



Cisco Cloud Native BNG

Changing the Economics of Broadband Networks

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Agenda

1



The Architecture Transition

2



Cloud Native BNG Overview

3



Fixed Mobile Convergence

4



Automation & Assurance

5



Summary

The Architecture Transition

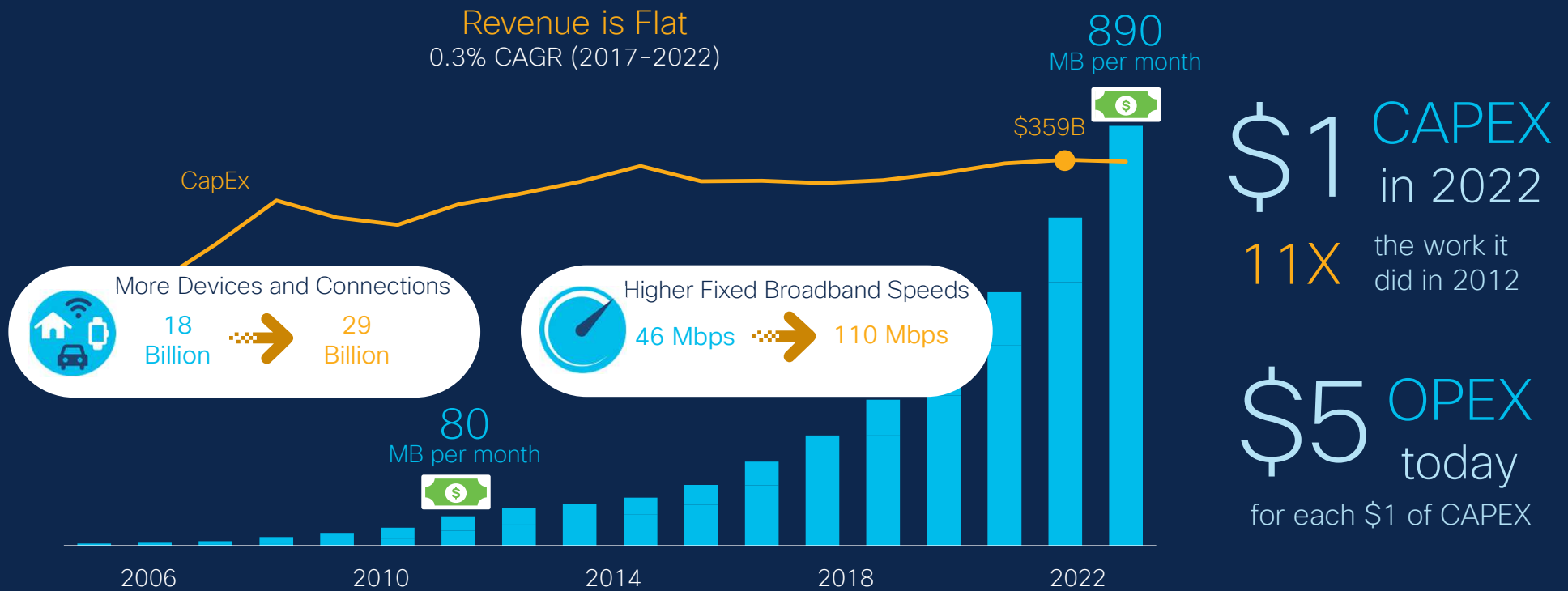
Current Network Challenges

New Architecture Drivers

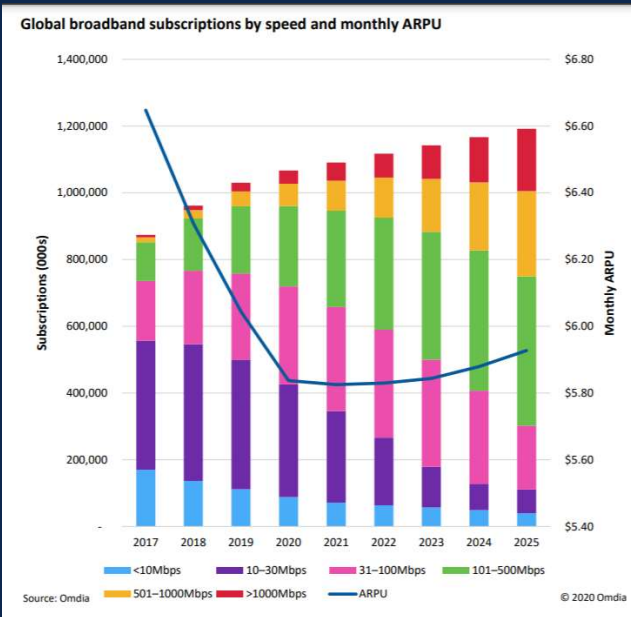
Evolution of Subscriber Management

Business Challenges at Mass Scale

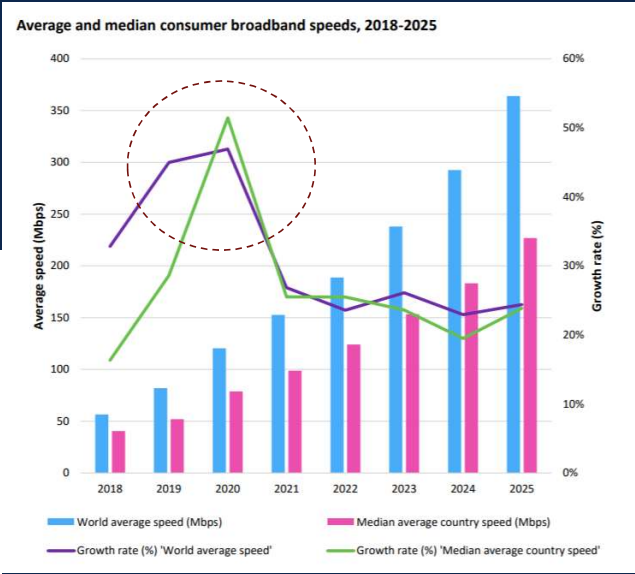
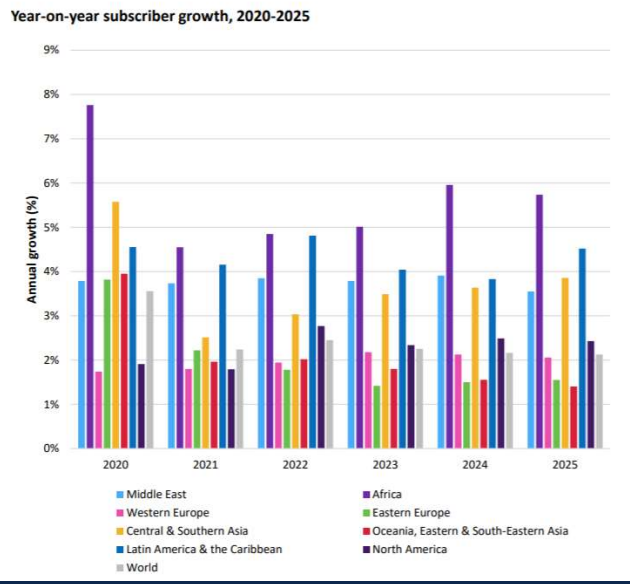
Traditional economics are beginning to break



Broadband Market context



Global consumer fixed broadband subscriptions is expected to reach 1.19 billion by 2025 – CAGR of 2% between 2020 and 2025.



Median average country download speed has increased by over 50% between 2019 and 2020 to 79Mbps, approx double the previous y-o-y growth rate.

ARPU decline will stop in 2020 and from 2023 it will increase as consumers move up the broadband stack to improve their service experience

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Source: Omdia Consumer Broadband Subscription and Revenue Forecast Report: 2020-25

Fixed Line Network Design Challenges

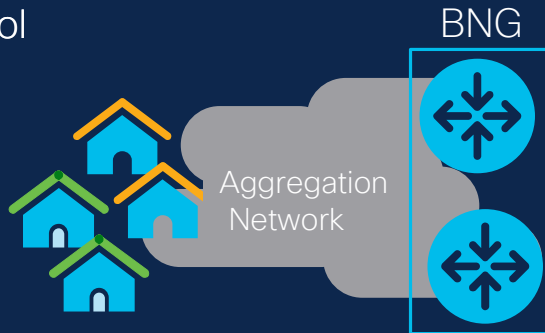


Growth Planning at flat ARPU



Large Number of OSS/BSS Integration Touchpoints

Inefficient Scaling of Control Plane & User Plane



Long Time to Market

Many Distributed BNGs to Manage

Full Node upgrade

Slow Feature Velocity



Content Caching

Inefficient IP Address Management

New Architecture Drivers



5G Network Transformation



Independent CP and UP scaling and ease of integration



Common Policy, Convergence, New Business Models



Common infrastructure for different access technologies

The Evolution of Subscriber Management

The Shift



The Benefits

Efficient Use of Resources

Control plane can scale based on subscribers on x86 servers, while user plane can scale based on bandwidth.

Centralized Subscriber Mng

Centralized network-wide view of all subscribers. Efficient centralized IP address management.

Optimized OSS/BSS Integration

Single integration via centralized control plane significantly reduces OpEx

Subscriber Mng Convergence

CapEx and OpEx savings with a single subscriber management stack. services. Unified policy and new multi-access services.

Agility & Feature Velocity

CapEx and OpEx savings with a single subscriber management stack. services. Unified policy and new multi-access services.

Cisco Cloud Native BNG Overview

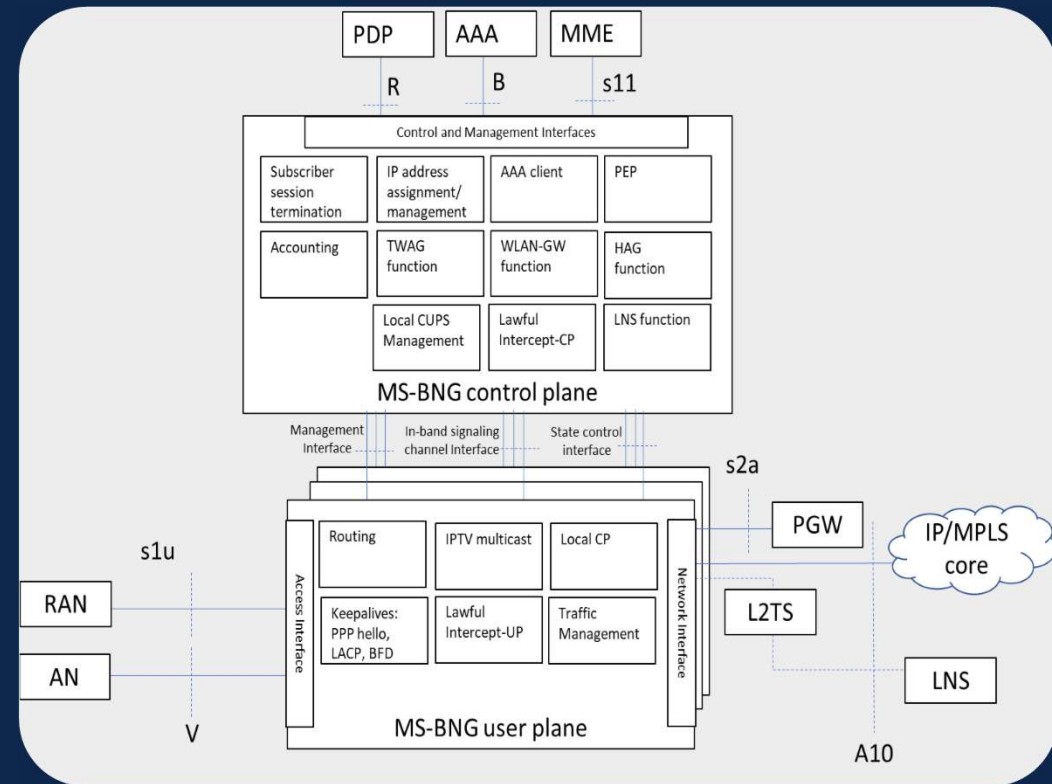
Cisco cnBNG Architecture

SMI callouts

TCO savings

Standardization of CUPS BNG

- TR-459 is a CUPS Disaggregated BNG standard defined by Broadband forum
- State Control interface (SCi)
 - To install traffic forwarding rules and states on UP
 - Flexible Packet Match rules with actions to be programmed
- Control Packet Redirect Interface (CPRI)
 - In-band signaling channel to trigger subscriber authentication
- Management Interface (Mi)
 - Pushing configuration and retrieving operational state and status from the UPs



SCi: PFCP

CPRI: GTP-u

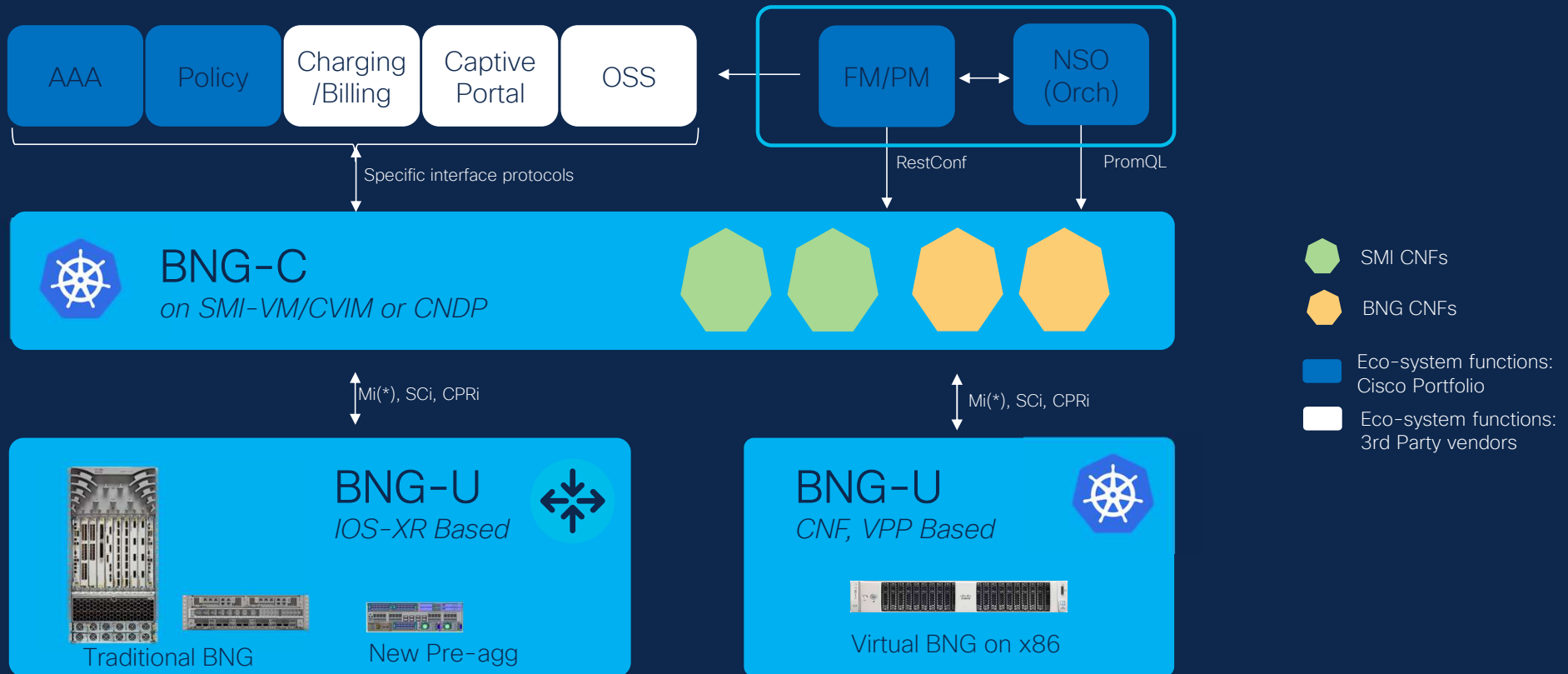
Source TR-459



Cisco cnBNG Architecture



- Architected and Aligned to:
- 3GPP Release 16
 - BBF TR-458: CUPS for 5G FMC
 - BBF TR-456: AGF Functional Requirements
 - BBF TR-459: Disaggregated BNG



(*) roadmap TBD

Subscriber Microservices Infrastructure (SMI) : Key Capabilities

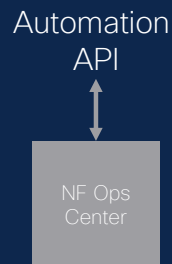
SMI K8s Cluster Manager



SMI CM provides K8s CaaS LCM:

- Provision K8s cluster,
- Deploy K8s Addons
- Customize OS
- Offline Registry & Image Repository
- Launch Apps
- K8s Upgrade

Ops Center Framework



OPS Center provides Common MGMT API:

- NETCONF/REST API
- CLI Interface
- YANG Model
- Config DB
- Operational Callback
- Security: NACM/AAA

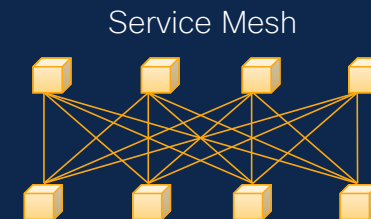
CEE: Common Execution Environment



CEE provides shared platform capabilities:

- Telemetry
- Alarming
- Logging
- Tracing
- Health-checks

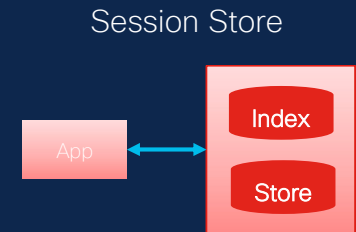
Intelligent Service Mesh



Intelligent Service Mesh connect microservices:

- Traffic Steering
- Load balancing
- Service-to-service authentication
- Policy
- Monitoring

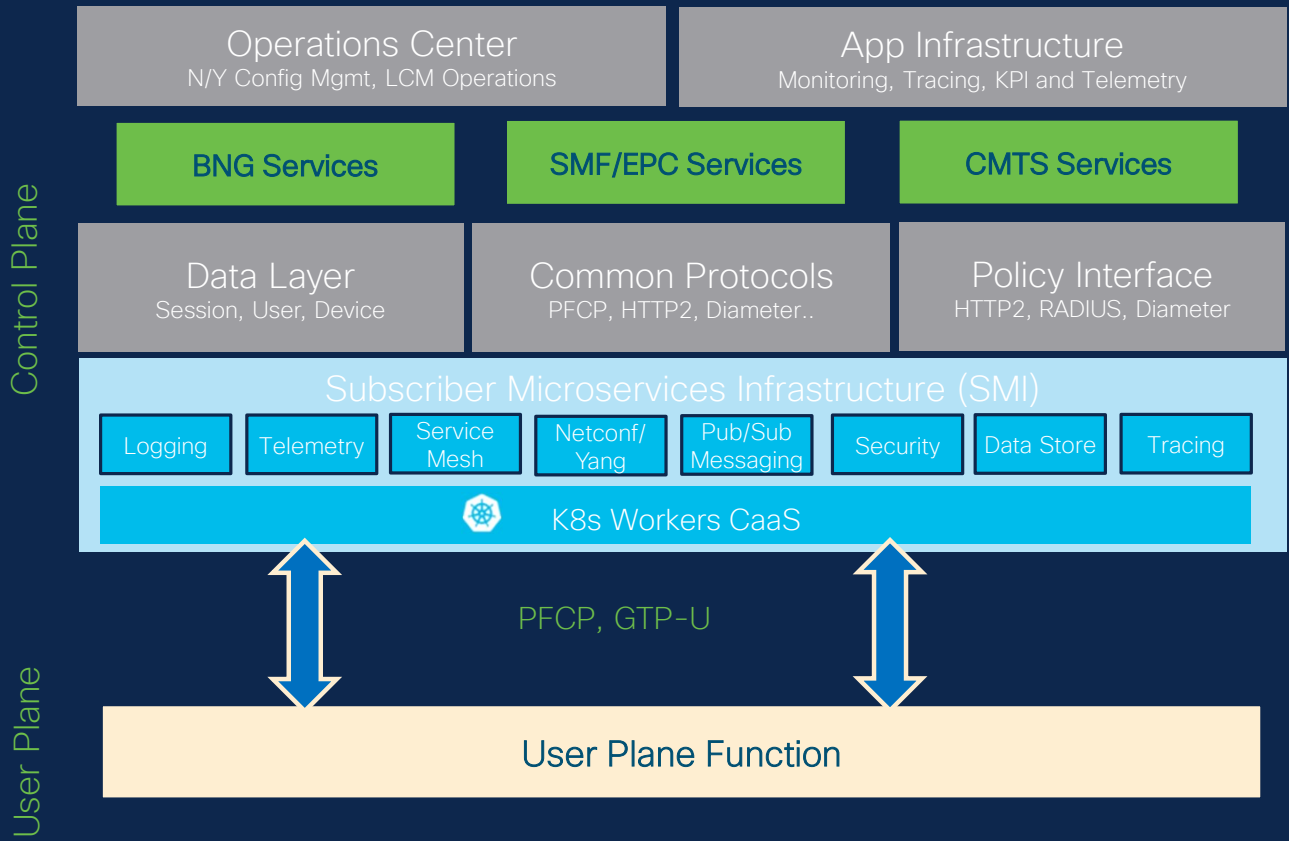
Common Data Layer



Common Data Layer for stateless microservices:

- In-memory session store
- Geo-redundancy
- High Performance
- Low latency

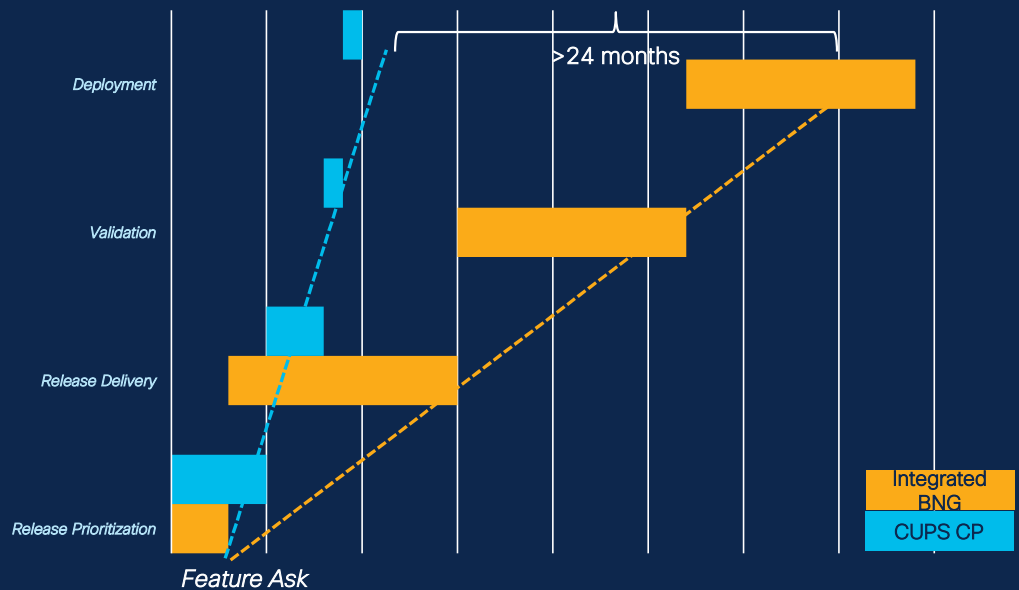
Clean-slate Architecture enabling Convergence



Micro-Services Based Feature Delivery

Cloud-Native CP v/s Traditional Delivery

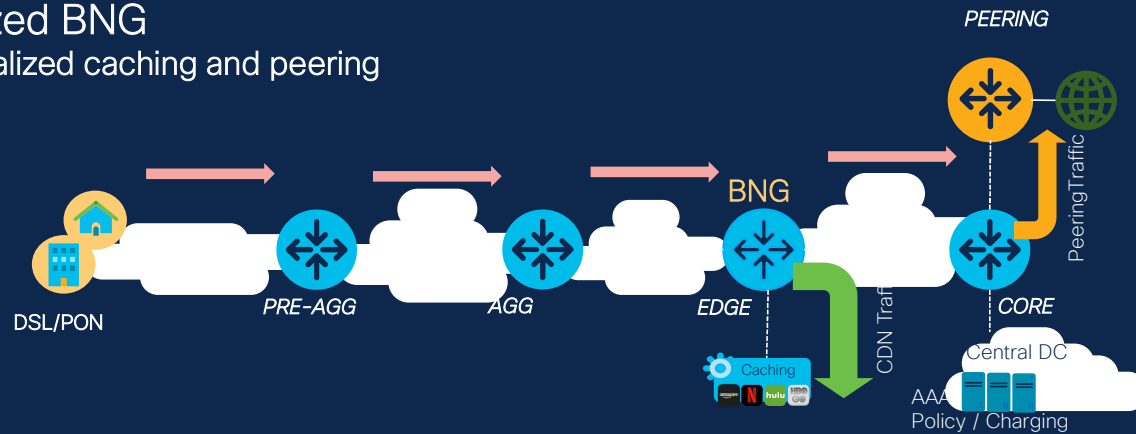
Feature Delivery Schedule



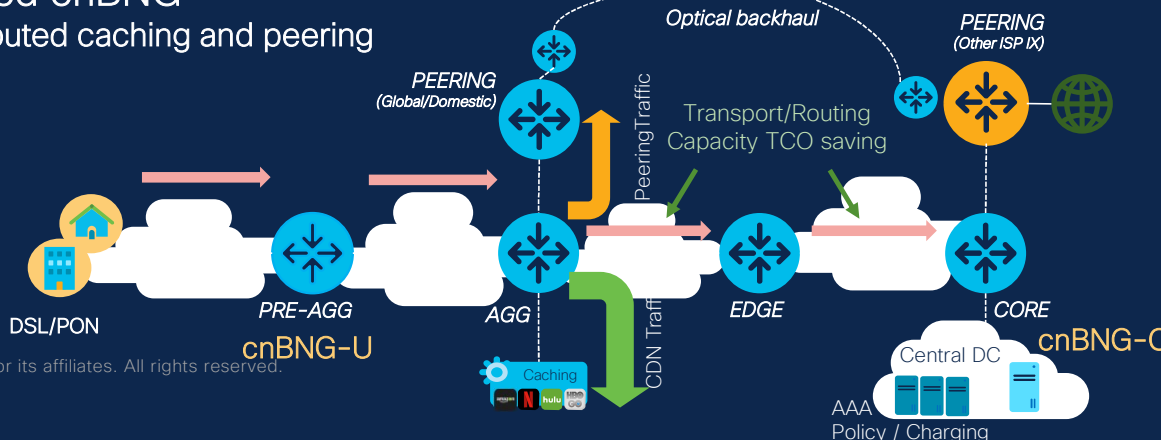
- 80-85% customization for wireline deployments are specific to control plane.
- Bottleneck for new-service insertion remains feature validation and deployment on the data-plane.
- Open APIs for policy insertion reduce dependency on integration with existing OSS/BSS infrastructure.
- Automate and manage rapid deployments.
- Isolate production changes and deploy once validated.

TCO Savings with distributed architecture

Centralized BNG
With centralized caching and peering



Distributed cnBNG
With distributed caching and peering



TCO Reduction
Upto 55%

Lean BNG User Planes

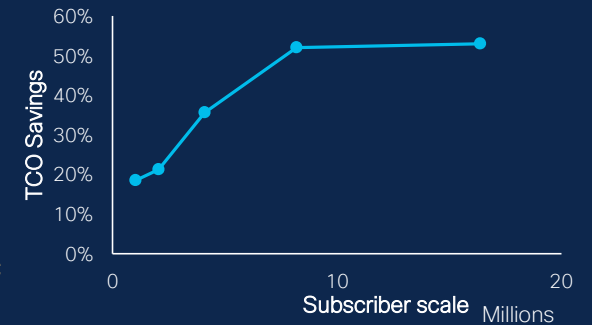


Subscriber termination at
Pre-agg / Agg layer




CDNs and Peering at Agg
Layer (Early offload)


TCO Savings: Centralized vs Distributed



cnBNG Subscriber Redundancy



 User Plane Redundancy: Session Redundancy Group (SRG): Hot Standby; Warm Standby

 CP Redundancy: Within cluster (provided by SMI); Across the cluster (Geo-Redundancy)

Fixed Mobile Convergence

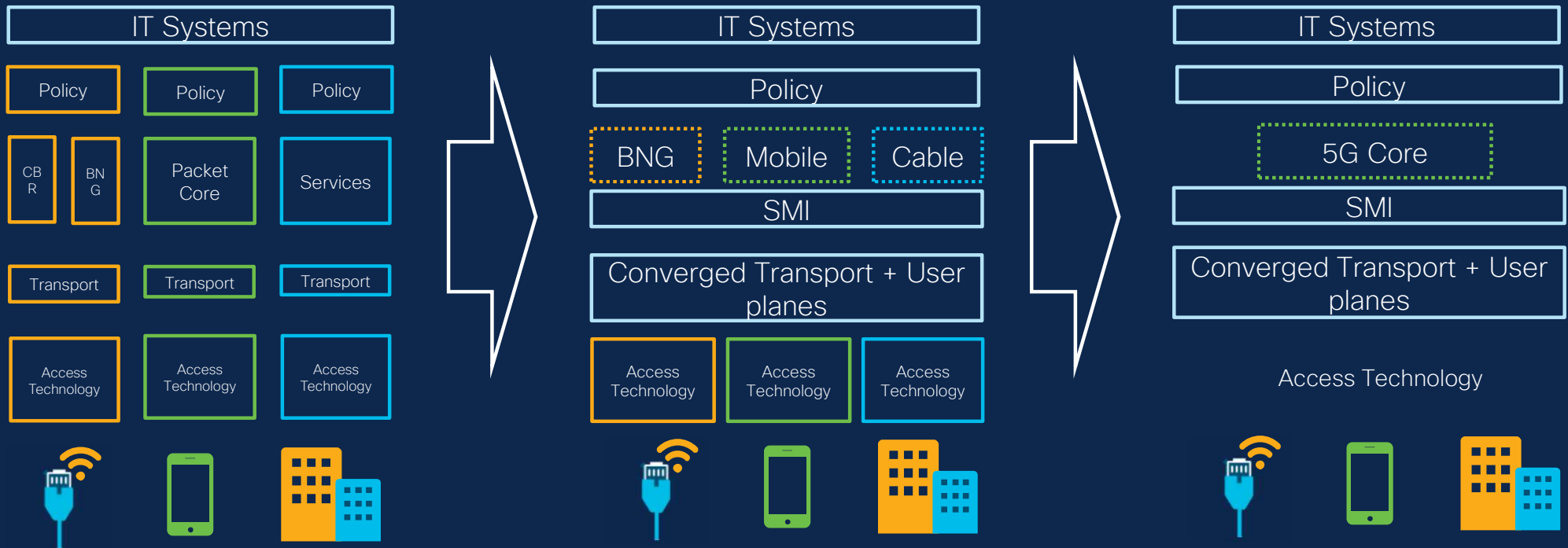
Paths to Converge

BBF & 3GPP Standardization

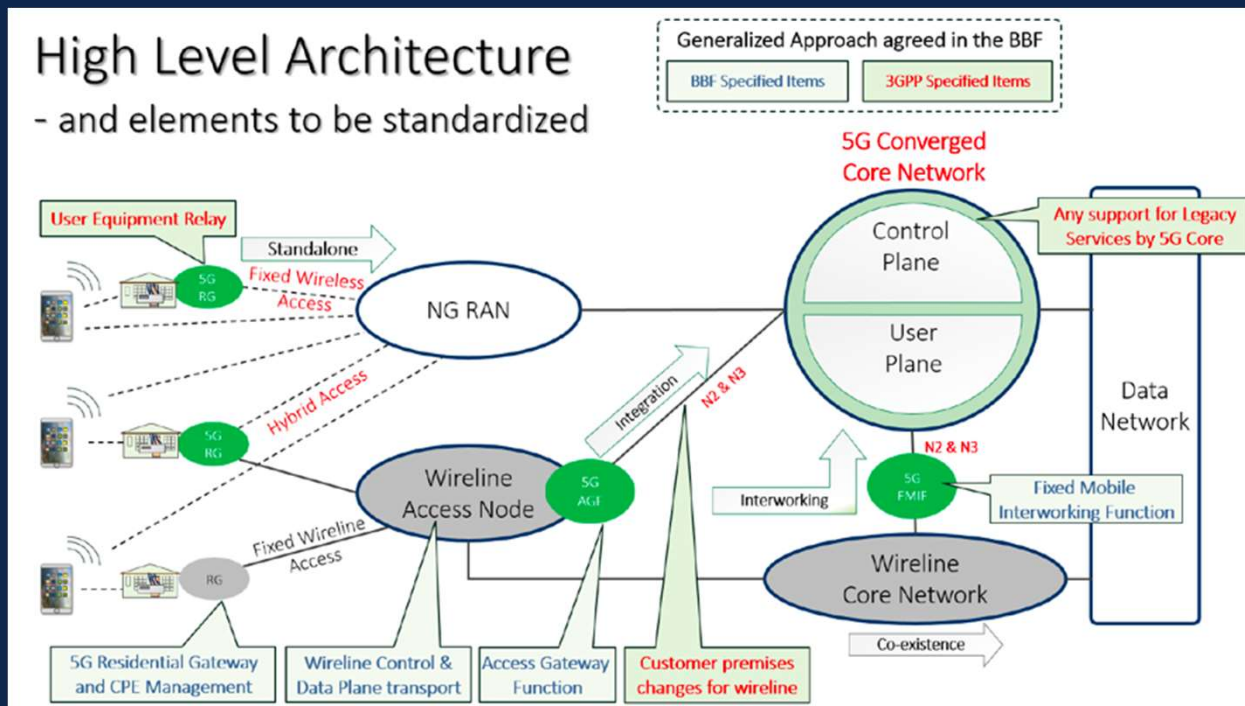
Convergence & Cisco

Paths to Converge

Wireline subscriber termination under the hood of 5G



Fixed Mobile Convergence BBF & 3GPP Standardization



3GPP Release 16
 BBF WT-458: CUPS for 5G FMC
 BBF WT-456: AGF Functional Requirements
 BBF WT-459: Disaggregated BNG

Converged Core

- 3GPP R16 and BBF are defining convergence
- 5GC Control Plane anchors Wireline and Wireless sessions
- Converged core strategies: standalone, integration, interworking, co-existence
- Common Access Edge drives wireline and wireless onto the same platforms
- Simplifies common billing and charging integration

Subscriber Management Convergence

Use Cases

Drivers

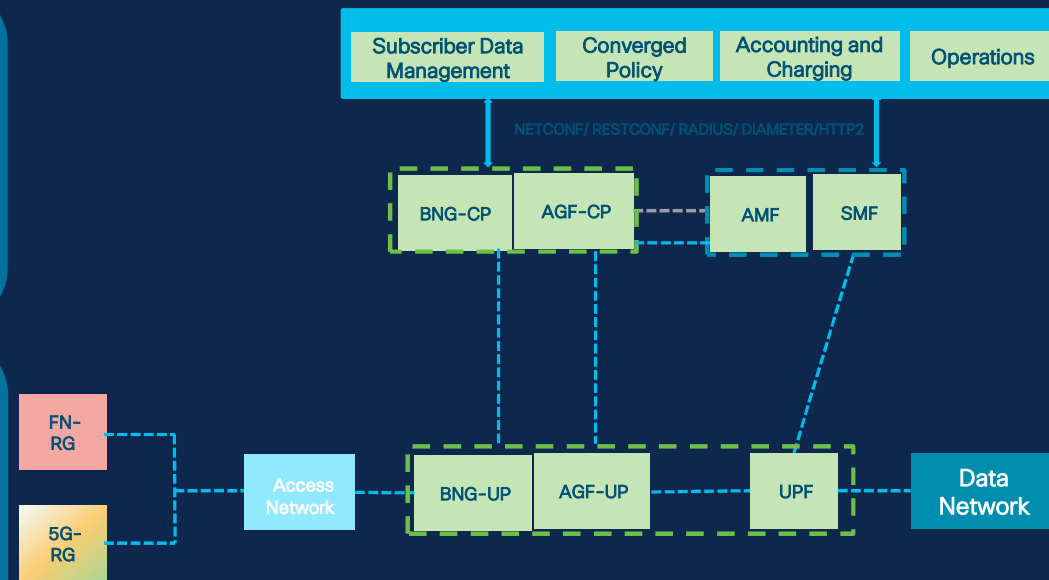
User Experience / New Revenue

- Multi access
 - Bandwidth Augmentation
 - Active standby (Radio / Fixed network)
 - ✓ Seamless transition
 - ✓ Differentiated services

OpEx Benefits / Convergence

- Fixed Wireless Access
 - Application level
 - ✓ IT / Backend systems convergence (Policy layer, Service Assurance)
 - Network level convergence
 - ✓ Combined Transport network
 - ✓ Combined Packet core, single breakout to internet

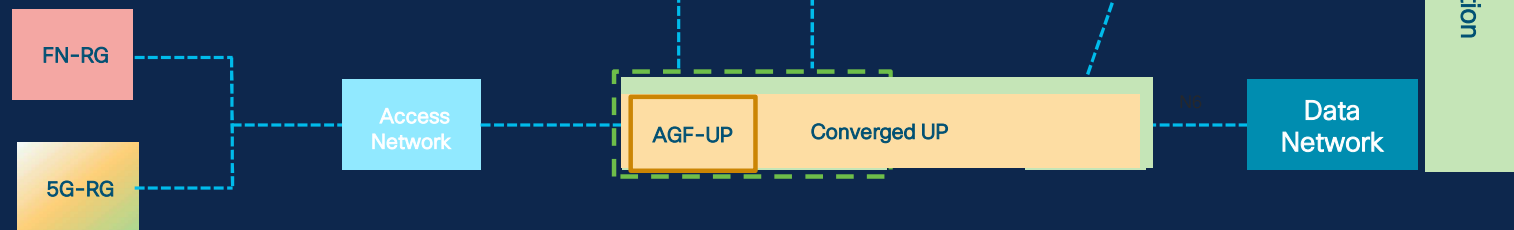
Simplified Representation of Architecture



Cisco Solutions for convergence

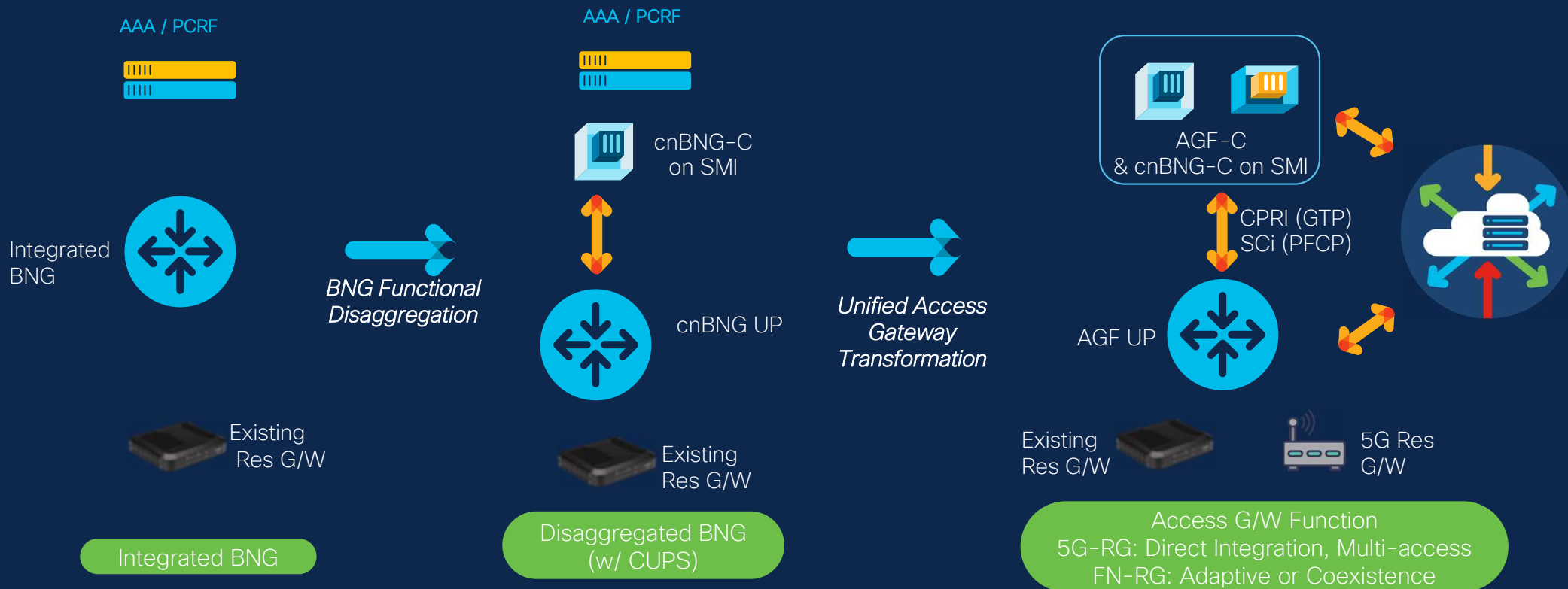
- Deployment Options

- Existing pBNG/ASR9k integrated solution (cnBNG/SMI is the next gen Architecture with CUPS model)
- Standalone cnBNG with wireline services offering
- Wireline integration with 5GC using AGF for integration
- Hybrid mode where cnBNG to terminate locally and AGF to integrate into 5GC based on profile
- Control Plane Functions to support both consolidated and standalone deployment modes



Wireline Broadband Journey Towards Convergence

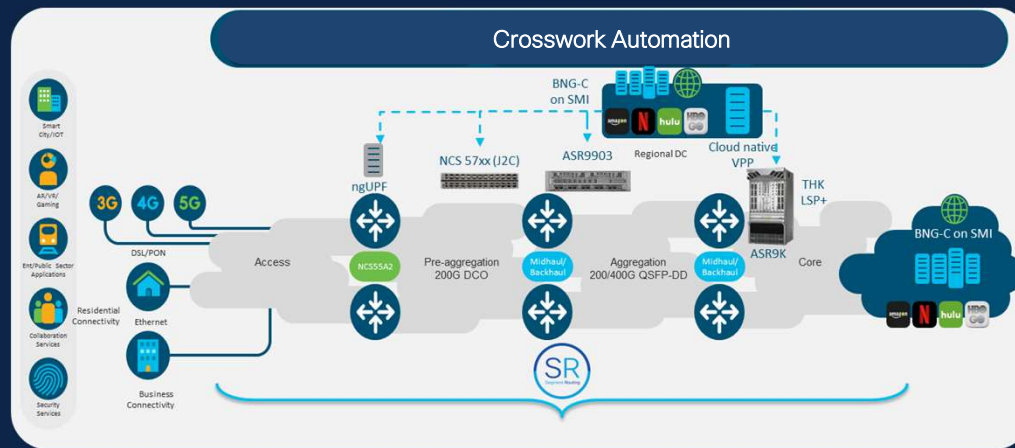
Cisco Cross Work Automation & Assurance Suite



Cisco Cloud Native BNG Benefits



Optimized
Network
buildouts



Convergence of wireline & wireless transport and unified cloud-native subscriber management

55%

Upto 55%
TCO Savings

Automated & Integrated Cloud Native Microservices-based Control Plane with On-demand Scale-in/out Operations

Fully Programmable & Enhanced Subscriber Visibility via Streaming Telemetry over a Large Collection of KPIs

BNG UP on Lean Aggregation Routers Driving Convergence & Traffic Offload for up to 55% TCO Savings

FMC-ready: reducing CapEx/ OpEx spend on siloed subscriber management stacks

Simplified access with strong EVPN & SRv6 Support: needed for Service chaining & Network slicing

End-to-end ecosystem: Automation, Telco Cloud, DC compute & fabric and converged subscriber management

Automation & Assurance

Integration capabilities

Operationalization

Integration Requirements In Existing Ecosystem

1

❖ Integration to existing OSS

2

❖ Integration to broadband policy solution

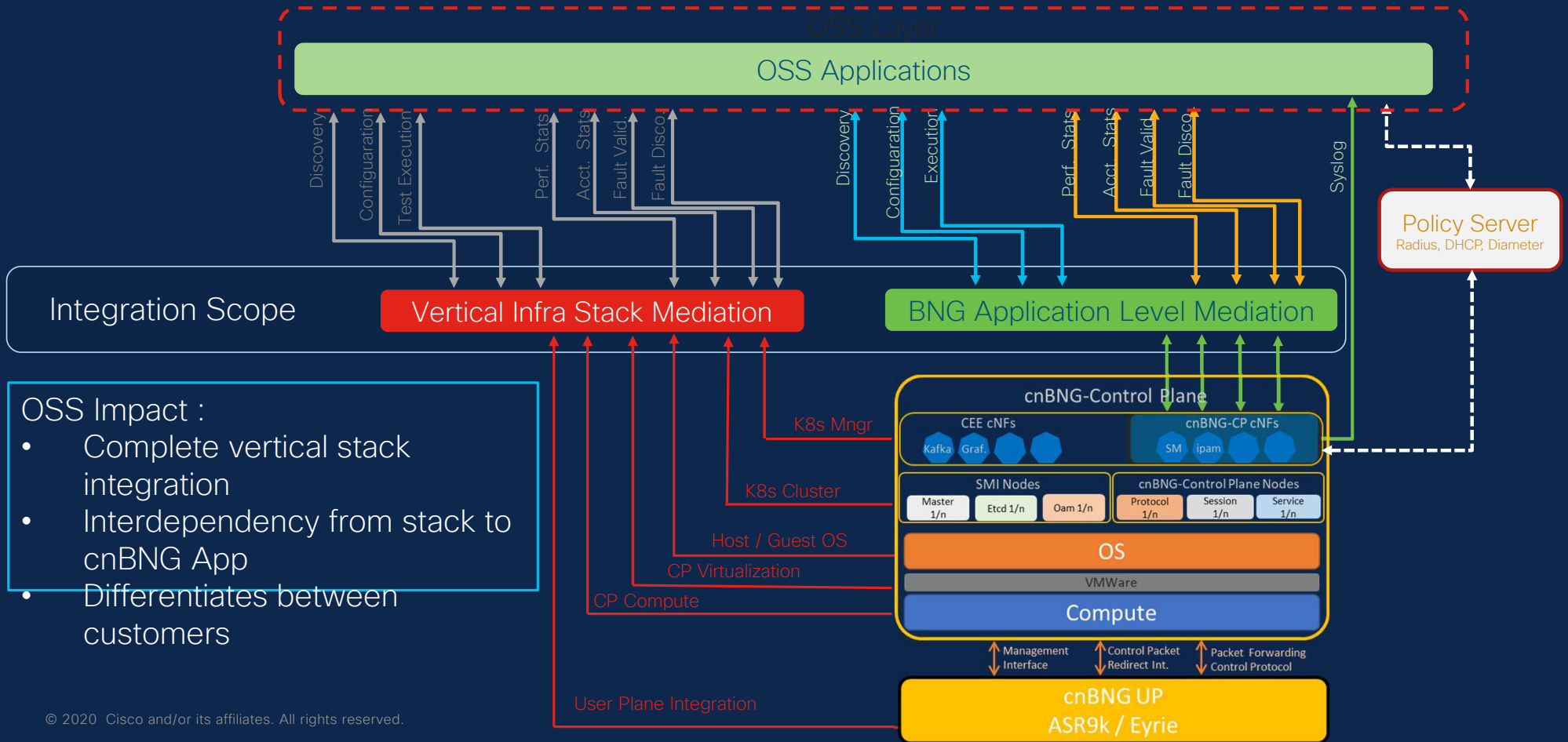
3

❖ Integration to broadband charging solution

4

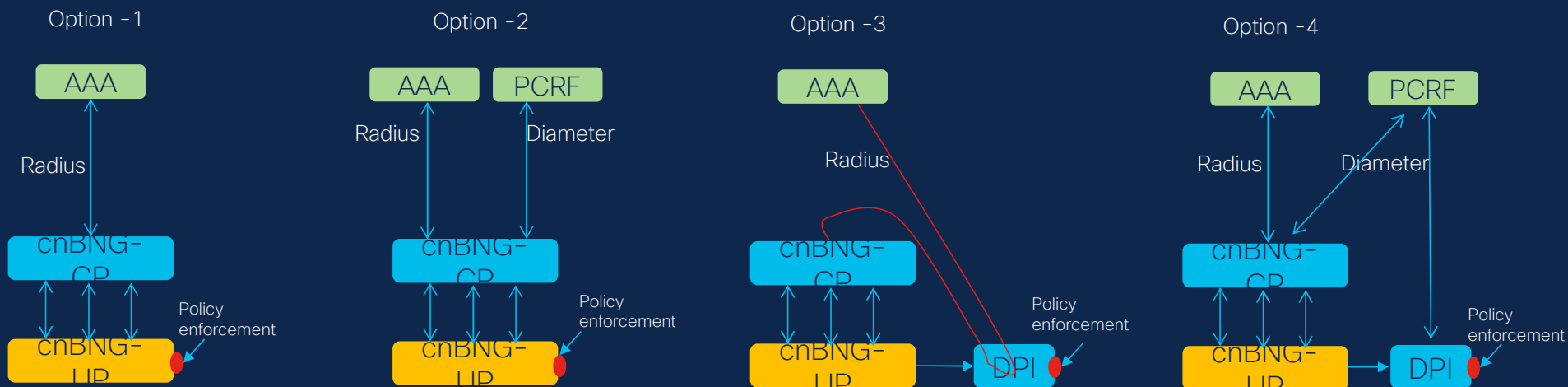
- ❑ Single pane of glass for cnBNG vertical stack
- ❑ Individual and network wide visibility on performance and fault management for cnBNG
- ❑ Abstraction and mediation of cnBNG to customer NBI and horizontal applications

cnBNG OSS Integration Framework



Policy Integration and Impact

- Blackbox vs Flexible Policy Layer
 - Possibility to add, modify attributes without policy vendor involvement
- IETF Standard Attributes vs Vendor Specific Attributes (VSA) in use
 - How are current services being delivered?
 - VSA transformation to IETF Standard Attributes



Charging Integration and Impact

1

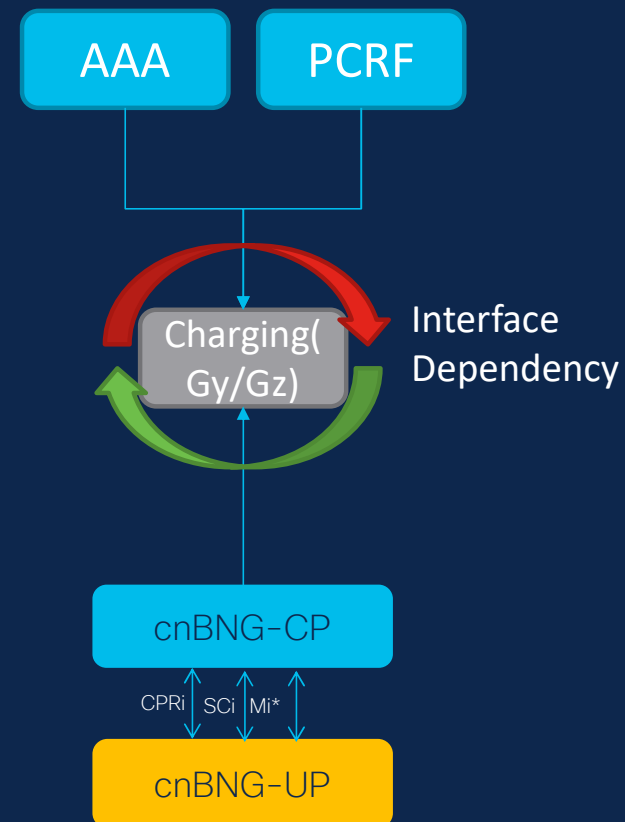
- Dynamic Charging is not part of Wireline broadband services

2

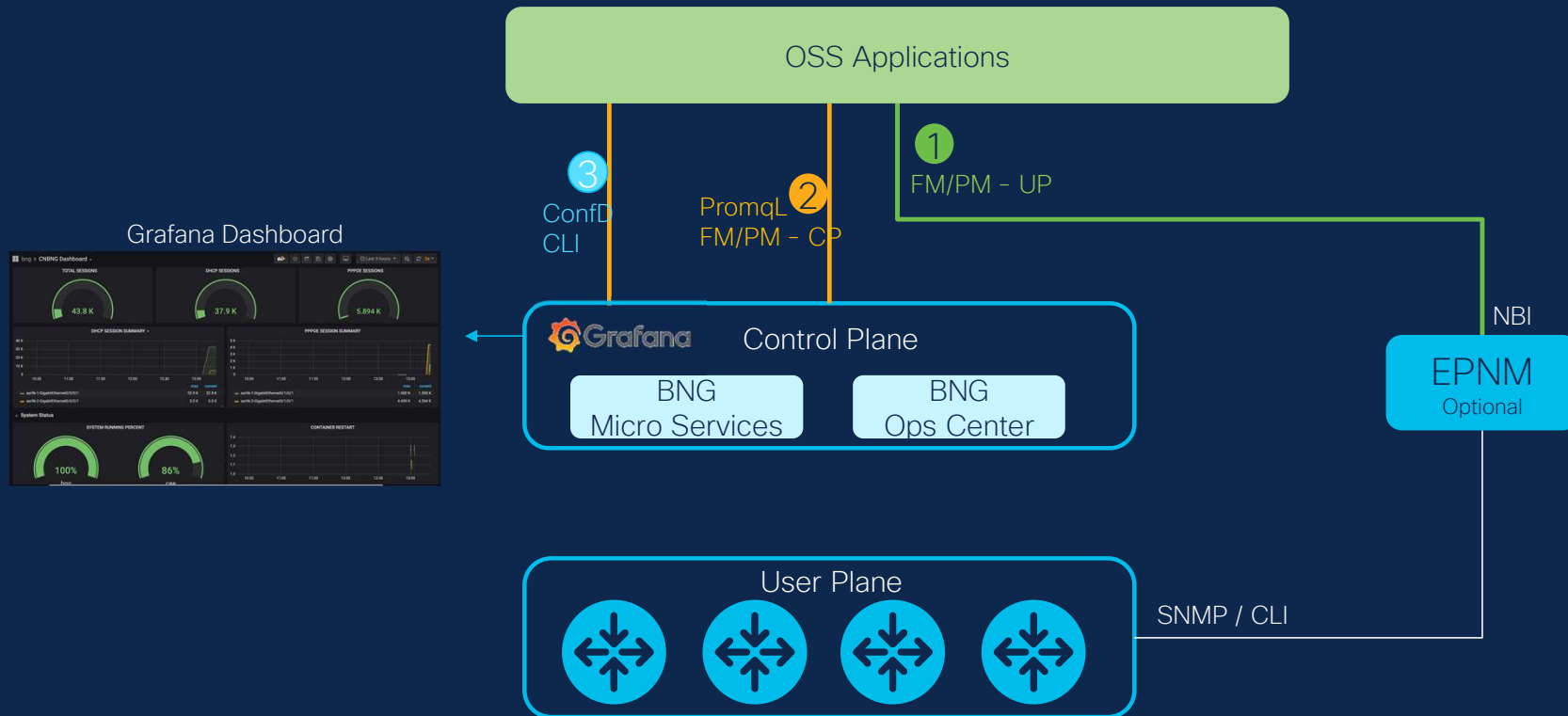
- Standard Accounting
 - Start/stop/interim
 - In/out (octet/packet)

3

- VSA based Accounting
 - Per Q, app, DPI
 - Non-charge , Time based



cnBNG Standalone Integration Capabilities

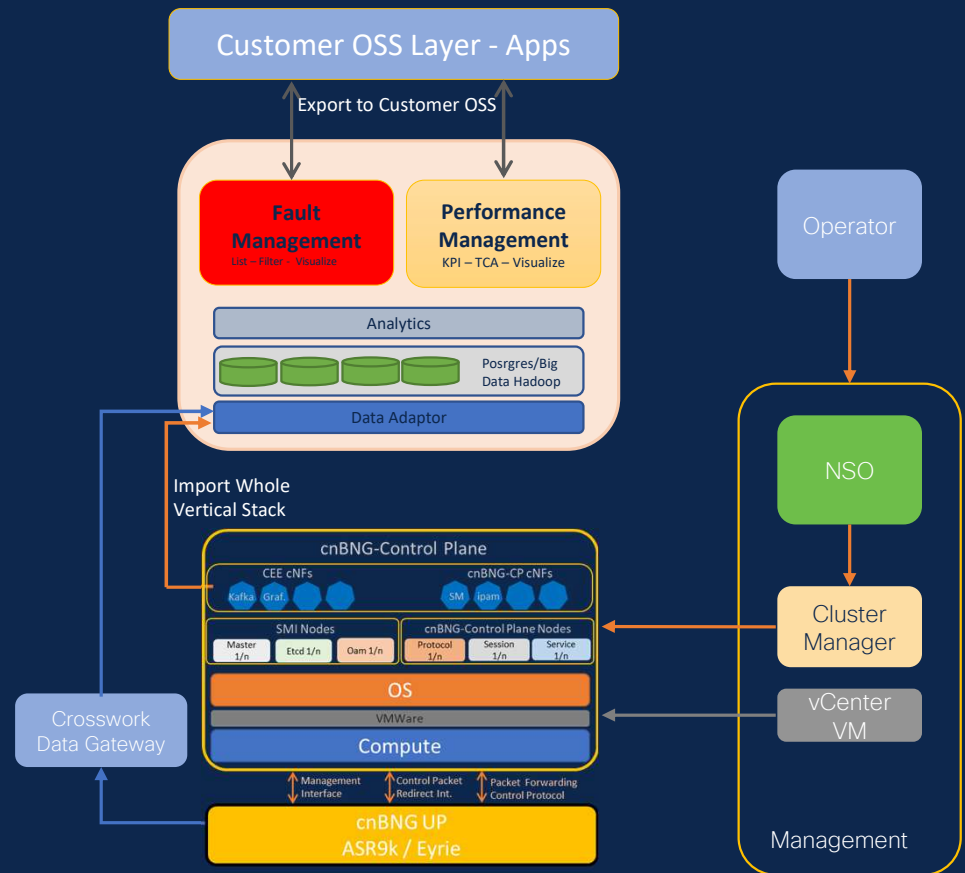


cnBNG Operationalization

1 Single Pane Of Glass for Fault & Performance Mngt. for Complete Vertical Stack (Compute, OS, SMI, cnBNG Apps)

2 Single Tool for all cnBNG Infrastructure and cnBNG Applications in the network

3 Single point of integration for Customer OSS Layer and Applications



cnBNG Fault and Performance Management Screens



Summary

Cisco Cloud Native BNG Solution



Cloud Native Control Plane



Agile Scalability & Rapid Service Deployment



Cost Effective User Planes



Wide Choice of User Planes, Distributed for Peering/ CDN Offload



Converged Subscriber Mgmt. Infrastructure



Introduction of New Services & Unified Support Structure



Automation, Telemetry & Inbuilt dashboards



Network-wide Visibility, Easier OSS/BSS Integration

Resource Links

Broadband forum TR459- [Link](#)

cnBNG documentation and data sheets - [Link](#)

For product related queries, please write to: spn-architectures@cisco.com

