Harnessing Memory-Driven Computing to fight Alzheimer's disease

Hewlett Packard Enterprise

DZNE
German Center for Neurodegenerative Diseases
within the Helmholtz Association

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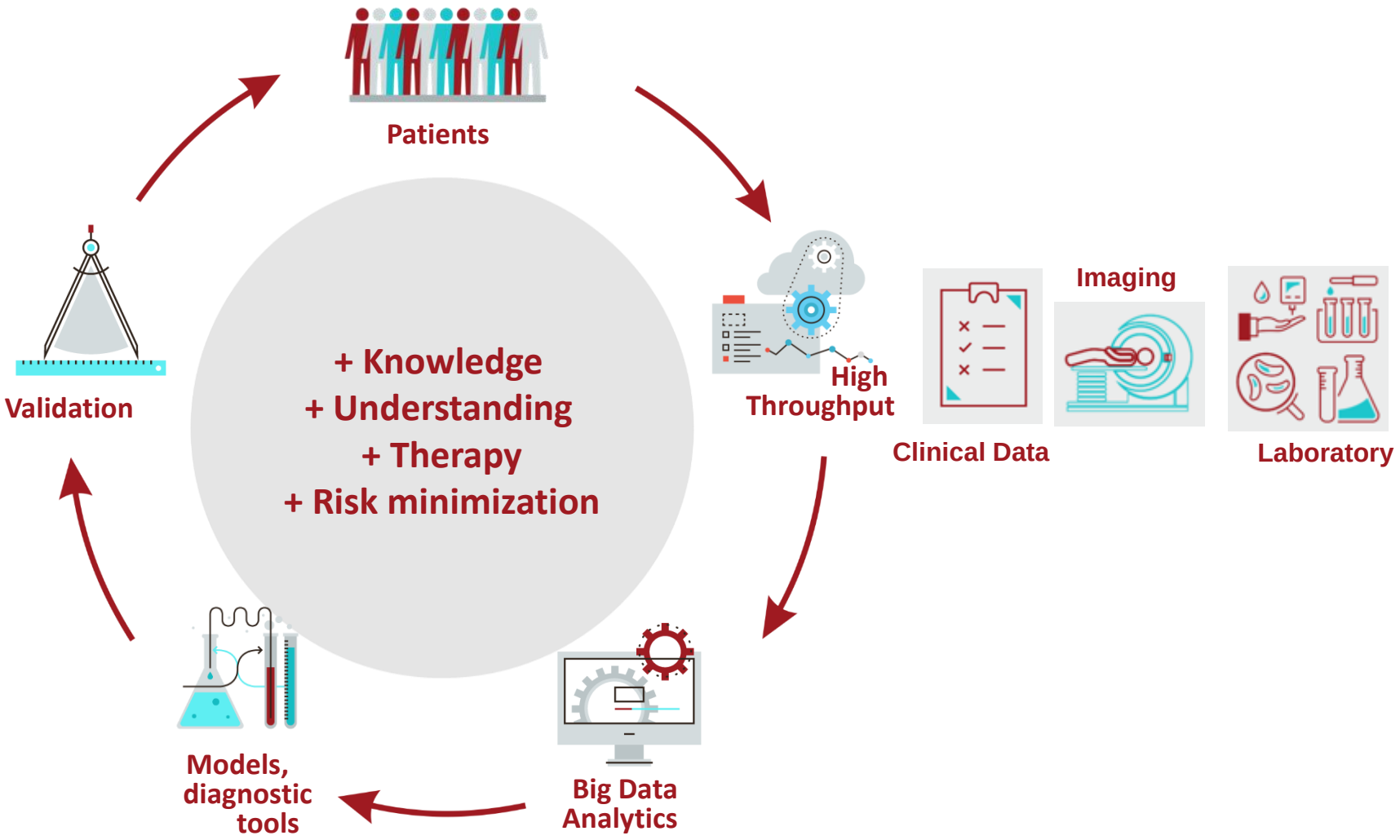
Development cycle in systems medicine



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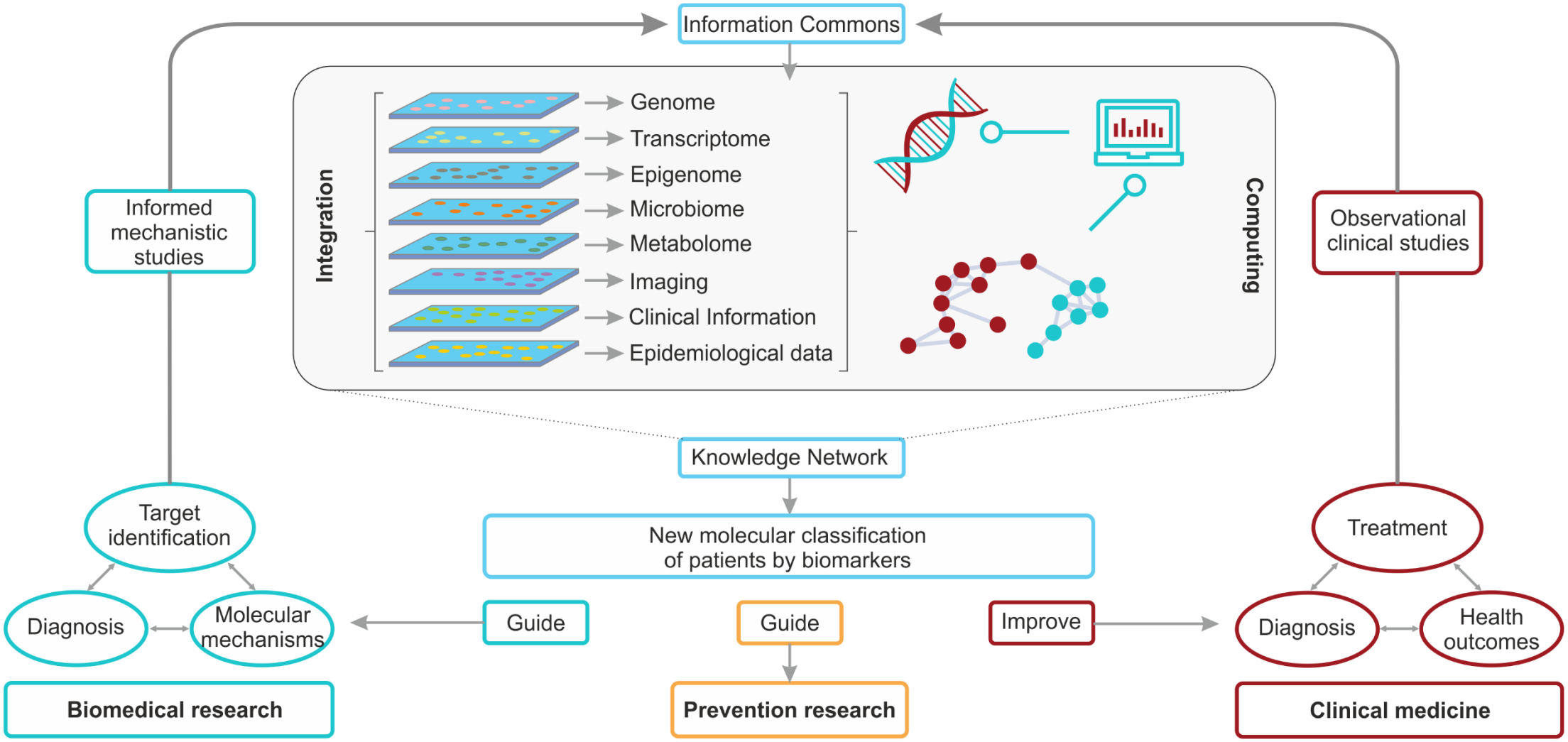
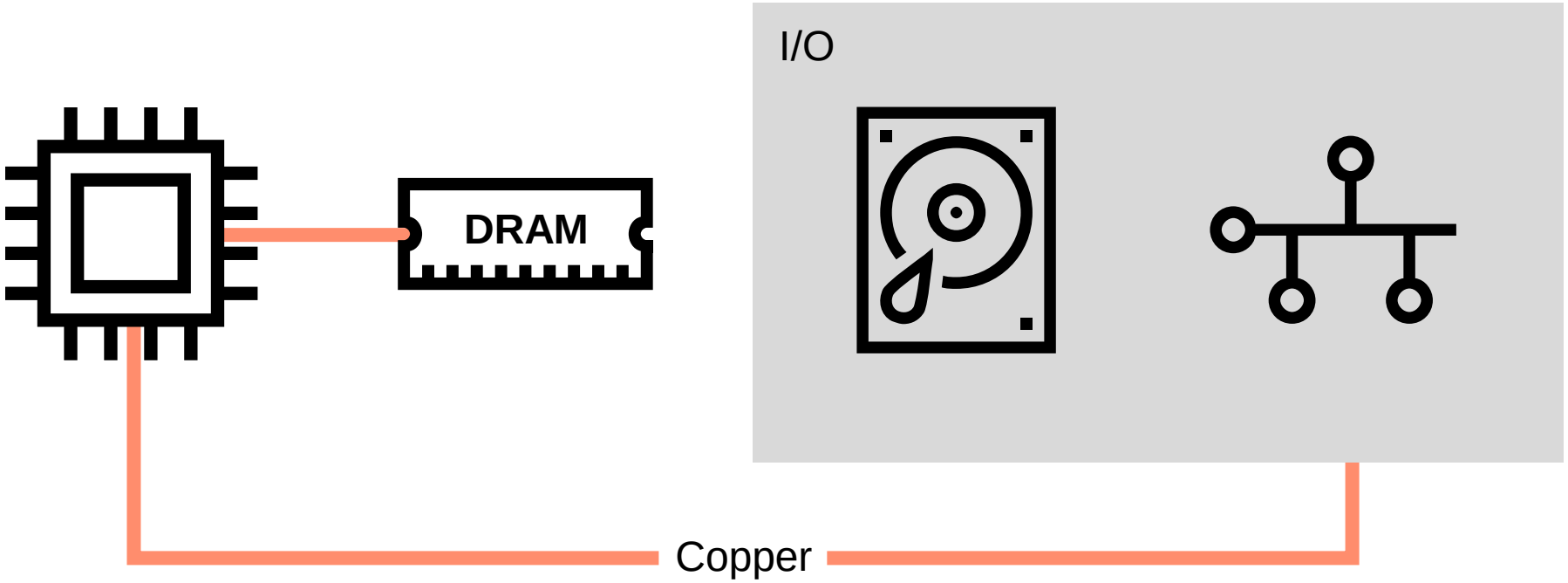
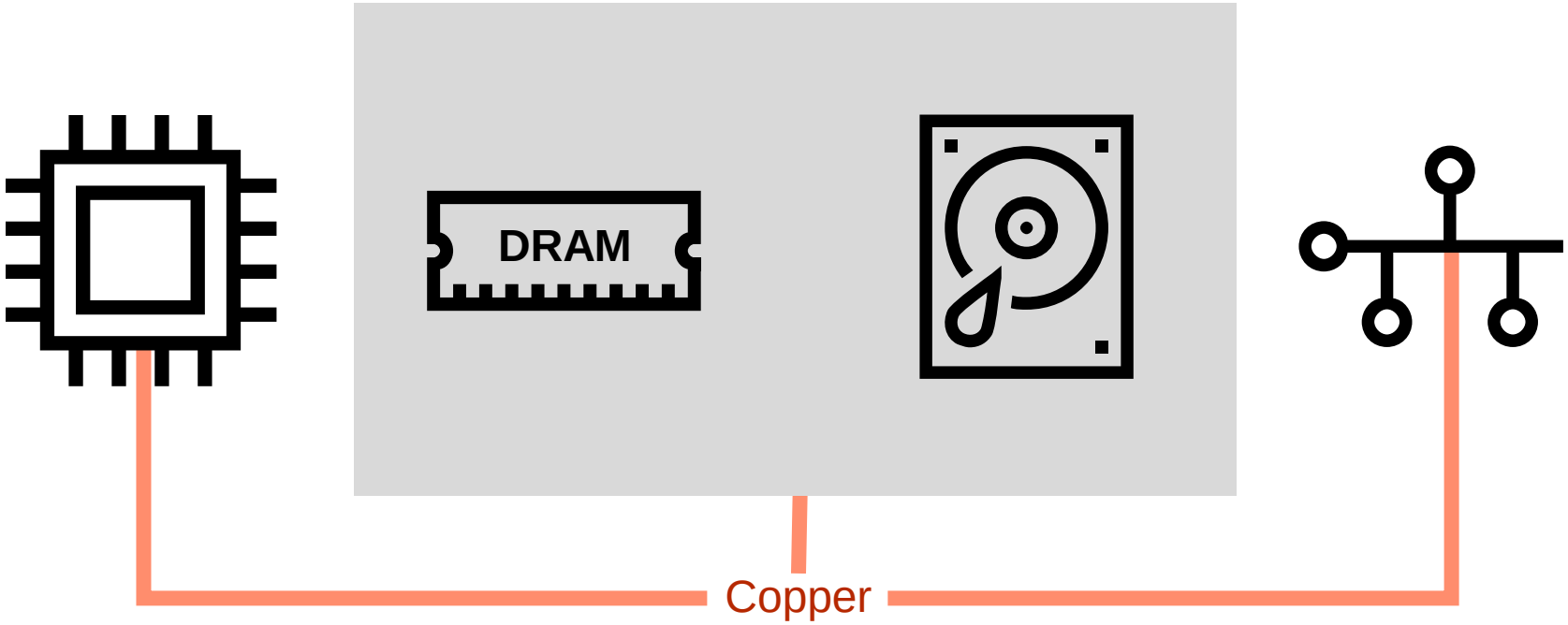
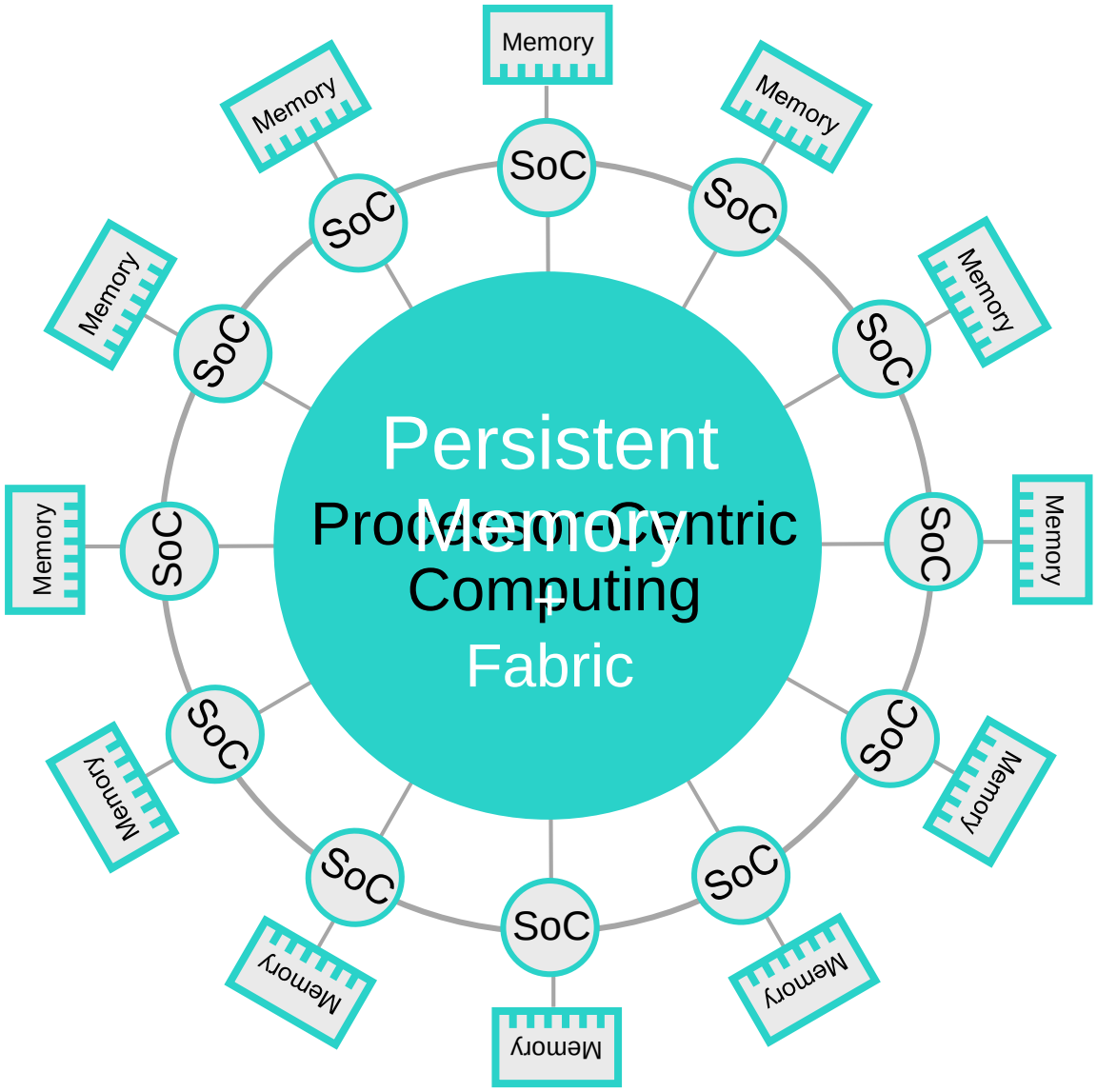
Computing is central




I/O
DRAM
Copper


DRAM
Copper

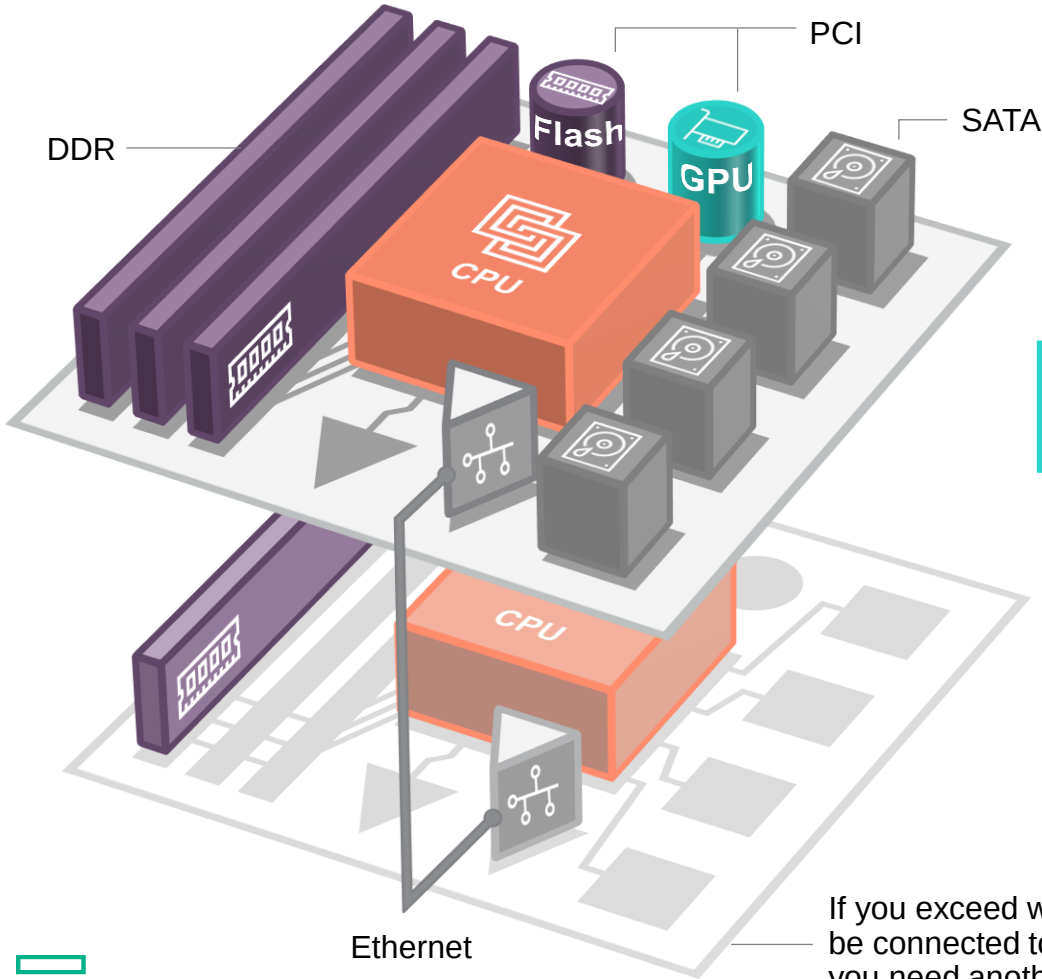


Memory-Driven Computing

Processor-Centric Computing

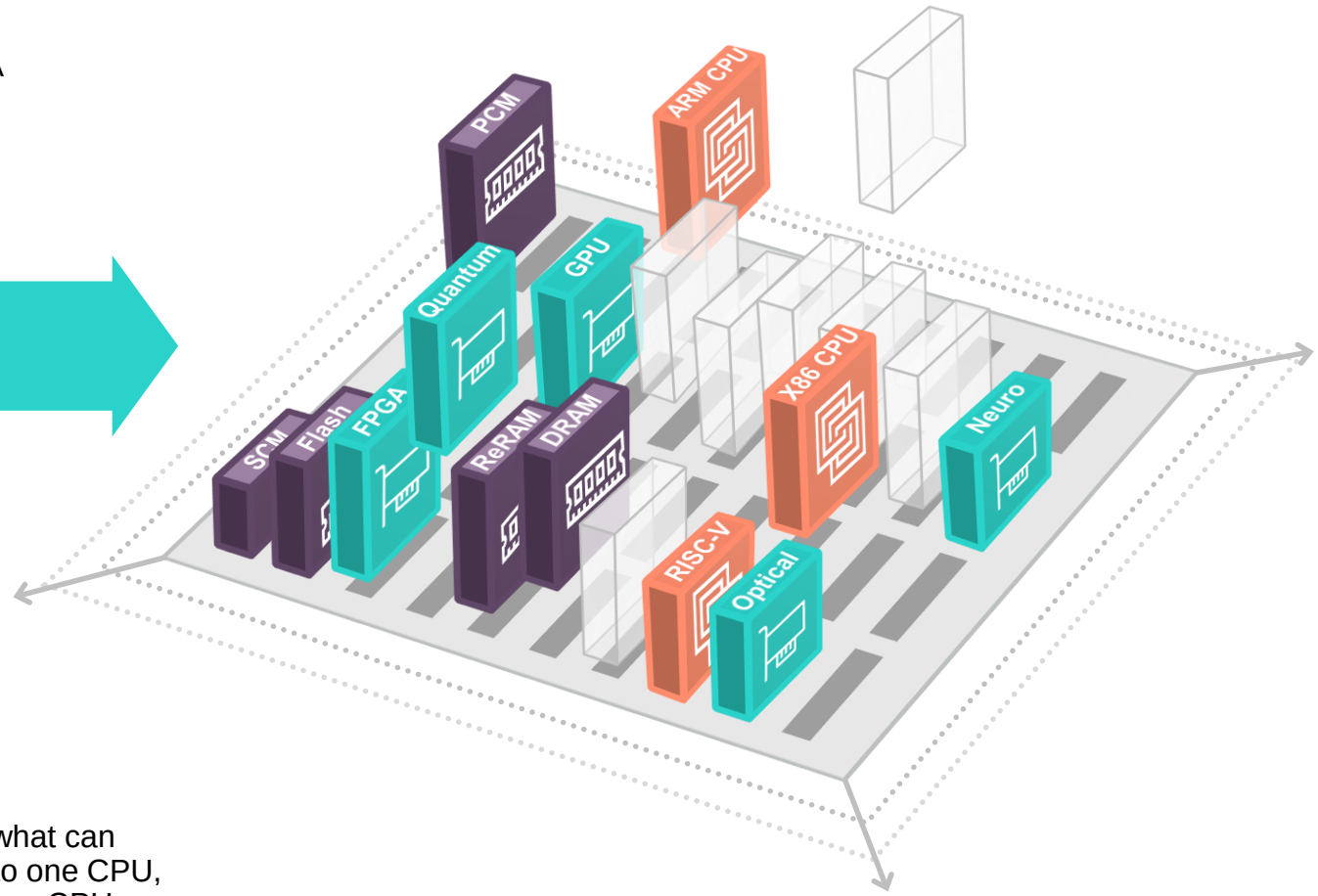
Classical vs. Memory-Driven Computing architecture

Today's architecture is constrained by the CPU



If you exceed what can be connected to one CPU, you need another CPU

Memory-Driven Computing: Mix and match at the speed of memory



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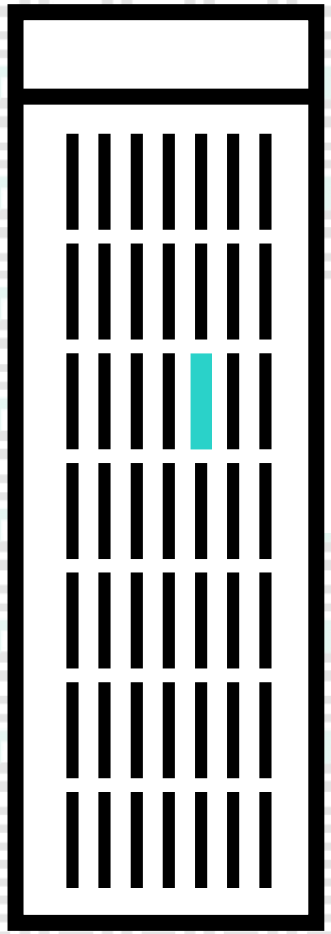
Photonic fabrics destroy distance

Photonics



Hundreds of racks can behave as a **single** server

2^{92} bytes = 4096 yottabytes (=$4096*10^{24}$ Bytes)

genomic data analysis - first use case

Can we make the processing of the raw genome data faster with **Memory-Driven Computing**?

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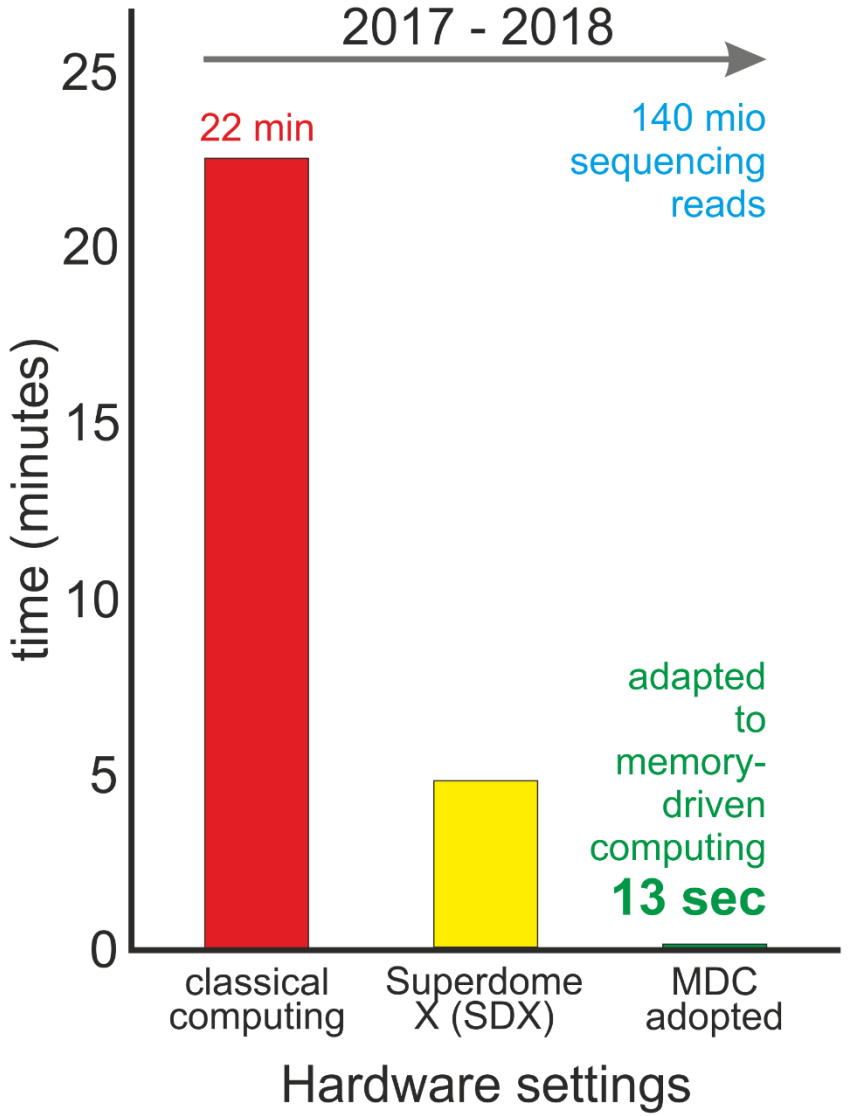
Near optimal RNA-Seq quantification

- Using Superdome X
- Memory-Driven Computing - Architecture
- Small Change in Code



60%
energy reduction
cuts research costs

13sec
processing time
reduced from
22 minutes

101x
increase in analytics
speed removes
research bottlenecks

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Change Mindset

- Think of having ubiquitous memory
- Think of access to memory having no interference from other nodes
- Rethink code

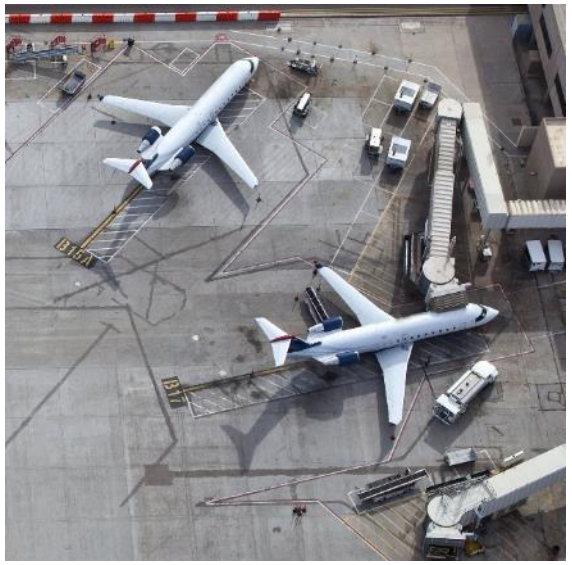
- Change mindset on approach

Transform performance with Memory-Driven programming

Modify existing frameworks

New algorithms

Completely rethink



In-memory analytics

15x
faster

Genomics

100x
faster

Large-scale graph inference

100x
faster

Financial models

10,000x
faster

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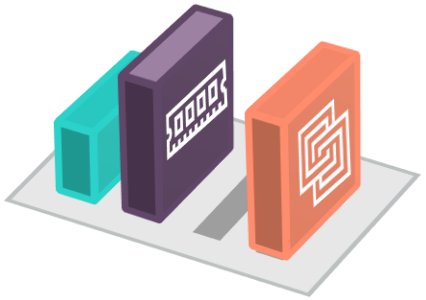
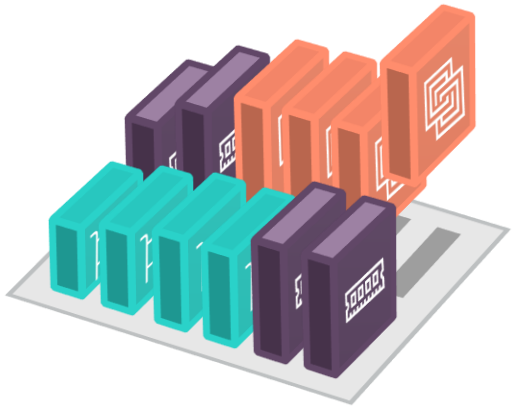
Memory-Driven Computing - future of computing

Edge device



- Near-zero power
- Persistent memory
- AI task-specific accelerator

Cloud

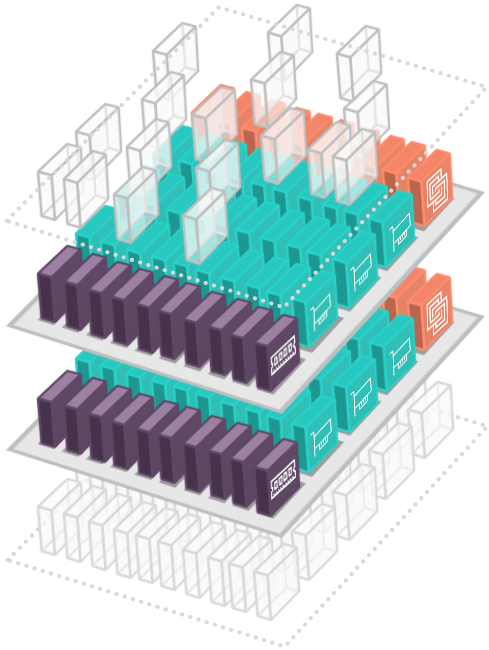


- Composable infrastructure from every edge to any cloud
- Microservices in microseconds at massive scale

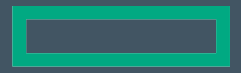
Big memory machine

- High-performance data analytics
- Large shared memory
- Monte Carlo, graph analytics applications

Exascale computer



- 100,000+ components
- Ultra-fast message passing and checkpointing
- 20x more energy-efficient than state-of-the-art



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