



# Network programmability

Innovation at the speed of Software

EU-LAC ICT & e-Infrastructures Conference for R&D cooperation

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# Agenda

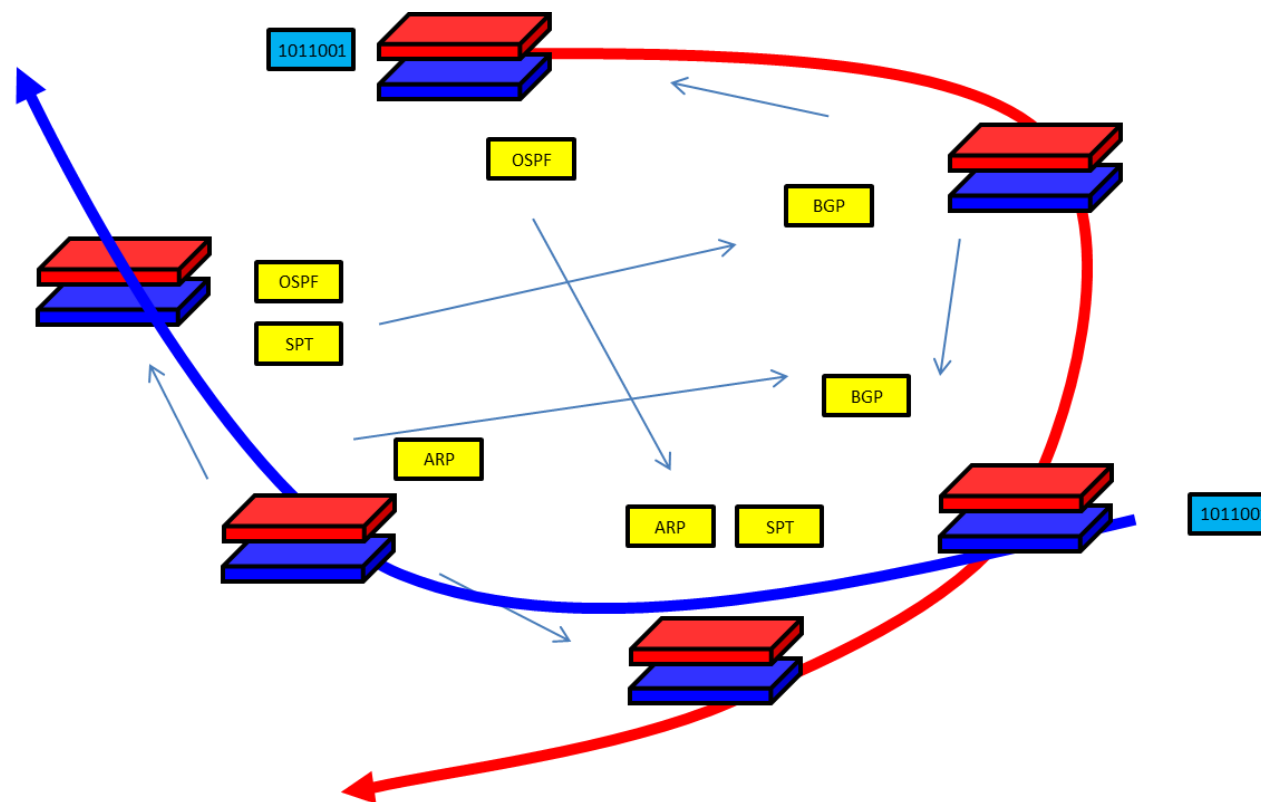
- What is Software Defined Network? What is network programmability?
- Network innovation – *State of affairs*
- Innovation at the speed of software
- What opportunities lie ahead?

# What problems does it solve?

- Current set of available network behaviors limited due to expressiveness power of current network algorithms and protocols (*a.k.a. our bag of tools*)

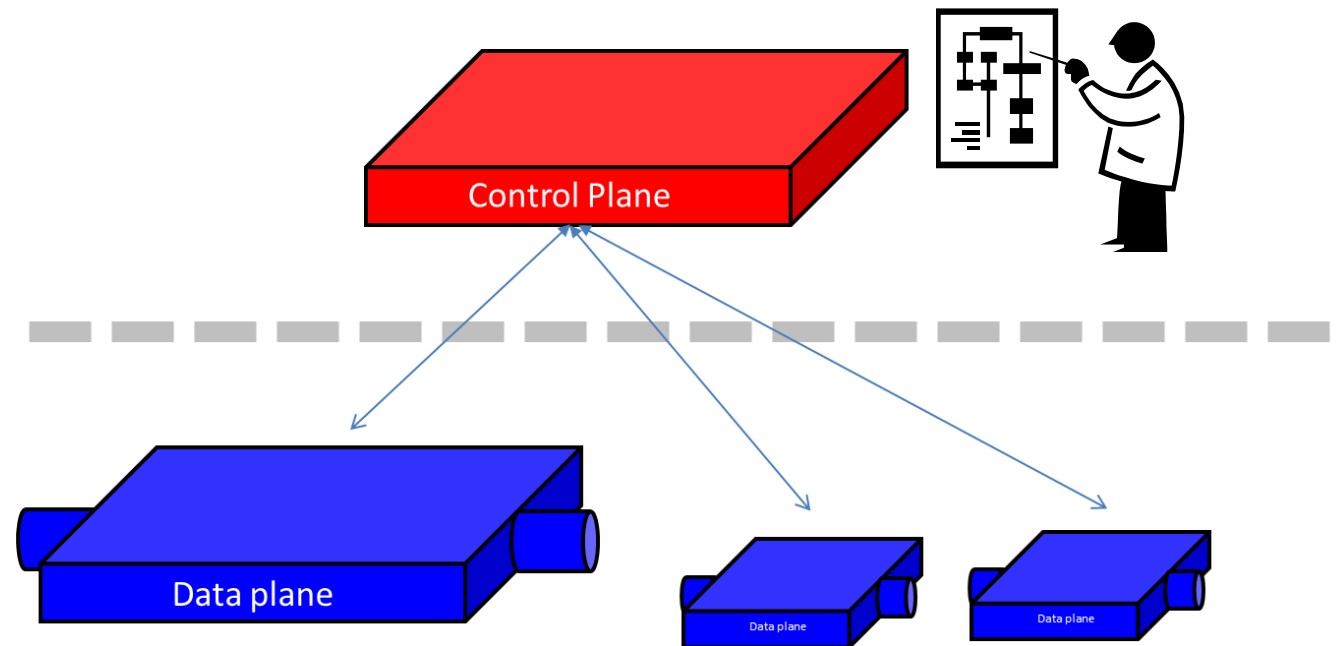
Spanning Tree, RIPv{1|2}, EIGRP, OSPF, BGP, IS-IS can only go so far...

Distributed vs. Centralized



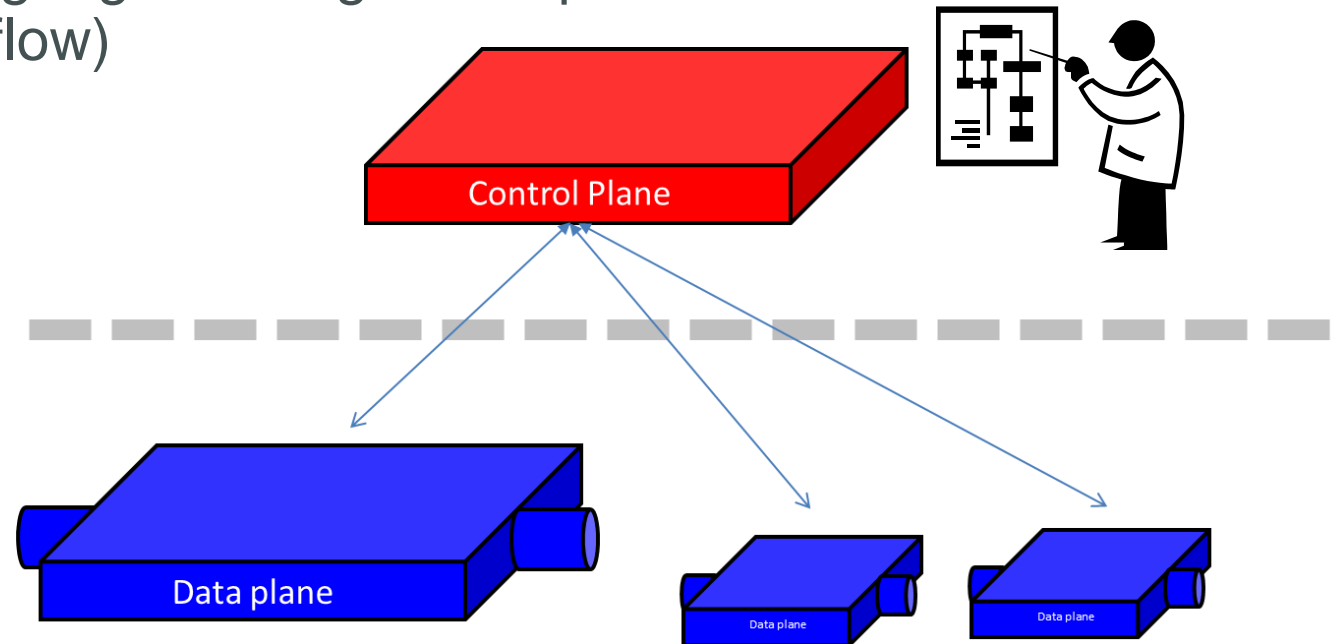
# What is SDN? What is Network programmability?

- A way to programmatically and in real-time, modify traffic forwarding behavior of the network...
- Control and forwarding logic **separated**...  
A standard and open protocol between both...



# What problems does it solve?

- Software defined network “outsources” forwarding logic to a central controller and behavior is then imposed on the network
- Central controller is an application running on a “general purpose computer”
- Application can be written in any language as long as it “speaks” an standard communications protocol (i.e. Openflow)



# Network Innovation – *Current state of affairs*

- Do you want a new “application” on the network?
- Few options...(really, really, really few options)...
  - Hardware (Vendor 1)
  - Operating System (Vendor 1)
  - Application (Vendor 1)



# Innovation at the speed of software (...)

- Do you want a new “application” on the network?

1

- Choose an SDN-able device

2

- Choose a proprietary or Open Source Operating System (a.k.a. Controller)
- Choose the application

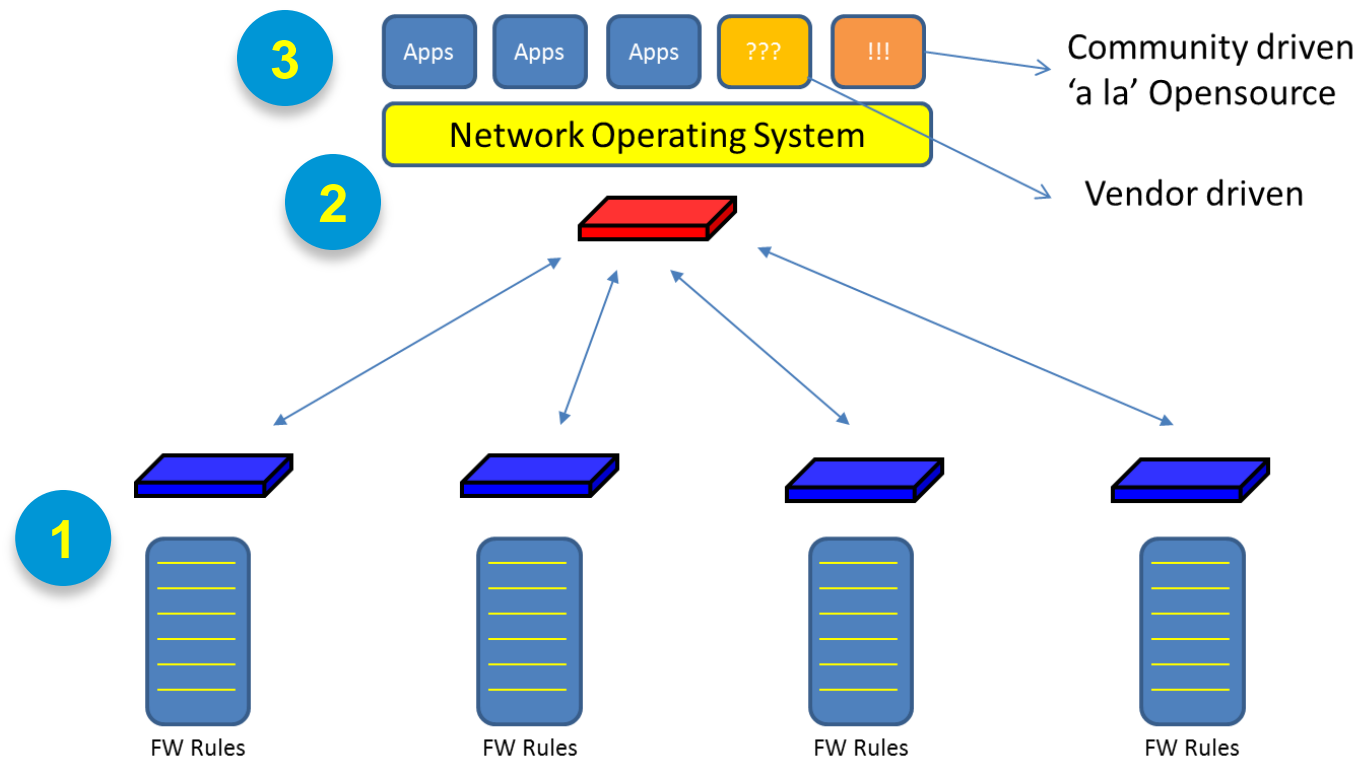
3

Vendor

Open Sourced

Locally developed

- ???
- Profit!



# What opportunities lie ahead?

- We are at the dawn of a new networking era...
- We are at the dawn of a new networking industry...
- Barrier to network application development much lower...
  - New markets (HW/SW separation)...
  - New network applications...
- Huge opportunities for academia and industry joint ventures...
  - The 80's are back...





