Enabling Grid in Industry and Enterprise

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Intel and the Grid – Parallelism

- Intel is working on the use of parallelism at many levels:
  - From multi-processor, hyper-threading and dual-core, up through clusters and HPC, and Grid
  - What is common – is our interest in standards which enable broad adoption and innovation
  - OpenMP and MPI are examples of standards specific to parallelism we are very active with and support strongly. (we are helping create volume usage and deployment!)
  - Grid stands as an area ripe for broader adoption through standards – and Intel is involved heavily with this in mind

Intel and the Grid

- Our view of the Grid:
  - A key infrastructure technology (virtualizing and federating distributed data centers)
  - An important extension of the SOA model (dynamic, policy–based execution of services on suitable resources)
  - An opportunity to drive broad adoption with commodity platforms
- We work with the Grid community in several ways:
  - Enable software developers of today's Grid solutions
    - Industrial/corporate developers, academic/research developers,
      and foster ISVs too!
  - Create new, exciting Grid showcases (GPE)
  - Participation at Grid standards bodies (GGF, EGA, OASIS, DMTF)

Grid Business Drivers

- Lower TCO, higher ROI
  - Avoid over–provisioning by breaking down apps silos
  - Reduce management/administration effort
  - Facilitate heterogeneous configurations
- Business agility
  - Rapidly adapt to changing usage patterns
  - Grow by scaling out, not up
  - Potential to aggregate resources (⇒ new capabilities)
  - Highly efficient B2B collaborations
- High availability/reliability
  - Benefits of distributed infrastructure “without the pain”
  - Automated discover/provisioning allows rapid, automated response to problems

Grid Evolution

Clusters

- Co–located parallel systems
- Managed as a single entity

Issues

- Management
- Apps parallelization
- Job scheduling

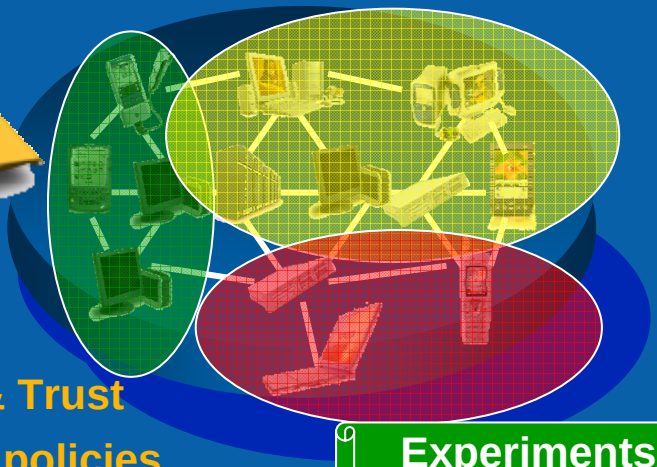
Established Technology

Adoption ramping up

- Resource mgmt./discovery
- Service–oriented apps
- Orchestration

Grid 2.0

- Involves multiple organizations



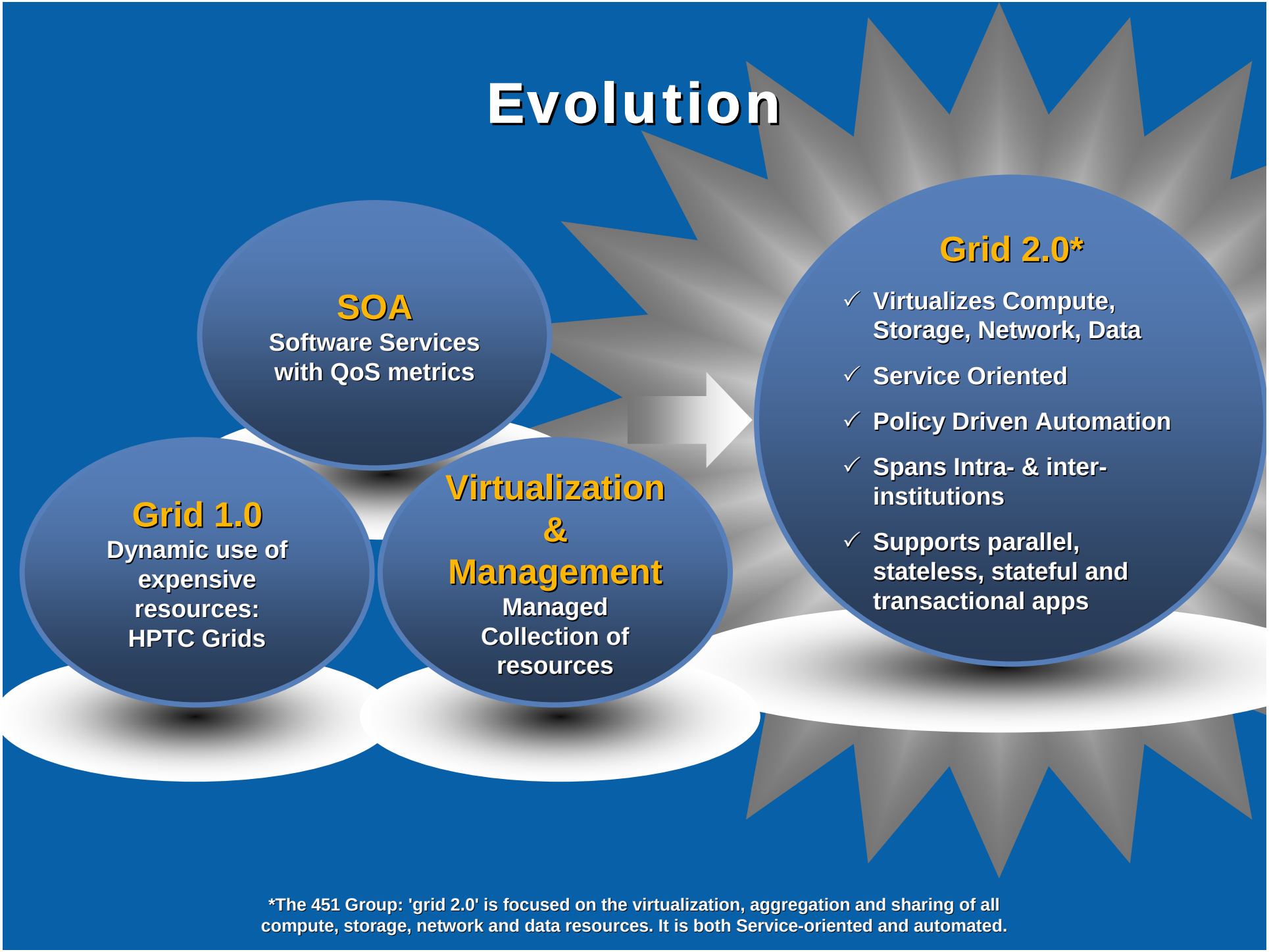
Grid 1.0

- Distributed, virtualized systems
- Restricted to one organization (single security and trust domain)

- Security & Trust
- SLAs and policies
- Business models

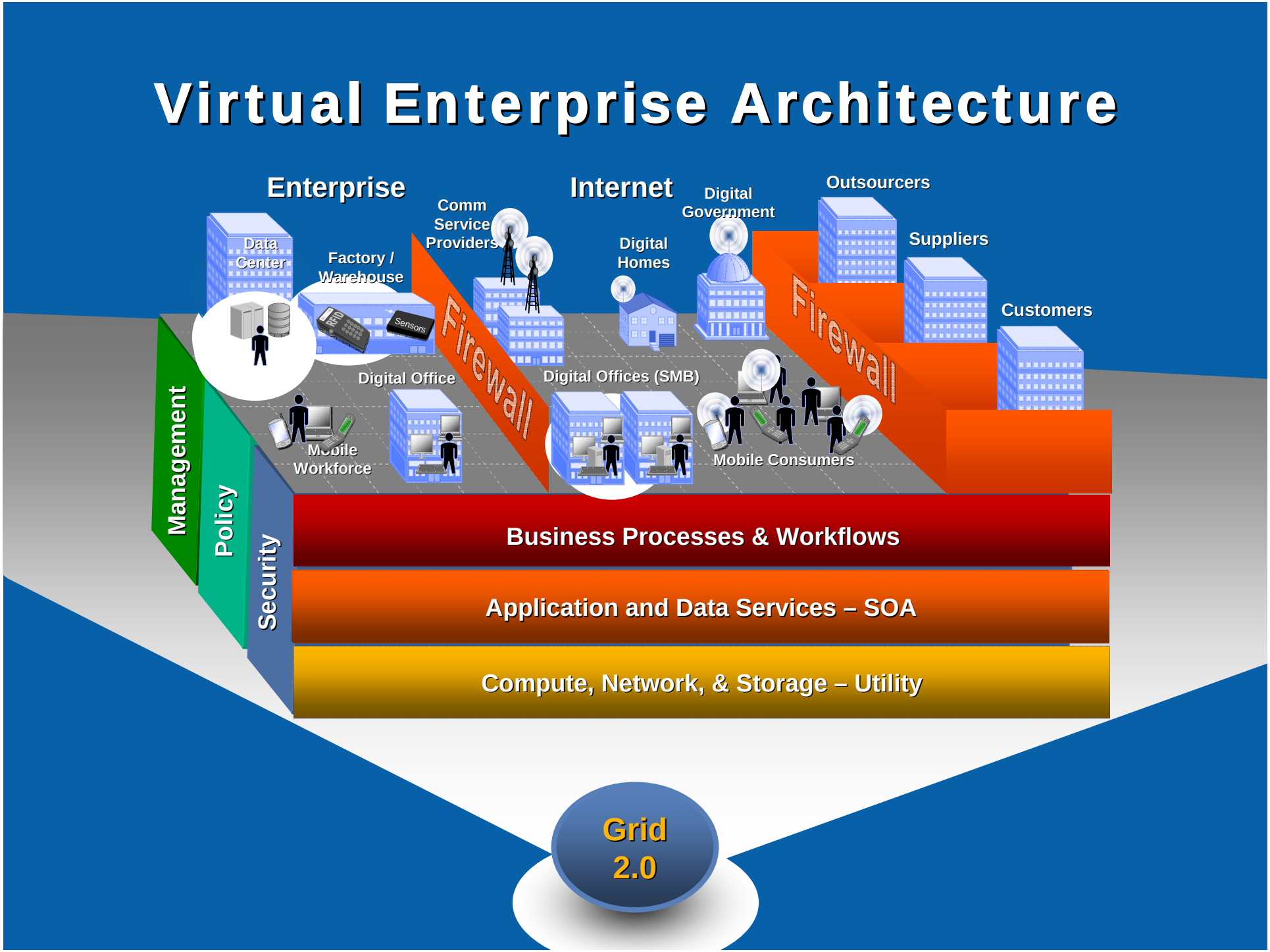
Experiments/ showcases

Evolution



*The 451 Group: 'grid 2.0' is focused on the virtualization, aggregation and sharing of all compute, storage, network and data resources. It is both Service-oriented and automated.

Virtual Enterprise Architecture



Utility Infrastructure Capabilities

Power Efficient Datacenter

- Multi-Level Power Mgmt
- Performance / Watt / Sqft

Utility SLA

- Monitoring, Logging
- Metering
- QoS

Security & Audit

- AAA – Authentication, Authorization, Access Control
- Intrusion Detection & Isolation
- Identity Management

Dynamic Resource Allocation

- Policy Driven Provisioning
- Load Balancing
- Migration
- Fail-over
- Virtualization

Simplified Management

- Discovery & Config
- In-Band / Out-of-Band
- IPMI, SMASH
- Disaster Recovery

Data Intensive Computing

- Dynamic, Policy Based Transformations
- Federated Data
- Messaging

Intel Technology Innovations

Intel® Dual-Core Server Processor

- **Performance, Power and space efficient**

Intel® I/OAT (IO Acceleration Technology)

- Up to 40% less CPU overhead

Intel® AMT (Active Management Technology)

- "Embedded IT"
- Discover computing hardware assets regardless of OS state
- Troubleshoot, disaster recovery and inventory management

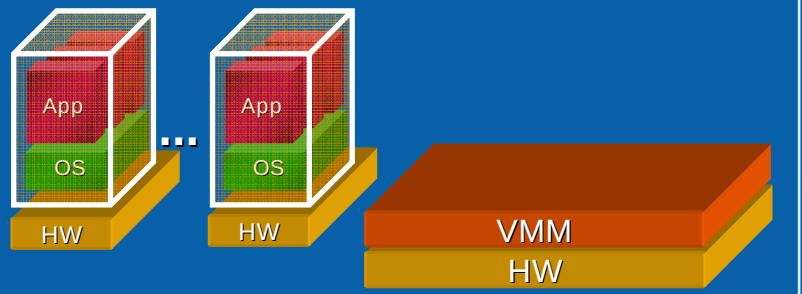
Intel® VT (Virtualization Technology)

- HW assisted virtualization complementary to today's virtualization software products (VMWare, Microsoft and Xen)
- Eliminates the need for binary translation and "on the fly" patching schemes, i.e. support for un-altered OS's
- Fast, safe and reliable

Performance, Management, Efficiency

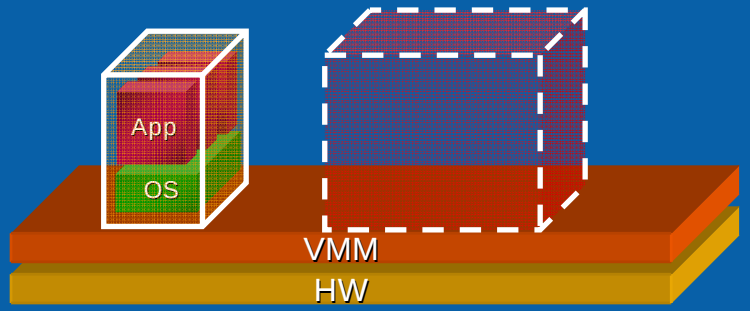
Business Value of Virtualization

Server Consolidation



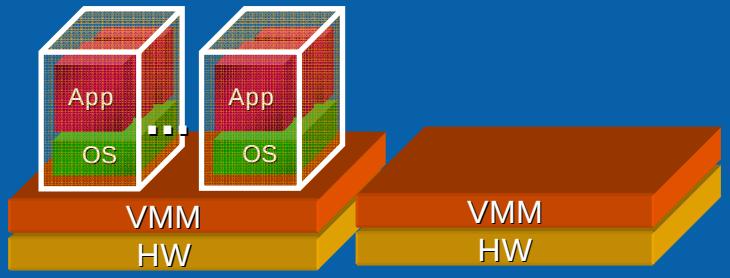
Multiple App/OS – 10:1 in many cases

R&D Production



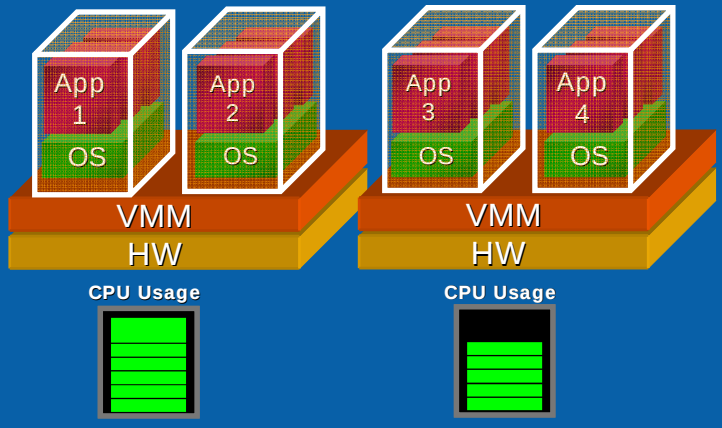
Enables rapid deployment

Disaster Recovery



Upholding high-levels of business continuity

Dynamic Load Balancing



Balancing utilization with head room

Higher Utilization, Isolation, Lower TCO

Service Level Automation:
What It Does

Delivers guaranteed quantity & quality of application service flow as efficiently and cost effectively as possible!

- **Decouples resources from services**
- **Automates service delivery by optimizing dynamics**
- **Delivers radically improved**
  - **Agility**
  - **CapEx**
  - **OpEx**

Utility Infrastructure Summary

- Policy driven infrastructure management is the key
- Standard implementation of the infrastructure capabilities are desired
  - Driven through DMTF, OASIS, OGF

- Advance capabilities that would provide leap-ahead
  - Hardware partitioning
  - Aggregation
  - Autonomics and self-management
  - Distributed resource / Virtual Machine Management
  - Metering

Service Oriented Architecture

SOA is:

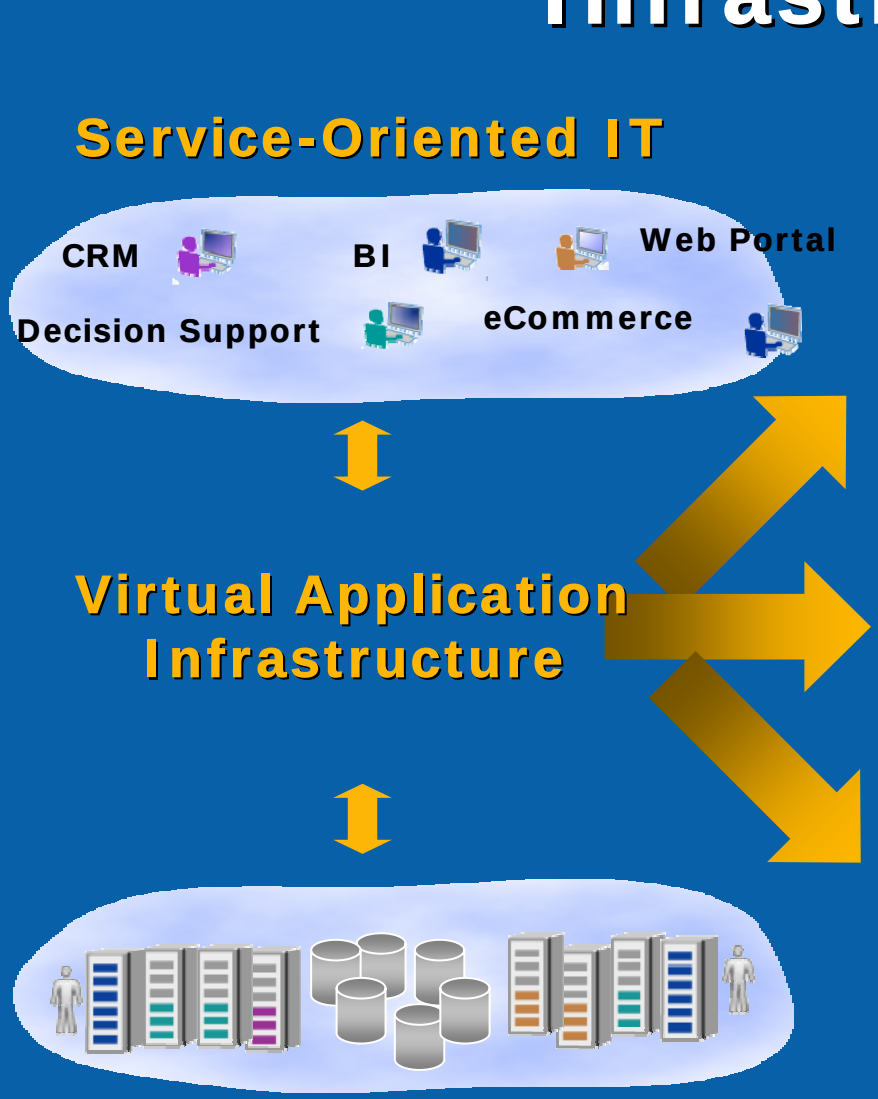
- Applications organized into business units of work that are network accessible
- Service interface definitions as first-class development interfaces
- Quality of service (QoS) characteristics (security, transactions, performance, etc.) explicitly identified
- Software infrastructure takes active responsibility for managing QoS and enforcing policy for service access and execution
- Services and metadata usually cataloged in a repository
- Protocols and structures based on open standards (e.g., SOAP)

Randy Heffner, vice president, Forrester Research Inc.

Key Requirements for Securing SOA

- **Trust**
  - Requirements: Authentication, authorization, confidentiality
  - Many standards: WS-Security, SAML, XML-DigSig/Enc, WS-Trust
- **Risk**
  - Requirements: Attack prevention, anomaly detection, DoS protection, Schema validation
- **Reliability**
  - Requirements: Administration, redundancy & failover, high availability & fault tolerance, logging/alerting

Attributes of Virtual Application Infrastructure



Policy-Based Execution Management

Autonomically reconcile business workload with resource constraints according to user-defined policy framework.

- Prioritization
- Scheduling
- Scalability
- Security

Service Orchestration & Provisioning

Automate orchestration & provisioning of distributed application services.

- Configuration
- Deployment
- Activation
- Failover

Self-Managed Environment

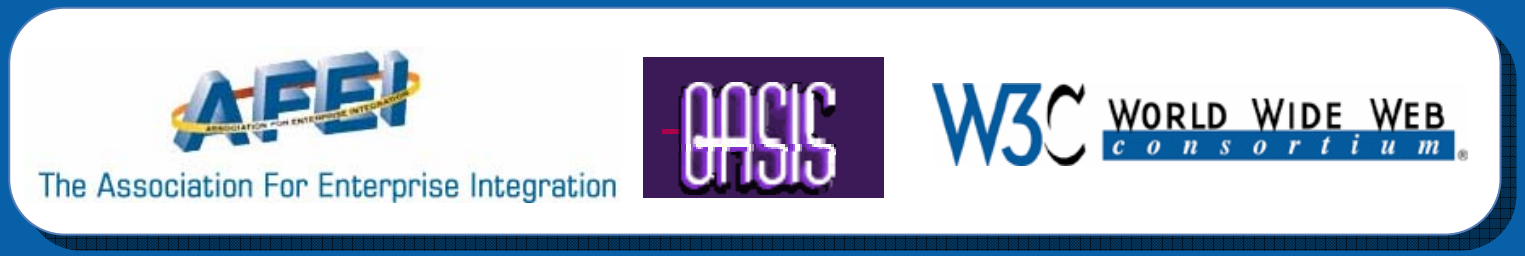
Optimize efficiency of IT staff & utilization of complex, distributed system resources.

- Diagnostics
- Alerting
- Self-Healing
- Extensible

Future of Services Infrastructure

- Challenges for SOA:
  - Reliable messaging & guaranteed delivery
  - Policy management & enforcement
  - Federated trust

- Work with the Standards forums:
  - WS-Security, WS-Trust, WS-Reliability, SafeSOA...



Lessons Learnt – Grid Challenges

Integration into Enterprise IT environments

Hype versus Reality

Changes in mindset (user, admin, management)

Maturity of technology, standards and solutions

Compatibility, portability, interoperability

Need for healthy ecosystem, multiple vendors

The Way Forward

Drive industry standards

- Align vendors, achieve common understanding
- Assure interoperability
- Facilitate reusable solutions
- Enable multiple sources

Develop Grid 2.0 framework for medium/long term

- Reusable framework
- Flexible solutions
- Minimize duplication
- Fully support new modes of working – enable new methodologies

Grow solution ecosystem

- HW and SW vendors
- SW infrastructure and solution providers
- Create multiple sources to minimize business impact
- Drive interoperability

Reframe current solutions for short term

- Provide tangible benefits through incremental solutions
- Address customer mindset
- Accommodate legacy environment
- Educate potential adopters (users, admin, stakeholders)


intel
Leap ahead™