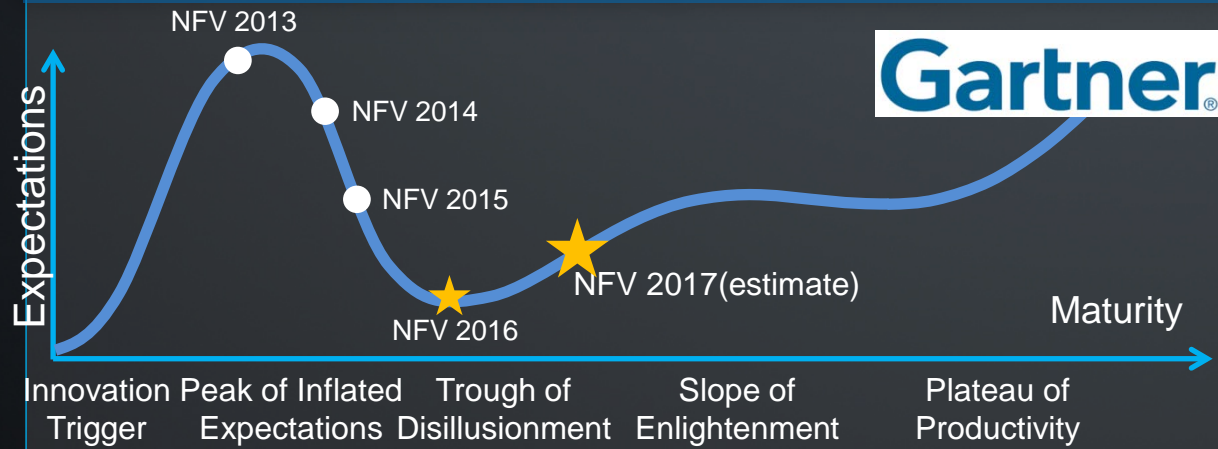# Towards CloudNative, Embrace the future of all cloud
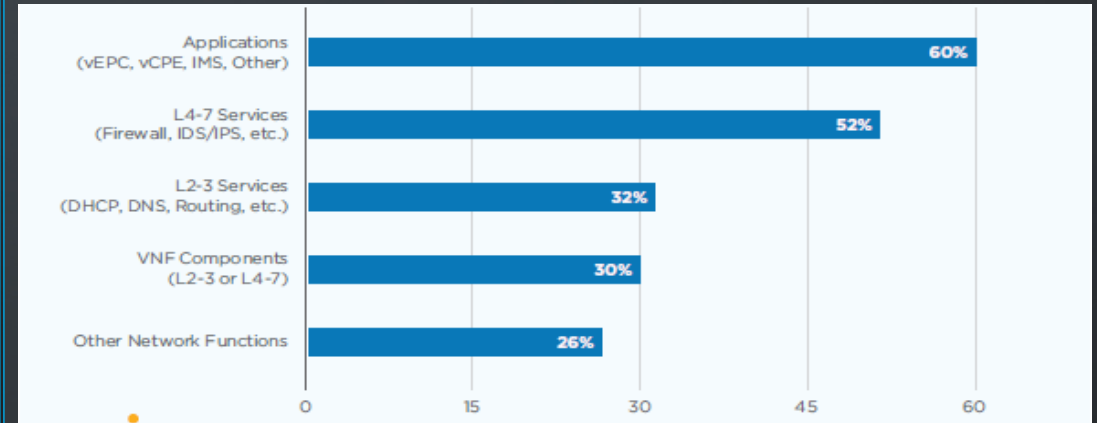
HUAWEI

NFV is getting maturing, focusing on 4 main cases

NFV is Crossing the Chasm

Expectations

NFV 2013
NFV 2014
NFV 2015
NFV 2017(estimate)
NFV 2016

Maturity

Innovation Trigger | Peak of Inflated Expectations | Trough of Disillusionment | Slope of Enlightenment | Plateau of Productivity

Gartner®

Source: Hype Cycle for Communications Service Provider Operations(2013,2014.2015,2016)

Top NFV use cases

Applications (vEPC, vCPE, IMS, Other) — 60%
L4-7 Services (Firewall, IDS/IPS, etc.) — 52%
L2-3 Services (DHCP, DNS, Routing, etc.) — 32%
VNF Components (L2-3 or L4-7) — 30%
Other Network Functions — 26%

0   15   30   45   60

Source: SDxCentral , Powering NFV -Virtual Network Functions , 2017

MAIN CASES

Basic service, new deployment

VoLTE
VoWiFi
4G Data

Replacing legacy EOX

NFV

Traditional legacy network   switch over
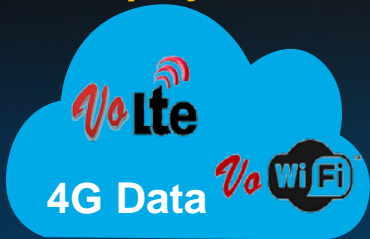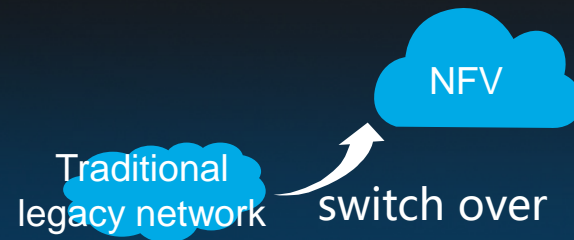
Simplify service provision

VPN

Innovation service trial

Enterprise, verticals

...   NB-IoT
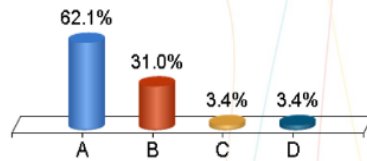
HUAWEI
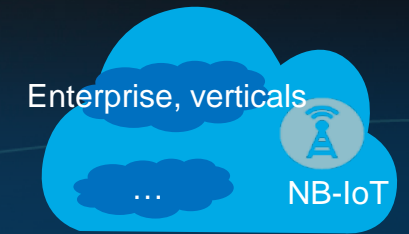
NFV deployment and evolve direction

2. Which is the most suitable maintenance SLA (Service Level agreement) for VNF and NFVI?

A. Same SLA as VNF (99.999%)

B. Separate SLA for both VNF (99.999%) and NFVI (99.9%)
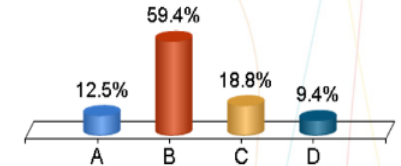
C. Same SLA as NFVI (99.9%)

D. Other

62.1% | 31.0% | 3.4% | 3.4%
A | B | C | D

62.1%
99.999% SLA, Telco reliability

59.4%
CI/CD makes NFV more efficiency

2. Which one is most useful in order to make NFV deployment more efficient?

A. Automatic Integration Tools

B. CI (Continuous Integration)/CD (Continuous Delivery) for Parallel Deployment

C. Pre-integrated Solution

D. Others

12.5% | 59.4% | 18.8% | 9.4%
A | B | C | D

Towards future 5G: the construction of all cloud netwok

Source: carrier investigation and interview report, 2017

1. Which is the most important NFV capability to support the evolution to the future 5G/IoT network?

A. Unified NFVI for Smooth Evolution

B. Automatic Maintenance for OPEX Saving
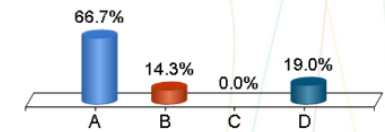
C. Devops for Quick New Service Launch

D. Others

21.1% | 26.3% | 42.1% | 10.5%
A | B | C | D
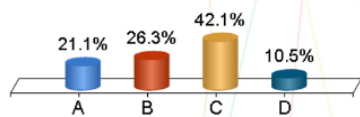
42.1%
DevOps is the key capability evolving to 5G/IoT

66.7%
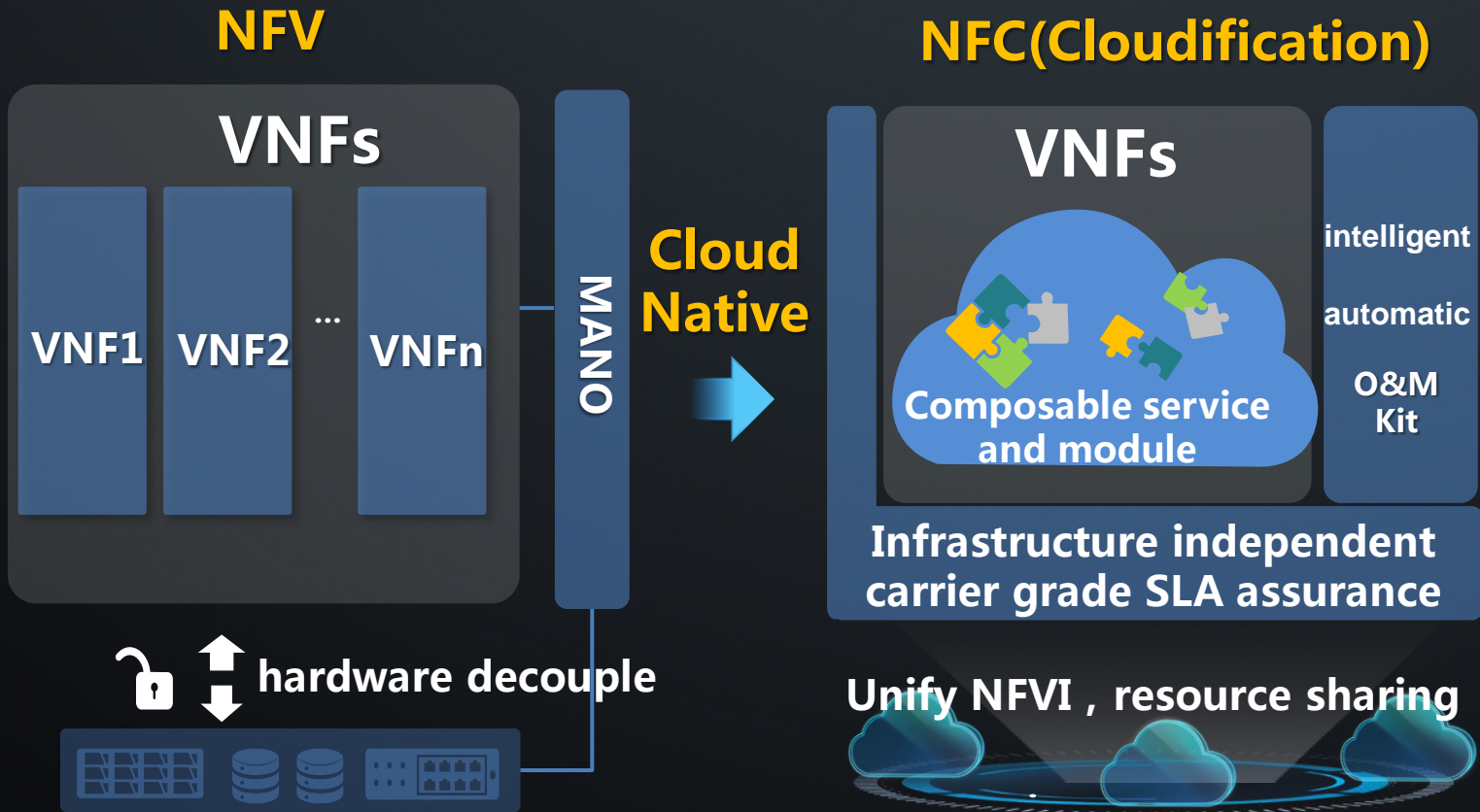**Enterprise/Verticals** can exploit the value of NFV

2. What's your next plan to leverage NFV benefits (automatic maintenance, quick TTM, and etc.)?

A. To Enter Enterprise Or Vertical Market

B. To Build An Autonomous Network

C. To Provide Hosting Service To Mvnos

D. Others

66.7% | 14.3% | 0.0% | 19.0%
A | B | C | D

HUAWEI

Maximize NFV potential based on Cloud Native

NFV

VNFs

VNF1 VNF2 ... VNFn

MANO

Cloud Native

hardware decouple

NFC(Cloudification)

VNFs

Composable service and module

intelligent automatic O&M Kit

Infrastructure independent carrier grade SLA assurance
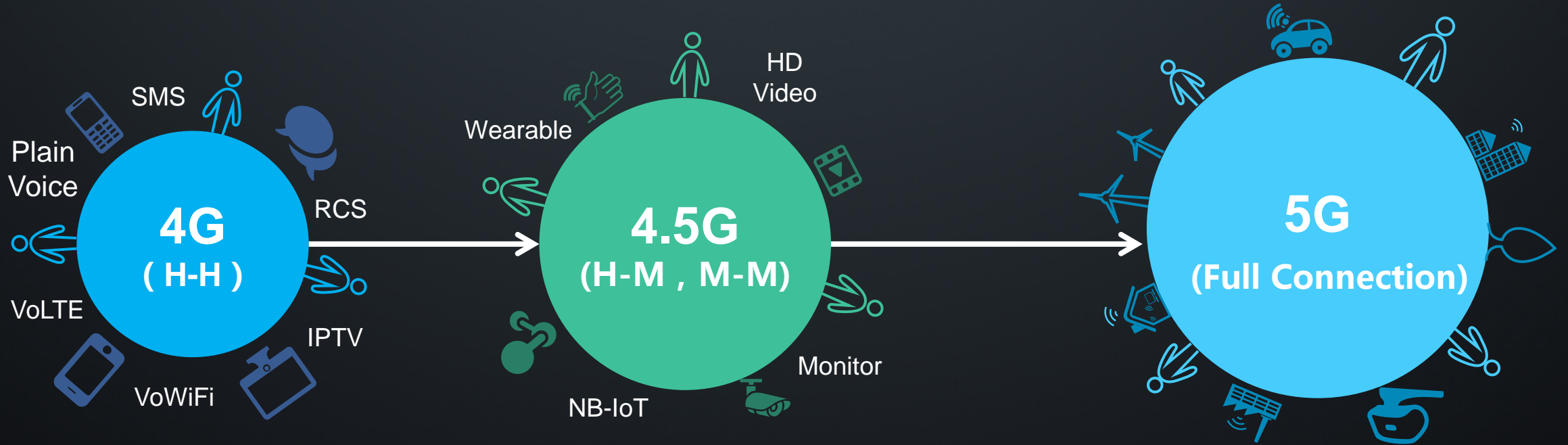
Unify NFVI , resource sharing

Robust : High reliability independent of the infrastructure
99.9% Infrastructure，99.999% service reliability

Elastic : service lossless
Service lossless Scaling, Resource On-demand

Efficient : Automatic and intelligent O&M
Cross - layer analysis, fault locate, and recovery

Agile : Lego style service composition
TTM from "month" to "week", trying new service quickly with low cost

Introducing key technology considering the business value as the core target

4G (H-H)

SMS
Plain Voice
VoLTE
RCS
IPTV
VoWiFi

4.5G (H-M , M-M)

Wearable
HD Video
Monitor
NB-IoT

5G (Full Connection)

Cloud Native	Robust+ elasticity + Efficient	Agile

Key technology

Stateless design   CI/CD   Automatic OM   Micro service   Container   DevOps
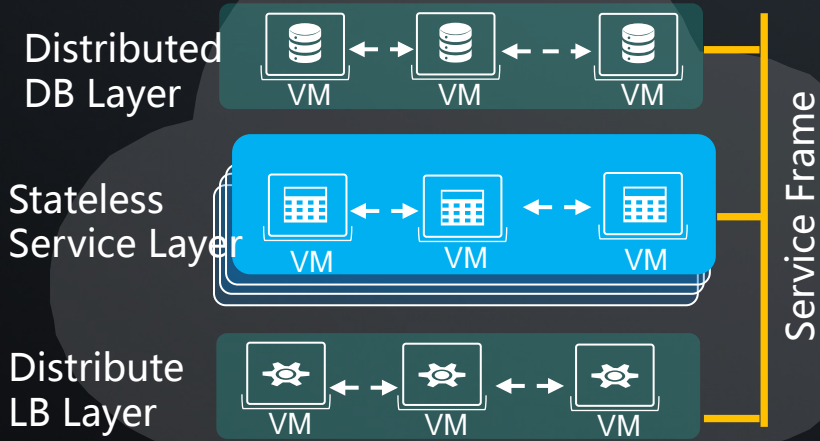
Introduce step by step in pace with business evolution, not hastily

Stateless Design : The Foundation Of Robust, Elasticity And Agility

Stateless distributed software architecture based on Cloud Native concept

Support carrier grade SLA

Distributed DB Layer

Stateless Service Layer

Distribute LB Layer

Service Frame

Infrastructure independent

99.9% Infrastructure

Re-define the VNF software architecture

NFVI independent High reliability

99. 999%

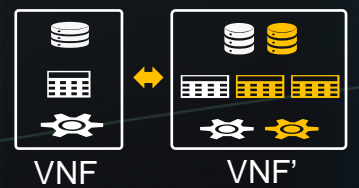**lossless , fast scaling**

VM   VM

Resource efficient

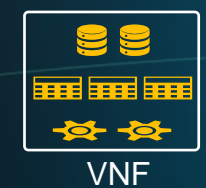**N-Way redundant : Multi-point failure tolerance**

"Design for Failure"

VM   VM   VM ... VM

VNF

Service rebalance quickly and lossless

VM   VM ... VM

Scale independently in different level

VNF   VNF'
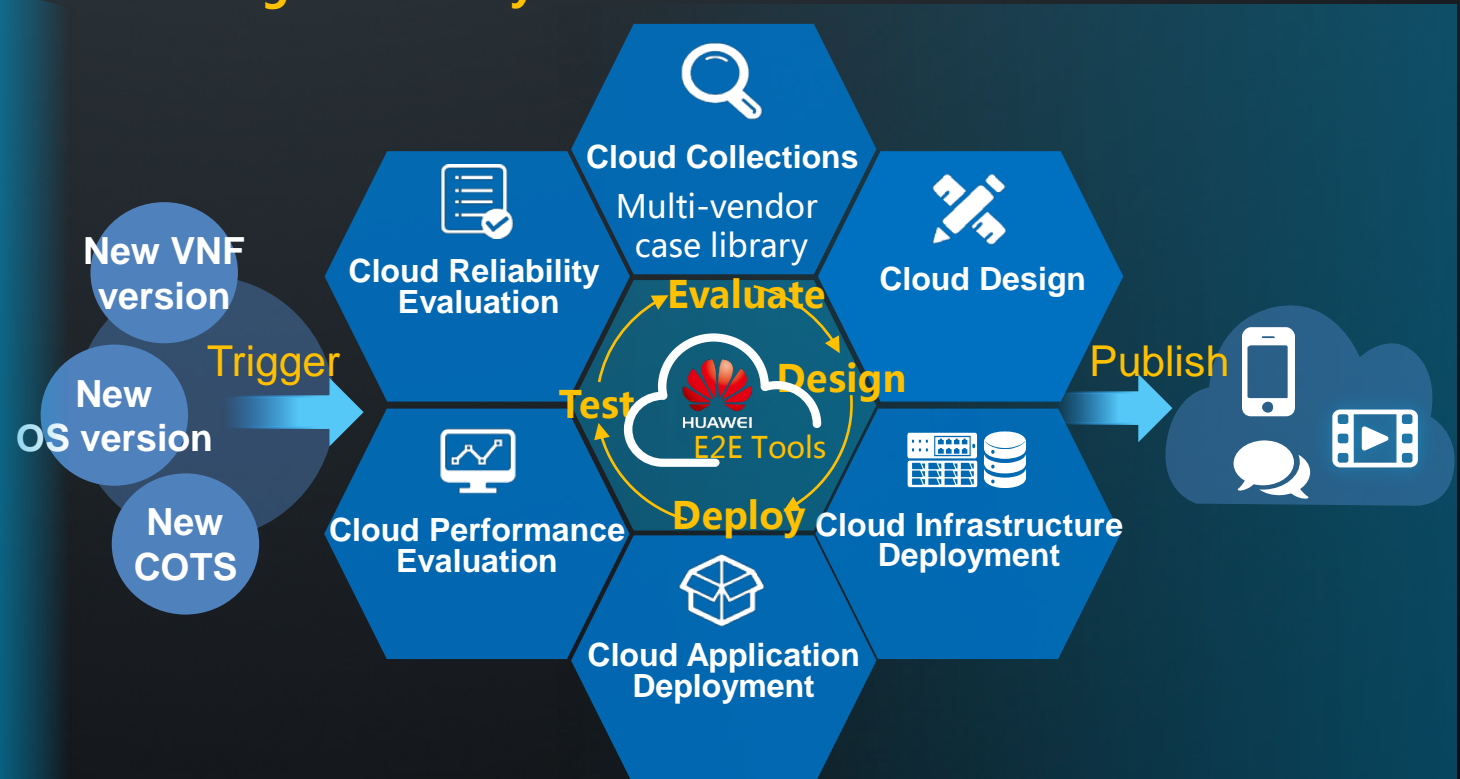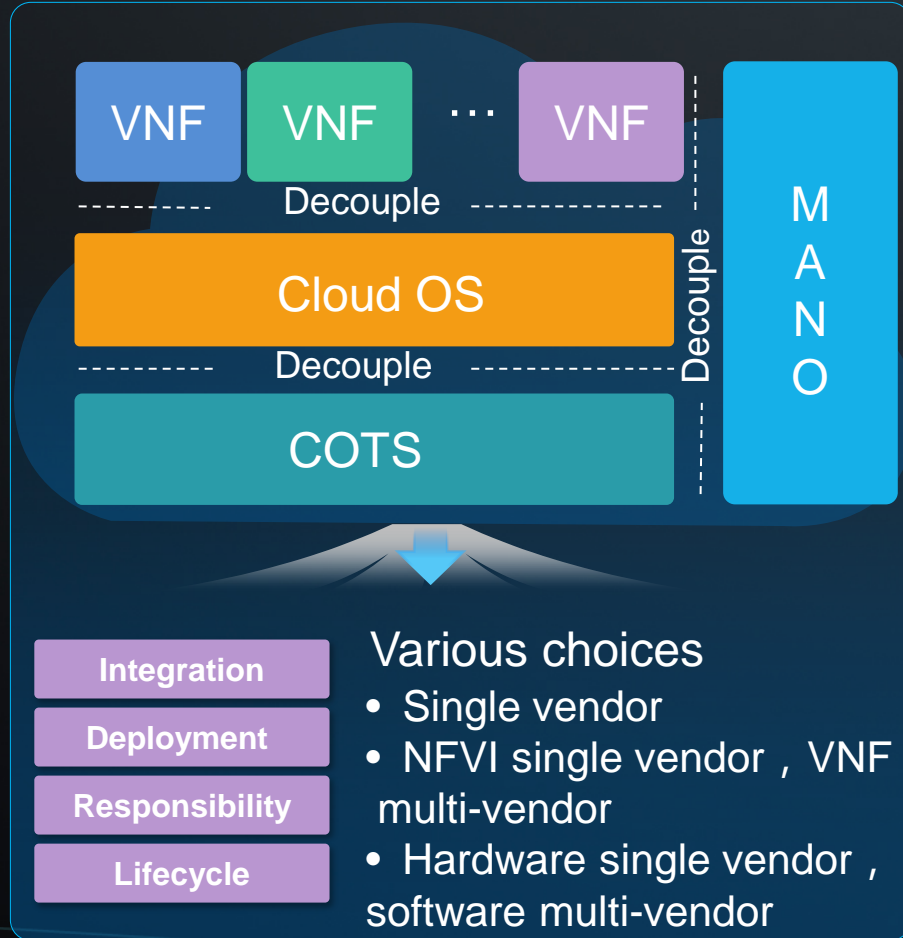
All active resource saving

VNF

CI/CD : The effective way to improve the efficiency under multi-vendor environment

NFV Target : 3 layer decoupled , Unified NFVI

CI/CD improves deployment efficiency, make the lifecycle management easy

VNF VNF ··· VNF

Decouple

Cloud OS

Decouple

COTS

MANO

Decouple

Various choices
- Single vendor
- NFVI single vendor , VNF multi-vendor
- Hardware single vendor , software multi-vendor

Integration

Deployment

Responsibility

Lifecycle

New VNF version

New OS version

New COTS

Trigger

Cloud Reliability Evaluation

Cloud Collections
Multi-vendor case library

Cloud Design

Evaluate

Design

HUAWEI E2E Tools

Test

Deploy

Cloud Performance Evaluation

Cloud Infrastructure Deployment

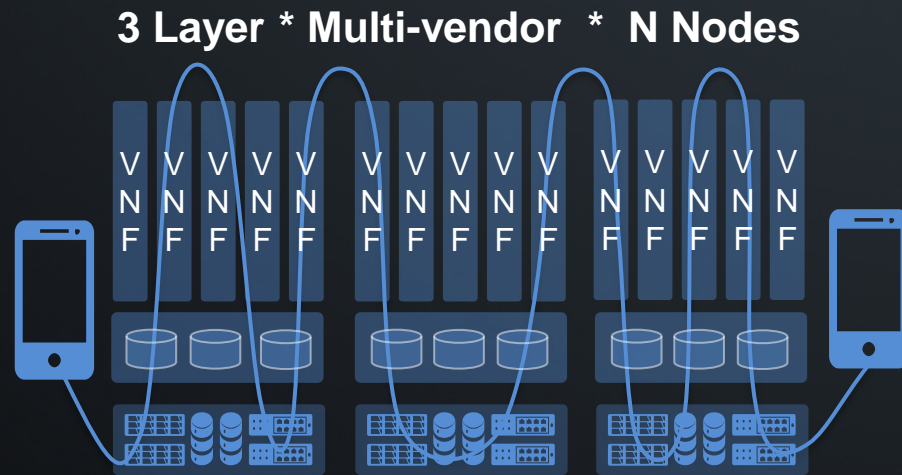Cloud Application Deployment

Publish

- **80%** automatic test
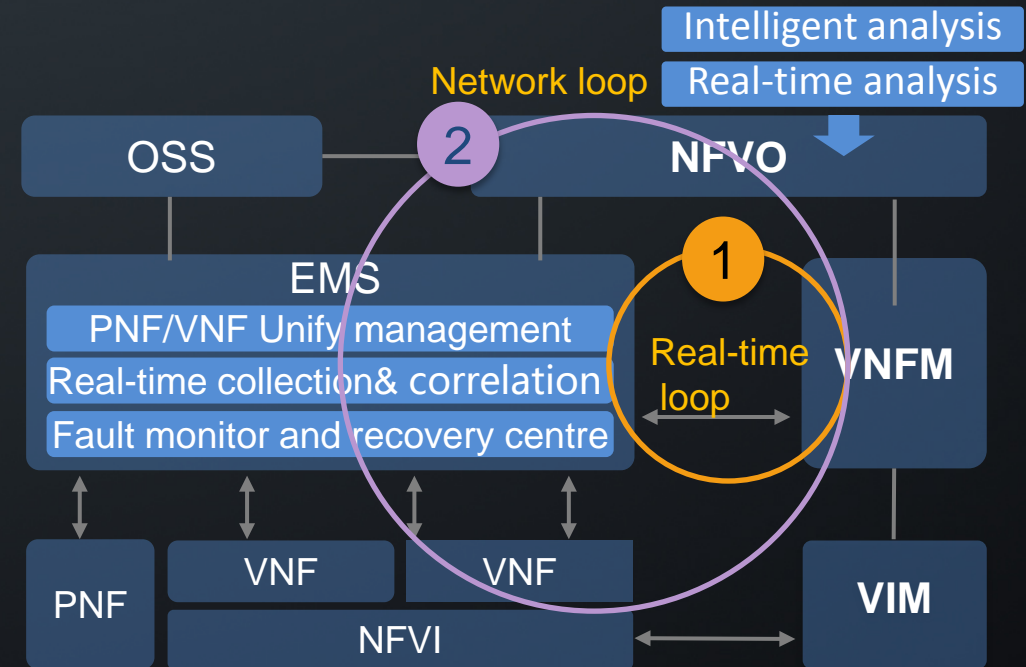- **2 hours** single VNF Regression Testing and deployment

Automatic O&M : The necessary means to deal with decoupled environment

Decouple and layered system makes OM complex

3 Layer * Multi-vendor * N Nodes

OM complexity grows exponentially along with the network scale
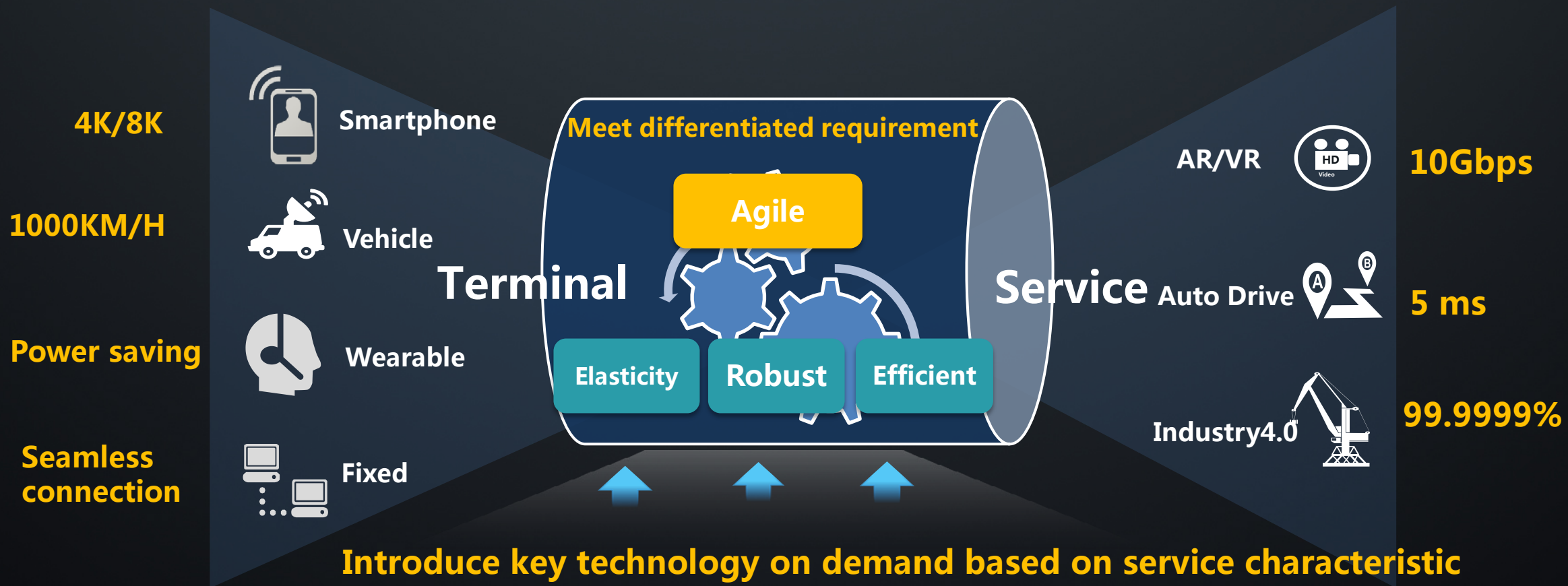

Automatic O&M System

Key capability :
- Cross layer、Cross DC、Cross service , unified management of the whole network
- Fault prediction proactively and real-time recovery
- Cross layer alarm analysis, correlation and fault locating
- Big data based orchestration and optimization
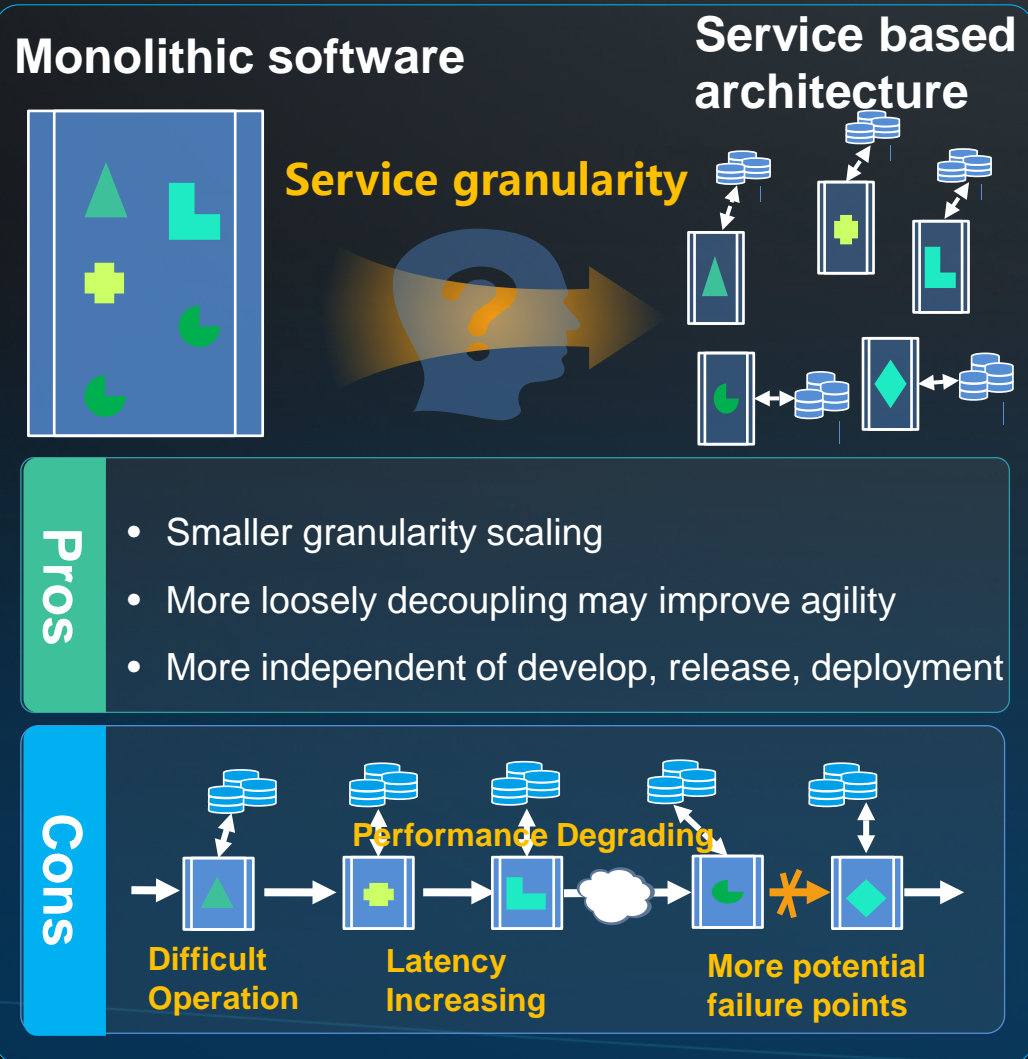
Construct agile ability future 5G service oriented

4K/8K

1000KM/H

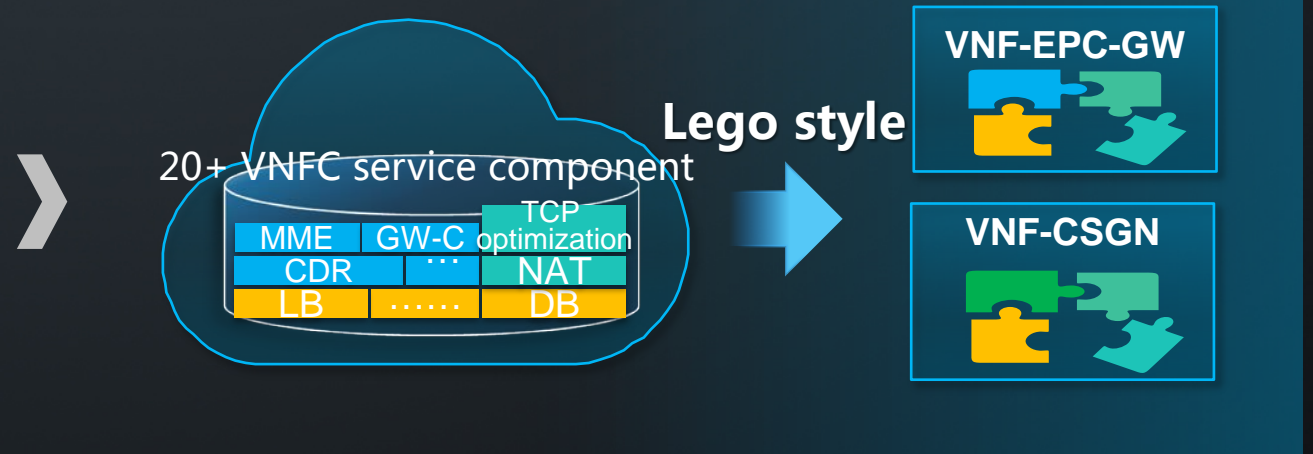**Power saving**

Seamless connection

Smartphone

Vehicle

Wearable

Fixed

Terminal

Meet differentiated requirement

Agile

Elasticity **Robust** **Efficient**

Service

AR/VR **10Gbps**

Auto Drive **5 ms**

Industry4.0 **99.9999%**

Introduce key technology on demand based on service characteristic

(Micro) Service

...

Container

docker

...

DevOps

Micro service : service architecture is key point, "Micro" must consider the service characteristic

Monolithic software

Service granularity

Service based architecture

Pros
- Smaller granularity scaling
- More loosely decoupling may improve agility
- More independent of develop, release, deployment

Cons

Performance Degrading

Difficult Operation · Latency Increasing · More potential failure points

Stateless distributed service based architecture

20+ VNFC service component

MME	GW-C	TCP optimization
CDR	...	NAT
LB	......	DB

Lego style

VNF-EPC-GW

VNF-CSGN

Further "Micro" Principle

Change Fast
- Such as IoT, enterprise, policy control, video services must be further "micro"

Basic Service
- Basic voice, data service such as EPC、IMS, must be further "micro" in pace with 5G

Mature Service
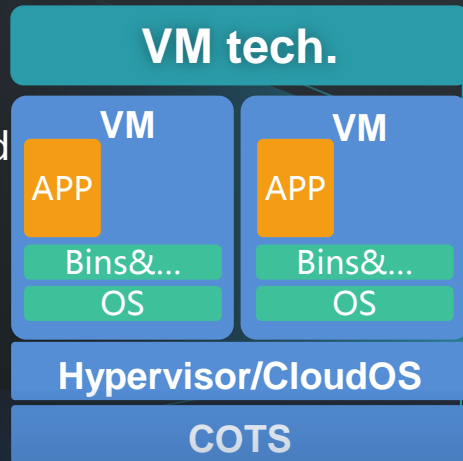- Such as 2G/3G MSS、STP, may be further "micro" if clear value is seen

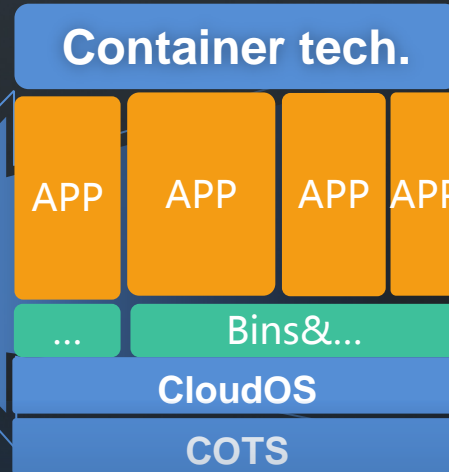# Container : may coexist with VM in different application scenario

Pros
- Maturity in commercial deployment and standard
- Strong isolation
- Better security

Cons
- Slow create and start up (in minutes)
- Big Image

VM tech.

VM	VM
APP	APP
Bins&...	Bins&...
OS	OS

Hypervisor/CloudOS

COTS

V.S

Container tech.

APP	APP	APP	APP

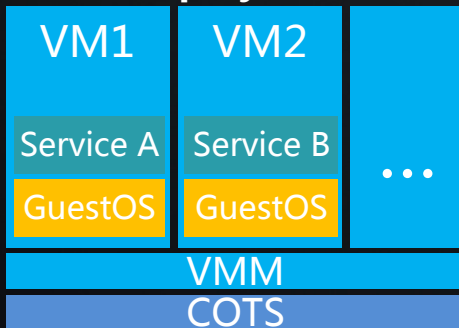| ...	Bins&...

CloudOS

COTS

Pros
- High resource efficiency
- Better performance
- Quick start up and scale (in seconds)

Cons
- Weaker isolation
- Eco system not mature comparing with VM

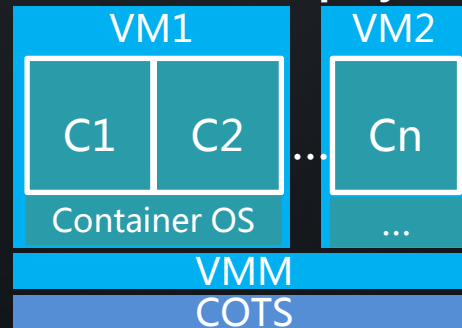## Multiple deploy mode , choose according to different scenario

VM deployment

VM1	VM2	
Service A	Service B	...
GuestOS	GuestOS	

VMM

COTS

Pros : high maturity and security
Cons : performance lower

VM+Container deployment

VM1		VM2
C1	C2	Cn
Container OS	...	...

VMM

COTS

Pros : High security, flexibility improving
Cons : performance loss

Bare metal container deployment

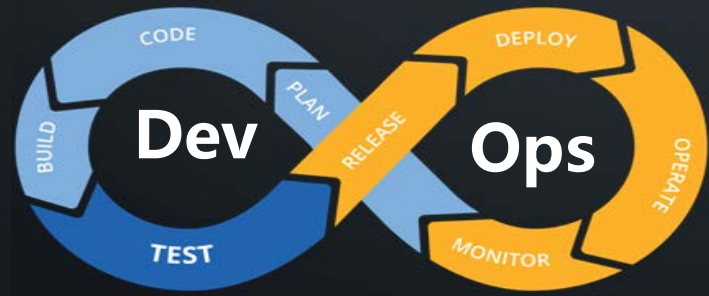| C1	C2		Cn
		...	
LB	Service 1		Service n

Container OS

COTS
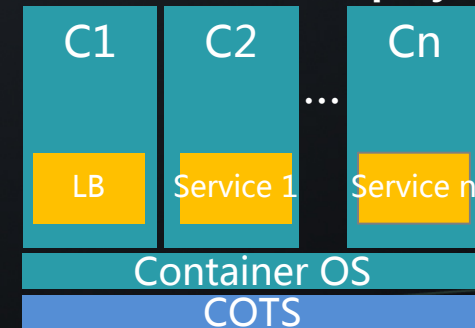
Pros : higher performance and flexibility
Cons : weaker security, better to cooperate with micro service

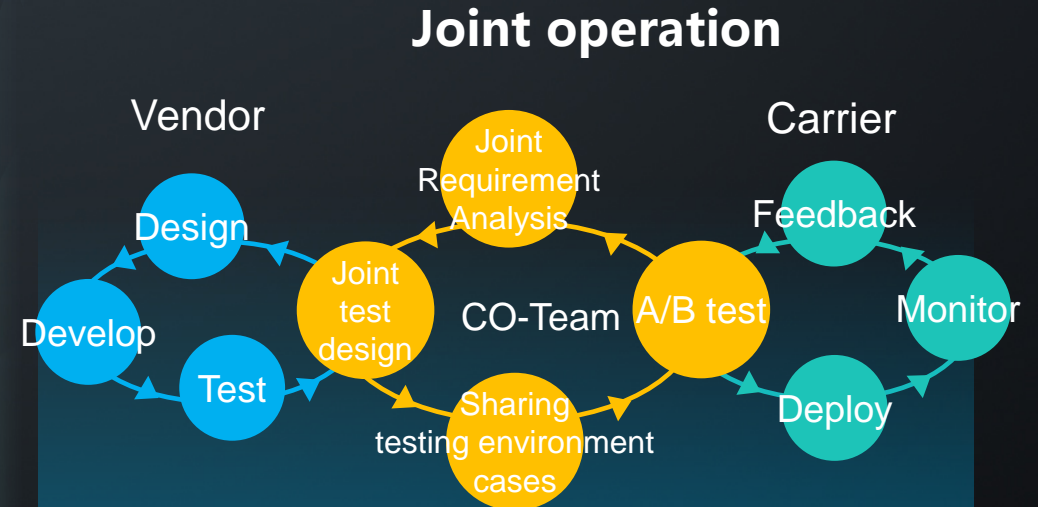# DevOps : Fully consider the difference between CT and IT

Dev / Ops

IT V.S CT

Self develop and operation	Vendor develop Carrier operation
Powerful, complete develop team	Lack experience in development
Numerous service	Basic pipeline service is main stream

Telco DevOps

Joint operation

Vendor

Design

Develop

Test

Joint Requirement Analysis

Joint test design

CO-Team

Sharing testing environment cases

A/B test

Carrier

Feedback

Monitor

Deploy

Suitable application domain

Operation   Enterprise   Vertical   …

Huawei is actively exploring and practicing 5G

2017shanghai MWC With China Mobile, present the first 5G core prototype based on micro service and container

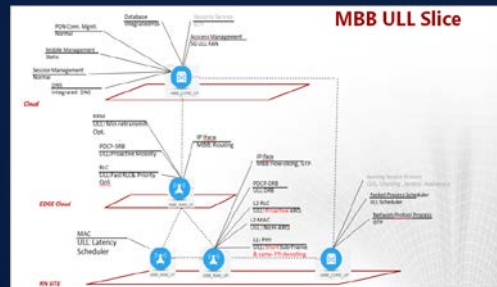**2017 MWC Present the EPC-GW based on the service architecture and container**

- Generate on demand
- Deploy on demand
- Develop on demand

2016&2017 MWC DT&Huawei present the 5G network slicing

- MBB ULL Slice
- xMBB Slice(AR)
- GLA Slice(Robot Arm)
- FMC Slice(4K Video)

Huawei NFV solution win the best technology enabler prize of GSMA

2017 IMS World Forum

2017 Globe Policy Control Conference

5G World 2017

Huawei NFV solution win

2017 MWC "best technology enabler"

Best vSBC solution

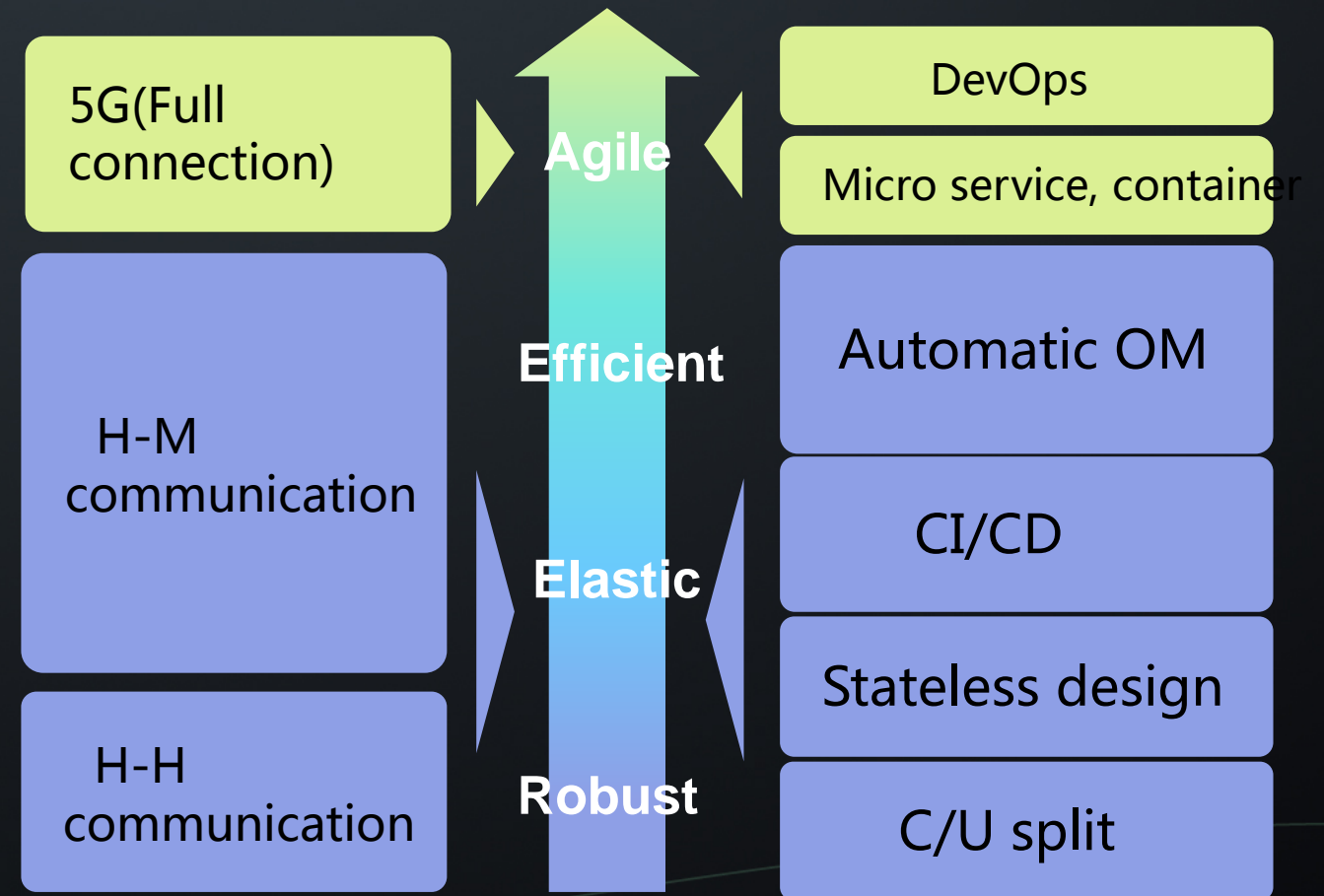**Best vPCRF operation architecture**

Best 5G Core Development

https://www.globalmobileawards.com/best-technology-enabler

Summary : Towards CloudNative, Embrace the future of the all cloud

- The rapid developing new IT technology, which Cloud native is the representative, shall be introduced into the telecom domain, with the consideration of business essential

- The introduction of new technology must fully consider the different SLA requirement, application scenario, developing and operation mode of telecom service from IT

5G(Full connection)

H-M communication

H-H communication

Agile

Efficient

Elastic

Robust

DevOps

Micro service, container

Automatic OM

CI/CD

Stateless design

C/U split

Thank You.