Multi-carrier DAS

(500MHz+200MHz)

Key Feature

5G NR Digital Sharing DAS.

- **Integrate all carriers 5GNR frequency bands.**
  - Services full Sub-6GHz 5GNR frequency spectrum simultaneously (3.6GHz～4.1GHz/4.5GHz～4.6GHz/4.9GHz～5.0GHz)
  - 4x4 MIMO for delivers fast data speed

- **Digital frame transmission over optical fiber**
  - Easy to Install / Provides high quality by TJ's advanced digital technologies
  - Ready to O-RAN evolution with future software upgrades

- **Remote Monitoring**
  - Providing an RMS protocol according to customer specifications

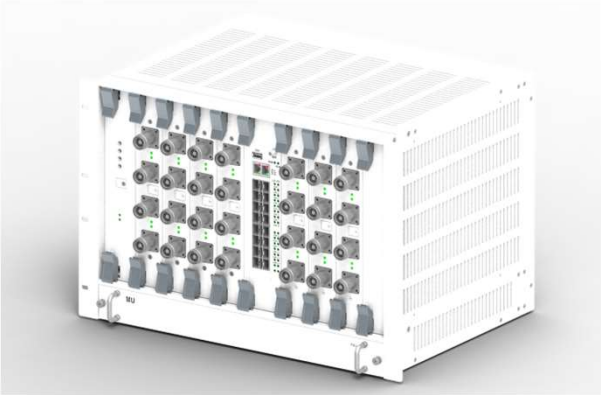
- **Integrated up to 100Mbps IP Transport**
  - Support user connection for Wi-Fi Camera, AP or IoT Device Connectivity

- **Delivers end user satisfaction by cost-effective, eco-friendly equipment**
  - Multi-carrier integrate to reduce install space, components and fiber lease fee
  - Minimize carbon generate by TJ's advanced digital technologies such as MU energy harvesting and ultra wideband digital linearized amplifier

System Configuration

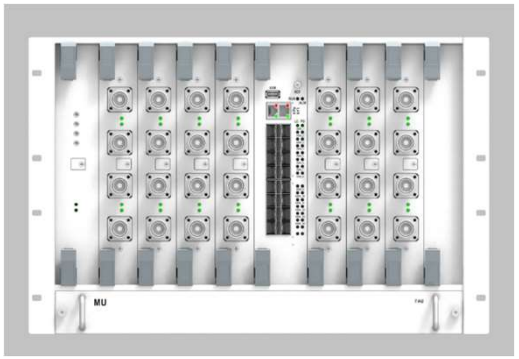
System Components

- **MU (Master Unit)**



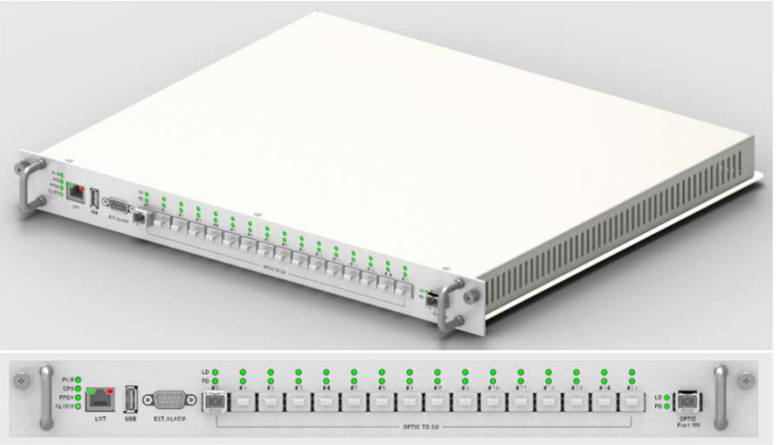
- A small, competitive product that integrates all function of DAS Head-End
- Accommodates 7 BBU (Each BBU supports 100MHz 4x4 MIMO)
- Time synchronization acquisition
- Minimize the influence on Base Station with integrated digital filter
- Provides eight(8) branches are connected to the HU
- Energy harvesting from RF signal with TJ's unique eco-friendly technology
  ➔ Converting RF energy into DC and using batteries.
  (A dedicated battery and built-in RF to DC Rectifier)

Item	Specification
Size	480 x 350 x 264
Weight	20Kg
Mount Type	Rack



System Components

- HU (Hub Unit)



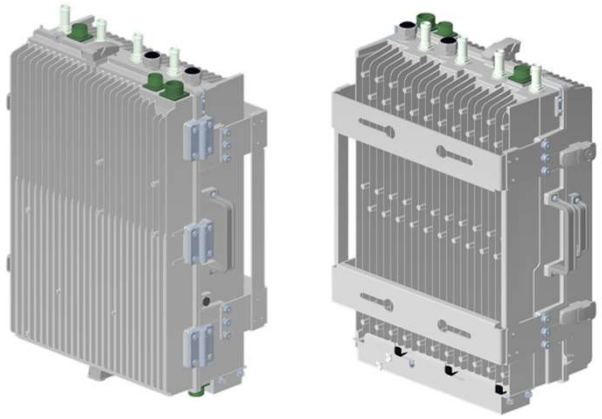
Item	Specification
Size	480 x 350 x 44
Weight	10Kg
Mount Type	Rack

- Extend MU's optical branch to eight(8) SU
- Transmit control commands to the SU and collect status information of each RU
- Converts AC input into DC-48V, and supply to SUs

System Configuration

System Components

- **SU (Service Unit)**

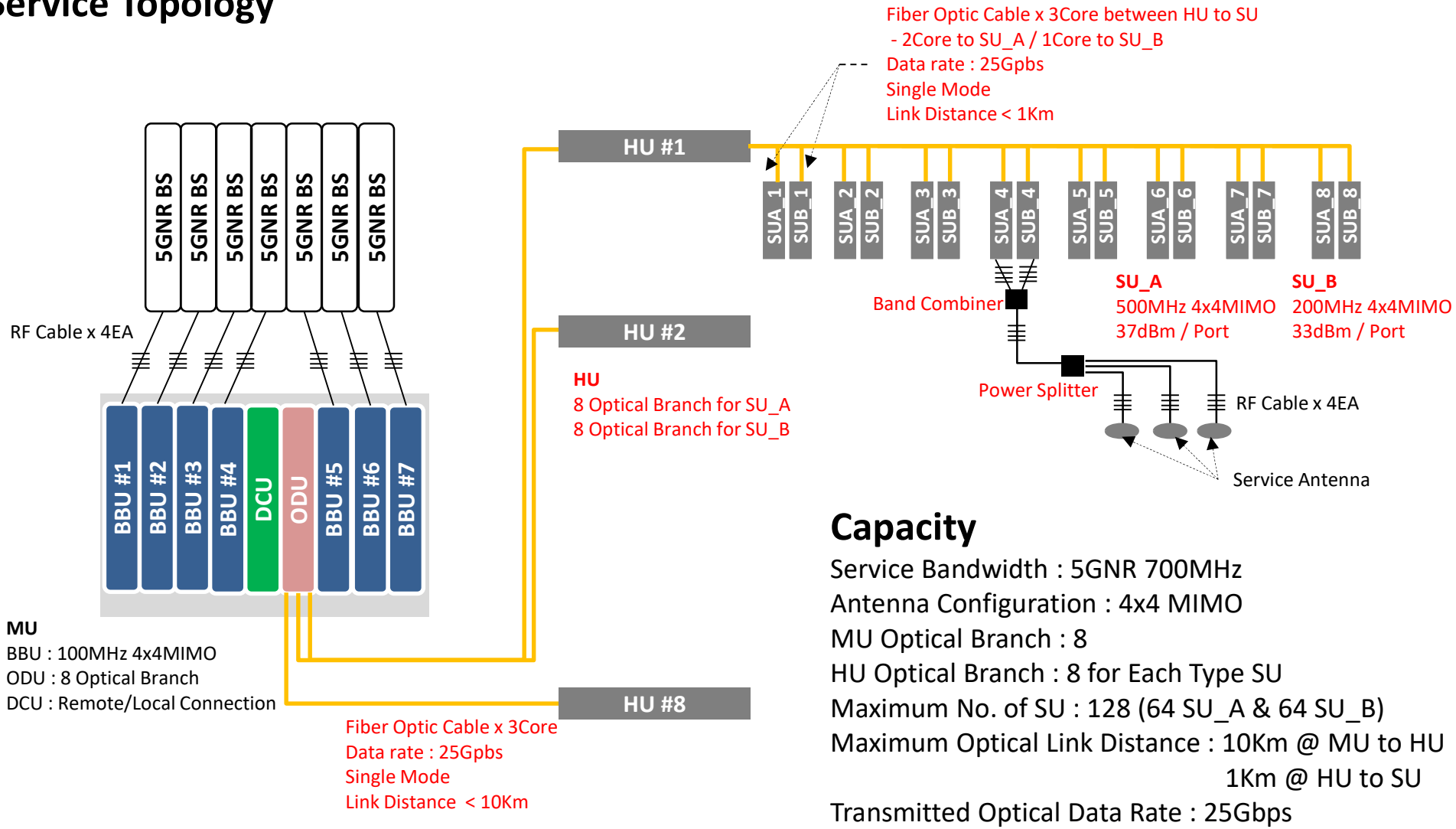


Item	Specification
Size	SU_A : TBD / SU_B : TBD
Weight	SU_A, SU_B : Less than 20Kg
Mount Type	Rack or Wall

- Service Unit of Digital DAS
- 2 types of SU support700MHz full Sub-6GHz 5GNR band
  - ➔ SU_A : 3.6GHz～4.1GHz (BW 500MHz)
  - ➔ SU_B : 4.5GHz～4.6GHz&4.9GHz～5.0GHz (BW 200MHz)
- 30dBm / 100MHz High Power (Total 38.5dBm /Port)
- 4x4 MIMO
- Provides UL noise cancellation with our unique DSP Technology (Adaptive Smart SRRC Filter)
  - ➔ Noise removal up to 18dB (@64 SU)
- Increase power efficiency with ultra wideband digital linearized power amplifier algorithm
- Suitable for both indoor or outdoor installations

System Configuration

Service Topology

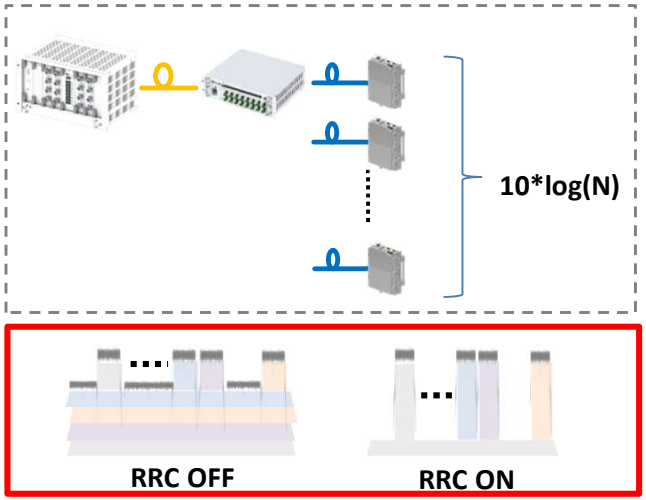


Capacity

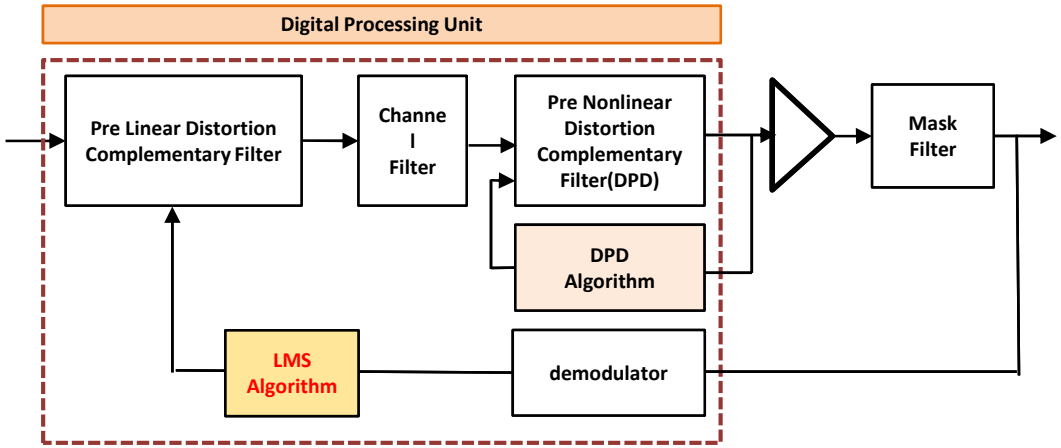
Service Bandwidth : 5GNR 700MHz
Antenna Configuration : 4x4 MIMO
MU Optical Branch : 8
HU Optical Branch : 8 for Each Type SU
Maximum No. of SU : 128 (64 SU_A & 64 SU_B)
Maximum Optical Link Distance : 10Km @ MU to HU
1Km @ HU to SU
Transmitted Optical Data Rate : 25Gbps

UL Noise Cancellation

- UL noise increases by 10*log(N) in proportion to number of SU
- RRC filter removes UL noise notably
- RRC filter
  - Consists of SRRC filters and switch circuits
  - Remove noise selectively according to Input Signals
  - Noise removal performance: max. 21dB (SU 128 units basis)
  - Upgradable remotely



Block Diagram /RRC filter



Advanced technologies

Energy Harvesting – Cost Effective Solution

Th output power of the BTS Antenna Port is higher than 40dBm

↓

The Power Attenuator is necessary to reduce high level signal

The Built -in Power Attenuator (POI) is necessary to accept the signal directly

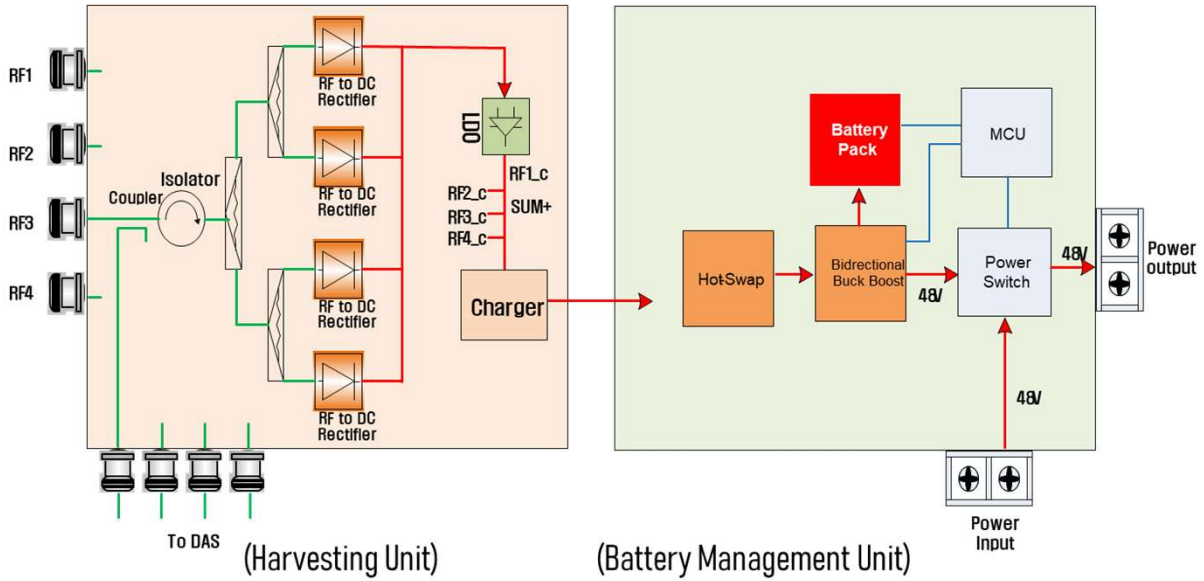
↓

Increase of Material Cost & Causes the heating problems

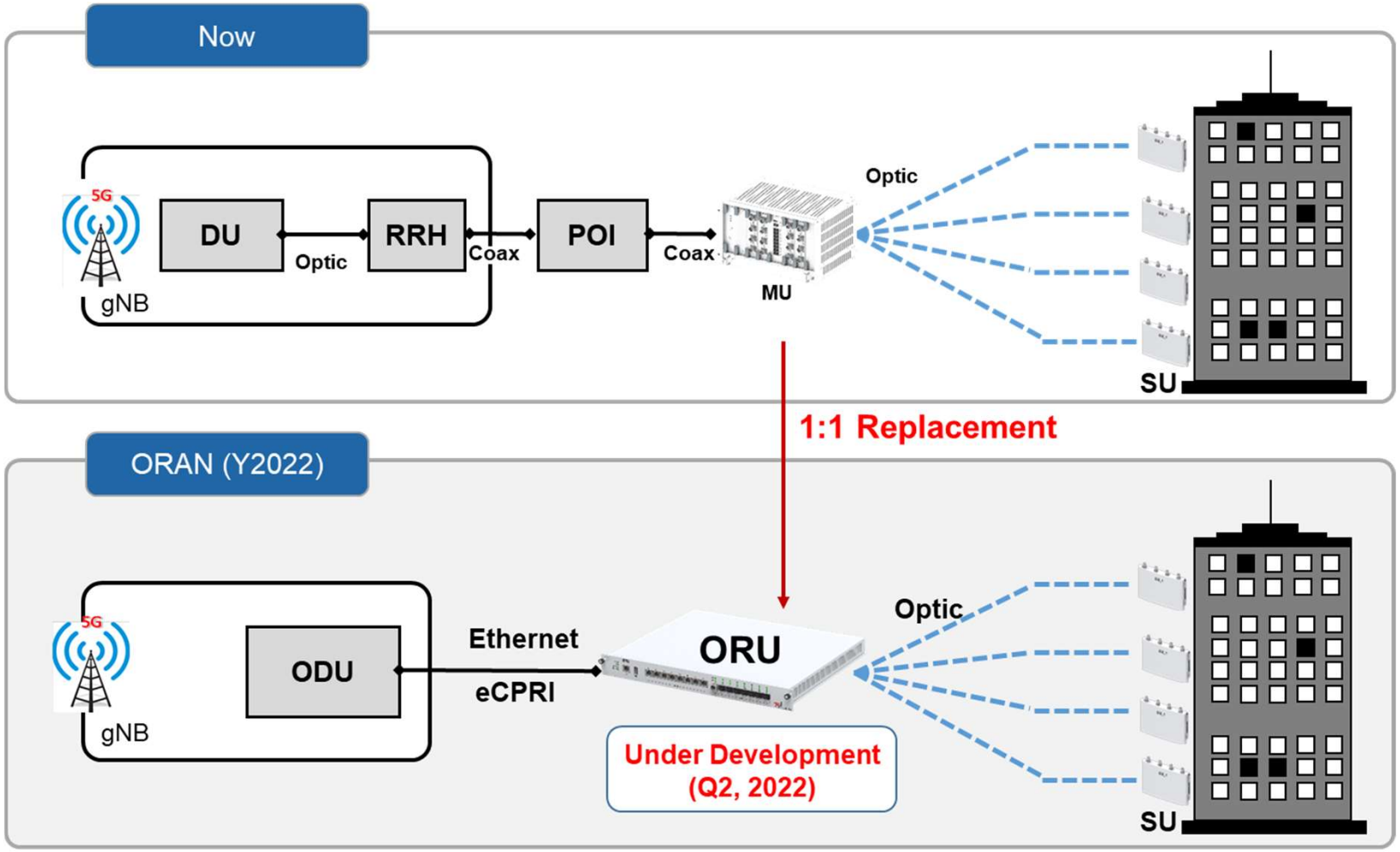
↓

Energy Harvesting Technologies can reduce the amount of carbon by converting consumed RF energy into DC power and recycling it and improves the equipment heat problem.

Block Diagram



Ready to O-RAN evolution



Specifications

RF Specifications

Parameter		Specifications	Note
Service Frequency		700MHz - SU_A : 3.6GHz~4.1GHz (500MHz BW) - SU_B : 4.5GHz~4.6GHz & 4.9GHz~5.0GHz (200MHz BW)	
Antenna Configuration		4x4 MIMO	
Topology (MU : HU : SU)		1 : 8 : 128 (64 SU_A, 64 SU_B)	
DL	Max. Input	≤ -10dBm / 100MHz	(*)
	Max. Output	30dBm / 100MHz SU_A : 37dBm/Port SU_B : 33dBm/Port	
	Max. Gain	40dB	
	ALC	MU Input ALC : 15dB (0.5dB Step) SU Output ALC : 5dB (0.5dB Step)	
UL	Max. Input	≤ -50dBm	
	Max. Output	≤ -20dBm / 200MHz	(**)
	Max. Gain	30dB	
	ALC	SU Input ALC : 15dB (0.5dB Step) MU Output ALC : 5dB (0.5dB Step)	

(*) DL Max. Input Level ≤ 43dBm / 100MHz when using Harvesting Unit.
(**) UL Max. Output Level ≤ -73dBm / 200MHz when using Harvesting Unit.

Specifications

RF Specifications

Parameter		Specifications	Note
Flatness		±3dB	
Group Delay		≤ 6us (MU – HU – SU)	One way
Delay Equalization	Max. Range	80us	(*)
	Control Step	0.1us	
	Accuracy	±0.2us	
TDD Sync	Method	Decoding @ Each BBU	(**)
	Acquisition Speed	< 40ms	
	Hold-Over	> 1 minute	
Error Vector Magnitude		≤ 3%	
ACLR		45dBc or -35dBm/MHz	
Noise Figure		Typical < 6dB (Max. < 7dB)	
RF Port Impedance		50 Ohm	
VSWR		≤ 1.5 : 1	

(*) Maximum group delay @ maximum optical link distance : 61us
- Optical Fiber Delay : 55us/Km (5us/Km), System Delay : 6us

(**) Alarm occurs when the Sync acquired in each BBU is different from each other.

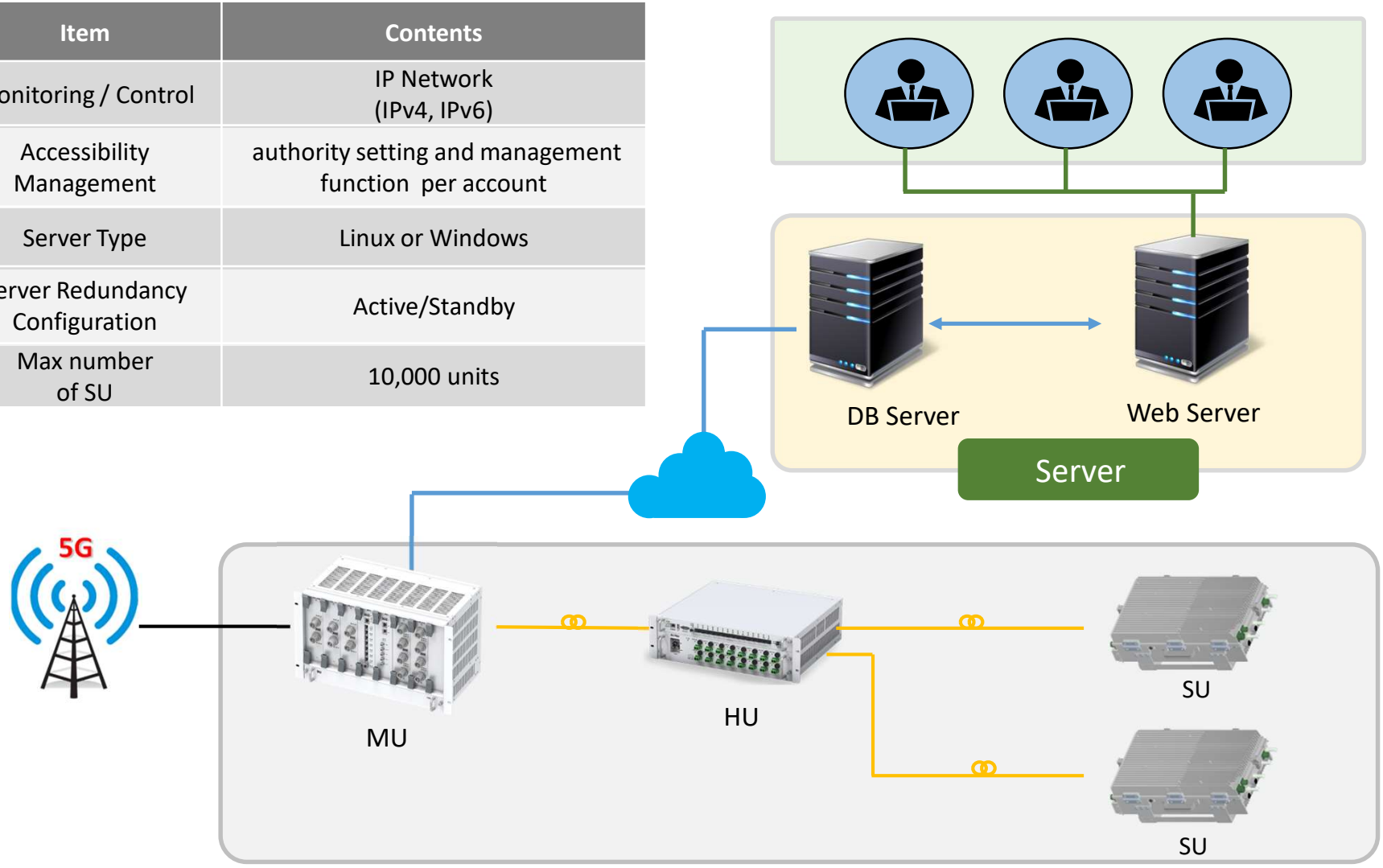
Specifications

Mechanical Specifications

Parameter	Specifications			
	MU	HU	SU_A	SU_B
RF Connector	4.3/10 DIN (F)	-	4.3/10 DIN (F)	4.3/10 DIN (F)
Optic Connector	SC-APC	SC-APC	SC-APC	SC-APC
User Interface	RJ-45	RJ-45	RJ-45	RJ-45
Mount Type	Rack	Rack	Rack / Wall / Ceiling	Rack / Wall / Ceiling
Power	-48Vdc	100Vac	100Vac	100~Vac
Size [Unit : mm]	480 x 350 x 264	480 x 350 x 44	TBD	TBD
Weight [Unit : Kg]	< 20	< 10	< 20	< 20
Protection			IP66	IP66
Cooling	Fan	Fan	No Fan	No Fan
Operating Temp.	-10℃ ~+40℃			
Operating Humidity	0% ~ 95% (No Condensing)			

Remote Access System (EMS:Equipment Management System)

Item	Contents
Monitoring / Control	IP Network (IPv4, IPv6)
Accessibility Management	authority setting and management function per account
Server Type	Linux or Windows
Server Redundancy Configuration	Active/Standby
Max number of SU	10,000 units



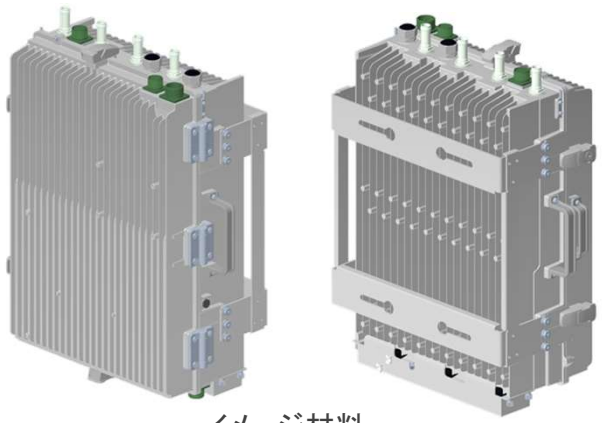
Multi-carrier DAS

(700MHz)

システム構成

システムコンポーネント

- **SU (Service Unit)**



イメージ材料

Item	Specification
Size	SU : 400 x 330 x 160
Weight	SU: less than 20Kg
Power Consumption	180W
Mount Type	Rack or Wall

- Services 700MHz full Sub-6GHz 5GNR band
- 20dBm/100MHz High Power
- 4x4 MIMO
- Provides UL noise cancellation with unique DSP Technology (Adaptive Smart SRRC Filter)
  ➔ Noise removal up to 18dB (@64 SU)
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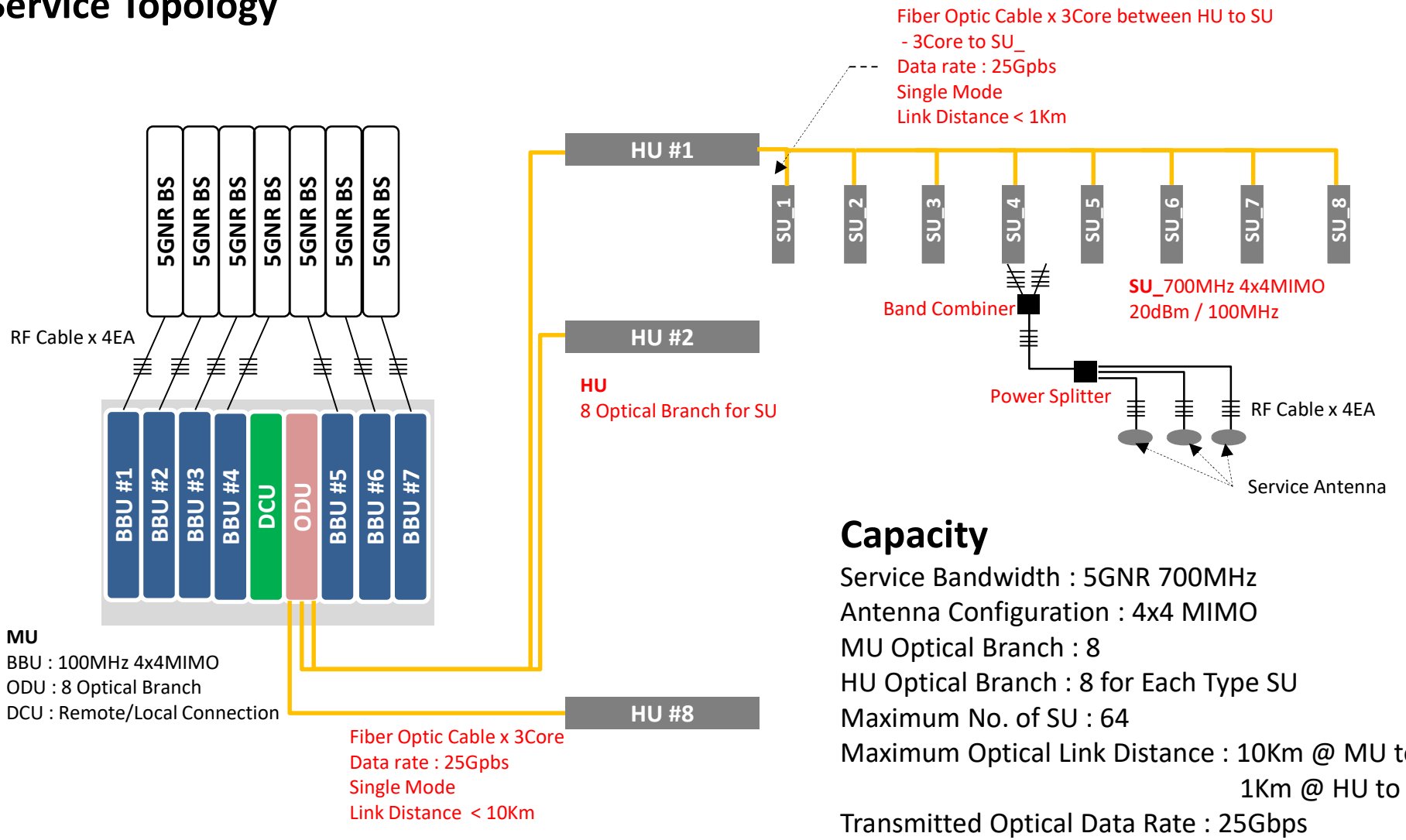

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