Challenge to Multi-access Edge Computing
CANDAR 2020 Special Session

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MEC(Multi-access Edge Computing)

5G : low latency (< 0.5msec) and high bandwidth
→New applications treating timing-critical multiple jobs.
Low energy and low cost

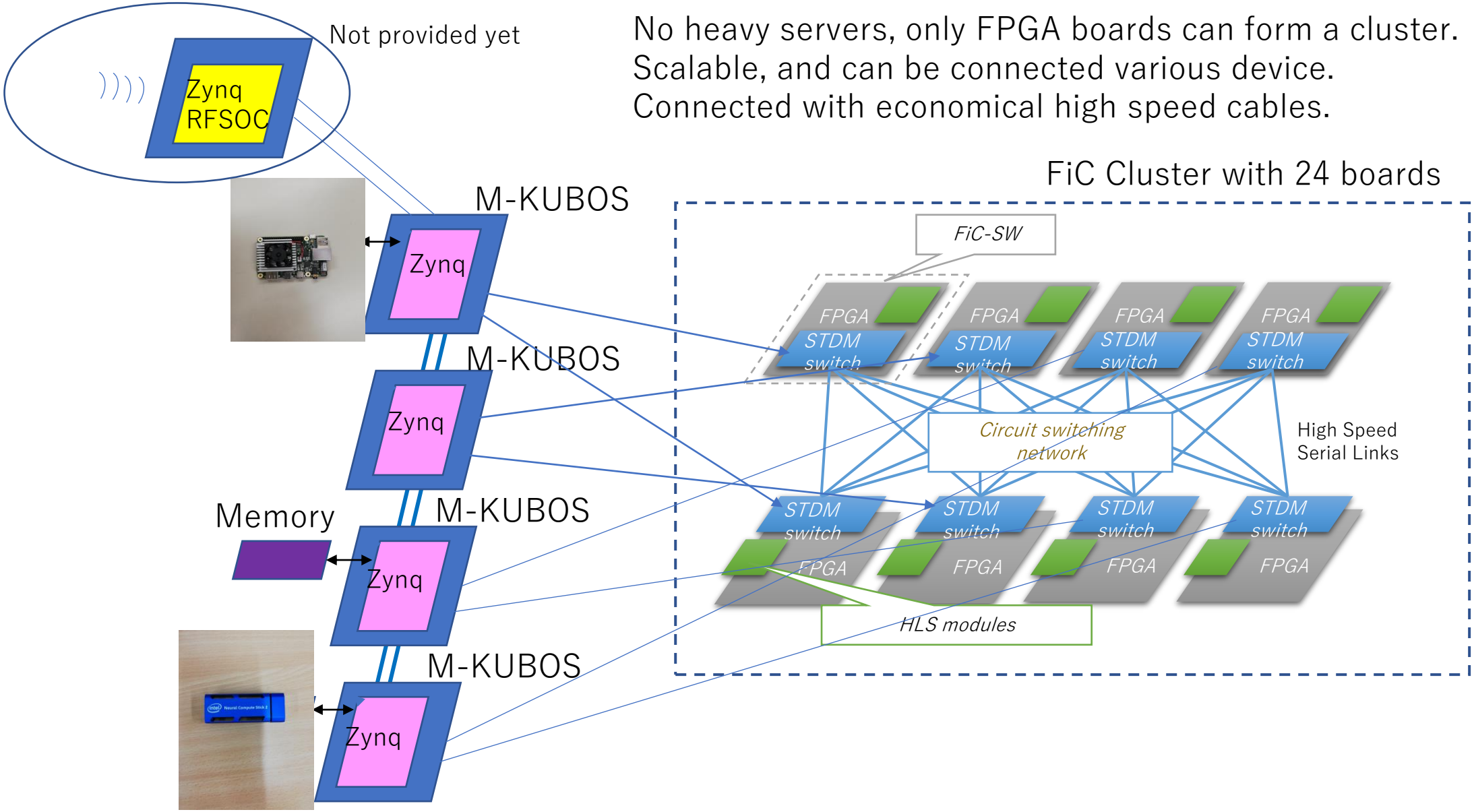
This session is presented by the CREST project “Innovative Computing Technologies for the Society 5.0”

Multi-node integrated system for MEC

- **2019.10—2025.3 5.5year**
  - G1: MEC platform: Hideharu Amano (Keio Univ.)
  - G2: A new reconfigurable device for MEC：Masahiro Iida （Kumamoto Univ.）
  - G3: MEC system software: Midori Sugaya （Shibaura Tech. ）
  - G4: MEC application: Hiroaki Nishi (Keio Univ.)
  - G5: Design tools for MEC: Kazuhiro Wakabayashi （U. of Tokyo）

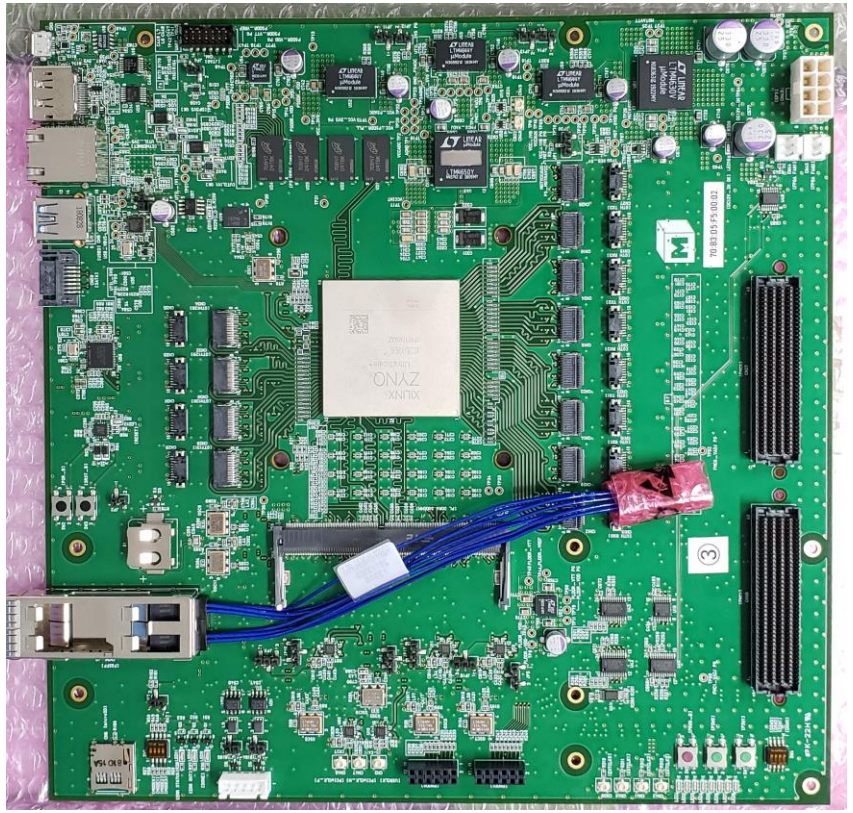
The current platform: M-KUBOS/PYNQ cluster

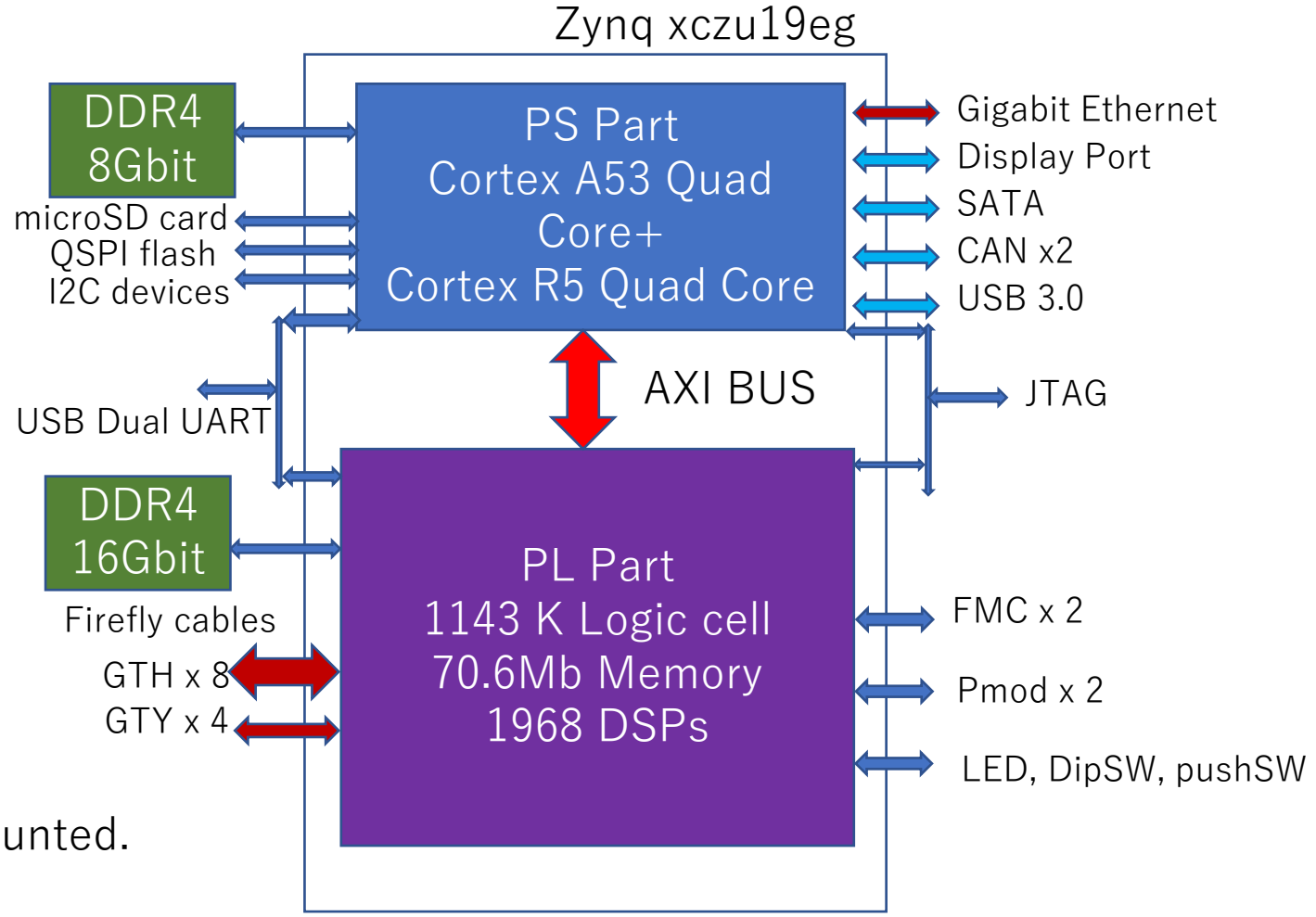
No heavy servers, only FPGA boards can form a cluster.
Scalable, and can be connected various device.
Connected with economical high speed cables.



PALTEK　M-KUBOS/PYNQ

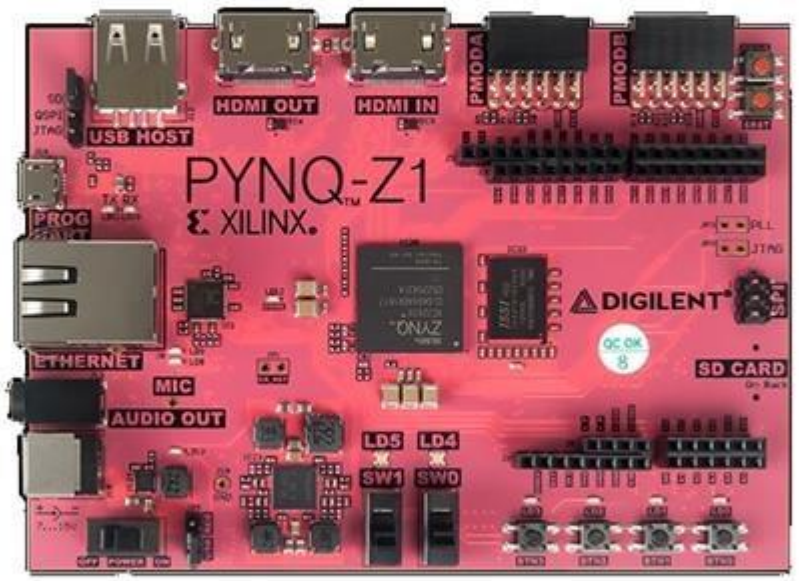
https://www.paltek.co.jp/mcube/index.html



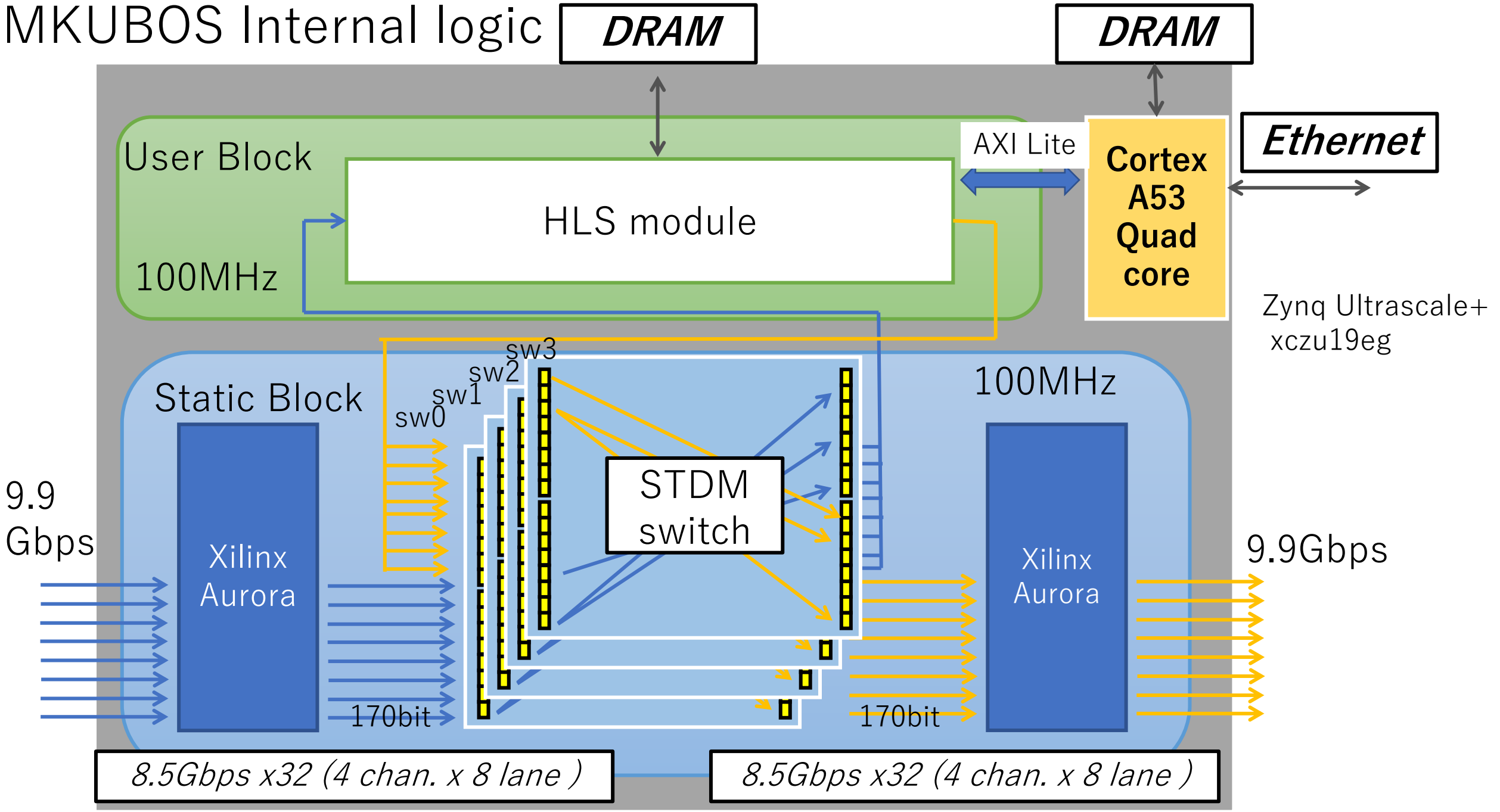


The highest rank Zynq Ultrascale+ is mounted.
Various interface.
Powerful serial cables.

PYNQ as software platform for clusters

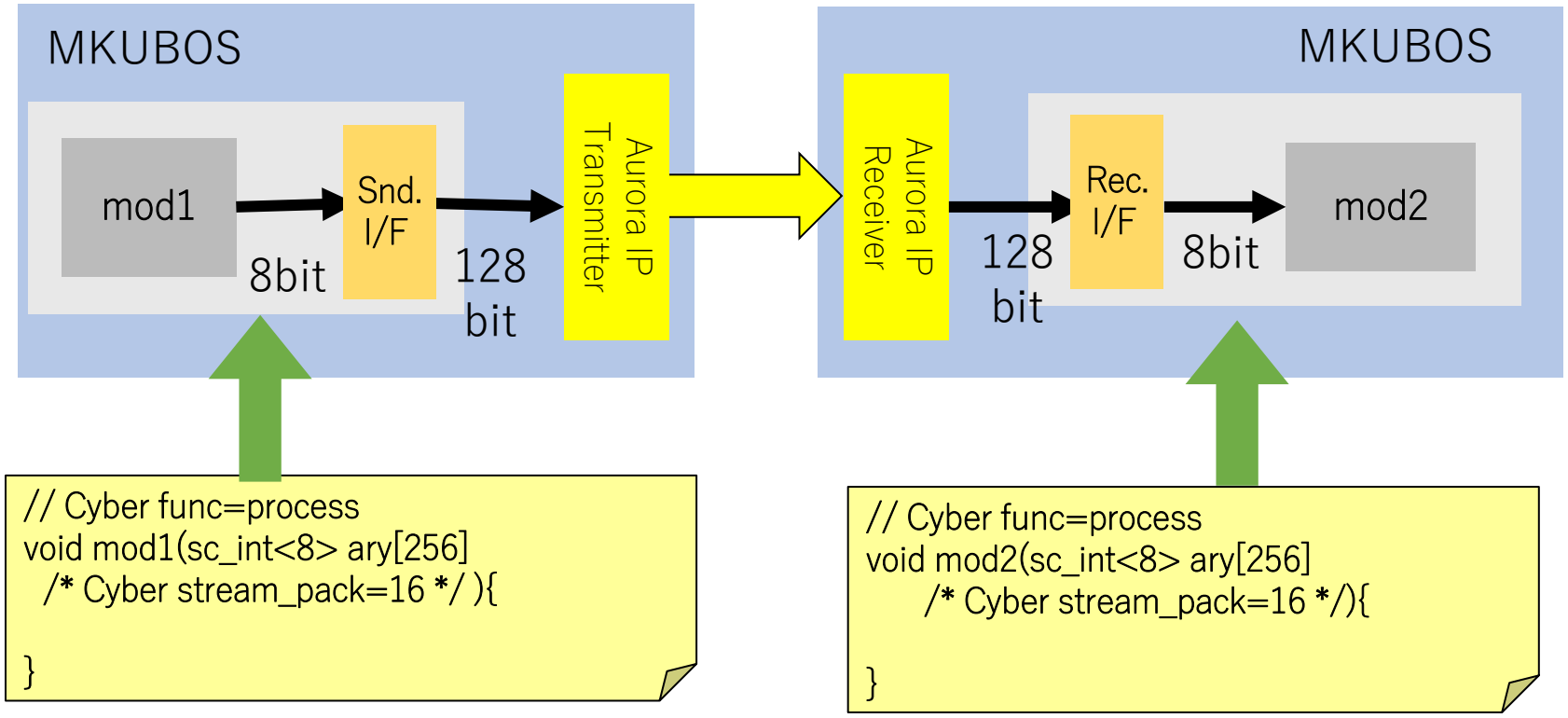


- Open source originally developed for the PYNQ-Z1 embedded board.
- Ubuntu Linux runs.
- PL part can be configured easily (Overlay)
- AI application can be easily implemented with Python/Jupyter Notebook
- Common programming language (C/C++) can be also used.
- Now, APIs for cluster management is under development.


MKUBOS Internal logic
DRAM
DRAM
User Block
HLS module
100MHz
AXI Lite
Cortex A53 Quad core
Ethernet
Zynq Ultrascale+ xczu19eg
Static Block
sw0
sw1
sw2
sw3
STDM switch
100MHz
9.9 Gbps
Xilinx Aurora
Xilinx Aurora
9.9Gbps
170bit
170bit
8.5Gbps x32 (4 chan. x 8 lane)
8.5Gbps x32 (4 chan. x 8 lane)

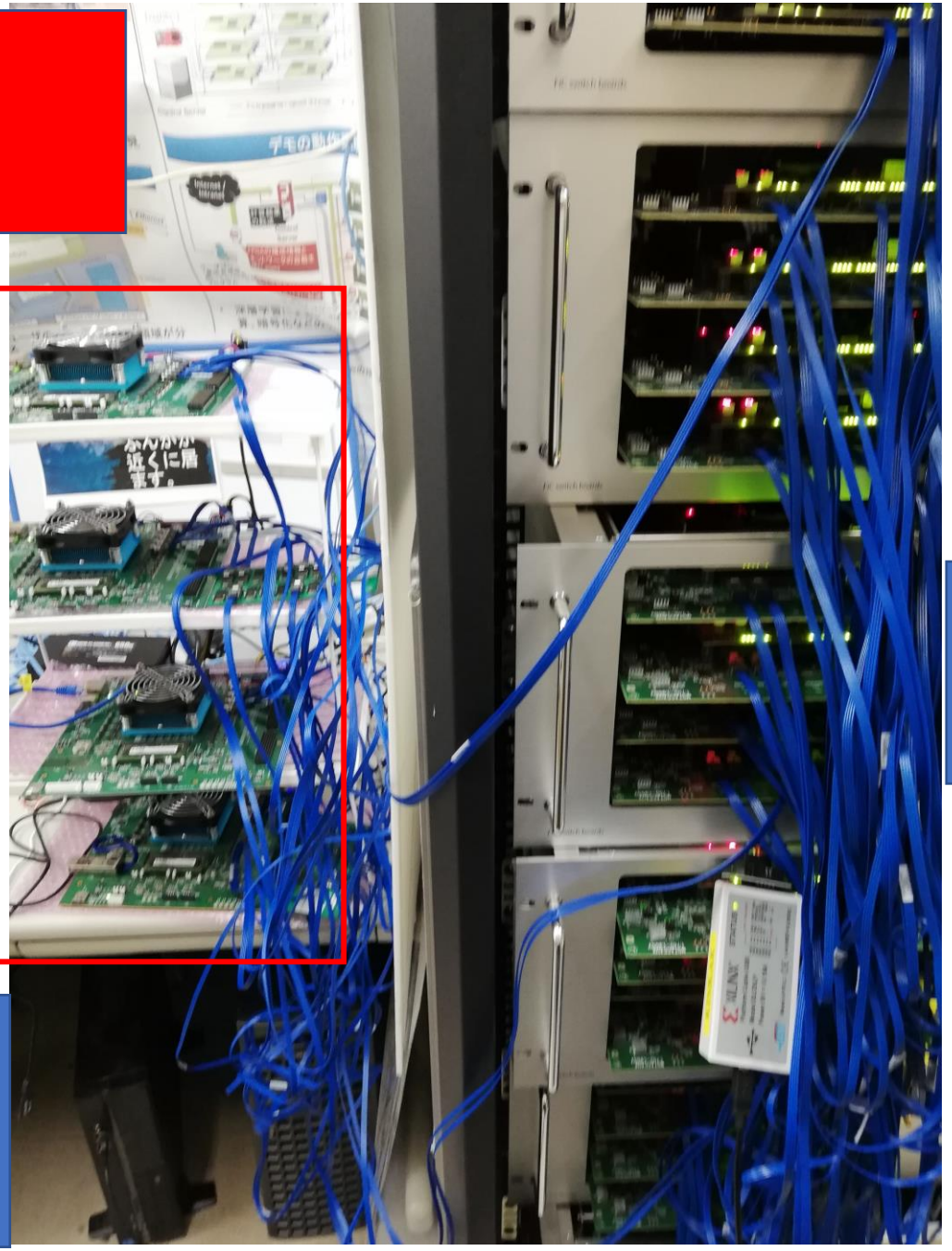
HLS design for multiple boards

- User can describe HLS modules without caring that they work on the same board or not.
- Interface modules between boards are inserted automatically.



Applications
Prof.Nishi

M-KUBOS
PYNQ
Cluster



Extension: FiC Cluster

The parallel board programming HLS

System Software using ROS
Prof.Ohkawa

Job schedulers, multi-board management system

Today's Agenda

13:00-13:20	Introduction	H.Amano (Keio Univ.)
13:20-14:00	The structure of 5G Base Station	M.Kashio (Fomalhaut Techno Solutions)
14:00-14:25	What can MEC do and What its infrastructures need?	T.Kudoh (Univ. of Tokyo)
	Break	
14:40-15:20	Multi-access Edge Computing for Smart Community Data Services	H.Nishi (Keio Univ.)
15:20-15:50	Introducing ROS to MEC	T.Ohkawa (Tokai Univ.)

Now, let's enjoy their talk!