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Introduction to IT Infrastructure
Components and Their Operation

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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

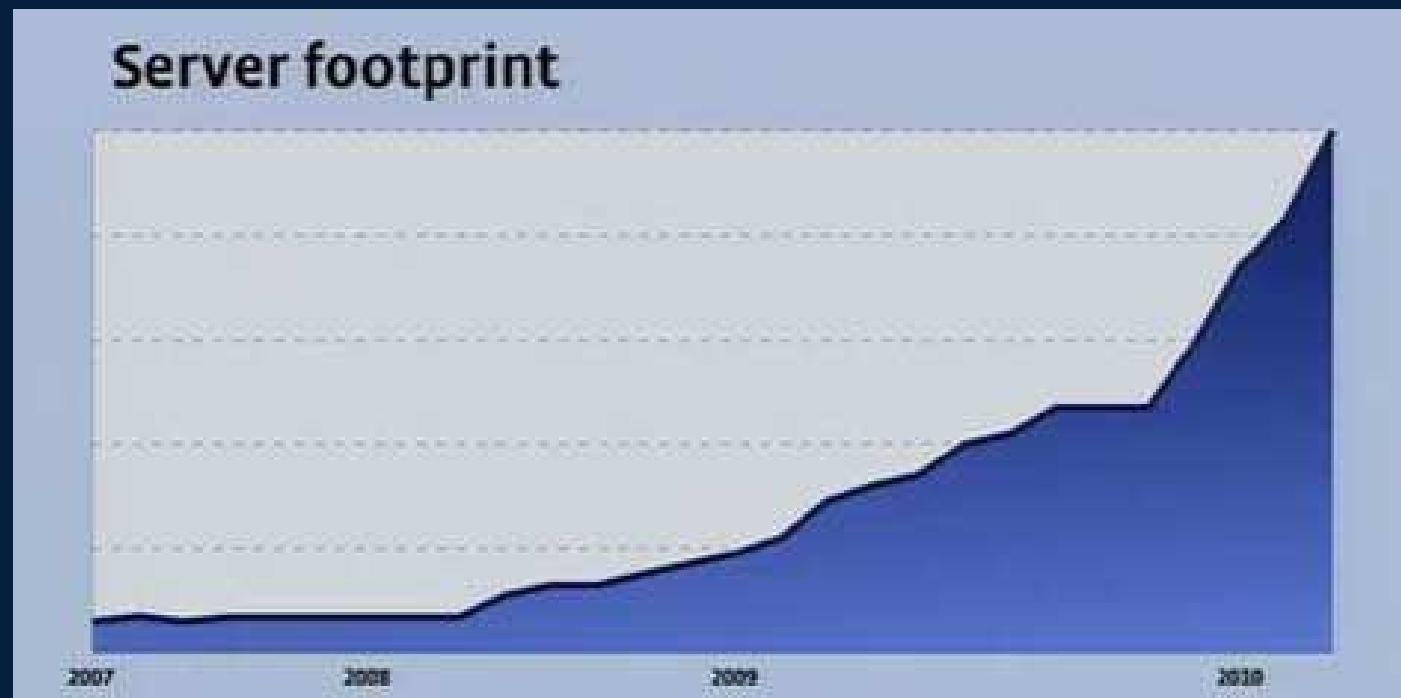
IT Challenges of Enterprises today

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



IT Infrastructure Scale in Numbers

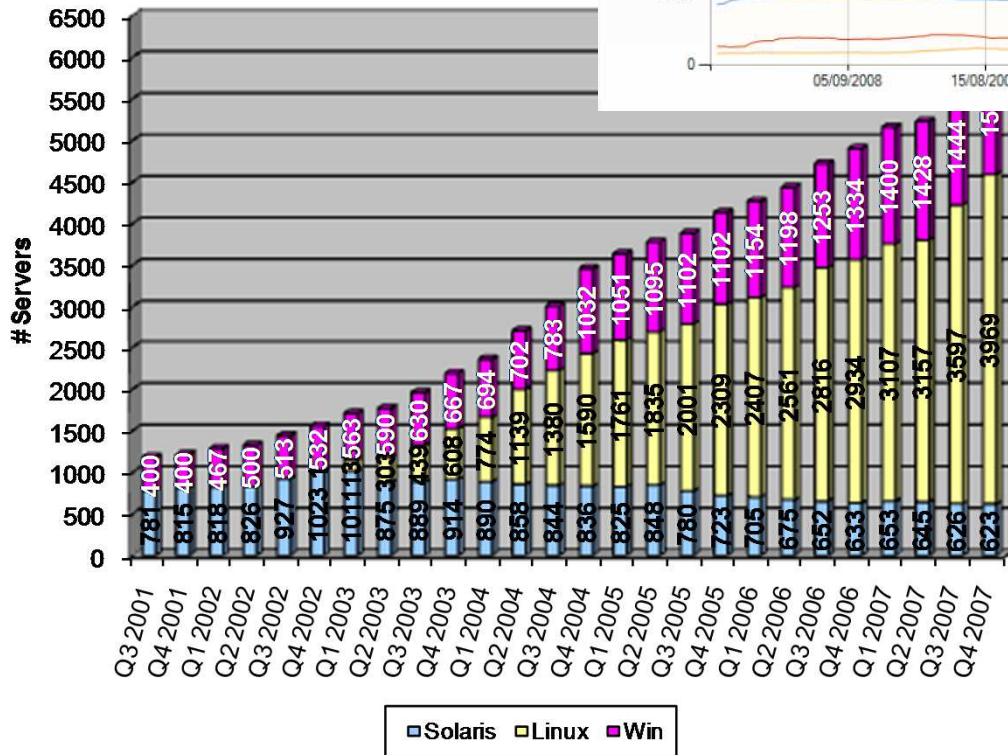
- Physical expansion
- Capacity planning



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

IT Infrastructure Scale in Numbers

European Servers



Inventory History



- Unix / linux
- Windows
- SAN / NAS

Diversity of an IT plant

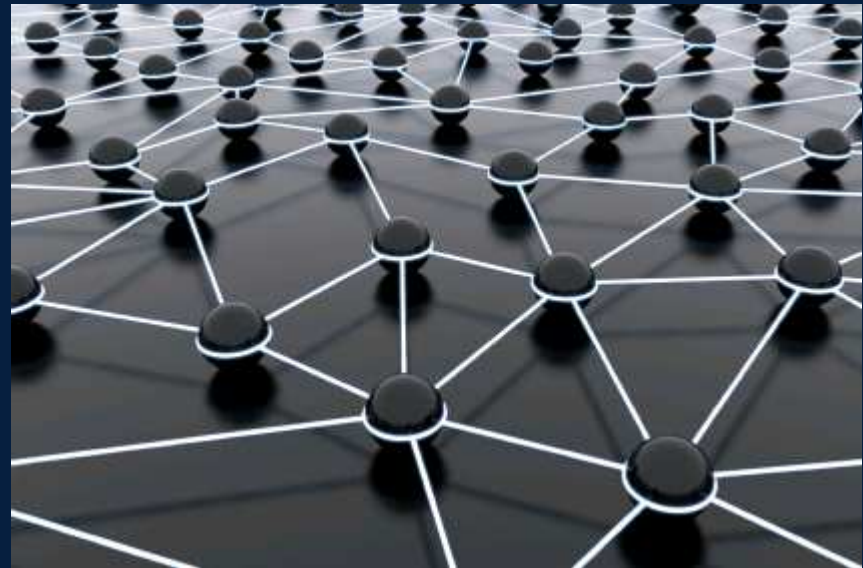
- Every effort is made to have uniform components (e.g. hw models, software components)
- Avoid vendor locking (price competition, delivery capability, service quality)
- Lifecycle management (HW and SW), decommission is often a pain
- Custom solutions
 - Wrappers, for easier work
 - Central configuration 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

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



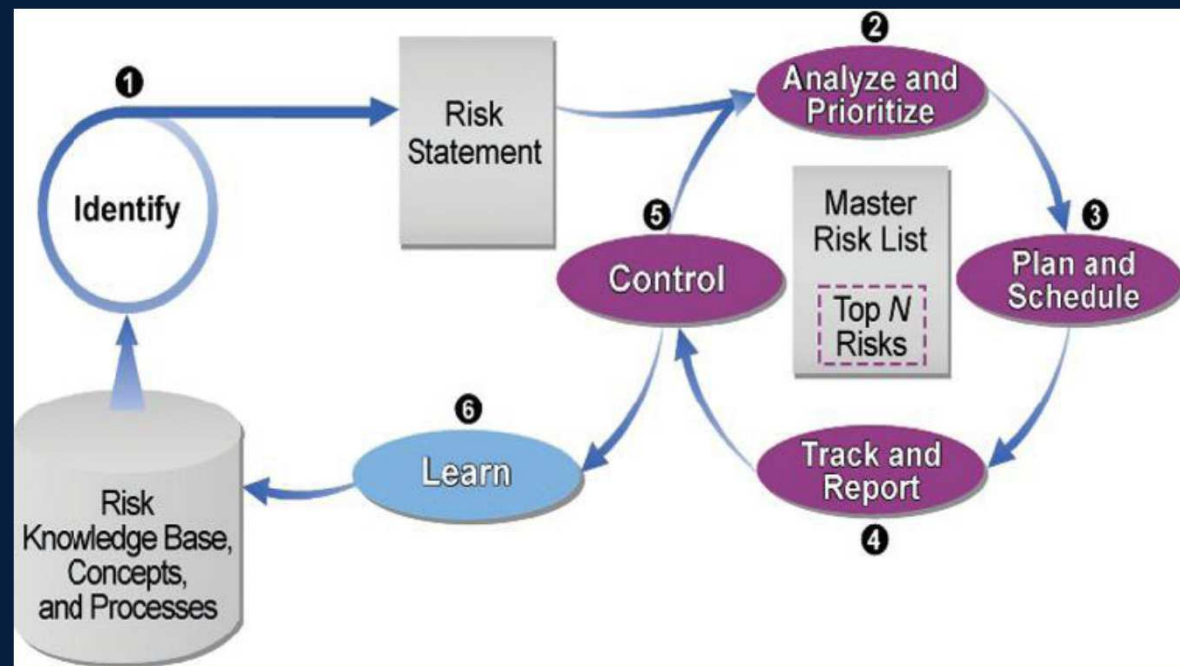
Change and Risk Management

- 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



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

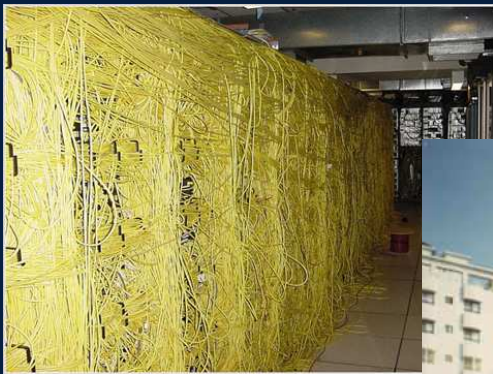
Availability	Downtime [mins]
99.999%	525
99.9999%	52
99.99999%	5



Data Centers

Problem

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



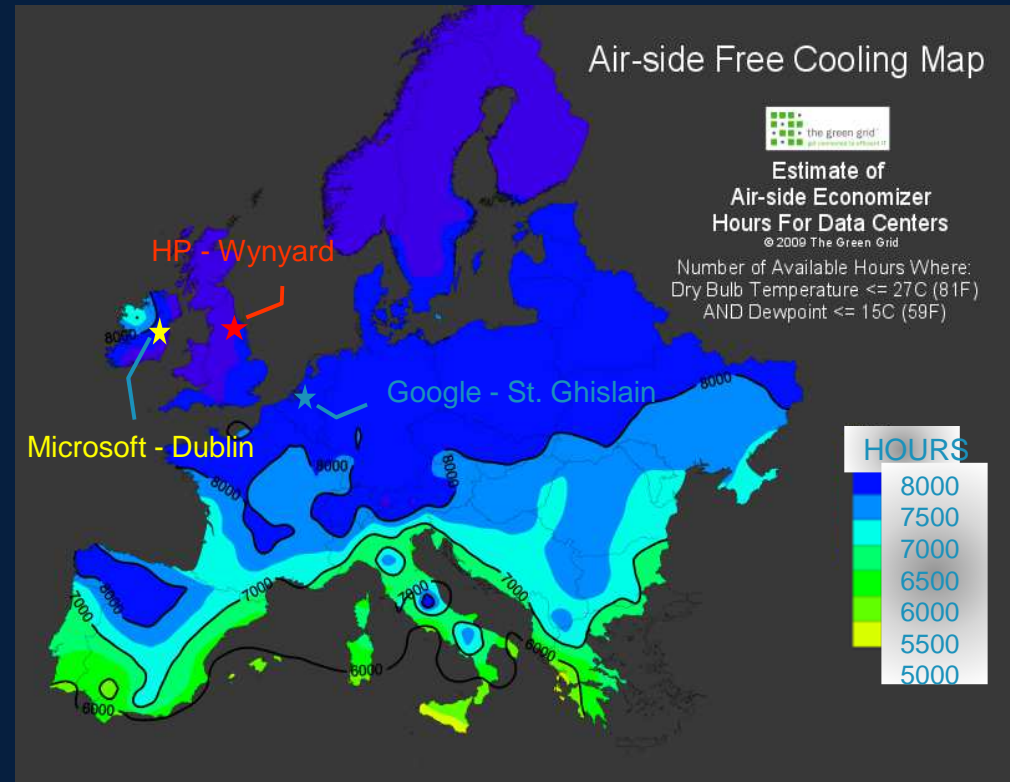
Design

- 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

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

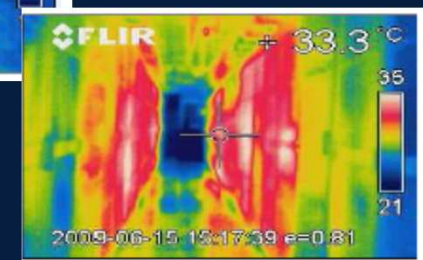
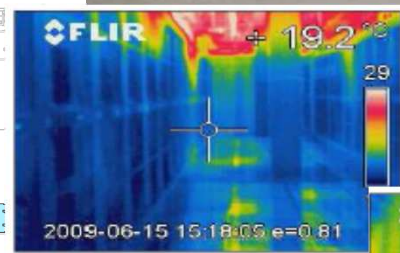
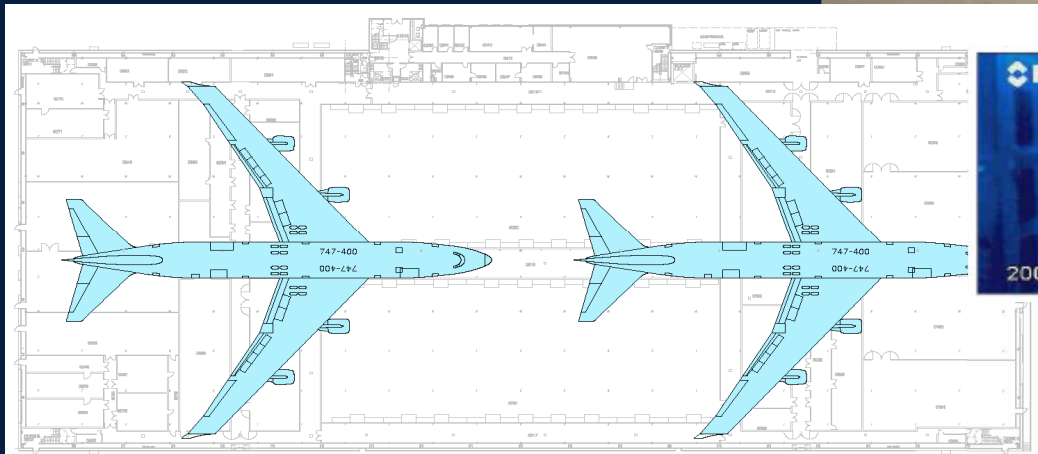
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- Dark Blue Zone: Free cooling available for circa 8000hrs per year (91%) (1 year = 8760 hours)
- Data hall recommended range: 18°C - 27°C
- Data hall allowable Range: 15°C - 32°C

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



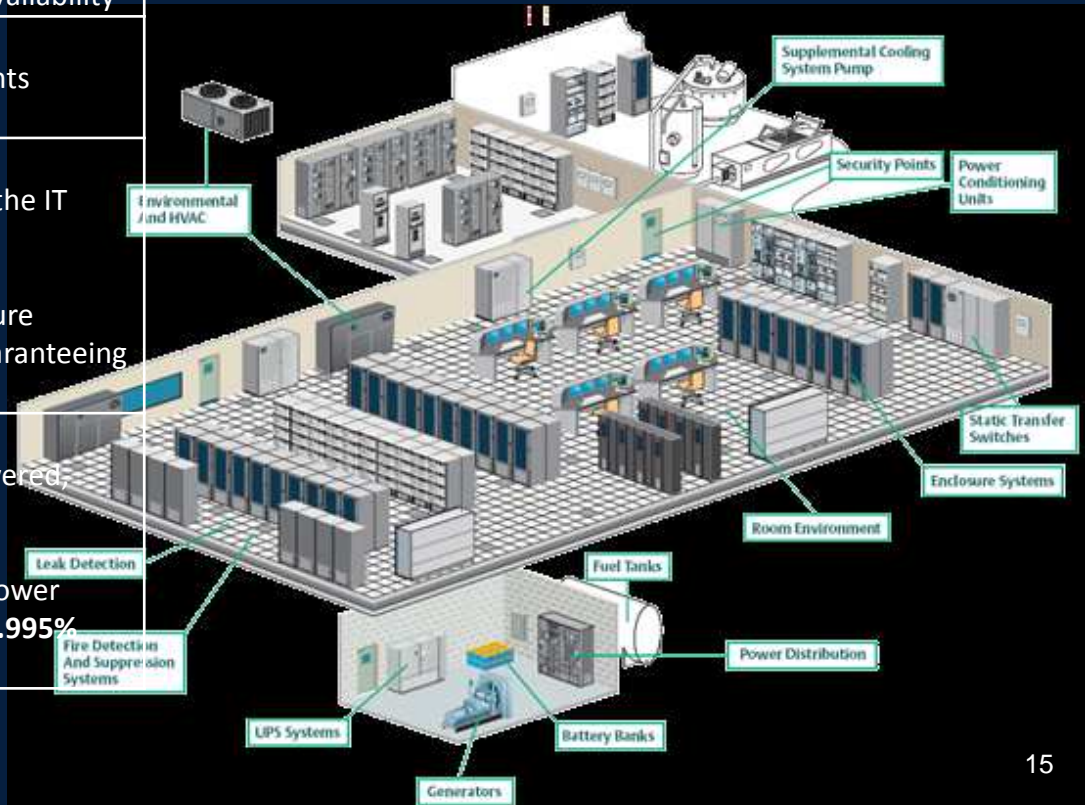
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Classification and Operation Models

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

Tier Level	Requirements
1	<ul style="list-style-type: none"> Single non-redundant distribution path serving the IT equipment Non-redundant capacity components Basic site infrastructure guaranteeing 99.671% availability
2	<ul style="list-style-type: none"> Fulfils all Tier 1 requirements Redundant site infrastructure capacity components guaranteeing 99.741% availability
3	<ul style="list-style-type: none"> Fulfils 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	<ul style="list-style-type: none"> Fulfils 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 ration models



Hardware Implementation

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



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The Google Way



Q & A



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?