

DAQ architecture - networking

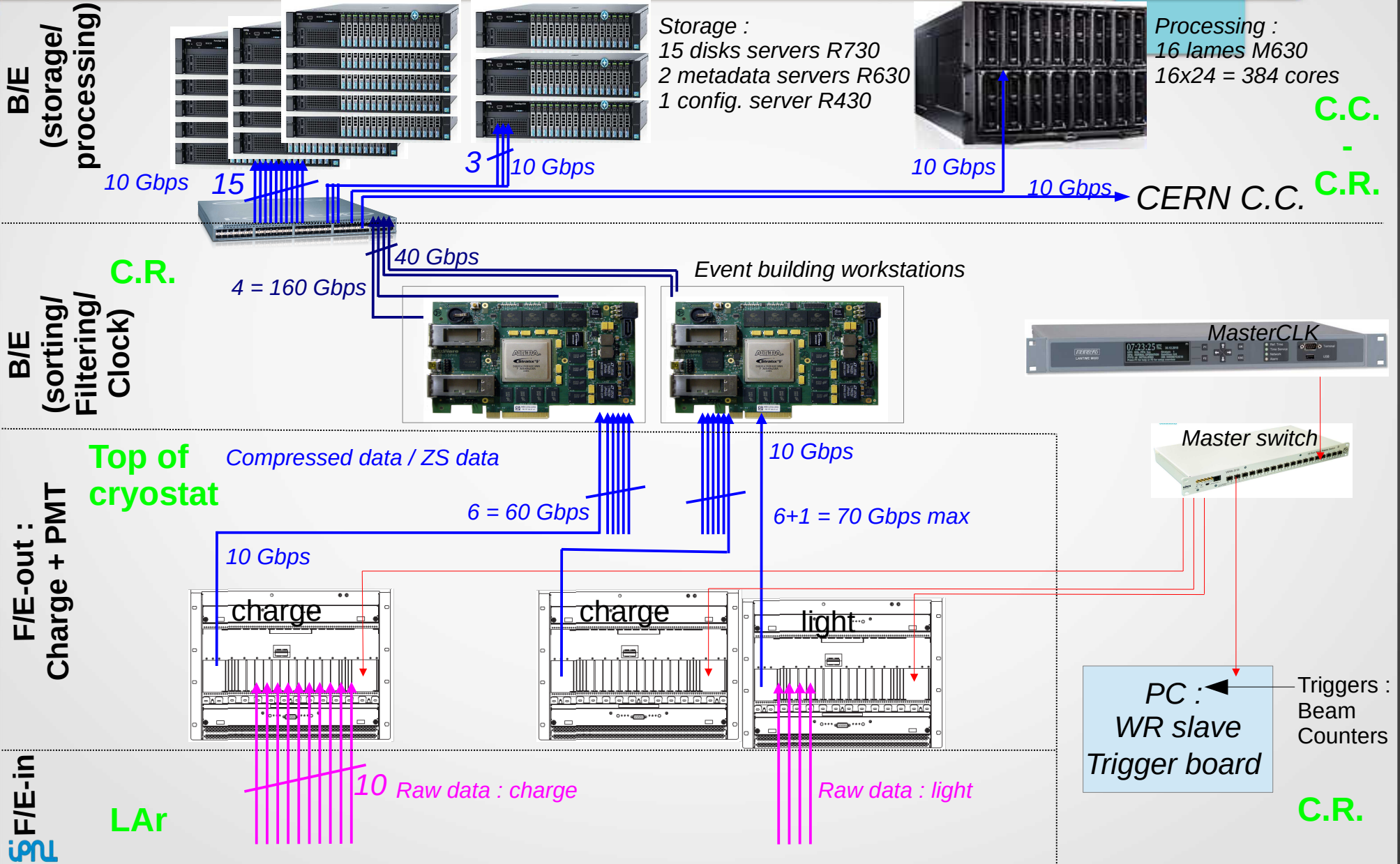
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DUNE DAQ WG

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WA105 data network

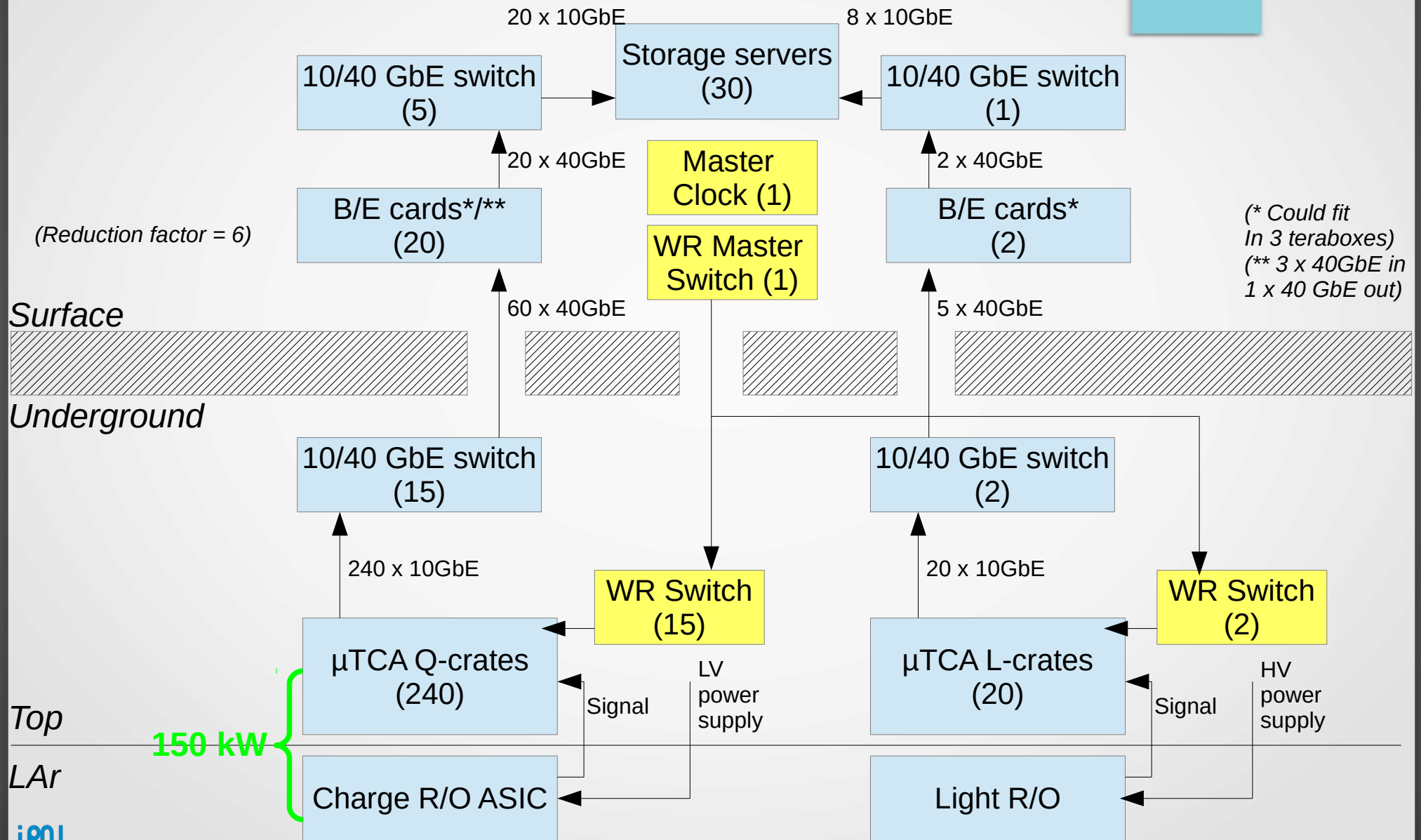


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-
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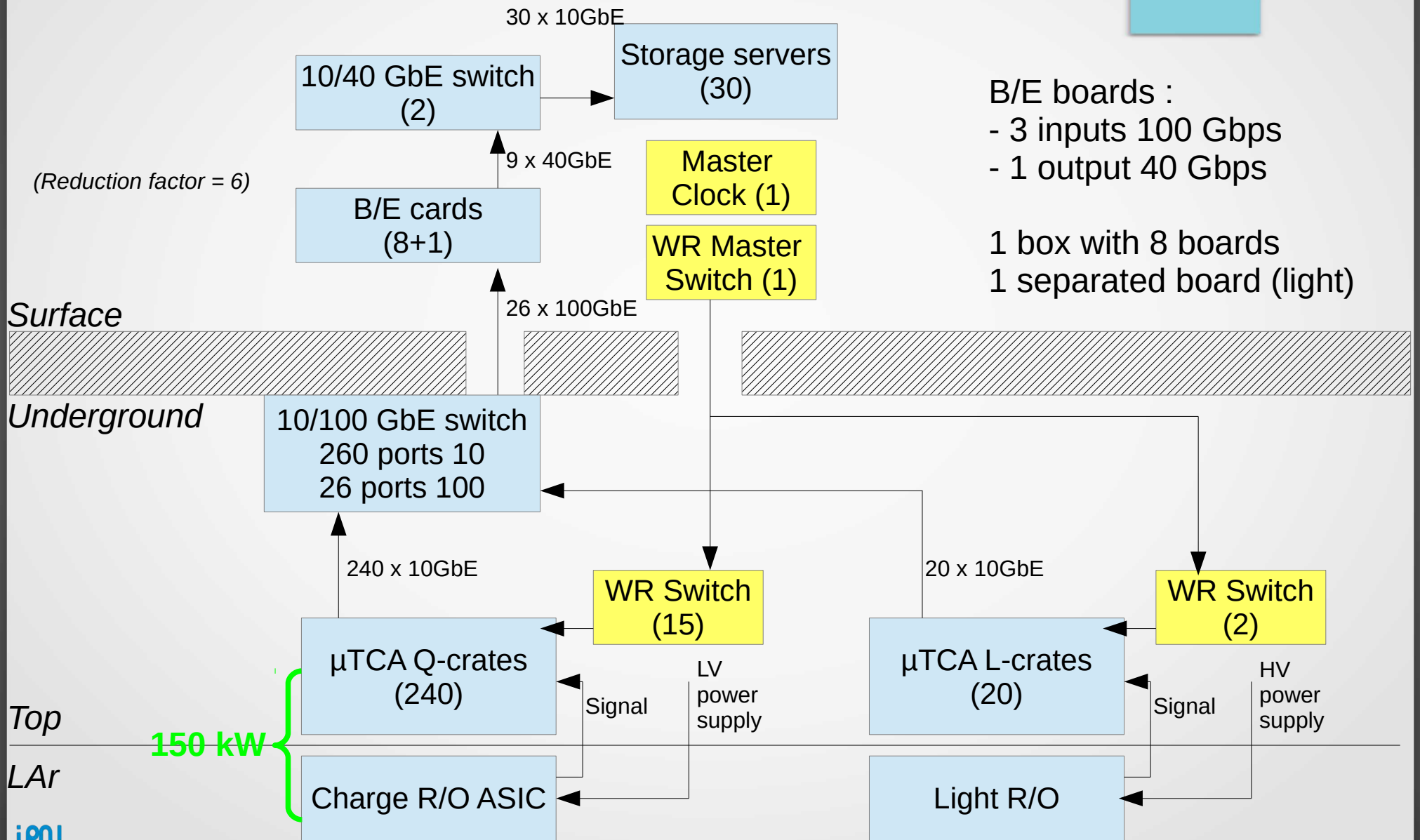
C.R.



DUNE proposed scheme



DUNE proposed scheme



B/E boards :
 - 3 inputs 100 Gbps
 - 1 output 40 Gbps

1 box with 8 boards
 1 separated board (light)

10/40 switches specs.

Brocade ICX 7750 Switches



All Brocade ICX 7750 Switches offer two slots for load-sharing, redundant power supplies, four fan slots, one RJ-45 network management port, one mini USB serial management port, and one USB storage port.

Brocade ICX 7750-26Q	26×40 GbE QSFP+ ports
Brocade ICX 7750-48F	48×1/10 GbE SFP+ ports and 6×40 GbE QSFP ports
Brocade ICX 7750-48C	48×1/10 GbE RJ-45 10GBASE-T ports and 6×40 GbE QSFP ports

Brocade ICX 7750 Port Options

All Brocade ICX 7750 Switches offer one modular interface slot in the back of the unit for additional ports.

ICX7750-6Q module	6×40 GbE QSFP+ module
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Brocade ICX 7750 Power Supply Options

The Brocade ICX 7750 offers a selection of AC/DC power supply options with front-to-back or back-to-front airflow cooling options.

RPS9 power supply	500 W AC power supply
RPS9DC power supply	500 W DC power supply

16 k\$

10/40 switches specs.

OPTION 1 : Nexus 3172TQ : 48 ports 1/10G baseT, 6 ports 40G QSFP+
N3K-C3172TQ-10GT Nexus 3172T 48 x 1/10GBase-T and 6 QSFP+ ports

OPTION 2 : Nexus 9372TX : 48 ports 1/10G baseT, 6 ports 40G QSFP+
N9K-C9372TX Nexus 9300 with 48p 1/10G-T and 6p 40G QSFP+

*10 to 12 k€
w. academic
discount*

OPTION 3 : Nexus 9396TX : 48 ports 1/10G baseT, 12 ports 40G QSFP+
N9K-C9396TX Nexus 9300 48p 1/10GBASE-T & additional uplink module req.
N9K-M12PQ ACI Uplink Module for Nexus 9300 12p 40G QSFP

**S4820T, 48 x 10GBaseT + 4 x 40G
QSFP+ Ports, 1 x AC PSU, 2 x Fan, IO
Panel to PSU (Normal) Airflow**

14 k€



Composants

2 European Power Cord for S/C/Z Series

Logiciel

1 Force10 client ne déploiera pas ce commutateur en environnement iSCSI ou FCOE

1 S4820T AC Power Supply, IO Panel to PSU (Normal) Airflow

Service

1 Base Warranty

1 1Yr Return to Depot - Minimum Warranty

1 90 Day SW Bug Fixes Support & Media Replacement

1 3Yr ProSupport Force10 Next Business Day Service On-Site

1 INFO Export Compliance Rules must be followed

10/100 switches specs

Brocade MLX Series at a Glance

Features	MLXe-4	MLXe-8	MLXe-16	MLXe-32
Interface slots	4	8	16	32
Switch fabric capacity	1.92 Tbps	3.84 Tbps	7.68 Tbps	15.36 Tbps
Data forwarding capacity	1.6 Tbps	3.2 Tbps	6.4 Tbps	12.8 Tbps
Packet routing performance	1.19 billion pps	2.38 billion pps	4.75 billion pps	9.5 billion pps
Maximum 100 GbE ports	8	16	32	64
Maximum 40 GbE ports	16	32	64	128
Maximum 10 GbE ports	96	192	384	768
Maximum 1 GbE ports	192	384	768	1,536
Height (inches/rack units)	8.71 in./3RU	12.21 in./7RU	24.50 in./14RU	57.75 in./33RU
Management module redundancy	1:1	1:1	1:1	1:1
Switch fabric redundancy	N+1	N+1	N+1	N+1
Power supply redundancy	1+1	1+1	1+1	1+1
Airflow	Side to back	Side to back	Front to back	Front to back

Brocade MLX Series Power Specifications

	MLXe-4	MLXe-8	MLXe-16	MLXe-32
Maximum DC power consumption (W)	2,083	4,060	7,107	14,232
Maximum AC power consumption (W) (100-240 VAC)	2,083	4,060	7,107	14,232
Maximum thermal output (BTU/HR)	7,108	13,858	24,255	48,575

Brocade MLX Series Physical Specifications

Model	Dimensions	Weight
Brocade MLXe-4	17.20 in. W x 8.71 in. H x 23.0 in. D (43.69 cm x 22.12 cm x 58.42 cm)	117 lb (53 kg)
Brocade MLXe-8	17.20 in. W x 12.21 in. H x 24.0 in. D (43.69 cm x 31.01 cm x 60.96 cm)	171 lb (78 kg)
Brocade MLXe-16	17.20 in. W x 24.47 in. H x 24.18 in. D (43.69 cm x 62.15 cm x 61.42 cm)	351 lb (159 kg)
Brocade MLXe-32	17.45 in. W x 57.75 in. H x 26.88 in. D (44.32 cm x 146.69 cm x 68.28 cm)	505 lb (229 kg)

DUNE dual phase :
- 240 10Gbps links
for charge
- 20 10Gbps links
for light

(7 kW)

10/100 switches specs

Nexus 9500 Chassis	Cisco Nexus 9504 Switch	Cisco Nexus 9508 Switch	Cisco Nexus 9516 Switch
Form factor	7 RU	13 RU	21 RU
Line card slots	4	8	16
Supervisor slots	2	2	2
Fabric module slots	6	6	6
ACI support	Yes	Yes	Yes
Bandwidth per slot (Tbps)	3.84	3.84	3.84
Bandwidth per system (Tbps)	15	30	60
Maximum number of 1/10G BASE-T ports	192	384	768
Maximum number of 10 GE ports	576	1152	2304
Maximum number of 40 GE ports	144	288	576
Maximum number of 100GE ports	32	64	128
Airflow	Front to back	Front to back	Front to back
Power supplies (3-kW AC)	Up to 4	Up to 8	Up to 10
Fan trays	3	3	3

(12 kW)

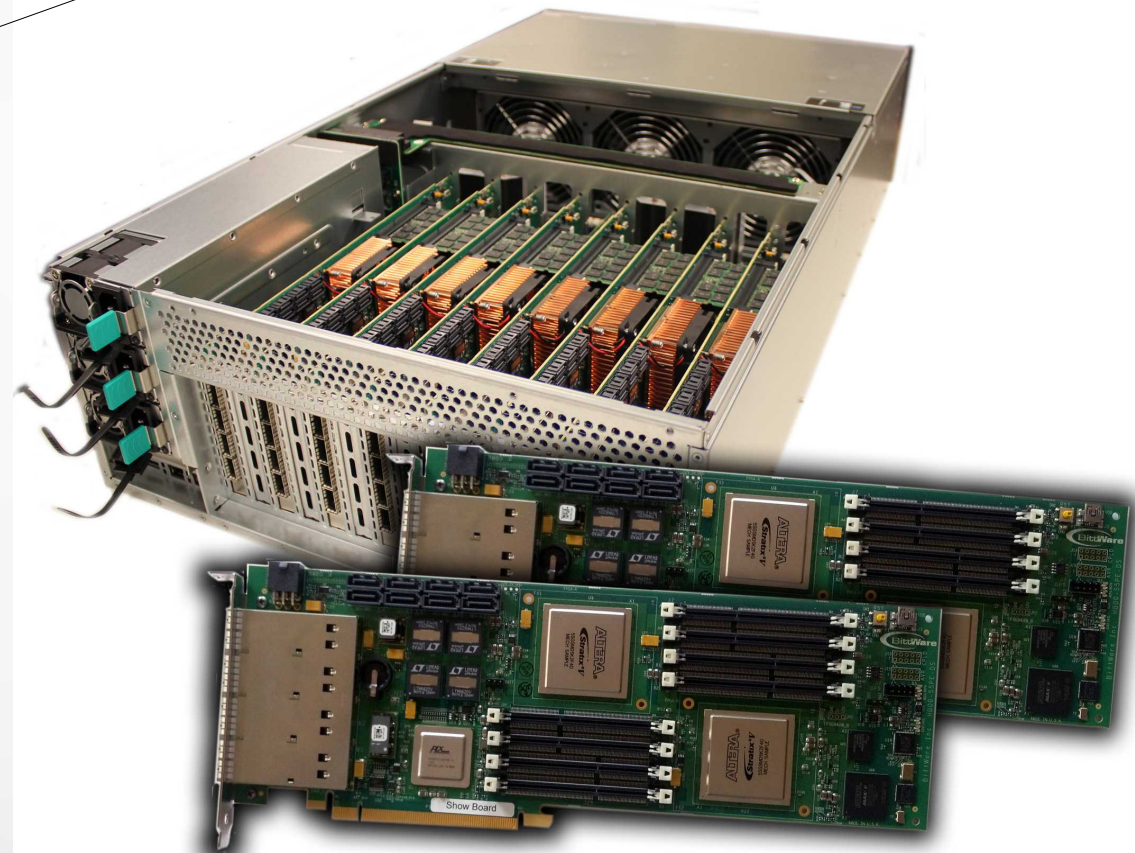
DUNE dual phase :
 - 240 10Gbps links for charge
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DUNE B/E board

Terabox

- 24 TeraFLOPS processing: 16x Altera Arria 10 or Stratix V FPGAs
Up to 18 million logic elements (Arria 10 GX)
Up to 62,000 multipliers (Stratix V GS)
Dual card wrt WA105 cards
New FPGA-board with Stratix X available by the time of DUNE
- 1.28 Terabits/sec I/O
- 128x 10GigE, 32x 40GigE, 32x 100 GigE,
or 32x QDR Infiniband
- 6.5 Terabits/sec memory bandwidth
Up to 64 banks DDR3-1600 (512 GBytes)
DDR4, QDR-IV, QDRII+, and RLDRAM3 memory options
- 4U or 5U Rackmount PCIe system
(server, industrial, or expansion)
Dual socket Intel Ivy Bridge with up to 12 cores
Up to 768 GBytes of system memory
8 Gen3 x16 PCIe slots
- Complete software support
Windows and Linux 64 drivers, interface libraries, and
hardware management
FPGA development kit for Arria 10 and Stratix V

4 fibres per board : 3 R / 1 W



Power estimate

ITEM	CONSUMPTION	# of UNITS	TOTAL (kW)
TOTAL F/E			150 kW
• B/E cards (terabox)	• 1.5 kW max.	2	3.0
• Switch (10/100 GbE)	• 12 kW max.	1	12
• Switch (10/40 GbE)	• 0.35 kW max.	2	0.7
• WR switch	• 0.3 kW typ.	18	5.4
• B/E storage	• 0.7 max. / 0.35 meas.	30	10.5
• B/E configuration	• 0.4 kW max.	6	2.4
• B/E online proc.	• 3 kW max.	2	6.0
TOTAL B/E			40.0

Underground.vs.surface :

$(150+12+17 \times 0.3).$ vs. $(3.0+2 \times 0.35+1 \times 0.3+18.9) = \mathbf{167.1}$.vs. $\mathbf{22.9}$

Comments

- Simplified network architecture with 100GbE standards already available on the market.
- Making the exercise one goes from ~20 switches down to 1 !
- Prices will decrease...
- *Position of the WR Master Switch may be moved underground if GPS timing is available there.*
- *Estimate of the F/E power is at the limit, very conservative as well.*
- The total power consumption is estimated below 200kW for the double phase option, 80 % of which go underground.