Proposal for integrating the network switch function into BEC
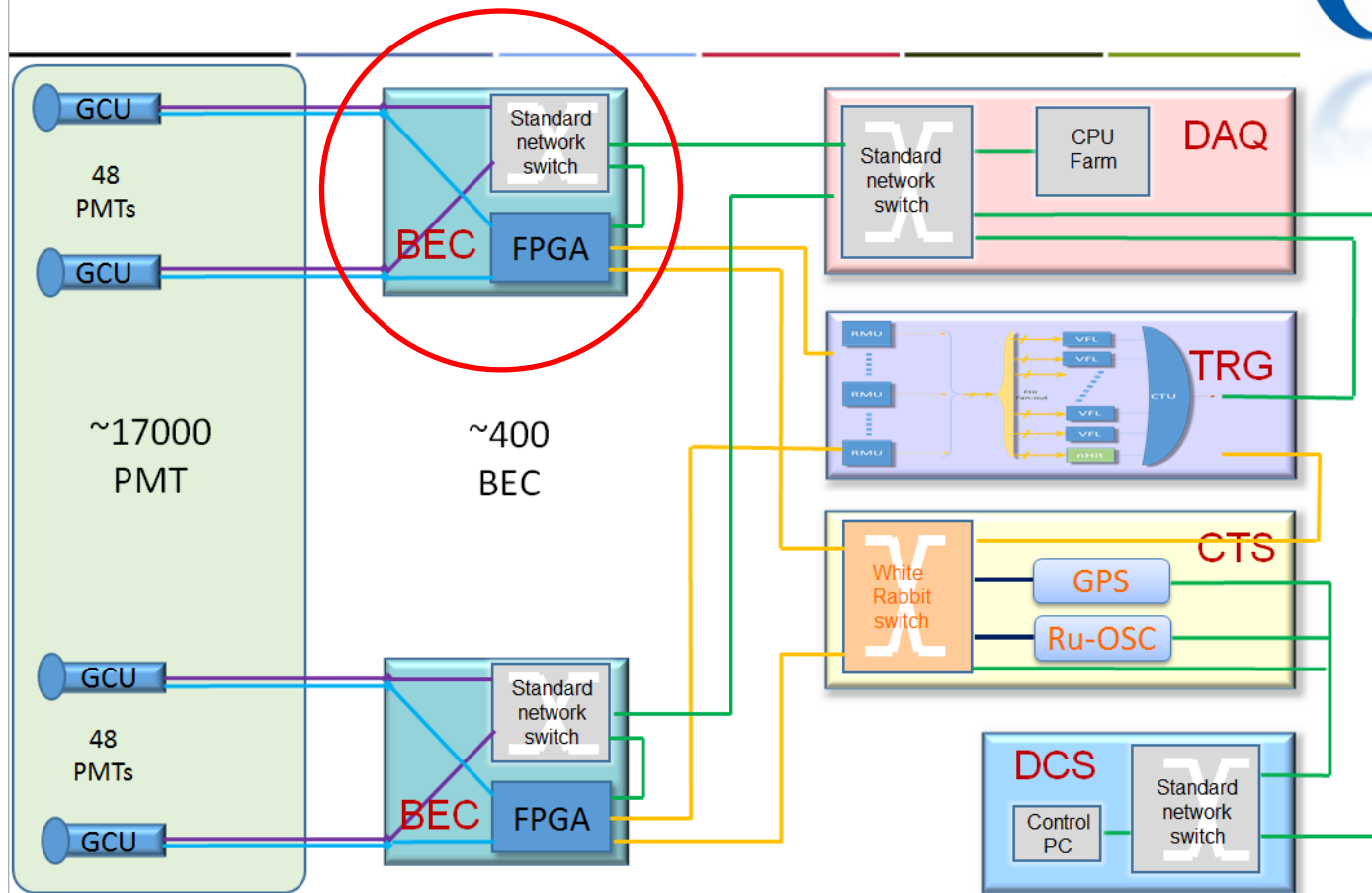
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2016-11-14

JUNO workshops in Brussels

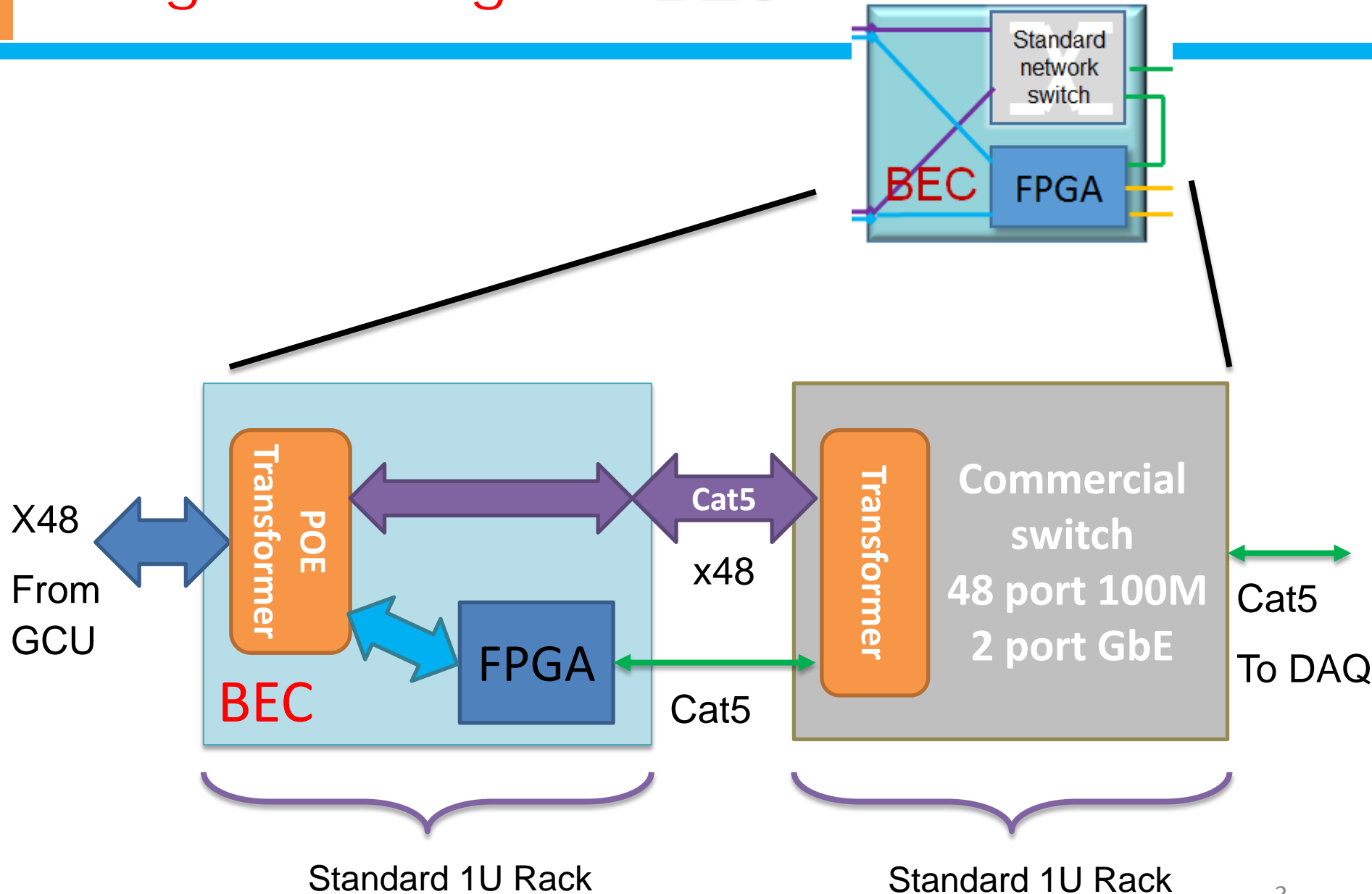# Location

From Overview of JUNO Trigger/Timing system, by _Guanghua Gong_
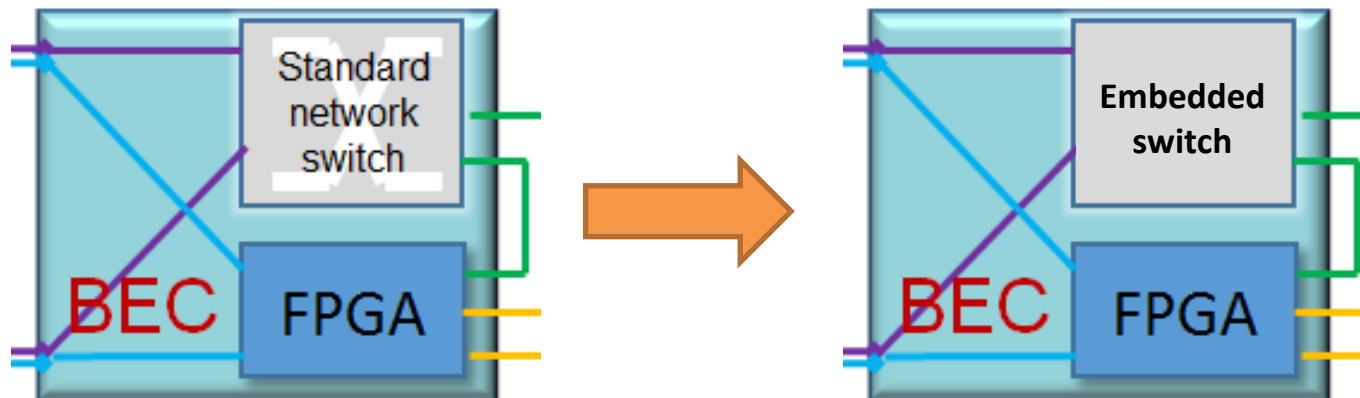
Original design of **BEC**

Motivation

Integrate the network switch function into BEC

- Improve reliability

  – Eliminate the Ethernet cables, total 17000, between BEC and standard network switch.

- Save space

  – Keep the BEC in standard 1U rack.

Requirement

- Switch with 48 10/100 Ports and at least two GbE Ports

- Daughter board / mezzanine card
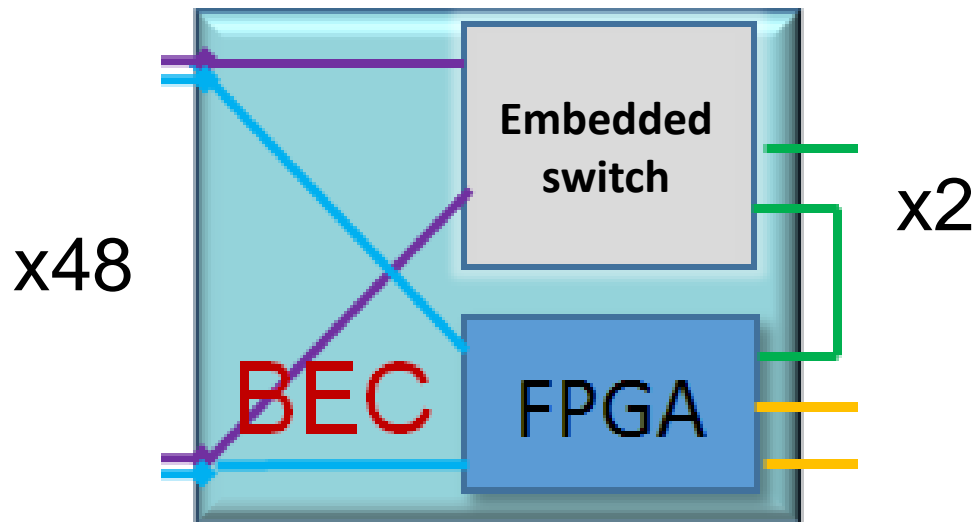
Design Concept

- Use Broadcom Chip: BCM53286M
  - Tenth-generation L2+ Fast Ethernet (FE) switch with the following interfaces:
    - 24-port 10/100 transceivers for TX/RX supporting auto power-down modes
    - 24 MAC and one MAC/GMAC for IMP
    - 4 x GbE (SGMII/SerDes)
    - 1.5 MB packet buffer and control memory
    - Management port with RvMII/MII or RGMII interface
  - Nonblocking switch fabric
  - MAC Address Learning:
    - 16K MAC addresses: automatic learning and aging
    - 4K-entry multicast address table
    - Enable/disable MAC learning based on per-port, per-VLAN or per-packet flow (Compact Field Processor)
  - Virtual Multicast Packet Replication

Design Concept
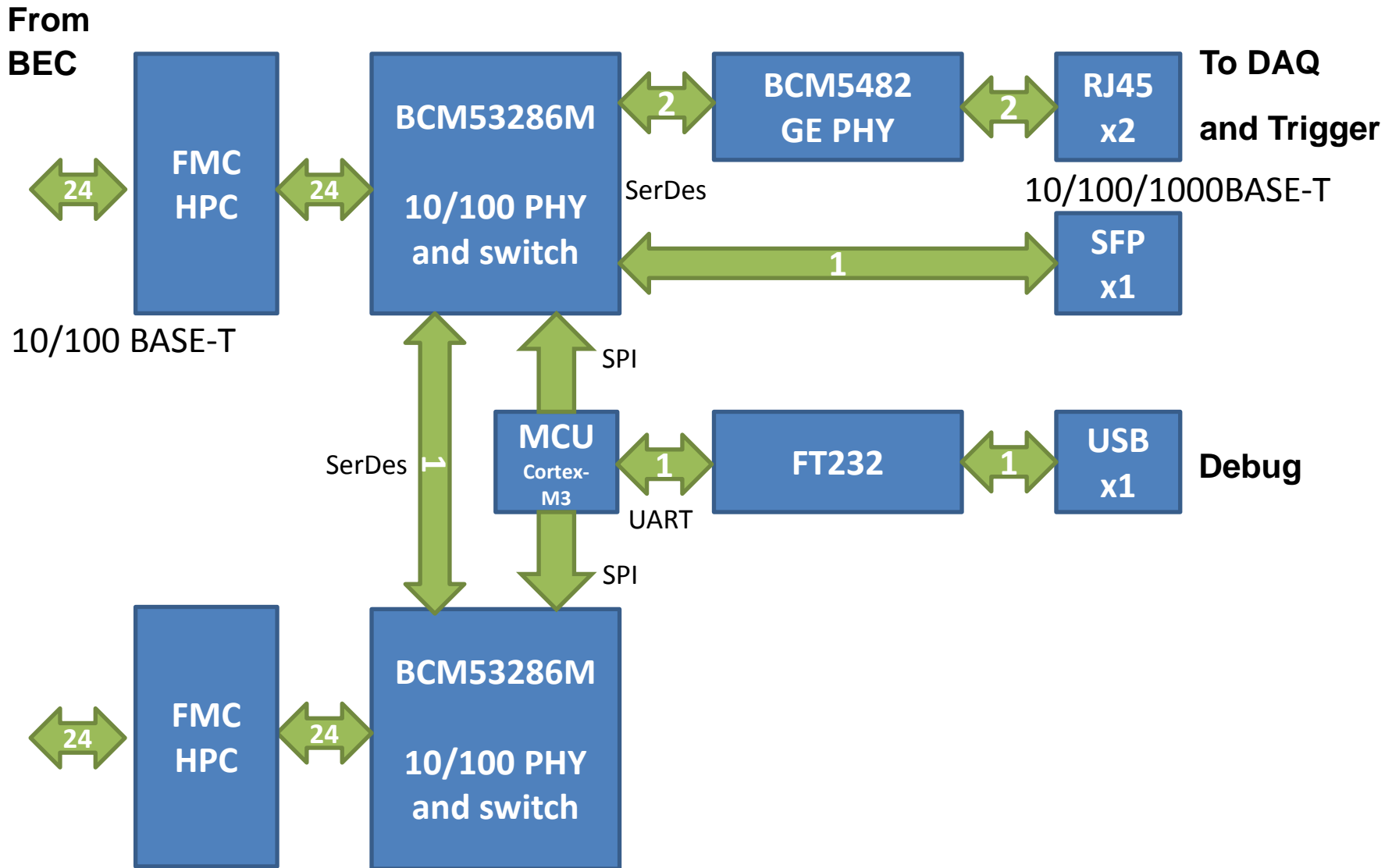
Dimension

- **Double Width Mezzanine Module**

  – 76.5 mm x 139 mm

Figure 2. Typical example of double width commercial grade FMC Module

- From ANSI/VITA 57.1-2008

- We will have two FMC HPC.

- Each of FMC has 24-port Ethernet.
  - The transformers for 100Mbit POE are in BEC motherboard.

- LA00~23 are defined as M2C, which means send signals from switch board to BEC board.
  - M means mezzanine, which is switch board;
  - C means carrier, which is switch board.

- HA00~23 are defined as C2M
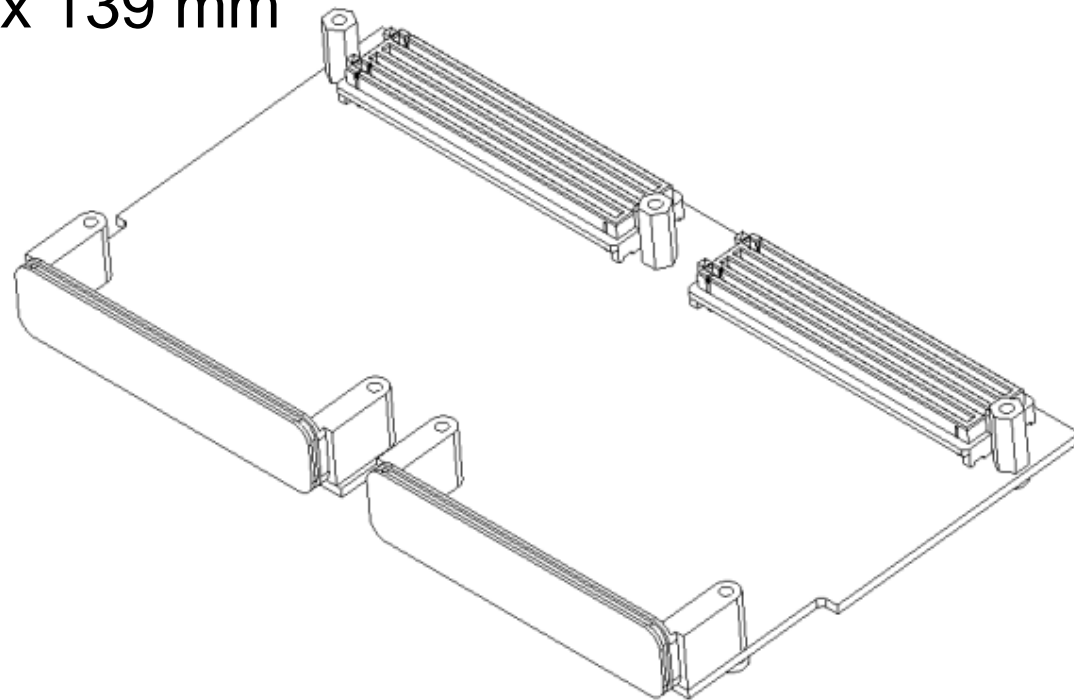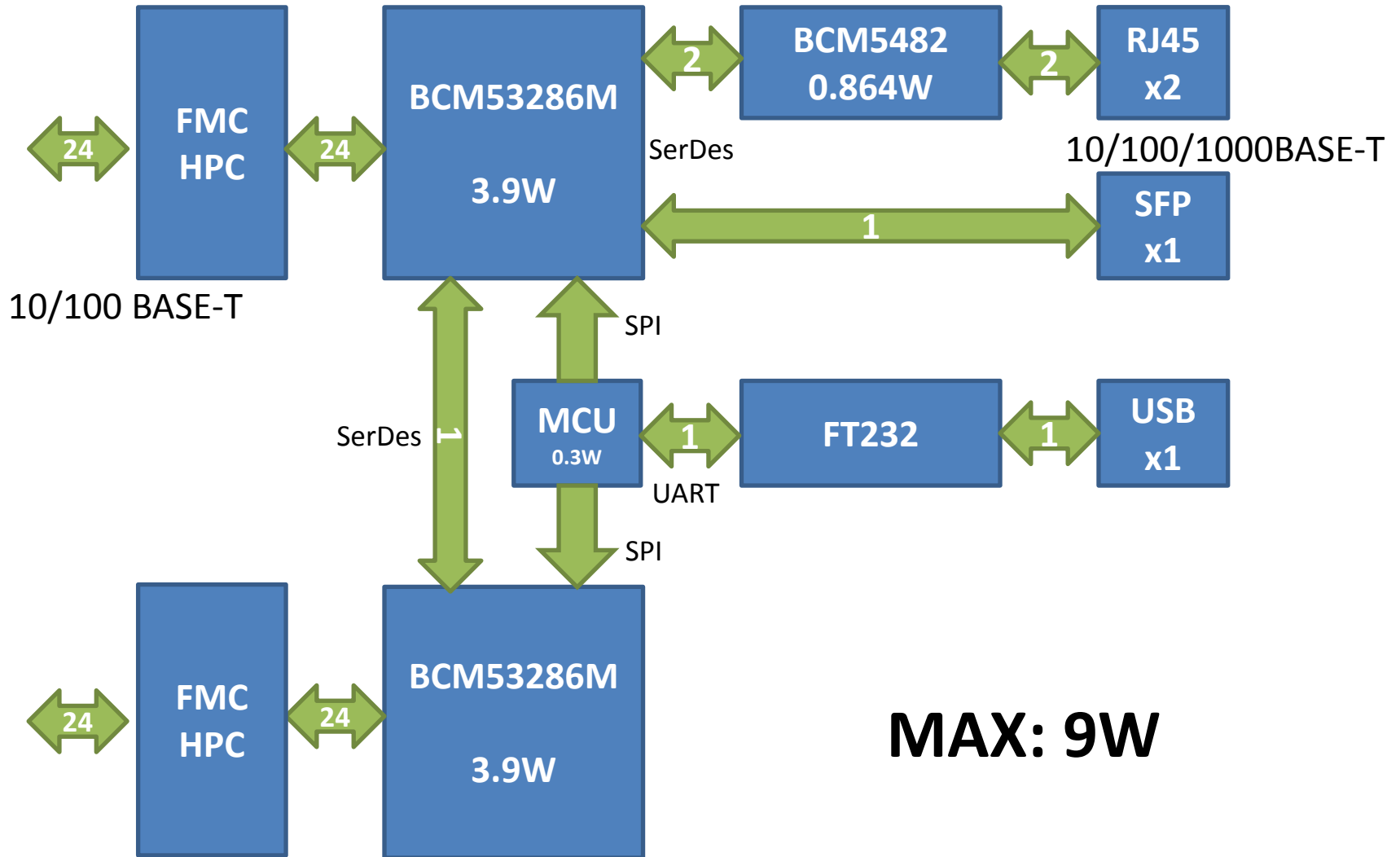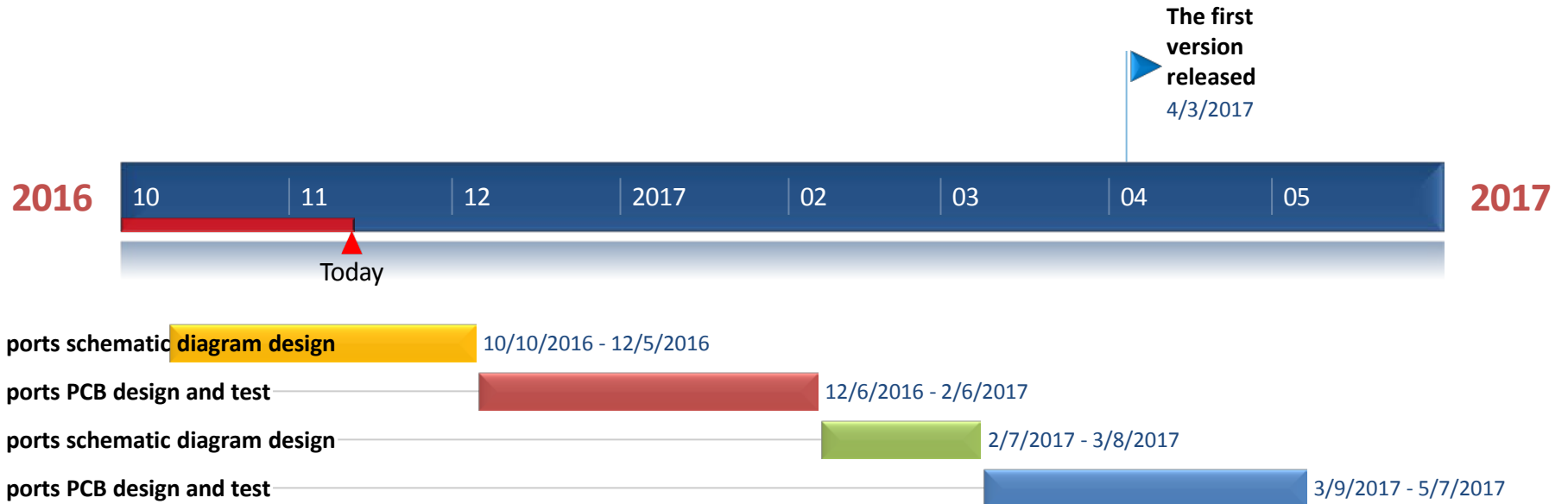
- HB00~21 and LA32, 33 are used to indicate the link status.
  - Low when link is established and up

- 12P0V and 3P3V are provided by BEC board.

- GA0, GA1 may be used for set the address by BEC.

- PG_M2C is used as switch board is ready to BEC.

	K	J	H	G	F	E	D	C	B	A
1	NC	GND	NC	GND	PG_M2C	GND	NC	GND	NC	GND
2	GND	NC	NC	NC	GND	C2M01_P	GND	NC	GND	NC
3	GND	NC	GND	NC	GND	C2M01_N	GND	NC	GND	NC
4	NC	GND	NC	GND	C2M00_P	GND	NC	GND	NC	GND
5	NC	GND	NC	GND	C2M00_N	GND	NC	GND	NC	GND
6	GND	C2M03_P	GND	M2C00_P	GND	C2M05_P	GND	NC	GND	NC
7	C2M02_P	C2M03_N	M2C02_P	M2C00_N	C2M04_P	C2M05_N	GND	NC	GND	NC
8	C2M02_N	GND	M2C02_N	GND	C2M04_N	GND	M2C01_P	GND	NC	GND
9	GND	C2M07_P	GND	M2C03_P	GND	C2M09_P	M2C01_N	GND	NC	GND
10	C2M06_P	C2M07_N	M2C04_P	M2C03_N	C2M08_P	C2M09_N	GND	M2C06_P	GND	NC
11	C2M06_N	GND	M2C04_N	GND	C2M08_N	GND	M2C05_P	M2C06_N	GND	NC
12	GND	C2M11_P	GND	M2C08_P	GND	C2M13_P	M2C05_N	GND	NC	GND
13	C2M10_P	C2M11_N	M2C07_P	M2C08_N	C2M12_P	C2M13_N	GND	GND	NC	GND
14	C2M10_N	GND	M2C07_N	GND	C2M12_N	GND	M2C09_P	M2C10_P	GND	NC
15	GND	C2M14_P	GND	M2C12_P	GND	C2M16_P	M2C09_N	M2C10_N	GND	NC
16	C2M17_P	C2M14_N	M2C11_P	M2C12_N	C2M15_P	C2M16_N	GND	GND	NC	GND
17	C2M17_N	GND	M2C11_N	GND	C2M15_N	GND	M2C13_P	GND	NC	GND
18	GND	C2M18_P	GND	M2C16_P	GND	C2M20_P	M2C13_N	M2C14_P	GND	NC
19	C2M21_P	C2M18_N	M2C15_P	M2C16_N	C2M19_P	C2M20_N	GND	M2C14_N	GND	NC
20	C2M21_N	GND	M2C15_N	GND	C2M19_N	GND	M2C17_P	GND	NC	GND
21	GND	C2M22_P	GND	M2C20_P	GND	LINK#3	M2C17_N	GND	NC	GND
22	C2M23_P	C2M22_N	M2C19_P	M2C20_N	LINK#2	ACT#3	GND	M2C18_P	GND	NC
23	C2M23_N	GND	M2C19_N	GND	ACT#2	GND	M2C23_P	M2C18_N	GND	NC
24	GND	LINK#1	GND	M2C22_P	GND	LINK#5	M2C23_N	GND	NC	GND
25	LINK#0	ACT#1	M2C21_P	M2C22_N	LINK#4	ACT#5	GND	GND	NC	GND
26	ACT#0	GND	M2C21_N	GND	ACT#4	GND	NC	NC	GND	NC
27	GND	LINK#7	GND	NC	GND	LINK#9	NC	NC	GND	NC
28	LINK#6	ACT#7	NC	NC	LINK#8	ACT#9	GND	GND	NC	GND
29	ACT#6	GND	NC	GND	ACT#8	GND	NC	GND	NC	GND
30	GND	LINK#11	GND	NC	GND	LINK#13	NC	NC	GND	NC
31	LINK#10	ACT#11	NC	NC	LINK#12	ACT#13	NC	NC	GND	NC
32	ACT#10	GND	NC	GND	ACT#12	GND	NC	GND	NC	GND
33	GND	LINK#15	GND	NC	GND	LINK#19	NC	GND	NC	GND
34	LINK#14	ACT#15	NC	NC	LINK#16	ACT#19	NC	GA0	GND	NC
35	ACT#14	GND	NC	GND	ACT#16	GND	GA1	12P0V	GND	NC
36	GND	LINK#18	GND	LINK#23	GND	LINK#21	3P3V	GND	NC	GND
37	LINK#17	ACT#18	LINK#22	ACT#23	LINK#20	ACT#21	GND	12P0V	NC	GND
38	ACT#17	GND	ACT#22	GND	ACT#20	GND	3P3V	GND	GND	NC
39	GND	NC	GND	NC	GND	NC	GND	3P3V	GND	NC
40	NC	GND	NC	GND	NC	GND	3P3V	GND	NC	GND

Power Estimation

Preliminary plan

The first version released
4/3/2017

2016 | 10 | 11 | 12 | 2017 | 02 | 03 | 04 | 05 | **2017**

Today

24 ports schematic diagram design   10/10/2016 - 12/5/2016

24 ports PCB design and test   12/6/2016 - 2/6/2017

48 ports schematic diagram design   2/7/2017 - 3/8/2017

48 ports PCB design and test   3/9/2017 - 5/7/2017

Thanks !

Cost of components

Item	Price/€	Quantity	Subtotal/€
BCM53286MKPBG	80	2	160
BCM5482A2KFBG	10	2	20
Others	20	2	40
FMC	40	2	80

Total: about 300€