Cisco Connect

Dubai, UAE
20th March 2013

Software Defined Networking and Use Cases

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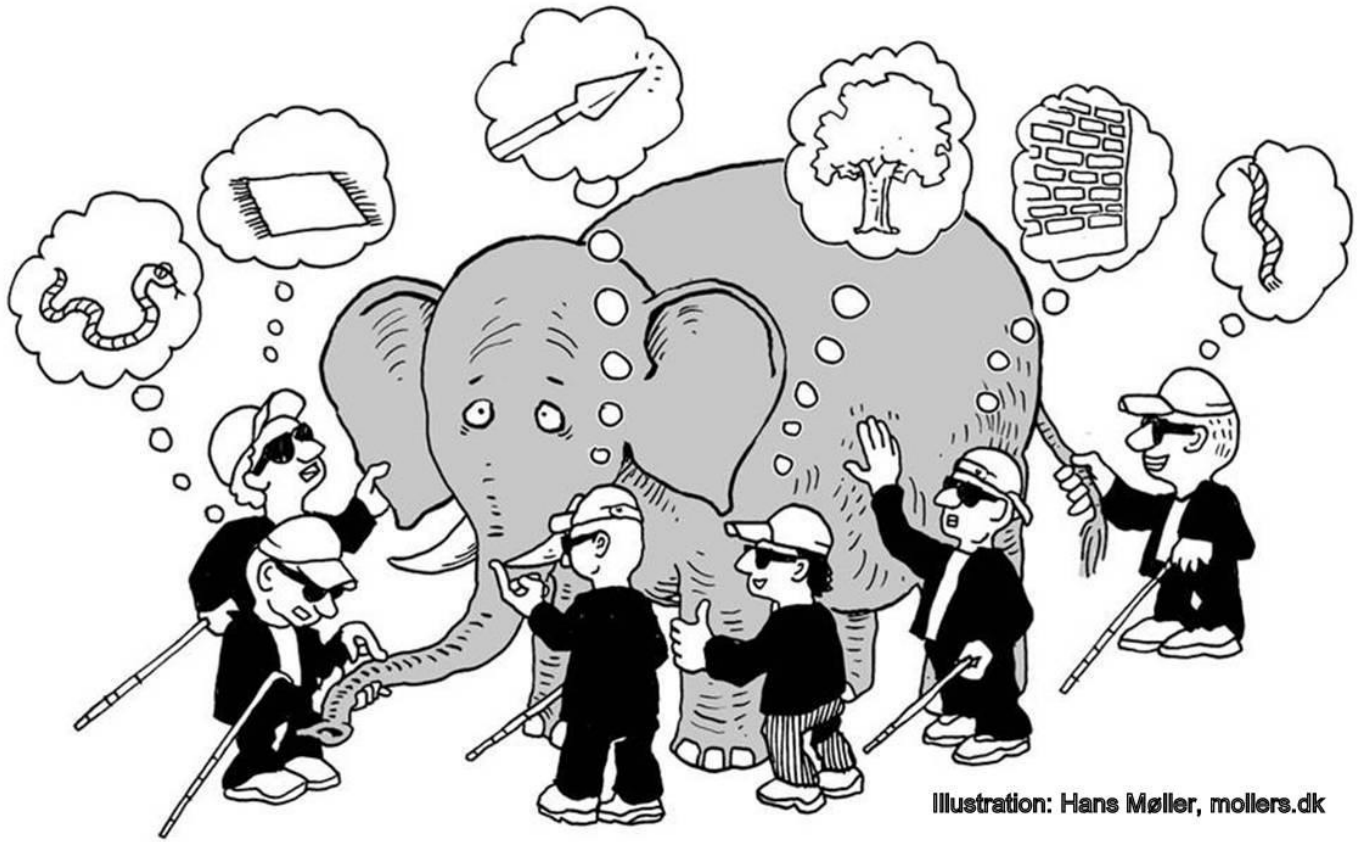
Consulting Systems Architect

Perception



All things to all people

A better way to build a network

Hardware doesn't matter

The answer to *every* network issue

Simplified troubleshooting

Unlimited bandwidth

Unlimited resources

Whatever you want it to be

SDN Is…

"A way to optimize link utilization in my network enhanced, application driven routing"

"An open solution for customized flow forwarding control in and between Data Centers"

"A platform for developing new control planes"

"An open solution for VM mobility in the Data-Center"

"A solution to automated network configuration and control"

"Develop solutions at software speeds: I don't want to work with my network vendor or go through lengthy standardization."

"A way to reduce the CAPEX of my network and leverage commodity switches"

"A means to get assured quality of experience for my cloud service offerings"

"A solution to build a very large scale layer-2 network"

"A means to do traffic engineering without MPLS"

"A solution to build virtual topologies with optimum multicast forwarding behavior"

Diverse Drivers

Common Concepts

Different Execution Paths

"A means to scale my fixed/mobile gateways and optimize their placement"

"A way to optimize broadcast TV delivery by optimizing cache placement and cache selection"

"A way to build my own security/encryption solution"

"A way to scale my firewalls and load balancers"

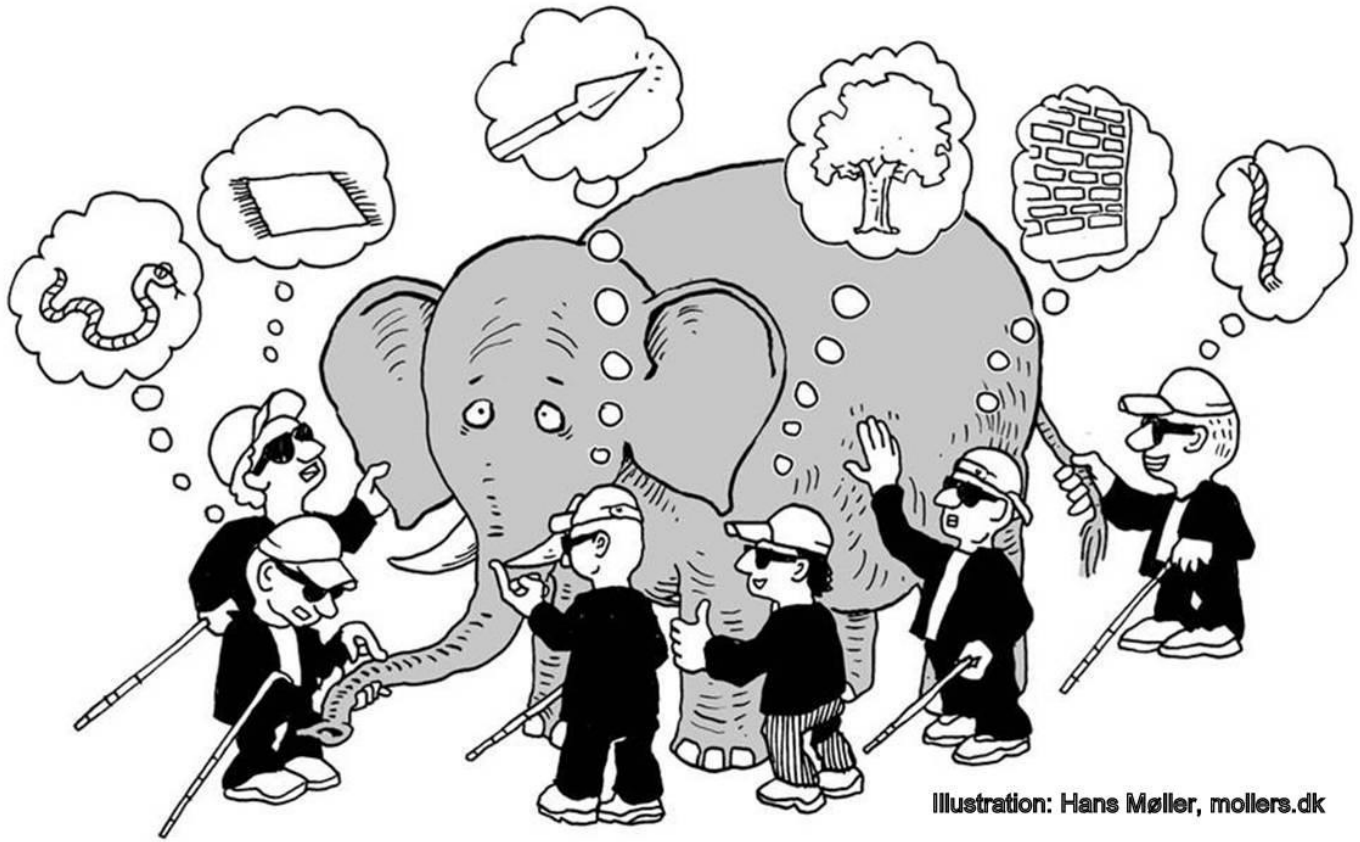
"A way to distribute policy/intent, e.g. for DDoS prevention, in the network"

"A way to configure my entire network as a whole rather than individual devices"

"A solution to get a global view of the network – topology and state"

Simplified Operations – Enhanced Agility – New Business Opportunities

Perception



Reality

Evolving way of centralizing network control.

Specialized hardware is still beneficial

Lowest common denominator features

A process of defining network requirements

Ability to automate QoS deployments

Ability to enforce policy for an entire network

Centralized control providing in a repeatable automated fashon what you can already do today.

The latest buzz word

"…In the SDN architecture, the control and data planes are decoupled, network intelligence and state are logically centralized, and the underlying network infrastructure is abstracted from the applications…"

https://www.opennetworking.org/images/stories/downloads/white-papers/wp-sdn-newnorm.pdf

"…open standard that enables researchers to run experimental protocols in campus networks. Provides standard hook for researchers to run experiments, without exposing internal working of vendor devices……"

http://www.openflow.org/wp/learnmore/

Customer Insights: Network Programmability

Research/ Academia

- Experimental OpenFlow/SDN components for production networks

Network "Slicing"

Massively Scalable Data Center

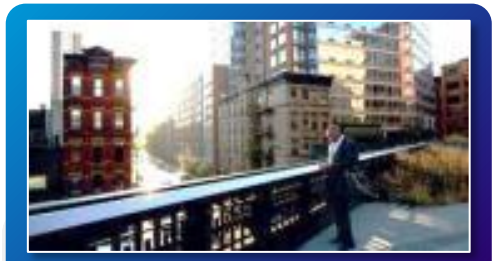
- Customize with Programmatic APIs to provide deep insight into network traffic

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

Diverse Network Programmability Requirements Across Segments: Automation, Monitoring & Flow Programmability

Classes of Use-Cases

"Leveraging APIs and logically centralized control plane components"

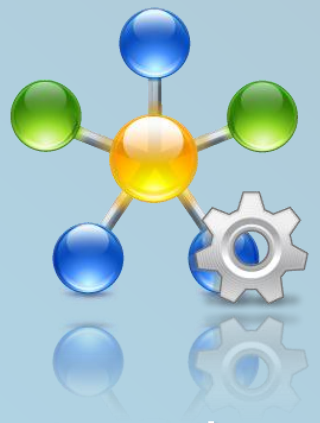
Custom Routing (incl. business logic)
Online Traffic Engineering

Custom Traffic Processing
(Analytics, Encryption)

Consistent Network Policy,
Security, Thread Mitigation

Virtualization and Domain Isolation
(Device/Appliance/Network)

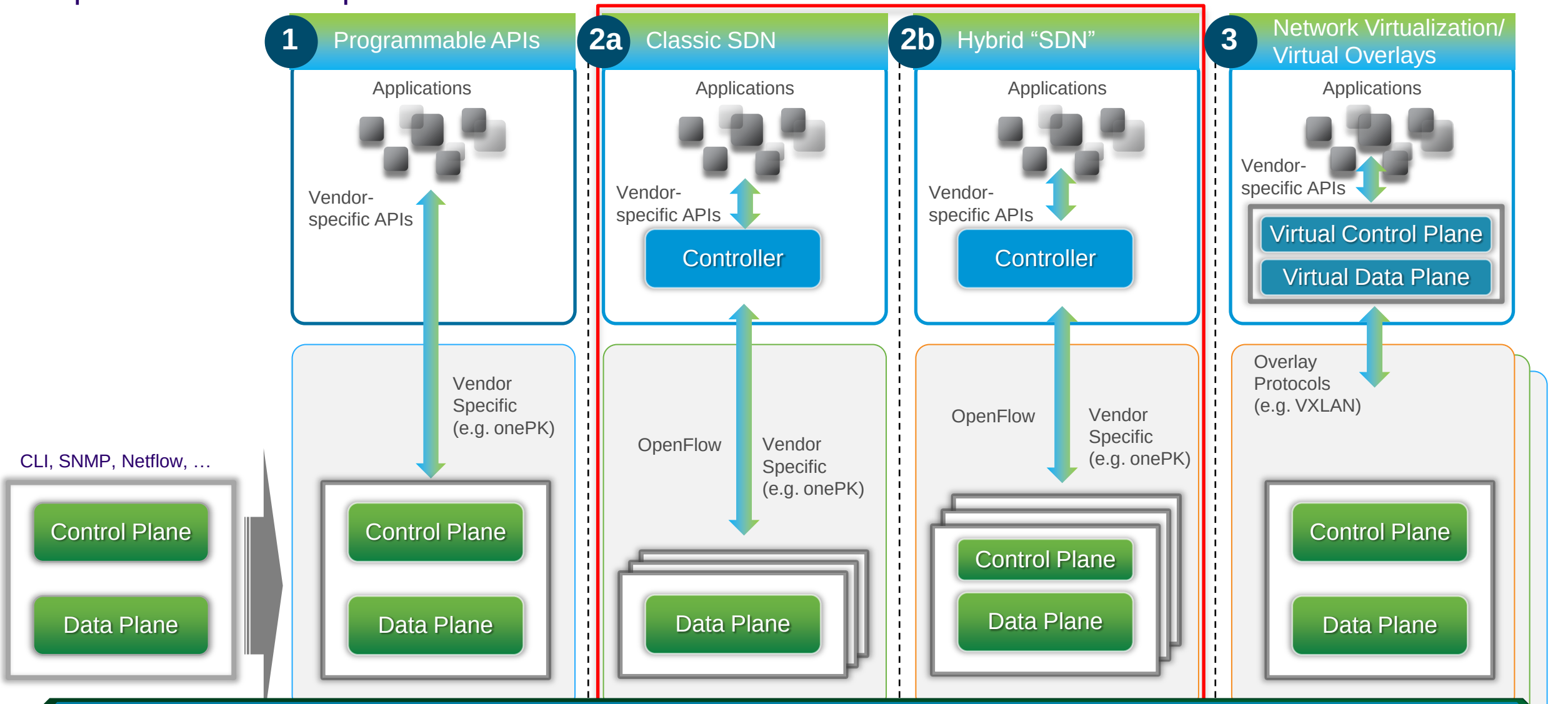
Federating different Network Control Points
(LAN-WAN, DC-WAN, Virtual-Physical, Layer-1-3)



Automation of
Network Control
and Configuration
(Fulfillment and Assurance)
Virtual & Physical

Network Programmability Models

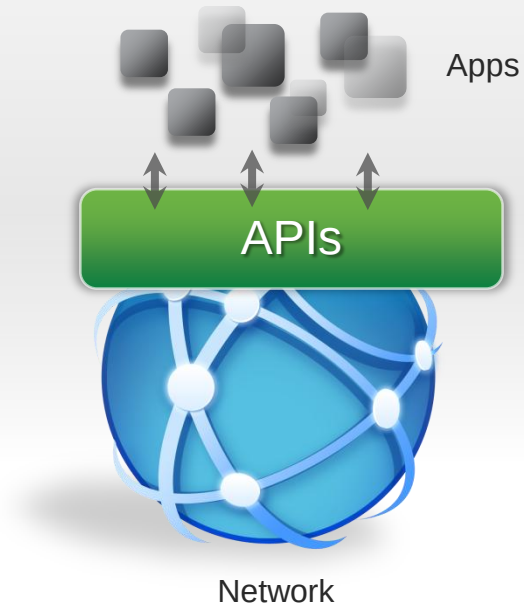
Implementation Perspective: Evolve the Control-Plane Architecture



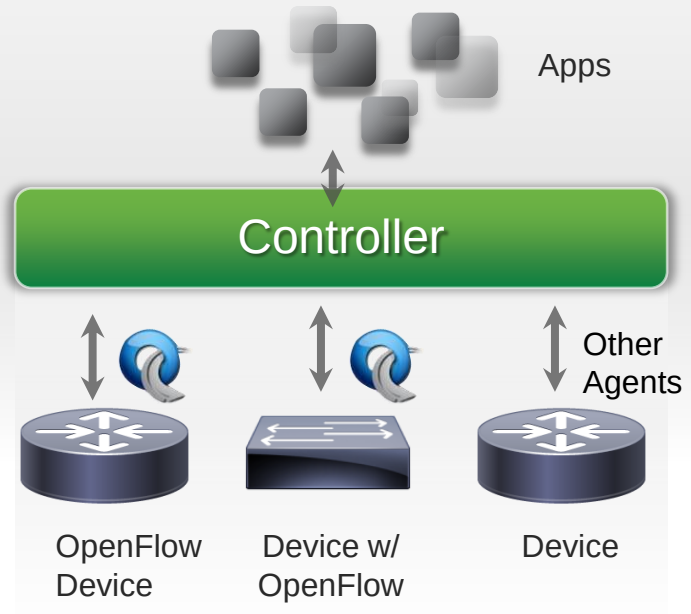
Openstack and Network Overlays Apply to All Models (Physical/Virtual)
Custom Features Can Be Built

Implementing Customer Use Cases

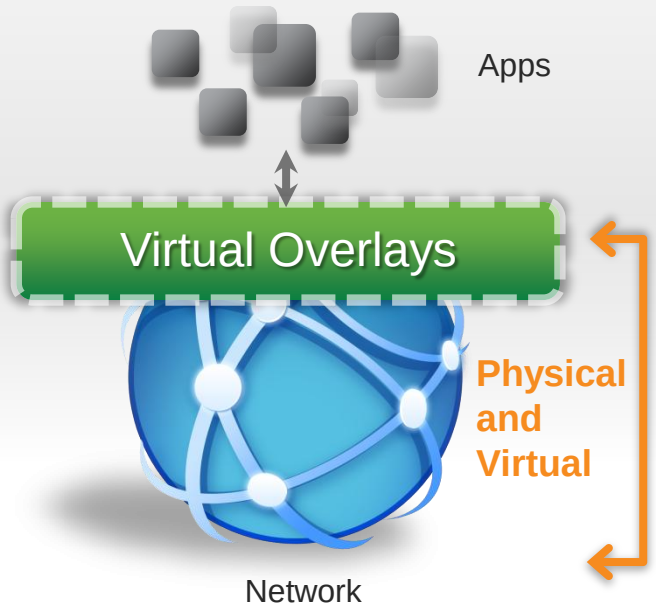
Approach 1



Approach 2



Approach 3



Cisco Approach: Flexibility to Choose—The Power of "AND"

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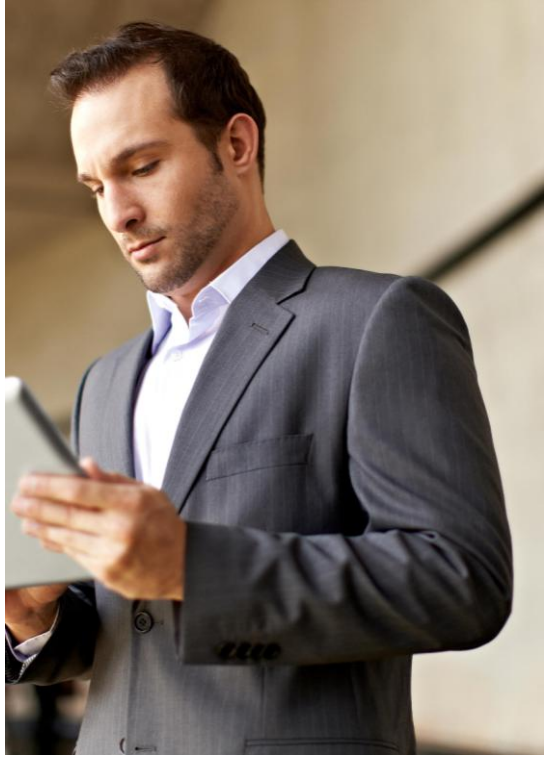
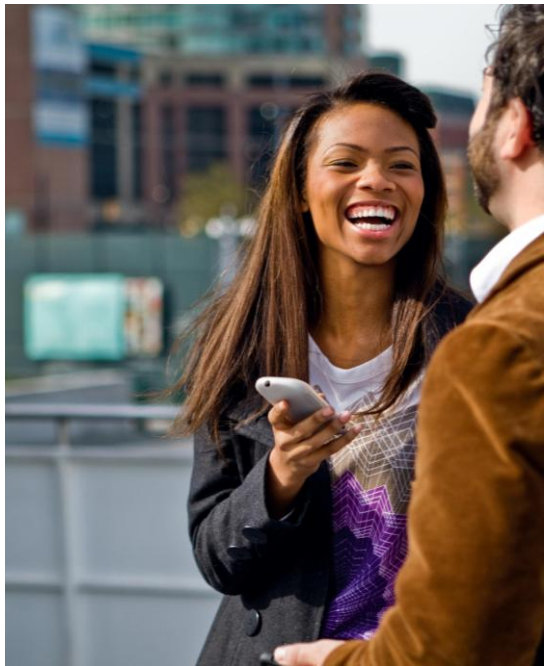
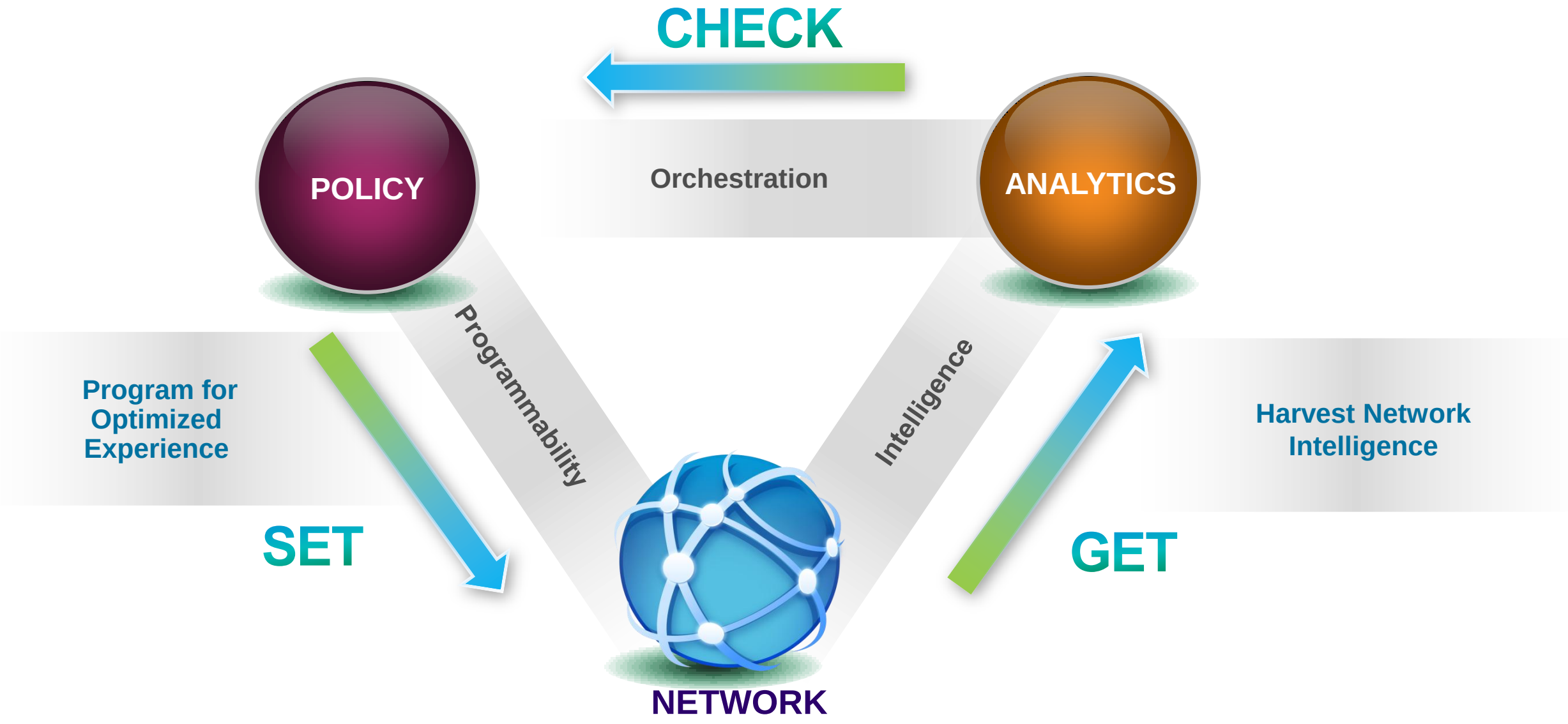
Cisco ONE - Open Network Environment



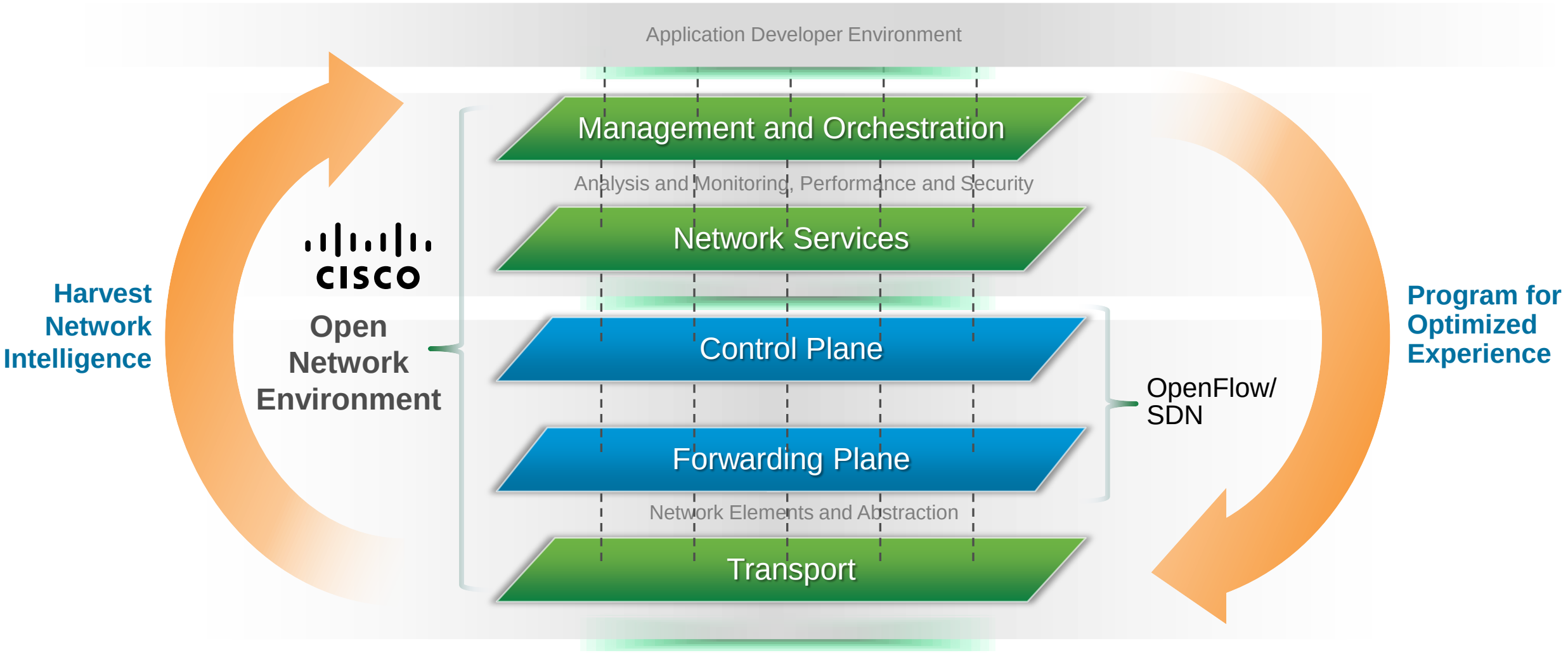


Harnessing Network Value

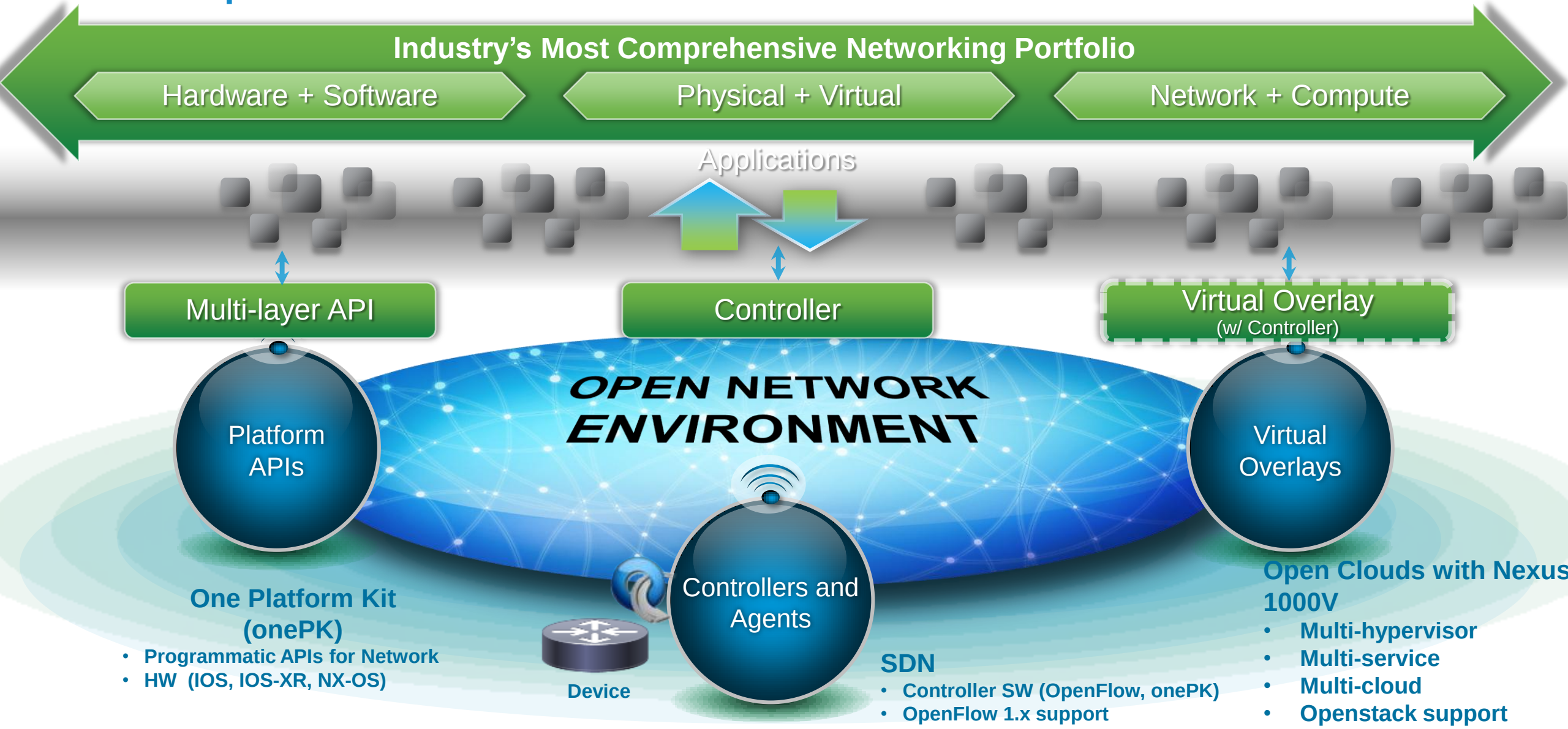


Cisco's Differentiation: Multi-layered Programmability

Flexibility in Deriving Abstractions



Cisco Open Network Environment – Announced June 2012



Cisco Open Network Environment Building Blocks

Platform APIs

onePK

Comprehensive
Developer Kit
IOS, IOS-XR
and NX-OS

Controllers & Agents

SDN
Controller Software

OpenFlow Agent

Overlay Virtual Networks

Nexus 1000V
OpenStack
REST API

Multi-Hypervisors
VXLAN Gateway

Services Chaining

Industry's Broadest Approach for Network Programmability

Cisco onePK (one Platform Kit)

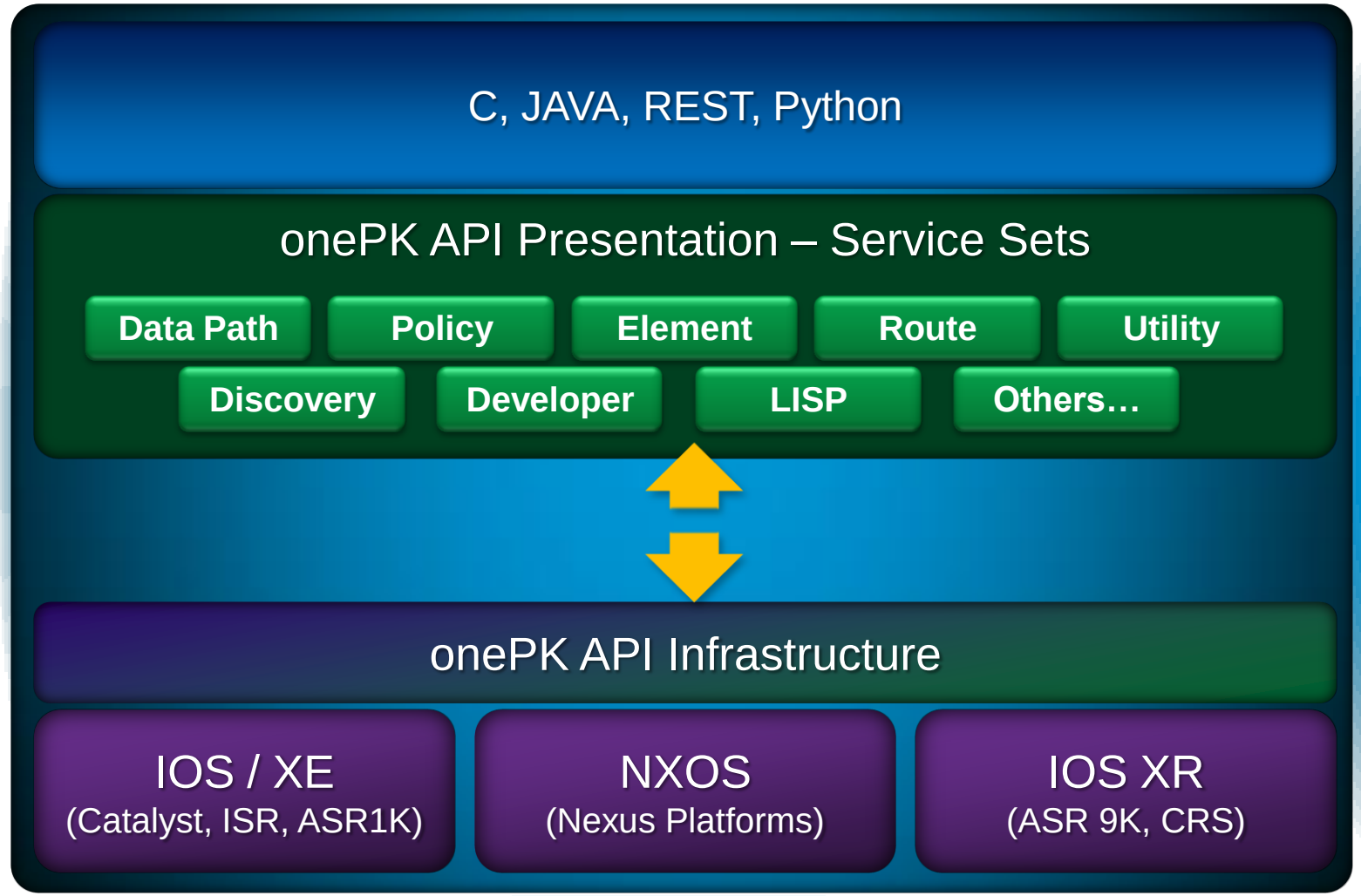
Rapid Application Development

Developer Environment
- Language of Choice
- Programmatic Interfaces
- Rich Data Delivery via APIs

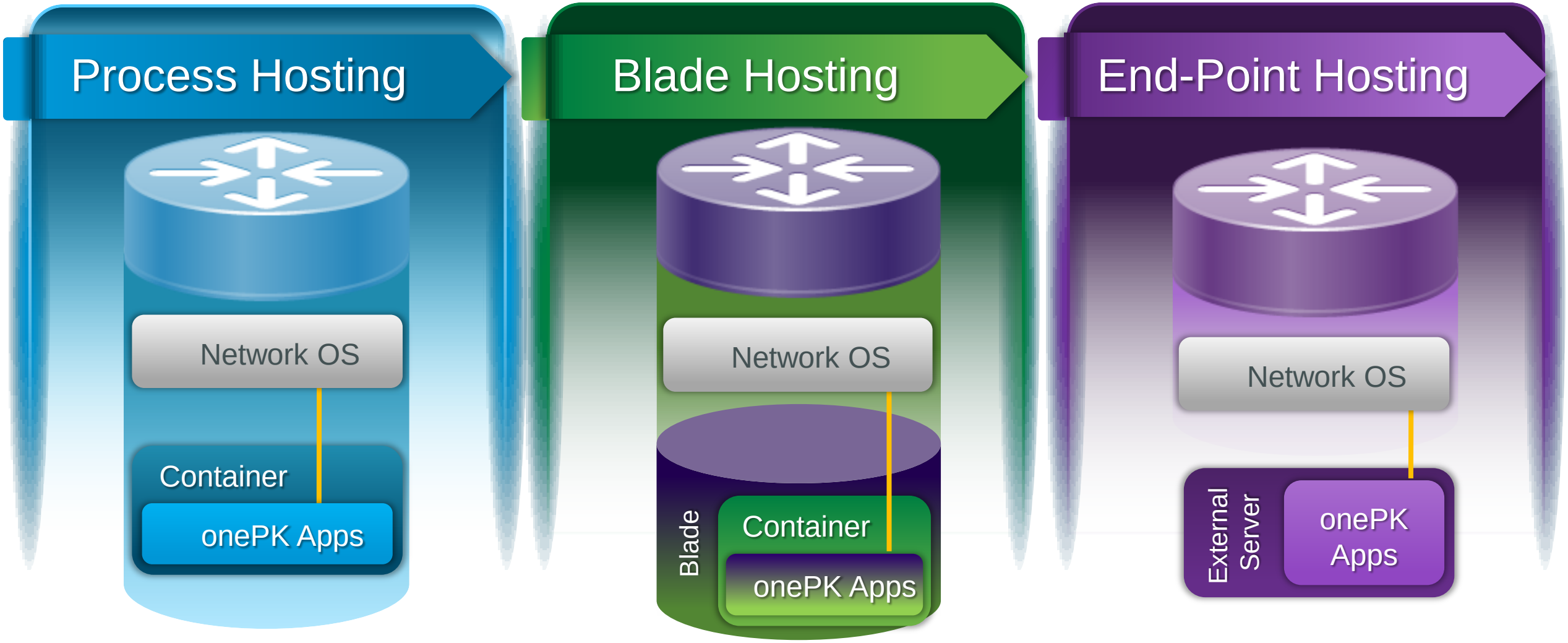
Comprehensive Service Sets
- Flexible Apps;
- New Services Monetization Opportunity

Flexible Application Deployment
- On a Service Blade
- On an External Server
- Directly on the Device

Comprehensive and Consistent Platform Support:
- IOS/XE, NX-OS, IOS-XR



onePK Application Hosting Options



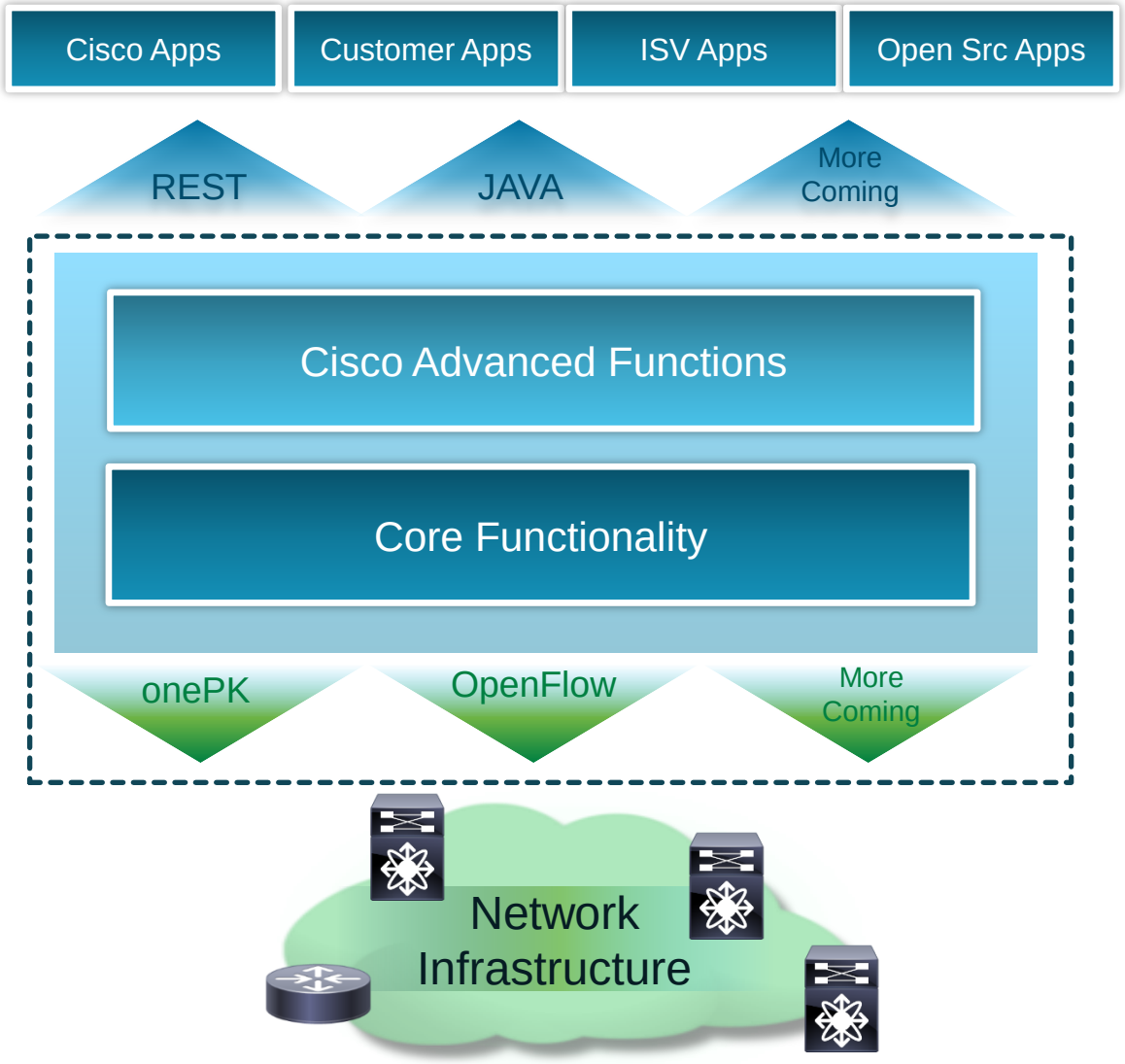
Write Once, Run Anywhere

onePK APIs are Grouped in Service Sets

Base Service Set	Description
Data Path	Provides packet delivery service to application: Copy, Punt, Inject
Policy	Provides filtering (NBAR, ACL), classification (Class-maps, Policy-maps), actions (Marking, Policing, Queuing, Copy, Punt) and applying policies to interfaces on network elements
Routing	Read RIB routes, add/remove routes, receive RIB notifications
Element	Get element properties, CPU/memory statistics, network interfaces, element and interface events
Discovery	L3 topology and local service discovery
Utility	Syslog events notification, Path tracing capabilities (ingress/egress and interface stats, next-hop info, etc.)
Developer	Debug capability, CLI extension which allows application to extend/integrate application's CLIs with network element

Cisco ONE Software Controller A JAVA/OSGI Application

Industry's Most Extensible Controller Architecture



Multiple published APIs for popular languages and software (Eg: OpenStack)

Modular architecture allows rapid adoption of evolving controller functionality while minimizing operational disruption

Extensible protocol support ensures continuous adoption of emerging standards

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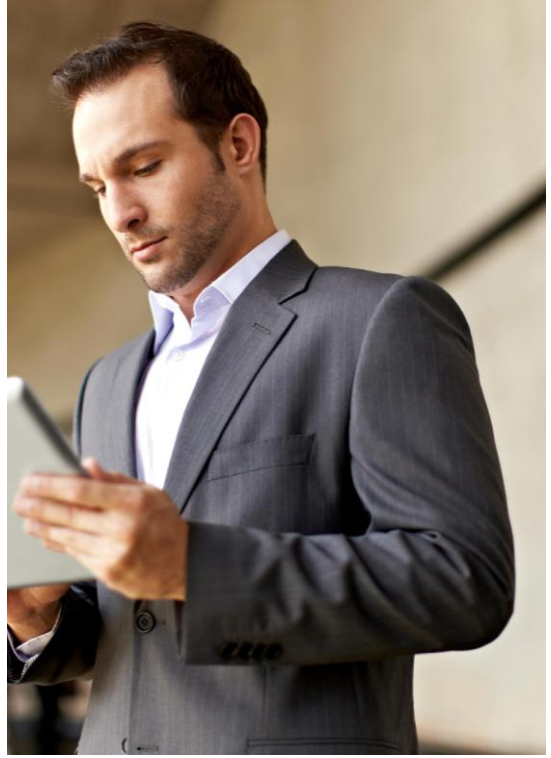
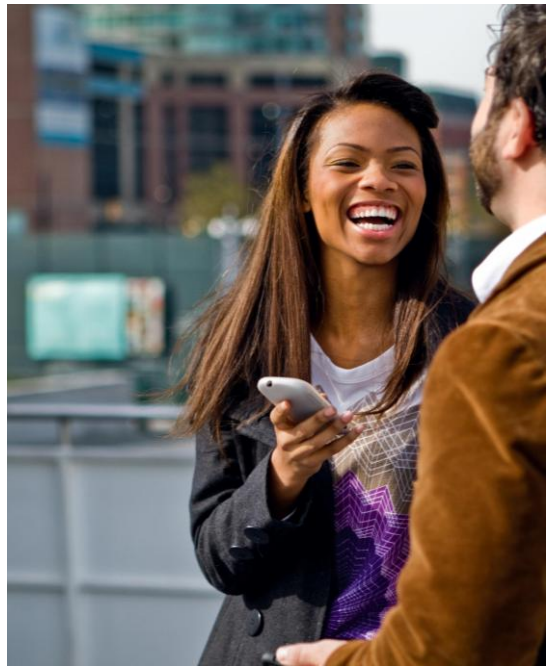
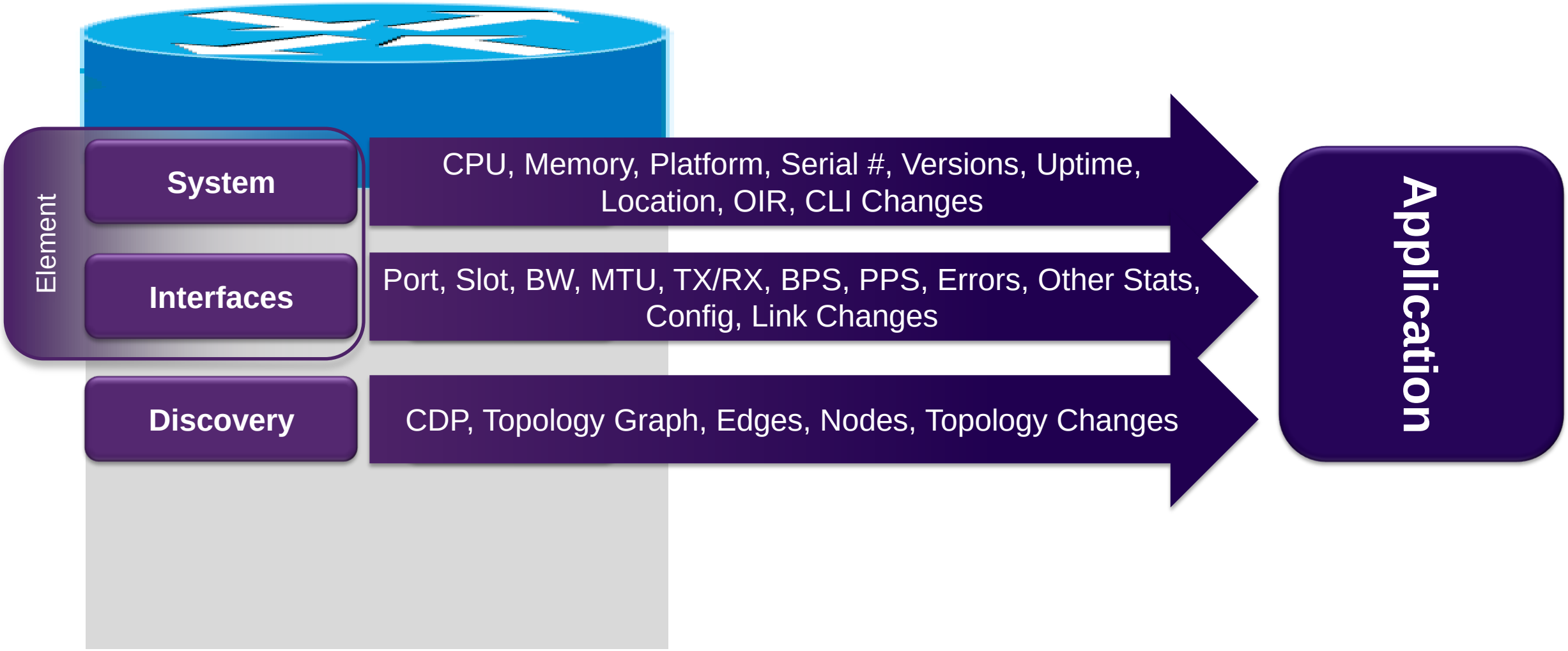
Use Cases

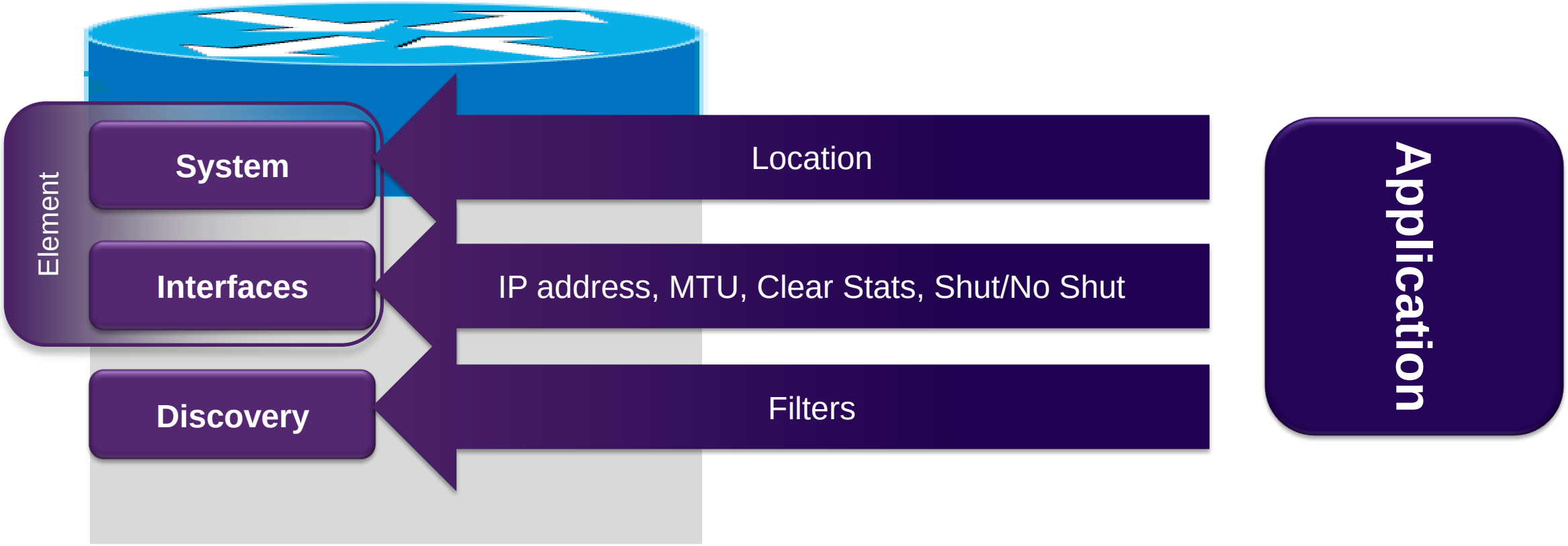




Getting Properties and Statistics

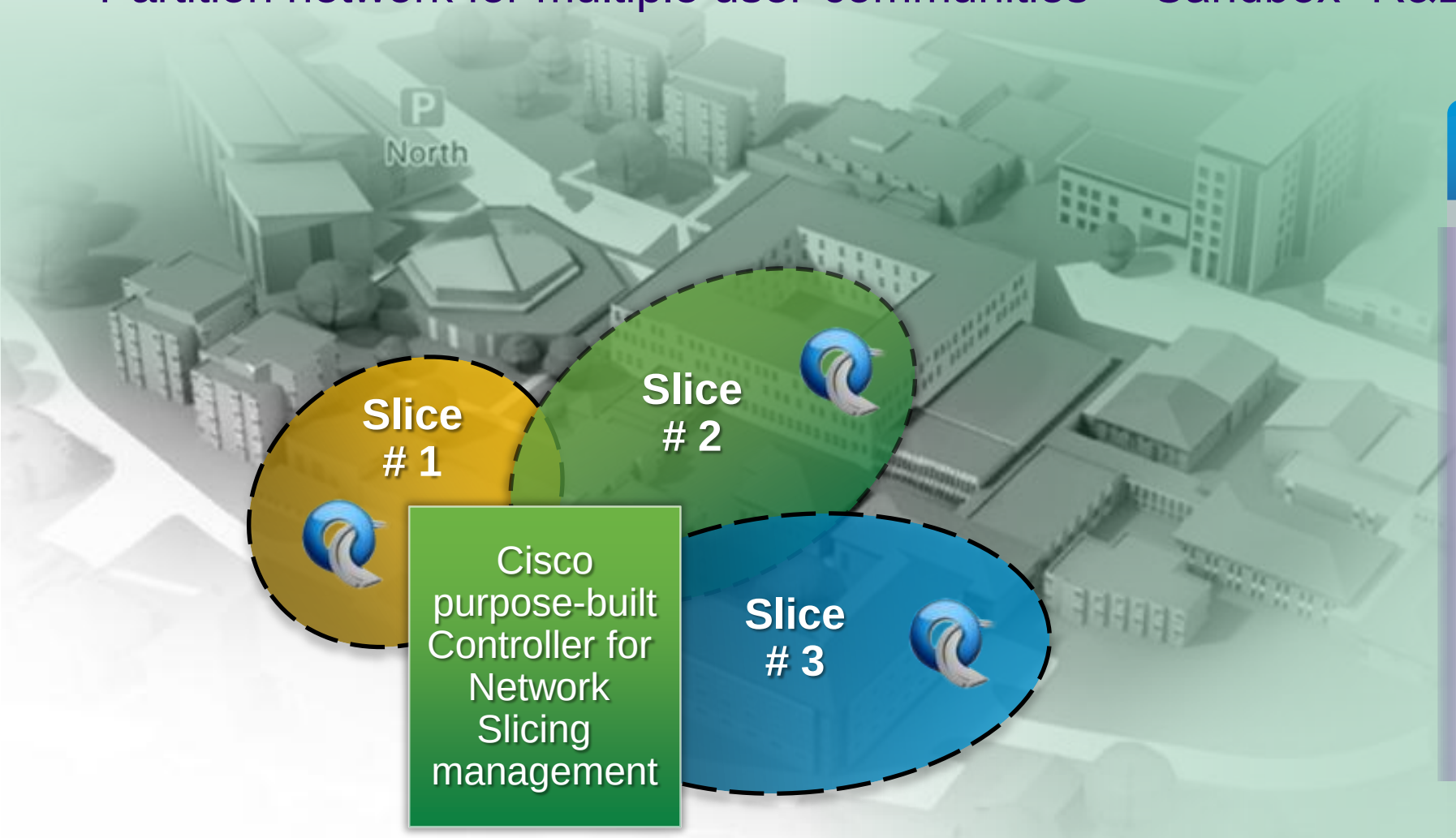


Setting Properties and Statistics



Use Case: Campus Network “Slicing”

Partition network for multiple user-communities—“Sandbox” R&D dept.



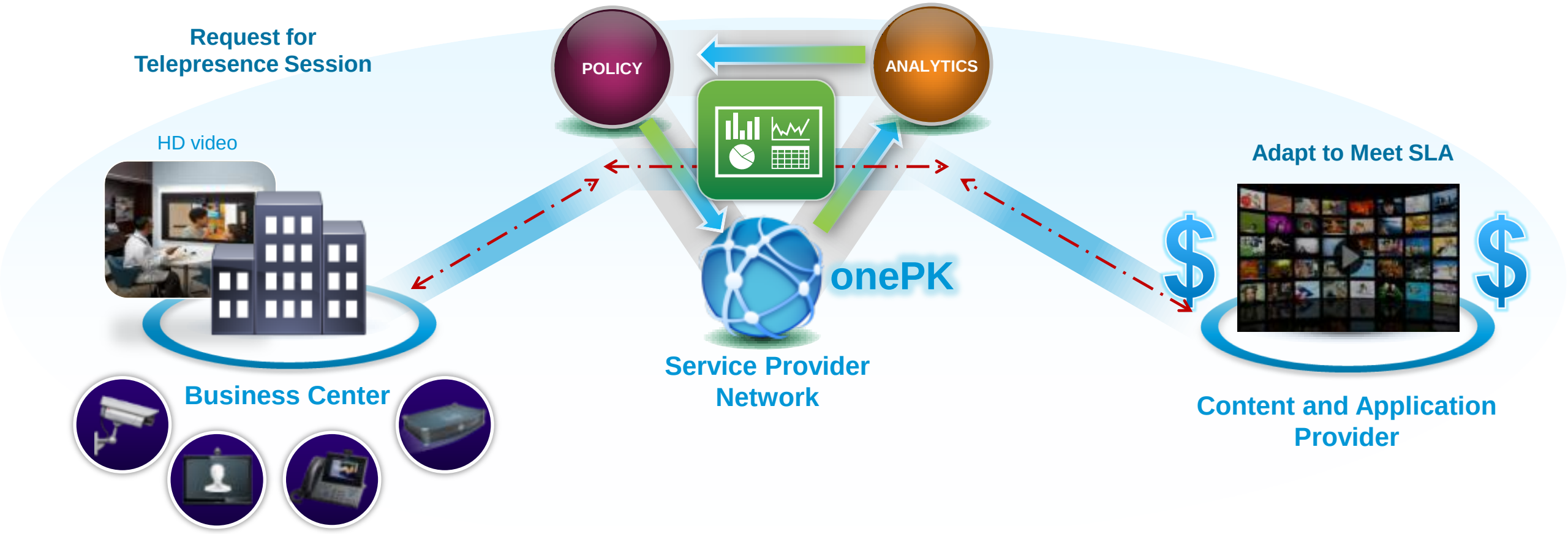
Solution

- OpenFlow experimental support (v1.0)
- Experimental controller software
- Integrated slicing management
- Programmatic Interfaces (Eg. REST)

Consistent Policy Management for Maximum Flexibility and Innovation

Use Case: Agile Service Delivery for Service Providers

Monetize Via Real-time Network Adaptation and Maintain SLA

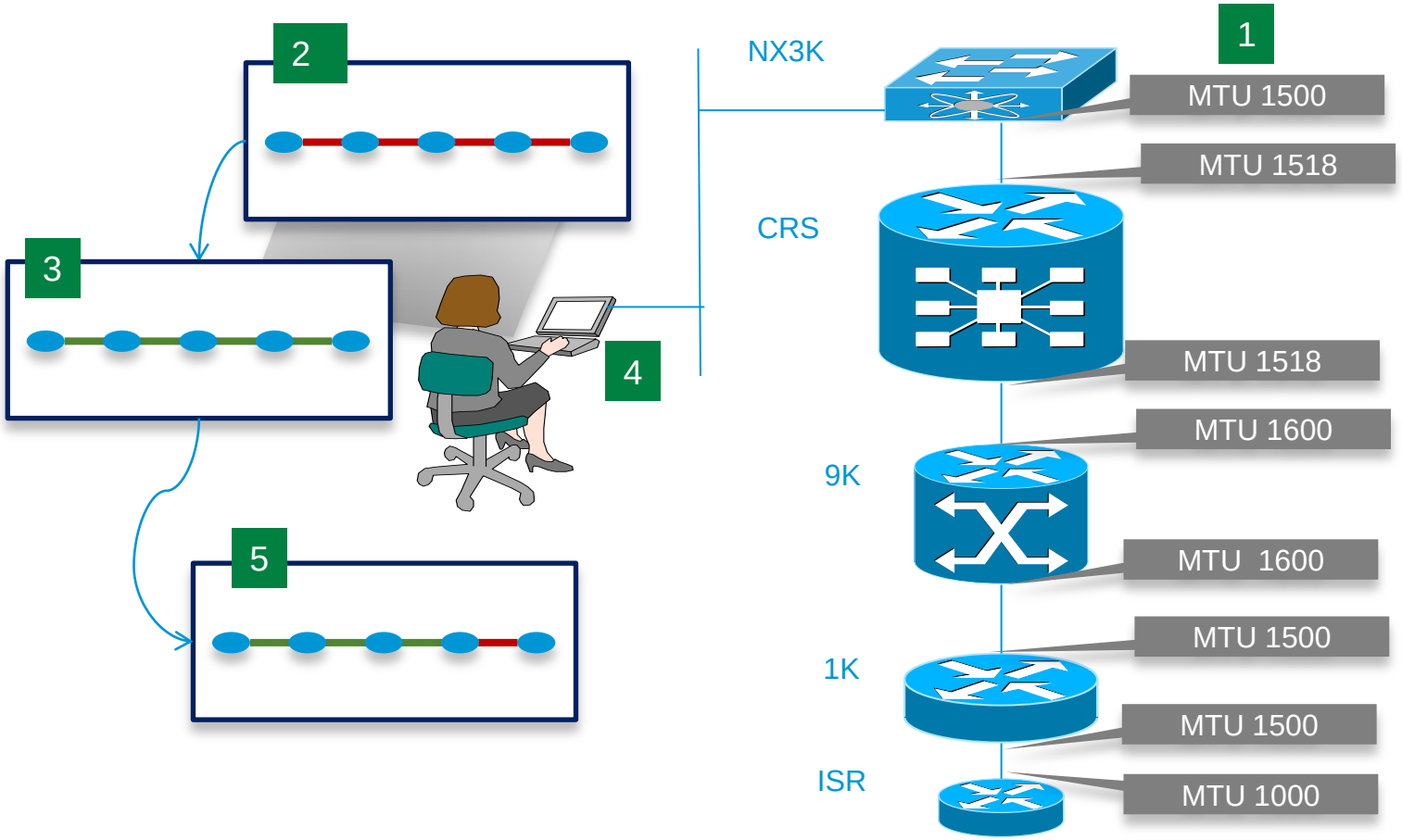


Adaptive Architecture Optimizes Resource Utilization

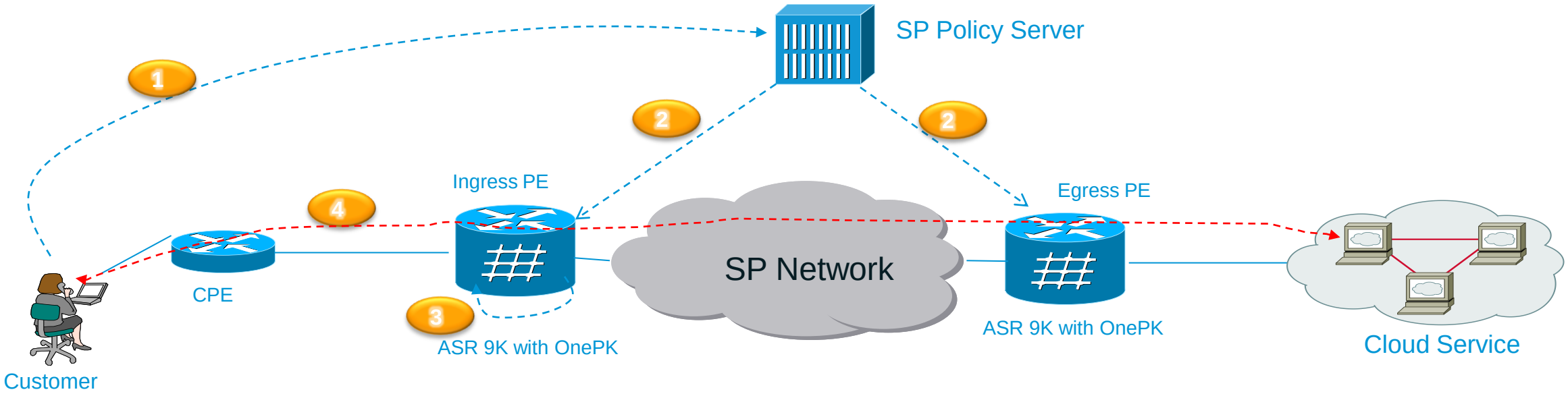
Example: Simplified Management

Problem: Misconfigurations cause network outages, degrade performance, impact SLAs.
Value proposition: Get, set, and detect configuration changes via cross-platform API

1. Network begins with mismatched parameters on either side of link (e.g. MTU)
2. Application checks parameters on either side and identifies mismatches (red lines)
3. Application sets parameters to match (lines turn green)
4. Application registers for events related to parameters change.
5. Users logs into console and manually changes parameter. Topology indicates change.



Example: Dynamic Bandwidth/QoS Allocation



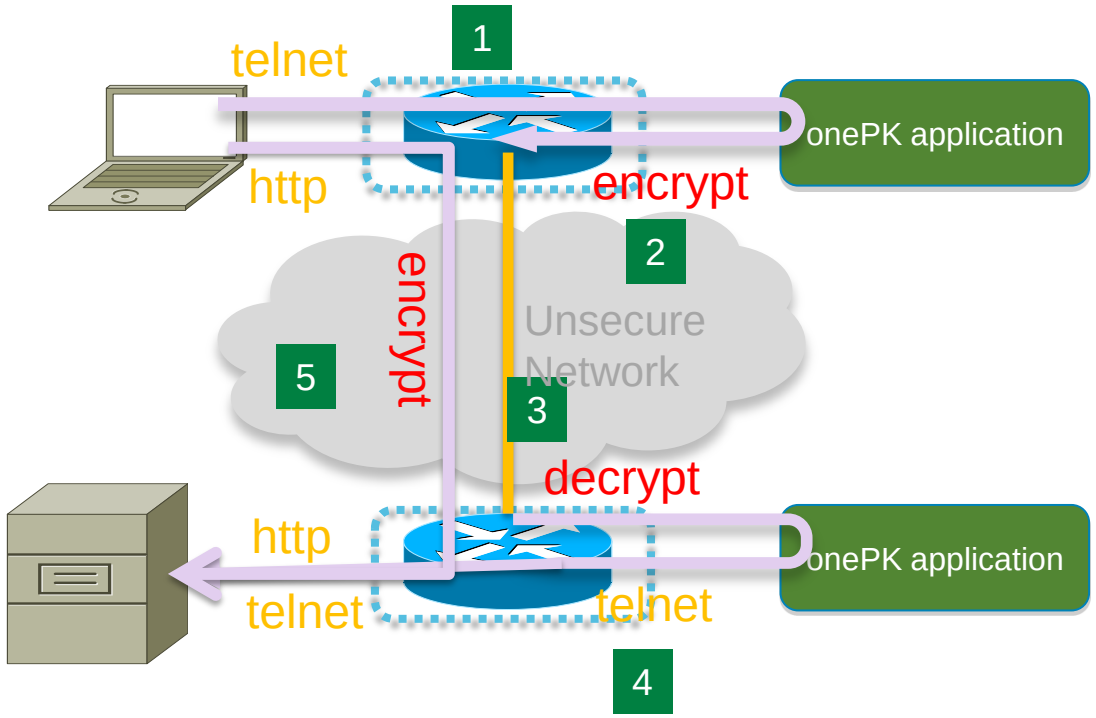
1. Customer requests premium access to cloud service
2. Policy server pushes customer policy to OnePK on 9k
3. SP Policy Server uses OnePK API to program higher bandwidth QoS policy for specific flow [Customer IP <---> Cloud Service IP]
4. Customer traffic matching the policy is given premium QoS treatment

Using OnePK API, SPs can build such custom apps to create differentiated, revenue generating services

Example: Customer Encryption

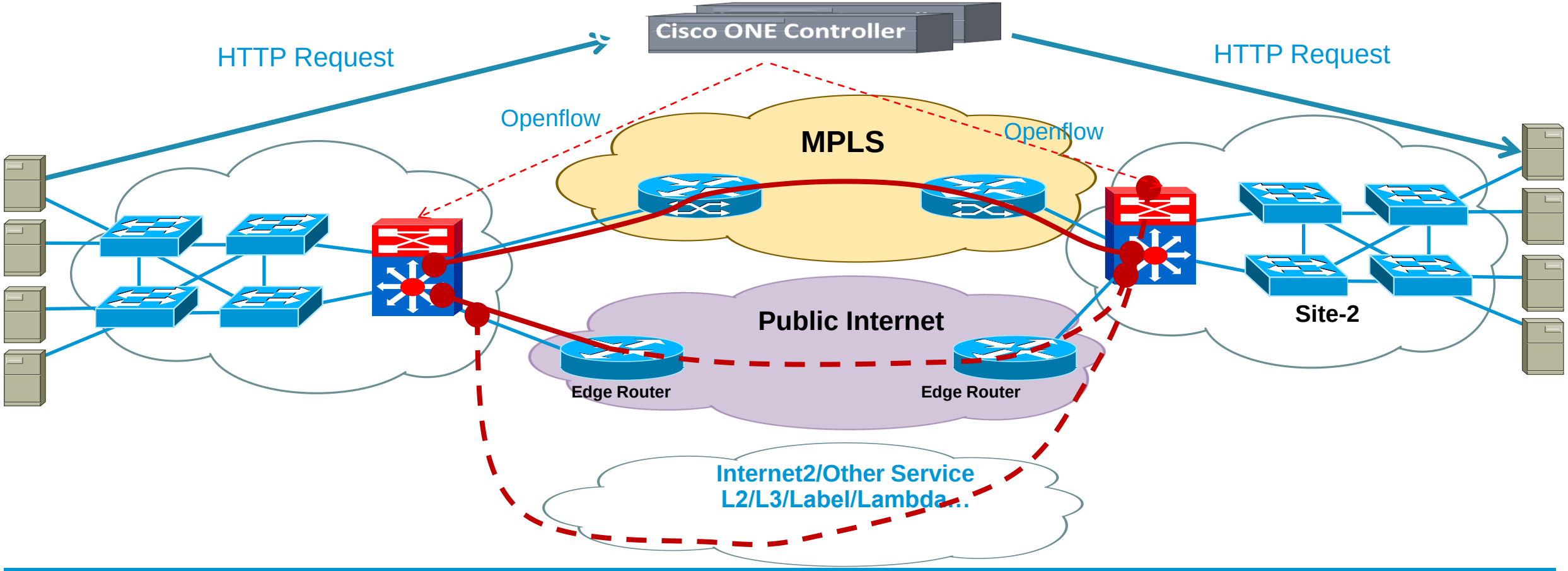
Problem: Customers want custom encryption on specific traffic types
Value proposition: Punt traffic of interest, encrypt, and re-inject.

1. Policy APIs on ingress router are set to punt telnet and syslog to app
2. App encrypts punted traffic and re-injects into data path.
3. Policy APIs on egress router punt telnet and syslog to app
4. App decrypts punted traffic and re-injects into data path.
5. Traffic that does not match policy passes through unencrypted.



Use Case: Custom Forwarding - Transit Selection

Utilizing Topology Independent Forwarding



Business Application Driven Requests Flow Based Traffic Steering with Flowspec Granularity

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Summary

Cisco Vision: Exposing The Entire Network Value

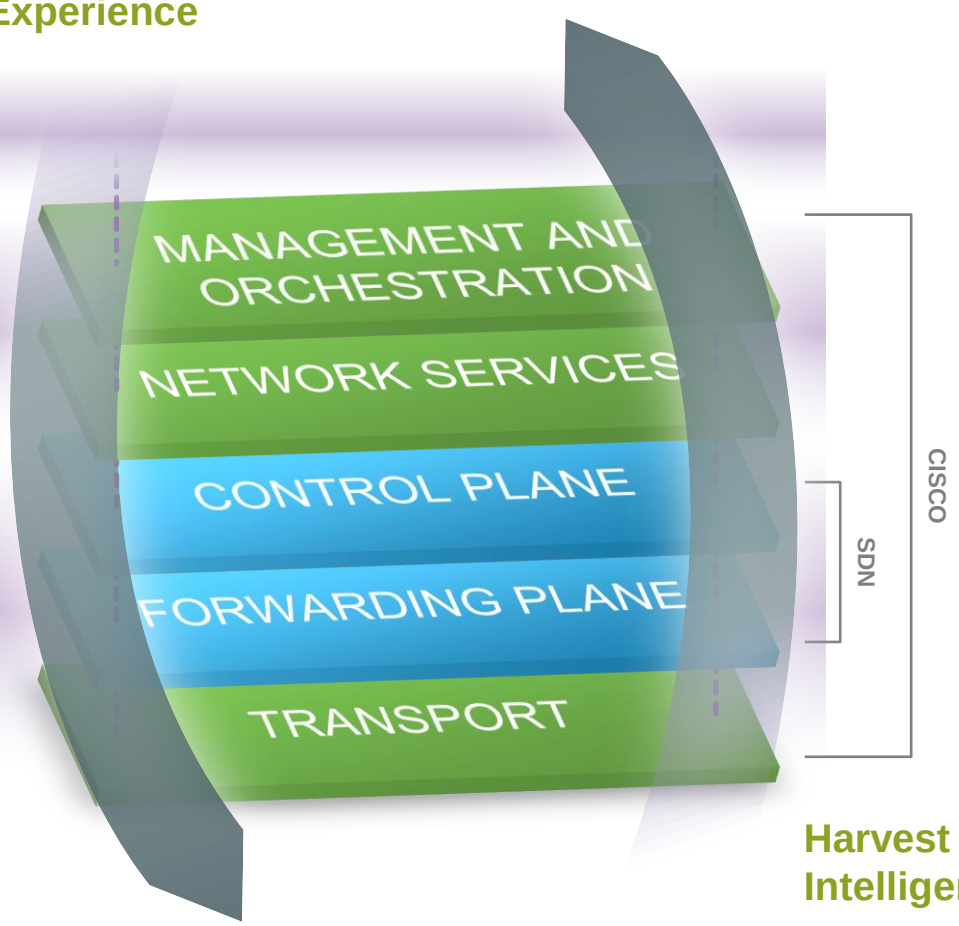
Programmatic Control across Multiple Network Planes

Program Policies for Optimized Experience

Application Developer Environment

Analysis and Monitoring, Performance and Security

Network Elements and Abstraction



Harvest Network Intelligence

Any Object

- Switch/Router
- ASIC
- Network Fabric
- Compute

Any Service

- Cloud
- Collaboration
- Video
- Security
- Mobility

Any Layer

- L1-7
- Control/Data Plane
- Hardware/Software
- ASICs/OS

Open Network Environment – Summary

The Industry's Broadest Approach to Programmatic Access to the Network

Evolutionary step for networking:
Complement/evolve the Network Control Plane where needed

Centered around delivering open, programmable environment for real-world use cases

- No one-size-fits-all
- Cisco will support Network Virtualization, APIs and Agents/Controllers
- Joint evolution with industry and academia

Technology-agnostic

Not predicated on a particular technology or standard

Draw from Cisco technologies and industry standards

Delivered as incremental functionality

Many customers will use hybrid implementations

Build upon existing infrastructure with investment protection

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www.cisco.com/go/getyourbuildon

Thank you.