STORAGE DEVELOPER CONFERENCE
SDC 21
BY Developers FOR Developers
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A SNIA Event

The building blocks to design a computational storage device

Presentation Subtitle

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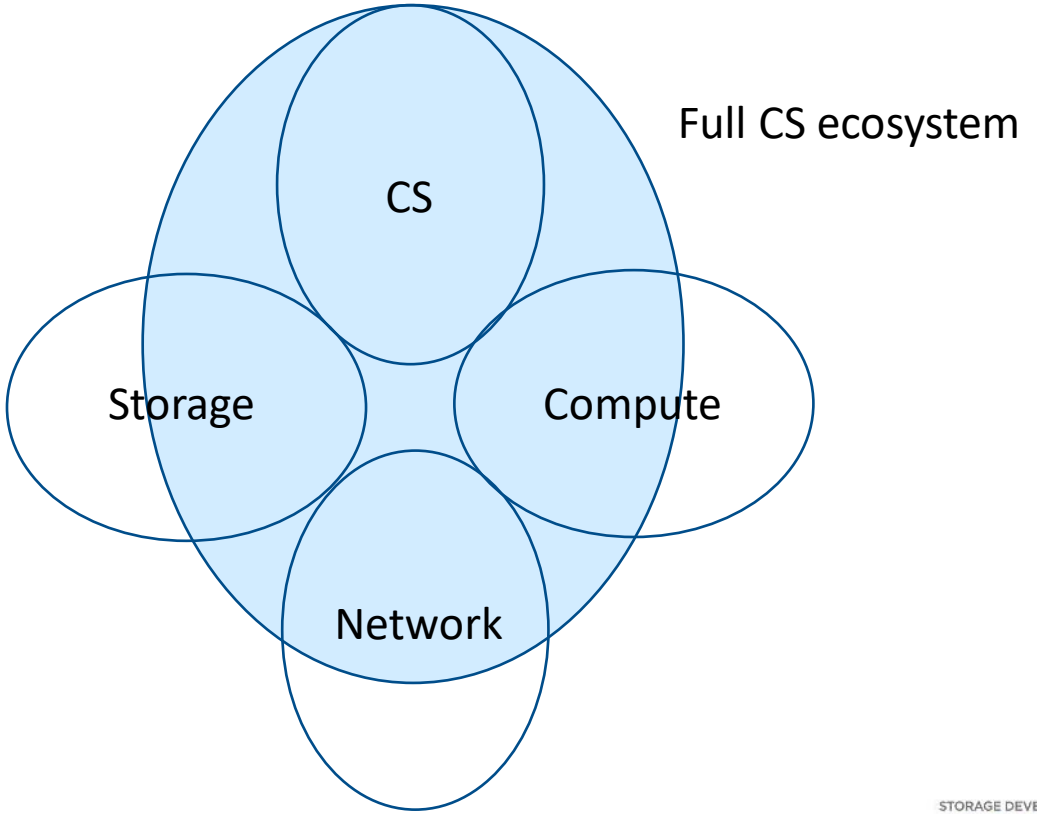
Computational storage

- What is a device
  - Processor (CSP)
  - Drive (CSD)
  - Array (CSA)

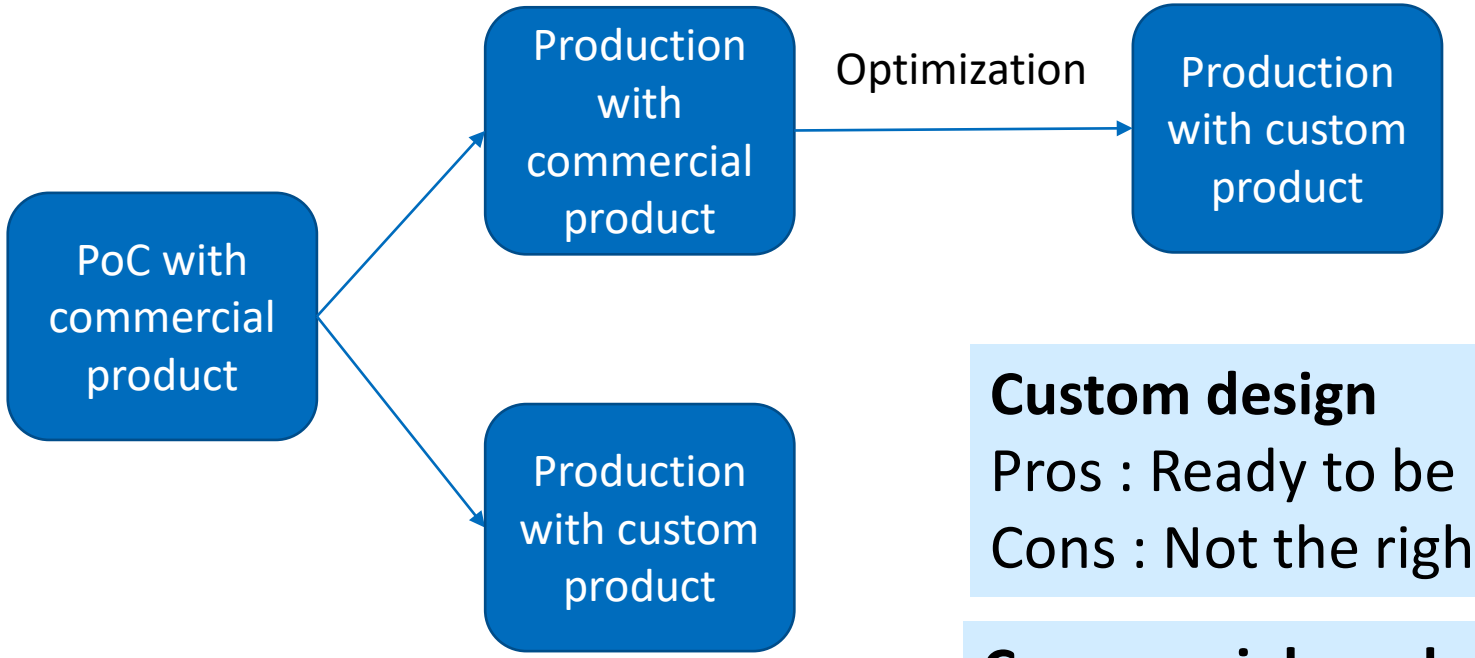
- First, let's answers few questions
  - Why using CS?
    - Need of more performance, lower power, higher density, all of them?
  - And which CS technology to use?

Ecosystem overview

- Large ecosystem
  - Mix of computing, networking and storage ecosystem
- For all the building blocks
  - IP, NVM, processing, software, systems



Custom design or commercial product ?



Custom design

Pros : Ready to be used

Cons : Not the right one for your specific workload

Commercial product

Pros : Optimized platform

Cons : Dev time, Expertise, capex, license

The system benefits

- Power consumption
- TCO
- Density
- Carbon footprint

- How to estimate it?
  - With a system simulator tool
  - Including the full value chain, from chip to data center

Benefits:
Density : -7%
TCO : -15%
Power : -25%

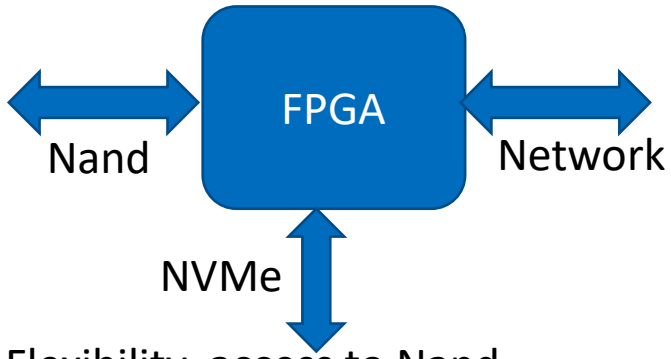
Example for 1000 VM
in a cloud environment

Focus on the carbon footprint reduction

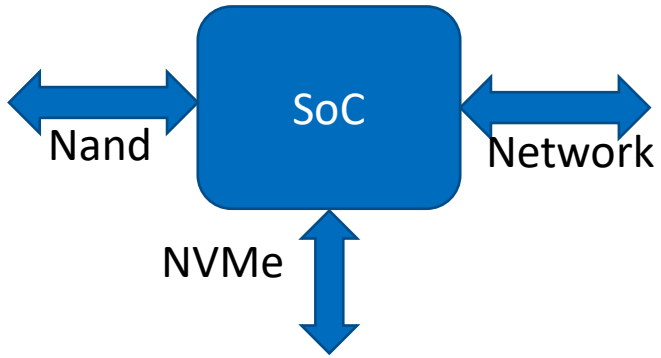
- CS benefit : lower power consumption, ok well understood
  - Example : -25% for 1000 VMs in a cloud environment
- That's not all
  - The carbon footprint includes energy consumption for
    - Use
    - Manufacturing
    - Transport
    - Recycling

Higher density => less manufacturing/transport/recycling energy
=> may lead to -50% carbon footprint reduction

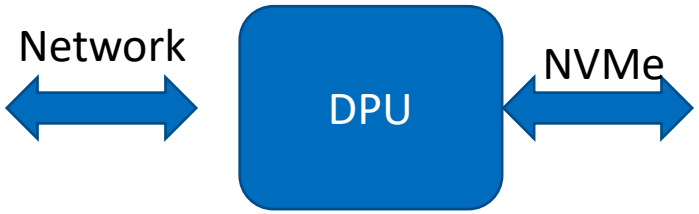
Computing (FPGA, SoC, DPU, GPU)



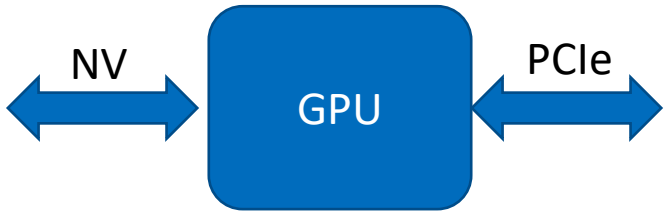
(+) Flexibility, access to Nand
(-) Complex to develop / power consumption



(+) Easy to program, access to Nand
(-) Cost development (if ASIC), computing performance



(+) In the network dataflow
(-) Specific architecture



(+) Very high performance for specific applications
(-) No direct access to Nand, power consumption

Non-volatile memories

Flash

(+) High density
(-) Endurance

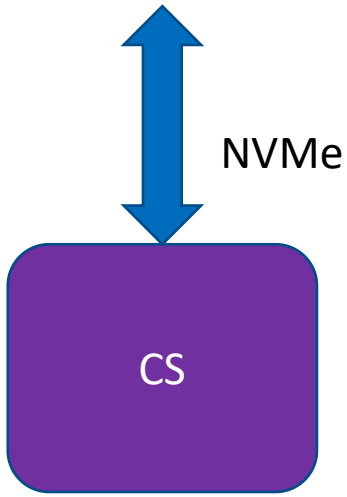
MRAM

(+) Low latency
(-) Low density

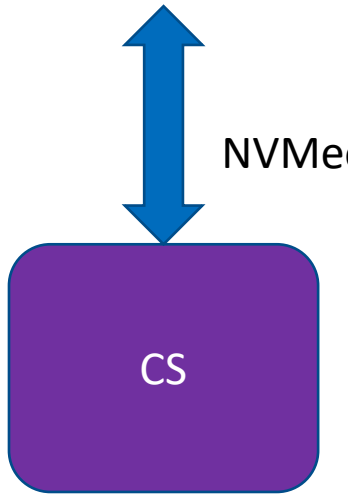
3DXP

(+) Ratio perf/density
(-) Limited number of providers

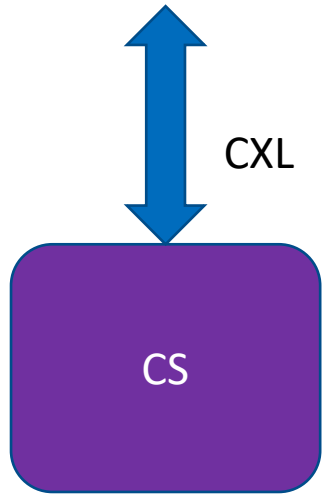
Interfaces (NVMe, NVMeoF, CXL)



(+) Standard
(-) None

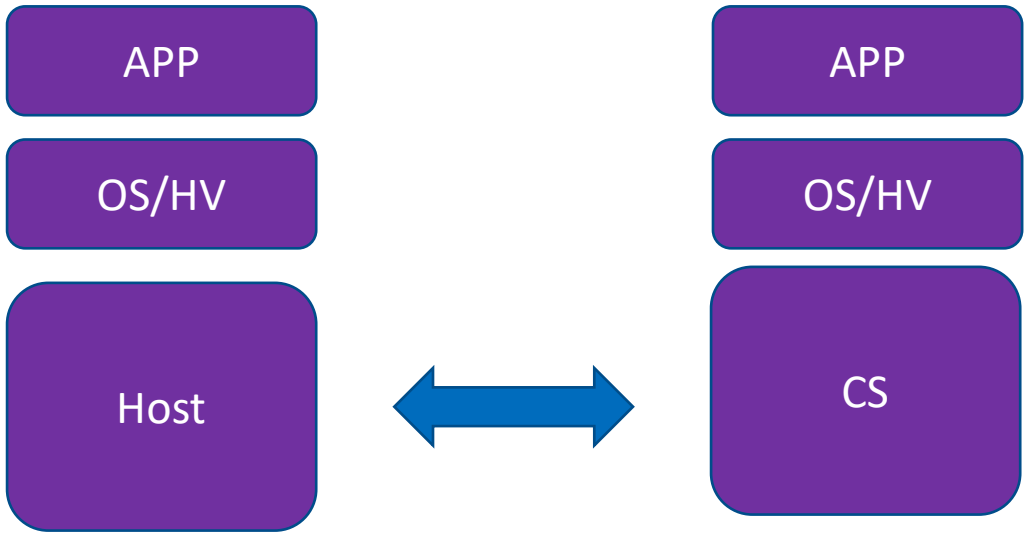


(+) Allowing remote CS
(-) Network latency



(+) High level of integration
(-) Very new, limited ecosystem

Software



This is the most important part of computation storage design,
Developping your own software (with both custom and commercial product)
Will allow you to bring the real added value

Conclusion

- Designing computational storage devices:
  a great opportunity to
  - Bring innovation and added value at the hardware architecture level
  - Develop new integration services
  - Re-think data center design, including eco-design methodology to reduce the carbon footprint :
    - Lower power consumption
    - Higher density
    - Longer life time

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