

A large, stylized blue cloud graphic that serves as a background for the title text.

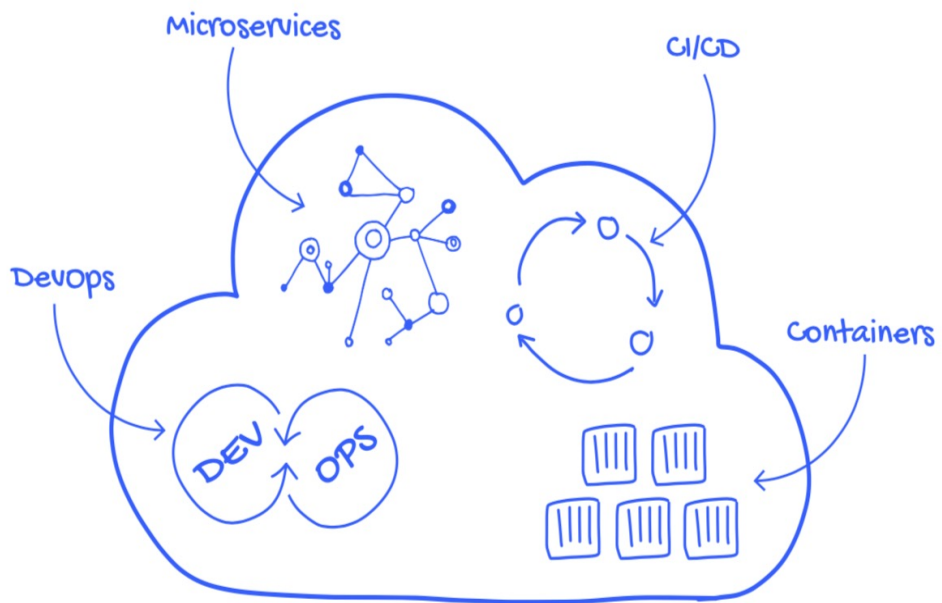
# *The Evolution of BNG Architecture*

*“The Cloud Native BNG”*

*Tanveer Hamdani*  
*Cisco Systems*

*07<sup>th</sup> April 2022*

# Agenda



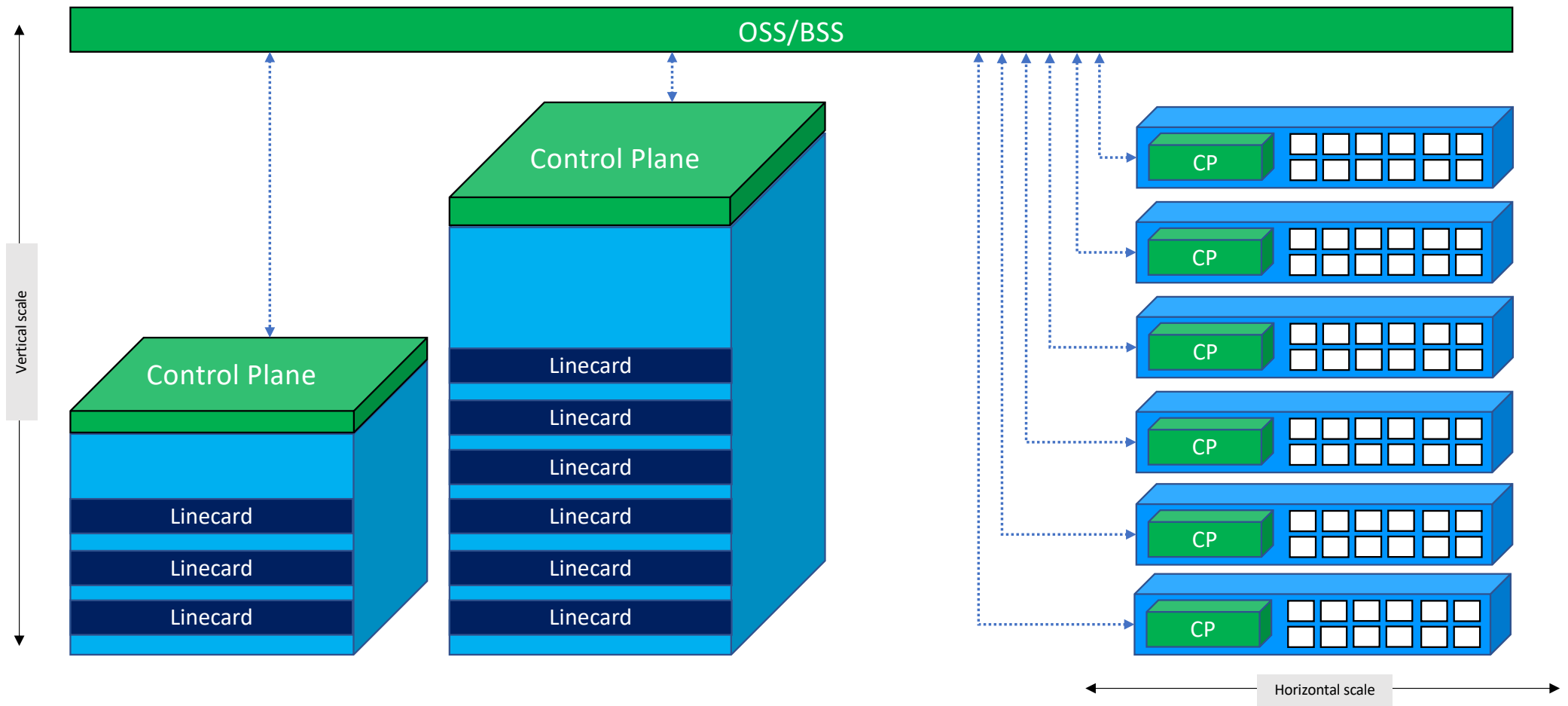
*Current Architecture*

*Drivers for new Architecture*

*Cloud Native Architecture*

*Q&A*

# Current BNG Architecture



# New Architecture Drivers



Services closer to subscriber



Independent CP and UP scaling and ease of integration



Simplified Operations



Common infrastructure

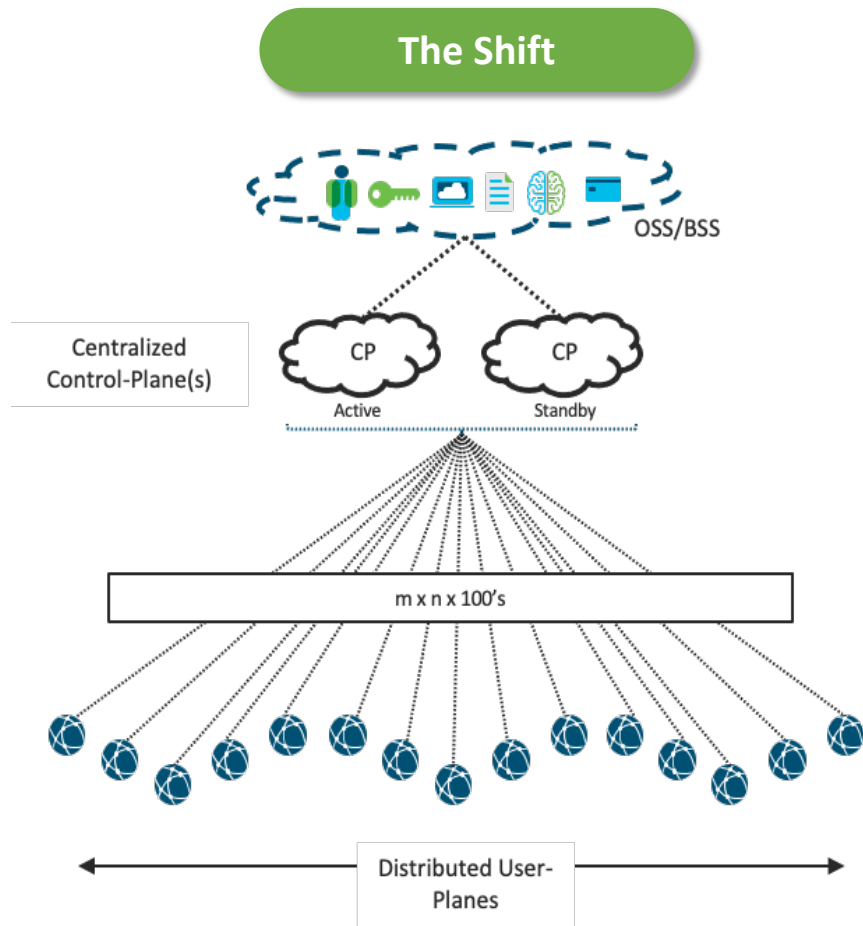


Wireline & Wireless convergence



Common services wireless and wireline

# The cloud native BNG Architecture



## The Benefits

### Reduced Transport Costs

Lower cost, higher bandwidth, simpler platforms in Aggregation/ Access.  
Offload traffic at the edge of the network

### New Services & Better User Experience

Cater for low latency services and bring edge closer to end users.

### Optimized OSS/BSS Integration

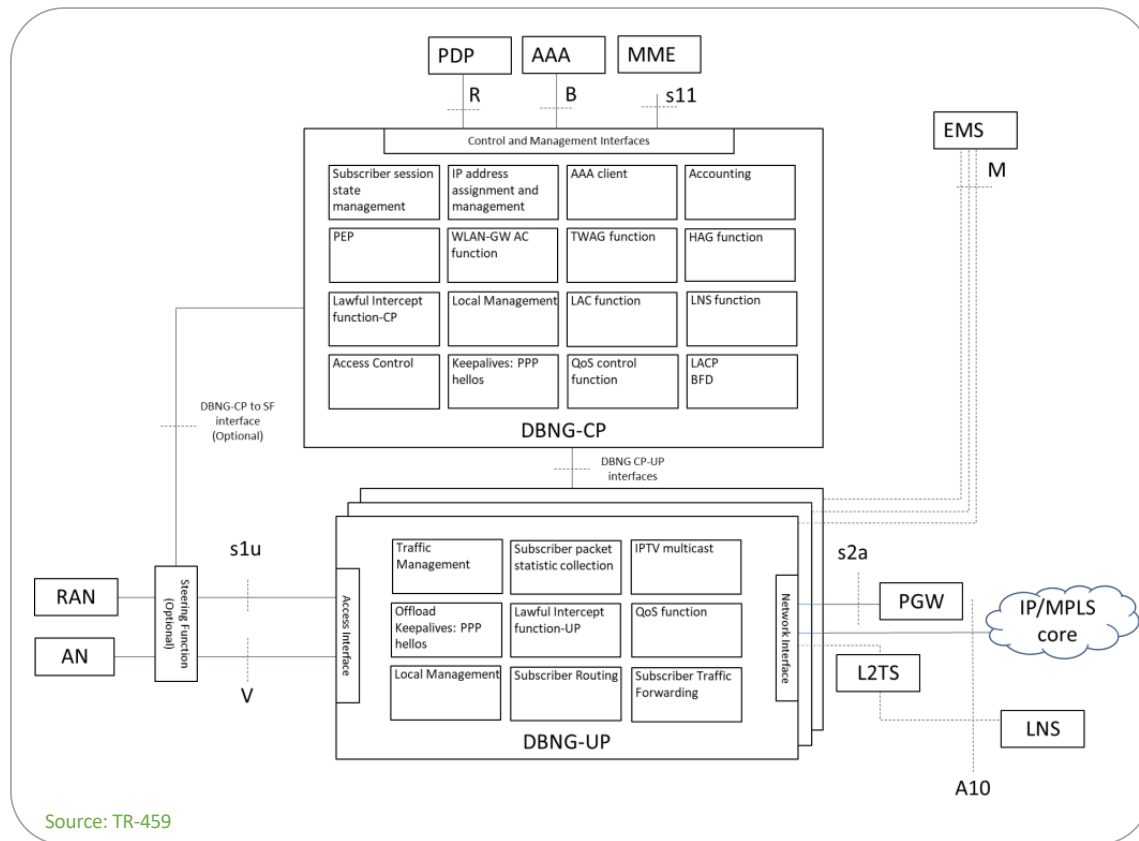
Single integration via centralized control plane significantly reduces OpEx

### Subscriber Mng Simplification

Single Subscriber view and orchestration across services. Unified Policy, new service offers

# Cloud Native BNG Architecture

Broadband Forum (BBF) Disaggregated BNG (D-BNG) Standard released June 2020 → [TR-459](#)



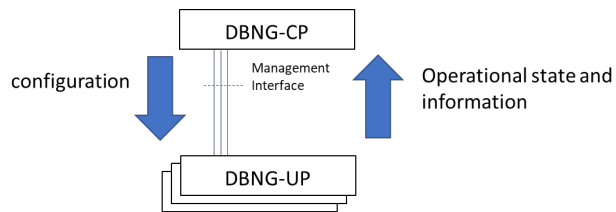
- “TR-459 D-BNG”
- **Control Plane (CP) Functions**
  - Subscriber State Management
  - IP Address Management
  - Accounting
  - AAA Client
  - Policy Programming to UP
  - Northbound Connections
- **User Plane (UP) Functions**
  - Subscriber Termination from access
  - Policy Enforcement
  - QoS
  - Subscriber Routing
  - Access line management
  - Lawful Intercept Enforcement

# TR-459 D-BNG – cnBNG Interfaces

1

## Mi (Management Interface)

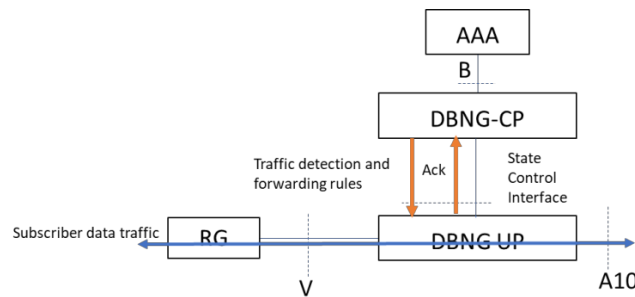
- Model Driven Interface
- Configure User Plane
- Retrieve Operational State and Information from User Plane



2

## SCi (State Control Interface) - PFCP

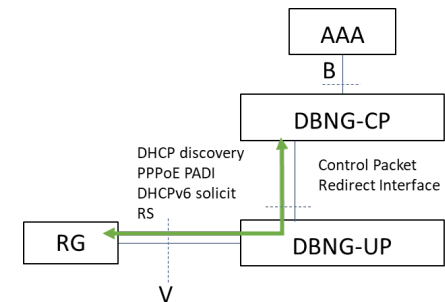
- Defined by 3GPP TS 29.244, BBF has additions for wireline use cases
- Used to program Subscriber sessions and redirection rules on the UP



3

## CPRi (Control Packet Redirect) – GTP-u

- In-band signaling channel to trigger subscriber authentication
- GTP-u as the tunnel
- Tunnels Control packets between RG and CP over the UP
- Implements a tunnel per subscriber

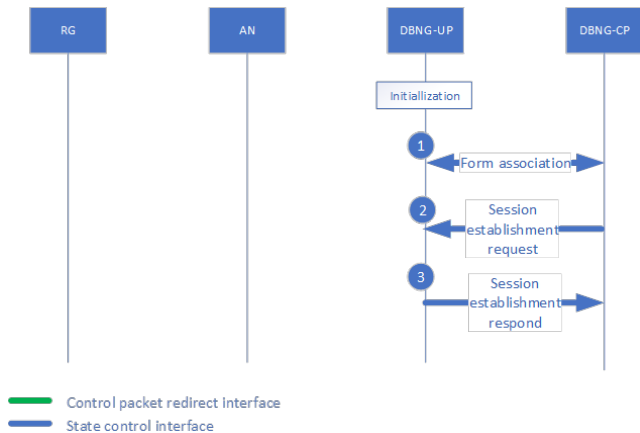


# cnBNG Basic Operation Workflow

1

## UP-CP Association

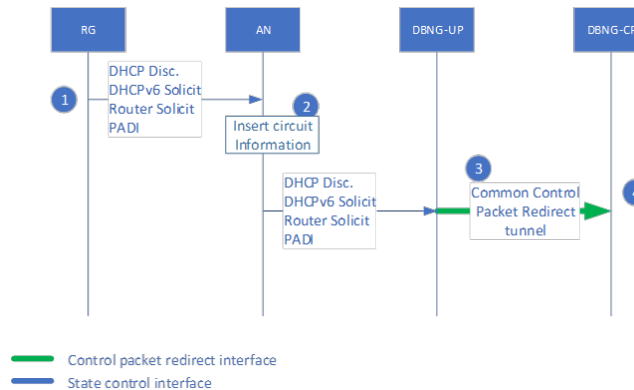
- Uses PFCP Node Messages to setup association
- UP Initiates an association request to CP IP address
- UP and CP negotiates UP supported functions by using a BBF IE (UP Function Features)
- Successful negotiation result in periodic heartbeat
- Any changes are programed via Assoc. Update msges.



2

## Default Control Packet Redirect

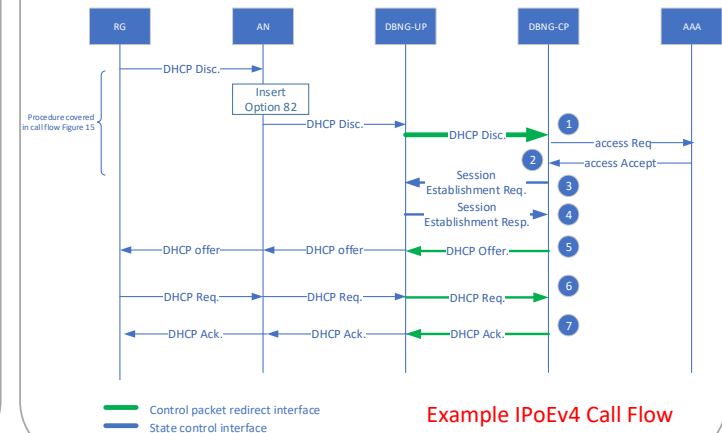
- CP installs a default control packet redirection rule (PDR) to UP for initial control packets to be redirected
- Initial PDR is two way ( from RG to CP, from CP to RG)
- Once the subscriber session is created upon successful auth, then Default PDR is not used and all control packets follow the respective session PDRs.



3

## Session Establishment

- CP programs a subscriber session on the UP before DHCP Req. State.
- A separate session is established per subscriber between UP and CP, thus has its own PDRs
- Four PDRs are programmed
  - 2 PDR for Control packets
  - 2 PDRs for upstream/downstream Data packets
- IP pools are managed by CP and allocated to UP
  - Summary Route is programmed by CP to UP

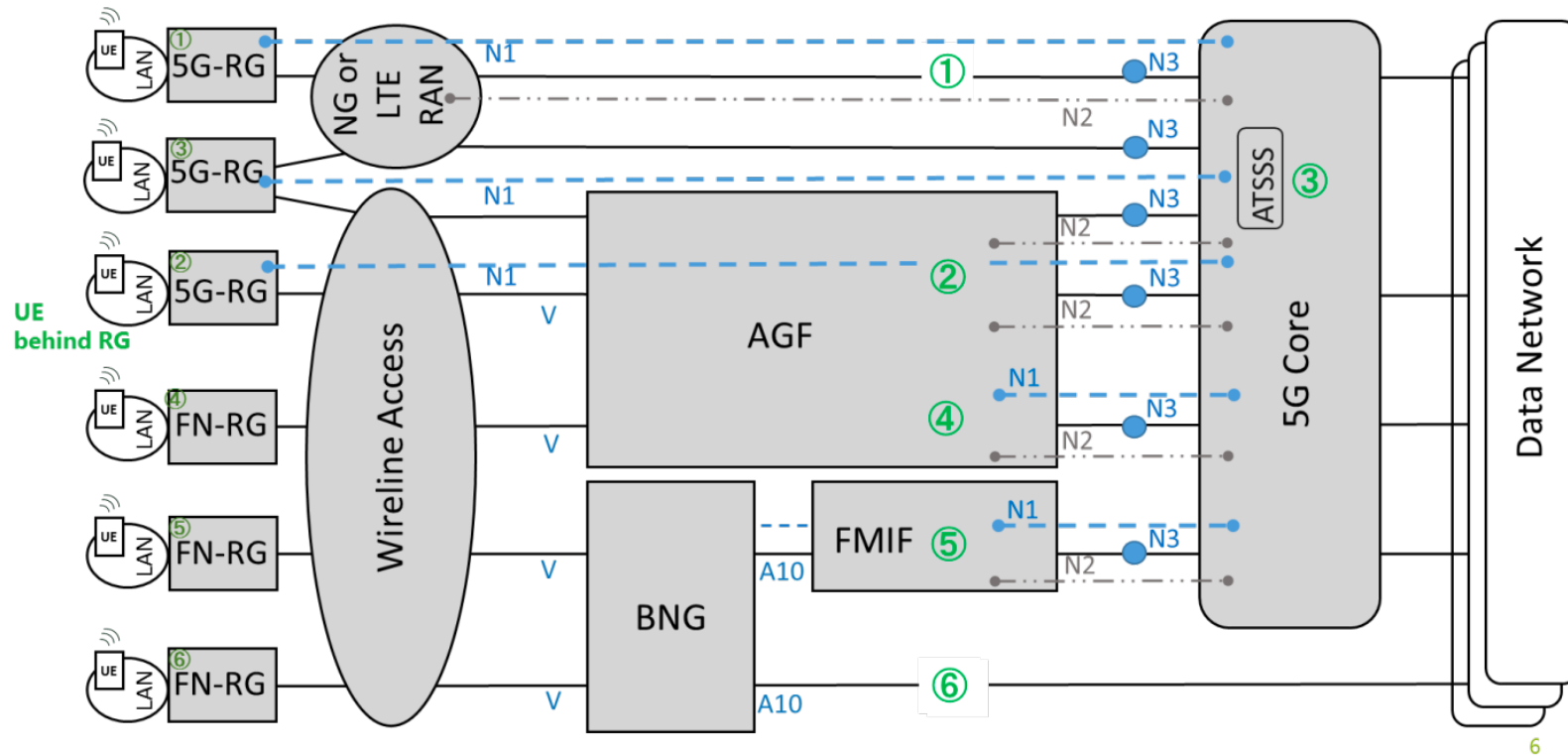




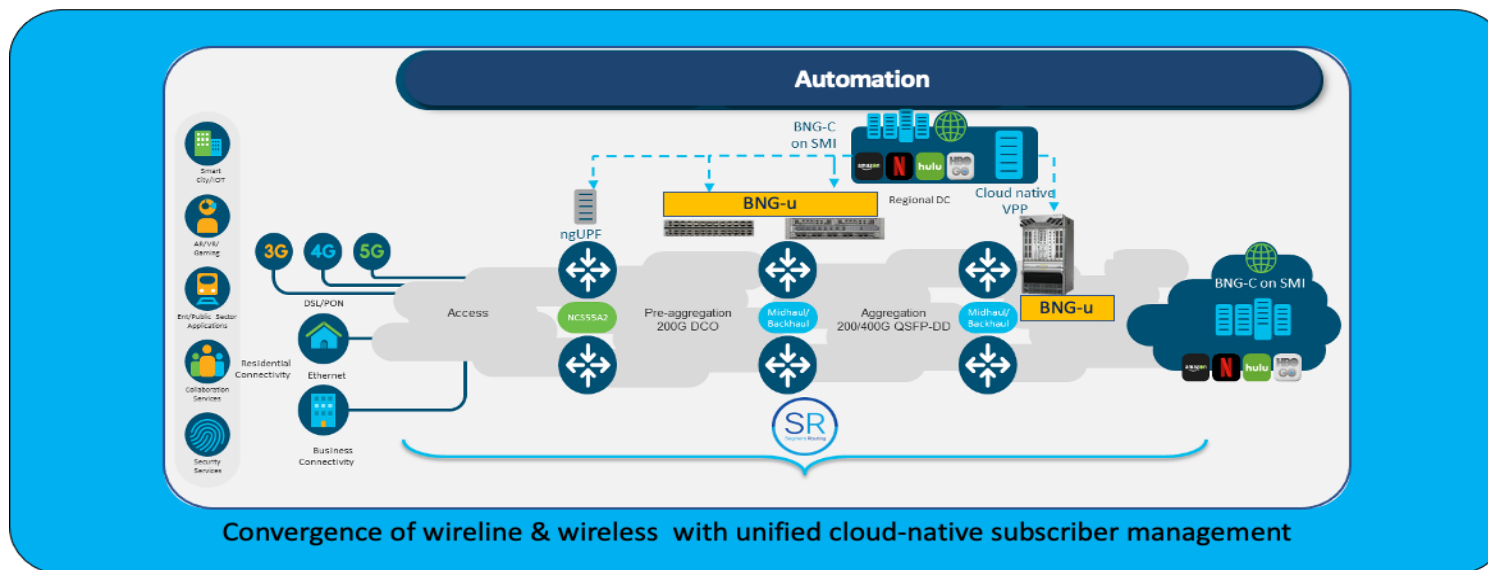
# WWC Convergence

Deployment scenarios connecting RGs to the Data Network

- ① Fixed Wireless Access
- ② Integration in Direct mode
- ③ Multi-Access
- ④ Integration in Adaptive mode
- ⑤ Interworking
- ⑥ Coexistence



# Cloud-native BNG Summary



## Agile Control Plane

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

## Path to Subscriber Services Convergence

- Common Subscriber Management Infrastructure across Mobile & Cable
- Common user plane with ngUPF
- Common Policy-Plane and Aggregation Network

## Ease of Operations

- Restrict Touch-points by Centralizing Backend.
- Optimize IP-Addressing
- Batch Packet Processing

## Optimized Data Plane Choices

- Variety of Cost-optimized User Planes (UP) based on Router NPUs & Virtual x86

## Improved Subscriber Visibility

- Subscriber Visibility using Streaming Telemetry across all Data Planes
- Real-time API Interaction with Back-end Systems

## Enhanced Redundancy

- Stateful Redundancy including On-demand Subscriber Migration & Pro-active Protection
- Cloud-Native Service Redundancy

