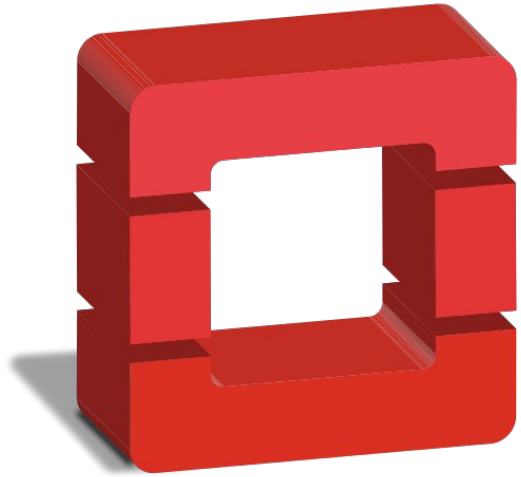

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CLOUD SOFTWARE

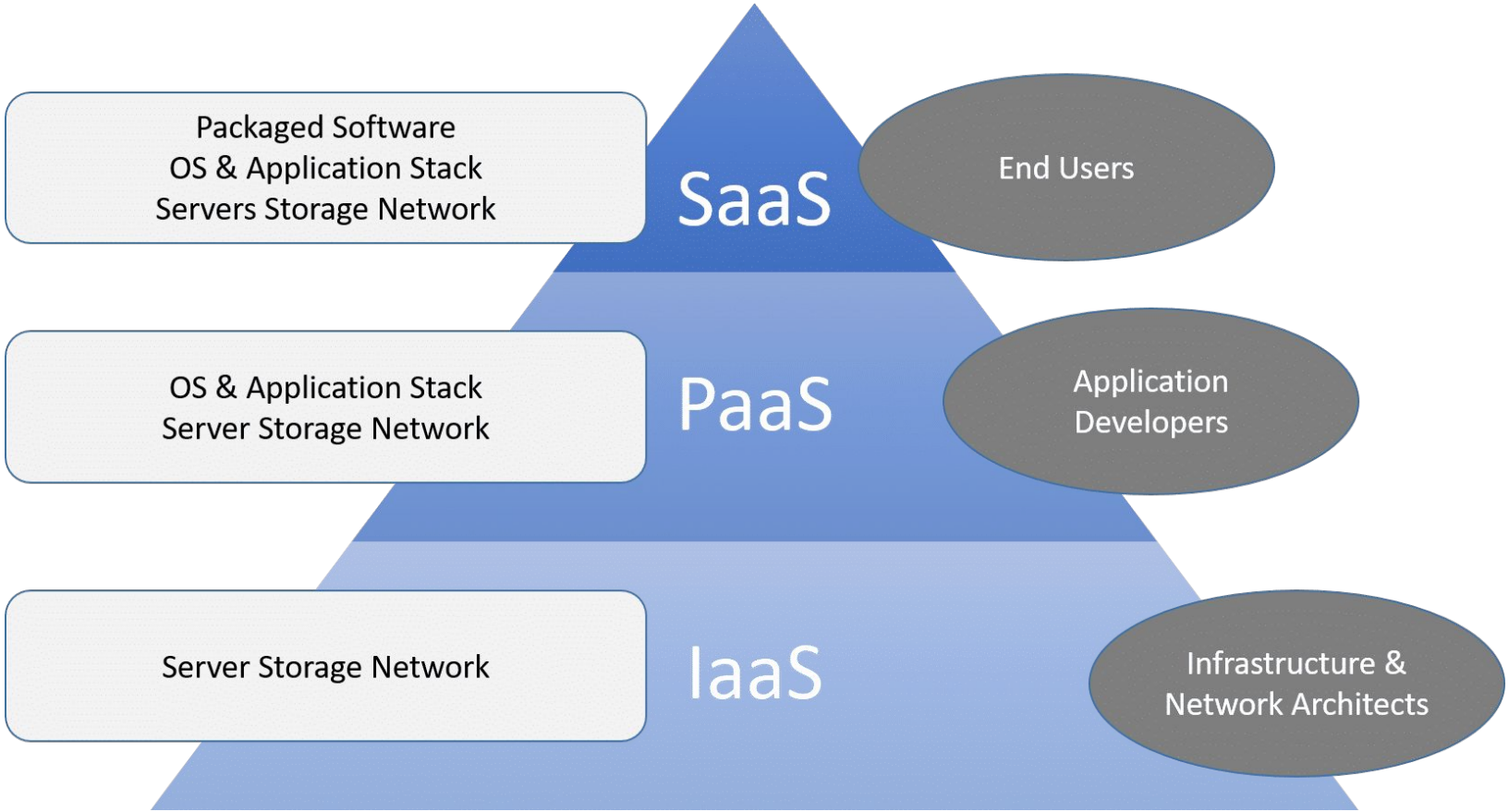
What is cloud computing?

Cloud computing is a technology that allows users to access and store data and applications over the internet rather than on a local computer or on-premises server. It provides scalable and flexible resources, such as servers, storage, databases, networking, software, and analytics, managed by third-party providers like Amazon Web Services (AWS), Google Cloud Platform (GCP), and Microsoft Azure. This approach reduces the need for organizations to invest in their own hardware and infrastructure, making it easier to scale resources up or down based on demand.

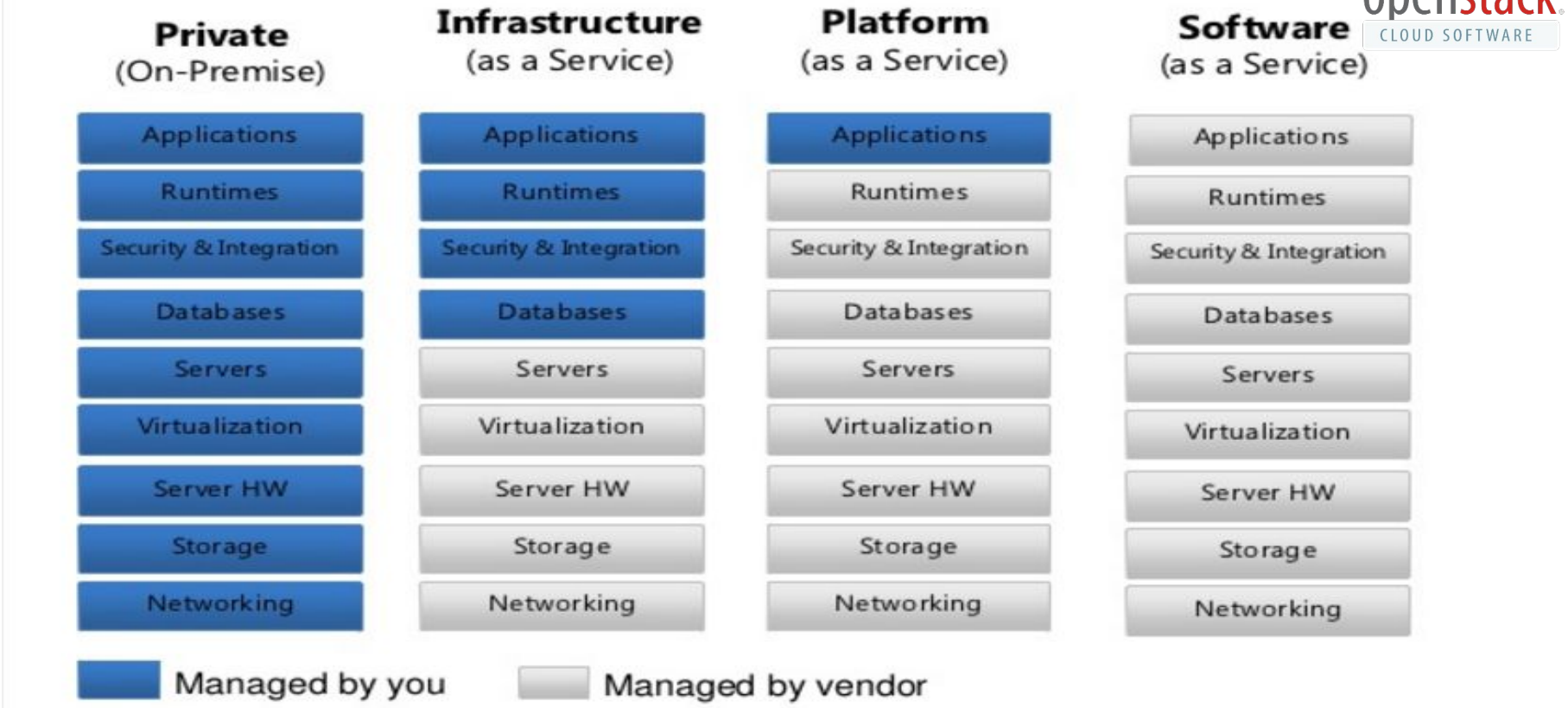
There are three main types of cloud services:

1. **Infrastructure as a Service (IaaS)**: Provides virtualized computing resources over the internet. Users can rent IT infrastructure like servers and storage on a pay-as-you-go basis. Examples include AWS EC2 and Google Compute Engine.
2. **Platform as a Service (PaaS)**: Provides a platform allowing customers to develop, run, and manage applications without handling the underlying infrastructure. This is beneficial for developers who need a controlled environment for application development. Examples include Google App Engine and Microsoft Azure App Service.
3. **Software as a Service (SaaS)**: Delivers software applications over the internet on a subscription basis. Users can access these applications through a web browser, and the software is managed by the service provider. Examples include Mi soft 365 and Salesforce.

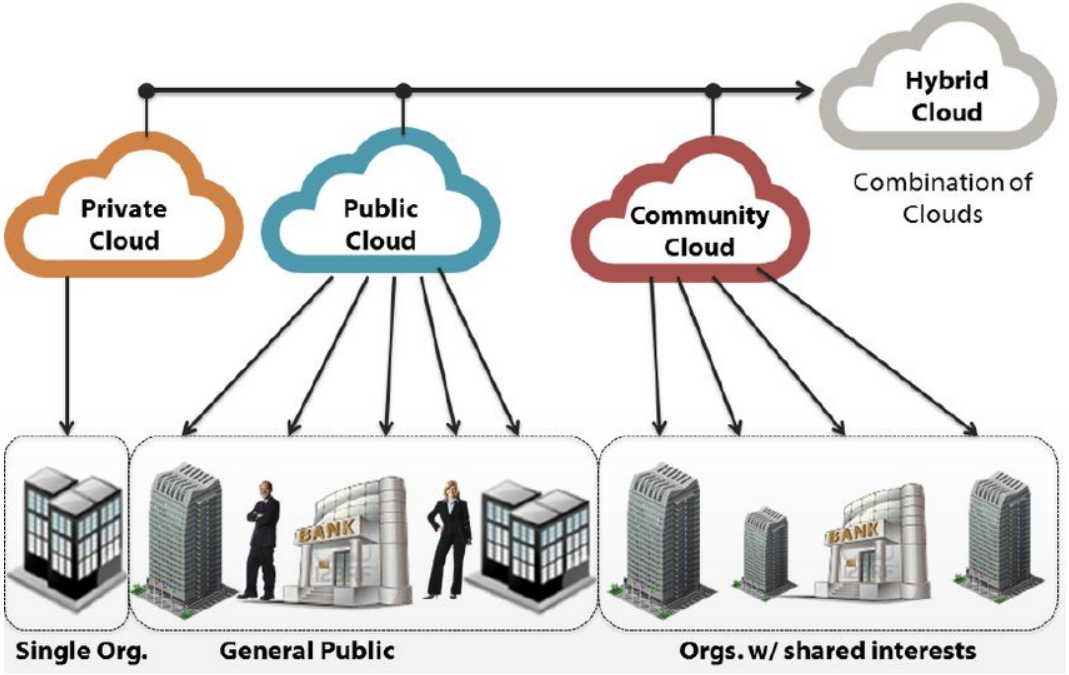
Cloud Service Models



Cloud Service Model



Cloud Deployment models



What is OpenStack?

OpenStack is a free and open-source software platform for cloud computing, mostly deployed as an **infrastructure-as-a-service (IaaS)**. The software platform consists of interrelated components that control diverse, multi-vendor hardware pools of processing, storage, and networking resources throughout a data center.

Summary: Python and OpenStack Relationship

Python is essential to OpenStack, an open-source cloud computing platform for Infrastructure as a Service (IaaS). The relationship between them can be understood through the following points:

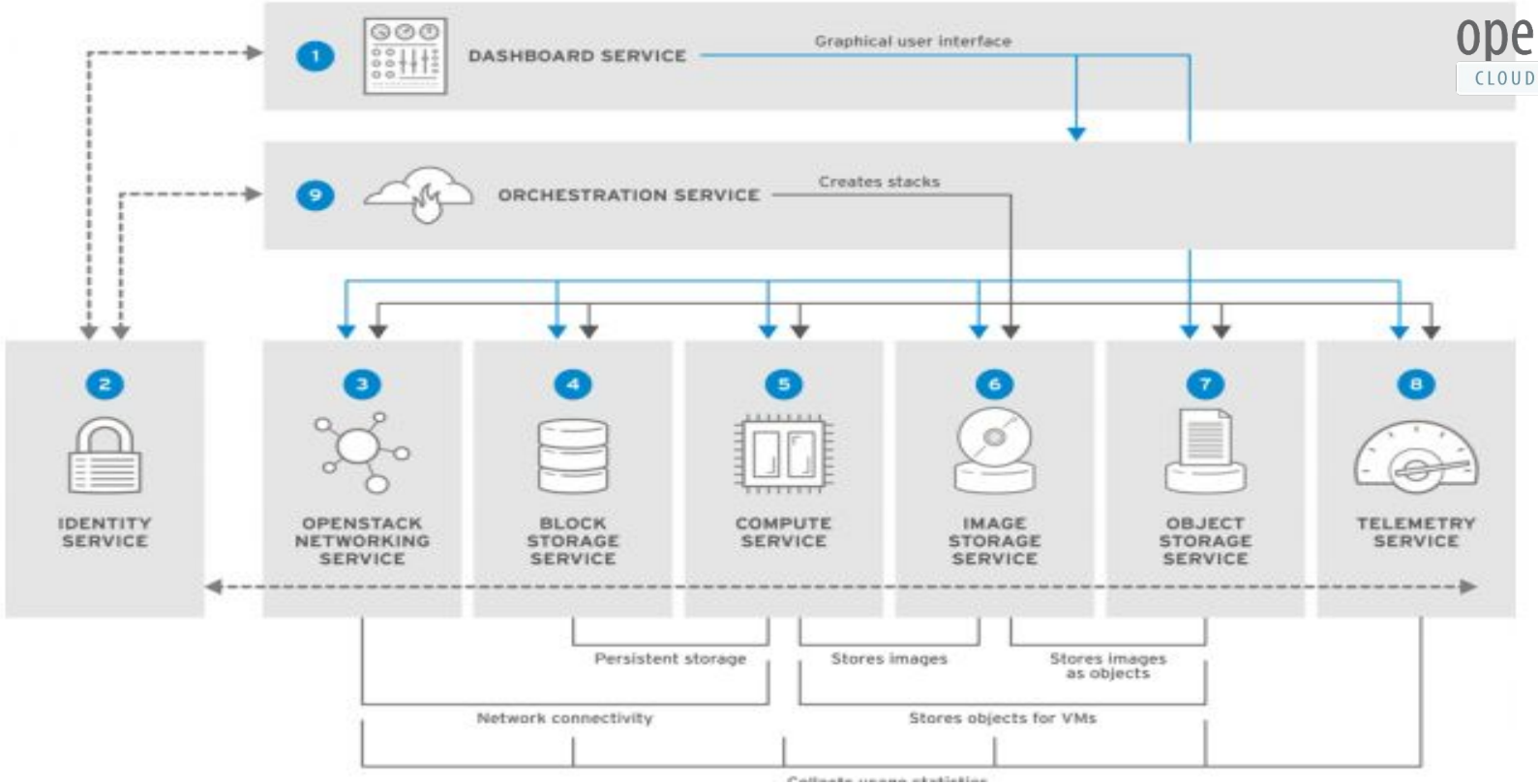
1 **Core Implementation**: OpenStack’s core services, such as Nova (compute), Neutron (networking), Keystone (identity), and more, are primarily written in Python. This is due to Python's flexibility, readability, and strong support for network operations, which are crucial for cloud environments.

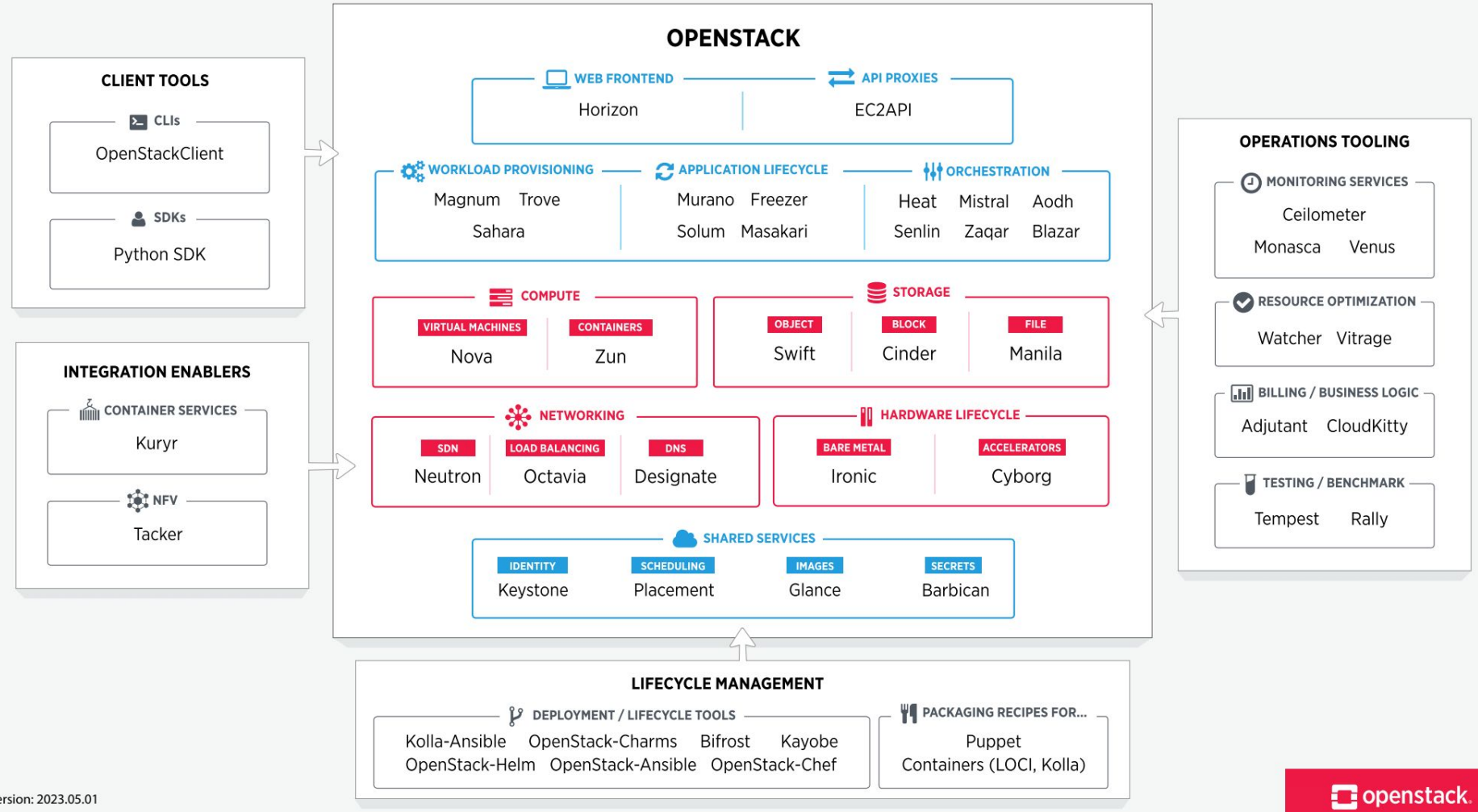
2 SDK and API: OpenStack provides a Python SDK, allowing developers to interact with OpenStack services through simplified code rather than direct API calls. Python APIs in OpenStack facilitate communication between components and enable programmatic control, making resource management and automation more accessible.

3 Orchestration and Automation: Python is also central to OpenStack's orchestration capabilities, particularly through services like Heat, which allow users to define infrastructure as code (IaC). Python’s extensive libraries and support for asynchronous programming make it ideal for handling large-scale, automated cloud deployments.

4 Community and Ecosystem: OpenStack has a strong Python developer community, which contributes to its ecosystem of tools and libraries. Python packages such as SQLAlchemy for database management and eventlet for asynchronous networking play significant roles in OpenStack's infrastructure.

Components


1
DASHBOARD SERVICE
Graphical user interface
9
ORCHESTRATION SERVICE
Creates stacks
2
IDENTITY SERVICE
3
OPENSTACK NETWORKING SERVICE
4
BLOCK STORAGE SERVICE
5
COMPUTE SERVICE
6
IMAGE STORAGE SERVICE
7
OBJECT STORAGE SERVICE
8
TELEMETRY SERVICE
Persistent storage
Stores images
Stores images as objects
Network connectivity
Stores objects for VMs



Version: 2023.05.01

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OpenStack Documentation

Installation Guide

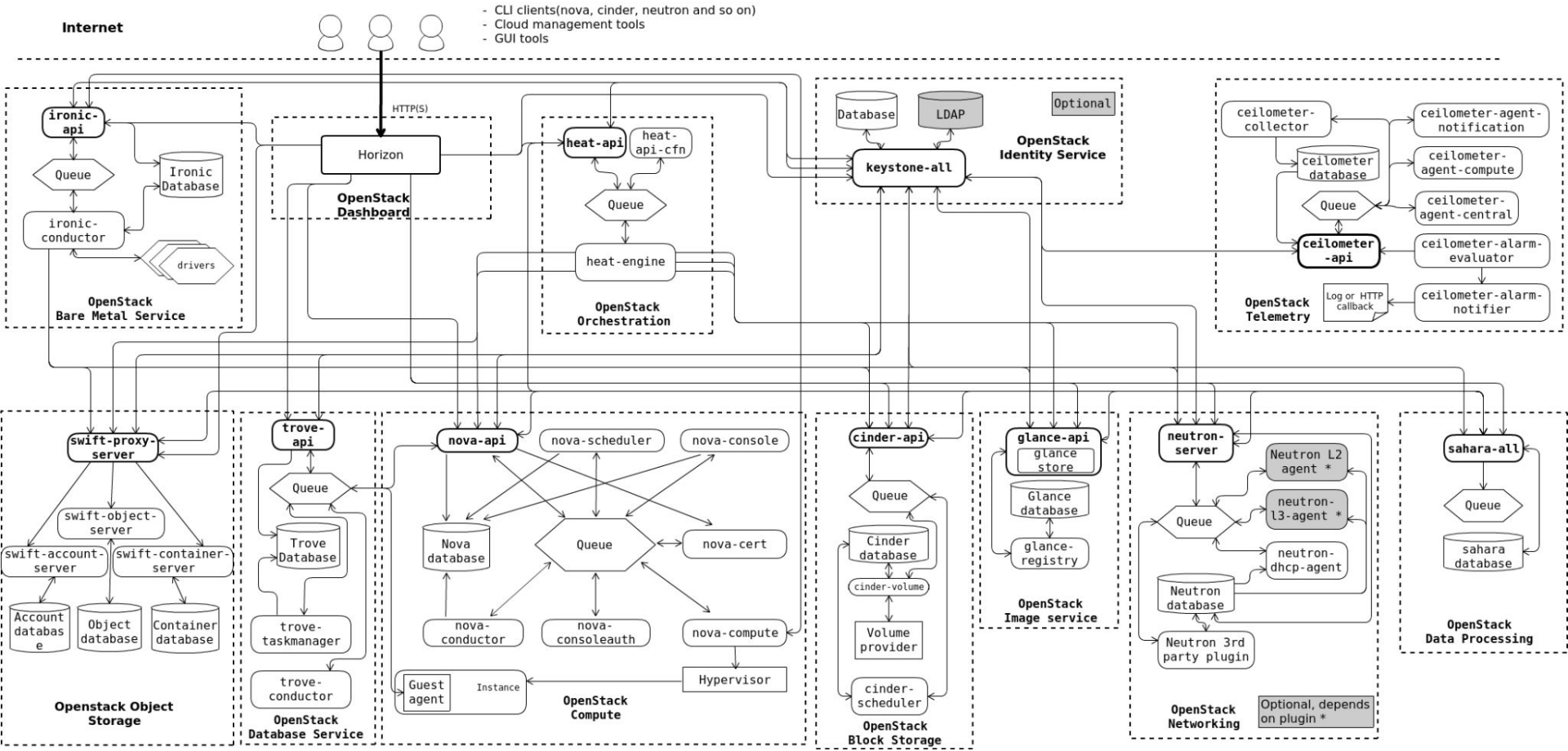
Conventions
Preface
Get started with OpenStack
Overview
Environment
Install OpenStack services
Launch an instance
Firewalls and default ports
Appendix

OpenStack Installation Guide

- Conventions
  - Notices
  - Command prompts
- Preface
  - Abstract
  - Operating systems
- Get started with OpenStack
  - The OpenStack services
  - The OpenStack architecture
    - Conceptual architecture
    - Logical architecture
- Overview
  - Example architecture
    - Controller
    - Compute
    - Block Storage
    - Object Storage
  - Networking
    - Networking Option 1: Provider networks
    - Networking Option 2: Self-service networks
- Environment
  - Security
  - Host networking

https://docs.openstack.org/install-guide/

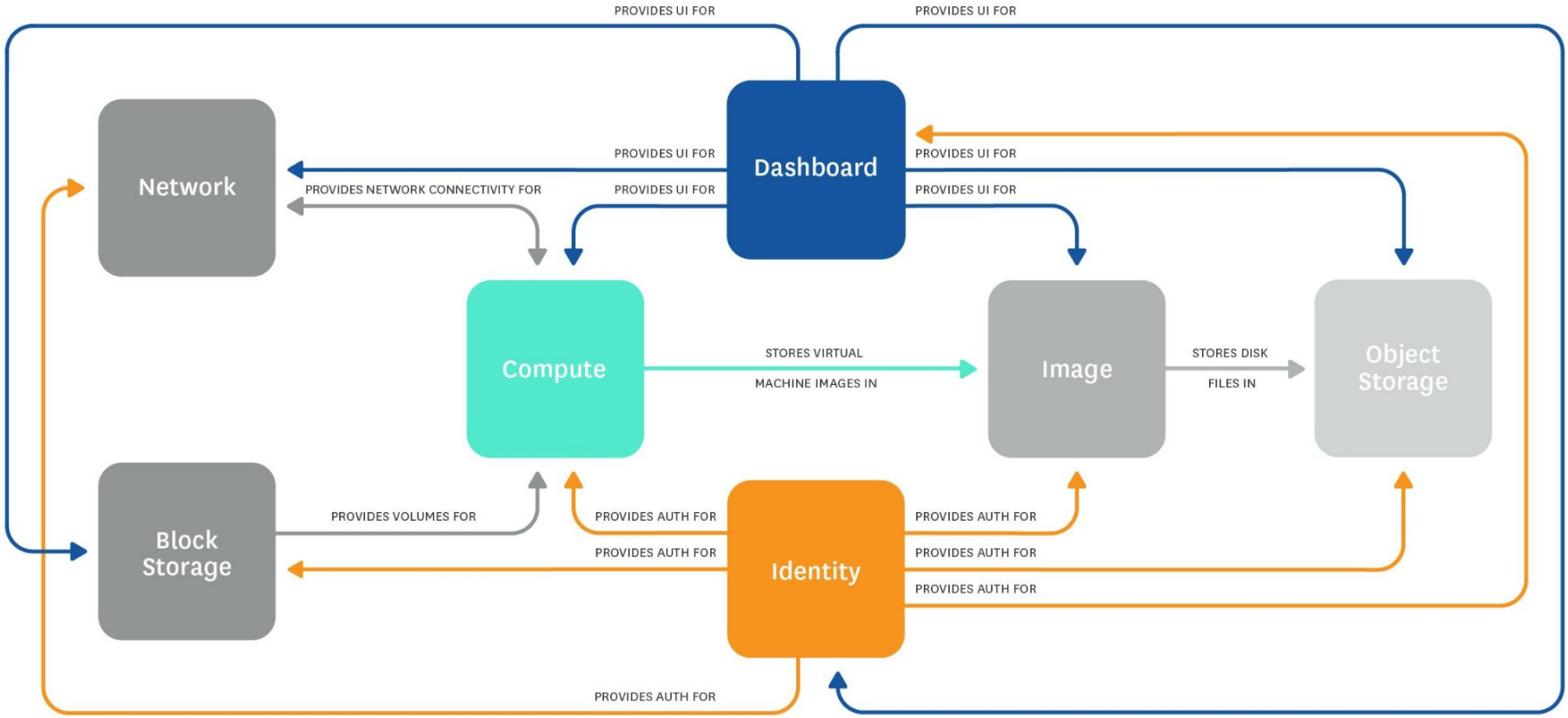
https://docs.openstack.org/install-guide/get-started-logical-architecture.html



OpenStack Compute (nova)

- serves as the core of the OpenStack cloud by providing virtual machines on demand.

- Compute schedules virtual machines to run on a set of nodes by defining drivers that interact with underlying virtualization mechanisms, and by exposing the functionality to the other OpenStack components


PROVIDES UI FOR
PROVIDES UI FOR
Network
Dashboard
PROVIDES UI FOR
PROVIDES UI FOR
PROVIDES NETWORK CONNECTIVITY FOR
PROVIDES UI FOR
PROVIDES UI FOR
Compute
STORES VIRTUAL
MACHINE IMAGES IN
Image
STORES DISK
FILES IN
Object Storage
Block Storage
PROVIDES VOLUMES FOR
PROVIDES AUTH FOR
PROVIDES AUTH FOR
Identity
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OpenStack Networking (neutron)

- handles creation and management of a virtual networking infrastructure
- provides cloud administrators with flexibility to decide which individual services to run on which physical systems
- All service daemons can be run on a single physical host for evaluation purposes

OpenStack Block Storage (cinder)

- provides persistent block storage management for virtual hard drives

- Block Storage enables the user to create and delete block devices, and to manage attachment of block devices to servers.

- OpenStack Block Storage advantages include:
  - Creating, listing and deleting volumes and snapshots.
  - Attaching and detaching volumes to running virtual machines.

OpenStack Object Storage (swift)

- provides an HTTP-accessible storage system for large amounts of data, including static entities such as videos, images, email messages, files, or VM images.

- distributed architecture supports horizontal scaling as well as failover redundancy with software-based data replication

OpenStack Database-as-a-Service (trove)

- allows users to select, provision, and operate a variety of relational and non-relational databases and handles more complex database administration tasks out-of-the-box.

- Users and database administrators can provision and manage multiple database instances in the cloud.

- High-performance resource isolation while automating complex administrative tasks such as deployment, configuration, patching, backup, restore, and monitoring.

OpenStack Bare Metal Provisioning (ironic)

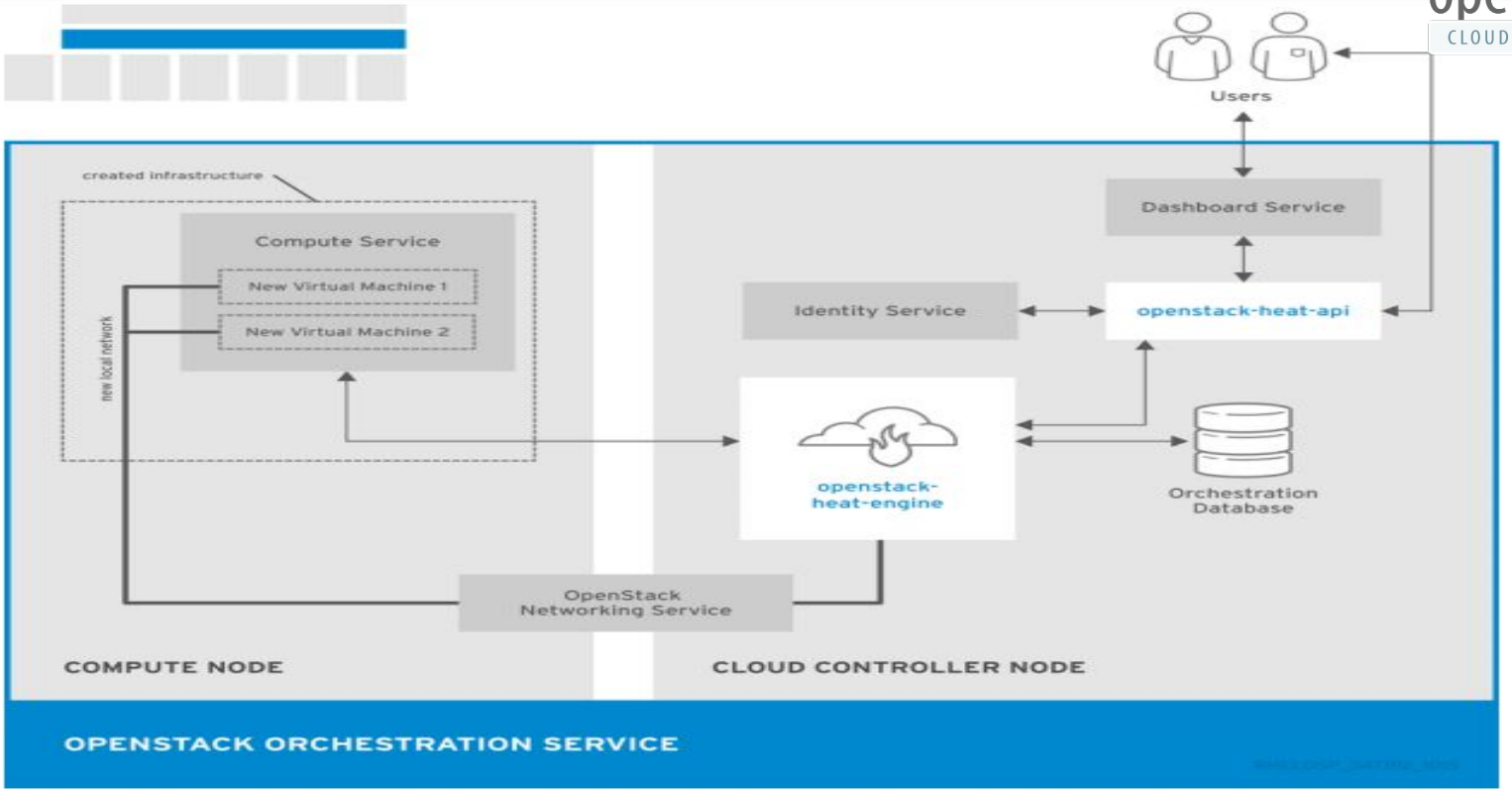
- enables the user to provision physical, or bare metal machines, for a variety of hardware vendors with hardware-specific drivers.

- Bare Metal Provisioning uses the Compute service for scheduling and quota management, and uses the Identity service for authentication.

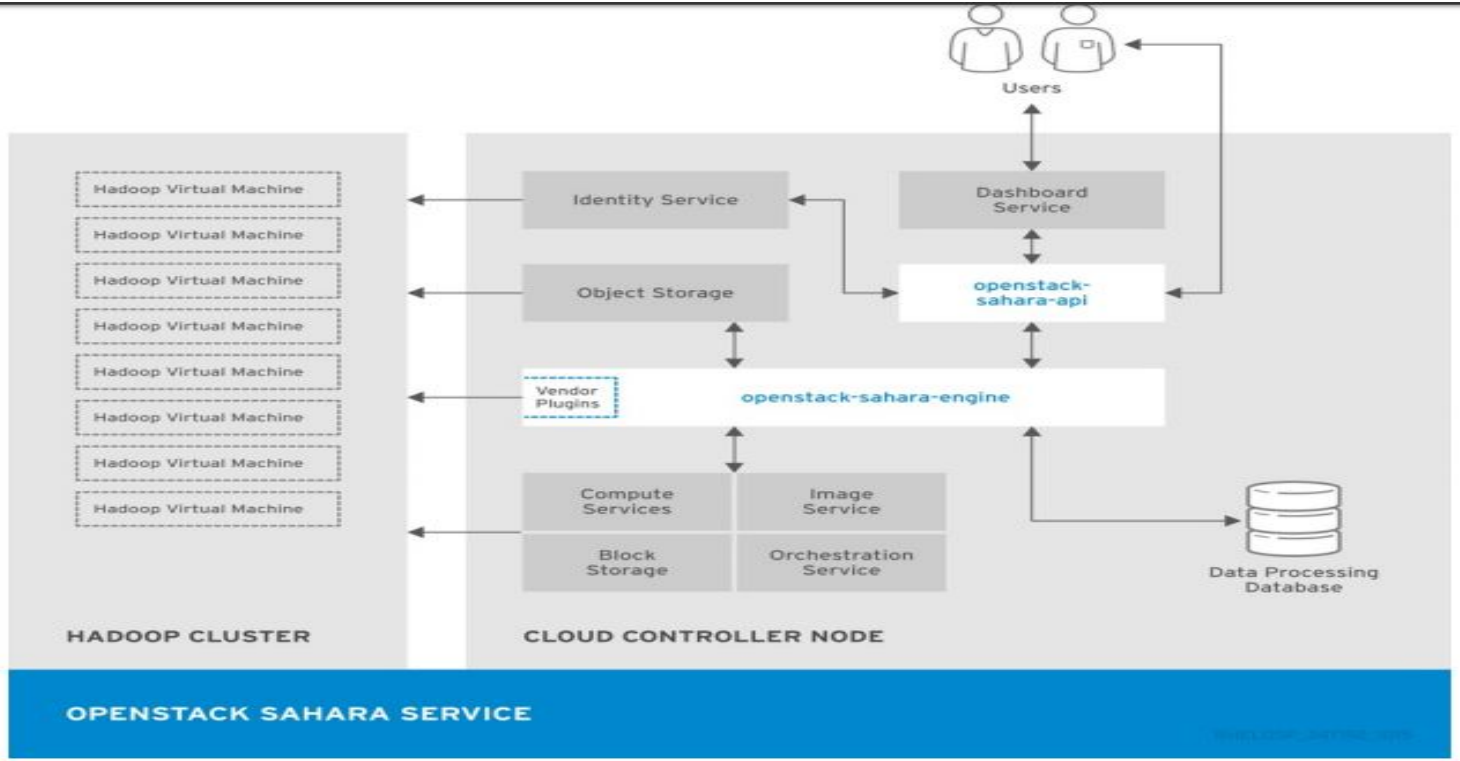
OpenStack Image (glance)

- OpenStack Image acts as a registry for virtual disk images.
- Users can add new images or take a snapshot of an existing server for immediate storage.
- You can use the snapshots for backup or as templates for new servers.

OpenStack Orchestration (heat)



OpenStack Data Processing (sahara)



CONCLUSION

- OpenStack is an early project but it is fully open source and based on open cloud standards.
- Hundreds of the world's largest brands rely on OpenStack
- reducing costs and helping them move faster
- OpenStack has a strong ecosystem