



Virtual and Physical Cellular Architectures for Kilo-processor Chip Computers - a few prototype platforms

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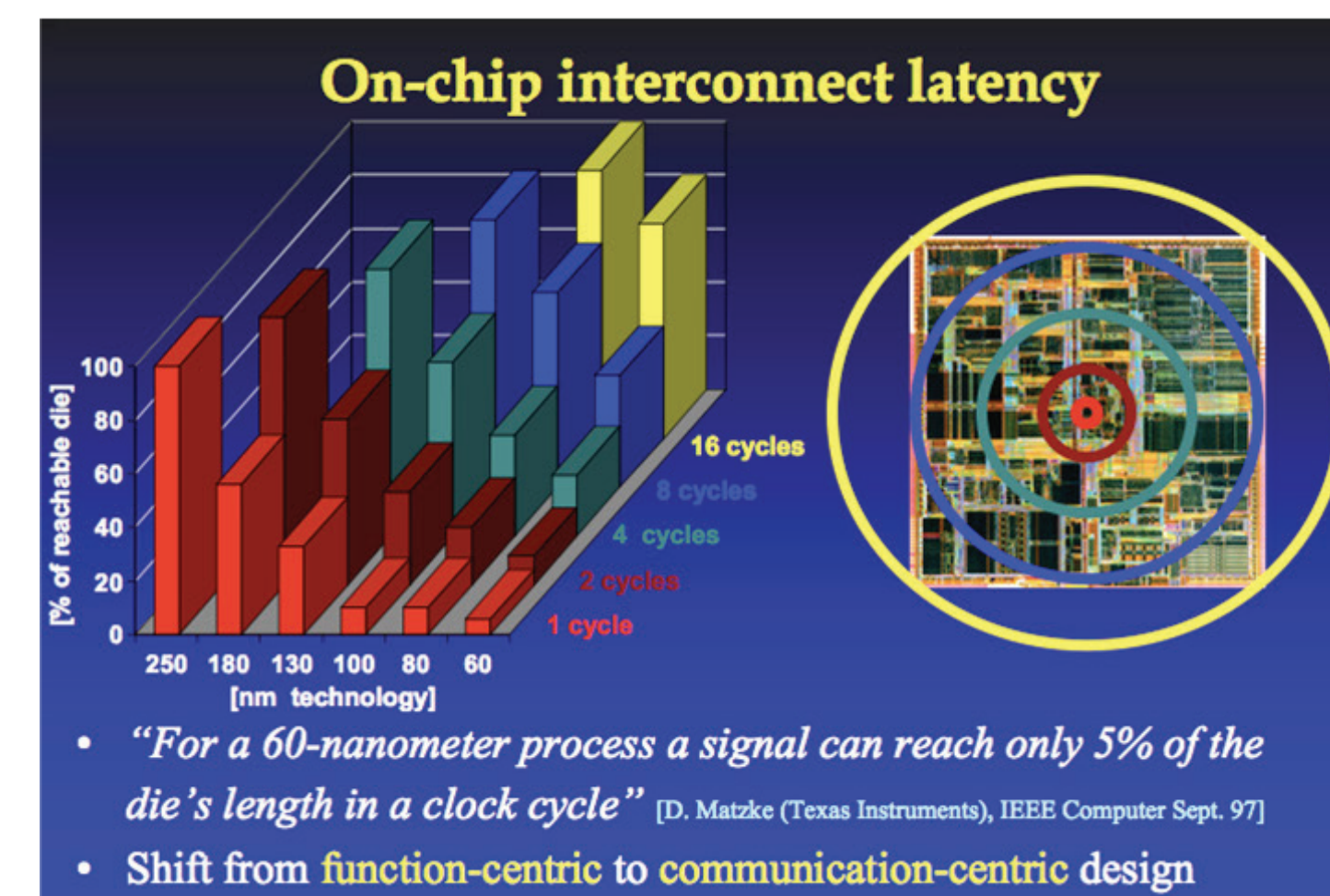


A new era in computing starts

- NOT just parallel
- NOT using the present algorithms
- NOT massaging the nanoscale devices to repeat the functional primitives of CMOS building blocks
- Running time is NOT the only measure : speed, power, area, accuracy, bandwidth
- There are NO efficient design tools

Key: understanding spatial-temporal algorithmic dynamics
Cellular Wave Computers: one way of thinking

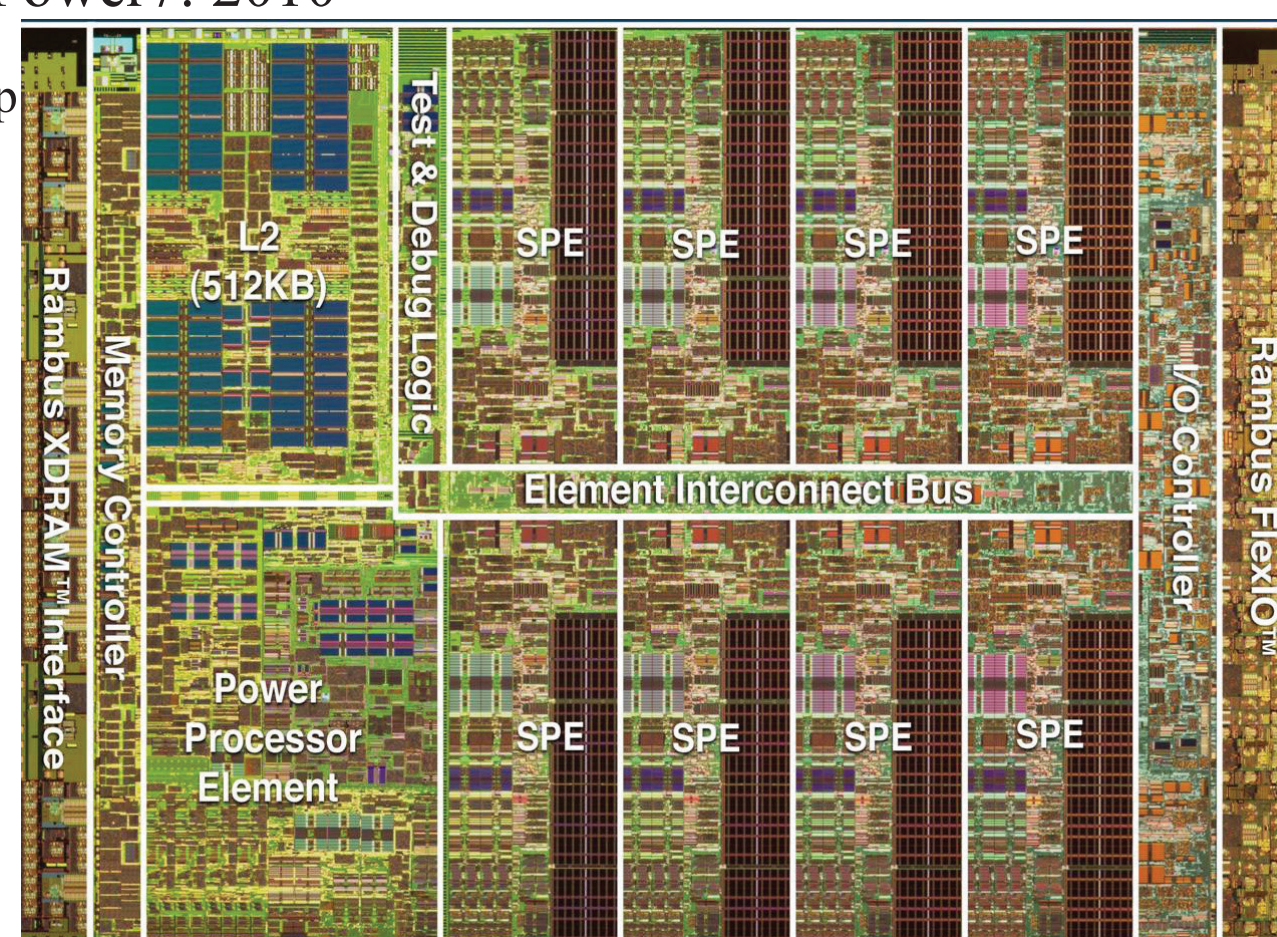
...but it also doesn't scale terrible well.



1. CELL Broadband Engine Architecture (CBEA) and high-end supercomputer

==> Power7: 2010

- Heterogeneous, multi-core CELL Multiprocessor chip
 - 241M transistor, 235mm²
 - 200 GFlops (SP) @3.2GHz
 - 200 GB/s bus (internal) @ 3.2GHz
 - dual XDR controller (25.6GB/s)
 - two configurable interfaces (76.8GB/s)
- Power Processor Element (PPE)
 - General purpose processor
- Synergistic Processor Element (SPE)
 - SIMD-only engine
 - fast access to 256KB local memories
 - Globally coherent DMA to transfer data
- Racks, cabinets, PetaFlops systems

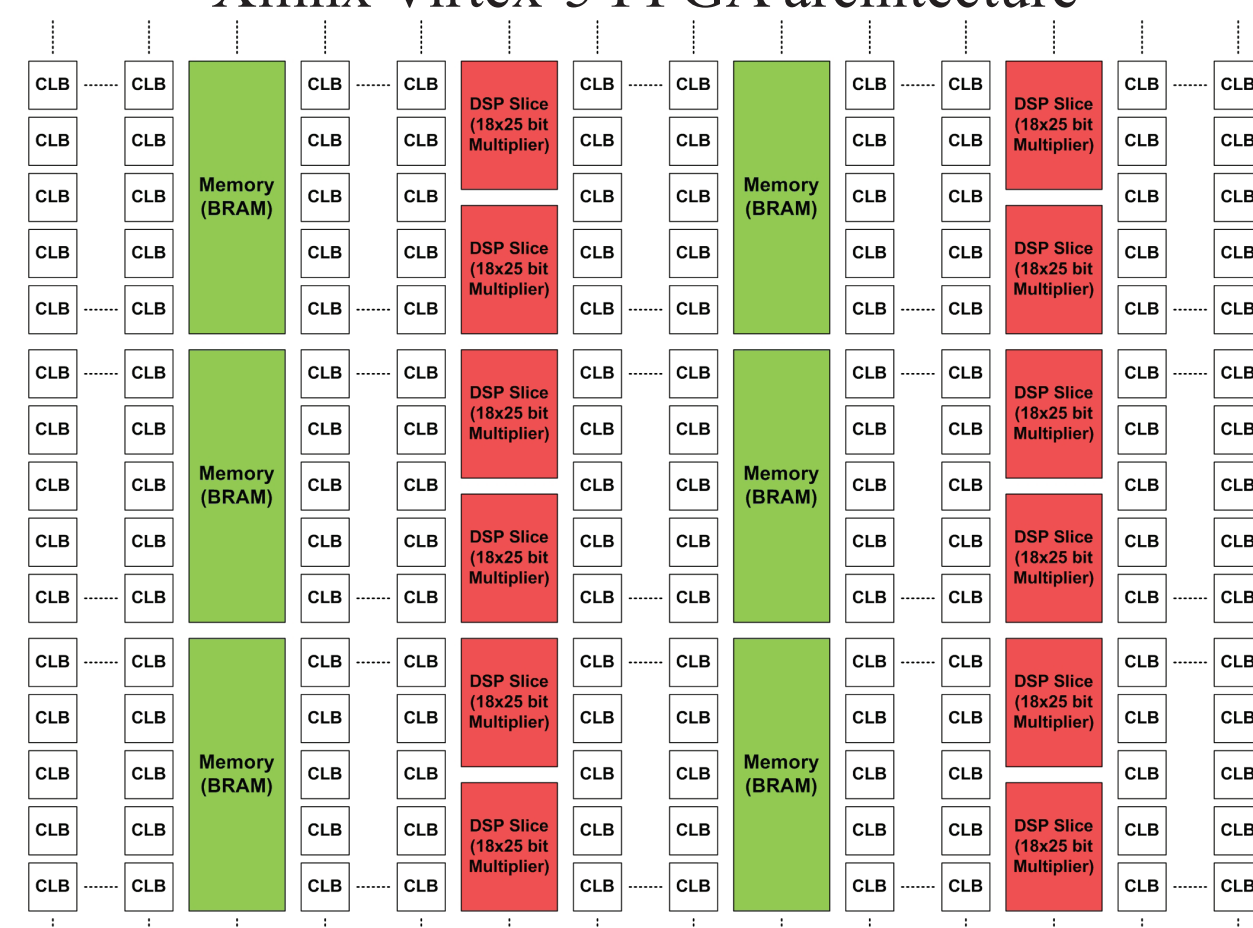


6. Cellular big cores: Intel Cloud 48 - 2010

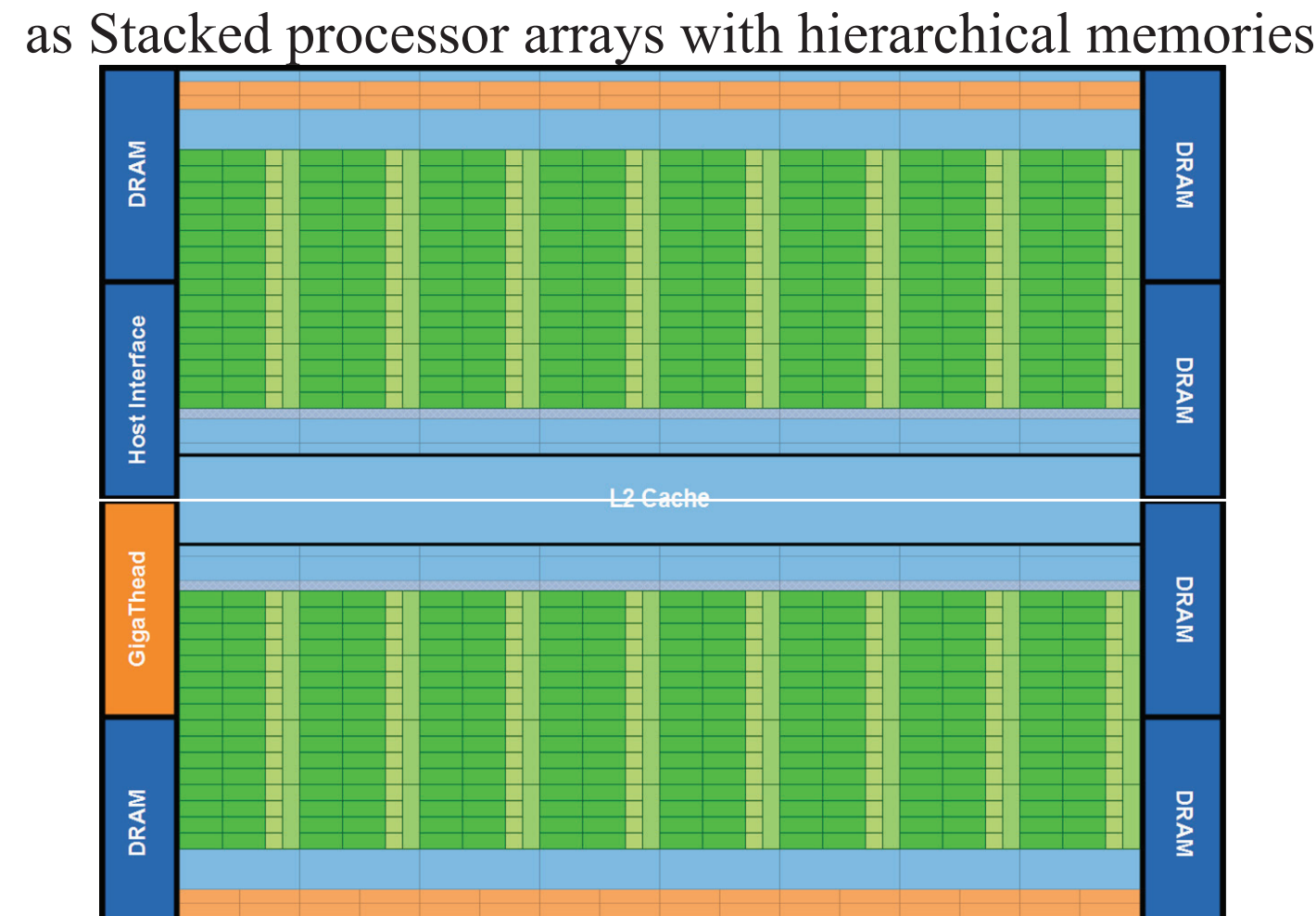


48 IA processors in cellular communication scheme

2. Many-10k-processors in FPGA
Xilinx Virtex-5 FPGA architecture



3. Graphic Programming Units
as Stacked processor arrays with hierarchical memories



4. Visual Microprocessor w/ mixed mode cellular processor array

Eye-RIS v.1.2

Eye-RIS v.2.1

EyeRIS camera computer

- 25k processors with optical sensors
- 1000 frame per sec
- 80 gr

AnaFocus Ltd.

5. Digital Cellular Sensory Computer: XENON V3

XENON V3 architecture

Topographic sensor-processor arrangement (integrated InGaAs/InP sensors are not shown in the photo)

Photo of the ASIC processor layer:

- Processors: 64 (8x8)
- Sensors: 4096 (64x64)
- Processing speed (depends on algorithmic complexity): > 1000 fps
- Programming: general purpose

EUTECUS, Inc. - proprietary

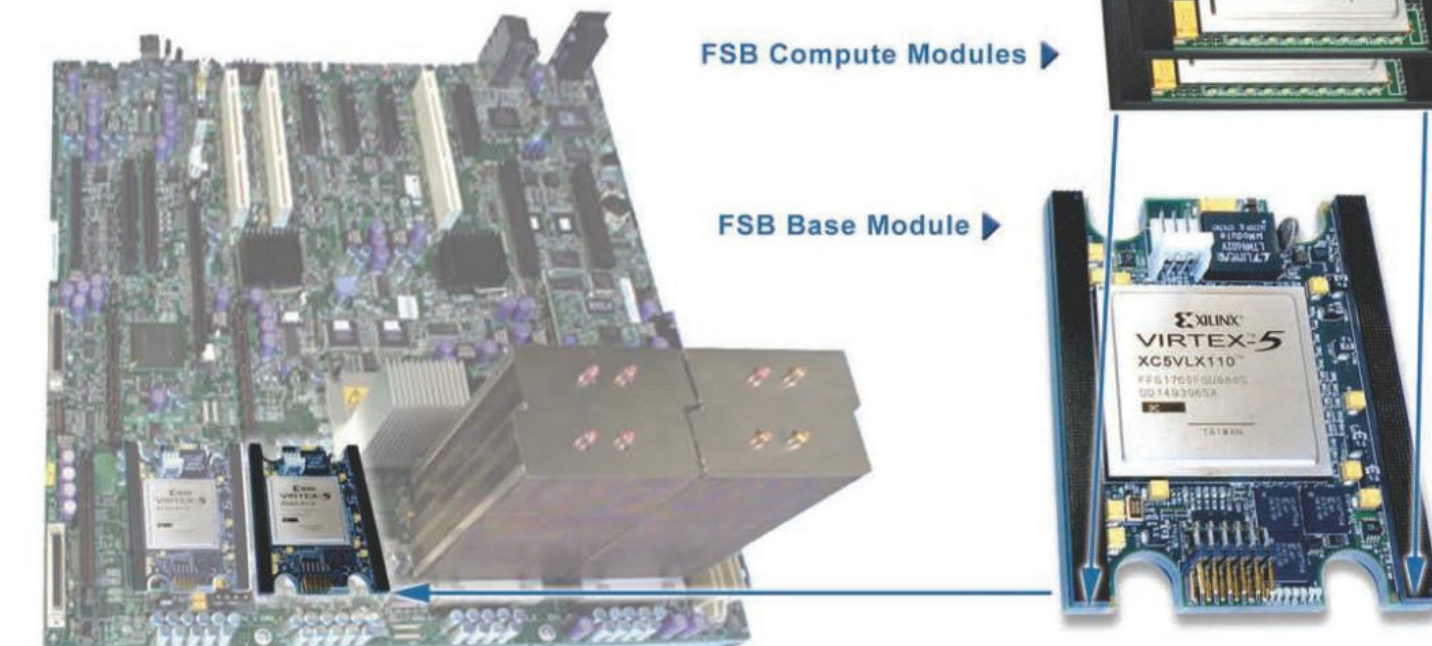
7. Bi-i camera computer

30.000 frames/sec,
Product of the Year in 2003 at „VISION 2003” in Stuttgart

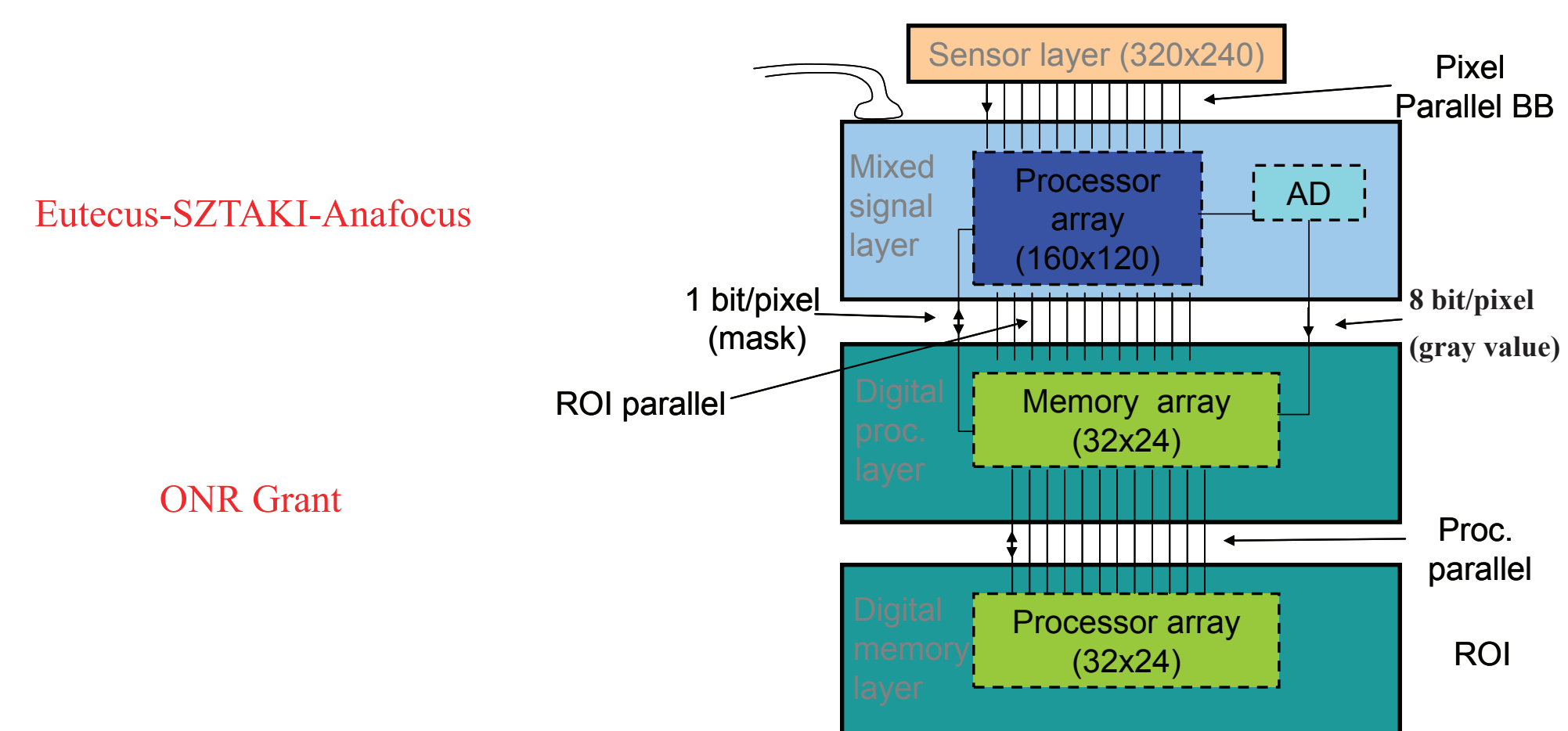


8. FPGA Accelerated Computing

Desktop Megaprocessor Computer



9. Viscube 3D architecture



10. Programmable Optical Analog-and-logic Cellular (POAC) computer Laptop version

