

Contents	
EXECUTIVE SUMMARY	3
SECTION 1: BACKGROUND AND METHODOLOGY	5
BACKGROUND	5
METHOD	5
SECTION 2: PUBLIC SECTOR - SURVEY RESULTS	6
INTRODUCTION	6
SECTOR RESPONSES TO SURVEY	6
CURRENT SITUATION ON PUBLIC SECTOR OWNED DATA CENTRES	7
KEY POINTS FROM THE SURVEY	13
SECTION 3: EXPERT VIEWS ON FUTURE PROOFING AND BEST PRACTICE	14
ADVISORY GROUP	14
GARTNER	15
VISITS: PRIVATE SECTOR HOSTING	16
PROCUREMENT	17
OTHER GOVERNMENTS' APPROACHES	18
SECTION 4: CONCLUSIONS	19
ANNEX A – ENGAGEMENT	21
ANNEX B – POWER USAGE EFFECTIVENESS (PUE)	24
ANNEX C – DATA CENTRE ADVISORY GROUP.	25
ANNEX D – SECTORAL SURVEY RESULTS	29
CENTRAL GOVERNMENT	29
LOCAL GOVERNMENT	33
SCOTTISH POLICE AUTHORITY	37
SCOTTISH FIRE AND RESCUE SERVICE	38
HEALTH	39
EDUCATION	40
ANNEX E – POSSIBLE GUIDANCE	43

Executive Summary

This report sets out the findings of a review of the public sector data centre landscape. The landscape review was the first phase of the project to deliver the data hosting and data centre strategy published in April 2014.

The findings in this paper therefore reflect the evidence gathered through the various channels described in [section 1](#) of this document. This evidence was gathered in quarters 1 and 2 in 2013.

The input and analysis of the information gathered from stakeholders described in this document, and a greater understanding of the advancement in technology over the same period was used to guide the direction taken to produce the Data Hosting and Data Centre Strategy for the Scottish public sector.

The stakeholders involved were invited to provide additional comment or reflection and these have been included under the relevant sections. It should be noted that these comments are the views of individuals and therefore should not be seen as representative of the sectors, The Scottish Government or the ICT industry as a whole. It has been very useful in establishing the understanding of the knowledge of stakeholders and information available to the wider public sector on the overall data centre landscape which has helped deliver the strategic requirements.

This report should be viewed as background information that informs the delivery of the strategy.

[Scotland's Digital Future: Delivery of Public Services](#) included a commitment to “develop a national strategy to consolidate and re-use the world class data centres available in the public and private sectors across Scotland”.

A review was carried out to:

- understand better the current landscape and thinking in the public sector
- understand how technology developments and related service offerings impact on a strategy
- make recommendations as to the approach and content of such a strategy and to recommend next steps

A summary of key findings of the review are as follows:

- public sector organisations are not making decisions against any common set of principles, considerations or evidence and generally lack evidence against which to take decisions on future provision
- a small but significant number are still considering building their own data centre
- some organisations have their own well designed and provisioned data centres which they intend to continue to use for the foreseeable future. However, many are not housed in appropriately secure and reliable facilities, and this represents a significant business risk for the public sector in their drive to provide a Digital First service

- most organisations and sectors have varying levels of requirements for hosting and delivering services. They would be willing to adhere to a national approach if in doing so they can demonstrate that services can be delivered cheaper, securely and highly available
- organisations will be more open to change if guidance and support is available to help them make informed decisions on the best approach for hosting their ICT infrastructure and services. In particular guidance on use of cloud hosting is required
- we need to identify how costs can be measured in a consistent way while providing evidence that secure & reliable services can be delivered out with an organisation's own environment and with robust service level agreements
- data centre providers whose core business is to deliver services and space operate at all security levels and with very tightly controlled service level agreements. They have effective strategies for reaching world class PUE (Power Usage Effectiveness, see [annex B](#)) levels and have a clear understanding of energy consumption at all times

Section 1: Background and Methodology

Background

[Scotland's Digital Future: Delivery of Public Services](#) set out an objective of developing a National strategy for the public sector's data storage focusing on consolidation and re-use. This reflected a recommendation in the [Review of ICT Infrastructure in the Public Sector in Scotland](#) report by John McClelland which suggested that significant efficiency and energy savings could be achieved through consolidation.

A project under the governance of the Digital Public Services (DPS) Programme Board was set up to take this forward. In taking the project forward it has been important to take account of the developing role of cloud services and virtualisation to ensure that moving from the current landscape to a future state is maximising the use of new and future technology.

Method

Evidence was gathered from a number of sources including:

- a survey circulated throughout the public sector
- Digital Public Services roadshow workshops
- an advisory group convened for the review
- meetings with a number of organisations from both the public & private sector
- discussions with other countries Governments
- visits to a number of data centres

The survey was issued to public sector organisations through their representatives on the DPS National Board (now the DPS Strategy Assurance Board) and a number of meetings were also held with public sector representatives. The purpose was to understand current arrangements and organisations' thoughts on the future hosting of their ICT services. The survey therefore provides both a baseline and an indication of the organisational and cultural challenge in achieving changed practice.

As indicated, we then took evidence from a range of expert partners and from an advisory group composing public sector and ICT industry members to further develop the way forward.

The full list of organisation can be found at [Annex A](#).

Section 2: Public Sector - Survey results

Introduction

The survey, which was published via Survey Monkey, provided updated information from the surveys carried out in 2010 which informed the McClelland review on public sector ownership. The aims were to:

- investigate organisations' views for sharing facilities
- understand any perceived barriers to sharing
- understand intentions in respect of use of the cloud

Key overall stats are below and individual sectoral positions are described in more detail in [Annex D](#).

The general observation is that organisations have different approaches to meeting similar requirements.

The survey confirmed that, currently, Scottish public sector organisations house ICT systems in a number of locations each with a variety of facilities. These include mainframe and midrange platforms located in traditional purpose built data centre environments in both the public and private sectors, as well as other servers and communications equipment in less controlled or secure locations, including some office environments.

Sector responses to survey

sector		sent	received	%returned
Central Government		55	35	63.64%
Local Government		32	17	53.13%
Fire Service*		1	1	100.00%
Police Service*		1	1	100.00%
Health*		1	1	100.00%
FE/HE	Universities	19	12	63.16%
	Colleges**	42	1	

* It should be noted that Fire/Police/Health responded out with the survey with an overview of their position.
** The 1 College response has not been included in the analysis.

Current situation on public sector owned data centres

data centre usage

Please describe all your data centre(s) and tier rating

	Primary Data Centre	Secondary Data Centre	Third Data Centre
organisations who own their own data centres	78.5%	23%	9%
Tier rating of DC - One	10%	9.5%	25%
Tier rating of DC - two	49%	48.5%	0
Tier rating of DC - three	28%	29%	37.5%
Tier rating of DC - four	2%	0	0
Tier rating of DC unknown	11%	13%	37.5%
of those who own their own data centres how many measures energy consumption.	40%	60%	28%
of those who measure energy consumption how many measures PUE	19%	33%	0
PUE range rating	1.4 – 2.6	1.6 – 1.9	0

The number of organisations who responded and used an alternative to owning their own data centres

	Primary Data Centre	Secondary Data Centre	Third Data Centre
organisations who used alternatives to owning their own data centres	21.5%	66%	17%
co-located in self-managed rack space from commercial supplier	1.5%	6%	1.5%
co-located in self-managed rack space with existing Public sector Organisation	3%	9%	3%
outsourced fully managed housing service with commercial provider	3%	1.5%	3%
hosted cloud	0	1.5%	0
managed cloud computing	1.5%	1.5%	0
disaster recovery site	0	23%	0
Something else	9%	10%	0

Externally managed service

37% use an externally managed service for some of their data centre requirements with 80% of these providing 24/7 service. The main reasons for 24/7 service was around provision of web site functionality, business operations and were delivered as part of managed services.

Future plans for data centres

What are your plans for the delivery of data centre services in the future?

	Not considering %	0 - 2 years %	3 – 4 years %	5+ years %
maintain and invest in existing data centre	28	48	10	14
build new data centre onsite	87	3	3	7
co-locate in self-managed rack space from commercial provider	77	12	8	3
co-locate with existing Public sector organisation	38	42	12	8
Outsource fully managed hosting service to commercial provider	79	15	3	3
hosted cloud computing	36	38	20	6
managed cloud computing	43	31	18	8
disaster recovery site	46	48	3	3

additional comments:

- open to consider opportunities but have very little data of a significant risk level to warrant expensive solutions
- we have already virtualised our servers, and consolidated our storage to enable mobility of our services and facilitate DR across our two main sites. Using internal cloud we are actively considering hosting options and taking up some services on

external cloud, but currently bandwidth and costs mean this is not feasible. We expect SWAN to increase options available

How would you rate the following risks associated with sharing a data centre with another organisation?

	Very low %	Low %	Acceptable %	High %	Very high %
security	10	14	36	22	19
capacity performance	10	15	41	25	9
scalability	12	24	36	25	3
financial	7	22	48	18	5
catastrophic loss	5	24	48	12	12
culture change	12	15	36	32	5
conflict of interest	5	24	25	37	9
travel between locations	5	12	61	19	3

additional comments:

- all very much dependant on the organisation's set-up, capabilities and the agreed SLA
- SWAN implementation should ease some of the concerns. Costs of hosting are a major concern
- the data within our core line of business application is currently assessed as IL4 in aggregate
- the risks depend on how the facility is managed
- very much depends on the organisation, the system and the data centre in question
- the communication links to our remote sites are very poor we would want to understand the impact to our network for a shared data centre
- all the answers depend on the organisation and their on-site setup, and the costs that would arise

How would you rate the following benefits associated with sharing a data centre with another organisation

	Very low %	Low %	Acceptable %	High %	Very high %
lower carbon footprint	2	12	27	49	10
disaster recovery	3	2	32	48	15
more flexibility	5	17	53	15	10
energy cost reduction	2	15	27	44	12
value for money	3	7	36	37	17

additional comments:

- benefits of shared services from applications, staff & systems
- cost/access/security/performance would be concerns

Would you consider hosting another data public sector organisations data centre in your facility? Yes/no

- **62.5%** would consider hosting

Would you consider co-locating with another public sector organisation? Yes/no

- **81.5%** would consider being hosted

additional comments:

- subject to acceptable commercial/service terms
- to move our services out completely would require significant assurances in terms of performance and convenience of access and recovery
- cost/performance/security are the major issues
- we would need to know in greater detail how any colocation agreement would operate and the facilities available before we could commit to using such services
- blocker for us co-locating to another public sector organisation is the need for us to have the hosting organisation accept commercial risk
- only the DR site would be co-located
- not our facility but would be happy to join discussions about jointly using our facilities

If you had to co-locate what is the maximum travel time between your location and a shared data centre that you would accept?

	Acceptable %
we cannot co-locate	9
less than 30 minutes	25
less than 1 hour	55
less than 3 hours	7
less than 5 hours	7

additional comments:

- the distance is the dictating factor for DR
- if the co-location offered a fully managed service this would be less important
- to be honest I don't think there would be a huge amount of travelling between data centres

- would be looking for fully hosted solution - 5 hours is fine
- this would depend on the service level agreements internally and with the hosting organisation
- it's less about travel time and more about the potential latency issues on applications such as hosted desktops
- it should be irrelevant
- onsite support would help, if only to power on / off systems etc.
- most things are managed remotely now so do not always require access

Are you considering using the cloud? Yes/no

- **72%** of organisations are considering using the cloud

What services are you considering putting in the cloud?

	Yes %	No %	Don't know %
business applications: (CRM, email, etc.)	68	15	17
ICT management: (backups, disaster recovery etc.)	53	34	13
Infrastructure on-demand: (storage, network, server etc.)	51	21	28
collaboration applications	64	15	21
core business applications	28	49	23
legacy applications	13	57	30
research & development	30	30	40

Please comment on any other services you are considering:

- already use a number of cloud based applications such as procurement, registration, web hosting etc. Have an open mind to cloud based services and look at each case on its merits
- please define "cloud"
- we already use cloud for some business applications. Considered when procuring new or replacement solutions
- security is a key factor so will need further guidance on this
- we have not fully explored as yet

What is stopping you moving data centre elements to the cloud?

	yes	no
lack of information	47%	53%
uncertainty of data privacy	87%	13%
existing infrastructure	73%	27%
ability to meet service level agreements	67%	33%
ease of transition	80%	20%
security and control of data	100%	0

Overall additional comments

- procurement arrangements to support the use of public sector data centres need to be in place
- as a relatively small user of IT we have a very simple solution at the moment. Very willing to consider shared services with others
- consideration should be given to localised Dr / backup facilities shared between local public bodies e.g. Health Board and Local Authority to provide quick Business Continuity implementation
- case studies on a range of organisation sizes looking at cost/benefits would be useful in understanding what is available to reuse
- considering data needs of organisations with differing levels of reliance on that data is important - the high cost of resilient data centres often exceeds needs of an organisation
- we would need to know how communication links would affect the sharing of data centres. Most of our remote sites are on islands with poor connection speeds
- the survey questions don't really allow us to accurately reflect the current position. We are considering cloud and shared services but this is done in the context of selecting the correct approach for each specific requirement rather than a one size fits all approach
- the survey makes assumptions that serious consideration has been given to data centre strategy at a local level; in the absence of a national strategy or any incentives to change this is a flawed assumption

Key points from the survey

- most organisations have their own data centre to meet primary needs but 21% have found other solutions acceptable. The business cases that the latter group developed could have wider relevance
- most data centre owners expect further investment in their own data centre within the next two years
- other or additional options are being considered with a focus on public sector sharing and cloud solutions
- many organisations do not have a clear view of current costs or energy efficiency making their comparison of solutions problematic
- organisations require guidance on the use of cloud services
- any use of a shared public sector service requires a SLA with explicit allocation of liability for service failure

Section 3: Expert views on future proofing and best practice

The findings from the survey informed the discussions held with experts which can be summarised as follows:

Advisory Group

The advisory group was made up of a mix of public sector representatives and ICT industry experts, the remit of the group can be viewed at [Annex C](#). There was one round table meeting and an information day organised for the Public sector reps to discuss ITaaS (IT as a Service) which was hosted by EMC.

The meeting discussed the variance in delivery of hosting services and of future intentions that the survey responses had highlighted and considered in more detail the challenges organisations face. The ICT industry experts described their thoughts on how the challenges could be met and how they have overcome them in their own organisations and helped others to consolidate their services.

The key points from the meeting from the public sector reps were:

- there were huge cultural issues to overcome in organisations giving up hosting their own services centred on security concerns and loss of control and possibly loss of jobs
- it would be easier to comply with any initiative if it was mandated to do so
- use of the cloud was still full of the unknown and uncertainty for some
- there is no single public sector facility in Scotland suitable for the hosting of public sector services that would meet the needs of all organisations in terms of location i.e. 3 or 4 would be required in strategic locations spread over the country

The key points from the meeting from the ICT industry reps were:

- In response to the cultural issues:
 - commercial data centres hold data up to Impact Level 6 the highest security level
 - freedom to design custom data centre solutions in the public sector has naturally resulted in diversity of design and redundant variation in terms of overlapping design and data centre capacity. That is driving an unnecessary cost premium. The latest cloud based solutions can deliver increased control as capacity may be flexed up and down almost immediately with end customers only paying for what they use
 - the impact on jobs can be viewed as a net gain as unnecessary cost may be removed from the hosting function and redeployed into innovation and growth support areas to better meet the needs of public sector services i.e. shifting the balance from support to innovation
- the first step to consolidating and sharing services is virtualisation
- there is little evidence of organisations asking for shared services and joint hosting requirements

- there are cost savings to be made from a shift from a Capex to an Opex based funding environment
- the total cost of service delivery was not measured consistently by organisations
- their experience was that a lot of organisations were unaware of all the services they run and that they continued to host paying licenses and support fees when there was no business requirement
- greater briefing from the Industry would be advantageous in advancing Public sector understanding of the abilities of a cloud approach which is now widely used by consumers with the advent of the Apple Icloud and online storage mediums such as Flickr, Dropbox, etc.

Meeting conclusions

- If there was a cheaper way with no risk to delivering a service it would be difficult not to consider using it
- more information on how and what cloud use in the Public sector was required
- A sectoral approach to consolidation was most likely to have greater support in the initial transformation roadmap with a view for further consolidation at a later date
- mandation where appropriate to consolidate would be the quickest way to deliver savings but recognising savings are not just from consolidation but from virtualisation and moving to cloud services also
- current costs are not measured consistently in each organisation
- as there is no centralised viable hosting solution available, public sector organisations have nothing compelling to contrast their solutions against; This leaves them free to make their own arrangements either in house or spreading buying power across multiple suppliers with a myriad of solutions
- there are no significant technical issues in moving towards aggregating demand for hosting services across public sector and delivering a rationalised hosting solution with required levels of security but at significantly lower cost
- the baseline current costs for hosting services are often skewed as energy costs, the highest driver, are often lost in general property costs and not identified as a specific data centre support cost. The same is true for security and other building maintenance costs
- data centres that are housed in re-purposed buildings struggle to make use of renewable energies when contrasted with the latest data centre designs that use ambient air cooling as well as solar and wind power to drive towards a net zero data centre that draws zero power from the national grid

Gartner

Gartner were approached for an independent view on best practice for running hosting services, how to standardise the measurement of the total end to end cost of running services and what an organisation should consider before deciding how to deliver their services.

The key message was that organisations should define their service workload needs, capacity variability needs, predictability of capacity needs, security and regulatory

compliance needs, and managed services needs to choose the appropriate delivery model:

- externally managed (Hosted managed services, platform as a service, full-service hosted and software as a service) or
- internally managed (internal data centre, co-location, unmanaged cloud infrastructure as a service)

Visits: Private Sector Hosting

A number of companies were visited to understand how they deliver data hosting services and how they are shaping the delivery of future services.

data centre providers focus on a high quality cost effective data centre environment - that is their core business. They are continually managing the environment inside to reduce energy consumption and achieve PUE ratings of below 1.8. They recognise that as well as helping reduce the carbon footprint energy efficient data centre can make considerable savings. A 2000 square metre data centre that reduces its PUE 0.1 i.e. 1.8 to 1.7 would make a saving of around £400,000 per annum.

Modern commercial data centre providers provide managed service expertise which means they can manage clients environment up to and where appropriate beyond the operating system. This means that the basic availability of the infrastructure is guaranteed with a 99.9% uptime SLA, and reduces overheads, freeing up time for in-house technical personnel on the client side.

A well run private data centre is built to ISO 27001 Information Security Standards and has:

- 24/7 on-site security.
- 24/7 security monitoring with a direct connection to the emergency services.
- High security perimeter fence

It has multi multi-gigabit network links delivered through diverse physical and logical routes to completely eliminate single-points-of-failure and can connect with the following:

- JANET interconnectivity
- Connectivity to Government (GSI) and NHS (N3)
- Linked with multiple telecoms data carriers including BT, Virgin Media and Cable & Wireless
- PSN connectivity
- SWAN (when available) connectivity

It has built in resiliency delivering availability through:

- Provision of a resilient power supply via on-site transformers linked to the National Grid delivering a minimum of 2 x 32 Amps to every rack
- Back-up via a battery based N+1 uninterruptible power supply (UPS)

- Secondary power back-up via an on-site generator, capable of powering the entire data centre facility
- Protected by advanced fire and smoke detection systems, Complemented by an automated gas based fire suppression system
- The data centre should provide defence against water; backed by intelligent flood detection
- Temperature and humidity N+1 free-cooling units located within each vault.
- Forced under-floor circulation and 'Cold Aisle' containment to prevent hot air recirculation within banks of racks. This means more energy is saved as only relevant areas are cooled, not the whole room

It is built to deliver environmental benefits through certification to a number of standards:

- ISO 14001 – an internationally recognised accreditation for organisations that demonstrate superior environmental management
- EU Code of Conduct for data centres – Corporate Status. Each of our data centres has been audited and is operated to the Code's best practices for maximising energy efficiency. State-of-the-art power efficient equipment and infrastructure to minimise electricity consumption and thermal output from the data centre
- High tech cooling systems, including 'free-cooling', installed to minimise energy usage whilst effectively maintaining a constant cool temperature
- Motion-activated light controllers to reduce energy consumption and heat load

Procurement

Scottish Procurement is currently looking to renew an existing framework which provided hosting services for websites. We have been discussing the possibility of extending the scope of that framework to include services for wider hosting requirements. The scope of this would not involve applications or managed services as there are a number of other frameworks that already do that such as the IT Managed Services (ITMS) and the Apps & Web frameworks. There are also a number of UK frameworks such as G-cloud and a UK level ITMS as well as others.

The SWAN procurement will potentially provide additional options for procurement and there are also other bodies that deliver procurement frameworks and routes to market for public sector bodies such as APUC and the JANET brokerage service in the FE/HE sector and the NSS in the Health sector.

Other Governments' approaches

UK

Cabinet Office began a similar process to review the data centre landscape in 2010 and initially had difficulty in gathering data from organisations, although they felt they had enough to extrapolate what they had to provide an idea of the position. The project is now being run by the Government Digital Service (GDS) who identified 6 strategic departments to work closely with to obtain accurate metrics and costs. The figures recorded were, in the end, not too different from the early analysis and it was agreed this provided a picture throughout their jurisdiction. They are currently at Outline Business Case to look at 2 options for providing their future hosting requirements.

The two options being considered are a procurement framework for the provision of infrastructure and services and the option to work in a Joint Venture (JV) to provide a crown hosting service with a single supplier. They expect to half their estimated £550m hosting costs.

Northern Ireland (NI)

Earlier this year(2013) NI tendered for the production of an Outline Business Case (OBC) for data centre services for the NI public sector.

The OBC has now been Treasury approved and has been sent to the NI strategic investment board for implementation.

Two cross-public sector data centres are being established. There is already a large shared service department in NI and organisations using this will move into the new facility and it will be made available for all other organisations. Already their health board wants to move into it but that will be in addition to two existing sites they have.

Section 4: Conclusions

Energy consumption accounts for around one third of the cost of running a data centre and there is little evidence that public sector organisations are controlling this effectively while private sector facilities are managing this as a priority.

Given the extent of organisation specific arrangements there would continue to appear to be considerable scope for cost saving through consolidation.

Organisations face many options in making arrangements for data hosting but lack both an information base for doing so, and wish guidance for the Scottish public sector on use of cloud services.

Views expressed in meetings were to the effect that public sector shared service offerings were not attractive in terms of service offered or costs (although noting that full costing of their own facilities may not be available for detailed comparison).

Cloud services offer scalability and the avoidance of capital expenditure. A procurement framework for these, to include hosting is required.

Other governments are driving consolidation through provision of new public sector or external data hosting services.

However, all engaged parties considered that consolidation of data centres and or services at a national level could be problematic. There was a greater appetite for driving consolidation at sectoral and/or geographic level.

These points and the fuller information in previous sections suggest a foundation for consolidation requires:

(a) provision available outside the individual organisation that meets business requirements, and

(b) this can be demonstrated to:

- **address concerns in relation to security**
- **be a more cost and energy efficient solution than present arrangements.**

Recommendations

Principles

In order to provide a basis for consolidation it is suggested that organisations should follow a set of principles and that related guidance could usefully be developed. The expectation is that, by following such principles and guidance, decisions would be taken that would result purchasing via a range of procurement framework's that deliver on the strategy. Suggested principles are below. Further detail of possible guidance is at [Annex E](#), with the guidance on use of cloud identified as that which is required most urgently.

Principle	guidance
1. No new data centres should be built to meet the needs of an individual or small number of organisations.	Standards that a public sector data centre should meet.
2. Organisations audit their ICT data centre and hosting arrangements	Audit of existing data centre/hosting facilities
3. Cost of running data centres and hosting is known.	Standardised cost model that will allow organisations to compare their current delivery model to the alternatives.
4. Organisations measure and continually improve on their data centres PUE.	Toolkit for assessing the efficiency and effectiveness of existing services and data centres in line with Industry Standards
5. Utility and cloud computing is considered in assessing the appropriateness of current arrangements and future investment plans	The High Level Operating Framework is developed to set out principles to follow in determining use of cloud services
6. Co-location in existing data centres is considered	Model SLA provisions

Annex A – engagement

private sector	ICT industry	wider groups
SCC	HP	UK Cabinet Office
scolocate	EMC	Northern Ireland Enterprise Shared Services
Brightsolid	Capita	Carbon Trust
ScotiaGlobal	CISCO	Data Centre Advisory Group
Comrie Development Trust	Oracle	
Fife Council Economic development team		
Aecom		
Leading Edge Forum		
Gartner		

Central Government	responded	Local Authority	responded
Accountant in Bankruptcy		Angus	
Accounts Commission for Scotland		Aberdeen City	
Architecture and Design Scotland	yes	Aberdeenshire Council	
Audit Scotland	yes	Argyll & Bute	yes
Bòrd na Gàidhlig		City of Edinburgh	
cairngorms National Park Authority		Clackmannanshire	
Caledonian MacBrayne ferries		Comhairle nan Eilean Siar	yes
Caledonian Maritime Assets Ltd	yes	Dumfries & Galloway Council	yes
Care Inspectorate	yes	Dundee City	yes
Creative Scotland	yes	East Ayrshire	yes
Crofting Commission	yes	East Dunbartonshire	
Crown Office and Procurator Fiscal Service	yes	East Lothian	yes
David MacBrayne Group	yes	East Renfrewshire	yes
Disclosure Scotland	yes	Falkirk Council	
Education Scotland	yes	Fife	yes
Highlands and Islands Airports Ltd	yes	Glasgow City	yes
Highlands and Islands Enterprise		Highland	yes
Historic Scotland	yes	Inverclyde	yes
Loch Lomond and The Trossachs National Park Authority	yes	Midlothian	
National Galleries of	yes	Moray	yes

Scotland	
National Library of Scotland	yes
National Museums of Scotland	yes
National Records of Scotland	
Office of the Scottish Charity Regulator	yes
Quality Meat Scotland	yes
RCAHMS	
Registers of Scotland	yes
Risk Management Authority	
Royal Botanic Garden, Edinburgh	yes
Scottish Agricultural Wages Board	
Scottish Canals	yes
Scottish Children's Reporter Administration	yes
Scottish Court Service	yes
Scottish Criminal Cases Review Commission	
Scottish Enterprise	
Scottish Environment Protection Agency	
Scottish Funding Council	yes
Scottish Futures Trust	yes
Scottish Government	yes
Scottish Housing Regulator	
Scottish Legal Aid Board	yes
Scottish Legal Complaints Commission	
Scottish Natural Heritage	yes
Scottish Prison Service	yes
Scottish Public Pensions Agency	yes
Scottish Qualifications Authority	
Scottish Social Services Council	
Scottish Water	yes
Skills Development Scotland	yes

North Ayrshire	
North Lanarkshire	yes
Orkney Islands	
Perth & Kinross	
Renfrewshire	
Scottish Borders	
Shetland Islands	yes
South Ayrshire	
South Lanarkshire	yes
Stirling	
West Dunbartonshire	yes
West Lothian	yes

Universities	responded
Edinburgh Napier University	
Glasgow Caledonian University	
Glasgow School of Art	yes
Heriot-Watt University	yes
Queen Margaret University	
Robert Gordon University	yes
Royal Scottish Academy of Music & Drama	
Scottish Agricultural University	
University of Stirling	yes
University of Strathclyde	yes
University of Aberdeen	yes
University of Abertay Dundee	
University of Dundee	yes
University of Edinburgh	yes
University of Glasgow	yes

Sportscotland	yes
Student Awards Agency for Scotland	
Transport Scotland	
VisitScotland	yes
Water Industry Commission for Scotland	yes

University of St. Andrews	yes
University of the West of Scotland	yes
University of the Highlands and Islands	yes
The Open University in Scotland	

Annex B – Power Usage Effectiveness (PUE)

Energy use and Environmental impact

It is well recognised that data centres are large consumers of energy, the main areas are IT power and ancillary/cooling power.

The approaches to reduce these costs are expensive and for many organisations prohibitive.

Organisations can reduce the impact of their activities on the environment by taking advantage of the various deployment methods in this strategy.

IT process (rack) power for	Facility (ancillary/cooling power for non IT resource)
servers	lighting
storage equipment	cooling
telco equipment	heating
network equipment	ventilation
etc.	computer-room air conditioners
	battery backup (UPS)
	power distributors
	etc.

- **cloud** computing providers invest in large-scale data centres that offer organisations a greener alternative to that in which they can deliver themselves
- organisations can share the cost of energy consumption through the co-location (**consolidation**) of their servers and hosting them in a reduced number of facilities
- another method of reducing the amount of energy consumed is through the **virtualisation** of servers where appropriate

The only credible and widely accepted energy performance rating system for data centres used was introduced by The Green Grid who developed a standard to calculate how much power is being used by the IT equipment in a data centre in relationship to the power used to cool and run the data centre.

This recognised standard is known as the PUE (Power usage effectiveness) rating where the most efficient score is 1.

PUE rating	Level of Efficiency
>3	Very Inefficient
2.5	Inefficient
2	Average
1.5	Efficient
<1.2	Very Efficient

The rating is calculated by dividing the total data centre load by the IT load.

Annex C – data centre advisory group.

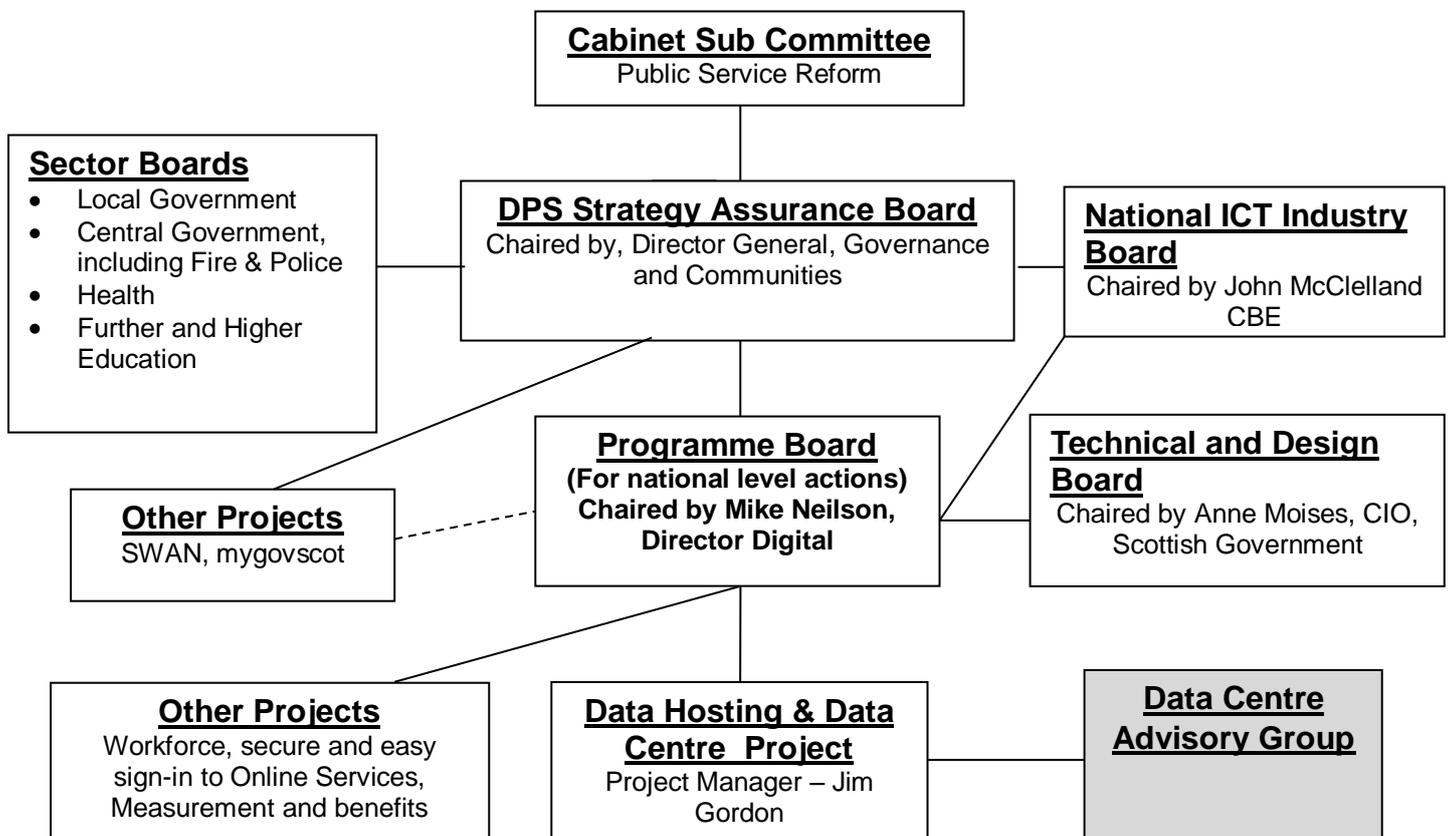
Scottish Government Data Centre Advisory Group Terms of Reference and Strategic Objectives

Introduction

The strategy Scotland’s Digital Future: Delivery of Public Services has under its principles a number of actions to deliver on collaboration and value for money. One of the actions sets an objective to develop a strategy on a National approach to data management and storage which will aim to consolidate and reuse the world-class data centres available in the public and private sectors across Scotland. In addition to the deliverables described in the National strategy the project will consider technology trends and aim to future proof the public sector data storage requirements based on our ambitions to exploit and deploy new technology across the public sector. These actions are being progressed within the data centre project.

Scottish Government, in leading the delivery of this project wishes wide participation and collaboration in order to access the most up to date knowledge and experience available. One of the methods that we use to do this is by running advisory groups, which enable us to seek expert and informed opinion and advice from individuals or organisations involved in the specific subject.

Governance structure



The project sits within the DPS Programme Office and the Project Manager will be responsible for steering the Project and the SRO will be responsible for reporting progress and issues to the Programme Board for National Projects. The programme board as part of a wider National programme of projects will engage with the National DPS Strategy Assurance Board to provide assurance to fulfil their sponsorship role.

Role	Assigned responsibility
Project Support	DPS Programme Office
Project Manager	Jim Gordon
Cross Public sector & Industry Advisory Group (specific to data centres)	ICT Industry specialists and Sectoral representatives to be appointed by DPS Strategy Assurance Board.
SRO	Julie Kane
Overall Programme Lead	Jane Morgan
Programme Board for National Projects	Board chaired by Mike Neilson, Director Digital, Scottish Government
DPS Strategy Assurance Board	Board chaired by DG Governance & Communities

The key outputs that will be delivered by the data centre project are:

- A survey to provide the evidence base for a set of recommendations
- A report on the current landscape including commonality, challenges and opportunities
- An analysis of future trends and the model options to meet the requirements for the delivery of public services in the future
- The strategic case for change setting out evidenced based options and recommendations to support delivery of national and sectoral implementation where appropriate

Purpose of the Advisory Group

The Group's main role is to draw on their expertise to provide independent advice and to provide feedback on the strategic focus of the development of the data centre strategy and advise how the Scottish Public sector can achieve:

- efficient and effective data hosting and storage including:
 - best use of the current data centre estate
 - any requirement for new facilities
 - reduction in energy, carbon and other environmental impacts
 - appropriate use of cloud based services
 - appropriate use of Business Process Outsourcing services
 - requirements for supporting management infrastructure, tools and processes
 - future proofing against developing technology and business requirements

The Advisory Group will work in support of the objectives of the data centre project by:

- advising on the creation of a data centre technology roadmap (looking at the next year, 3-5 years and 7-10 years) to improve the current public sector data centre arrangements by providing a mechanism to help forecast technology developments and provide a framework to help the public sector future proofs its requirements
- providing advice about how data centres and connectivity between them can achieve a performance that can serve the workforce and the customer effectively
- advising on the standards for any existing and future data centres that host public sector data and services
- providing advice on how to standardise and implement a measurement for data centre energy consumption
- provide advice on improvements to DC efficiency and mitigating environmental impact. Recommending where efficiency savings, effectiveness improvements and environmental benefits can be adopted in data centres
- assisting with any engagement of stakeholders to understand their requirements and approach to data management including their future needs in line with the adoption of new technology such as cloud computing
- providing advice on security strategies, standards and appropriate safeguards for the management of data
- considering and advising on the implications of proposed changes that the strategy may raise including portability of infrastructure and services between hosting options and suitable transition approaches
- proactively identifying other areas that may contribute to the success of the project
- sharing and publicising the exchange of information, knowledge and expertise

Membership

The group will be made up of representatives from industry and the public sector who have knowledge of the current public sector data centre scene and who have an interest in how the future of data storage and hosting services are efficiently delivered.

Current membership

Various reps. from ICT industry
Rep. from Central Government
Rep. from Local Government
Rep. from HE/FE
Rep. from NHS
Rep. from Police Services Scotland
Rep. from Fire Services Scotland
Scottish Government

Attendance

Members are to contribute to the smooth running of the data centre project by acting mainly as a virtual group, with occasional physical meetings where appropriate.

Members are to contribute to the smooth running of the data centre project by:

- entering into constructive debate and being co-operative and openly discussing any barriers or challenges to be overcome in fulfilling the purpose and delivering the objectives of the project,
- undertaking actions assigned wholeheartedly and in a timely manner

Annex D – sectoral survey results

Central Government

Facilities

- **74.2%** of Central Government organisations have a primary data centre in their own premises
- **63%** of organisations use a secondary site, **23%** of which own their own, others use another or outsource their requirement
- **17%** of organisations use a third site **50%** of which are on their own premises

Tier rating	Primary DC %	Secondary DC %	Third DC %
unknown	16	25	50
One	12	0	0
two	36	50	0
three	32	25	50
four	4*	0	0

* Highlands & Islands Airports Limited

- **44%** use a managed service for certain services.
- **80%** of those are 24/7 and are necessary because:
 - email filtering and archiving is carried out around the clock
 - overseas support to Scottish Enterprise & increasing 24/7 use on citizen facing web-based systems
 - commercial systems require 24/7 uptime
 - it was included as part of contract
 - only for critical applications that need this support type

Primary site

- **25.8%** co-locate with other organisations or outsource altogether
- **32%** measure their energy consumption but **0 (ZERO) %** measure its PUE rating

Secondary site

- **37%** use the private sector in either a cloud service, hosted service or managed service
- **18%** co-locate a secondary site with another public sector organisation
- **13.6%** that have a second site measure their energy consumption and none measure a PUE rating

Third site

- **33%** of them are on their own premises
- **16.5%** that have a third site measure their energy consumption but none of them measure its PUE rating

additional sites

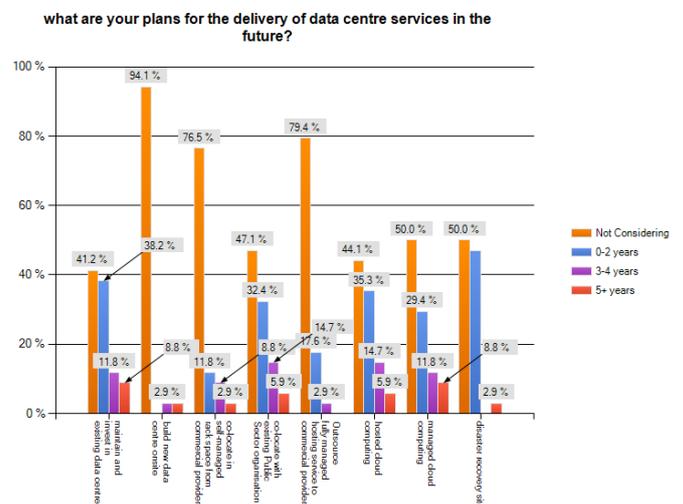
- One organisation advised they had an additional site.

Costs/Efficiency (energy)

- No one who responded to the survey in central government is monitoring a PUE rating, this is currently the most commonly accepted method of measuring a data centres efficiency.
- The vast majority of organisations do not know how much their current service costs.
- The more facilities organisations own the less they manage them efficiently.
- Energy consumption in any form is not monitored by 66% of organisations

Future plans

- **38%** are planning to invest in their existing data centre in the next 2 years
- **3%** are planning to build a new data centre in the next 5 years
- **3%** are planning to build a new centre in the future
- **50%** are planning to use some form of cloud services in the next 5 years
- **17.6%** are planning to use a fully outsourced managed solution in the next 2 years
- **41.2%** are planning on investing in Disaster Recovery in the next 4 years



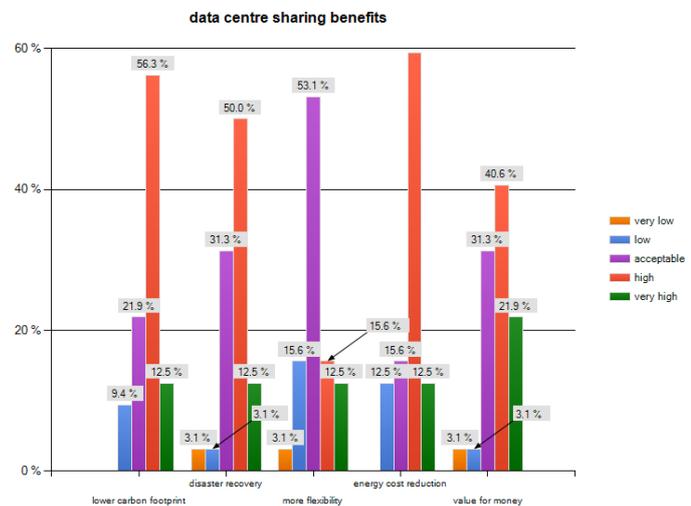
Comments

- we have already virtualised our servers, and consolidated our storage to enable mobility of our services and facilitate DR across our two main sites using internal cloud. We are actively considering hosting options and taking up some services on external cloud, but currently bandwidth and costs mean this is not feasible. We expect SWAN to increase options available
- the datacentre is in the first year of its 5 year life cycle. Currently there are no plans to replace the datacentre until the end of the life cycle. The datacentre is split across two buildings located with 300m of each other for DR purposes.
- when our building leases expire, we are looking to move our DR site into an existing public sector data centre

Sharing data centres

Views on sharing

- nearly **72%** of organisations would share hosting facilities but **44%** felt there was a risk of conflict of interest i.e. The host organisation would make decisions on the facility based on their own interests
- Only **21%** would consider co-locating if the facility was over 1 hour away
- **94%** felt sharing would offer value for money
- **87.5%** felt that they would achieve energy savings
- **40%** felt the risk to sharing hosting in their organisation was cultural
- **40%** felt security of their data was at risk if sharing



Cloud

- **90%** are considering moving some services into the cloud
- **45%** would want to know more information on the cloud and how secure it is
- **100%** said security and control of data would be a concern in moving to the cloud
- Over **90%** said ease of transition was a concern

The types of services they would consider using is

Service	%
business applications: (CRM, email, etc.)	68
ICT management: (backups, disaster recovery etc.)	54
Infrastructure on-demand: (storage, network, server etc.)	41
collaboration applications	60
core business applications	18
legacy applications	9
research & development	18

Those not considering moving to the cloud advised the following factors as issues

- uncertainty of data privacy
- existing infrastructure
- ability to meet SLAs
- ease of transition
- security and control of data

additional general comments

- we would need to assess how communication links would affect the sharing of data centres. Most of our remote sites are on islands with poor connection speeds
- as a relatively small user of IT we have a very simple solution at the moment. very willing to consider shared services with others
- the survey questions don't really allow us to accurately reflect the current position. We are considering cloud and shared services but this is done in the context of selecting the correct approach for each specific requirement rather than a one size fits all approach

Local Government

Facilities

- **94%** of Local Government organisations who responded have a primary data centre in their own premises
- **75%** of organisations use a secondary site, **25%** of which own their own, others use another or outsource their requirement
- **8%** of organisations use a third site **none** of which are on their own premises

Tier rating	Primary DC %	Secondary DC %	Third DC %
unknown	6.5	0	0
One	6.5	0	0
two	67	67	0
three	20	33	0
four	0	0	0

- **37.5%** use a managed service for certain services
- **85%** of those are 24/7 which is necessary because:
 - the service we outsource is firewall management. As our web services can be accessed 24/7 we need our firewalls to be available 24/7
 - the external hosting arrangement is for the Council's website and therefore requires to be 24/7
 - for access in the event of an out of hours incident
 - a number of our systems operate 24/7 e.g. website, email, social care, and a number of systems run batch type jobs overnight. System maintenance & changes are done out of service hours

Primary site

- **6%** outsource everything
- **62.5%** measure their energy consumption but only **20%** measure its PUE rating, this rates between **2 & 2.61**

Secondary site

- **16%** co-locate with another public sector organisation.
- **33%** that have a second site measure their energy consumption and **50%** of them measure a PUE rating ranging from 1.6 – 1.63

Third site

- **6%** have a third site, **100%** are on a commercial site and is a tier 4 rating.

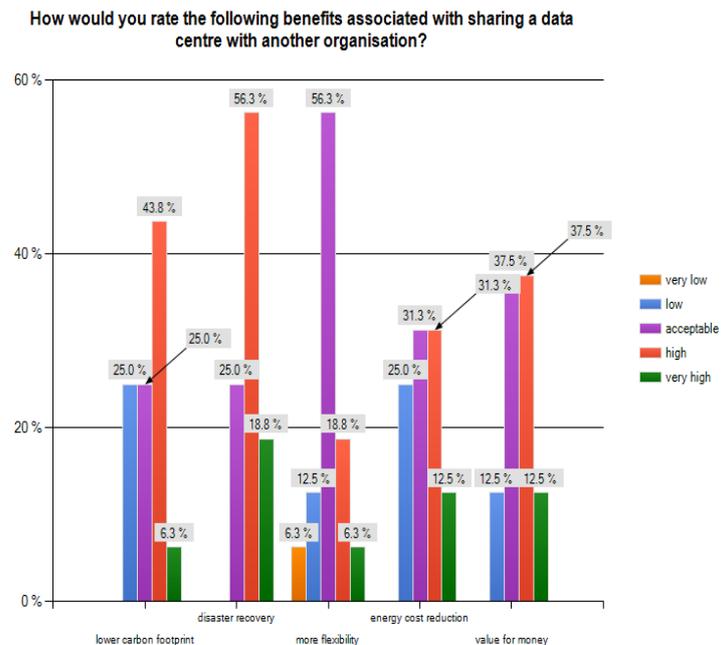
additional sites

There were no additional sites

Sharing data centres

Views on sharing

- **100%** would consider hosting another public sector organisations data centre.
- Nearly **94%** of organisations would share hosting facilities but over **50%** felt there was a conflict of interest in being hosted. i.e. The host organisation would make decisions on the facility based on their own interests
- Only **21%** would consider sharing if the facility was over 1 hour away.
- **94%** felt sharing would offer value for money.
- **87.5%** felt that they would achieve energy savings.
- **37%** felt security of their data was at risk if sharing.
- **25%** had concerns that sharing would cost them more money.
- **31%** felt the risk to sharing hosting in their organisation was cultural.



Comments received

- the risks depend on how the facility is managed
- cost/access/security/performance would be concerns

Cloud

- **87.5%** are considering moving some services into the cloud
- **33%** of those not considering the cloud felt more information on the cloud and how secure it is would be helpful
- **100%** of those not considering the cloud felt they needed more information on security and control of data as it would be a concern in moving to the cloud
- Over **90%** of those not considering the cloud felt they needed more information on the ease of transition to it

The types of services they would consider using is:

Service	%
business applications: (CRM, email, etc.)	64
ICT management: (backups, disaster recovery etc.)	50
Infrastructure on-demand: (storage, network, server etc.)	57
collaboration applications	71
core business applications	36
legacy applications	14
research & development	43

Those not considering moving to the cloud advised the following factors as issues:

- uncertainty of data privacy
- existing infrastructure
- ability to meet SLAs
- ease of transition
- security and control of data

Comments

- already use a number of cloud based applications such as procurement, registration, web hosting etc. Have an open mind to cloud based services and look at each case on its merits
- we already use cloud for some business applications. Considered when procuring new or replacement solutions

Overall additional comments

- consideration should be given to localised DR/ backup facilities shared between local public bodies e.g. Health Board and Local Authority to provide quick business continuity implementation.
- procurement arrangements to support the use of public sector data centres need to be in place.

Scottish Police Authority

Due to the timing and circumstances of their new status as a single force the evidence gathered was captured through a discussion with the Scottish Police Authority's (SPA) ICT Operations Manager. SPA is now the body representing the Police sector for their ICT operations in Scotland.

The Scottish Police Authority (SPA) now represents the 8 previous constabularies and 3 other agencies including Scottish Crime and Drug Enforcement Agency (SCDEA) & the Scottish Police College. Their services span in excess of 22 data hosting locations across Scotland supporting around 25000 staff and over 15000 end point devices. The SPA has a good number of shared national applications used by most/all of the previous organisation structure however there is also a substantial number of local and regional services still used.

SPA is currently undertaking their own strategy to establish a rationalised, leaner hosting infrastructure. This will support the cost effective delivery of services and allow for a reduction in capital spend required to maintain and develop services. By further reducing the legacy facilities that exist, SPA will look to reduce the amount of hosting facilities into 2 or 3 data centres as well as consolidating a number of commodity services.

Summary Points:

- Police use a managed service in Pulsant (in what was previously called ScoLocate) which is in excess of a Tier 3 rating
- all original Police bodies provide hosting from a local primary facility, generally confirming to Tier 2
- all original Police bodies in addition provide hosting from a number of smaller locations, generally confirming to Tier 2
- at present power consumption within Police facilities is not fully evaluated
- 24/7 availability and associated support of hosting locations is a requirement for the majority of Police services but restricted to a core set of business applications
- SPA are keen to take forward a strategy that will allow them to:
 - Establish a hosting consolidation plan
 - Establish DR hosting
- SPA would be happy to consider the sharing of hosting facilities or using those of an appropriate service provider as long as appropriate risk controls are in place
- SPA is fully supportive of cloud, both public and private. In general public cloud is not considered suitable at present for business critical services and systems containing sensitive information

Scottish Fire and Rescue Service

Due to the timing and circumstances of their new status as a single force the evidence gathered was captured through a discussion with the Scottish Fire and Rescue Service's (SFRS) ICT Operations Manager. SFRS is now the body that represents all the Fire services in Scotland.

SFRS represents the 8 legacy fire services and the Scottish Fire College. Their services span in excess of 20 data hosting locations across Scotland supporting around 9500 staff and over 4000 end point devices. The SFRS has a good number of shared national applications used by most/all of the previous organisation structure however there is also a substantial number of local and regional services still used.

SFRS are currently undertaking their own strategy to establish a rationalised, leaner hosting infrastructure. This will support the cost effective delivery of services and allow for a reduction in capital spend required to maintain and develop services. By further reducing the legacy facilities that exist, SFRS will look to reduce the amount of hosting facilities into 2 or 3 data centres as well as consolidating a number of commodity services.

Summary Points:

- all original Fire bodies provide hosting from a local primary facility, generally conforming to Tier 2
- all original Fire bodies in addition provide hosting from a number of smaller locations, generally conforming to Tier 2
- at present power consumption within Fire facilities is not fully evaluated
- 24/7 availability and associated support of hosting locations is a requirement for the majority of Fire services but restricted to a core set of business applications
- SFRS are keen to take forward a strategy that will allow them to:
 - Establish a hosting consolidation plan
 - Establish DR hosting
- SFRS would be happy to consider the sharing of hosting facilities or using those of an appropriate service provider as long as appropriate risk controls are in place
- SFRS is fully supportive of cloud, both public and private. In general public cloud is not considered suitable at present for business critical services and systems containing sensitive information

Health

NHS Scotland comprises of 22 Health Boards consisting of 14 territorial and 8 Special Health Boards including NHS24 and Scottish Ambulance Service. This spans in excess of 3200 locations across Scotland with around 160,000 staff and over 100,000 end point devices. NHS Scotland has a good number of shared national applications used by most/all Health Boards. This is supplemented by a substantial number of local and regional applications accessed by Boards or collaborative groups where a common business need exists.

NHSScotland are currently undertaking their own strategy to establish a rationalised, leaner hosting infrastructure. This will support the cost effective delivery of services and allow for a reduction in capital spend required to maintain and develop facilities. By further reducing the legacy facilities that exist, NHS SCOTLAND will look to reduce demand by adopting commodity solutions hosted in the private and public cloud to meet the shifting demands of the service.

Summary Points:

- National hosting for NHS Scotland is contracted to Atos, served by their Livingston and Edinburgh facilities which are in excess of Tier 3
- Atos provide a managed service
- all 22 Health Boards provide hosting from a local primary facility (generally confirming to Tier 2 with a lesser number being Tier 1)
- all 22 Health Boards provide hosting from a number of smaller locations, generally confirming to Tier 1 or potentially Tier 2 in a small number of instances for larger Health Boards
- at present power consumption within Health Boards facilities is not evaluated
- available hosting capacity is not currently measured across NHS Scotland as a whole
- 24/7 availability and associated support of hosting locations is a requirement for the majority of Health Boards but restricted to a core set of business applications.
- NHS Scotland are keen to take forward a strategy that will allow them to:
 - Establish hosting consolidation plan
 - Establish a hosting catalogue
 - Establish DR hosting for all Boards
- NHS Scotland would be happy to consider the sharing of hosting facilities or using those of an appropriate service provider
- NHS Scotland is fully supportive of cloud, both public and private. In general public cloud is not considered suitable at present for business critical services and systems containing sensitive information

Education

Facilities

- **83%** of universities have a primary data centre in their own premises
- **75%** have a second site, **90%** of which are on their own premises
- **33%** have a second site, **100%** of which are on their own premises

Tier rating	Primary DC %	Secondary DC %	Third DC %
unknown	11	14.5	25
One	11	28.5	50
two	44	28.5	0
three	33	28.5	25
four	0	0	0

- **16.7%** use a managed service for certain services. **50%** of those are **24/7**

Comments

- virtual learning environment provides learning materials to students around the world 24/7 as part of a shared service in another public sector organisation.

Primary site

- **17%** co-host with other another organisation
- **58%** measure their energy consumption but only **25%** measure its PUE rating ranging from **1.35 – 1.86**

Secondary site

- **10%** self-manage co-located in private sector tier 3
- **22%** that have a second site measure their energy consumption but only **50%** of them measure its PUE rating which is **1.92**

Third site

- **25%** that have a third site measure their energy consumption but none of them measure its PUE rating

additional sites

No organisations advised they had any further sites

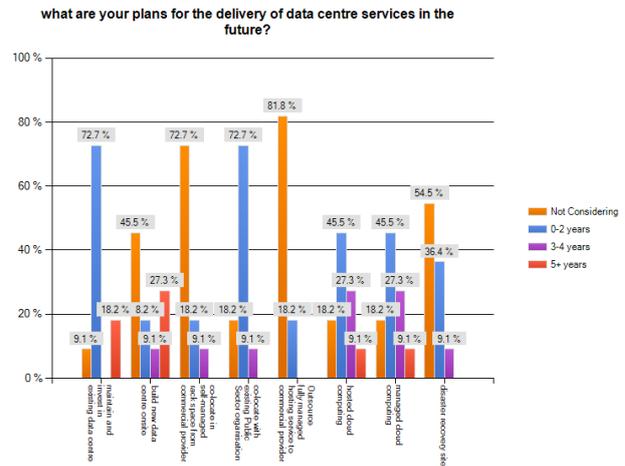
Costs/Efficiency (energy)

- **58%** of organisations measure their primary sites energy costs with **22%** measuring their secondary site

- **25%** of Universities monitor a PUE rating in the main site, this is currently the most commonly accepted method of measuring a data centres efficiency
- The ratings are between **1.35 & 1.86**
- The more facilities organisations own the less they manage them efficiently
- Energy consumption is not monitored by **42%** of organisations

Future plans

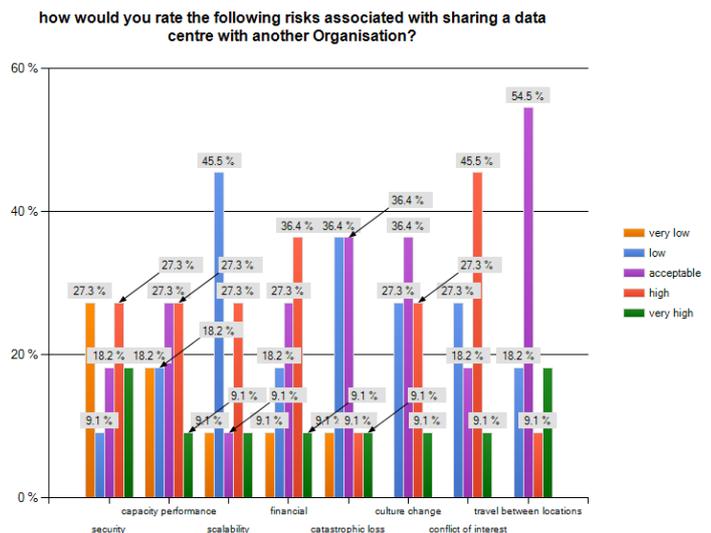
- **72.7%** are planning to invest in their existing data centre in the next 2 years
- **17.7%** are planning to build a new data centre in the next 4 years
- **71.8%** are planning to use some form of cloud services in the next 5 years
- **18.2%** are planning to use a fully outsourced managed solution in the next 2 years
- **45.5%** are planning on investing in Disaster Recovery in the next 4 years



Sharing data centres

Views on sharing

- **63.6%** would consider hosting another public sector organisations data centre
- Nearly **91%** of organisations would share hosting facilities but over **54%** felt there was a conflict of interest in being hosted. i.e. The host organisation would make decisions on the facility based on their own interests
- Only **27.3%** would consider sharing if the facility was over 1 hour away
- **81.8%** felt sharing would offer value for money
- **81.8%** felt that they would achieve energy savings
- **45.5%** felt security of their data was at risk if sharing
- **45.5%** had concerns that sharing would cost them more money
- **36.4%** felt the risk to sharing hosting in their organisation was cultural



Comments received

- the risks are all very much dependant on the organisations set-up, capabilities and the agreed SLA

Cloud

- **90.9%** are considering moving some services into the cloud.
- **100%** of those not considering the cloud felt they needed more information on security and control of data as it would be a concern in moving to the cloud.
- **100%** of those not considering the cloud felt they needed more information on the ease of transition to it.

The types of services they would consider using is:

Service	%
business applications: (CRM, email, etc.)	73
ICT management: (backups, disaster recovery etc.)	55
Infrastructure on-demand: (storage, network, server etc.)	64
collaboration applications	64
core business applications	36
legacy applications	18
research & development	36

Those not considering moving to the cloud advised the following factors as issues:

- uncertainty of data privacy
- existing infrastructure
- ability to meet SLAs
- ease of transition
- security and control of data

Annex E – Possible Guidance

- develop toolkits to support guidance/strategy on best practice to help organisations make choices e.g.
 - audit existing data centre/hosting facilities
 - standardised cost model that will allow organisations to compare their current delivery model to the alternatives.
 - identify the skills both internal and external to run hosting services to their optimum efficiency
 - energy efficiency standards
 - pros and cons of the various hosting options.
 - use of existing and emerging procurement frameworks e.g. SWAN, g-cloud
- guidance on what a public sector data centre standard should be
- create guidance/strategy on best practice
 - reuse of existing facilities that have through the toolkits demonstrated they meet standards
 - consolidation plans at sectoral level building to a national roadmap/plan
 - energy targets for public sector hosting facilities.
- identify case studies on local/national/international approaches that show best practice and lessons learned
- sectoral led governance advocating mandatory returns based on key metrics from the measurement and benefits framework.
- National reporting and monitoring
- policy on cloud usage for the public sector.
- develop a procurement framework - We will work with sectors to understand the services they would be interested in using and engage with procurement colleagues to provide this.



© Crown copyright 2014

You may re-use this information (excluding logos and images) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit <http://www.nationalarchives.gov.uk/doc/open-government-licence/> or e-mail: psi@nationalarchives.gsi.gov.uk.

Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.

ISBN: 978-1-78412-440-3 (web only)

The Scottish Government
St Andrew's House
Edinburgh
EH1 3DG

Produced for the Scottish Government by APS Group Scotland
DPPAS28844 (04/14)

Published by the Scottish Government, April 2014

w w w . s c o t l a n d . g o v . u k