Data Centres

“The true costs, see through the Hype”

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Agenda

- Where we have come from
- Lost income in today's Data Centre
- Build in control
- “Green” versus Cost?
- Conclusion

Where we have come from

Where we have come from

- Thirty years ago! Data Centers consisted of bulky, physically large mainframe computers.
- which user requirements were fed into the mainframes with punched cards and paper reports or magnetic tapes were produced.
- Then replaced by on-line operations in which dumb terminals; connected directly to the mainframe computers allowing the end user to access their applications or data over bulky coaxial cables.

Where we have come from

- In the 1980s PCs allowed users to store and access their data locally.
- This was then extended to connecting the users in the department via a local area network.
- This decentralised operation caused problems for the IT departments being able to control and manage the flow of data.
- So created LANs that were connected together allowing different department users to share data and also provided the IT department with more control on the companies databases

Where we have come from

- The next logical step was to centralise the department's storage in one area that could be locally controlled and managed by the IT department. (sounds like a mainframe!)
- Today's Data Centre has this centralised architecture with multiple servers containing the enterprises databases.
- These Data Centers are heavily involved with the networking, both locally and allowing remote access by mobile workers.
- Today's Data Centers contain not only the servers, along with their data storage devices, such as hard disks, but also the core networking, switching and routers

Where we have come from

- The more sophisticated Data Centers also house storage area network servers and KVM
- The release of TIA/EIA 942, the Telecommunications Infrastructure for Data Centres in April 2005 provided an approach to physically configuring Data Centers of any size.
- Significantly, this included a standard for the cabling architecture infrastructure, thereby providing a guide for data center architecture implementation.

Lost income in today's Data Centres

Lost income in today's Data Centres

- TIA/EIA 942, ranks Data Centers by tiers as a measure of their reliability and redundancy.
- There are four tiers, the higher the tier, the more redundancy and, hence, higher costs (or ROI) associated with the Data Center.
- There are four areas to be rated as Tier 1 through to Tier 4, which include:
  - Telecommunications
  - Architectural
  - Electrical
  - Mechanical
- Each Data Center can have different tiers in each of the above areas. With multiple tier areas, the Data Center will be rated by the lowest tier area.

Lost income in today's Data Centres

- In addition to the data processing equipment, data centres also incorporate other infrastructures including:
  - Cabling system
  - Power supply and back up
  - Cooling and other environmental equipment
  - Physical security systems
  - Network operations centre (NOC) – these centres monitor the Data Center
  - Operations, which are typically internally operated or, in some instances, are outsourced to a third party.
  - Fire and smoke systems.

Lost income in today's Data Centres

- TIER I
  - Annual IT downtime due to site 28.8 hrs
  - Site availability 99.671%
- TIER II
  - Annual IT downtime due to site 22 hrs
  - Site availability 99.749%
- TIER III
  - Annual IT downtime due to site 1.6 hrs
  - Site availability 99.982%
- TIER IV
  - Annual IT downtime due to site 0.4 hrs
  - Site availability 99.99995%

Lost income in today's Data Centres

- People
  - Number of Direct and in-direct idle workers
- Product
  - Cost per unit at that stage in production
  - Units per hour
- Start-Up
  - Electrical surge cost, Set up, % reduced till start/stop
  - Equipment fatigue
  - Scrap produced, is it recycle able
- Bottleneck
  - List other downstream equipment, and % effected
- Expected Sales
  - Percentage effect on product out the door.

Lost income in today's Data Centres

- Brokerage operations £5.45 million / hour
- Credit card authorization £2.6 million / hour
- Package shipping services £150,000 / hour
- Home shopping channel £113,000 / hour
- Catalog sales center £90,000 / hour
- Airline reservation center £89,000 / hour
- Cellular service activation £41,000 / hour

Lost income in today's Data Centres

- A major credit card company states that they will loose £2.6m per hour for down time – this means
- TIER I
  - Annual IT downtime due to site 28.8 hrs
  - £74 million!
- TIER II
  - Annual IT downtime due to site 22 hrs
  - £57 million!
- TIER III
  - Annual IT downtime due to site 1.6 hrs
  - £4 million!
- TIER IV
  - Annual IT downtime due to site 0.4 hrs
  - £1 million!

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Build in control

Build in control

- Building in control
  - How can this be done without measurement?
- How much does your Data Centre cost to run?
  - How much operational cost goes on IT activity, how much on keeping that activity running?
- How quickly can you find a problem?
  - When it happens? Or before it happens?
- What will it take to build in control
  - When the effect is too great for the business?
  - When Government makes it law?

Build in control

- The Car
  - Allows you to take a journey from point A – to point B
  - Moves you faster than ever before
  - Uses fossil fuel - economically
  - Needs a road to drive on (most of the time)
  - And is safe (apart from human error)

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Build in control

- How do we know the difference?
  - We do actually move, we measure the mileage taken
  - We measure the speed of the car MPH
  - We measure fuel consumption (how many miles per gallon)
  - We have standards for faster speeds –what kind of road (Cat5e / Cat6a?)
  - We make the products safer, trying to remove human error!

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Build in control

- Data Centres have been operating with minimal measurements

- The measurements taken are at too high a level and taken at spot times
- Measuring a car's speed and efficiency helps to develop, better cars and know they are better

- For a data centre it gives the same ability – nothing new?

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Build in control

- Measurement gives a benchmark
- Giving you the ability to identify the areas of the Data Centre that are performing poorly
- Allowing you to plan for future equipment installations
- For a Data Centre you must measure continuously
- A measured and controlled Data Centre saves you money

“Green” versus Cost?

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“Green” versus Cost?

- What does this actually mean?
  - Offsetting your carbon footprint?
  - Using reusable energy?
  - Using less energy?

- It means in the commercial world:
  - Being seen to be green, has it impact on the share price
  - Being driven to compete against the technology used by their competitors
  - Being driven by a revenue stream (Carbon credits)
  - Being driven by legislation

“Green” versus Cost?

- We are in the commercial world and so the driver at this stage of the markets development, needs to be of a commercial benefit, not just green words
- To ensure the commercial benefit, we need to use intelligent networks for both Power and Infrastructure
- This intelligence is at an additional cost, compared to the traditional dum systems
- The perception is that this is the cost for going green
- The reality is to make your company more efficient

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“Green” versus Cost?

A case study

- Approximate values and assumptions as detailed below regarding the deployment of the 100 to 2000 racks over 5 years.
- The required figure of PUE OF 1.25, was ambitious as most well run monitored DC's have a PUE of 2.0
- Facilities without monitoring power to rack can have a PUE well in excess of 3.0
- Tier III concurrently maintainable

“Green” versus Cost?

- Information Supplied by client.

- PUE = Total Facility Power / IT Equipment Power
  - Total Facility Power is defined as the power measured at the utility meter the power dedicated solely to the Data Center
  - The IT Equipment Power is defined as the equipment that is used to manage, process, store, or route data within the Data Center

- PUE = 1.25 Target (DCiE value of 80%)
- PUE = 2.0 Achievable with a monitored solution (50%)
- PUE = 3.5 Current (DCiE value of 28.5%)

“Green” versus Cost?

- Electricity cost 50 to 87.4 Euro /MWhr (low cost Eastern Eur)
- Racks 100 to 2000
- Rack rating 5.3 kW to 8.3 kW

Parameter	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Total / Ave
No of Racks installed	100	400	500	500	500	**2000**
Ave Rack kW rating	5.3	6.5	7.5	8.3	8.3	
Energy cost Euro/MWhr	50	55	65	75	87.4	
Totals						
Kw	**530**	**2,600**	**3,750**	**4,150**	**4,150**	**15,180**
cost £'s/rack/yr	**£1,555**	**£2,098**	**£2,861**	**£3,654**	**£4,258**	
cost £'s total racks/yr	**£155,534**	**£839,296**	**£1,430,618**	**£1,826,789**	**£2,128,818**	**£6,381,053**

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“Green” versus Cost?

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Total cost	**£155,534**	**£839,296**	**£1,430,618**	**£1,826,789**	**£2,128,818**
To power IT equipment					
Total cost PUE 3.0	**£466,601**	**£2,517,887**	**£4,291,853**	**£5,480,366**	**£6,386,453**
Cost with no monitoring and control					
Total cost PUE 2.0	**£311,068**	**£1,678,591**	**£2,861,235**	**£3,653,577**	**£4,257,635**
Achievable cost with Monitoring deployed					
Total cost PUE 1.25	**£194,417**	**£1,049,120**	**£1,788,272**	**£2,283,486**	**£2,661,022**
Targeted / optimised cost with monitoring deployed					

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“Green” versus Cost?

- Power saving based on a non monitored solution with a PUE of 3.0 and a targeted monitored solution with a PUE of,

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Total
PUE 1.25	£272,184	£1,468,767	£2,503,581	£3,196,880	£3,725,431	£11,166,843
PUE 2.0	£155,534	£839,296	£1,430,618	£1,826,789	£2,128,818	£6,381,053

- Estimated cost for Temperature and Power Monitoring per rack for a n+1 solution £650 [Inc Hardware, Software, Installation, configuration and Commissioning]

	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5
Total Monitoring Solution Cost	£75,000	£300,000	£375,000	£375,000	£375,000

“Green” versus Cost?

- So an ROI of 3 months per years growth – is this a good return?
- Is this the kind of return you are looking for on savings that you will see from the installation of an IPM / IIM solution?
- With today's demands on budgets, this seems to be a very easy sell to the budget holders, don’t you think?

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“Green” versus Cost?

- If the answer was yes to any of the previous questions, then you maybe missing the main benefit.
- The fact that monitoring can lead to reduced costs by way of more intelligent use of server loading, UPS loading and aircon settings, it should be considered very much as a secondary benefit.
- The obvious point being that the user has to choose to act on the information. The monitoring itself does nothing to save costs.
- The intelligence needs to become part of the organisation and implemented across different functions (true integration)

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“Green” versus Cost?

- The key benefits to deploying intelligence into your network / DC are:
  - Health monitoring to maximise uptime (which should be the biggest business driver) and also to prove the integrity of the Data Centre to its users, either internal or external.
  - Data collection leading to increased uptime through the identification of critical trends.
  - Creation of a billing stream based on actual power consumption.
  - Lengthening the capacity lifetime of a Data Centre by analysing true power used as opposed to basing Data Centre life on plated values. (This is probably the best ROI indicator).

“Green” versus Cost?

- What does this actually mean?
  - Offsetting your carbon footprint?
    - If you don’t then you will be operating outside of your carbon budget
    - Operating outside of this, is a £0.04/Kw levy
    - Self regulation, before Government regulation
    - Ability to sell your surplus Carbon credits
  - Using reusable energy?
    - Very difficult to get 100%, as it would take a solar farm the size of 20 football pitches or a wind farm with 100 25m blades
  - Using less energy?
    - Not too easy, but an example an LED light on a power strip cost £0.25 / year to run (or for a 2,000 cab site = £16k)

“Green” versus Cost?

- It means in the commercial world:
  - Being seen to be green, has an impact on the share price
    - over the past three years companies with climate change risk management already in place, for the most part, out-performed companies within the same sector that didn't have policies in place (Computing 16th Nov)
  - Being driven to compete with against the technology used by their competitors
    - Increased uptime, reduce costs = more sales, more profit
  - Being driven by a revenue stream (Carbon credits)
    - Trading on the Carbon stock market
  - Being driven by legislation
    - You will do this to meet the law

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Conclusion

- Today's and tomorrow's DCs number one driver is uptime, and should almost be at any costs, depending on your industry.
- It is an oxymoron to call a Data Centre green
- Reducing carbon emissions, increases efficiency
- You can only gain efficiency if you are measuring, you need to know your starting point or what area to focus on for improvement

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Conclusion

- It is all about balance, income (reliability of Network) and cost (reducing cost of ownership – energy and life span) versus buying what you need
- Energy legislation is forcing Date Centre's to measure and more importantly control energy consumption
- The by-product of this is a more efficient Data Centre, which is good for the environment and good for business
- Confusion creates opportunity, don't be confused, be proactive and measure and control your Data Centre

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Questions?

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