



Knowledge
Transfer
Network

Digital Systems

Which Cloud is right for You?

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Intellect



About the Speaker

**Director, Digital Systems KTN
Technology Strategy Board programme
Launched October 2009
New “IT Knowledge Transfer Network”**

- “ Cyber-Security
- “ Location and Timing
- “ Scalable Computing
 - Built upon the foundations of Grid Computing Now! KTN
 - Focused on Cloud/Utility, Sustainability and Distributed Applications/Services
- “ Working since October 2009 on G-Cloud & Apps Store



Agenda



1. Towards IT as a Service

“Virtualisation

2. Cloud Computing

“Challenges

3. Data Centre Efficiency

“Practical Steps

4. Examples

“G-Cloud

“Hampshire CC

5. Towards the New IT

“Conclusions

Maslow's ROI Hierarchy for Enterprise 2.0



Hutch Carpenter, 2010

Where are we heading?

Old World

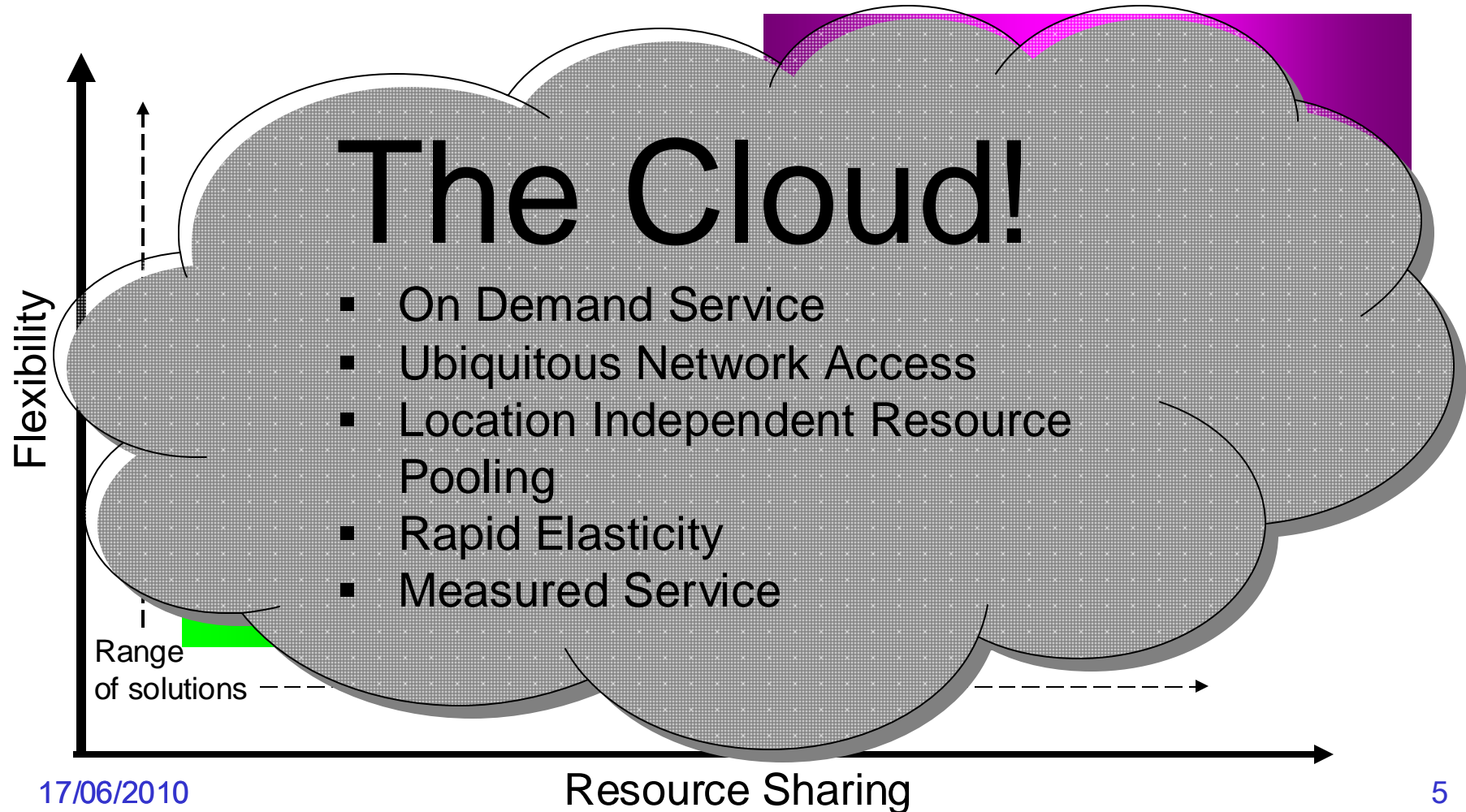
Static
Silo
Physical
Manual
Application



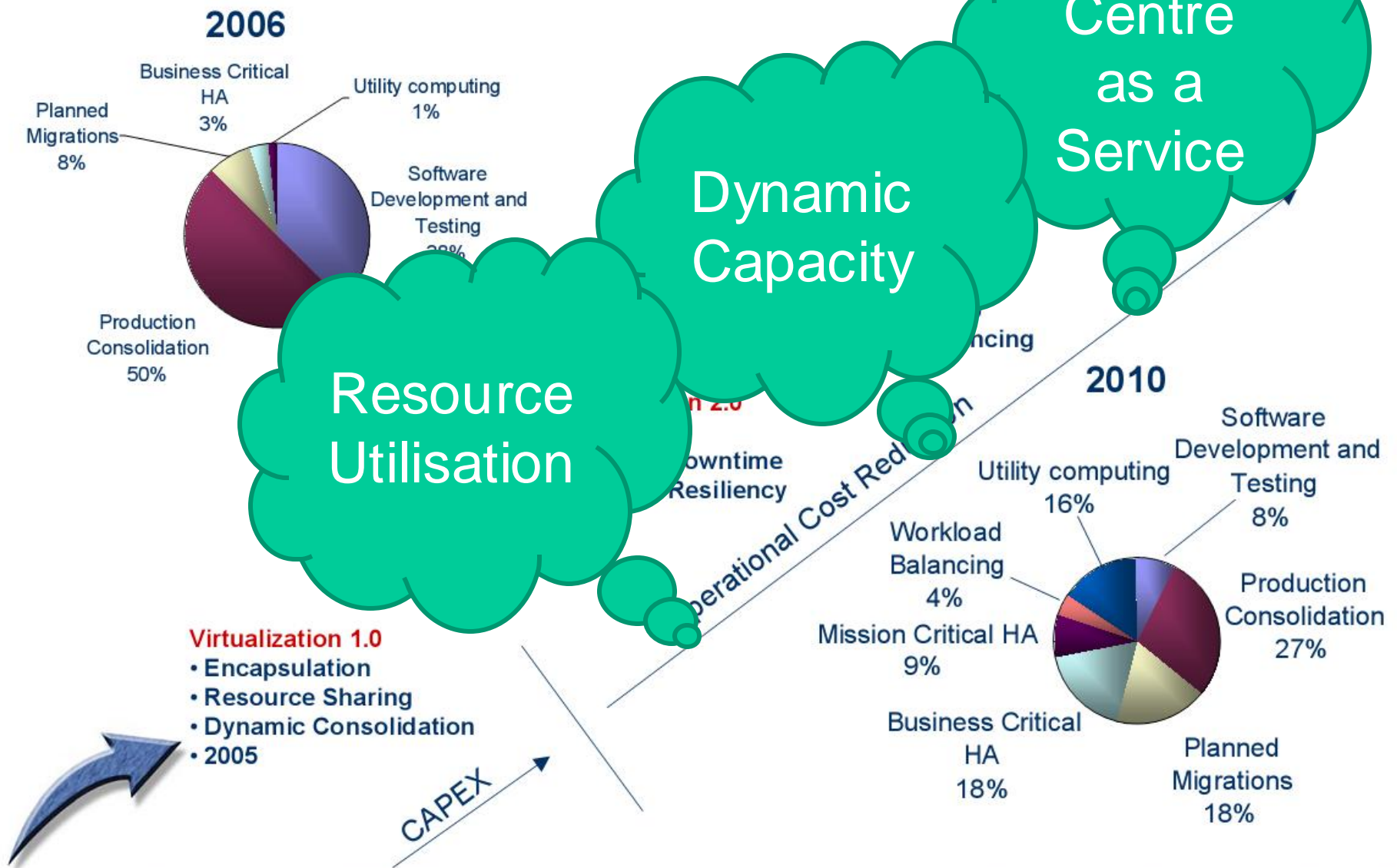
New World

Dynamic
Shared
Virtual
Automated
Service

IT Architecture Trends



The Next Virtualization Milestones



Delivery Model

Model	Capability Provided	Example Services
SaaS	To use the provider's applications running on a cloud infrastructure and accessible from various client devices through a thin client interface such as a Web browser	<ul style="list-style-type: none"> ▪ Citizen Engagement (Wikis, Blogs, Data.gov) ▪ Government Productivity (Cloud based tools) ▪ Business Enablement (Salesforce.com) ▪ Enterprise Applications (Core Mission & Business Services)
PaaS	To deploy onto the cloud infrastructure consumer-created applications using programming languages and tools supported by the provider (e.g., java, python, .Net)	<ul style="list-style-type: none"> ▪ Database and Database Management Systems ▪ Developer / Testing Tools ▪ Virtual Environments
IaaS	To provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications	<ul style="list-style-type: none"> ~ Computing ~ Storage ~ Application hosting

Deployment Model Overview

PRIVATE CLOUD

Operated solely for an organization.

COMMUNITY CLOUD

Shared by several organizations and supports a specific community that has shared concerns

PUBLIC CLOUD

Made available to the general public or a large industry group and is owned by an organization selling cloud services.

HYBRID CLOUD

Composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability

Market Dynamics

Service Providers

Amazon; Google; Microsoft; etc.

Infrastructure Providers

Sun; IBM; HP; BT; Rackspace;
Teradata etc.

Platform Service Providers

VMWare; Citrix/Xen; Microsoft;
Platform

Application Vendors

SalesForce; SAP; Oracle; Google

Systems Integrators

HP/EDS; CSC; Capgemini;
citihub; etc.

E-Mail Services (Hotmail, Gmail)

CRM Systems (SalesForce)

Office Systems (Google Docs)

Microsoft Application Migration

Financial Sector

“ Private Cloud

Virtual Data Centres (Cisco,
Betfair)

Government Initiatives

“ US Federal Cloud Computing
Initiative/Storefront

“ UK G-Cloud



Steve Staso

Challenges

Opportunities:-

- "Reduced Capital Outlay
- "Purchase Flexibility
- "Instant Access
- "Reduced Unit Costs
- "Scale Up, and Down!
- "Elasticity in Usage Costs
- "Offloaded Power/Carbon Costs
- "Interoperable Open Services

Issues:-

- "Life beyond the "firewall"
 - "Physical Security
 - "Network Access
 - "Latency
- "Quality of Service
 - "Service Level Agreements
 - "Data Security
- "Provisioning Models
 - "Proprietary Interfaces
- "Application Support
 - "Scalability Models
- "Software Licensing Models



Getting to the Cloud

Infrastructure

- Consolidate
- Virtualise
- Public/Private Split

Applications

- SaaS
 - Office; Collaboration; CRM; Application/Information
- Enterprise SaaS
 - Service enabled/Scalable implementations

Migration

- MS Azure Strategy
 - Local, Private, Public
- Proprietary Solutions
 - Multi-tenanted
 - Service Orientation
 - Web Services
 - Dynamic Assembly

Platforms

- e-Commerce
- Document Management
- Communication



Future Risks in the Cloud

Denial of service

- “ Resource consumption, traffic redirection, inter-cloud, to the user

Trojan Clouds

- “ Imitate providers, infiltrate supply chains . ID & Authentication

Application Framework attacks

- “ Repeatable, pervasive

Separation and Inference

- “ Virtualisation, Inference attacks due to privileged access

Covering Tracks

- “ Data Movement



The Cloud Complications

The following should be considered:

- “ Geography. Various countries with different laws and regulations.
- “ Ownership and rights. Clear responsibilities associated with data assets must be established even though the data is transient. Establishing boundaries is key.
- “ Potential for users to gain access to shared resources, and possibly to other users.
- “ Data loss. An incident may lead to a loss of system information and data for several customers on shared infrastructure.
- “ If hardware is seized as part of a legal investigation, it may contain data relating to several customers and may incur the loss or disclosure of that data.
- “ Secure disposal. Disposing of servers, hard drives etc is challenging for Cloud Service providers.

Public, Hybrid or Private?

**Estimated energy cost in USA
(2011) - \$7.4 billion**

**Estimated energy cost in
Western Europe (2007) - £4.48
billion**

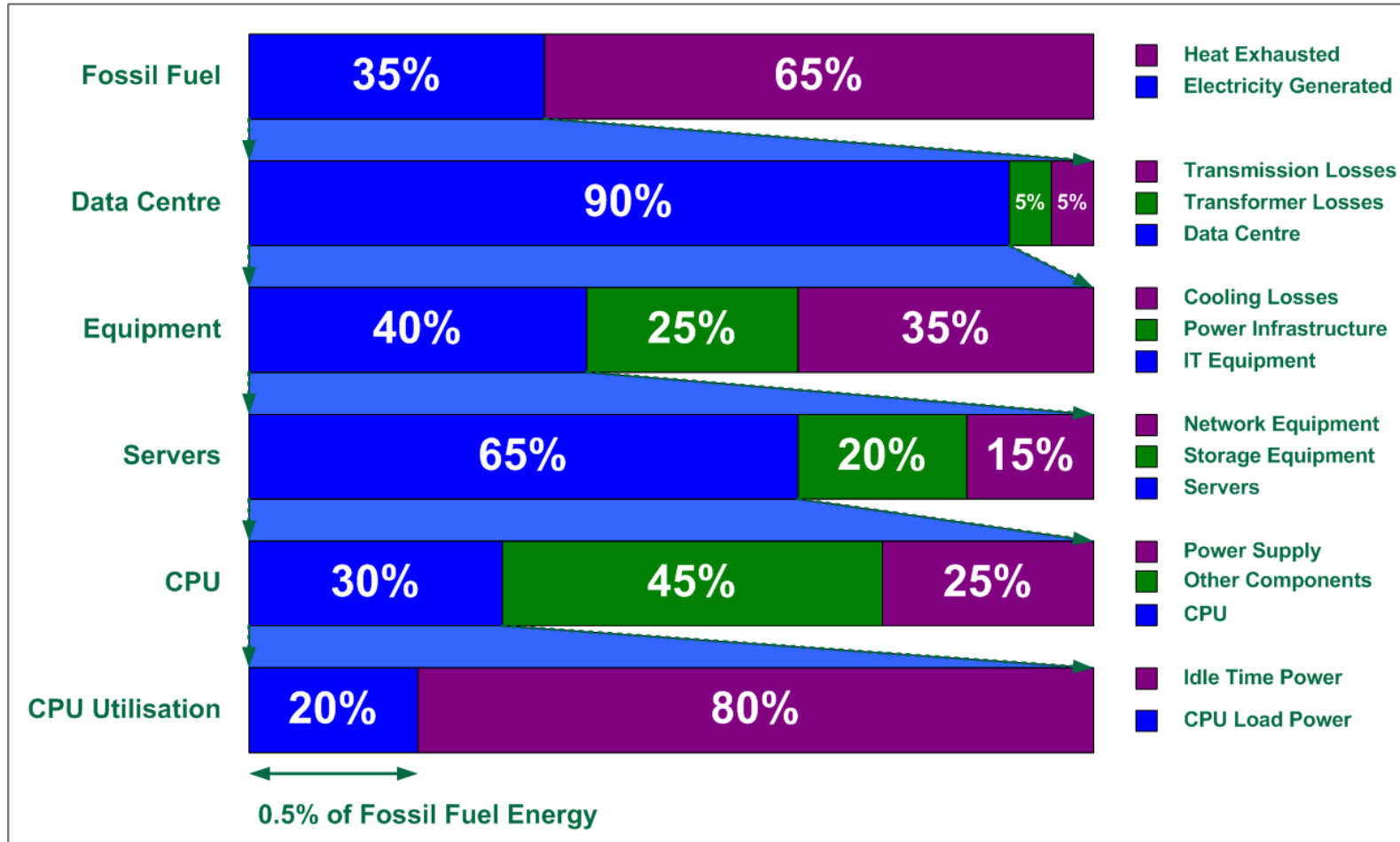
**Estimated energy cost in
Western Europe (2020) - £8.32
billion**

What can you afford?





Recognising the Problem



Google Data Centres – State of the Art?

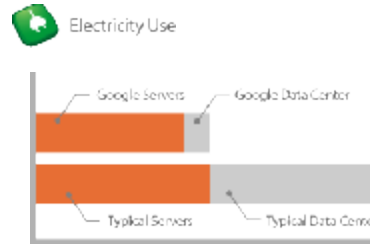
1M(est) Servers in 3 doz. Data Centres Power Usage Effectiveness (PUE)

“EPA 2011 Forecast Average 1.9 with equipment trends

“Google attained 1.10/Qtr in best facility (10% overhead!)

Five step plan

1. Minimize electricity used by servers
2. Reduce the energy used by the data center facilities themselves
3. Conserve precious fresh water by using recycled water instead
4. Reuse or recycle all electronic equipment that leaves our data centers
5. Engage with peers to advance smarter energy practice



$$PUE = \frac{\text{Total Facility Power}}{\text{IT Equipment Power}}$$

EPA Scenarios	PUE
Current Trends	1.9
Improved Operations	1.7
Best Practices	1.3
State-of-the-Art	1.2



Tech Titans Building Boom By Randy H. Katz

<http://www.spectrum.ieee.org/print/7327> and Google's own information

<http://www.google.com/corporate/green/datacenters/>



Practical Steps

Industry Metrics (PUE)
EC Code of Conduct on Data Centres
Voluntary Code
Participants: Subscribe, document your results
Endorsers: Support
Best practice guide – Peer Reviewed

http://re.jrc.ec.europa.eu/energyefficiency/html/standby_initiative_data_centers.htm

Cooling Strategies
Virtualisation
“Server
“Storage
“Desktop
“Network
“Data Centre!
Clean Energy Sources
Case studies available



Hampshire County Council

**Public Sector sustainability commitment
Green IT Action plan:-**

- 1.Reduce Energy Consumption**
- 2.Improve Reuse/Recycling of ICT equipment and consumables**
- 3.Utilise ICT to improve sustainability of working practices**
- 4.Improve standard of procured equipment**
- 5.Develop ICT's contribution to sustainable communities**
- 6.Use ICT to communicate and share best practice**
- 7.Develop realistic and achievable performance measures**

Results:-

“Refurbished 1960’s office building for Data Centre

“Reduced number of servers by 25% with Virtualisation

“Reduced energy consumption by 42% through more efficient airflow

“Innovative cooling strategies allow for flexible reuse of heated water

“PUE reduced to an estimated 1.58

“Adopted Thin Client for the desktop yielding >30% energy saving, reduced network capacity, 60% reduction in embedded carbon and >7 year lifespan

“Minimum 5 year equipment lifespan

See website for this & more case studies

But the real benefits ...

Using IT to reduce the carbon costs of our existing “business” services...

“Minimising Transport (17% of Carbon Use)

Optimising delivery and logistics

“Avoiding travel, commuting costs

Intelligent transport services

“Avoid delays, service disruptions

Find new ways to deliver services

“Online access

“Integrated government services

“Local collection services



G-Cloud – A Key Policy Enabler

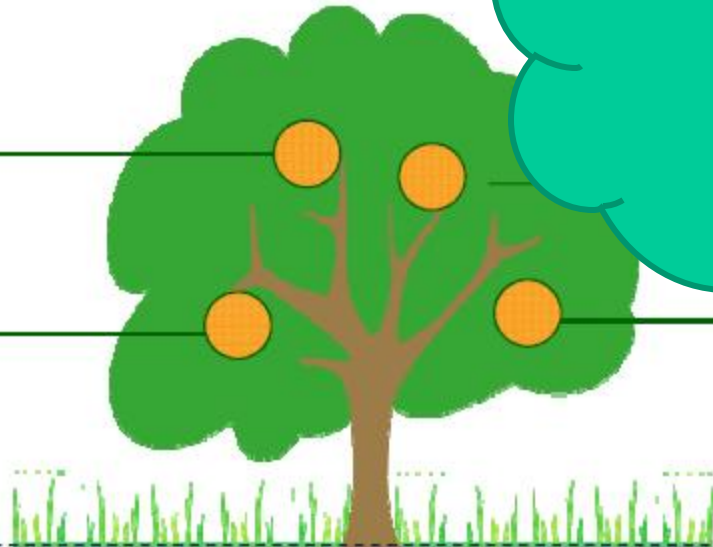


Benefits

Modernise digital services for citizens

Save money

Address sustainability agenda



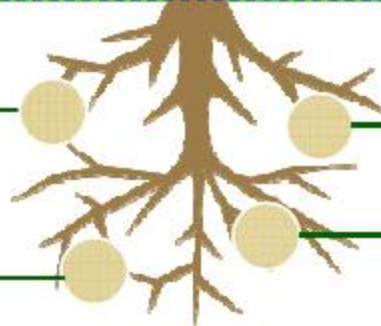
Enablers

Leverage investment of global ICT industry

CTO Council governed standards and champion assets

Public Cloud services and shared applications

Infrastructure standardisation and process automation

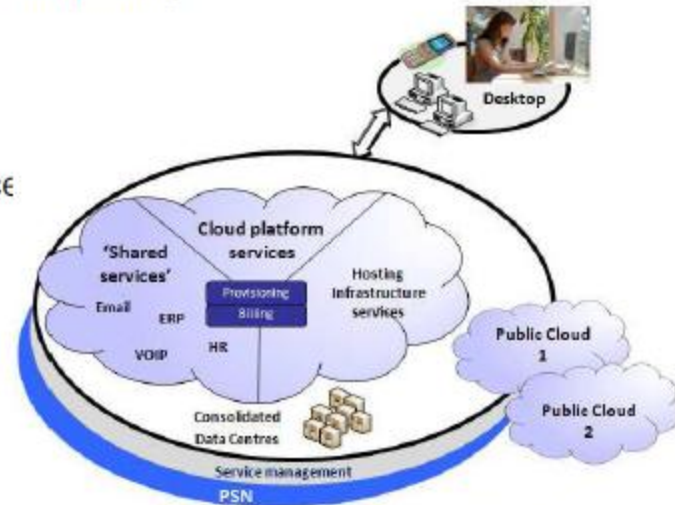


G-Cloud Programme – Three Elements of the ICT Strategy

- **G-Cloud** : *“bringing utility convenience to Public Sector ICT – shared, secure, flexible, agile, transparent and efficient allocation of ICT when it’s needed, through sharing standardised resources to reduce costs”*
- **Application Store**: *“enabling faster, more cost-effective and more consistent certified solutions to business challenges through reusing and sharing applications and services”*
- **Data Centre Consolidation**: *“delivering Public Sector ICT services from the optimum number of high performing, energy-efficient, cost-effective, secure and standards-based data centres”*

G-Cloud

- The Public Sector brand for trusted cloud computing
- Enables cost savings through
 - Consolidating buying power
 - Reducing design, procurement and assurance overheads
 - Improved operational efficiency through standardisation and automation
 - Flexibility to scale up and down
 - Sharing infrastructure across departments, enabling high load levels, avoiding purchasing equipment for temporary requirements.
- Services categories will include
 - Shared Services/Business services
 - Utility applications
 - Common public sector applications
 - Development platform for custom applications
 - Infrastructure and Service Management



Government Applications Store Principles

- “Find it – build it – run it – share it”, the “one stop shop” for Public Sector business and ICT services
- Based on a central catalogue of pre-procured and G-Cloud certified services and applications. Business services, Development platform and Infrastructure.
- Presented in the context of “your organisation”, “your sector”
- Services instantiated in your data context
- Lowest price for the Public Sector, all benefit from the volume driven price reductions
- Choice of infrastructure platforms for all applications
- Innovation encouraged – a market place for new ideas from suppliers and end users
- You can “see what’s coming” as well as “what’s there”



Dynamics of the New IT

Economics of IT are changing

Virtualised Infrastructures are a commodity

Commercial Utilities have scale/efficiency

Where is the breakpoint between own and rent? (70%)

Application migration is a challenge

Performance cannot yet be assured

Resilience must be designed in

But it's cheap, a credit card can obtain!

Start with Private Cloud and expand ...

Can IT lead the organisation forwards?





Thank You!

Questions, Comments?

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