

Introduction to Software Defined Networking

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Agenda

- **What is SDN and What it is not**
- SDN Trends
- Getting Ready for SDN

What is SDN

- Simply, it is a new 'approach' to networking.
- Which means, it is not just one specific solution, technology or product. It is a range of advances in networking.
- It is a Buzz word that is used for Marketing purposes, to present new products.
- But there are interesting concepts that are emerging.

What SDN is not...

- It is not ‘only’ decoupling of Forwarding Plane and Control Plane.
- It is not ‘only’ networking on white-boxes / generic hardware.
- It is not ‘only’ programmability support on embedded network devices to program the network.

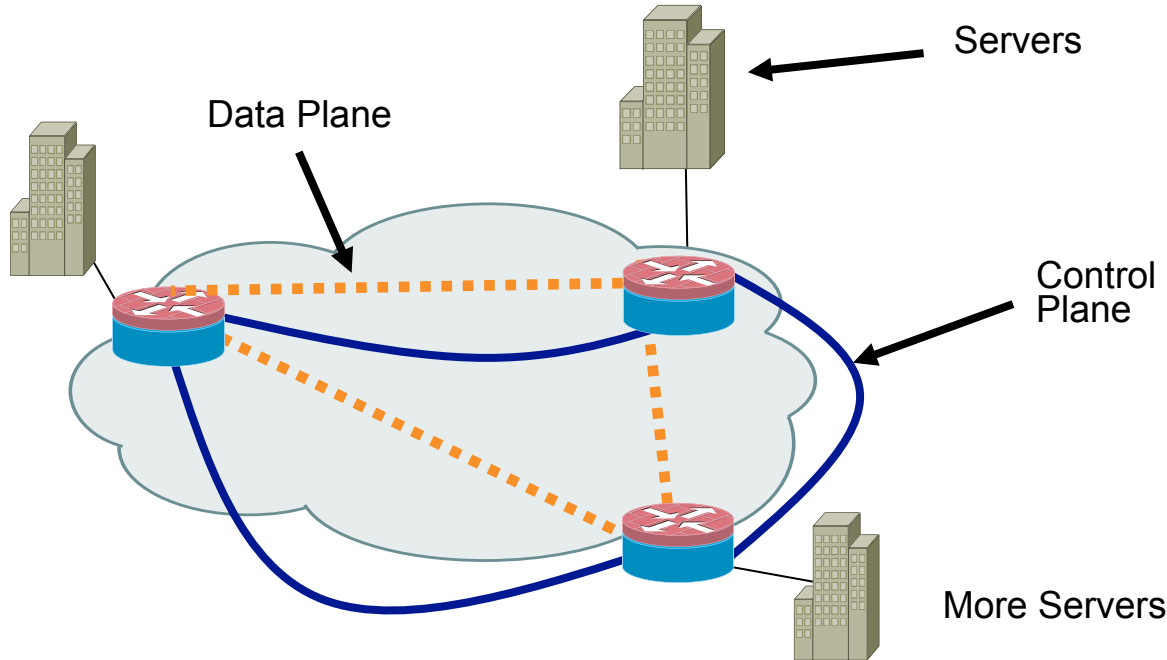
What is SDN again

- It is a journey of transforming the networking industry, challenging the way we build and manage networks today.
- It is allowing us to easily control the network, in the same way we control applications and operating systems.
- Bringing more flexibility to existing and future networking to influence design and operations from external applications.
- Providing new ways of interaction with network devices.

The Need for SDN

IT : Hi SDN...can you solve my network problems.

SDN : what kind of problems ?



Custom Traffic Engineering

Consistent Network Policy

Accounting

Consolidation :DC + WAN + LAN

Network Function Virtualization

Automation and Network Mgmt

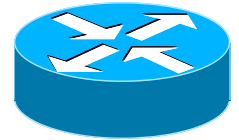
Zero Touch fast provisioning

More examples:

- Steering traffic and priority based on Weather/Environment changes.
- If a host becomes infected, re-direct their traffic to a portal that will clean their traffic and send them a warning note to their browser.
- i.e : Allowing granular automatic network changes and routing based directly on Business Metrics and driven from IT Applications.



Why cant I just tell you what I want to do, and you translate it to your language



Error, Command Not Found

Existing technology is limiting us?

- Because the boxes speak protocols/algorithms that are not familiar to other IT personnel and only network people can comprehend...i.e : BGP, OSPF, MPLS...etc
- Because interacting with the network required a language, that a few people in the organization understands...i.e: Vendor specific CLI
- In summary, that always limited what networks can do.



How do I tell you what to do exactly

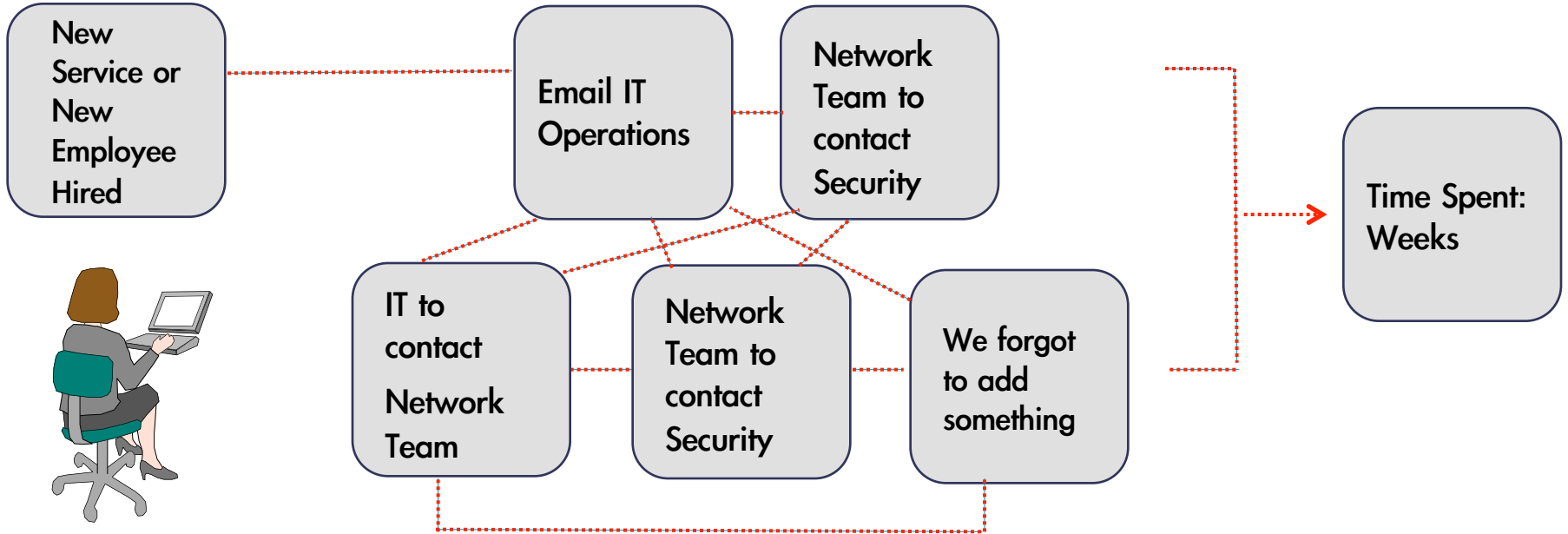


Learn my CLI + BGP, MPLS, OSPF ☺

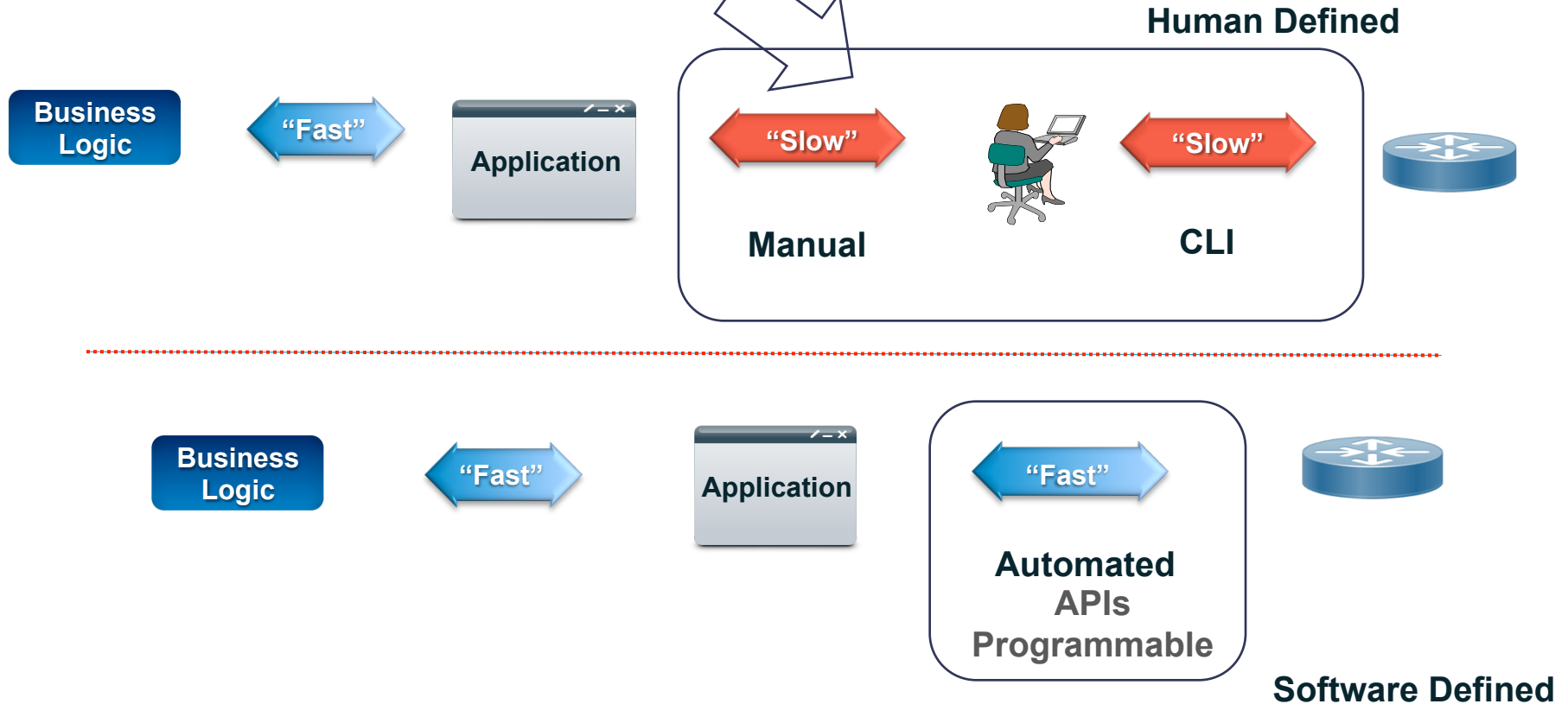


Existing provisioning process

- Slow, Time consuming, Human-dependent



Human factor is a bottleneck in business automation



SDN Addresses needs for

- Centralized configuration, management/control, monitoring of network devices (physical or virtual).
- Ability to override traditional forwarding algorithms to suite unique business or technical needs.
- Allowing external applications or systems to influence network provisioning and operation.
- Rapid and scalable deployment of network services with lifecycle management.

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- **SDN Trends**
- Getting Ready for SDN

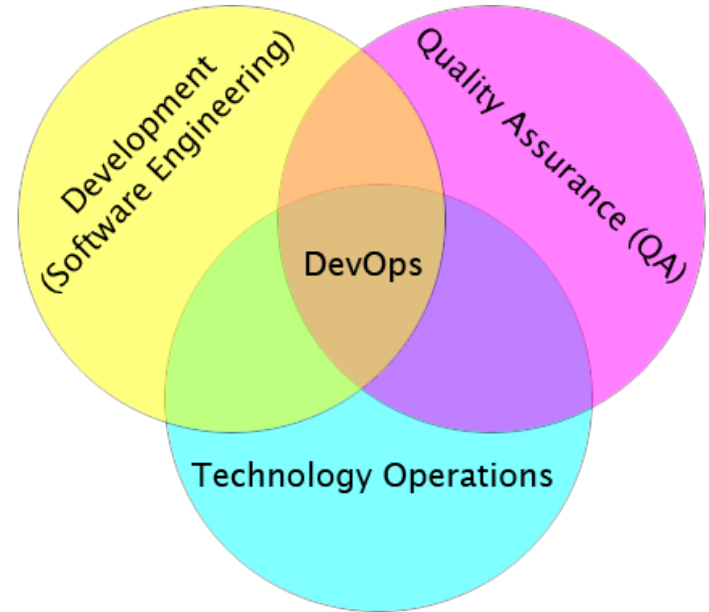
Evolution

We no longer work in Silos

Evolve from what started as DevOps to NetOps

- Programming technologies married Operations
 - Java, C, Python, REST, Chef, Puppet, OpenStack, Controllers, NetConf/Yang, OpenFlow ...
- That fosters innovation and automation
 - Automated provisioning, dynamic traffic engineering, integrated with routers and switches and continuous integration
- Combining network operations and development
 - IT and network operations, business application and infrastructure developers

Integrate: Simplify & Automate & Move Fast



Network Function Virtualization

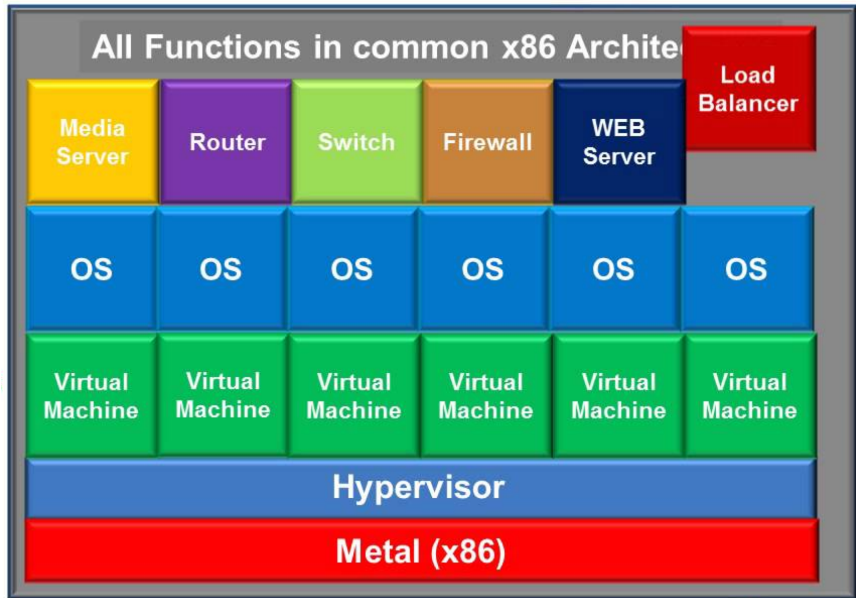
Enablers, benefits and applications

- **Technology enabler**

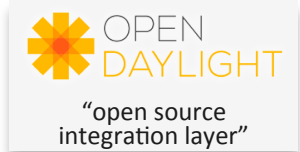
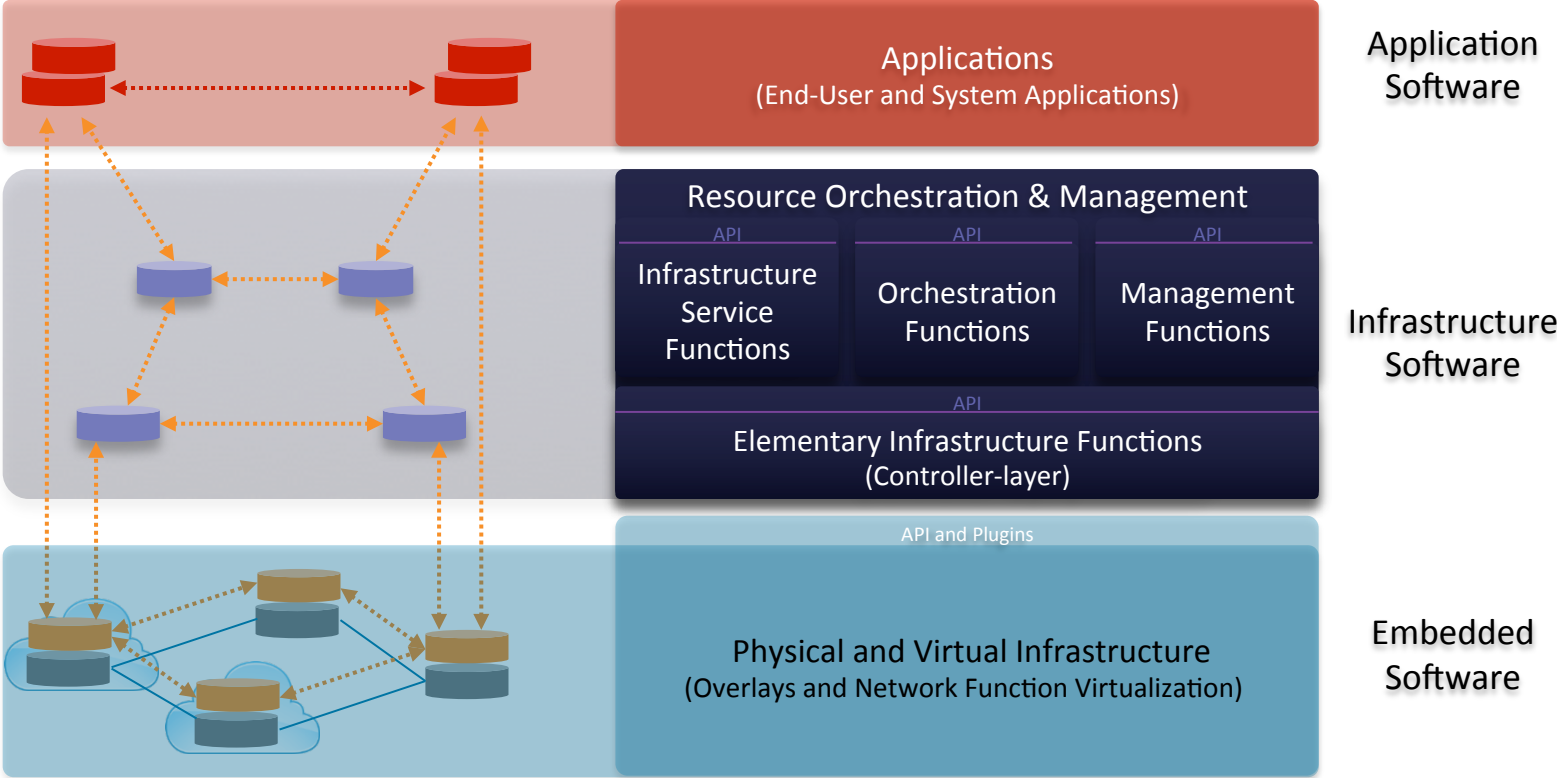
- Hypervisor and cloud computing technology
- Improving x86 h/w performance
- Optimised packet processing and coding techniques
- Network industry standardising on Ethernet
- SDN based orchestration

- **Return on Investment**

- Reduction in CAPEX and OPEX
- Shorter innovation cycle
- Improved service agility



Evolving The Network Software Stack



Customer Needs: Network Programmability



Research/ Academia

- Experimental OpenFlow/SDN components for production networks

Network
“Slicing”



Massively Scalable Data Center

- Customize with Programmatic APIs to provide deep insight into network traffic

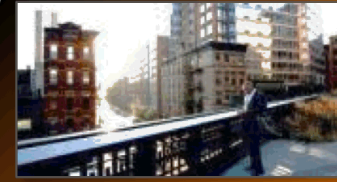
Network Flow
Management



Cloud

- Automated provisioning and programmable overlay, OpenStack

Scalable
Multi-Tenancy



Service Providers

- Policy-based control and analytics to optimize and monetize service delivery

Agile Service Delivery

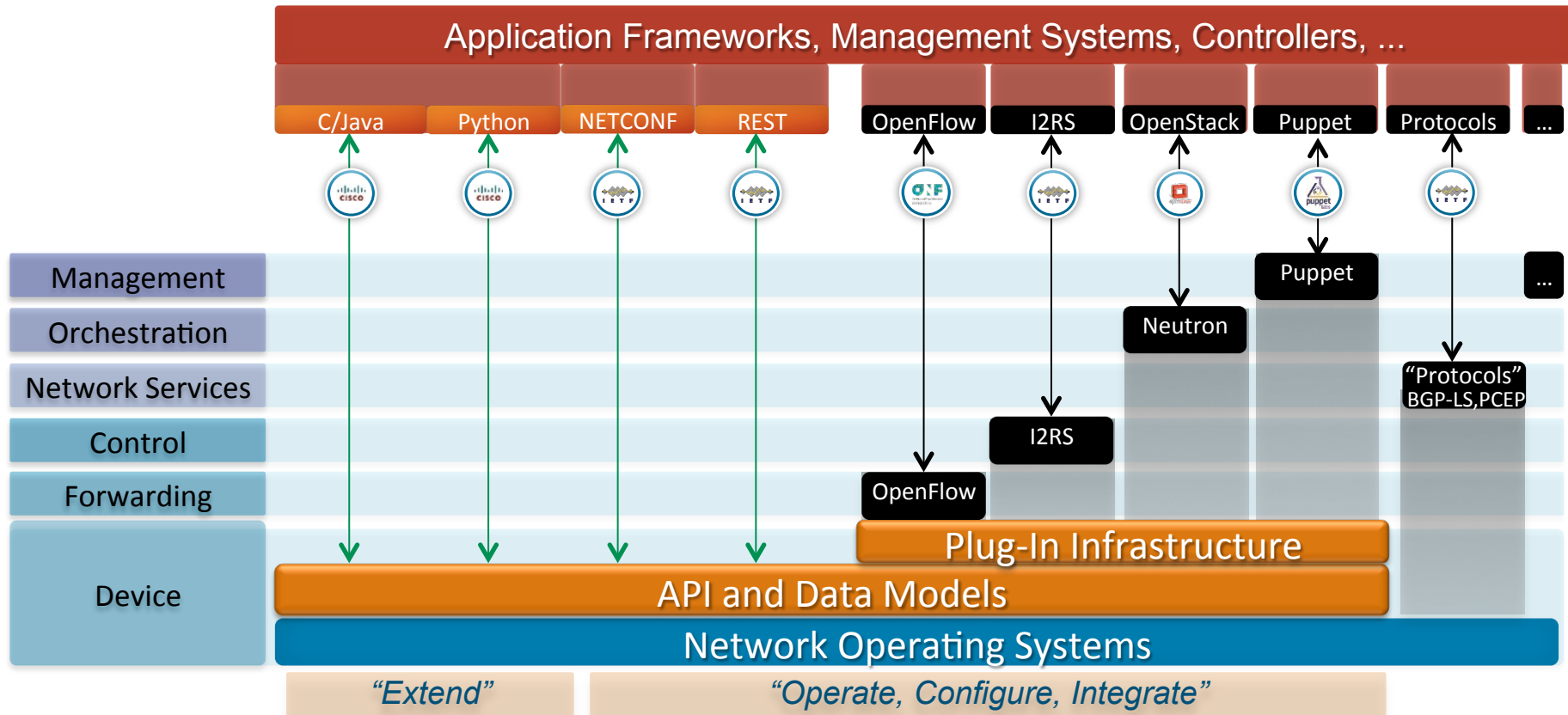


Enterprise

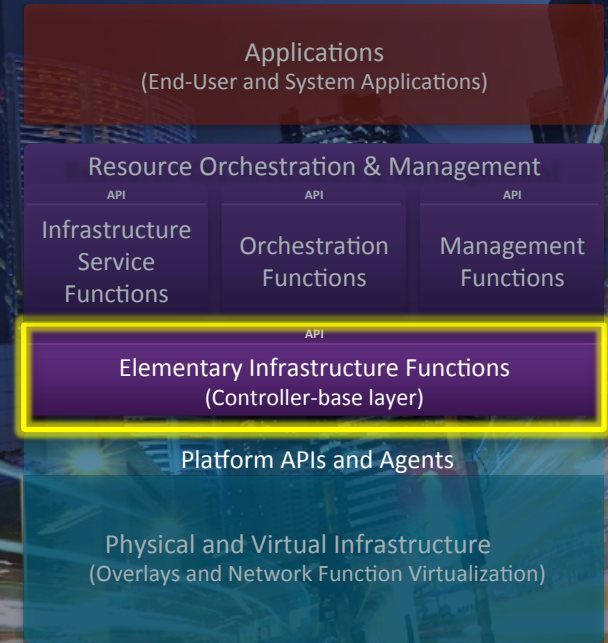
- Virtual workloads, VDI, Orchestration of security profiles

Private Cloud
Automation

SDN Trends and Programmatic Interfaces



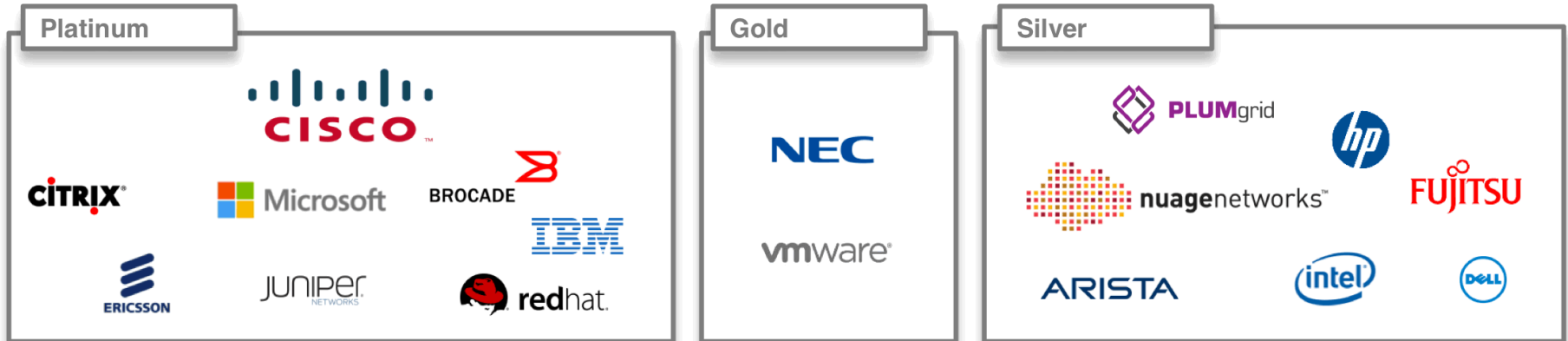
Example : Open Source Controller Open DayLight Controller



What Is OpenDaylight?



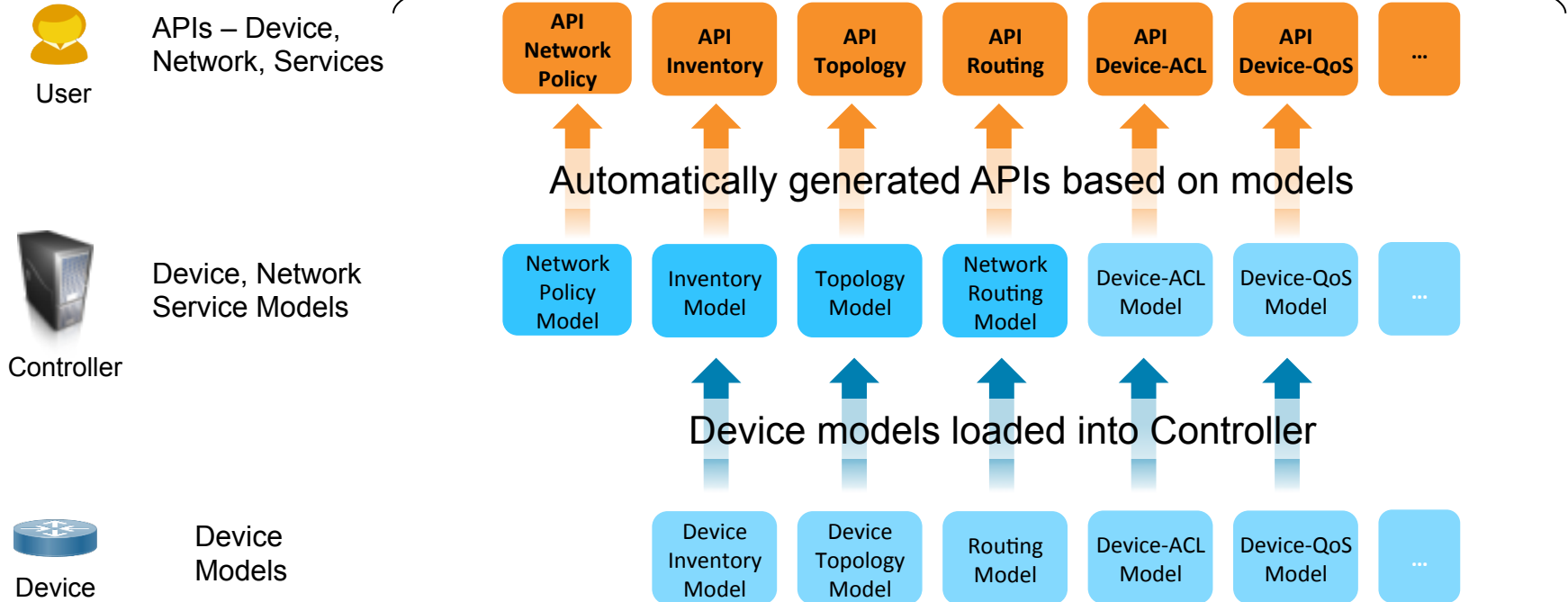
- ...an open source project formed by industry leaders and others under the Linux Foundation with the mutual goal of furthering the adoption and innovation of Software Defined Networking (SDN) through the creation of a common vendor supported framework.
- Focus: Customers with some programming resources that desire a free, community-supported SDN controller, especially if focus is on OpenFlow



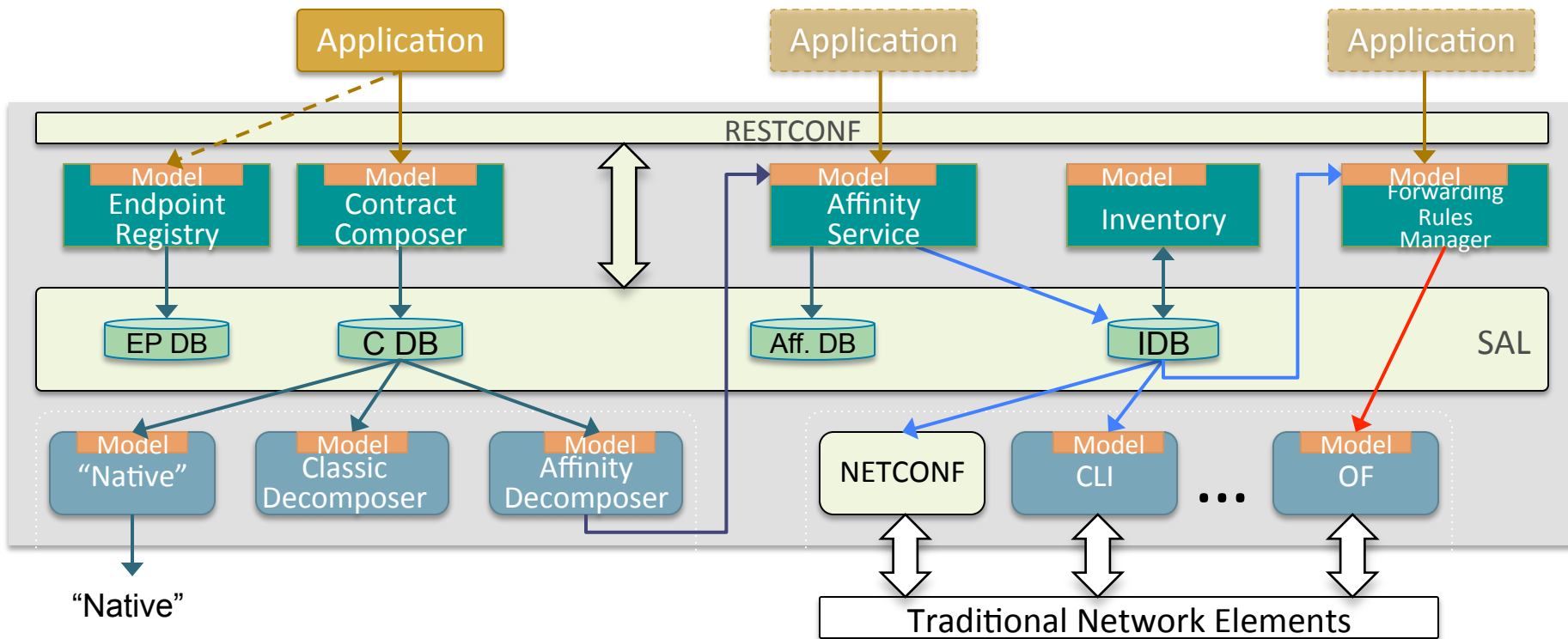
Model Driven Controller Architecture

Controller naturally exposes all APIs: Devices and Network APIs

Northbound API = SUM (Device APIs) + Controller-Services APIs

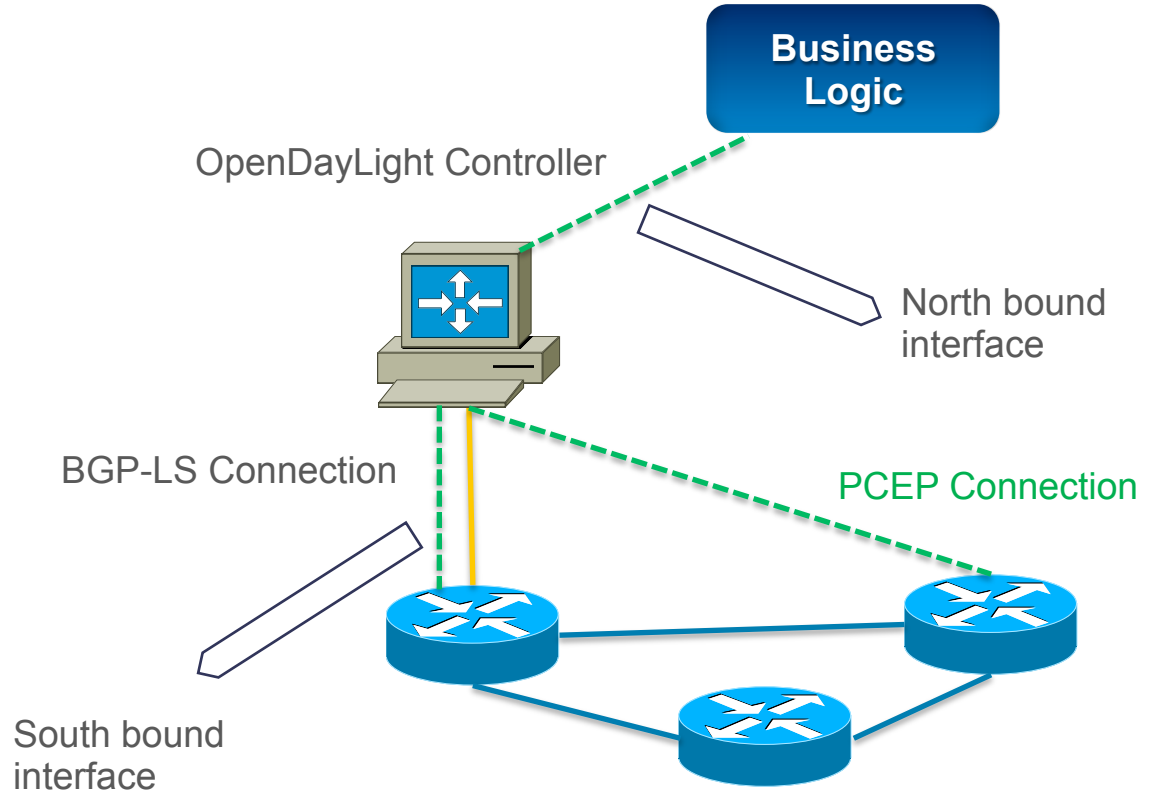


Application Policy Plugin Architecture



Basic Use-Case of OpenDayLight

- Step 1 : Query network topology details from the controller using its northbound interface
- Step 2 : Create, update and delete paths in the network using the controller southbound interface



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Get Familiar with the Industry Standards + Initiatives



Early Adopters and Operational Networks

- AT&T

<http://www.packetdesign.com/blog/att-slow-crawl-to-sdn-ubiquity>

- Microsoft :

<http://www.zdnet.com/article/why-microsoft-is-invested-in-opendaylight/>

- Telefonica :

newsroom.cisco.com/press-release-content;jsessionid=10100EEF9E1CB4FAFCFD6962E824E8E1?type=webcontent&articleId=1488116

- Google :

<http://www.networkcomputing.com/networking/inside-googles-software-defined-network/a/d-id/1234201?>

- Amazon:

<http://www.infoworld.com/article/2608106/sdn/sdn-secrets-of-amazon-and-google.html>

- Facebook :

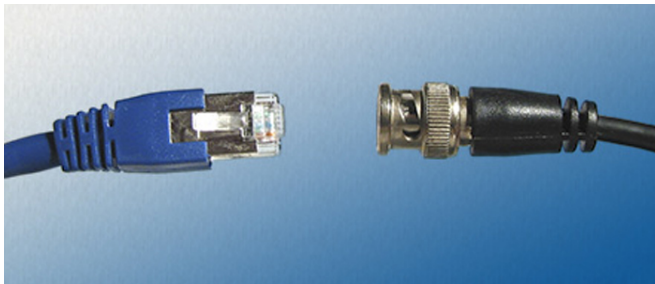
<https://gigaom.com/2014/11/14/facebook-shows-the-promise-of-sdn-with-new-networking-tech/>

Play with the Tools (Controller...etc)

- Find out what are your top challenges that can be solved with SDN.
- Download the tools, build a lab, get trained, test and break things.
- Read tweets and blogs, attend conferences.
- Find out what others are doing.
- Take baby steps, try to automate some things, rinse and repeat.

Get Familiar with new skills

- Every once in a while, engineers need to sharpen some skills.
- This is the time to start the path to a network engineer with software programming and networking hybrid skills.
- Remember the transition from Analog circuit switched networks to IP Telephone ;)



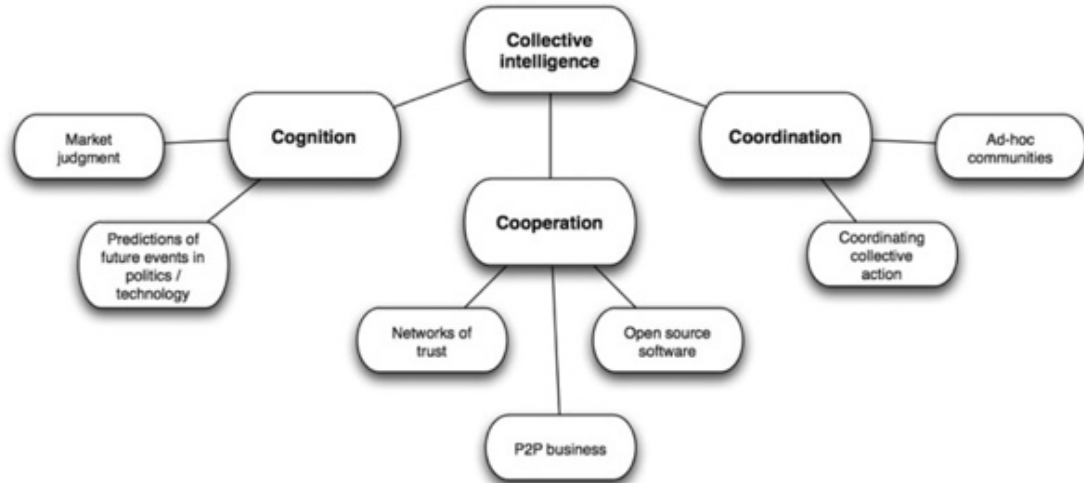
Get on the bandwagon

- Linux, Sed, Awk
- Automation, Puppet/Chef
- Python, Go Lang, RegEx, Web Services
- Parsing, Pattern matching, JSON, XML
- REST, NetConf/YANG
- Cooperate with the Open source community

Training

Knowledge

useful abilities.
backbone of co
quired for a tr



Thank you

- Q&A