Introduction to IT Infrastructure Components and Their Operation

Balázs Kuti
Agenda

- Challenges faced by enterprises today, scale of the IT plant
- Diversity of an IT plant
- Key Server Infrastructure Components
- Configuration Management
- ITIL, IT Support Models
- Change and Risk Management
- Data Centers
- Q&A
IT Challenges of Enterprises today

- Challenges:
  - Scale
  - Deployment and OS build
  - OS & Configuration Diversity/Hygiene
  - Support personnel
  - High availability/resiliency
  - Special HW (trader desktops)
  - Environment, power saving

Morgan Stanley
IT Infrastructure Scale in Numbers

- Physical expansion
- Capacity planning

The most popular social network’s server count: 60,000 +

Morgan Stanley
IT Infrastructure Scale in Numbers

- Unix / linux
- Windows
- SAN / NAS

Morgan Stanley
Diversity of an IT plant

• Every effort is made to have uniform components (e.g. hw models, software components)

• Avoid vendor locking (price competition, delivery capability, service quality)

• Lifecycle management (HW and SW), decommission is often a pain

• Custom solutions
  – Wrappers, for easier work
  – Central configuration database
  – Access and auditing
  – Protection from mistakes
  – Examples: managing VMWare servers from Unix command line, manipulating NAS filers and shares, managing SAN configuration

• Self service, post-build custom application profiles

Morgan Stanley
Key Components of the IT Infrastructure

- Network and Boot services
  - DNS, DHCP, PXE, Printing, Monitoring
- Security components
  - Firewalls, network monitoring
- Store user information (authentication/authorization)
  - Active Directory, LDAP
- Cross-platform authentication
  - Kerberos
- Lifecycle and configuration management
  - Distribution servers, Configuration and patch management, CMDB
Grid Node management

• Configuration management for tens of thousands of nodes
• Utilization and health monitoring
• Managing node allocations and chargeback
• Single or multiple schedulers
• Low HW specification
• Special network configuration
• Storage issues

Morgan Stanley
Change and Risk Management

• What is change management?
• Change / Configuration / Release Management
  – Development and testing
  – Approval process
  – Importance of checkout and backout
• Major incidents can be caused by minor changes
• Blackout periods

Morgan Stanley
Change and Risk Management

- How to make it measurable?
- Identify – Prioritize – Plan and Schedule – Track and Report
- Examples
  - Data Center in Iceland
Support model

- Why do we need support model?
- Who are the customers?
- ITIL (Service Desk, L1-L2-L3-Eng, ECC, local IT support), Service Managers, SLA
- Follow the Sun

<table>
<thead>
<tr>
<th>Availability</th>
<th>Downtime [mins]</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.999%</td>
<td>525</td>
</tr>
<tr>
<td>99.9999%</td>
<td>52</td>
</tr>
<tr>
<td>99.99999%</td>
<td>5</td>
</tr>
</tbody>
</table>

Morgan Stanley
Data Centers

Problem
Safe and reliable centralized operation of the IT infrastructure under extreme circumstances

Design
- Many engineering disciplines involved
- Site selection criteria
- Accommodate computers, storage, backup, network equipment
- Accommodate supplementary equipment: Fire extinguisher, cooling, UPS, Generators, fuel, etc.
- Redundant network (IP, FC) and grid connection on physically different paths
- Security (physical, internal, external)
- Change, risk, vendor management
- CO2 emission, green technologies

Morgan Stanley
Datacenter Site Strategy

- Property price
- Risk assessment:
  - Political stability
  - Economy
  - Natural, terrorist disasters
- Green energy sources:
  - Hydro-, solar-, wind power
  - Waste heat recycling opportunities
    - IBM’s DC in Switzerland heats a town swimming pool
  - Cheap cooling (air and/or water)
- Independent and high capacity
  - Power sources
  - Network connections

Morgan Stanley

- Dark Blue Zone: Free cooling available for circa 8000hrs per year (91%)
  (1 year = 8760 hours)
- Data hall recommended range: 18°C - 27°C
- Data hall allowable Range: 15°C - 32°C
Data Center Scale and Management

- IT vs. non-IT floor space up to 1:1
- Power usage monitoring (Powerdown events)
- Finding and fixing cooling inefficiencies
Classification and Operation Models

- Resiliency Levels: Tier 1-2-3-4

<table>
<thead>
<tr>
<th>Tier Level</th>
<th>Requirements</th>
</tr>
</thead>
</table>
| 1          | • Single non-redundant distribution path serving the IT equipment  
            • Non-redundant capacity components  
            • Basic site infrastructure guaranteeing 99.671% availability |
| 2          | • Fulfills all Tier 1 requirements  
            • Redundant site infrastructure capacity components guaranteeing 99.741% availability |
| 3          | • Fulfills all Tier 1 & Tier 2 requirements  
            • Multiple independent distribution paths serving the IT equipment  
            • All IT equipment must be dual-powered and fully compatible with the topology of a site's architecture  
            • Concurrently maintainable site infrastructure guaranteeing 99.982% availability |
| 4          | • Fulfills all Tier 1, Tier 2 and Tier 3 requirements  
            • All cooling equipment is independently dual-powered, including chillers and Heating, Ventilating and Air Conditioning (HVAC) systems  
            • Fault tolerant site infrastructure with electrical power storage and distribution facilities guaranteeing 99.995% availability |

- Operation model
  - Rent computing power from the “Cloud” (Amazon, HP, Oracle)
  - Rent a facility with personnel
  - Buy a facility
  - BCP site rations models
Hardware Implementation

Traditional solutions: blade chassis, IBM iDataPlex HP Spartans with top-of-rack switch

The Google Way

Morgan Stanley
Q & A

Morgan Stanley
Questions for invaluable prize

• How would you make the Grid power consumption more efficient?

• What kind of performance counters would you check if there’s a suspected disks subsystem performance issue?