



UNIVERSITY OF ŽILINA  
Faculty of Management Science  
and Informatics

# Nasadenie a používanie privátneho akademického cloudu

**CSNOG 2024**

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# Katedra informačných sietí

- Výučba
  - Počítačové siete
    - Cisco, Juniper, Fortinet, Mikrotik
    - GNS3
  - VoIP
    - Asterisk
  - Administrácia OS
    - Linux, Windows
    - DNS, DHCP, NTP, Mail, Web..
  - Virtualizácia
    - KVM, XCP-ng, VMWare
    - AWS, OpenStack,
    - Docker, Kubernetes
  - Bezpečnosť
- Projektová výučba
  - 2 roky počas Ing. štúdia
- Záverečné práce
- Výskum
  - Cloud
  - Počítačové siete
  - SDN/SD-WAN
  - Bezpečnosť
  - Detekcia útokov a anomálií v sieťach

# Pred cloudom – do roku 2014

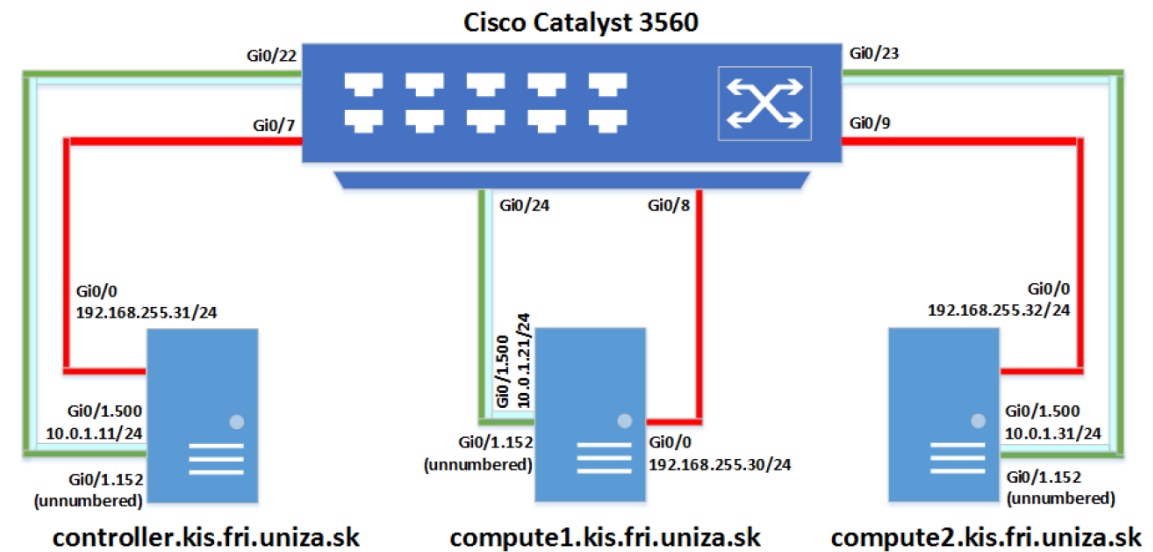
- Oracle VirtualBox na PC v laboratóriách
  - Pri poruche PC v učebni boli VM nedostupné
  - Študenti prezenčne v laboratóriu
  - Nedostatočné prostriedky
- Virtualizačný server
  - Dell PE T300
  - 1x Intel Xeon X3353, 8 GB RAM, 2x 500 HDD
  - Citrix XenServer 6.0
- Problém s automatizáciou rovnakej inštalácie



# Cloud 1.0 – rok 2014

- 1 Controller
  - Dell PE 1955 – 2x Intel Xeon E5335, 8 GB RAM, 2x 72 GB HDD
- 2 Compute node
  - Dell PE 2950 – 2x Intel Xeon E5450, 32 GB RAM, 2x 250 GB + 4x 320 GB HDD
  - Desktop PC – 1x Intel Core 2Duo 6420, 4 GB RAM, 1x 320 GB HDD

- OpenStack Juno
  - Manuálna inštalácia
  - 10tky hodín => 5hod



# Cloud 2.0 - Špecifikácie

## ■ Riadiace servery:

- 2ks Cisco UCS C220M3
  - 2x Xeon E5-2667v2 8c/16t,
  - 128GB RAM
  - 500GB SSD, 600GB HDD
  - 2x 10GbE
  - VMWare ESXi, XCP-ng

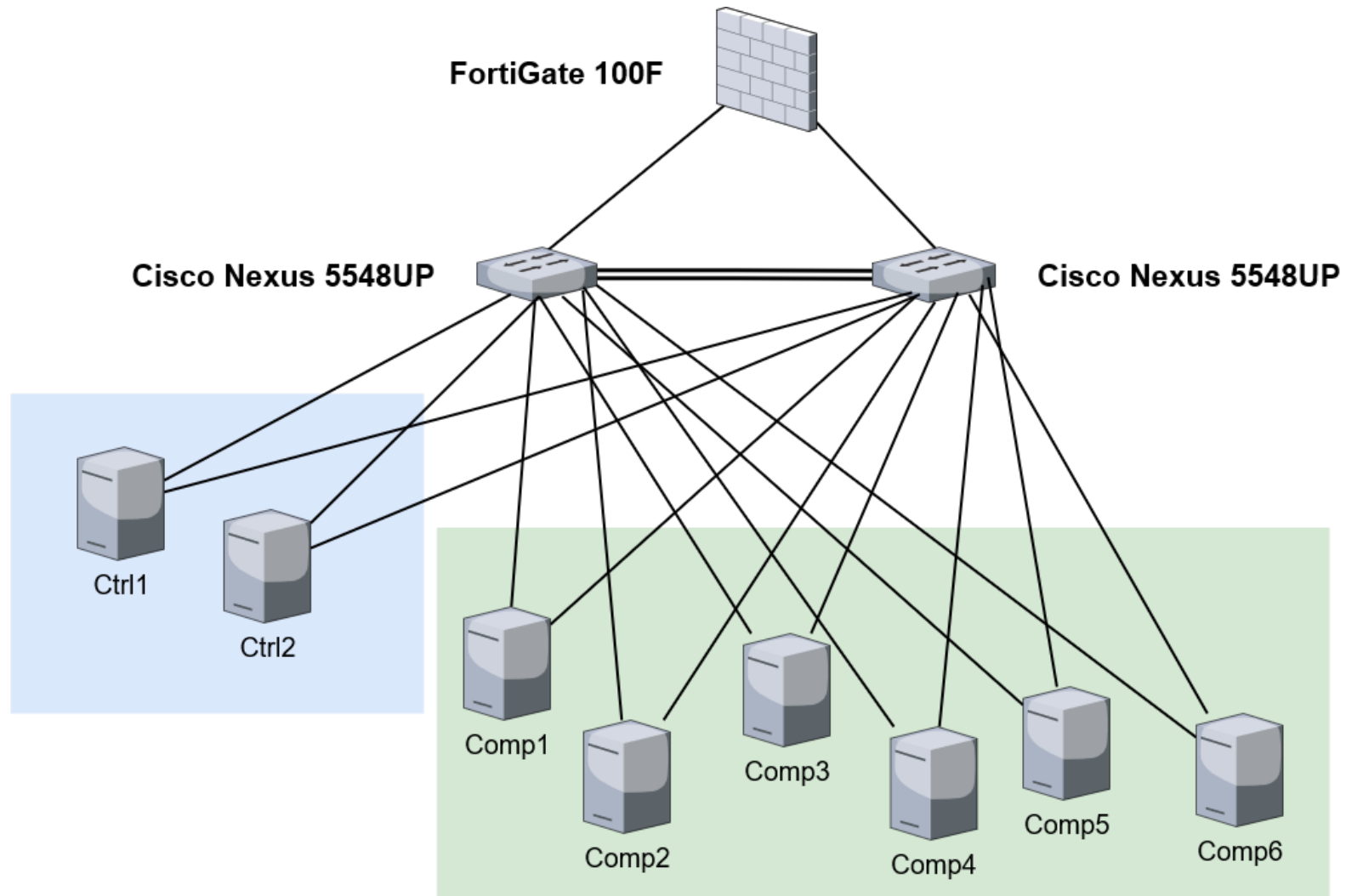


## ■ Výpočtové servery:

- 6ks Lenovo x3650M5
  - 2x Xeon E5-2699v3 18c/36t
  - (2 servery 2x Xeon E5-2680v4 14c/28t)
  - 512GB RAM
  - Systém: 300GB HDD
  - Storage: 4x 1,2TB HDD
  - 2x 10GbE



# Cloud 2.0 – Siet'



# OpenStack Charms

- Automatizované nasadenie
  - Canonical
  - MAAS – baremetal cez PXE
  - Juju
    - orchestrácia s charms
    - LXD / VM / baremetal
    - Charmhub (ako Docker Hub)
- OpenStack Yoga
  - Neutron, OVN, Nova, Horizon, Glance, Heat, Keystone, Vault, Cinder
- Ceph cluster



The screenshot shows the MAAS web interface. On the left is a dark sidebar with a menu containing categories like HARDWARE, KVM, ORGANISATION, CONFIGURATION, NETWORKING, and Settings. The main area displays a table of 10 machines. Each row includes a checkbox, the machine name (e.g., juju.maas), its IP address, status (On), hypervisor (Vmware or Ipmi), OS (Ubuntu 20.04 LTS), user, profile, architecture, and disk space. At the bottom, there are links for 'Local documentation', 'Legal information', and 'Give feedback', along with the Canonical logo and the version 'maas MAAS: 3.4.0'.

# OpenStack Charms – Postup nasadenia

1. Inštalácia MAAS a Juju
2. Nastavenie IPMI a PXE bootu na serveri
3. Pridanie serverov / VM do MAAS (+IPMI prístup)
4. Deployment Juju controllera (stačí VM)
5. Deployment OpenStacku
  - Samostatné príkazy pre jednotlivé moduly
    - `juju deploy -n 4 --channel reef/stable --config ceph-osd.yaml --constraints tags=compute ceph-osd`
    - `juju deploy -n 3 --to lxd:0,lxd:1,lxd:2 --channel 8.0/stable mysql-innodb-cluster`
  - Bundle (yaml popis)
  - 3 hodiny bez interakcie administrátora



# OpenStack Charms – Stav charmov

App	Version	Status	Scale	Charm	Channel	Rev	Exposed	Message
ceph-dashboard		active	3	ceph-dashboard	quincy/stable	35	no	Unit is ready
ceph-fs	17.2.5	active	3	ceph-fs	quincy/stable	57	no	Unit is ready
ceph-mon	17.2.5	active	3	ceph-mon	quincy/stable	173	no	Unit is ready and clustered
ceph-osd	17.2.5	active	3	ceph-osd	quincy/stable	559	no	Unit is ready (4 OSD)
ceph-radosgw	17.2.5	active	1	ceph-radosgw	quincy/stable	526	no	Unit is ready
cinder	20.2.0	active	1	cinder	yoga/stable	656	no	Unit is ready
cinder-ceph	20.2.0	active	1	cinder-ceph	yoga/stable	527	no	Unit is ready
cinder-mysql-router	8.0.35	active	1	mysql-router	8.0/stable	90	no	Unit is ready
dashboard-mysql-router	8.0.35	active	1	mysql-router	8.0/stable	90	no	Unit is ready
glance	24.2.0	active	1	glance	yoga/stable	562	no	Unit is ready
glance-mysql-router	8.0.35	active	1	mysql-router	8.0/stable	90	no	Unit is ready
heat	18.0.1	active	1	heat	yoga/stable	520	no	Unit is ready
keystone	21.0.0	active	1	keystone	yoga/stable	647	no	Application Ready
keystone-mysql-router	8.0.35	active	1	mysql-router	8.0/stable	90	no	Unit is ready
memcached		active	1	memcached	latest/stable	38	no	Unit is ready
mysql-innodb-cluster	8.0.35	active	6	mysql-innodb-cluster	8.0/stable	56	no	Unit is ready: Mode: R/W, Cluster is
ONLINE and can tolerate up to 2 failures.								
neutron-api	20.3.0	active	1	neutron-api	yoga/stable	560	no	Unit is ready
neutron-api-plugin-ovn	20.3.0	active	1	neutron-api-plugin-ovn	yoga/stable	29	no	Unit is ready
neutron-mysql-router	8.0.35	active	1	mysql-router	8.0/stable	90	no	Unit is ready
nova-cloud-controller	25.1.1	active	1	nova-cloud-controller	yoga/stable	679	no	Unit is ready
nova-compute	25.1.1	active	3	nova-compute	yoga/stable	681	no	Unit is ready
nova-mysql-router	8.0.35	active	1	mysql-router	8.0/stable	90	no	Unit is ready
ntp	3.5	active	3	ntp	latest/stable	50	no	chrony: Ready
openstack-dashboard	22.1.0	active	1	openstack-dashboard	yoga/stable	589	no	Unit is ready
ovn-central	22.03.2	active	3	ovn-central	22.03/stable	144	no	Unit is ready (leader: ovnsb_db)
ovn-chassis	22.03.2	active	3	ovn-chassis	22.03/stable	163	no	Unit is ready
placement	7.0.0	active	1	placement	yoga/stable	85	no	Unit is ready
placement-mysql-router	8.0.35	active	1	mysql-router	8.0/stable	90	no	Unit is ready
rabbitmq-server	3.8.2	active	5	rabbitmq-server	3.9/stable	182	no	Unit is ready and clustered
vault	1.7.9	active	1	vault	1.7/stable	107	no	Unit is ready (active: true, mlock:
disabled)								
vault-mysql-router	8.0.35	active	1	mysql-router	8.0/stable	90	no	Unit is ready

# OpenStack Charms – Stav charmov (2)

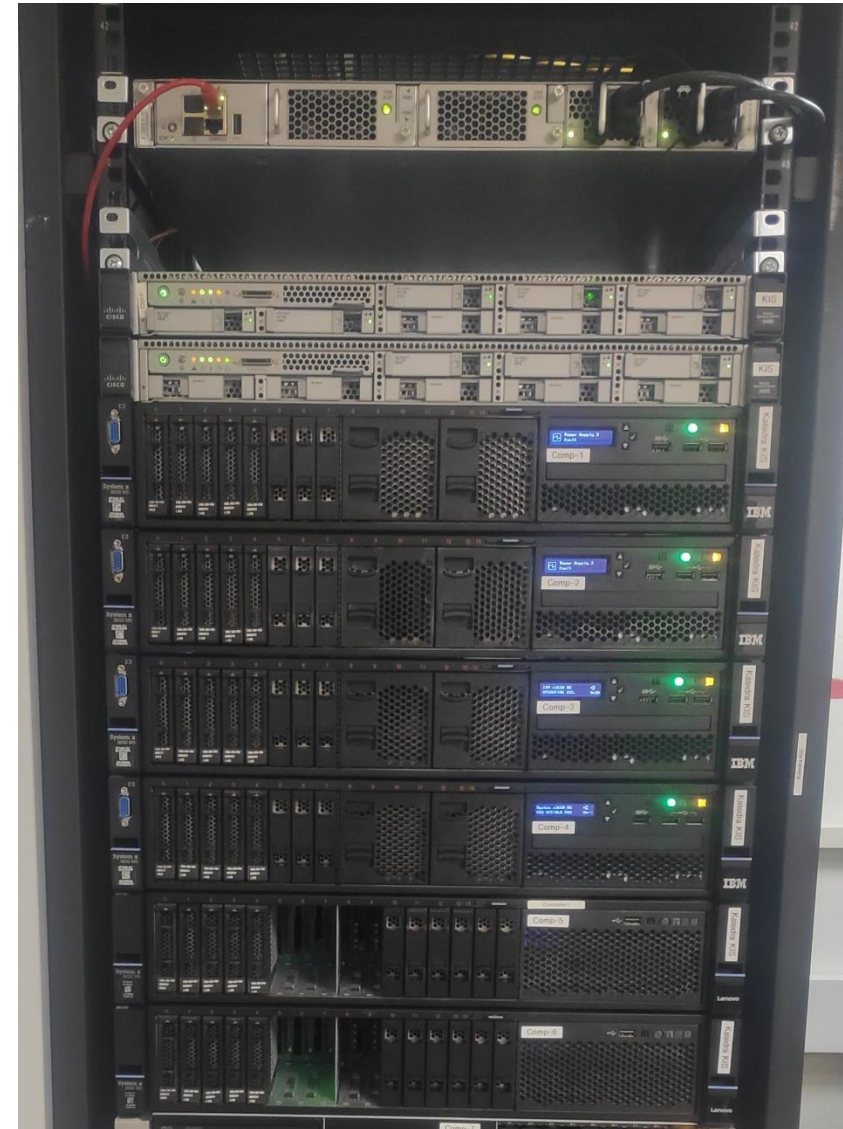
Unit	Workload	Agent	Machine	Public address	Ports	Message
ceph-fs/0	active	idle	1/lxd/0	10.11.1.21		Unit is ready
ceph-fs/1*	active	idle	2/lxd/0	10.11.1.25		Unit is ready
ceph-fs/2	active	idle	3/lxd/0	10.11.1.31		Unit is ready
ceph-mon/0*	active	idle	1/lxd/1	10.11.1.22		Unit is ready and clustered
ceph-dashboard/0	active	idle		10.11.1.22		Unit is ready
ceph-mon/1	active	idle	2/lxd/1	10.11.1.24		Unit is ready and clustered
ceph-dashboard/1	active	idle		10.11.1.24		Unit is ready
ceph-mon/2	active	idle	3/lxd/1	10.11.1.28		Unit is ready and clustered
ceph-dashboard/2*	active	idle		10.11.1.28		Unit is ready
ceph-osd/0*	active	idle	1	10.11.0.21		Unit is ready (4 OSD)
ceph-osd/1	active	idle	2	10.11.0.22		Unit is ready (4 OSD)
ceph-osd/2	active	idle	3	10.11.0.23		Unit is ready (4 OSD)
ceph-radosgw/0*	active	idle	0/lxd/0	10.11.1.19	80/tcp	Unit is ready
cinder/0*	active	idle	0/lxd/1	10.11.1.13	8776/tcp	Unit is ready
cinder-ceph/0*	active	idle		10.11.1.13		Unit is ready
cinder-mysql-router/0*	active	idle		10.11.1.13		Unit is ready
designate-bind/0*	active	idle	0/lxd/3	10.11.1.5		Unit is ready
designate/0*	active	idle	0/lxd/2	10.11.1.15	9001/tcp	Unit is ready
glance/0*	active	idle	0/lxd/4	10.11.1.2	9292/tcp	Unit is ready
glance-mysql-router/0*	active	idle		10.11.1.2		Unit is ready
heat/0*	active	idle	0/lxd/5	10.11.1.0	8000/tcp,8004/tcp	Unit is ready
keystone/0*	active	idle	0/lxd/6	10.11.1.1	5000/tcp	Unit is ready
keystone-mysql-router/0*	active	idle		10.11.1.1		Unit is ready
memcached/0*	active	idle	0/lxd/7	10.11.1.14	11211/tcp	Unit is ready
neutron-api/0*	active	idle	0/lxd/11	10.11.1.6	9696/tcp	Unit is ready
neutron-api-plugin-ovn/0*	active	idle		10.11.1.6		Unit is ready
neutron-mysql-router/0*	active	idle		10.11.1.6		Unit is ready
nova-cloud-controller/0*	active	idle	0/lxd/12	10.11.1.16	8774/tcp,8775/tcp	Unit is ready
nova-mysql-router/0*	active	idle		10.11.1.16		Unit is ready

# Problémy s Cloud 2.0 (OpenStack Charms)

- Dlhé výpadky elektrického prúdu
  - Nekonzistencia databázového clustra
  - Niektoré služby sa nespustia po výpadku
- RabbitMQ
  - Problém s kapacitou
    - Výpadky služieb/modulov => rozšírenie clustra
  - Citlivý na spoľahlivú infraštruktúru
    - Nekonzistencia clustra => autoheal

# Plány do budúcnosti

- Zálohovanie
- Bezpečný upgrade
- Rozšírenie o nové servery
- Zber metrík a logov
- Právne ošetrenie využívania služieb
- Pridanie ďalších služieb
  - Designate (DNS)
  - Manila (Shared FS)
  - Octavia (LB)
  - Skyline (nové GUI)
  - Ceilometer
- Doplnenie verejnej dokumentácie
  - <https://docs.cc.uniza.sk>
  - Nasadenie, riešenie problémov





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**Ďakujem za pozornosť.**

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