



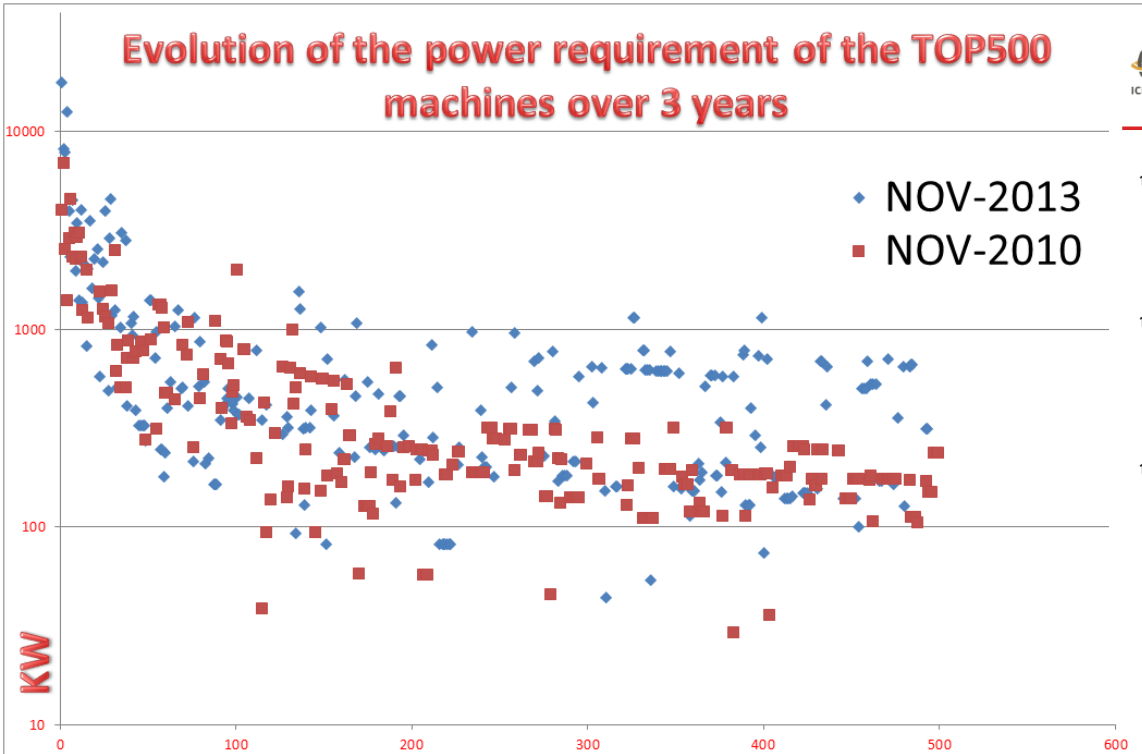
The Machine: The future of technology

Patrick Demichel – Distinguished Technologist
Enterprise Group EMEA
Sep 2014

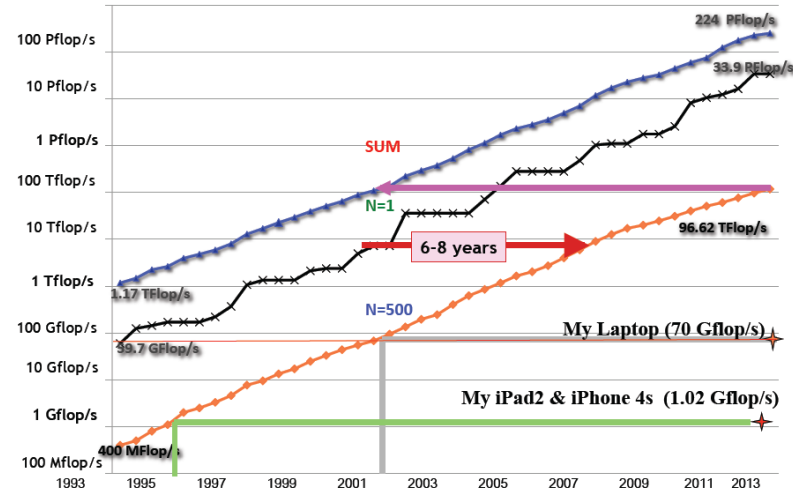
Trend in the datacenter power usage

In average every 3 years the datacenters increase their capacity by 3

TOP500 systems moved from an average of 200 KW in 2010 to 600 KW in 2013 : **an unsustainable trend**

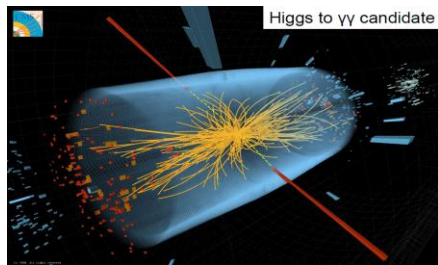
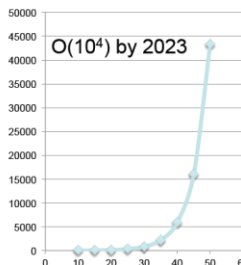
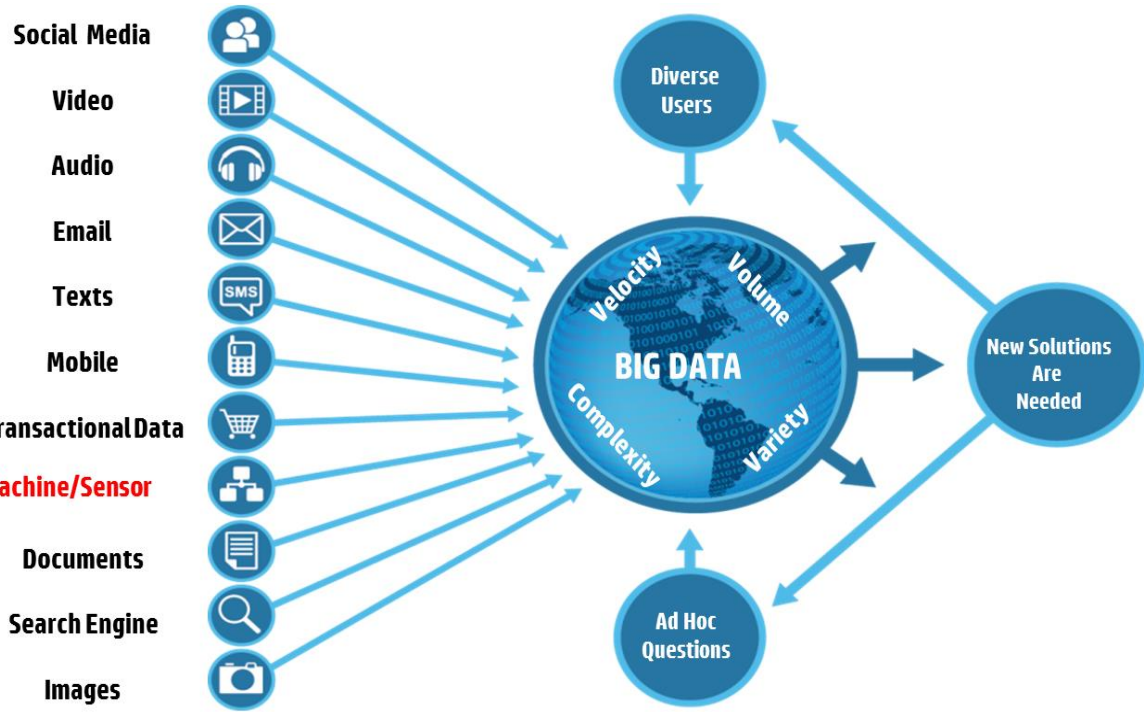


Performance Development of HPC Over the Last 20 Years



Tsunami of data on the horizon

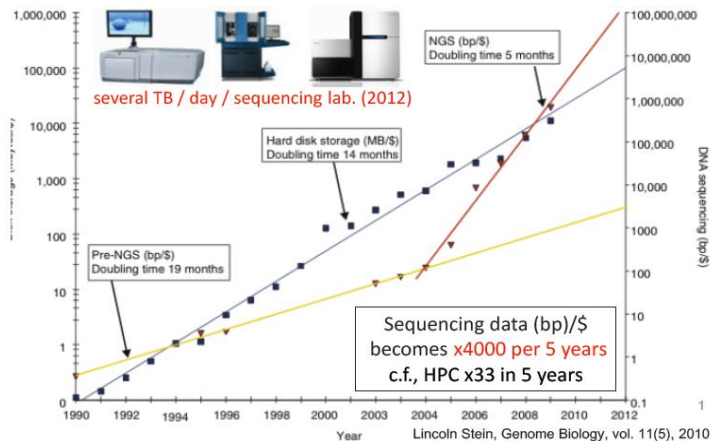
202X will be the decade of Extreme Data; massive compute is required for Extreme Analytics



Problem: Hoped for solution:

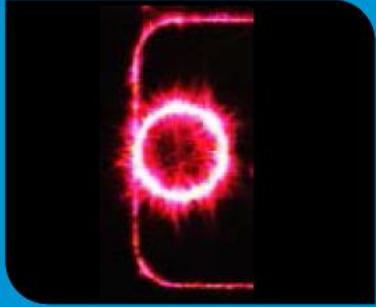
$$O(10^4) \sim O(10) \times O(10) \times O(10) \times O(10)$$

Moore's law New hardware architectures New algorithms Built a better detector

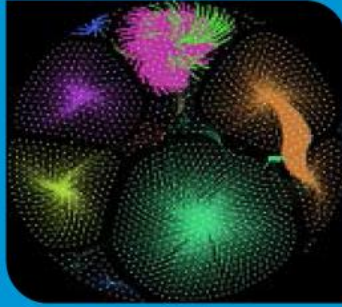


3 disruptive technologies to the rescue

But need holistic redesign for big impact



Breakthroughs in photonics transmit data via light, delivering quantum leaps in speed and power-efficiency



Powerful, intuitive tools to analyze, visualize and convert Big Data into actionable intelligence



Massive, universal memory enables software-defined computing from the personal to the zettascale

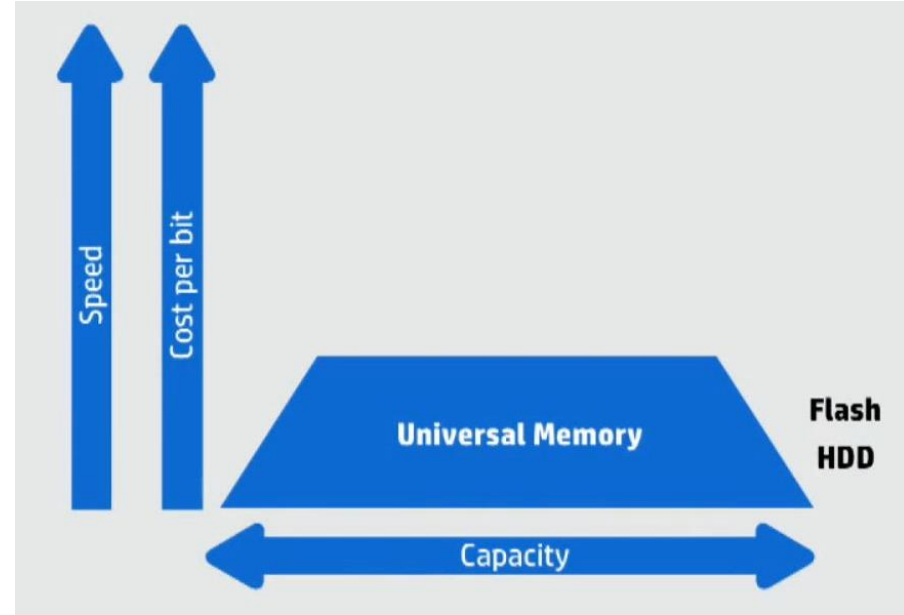
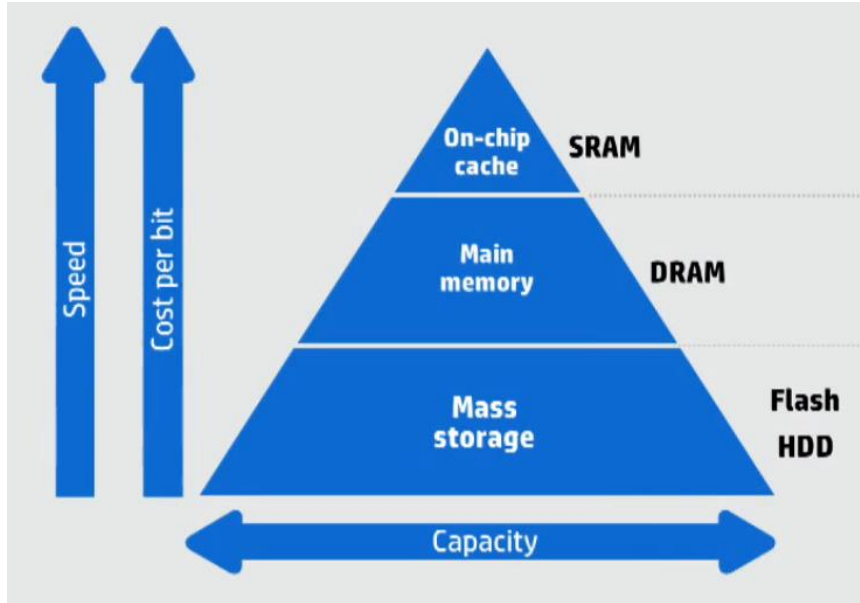
UNIVERSAL MEMORY

Massive memory pool



A drastic reduction of the memory stack complexity and cost

But requires a complete software stack redesign to leverage the full potentiality of the new architecture



Fabric for The Machine

What do we mean by fabric?

The internal network including switches, end-points, low level software and the physical layer.

Internal fabric only – Ethernet & TCP/IP beyond pod

Why are we innovating & leveraging in this space?

Memristor redefines latency of storage, need system level interconnect to match.

SOC brings the network interface on chip enabling very lightweight communications.

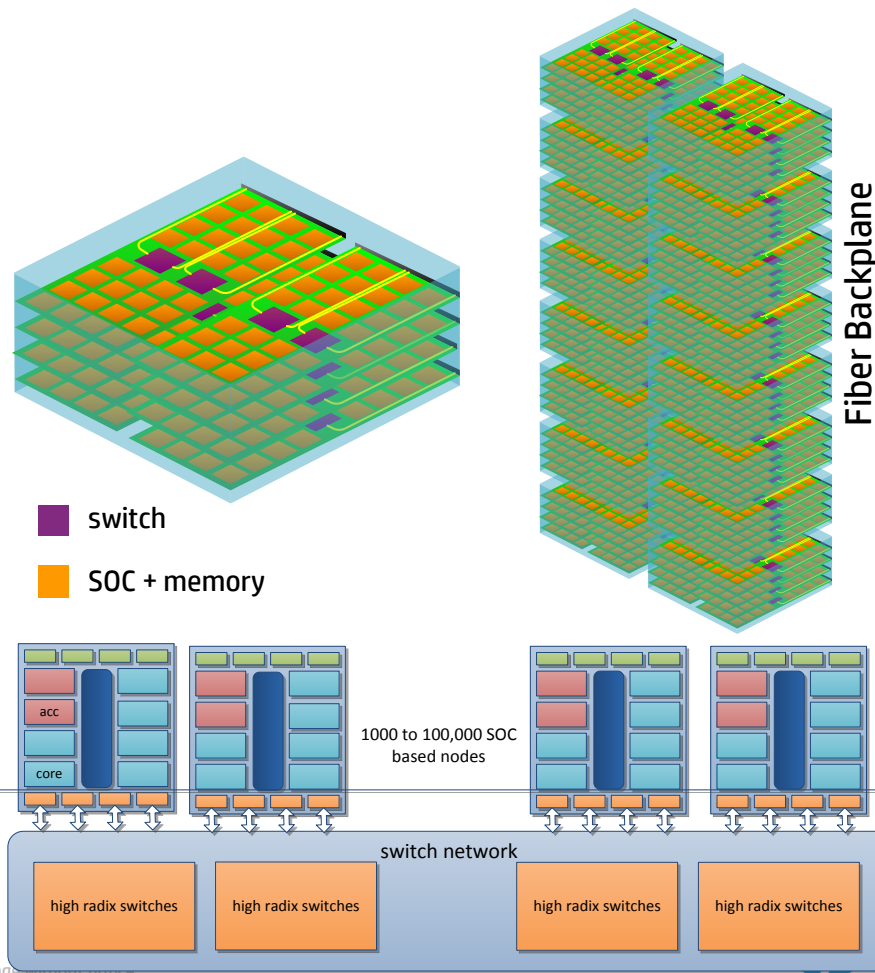
Photonics enables unprecedented bandwidth density without length limitations, **leverage HP siP, Intel, Luxtera, and more**

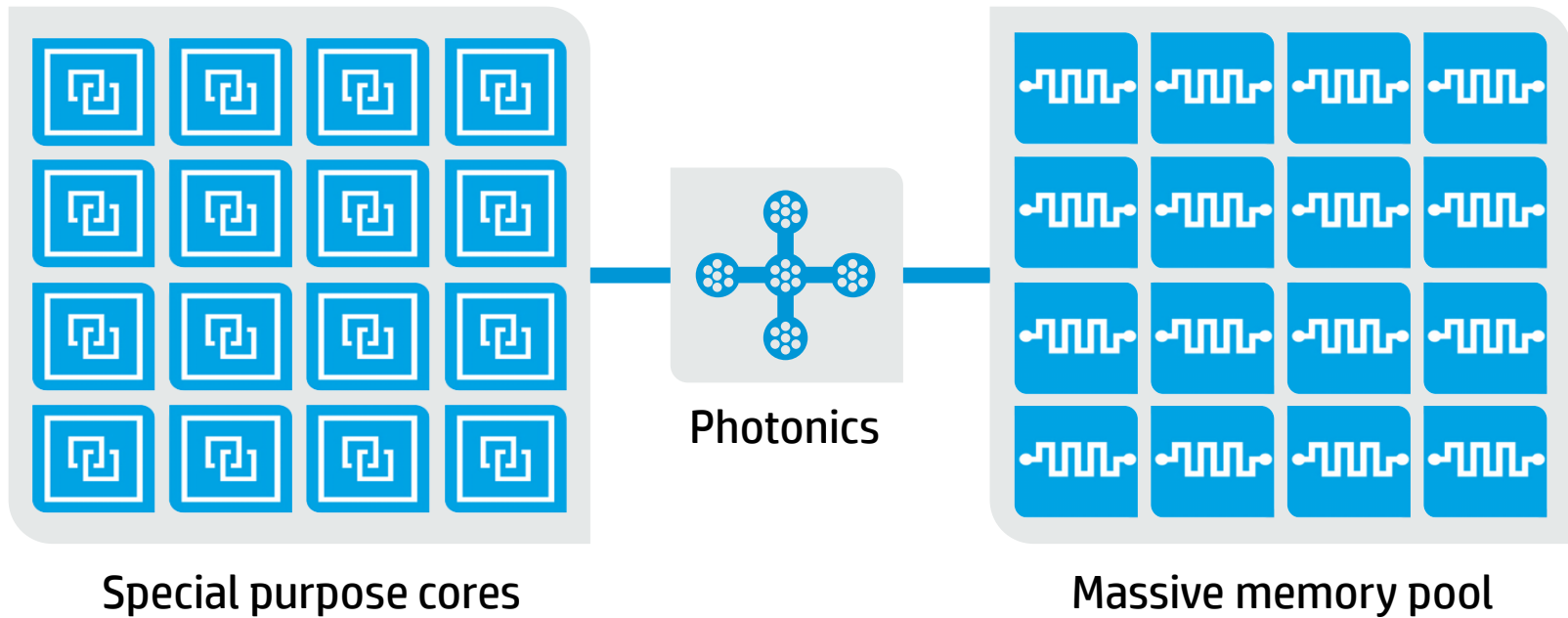
HP advantage

Existing HP fabric designs in servers and networking

Photonics research coming to fruition

Ability to exploit in multiple market segments mobile -DC





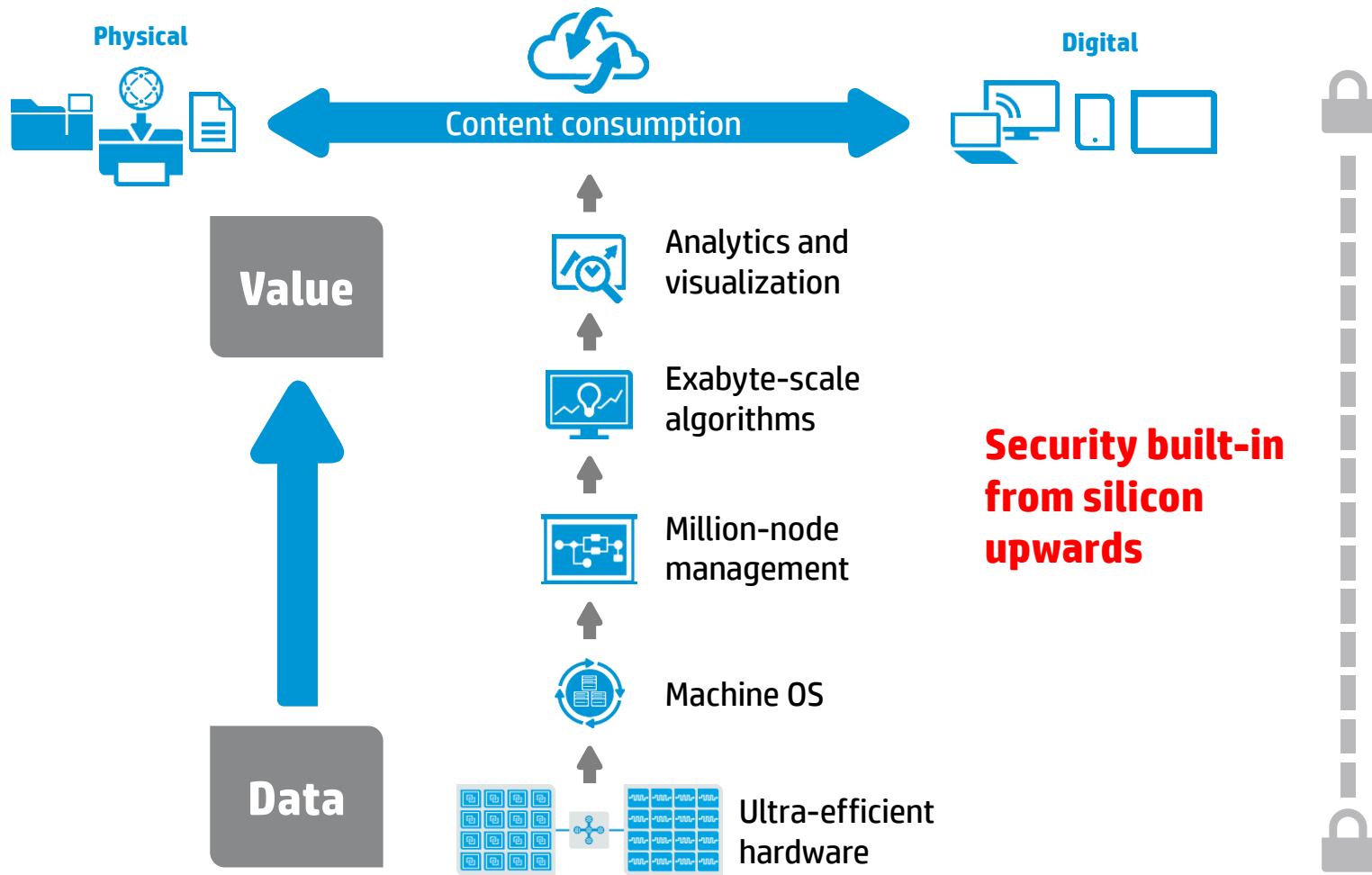
The Machine

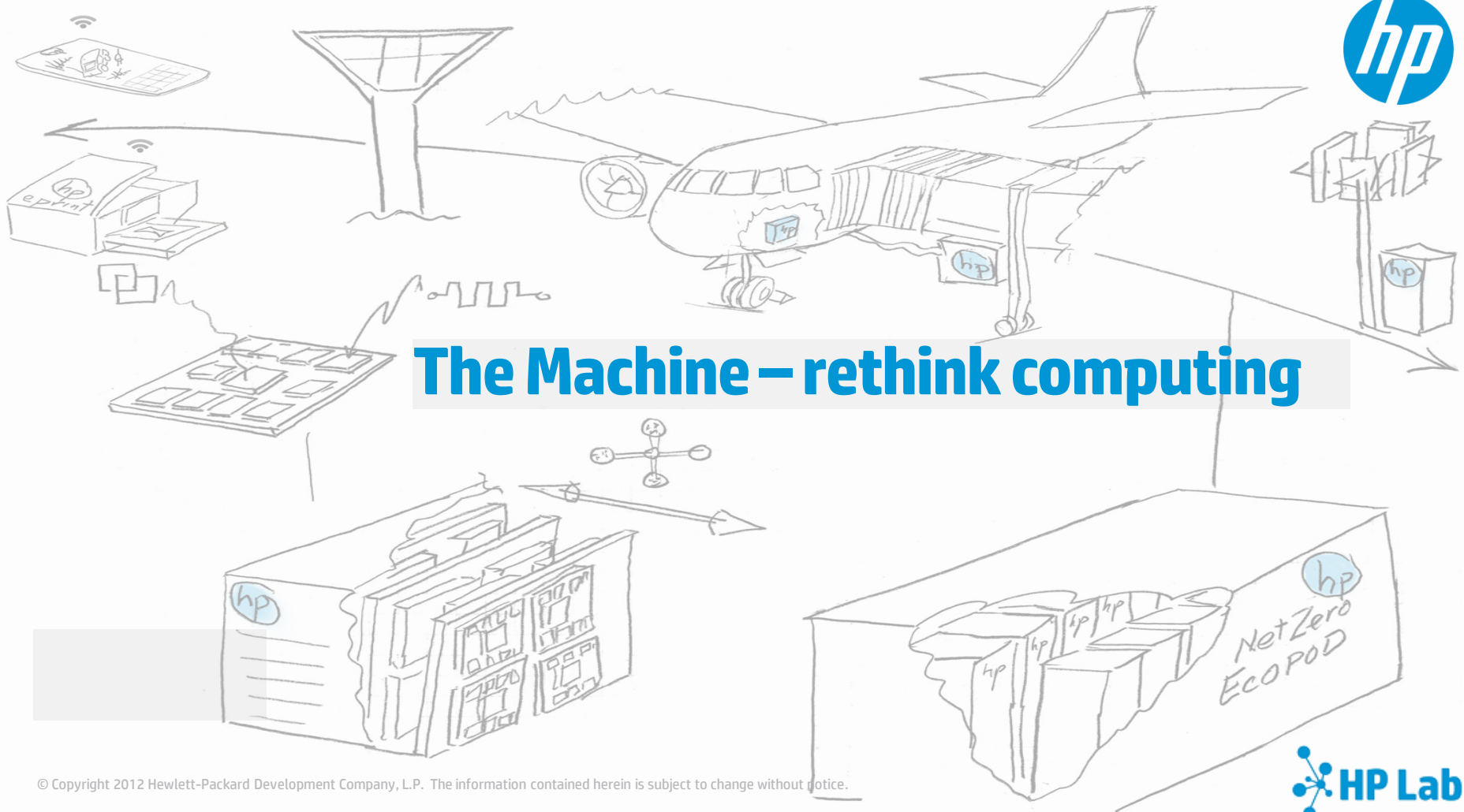
The OS for The Machine (THEOS)

Primary Objective

- *Develop system software technologies for big data applications that allow applications to effectively utilize the massive, distributed non-volatile main memory of The Machine*
 - *where those technologies consist of the capture, storage, organization, indexing, searching, protecting, monitoring, and analysis of data in a secure environment*
 - *with focus on the following long running workloads with persistent data*
 - *Tera-graph*
 - *Giga-event (IoT)*
 - *HAVEn*
 - *Cognitive computing*
 - *Exa-ops*
 - *at an unprecedented scale (tens of thousands of cores, many petabytes of NVRAM)*
 - *with an emphasis on real-time processing*

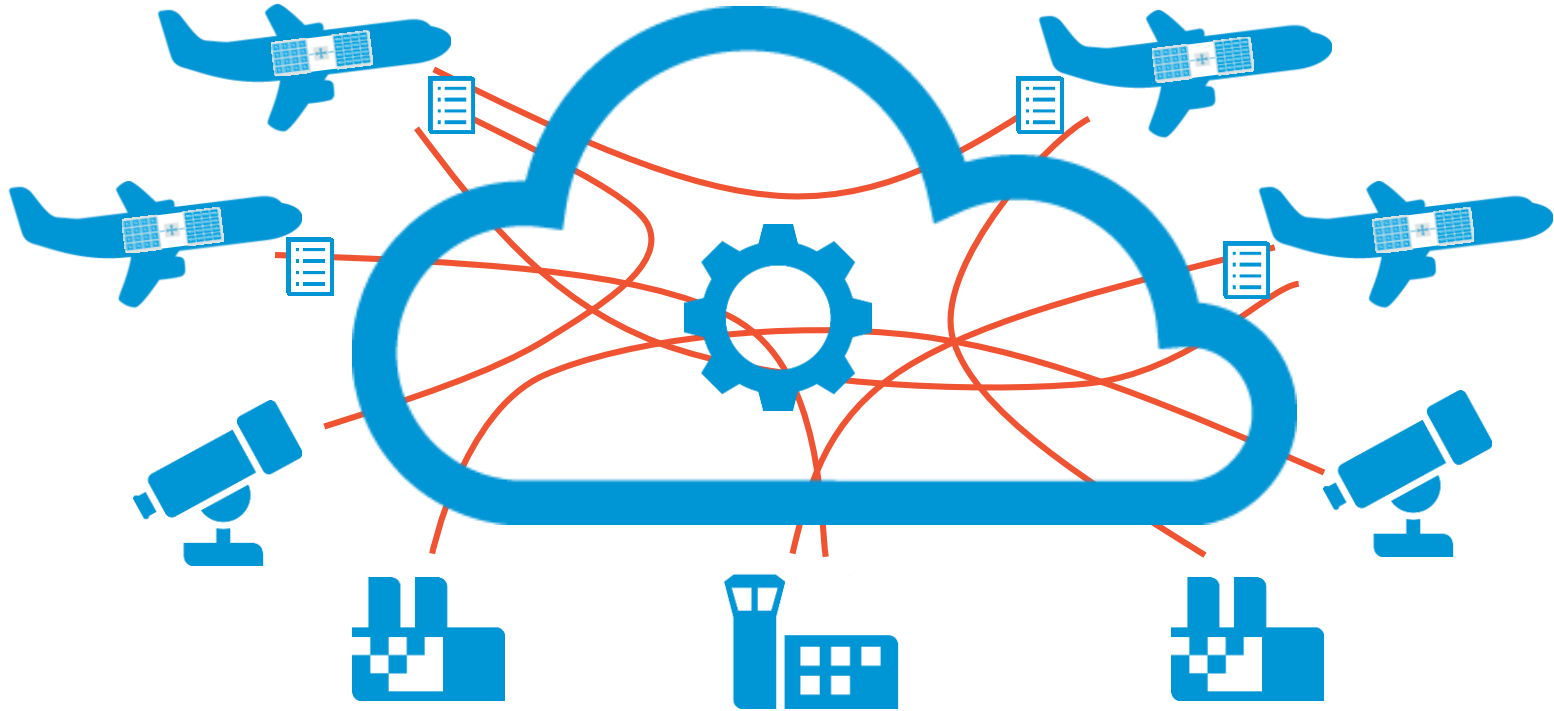






The Machine – rethink computing

A mesh of connected aircrafts ...



From microprocessors to nanostores for extreme efficiency

Game-changing differentiation for the data-centric data center

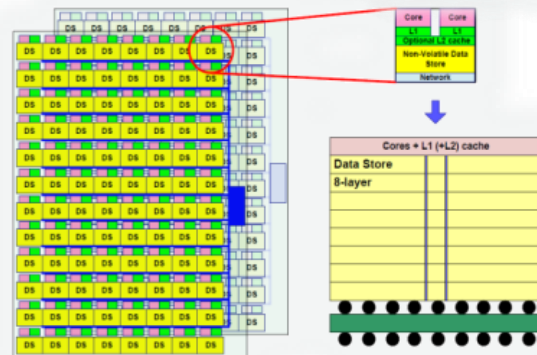
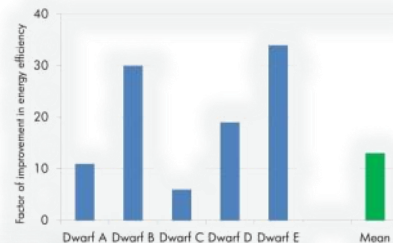


Enabled by HP **Memristors** technology,

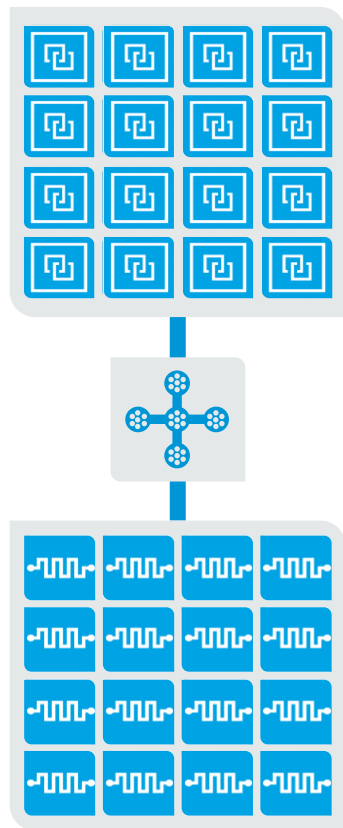
HP Nanostores provide flat converged storage hierarchy with compute colocation for

10-100X better performance/watt

- **More efficient insight extraction from cold data**
- **Fast insights on hot data**



Future History



- SoC Partners selected for co-development
- Machine OS development begins

- Memristors begin sampling
- Physical infrastructure of Core prototypes established
- Open Source Machine OS SDK and emulators released
- ISV Partner collaborations begin

- Edge devices ship in volume
- Core Machines running real-world workloads at scale
- Machine OS released

- Core devices at volume
- Machine available as product, service, and as a business process transformation

2014

2015

2016

2017

2018

2019

2020

- Memristor DIMMs launched
- Integrated core technologies demonstrated

- Edge devices begin sampling
- Machine OS enters public beta

Distributed mesh compute goes mainstream



Thanks

