Vision to Reality Experience

Tareq Amin
Rakuten Mobile – Chief Technology Officer

Rakuten Mobile

PHASE 1

Creating the Vision together with Giants
How can we convince Global Giants for a shared vision?

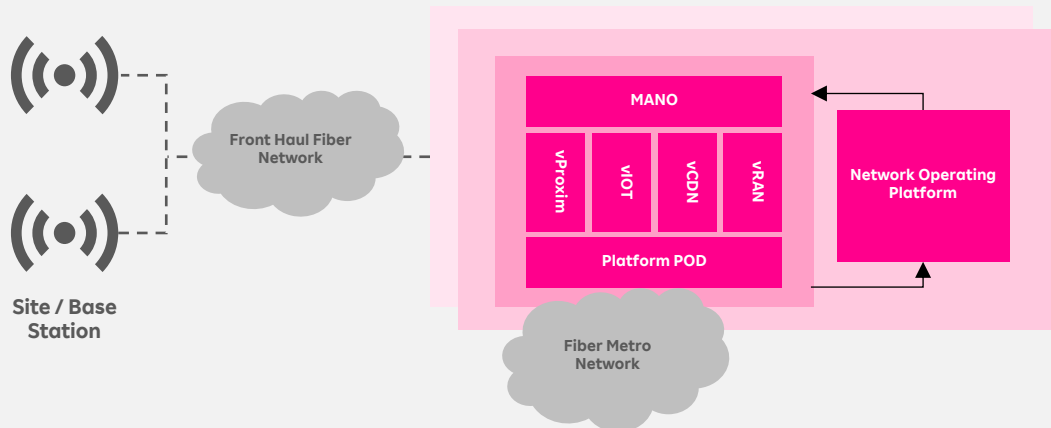# Rakuten Mobile Simplified Architecture

Four Success Factors

Virtualized, decoupled RAN architecture
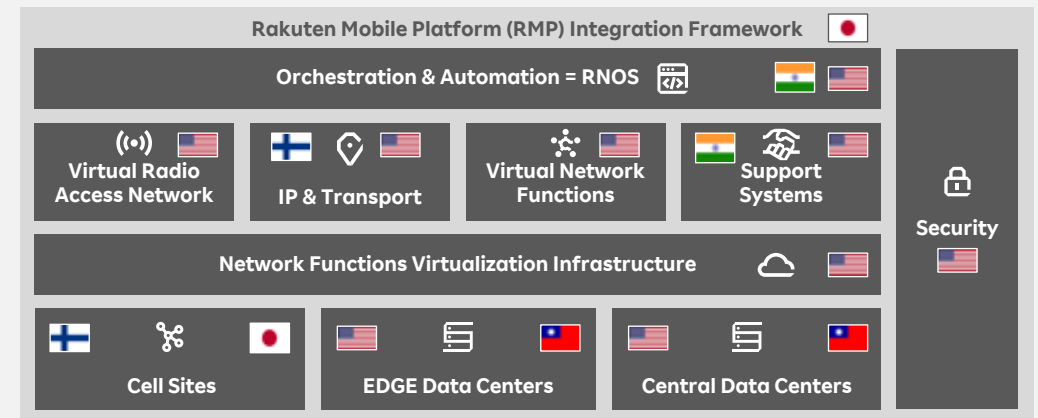
Standardized, open hardware and software frameworks

Optimal mix of edge and centralized data center resources

Pervasive automation and zero operations control

Edge Data Centers

Site / Base Station

Front Haul Fiber Network

Fiber Metro Network

MANO

vProxim | vIOT | vCDN | vRAN

Platform POD

Network Operating Platform

Rakuten Mobile Simplified Architecture

Rakuten Mobile Platform (RMP) Integration Framework

Orchestration & Automation = RNOS

Virtual Radio Access Network

IP & Transport

Virtual Network Functions

Support Systems

Network Functions Virtualization Infrastructure
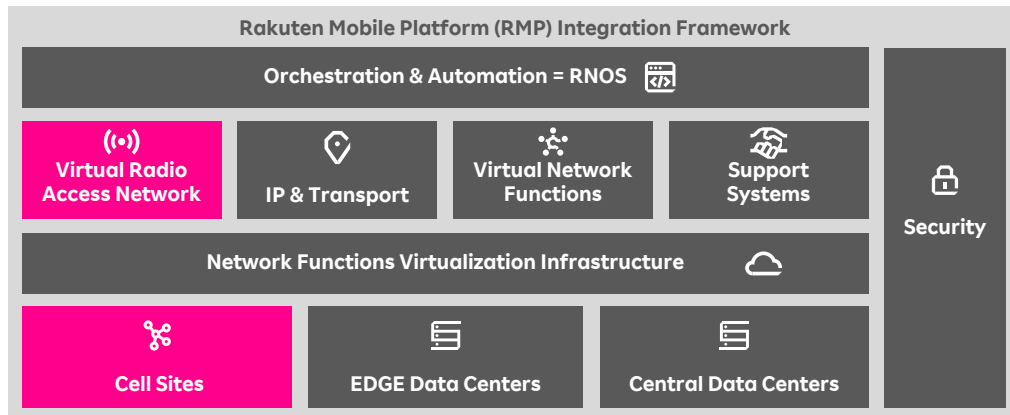
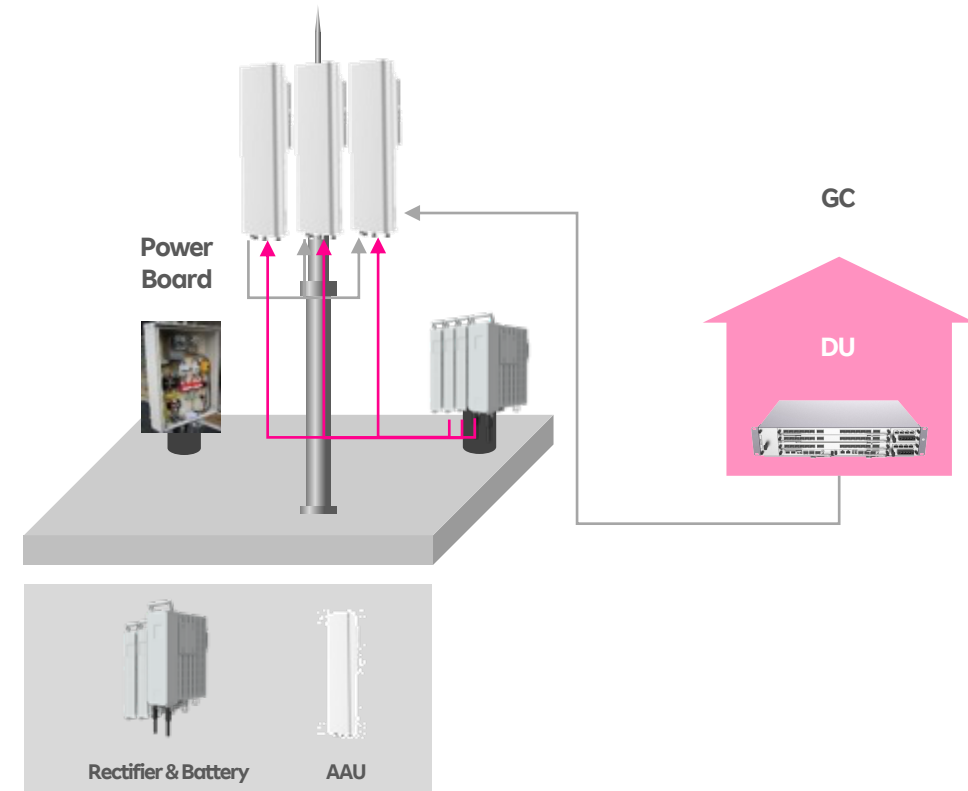Cell Sites

EDGE Data Centers

Central Data Centers

Security

Architecture

- World's First OpenRAN Deployment
- 40% Cheaper CapEx and 30% Lower OpEx
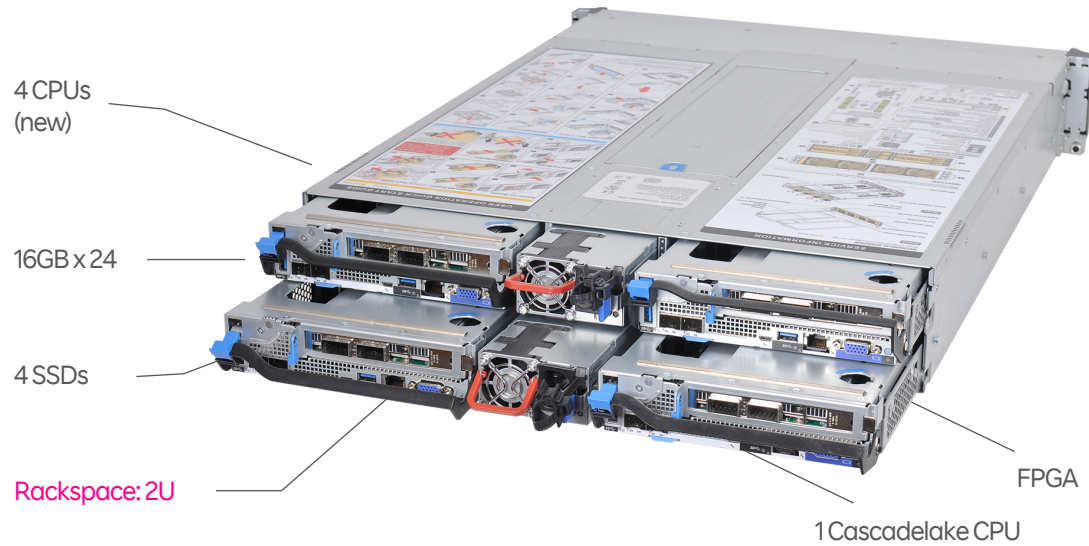- Nokia opens remote radio head interfaces to Altiostar

Rakuten Mobile Platform (RMP) Integration Framework

Orchestration & Automation = RNOS

| Virtual Radio Access Network | IP & Transport | Virtual Network Functions | Support Systems | Security |

Network Functions Virtualization Infrastructure

| Cell Sites | EDGE Data Centers | Central Data Centers |

Integrated RRH + Antenna

Rakuten Simplified Site Deployment

Power Board

GC

DU

Rectifier & Battery   AAU

16 Mobile base stations per server

4 CPUs (new)

16GB x 24

4 SSDs

Rackspace: 2U

1 Cascadelake CPU

FPGA
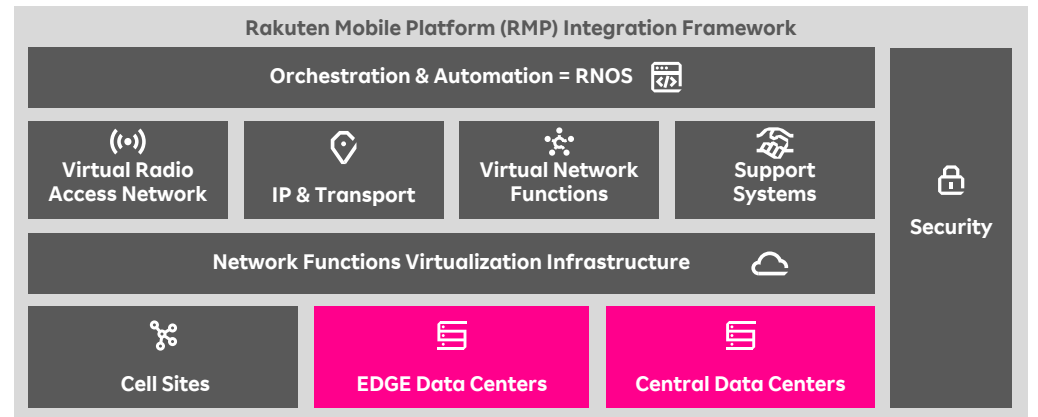
Memory: 16GB x 6
1 SSD

Cloud Native & Security

- World's First COTS Telco Deployment
- Standardized hardware from Quanta with minimal SKU
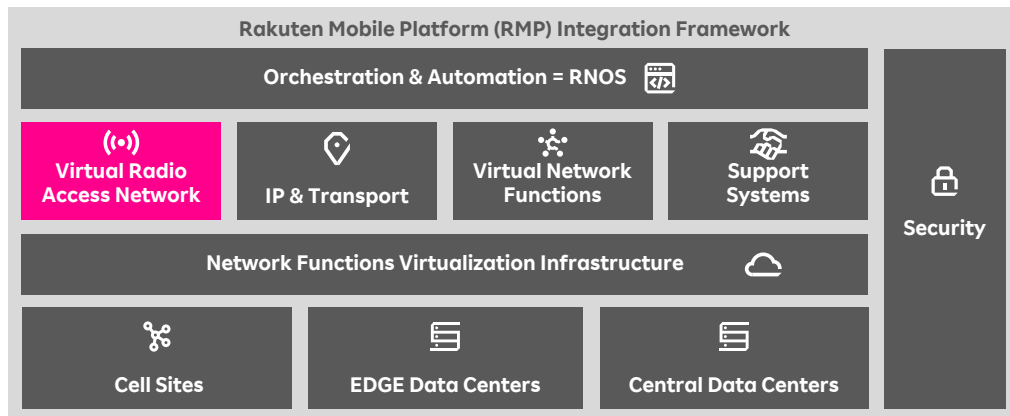- Leading edge cloud architecture from Cisco

Rakuten Mobile Platform (RMP) Integration Framework

Orchestration & Automation = RNOS

Virtual Radio Access Network	IP & Transport	Virtual Network Functions	Support Systems	Security

Network Functions Virtualization Infrastructure

Cell Sites	EDGE Data Centers	Central Data Centers

Altiostar

- Most advanced OpenRan Vendor
- Rakuten investment in Altiostar
- First Call on Network – Feb 2019

Rakuten Mobile Platform (RMP) Integration Framework

Orchestration & Automation = RNOS

Virtual Radio Access Network	IP & Transport	Virtual Network Functions	Support Systems	Security

Network Functions Virtualization Infrastructure

| Cell Sites | EDGE Data Centers | Central Data Centers | |

4G 1ST GEN
ZERO FOOTPRINT

4G 2ND GEN
INTEGRATED
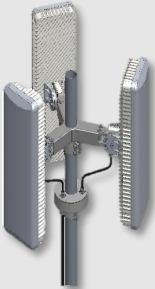
5G 28GHZ
COST EFFECTIVE

5G 3.7GHZ
JAPAN QUALITY

World's Largest HETNET ORAN deployment

Nokia	KMW	Airspan	Airspan	Airspan	Sercomm	Sercomm	Airspan & Qualcomm	NEC
Macro	Macro	Mini Macro	Small cell	Small Cell	Enterprise Small cell	Femto	mmW DRU	Sub6 RU

Rakuten Unified Managed WiFi Platform

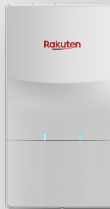## Mobile APP for Secure and Clean Internet for family
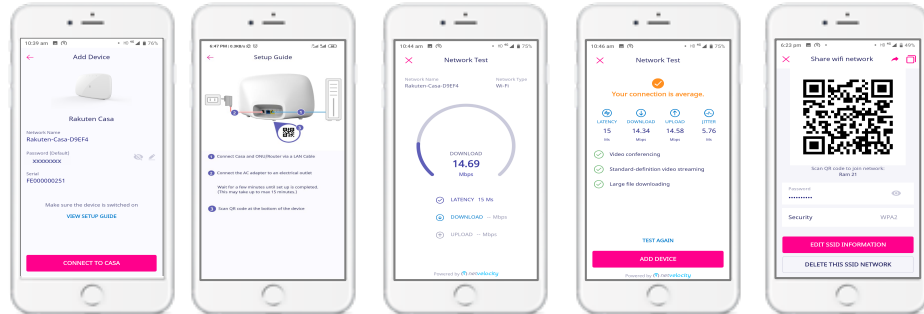
Rakuten Casa

5G CPE

Unified software stack and architecture for various usecase and hardware SKUs.

Rakuten Mobile Platform (RMP) Integration Framework

Orchestration & Automation = RNOS				
Virtual Wireless LAN Controller	IP & Transport	DPI and BI	Support Systems	Security
Network Functions Virtualization Infrastructure				
Open WiFi SW	Telemetry	Access Portal	TWAG	
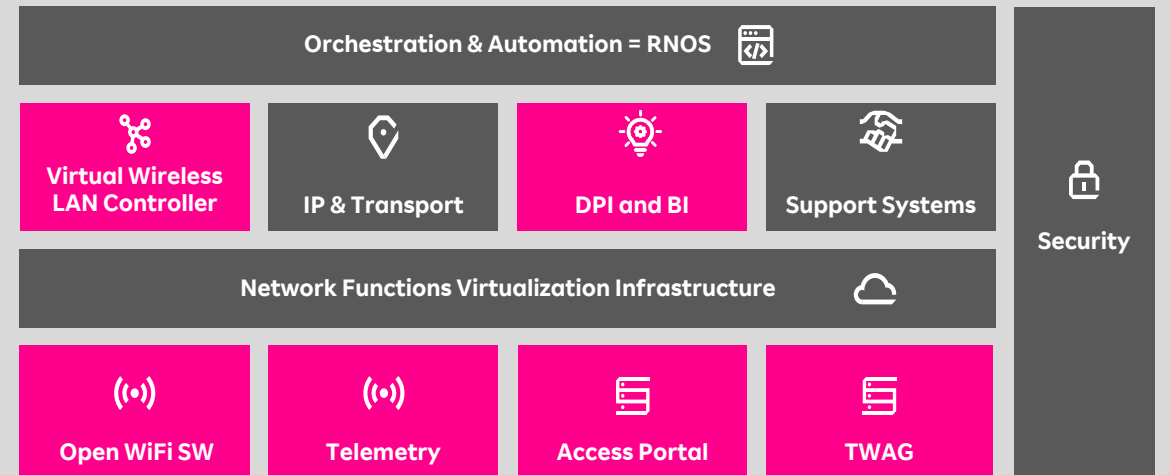
Experience

Customer at the Center of Everything

- Rakuten own IP,
- End to End solution based on RCP platform.
- Managed WiFi for LTE offload and enterprise use case
- Can be deployed over trusted or un-trustrated backhaul network

RMI RAN Intelligence

- eSON client is integrated in the vCU, provides real-time measurement information and performs Near RT (milliseconds) interference mitigation.

- Streaming cell traces from vCU providing rich datasets for non-real time optimization.

- eSON stats with Cell Trace logs, we developed many AI-Algorithms like,

  - RET

  - Interference Mitigation.

  - Optimizations on Mobility.

  - Impact analysis.

  - Outage Compensation

  - Proactive FEMTO cell prediction.

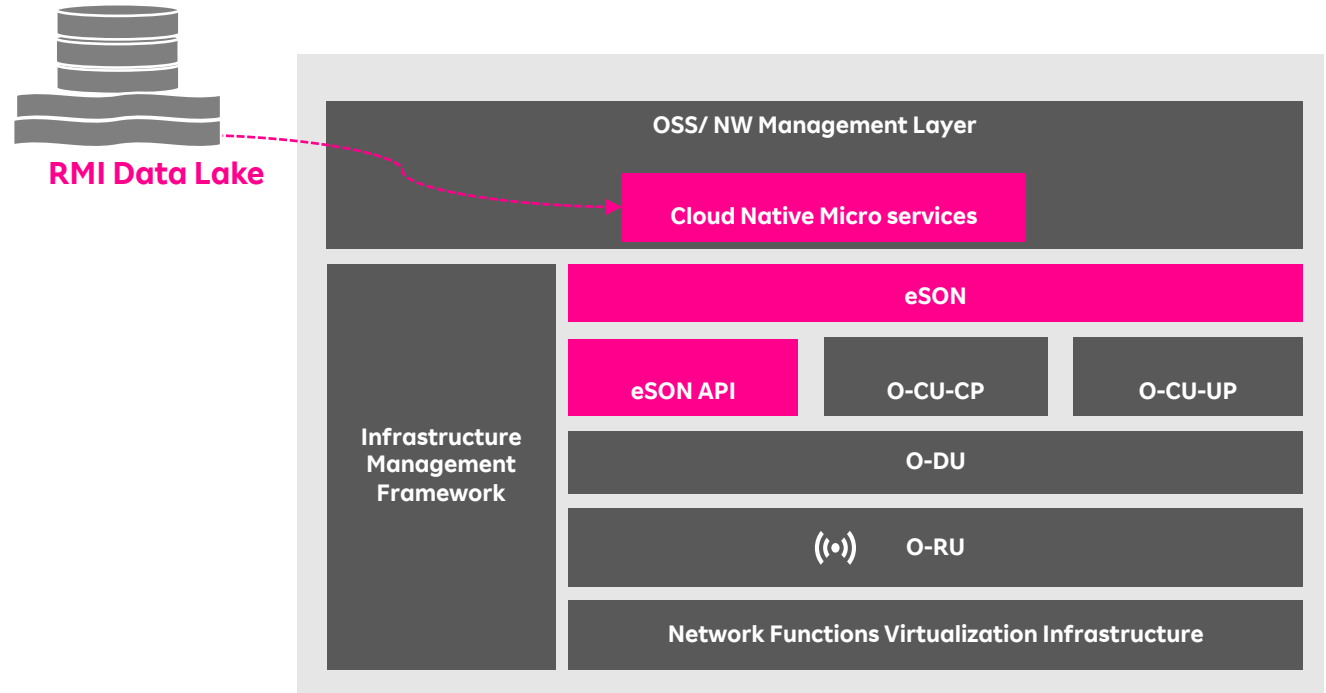 - Anomaly Detection & Prediction...

RMI Data Lake

OSS/ NW Management Layer
Cloud Native Micro services

Infrastructure Management Framework

eSON

eSON API	O-CU-CP	O-CU-UP

O-DU

((•)) O-RU

Network Functions Virtualization Infrastructure

R

PHASE 2

Scaling the Complexity for Completeness

How will we grow the solution in the relevant areas?
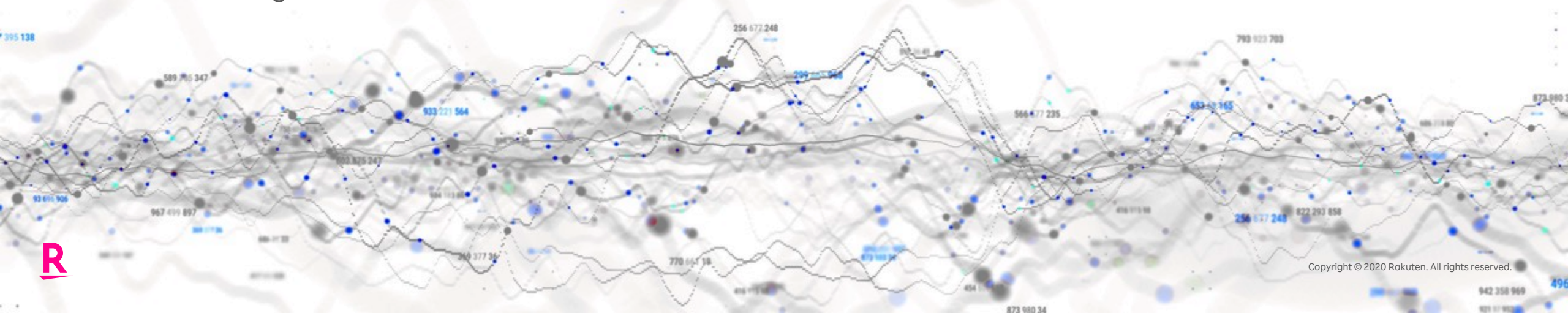
Link - Rich Communication Services

Rakuten Casa

Rakuten Mini Handset

Experience

Customer at the Center of Everything

- Rakuten designs experiences not just products, such as Link
- Simplified onboarding experience with facial recognition
- New device portfolio with Femto, handsets, IoT devices

Rakuten Mobile Platform (RMP) Integration Framework

Orchestration & Automation = RNOS			
Virtual Radio Access Network	IP & Transport	Virtual Network Functions	Support Systems
Network Functions Virtualization Infrastructure			
Cell Sites	EDGE Data Centers	Central Data Centers	

Security
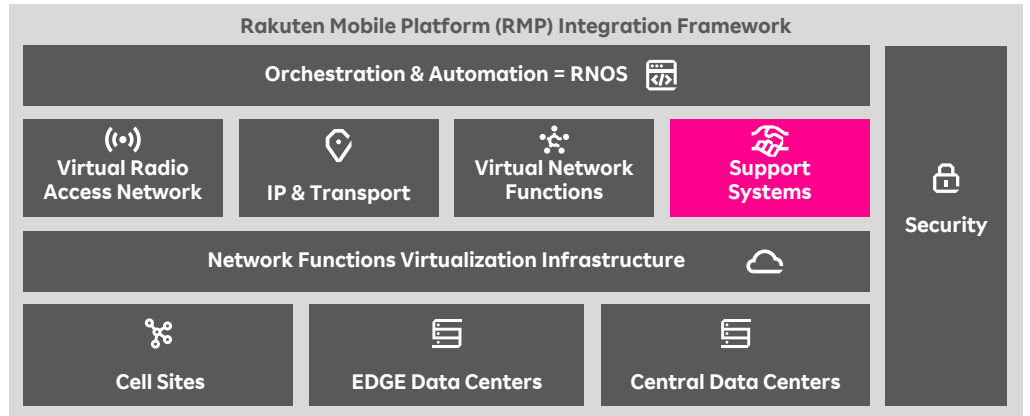
Core & IP Transport

- Fully Virtualized VNF-based Core & IP Transport
- 182 VNF's onboarded with single control architecture
- 8TB connectivity for Tokyo

Rakuten Mobile Platform (RMP) Integration Framework

Orchestration & Automation = RNOS 🖳				Security 🔒
Virtual Radio Access Network (•)	IP & Transport 📍	Virtual Network Functions ⚬	Support Systems 🤝	
Network Functions Virtualization Infrastructure ☁				
Cell Sites ⚒	EDGE Data Centers 🗐	Central Data Centers 🗐		

R

2018 ▸ **SEP 19** ▸ **2020**
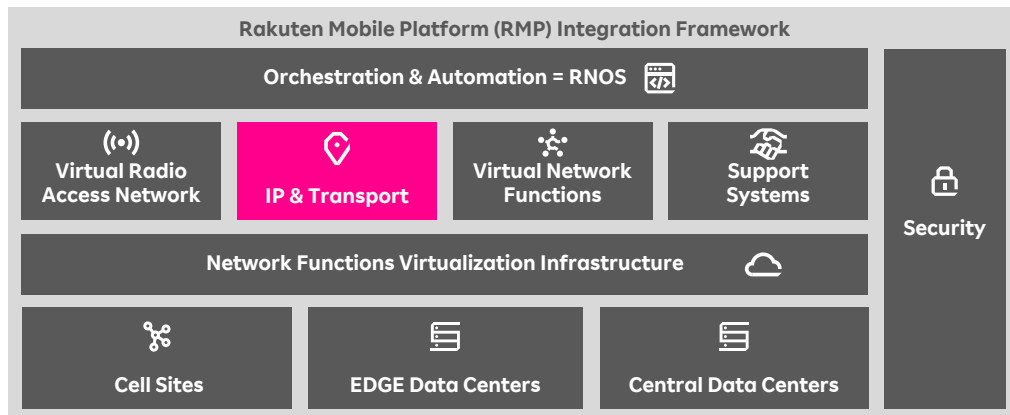
Automation

Onboarding from 10 hours to 8 minutes

Traditional Network

| Planning ~3 Hr | Pre-Configuration ~2 Hr | Config & Execution ~3 Hr | Post Execution ~2 Hr |

Rakuten Network

| Planning 0 Hr | Pre-Configuration 0 Hr | Config & Execution 8 mins | Post Execution 0 Hr |
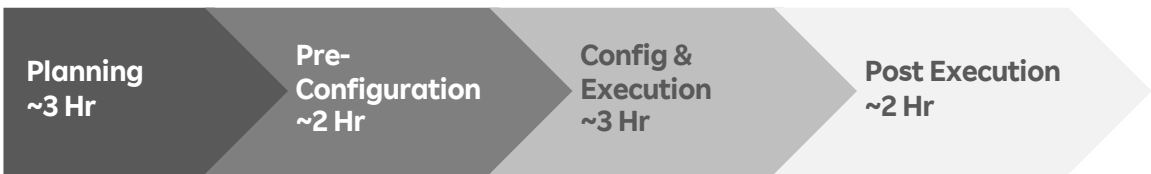
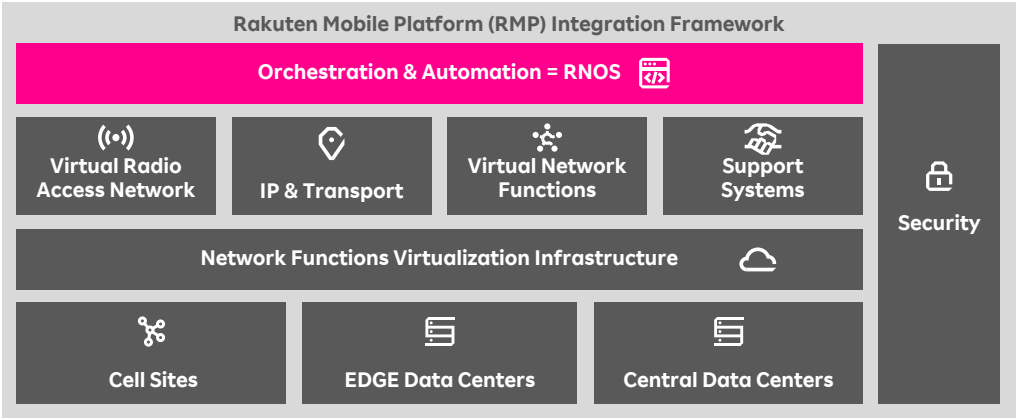- Single platform for OSS monitoring customer experience & deployment
- Embedded automation framework with Analytics & AI
- Strong partnership with InnoEye for development

Rakuten Mobile Platform (RMP) Integration Framework

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| Virtual Radio Access Network | IP & Transport | Virtual Network Functions | Support Systems | Security |

Network Functions Virtualization Infrastructure

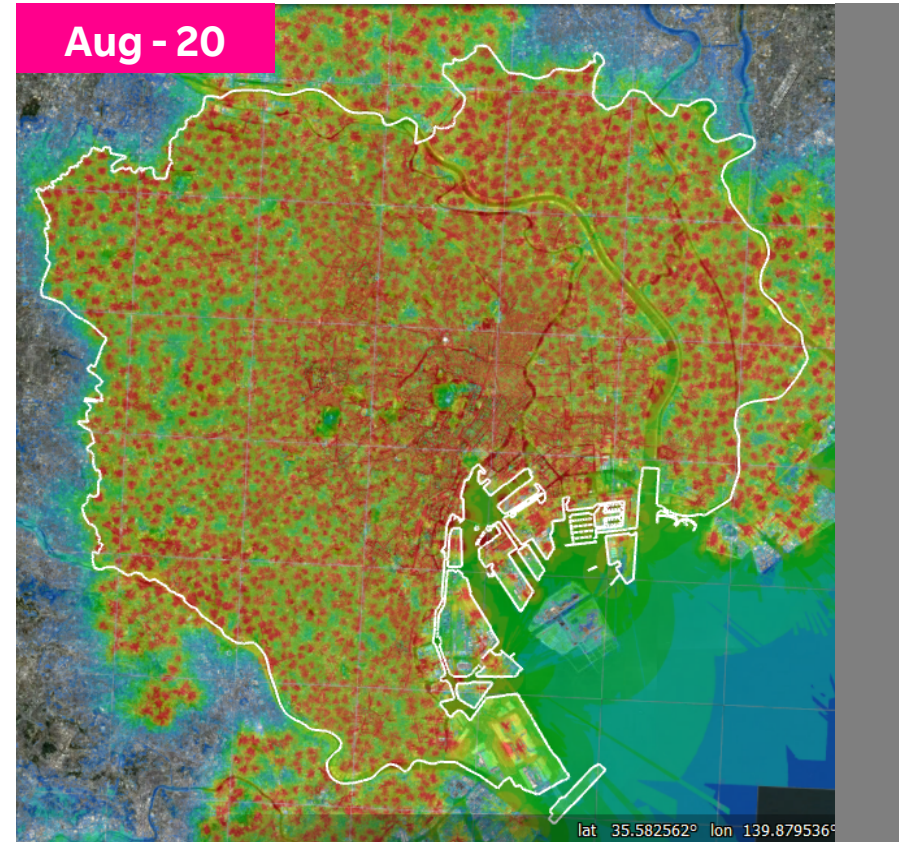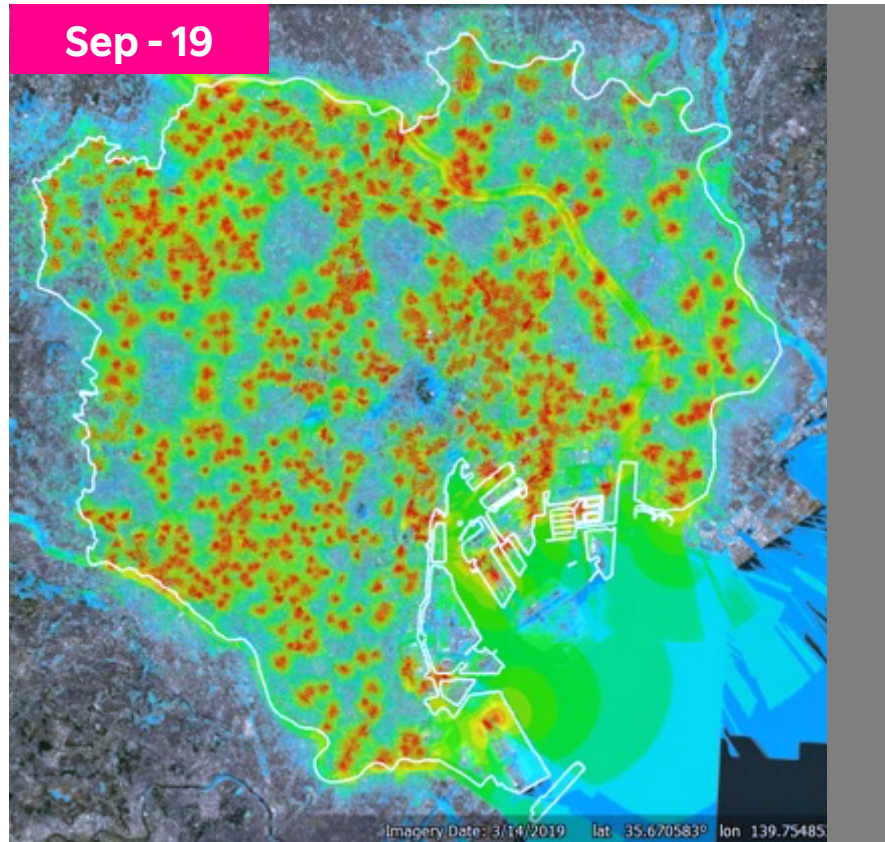| Cell Sites | EDGE Data Centers | Central Data Centers |

REALITY CHECK

What have we achieved so far?

How Real is the Current Architecture?

We are deploying the Rakuten Mobile Platform-based Architecture at Japan successfully...

Sep - 19

Aug - 20

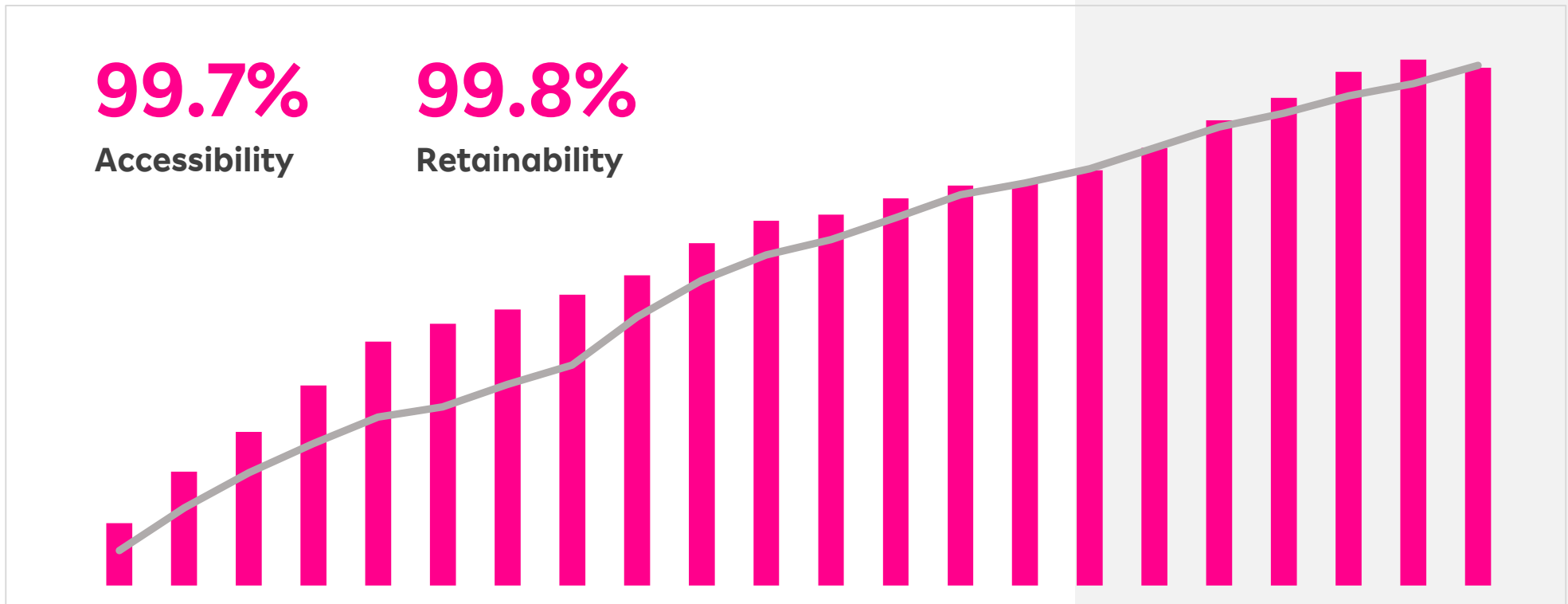**There are already 5,900 Sites on air as of Aug, 2020**

How Real is the Current Architecture?

… and so far, the NW is performing well with the increasing traffic

99.8%
Availability

99.7%
Accessibility
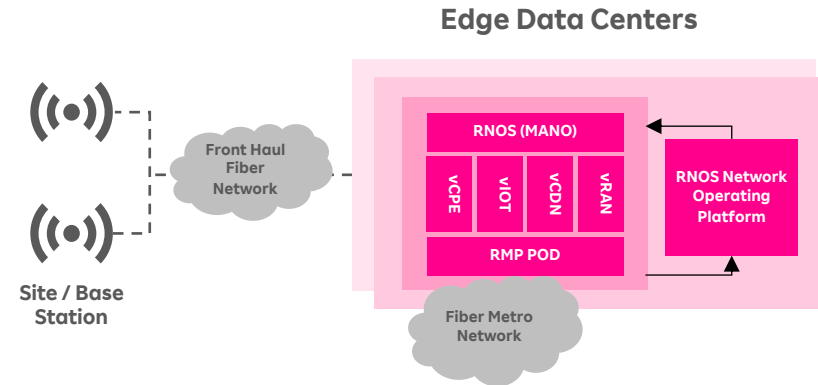
99.8%
Retainability

NB. Average Daily Active Subs & Data Volume is calculated weekly starting from Apr 8, 2020. Selected NW KPIs are average during the week of Aug 31, 2020.

R

vRAN Innovation: The Key Enabler

To achieve such a performance, Altiostar delivered several revolutionary innovations

Edge Data Centers

Radio Innovations

- Fully virtualized eNB - virtualizing the RAN on COTS HW
- Containerized vRAN micro-services based on Kubernetes Platform
- 48-sectors of Baseband processing on single 2U4N server
- End-to-end orchestration and automation of eNB as a VNF

Infrastructure Innovations

- Telemetry-based RCA and auto-diagnose for issues
- Zero-touch infrastructure automation ready for deploying real-time and extremely latency sensitive applications like vDU
- Future-proof Hardware and Software solution – Upfront architecture & design that can support 5G
- Facilitating Open interfaces and making Disaggregation of Hardware and Software a reality
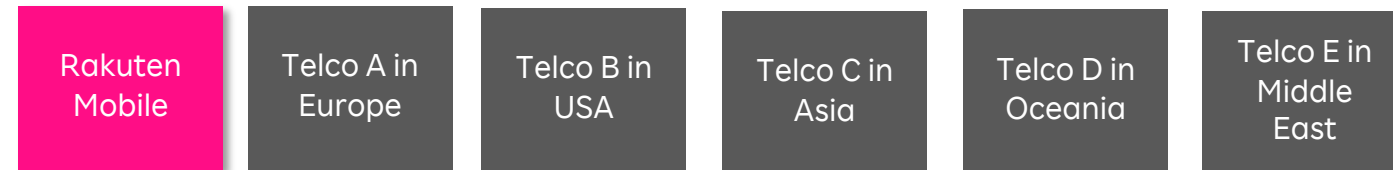
PHASE 3

Committing for Global Future

Can we change the Telco Industry for good?

Rakuten Communications Platform (RCP) is the next generation Operator Enabling Platform

RCP is the first multi-tenant Global Telco platform enabling CSPs with XaaS & Subscription model.

Rakuten Mobile	Telco A in Europe	Telco B in USA	Telco C in Asia	Telco D in Oceania	Telco E in Middle East

Rakuten Communications Platform

Marketplace
Open Innovation Powered by the Open Source ecosystem

Functions
Shared Network Platform as Commercial Model – Network Sharing

Automator
Cloud Native Operations for Telco – Intelligent Operations

Uplift
Services to integrate into existing networks

Cluster
Highest Efficiency on Infrastructure Utilization – Kubernetes

- Built for **telco** industry
- Optimized for **real-time**
- Application **Agnostic**
- Designed as & for **cloud native**
- **Open DNA**
- Global Interest and ongoing conversations with **50+ CSPs**

Designed and built upfront as Open platform to enable co-innovation

Leveraging open-source technology across the board as a critical enabler to drive innovation and openness:

✓ One API decoupling layer to expose all network services to the ecosystem / marketplace to enable B2B.

✓ Designed upfront for Slicing + xNF placement to enable multi-tenant Edge and Central computing.

Actively driving and **co-innovating on key industry** cloud native open source initiatives such as:

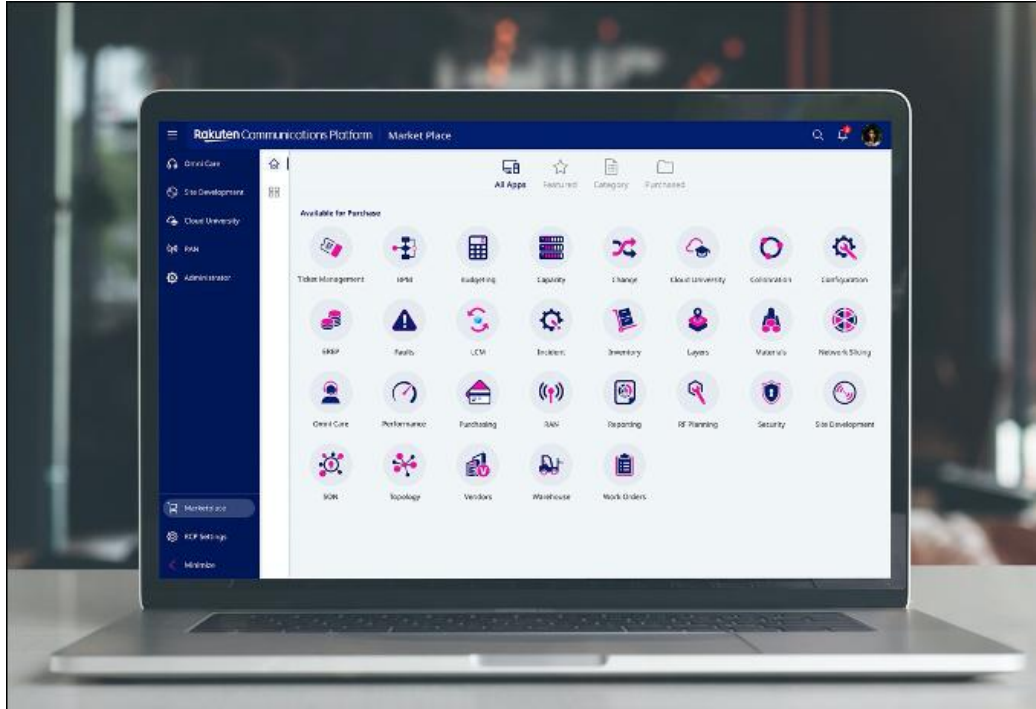✓ Open-source based "infra & platform-as-a-code" application templates on top of K8s (ecosystem leverage).

Creating a **global network of co-innovation labs** with RCP customers:

✓ HW Abstraction for all workloads leveraging K8s, Intel Containers Bare-metal Architecture (both OS) and Robin.io

TELECOM INFRA PROJECT

O-RAN ALLIANCE

CLOUD NATIVE COMPUTING FOUNDATION

3GPP A GLOBAL INITIATIVE

ROBIN

HELM

intel

kafka

yugabyteDB

Tokyo
San Mateo
Rome
Bangalore
Singapore

5G Live with RCP for Rakuten Mobile

- **10+** Applications Live for Rakuten Mobile
  - **vRAN 5G** , IOT , **5G Open Core** , Omnicare, Leap
  - 50+ Inhouse Developed OSS & Telco Functions
- **ONE**: Orchestrator, Telemetry & Cloud
- RCP Edge for **MEC & Immersive Media Services**
- Common **PaaS & Data Plane**
- Elastic & Integrated **Data Lake & AI Studio**

Thank you.

Rakuten Mobile