



Software Defined Networks Four Years Later

Quo Vadis, SDN?

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Who is Ivan Pepelnjak (@ioshints)

Past

- Kernel programmer, network OS and web developer
- Sysadmin, database admin, network engineer, CCIE
- Trainer, course developer, curriculum architect
- Team lead, CTO, business owner



Present

- Network architect, consultant, blogger, webinar and book author

Focus

- Large-scale data centers, clouds and network virtualization
- Software Defined Networking and NFV
- Scalable application design



What Is SDN?

SDN is the physical separation of the network control plane from the forwarding plane, and where a control plane controls several devices

SDN is the physical abstraction of the network control plane from the forwarding plane, and where a central controller plane controls several devices

Mostly Useless

**SDN is packet forwarding done
in software (on x86 platform)**

SDN is packed with things done
in software (platform)

**Exciting but
Misleading**

**SDN is whitebox switching
(running software on third-party
cheap hardware)**

SDN is whiteb
(running s
cheap l
third-party

Margin Shifting Exercise

**SDN is network automation –
programmable access to
network devices**

SDN is network automation -
programmable access to
network

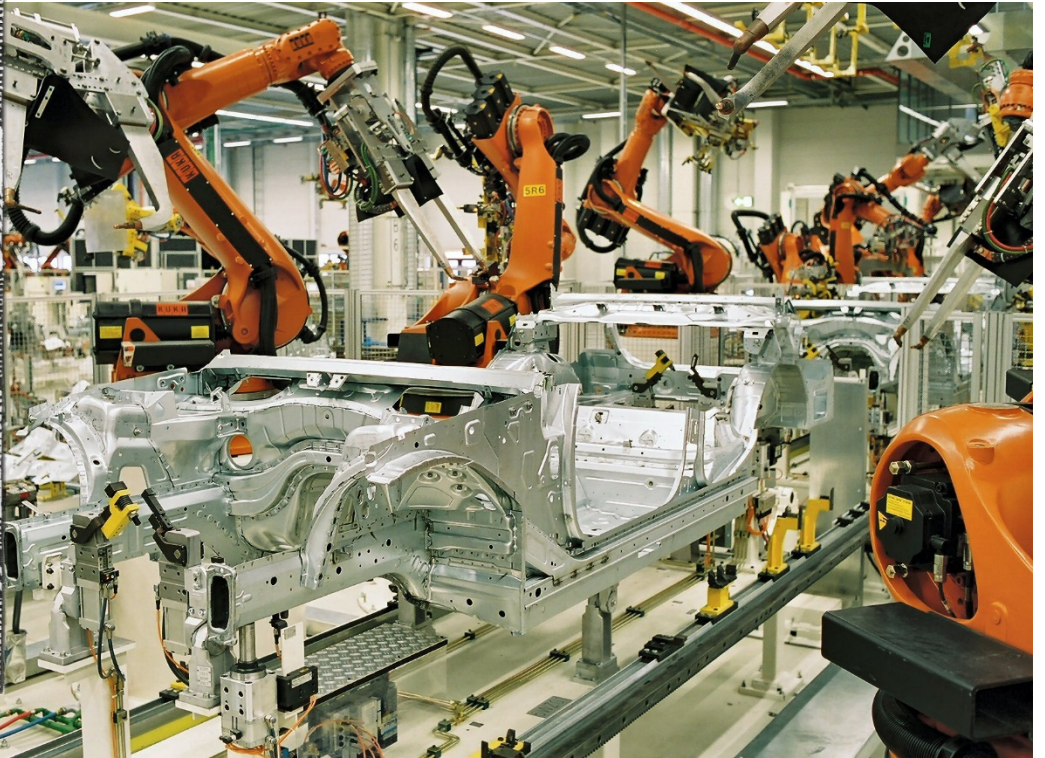
API != SDN

SDN is an approach to computer networking that allows network administrators to manage network services through abstraction of lower level functionality

SDN is an approach to computer networking that allows network administrators to manage network settings through abstract, higher level functions. This makes sense.

This Makes Sense

Isn't That Just a Glorified Orchestration System?



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SDN and NetOps is a lifestyle change

SDN Architectures

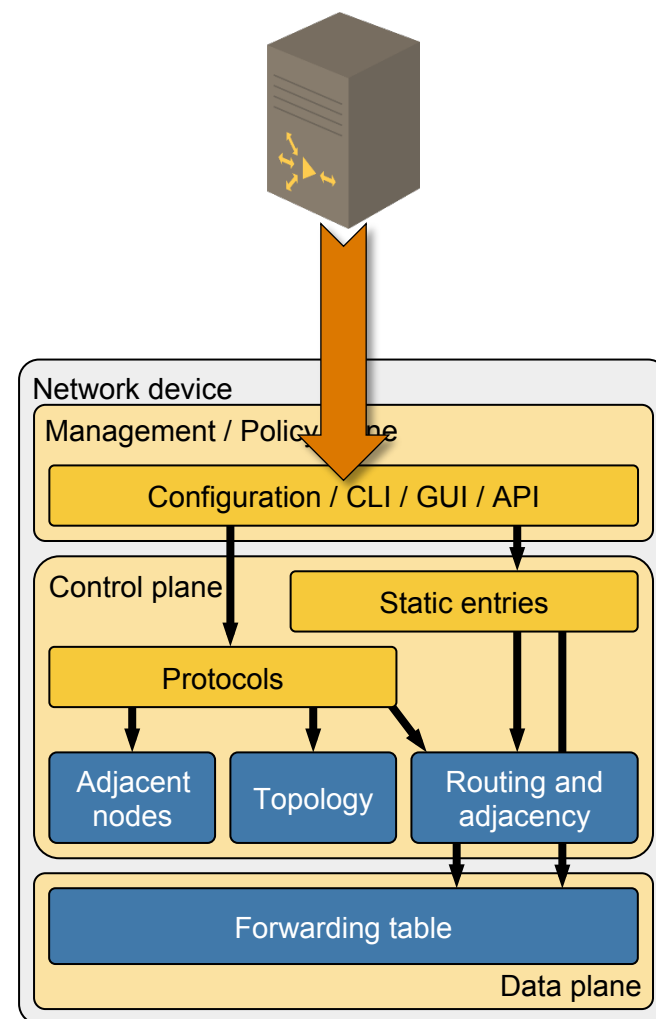
Device Provisioning Systems

Controller is used to provision new devices

- Usually template-driven device configuration with automatic deployment
- Widely used in large-scale operations and service provider networks (residential CPE)
- Automatic configuration deployment supported by most networking vendors

Sample tools and products

- Ansible
- Arista ZTP Server
- Dell Fabric Manager



Service Provisioning Systems

Controller is used to provision new services

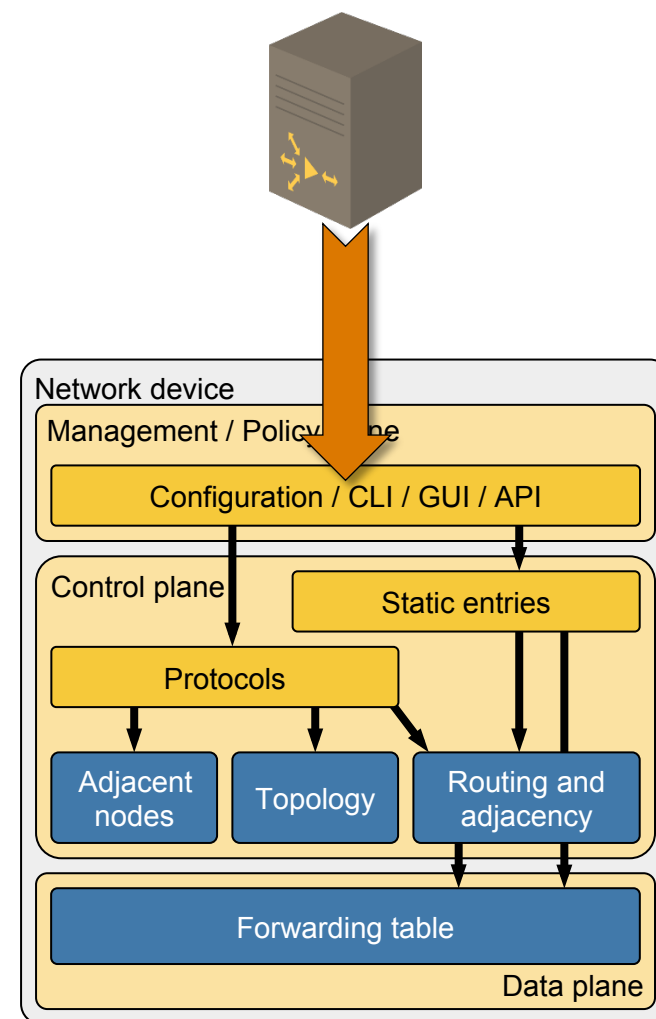
- Usually template-driven device configuration with automatic deployment
- Commonly used in large service provider networks

Challenges

- Unreliable configuration deployment
- Software release dependencies
- Multi-vendor deployments
- Transactional consistency

Sample tools and products

- Cloud orchestration systems
- Configuration automation tools (Ansible / Chef / Puppet)
- Tail-f NCS
- Cisco Prime Fulfillment MVSO, UCS Director
- Anuta Networks NCX



Routing and Forwarding Adjustment Controllers

Controller is used to adjust forwarding paths

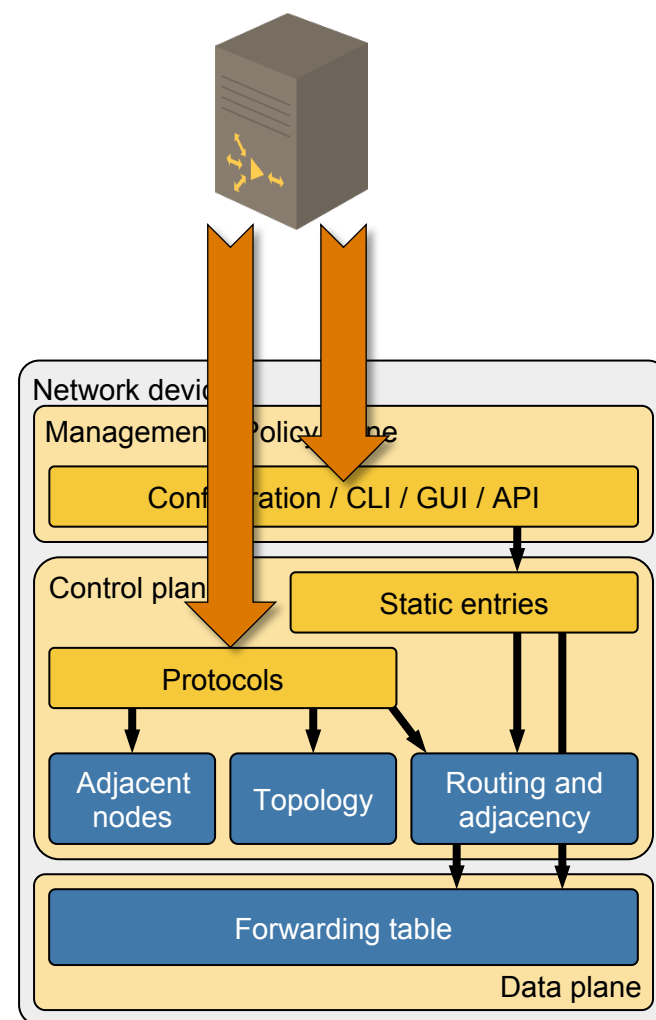
- Changes in device configuration (MPLS-TE tunnels or routing protocol metrics)
- Automatic creation of TE paths (example: PCEP)
- Adjustment of forwarding information (example: BGP)

Challenges

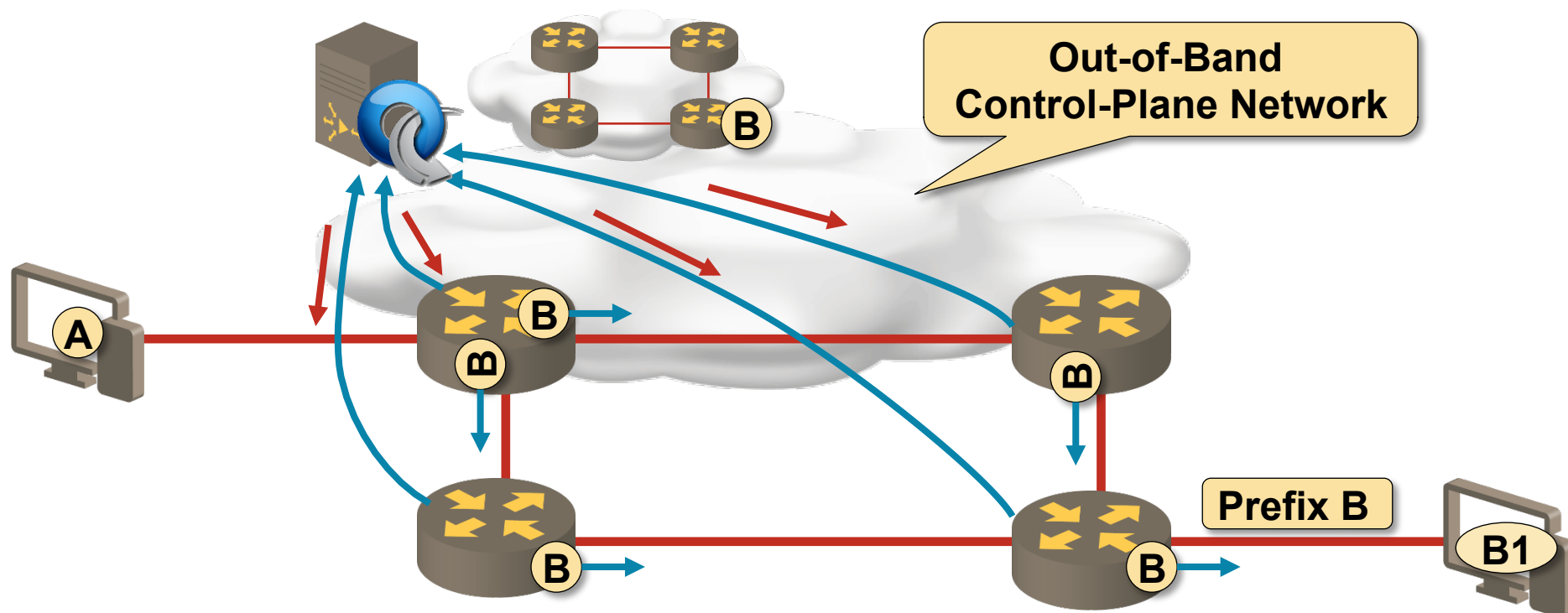
- Limited by destination-only forwarding model

Sample tools and products

- Cariden MATE
- Cisco PfR
- Quagga, ExaBGP...



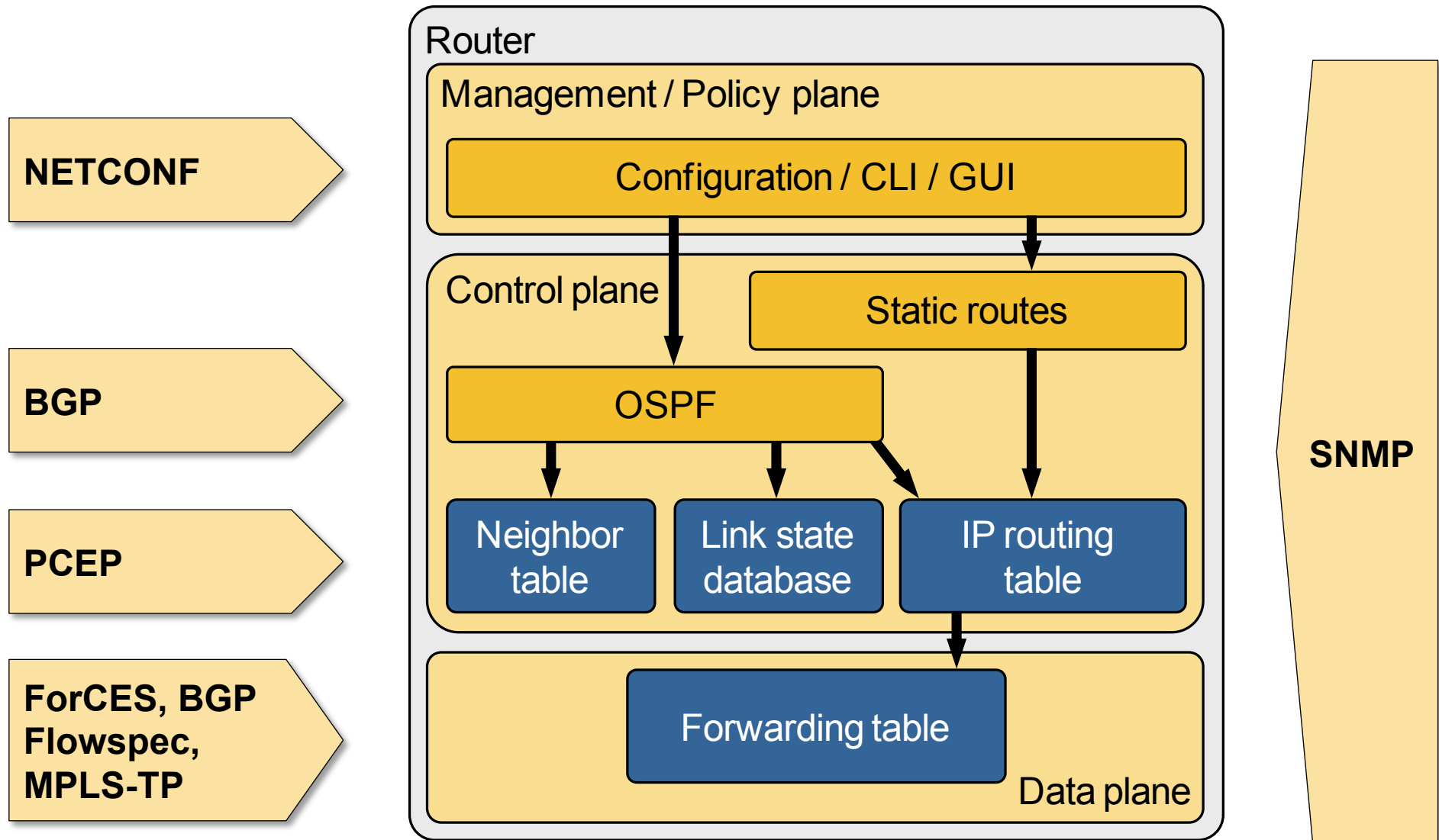
Centralized Control Plane (example: OpenFlow)



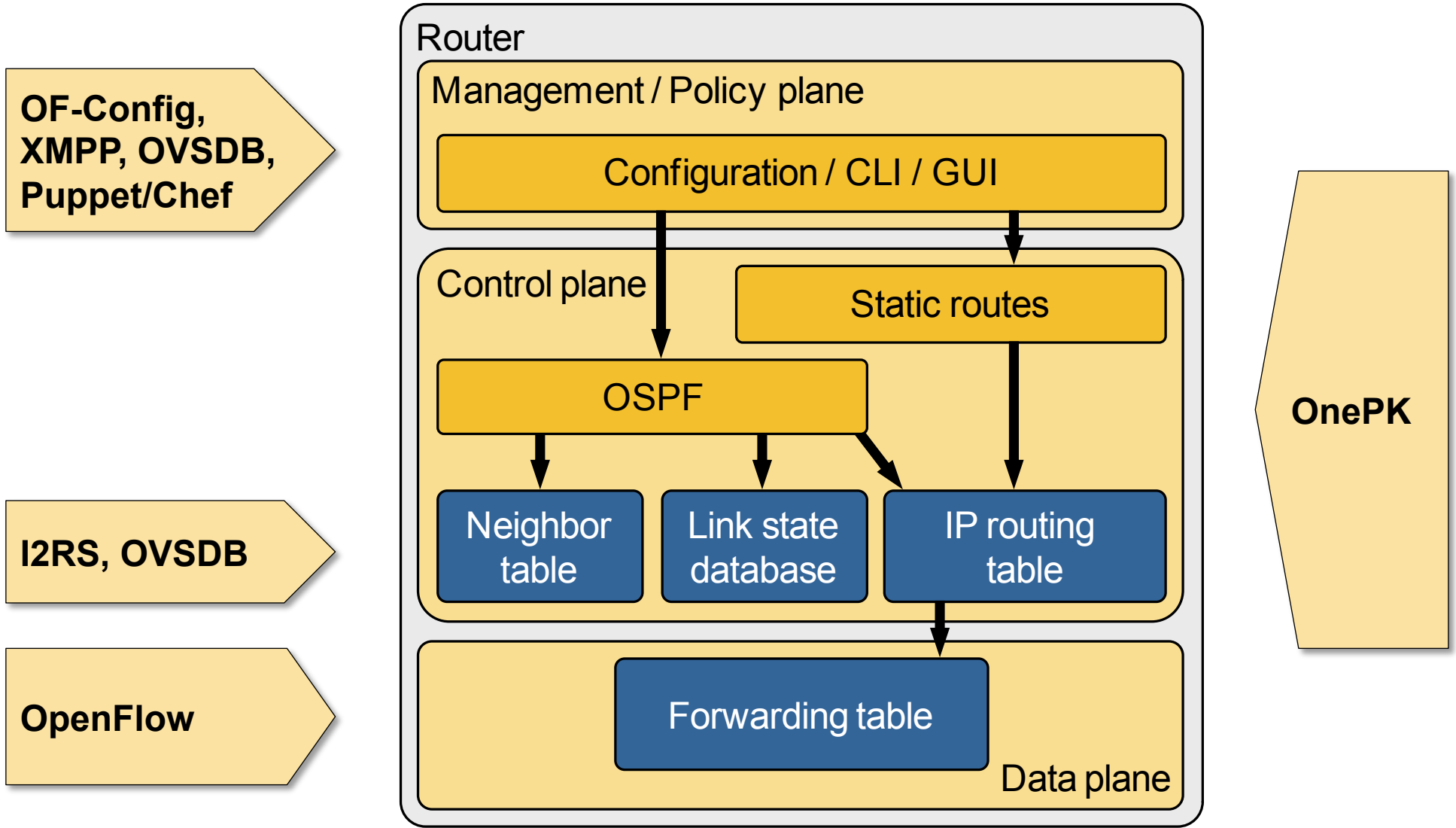
- Control plane implemented in a central controller
- Network elements are dumb: packet forwarding only (incl. punt to controller)
- Controller has to reinvent all the wheels: routing protocols, LACP, LLDP, BFD...
- Serious scalability limitations, hard to implement fast feedback loops
- Production-grade implementations use OpenFlow for exceptions or rely heavily on OpenFlow extensions

The SDN Toolbox

SDN Toolbox: Existing Tools



SDN Toolbox: Emerging Protocols





**Network Functions
Virtualisation ISG (NFV)**

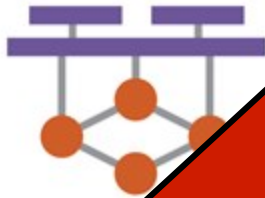


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OPEN
LIGHT

ONS



Standards

SDN
&NFV 2014
SOFTWARE DEFINED NETWORKING
& VIRTUALISATION SUMMIT

Will SDN and NFV
Save the Day?

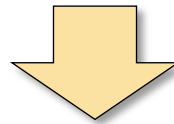


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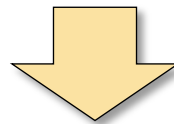
Technology Is an Enabler, Not a Solution

**We Need to
Change the Model**

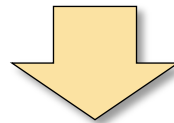
Simplify



Standardize



Automate



Abstract

Automate Everything

Start NOW

Stay in Touch

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