Virtualization Technologies in SCADA/EMS/DMS/OMS

Vendor perspective
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Overview

- Why use Virtualization?
- Currently used technologies
- Adoption Considerations
- Cloud Computing
- Current & Future Trends
Why use Virtualization?

• Reduce Total Cost of Ownership (TCO)
  – Maximize Hardware utilization to reduce
    • Hardware costs (upfront and maintenance)
    • Energy costs
      – Power & Cooling
    • Floor Space
  – Lower cost of HW upgrades
Why use Virtualization?

• Virtualization added features
  – High Availability
  – Backup and Recovery
  – Disaster Recovery
  – Running legacy applications
  – Cloning & Snapshotting
Why use Virtualization?

• Drawbacks to consider
  – Increased complexity
  – Staff training
  – Potentially higher upfront costs
  – Performance
Currently used technologies

Virtualized Deployments

- PowerVM
- HP VSE
- Hyper-V
- vSphere

Legend:
- Production
- R&D
Currently used technologies

• New System deployments
  – ~20% are fully virtualized (Servers)
  – ~50% make use of virtualization
Cloud Computing

Application
- Monitoring
- Content
- Collaboration
- Communication
- Finance

Platform
- Object Storage
- Identity
- Runtime
- Queue
- Database

Infrastructure
- Compute
- Block Storage
- Network

Cloud computing [CC BY-SA 3.0]
Created by Sam Johnston
Cloud Computing

• National Institute of Standards and Technology (NIST) definition
  – Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.
Cloud Computing

• NIST Definition - Essential Characteristics.
  – On-demand self-service
  – Broad network access
  – Resource pooling
  – Rapid elasticity
  – Measured service
Cloud Computing

• NIST Definition - Service Models
  – Software as a service (SaaS)
  – Platform as a Service (PaaS)
  – Infrastructure as a Service (IaaS)
Cloud Computing

• NIST Definition - Deployment models
  – Private cloud
  – Public cloud
  – Community cloud
  – Hybrid cloud
Cloud Computing

• Ventyx R&D
  – Private Cloud
    • On premises
    • Geographically spread
  – PaaS

• Ventyx Sales and Marketing
  – Public Cloud
    • Amazon AWS – EC2
  – IaaS
Ventyx R&D private Cloud

• All Development and Unit testing is performed under virtualized platforms on private cloud
• Multi-tiered systems deployed on demand
    – Single click Self provisioning
Ventyx R&D private Cloud

• Image library
  – Each release or build is deployed once and checked-in to the Image library

• Web based Self Service portal
  – Each developer/tester can obtain a full Test environment without involving System Integration or IT department
Ventyx R&D private Cloud
Ventyx R&D private Cloud

• Linked Clones
  – Greatly reduce storage footprint by de-duplicating data in similar system images

• Platform Leases
  – Eliminate resource sprawl by reclaiming computing resources from expired images
    • Storage
    • CPU
    • Memory
Virtualization Adoption Challenges

• Request For Proposal Specifications
• IT vs OT
• Cyber Security
• 3rd party licensing
RFP Specifications

- Do not spell out Virtualization requirements
- Turn-key systems
  - Do not fully leverage Virtualization technologies.
- Performance requirements
  - High % of idle resources under high activity
RFP Specifications

• Upfront costs can be higher than non virtualized solutions.
  – Depending on Configurations Features and Licensing
  – i.e. requirements for empty CPU and Memory Slots
IT vs OT

• Corporate IT vs Operational IT
  – Traditional rivalries
  – Different focus
  – Balance of powers differs by utility
  – Influence over RFP specification definitions
IT vs OT

**IT focus**
- Optimizing resources
- Cost reductions
- Standardization
- 8x5
- Aggressive adopters

**OT focus**
- Real Time operations
- Safety
- Reliability
- 24/7
- Conservative adopters
Cyber Security

• Prevents full consolidation
  – Security Zones
    • Production
    • DMZ
    • QAS
    • PDS
  – NERC-CIP
    • Electronic Security Perimeter
    • Critical Cyber assets
3<sup>rd</sup> Party licensing

- Oracle
  - Virtualization or “software partitioning” is not recognized for CPU licensing metrics. (Exception OracleVM)
Current & Future Trends

• IT/OT convergence
  – Integration of OT and IT decisions
  – OT Virtualization adoption to converge with IT
  – Virtualization oriented RFP Specifications
    • Aligned with Organization’s IT strategy
  – IT Software Purchasing model
    • Utilities provide the platform
    • Vendors provide the software
Current & Future Trends

• Cloud Computing
  – Limited adoption
    • non-critical cyber assets (NERC-CIP)

• Hosted Solutions
  – Leveraging Virtualization
  – SaaS
Current & Future Trends

• CPU Architecture
  – Everything runs on x64