



## **Integration of Virtual System and Business Application Management Using Standardized Interfaces**

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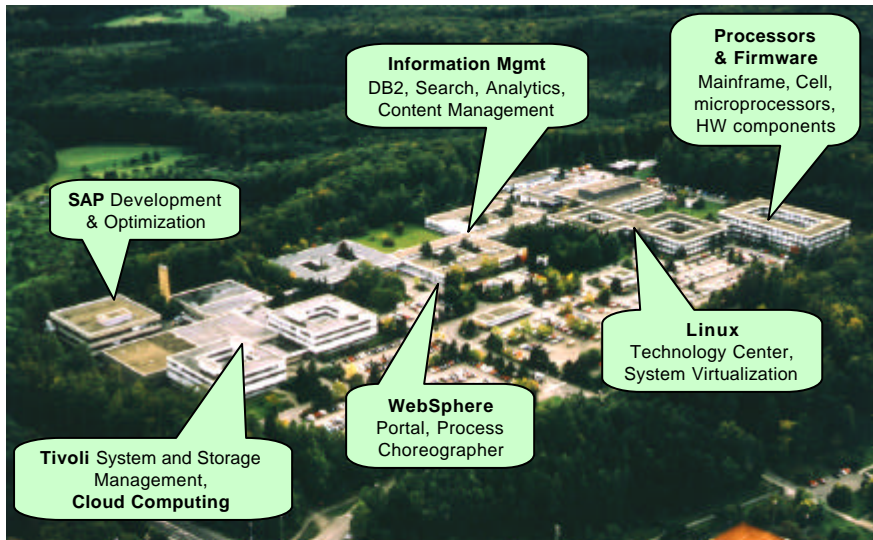
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## **Agenda**

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

## IBM Deutschland Research & Development Böblingen

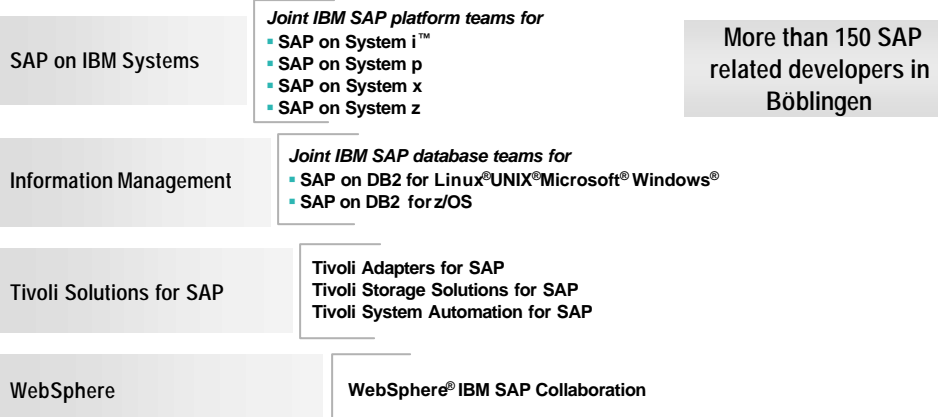


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## SAP related development competence in the Böblingen Lab

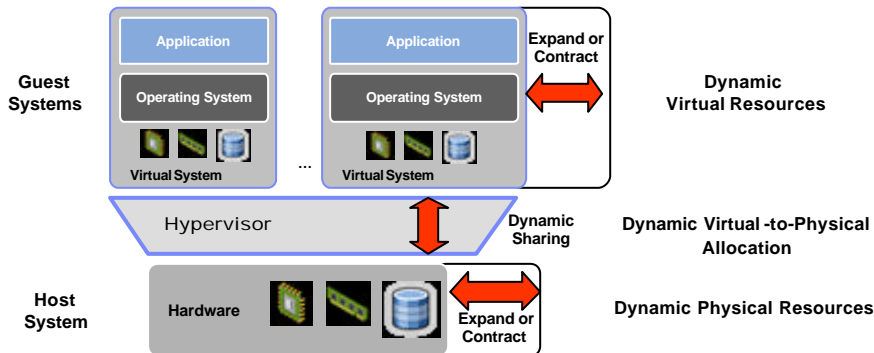


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## System Virtualization: Concept



- 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 Virtualization: Use Cases vs. Capabilities

### Virtualization use cases

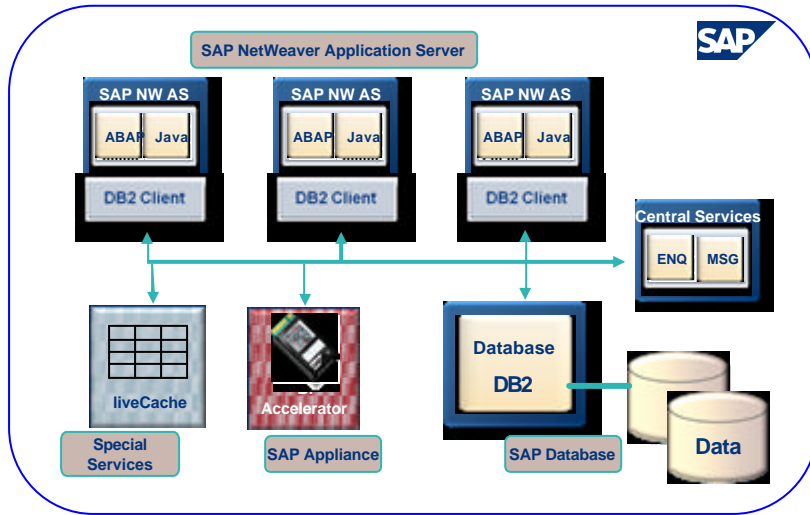
- Power saving
- Planned maintenance
- Changing capacity requirements
- Changing capacity offering/availability
- Stateful cloning
- Protecting long running jobs from system failures
- Reproducing situations
- Metering of job resource consumption
- Resource consumption enforcement
- Protection against 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

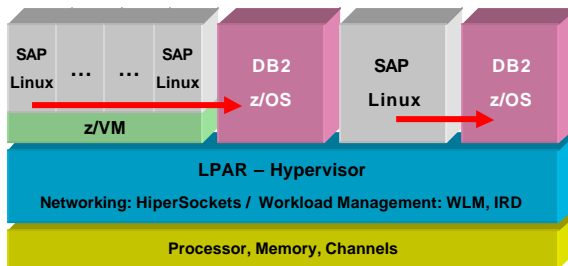


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## IBM Mainframe: The Golden Standard in Virtualization



IBM System z

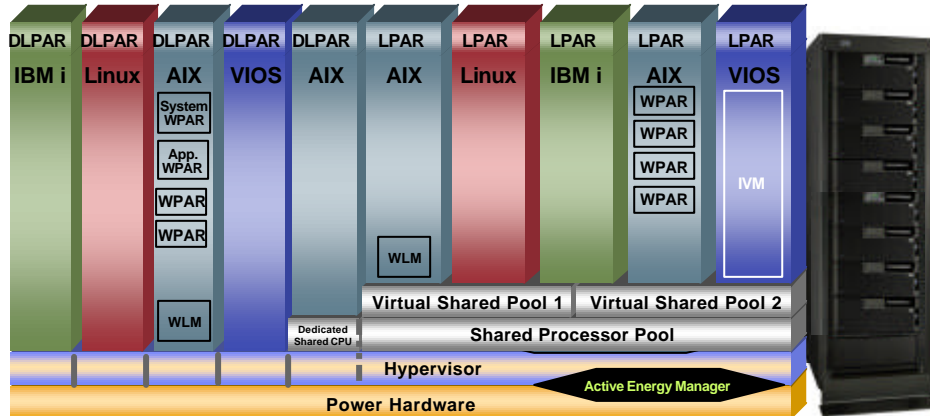
- Logical Partitioning (LPAR)
- I/O Subsystem:
  - Complete separation of I/O from processing
  - Dynamic sharing of network and I/O adapters
- Parallel Sysplex: Virtualization across servers via Coupling Facility
  - DB2: Parallel database with shared data access and unlimited scalability
- z/VM: 2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

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## 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

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## 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  
 . . .

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## OGF Grid & Virtualization

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



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### OGF Areas and Groups

#### Infrastructure

#### Grid And Virtualization Working Group (GRIDVIRT-WG)

Group Information

Group Type: Working Group

Group Chair(s): Erol Bozak, Wolfgang Reichert

Group Email: [gridvirt-wg@ogf.org](mailto:gridvirt-wg@ogf.org) (Subscribe) (Archive by date)

Group Description

System virtualization breaks new grounds in isolation, consolidation, and migration of resources. In turn, Grids offer new paradigms for dissemination and aggregation of IT operations, often on a large scale. In this WG, we believe that system virtualization and Grids are complementary and highly synergistic in maximizing the yield of an IT infrastructure.

## RESERVOIR Project

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



RESERVOIR

### Welcome to Reservoir!


#### Resources and Services Virtualization without Barriers

Resources and Services Virtualization without Barriers is an European Union FP7 funded project that will enable massive scale deployment and management of complex IT services across different administrative domains, IT platforms and geographies. The project will provide a foundation for a service-based online economy, where - using virtualization technologies - resources and services are transparently provisioned and managed on an on-demand basis at competitive costs with high quality of service.

Web 2.0 is rapidly taking hold, offering "the web as a platform". In parallel, traditional client-server computing is starting to lose ground as a new paradigm emerges - the Cloud Computing paradigm. Cloud Computing allows data centers to operate more like the Internet by enabling computing across a distributed, globally accessible fabric of resources, delivering service based on demand over the web, reducing software complexity and costs, expediting time-to-market, improving reliability and enhancing accessibility of consumers to government and business services. Thus, Cloud Computing represents a true materialization of Service-Oriented Computing's visionary promise. In RESERVOIR, we are developing breakthrough system and service technologies that will serve as the infrastructure for Cloud Computing. We aim to achieve this goal by creative coupling of virtualization, grid computing, and business service management techniques.






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**Consortium**

Resources and Services Virtualization without Barriers

Partners in the consortium come from both industry and academia, and represent:



**IBM Haifa Research Lab** - HRL is recognized as a center of competence in system technology and virtualization in particular, and is involved in advanced research and development in these areas. A recent achievement of HRL is a key contribution to the development of the IBM Virtualization Manager product. HRL is the Project Coordinators for RESERVOIR.

**Telefónica Investigación y Desarrollo** - the research arm of the Telefónica Group, which is one of the world's largest telecom companies.

**University College of London** - One of the premier universities in the United Kingdom with a strong emphasis on research.

**Umeå University** - The largest and oldest university in northern Sweden with over 27,000 students.

**SAP Research** - The technology research department of SAP, the world's leading provider of e-business software solutions.

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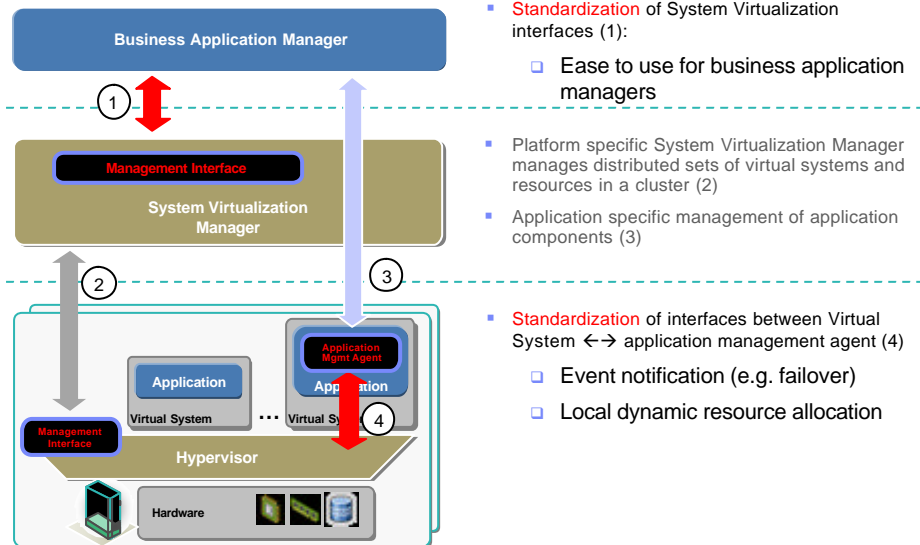
## RESERVOIR: SAP Use Cases and Requirements

- **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**
- ...

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## Objective: Standardization of Management Interfaces

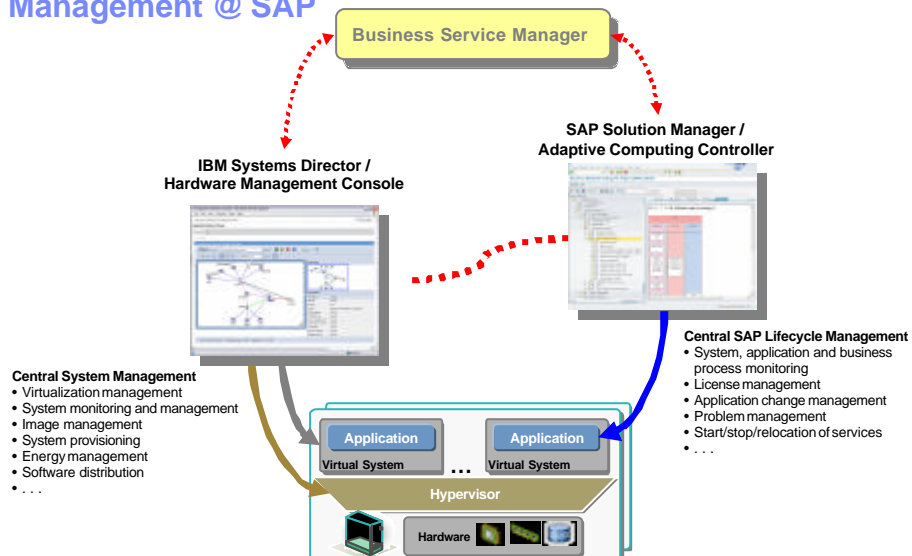


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## Integration of Virtualization and Business Application Management @ SAP



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## 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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