Taming exabytes

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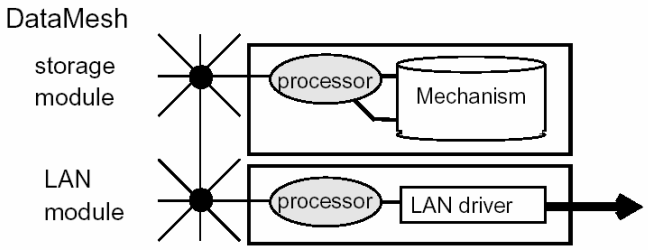
Key messages

- System complexity is increasing
  - System management must be part of the architecture
    … not added later
  - Massive automation is the key to deal with complexity
    → self-managing systems

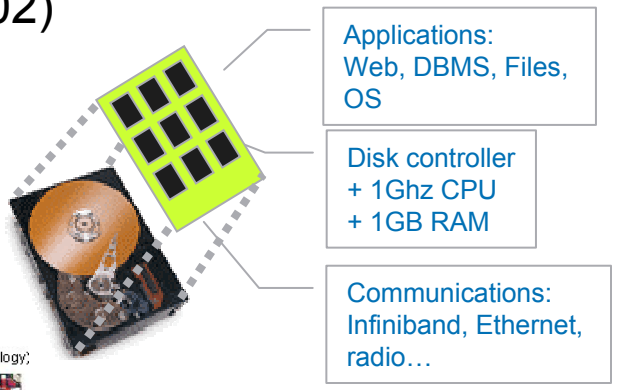
- Storage is the core of modern infrastructures
  - Networked and shared
  - Built-in capabilities for data management and more

Disks are getting smart and collective

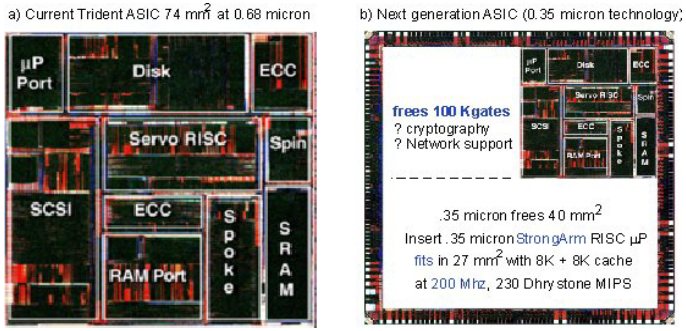
1988 john wilkes – DataMesh



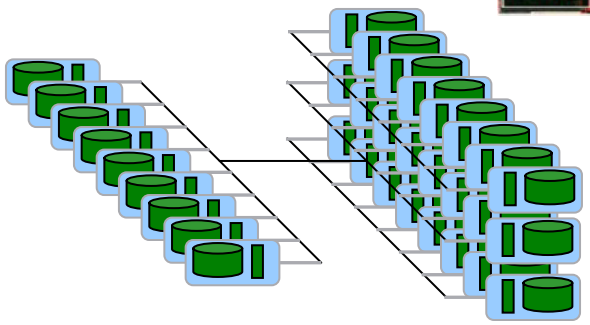
1999+ Jim Gray – "disks are becoming computers" (*Storage bricks have arrived*, FAST 2002)



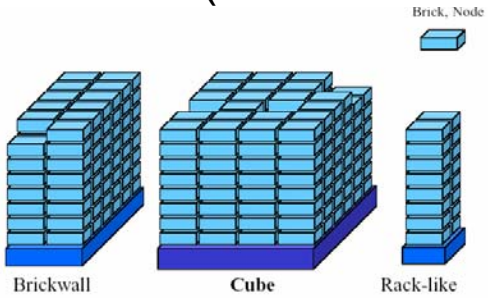
1996 Garth Gibson – NASD



2003 HPL – federated array of bricks (FAB)



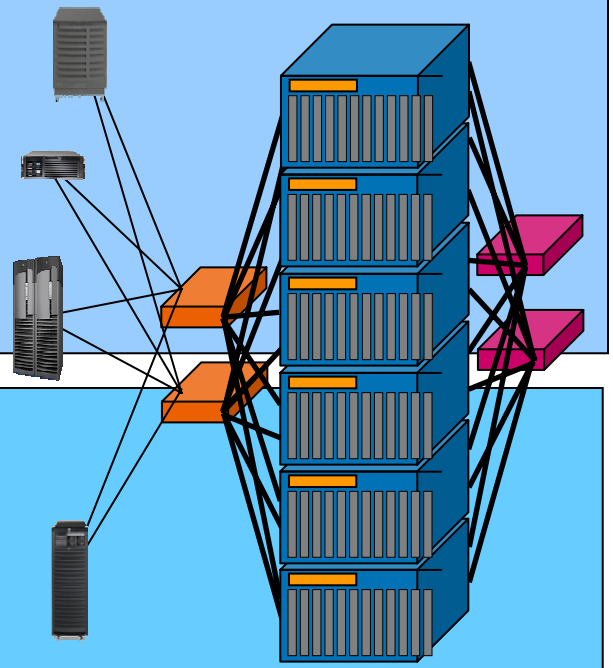
2001 IBM Almaden – Collective Intelligent bricks (aka IceCube)



HP StorageWorks Grid

Next-generation storage architecture in Adaptive Enterprise.

- Scale-out platform
  - Provides ability to add/remove resources (i.e. capacity/performance) dynamically
  - Facilitates support for non-uniform grid
- Administered as a single system
  - Addresses complexity of controlling a large number modular components
- Built on Industry Standard Technology
  - Fundamentally changes technology cost structure

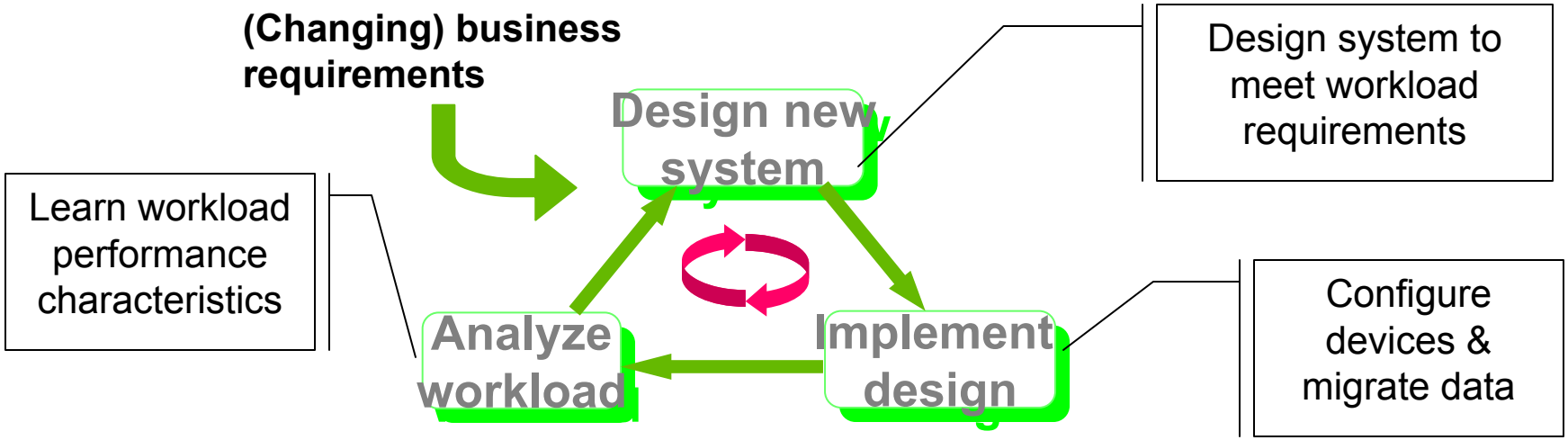


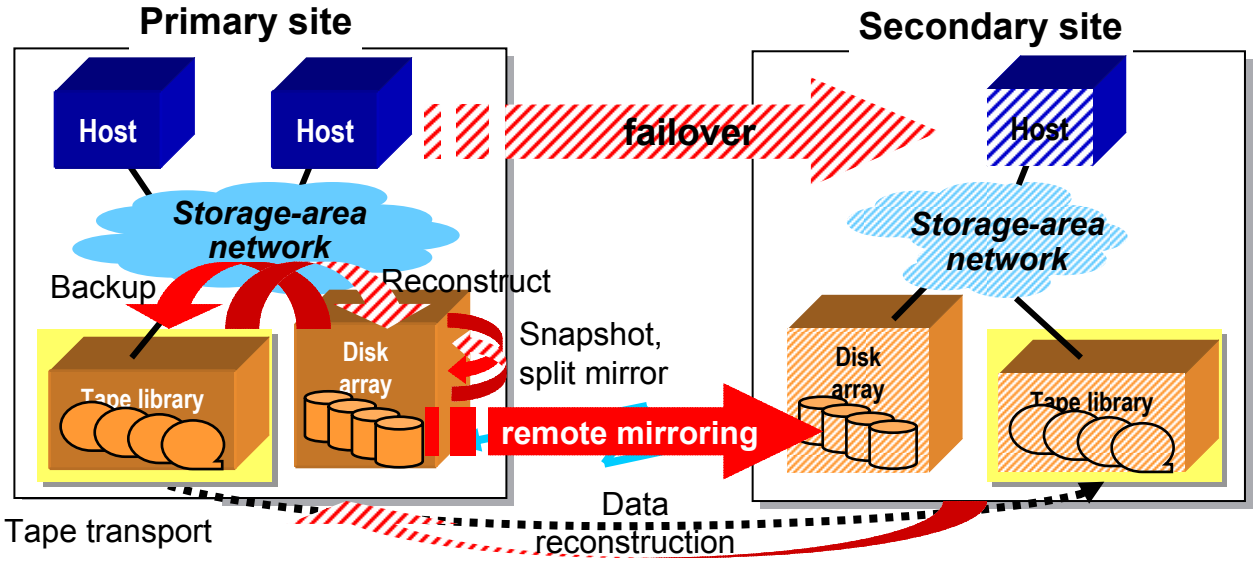
- Dynamic service binding
  - Provides ability to (re-)deploy new capabilities
- "Open" platform
  - Provides ability for additional innovation
  - Provides ability to incorporate heterogeneous technology
- Collocation
  - Provides platform for optimization

Self-managing storage systems

- Manageability built-in to system architecture
  - Simplified management as a design goal
  - controllable systems: either provide self-control or enable outside control
- Complete automation is key to self-management
  - Specify what's wanted (goals), not how to achieve it (implementation)
  - Management system must choose what to do, not people
  - Human oversight + feedback to correct/refine choices

Example: performance and dependability





Recap: more research focus

- Large-scale storage infrastructure
  - Challenge: scalability with ease of management
- Large-scale system management
  - Challenge: minimize *human touch* during system lifetime
- Storage security
  - Urgent need to include networked storage systems into overall (data) security architecture!
  - Gets post-facto consideration, e.g.: this presentation!

HP vision: storage as a utility

scalable,
non-disruptive growth

self managing

available and
accessible

flexible and efficient
resource utilization