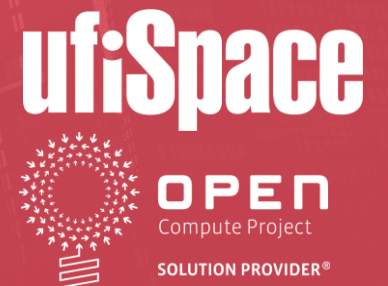# UfiSpace OCP Contribution for Disaggregated Cell Site Gateways (IC)

Presented by Kei Lee, AVP Technical Sales
kei.lee@ufispace.com

Models Seeking OCP Accepted Status

- **S9500-22XST**

    - High capacity (QAX)

    - 1/10/25/40/100G with RJ45 compatibility

- **S9501-28SMT and S9501-18SMT**

    - Mid to Low capacity (QUX)

    - 1/10G with RJ45 compatibility

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Why Disaggregated Cell Site Gateways?

TELCO

Majority of open disaggregation journeys begin at the cell site

- Traffic pattern is simpler than other parts of network

- Easy to start small with minimal investment

- Upgrade in segments, minimize impact for carrier's entire network architecture

- Prepare network for the stringent timing requirements of 5G RAN

Efficiently realize the values of open disaggregation

- Flexibility – Choose the most suitable HW, SW, maintenance and even business model that best fits the customer's needs.

- Versatility – A single model of CSR can perform multiple functions, reducing inventory and making sparing/maintenance easier.

- Control – Upgrade SW and HW separately, no vendor lock in, and choose services that they need to run their services without the extra padding.

**UfiSpace's models are for various application scenarios**

- Not all cell sites are created equal (rural v urban, US v EU, etc.)

- More applications are being explored (wireless backhaul, private 5G, etc.)

- Requests of a multitude of service providers in EU, NASA, and APAC markets

- OCP Accepted is trusted by the industry for interoperability with open standards.

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S9500-22XST Disaggregated Cell Site Gateway

- Individual BMC for monitoring and managing equipment health status

- Intel® Broadwell-DE 4-Core 1.5G
- Broadcom Qumran-AX Silicon
- 2GB external packet Buffer
- Deliver high performance 300Gbps switching capacity
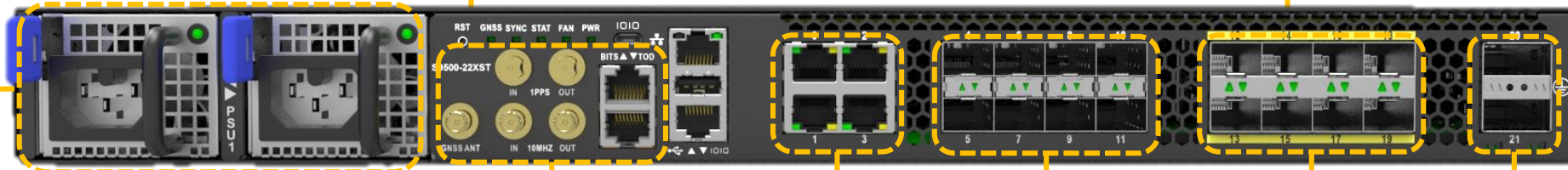
- Redundant, hot swappable power supplies (AC/DC)

- Rich timing input/output interfaces: GNSS, ToD, BITS, 1PPS and 10MHz
- Supports full SyncE and IEEE 1588v2 (T-GM, T-BC, T-TC, and T-TSC)

- 4-port 100M/1GE RJ45
- Support for legacy BBU

- 8-port 100M/1GE/10GE SFP+
- Support for legacy BBU

- 8-port 1GE/10GE/25GE SFP28
- Fulfill bandwidth demand of 5G BBU

- 2-port 40GE/100GE QSFP28
- Backhaul capacity up to 100G

System Block Diagram: S9500-22XST

TELCO
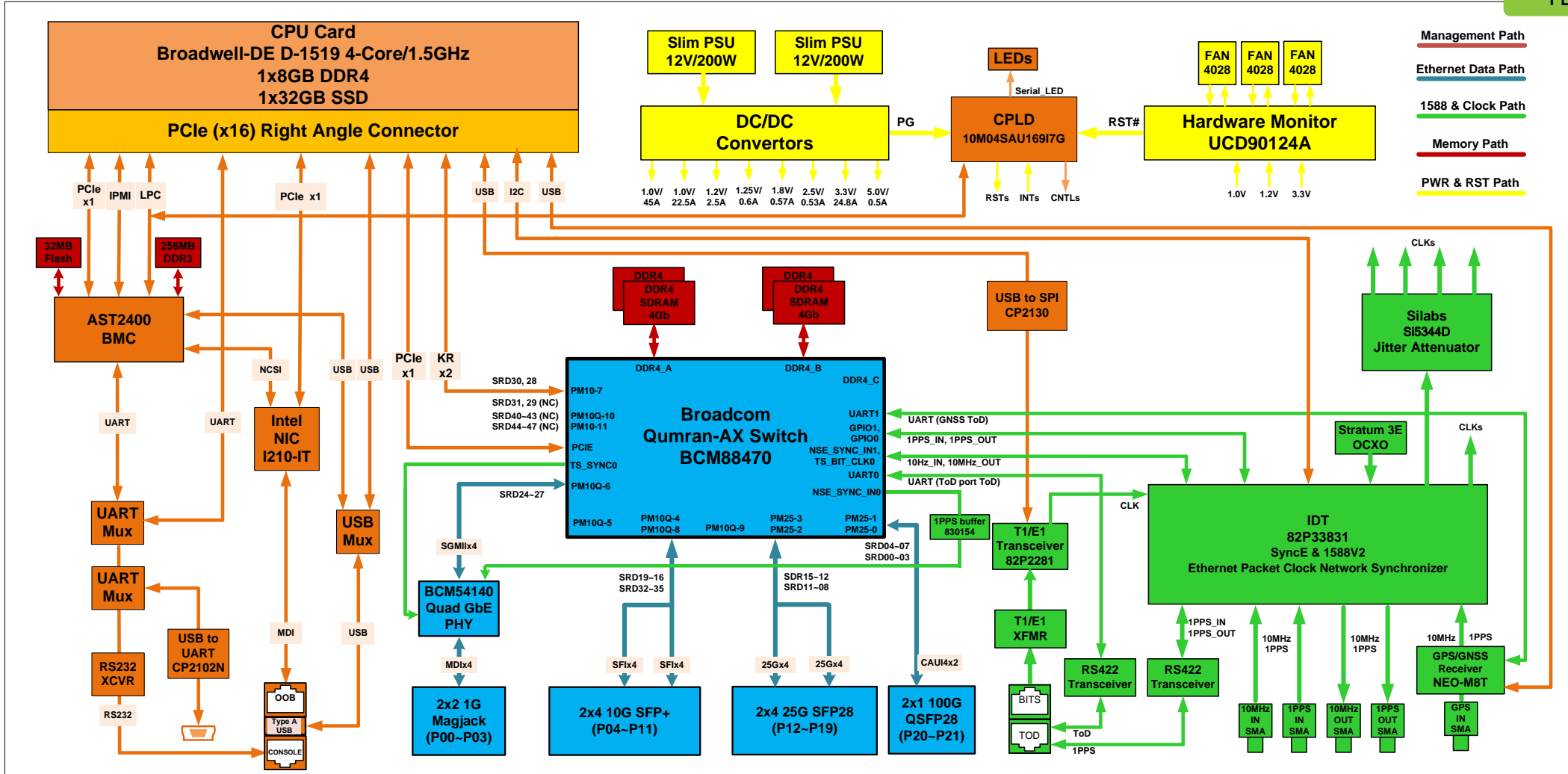
Legend:
- Management Path
- Ethernet Data Path
- 1588 & Clock Path
- Memory Path
- PWR & RST Path

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S9501-28SMT and S9501-18SMT Series Disaggregated Cell Site Gateways

- Individual BMC for monitoring and managing equipment health status

- In-house timing solution enables Class C timing accuracy and accelerates TTM of SW and HW development

- Intel® Denverton-NS 4-Core, 1.6GHz
- Broadcom Qumran-UX Silicon with
- 1GB external packet Buffer
- Deliver high performance 120Gbps and 64Gbps switching capacity

- 2 hot swappable power supplies with
- 1+1 redundancy support
- AC and DC options available

- Rich timing input/output interfaces: GNSS, ToD, BITS, 1PPS and 10MHz
- Supports full SyncE and IEEE 1588v2 (T-GM, T-BC/OC, T-TC, and T-TSC)

- 100M/1GE RJ45
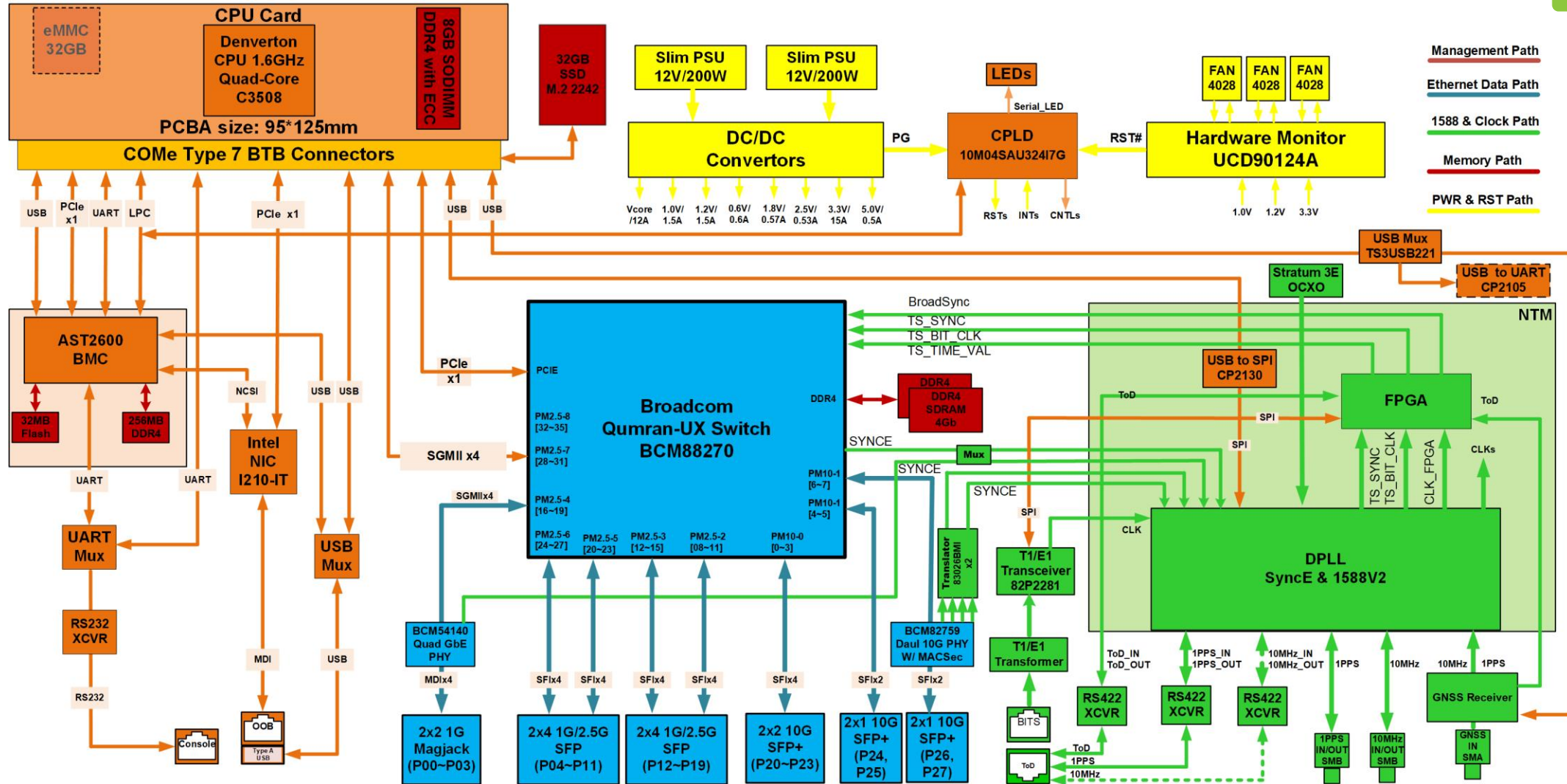- Support for legacy BBU

- 100M/1GE/2.5GE SFP
- Support for legacy BBU

- 1GE/2.5GE/10GE SFP+
- Support MACsec

- 1GE/2.5GE/10GE SFP+

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System Block Diagram: S9501-28SMT

TELCO

CPU Card

eMMC 32GB

Denverton CPU 1.6GHz Quad-Core C3508

8GB SODIMM DDR4 with ECC

PCBA size: 95*125mm

COMe Type 7 BTB Connectors

32GB SSD M.2 2242

Slim PSU 12V/200W

Slim PSU 12V/200W

LEDs

Serial_LED

FAN 4028 FAN 4028 FAN 4028

DC/DC Convertors

PG

CPLD 10M04SAU324I7G

RST#

Hardware Monitor UCD90124A

Vcore /12A | 1.0V/ 1.5A | 1.2V/ 1.5A | 0.6V/ 0.6A | 1.8V/ 0.57A | 2.5V/ 0.53A | 3.3V/ 15A | 5.0V/ 0.5A

RSTs INTs CNTLs

1.0V 1.2V 3.3V

USB PCIe x1 UART LPC

PCIe x1

USB USB

USB Mux TS3USB221

USB to UART CP2105

Stratum 3E OCXO

NTM

AST2600 BMC

NCSI

USB USB

USB to SPI CP2130

BroadSync
TS_SYNC
TS_BIT_CLK
TS_TIME_VAL

32MB Flash

256MB DDR4

PCIe x1

PCIE

FPGA

ToD

SPI

ToD

UART UART

Intel NIC I210-IT

SGMII x4

PM2.5-7 [28~31]

Broadcom Qumran-UX Switch BCM88270

DDR4

DDR4 DDR4 SDRAM 4Gb

TS_SYNC TS_BIT_CLK CLK_FPGA CLKs

SYNCE

Mux

SPI

UART Mux

USB Mux

PM2.5-4 [16~19]

SGMIIx4

SYNCE

SYNCE

SPI

CLK

DPLL SyncE & 1588V2

RS232 XCVR

PM2.5-6 [24~27] | PM2.5-5 [20~23] | PM2.5-3 [12~15] | PM2.5-2 [08~11] | PM10-0 [0~3]

PM10-1 [6~7]

PM10-1 [4~5]

Translator 83026BMI x2

T1/E1 Transceiver 82P2281

MDI

USB

BCM54140 Quad GbE PHY

BCM82759 Daul 10G PHY W/ MACSec

T1/E1 Transformer

ToD_IN ToD_OUT | 1PPS_IN 1PPS_OUT | 10MHz_IN 10MHz_OUT | 1PPS | 10MHz | 10MHz | 1PPS

RS232

MDIx4 | SFIx4 | SFIx4 | SFIx4 | SFIx4 | SFIx4 | SFIx2 | SFIx2

BITS

RS422 XCVR | RS422 XCVR | RS422 XCVR

GNSS Receiver

Console

OOB
Type A USB

2x2 1G Magjack (P00~P03) | 2x4 1G/2.5G SFP (P04~P11) | 2x4 1G/2.5G SFP (P12~P19) | 2x2 10G SFP+ (P20~P23) | 2x1 10G SFP+ (P24, P25) | 2x1 10G SFP+ (P26, P27)

ToD

ToD 1PPS 10MHz

1PPS IN/OUT SMB | 10MHz IN/OUT SMB | GNSS IN SMA

Management Path
Ethernet Data Path
1588 & Clock Path
Memory Path
PWR & RST Path

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System Block Diagram: S9501-18SMT

TELCO

CPU Card
- eMMC 32GB
- Denverton CPU 1.6GHz Quad-Core C3508
- 8GB SODIMM DDR4 with ECC
- PCBA size: 95*125mm
- COMe Type 7 BTB Connectors

32GB SSD M.2 2242

Slim PSU 12V/200W
Slim PSU 12V/200W

LEDs
Serial_LED

FAN 4028
FAN 4028
FAN 4028

DC/DC Convertors
PG

CPLD 10M04SAU324I7G
RST#

Hardware Monitor UCD90124A

Legend:
- Management Path
- Ethernet Data Path
- 1588 & Clock Path
- Memory Path
- PWR & RST Path

Vcore /12A | 1.0V/ 1.5A | 1.2V/ 1.5A | 0.6V/ 0.6A | 1.8V/ 0.57A | 2.5V/ 0.53A | 3.3V/ 15A | 5.0V/ 0.5A

RSTs | INTs | CNTLs

1.0V | 1.2V | 3.3V

USB | PCIe x1 | UART | LPC
PCIe x1
USB | USB

USB Mux TS3USB221
USB to UART CP2105

Stratum 3E OCXO

NTM

AST2600 BMC
- NCSI
- 32MB Flash
- 256MB DDR4
- USB | USB

PCIe x1

BroadSync
TS_SYNC
TS_BIT_CLK
TS_TIME_VAL

USB to SPI CP2130

FPGA
ToD | ToD
SPI
SPI
TS_SYNC | TS_BIT_CLK | CLK_FPGA | CLKs

Broadcom Qumran-UX Switch BCM88272
- PCIE
- DDR4
- PM2.5-7 [28~31]
- PM2.5-4 [16~19]
- PM2.5-6 [24~27]
- PM2.5-5 [20~23]
- PM2.5-3 [12~15]
- PM2.5-2 [08~11]
- PM10-1 [4~5]
- PM10-0 [0~3]

DDR4 DDR4 SDRAM 4Gb

SYNCE
SYNCE
Mux

UART

Intel NIC I210-IT

USB USB

USB Mux

SGMII x4

UART
UART

MDI
USB

UART Mux

RS232 XCVR

RS232

BCM54140 Quad GbE PHY
MDIx4

SGMIIx4

ToD
CLK

DPLL SyncE & 1588V2

2x2 1G Magjack (P00~P03)

SFIx4 | SFIx4 | SFIx4 | SFIx2

2x4 1G/2.5G SFP (P12~P19)
2x2 10G SFP+ (P20~P23)
2x1 10G SFP+ (P24, P25)

ToD_IN ToD_OUT | 1PPS_IN 1PPS_OUT | 10MHz_IN 10MHz_OUT | 1PPS | 10MHz | 10MHz | 1PPS

RS422 XCVR | RS422 XCVR | RS422 XCVR

GNSS Receiver

Console
OOB
Type A USB

ToD
ToD
1PPS
10MHz

1PPS IN/OUT SMB
10MHz IN/OUT SMB
GNSS IN SMA

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UfiSpace's DCSG Product Family Selection Matrix

TELCO

High
Speed & Capacity

Low Port Density — High Port Density

Low
Speed & Capacity

MACsec

ZR4+

S9500-30XS

S9500-22XST

MACsec

S9501-18SMT

S9501-28SMT

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Comparison Chart of Models

TELCO

Spec. \ Model	S9500-30XS	S9500-22XST	S9501-28SMT	S9501-18SMT
ASIC	BCM88470 (Qumran-AX)	BCM88470 (Qumran-AX)	BCM88270 (Qumran-UX)	BCM88272 (Qumran-UX)
CPU Subsystem				
CPU	Intel Broadwell-DE D1519 4-Core, 1.5GHz	Intel Broadwell-DE D1519 4-Core, 1.5GHz	Intel Denverton-NS C3508 4-Core, 1.6GHz	Intel Denverton-NS C3508 4-Core, 1.6GHz
Port Configuration				
100G QSFP28	2	2	0	0
25G SFP28	8	8	0	0
10G SFP+	20	8	8	6
1G SFP	0	0	16	8
1G RJ45	0	4	4	4
Timing				
IEEE 1588	T-GM, T-BC, T-TC, T-TSC	T-GM, T-BC, T-TC, T-TSC	T-GM, T-BC, T-TC, T-TSC	T-GM, T-BC, T-TC, T-TSC
SyncE	Yes	Yes	Yes	Yes
1PPS	input/output	input/output	input/output	input/output
10MHz	input/output	input/output	input/output	input/output
GNSS	input	input	input	input
BITS	input	input	input	No
TOD	input/output	input/output	input/output	input/output
Special Features				
IPSec	Yes	Yes	Yes	Yes
MACsec	support @ 100G ports	No	support @ port 26, 27	No

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What is UfiSpace Contributing?

TELCO

- **Design Specifications:**
  - 1 spec. for S9500-22XST
  - 1 spec. for S9501-28SMT & S9501-18SMT

- **Complete Design Packages:**
  - ✓ BOM
  - ✓ Gerber files
  - ✓ PCB Schematic files
  - ✓ BRD design files
  - ✓ Mechanical STEP files
  - ✓ Mechanical assemble Drawings
  - ✓ CPLD/FPGA Code
  - ✓ Programming Guide
  - ✓ Test Plan
    - 1 set for S9500-22XST
    - 1 set for S9501-28SMT
    - 1 set for S9501-18SMT

- **Contribution Readiness**
  - Specifications – Ready
  - Design Package – Preparing
  - IC Presentation – Overview ready, Waiting for design package

- **Product Readiness**
  - S9500-22XST – Field testing with SP
  - S9501-28/18SMT – NOS vendor porting

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OCP Tenants

TELCO

Efficiency

Our models offer more efficiency in terms of power and port configurations for telecom service providers adopt open disaggregation in areas where less capacity and less ports are required. For more efficient servicing and maintenance our disaggregated cell site gateways are equipped with hot swappable field replaceable power supplies and fans. Also, all of our cell site gateways support IEEE 1588v2 and SyncE timing synchronization with several timing interfaces to enable accurate timing at the cell sites. Additionally, all of our models are capable of functioning as a grandmaster clock, which means the service provider does not need to implement additional TGM equipment into their network.

Scalability

All our models come with automatic provisioning and remote management features. They enable service providers to deploy large scale disaggregated open network infrastructures for various 5G mobile network access applications. Components with firmware/software inside the box are 100% online programmable, easy to maintain and can be upgraded rapidly. Furthermore our disaggregated cell site gateways are designed in a compact, temperature hardened case, making it suitable for a wide range of environments and installation spaces, which enables large scale and rapid deployment.

Openness

Our cell site gateways are currently in the process of being contributed to OCP. Each model will have at least 2 to 3 available NOS integrated with the platforms. In addition, our cell site gateways support numerous open source options including ONL and ONIE as well as conforming to the OCP Cell Site Gateway Router specifications.

Impact

Our disaggregated cell site gateway routers enables a pathway for telecoms to adopt open disaggregated white box technology into their network architectures. This has been proven by current deployments from tier 1 telecoms around the world. But in many cases, what's available is an overkill on specs. By providing lower capacity and more economic options with our comprehensive product family, we are allowing an even wider range of telecoms, such as regional/rural telecoms, to be able to join in the open disaggregation revolution. In UfiSpace's S9501-28/18SMT models, UfiSpace also utilizes our own network timing module to enable Class C timing accuracy.

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TELCO

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