

NovoNet Vision and Operators' Perspective for ONAP

Yachen Wang

Deputy Director of Network Technology Dept. China Mobile

President of ONAP

Vice-chairman of ITU-T SG13 WP1(IMT2020)

2017-07

1

NovoNet: China Mobile Future Network Vision

2

ONAP: Vision and Operators' Perspective

China Mobile: World's Leading 4G Network



Bigger Network

1.5 M+ 4G BSs

Account for over **1/3** of global 4G BSs



More Subscribers

530 M+ 4G Subscribers

Account for over **30%** of global LTE users



More Device Choices

2600+ commercial devices

75% are 4G devices less than USD 145



Better User Experience

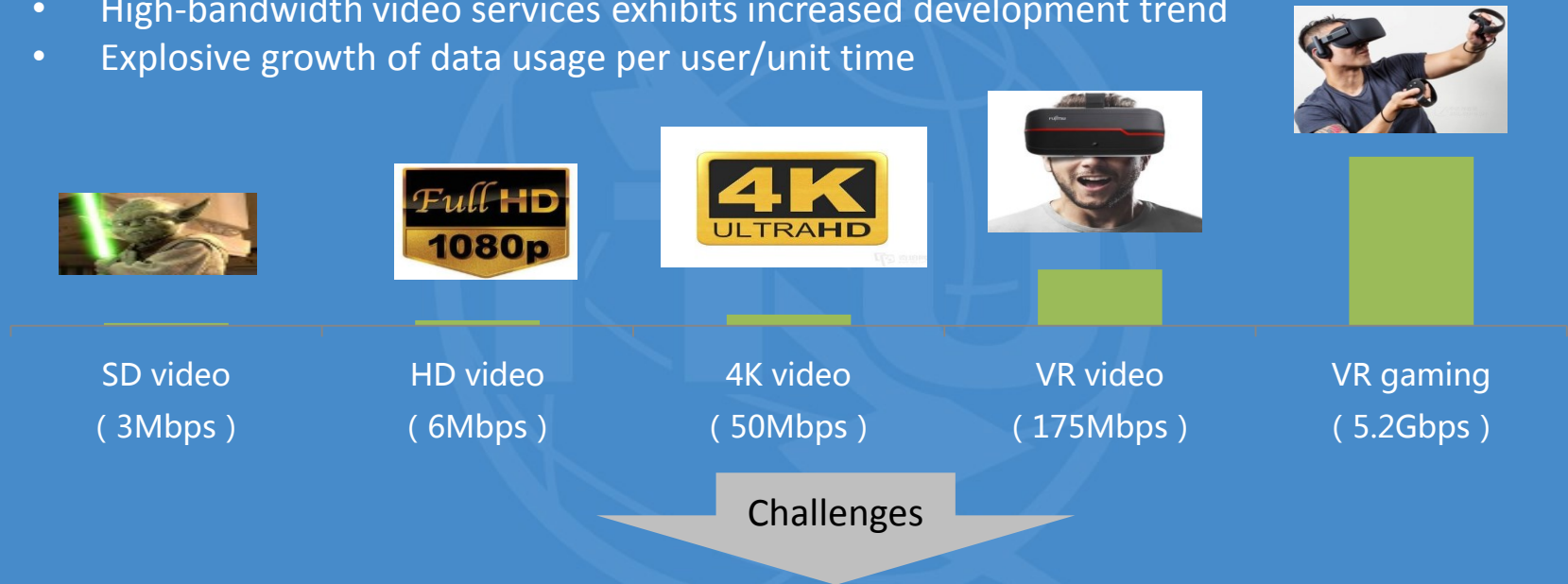
313 cities commercially launched
VoLTE

143M+ VoLTE subscribers

Market Triggers Operator's Network Transformation: Huge Traffic

Large granularity of video is the major part of the traffic in future — significant bandwidth demand

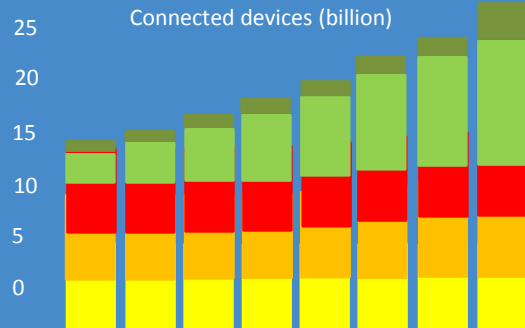
- High-bandwidth video services exhibits increased development trend
- Explosive growth of data usage per user/unit time



- **E2E traffic flow optimization is difficult: whole network resources usage is less than 50% (20-30% in extreme cases)** - however local congestion still exists
- **Traffic not terminating at edge:** many cross-segment network interconnections , traffic termination point is in central site

Market Triggers Operator's Network Transformation : Large Connection

Number and type of connection will increase significantly



	15 Billion	28 Billion	CAGR 2015-2021
Cellular IoT	0.4	1.5	27%
Non-cellular IoT	4.2	14.2	22%
PC/laptop/Tablet	1.7	1.8	1%
Mobile Phones	7.1	8.6	3%
Fixed Phones	1.3	1.4	0%

Saturation of connections between people

rapid growth of IoT connections

- IoT equipment CAGR is 23% between 2015 and 2021, will exceed the phone and become the largest Internet equipment.
- Global networking equipment is expected to reach 28 billion in 2021 , 16 billion relates to IoT

Challenges

- Tremendous types of business, requires high network capabilities
- Large amount of on-demand and dynamic business requirements bring challenges the network openness, automated tools and business processes

NovoNet – China Mobile’s Vision of Future Network

Novo
+
Net



New Network Architecture

- Virtualized Network Function
- Centralized Control
- Programmable Network



New Network Operation

- Auto Deployment
- Flexible Orchestration
- Maximal Usage



New Network Service

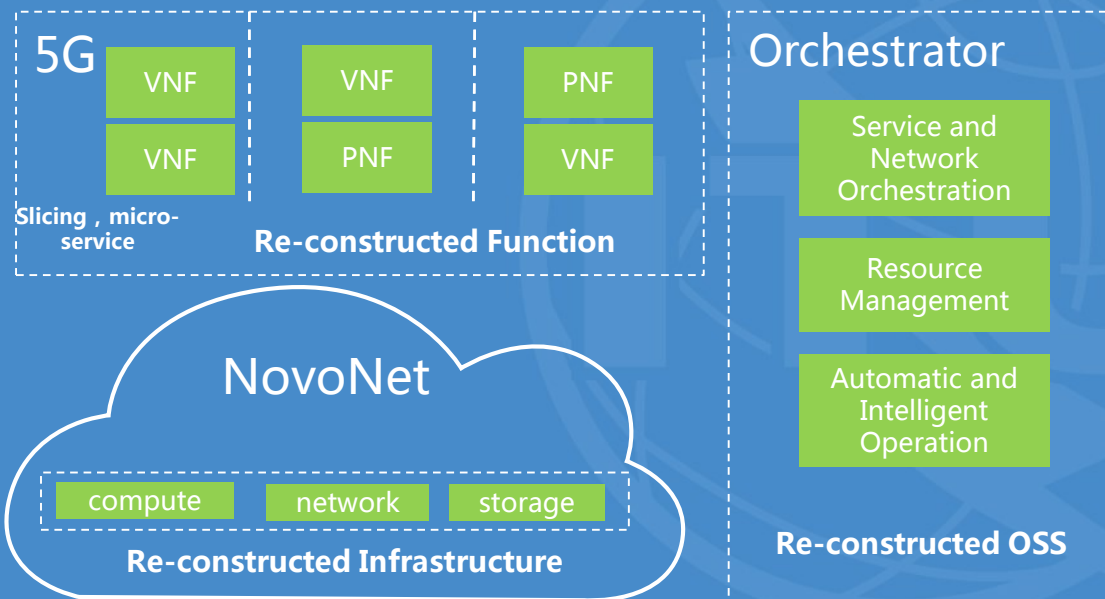
- More Open
- More Agile
- On-demand

Enabler Technology
NFV



Enabler Technology
SDN

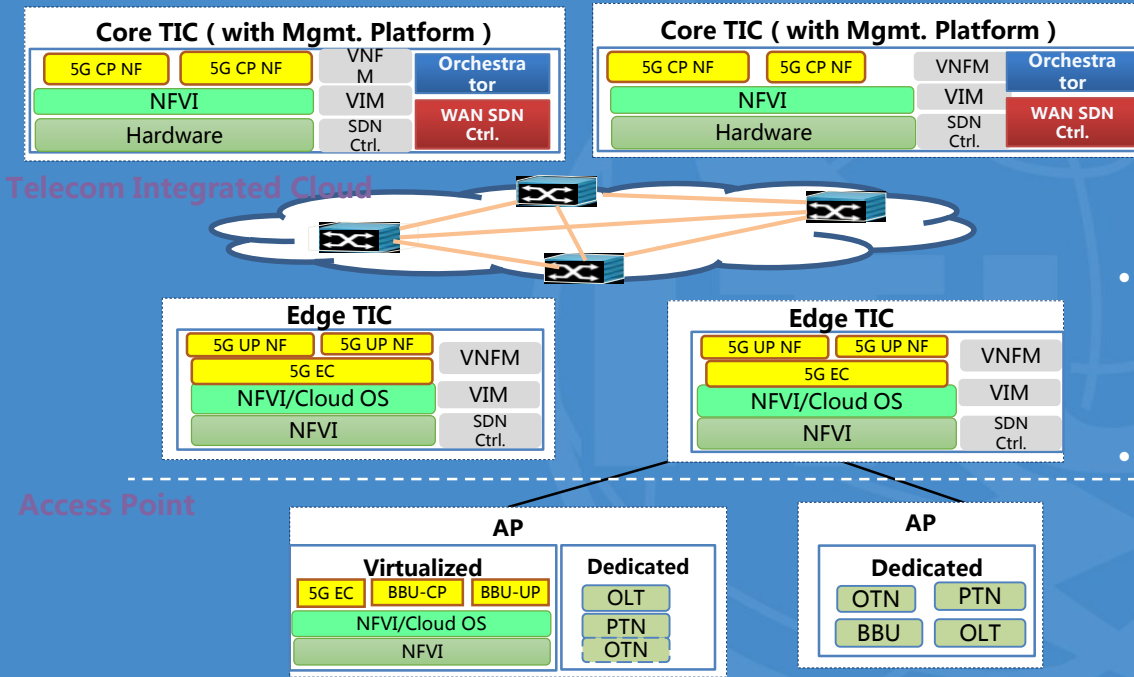
Future Network: Re-construction of Infrastructure NFs and OSS



Features of Future network

- Re-constructed Function(s)
- Re-constructed Infrastructure
- Re-constructed Network Operation and Service Delivery

1、 Re-construction of Infrastructure

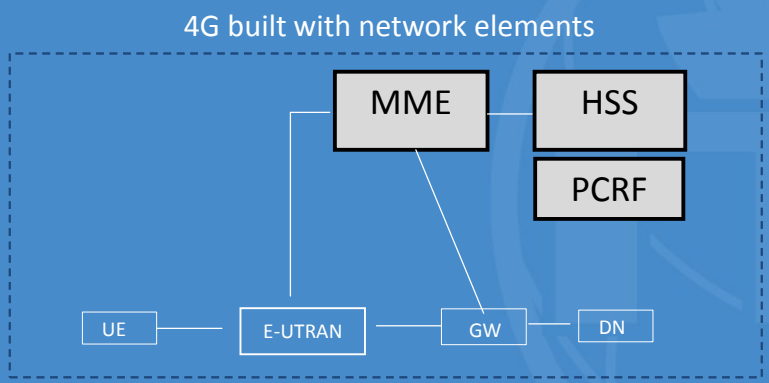


TIC : Telecom Integrated Cloud

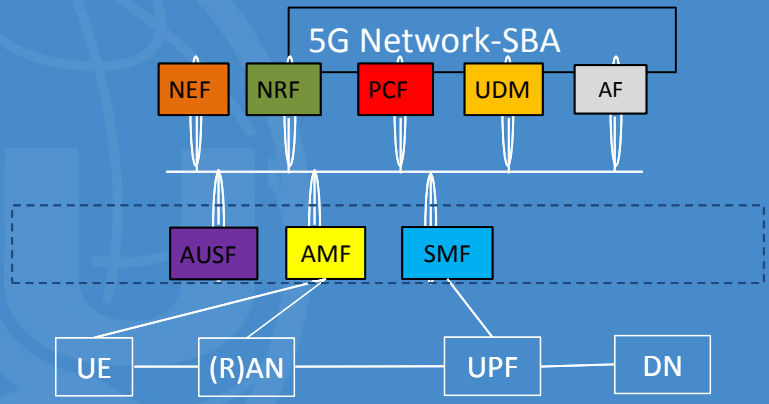
- new cloudified DCs, replacing legacy Central Offices
- easy to copy and re-construct
- Separating C/U plane
 - centralized control unit in core TICs, off-loading data traffic at edge of network
- Network
 - Building up powerful controller to achieve intelligent routing and automatic configuration

2、 Re-construction of Network Functions in 5G: SBA

Service-based Architecture (SBA): design network functions as elementary “services”, interact through API. Three principles to define services: self-contained, reusable and independent management. SBA has been accepted as the unique architecture by 3GPP SA2#112 in May 2017.



Rigid network: fixed connection, fixed capability and stateful signaling interaction



Soft network: network functions are decoupled with service module, invoke by API

- Agile : service is decoupled, network deployment, maintenance and update is faster
- Scalability : lightweight interface makes new feature be introduced without define point-to-point reference point

- Flexible : through modularization, reusability to achieve composition to meet flexible networking of network slicing
- Openness : new REST API interface makes operator and the third-part invoke network services much easier



2、 Re-construction of Network Functions in 5G: Slicing

Massive IoT

no mobility , Small data : 100kbps
Low throughput , terminal 10 years
High density 100 million
connections/km²



eMBB

High throughput :
100Mbps~1Gbps
High mobility support

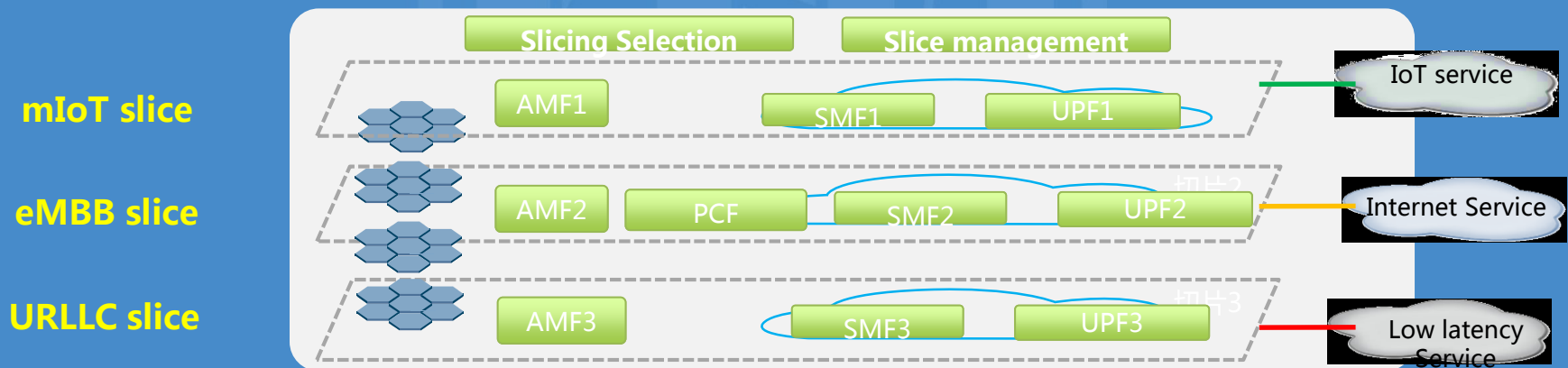


URLLC

latency : 1ms~5ms
high availability, mobility and edge
computing support



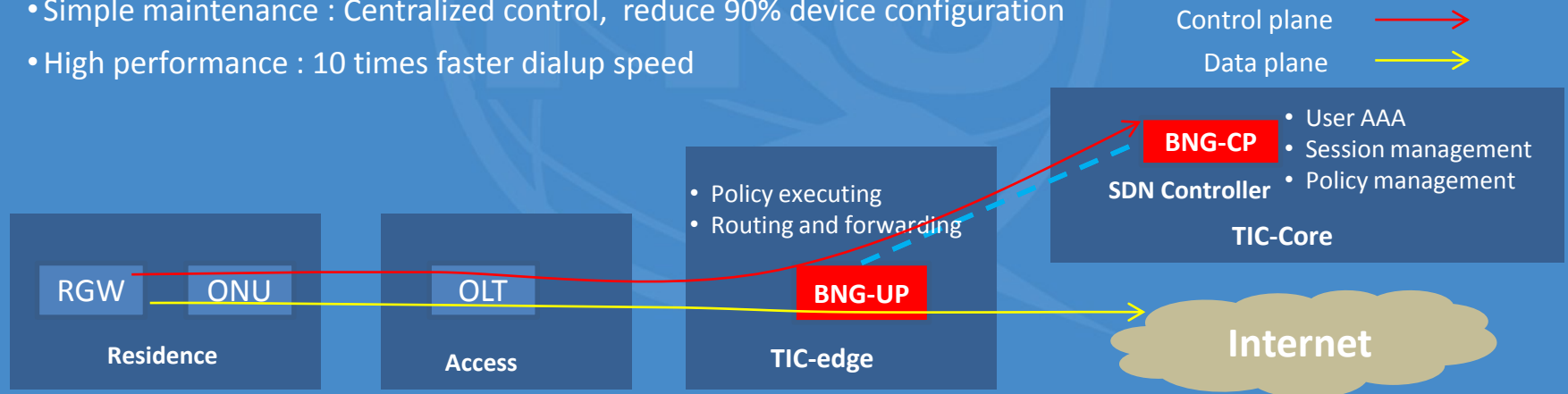
Customized 、 Logical Isolation、 Dedicated Resource and Network



Flexible deployment and scalability of slice need the support of Orchestrator

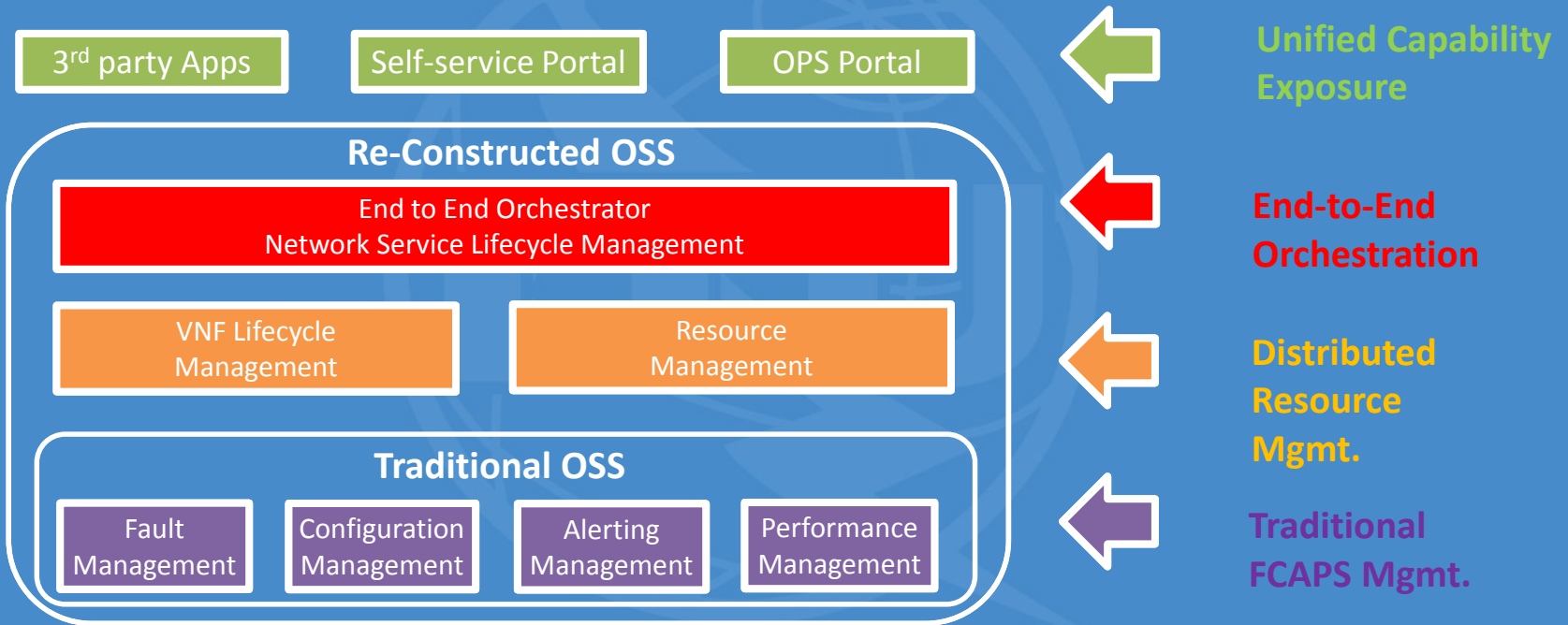
2、 Re-construction of Network Functions in 5G: C/U Separated

- **Separation of control and user plane**
 - Centralized Control Plane : NFV provides flexibility and scalability in TIC-CORE
 - Distributed User Plane : High performance hardware ensures data forwarding in TIC-EDGE
- **Advantages**
 - High utilization : Network utilization rises more than 50%
 - Simple maintenance : Centralized control, reduce 90% device configuration
 - High performance : 10 times faster dialup speed



3、 Re-construction of OSS: Orchestrator

New network operation requires a new operation support system.



A new Orchestrator could be the core of next generation OSS.

3、 Re-construction of OSS: Orchestrator

Orchestrator: enable us to organize network as easy as play Lego

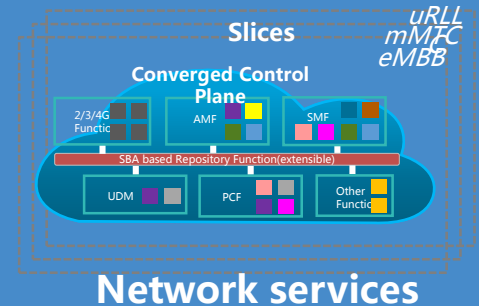
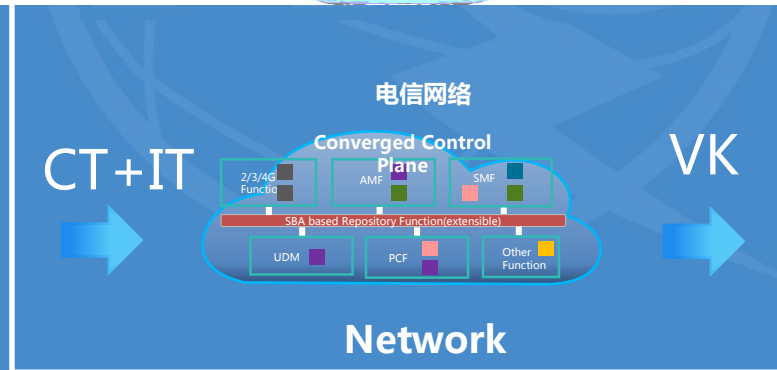


Orchestrator

- CSCF
- mobility
- VoLTE AS
- Access control
- MME
- Charging
- PGW
- Authentication
- PCRF
- Policy
- SBC
- Session

CT+IT

VK



Resource



1

NovoNet: China Mobile Future Network Vision

2

ONAP: Vision and Operators' Perspective

ONAP Vision



The Top, Global Automation platform for Network, Infrastructure & Services across Service Providers, Cloud Providers and Enterprises in a Software-Defined, Virtualized Era

ONAP Scope and Objective

- **ONAP (Open Network Automation Platform) is an open source software platform that delivers capabilities for the design, creation, orchestration, monitoring, and life cycle management of VNFs/SDNs and high-level services that combine the above.**
- **ONAP provides for automatic, policy-driven interaction of these functions and services in a dynamic, real-time cloud environment.**
- **ONAP uses cloud technologies and network virtualization to offer services, achieving both faster development and greater operational automation. It lets service providers quickly add features and reduces operations costs. It gives service providers and businesses with their own network clouds more control of their network services, and enables developers to create new services**



What is ONAP Solving?

- **Aligning the global service provider ecosystem around a common network operating system for NFV/SDN automation**
- **Reducing manual processes required to deliver NFV/SDN-based infrastructure and services through open source components – TTM & MTTR (Meantime to revenue) & Customer experience**
- **Reducing the OpEx associated with automating network deployments within a virtualized environment, especially with new technologies on the horizon, like 5G**
- **Speeding the adoption of Open Source Networking technology in the ecosystem by harmonizing and aligning existing open source projects**

Linux Foundation Framework, Governance, Control Bringing the best of both worlds together



+



- 2+ years of Deployment Maturity at AT&T
- Comprehensive: Design +Orchestration + Control + Policy + Analytics
- Model-based design enabling self-serve capabilities for instantiation and closed loop automation

- ✦ Open TOSCA model
- ✦ Most Advanced Open Source Process & tool chain
- ✦ Architected for ease of VNF insertion (SDK)

Based on extensions & integration with OpenDaylight & OPNFV

ONAP architecture

Active & Available Inventory (A&AI)

- Real-time topology map with context views of virtual networks, services and applications
- Uses the network resources as the database of record due to their dynamic nature

Service Orchestrator (SO)

- Orchestrates and manages the delivery, modification or removal of networks & services
- Provides cross domain orchestration and coordination
- Integrate TOSCA end-to-end orchestration

ONAP Portal

Service Design & Creation

Policy Creation

Analytic Application Design

Recipe/Engineering Rules & Policy Distribution

Design Platform

- **Service Design:** environment to define service and resource, constraints, instantiation & modification recipes.
- **Policy Creation:** Associate anomalous and actionable conditions with automated remedy actions
- Provides SDK to onboard and certify Vendor VNFs

Dashboard

OA&M
Operation
Administration
& Maintenance

Active & Available
Inventory

Service Orchestrator

Common Services, Data Movement, Access Control & APIs

Data Collection & Analytics

Data Collection, Analytics & Events (DCAE)

- Collects Telemetry Data from VNFs and other sources
- Analytic Applications Detect Anomalous conditions
- Publishes Actionable conditions

Controllers

SDN Infra. Cont Network Cont App. Cont VNF Cont

Controllers

- **Network:** Configuration Management of VNFs, infrastructure networking & WANs
- **Service:** configures & manages of Service VFs
- **Infrastructure:** Configuration Management of infrastructure (compute, storage, etc.)



ONAP: The Business Value

Accelerate Services with Network Automation

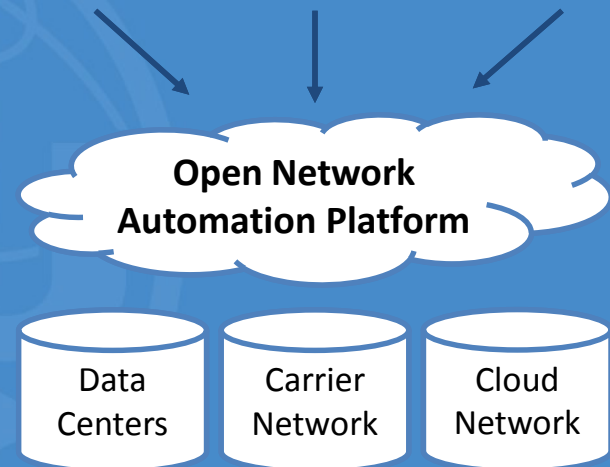
End User Value

1. Faster Services on Demand including 4G, 5G & Business/Enterprise solutions
2. Elimination of manual steps/errors/time
3. Design, Agility & Automation enabler for 5G

Open Source Ecosystem Value

1. Harmonized shared investment in technology across Major Carriers globally
2. Neutral platform that will foster innovation on top of SDN/NFV eg Services, Virtual Functions, 5G Apps, IOT ecosystem

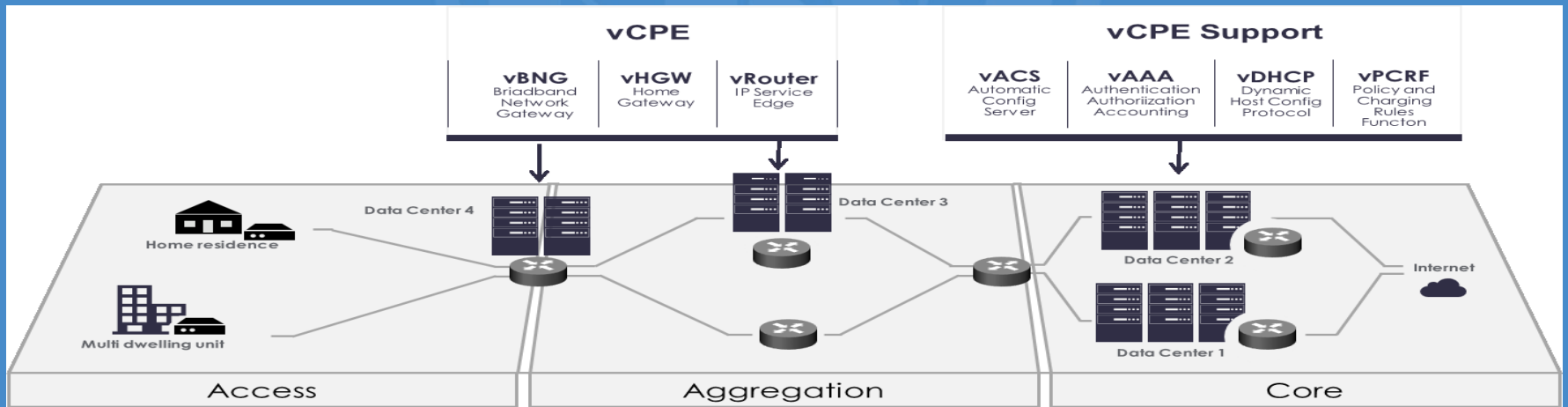
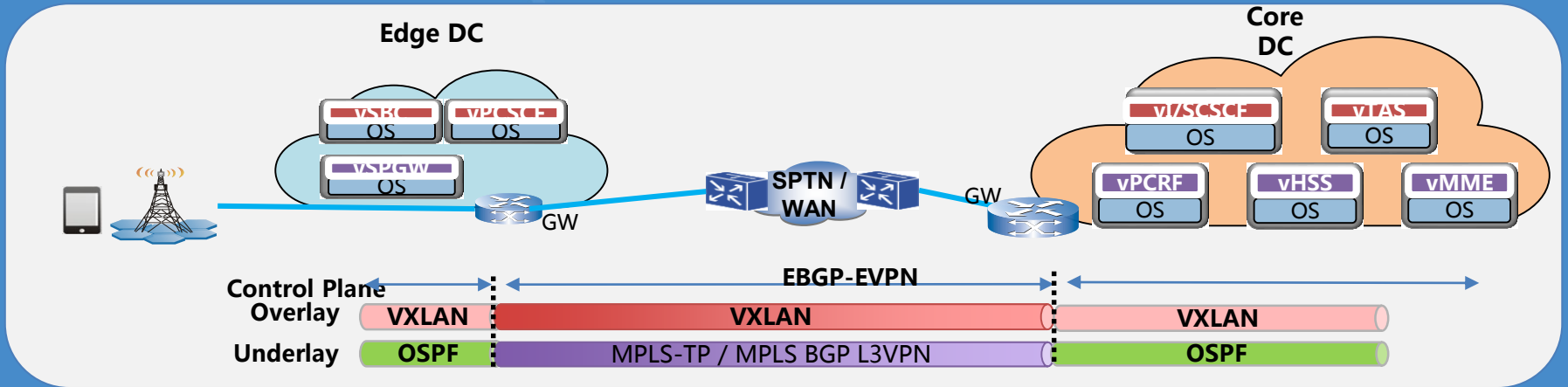
Residential Services Enterprise Services Cloud Services



At Inception, ONAP enables up to 38% of Global Subscribers

R1 timeline Scenarios and use case

VoLTE(vIMS + vEPC)



Why ONAP?

Unified Platform Industry convergence Build a strong open ecosystem Harmonize ecosystem Enable the community to take advantage of the best architectural components of both projects Drive NFV innovation in the marketplace	VNF Onboarding Cut down the time and cost of getting VNFs into the network Onboard vendor VNFs with standard processes, and operate these resources via vendor-agnostic controllers and standard management, security, and application interfaces VNF shipping container	Fully Automated Platform Carriers step into cloud/SDN network commercial launch era to fast deployment, more efficient maintenance and short TTM Self deployment Self test Self heal Self optimization
Agile Operation Fast service deployment Process automation Big data empowered solution DIY self service User lifecycle assurance	Support 5G/IOT Evolution Allow operators to enjoy 5G and IoT technologies Automate massive number of connected devices Automate differentiated service requirements	Improve Customer Experience Allow end users to automate, design, orchestrate, and manage services and virtual functions

LF Governance, Process & Organization

- **Governing Board**
 - Responsible for budget, trademark/legal, marketing, compliance & overall direction
- **Technical Steering Committee**
 - Fair Technical Board starting with commitment to project success and transitioning to merit based over time
- **Process & Governance**
 - LF based consistent process & governance
- **Officer Position in ONAP Governing Board**
 - Chair: Chris Rice (AT&T)
 - President: Yachen Wang (China Mobile)
 - Treasurer: Vincent Danno (Orange)



A Growing Ecosystem – represents ~45% of Global Subs



-
- We are hoping that all partners work together to build the healthy ecosystem and accelerate the maturity of NFV and SDN.
 - We are expecting that ONAP and other open source projects and SDOs (i.e. ITU-T,ETSI,3GPP etc) could collaborate closely to promote industrial innovation and transformation.
 - We are expecting for more participants to join in this project and promote ONAP to be a successful open source community.

