Integration of Virtual System and Business Application Management Using Standardized Interfaces

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Agenda

- **Introduction**
  - **Virtualization concepts, capabilities & use cases**
- **Integration of application and system management**
  - **Monitoring**
  - **Management operations**
- **Search for Standards**
  - **DMTF CIM**
  - **OGF**
  - **RESERVOIR**
- **Conclusion**

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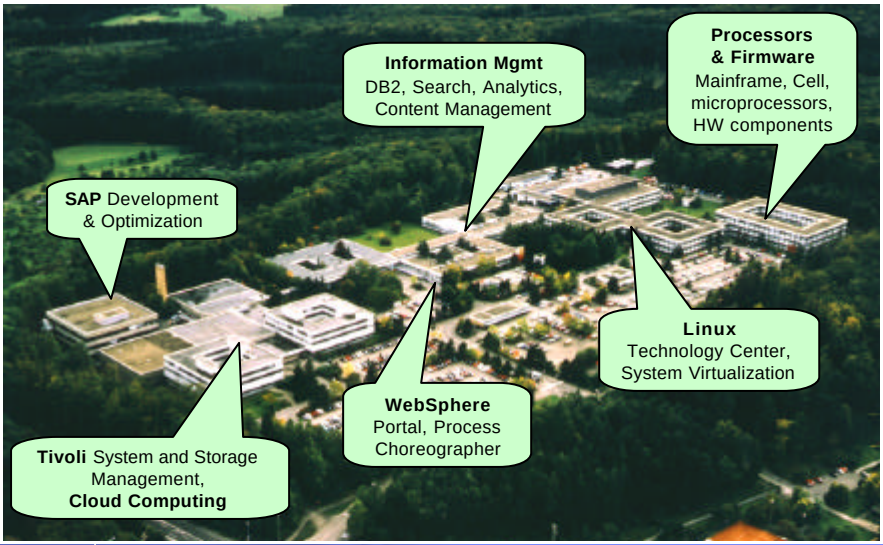
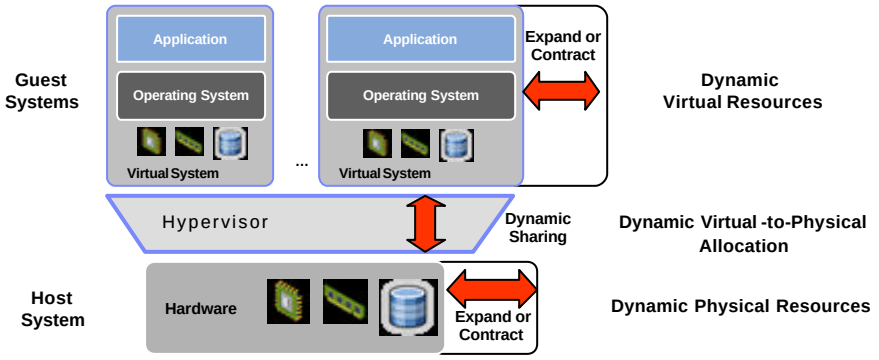


SAP related development competence in the Böblingen Lab

SAP on IBM Systems	*Joint IBM SAP platform teams for* ▪ SAP on System i™ ▪ SAP on System p ▪ SAP on System x ▪ SAP on System z
Information Management	*Joint IBM SAP database teams for* ▪ SAP on DB2 for Linux®UNIX®Microsoft® Windows® ▪ SAP on DB2 for z/OS
Tivoli Solutions for SAP	Tivoli Adapters for SAP Tivoli Storage Solutions for SAP Tivoli System Automation for SAP
WebSphere	WebSphere® IBM SAP Collaboration

More than 150 SAP related developers in Böblingen

System Virtualization: Concept



- Virtualization decouples presentation of resources to consumers (applications) from actual resources through a virtualization layer
- Several virtual systems may share a single physical host
- The relations between virtual and physical entities are not permanent (e.g. live system relocation)

System Virtualizaton: Use Cases vs. Capabilities

Virtualization use cases

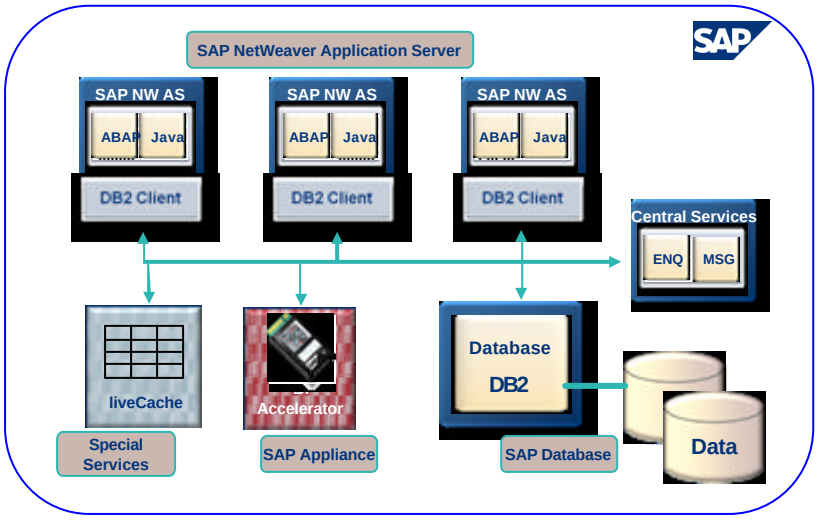
- Power saving
- Planned maintenance
- Changing capacity requirements
- Changing capacity offering/availability
- Stateful cloning
- Protecting long running jobs from system failures
- Reproducing situations
- Metering of job resource consumption
- Resource consumption enforcement
- Protection against malware
- Ensuring security
- Avoiding conflicts
- Emulating an environment for legacy jobs

Virtualization capabilities

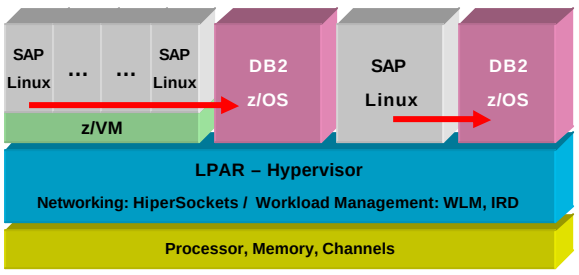
- Live migration
- Dynamic resizing
- Snapshotting
- Isolation
- Provisioning

➢ **Use cases are driven by application needs**

SAP Business Application: Technical Landscape



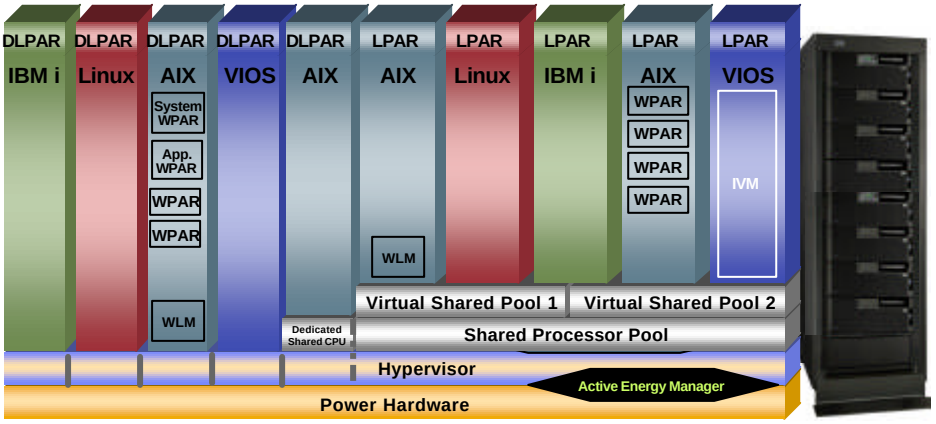
IBM Mainframe: The Golden Standard in Virtualization



IBM System z

- Logical Partitioning (LPAR)
- I/O Subsystem:
  - Complete separation of I/O from processing
  - Dynamic sharing of network and I/O adapters
- Parallel Sysplex: Virtualization across servers via Coupling Facility
  - DB2: Parallel database with shared data access and unlimited scalability
- z/VM: 2nd level of system virtualization
  - Virtualization of processor, memory, network, I/O, hardware emulation, …

Multiple Virtualization Layers on IBM Power Systems



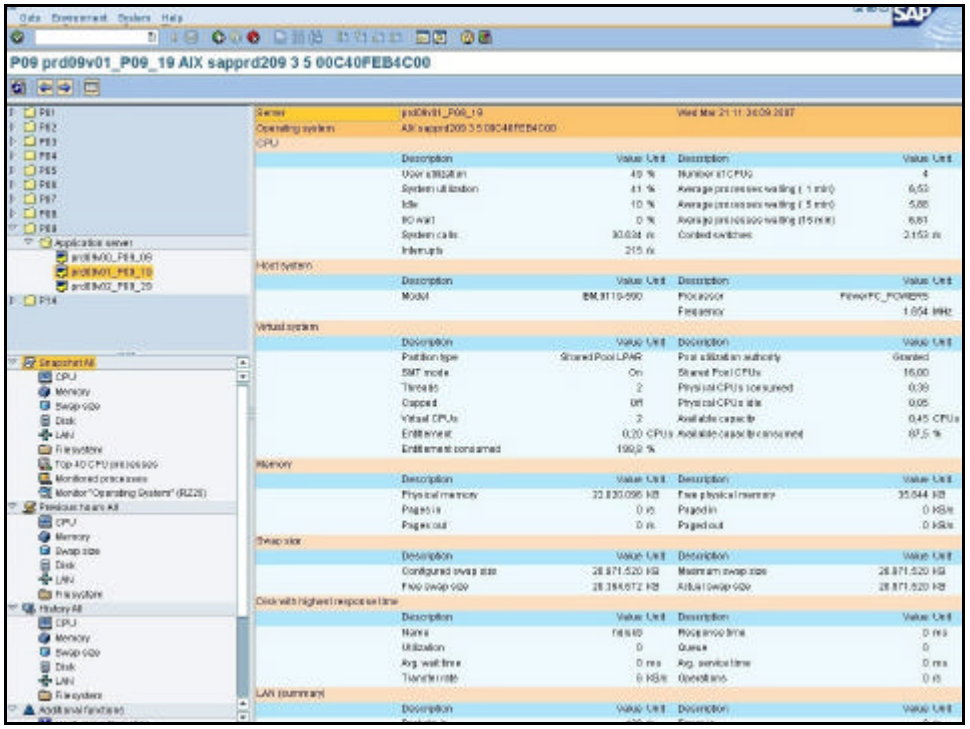
- Dynamic LPARs + Shared Pool LPARs
- Workload Partitions (WPAR) can be used inside LPARs
  - Different types of WPARs (different sharing attributes)
- Virtual I/O Server (VIOS)

IBM System p

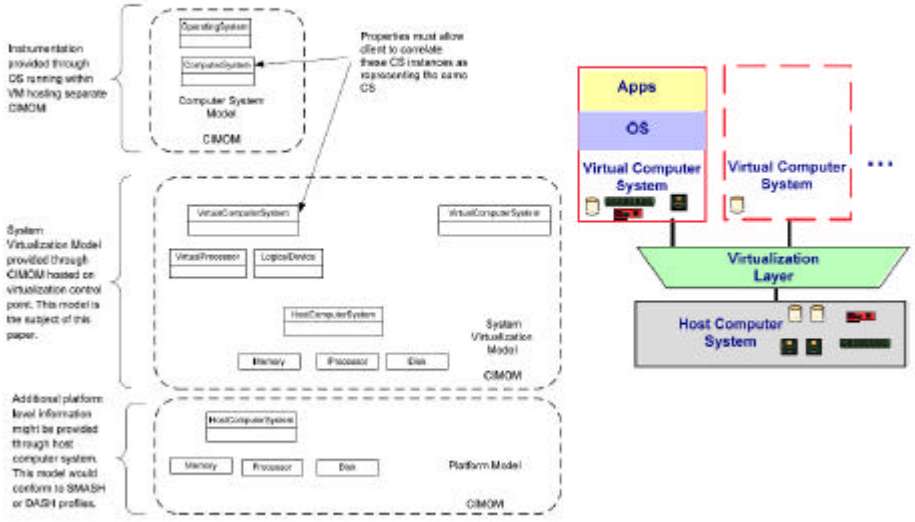
Virtual System Monitoring within SAP

- **SAP CCMS (Central Computing System Management)**
  - **Integrated application, system and database monitoring**
  - **System monitoring according to DMTF System Virtualization metrics**
    - **Virtual System & Host System metrics**
    - **Plus platform-specific extensions**

NumberOfPhysicalCPUsUtilized
ActiveVirtualProcessors
MaxCPUsAvailable
TotalCPUTime [interval metric]
StealTime [interval metric]
PhysicalMemoryAllocatedToVirtualSystem
. . .

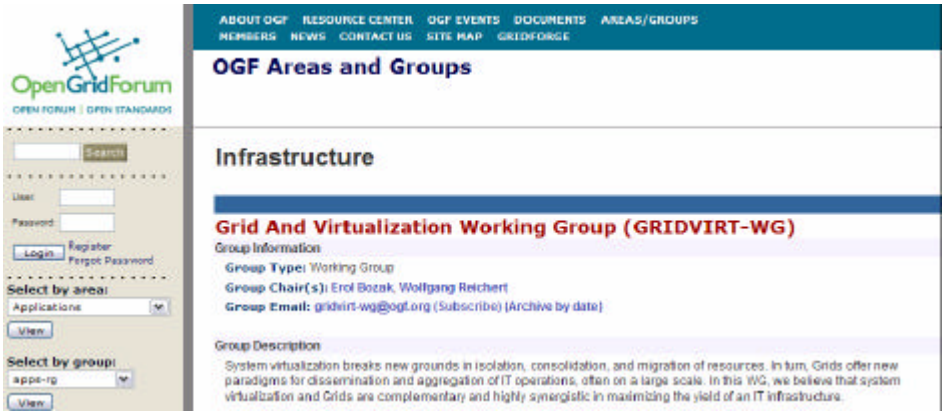


CIM System Virtualization Model



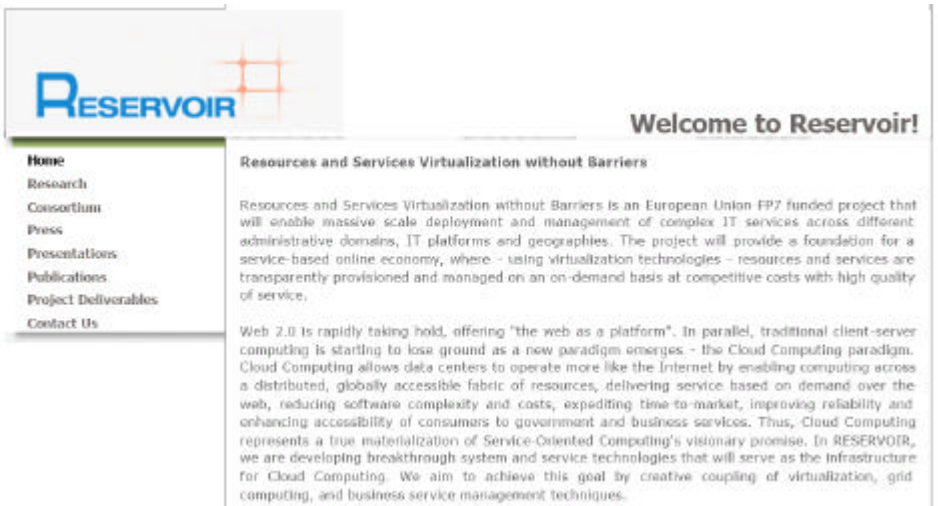
OGF Grid & Virtualization

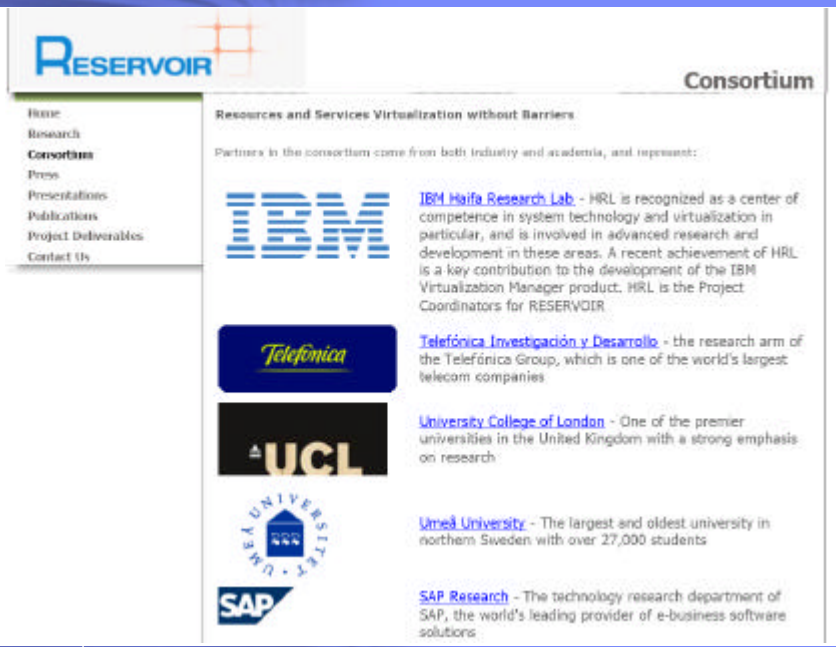
https://forge.gridforum.org/sf/projects/gridvirt-wg



RESERVOIR Project

http://www.reservoir-fp7.eu/

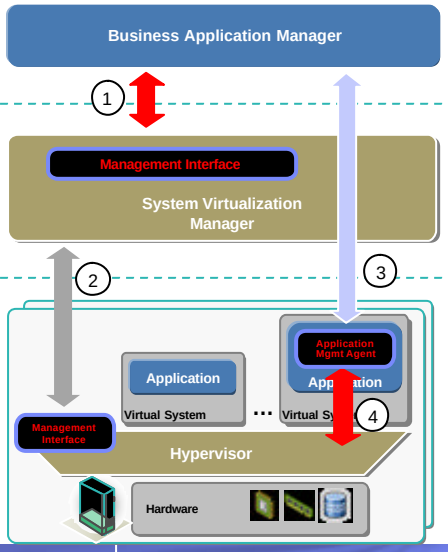




RESERVOIR: SAP Use Cases and Requirements

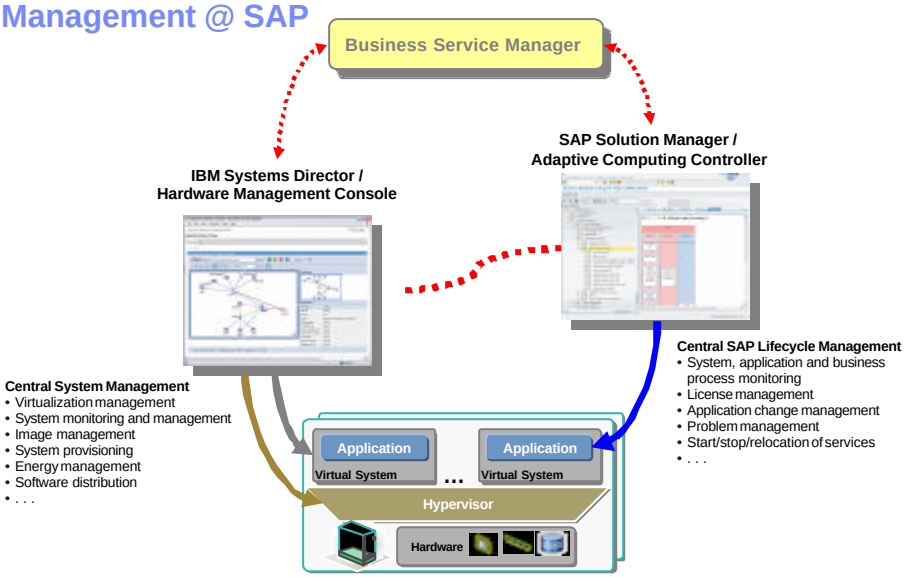
- Creating a manifest of a service application
  - Images, contextualization scripts, DB content, all other configuration data
  - Means to contextualize and customize
  - Considering OVF (Open Virtual Format, DMTF Standard) + Extensions
- Provisioning a service application from a manifest
- Dynamic adjustment of resource allocation
  - Capacity planning
  - Automatic adaptive resource allocation / Self-optimization based on SLA and actual workload
- Elastic array of virtual execution environments
  - Dynamic scale-out by adding virtual servers to a service application
- Live migration
- . . .

Objective: Standardization of Management Interfaces



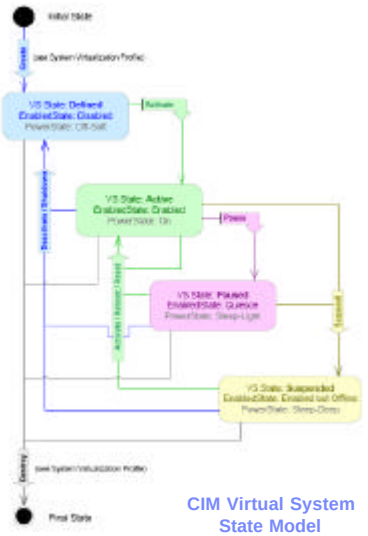
- Standardization of System Virtualization interfaces (1):
  - Ease to use for business application managers
- Platform specific System Virtualization Manager manages distributed sets of virtual systems and resources in a cluster (2)
- Application specific management of application components (3)
- Standardization of interfaces between Virtual System ←→ application management agent (4)
  - Event notification (e.g. failover)
  - Local dynamic resource allocation

Integration of Virtualization and Business Application Management @ SAP



Simplified Interfaces Between Application Manager and System Virtualization Manager

- **Topology discovery**
  - **GetAllHostSystems**
  - **GetAllVirtualSystems**
  - **GetAllVirtualSystemsOnHost**
  - **GetVirtualSystemTopology**
- **System info**
  - **GetSystemInfo**
  - **GetVirtualSystemManagementCapabilities**
  - **GetSystemMetrics**
- **System operations**
  - **Activate, Reboot**
  - **Deactivate, Shutdown**
  - **MigrateVirtualSystemToHost**
  - **. . .**



CIM Virtual System State Model

Summary

- ***Virtualization is designed to be transparent.***
- ***However, when management of complex business application is concerned the application management components must be aware of virtualization.***
- ***In a proof-of-concept the author has shown how to integrate SAP application management with system virtualization managers like IBM Power Systems management console.***
- ***The integration has been built on top of the newly defined DMTF System Virtualization standard. Most likely it is the first exploitation of this new DMTF standard in the context of commercial applications.***

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