BORSA ITALIANA

London STOCK EXCHANGE

FST Forum

Managed Datacentres

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Location of meeting :London PSQ

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Agenda

1. Introduction

2. Challenges

3. New Technologies

4. Datacenter Management

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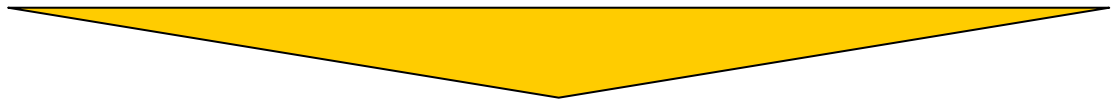
Introduction

- Actual lifecycle of a datacenter is about 10 years, much higher than average application lifecycle (about three times).
- It is more difficult to find available datacentre space close to city centre, especially where there is a lot of demand for real estate market (City of London, Milan City Center, Paris and so on)
- Server Technology trends concentrate servers within a smaller space resulting in increasing power demand per server and per square metre.
- This results in a risk that you build a datacentre that becomes outdated and requires refurbishment during its lifecycle to meet the increasing power demands.



- A new datacentre must be equipped to host, at least, two generations of servers before refurbishment is required.
- Development plans are the most critical issue in DC design to protect DC Real Estate investment and to ensure that they fit the immediate business requirement and future business strategy.

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Major Milestones in last 10 years

- Sept. 11 2001
- IRA attack Bishopsgate 24th April 1993
  - Rewriting of physical security measures in order to guarantee Business Continuity.
    - Anti terrorism measures.
    - Crisis management.
    - People control.

- Sept. 28 2003 (Italian National Blackout)
  - Necessity to face long term power interruption.
    - No possibility to refill diesel tanks during blackouts.
  - Necessity to face unpredictable effects like battery fires.
  - Necessity to assure full datacentre functions in case of power interruption.

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Major Milestones in last 10 years

- Introduction of small servers (pizza boxes) and blades:
  - unpredictable power consumption increases, from 2.5KW per cabinet up to 6-8KW per cabinet.
  - forecasts predict about 10KW (even up to 24KW) in the next 3 years with next generation blade servers.
- Development of telecommunication technology:
  - structured cabling will become out of date in the near future.
- Increase of network security measures:
  - Redraw of server architectures needing up to 5-8 ports per server.

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Agenda

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2. Challenges

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Challenges

- Add more resiliency to the enterprise IT infrastructure to insure business continuity.
- Provide physical security close to the highest possible level.
- Optimise space requirements.
- Reduce power consumption contributing towards the organisations environmental commitments.
- Provide flexible available capacity to applications in a small amount of time (e.g. dynamically assign servers to applications).
- Minimise the number of idle servers.
- Provide services as close as possible to the customers.
- Support high speed operations.
- Assure availability of more than two telecom operators at the DC premises.

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Challenges cont.

- Increase density
  - Concentrate servers in smaller spaces (e.g. using blades)
  - Consolidate services like backup and massive storage
  - Centralise DC management
- Increase performance
  - Provide energy of up to 20 KW per cabinet
  - Provide new methods of cooling
  - Host next generation telco equipment
- Reduce operational costs and consumption
  - Provide more interfaces per server
  - Study solutions for sturdier and simpler cabling.
  - Ensure that we maximise the use of idle servers by dynamically assigning idle servers to applications
  - Centralise server management and deployment

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Challenges cont.

- Provide higher SLA to business continuity
  - Server room separation
  - State of the art Power Distribution with control technology
  - Segregation of power distribution lines (multiple providers)
  - Multiple Feed Redundancy for UPS plants
  - Failover refrigeration plants (**Uninterruptable Cooling Supply**)

- Provide more physical security
  - Introduction of neighbourhood control
  - Increase DC resistance to attacks and to physical penetration attempts
  - Review fire detection and fire resistance capabilities.
  - Increase blackout resistance (UPS may not be enough!!!)

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New Technologies: DataCentre Refrigeration

- Cooling
- Separate Hot air from Cold Air
  - Hot Aisle/Cold Aisle
  - Air guides for equipment with non front to back airflow
  - Cabinet fillers to eliminate air mix into and through the cabinet
  - Passive cabinets for non occupied positions
  - Panels or curtains up to the ceiling
  - Separation in small rooms that can be filled and optimized much faster
- Design datacentre cooling for high efficiency
  - Choose an appropriate cold air temperature (cold air can be up to 25 °C)
  - Datacenter must not be designed for human presence
  - Control air speed and flow to avoid Venturi effect.
  - Fit fan coils on cabinet ceiling and into passive racks
  - Manage air pressure in under floor voids and ceiling to avoid hot air returns.

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New Technologies: DataCentre Refrigeration

•Free cooling

- In case of external low temperature an option to save refrigeration running costs is to bring external air into the datacentre
  - t >30°C No benefit at all
  - 24°C < t < 30°C it is better to chill outside air rather than hot isle air
  - t < 24°C mix appropriately of external air and chilled returning air.

- It is necessary to control moisture of incoming air in order to avoid dangerous condensation.

- Fan speed becomes very variable so it is necessary that they be inverter driven.

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New Technologies: DataCentre Refrigeration

- It is not possible to refrigerate a new generation DC with traditional direct expansion plants because of the density of cooling energy required. Traditional conditioning solutions require too much space and too much energy (with traditional plant no space benefits over 5KW per rack).
- Design of innovative plants is necessary for new high density DC
  - Cold water (10°C to 15°C) can be pumped from sub-surface water bearing stratum (very easy in many locations like Milan suburbs)
  - During summer, when cooling necessities increase, water can be chilled again with a cogeneration plant, recovering wasted heat from power generation and eventually from other heat sources like solar energy (http://www.baxterenergy.it, www.malpensaenergia.it)

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New Technologies: Air Quality Improvement

- Dust reduction
  - Dust is among the most frequent causes of equipment failure and fire ignition.
  - Air filtration and continuous vacuum cleaning is necessary to reduce dust accumulation
  - Presence of non technical persons (cleaners) close to the cabinets increases the need for physical security measures, however obviously helps in terms of a cleaner environment

- Humidity
  - Servers have no particular need of humidity control when it stays below 50%
  - Condensation must be absolutely avoided, particular care in air management must be set in place in case of free cooling.

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New Technologies: Blade Servers

- Blade systems can concentrate up to 64 servers into a cabinet saving up to 50% of space (higher percentages of savings for powerful servers)
- Integrated mid-performance switches reduce of local cabling needs by up to 80% (uplink only)
- Consolidated power suppliers increase efficiency by 25%
- Blade servers are more power efficient than traditional ones.
- New blades natively integrate state of the art technology for server administration like remote deployment, centralised management and automatic diagnostics which reduces the management overhead, compared to traditional technology.

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New technologies: Blade Servers

- Blade usage allows definition of capacity units that can be dynamically assigned to applications when needed.
- Standardised server models reduce retention of spare ports, reduce management and maintenance complexity
- High server density within the cabinet may require new cooling methods.

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New technologies: Blade Servers

- A new blade system installation must be carefully designed in order to optimize all variables:
  - Power consumption
  - Space Organisation
  - Communication Equipment

- A new blade system design requires availability of very skilled engineers able to manage the strong interaction between all the components:
  - Servers
  - Communication
  - Power
  - Space

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New Technologies: Power Supply

- UPS must provide, at least, 40 minutes of power autonomy to the DC in order to allow the engineering team for time to turn on manually power generators in case of starting problems.

- UPS management must be integrated with system management in order to provide up to date information and to avoid untimely shutdowns.

- UPS duplication could not be efficient due to the necessity to optimise space. Other multi feed redundancy configurations can be a lot more efficient in utilising space.

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Agenda

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3. New Technologies

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Datacentre Management

- The datacentre is the heart of the business – hosts all core business systems and data
- Core UK datacentre fully manned and managed 24/7/365
- Without appropriate management, the business is susceptible to data loss, unplanned outages and reputation damage
- Risks may be realised through human error, system failure, or malicious activity
- Risks mitigated through environment segregation, change control, access control procedures

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Environment Segregation

- Live environments physically separated from pre-production, development, test and proof of concept environments
- Live network environment never used for non-live, non-production traffic
- Third party systems physically separated from LSE systems

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Change Control

- LSE employs rigorous change control across all data centre environments
- Changes restricted to defined time periods
- Defined change lead times (minimum 7days) to allow for review and sign off
- Proposed changes reviewed by technical peers, line manager, service manager
- Approved changes must be further approved by unit wide daily change review meeting
- All changes must be proven to have considered impact of success and failure, implementation plan and roll back plan
- Resourcing for change must be agreed by all relevant teams
- All changes must be implemented to plan – no overruns without escalation
- No changes withdrawn without escalation
- Exceptional changes e.g. inside lead time must be approved at highest level of senior management

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Access Control

- Access to the Computer Rooms is restricted. Controlling access is the responsibility of the Datacentre Manager.
- Access during live service hours restricted to visual inspections and live service issues, and must be approved by senior management
- Approved change control documentation required to access the datacentre for any purpose
- Every entry to Datacentre must have associate risk control document
- Third party partners must be accompanied by authorised staff
- External contractors cannot enter Datacentre without permit to work