OpenStack, rozwiązanie cloudowe oparte o technologie Opensource.

Wprowadzenie oraz studium przypadku Edge Clouda

28-05-2019

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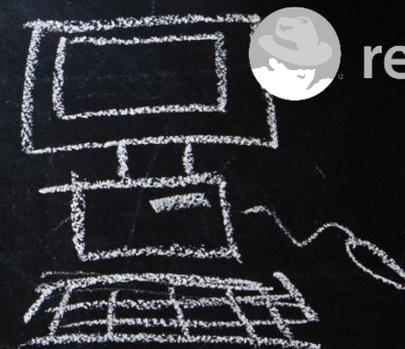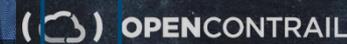# 1 Introduction

Why OpenSource is so important

81% SAY OPEN SOURCE WILL BECOME MORE IMPORTANT OVER THE NEXT FEW YEARS

experience true
INTEROPERABILITY
key to prevent vendor lock-in

INNOVATE
faster than market

FLEXIBILITY
and control over the environment and business model
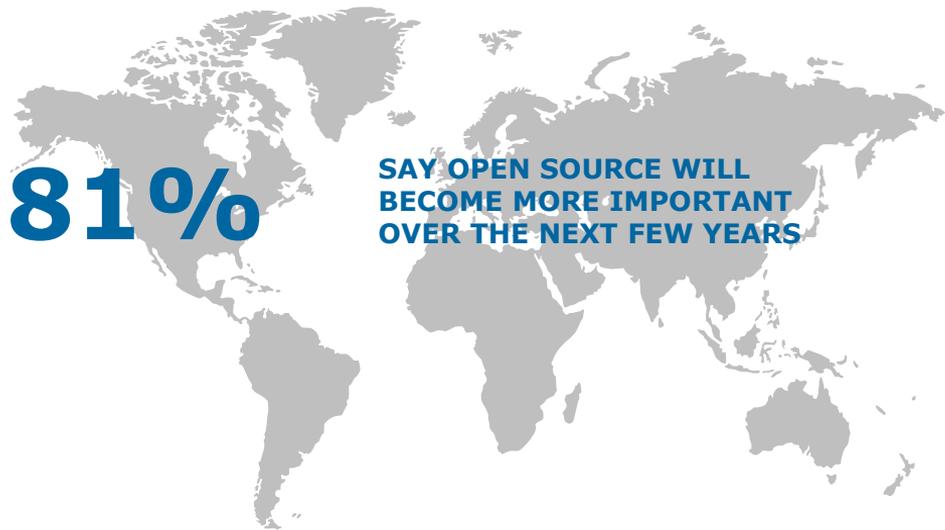
according to survey made by Openstack Foundation in 2018

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What is „OpenSource" ?
What OpenSource does make for Cloud ?

Choice & control: ability to choose between solutions

Ability to contribute or directly influence the roadmap

Widely adopted open source APIs are the new standards

1	OPEN COMMUNITY
2	OPEN DESIGN
3	OPEN DEVELOPMENT
4	DECENTRALIZED

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What is „Cloud" ?

Clouds are pool of virtual resources, such as raw processing power, memory, network, storage or cloud-based applications; orchestrated by management and automation software…

Public Cloud: shared resource, „pay-as-you-go" models are common. OpenStack public cloud is available in 60+ datacenters globally

Hybrid Cloud: a mix of public cloud and private cloud **orchestrated together** to meet company needs

Private Cloud: dedicated to a single user. Can be hosted private cloud in a vendor's data center or customer, or remotly managed private cloud
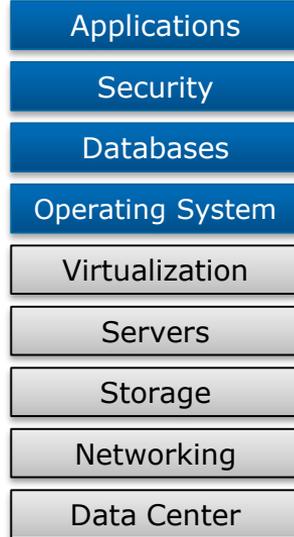
3 Clouds Models

AtoS

What is „Cloud" ?

Enterprise IT (legacy IT)	Infrastructure (as a Service)	Platform (as a Service)	Software (as a Service)
Applications	Applications	Applications	Applications
Security	Security	Security	Security
Databases	Databases	Databases	Databases
Operating System	Operating System	Operating System	Operating System
Virtualization	Virtualization	Virtualization	Virtualization
Servers	Servers	Servers	Servers
Storage	Storage	Storage	Storage
Networking	Networking	Networking	Networking
Data Center	Data Center	Data Center	Data Center

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Modern applications drive infrastructure.
Not the other way around !

MODERN APPLICATIONS' REQUIREMENTS

COMPUTE

STORAGE

NETWORKING

➢ Packaged as lighweight containers

➢ Developed with best-of-breed languages

➢ Designed as loosely coupled microservices

➢ Centered around APIs for interconnection and collaboration

➢ Architected with separation of stateless and stateful services

➢ Isolated from server and operating system dependencies

➢ Deployed on self-service, elastic, cloud infrastrcutre

➢ Managed through agile DevOps processes

➢ Automated capabilities

➢ Compliant with security standards and regulations

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Why do we need to build those applications in private Cloud ?

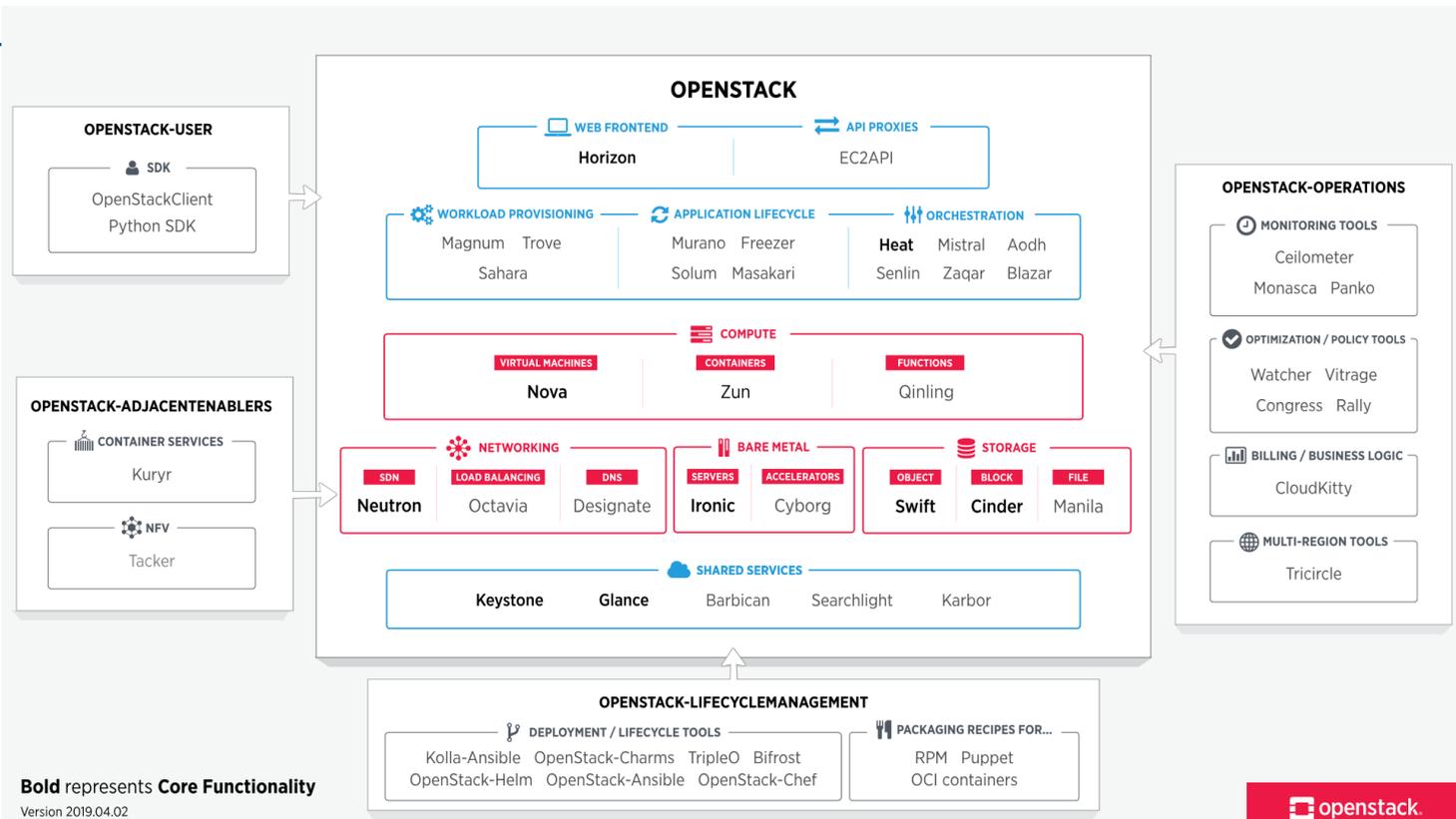| Private Cloud	Public Cloud
▶ Sensitive workloads with strict security and privacy regulations	▶ Non-sensitive data and lower-security workloads
▶ Lower cost for high and constant load applications	▶ Lower cost for unpredictable load applications
▶ Workloads with high predictable usage patterns	▶ Workloads with highly fluctuating usage patterns

AtoS

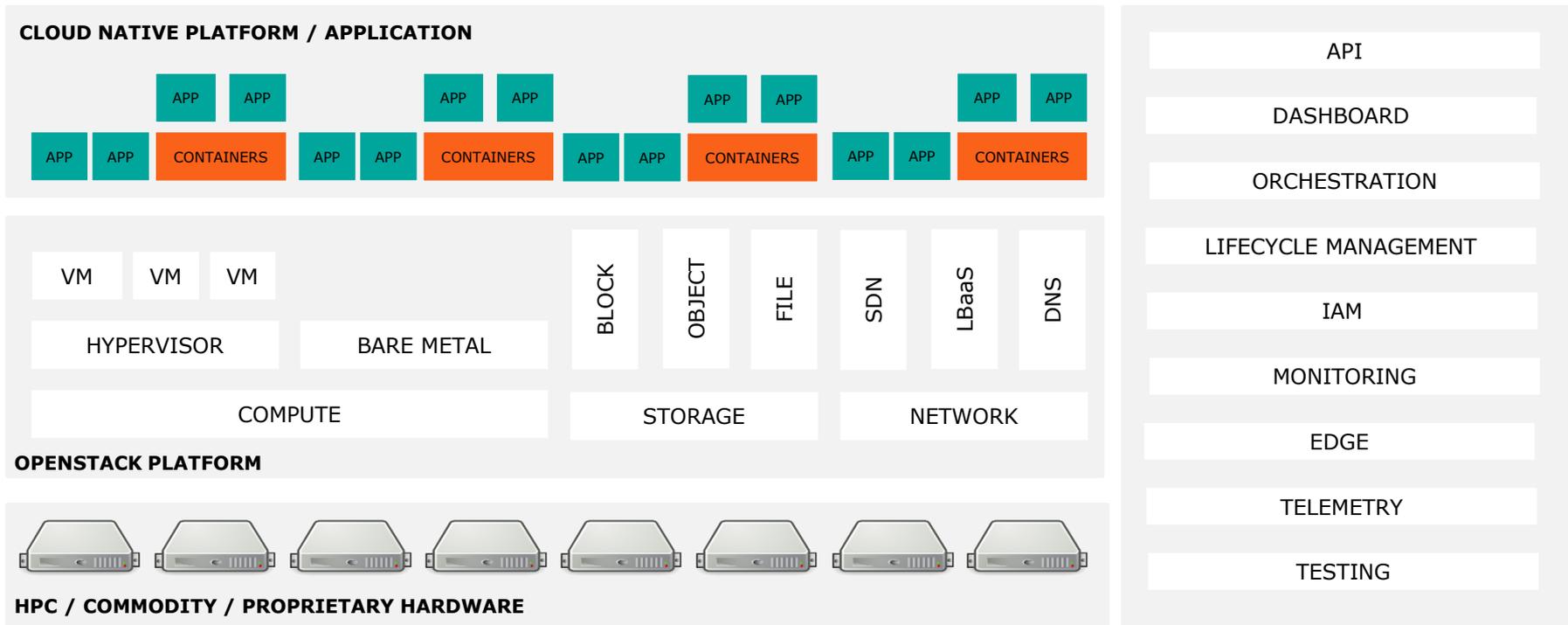# Open Infrastructure

What is „OpenStack" ?
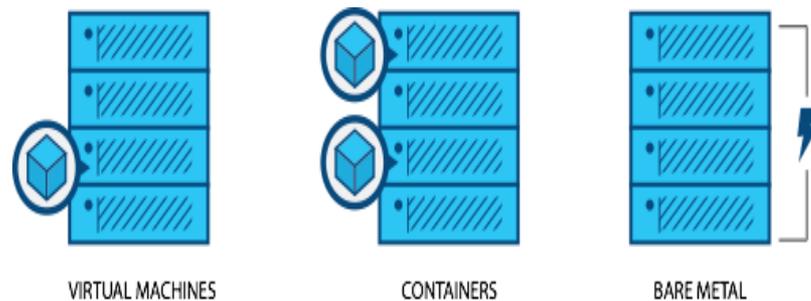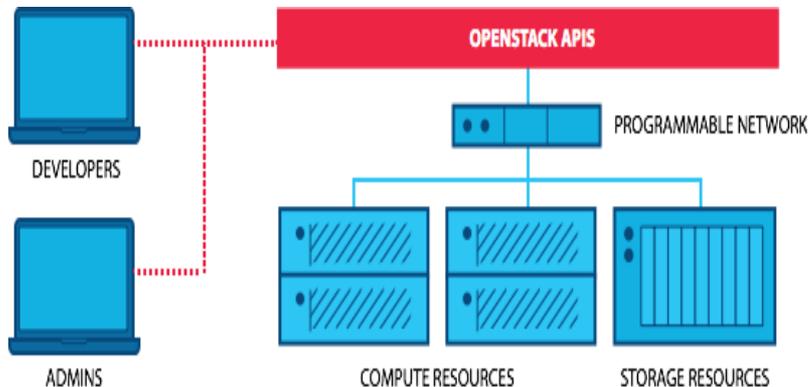
Programmable infrastructure that lays a common set of APIs on top of compute, networking and storage

One platform for virtual machines, containers and bare metal
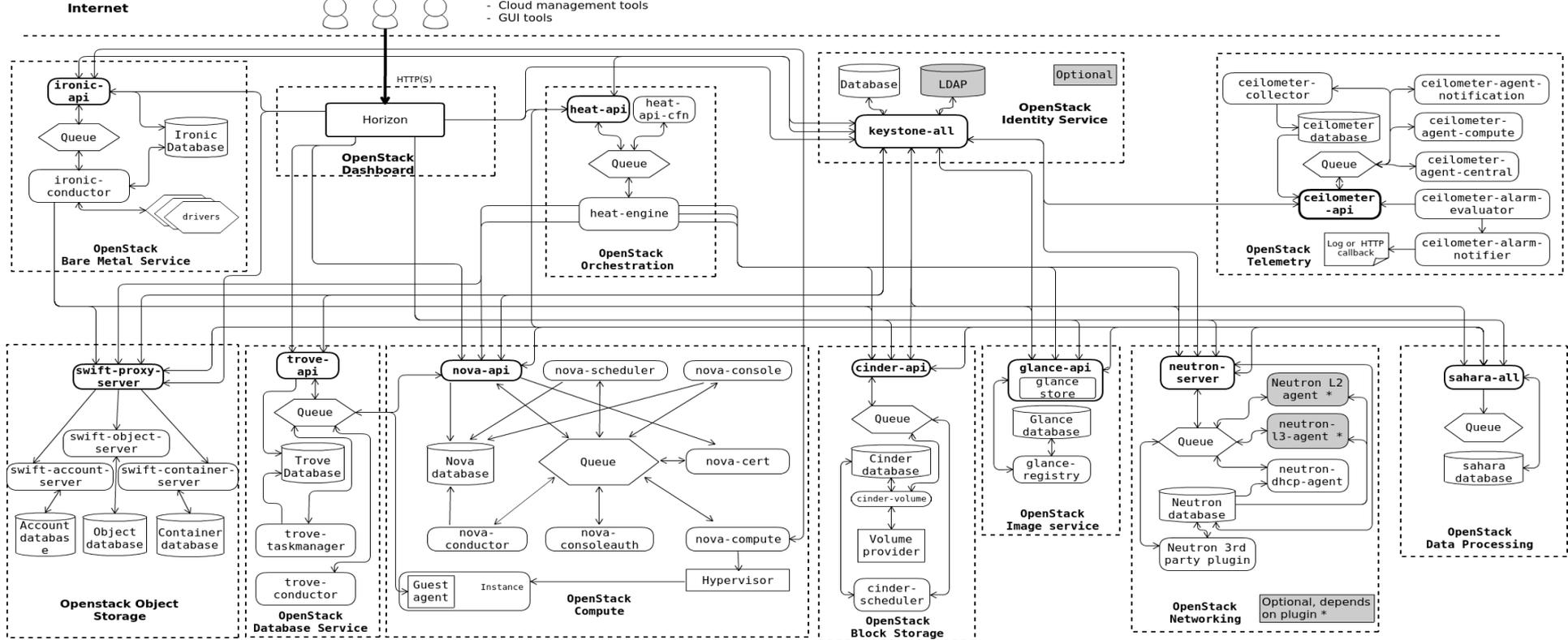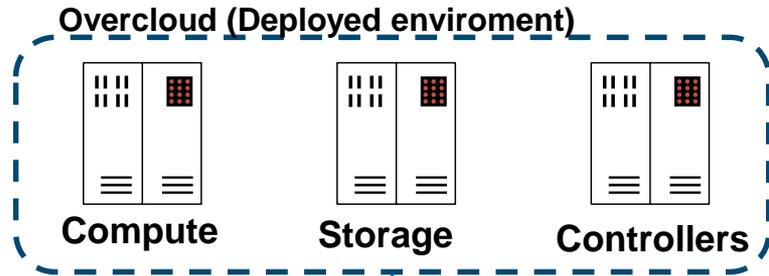
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OpenStack Architecture

OPENSTACK-USER

👤 **SDK**
OpenStackClient
Python SDK

OPENSTACK-ADJACENTENABLERS

CONTAINER SERVICES
Kuryr

NFV
Tacker

OPENSTACK

💻 **WEB FRONTEND** | ⇄ **API PROXIES**
Horizon | EC2API

⚙️ **WORKLOAD PROVISIONING** | 🔄 **APPLICATION LIFECYCLE** | ♨️ **ORCHESTRATION**
Magnum Trove | Murano Freezer | **Heat** Mistral Aodh
Sahara | Solum Masakari | Senlin Zaqar Blazar

🖥 **COMPUTE**

VIRTUAL MACHINES	**CONTAINERS**	**FUNCTIONS**
Nova	Zun	Qinling

❋ **NETWORKING**

SDN	**LOAD BALANCING**	**DNS**
Neutron	Octavia	Designate

🖥 **BARE METAL**

SERVERS	**ACCELERATORS**
Ironic	Cyborg

🗄 **STORAGE**

OBJECT	**BLOCK**	**FILE**
Swift	**Cinder**	Manila

☁️ **SHARED SERVICES**
Keystone **Glance** Barbican Searchlight Karbor

OPENSTACK-OPERATIONS

🕐 **MONITORING TOOLS**
Ceilometer
Monasca Panko

✅ **OPTIMIZATION / POLICY TOOLS**
Watcher Vitrage
Congress Rally

📊 **BILLING / BUSINESS LOGIC**
CloudKitty

🌐 **MULTI-REGION TOOLS**
Tricircle

OPENSTACK-LIFECYCLEMANAGEMENT

⚒ **DEPLOYMENT / LIFECYCLE TOOLS**
Kolla-Ansible OpenStack-Charms TripleO Bifrost
OpenStack-Helm OpenStack-Ansible OpenStack-Chef

🍴 **PACKAGING RECIPES FOR...**
RPM Puppet
OCI containers

Bold represents **Core Functionality**
Version 2019.04.02

🔲 openstack.

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OpenStack Architecture

openstack®

CLOUD NATIVE PLATFORM / APPLICATION

| APP | APP |
| APP | APP | CONTAINERS |

| APP | APP |
| APP | APP | CONTAINERS |

| APP | APP |
| APP | APP | CONTAINERS |

| APP | APP |
| APP | APP | CONTAINERS |

| VM | VM | VM |

| HYPERVISOR | BARE METAL |

| BLOCK | OBJECT | FILE | SDN | LBaaS | DNS |

| COMPUTE | STORAGE | NETWORK |

OPENSTACK PLATFORM

HPC / COMMODITY / PROPRIETARY HARDWARE

| API |
| DASHBOARD |
| ORCHESTRATION |
| LIFECYCLE MANAGEMENT |
| IAM |
| MONITORING |
| EDGE |
| TELEMETRY |
| TESTING |

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OpenStack Architecture

TripleO deployment of OpenStack
OpenStack Over OpenStack (OoO)

Overcloud (Deployed enviroment)

Compute   **Storage**   **Controllers**

Deploy, configure and manage nodes

Undercloud (Director)
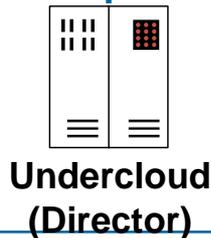
▶ Description of the Overcloud deployment is controlled via YAML templates

▶ Overcloud is configured by HEAT and Ansible templates

▶ Infrastructure-as-a-Code deployment model

▶ Overcloud lifecycle is entirely managed through the Undercloud

Undercloud

Undercloud Node	
Horizon	Neutron
Ceilometer	Glance
MariaDB	RabbitMQ
Nova	OpenStack Clients
Heat	Ceph-Mon
Keystone	Neutron Open VSwitch Agent
Ironic	

Overcloud

Controller Node	
Horizon	Cinder API
Glance	Cinder Volume
MariaDB	Swift Proxy
Swift Storage	Heat API
OpenStack Clients	Heat Engine
Keystone	RabbitMQ
Ceilometer	Neutron Open VSwitch Agent
Nova API	
Neutron Server	

Object Storage Node
- Swift Storage
- Ceilometer Agent
- Neutron Open VSwitch Agent

Block Storage Node
- Cinder Volume
- Ceilometer Agent
- Neutron Open VSwitch Agent

Compute Node
- Nova Compute
- Nova KVM
- Ceilometer Agent
- Neutron Open VSwitch Agent

Ceph Storage Node
- Ceph-OSD

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OpenStack physical networking

▶ Networks separated into VLANs by function

▶ Bonded data interface for performance and redundancy
  – 10/25GbE SFP+ DAC

▶ Dedicated O&M interface
  – 1GbE copper

▶ Dedicated IPMI interface
  – 1GbE copper
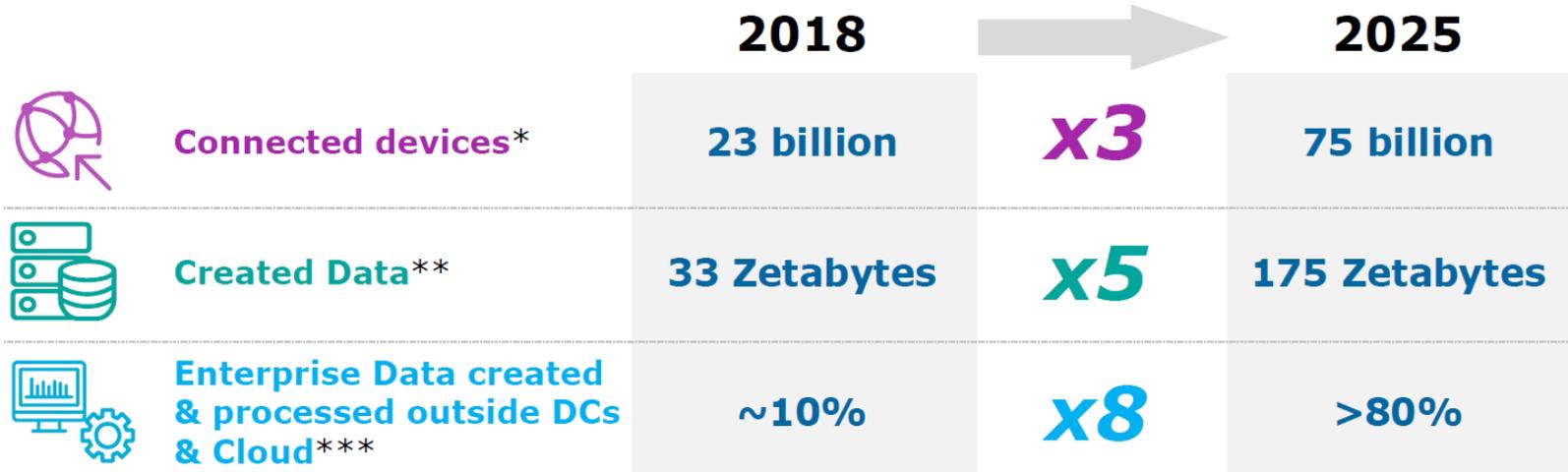
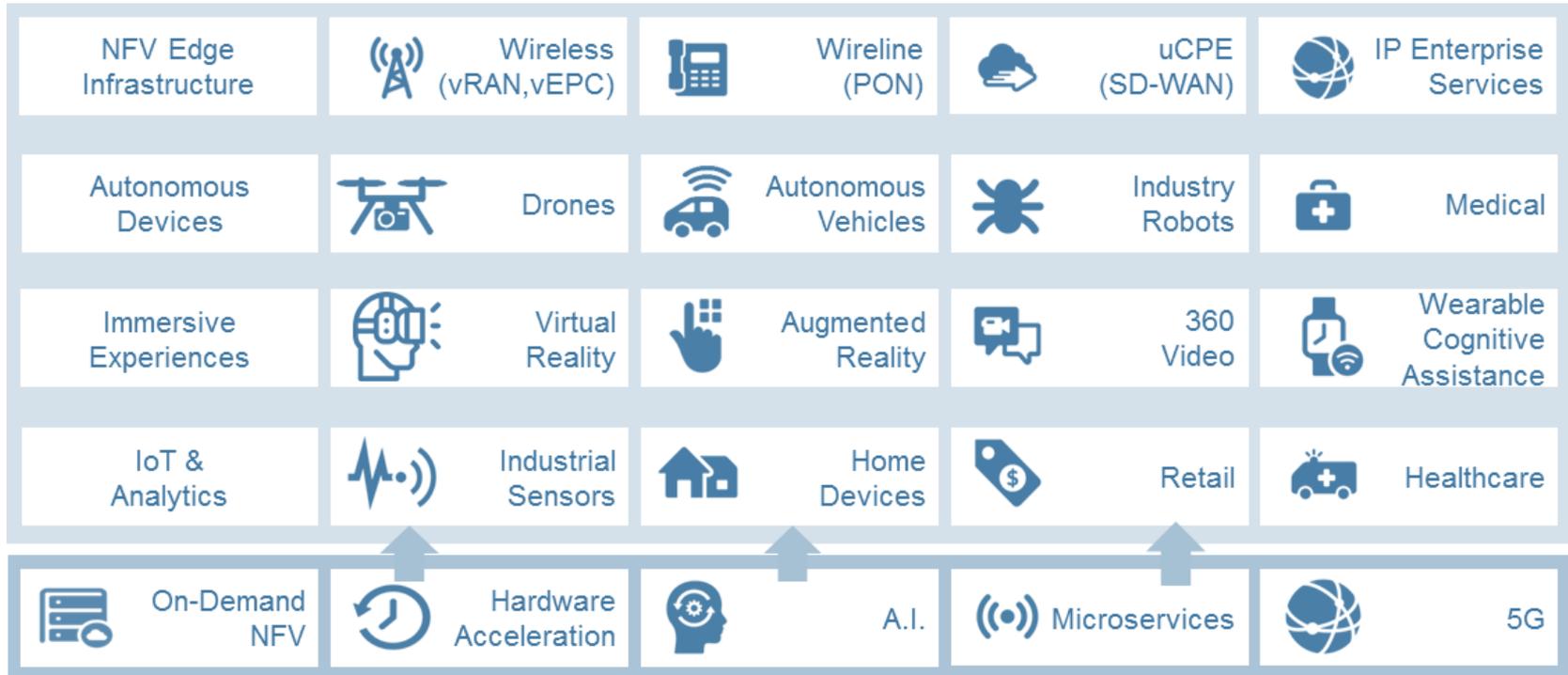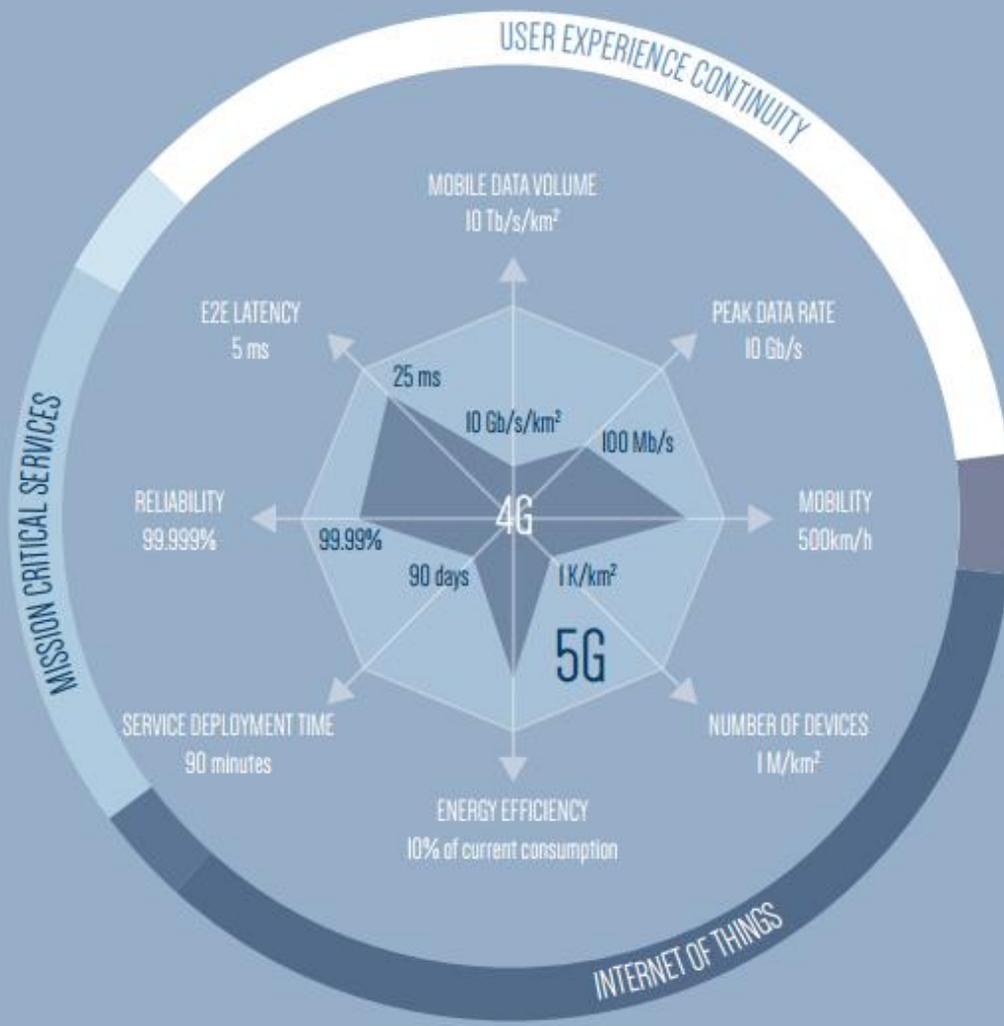Trusted partner for your **Digital Journey**

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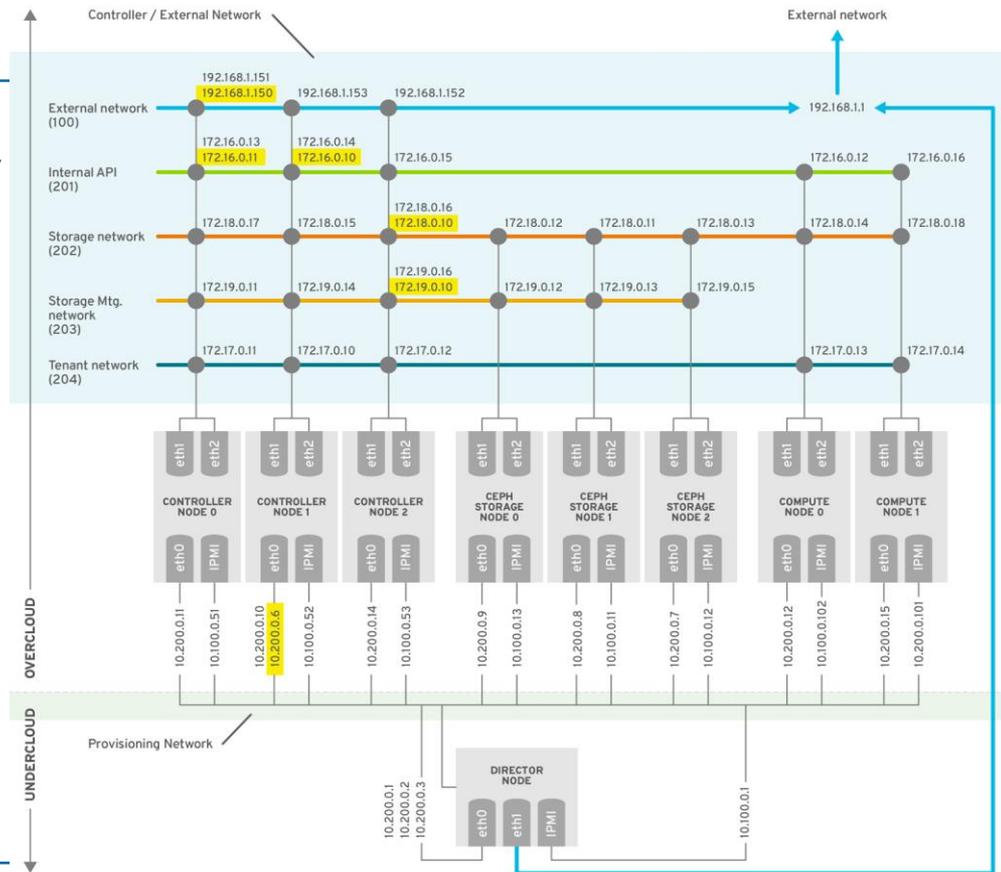
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EDGE Computing

Leveraging the data deluge

> **"Digital transformation is not about the evolution of devices, it is about the integration of intelligent data into everything that we do."** (IDC)

	2018	→	**2025**
Connected devices*	23 billion	x3	75 billion
Created Data**	33 Zetabytes	x5	175 Zetabytes
Enterprise Data created & processed outside DCs & Cloud***	~10%	x8	>80%

*Source: *IHS **IDC ***Gartner - October 3, 2018 "What Edge Computing Means for Infrastructure and Operations" – 2025 extrapolated from ~75% in 2022*

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Edge – Use Cases

NFV Edge Infrastructure	Wireless (vRAN, vEPC)	Wireline (PON)	uCPE (SD-WAN)	IP Enterprise Services
Autonomous Devices	Drones	Autonomous Vehicles	Industry Robots	Medical
Immersive Experiences	Virtual Reality	Augmented Reality	360 Video	Wearable Cognitive Assistance
IoT & Analytics	Industrial Sensors	Home Devices	Retail	Healthcare
On-Demand NFV	Hardware Acceleration	A.I.	Microservices	5G

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EDGE – 5G Constrains

Latency	Bandwidth	Resilience
CUSTOMER ⇔ SERVICE RTT = 1ms => distance 100km	Funnel of 1M's of 1Gb/s connections	Make edge sites autonomous, minimize failure domain to 1 site

Regulations	Distribution	Scale
Keep sensitive data on-site / within regulatory region	Need to deploy and perform the lifecycle management of distibuted systems	Need to manage 10-100k's of sites with 1-10's of nodes each

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Edge – Classic topology
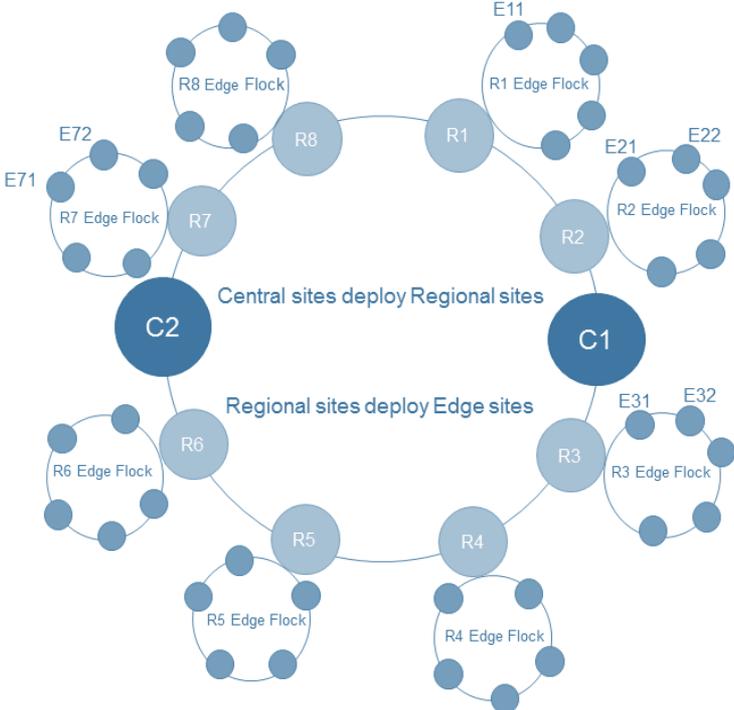
E: Edge Site
R: Regional Site
C: Central Site

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Edge – Deployment Model
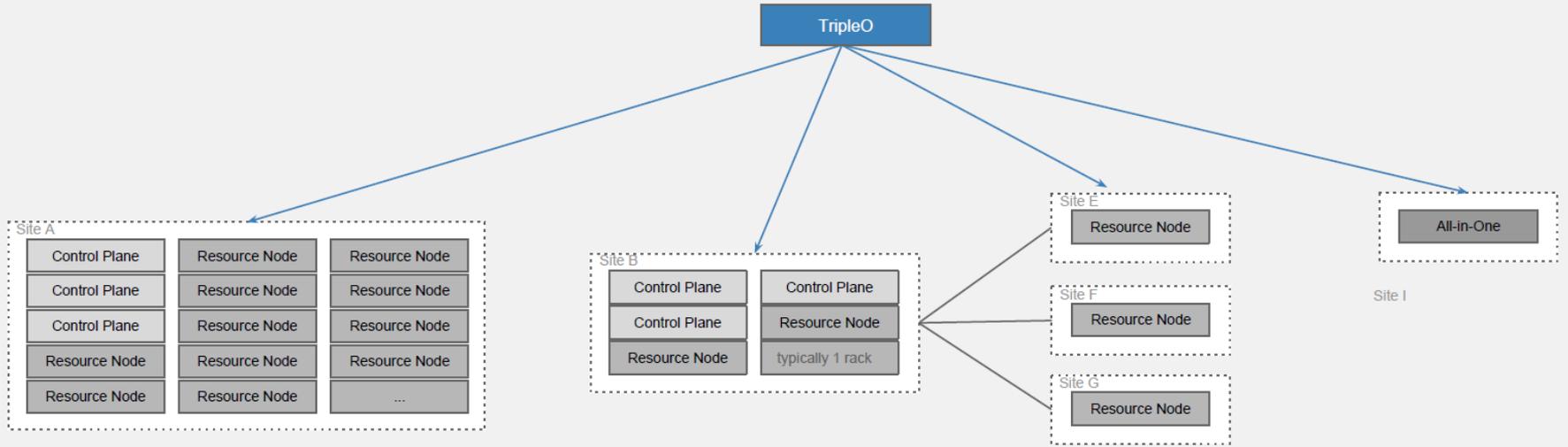
Thanks

For more information please contact:
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