Container-less Development or Immutable Containers?

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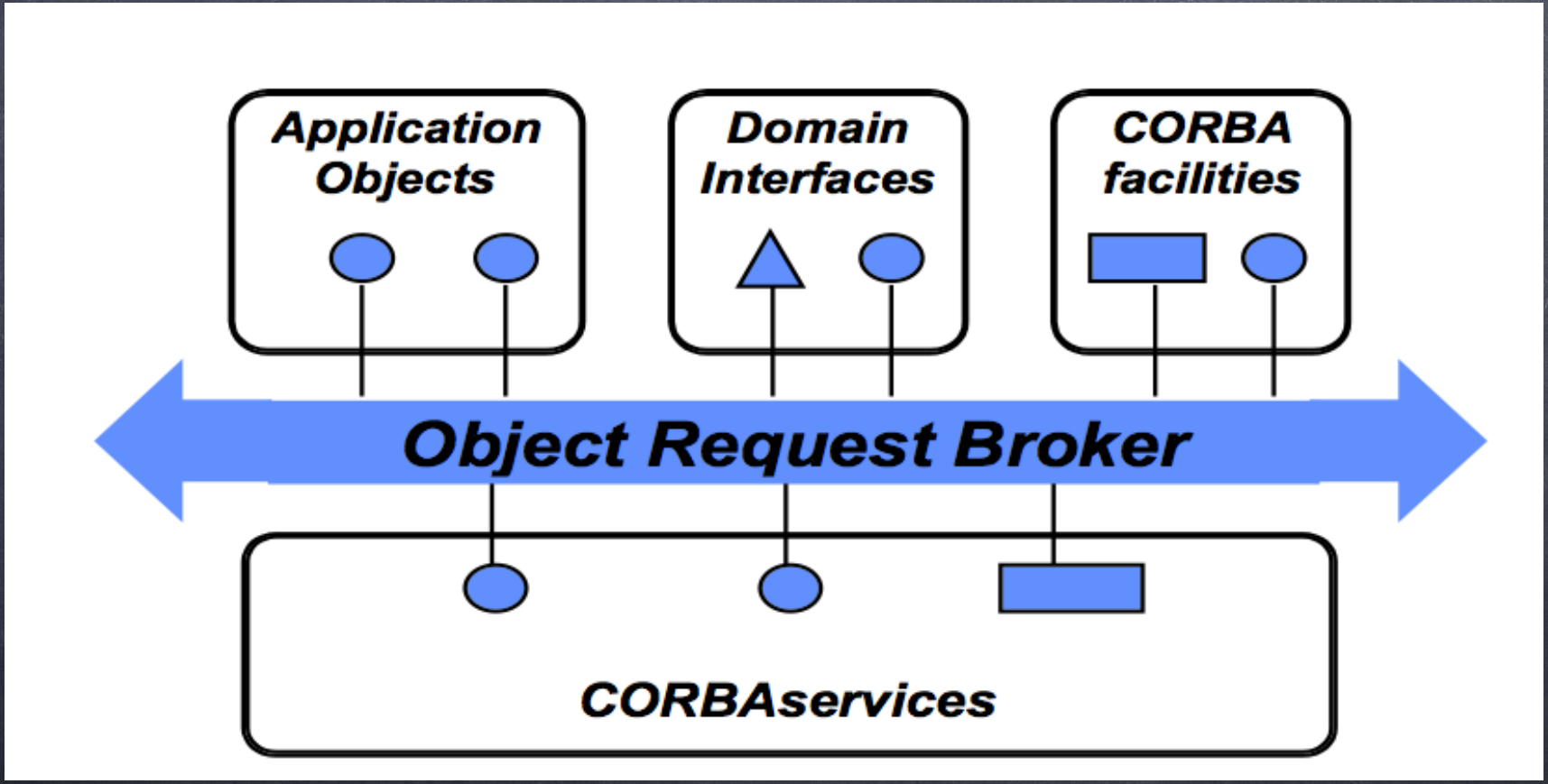
Distributed systems archeology

- 1970's-1990's client-server rules
  - Typically single-threaded
  - Multi-threading in languages rare
    - setjmp/longjump anyone?
- Core services/capabilities begin to emerge
  - Transactions, messaging, storage, ...

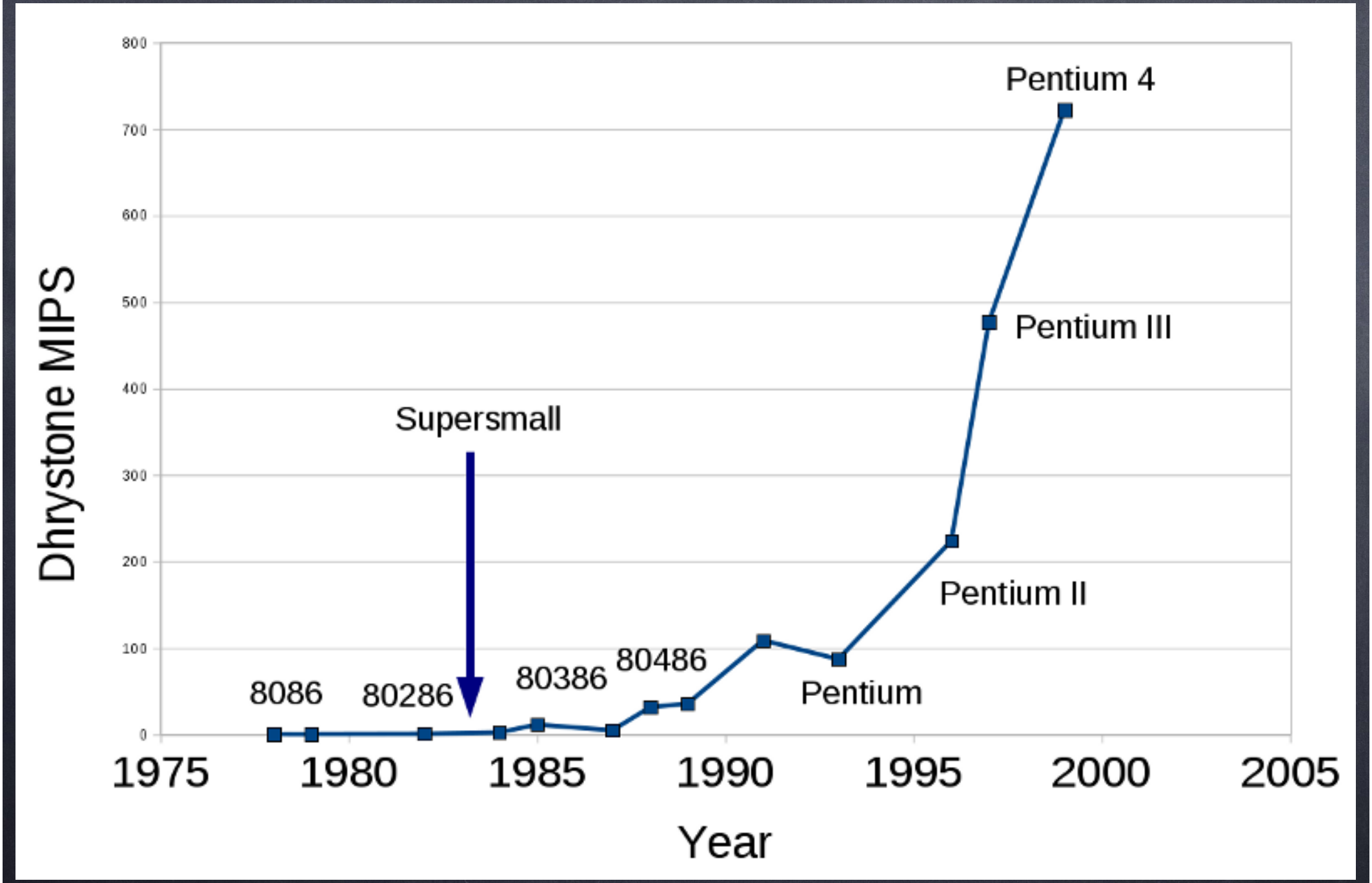

PERQ

CORBA (other architectures are available)



And then ...

- Late 90's/2000's
  - New generation of chips, e.g., M68030, SPARC, Xeon, Itanium
  - Multi-core, hyper-threads
- RAM sizes "explode"; access times too
  - 64 Meg in Sun 3/80, 512 Meg Pentium 3
- Network speeds improve more slowly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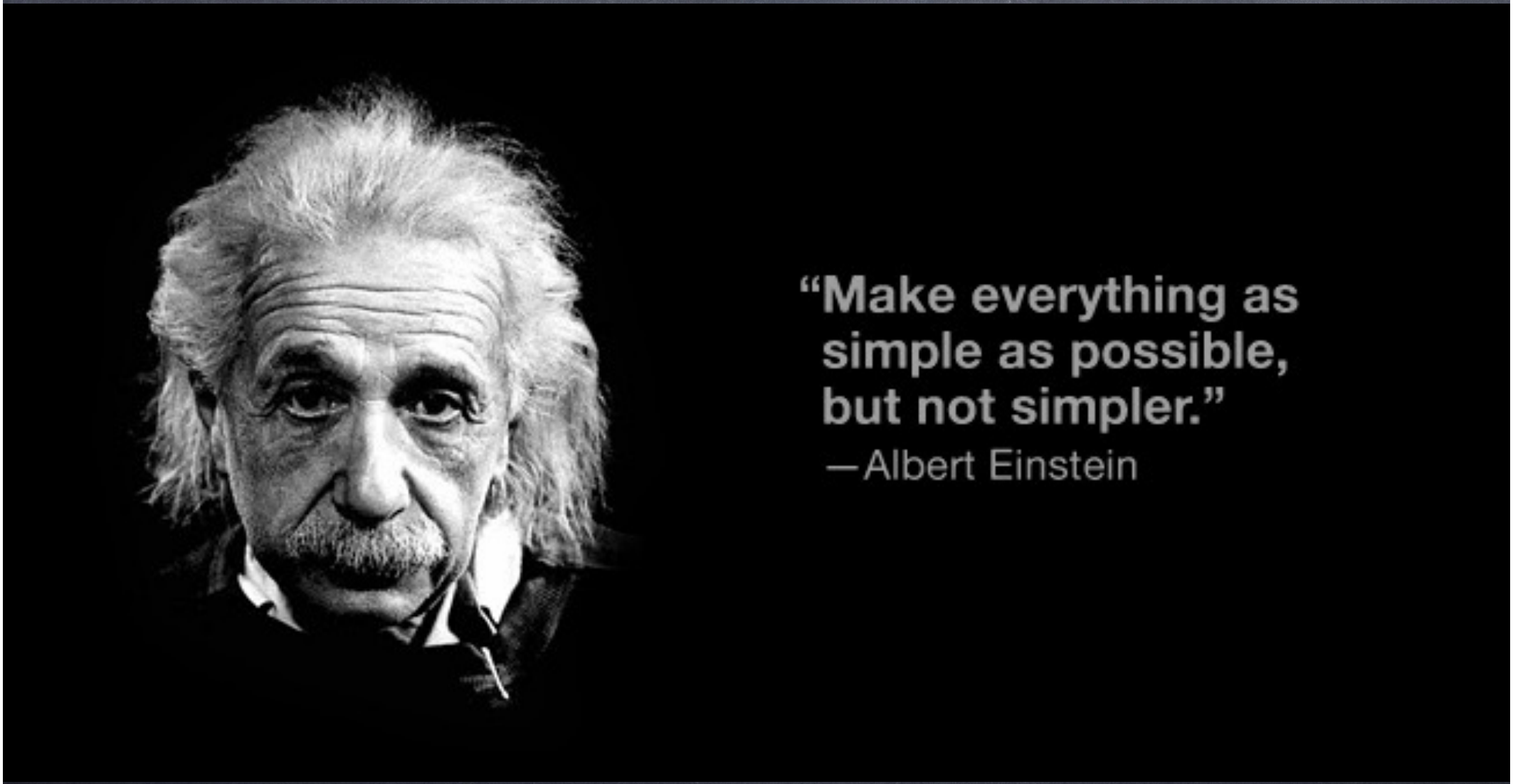
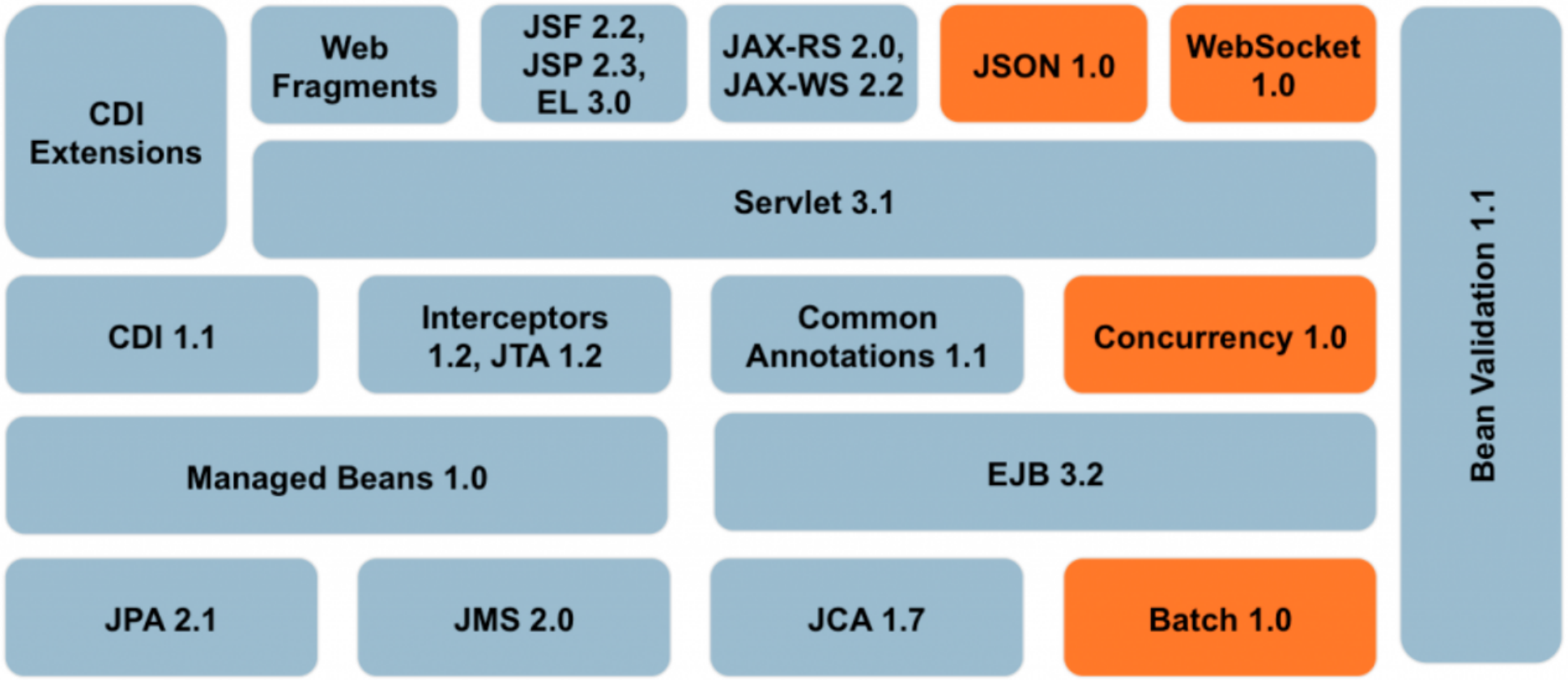
COMPAQ
THE
SPIRIT GATE
WIZARDS

The application container

- Encourages co-location of capabilities/ services
  - Improve performance & memory footprint
- Application containers encapsulate and abstract
  - Thread pooling, transaction management, security, connection pooling, ...


“Make everything as simple as possible, but not simpler.”
—Albert Einstein

Java EE components



Application container backlash

- Not as simple to develop the "easy stuff"
- Application containers begin to be viewed as bloated
  - Not everyone wants all enterprise services
  - All-or-nothing approach to capabilities
- OSGi or MSC evolve to address dynamic updates

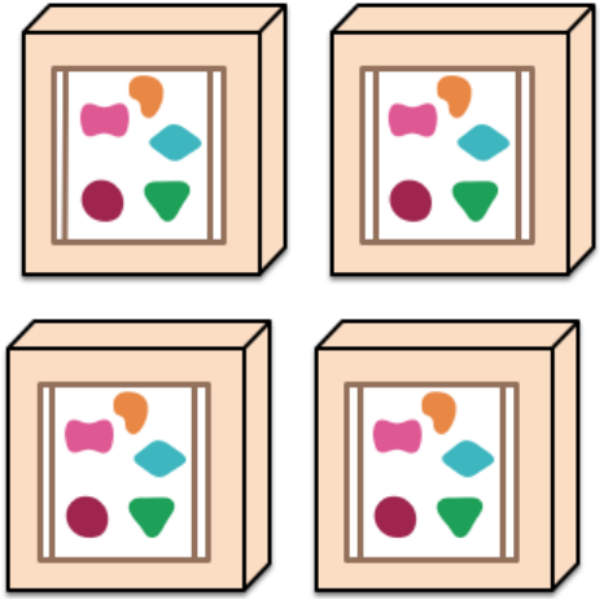
Java EE stripped down

- Many developers are happy with Java EE
  - Robust and mature components; well understood
  - Scalable, standards compliant, integrates well
- Not everyone wants to use all of Java EE
  - Stripping down is common
- Ditch the container to use components "raw"
  - WildFly-Swarm

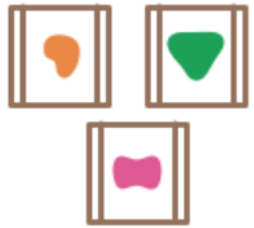
Microservices

A monolithic application puts all its functionality into a single process...

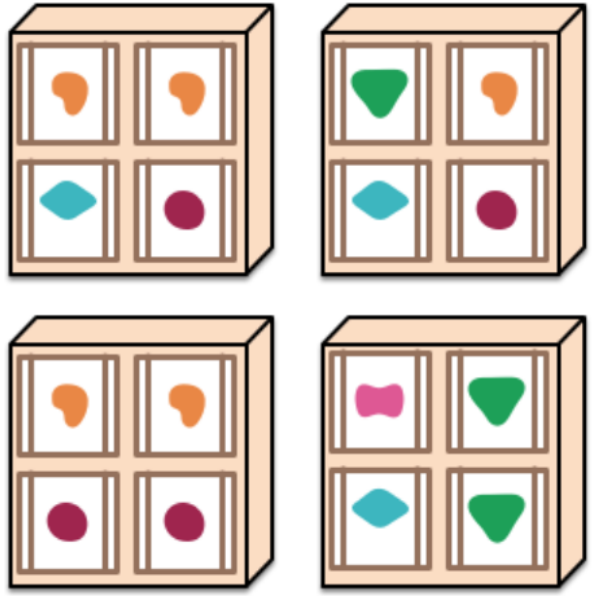
... and scales by replicating the monolith on multiple servers



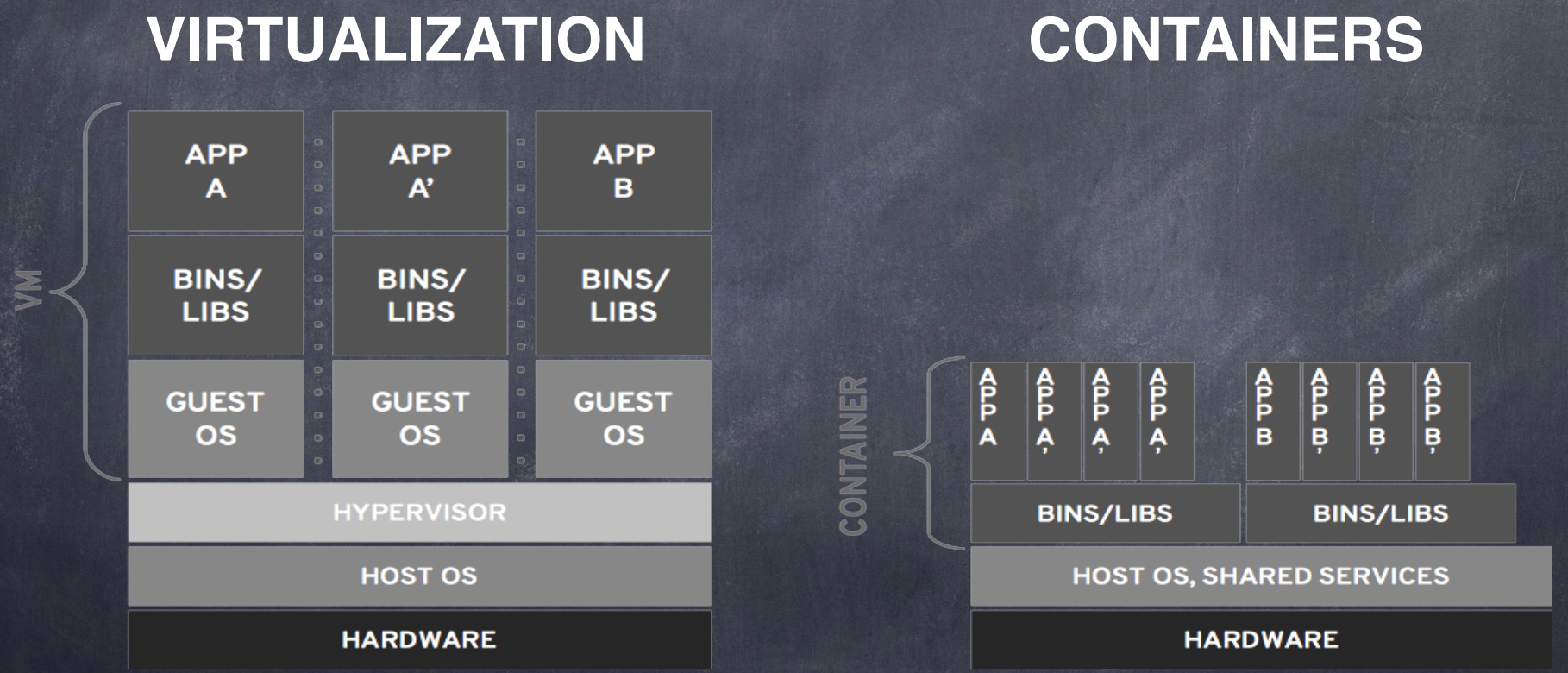
A microservices architecture puts each element of functionality into a separate service...

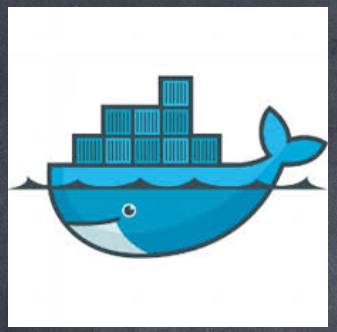


... and scales by distributing these services across servers, replicating as needed.



Along come Linux Containers!





Such as Docker

- Solve the problem of moving applications between infrastructures
- Docker is disruptive:
  - Technology Advantages – componentised applications packaged and separated in their own containers
  - Business Benefits – "standard" container means faster delivery as only one mechanism for packaging
  - Ecosystem – Docker, Google, OpenStack, Red Hat, RackSpace, IBM, VMWare, Microsoft and Amazon

Kubernetes

- Open source project from Google
- The de facto standard for cluster management for Docker containers
- Packages Orchestration, service discovery, load balancing - all behind a simple rest API
- Backing from Google, IBM, Red Hat, Microsoft, Rackspace, Cloudbees etc.

Kubernetes and Containers

- Kubernetes requires immutability of images
  - Any changes to a running image are lost
  - Can still be made but volatile
- State must be stored off image
  - Shared (persistent) volumes, non-Container services etc.

Immutability simplifies architectures

- Dynamic reconfiguration in Containers?
  - New images can be created quickly
  - Memory footprint still small
- Rip out some application container code
  - Update? Create new image and redeploy!
  - Keep connection pools, thread pools, dependency injection, ...

Enterprise capabilities

- However, the need for transactions, reliable messaging etc. doesn't go away
  - Applications still need them
- Application containers breaking into pieces
  - Independently deployable (Container) services
- Available to different language clients using REST/HTTP and other protocols

Balls of mud made of services

"**If you're building a monolithic system and it's turning into a big ball of mud, perhaps you should consider whether you're taking enough care of your software architecture**. Do you really understand what the core structural abstractions are in your software? Are their interfaces and responsibilities clear too? **If not, why do you think moving to a microservices architecture will help?** Sure, the physical separation of services will force you to not take some shortcuts, but you can achieve the same separation between components in a monolith." **http://www.infoq.com/news/2014/08/microservices_ballmud**