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Micro Cloud (Hybrid) Architecture DRAFT

Disposable HW and SW architecture required! Vendor-lock-in may be kept at minimum levels. SDDC (Software-Defined Data Center): A data storage facility where networking, storage, CPU and security are virtualized and delivered as a service. Stable, cheap, good enough.

Tier	Description
I	A Tier 1 data center is a basic server room implementing the general guidelines for computer system installations. This first level runs within a 99.671 percent availability through one non-redundant distribution path with non-redundant capacity components.
II	A Tier 2 data center Includes all requirements of Tier 1, plus a guarantee of 99.741 percent availability with redundant site infrastructure capacity components.
III	In addition to fulfilling requirements of Tiers 1 and 2, Tier 3 data centers provide dual-powered IT equipment to receive data from multiple independent distribution paths with an increased availability of 99.982 percent guaranteed.
IV	Tier 4 data centers include the components of the first three Tiers with the addition of independently dual-powered cooling equipment. The site infrastructure is fault-tolerant with distribution capability and the capacity to store electrical power. An availability of 99.995 percent is guaranteed.

Basic Topology Important parts

Command and conquer	Openstack Horizon, Proxmox Datacenter Manager, Nutanix Prism etc.
Compute Nodes	KVM
Storage Nodes	File, Block, Objects

Network remarks

Disable Spanning Tree Protocol for servers

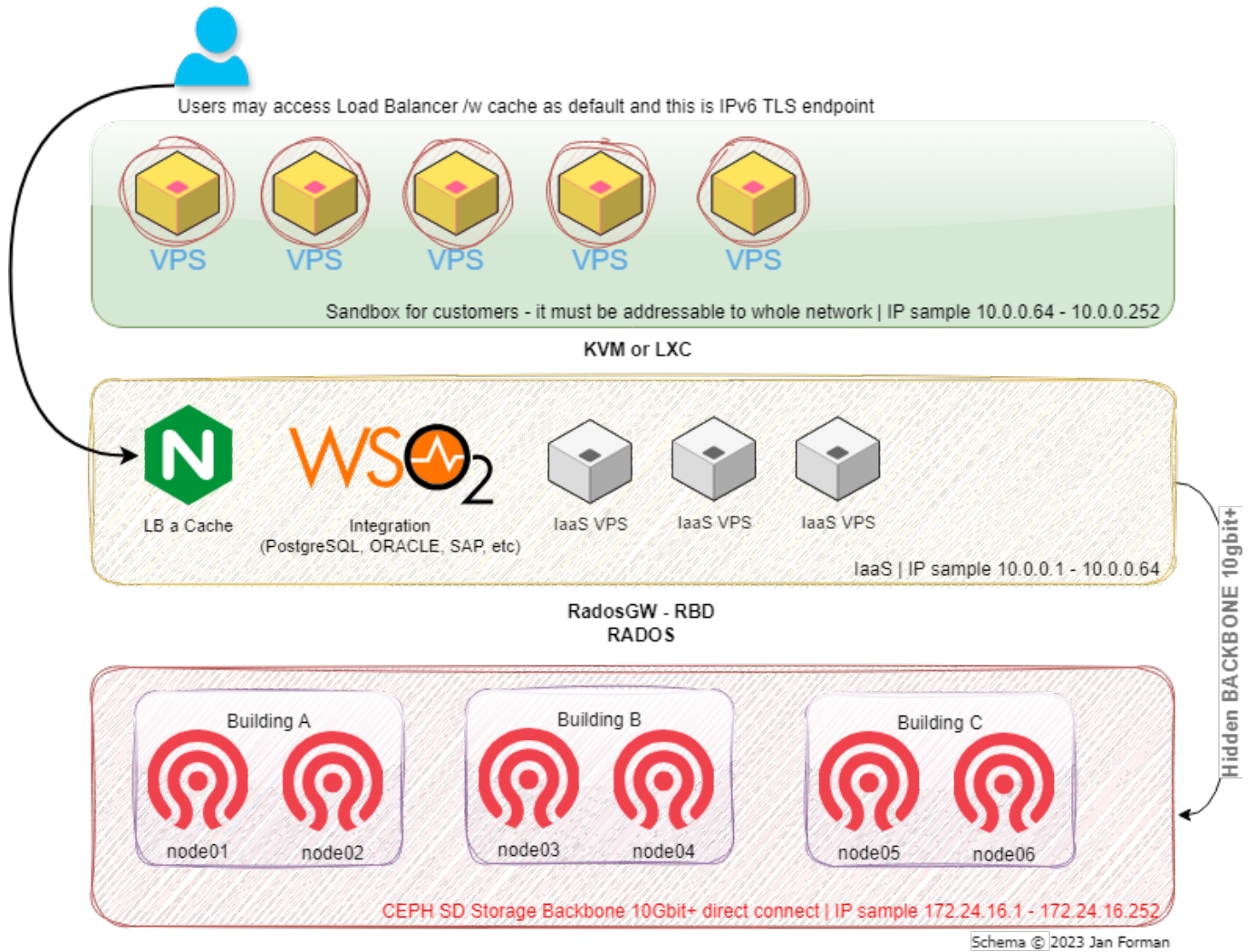
AWS Basic knowledge (Introduction by Chetan)

This is My Architecture playlist from AWS

[This is my architecture](#)

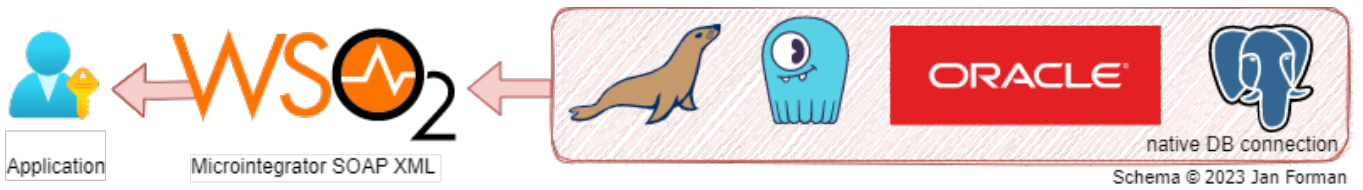
Schematics

Basic Topology



Firewalls are templates linked to VPS instance

Integration Schema



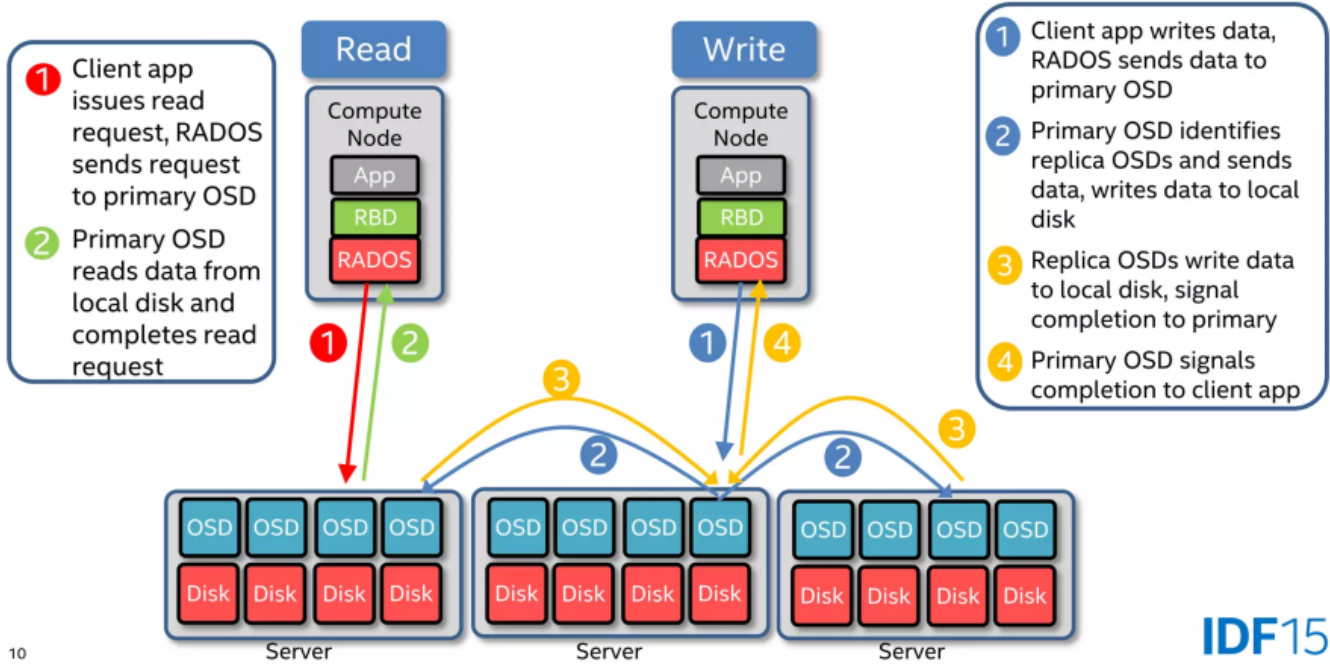
Service Flow

CEPH SD Storage Schema

Ceph Storage at CERN (IT Department)

Exabyte storage scaleout with Geocluster and autoscaling

Object Store Daemon (OSD) Read and Write Flow



IDF15

10 © 2015 Jian Zhang Intel CEPH software optimizations for cloud workloads

Replication HA schema

- root
- \ datacenter
- \ \ row
- \ \ \ rack
- \ \ \ \ host
- \ \ \ \ \ osd

AZ recommendation

EBS	1x AZ
EFS	~3x AZ (Full region)
S3	~3x AZ (Full region)

HA granularity

By service	No HA	Single AZ	MultiAZ
VPS	Yes	No	No
CephFS	No	Yes	may
Blockstorage - CEPH	No	Yes	may
Blockstorage - RustFS	Yes	may	No
Blockstorage - Garage	Yes	may	No
GalleraCluster	No	Yes	may
ScyllaDB	No	Yes	may
Mariadb	Yes	Yes	may
Postgresql	Yes	Yes	may
Citus	No	Yes	may

Software Stack

Cloud Core Infrastructure (IaaS)

Type	Cloud Service Description	CPU support
Compute Nodes and Management	AWS EC2 replacement with cloudinit support	ARM support
Openstack	Full, but as LEGO style	YES
Proxmox	Light, but EASY to implement	YES
- LXC may deploy container templates - both have native CEPH support		
SD Storage (Object, Block, File) Scaleout	AWS S3 compatible and EBS replacement	
AWS EBS - CEPH SD Block Storage	Hyperconverged or PetaSAN	YES
AWS EFS - CEPH SD File Storage	Hyperconverged or PetaSAN	YES
SD Load Balancer, Cache	AWS ELB / Citrix Netscaler replacement	
NGINX	or AlibabaCloud clone	YES
Integration + Enterprise Service Bus	IBM WebSphere replacement	
WSO2 Integrator		YES
Mass webhosting		
ISP Config		YES
MQTT Platform	AWS IoT core replacement	
Mosquitto		YES
Cloud Data Synchronization / Backup		
Rclone		YES
Restic		YES
Infrastructure Monitoring System	AWS CloudWatch replacement	
NetXMS		agent only
Grafana		YES
Kubernetes Orchestrator	AWS EKS replacement	
Mikro K8s		
Microsoft Windows	Windows Infrastructure	\$\$\$ not recommended
1x Datacenter - dedicated HW	Xx Server Standard on KVM	no/LIMITED
XXX users	CAL (client access licence) per user	
Cloudinit for Windows		

Deployment

Ansible
Terraform
Juju

Security as a Service (SECaaS)

Type	Cloud Service Description	CPU support
WAF (Application Firewall)		
OWASP® ModSecurity	+nginx connector	YES
SD Firewall	AWS VPC, Security groups replacement	
Integrated firewall with templates	inside hypervisor	YES
pfSense	+platform integrated (VPS sandboxing)	LIMITED

Software as a Service (SaaS)

Type	Info	Service Description	Location
Services and Management	API catalog	WSO2 API Manager	KVM or LXC
DB	PostgreSQL	CitusData (Sharding Cluster)	KVM or LXC
DB	PostgreSQL	Postgresql	KVM or LXC
DB	PostgreSQL	Neon	KVM or LXC
DB	MariaDB	MariaDB with GalleraCluster	KVM or LXC
DB	AWS DynamoDB replacement	ScyllaDB Alternator	KVM or LXC
Storage	AWS S3	Ceph version	CEPH Cluster
Storage	AWS S3	Garage	Garage
Storage	AWS S3	Minio version	Minio Cluster

Platform as a Service (PaaS)

Type	Name	Service Description	Location
Web Publishing	Info	Wordpress	ISPCConfig
Web Storage	Network Drive	NextCloud * can use AWS S3	ISPCConfig, LXC or KVM
Videoconferencing	Talk	Talk * WebRTC	Inside Nextcloud + coTurn Server
Bug Tracking	Bug Tracking	Mantis Bug Tracker	ISPCConfig
Forum	Discussion Forum	VanillaForums	ISPCConfig
Knowledge Base	Wikipedia	DokuWiki	ISPCConfig

* WebRTC is decentralized protocol it may needs some help from CDN

Cloud-Init

KVM - Virtual drive with configuration

LXC - scripts for distribution executed directly in container

API + CLI

[PROXMOX API documentation](#)

Multiuser setups

You may use pools inside Proxmox to separate users and namespaces inside Kubernetes

Kubernetes (MicroK8s)

The screenshot shows the Kubernetes dashboard interface. At the top, there's a navigation bar with 'Workloads > Pods' selected. On the left, a sidebar lists various Kubernetes resources like Cron Jobs, Daemon Sets, Deployments, etc. The main area is divided into two charts: 'CPU Usage' and 'Memory Usage', both showing data from 13:04 to 13:16. Below the charts is a table titled 'Pods' with columns for Name, Namespace, Images, Labels, Node, Status, Restarts, CPU Usage (cores), Memory Usage (bytes), and Created. The table lists several pods including 'registry-766d4b9987-tbg69', 'nginx-pod', 'nginx-ingress-controller-djcmc', 'metrics-server-df8dbf7f-bcp7c', and 'mariadb-pod'.

Name	Namespace	Images	Labels	Node	Status	Restarts	CPU Usage (cores)	Memory Usage (bytes)	Created
registry-766d4b9987-tbg69	container-registry	registry:2.8.1	app: registry pod-template-hash: 766d4b9987	microk8s	Running	0	1.00m	5.72Mi	22 minutes ago
nginx-pod	default	nginx	run: nginx-pod	microk8s	Running	0	0.00m	7.13Mi	25 minutes ago
nginx-ingress-controller-djcmc	ingress	registry.k8s.io/nginx-ingress-controller:v1.1.2	controller-revision-hash: 6d4f68995 name: nginx-ingress-microk8s	microk8s	Running	0	4.00m	102.25Mi	19 minutes ago
metrics-server-df8dbf7f-bcp7c	kube-system	registry.k8s.io/metrics-server:v0.6.3	pod-template-generation: 1 k8s-app: metrics-server	microk8s	Running	0	8.00m	16.79Mi	34 minutes ago
mariadb-pod	default	mariadb	run: mariadb-pod	microk8s	Running	0	1.00m	91.50Mi	26 minutes ago

Hardware Draft

Compute nodes
AMD Epyc
EBS - SD Storage
Ampere / ARM 4x core+

Security

Biometric Readers + card

Power Backup

Inside everyrack plus diesel generators outside building

Man-Trap

Cage or room with Biometric Readers + card

Zero-Trust-Security

Every microservice must not trust to anyone else

Main-Distribution-Frame (MDF)

Incoming and outgoing communication and power lines within a building

A panel or set of panels where all communication cables from different parts of the building are both terminated and connected.

Cage or room with Biometric Readers + card

Intermediate Distribution Frame (IDF)

A wall-mounted or free-standing rack used to manage and interconnect a telecommunications cable between end-user devices and the main distribution frame (MDF).

Meet-Me-Room (MMR)

Network interchange place

Cage or room with Biometric Readers + card

Carrier Hotel

Internet exchange points for an area.

East-West Traffic

From server to server within a network's data center

North-South Traffic

Data flowing from or to a system physically residing outside the data center

CDN

Content Delivery Network with NGINX or TENGINE

Hardware suppliers & Datacenter vendors

Reuse what's possible and make sense

Custom boards from 1000+ pcs

Hardware	Datacenter builders
ASRock Rack	Equinix
Gigabyte Enterprise	Digital Realty
Ingrasys	Cologix
Wiwynn	Aligned
Quanta Cloud Technology	DataBank
Tyan	NTT Data
Inventec	Digital Edge
ZT systems	EdgeConneX
Supermicro	
Aivres	

Remarks

Add Storage type

Datacenter

The screenshot shows a storage management interface. On the left is a sidebar menu with options: Search, Summary, Notes, Cluster, Ceph, Options, Storage (highlighted), Backup, Replication, Permissions, Users, API Tokens, and Two Factor. A dropdown menu is open over the 'Storage' option, listing various storage types: Directory, LVM, LVM-Thin, BTRFS, NFS, SMB/CIFS, GlusterFS, iSCSI, CephFS (highlighted), RBD, ZFS over iSCSI, ZFS, Proxmox Backup Server, and ESXi. In the background, a table lists existing storage configurations:

Type	Content
RBD (PVE)	Disk image, Container
Directory	VZDump backup file
LVM-Thin	Disk image, Container
NFS	VZDump backup file
NFS	Disk image, ISO image, Container template

Backup

Virtual Machine 111 (ora-jispcv.hzscr.internal) on node 'cloud-gis02' legacy sql Start Shutdown Migrate Console More Help

Backup now Restore Show Configuration Edit Notes Change Protection Remove Storage: synology-backup

Name	Notes	Date ↓	Format	Size
vzdump-qemu-111-2024_08_24-03_00_04.vma.zst		2024-08-24 03:00:04	vma.zst	140.98 GB
vzdump-qemu-111-2024_08_17-03_00_00.vma.zst		2024-08-17 03:00:00	vma.zst	141.38 GB
vzdump-qemu-111-2024_08_10-03_00_01.vma.zst		2024-08-10 03:00:01	vma.zst	142.88 GB
vzdump-qemu-111-2024_08_03-03_00_10.vma.zst		2024-08-03 03:00:10	vma.zst	143.00 GB
vzdump-qemu-111-2024_07_27-03_00_00.vma.zst		2024-07-27 03:00:00	vma.zst	143.10 GB
vzdump-qemu-111-2024_07_20-03_00_10.vma.zst		2024-07-20 03:00:10	vma.zst	143.09 GB
vzdump-qemu-111-2024_07_13-03_00_05.vma.zst		2024-07-13 03:00:05	vma.zst	143.64 GB

Storage CEPH

Replication schema

Reload Create OSD Manage Global Flags No OSD selected Details Start Stop

Name ↑	Class	OSD Type	Status	Version	weight	reweight	Used (%)	Total	Apply/Commit Latency (ms)	PGs
default				18.2.2						
cloud-gis00				18.2.2						
osd.0	ssd	bluestore	up / in	18.2.2	1.74599	1.00	7.87	1.75 TiB	1 / 1	86
osd.7	ssd	bluestore	up / in	18.2.2	1.74599	1.00	10.99	1.75 TiB	1 / 1	76
osd.8	ssd	bluestore	up / in	18.2.2	1.81879	1.00	10.16	1.82 TiB	1 / 1	79
cloud-gis01				18.2.2						
osd.1	ssd	bluestore	up / in	18.2.2	1.7466	1.00	10.11	1.75 TiB	0 / 0	87
osd.2	ssd	bluestore	up / in	18.2.2	1.7466	0.95001	10.54	1.75 TiB	0 / 0	72
osd.3	ssd	bluestore	up / in	18.2.2	1.7466	0.95001	8.79	1.75 TiB	0 / 0	82
cloud-gis02				18.2.2						
osd.4	ssd	bluestore	up / in	18.2.2	1.7466	0.90002	9.20	1.75 TiB	0 / 0	78
osd.5	ssd	bluestore	up / in	18.2.2	1.7466	1.00	8.77	1.75 TiB	0 / 0	75
osd.6	ssd	bluestore	up / in	18.2.2	1.7466	0.95001	11.45	1.75 TiB	0 / 0	88

CEPH One SSD backbone network connectivity

Details: OSD 8 ⊗

Reload

General **Network** Devices

Front Address (Client & Monitor)	v2: 172.24.16.1:6808 v1: 172.24.16.1:6809
Heartbeat Front Address	v2: 172.24.16.1:6813 v1: 172.24.16.1:6814
Back Address (OSD)	v2: 172.24.16.1:6810 v1: 172.24.16.1:6811
Heartbeat Back Address	v2: 172.24.16.1:6816 v1: 172.24.16.1:6818

CEPH Pools (replication config)

Pool #	Name	Size/min	# of Placement Groups	Optimal # of PGs	Autoscale Mode	CRUSH Rule (ID)	Used (%)
3	ceph-pool	3/2	64	32	off	replicated_rule (0)	1.61 TiB (12.81%)
12	.mgr	3/2	1	1	on	replicated_rule (0)	209.26 MiB (0.00%)
13	.rgw.root	3/2	32	32	warn	replicated_rule (0)	48.00 KiB (0.00%)
14	default.rgw.log	3/2	32	32	warn	replicated_rule (0)	408.00 KiB (0.00%)
15	default.rgw.control	3/2	32	32	warn	replicated_rule (0)	0 B (0.00%)
16	default.rgw.meta	3/2	8	8	warn	replicated_rule (0)	119.21 KiB (0.00%)
17	default.rgw.buckets.index	3/2	8	8	warn	replicated_rule (0)	157.69 KiB (0.00%)
18	default.rgw.buckets.data	3/2	32	32	warn	replicated_rule (0)	93.65 GiB (0.83%)
19	default.rgw.buckets.non-ec	3/2	32	32	warn	replicated_rule (0)	15.59 KiB (0.00%)
							1.70 TiB

Create VM

Create: LXC Container

General **Template** Disks CPU Memory Network DNS Confirm

Storage:

Template:

Name	For...	Size
amzn-2-standard-amd64.tar.gz	tgz	91.42 MB
centos-6-arctic_10-1_x86_64.tar.gz	tgz	1.37 GB
centos-6-oracle12c-1_x86_64.tar.gz	tgz	5.56 GB
debian-12-standard_12.2-1_amd64.tar.zst	tzst	126.13 MB
oracle-8-cloud_amd64.tar.gz	tgz	214.10 MB
rockylinux-9-default_20221109_amd64.tar.xz	txz	102.70 MB
ubuntu-22.04-standard_22.04-1_amd64.tar.zst	tzst	129.82 MB
ubuntu-24.04-standard_24.04-2_amd64.tar.zst	tzst	141.59 MB

Running VM

Virtual Machine 125 (wso2mi.hzspk.internal) on node 'cloud-gis02'

Start Shutdown Migrate Console More Help

Summary

- Console
- Hardware
- Cloud-Init
- Options
- Task History
- Monitor
- Backup
- Replication
- Snapshots
- Firewall
- Permissions

wso2mi.hzspk.internal (Uptime: 361 days 20:35:0)

Status: running

HA State: started, Group: XeonE5-2680

Node: cloud-gis02

CPU usage: 1.11% of 4 CPU(s)

Memory usage: 70.62% (2.82 GiB of 4.00 GiB)

Bootdisk size: 16.00 GiB

IPs: 10.160.149.9, fe80::be24:11ff:fe0e:2628

Notes: WSO2 µIntegrator 4.1 == ! ==
IP: 10.160.149.9 @ UBUNTU 22.04 LTS 64bit
ORACLE, Postgres, MariaDB, MSSQL connectors
+Mosquito 3.1 +NGINX

CPU usage graph: Shows CPU usage percentage over time, fluctuating between approximately 1% and 1.2%.

Memory usage graph: Shows total and RAM usage in bytes over time, with RAM usage consistently around 2.8 GiB.

Network traffic graph: Shows network traffic in bytes over time, with a significant spike in netin traffic around 2024-08-21.

Container 106 (sz-hzscr.internal) on node 'cloud-gis01' No Tags

Start Shutdown Migrate Console More Help

Week (average)

sz-hzscr.internal (Uptime: 12 days 21:06:43) CentOS

Status running

HA State none

Node cloud-gis01

Unprivileged No

CPU usage 0.01% of 6 CPU(s)

Memory usage 13.07% (133.79 MiB of 1.00 GiB)

SWAP usage N/A

Bootdisk size 18.43% (2.87 GiB of 15.58 GiB)

Notes

Polohy SŽ, IZS == 1 ==

IP: 10.160.149.24 @ ROCKY Linux 8.10 + NGINX + PHP + SQLite3 + SpatialLite

Parsuje data SŽ a na základě propojení dat odhaduje polohu vlaků Poskytuje GeoJSON rozhraní nad polohami vozidel

<http://10.160.149.24>

CPU usage

Memory usage

Network traffic

Firewall Template (SEcaaS)

Group:		Rules:												
Create	Remove	Add	Copy	Remove	Edit									
Group ↑	Comment	On	Type	Action	Macro	Protocol	Source	S.Port	Destination	D.Port				
ags	ArcGIS Enterprise	<input checked="" type="checkbox"/>	out	ACCEPT	Ping									
lb	Load Balancer	<input checked="" type="checkbox"/>	out	DROP										
scylladb	Big Data	<input checked="" type="checkbox"/>	in	ACCEPT	Ping									
web	Accept HTTP traffic	<input checked="" type="checkbox"/>	in	ACCEPT		tcp			+cloud	8080				
wso2	Micro Integrator	<input checked="" type="checkbox"/>	in	ACCEPT	HTTP		+cloud		+cloud					
		<input checked="" type="checkbox"/>	in	ACCEPT	HTTPS		+cloud		+cloud					
		<input checked="" type="checkbox"/>	in	DROP										

MultiCluster Proxmox Dashboard

The screenshot displays the Proxmox VE dashboard with the following sections:

- System Resources:** CPU (2.5%), RAM (45.6%), and DISK (23.0%) usage for the cloud-gis cluster.
- Status:** 3 online node(s), 0 offline node(s).
- Virtual machines:** 6 virtual machine(s) started, 1 virtual machine(s) stopped, 0 template(s).
- LXC Containers:** 18 LXC container(s) started, 1 LXC container(s) stopped.
- Resources Summary:**
 - CPU: 3% (144 CPU(s))
 - RAM: 46% (169.69 GB / 371.36 GB)
 - DISK: 25% (24.74 TB / 98.93 TB)
- Nodes Table:**

Node	ID	IP	CPU	RAM	DISK	UPTIME
cloud-gis00	1	10.160.149.10	4.4%	14.8%	7.1%	40 jour(s) 00:45:58
cloud-gis01	2	10.160.149.11	1.9%	72.4%	15.3%	411 jour(s) 03:05:45
cloud-gis02	3	10.160.149.12	1.4%	70.4%	19.3%	413 jour(s) 02:14:02
- Server load:** A line graph showing AVG server load for cloud-gis00, cloud-gis01, and cloud-gis02 over time.
- Activity Log:**

Start time	End time	Duration	Node	User	Description	Status
28/08/24 11:48:08	28/08/24 11:48:55	00:00:47	cloud-gis00	root@pam	Shell	OK
28/08/24 11:45:54	28/08/24 11:48:06	00:02:12	cloud-gis00	root@pam	Shell	OK
28/08/24 11:45:04	28/08/24 11:45:49	00:00:45	cloud-gis00	root@pam	Shell	OK
28/08/24 11:08:12	28/08/24 11:52:25	00:44:13	cloud-gis00	root@pam	Shell	OK
28/08/24 11:07:47	28/08/24 11:08:09	00:00:22	cloud-gis00	root@pam	Shell	OK

MultiCluster Kubernetes Dashboard

[Kubernetes KubeWall](#)

Proxmox on RaspberryPI 5 / with Win11 ARM inside

Proxmox direct import from VMWare ESXi

<https://www.youtube.com/watch?v=8Z9Zvt2RxlA>

AWS Load Balancer

VPC dashboard Subnets (1/2) info

Last updated 12 minutes ago Actions Create subnet

Find resources by attribute or tag

Name	Subnet ID	State	VPC	IPv4 CIDR	IPv6 CIDR	Available IPv4 addresses
<input checked="" type="checkbox"/>	subnet-0ff8394458cb94e1c	Available	vpc-05adaa844b29dde10	172.31.0.0/20	2a05:d016:8cd:c9c9::/64	4090
<input type="checkbox"/>	my-test-subnet-delete	Available	vpc-05adaa844b29dde10	172.31.16.0/24	-	250

subnet-0ff8394458cb94e1c

Details | Flow logs | Route table | Network ACL | CIDR reservations | Sharing | Tags

Details

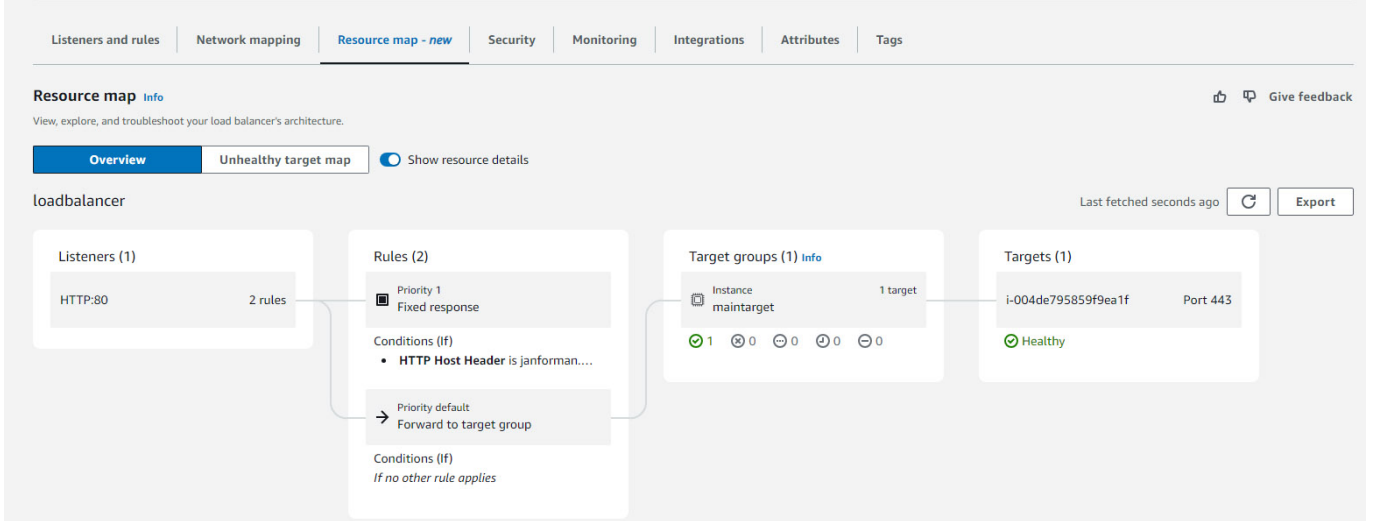
Subnet ID subnet-0ff8394458cb94e1c	Subnet ARN arn:aws:ec2:eu-north-1:964348697580:subnet/subnet-0ff8394458cb94e1c	State Available	IPv4 CIDR 172.31.0.0/20
Available IPv4 addresses 4090	IPv6 CIDR 2a05:d016:8cd:c9c9::/64	Availability Zone eu-north-1c	Availability Zone ID eun1-az3
Network border group eu-north-1	VPC vpc-05adaa844b29dde10	Route table rtb-0d4956eb400df7ae5	Network ACL acl-0fb585019407f5f5b
Default subnet Yes	Auto-assign public IPv4 address Yes	Auto-assign IPv6 address No	Auto-assign customer-owned IPv4 address No
Customer-owned IPv4 pool		IPv4 CIDR reservations	IPv6 CIDR reservations

loadbalancer Actions

Details

Load balancer type Application	Status Active	VPC vpc-05adaa844b29dde10	IP address type IPv4
Scheme Internet-facing	Hosted zone Z23TAZGLKFMNIO	Availability Zones subnet-0ff8394458cb94e1c eu-north-1c (eun1-az3) subnet-0072d5382bbbf4fa eu-north-1a (eun1-az1)	Date created June 17, 2024, 10:45 (UTC+02:00)
Load balancer ARN arn:aws:elasticloadbalancing:eu-north-1:964348697580:loadbalancer/app/loadbalancer/c523f95aa5f7762d	DNS name loadbalancer-873478218.eu-north-1.elb.amazonaws.com (A Record)		

Listeners and rules | Network mapping | **Resource map - new** | Security | Monitoring | Integrations | Attributes | Tags



EC2 > Target groups > maintarget

maintarget Actions ▾

Details

arn:aws:elasticloadbalancing:eu-north-1:964348697580:targetgroup/maintarget/a1235ec01f739182

Target type Instance	Protocol : Port HTTPS: 443	Protocol version HTTP1	VPC vpc-05adaa844b29dde10
IP address type IPv4	Load balancer loadbalancer		

1 Total targets	1 Healthy 0 Anomalous	0 Unhealthy	0 Unused	0 Initial	0 Draining
--------------------	-----------------------------	----------------	-------------	--------------	---------------

► **Distribution of targets by Availability Zone (AZ)**
Select values in this table to see corresponding filters applied to the Registered targets table below.

Registered targets (1) Anomaly mitigation: Not applicable ↻ Deregister Register targets

Target groups route requests to individual registered targets using the protocol and port number specified. Health checks are performed on all registered targets according to the target group's health check settings. Anomaly detection is automatically applied to HTTP/HTTPS target groups with at least 3 healthy targets.

Filter targets < 1 > ⚙

Instance ID	Name	Port	Zone	Health status	Health status details	Launch...	Anomaly detection result
i-004de795859f9ea1f	eu-north-1	443	eu-north-1c	Healthy	-	November...	Normal

AWS S3 (replicated across AZs within location), S3 Express One Zone (faster, cheaper only one zone)

Software stack overview

Sorted by my recommendation

Openstack	Pros	Cons
	OpenSource, cost-effective	Hard to setup
	Modular design	Modular design
	Ultimate solution for very large clouds	Higher maintenance costs
NASA Hybrid Cloud Amazon AWS and OpenStack, SEZNAM.cz		
AT&T runs its mobile core network on an OpenStack cloud, serving millions of subscribers.		
China Mobile, one of the world's largest telecom providers, is building the biggest NFV network based on OpenStack with over 50,000 servers.		
OpenStack is more alive than ever with 40 million cores in production and over 300 public cloud data centers worldwide.		
Proxmox	Pros	Cons
	OpenSource, cost-effective	Scalability issues for very large environments
	Easy to setup	approx. 32 servers in group more needs MultiCluster manager
	Multiple HV KVM, LXC	Limited enterprise support
	LXC is very lightweight	Upgrade on OS level
	Integrated SD storage, SD firewall (like AWS sg)	
	CEPH and ZFS implemented, IPAM support	
	Can consume CEPH from a dedicated cluster	
	Open vSwitch alternative to vSphere Distributed Switch	
	SDN Network alternative to NSX-T Data Center	
OpenNebula	Pros	Cons
	Multiple HV KVM, LXC, vCenter	
	Kubernetes included	
Nutanix AHV	Pros	Cons
	Kubernetes Support	Vendor-lock-in (Closed opensource products)
	Integrated storage and networking solutions	Messy Architecture
	Rocky Linux, Cassandra	No external storage support
Microsoft Hyper-V	Pros	Cons

Openstack	Pros	Cons
	Easy to setup	Cost, limited functionality
		Additional licensing costs!
		Vendor-lock-in
VMWare	Pros	Cons
	Easy to setup	Higher cost
		Additional licensing costs!
		Vendor-lock-in

CEPH	Pros	Cons
	No single point of failure	Complex
	Data durability via replication or erasure coding	minimum 8nodes+ recommended
	No interruption of service from rolling upgrades, online expansion, etc.	QoS on pool
	A single cluster can serve object, block, and file	
	Compatibility with Openstack, S3, K8s, Proxmox	

Notable known references	
Approx 3500 clusters worldwide with more than 1.5EB capacity	
CERN storage services and its support of experiments, 37000 users 5100 projects in data centers.	
SAMSUNG CHINA MOBILE	DigitalOcean
My experience from 7.3.2018 in production 18TB MLC AllFlash	

Competitors [Dell Isilon](#) [Dell Powerflex](#)

You may connect storage nodes with one network card and compute nodes with two (in LACP mode)

Openstack

The screenshot shows the OpenStack dashboard interface. At the top, there is a navigation bar with the OpenStack logo, the user's email 'janforman.com', and the role 'admin'. Below the navigation bar, a sidebar on the left lists various project components: Project, API Access (highlighted), Compute, Volumes, Container Infra, Network, Admin, and Identity. The main content area is titled 'API Access' and shows a list of service endpoints. At the top right of this area, there are buttons for 'View Credentials' and 'Download OpenStack RC File'. The list of endpoints is as follows:

Service	Service Endpoint
Compute	http://10.20.21.12:80/openstack-nova/v2.1
Identity	http://10.20.21.12/openstack-keystone/v3
Image	http://10.20.21.12:80/openstack-glance
Network	http://10.20.21.12:80/openstack-neutron
Placement	http://10.20.21.12:80/openstack-placement
Volumev2	http://10.20.21.12:80/openstack-cinder/v2/9cca5b7c2ba3428e95d3e71da229a71b
Volumev3	http://10.20.21.12:80/openstack-cinder/v3/9cca5b7c2ba3428e95d3e71da229a71b

Below the list, it indicates 'Zobrazeno 7 položek' (Showing 7 items).

Spustit instanci



Podrobnosti

Typy určují velikost výpočetních, pamětních a úložných možností instance.

Zdroj

Přiděleno

Zobrazena 1 položka

Typ

Název	VCPUS	RAM	Celková kapacita disku	Systémový disk	Efemérní disk	Veřejné
> t4g.small	2	8 MB	8 GB	0 GB	8 GB	Ano

Zobrazena 1 položka

Sítě

Síťové porty

Bezpečnostní skupiny

▼ Dostupné 4

Vyberte jeden

Key Pair

Konfigurace

Zobrazeny 4 položky

Skupiny serverů

Název	VCPUS	RAM	Celková kapacita disku	Systémový disk	Efemérní disk	Veřejné
> m1.tiny	1	512 MB	4 GB	4 GB	0 GB	Ano
> m1.small	1	2 GB	30 GB	30 GB	0 GB	Ano
> m1.medium	2	4 GB	60 GB	60 GB	0 GB	Ano
> m1.large	4	8 GB	90 GB	90 GB	0 GB	Ano

Zobrazeny 4 položky

Plánovač pokynů

Metadata

✕ Zrušit

< Zpět

Další >

Spustit instanci

Vytvořit obraz



Detaily obrazu *

Metadata

Detaily obrazu

Zadejte obraz pro nahrání do Služby obrazů.

Název obrazu

windows xp

Popis obrazu

Zdroj obrazu

Soubor *

Vybrat soubor WinXPSP3-VE-052011.iso

Formátovat *

- ISO - obraz optického disku
- PLOOP - Virtuozzo/Parallels Loopback Disk
- QCOW2 - emulátor QEMU
- Raw
- VDI - obraz virtuálního disku
- VHD - virtuální pevný disk
- VMDK - disk virtuálního stroje
- AKI - obraz kernelu Amazon**
- AMI - obraz stroje Amazon
- ARI - obraz Ramdisku Amazon

Viditelnost

- Privátní
- Sdíleno
- Community
- Veřejné

Ramdisk

Zvolit obraz

Minimální kapacita disku (GB)

0

Minimum RAM (MB)

0

Chráněno

- Ano
- Ne

Zrušit

< Zpět

Další >

Vytvořit obraz

- Project
- API Access
- Compute
- Overview
- Instances
- Images
- Key Pairs**
- Server Groups
- Volumes
- Container Infra
- Network
- Admin
- Identity

Project / Compute / Key Pairs

Key Pairs

Click here for filters or full text search. + Vytvořit klíč Import Public Key Delete Key Pairs

Zobrazena 1 položka

<input type="checkbox"/>	Název ^	Typ	
<input type="checkbox"/>	eu-plz-cloud	ssh	Delete Key Pair

Zobrazena 1 položka

openstack. janforman.com • admin admin

Project / Volumes / Volumes

Volumes

Filter + Create Volume ⇄ Accept Transfer 🗑 Delete Volumes

Zobrazena 1 položka

<input type="checkbox"/>	Name	Description	Size	Status	Group	Type	Attached To	Availability Zone	Bootable	Encrypted	Actions
<input type="checkbox"/>	elastic volume	-	8GiB	-	-	ebs-1000	nova	nova	No	No	Delete Volume

Project | API Access | Compute | Volumes | Snapshots | Groups | Group Snapshots | Container Infra | Network | Admin | Identity

MINIO S3 service for small networks

MINIO
OBJECT STORE
ADFL LICENSE

User

- Object Browser
- Access Keys
- Documentation

Administrator

- Buckets
- Policies
- Identity
- Monitoring
- Metrics**
- Logs
- Audit
- Events
- Configuration
- License

Metrics

Info Usage Traffic Resources

Server Information

Buckets

2

[Browse](#)

Objects

39

Reported Usage

4 GiB

- Time since last Heal Activity: n/a
- Time since last Scan Activity: n/a
- Uptime: n/a

Servers

3

● Online ● Offline

Drives

3

● Online ● Offline

Backend type: Erasure ✓

Standard storage class parity: 1 ✓

Reduced redundancy storage class parity: 1 ✓

Servers (3)

minio1.janforman.com:9000 ● 1/1 ● Drives 3/3 ● Network 30 minutes Up time Version: 2025-04-22T22:12:26Z ▼
minio2.janforman.com:9000 ● 1/1 ● Drives 3/3 ● Network 4 minutes Up time Version: 2025-04-22T22:12:26Z ▼
minio3.janforman.com:9000 ● 1/1 ● Drives 3/3 ● Network 1 hour Up time Version: 2025-04-22T22:12:26Z ▼

CEPH 3node 10gbit performance (KVM-VirtIO)

3 servers with 3xSSD (9 OSD)

Block Size	4k	(IOPS)	64k	(IOPS)
-----	---	----	----	----
Read	49.45 MB/s	(12.3k)	220.80 MB/s	(3.4k)
Write	49.54 MB/s	(12.3k)	221.96 MB/s	(3.4k)
Total	98.99 MB/s	(24.7k)	442.76 MB/s	(6.9k)
Block Size	512k	(IOPS)	1m	(IOPS)
-----	---	----	----	----
Read	597.15 MB/s	(1.1k)	663.25 MB/s	(647)
Write	628.88 MB/s	(1.2k)	707.43 MB/s	(690)
Total	1.22 GB/s	(2.3k)	1.37 GB/s	(1.3k)

CEPH Performance Proxmox

<https://www.proxmox.com/images/download/pve/docs/Proxmox-VE-Ceph-Benchmark-202312-rev0.pdf>

<https://cilium.io>

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