Services and Data Center IT infrastructure of VSB-TU Ostrava

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Data Center IaaS workshop
Helsinki, 11.9.2014

VSB-Technical University of Ostrava

- 25 000 students and 3000 employees on 7 faculties
- Center of information technologies provides centralized IT services (network, IT support, services and … data center)
- regional CESNET POP in our server rooms

Content

- Data Center infrastructure (network, servers, storage and server virtualization).
- Data Center services for university and other users.
- Data Center and network interconnection.

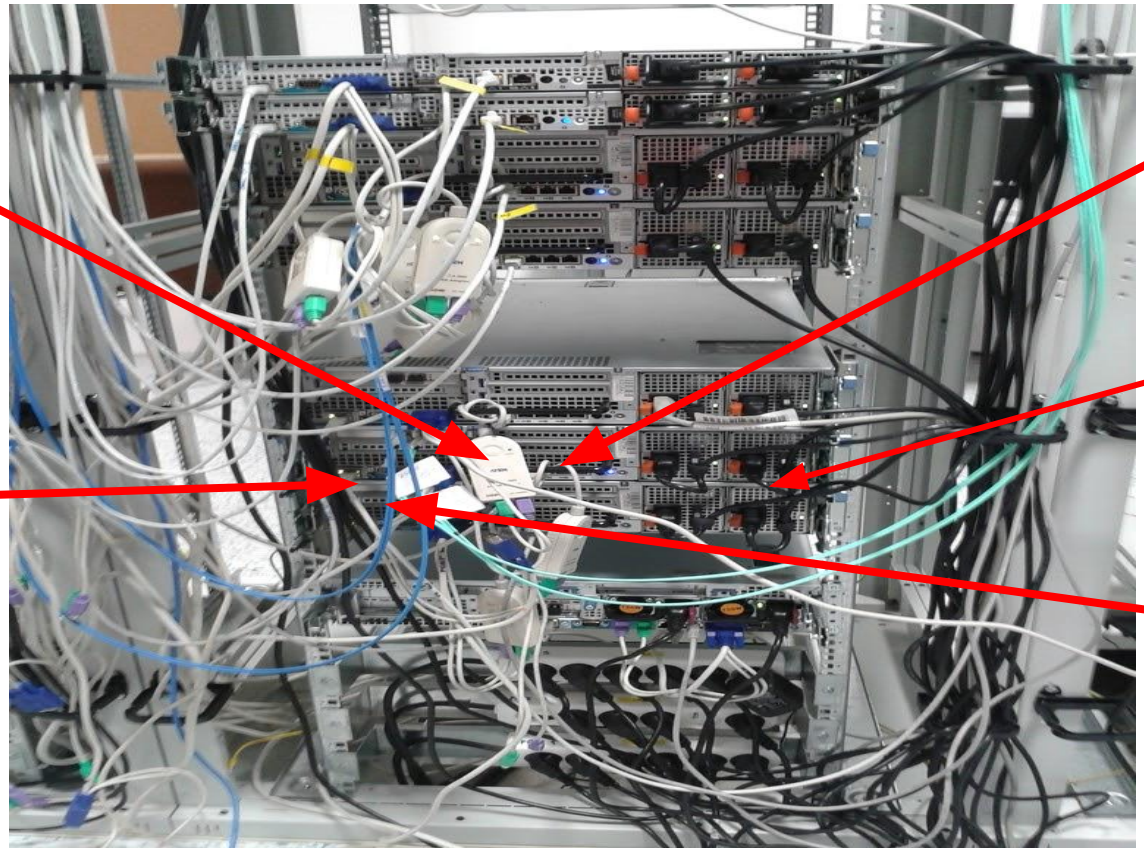
How DC looked before...

- before … 3 years ago
- “classical” technologies
- 1GE connectivity, port-channels
- complicated high-availability server connections
- stand-alone servers with local disks or HBA
- simple disk storage, SAN
- VMware vSphere for server virtualisation

Problems

- HW procurement (complicated law and regulations for public sector)
- backup hardware - higher costs
- bottleneck 1GE and 10GE was expensive
- network admins couldn’t see virtual machines in virtual infrastructure
- replacement/upgrade of simple disk storage
- elimination of local disks in servers, centralized disk storage
- conclusion - we needed better DC

How many cables server needs? :-)

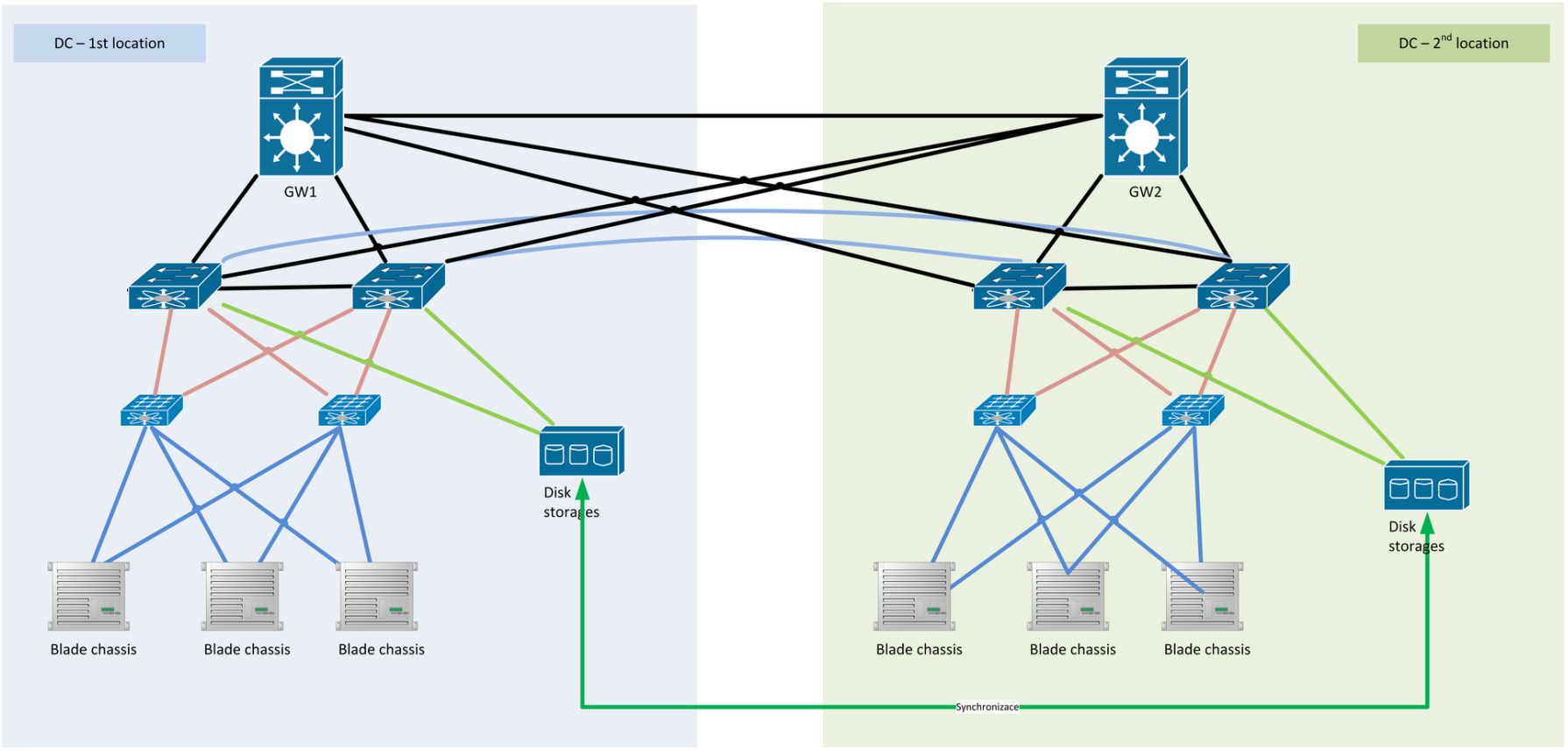


Main requirements

- integrate and use existing HW
- converged 10GE networks (DCB, FCoE)
- server virtualization
- N+1 redundancy in every layer (routers, switches, storages, …)
- scalable desing (mainly storages, servers, connectivity)
- multiple geographic separated locations
- LEGO design
- no vendor lock-in

Physical infrastructure

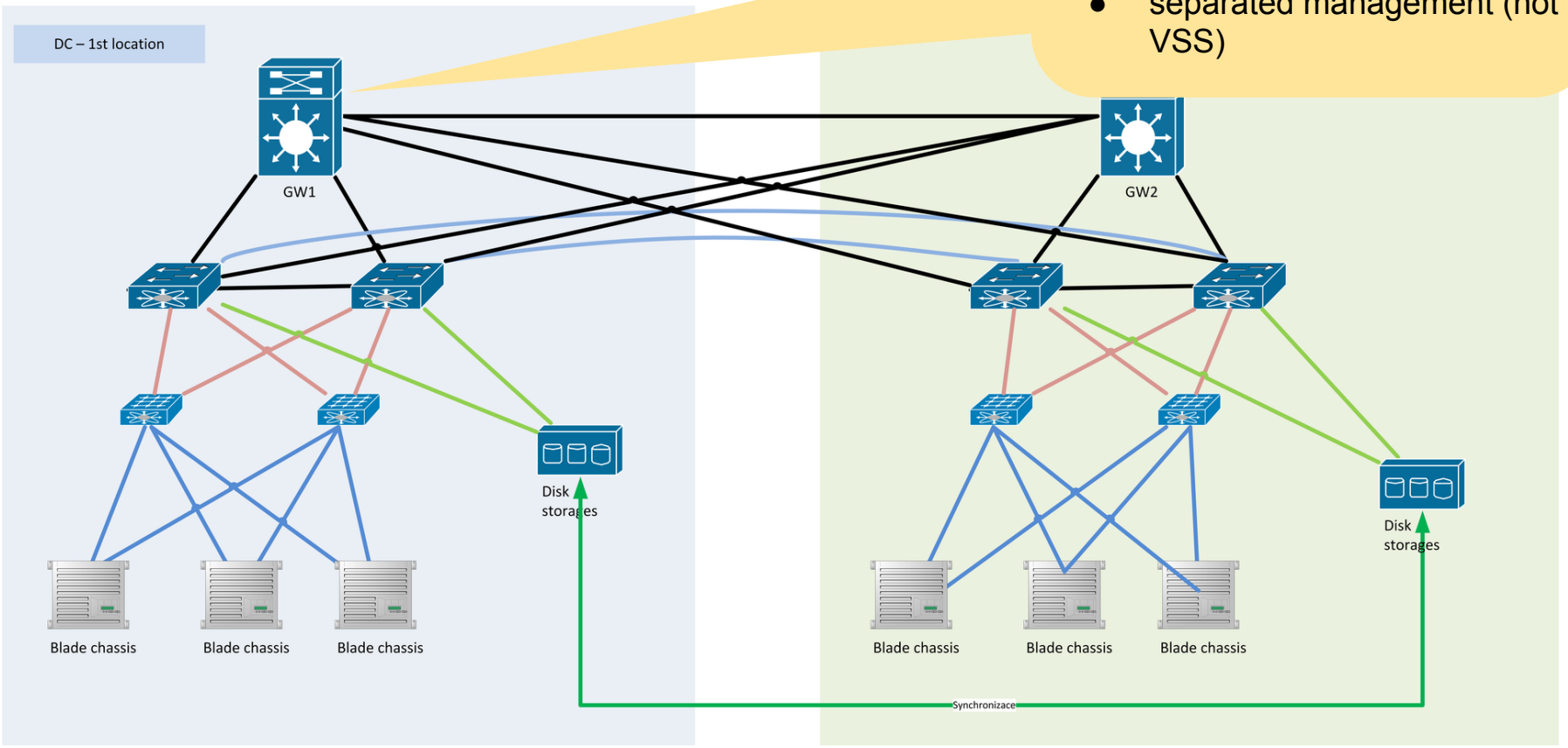
Basic DC topology, VSB – Technical University of Ostrava



Physical infrastruc

Cisco Catalyst 6500

- 10 GE ports
- routing, LAN switching
- IPv6, VRF, ...
- redundancy - VRRP, HSRP
- separated management (not VSS)

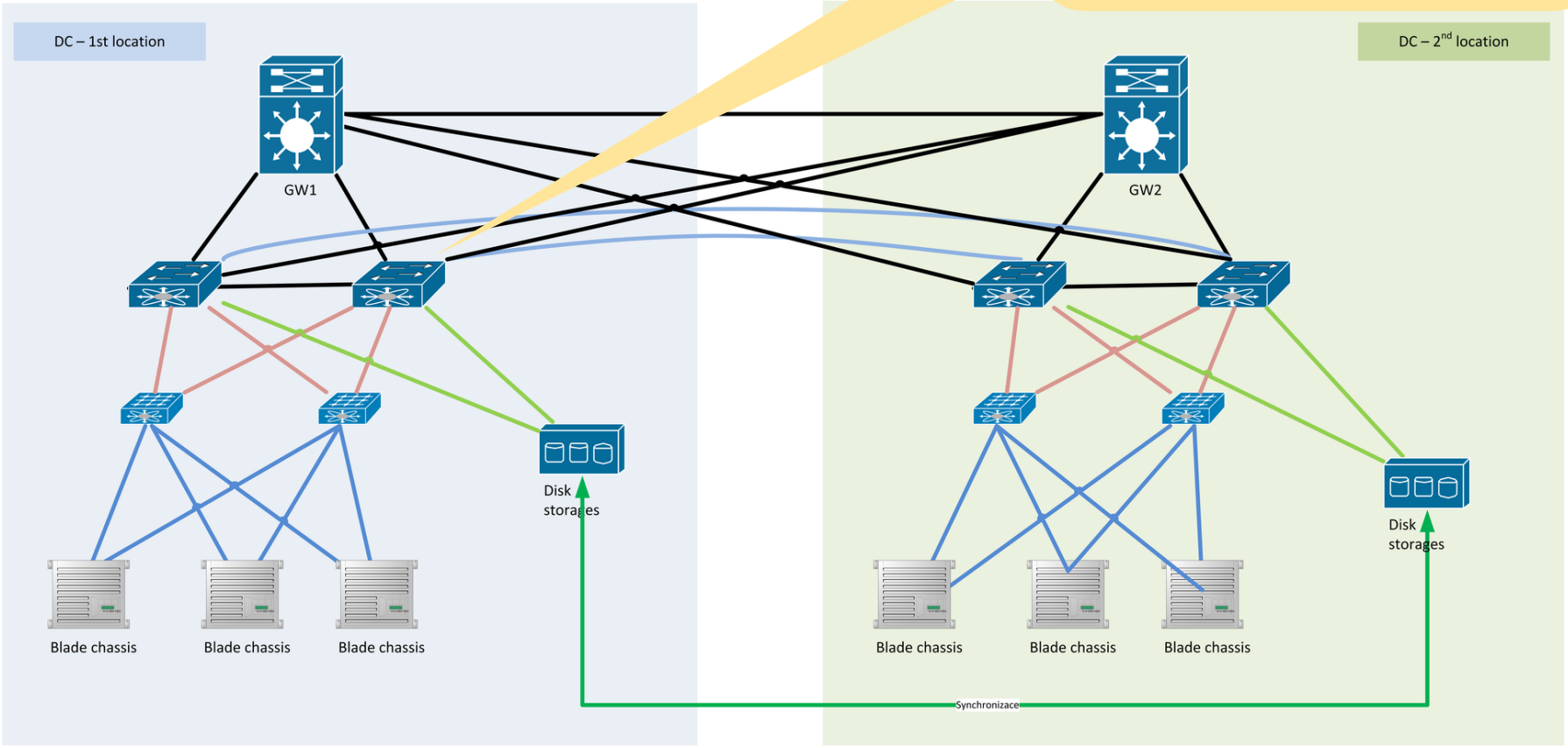


Physical infrastruc

Cisco Nexus 5548-UP

- LAN/SAN switching
- 10 GE DC ports
- FC ports
- vPC technology
- separated management

Basic DC topology, VSB – Technical Uni

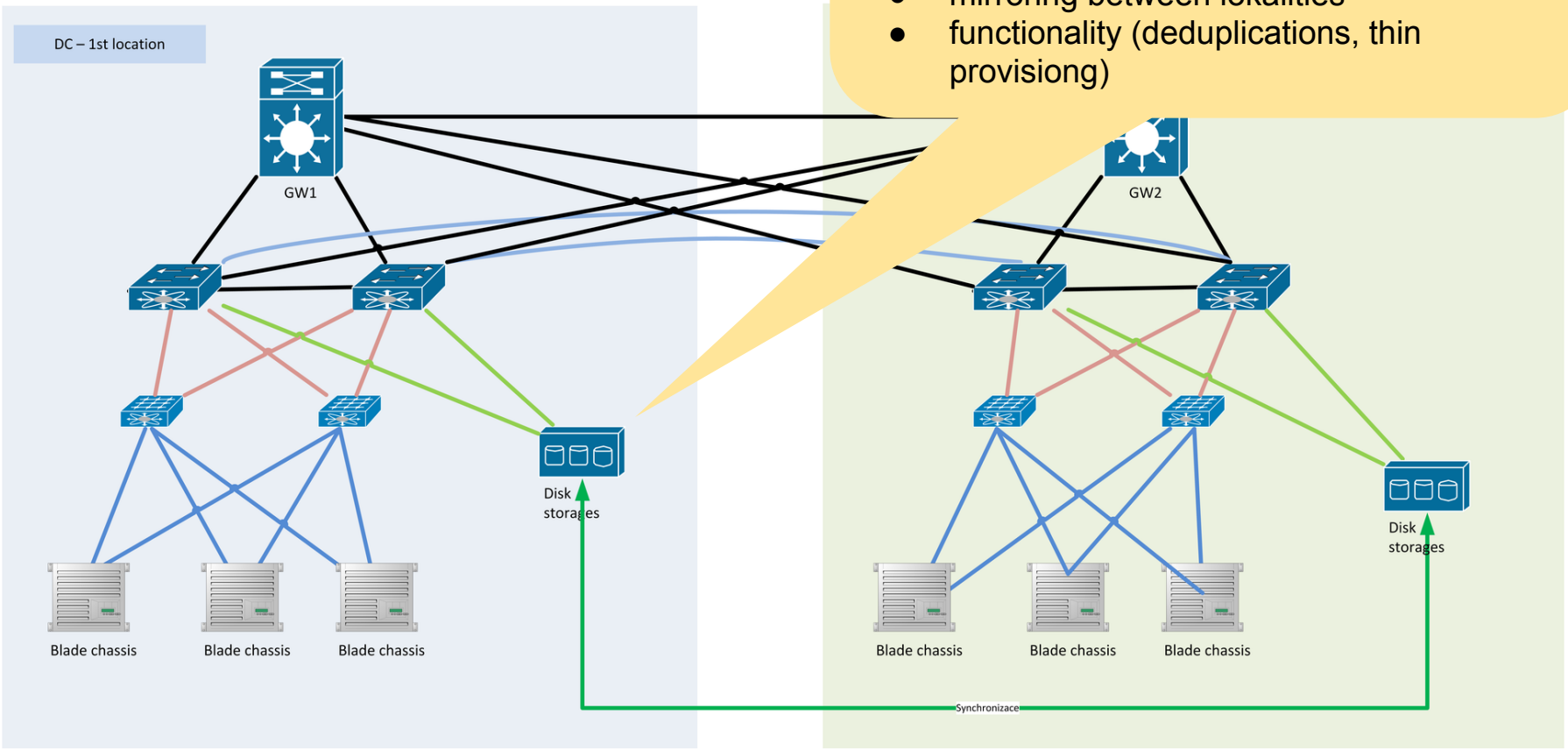


Physical infras

NetApp 3240

- disk storage
- FC, FCoE, NFS
- redundancy (2 controllers)
- Metrocluster technology
- mirroring between lokalities
- functionality (deduplications, thin provisiong)

Basic DC topology, VSB – Techn

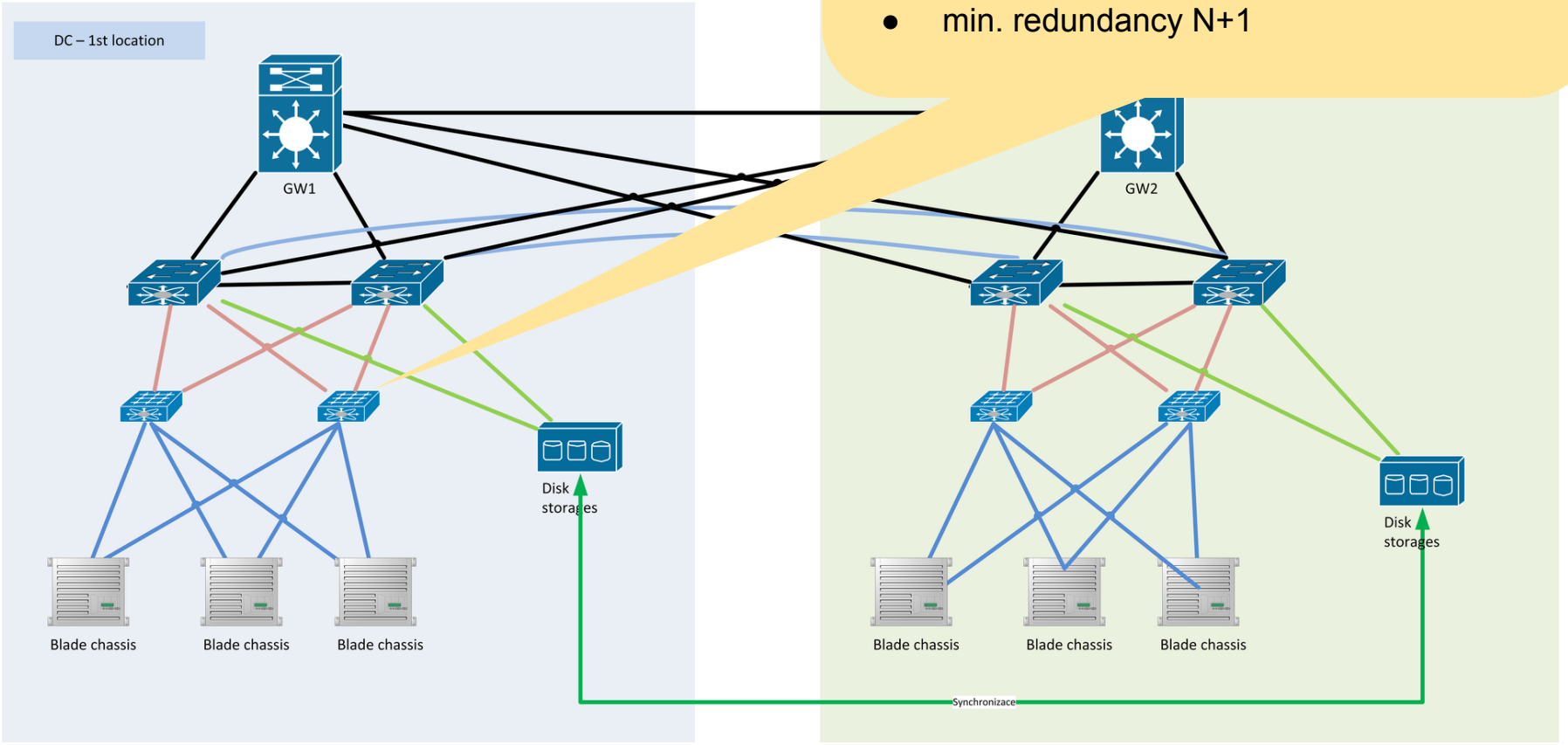


Fyzická infrast

Cisco UCS

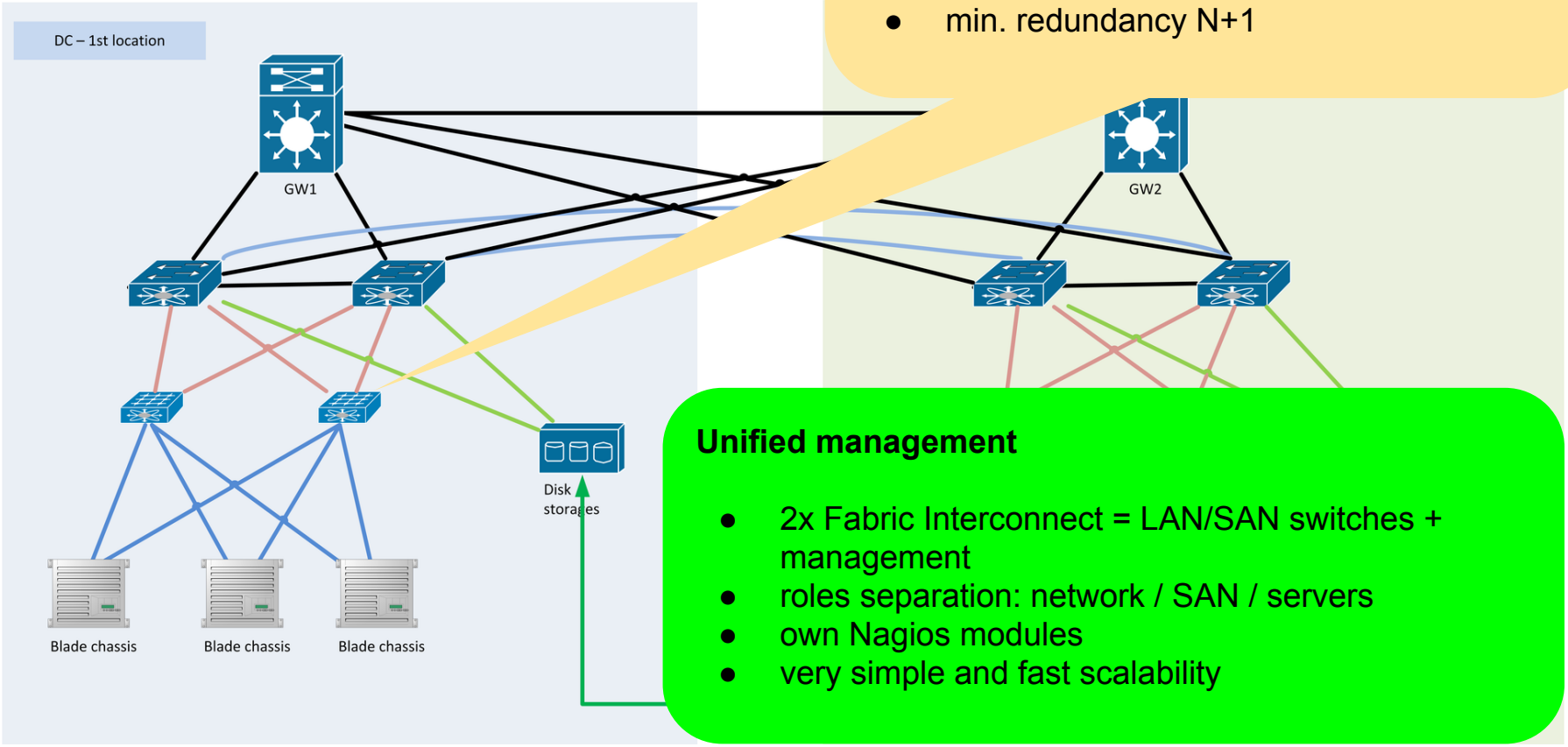
- consolidated server infrastructure
- Fabric Interconnect + blade chassis
- unified management
- server's profiles ("server DNA")
- IO modules
- min. redundancy N+1

Basic DC topology, VSB – Techn



Physical infras

Basic DC topology, VSB – Techn



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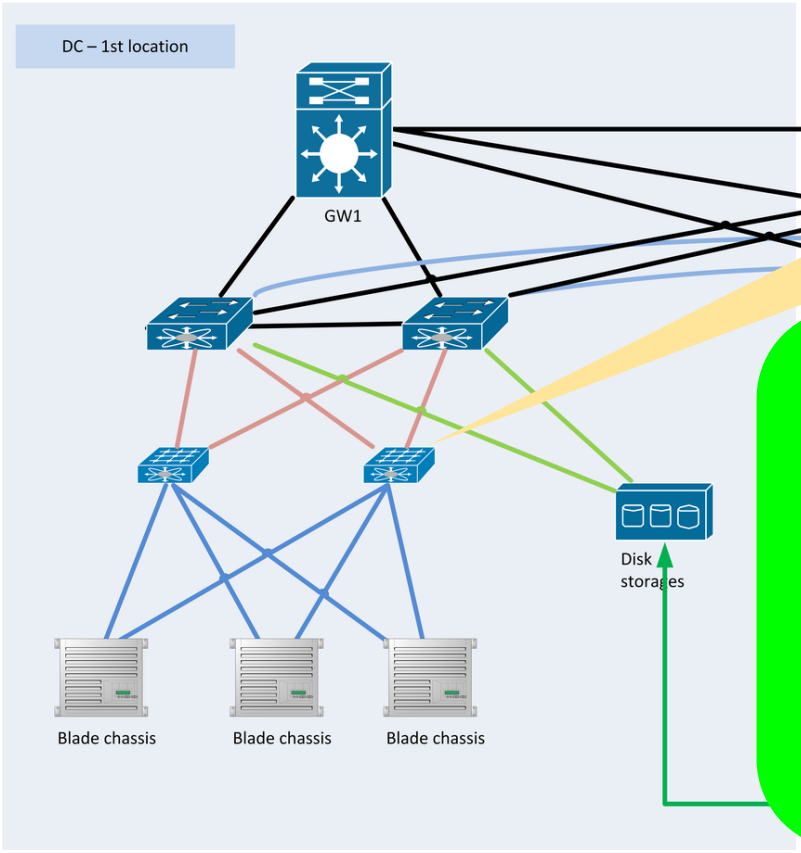
Unified management

- 2x Fabric Interconnect = LAN/SAN switches + management
- roles separation: network / SAN / servers
- own Nagios modules
- very simple and fast scalability

Physical infras

Basic DC topology, VSB – Techn



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Server's profiles

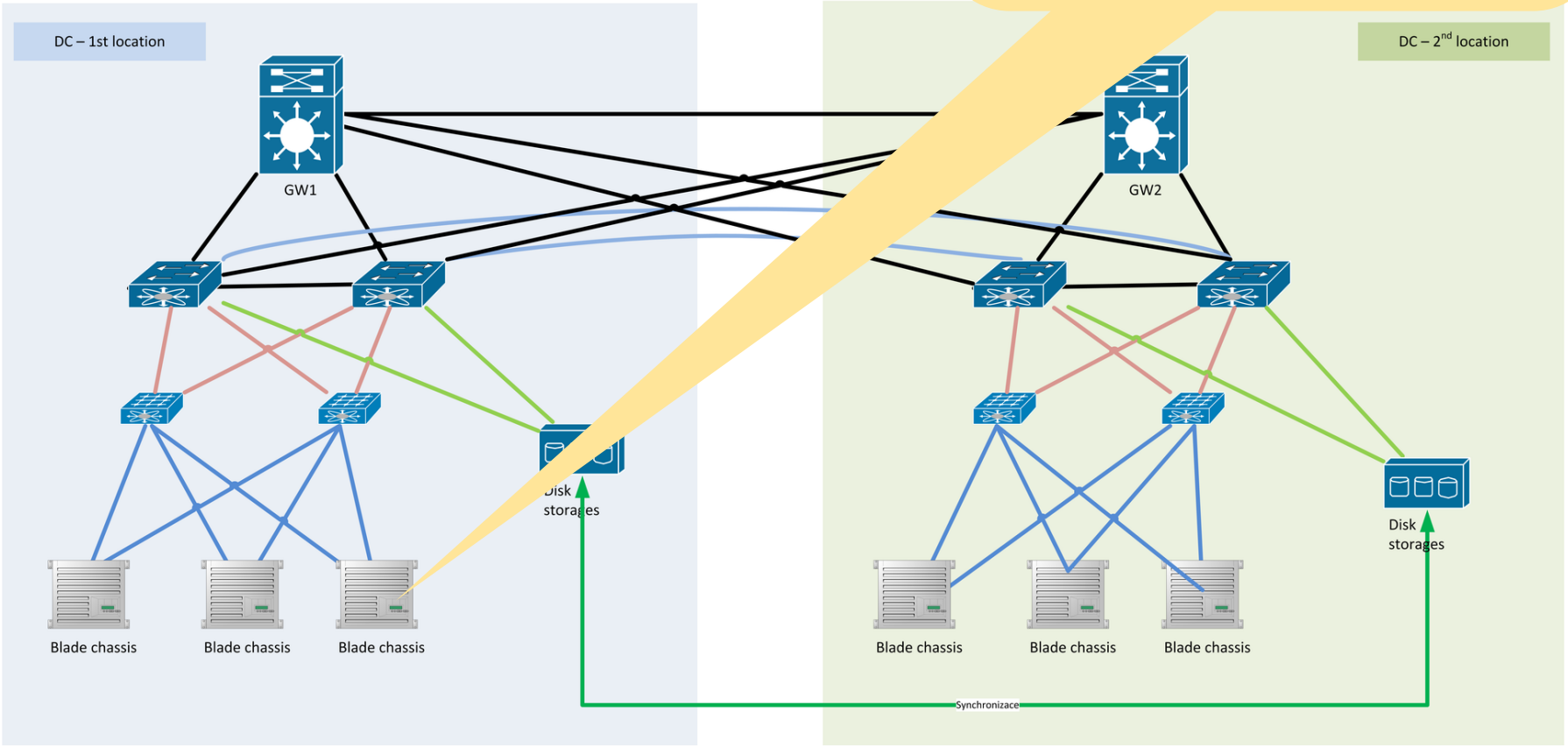
- very nice concept
- server profile contains all server settings (BIOS settings, MAC addresses, WWN, …)
- the server profile is applied to specific server
- templates, inheritance etc.
- very fast migration to another HW
- (6 servers migrated from old to new server in 40 minutes after delivery)

Fyzická infrastru

VMWARE

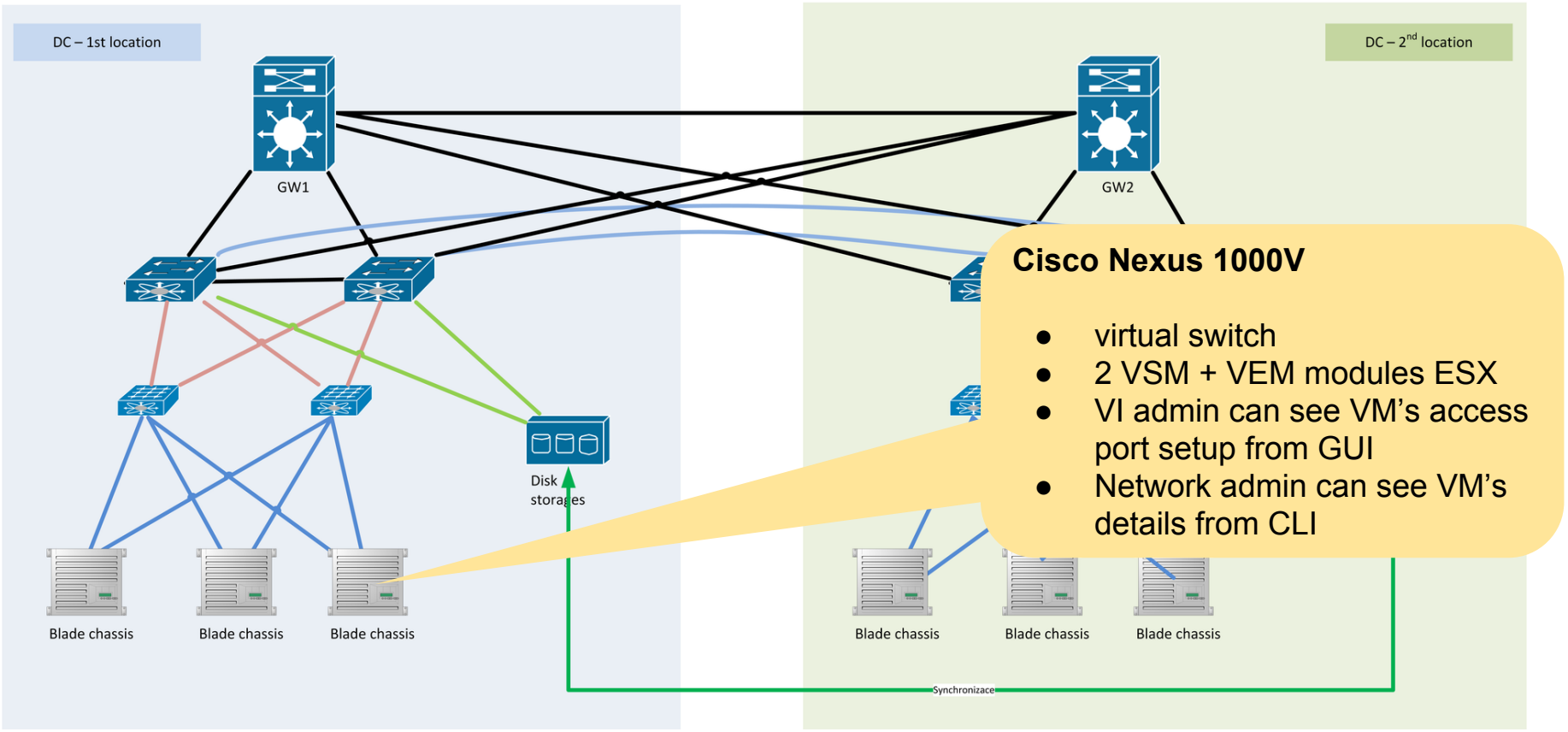
- ESX is running on Cisco UCS servers
- boot from centralized storage
- NFS for VI
- USB over IP (Eltima) - licence HW keys, USB flash

Basic DC topology, VSB – Technical Un



Physical infrastructure

Basic DC topology, VSB – Technical University of Ostrava



Cisco Nexus 1000V

- virtual switch
- 2 VSM + VEM modules ESX
- VI admin can see VM's access port setup from GUI
- Network admin can see VM's details from CLI

No vendor lock-in

- every part can be replaced
- routers
- DC switches
- server infrastructure
- storage
- virtualization

Advantages I.

- scalability
- network connection to different networks
- HW/SW maintanance/upgrade doesn’t affect hosted virtual machines
- remote repairs/upgrades without immediate physical presence
- services for remote users

Timeline

2010/10	converged ethernet, network tests
2011/6	PoC - server infrastructure and DC network (LAN, SAN)
2012/9 - 2013/7	HW procurements (servers, storage)
2012/9	full operation, migrating from old servers, server virtualization

Advantages II.

- NBD support for HW (instead 4/8 hours) for critical HW - financial savings
- DC availability 100% in last 2 years
- lower energy costs
- virtual machine capacity changes and performance (storage, RAM, CPU)

Services for university users

- physical or virtual server
- all infrastructure is managed by us
- no vlan-id / IP address space collisions
- no problems with IDM (username, password)
- user pays for capacities - vCPU, RAM, storage

Customers - non-univestity users

- some other universities
- CESNET (Czech NREN)
- spin-offs (university commercial companies)
- Academy of Sciences Ostrava (migrating)
- Ostrava city (backup DNS/mail/web servers)

Services for non-university users

- data center network is L2 network
- data center network has a L3 connectivity to different L3 networks (CESNET, VSB-TU, commercial ISP, …)
- DC network can be connected to any other network

Network connections

- types of connection
  - direct connection to DC
  - data circuit - CESNET MPLS VPN to other academic networks
- we don’t need to know IP addressing
- problem with vlan-id collisions

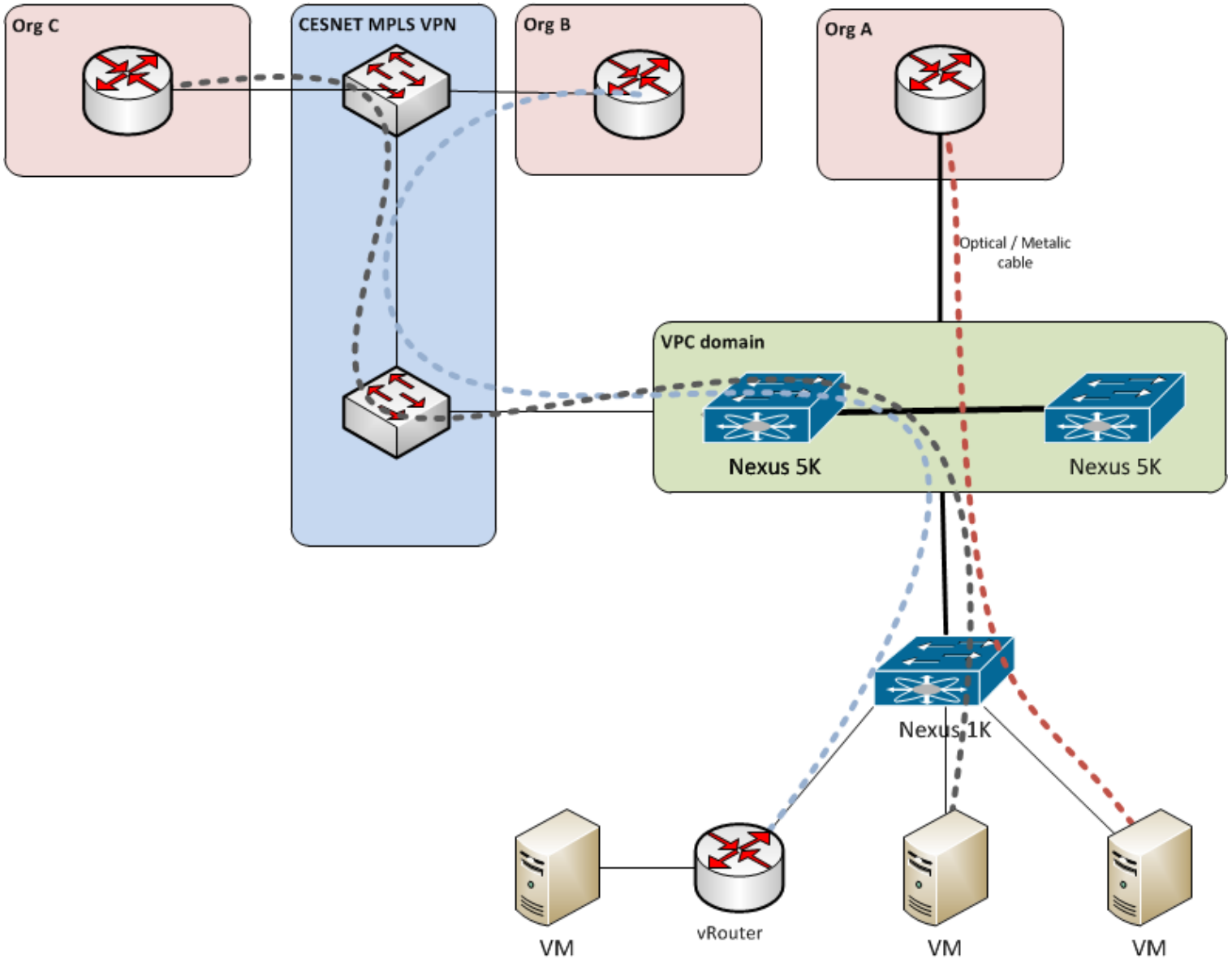


Fig.: Network connections scheme

Problems and future plans

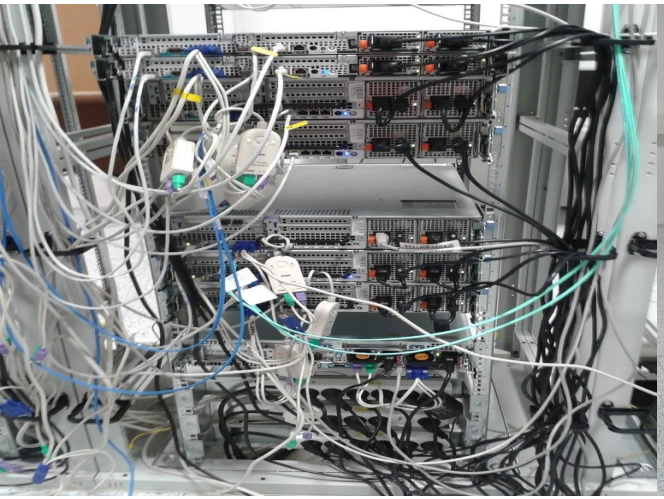
- new secondary DC locality (at 2014/11)
  - higher availability on infrastructure layer

- automated billing system - is usefull for
  - self-regulation
  - HW renewal

Problems and future plans

- vlan-id collisions
  - between our DC L2 network and other networks
  - Cisco Nexus 1000V and bridge domains concept testing
- better connection over CESNET (Czech NREN)
- best practice for DC hosting - vRouter vs. routing in home network
- authentication in VI
  - EduID for academic users
  - local accounts

Pictures...



The end...

Thank you for your attention.