5G 云网融合论坛

基于 Cloud Native 的应用转型

马建伟
英特尔网络平台事业部

intel.

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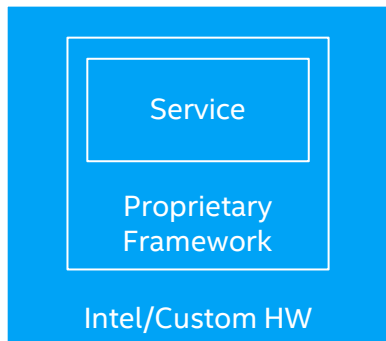
目 录

- Cloud Native 背景

- 基于 Cloud Native 的 5G 核心网架构

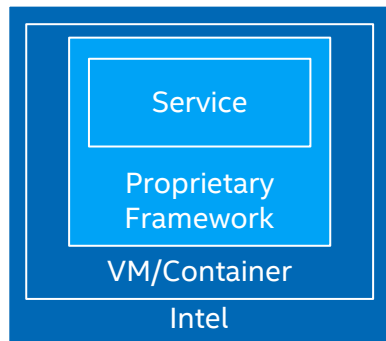- 英特尔对 Cloud Native 的社区贡献
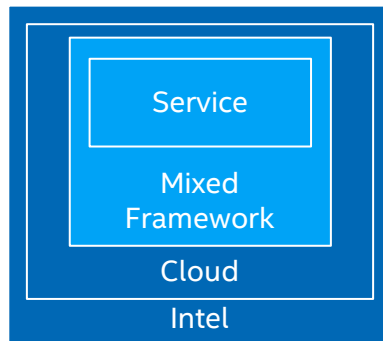
- 基于 Cloud Native 的参考设计架构

Cloud Native 演进之路

物理网元　　　　网络功能虚拟化　　　云化部署　　　　云原生设计
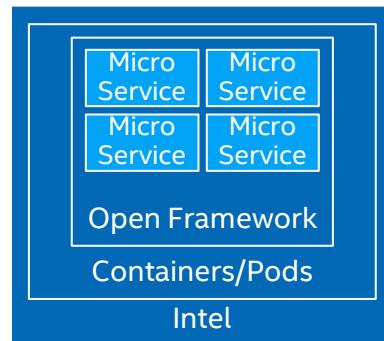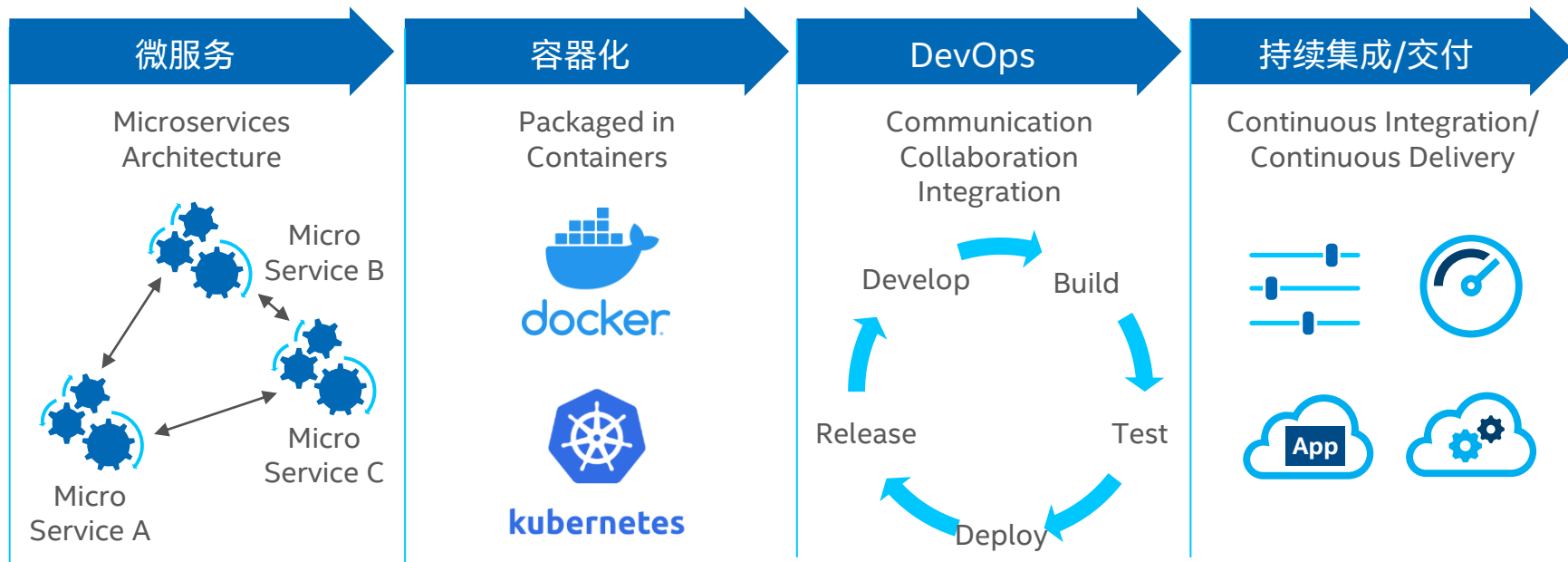

物理网元:
Service
Proprietary Framework
Intel/Custom HW

网络功能虚拟化:
Service
Proprietary Framework
VM/Container
Intel

云化部署:
Service
Mixed Framework
Cloud
Intel

云原生设计:
Micro Service Micro Service
Micro Service Micro Service
Open Framework
Containers/Pods
Intel

Cloud Native 架构和组成

微服务	容器化	DevOps	持续集成/交付

Microservices Architecture

Micro Service B

Micro Service C

Micro Service A

Packaged in Containers

docker

kubernetes

Communication Collaboration Integration

Develop → Build → Test → Deploy → Release → Develop

Continuous Integration/ Continuous Delivery

App

快速的创新，集成，部署

基于 Cloud Native 的 5G 核心网基础架构

- User equipment (UE)
- (Radio) Access Network (RAN)
- User Plane Function (UPF)
- Access and Mobility Function (AMF)
- Session Management Function (SMF)
- Policy Control Function (PCF)
- Authentication Server Function (AUSF)
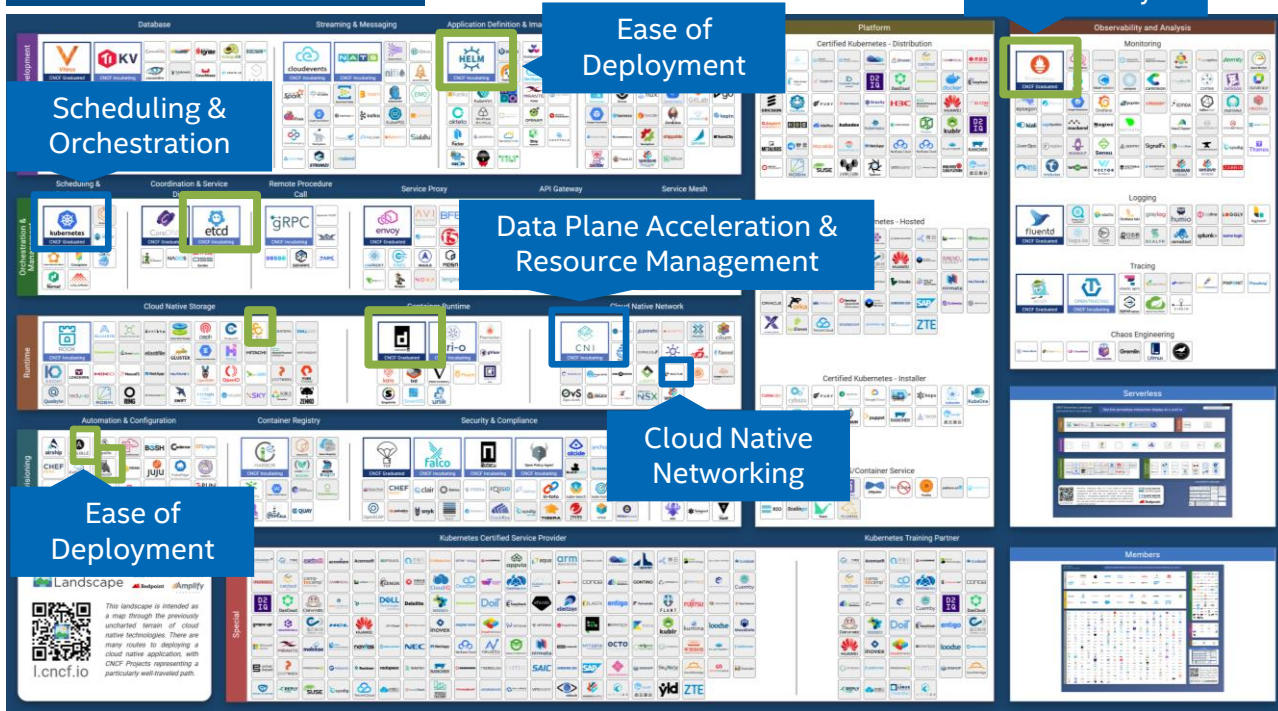- User Data Management (UDM)
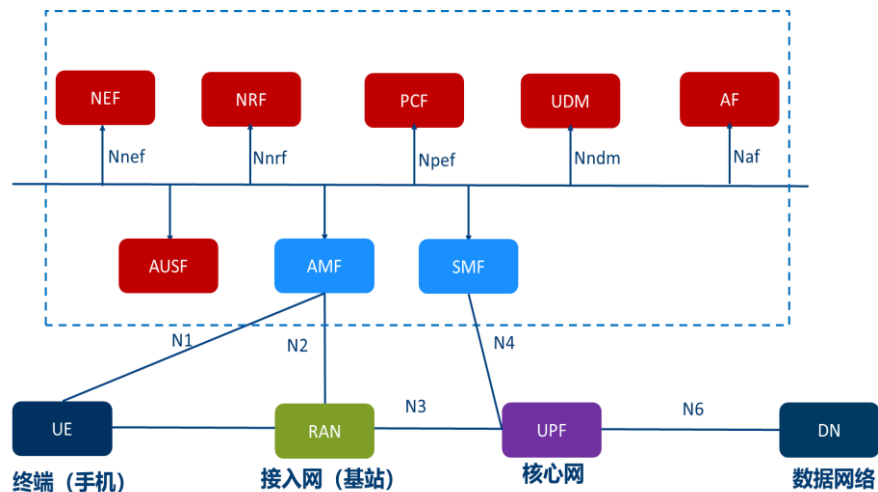
With 5G Core SA, cloud native is not nice to have but a must have !!

基于 5G 的端到端解决方案

Containers in VMs on Edge

Edge Cloud Site

1msec < E2E RTT < 10msec

Baremetal UPF (E2E RTT < 1ms)

UPF | e.g., CDN
gNB CU | MEC app

gNB RU-DU

Mobile Network

IP Backbone

Cell Site

UPF | e.g., V2X
gNB | MEC app

E2E RTT < 1msec

Internet

Service/Control Plane as cloud native microservices

Core Site A

AUSF | PCF | IMS
UDM | NEF | NRF
AMF | SMF | UPF

UPF currently as monolithic VM. Future, microservices, appropriately decomposed

Core Site B

AUSF | PCF | IMS
UDM | NEF | NRF
AMF | SMF | UPF

UPF currently as monolith. Future as microservices?

英特尔与社区的合作

Source: https://github.com/cncf/landscape
*Other names and brands may be claimed as the property of others.

Telemetry

Ease of Deployment

Scheduling & Orchestration

Data Plane Acceleration & Resource Management

Cloud Native Networking

Ease of Deployment

Projects contributing to

Tools used

Activities:

CNCF Telecom User Group

CNCF CNF Testbed

Kubernetes Special Interest Groups (SIGs) and Work Groups

WG: Resource Management

SIGs: Network, Node, Scheduling & Instrumentation

Cloud Native 在电信领域的痛点

自动化部署

应用可移植

报文处理加速

资源管理

平台安全

Cloudification

Scalable Platforms

ORCHSTRATION

OPTIMIZED CAPABILITIES

INTEL ARCHITECTURE

CPU　Memory　NIC　Accelerator

OPTIMIZED CAPABILITIES

INTEL ARCHITECTURE

CPU　Memory　NIC　Accelerator

Enabling Software

Platform Technologies

intel XEON GOLD inside™
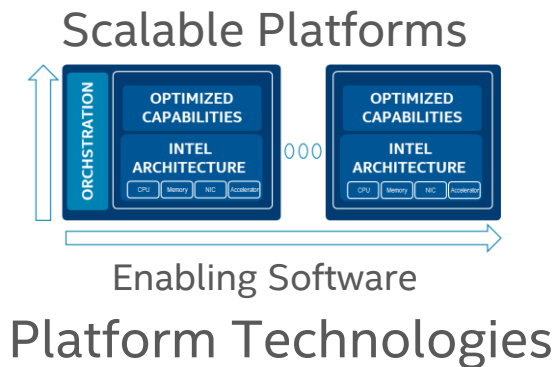
Intel® Ethernet Controller

Intel® QuickAssist Technology

intel OPTANE ≫ PERSISTENT MEMORY™

Supporting material available on Intel® Network Builders site:
Network Transformation Experience Kits: https://networkbuilders.intel.com/network-technologies/network-transformation-exp-kits
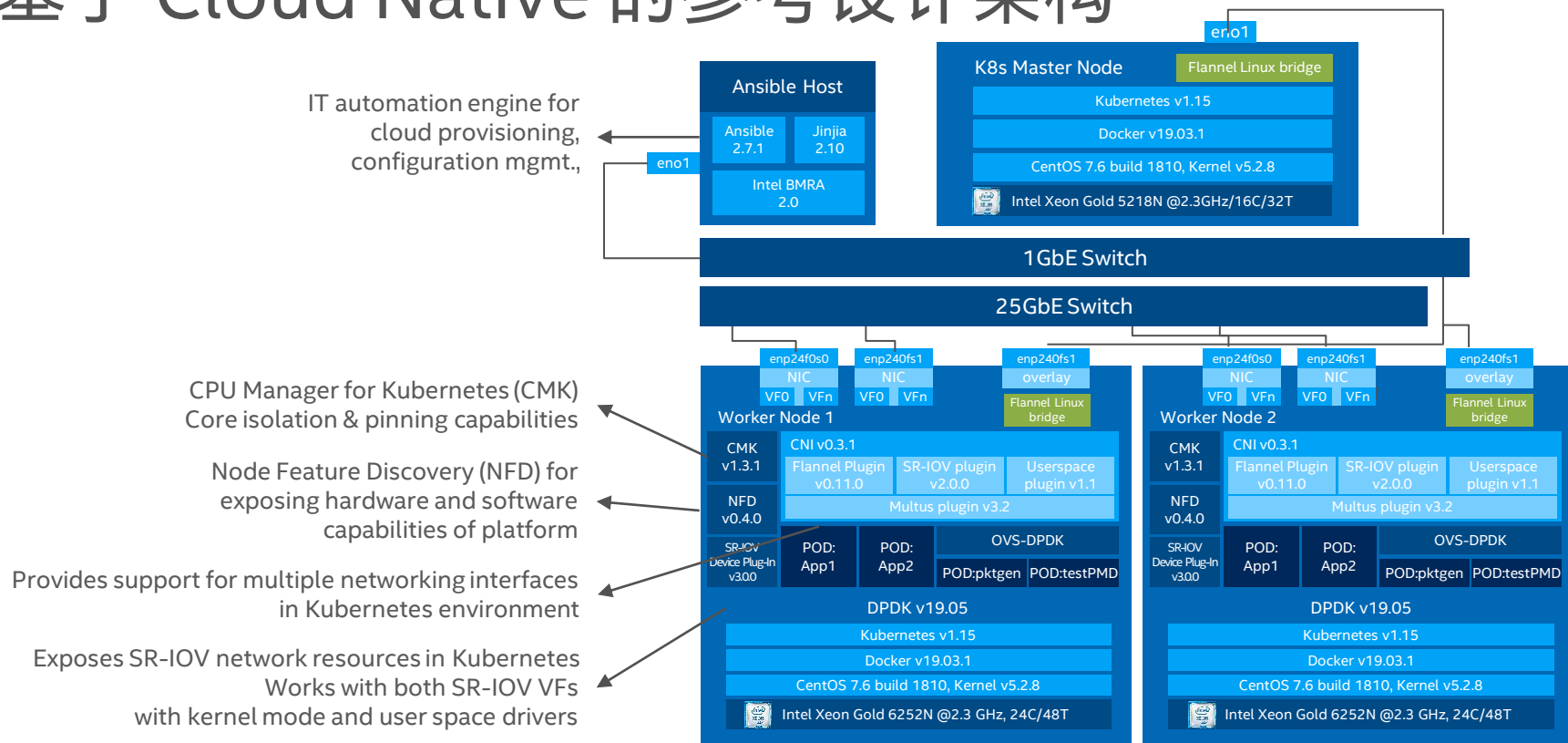Containers Experience Kits: https://networkbuilders.intel.com/network-technologies/container-experience-kits

英特尔对 Cloud Native 的增强

Industry Gaps

K8s Networking 🔒	
Packet Processing 🔒	
Resource Management (Enhanced Platform Awareness) 🔒	
Telemetry 🔒	
Ease of Deployment 🔒	

Addressed

Multiple Network for CNF	MULTUS
High Performance E-W	CNI USERSPACE CNI DPDK
High Performance N-S	CNI SR-IOV DPDK
HA Networking	CNI BOND-CNI
Platform Discovery	Node Feature Discovery (Intel AVX; SR-IOV; etc.)
CPU Pinning/Isolation	CPU Manager for Kubernetes (CMK)
Dynamic Huge Page	Native Huge Page Support for Kubernetes
Manage Devices	Device Plugin (SR-IOV, Intel QAT, GPU, user space)
Set NUMA Alignment	Topology Manager (NUMA)
Scheduling per Telemetry	Telemetry Aware Scheduler
Platform Telemetry	collectd
Deployment Playbook	HELM, ANSIBLE

Experience Kits:

https://networkbuilders.intel.com/network-technologies/container-experience-kits

基于 Cloud Native 的参考设计架构

IT automation engine for cloud provisioning, configuration mgmt.,

CPU Manager for Kubernetes (CMK) Core isolation & pinning capabilities

Node Feature Discovery (NFD) for exposing hardware and software capabilities of platform

Provides support for multiple networking interfaces in Kubernetes environment

Exposes SR-IOV network resources in Kubernetes Works with both SR-IOV VFs with kernel mode and user space drivers

https://github.com/intel/container-experience-kits/
https://builders.intel.com/docs/networkbuilders/container-bare-metal-for-2nd-generation-intel-xeon-scalable-processor.pdf