

Skoltech

Skolkovo Institute of Science and Technology



Lomonosov Moscow
State University

Software-Defined Networks (SDN)

Lecture 13: SDN for Enterprise Networks

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MILESTONES Xerox PARC history

<https://www.parc.com/about-parc/parc-history>

1973
Ethernet/ distributed computing

An internal memo proposes a system of interacting workstations, files, and printers, linked via one coaxial cable within a local area network, which components can join or leave without disturbing data traffic. The memo's author coins the term "Ethernet" to describe the network. Ethernet grows into a global standard.

more under 1973
personal workstation
Superpaint frame buffer

22 may 1973
Роберт Меткалф
и Дэвид Боггс
2,94 Мбит/с

Standards

- DIX – 1980r.
- IEEE Ethernet 802.3 – 1983r.
- IEEE Ethernet 10Base2, 10Base5 – 1983r.
- IEEE Ethernet 10BaseT – 1990r.
- IEEE 802.3u, 100BaseT – 1995r.
- IEEE 802.3z – 1998r.
- IEEE 802.3ab – 1999r.

digital



Ethernet Types



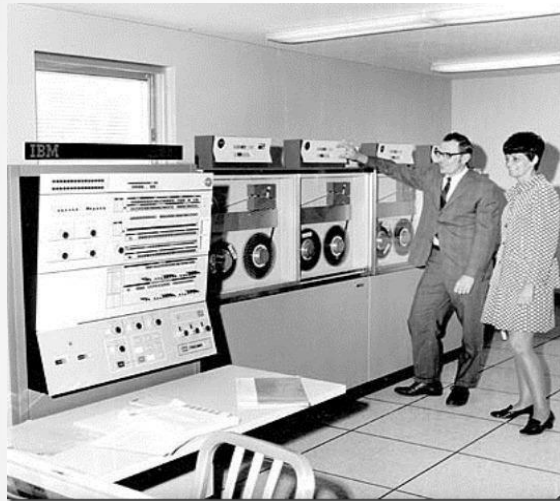
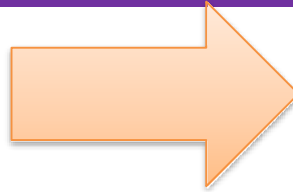
Ethernet	IEEE 802.3				
	10Base5	10Base2	1Base5	10BaseT	10Broad36
Data rate (Mbps)	10	10	1	10	10
Signaling method	Baseband	Baseband	Baseband	Baseband	Baseband
Max. segment length (m)	500	500	185	100(UTP)	1800
Media	50-ohm coax (thick)	50-ohm coax (thick)	50-ohm coax (thin)	Unshielded twisted pair	75-ohm coax
Topology	Bus	Bus	Bus	Star	Bus

Figure 5-2 Ethernet V2.0 and IEEE 802.3 Physical Characteristics

IT History



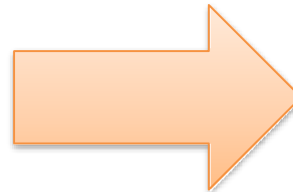
A slow-growing, closed, expensive system.
Small sales market



Specialized programs

Specialized operating system

Specialized hardware



Rapid innovation
Open interfaces
Large sales market

Apps



Open Interface

Operating system

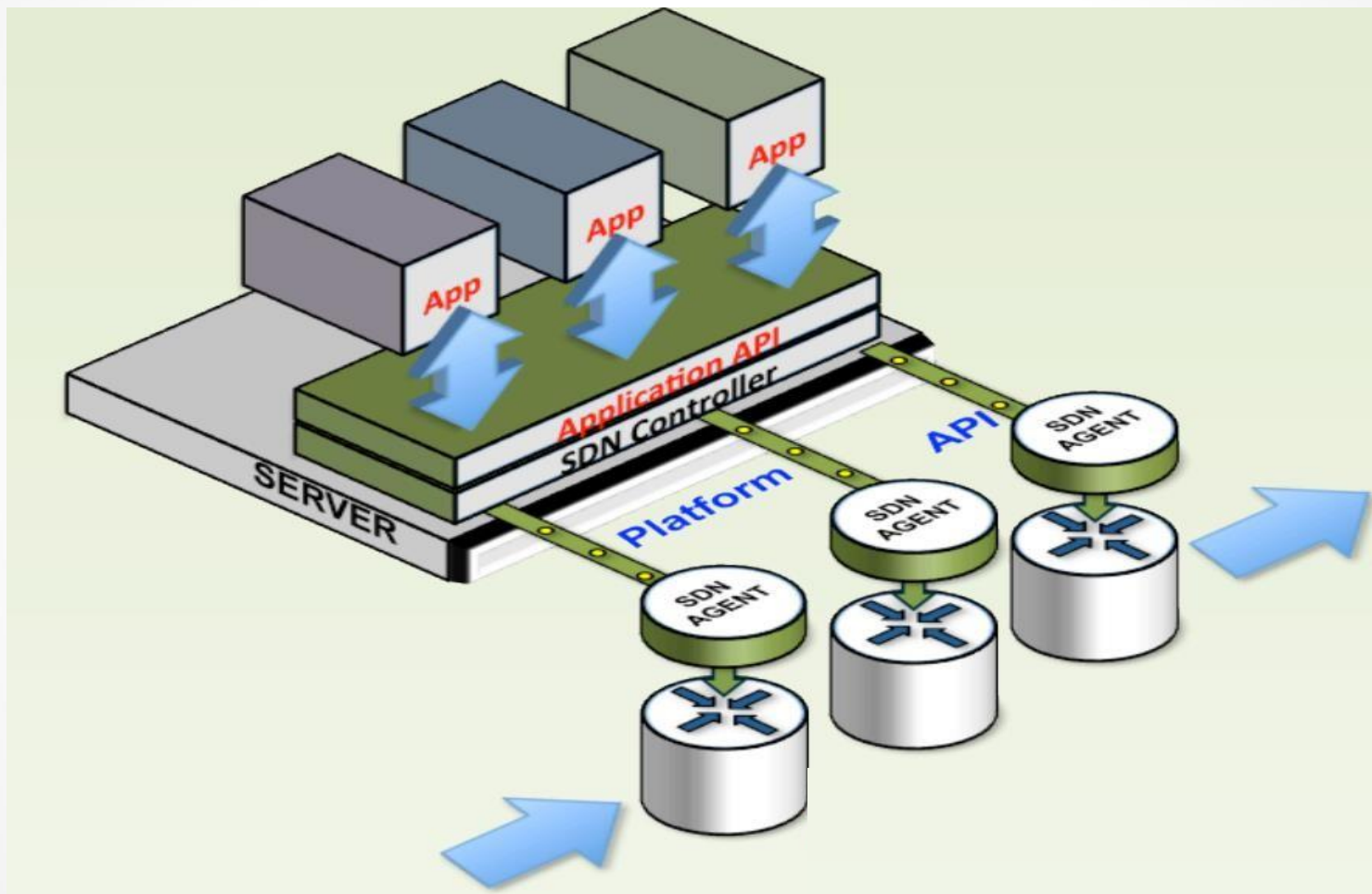


Open Interface

Microprocessors



SDN Architecture





SDN for enterprise networks

Motivating companies to SDN



Increasing the importance of applications / services



Increase in the number of applications / services



Network management automation



Increasing the speed of implementation of new applications and services

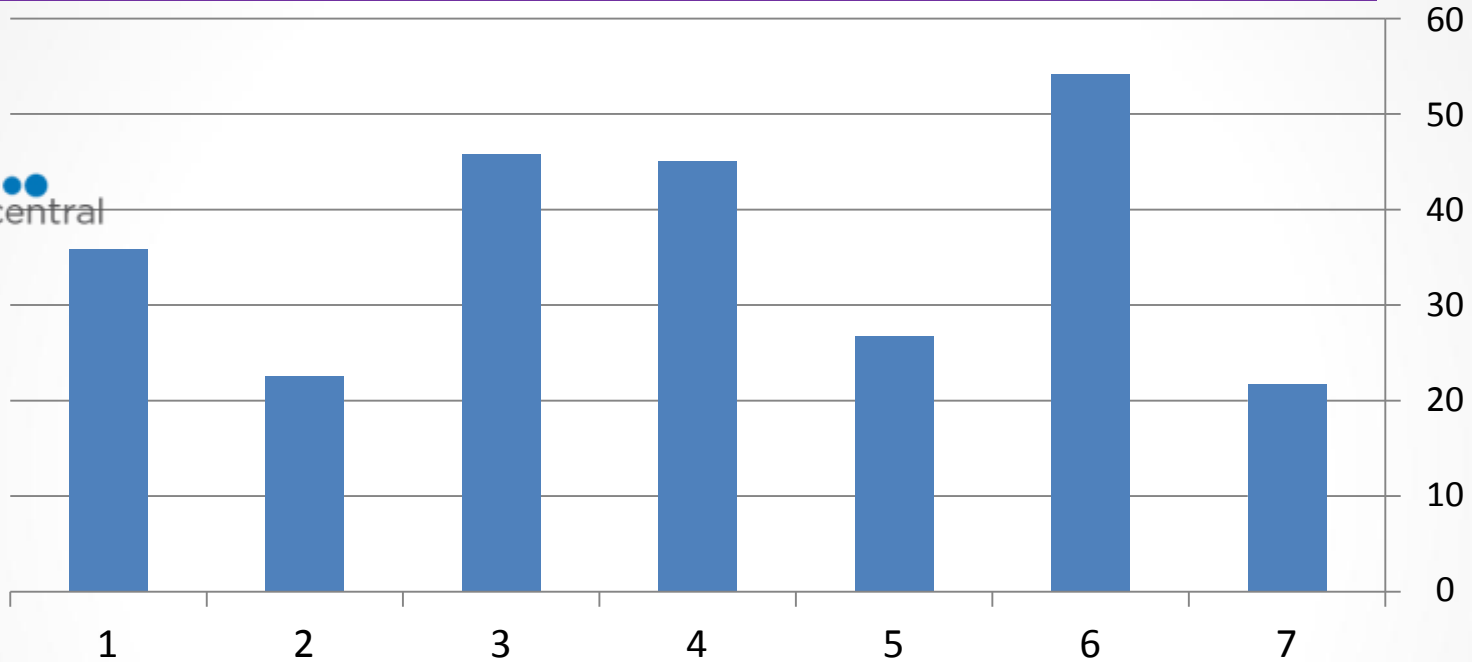


Virtualization



IT department tries to provide uninterrupted service, provide new opportunities to increase work productivity in the face of changing requirements users.

The benefits of SDN in the corporate network



1. Reduced operating costs (OPEX)
2. Simplification of network operation.
3. Automation.
4. Rapid introduction of new applications.
5. Investment Savings (CAPEX)
6. The ability to fine-tune the network and the services offered.
7. Increase in productivity.



Reduced OPEX costs

Увеличение
эффективности
использования сетевых
ресурсов

Увеличение гибкости IT
инфраструктуры

Получение
исчерпывающей
расширенной
информации о сети

Быстрое внедрение
новых сервисов и
приложений

Минимизация
вероятности
возникновения ошибок
при конфигурировании

Быстрое подключение
новых пользователей

Examples of SDN application in corporate networks



- Network virtualization.
- Fine control of traffic flow in the network depending on the requirements of applications.
- Implementation of quality of service policies.
- More flexible, carefully controlled connection of user devices to the network.
- Optimization of WIFI roaming in the corporate network.
- Optimization of the movement of broadcast traffic in the network.
- Flexible provision of security policies.
- Centralized management of a large number of devices from different manufacturers.
- Load balancing, fast rebuild in case of failure.
- Flexible selective traffic mirroring if necessary.
- Detailed monitoring of the state of the network and the introduction of new applications that have the ability to affect the operation of the network.

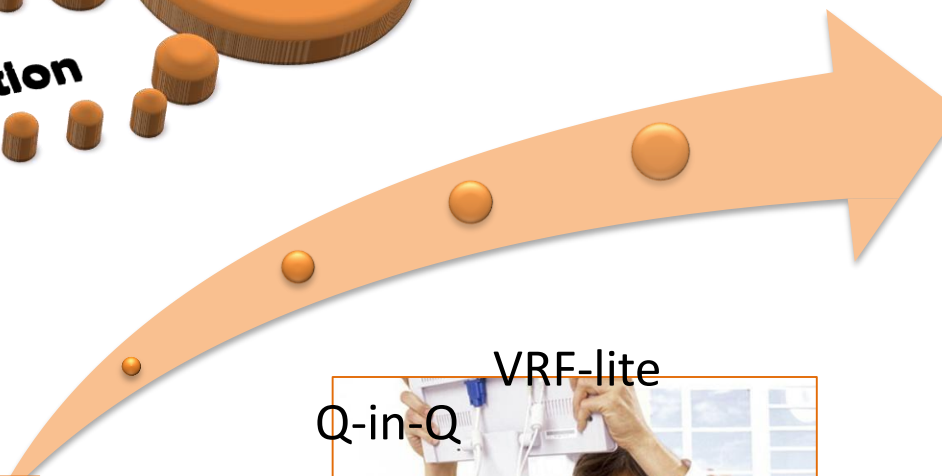


Network virtualization

Network Virtualization

Network Slicing

Traffic Isolation



Creation of a logical, virtual network, separate from the underlying network equipment

MPLS-VPN



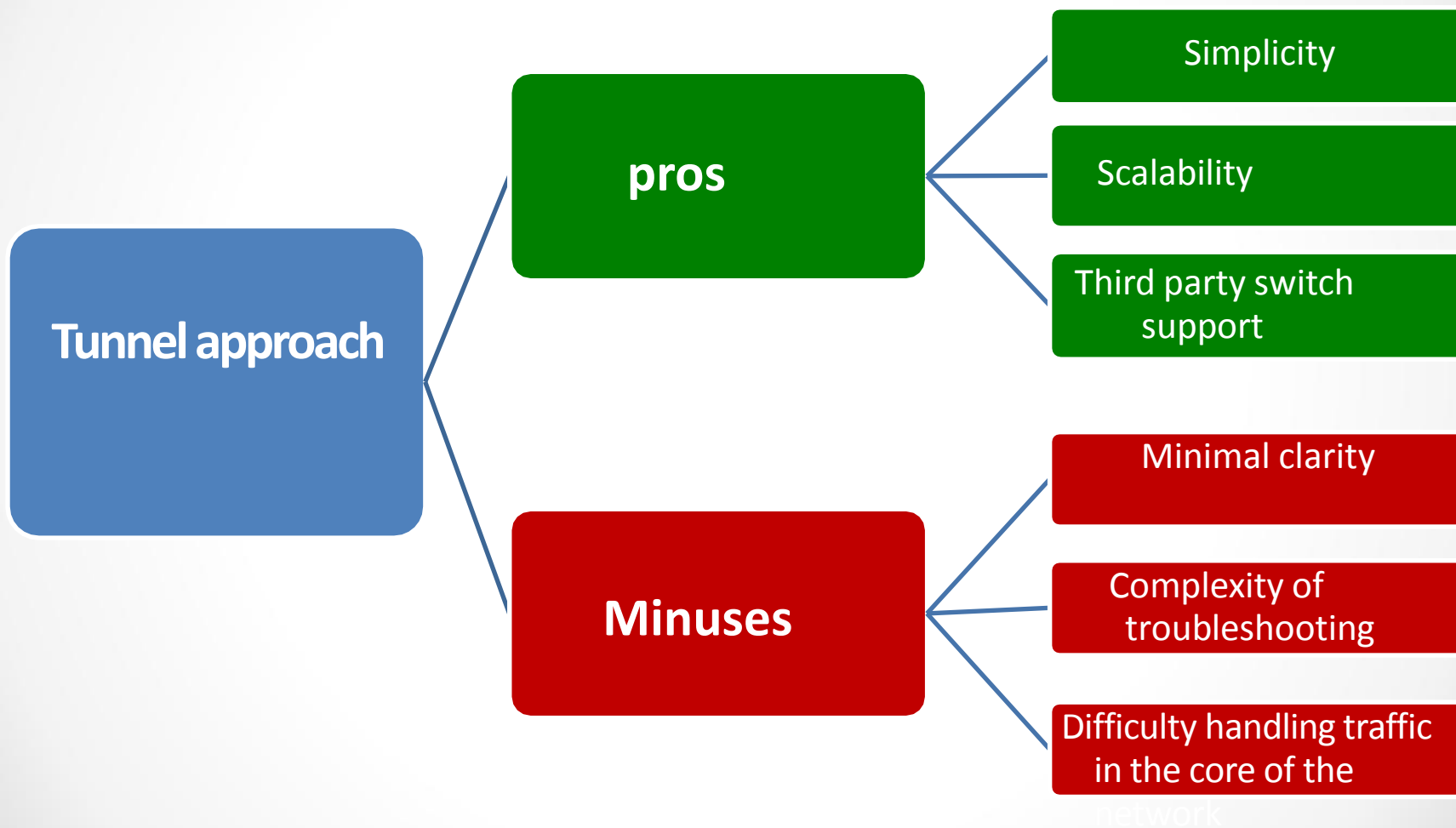
VLAN

Q-in-Q

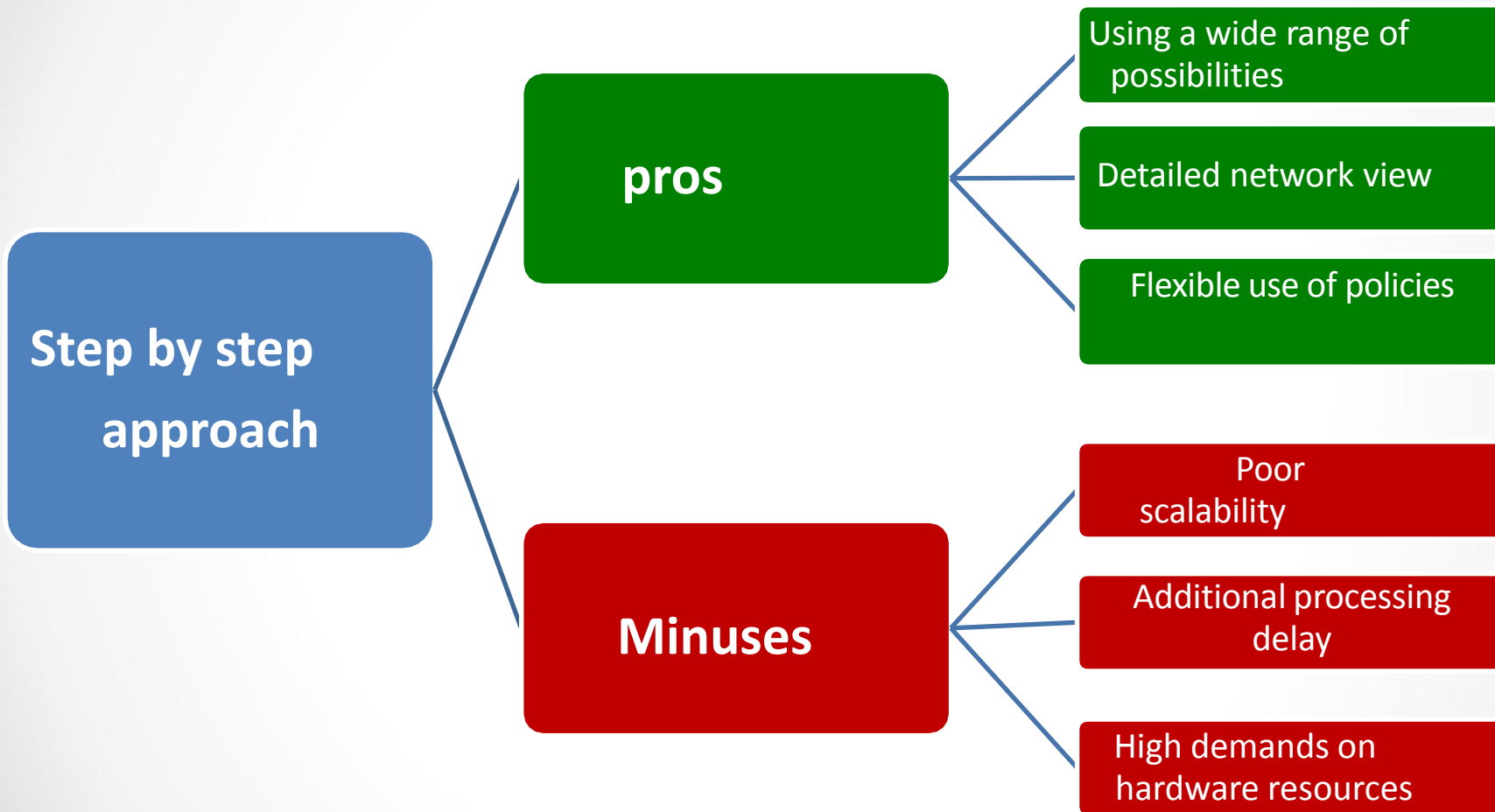
VRF-lite



SDN approach to network virtualization



SDN approach to network virtualization



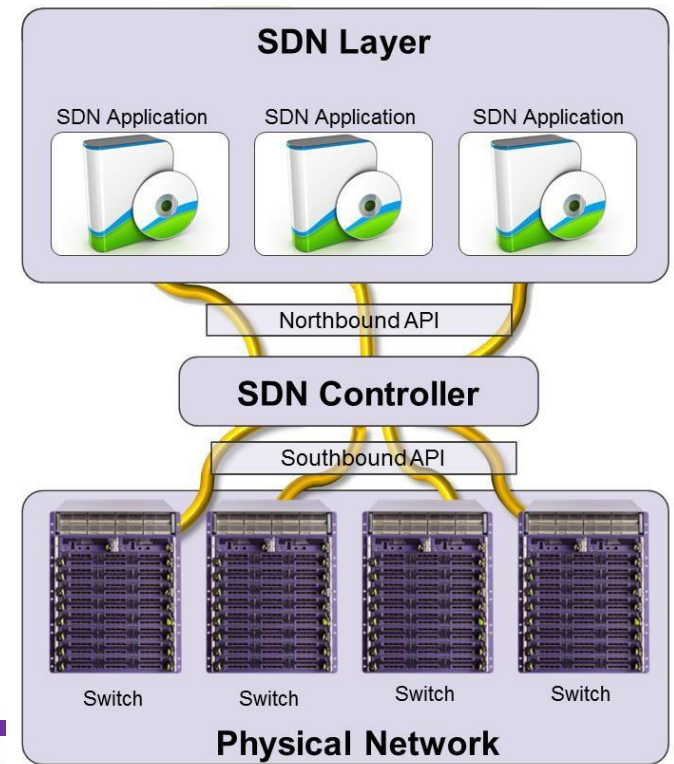
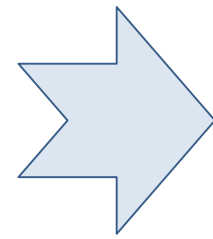
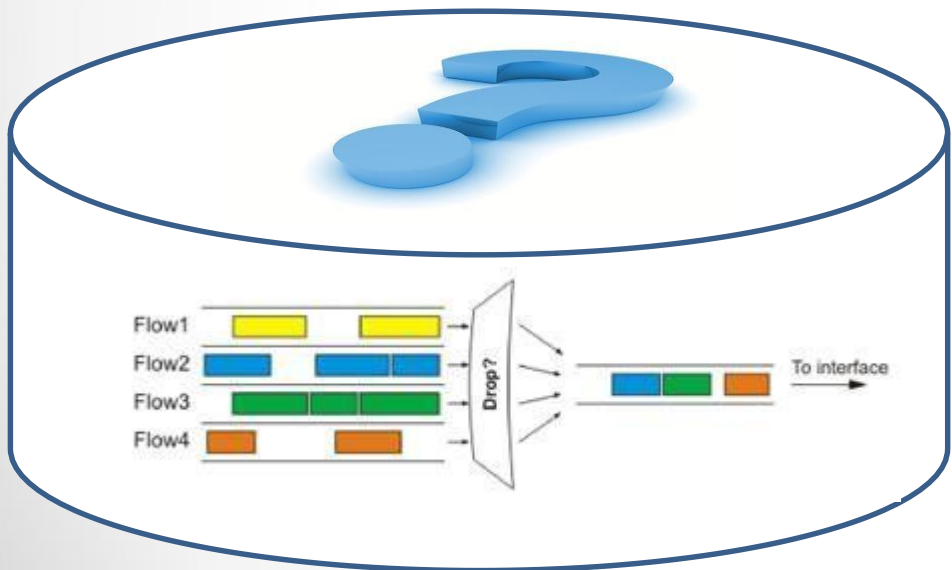
Flexible traffic management



IntServ

DiffServ

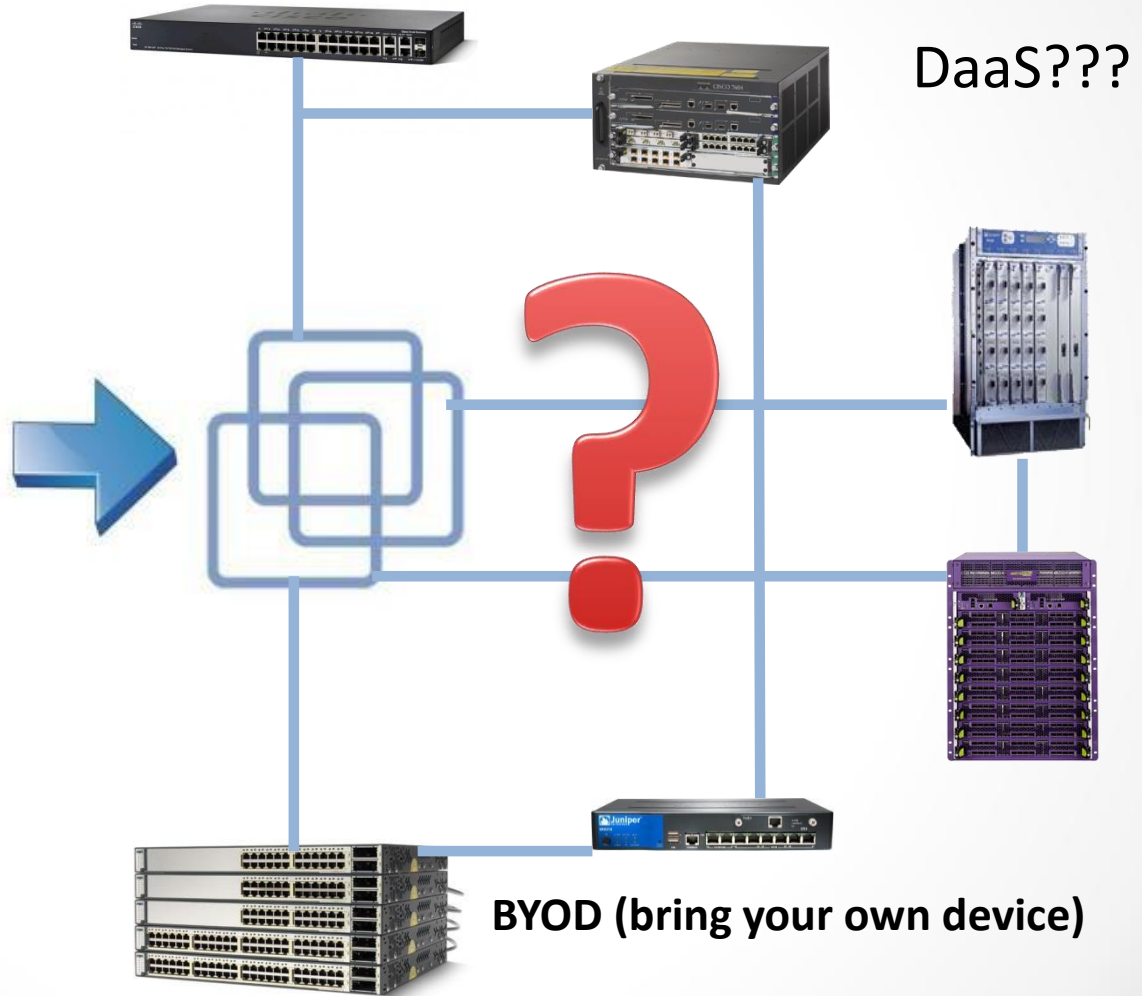
SDN/ПКС





BYOD or not BYOD?

BYOD





WiFi roaming

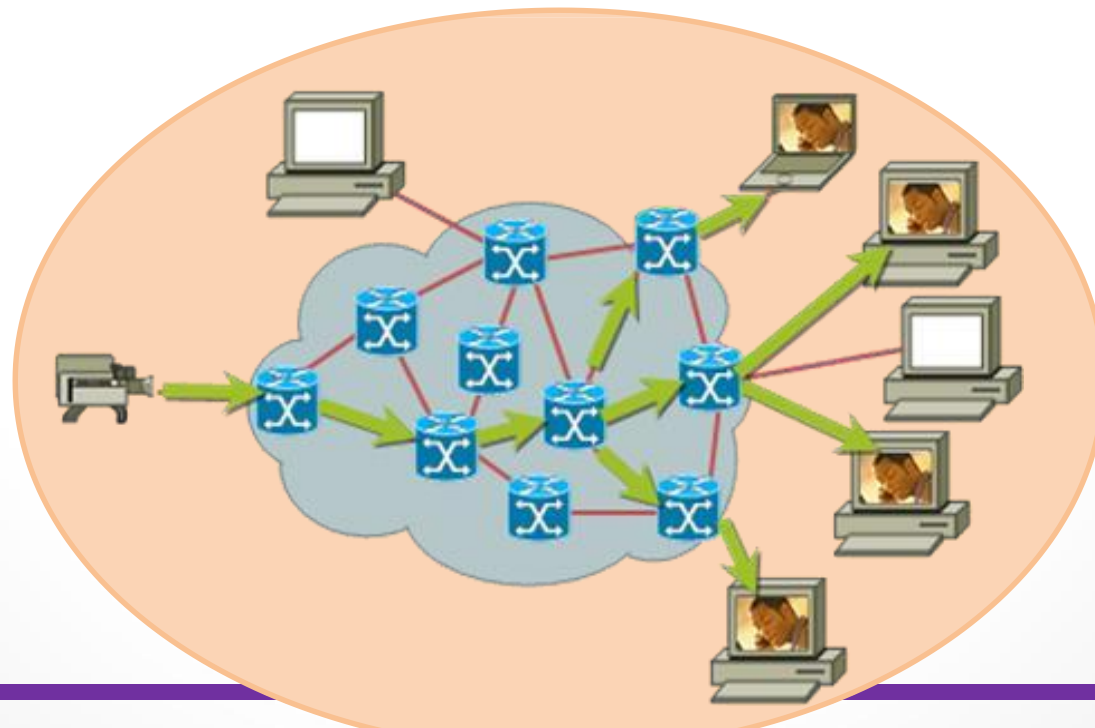
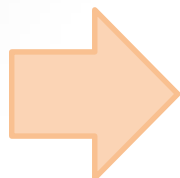
Mobile-IP

WLAN
контроллер

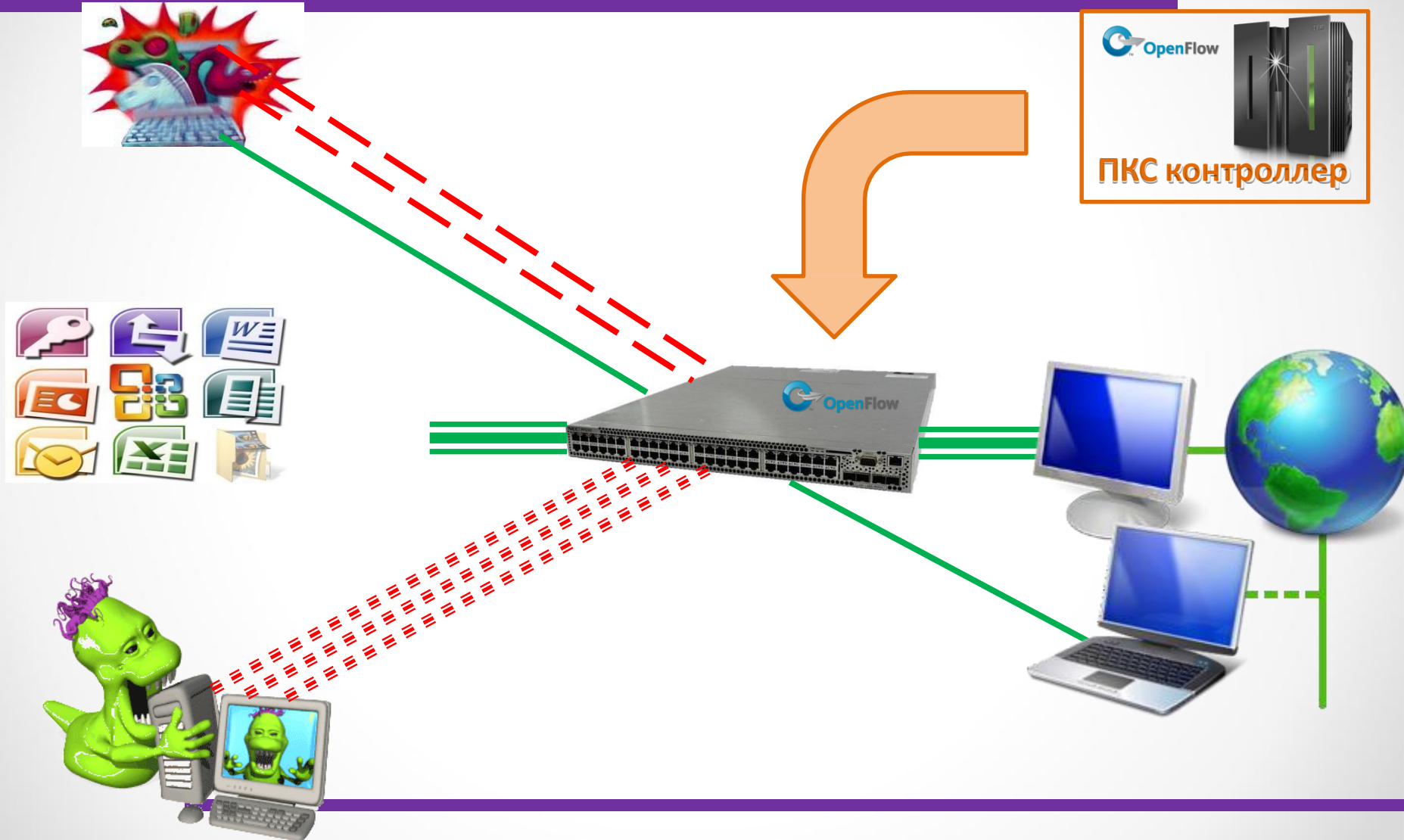
PKC
контроллер



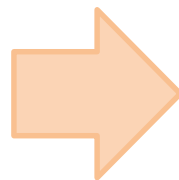
Multicast flows optimization



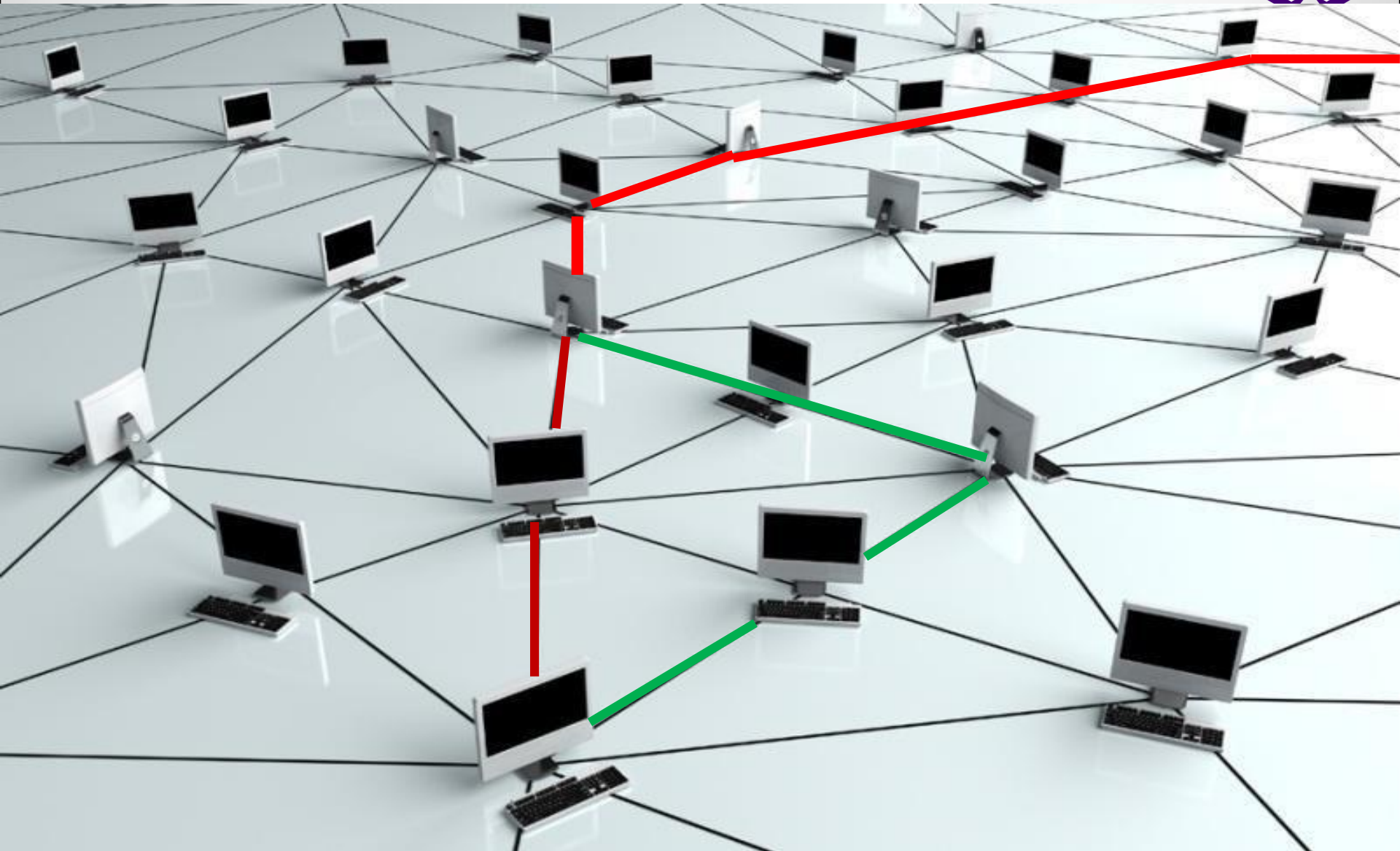
Enforcing network security policies



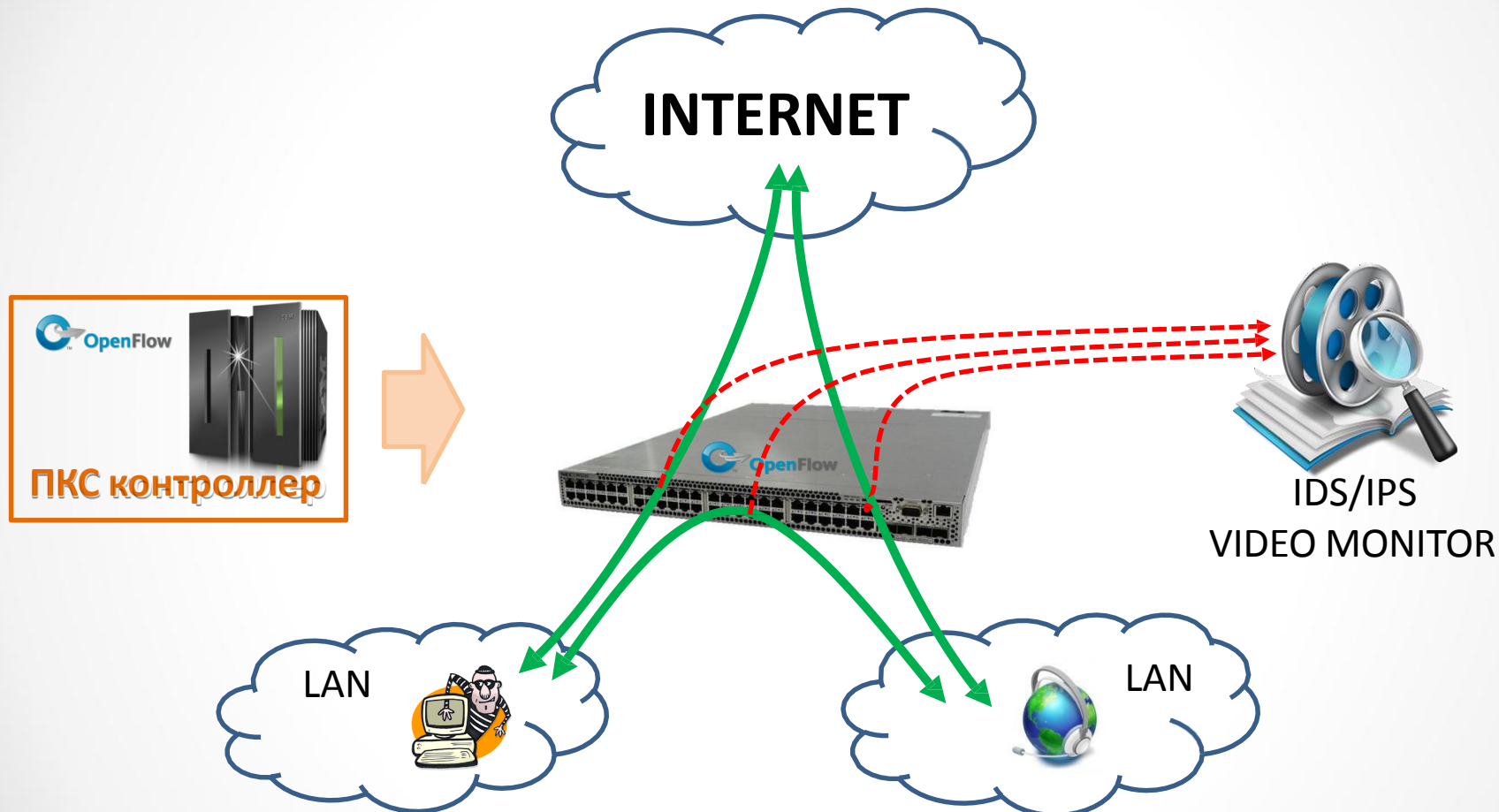
Centralized management



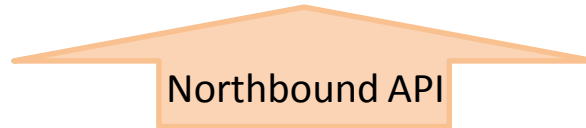
Traffic Engineering и Fast Failover



Intelligent traffic mirroring

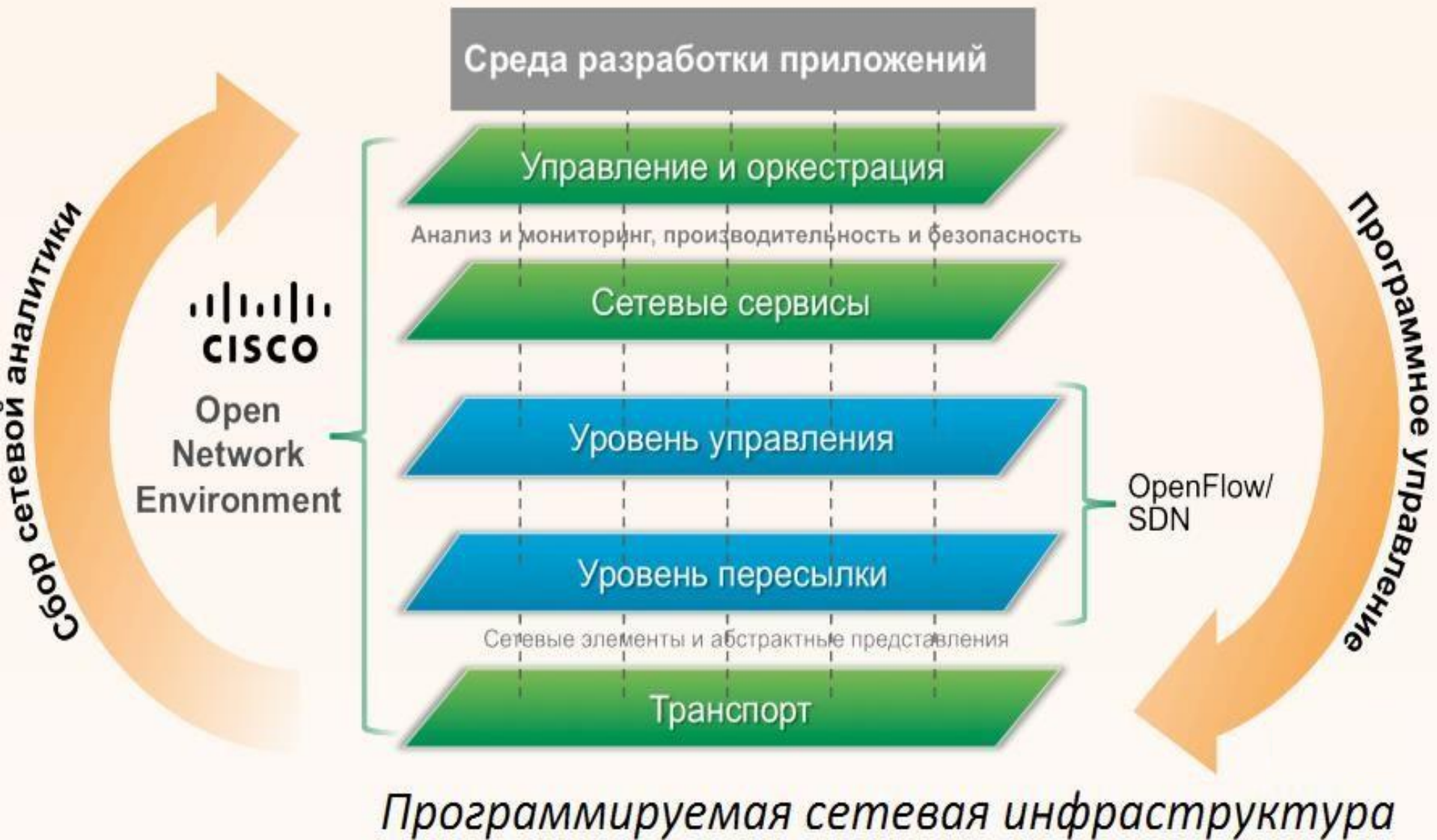


Monitoring and the impact of applications on network performance



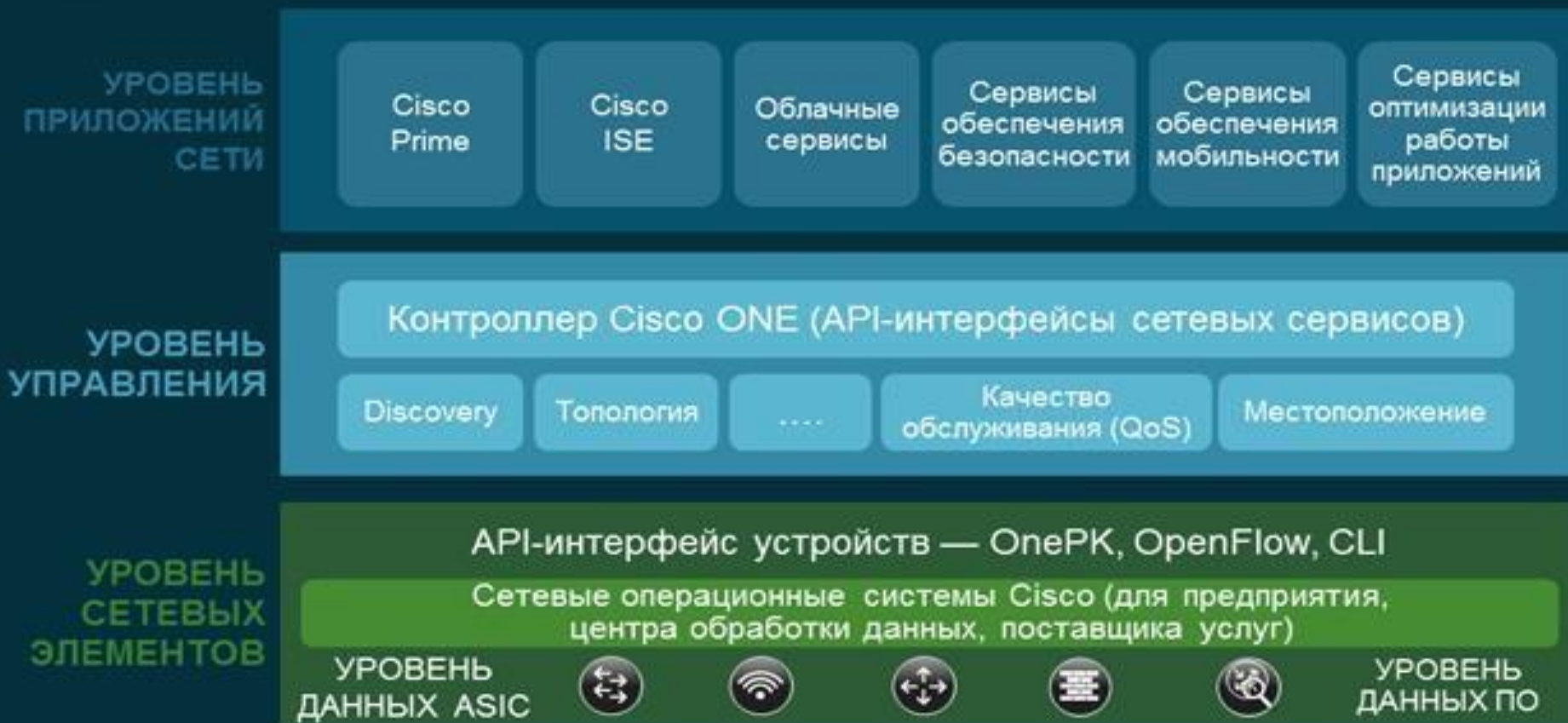
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Cisco's Approach

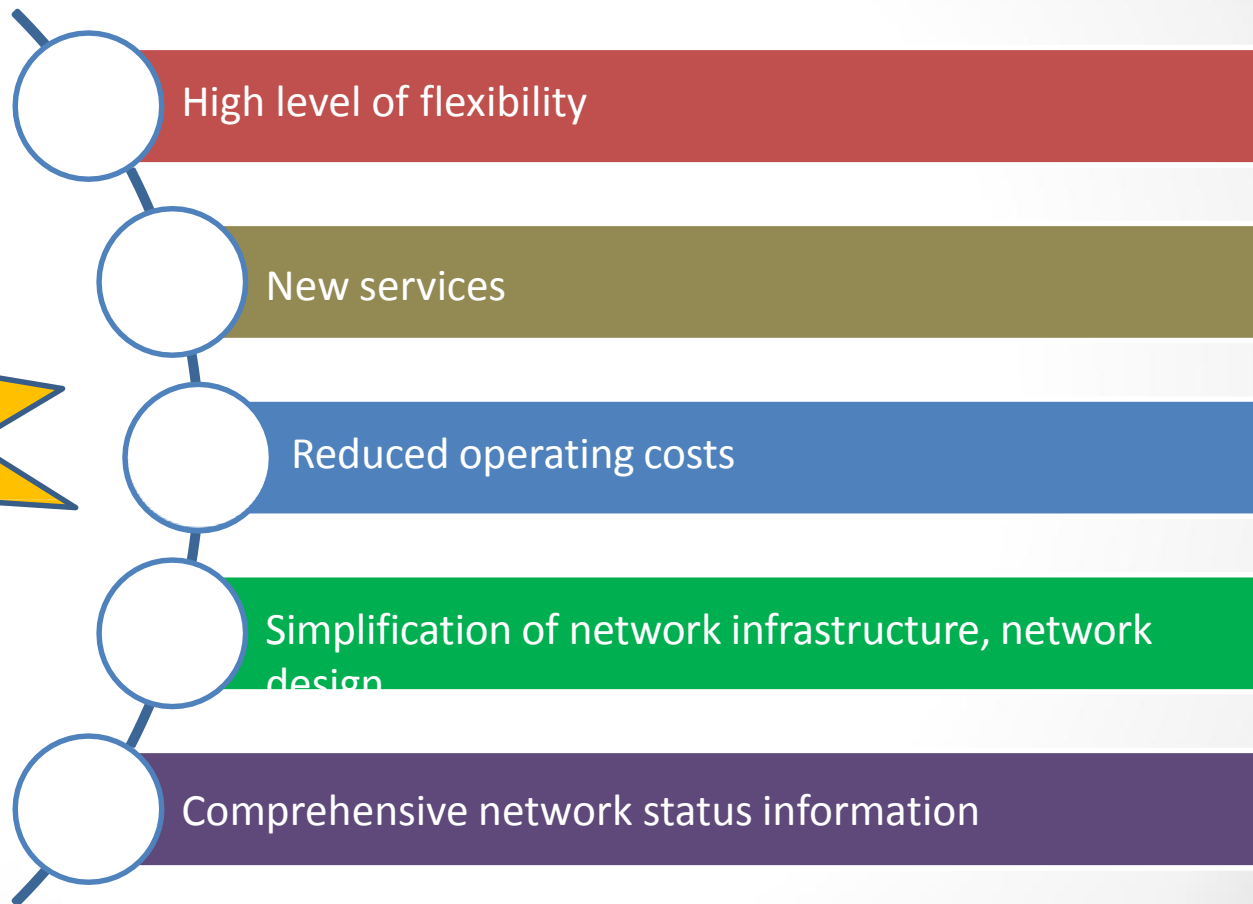




Архитектура Cisco ONE для корпоративных сетей



Conclusion





Thanks for your attention!

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