

REPORT OF IT MANAGER

SUBJECT: NETWORK INFRASTRUCTURE IMPROVEMENT REPORT

Purpose of Report

Approval is sought for expenditure to improve the network infrastructure (see attached report).

Background

Our wide area network is now inadequate for the ever-increasing demands which are placed on it. The network depends on the quality of our broadband internet services, in which we have invested very little in recent years, during which time the quality of the existing services have been deteriorating. In order to deliver a decent ICT service to as many centres as possible, broadband is no longer a very feasible option. Demands will grow as new internet-based developments offer more possibilities to us as an Authority

Proposal

The Welsh Assembly Government's Public Sector Broadband Aggregation project gives us an opportunity to substantially improve our network, as well as participating in the new all-Wales public network. It requires upfront investment for installation, and a doubling of our revenue expenditure on internet provision. The main benefits are -

- An ICT service to the outlying centres that compares more favourably with that offered to staff working at HQ
- Ability to cope with new internet-based developments
- Increased choices in future for a document management system (DMS), and is a necessary first step before a DMS can be considered
- Capacity that would allow us to consider a PSBA managed phone system when ours needs replacing in the next few years
- Ability to develop joint systems with Snowdonia and Brecon, or other authorities
- Capacity to broaden the scope of homeworking, leading to some reduction in travel
- Brings us into the 21st century

Recommendation

That Members APPROVE the expenditure required to join the PSBA network.

For further information contact Jan Waite on 01646 624811

Improvements to the Network Infrastructure March 2011

Our wide area network is now inadequate for the ever-increasing demands which are placed on it. The network depends on the quality of our broadband internet services, in which we have invested very little recent years, during which time the quality of the existing services have been deteriorating.

In order to deliver a decent ICT service to as many centres as possible, broadband is no longer a very feasible option. Demands will grow as new internet-based developments offer more possibilities to us as an Authority

1 The issues

- The speed of connection to the internet varies across all centres – see Appendix 1 for a list of speeds/costs at each centre.
- The maximum upload/download speeds in Appendix 1 are rarely achieved in practice – each centre may only be achieving between $\frac{1}{4}$ and $\frac{3}{4}$ of the quoted maximum.
- Each centre is linked to Llanion by a Virtual Private Network (VPN) connection, creating a permanent, secure tunnel through the open internet - this is used when staff access HQ systems using a Remote Desktop Connection (RDC) to Gateholm server in HQ. This is the fastest way of providing connections to HQ systems from the centres.
- This VPN connection is limited by the slowest of the upstream speeds at each end.
- Llanion has been experiencing slower connection speeds in the last 6-9 months. We can't be sure why this is, but suspect it is connected with the generally deteriorating service from Nildram, our Internet Service Provider (ISP). We are in the process of moving all our centres to a different service provider (Zen) as soon as we can, but this is particularly complex due to the email provision at HQ.
- Llanion connection is particularly overloaded by –
 - the VPNs to all centres
 - email for the Authority
 - internet browsing, including streaming media (videos), by 60+ users
 - Website Content Management System (CMS) users, whose systems reside on a server outside HQ – including the web developers who are permanently working on this server
- Llanion has a permanent 10Mbps connection to Pembrokeshire County Council (PCC) which was installed for the new Swift APAS planning system. It was originally intended that we would start using this connection for other traffic once we see how well APAS performs. This would reduce the load on the one HQ connection (see section 4.3).
- We are currently halfway through a fixed 3-year lease for our connection to PCC.
- Our broadband costs are very low compared with other National Parks – see Appendix 2.
- The Authority is taking advantage of new technological developments that are impacting on our limited broadband-based network – eg: streaming media such as You Tube, which require us to have much higher capacity connections than was the case only a couple of years ago.
- More staff are requesting home working with access to the network, not just email. Most requests have to be denied on the grounds of lack of capacity.
- For the last couple of years, the Welsh Assembly Government (WAG) have been promising increased connection speeds through its Public Sector Broadband Aggregation (PSBA) project. We now have a quote for joining the PSBA network (see section 4.5).

2 The user experience

- Browsing websites should be reasonably quick at all non-HQ centres as the VPN tunnels are not used, in fact it is likely to be slower at HQ due to the number of tunnels the one broadband connection is supporting.
- Using HQ servers from the centres through the VPN will inevitably be much slower than doing the same thing at HQ, but is sometimes much worse than others due to slow speeds at HQ, and at times is practically unusable. Speeds vary both from centre to centre, and at different times at the same centre.
- Use of Proprinter mapping system is particularly difficult – it can take half an hour to print a map.
- Startup times for machines were until recently very slow (10+ minutes). We have taken some measures to improve this (section 3), and some more improvements can be made (section 4).
- Web development, general browsing and use of the website Content Management System is sometimes very slow at Llanion due to the amount of traffic.
- We are forced to delay the delivery of emails over 10Mb till the end of the day, in order to reduce the load on the Llanion connection.

3 Measures taken to date (note some of these are technical issues and not easy to translate into lay terms).

- As service from Nildram has deteriorated, some broadband services have been moved to a new service provider (Zen).
- At centres where we are still using Nildram services we have introduced a faster web address lookup mechanism, OpenDNS.
- Computers at remote centres have had their startup times decreased by a change in the settings that are controlled from a central server.
- Broadband kit has been replaced with newer models and these have been kept up to date with current firmware releases.

4 Possible Solutions

We have investigated what the options are for improving our network infrastructure - these solutions are not mutually exclusive.

4.1 Upgrade existing broadband services

- Upgrade existing Zen services to the higher-spec service which would provide increased upload speed and traffic prioritization
- Replace Nildram services with Zen higher-spec service where possible.

Pros	Cons
Improved speeds Can do immediately Should show some improvement, but a trial is needed to evaluate the extent Can be tried at one or two centres first Most are on 1-month contracts, so could be downgraded if no improvement	Extra expense May not be enough of an improvement

4.2 Improve existing broadband connection speeds

- Install additional broadband lines at Llanion and centres
- Buy kit to bond the lines together at each centre

Appendix 3 shows approximate costs of upgrading all centres to 2 lines, with 3 at Llanion, both with and without improving the service spec, as in 4.1.

Pros	Cons
<p>Improved speeds Can do fairly quickly Can be phased installation (Llanion and 1 centre first as a trial) Broadband contract would only be for 1 month Northumberland use this technology as leased lines are too expensive. Works well for them with 3 lines at HQ and 2 at each centre</p>	<p>Extra expense Committed to 12 month contract on each new phone line Not guaranteed to double the speed For best results we need the same no. of lines and same kit at each end - it's not enough just to double the lines at Llanion.</p>

4.3 Increase use of the PCC connection

The proposal would be to redirect some or all of the VPN Tunnels from each centre via this link, leaving the main Llanion ADSL line for normal internet access (including access to our Web CMS system).

Until the new Swift APAS planning system went live (21st Feb) and we had the full complement of staff using the link, it was difficult to judge how this link performs for this purpose, let alone with additional traffic. Speed of response within APAS is not fast, but this might not necessarily be due to the connection. This needs to be trialled.

Another consideration is that if we do decide in future to add in the APAS document management system, then scanning documents up to PCC's servers would significantly add to the traffic on the connection, and the link will probably not be adequate. Before considering this option, we will arrange to do some trial scans of A0 documents to see how this affects the system speed. If we needed to increase the capacity of this connection it would nearly double the annual cost, and result in upgrade installation cost (I don't have actual figures, but the initial installation cost £4,000)

Pros	Cons
<p>Leaves Llanion broadband for normal browsing and website CMS work Would only be constrained by the upload speed at the outlying centres.</p>	<p>Feasibility unknown until we do a trial APAS Document management at PCC would alter this picture.</p>

4.4 Other measures to improve service

Install servers in at least some of the centres – we could mostly re-use ones that are being replaced at Llanion, but we may need to purchase small new ones for centres with limited space, such as Newport.

We might be able to offer local file storage, possibly replicated overnight to Llanion for backup. Could possibly replicate GIS on these local servers – at least as a read-only version of the base GIS layers. This would be complicated and needs careful consideration regarding backups, access, etc.

Pros	Cons
<p>Improved speed of computer startup, software patching and policy enforcement.</p> <p>If local storage, staff can use the PCs direct instead of using Remote Connection – much faster</p>	<p>Increased workload for IT team.</p> <p>Reliance on old servers plus cost of extended warranties, or cost of new servers.</p> <p>Increased complexity for backup process.</p> <p>Limited space at some centres. All our servers are rack based and would need appropriate housing. Possible security risk.</p> <p>If replication back to Llanion not feasible, local storage would need to be backed up in the same manner as Llanion – with tapes which need to be rotated, taken off-site, etc</p> <p>Staff who use Llanion and 1 or more other centres might find it more difficult to manage their filing.</p> <p>Any changes to the base GIS layers would have to be copied out to these servers. Local workspaces would have to be created and maintained to work with these local layers. Staff may save own workspaces locally, but if these are replicated back to Llanion, they won't work on Llanion servers, which could cause confusion</p>

4.5 Join the PSBA network

The PSBA project aims to improve network connections for all public bodies in Wales. We have just received a quote of **£38k installation cost, £20,000 per year** on a 5-year contract, for providing the following services -

Centre	Connection speed
Carew	4Mb
Castell Henllys	broadband
Cilrhedyn	broadband
Llanion main	100Mb
Newport	10Mb
St Davids	10Mb
Tenby	10Mb
Withybush	broadband

We do not yet know what speed of broadband we are being offered, but the other quoted speeds are for leased lines, so these will be guaranteed. The 3 centres that are still on broadband are in places where it is not economically feasible to install leased lines.

Pros	Cons
<p>Based on leased lines for 5 of the centres, which are symmetric in their speeds, and offer a vast improvement in speed and capacity compared to broadband</p> <p>Opens up possibilities for sharing systems with other organisations, esp SNPA and BBNPA, and increases our choice when looking at a document management system.</p> <p>Increased security – this will be a secure, resilient network, managed by PSBA.</p>	<p>Double the revenue cost, plus a large installation charge.</p> <p>Uncertain as to the quality of the provision at the broadband sites, but can only know this once it's installed.</p> <p>Time taken to get this setup. Unlikely to be able to do this much before mid-summer, probably much longer.</p>

5. Recommended options

We will continue implementing the improvements outlined in 4.4. above. In addition, we need to invest in one of the following two solutions to improve the network infrastructure.

(1) Recommended Option - Join the PSBA network

This is our best option for improving connection speeds between our centres and with other Authorities, and would give us substantially better connections speeds between the centres that are on PSBA leased lines. The connections would be secure, reliable and robust, and offer equal speeds on download and upload – a big benefit when connecting 2 centres together.

These are the main benefits to joining PSBA -

- An ICT service to the outlying centres that compares more favourably with that offered to staff working at HQ
- Ability to cope with new internet-based developments
- Increased choices in future for a document management system (DMS), and is a necessary first step before a DMS can be considered
- Capacity that would allow us to consider a PSBA managed phone system when ours needs replacing in the next few years
- Ability to develop joint systems with Snowdonia and Brecon, or other authorities
- Capacity to broaden the scope of homeworking, leading to some reduction in travel
- Brings us into the 21st century.

The quality of connection with centres still on broadband is unknown, but is likely to be improved on what we currently have. The service would be equivalent to the very best service level we could provide independently. If necessary, we could double the lines to these centres later on for a small additional cost.

Due to the fact that we still have approx 18 months left on the PCC leased line contract, the actual revenue cost would be as follows -

Year 1	Year 2	Years 3 - 5
£25,041	£22,520.50 (approx)	£20,000

There are a number of issues to be discussed with PSBA, as we have only just received the quote, and haven't yet seen the documentation. It is likely that we cannot go ahead for at least 3 months, for technical reasons, and it could be longer than that. This is a drastic change to our network, which needs careful planning, and it may be better to leave it till the off-season.

Who will benefit?

- 3 Web developers at Llanion
- up to 20 web content providers across all centres
- Planning team – it keeps the PCC link free for planning system (this will be re-routed round the PSBA network once we stop the PCC link at the end of the contract, which will more than cope with it)
- 10+ centre-based GIS users
- 30+ staff who access files and systems such as the A&E database, QLX, etc, from the leased-line centres
- 20+ staff who access systems from the broadband centres, although to a lesser degree than the 30+ above
- Everybody in future, with possibilities of document management system, improved phone system, better homeworking

(2) Alternative option - Improve our connections outside PSBA

If funding cannot be found to join PSBA, then we should do as much as we can afford to improve existing connections by increasing the no. of lines at centres, upgrading to a higher spec internet service, and possibly moving some of our traffic to the PCC link if tests show that this doesn't adversely affect the APAS planning system.

If the PCC link can't take this extra traffic, and certainly if we want to join PCC's planning DMS, upgrading this link would add approx £4000 for installation and an extra £4000+ per year (guestimates).

Who will benefit?

- Same as for option 1, but by a far smaller factor
- Planning team will not benefit at all, in fact their service is likely to deteriorate if the PCC link becomes loaded with more traffic

Summary of Costs of options (1) and (2)

	Installation cost	Annual cost Year 1	Std Annual cost	Increase in Std Year revenue cost
PSBA level 1	£38,000	£25,041	£20,000	£10,358
Non-PSBA	£8,460	£12 – 16k	£12 – 16k	£2524 / £6,979 *
Non-PSBA with PCC link enhancement	£12,460 **	£16 – 20k	£16 – 20k	£6524 / £10,976

* Figures based on Appendix 3 – low / high spec costings

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Jan Waite, IT Manager
14th March 2011

Appendix 1 – current internet provision at each Centre

The important figure is the upload speeds – when connecting a centre to HQ, it is the slower upload speed of the two which is the deciding factor for the speed of the connection.

Centre	Desirable down/upload speed (mbps)*	Current Max down/upload speed (mbps)	No. of PCs	Comment	Annual Cost
Carew	10/10	6.5/0.4	3	3 Desktops on VPN	£403
Castell Henllys	10/10	4.0/0.3	5	4 PCs on VPN, 1 public PC direct to internet	£403
Cilrhedyn	10/10	3.2/0.3	2-4	2 desktops, could also have 1 or 2 laptops, on VPN	£403
Llanion main	100/100 – would only need 1 connection if we achieved this speed, but note that we are committed to Llanion PCC for next 18 months.	6.5/0.8	50-80	These users are not using VPN	£923**
Llanion 2 (VC)		6.5/0.4	1-2	Dedicated mainly to videoconferencing, public access wi-fi, and kiosks. Used by IT Team for large downloads.	£416
Llanion 3 (PCC)		10/10	Up to 90	Leased line connection	£5041
Newport	100/100	6.5/0.4	5-7	3 desktops, possibly 2 laptops on VPN. 1 touchscreen & 1 public PC direct to internet	£416
St Davids	100/100	4/0.4	15-18	6 desktops on VPN, possibly 2 laptops. 5 touchscreens & 3 public PCs are direct to internet	£382
Tenby	100/100	6.0/0.8	3-5	2 desktops usually, 2 other desktops if in use. 1 touchscreen direct to internet. Server does occasional connections to HQ. Disaster Recovery (DR) centre for main HQ systems.	£923**
Withybush	10/10	3/0.4	1-2	Desktop, could also have a laptop	£332
Total annual spend on ADSL phone lines and ISP services					£9642.00

* There is no real benchmark for desirable speeds, and each NPA has different systems in place – these are what we would ideally like

* the costs for Llanion main and Tenby should be brought down within the next 6 months, when we change our ISP – probably to approx £700

Appendix 2 – benchmark costs in other NPAs in 2010 (where figures include non-ICT section expenditure, this is for 2009)

National Park	Annual Cost	Comment
Exmoor	Unknown	Probably similar to Dartmoor
Broads Authority	£8,000	
Pembrokeshire	£9,642	
New Forest	£12,500	
Snowdonia	£18,150	
Dartmoor	£24,492	
Northumberland	£25,000	Includes voice
North York Moors	£27,170	
Brecon Beacons	£30,000	
Lake District	£41,099	
Yorkshire Dales	£49,175	
Peak District	£56,907	

Appendix 3 – projected cost for 3 lines at HQ, 2 at all other centres

Installation/setup per centre

- £800 for bonding kit
- £40 ADSL activation
- £100 – potentially more for remote centres (BT need to quote for each line for exact pricing)

Total setup costs = £8460 minimum

Table showing annual revenue costs in this scenario

Centre	Low-spec	High-spec
Carew	£806	£1400
Castell Henllys	£806	£1400
Cilrhedyn	£806	£1400
Llanion main	£1209	£2100
Llanion 2 (for videoconference)	£416	£416
Llanion PCC (no change)	£5041	£5041
Newport	£806	£1400
St Davids	£806	£1400
Tenby	£806	£1400
Withybush	£664	£664 *
Projected total annual spend on ADSL phone lines and ISP services	£12,166	£16,621

** Not including Withybush in high-spec service, it probably doesn't warrant the cost of both doubled lines and high-spec*