Rakuten Mobile and Rakuten Communications Platform New Initiatives

August 11, 2020

Rakuten

Agenda

- Rakuten Mobile – Journey of innovation
- Keeping our Promises
- Our Network is 5G Ready
- Going Global - RCP (Rakuten Communications Platform)

Rakuten Mobile Journey of Innovation

World's First
Fully Virtualized
New Generation Network

April 8, 2020
Full-Scale Launch

Rakuten Architecture is Designed around Open Networks

An open network delivers cost effective & vendor agnostic solutions

RAN

OpenRAN ARCHITECTURE

Cloud native, de-coupled, OpenRAN Architecture

HW&SW

OPEN HW & SW

Standardized, open HW and SW frameworks

MEC

COTS-BASED MEC DESIGN

Optimal mix of edge and central DCs & resources

OPERATIONS

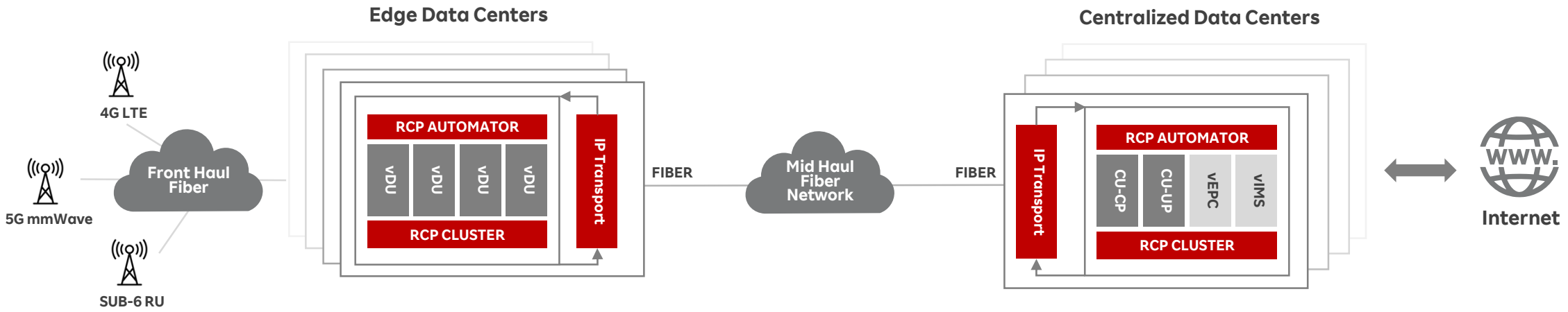
AUTOMATION & AI OPS

Pervasive automation and zero operations control

CORE

OpenCORE INNOVATION

Innovation partnership w/ NEC to create OpenCORE



Journey of Innovation since 2018

A highly stable, demand elastic and future-proof telco platform in only two years

Platform

Cloud Native Telco Platform

Highly stable. demand elastic, cloud native telco Platform

RAN

4G & 5G OpenRAN Platform

Cloud native 5G radio architecture deployed on RCP

Operations

Automation & AI-Operation

Ops efficiency with RMOPs being improved everyday

Transport

Elastic Backbone 8TB

Highest flexibility and scaling with lowest latency

Cloud

COTS based CDC, RDC & GCs

COTS based MEC Infrastructure deployed

Services

RCS Rakuten Link App

Single app for all communication needs deployed

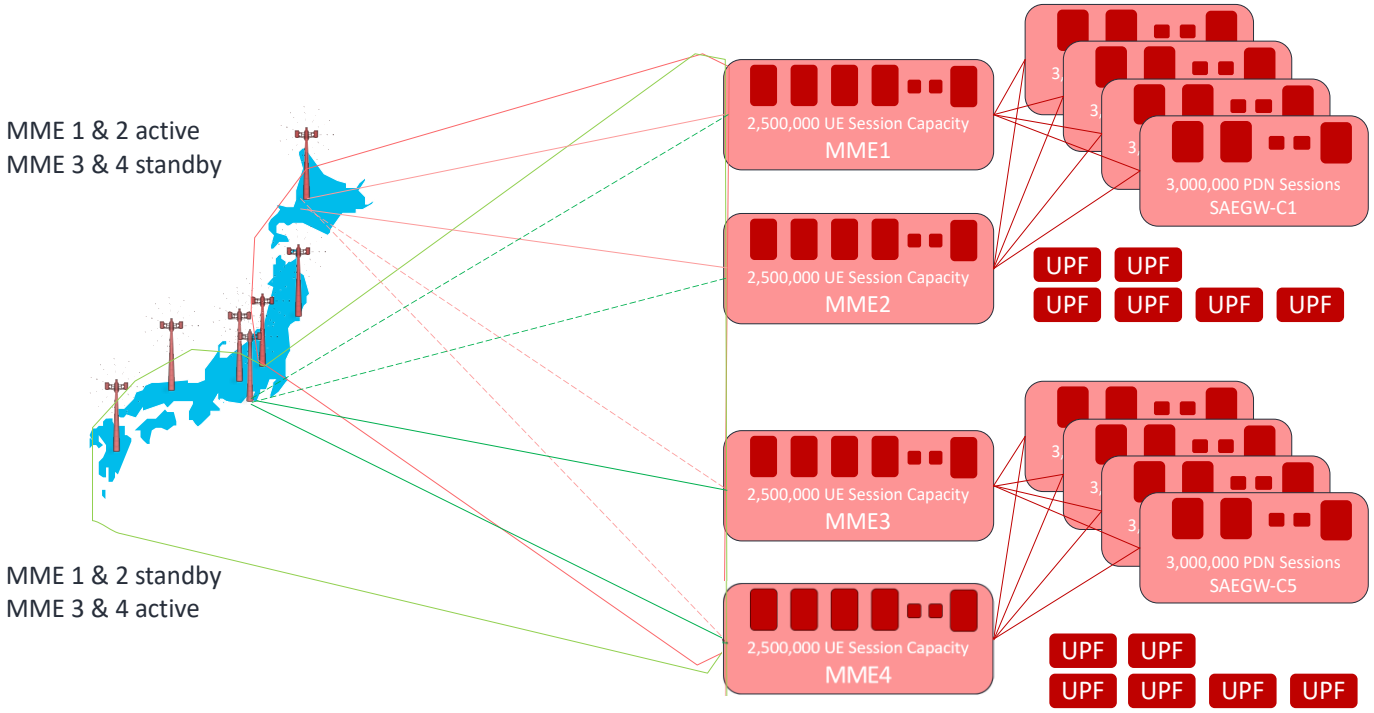
Three Layers of Redundancy Enables a Highly Stable Network

Seamless, reliable connectivity through virtual machines

System level Redundancy

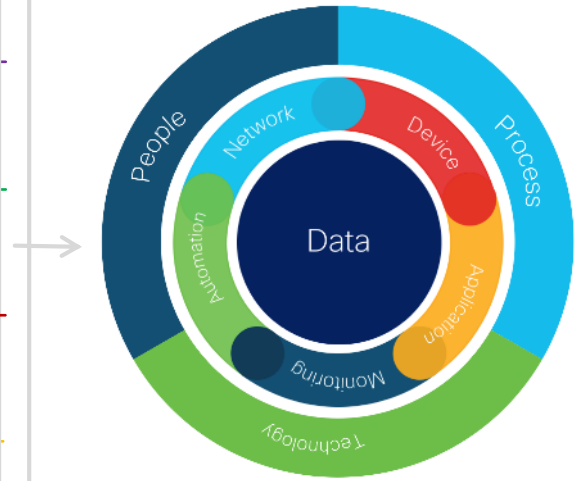
Node level Redundancy

Geographic Redundancy



Security at the Core of Our Cloud Native Network

1. Strong Identity using Certificates
2. Validated Secure Configuration
3. Segmentation of Network Services
4. Visibility of Network Activities
5. Limited Access to Network Elements
6. Many Security Perimeters



- Fronthaul
- MEC (GC)
- Backhaul
- DC (CDC)
- CNFs
- Manage
- Automation

Keeping Our Promises and Going Beyond

Network Able to Serve Demand of Data Hungry Customers

Data Volume / Sub

0.5GB/Day

2X more compared to other operators

Video Performance

2 Million Videos / Day

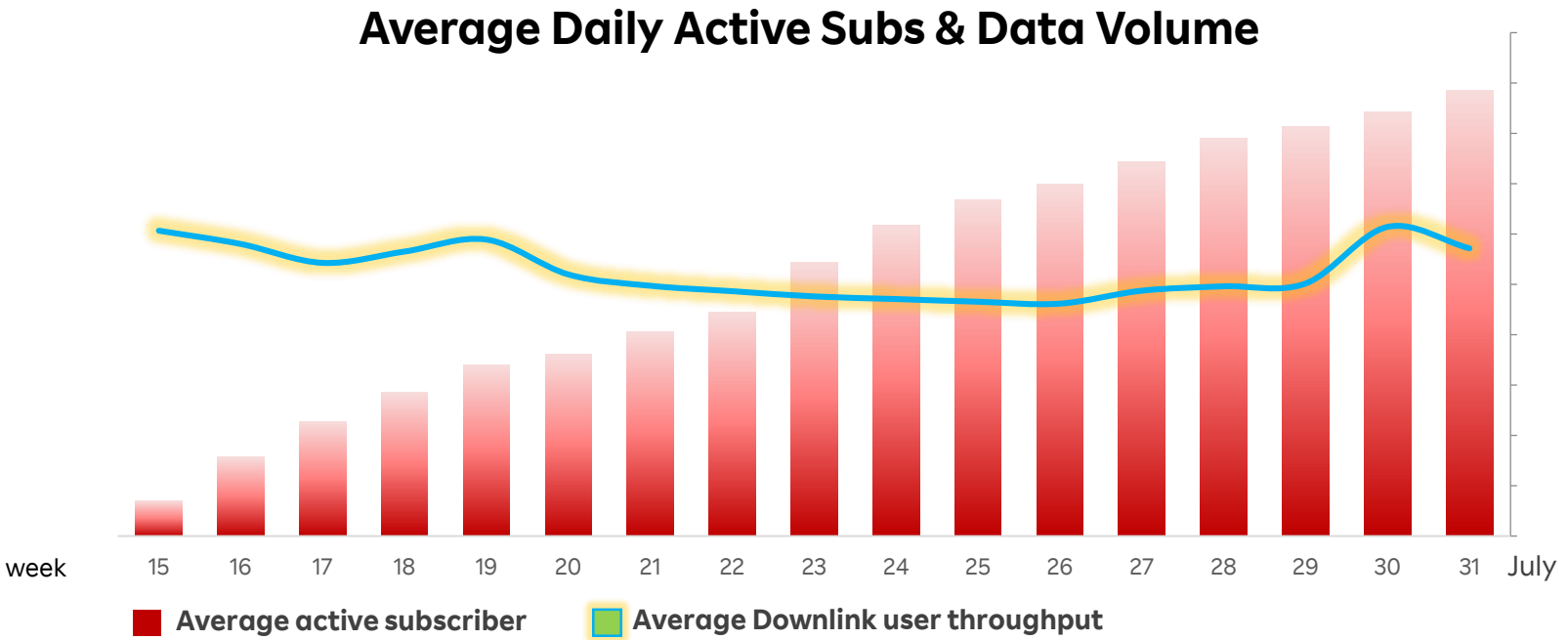
50% of traffic is video and streaming

RCS Calls Ratio

70%

2.5X more RCS calls than VoLTE

Elastic Cloud Network Architecture Delivers Stable Performance with Increasing Traffic



99.7%
AVAILABILITY

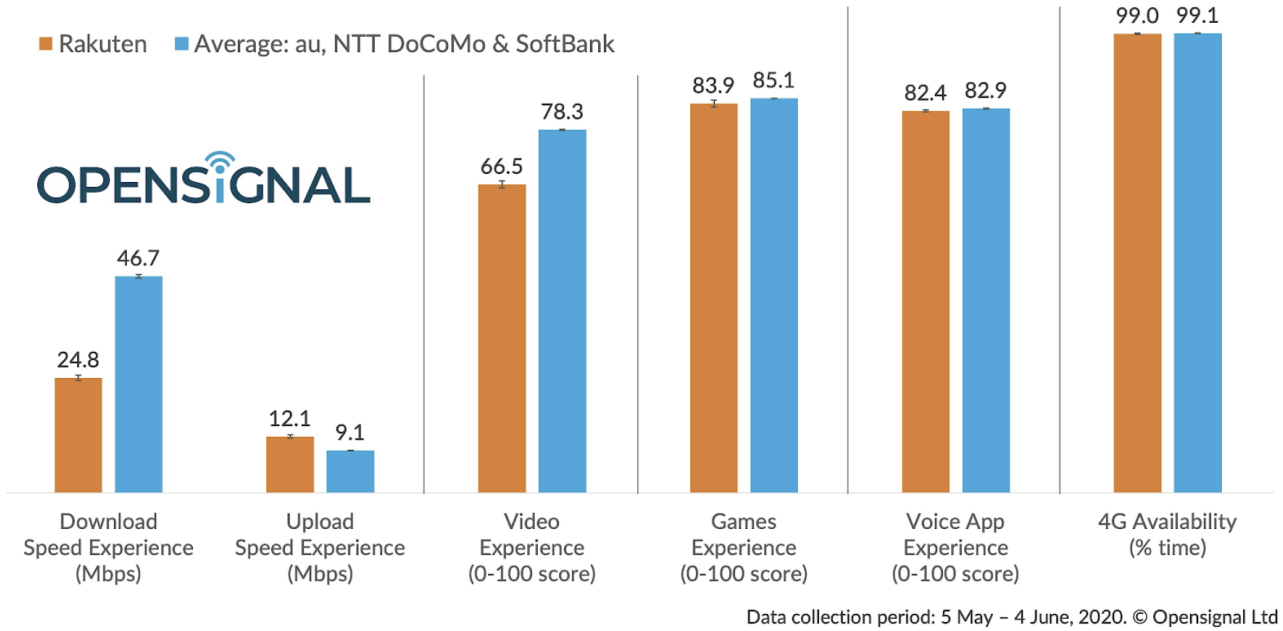
99.7%
ACCESSIBILITY

99.8%
RETAINABILITY

*Availability, accessibility, and retainability are a day value measured on 26 July, 2020

Opensignal Reports: “Rakuten’s Mobile Experience is All Set to Challenge Japan and the World”

Customer experience almost on par with established networks



Data collection period: 5 May – 4 June, 2020. © Opensignal Ltd

“…when Rakuten users are using Rakuten’s network the Download Speed Experience is much closer to users’ experience on the established networks. ”

World First E2E Virtualized Network

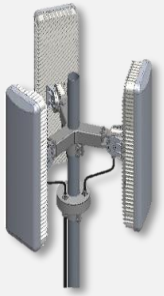
Embrace OpenRAN Base Station

Meets & Beats Customer Experience KPIs Globally

*Source : Opensignal, June 2020, “Why Rakuten’s mobile experience is set to challenge Japan and the world”

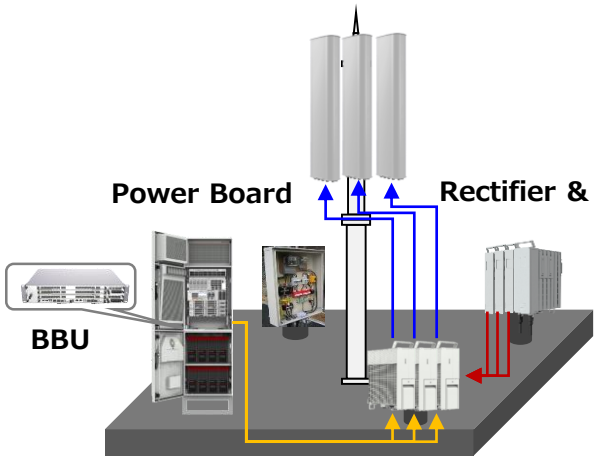
World’s Largest HETNET Open RAN Deployment

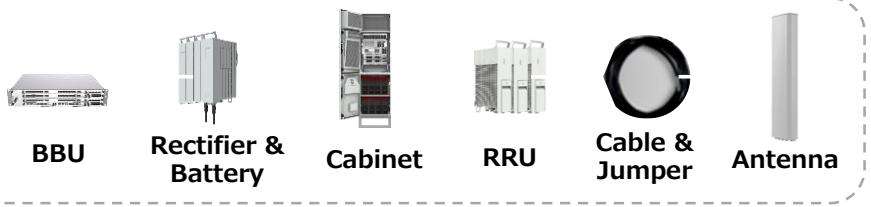
A diverse range of cell types enhances coverage experience

FI	KR	USA	USA	USA	TW	TW
						
Macro	Macro	Mini Macro	Small cell	Small Cell	Enterprise Small cell	Femto

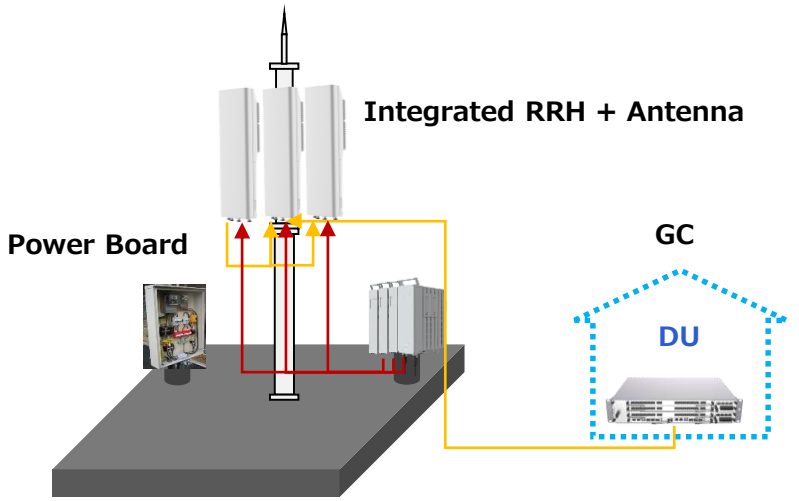
Simplified Site Deployment Reducing Cost and Build Out Time

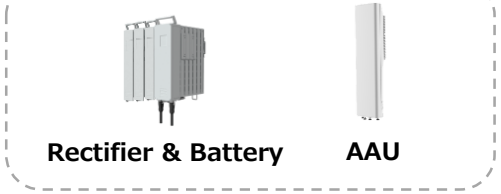
Traditional Site Deployment

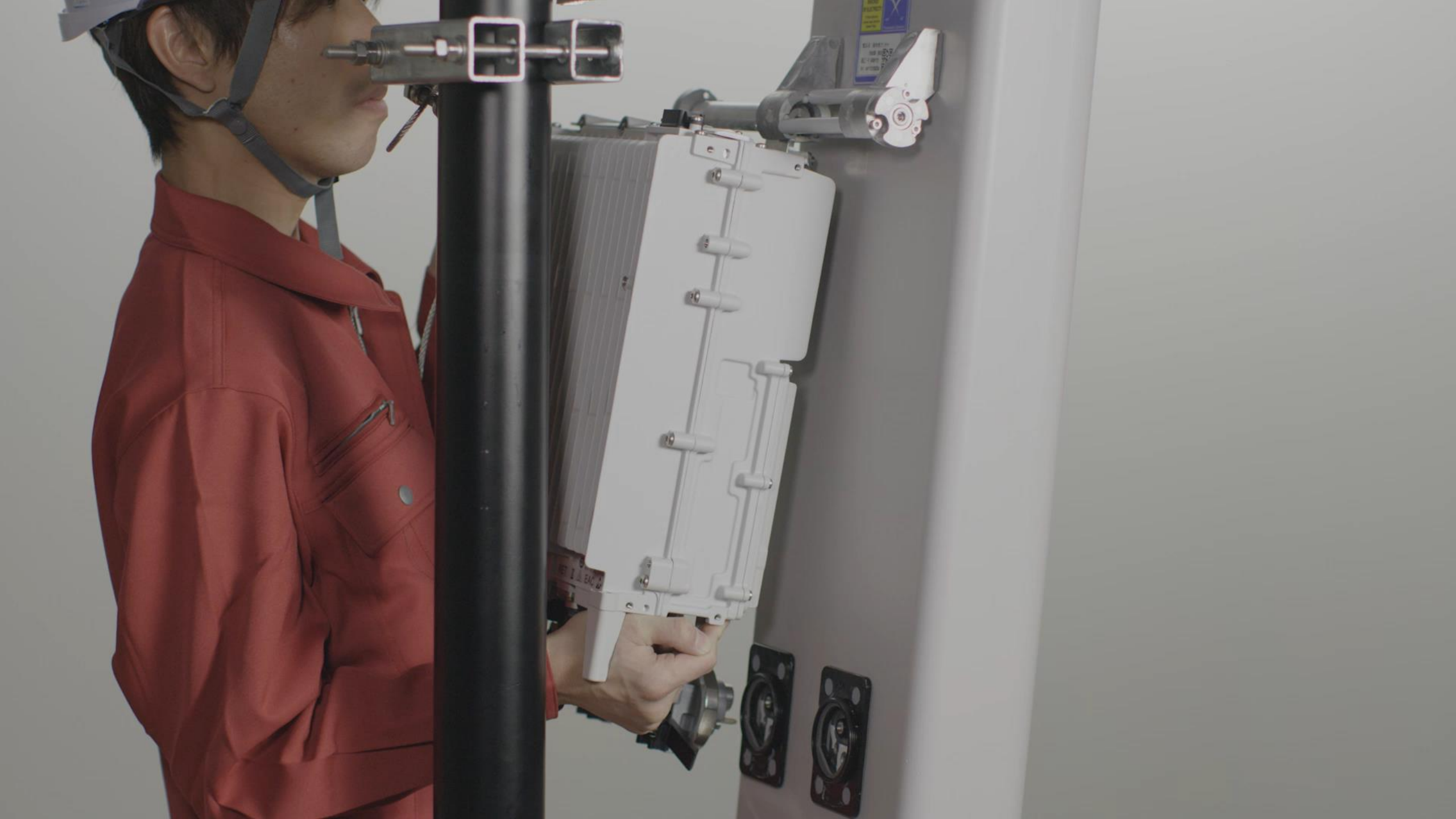




Rakuten Simplified Site Deployment

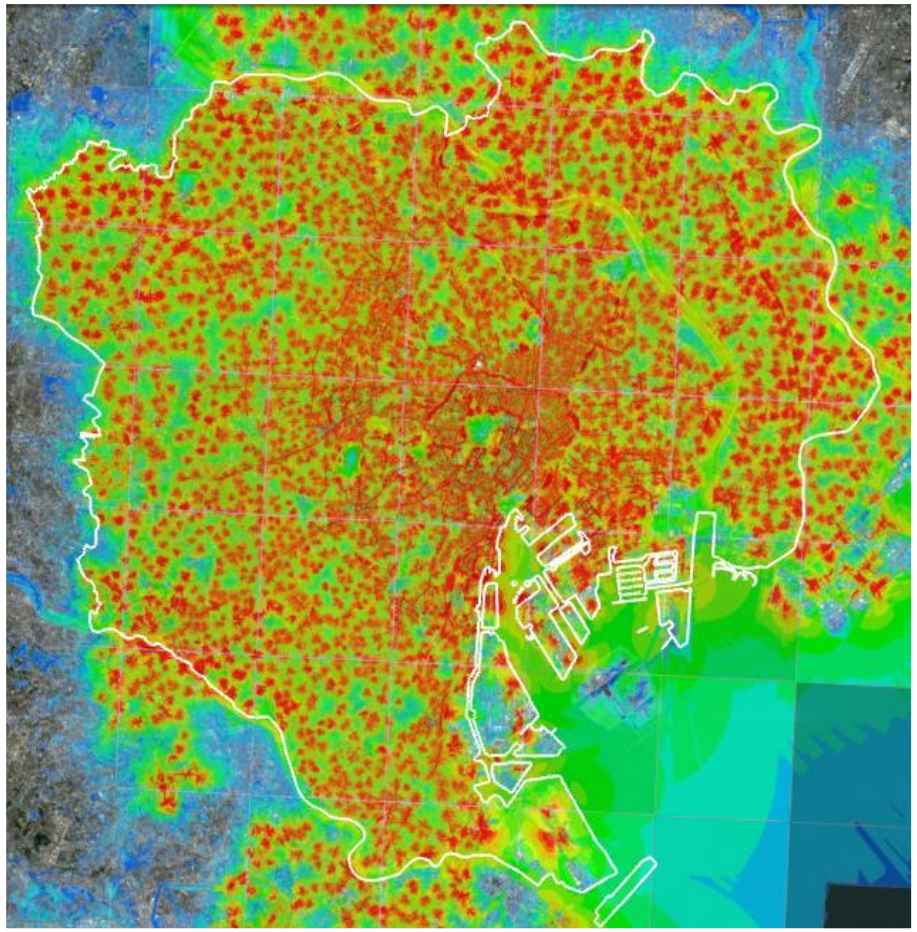






Accelerating Base Station Build-out Plan

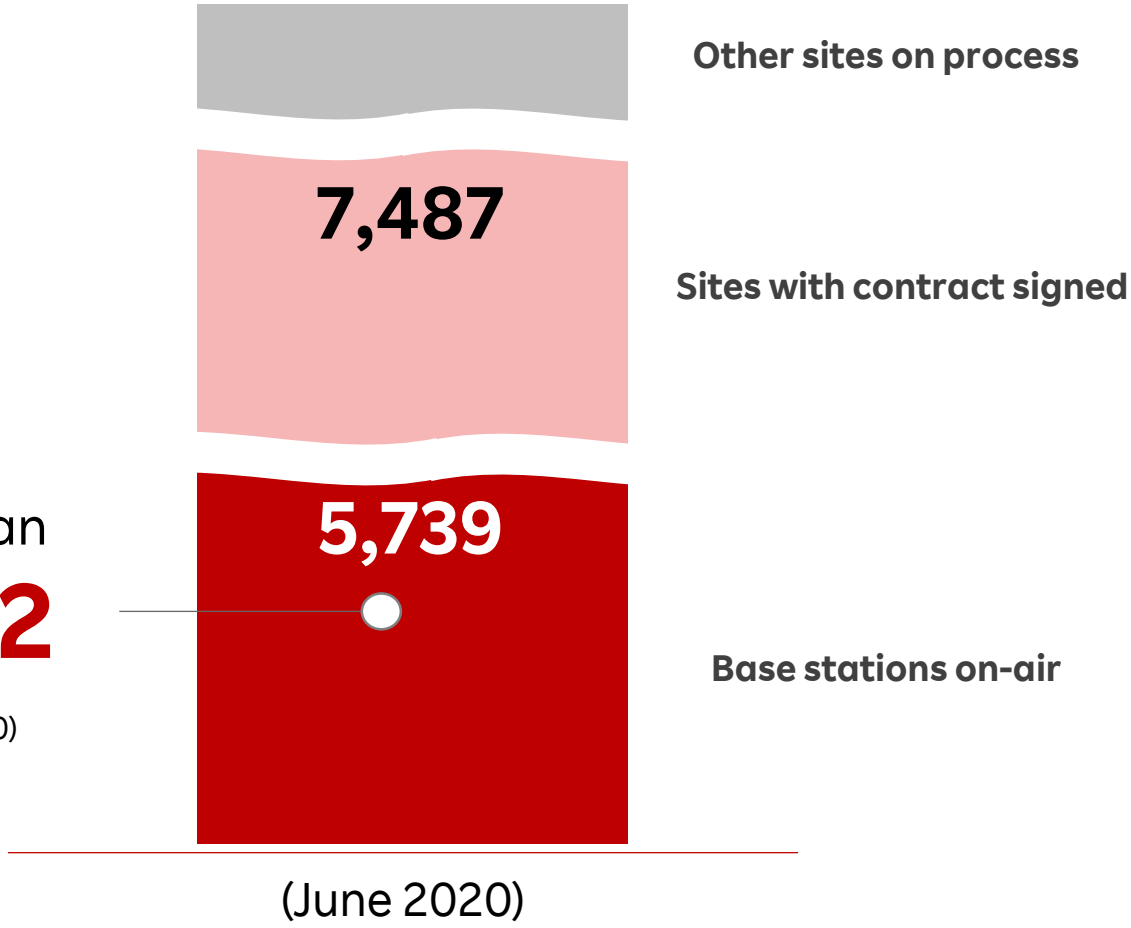
Provide 70% population coverage by march 2021



Initial Plan

3,432

(March 2020)



Unique Modular Concrete Poles that are Simple and Cost Effective

Cost Effective

40%

40% less cost compared to building top macro

Concrete Pole

Ease of Installation

Deploy maximum no. of poles nationwide

Complete Control

Ease of Access

To site maintenance

Modular

5G Ready

Minimum required space

Our Network is 5G Ready

5G Products Developed with Industry Leaders including Qualcomm, Airspan and NEC

5G NR (mmWave DRU)

28 GHz, 128 x 128 Antenna Element, 51 dBm EiRP

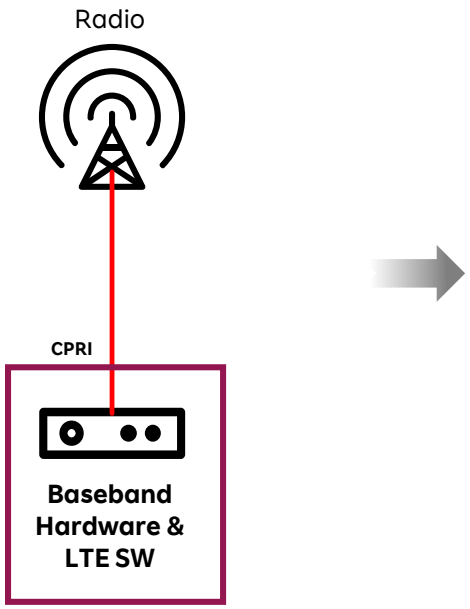
5G NR (Sub-6 RU)

3.8 GHz, 32 x 32 TRx, 70 dBm EiRP

OpenRAN Software Deployed on RCP : Industry-first Containerization

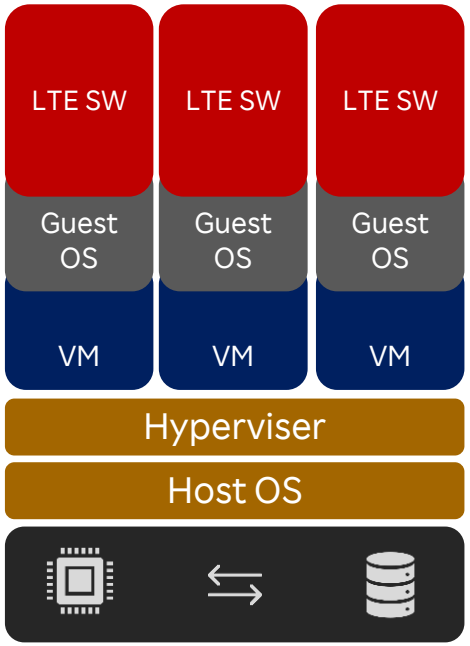
Enabling highly scalable and reliable platform

Legacy custom-build hardware with proprietary software implementation



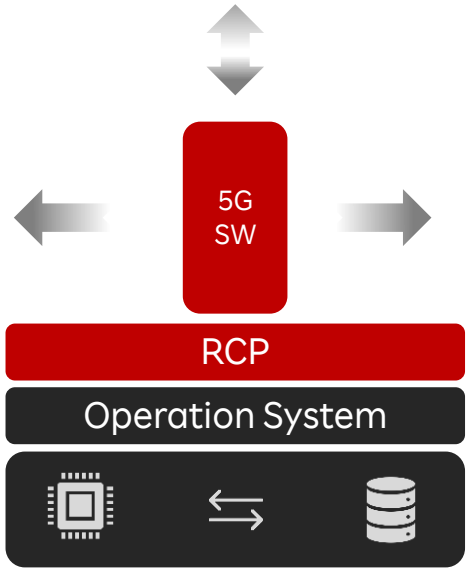
Cell Site

ORAN compliant software deployed as CNF (Cloud Network Function) on COTS hardware



Data Center

ORAN compliant software deployed as container on RCP platform



Data Center

Both VMs and Containers can Help Get the Most Out of Available Computer Hardware and Software Resources

Virtual Machines

- Heavyweight
- Limited performance
- Each VM runs in its own OS
- Hardware-level virtualization
- Startup time in minutes
- Allocates required memory
- Fully isolated and hence more secure

WHATS the **DIFF?**

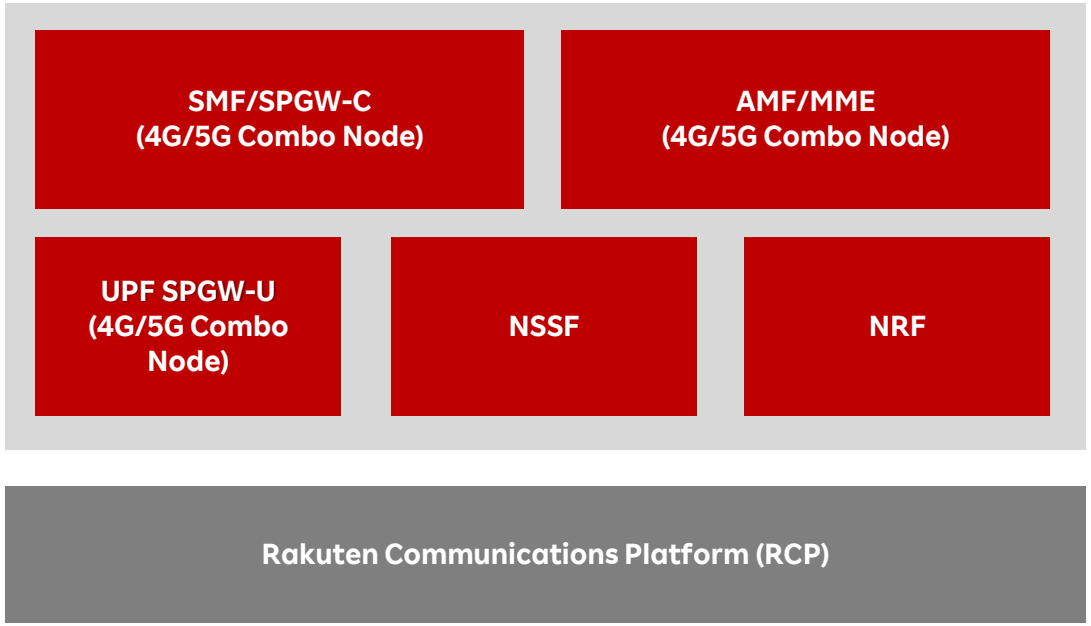
Containers

- Lightweight
- Native performance
- All containers share the host OS
- OS virtualization
- Startup time in milliseconds
- Requires less memory space
- Process-level isolation, possibly less secure

Delivering Japanese Quality through Partnership with NEC

Joint development of containerized converged 4G & 5G core

Cloud Native Converged 5G Core (NEC)



NEC Partnership for 5G Core

- **Partnership with NEC** for 5G openCore
- Cloud native **converged** core capabilities
- **Source code sharing and joint development** with Rakuten Mobile
- Collaboration on developing and selling 4G & 5G core to **global markets**

Awarded Japanese Government Grant for Further 5G Research

Rakuten Mobile Initiatives Selected by METI and New Energy and Industrial Technology Development Organization (NEDO) for "Research and Development Project for Enhancement of the bases for post-5G information and communication systems"

OSS/MANO enhancement

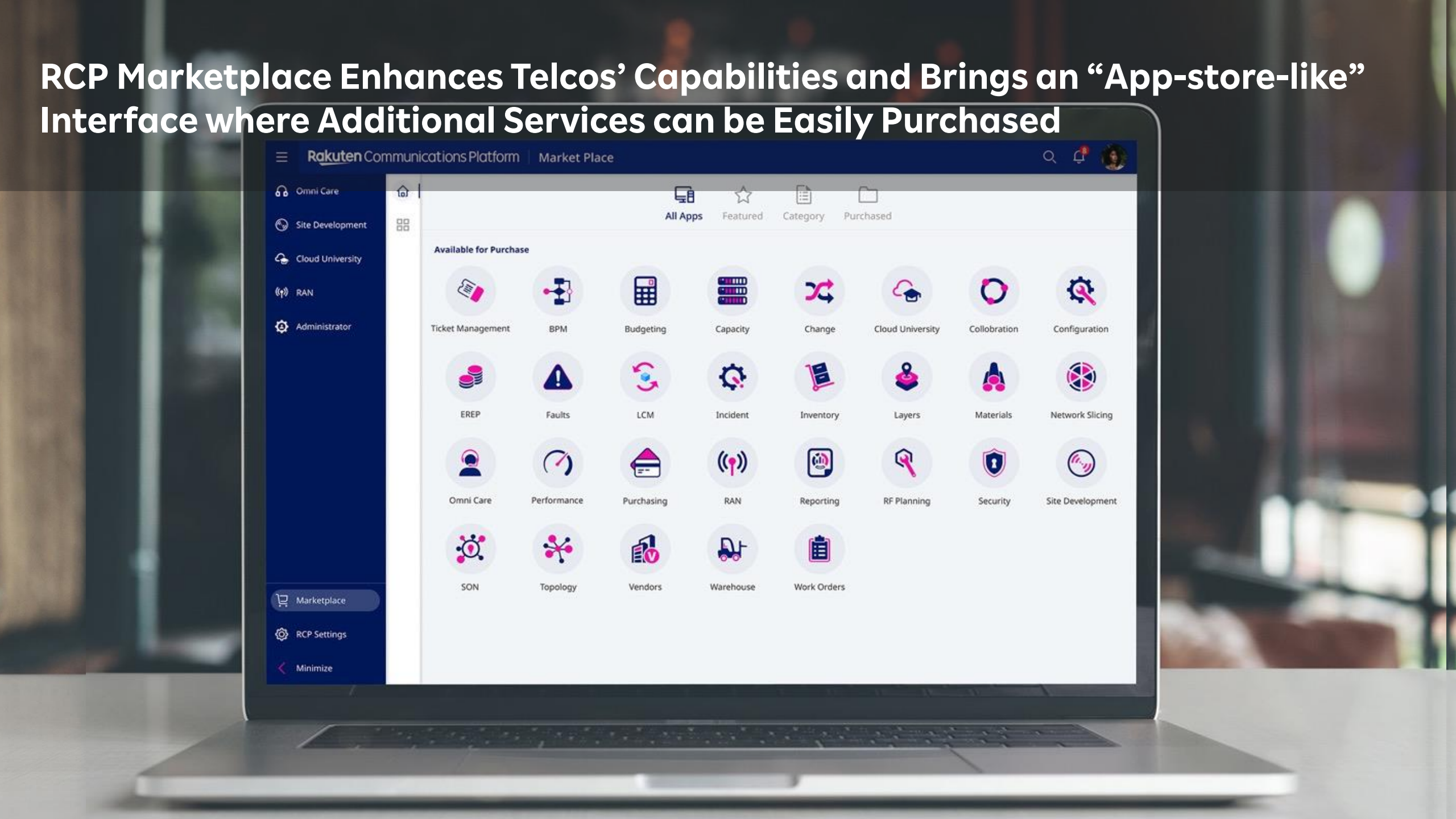
- E2E Slice Orchestration and Operation
- Prediction and dynamic resource allocation on multiple datacenter
- Near Realtime optimization

Open 5G RAN enhancement

- RAN network slicing
- Performance optimization + Support of new 3GPP features

Going Global with
Rakuten Communications Platform (RCP)

RCP Marketplace Enhances Telcos' Capabilities and Brings an "App-store-like" Interface where Additional Services can be Easily Purchased



Going Global with 5G: “Rakuten Communications Platform (RCP)”

A cost effective solution for 5G deployment

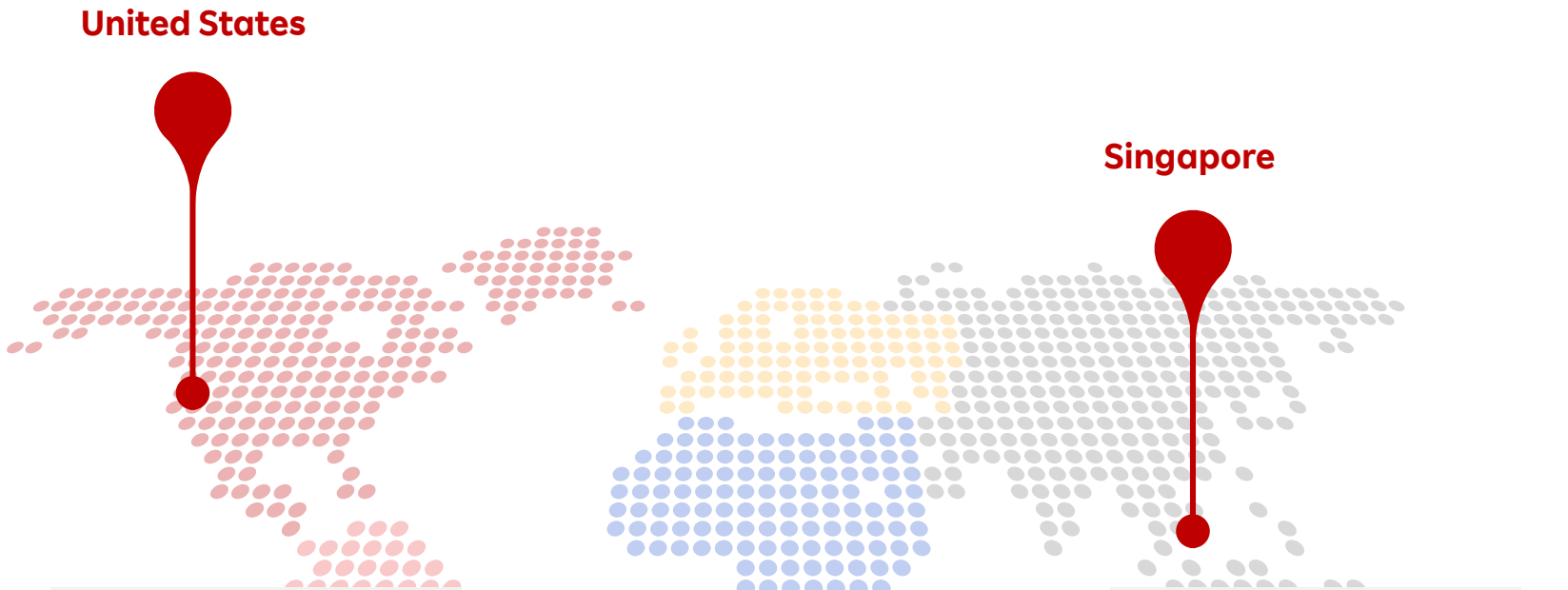
CAPEX Reduction of ~40%

	Traditional	RCP	% Change	Rationale for Change
Total Capex	**100**	**60**	**- 40%**	
Software	30	30	0%	• N/A
Hardware	45	17.5	- 60%	• Fewer site equipment due to virtualization and pooling of capacity / resources
Deployment	25	12.5	- 50%	

OPEX Reduction of ~30%

	Traditional	RCP	% Change	Rationale for Change
Total Opex	**100**	**70**	**- 30%**	
Rent & Electricity	40	30	- 25%	• Fewer site equipment reducing footprint need and total power consumption
Data Centers	5	10	100%	• Increased use of edge locations for low latency use cases
Transmission	10	15	50%	• Increased use of edge locations and transmission
Ops Center	10	5	- 50%	• Automation and scale of centralization of resources
Field Maintenance	35	10	- 70%	• Fewer site equipment and automation in maintenance

International Expansion Ramps Up for Rakuten Communications Platform



Global Establishment

2 New Global Offices

Singapore and USA

Global Discussions

70+ Operators and Govts

Strong interest from the Market

Rakuten