

Skoltech

Skolkovo Institute of Science and Technology



Lomonosov Moscow
State University

Software-Defined Networks (SDN)

Lecture 6: SDN/OpenFlow Controllers

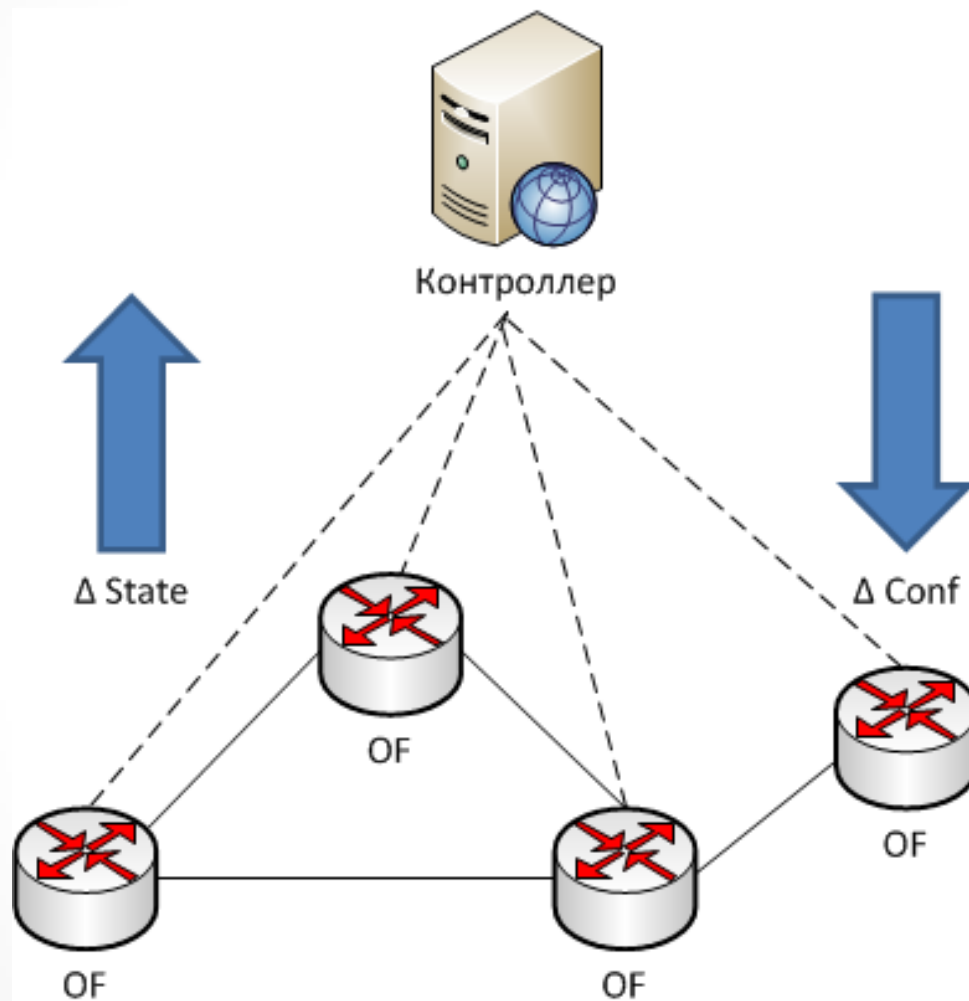
Vasily Pashkov

pashkov@lvk.cs.msu.su



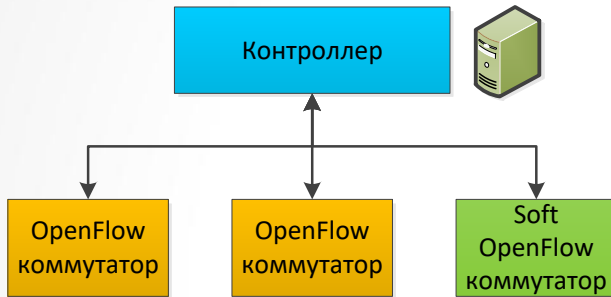
Distributed Control Plane

SDN Controller

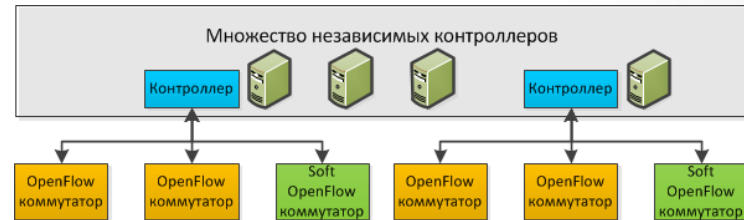




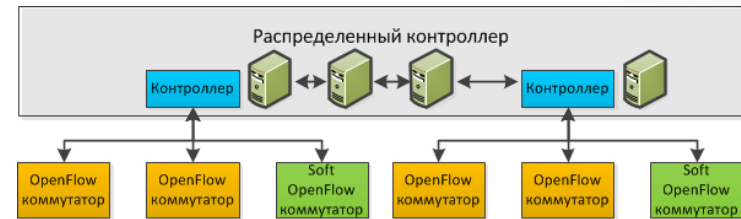
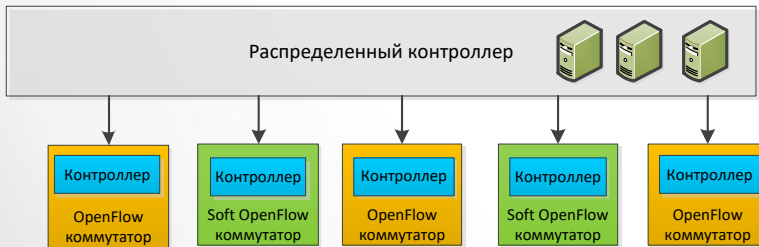
1. Centralized



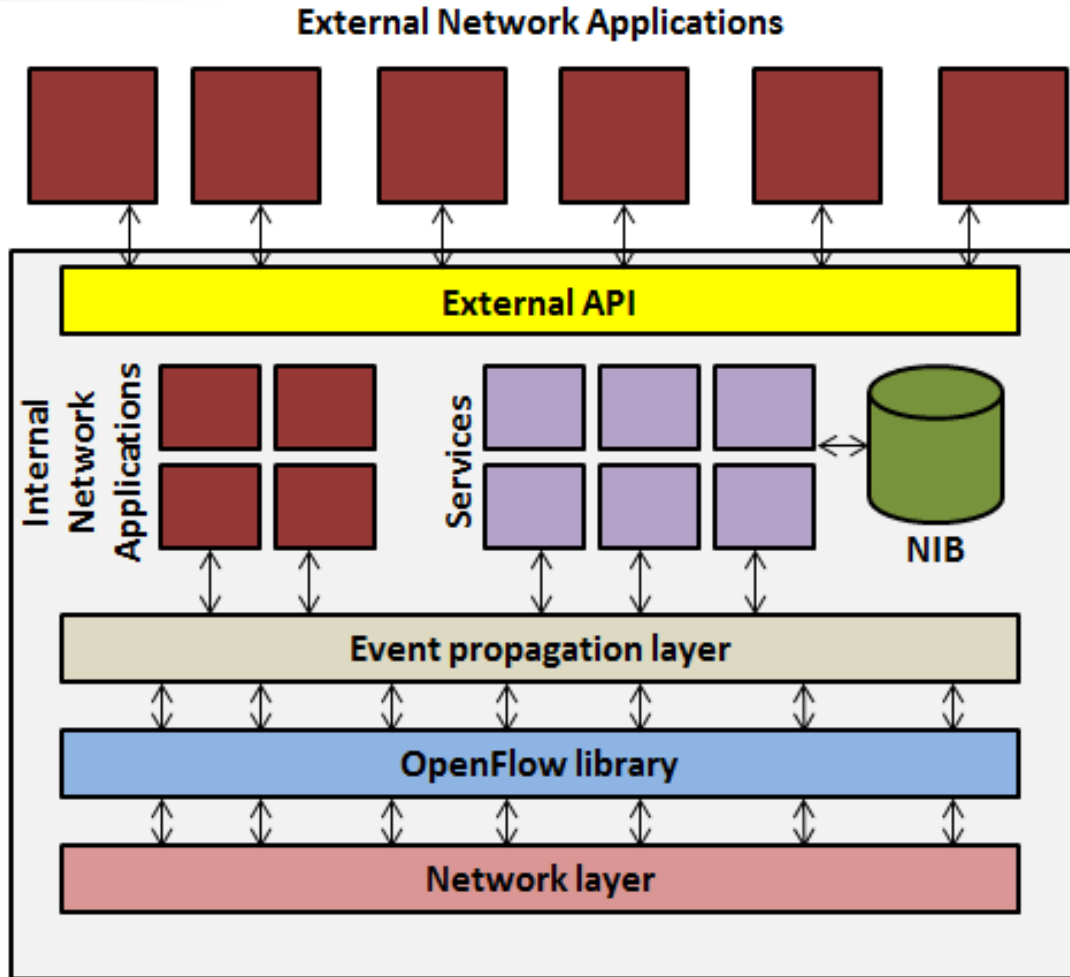
2. Distributed



3. Hierarchical



SDN Controller Architecture





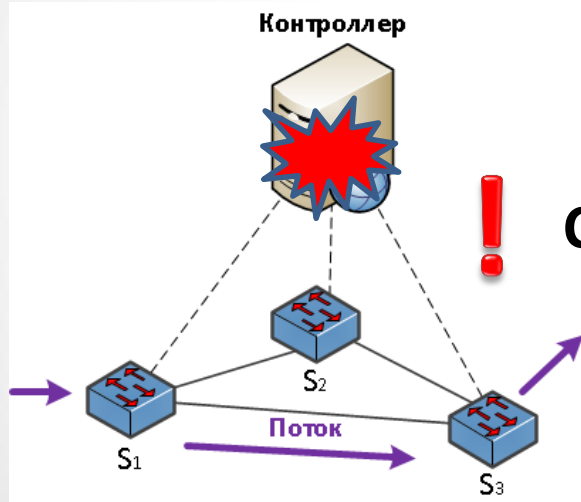
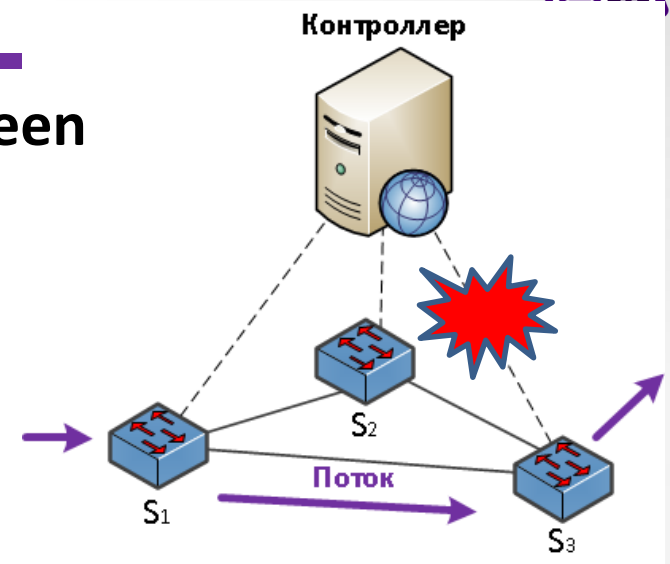
High Availability (HA)

- The network operates in 365/24/7 mode.
- The SDN control platform must be running continuously.
- The goal of high availability is to support the continued availability of the management platform and network applications.
- Causes of downtime: maintenance, software and hardware errors, hardware failure, attack, power outage, accident.

Availability coefficient, %	Downtime
99,999	5 min
99,99	52 min
99,9	8,7 h
99	3,7 days

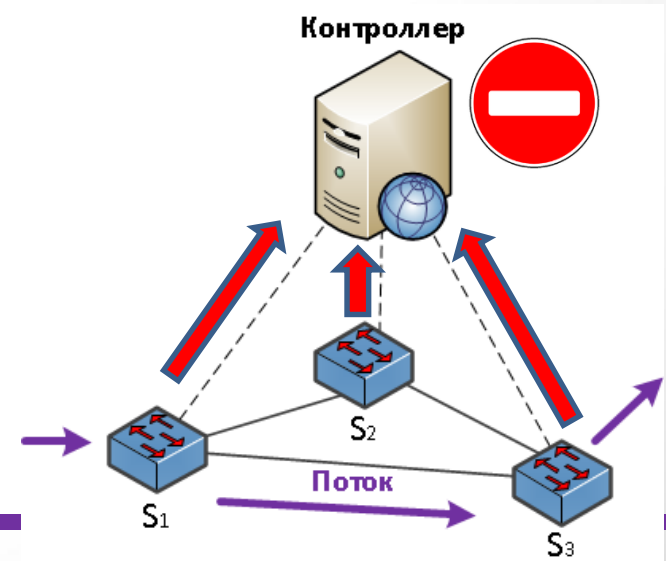
Failures

! Loss of connection between switch and controller

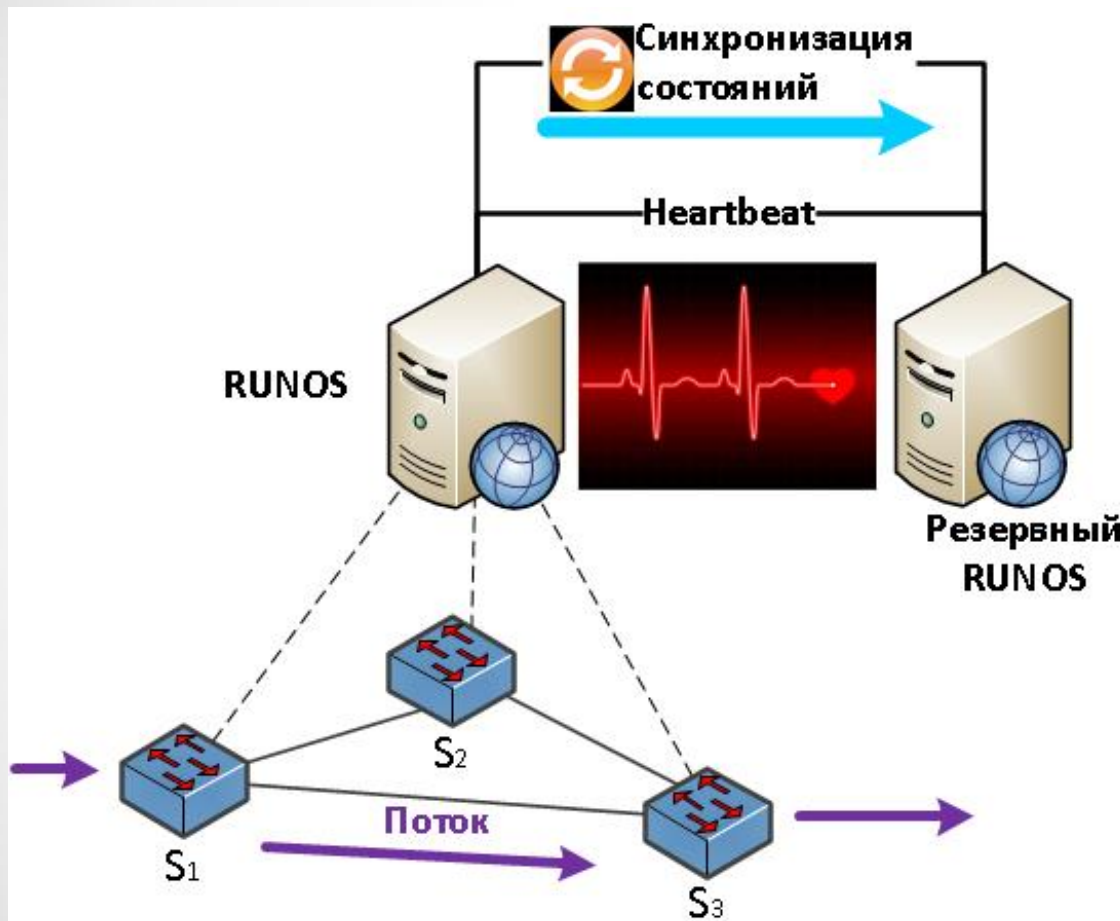


! Controller Failure

! Controller Overloading



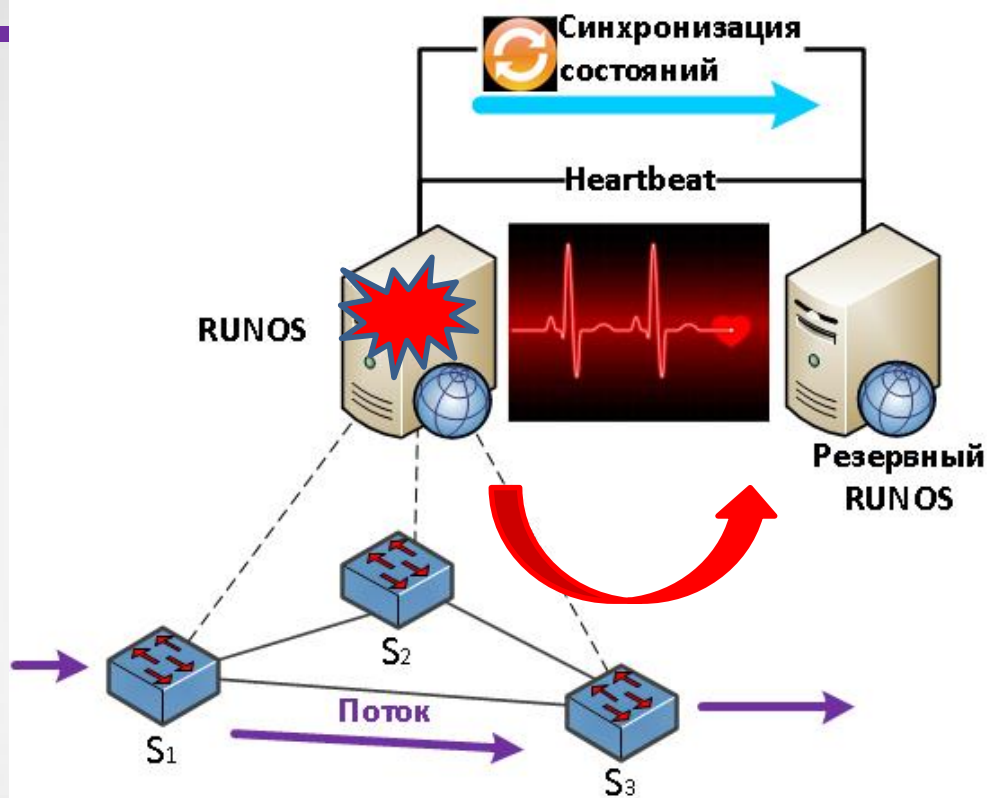
HA Active/Standby Techniques /1



Active/Standby (Passive) Techniques :

- **Cold**
[no sync]
- **Warm**
[periodic synchronization]
- **Hot** ←
[continuous synchronization]

Restoration

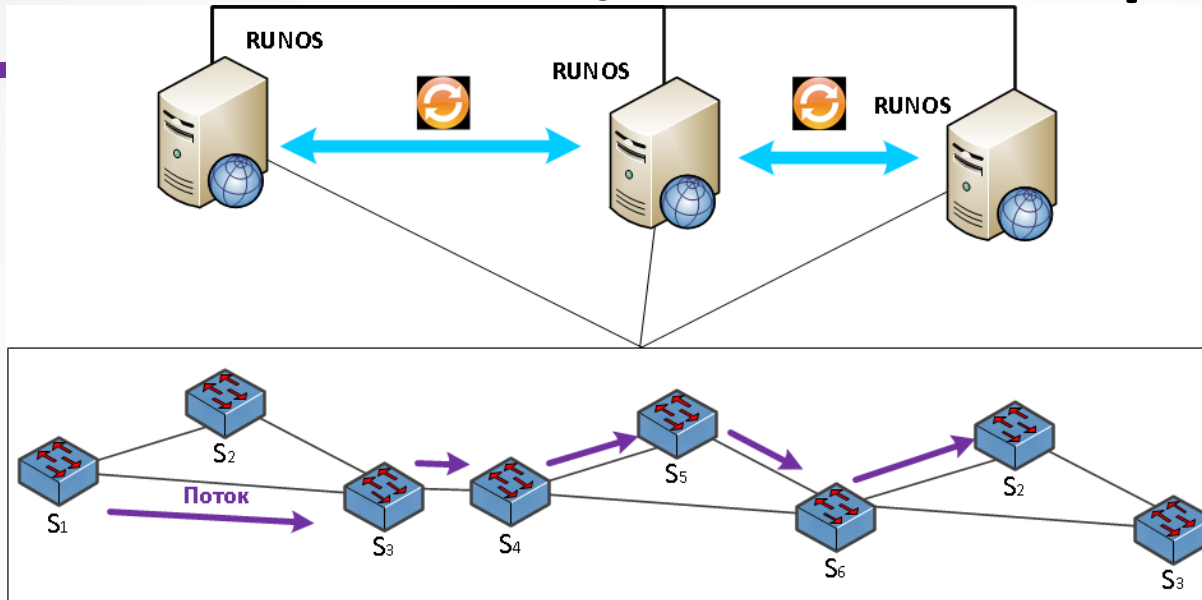


Features of the solution:

- OpenFlow ≥ 1.0
- Corporate networks.
- Does not scale
- Incomplete utilization of computing resources

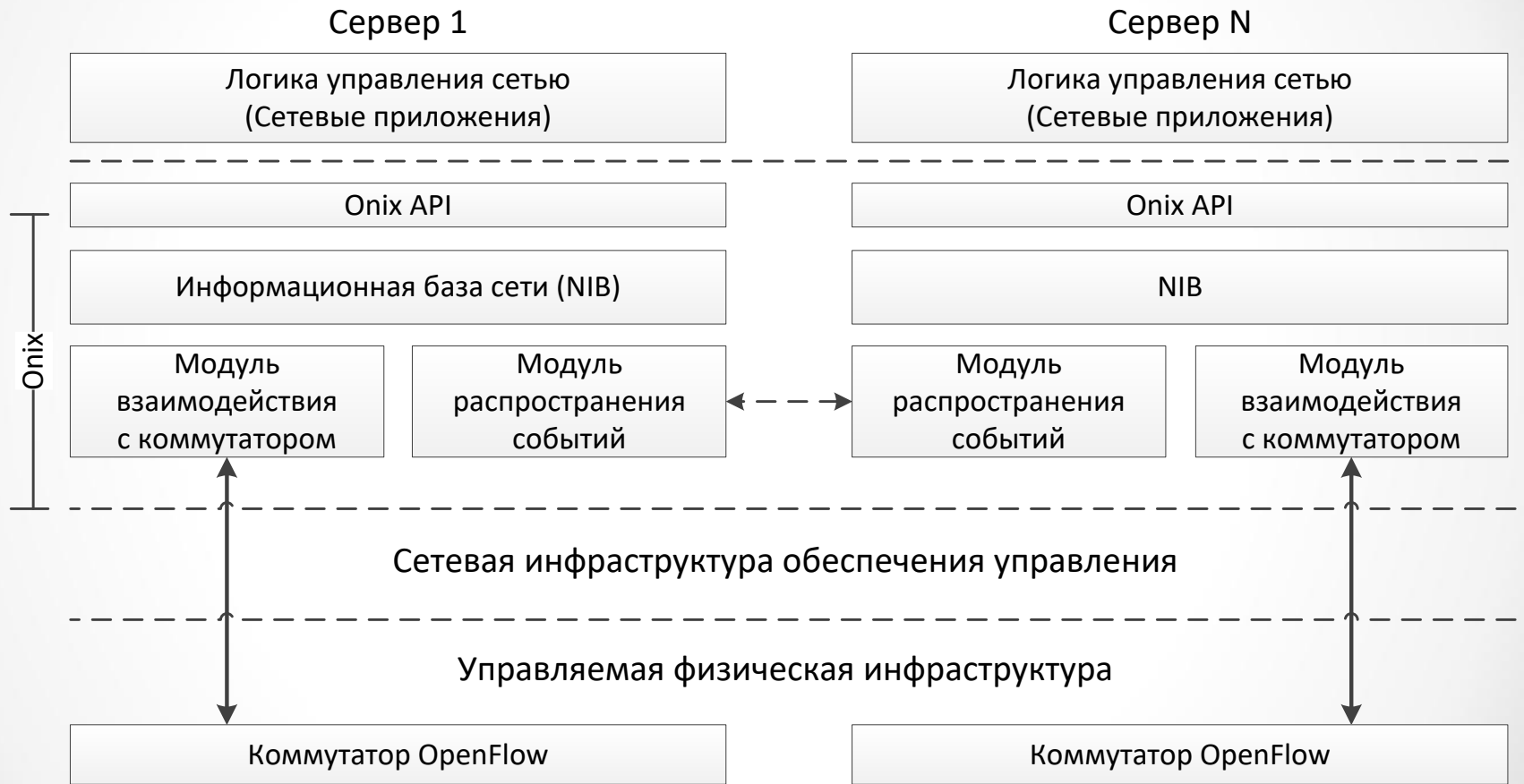
- + Single controller failure
- Loss of connection between switch and controller
- Controller overload

HA Active/Active Techniques /2

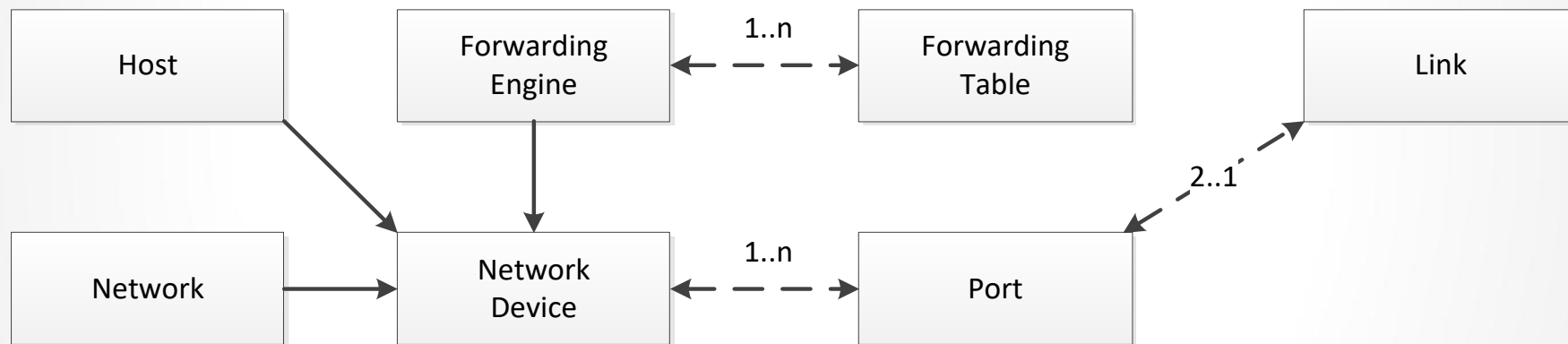


- Active / Active Backup Strategies
- Asymmetric
- Symmetrical
- High complexity [Requires coordination of controllers, global state support]
- High Availability [Minimum Downtime]
- High utilization of computing resources

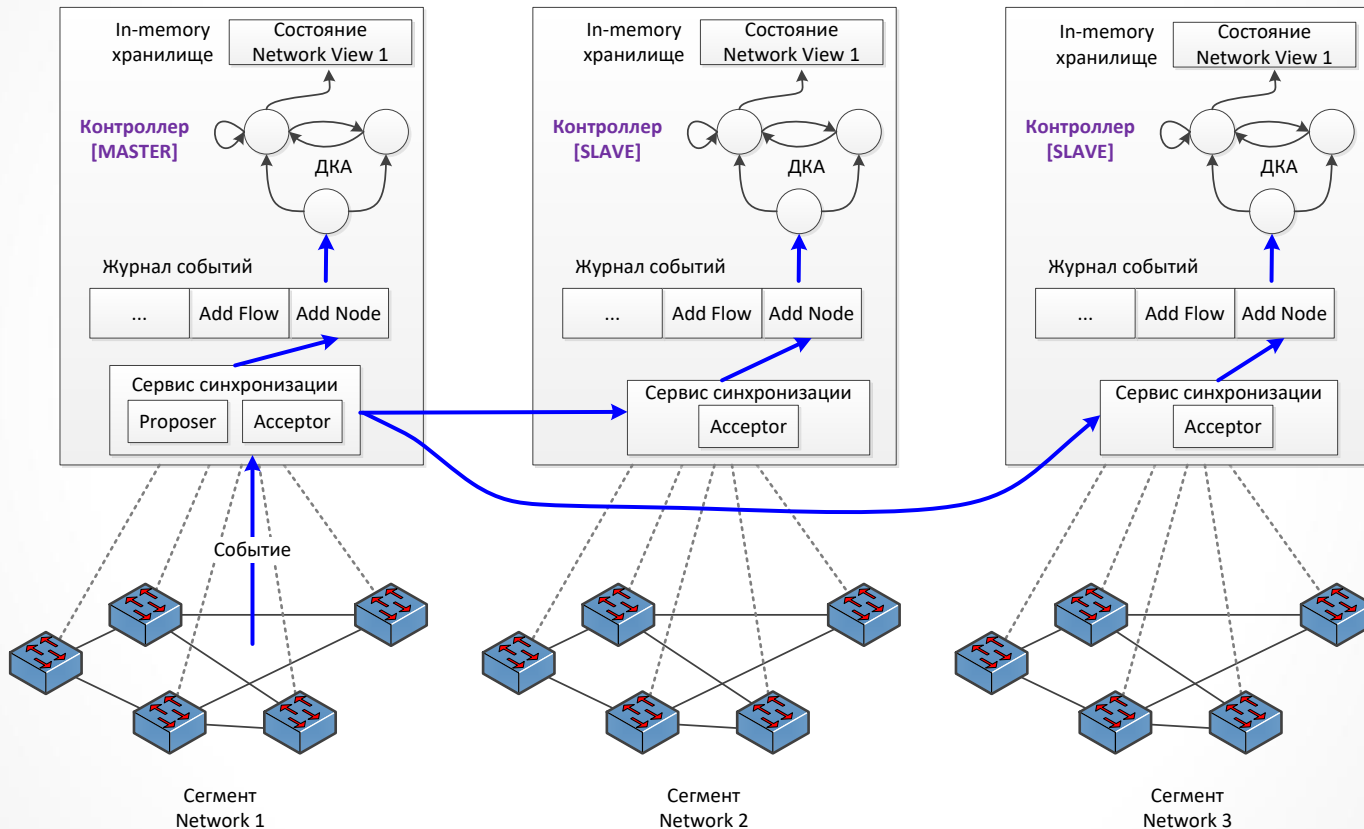
Onix Architecture



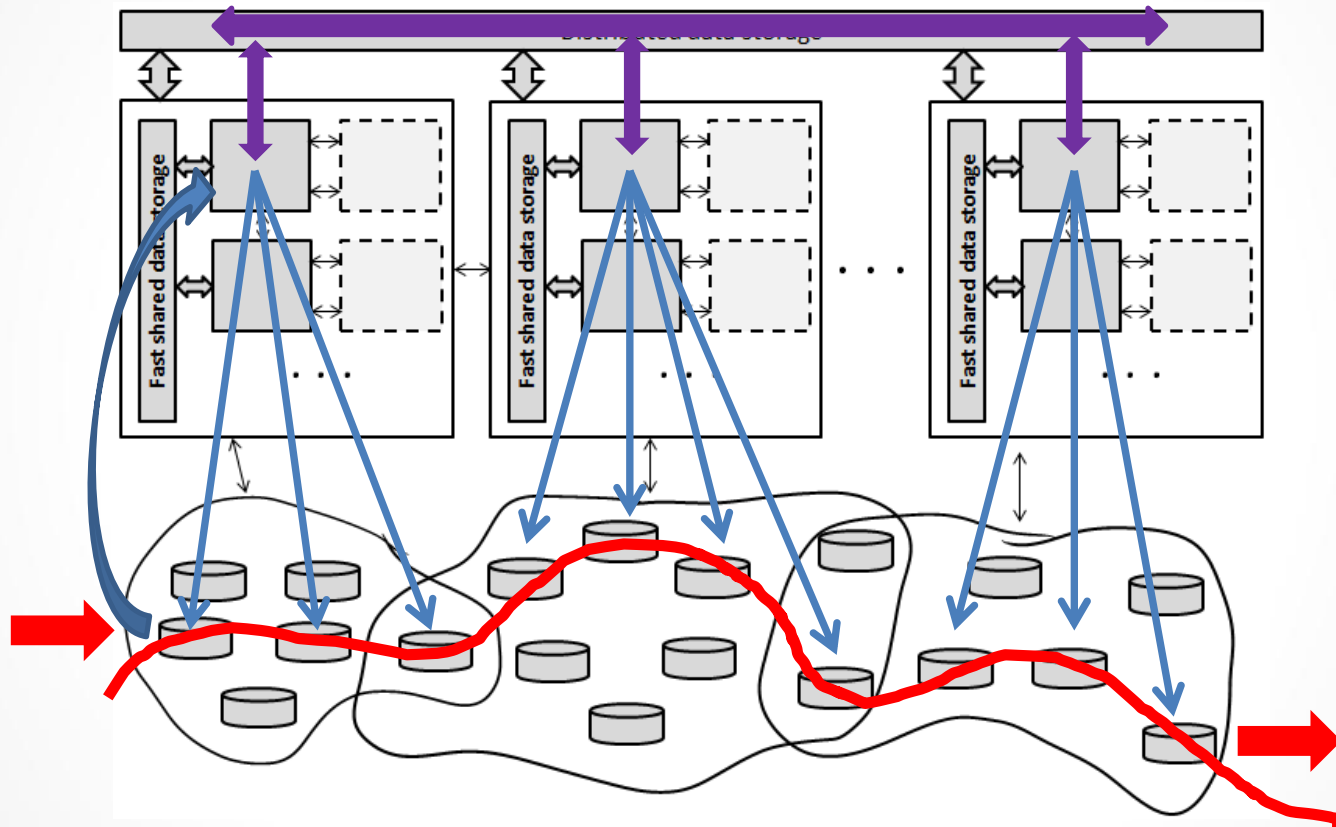
Network view (Onix)



Controller Synchronization



Distributed RUNOS





Thanks for your attention!

Vasily Pashkov
pashkov@lvk.cs.msu.su
