WARP

WIRELESS OPEN-ACCESS RESEARCH PLATFORM

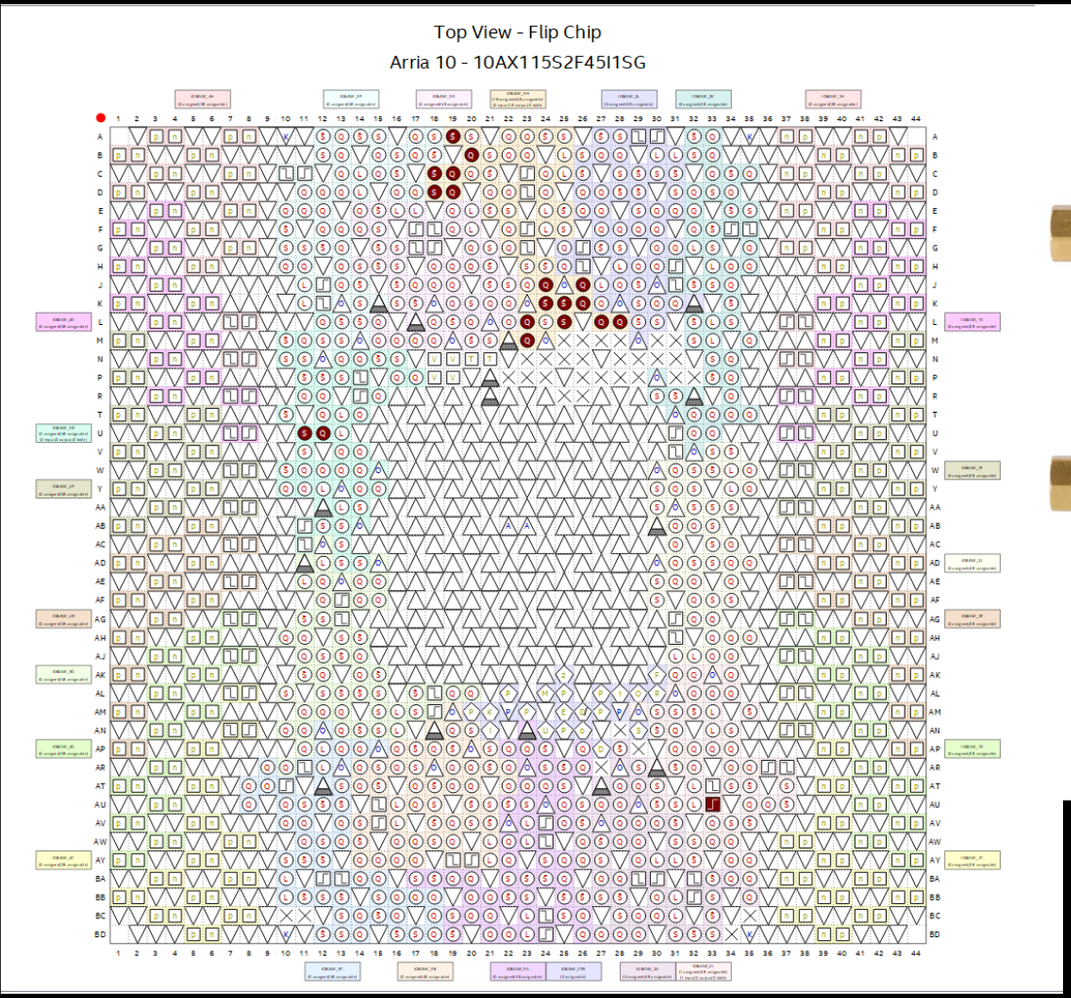
WHAT IS WARP?

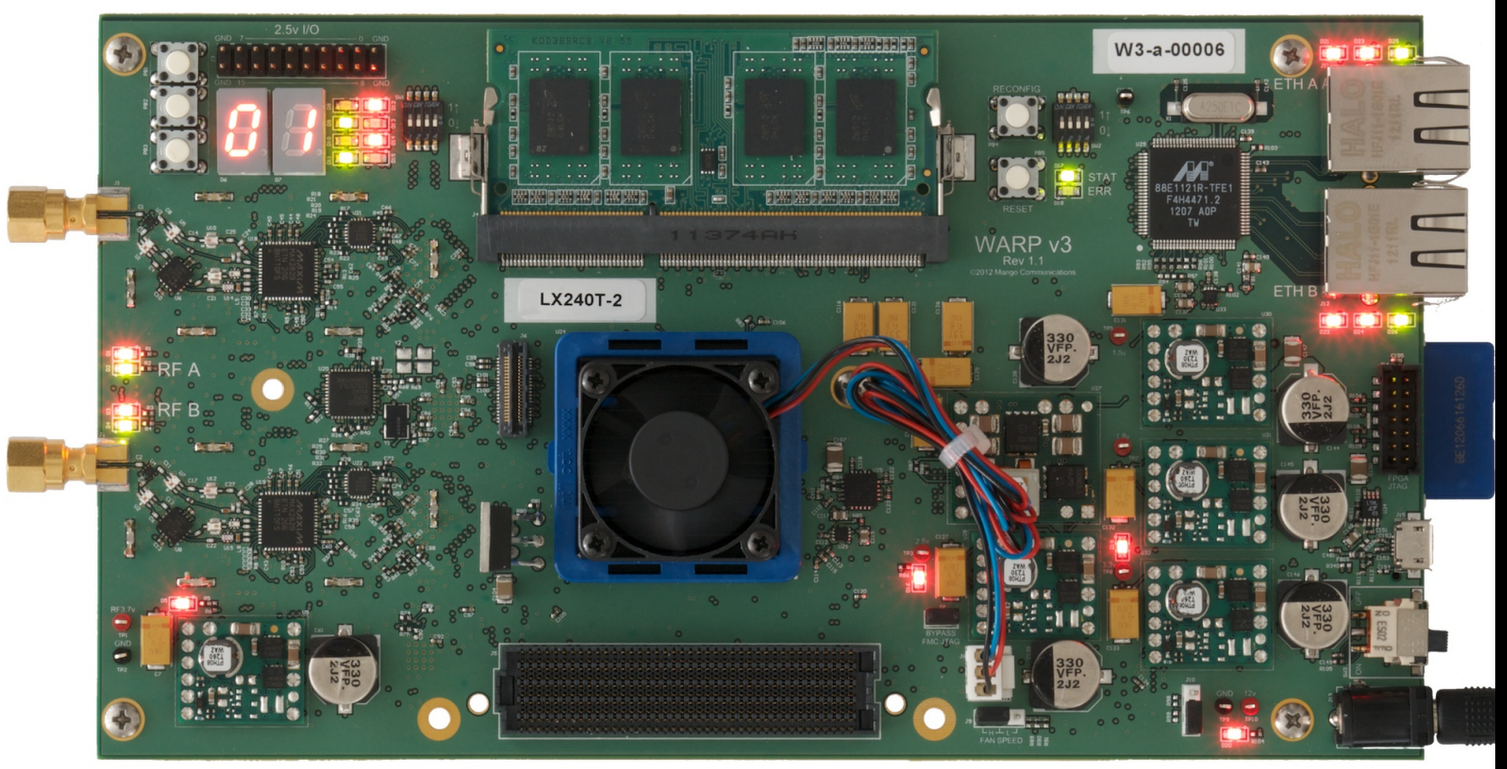
WARP is a custom research in advanced wireless algorithms and applications.

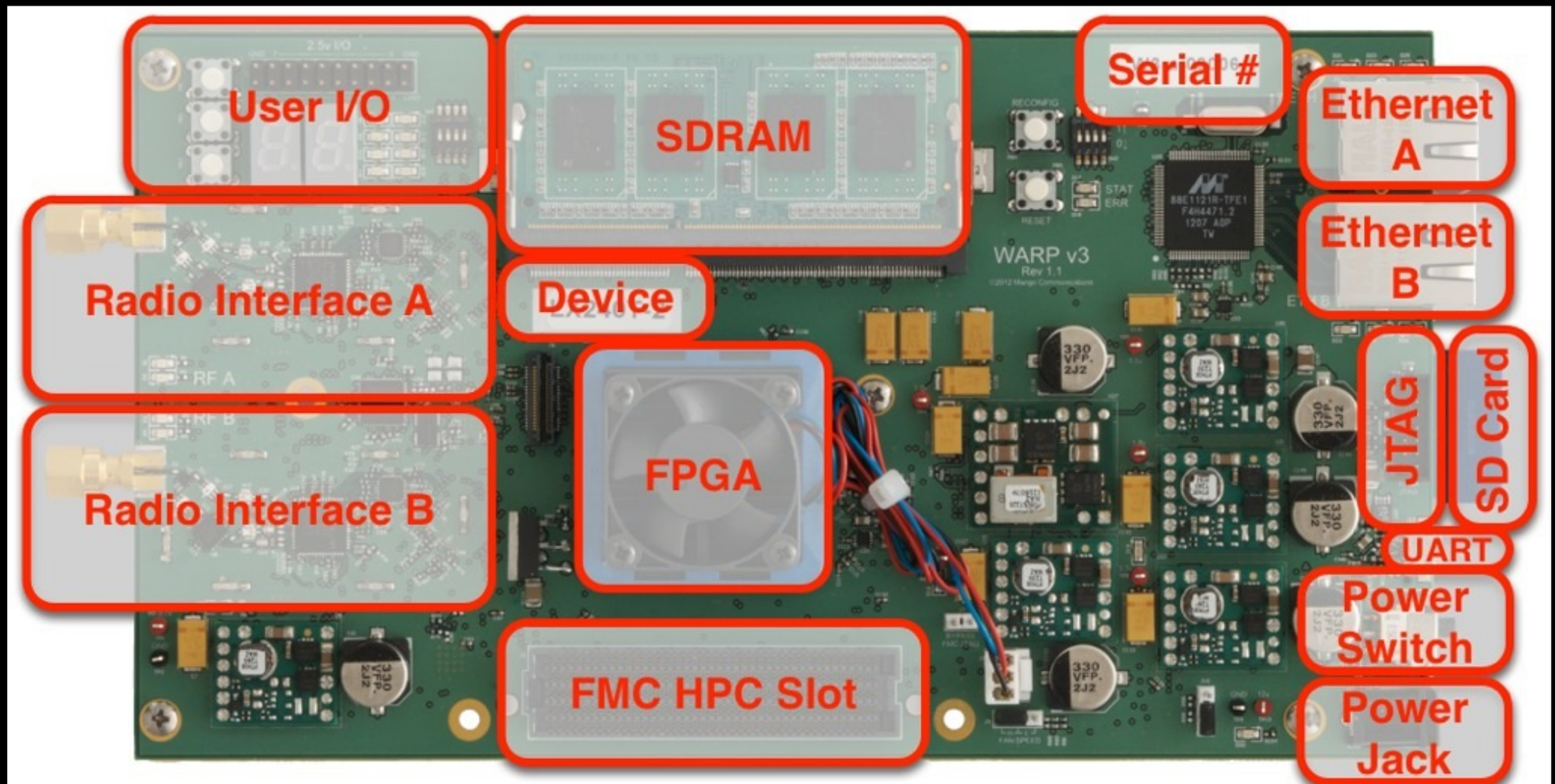
The platform consists of both custom hardware and FPGA implementations of key communications blocks. The hardware consists of boards coupled to wideband radios and other I/O interfaces

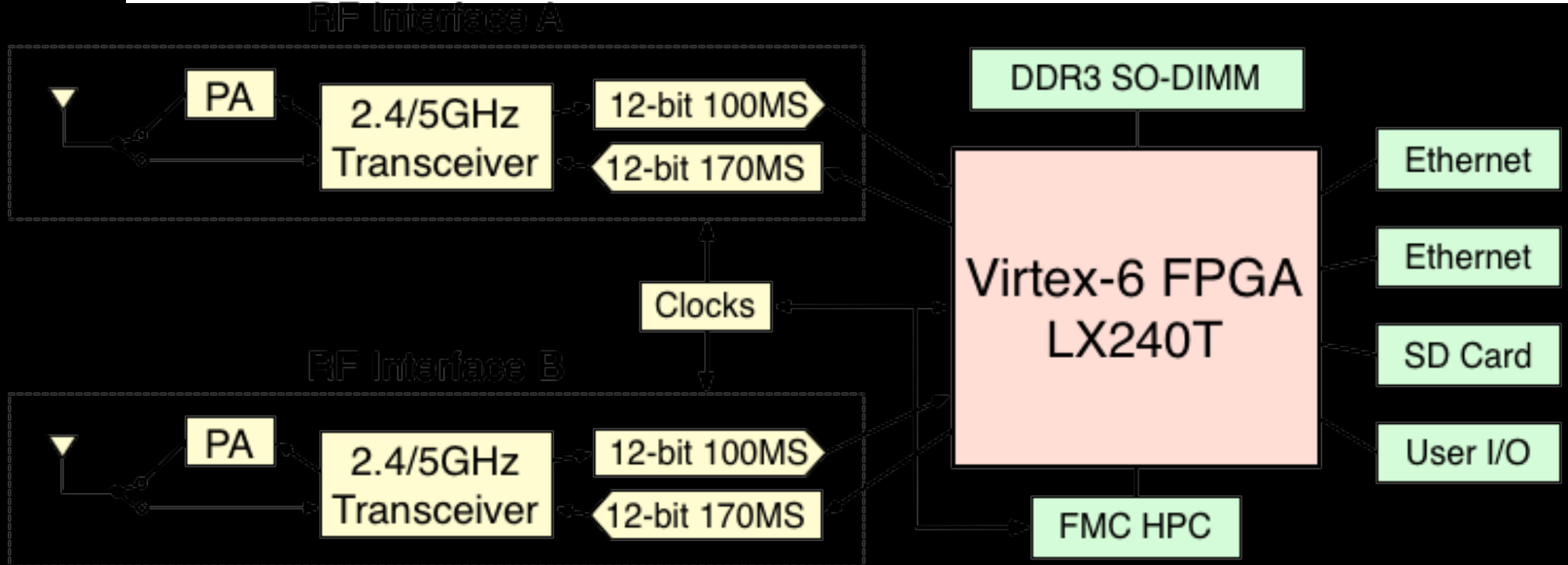
FPGA

Essentially, an FPGA is a hardware circuit that a user can program to carry out one or more logical operations. Taken a step further, FPGAs are integrated circuits, or ICs, which are sets of circuits on a chip—that's the "array" part. Those circuits, or arrays, are groups of programmable logic gates, memory, or other elements.






User I/O
SDRAM
Serial #
Ethernet A
Ethernet B
Radio Interface A
Device
Radio Interface B
FPGA
JTAG
SD Card
UART
Power Switch
Power Jack
FMC HPC Slot
WARP v3
Rev 1.1


RF Interface A
PA
2.4/5GHz Transceiver
12-bit 100MS
12-bit 170MS
Clocks
RF Interface B
PA
2.4/5GHz Transceiver
12-bit 100MS
12-bit 170MS
DDR3 SO-DIMM
Virtex-6 FPGA LX240T
FMC HPC
Ethernet
Ethernet
SD Card
User I/O

SO WHATS NEW/ DIFFERENT?

With a standard chip, such as the Intel Curie module in an Arduino board or a CPU in your laptop, the chip is fully baked. It can't be programmed; you get what you get. With these chips, a user can write software that loads onto a chip and executes functions. That software can later be replaced or deleted, but the hardware chip remains unchanged.

With an FPGA, there is no chip. The user programs the hardware circuit or circuits. The programming can be a single, simple logic gate (an AND or OR function), or it can involve one or more complex functions, including functions that, together, act as a comprehensive multi-core processor

So Why Would You Need an FPGA, Anyway?

I’m glad you asked! An FPGA is a semiconductor device on which the function can be defined after manufacturing.

An FPGA enables you to program product features and functions,adapt to new standards, and reconfigure hardware for even after the product has been installed in the field — hence the term field programmable!

WHY SHOULD YOU CARE?
NEED 5G?

- VIDEO

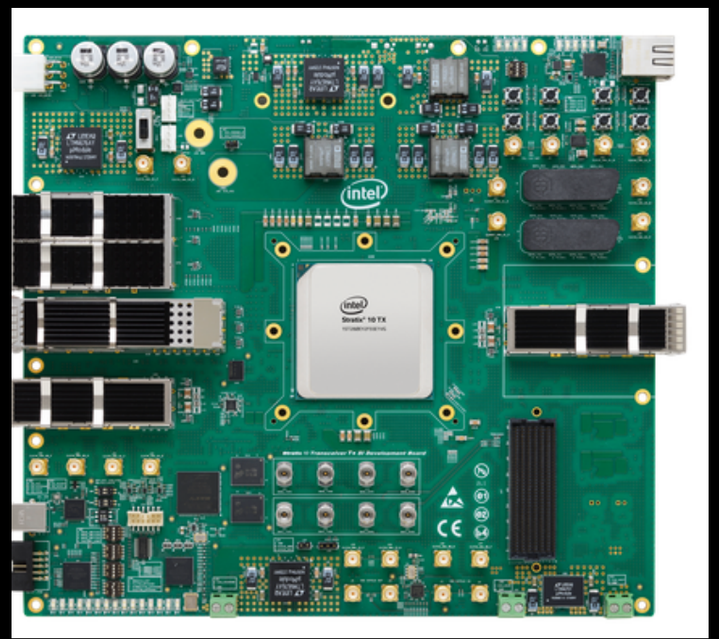
BENCHMARK SPEEDS

Intel® Stratix® 10 TX FPGA

Intel Stratix 10 TX FPGAs provide up to 144 transceiver lanes to support nearly 8Tbps of aggregate bandwidth and data rates from 1 to 58 Gbps. The combination of high bandwidth at faster date rate enables architects to scale to 100G, 200G and 400G delivery speeds.

Dual-mode transceiver technology for leading-edge interface standards, backplane, and versatile data switching applications:Up to 58 Gbps PAM4Up to 30 Gbps NRZ

Technology for mainstream and next-generation protocol and interfacestandards including: PCI Express* (PCIe*), 100 Gigabit Ethernet (100GbE), 400 Gigabit Ethernet, Common Public Radio Interface (CPRI), Fibre Channel, serial digital interface (SDI)



What’s in an FPGA, Anyway?

- As the name field-programmable gate array (FPGA) suggests, FPGAs are, at their core, simply integrated circuits that containa bunch of logic gates and I/O circuitry. The I/O circuitrytakes in data from a source and spits out data at the otherend into some other system or subsystem.

The building blocks of an FPGA...

- You can build anything digital from three simple pieces: awire, a logic gate, and a register.

- A logic gate performs simple logic operationson signals, and a wire connects these other pieces.

- Registers are simple devices that store pieces of data for usein the future. Think of registers as a short-term spot for that you can access quickly; this is where you would place a phone number given to you moments before dialing. as you try to remember something else, like the time to be at an appointment, that telephone number you tried to remember earlier is replaced with the starting time of the appointment.

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FPGA IRL

- Engine: Electronics in the engine control the fuel, ignition,and valves based on power demand, emissions,smoothness, starting cycle, and strategy.

- Transmission: Modern transmissions include electricalsystems to control gear ratio, shifting sequence, signalsbased on speed, power demand, and engine rotationsmeasured in revolutions per minute (RPMs)

- Sensors including cameras, lasers, and radar: These sensors are used to allow drivers to see in their blind spot when backing up or changing lanes, which the chances of an accident.

- Television Broadcasting

- Wireless Data

- High-Performance Computing