

# TRANSMISSION SOLUTION HANDOVER - 2017

NEP  
April 2017

# AGENDA



- › Solution Overview
- › Assumptions
- › Exclusions
- › Products
- › BoQ
- › Fully Outdoor Solution
- › Micro Sites Fiber backhaul solution

# OVERVIEW



- › Transmission solution is based on MTNI requirements which were shared and agreed with Ericsson:
  - Complete new links for new sites and swapped links in 2017 scope:
    - › In Total 1363 Microwave Links: (New Swap, ZS)
      - 1013 x Mini-Link TN links for access & hub sites
      - 20 x Mini-Link 6352 EBand links to handle high capacity requirements
      - 150 x Mini-Link PT 2020 for fully outdoor site solution
      - 180 x Mini-Link PT 2020 for Zero Site solution
    - › 20 x Mini-Link 6391 outdoor switch for outdoor site aggregation
  - Additional boards and accessories for 2016 scope; mainly:
    - › Radios, Antennas, radio accessories and SFPs
  - Micro Sites Fiber backhaul solution

# TX OFFER ASSUMPTIONS (1)



- › ML-TN R5 is ordered.
- › Transmission Bandwidth Dimensioning:
  - Based on MTNI requirements
  - Minimum 300Mbps has been considered for 1+0 links
  - Capacity offered is up to 1.6Gbps for 4+0 configuration
- › HW offered is capable to handle up to 456Mbps (1024QAM/56MHz) per MMU3A modem.
- › It is assumed that we will have Abis/IP for all the sites
- › TMR6101 with BBU is assumed for housing of AMM 20p in hub sites.
- › Housing for AMM6p is considered in RAN/Site solution offer/scope
- › It is assumed that the power for TRM equipment is considered in RBS site solution scope

Technology	Capacity
2G	8Mbps
Road sites	50Mbps
Secondary city sites	100Mbps
Important secondary city sites (*)	300Mbps
Capital city sites	300Mbps
Capital city tail sites	210~250Mbps

# TX OFFER ASSUMPTIONS (2)



- › All AMM 20p are Switch (NPU1 D) protected
- › All AMM 20p are Power (PFU1) protected
- › Radio sub-bands are added based on current frequencies in 2016 modernization plan.
- › ML 6363 is offered for 13, 18, 23 & 38GHz
- › ML 6363 is considered with ANT3/IPS3
- › RAU2 X is offered for 26GHz links
- › RAU2 X is considered with ANT2/IPS2
- › Radios offered have the HP capability
- › 10% of SHP/SHPX antennas for all frequencies when applicable
- › All offered antennas are modular

# TX OFFER ASSUMPTIONS (3)



- › XPIC function & cable are considered for all 2+0 and 4+0 links
- › SW & licenses are calculated and considered in the LoM based on the agreement with MTNI
- › 1 x Ethernet cable is added per AMM
- › Slot Extension is considered for all 20P
- › No LD2/LD3 cabinets are considered based on project practices and MTNI
- › Extra ANT3 interfaces are added
- › Extra ANT2 interfaces are added
- › TN/LH Header Compr is ordered for all 1+0 links
- › Adaptive Modulation is ordered for all modems

# TX OFFER ASSUMPTIONS (4)



- › No Electrical SFPs are needed for new links
- › 10mm IF cable to be used
- › Count of SFP+ is based on MTNI Request
- › 10G ports licenses are considered for all SFP+
- › Patch cords types are based on the project practices
- › The 10G extra capacity licenses to be upgrade licenses steps; 100 to 200 and 200 to 400
- › Radios and SFP accessories in the “Board and Accessories” BoQ to be based on the numbers of RAUs and SFPs in with extra 30%
- › Rosenburger surge arrestors are added for whole scope as per MTNI request
- › Local Clamps (approved by MTNI) are considered.

# TX OFFER ASSUMPTIONS (5)

R5&6



- › 150 new POI to be considered
- › Interfaces considered in POI for SFP are based on the project practices
- › 180 x ETU2 B, 100 x ETU3 are added
- › 30 x LTU B 32, 30 x LTU2155 are added
- › 60m radio cable to be considered per radio + 10% of the total requirement
- › Two 1G SFP per NPU1 D at POI (2\*150)
- › One 1G SFP per other NPU1 D & each ETU
- › Fixed attenuators to be considered; 5 & 7 dB
- › 18 GHz radios to be distributed as: 70% GSM band, 30% WiMax band
- › 13 GHz radios support the sub-band available to used in the region 03L/03H (6363) and A03/A07 (PT 2020)

# TX OFFER ASSUMPTIONS (6)

R5&6



- › Extra OMT interfaces for ANT3 (IPS3) are added
- › 25 x 1+0 links and 25 x 2+0 links swapped by PT 2020, frequency is based on the project practices
- › One 1G SFP is considered for each for PT 2020 radio
- › DC Power is considered for PT2020 + 70% accessories needed for PoE
- › Extra 15 x TMR6101 is added in accessories requirement as requested by MTNI.
- › EthoPDH and CES licenses have been considered for ETU/LTU B respectively
- › No AMM6p requirements for “Swap” type links, AMMs will be used from current balance.

# TX OFFER ASSUMPTIONS (7)

R7



- › RAU2 X Radios to be considered for type “New” links with ANT2 Antennas
- › Frequency bands of the links are based on MTNI and Ericsson agreement
- › One 1G SFP is added for all AMM 20p, with 50% extra on the total count
- › 40 PDU are added based on MTNI request
- › 18GHz sub band to be distributed as 70% as A11/A15 & 30% as A13/A17
- › 20 x 4+0 links to be swapped by MINI-LINK 6352 (Eband) with 5Gbps capacity
- › One 1G SFP & one 10G SFP+ and port licenses are considered for each for Eband radio

# TX OFFER ASSUMPTIONS (8)

R7



- › 100 x PT 2020 links are added with 1+0 (500Mbps) and 2+0 (900Mbps) configurations
- › 20 x ML 6391 switches are added
- › 20 x ETU2 B, 80 x ETU3 are added
- › One 1G SFP is considered for each for PT 2020 radio
- › DC Power is considered for PT2020 + 70% accessories needed for PoE
- › 38 x 4+0 MW links are ordered using the new sub-band of 23GHz; 02L/02H
- › One SFP & one SFP+ is ordered per each Switch

# TX OFFER ASSUMPTIONS (9)

## ZERO SITES



- › 180 x PT 2020 links are added as a transmission solution for Zero Sites
- › All PT links are 1+0 configurations
- › Frequencies 23/26/28 & 38 GHz are chosen, suitable for mid-short distances.
- › 0.3m antennas are considered for all links
- › 300Mbps is considered based on RAN requirements
- › 1xGE optical interface will be needed for traffic connection
- › DC power is assumed to be provided at site
- › TX high power radio is considered where applicable.
- › 20m optical traffic cable is considered.
- › 20m DC power cable is considered.

# EXCLUSIONS



- › Microwave link budgeting is not done for the offering
- › Capacity dimensioning is not done and assumptions are per MTN Irancell requirements
- › LOS Survey is not considered for the offering
- › Site Improvements to accommodate the new MW HW – this is not part of the MW solution proposed, like:
  - Civil Works or tower works
  - Structural analysis and strengthening
  - Supply and installation of MW Antenna Mounting poles
  - Cable trays and runways (Vertical and horizontal).

# PRODUCTS



MINI-LINK TN R5



MODULAR ANTENNAS



SWITCH 6391



MINI-LINK PT 2020



MINI-LINK 6352



MINI-LINK 6363



RAU2 X

# BOQ (1)

## NEW 1183 LINKS; HARDWARE



Link Configuration	Count of Links
1+0	274
2+0	623
4+0	286
<b>Total</b>	<b>1183</b>

AMM 6p C	AMM 20p B
313	482

Radio	Count of Links
RAU2 X	178
ML 6363	835
PT 2020	150
ML 6352	20
<b>Total</b>	<b>1183</b>

Region	Links	1+0	2+0	4+0
R5&6	909	166	568	175
R7	274	94	55	125
<b>Total</b>	<b>1183</b>	<b>260</b>	<b>623</b>	<b>300</b>
<b>Grand Total</b>		<b>1183</b>		

# BOQ (2)

## NEW 1183 LINKS; SOFTWARE



- › XPIC for 2+0 & 4+0 links
- › Adaptive Modulation is considered for all links
- › Ethernet Provider Mode considered for all nodes
- › Header Compression is considered for 1+0 links
- › 1588v2 Enhance Sync for all nodes
- › Ethernet over PDH license for ETU
- › CES license for LTU B 32
- › TX HP license for 6363 radios
- › 10G port license is considered for NPU1 D and EBand

Product	Name
ML 6352	M-L 6352 10 Gb port
ML 6352	M-L 6352 1588v2 Enh Sync
ML 6352	M-L 6352 Adapt Modulation
ML 6352	M-L 6352 Basic SW
ML 6352	M-L 6352 Enable Eth port
ML 6352	M-L 6352 Eth Provider Mode
ML 6352	M-L 6352 Eth SOAM FM/PM
ML 6352	M-L 6352 Header Compr
ML 6352	M-L 6352 Node GUI
ML 6352	M-L 6352 TX HP
ML TN	Ethernet Provider Mode
ML TN	Ethernet Switching on NPU3 B/C/D
ML TN	TN/LH 1588v2 Enh Sync
ML TN	TN/LH Basic SW R5
ML TN	TN/LH Craft
ML TN	TN/LH Eth SOAM FM/PM
ML TN	Adaptive Modulation
ML TN	TN/LH Header Compr
ML TN	XPIC for PDH/Ethernet
ML TN	AMM 20P Slot Extension
ML TN	TN TX HP
ML TN	TN/LH 10Gb port
ML TN	Additional ETU Ethernet Links
ML TN	TN/LH 4xE1/DS1 over CES
PT 2020	PT 2020 1588v2 Enh Synch
PT 2020	PT 2020 Adapt Modulation
PT 2020	PT 2020 All Outdoor
PT 2020	PT 2020 Basic SW
PT 2020	PT 2020 Eth SOAM FM/PM
PT 2020	PT 2020 Header Compression
PT 2020	PT 2020 TX HP

# BOQ (3)

## SERVICE CARDS & SFP+



- › All items are added and agreed by MTNI
- › 380 x ETU2 B/ ETU3
  - Will provide additional optical/electrical ports and Inverse Multiplex for Ethernet function (Ethernet to TDM)
- › 30 x LTU2 155
  - Provide SDH/STM-1 interface
- › 30 x LTU B 32/1
  - Provide E1 interfaces and CES solution
- › 130 x SFP+ 10G
  - 10G optical links to be used on the NPU1 D, ML 6352 and for the ML 6391

# BOQ (4)

## 20 E-BAND LINKS



- › 20 x 80GHz E-band hops
- › Maximum capacity; 5Gbps
- › Traffic is via 1GE/10GE optical interface
- › DC power feed
- › Features:
  - M-L 6352 10 Gb port
  - M-L 6352 1588v2 Enh Sync
  - M-L 6352 Adapt Modulation
  - M-L 6352 Basic SW
  - M-L 6352 Enable Eth port
  - M-L 6352 Eth Provider Mode
  - M-L 6352 Eth SOAM FM/PM
  - M-L 6352 Header Compr
  - M-L 6352 Node GUI
  - M-L 6352 TX HP

### DC + opto



ML 6352

Optical

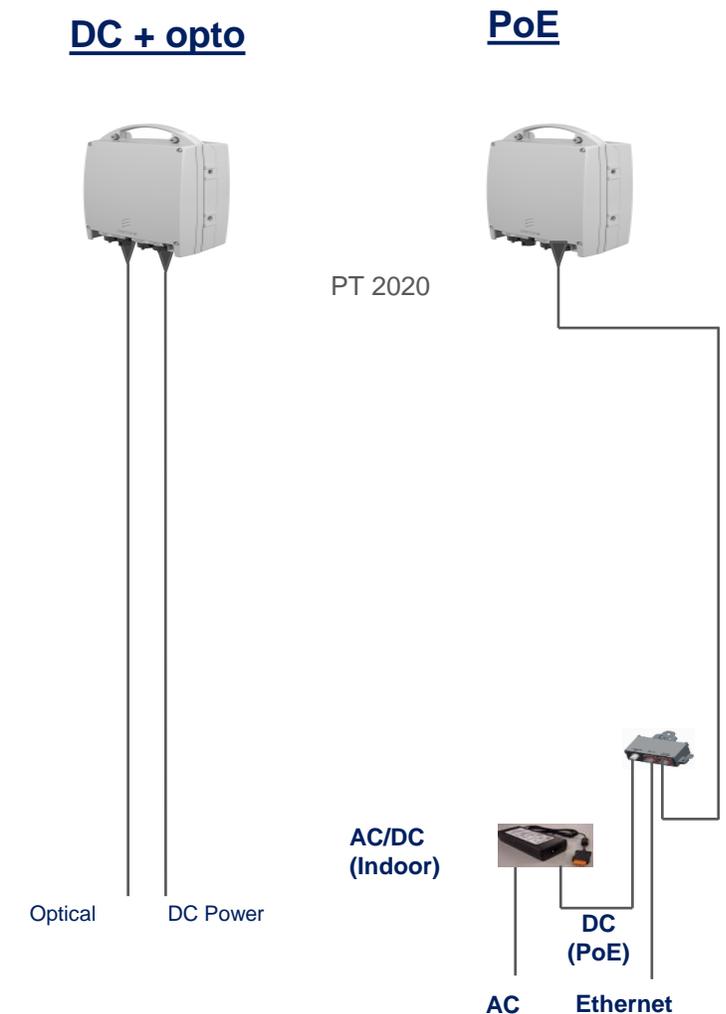
DC Power

# BOQ (5)

## 150 PT 2020 LINKS



- › 150 x fully outdoor PT 2020 hopes
- › Frequency bands are based on MTNI network
- › Up to 500Mbps on 1+0 & 900Mbps on 2+0
- › Traffic is via 1GE optical interface & PoE
- › DC power feed & PoE
- › Features:
  - PT 2020 1588v2 Enh Synch
  - PT 2020 Adapt Modulation
  - PT 2020 All Outdoor
  - PT 2020 Basic SW
  - PT 2020 Eth SOAM FM/PM
  - PT 2020 Header Compression
  - PT 2020 TX HP
  - PT 2020 XPIC

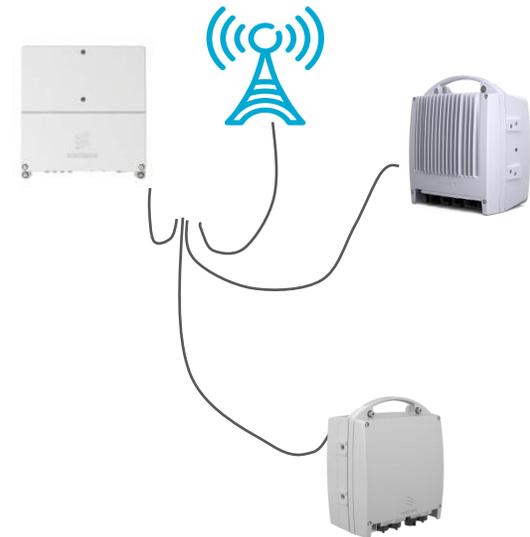


# BOQ (6)

## 20 SWITCHES



- › 20 x fully outdoor ML 6391 advance Ethernet switch
- › 1G & 10G interfaces are available
- › 4 Electrical GE ports are available
- › Aggregation of outdoor/indoor nodes
- › DC power feed
- › Can be wall mounted
- › Features:
  - Adv Ethernet - Switch 6391
  - O&M Usability - Switch 6391
  - Phase&time 1588 - Switch 6391
  - Sw 6391 10 Gb per port
  - Sw 6391 Enable Eth port



# BOQ (7)

## BOARD AND ACCESSORIES



- › Requirements are based on MTNI and Ericsson agreement.
- › Extra licenses are added as upgrade licenses to sum 10G capacity for each region
- › Needed SW licenses are added for extra AMMs and MMUs following the main BoQ logic.
- › Header Compression licenses are added for R7 based on the previous study done by Ericsson and approved by MTNI

Item	Count in Accessories
AMM 20p B -10 R5 w NPU1D	15
ANT2 HPX	310
IPS2	1450
LD3	6
LTU B 32/1	20
MMU3 A	100
NPU1 D Kit	215
RAU2 X	640
Sep Kit 2	1450
SFP GB-LX 1310nm -40/+85C	65
SFP GB-TX electrical	80
SFP S.1.1 1310nm -5/85	40
SFP S.1e electrical -5/85	30
SFP+ SM 10.3Gb/s 10km 1310nm	200
TCU-02	900
TMR 6101	30
TN/LH 10Gb port	200
TN/LH 1588v2 Enh Sync	15
TN/LH Header Compr	1118
XPIC 2xRJ45 Cable Assembly	1059

Cap Upgrade License	Per Region	Total
TN/LH Upgr 100 to 150 Mbps	34	10Gbps Pool
TN/LH Upgr 150 to 200 Mbps	34	
TN/LH Upgr 200 to 250 Mbps	34	
TN/LH Upgr 250 to 300 Mbps	34	
TN/LH Upgr 300 to 350 Mbps	32	
TN/LH Upgr 350 to 400 Mbps	32	

# BOQ (8)

## 180 ZERO SITES PT 2020 LINKS



- › 180 x fully outdoor PT 2020 hopes
- › Frequency bands are 23/26/28 38 GHz
- › 0.3m antennas for easy installation at Zero Site
- › Up to 300Mbps on 1+0 configuration
- › Traffic is via 1GE optical interface
- › DC power feed
- › Features:
  - PT 2020 1588v2 Enh Synch
  - PT 2020 Adapt Modulation
  - PT 2020 All Outdoor
  - PT 2020 Basic SW
  - PT 2020 Eth SOAM FM/PM
  - PT 2020 Header Compression
  - PT 2020 TX HP

Configuration	Sub-Band	No of Links
PT 2020_23GHz_0.3_1+0_300Mbps	A01/A05	45
PT 2020_26GHz_0.3_1+0_300Mbps	A01/A05	45
PT 2020_28GHz_0.3_1+0_300Mbps	A01/A05	45
PT 2020_38GHz_0.3_1+0_300Mbps	A12/A16	45

DC + opto

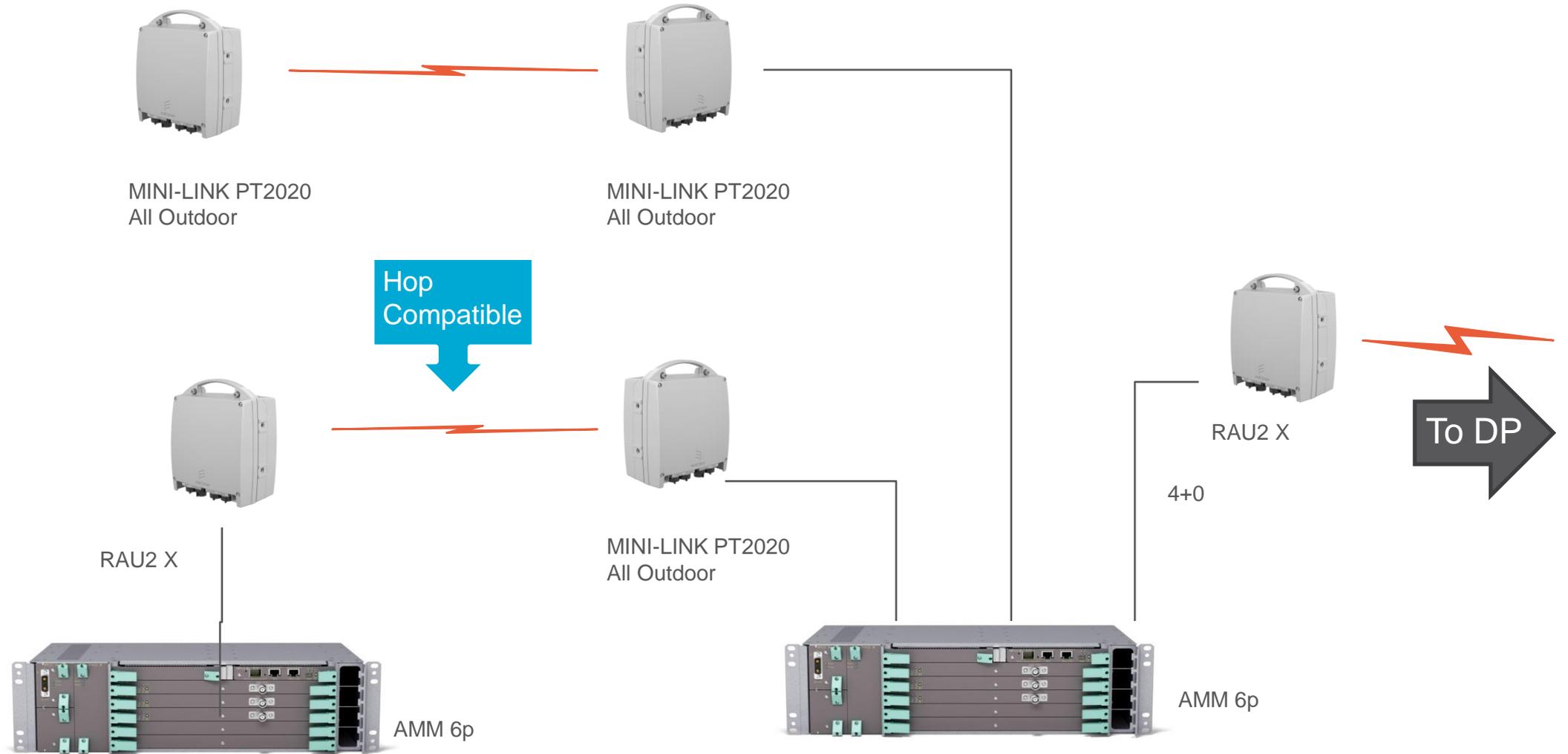


PT 2020

Optical

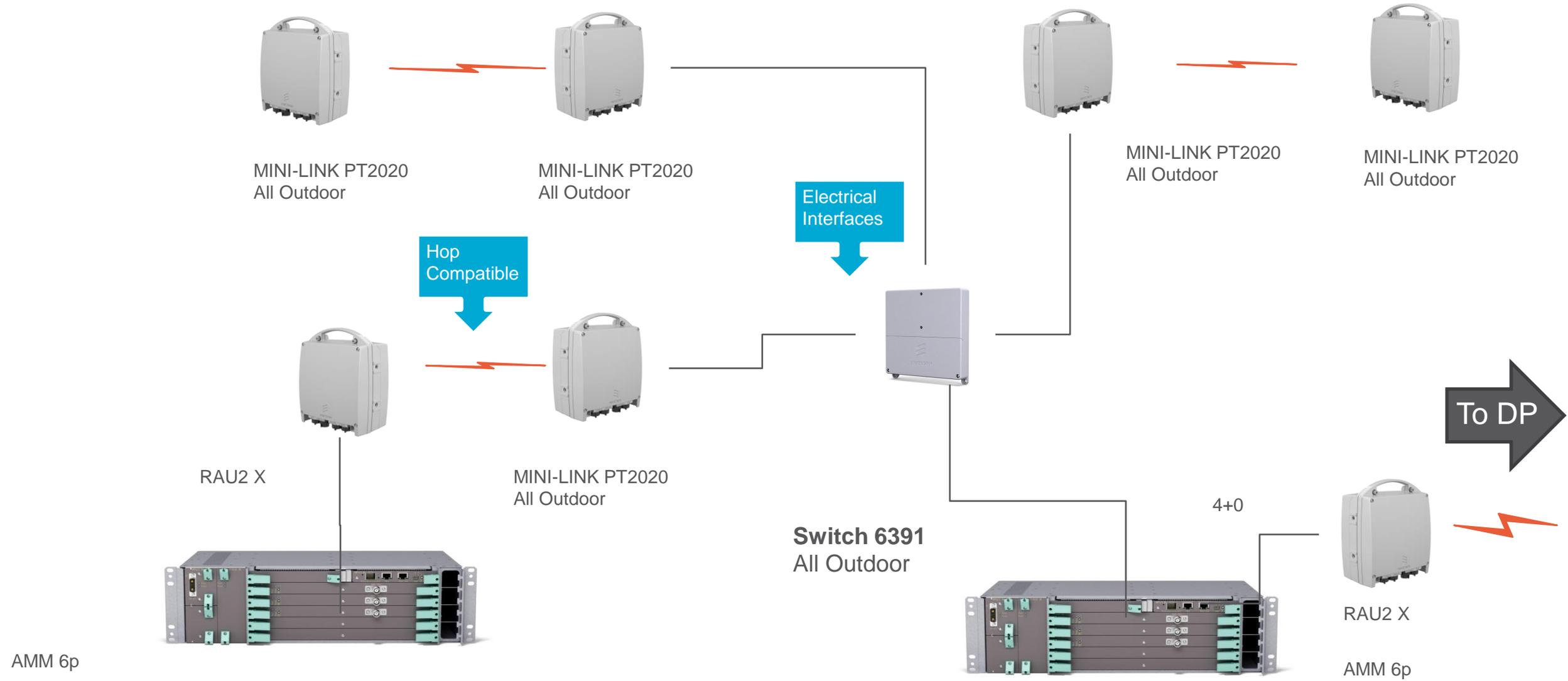
DC Power

# MINI-LINK OUTDOOR SOLUTION (1)



MINI-LINK TN with MINI-LINK PT 2020

# MINI-LINK OUTDOOR SOLUTION (2)



AMM 6p

RAU2 X

MINI-LINK PT2020  
All Outdoor

MINI-LINK PT2020  
All Outdoor

Hop  
Compatible

MINI-LINK PT2020  
All Outdoor

Electrical  
Interfaces

Switch 6391  
All Outdoor

MINI-LINK PT2020  
All Outdoor

MINI-LINK PT2020  
All Outdoor

4+0

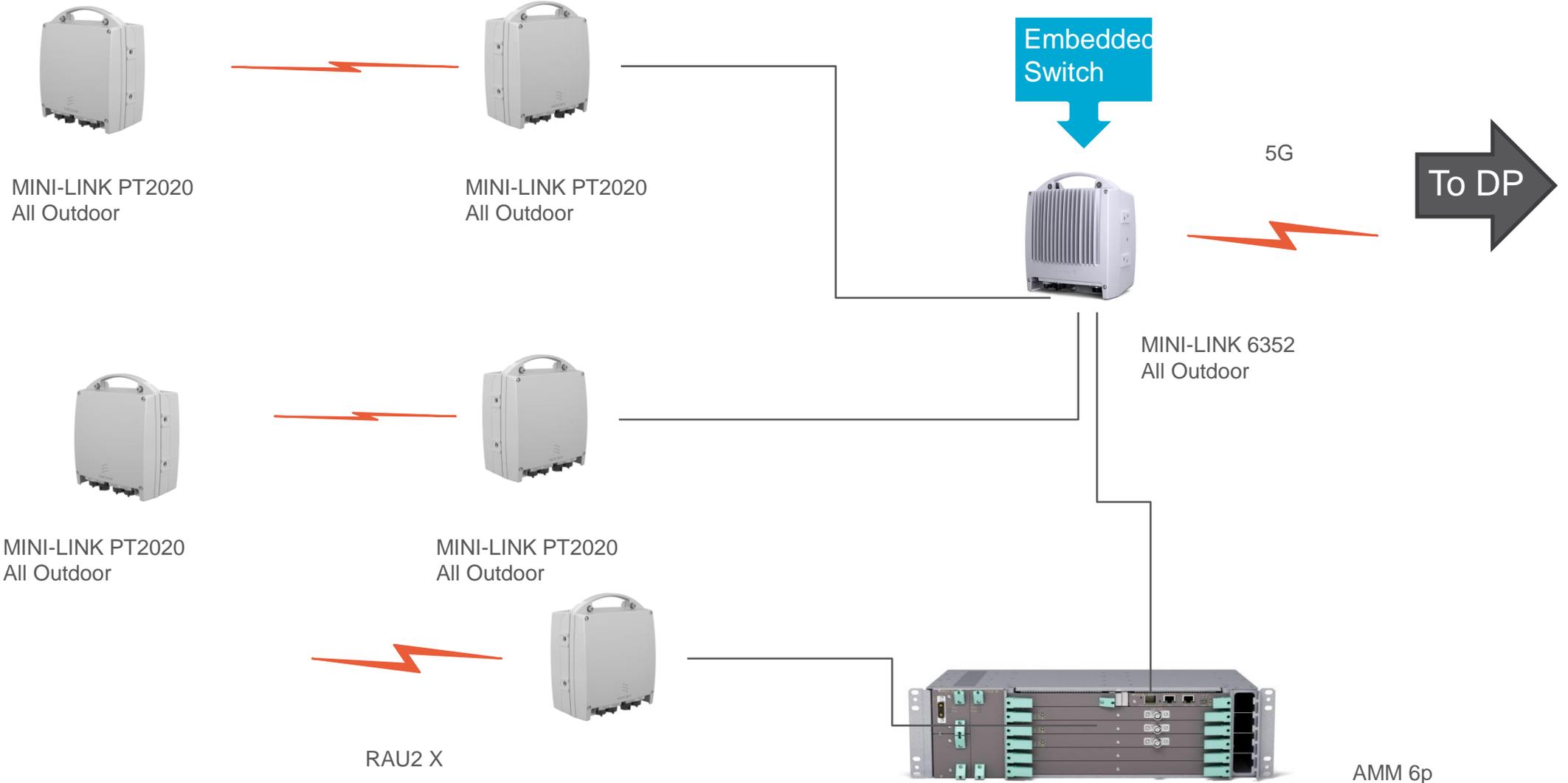
To DP

RAU2 X

AMM 6p

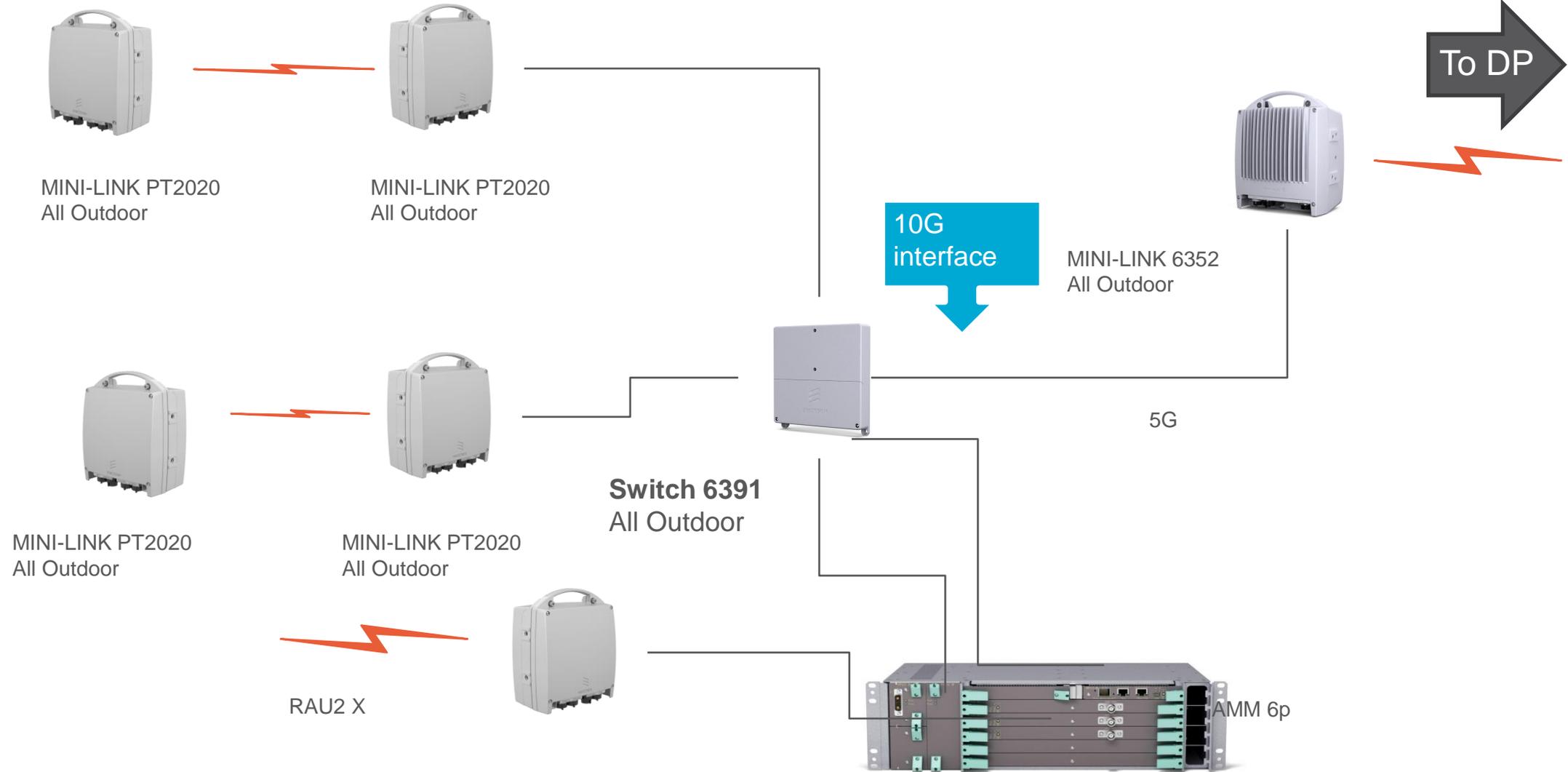
MINI-LINK TN with MINI-LINK PT 2020 & Switch 6391

# MINI-LINK OUTDOOR SOLUTION (3)



MINI-LINK TN with MINI-LINK PT 2020 & MINI-LINK 6352

# MINI-LINK OUTDOOR SOLUTION (4)



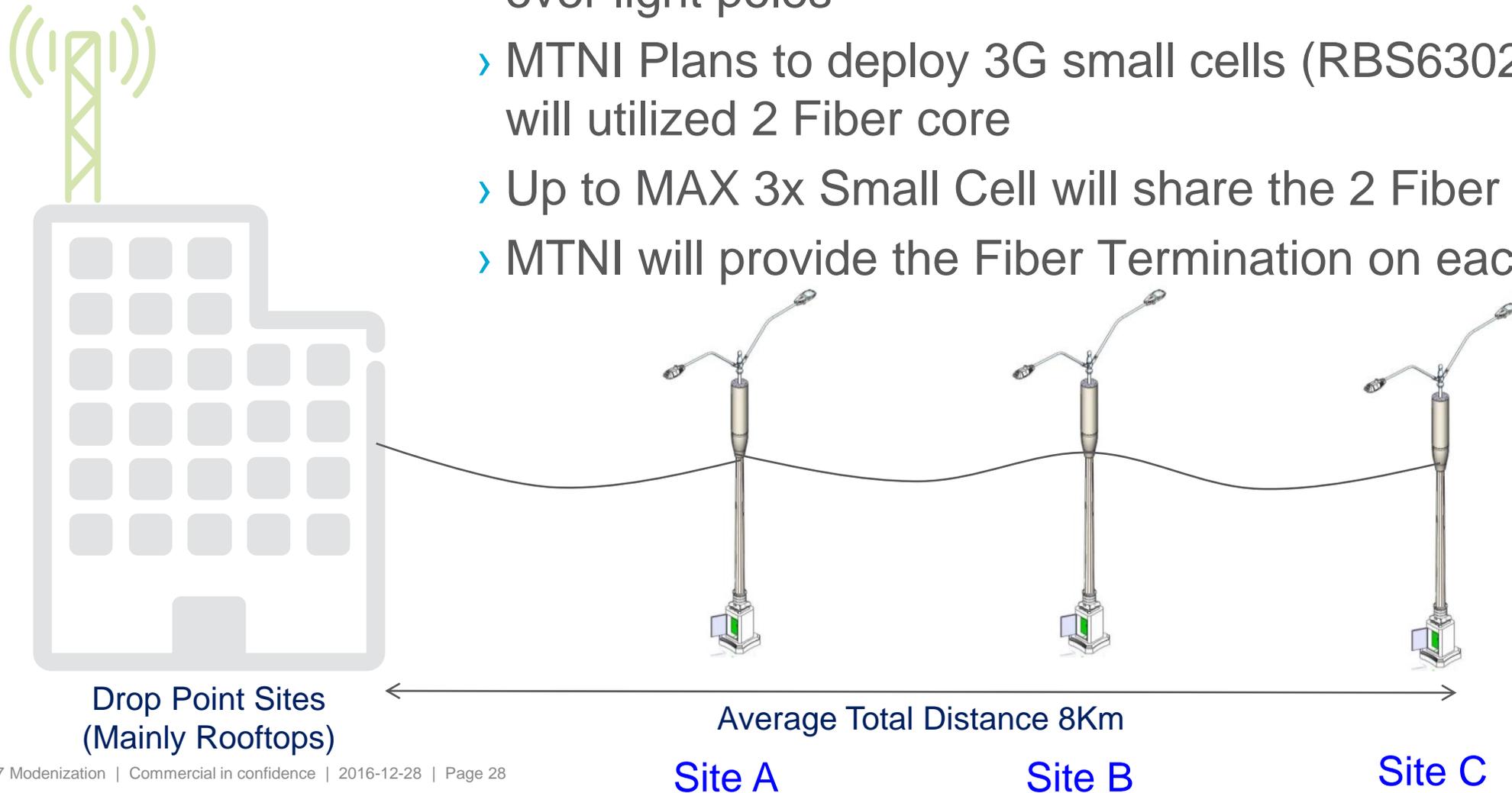
MINI-LINK TN with MINI-LINK PT 2020, MINI-LINK 6352 & Switch 6391

# MICRO SITES FIBER BACKHAUL SOLUTION

# BACKGROUND



- › MTNI Drop Point Sites are Connected via Aerial Fiber over light poles
- › MTNI Plans to deploy 3G small cells (RBS6302), and will utilize 2 Fiber core
- › Up to MAX 3x Small Cell will share the 2 Fiber Core
- › MTNI will provide the Fiber Termination on each site



# SOLUTION ASSUMPTIONS

MNTI CLARIFICATION MEETING 13-DEC-2016



## › Inputs confirmed by MTNI:

- Totally 60 Drop Points (DP) exist in Tehran and thus 59 segments in between
- One Fiber pair is available between each 2 Drop Points (DP) or in each Segment
- LC type connection available in OTN
- Multi (up to 3) 1Gbps ports available in OTN and corresponding SFPs
- It was agreed that Max of 3 Micro Sites per line/segment will be possible

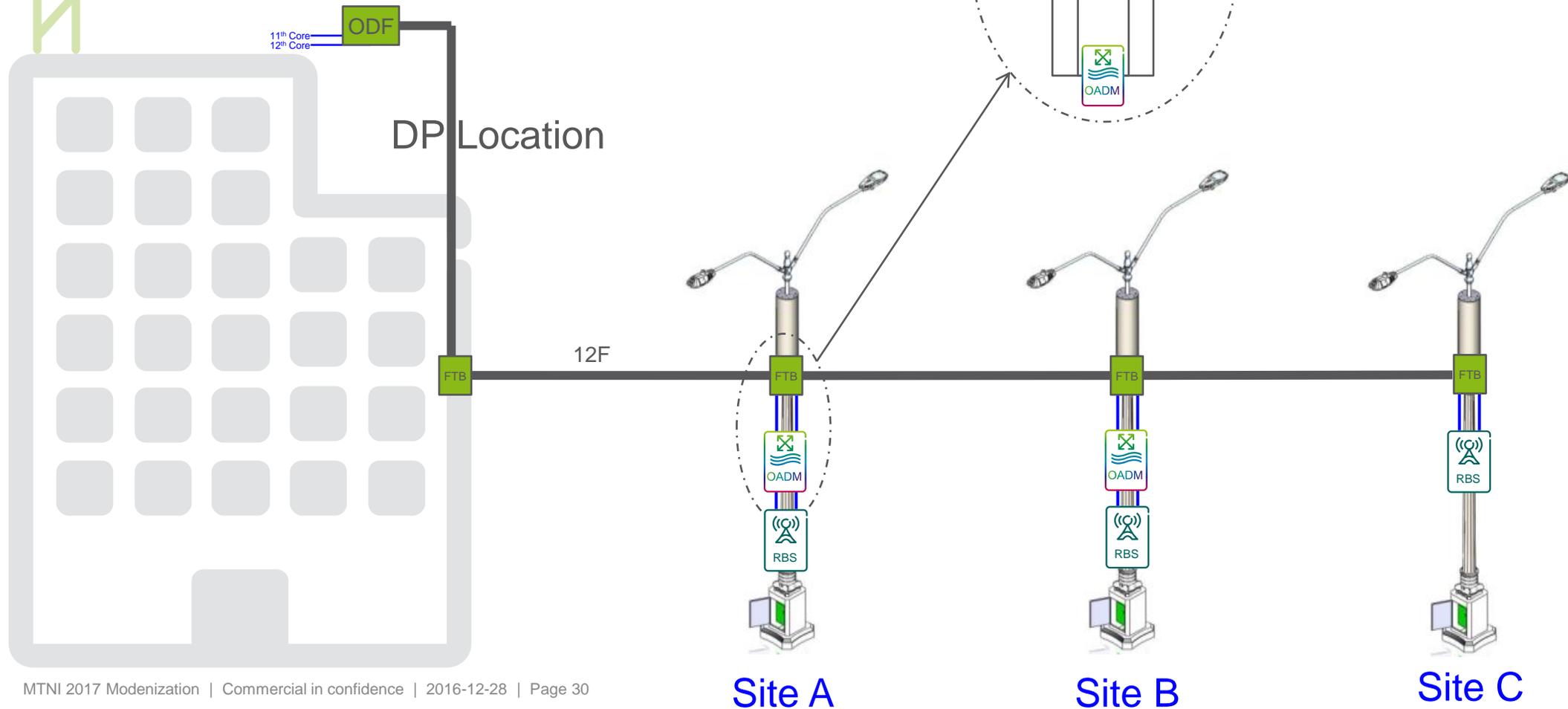
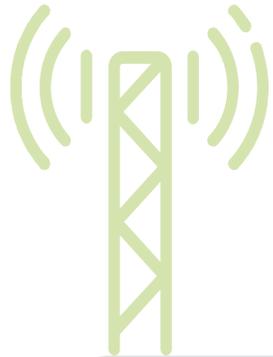
## › Agreed Solution:

- Ericsson will be quoting for the following:
  - › 100x Outdoor Filters to be used at sites locations when needed
  - › 50x Indoor Filters to be used in DPs locations
  - › 1Gbps SFPs for the complete solution (8Km SFPs are preferable if possible)
  - › LC-LC up to 10m patch cords (between RBS6302/DUW and filter and between indoor filter and OTN)
  - › Installation, Configuration services
- MTNI will be securing the following
  - › Radio HW, Site materials (i.e. antennas, cables, jumpers, CPRI fibers...) and Power cabinets with related cabling (i.e. PBC02, DC cables, AC cables...)
  - › OTN SFPs (GigE Grey SFP) – at least 3 per OTN
  - › AC power source
  - › Access to poles and poles selection
  - › Junction boxes and Fiber slicing services at filters location
  - › Fiber pair availability at the location of the site toward the DP
  - › Fixed radio planning (sites location) to be followed.



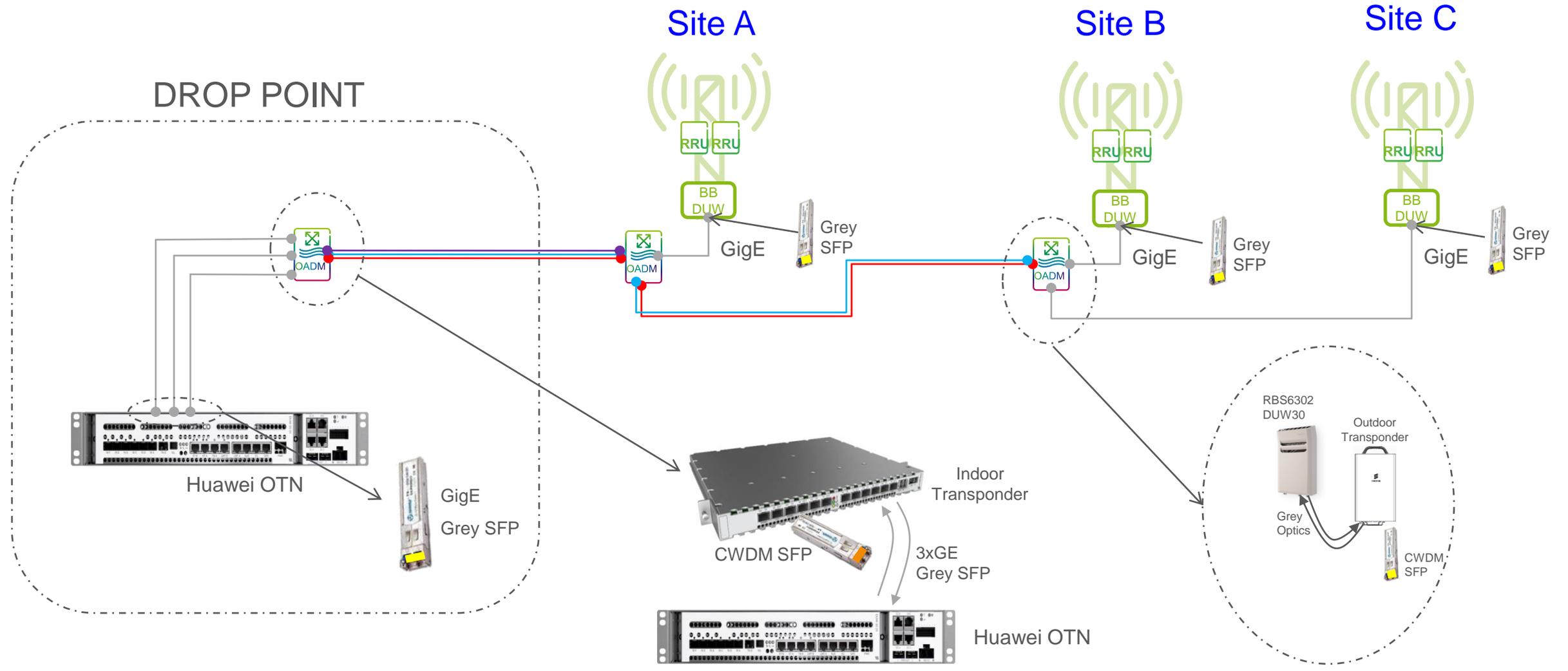
# FIBER SCHEMATIC

*“Schematic showing Fiber Core 11 & 12 assigned for small cell backhaul”*



# ARCHITECTURE

## RBS NOT SUPPORTING CWDM SFP



# BOQ

## MICRO SITES FIBER BACKHAUL



### › 50 x Sites for Drop Points

- Serving up to 3 Small/micro sites
- Total of 150 Small Sites

### › 50 x Site A

### › 50 x Site B

### › 50 x Site C

Description	Quantity
<b>Small Cell Fiber Backhaul - Drop Point</b>	
Small Cell Fiber Backhaul - Drop Point	50
Small Cell Fiber Backhaul - SW License	50
<b>Small Cell Fiber Backhaul - Site-A</b>	
Small Cell Fiber Backhaul - Site-A	50
RBS6302 - SFP 1000BaseLX, 10km	50
<b>Small Cell Fiber Backhaul - Site-B</b>	
Small Cell Fiber Backhaul - Site-B	50
RBS6302 - SFP 1000BaseLX, 10km	50
<b>Small Cell Fiber Backhaul - Site-C</b>	
Small Cell Fiber Backhaul - Site-C	50
RBS6302 - SFP 1000BaseLX, 10km	50

# INDOOR – AT DP LOCATION

## FRONTHAUL6688

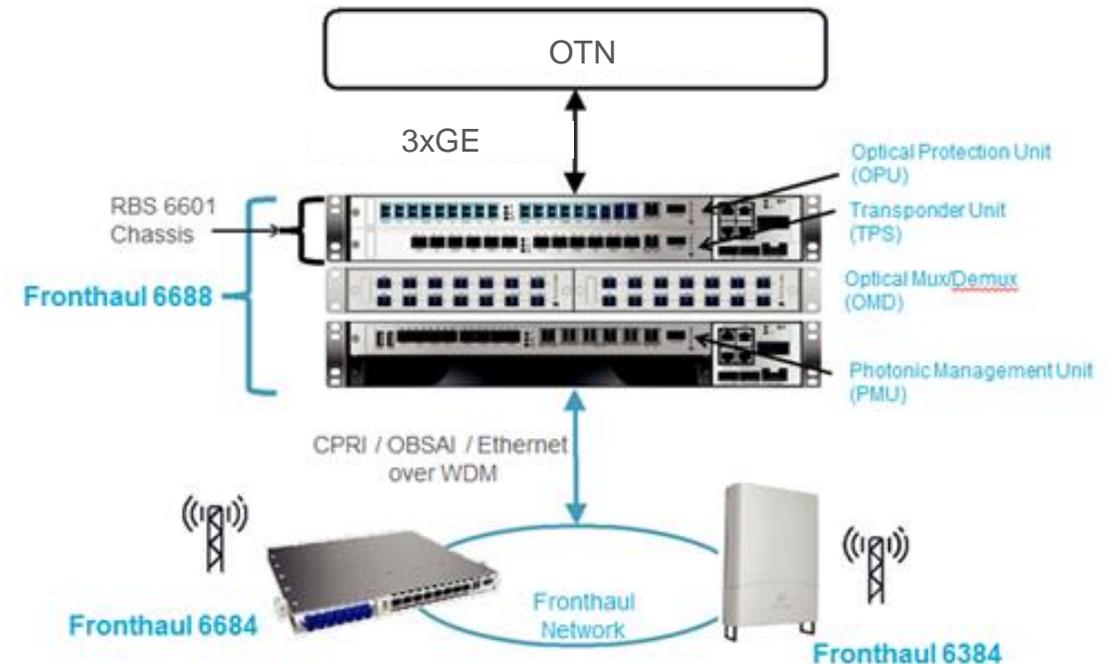


### > Physical

- Fronthaul 6688 (RBS 6601) Chassis for Active Modules: 2 slots; 1.5 RU (66 mm) x 19 inch (483 mm) x 350 mm
- Fronthaul 6688 Chassis for Passive Modules: 4 slots, 1 RU (44.4mm) x 19 inch (483 mm) x 222 mm

### > Power

- -48 V DC
- Power consumption depends on the configuration: to terminate one ring with 4 fully configured remote sites: 185W (typical), 210W (max)



# OUTDOOR – AT SITE LOCATION

## FRONTHAUL6384 - TRANSPONDER



### › Power

- -48 V DC
- Consumption: 22 W

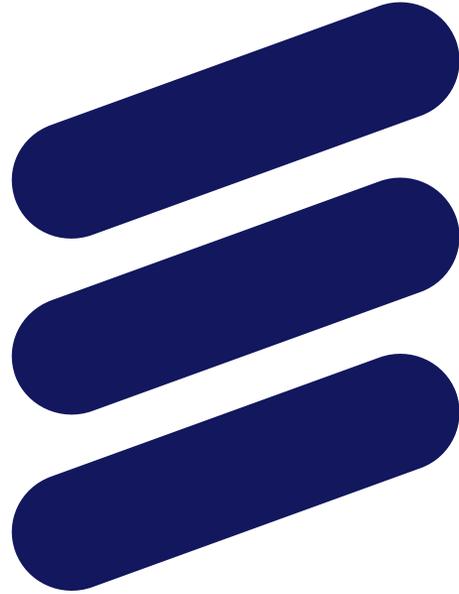
### › Dimensions

- Transponder & OAD enclosure:
  - › 427 x 240 x 62mm (without solar shield and handle)
  - › 535 x 269 x 115mm (with solar shield and handle)

### › Weight

- Transponder & OAD enclosure:
  - › 8.1 kg (without solar shield and handle)
  - › 9.1 kg (with solar shield and handle)





**ERICSSON**