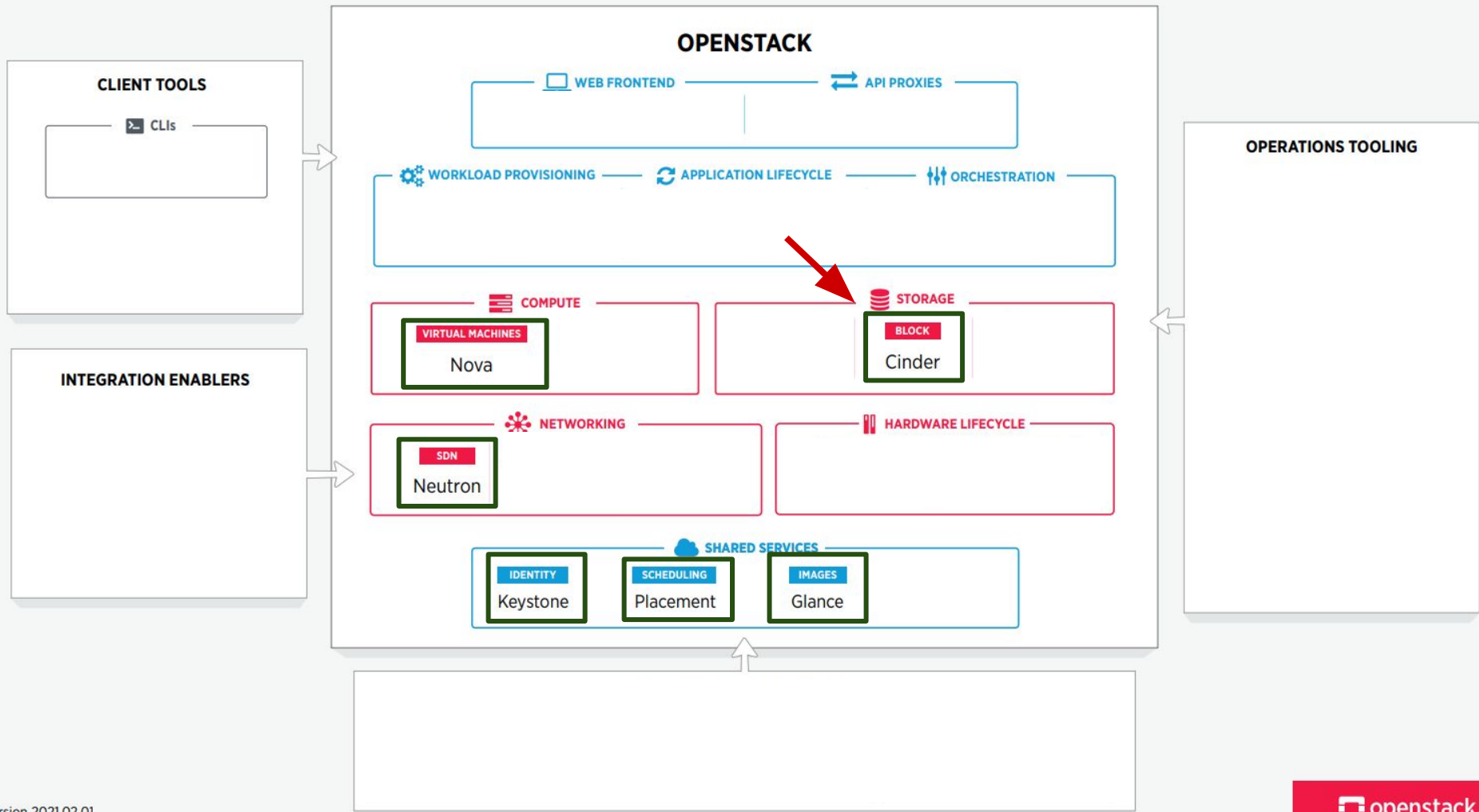


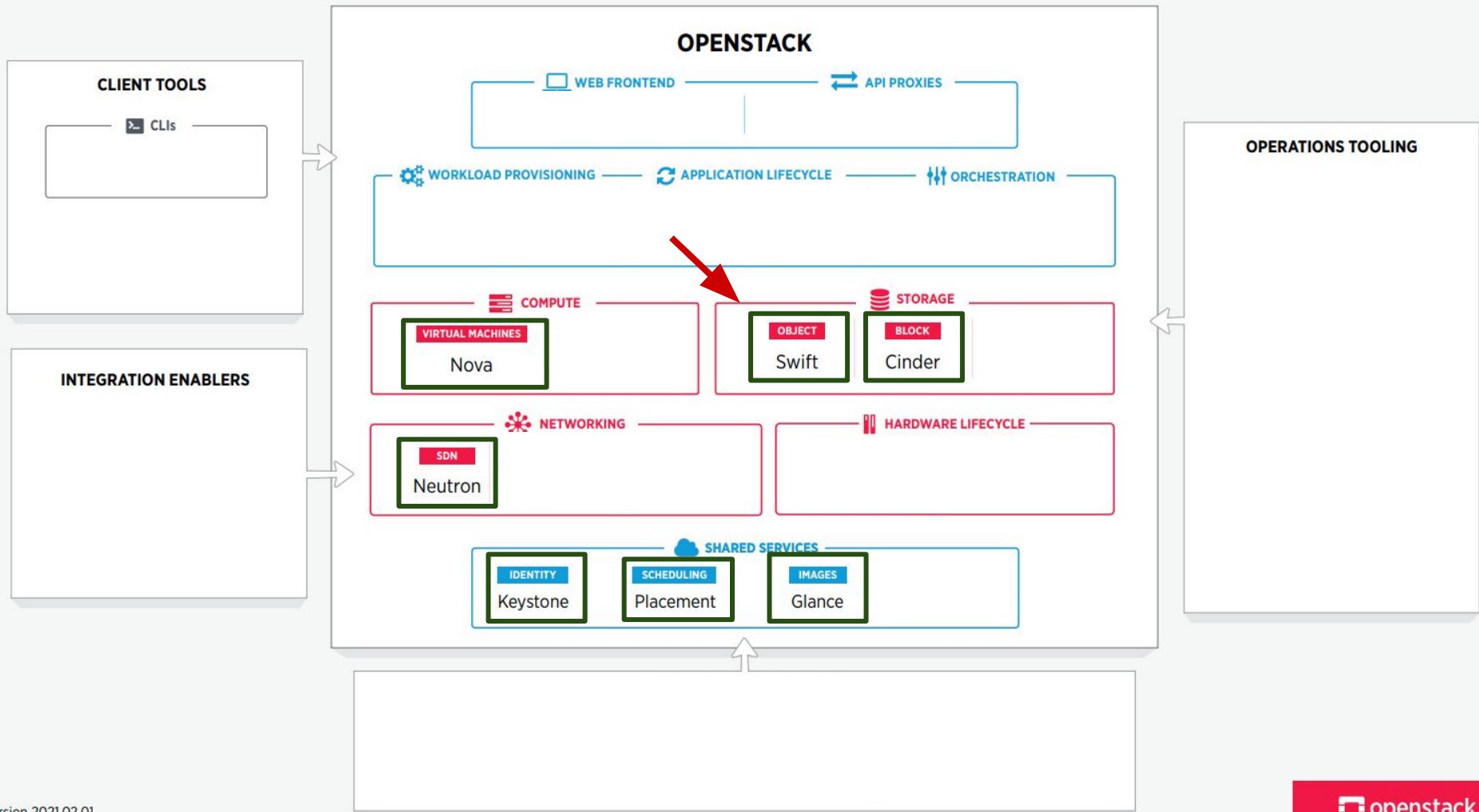


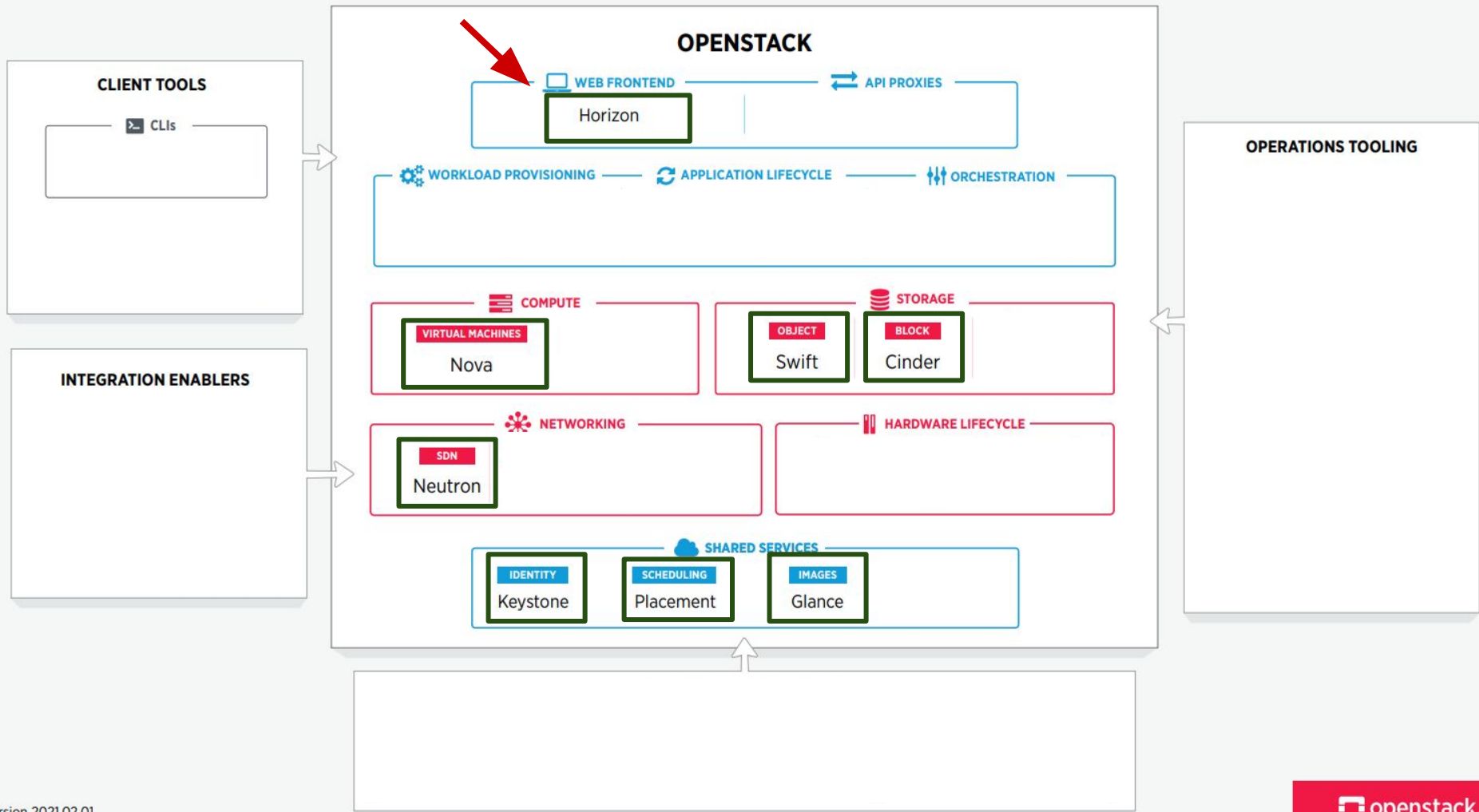


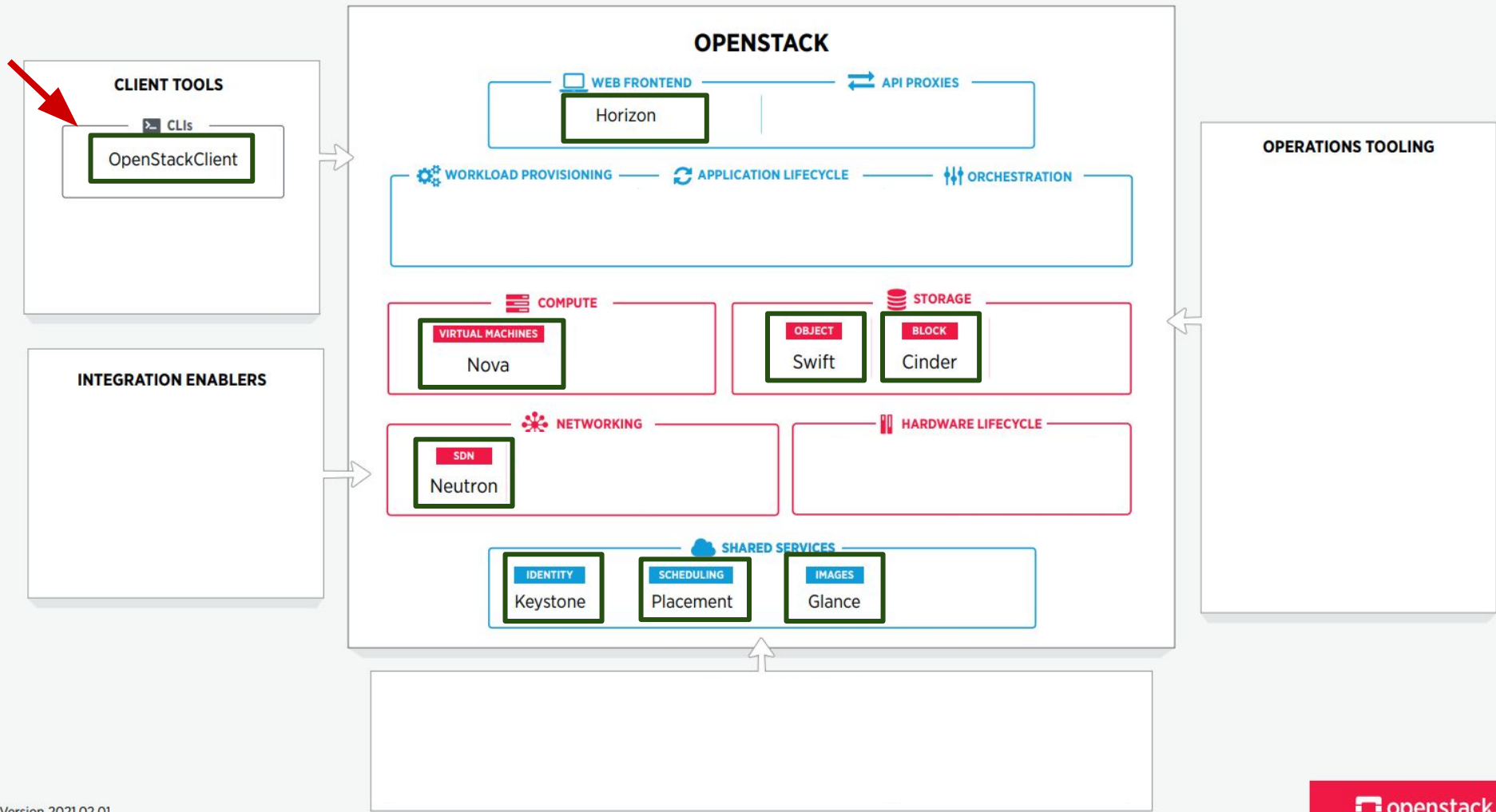


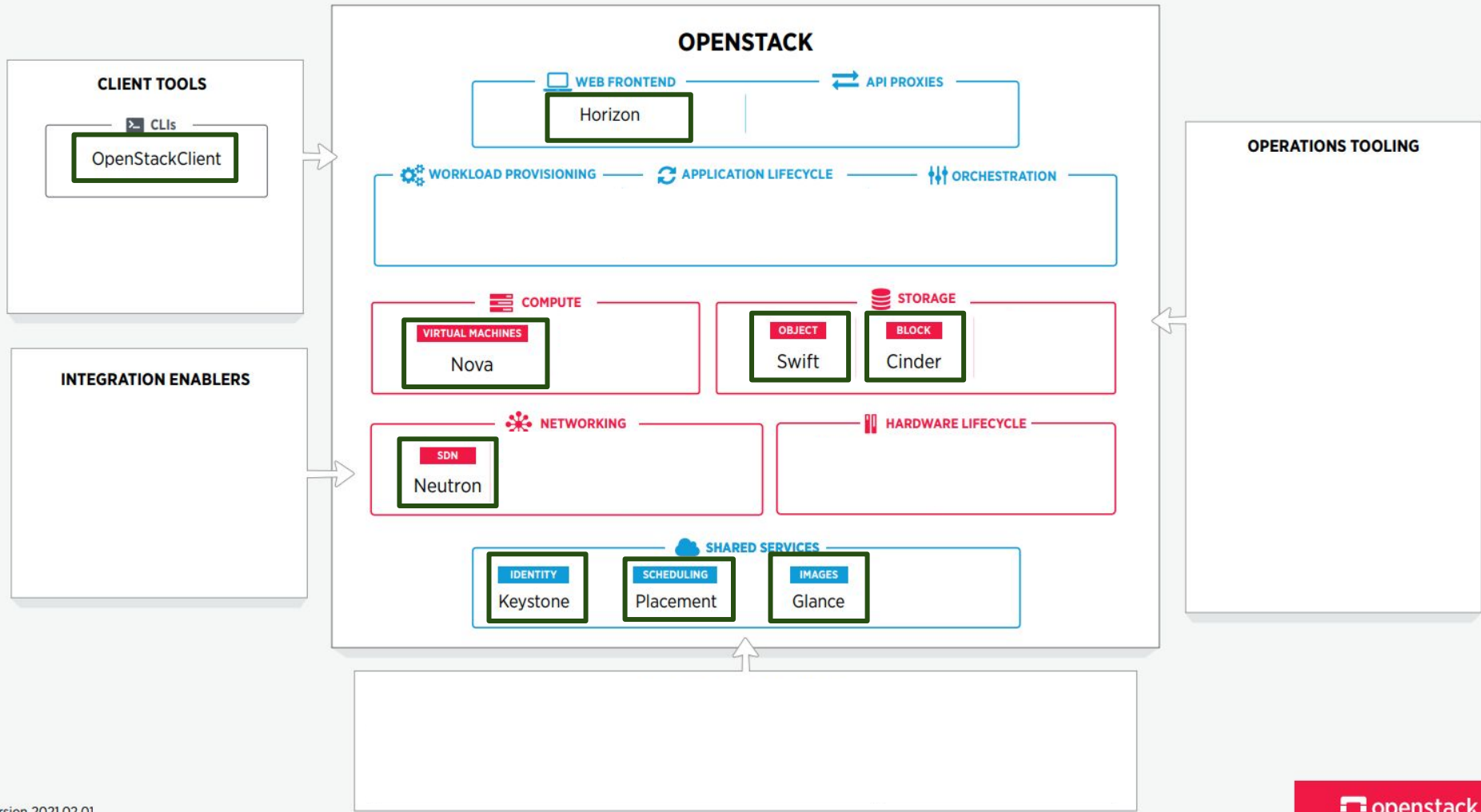


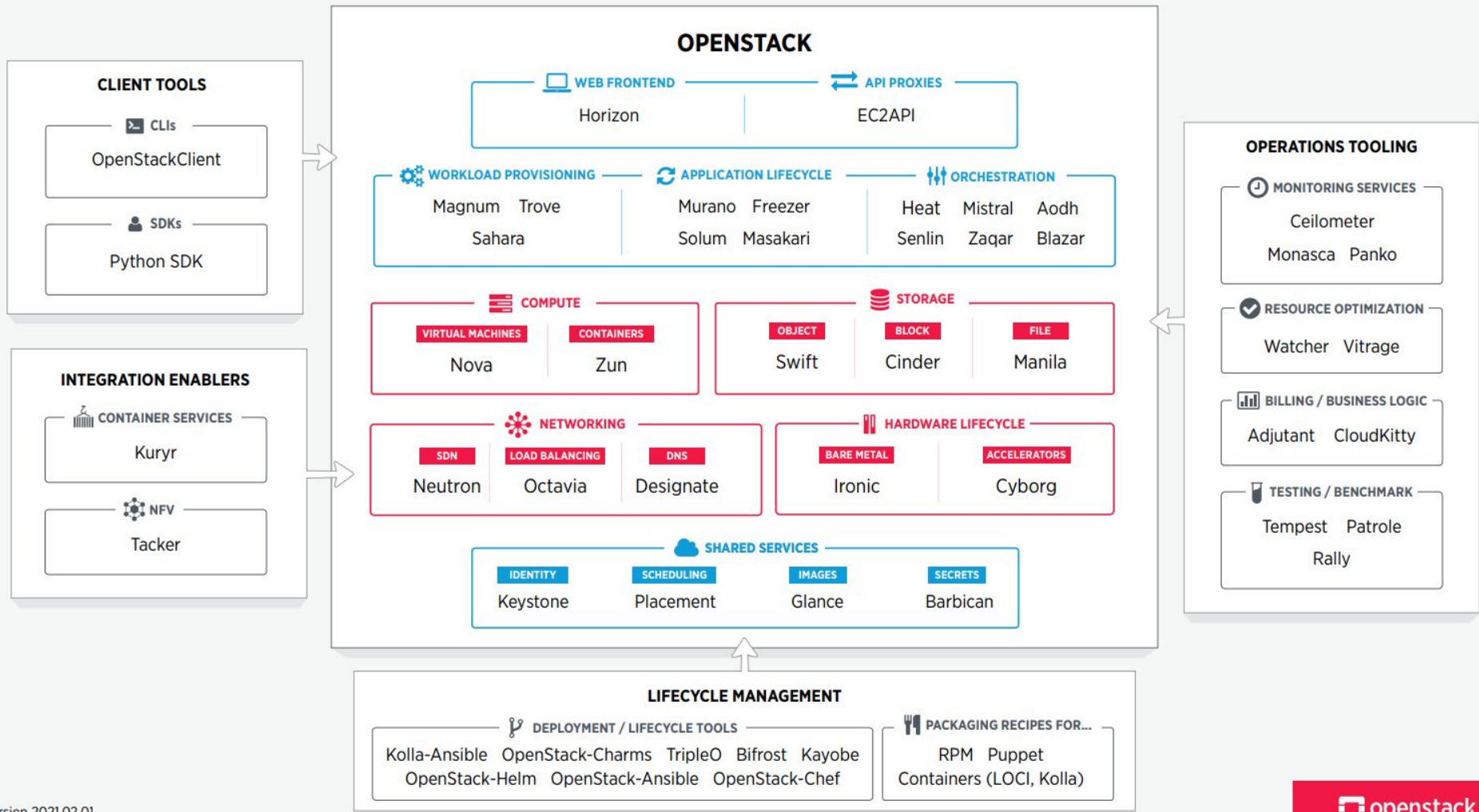




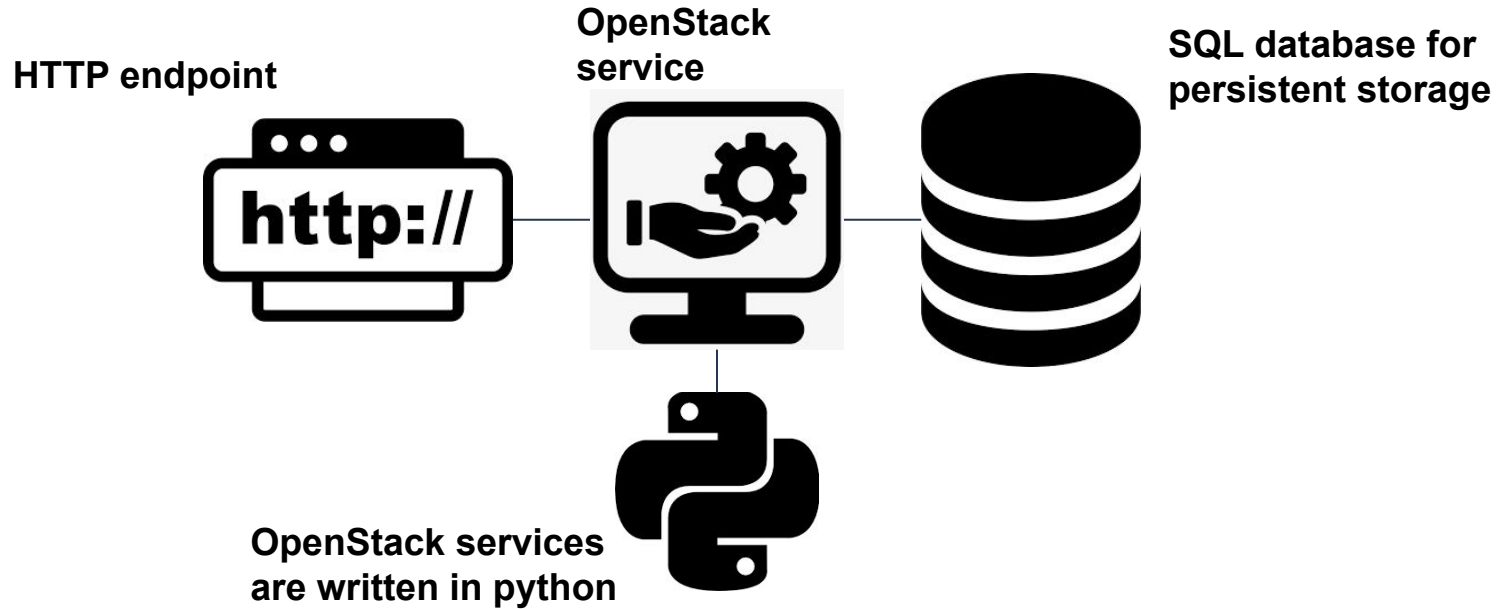








Common elements of OpenStack Services



Common elements of OpenStack Services



```
staliu@ui:~$ openstack router list
```

ID	Name	Status	State	Project
3a6a61f5-86c3-48f7-a176-f8d058b7b4d4	core-services-router	ACTIVE	UP	b3794220f66f40aeb862e70d963b34e3

Every object in OpenStack has an ID and a name

```
staliu@ui:~$ openstack network list
```

ID	Name	Subnets
0a2a8f81-4a40-4eb2-ab60-0316f1368748	paas-dev-net	fd5ee96
0d69df11-162e-43f8-b3fc-9ab4b2d2dea7	INFN_Cloud_Tifpabiophys-net	56cf78d
1540e151-438d-4393-a349-726c2c0a1598	corso-ccr-docker-net	1647e8c

```
staliu@ui:~$ openstack server list
```

ID	Name	Status	Networks	Image	Flavor	
641f144d-ee92-479b-a4d1-8152a9eae389	ui	ACTIVE	core-services-net=192.168.187.239, 192.135.24.51	Ubuntu-20.04-x86_64-2021-09-06	small	0c
748828e2-2bc6-493d-975b-3a3552564a2c	acostantini-accounting	ACTIVE	core-services-net=192.168.187.131, 192.135.24.156		small	69
03c36fc3-0d62-4760-843b-02288041b77b	harbor-23	ACTIVE	core-services-net=192.168.187.68, 192.135.24.142		large	65
9e03edfc-1dd5-4a63-83e9-3c4385a02a48	acostantini-test	ACTIVE	core-services-net=192.168.187.54, 192.135.24.11		small	f5
98ec20b9-da4c-4d8d-9997-9beee9dab14c	marica-test	ACTIVE				4e
3599a3b5-85b4-4f1d-b6f7-0191c30409d7	iam-users	SHUTOFF				bf
fc5e8d4c-9f5a-4333-9fcb-cdc6fabbb64c8	paas-mon-01	ACTIVE				
e096e7a4-dcd6-4f42-8601-34f87427a00c	status-test	SHUTOFF				
46991655-0fb2-4bf2-bb62-97a0dc93f583	zabbix-proxy	ACTIVE	core-services-net=192.168.187.52		medium	c6
f5db23f9-71f1-4765-96d8-908deeff6c3d	cnaf-accounting-collector	ACTIVE	core-services-net=192.168.187.135, 192.135.24.248		medium	
7d62f241-3385-4485-982c-e858026de292	status	ACTIVE	core-services-net=192.168.187.181, 192.135.24.204		small	
f4309321-510e-4a7b-9e13-6fe989b99304	guides	ACTIVE	core-services-net=192.168.187.145, 192.135.24.216		medium	
1531ecd0-4b91-4830-9803-c5989268a697	smtp-test	ACTIVE	core-services-net=192.168.187.77, 192.135.24.208		medium	
01d64128-917b-4d61-8beb-ab54f9735bbf	paas-db	ACTIVE	core-services-net=192.168.187.61, 192.135.24.239		medium	
4a6304f4-1c7e-4e9e-bdb5-fb8543b5c828	usermon-01	ACTIVE	core-services-net=192.168.187.42, 192.135.24.247		medium	
94da642d-effe-4aef-9389-a18906acc9c9	minio	ACTIVE	core-services-net=192.168.187.36, 192.135.24.243		large	
70fabaa0-062f-412a-9840-0025ee867d62	iam	ACTIVE	core-services-net=192.168.187.192, 192.135.24.222		medium	

Plus other attributes, depending on the object type

OpenStack logs

- Openstack service logs are highly configurable
 - as regards where they are written
 - as regards their verbosity
- A good practice is to avoid them to be too verbose in a production environment while increasing verbosity when actually needed, for example for bug tracking
- The default place for openstack logs is
 - `/var/log/<openstack service name>/`
- Log redirection to a local or remote syslog is also a common practice
- Also using a log analysis tool (e.g. ELK) is a good practice

OpenStack log format

The following is a sample log entry of the glance service. The single line entry has then been split in its components for easier analysis

```
2021-11-24 15:48:22.846 684 INFO eventlet.wsgi.server [req-d4c8c66b-1ee6-46d0-a58c-8fb5c20812d0 858347bd0cce456e95f1fce5a1bee39d
a083896e573943bfbce78caacc543e9d - default default] 10.200.0.236 -- [24/Nov/2021 15:48:22] "GET /v2/images HTTP/1.1" 200 20050
0.413936
```

2021-11-24 15:48:22.846	Date and time
684	Server process ID
INFO	Entry severity level
<u>eventlet.wsgi.server</u>	Server command name
<u>req-d4c8c66b-1ee6-46d0-a58c-8fb5c20812d0</u>	Request ID
<u>858347bd0cce456e95f1fce5a1bee39d</u>	OpenStack user ID
<u>a083896e573943bfbce78caacc543e9d</u>	OpenStack project ID
default	OpenStack user domain id
default	OpenStack project domain id
10.200.0.236	Client IP
[24/Nov/2021 15:48:22]	Date and time (provided by the <u>OpenStack</u> service)
GET /v2/images HTTP/1.1	HTTP request
200	HTTP return code
20050	??
0.413936	??

OpenStack log format



These examples coming from a different service show a similar structure:

```
2021-11-25 13:37:15.202 548951 INFO cinder.volume.manager [req-4f5bb0c4-4894-4cfa-81a1-d1fde87bc86d
dc92d20525cf0af8a9e90ce2ea9bba2607204b0436f94aaae2adb67835a79457 0a6073cba87b4f89b1c5b5c62d349776 - default default] Deleted volume
successfully.
```

```
2021-11-25 13:41:12.828 548951 INFO cinder.volume.flows.manager.create_volume [req-e4f707b2-7c3c-4530-96e1-14f8a30b9cb2
dc92d20525cf0af8a9e90ce2ea9bba2607204b0436f94aaae2adb67835a79457 0a6073cba87b4f89b1c5b5c62d349776 - default default] Volume
947c5cbf-1b8d-42ab-a720-84b80c105aec: being created as raw with specification: {'status': 'creating', 'volume_name':
'volume-947c5cbf-1b8d-42ab-a720-84b80c105aec', 'volume_size': 9}
```

Deployment models



As the OpenStack project has matured, vendors have pioneered multiple ways for customers to deploy OpenStack:

- **OpenStack-based Public Cloud**

A vendor provides a public cloud computing system based on the OpenStack project.

- **On-premises distribution**

In this model, a customer downloads and installs an OpenStack distribution in their internal network. See Distributions.

- **Hosted OpenStack Private Cloud**

A vendor hosts an OpenStack-based private cloud: including the underlying hardware and the OpenStack software.

- **OpenStack-as-a-Service**

A vendor hosts OpenStack management software (without any hardware) as a service. Customers sign up for the service and pair it with their internal servers, storage and networks to get a fully operational private cloud.

- **Appliance based OpenStack**

Nebula was a vendor that sold appliances that could be plugged into a network which spawned an OpenStack deployment.

Challenges to implementation



One Click Install

OpenStack is a combination of various projects such as compute, image, storage and networking. But OpenStack is a pluggable, modular architecture which makes a one click install process something that would only restrict a user's options. There are various vendors who are selling OpenStack with one click on top of their secret sauce for those who do want the ease of use. But there's a caveat with using vendors. It locks you into their solution and it may not be open source.

Documentation

OpenStack documentation needs improvement. For example, an analysis of comments from the users shows that documentation issues were the second most noted pain point. To get their issues resolved, users are turning to vendors support documentation to solve their problems. Improvement to OpenStack will only happen if core contributors participate more with the documentation team and keep them updated about the changes.

Upgrades

OpenStack still has no way to upgrade all its components with a one click install process. For example, a user may have to do a backup of a database and then later re-install it into the new release. This creates a slow and painful process that also forces the customer to take the system down. That's the kind of issue a customer would never have with a modern cloud service. The upgrades also require considerable expertise, which means customers often outsource to make sure updates go smoothly.

Long Term Release Support

Various telcos and service provider are asking for long term support for OpenStack. They are not happy with the current process of updates every six months. It becomes a drain on resources as upgrades always mean downtime, backing up systems and other such issues as security. They then have to integrate it all back into their own systems.

Too Many Vendors

When OpenStack started, critics called it a science project with no vendors. But times have changed. Critics now say vendors have crowded OpenStack, making it slow to evolve. In reality, these vendors mean more enterprise wants to get involved with OpenStack to build their open single tenant private environments. These customers are contributors to OpenStack but rely heavily on vendors to implement proprietary solutions that have a flavor of open source.

References

- <https://www.openstack.org/>
- <https://en.wikipedia.org/wiki/OpenStack>
- <https://openinfra.dev/>
- <https://thenewstack.io/openstack-has-its-issues-but-its-worth-a-fortune/>