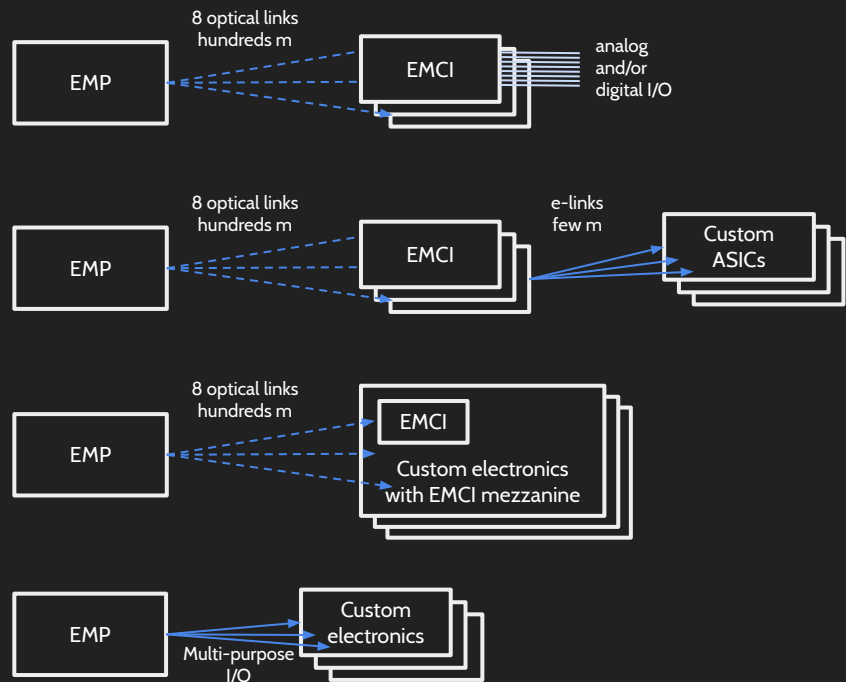


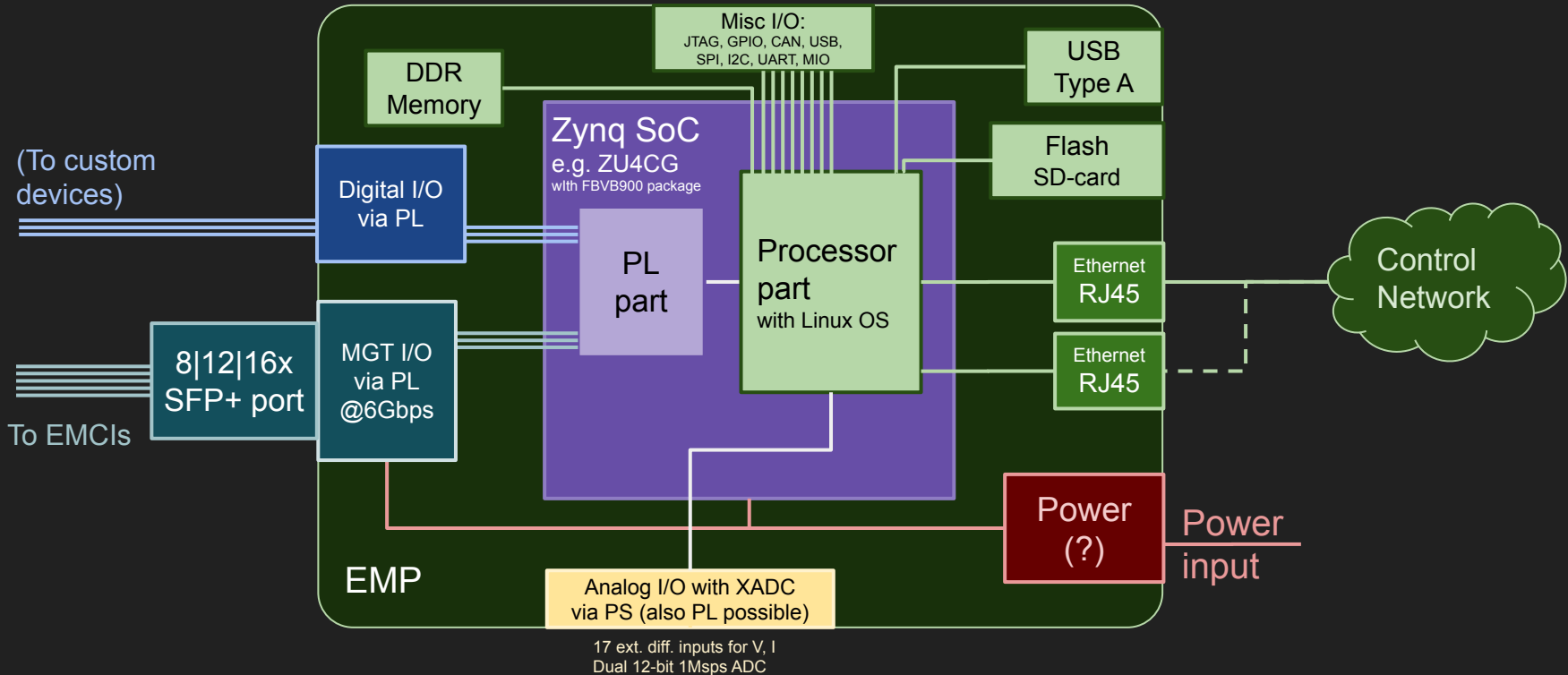
# EMCI/EMP: Concept and Desired Specs

- Solution with 2 stages, interconnected in star topology
- Components from FE to BE:
  - EMCI:
    - Based on IpGBT and VTRx+
    - Analog: 8 differential ADC channels 10 bit, 2 DACs (current, voltage)
    - Digital: 16 GPIOs, I2C (SPI and JTAG only via GPIO emulation)
    - Remote 12V power
    - Radiation limits: beyond 200 Mrad TID,  $1 \times 10^{15}$  NIEL, ? SEE
  - EMP:
    - Drives several EMCIs ( $\geq 8$  optical) or custom links and interfaces them to control network (Ethernet)
    - No particular rad tolerance
    - Does not require separate computing platform, just power (12V?) and Ethernet communication interface



# Embedded Monitoring and control Processor (EMP)

Should provide connectivity to at least 8 EMCIs and N Multi-purpose ports  
Specs doc to be circulated for feedback

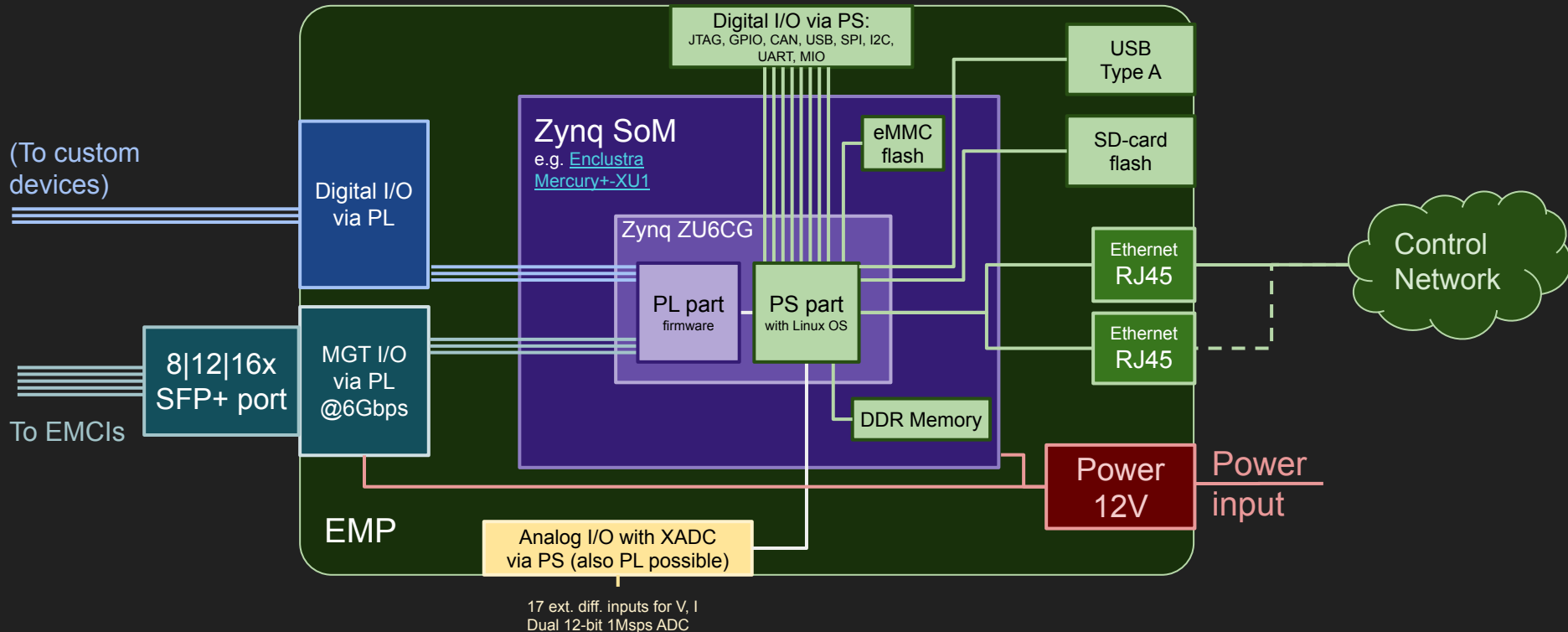


# EMP Receiver Cost Estimate

- [Some discussion on JIRA](#) (Paris, Piotr, Schlenk)
- Consider that cost will be dominated by SoC
- Considering Zynq Ultrascale+
- Using SoC on commercial SoM gives cost advantages, e.g. [Enclustra Mercury+ XU8](#), but have to deal with high-speed board connectors...
- Other components:
  - SFPs+housing (50CHF? per link)
  - Clock?
  - Jitter-cleaner?
- Current baseline estimate: still 1500CHF (with 8 links)

# Embedded Monitoring and control Processor (EMP)

Variant with System-on-Module (SoM) with MGT-compatible mezzanine connectors  
Should provide connectivity to 8|12|16 EMCIs and N Multi-purpose ports



# SoM for EMP?

- Potential advantages:
  - Cost (mass production)
  - Component selection/integration/validation already done for many components (Eth, USB, mem, flash, )
  - Powering scheme for SoC already solved, usually just need to provide 5-15V DC input
- Example: [Enclustra Mercury+ XU8](#)
  - XCZU4CG-1FBVB900E (with 16@12.5 GTH transceivers)
  - 3x 168-pin [Hirose FX10](#) connectors with 236 user I/Os
  - PS: 2GB ECC SDRAM, PL: 1GB
  - Flash: 64M QSPI, 16G eMMC
  - PS peripherals: USB, PCIe, 2x GB Eth, CAN ...
  - Supply: single 5-15V DC, Dimensions: 74 x 54 mm<sup>2</sup>
  - 672 USD for 30+ quantities (single 739 USD)
  - Development: baseboard [available](#) (PCIe or stand-alone use), with FMC connector



# EMP Integration/Aggregation - Ideas

## Single version

- Provide DIN-rail mounting support, no housing (can be added by user)

## 1U 19" crate with 3-4 EMPs

- Fibre connections with 2-row SFP+ cages or fibre aggregation modules (MTP)
- Could maybe fit 4x EMPs with 12 fibres each or 3x with 16 fibres each
- 2x unmanaged Gb Ethernet switch for 2-port network integration
- Possible cooling requirements need to be evaluated
- Fix EMP on internal DIN-rails?

