

RADIO BROADCASTER GWR GROUP TUNES INTO MULTICAST VPN TO RECEIVE CONVERGED NETWORK SAVINGS, FLEXIBILITY, AND STRATEGIC ADVANTAGE

EXECUTIVE SUMMARY

BACKGROUND

GWR Group plc is the UK's most listened to commercial radio group, broadcasting 31 FM local stations and its award-winning national station, Classic FM, with over six million listeners. The group is also the leading shareholder in Digital One (the national digital radio multiplex operator) and operates local and national digital multiplexes in the UK.

CHALLENGE

The need to operate three separate networks – data, voice, and satellite broadcasting – meant that the GWR Group had been following advances in IP and converged networking particularly closely. The term 'mission critical' took on new depths of meaning as any audio outage would be immediately noticed by GWR's radio listeners. And with content from stations being shared real-time, live-on-air, bandwidth could potentially mushroom as the network struggled to cope with multiple versions of the same audio stream being transmitted to multiple sites if approached using the common Unicast technologies. Another important requirement to consider was the complex call-handling functions demanded by GWR stations and their disc jockeys as listeners phone-in or become contestants in head-to-head competitions.

SOLUTION

GWR's vision of a fully converged network has been made real by joining with THUS plc and Cisco Systems® to create a pioneering multicast VPN (MVPN) along with its corporate voice telephony, data and even real-time broadcast audio flows. In building out its Multiprotocol Label Switching (MPLS) Layer 3 core network, THUS has worked with Cisco® to implement the multicast functionality of the Cisco IOS® Software. This winning combination delivers the quality of service (QoS) needed to prioritise radio broadcast streams with the network efficiency of multicast, where the source only sends content out across the network once with receiving stations opting in and out of the stream as appropriate.

RESULTS

GWR can rightly claim to be using one of the most technologically advanced networks in the world, delivering to it unprecedented flexibility. More than 10 million people in the UK can access GWR stations while others, from around the world, tune in over the Internet. The efficiencies of convergence – which allow the group to dispense with its old separate satellite and voice networks – will see return on investment (ROI) within just two years. More importantly, the 'plug-and-play' nature of the new IP network supports the agility that the group will need to continue to prosper. Widespread consolidation is expected within the sector and the network will easily be able to flex to meet the future demands of station mergers, acquisitions, and disposals.

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Vincent Bourne
Infrastructure Manager
GWR Group

With a staff of 900 and revenues for 2002-03 of £127.1 million, GWR Group plc is a leading commercial radio innovator. It holds and operates more licences than any other commercial UK company: 31 local FM services, with an interest in 18 local AM services operating as sister stations to FM services

The Group's largest station is Classic FM with more than six million listeners. Three-time winner of the Sony National Station of the Year award, Classic FM is currently Arts and Business' Champion of the Year for its work with young people and music education. Classic FM is also available in a number of overseas locations, with versions of the station broadcasting in Holland,

Finland, and South Africa. Listeners can also tune in over the Internet via www.classicfm.com and to other Classic FM sites run by overseas stations.

GWR is the major shareholder in Digital One, the UK national digital radio multiplex used by all commercial digital broadcasters. GWR also operates:

- Two national digital services
- 15 local digital radio multiplexes
- Classic FM TV, broadcast on Sky Free to Air, without a subscription being required
- Simulcasts of six radio stations on Sky.

INDUSTRY CONSOLIDATION

The company has come a long way from its beginnings in 1982 as a single commercial radio station, Wiltshire Radio. Looking to the future, GWR expects the pace of change to accelerate. With the passing of the Communications Act 2003, responsibility for regulating the radio industry in the UK passed to the Office of Communications (Ofcom) which also regulates telecommunications and television companies.

Crucial to the Communications Act is recognition of the need for radio companies to have the ability to consolidate and local radio ownership rules to be liberalised, potentially paving the way for greater industry consolidation. The agility with which companies will be able to respond will, to a large extent, depend on the flexibility of their corporate networking infrastructure. All this at a time of increasing Internet penetration, the expansion of digital broadcasting, and the rollout of fixed and mobile broadband services.

TECHNOLOGY AS A STRATEGIC ENABLER

Helping ensure that the group has the flexible and cost-effective network infrastructure it needs is the role of Vincent Bourne, GWR's infrastructure manager. His overriding aim is to help ensure that the group has the technology platform needed to prosper in a fast-changing market. Looking ahead, the unrelenting move towards digital working at all parts of the production and transmission chain will be matched only by the need to quickly absorb new stations into the group.

"I could see the possibilities of what IP-based data networking might do in terms of convergence, especially for voice telephony, which was maturing fast. I foresaw that it might provide the opportunity for us to reduce our cost model and give us more flexibility, especially for our broadcast traffic," says Bourne.

But while this was the vision, more pressing needs had to be addressed. The rapid growth of the group, fuelled in large measure by acquisitions, had created a very complex network with stations connected by a maze of leased lines and dialup modem links, with each site running its own type of private automatic branch exchange (PABX).

Knowing its plans for the future, the group standardised on Cisco Systems® hardware throughout its data network, primarily with Cisco® Catalyst® 2900 Series switches and Cisco 2600 and 3600 series routers. Dual Cisco Catalyst 6500 Series switches are used at larger sites to provide a Gigabit Ethernet backbone.

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THE SPECIAL NEEDS OF RADIO BROADCASTERS

While GWR had no doubt that an IP-based network would meet the group's data requirements, supporting radio broadcast operations would be far more demanding.

Important issues included:

- **Outages** – Any outages would be obvious, and they would contribute toward creating a defective product, which would inevitably affect audience figures and, consequently, advertising revenue – by far the group's main source of revenue.
- **Locality** – A key ingredient of GWR's approach is that each station serves a community and its success is rooted in its close relationship to that community, be it geographically-based or a community of common interest.
- **Disc jockeys** – Locality is underpinned by the regulator. GWR's FM broadcasting licence stipulates that it must source at least 13 hours programming each day from each local station, which means that a disc jockey has to be physically present in the station.

- **Reducing costs** – Costs can be significantly lowered by broadcasting shows that are piped in over the satellite network from other stations (as allowed), inserting local station jingles and advertising to maintain local identity.
- **Advertising air time** – Radio’s ability to pinpoint its target audience often contrasts with a buyer’s need to see a single GWR Local Radio Group brand that can provide a single source of multistation channels to market.
- **Voice telephony** – GWR’s growth by acquisition meant that there was no one standard PABX across the sites, each one of which had to be maintained either by GWR itself or through maintenance contracts with different vendors.
- **Specialist PABX functionality** – In addition to a normal voice PABX, every site needed the specialist call handling required to manage phone-ins and put listeners on air in, for example, a head-to-head competition. The initial requirement for some 35 PABXs across the group, therefore, swelled to around 70 PABXs with all of the costs and associated management headaches.
- **Music-on-hold** – The need for listeners to receive a local station-branded response meant that callers received their local radio broadcast as music-on-hold. With local PABXs inserting local music-on-hold was straightforward, but on a centralised IP network live music-on-hold represented a significant challenge as content would actually be generated by various sources at different times.

THE PATH TO CONVERGENCE

By mid-2003, GWR was able to focus on making the leap to a converged infrastructure. At the company’s request, Cisco Systems presented its convergence strategy and solution set to GWR’s senior IT management team. The result was two workstreams with one single purpose – to realise the convergence vision.

The first workstream was to evaluate the Cisco IP telephony solution against that of the incumbent supplier that had an installed base in GWR of around 30 per cent.

The second workstream would develop the group’s requirements for a converged network and find the best service provider to meet them.

CISCO IP TELEPHONY PROVES ITSELF

A six-month investigation into the two approaches saw Cisco’s CallManager emerge as the clear winner. “Commercially there wasn’t a lot of difference,” says Bourne, “but we found Cisco’s implementation of IP telephony to be a more feature-rich and elegant solution. Cisco’s approach to QoS helps ensure a more consistent approach with each piece of the hardware chain working to honour that level or prioritization.”

The evaluation also revealed the power and flexibility of Cisco CallManager’s ability to integrate with third-party applications, including software GWR was developing with another partner to provide the specialist call-handling facilities that the stations required on air.

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QOS AND IP MULTICAST

While the telephony workstream carried out its evaluation, work began planning the new data network.

“We wanted three things,” says Bourne. “The first was a new data network to replace our Frame Relay network which was already showing signs of needing more bandwidth. Secondly, we wanted the network to be able to replace our satellite network and for it to be able to deliver broadcast-quality audio and reliability. The third element was voice, which slotted into the plan as pretty much a no-brainer having taken on the audio broadcast traffic.”

Together, GWR and Cisco drew up requirements for such a network. The two key elements were QoS – to help ensure that radio streams and other traffic types were appropriately prioritised across the network – and IP Multicast.

IP Multicast has been used as a bespoke technology in large-scale financial production networks since 1997 when stock exchanges required a fast, efficient method to send market data to many subscribers simultaneously. IP Multicast is a bandwidth-conserving technology actively developed by Cisco that reduces traffic by simultaneously delivering a single stream of information – such as a radio programme – to potentially thousands of subscribers. IP Multicast packets are replicated in the network at the point where paths diverge by Cisco routers in a ‘tree-and-branch’ manner. That is, information is not only sent to users on the network who want it, but it is also conveyed to them in the most bandwidth efficient way possible.

Not surprisingly, therefore, with 31 sites, each generating content that is potentially of interest to every other station – and music on hold being generated from up to 40 separate sources – GWR saw the need for IP Multicast as a critical element of the proposed infrastructure.

GWR CHOOSES THUS TO PROVIDE CORE MPLS IP VPN WITH IP MULTICAST

In November 2002, GWR issued a request for information (RFI) to eight service providers. The responses were carefully reviewed and a far more detailed request for proposal (RFP) was issued to the four short-listed service providers. More meetings and detailed questions and answers followed, resulting in THUS being awarded the contract for the WAN.

According to Bourne, THUS was essentially an outsider because GWR had no existing relationship with them. As a Cisco Powered Network designated service provider, however, Bourne and his team knew that they had a close working relationship with Cisco and could offer end-to-end Cisco equipment and software. “THUS has a sound track record of innovation and a strong customer base in our sector, so they understood our requirements,” Bourne says. “It was also further building out its MPLS network and was willing to share the risk in implementing IP Multicast. Even more importantly, THUS was prepared to work in an extremely innovative and collaborative way with us to deliver the network we needed.”

To emphasise his point, Bourne recalls an early meeting with THUS Chief Operating Officer, Phil Male. “Instead of just listening to our vision and paying it lip service by saying ‘that’s a good idea’, I could just tell that he bought into it. A real passion came across.”

THUS: CONVERGING ON SUCCESS

Strong relationships with its technology associates are also important to THUS. “We have an excellent relationship with Cisco,” says Male. “All of our IP VPN services and our national Ethernet services hold the Cisco Powered Network designation. We’ve had a good, long-term relationship with Cisco and right from the word go we were using Cisco equipment as the foundation of all our next-generation services.”

THUS built its new MPLS network with Cisco 12000 Series routers at the core and Cisco 7600, 7300, and 7200 series routers at the edge, and from it, THUS was able to introduce two new strategic additions to its service portfolio. December 2002, saw the launch of THUS’s national Ethernet service. This was followed in September 2003 with the formal launch of the

company’s Layer 3 VPN services that – thanks to the catalyst of GWR – can now offer proven IP Multicast.

EXTENSIVE PROOF OF CONCEPT FOR MULTICAST

Critically, the new network had to support live radio multicasts and for this to happen, the network would have to work with an IP codec developed in-house by GWR, which it called BLAST.

“It took nine months for us to write BLAST,” says Bourne.

“While it is possible to purchase IP codecs, there was nothing on the market that would manage multicast, failover, and the other specialised features that we needed.” BLAST is designed to be self healing and will, for example, dynamically switch a 256 kbps radio stream from stereo to mono and reduce the capacity used should a portion of the bandwidth go down; or if a packet is dropped it effectively stretches the audio enough to fill the 26 milliseconds one packet represents.

“I had no doubt that the new network would function perfectly for data, but I needed to ensure that it would work just as well for telephony and – with BLAST – for our radio broadcasts,” he says.

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Phil Male
Chief Operating Officer
THUS plc

The key milestones were:

- **Developing a class of service (CoS)/QoS model** for GWR's VPN traffic. Experts from Cisco and THUS developed a 5-tier model, giving GWR maximum flexibility and the ability to prioritise its radio broadcasts above corporate IP telephony, data, and other application traffic types.
- **Creating the entire proposed GWR network within THUS's laboratories**, right down to the same hardware and even software versions. The entire infrastructure was subjected to two separate, detailed proof of concepts, each running for three days and comprising a team of each companies' top engineering experts.
- **Proof of concept one** focused on building the architecture and proving the overall design, including how multicast and MPLS worked with BLAST to support radio broadcasts.
- **Proof of concept two** refined the configuration, fine-tuning, for example, the architecture to deliver faster failover in case of failure.

"We created failures all over the lab network to see what would happen," says Bourne. "We found some interesting quirks in the pre-release version of the multicast software. Together with THUS we built a relationship with Cisco's multicast gurus, including those in the United States who were tweaking the Cisco IOS Software."

THUS meticulously recorded all the results to create a full report. "It was a hugely detailed document based on all of our test criteria, all of our test results, so that we went into things with our eyes wide open."

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PHASED GO-LIVE

The new network went live in two phases. The first, carrying data and voice telephony, was so successful that the Frame Relay network it replaced was out of service just three days after the new network was cut over.

The extensive proof of concept tests were repeated on the new network and then after only three months the old satellite network was closed with all networked radio broadcasts carried by the new network.

STRATEGIC ADVANTAGE, AND AT LOWER COST

It is perhaps ironic that one of the greatest compliments paid to the new network is that the change over has been invisible to listeners. Those with good hi-fi systems may, however, notice the increase in audio quality as the IP radio streams only go through one round of compression, compared to the original encoding to satellite and the second actually within the satellite itself.

For GWR, the success of the network means that the group now has the agility within its infrastructure that it will need to continue to prosper as the industry consolidates. It estimates that it has gained a nearly two-year advantage over its competitors.

Bringing new stations within the group will be as simple as providing a local connection to the network, giving the newcomer immediate access to all of GWR's resources – from sophisticated sales and customer relationship management (CRM) systems to play lists and content feeds.

The unique combination of MPLS delivering QoS and any-to-any connectivity, with IP Multicast providing state-of-the-art bandwidth efficiencies, means that GWR has dramatically reduced its infrastructure cost base while improving flexibility and bandwidth.

"If you take the view that our old satellite network and our old data network equals what we pay for the MPLS network, then the savings come from the voice side, and those are pretty well understood within the industry," says Bourne. "Every bit of the savings that we achieve by implementing IP telephony goes to the bottom line, with the additional benefit that we have a new high-capacity data network that we can broadcast on. By replacing every telephone handset in the group with the latest Cisco technology, Bourne expects that GWR will breakeven on their initial investment in less than two years.

In addition to reducing costs, the new network will also help enable flexible programming, increasing strengthening local identities and thereby helping to win and retain listeners. GWR has already taken advantage of this – operating a 'mini-network' cluster for a major pop concert allowing stations to opt for a different overnight feed to air the concert.

Importantly, news coverage will also benefit. In 2003 when sudden snow caused traffic chaos in the UK's south east, the local stations could not reflect what was happening

overnight because they were taking a national feed. "Now we could bring in a disc jockey to reflect what was happening and stations could pick that show up as appropriate," says Bourne.

Music on hold is also now offered, via Cisco CallManager, from any source, thereby meeting the needs of local callers as well as those of centralised GWR sales teams who want potential advertisers to hear the most appropriate content.

THE VALUE OF TEAMWORK

Reflecting on the project's success, Bourne emphasises the value of teamwork. "Cisco has taken a long-term view and from my own personal perspective has put great resources into the project. They have good people who are as excited about technology as we are," he says.

"We also established very good relationships with THUS" Bourne says. "We wanted to be part of the delivery team, and THUS welcomed us to that table."

Asked about the result of that three-way partnership, Bourne says: "The new network is the realisation of our long-held vision for the impact that a modern data network can have

on the radio business. It gives us the capability to broadcast live from any site to any site at the drop of a hat. The shared nature of the network means that costs are driven down by the removal of our previous voice and satellite networks; it is simply not possible to design a more elegant and cost-effective way of delivering the services. Converged networking is the future of broadcasting, no question."

FOR MORE INFORMATION

Cisco has awarded the Cisco Powered Network designation to a select group of service providers worldwide that are offering customers reliable, proven, cost-efficient technology and solutions.

Service providers whose services have earned the Cisco Powered Network designation are committed to deploying Cisco products and solutions end-to-end in their networks and to meeting high standards of operational excellence and customer service and support.

For further information about the Cisco Powered Network programme visit www.cisco.com/cpn



CISCO SYSTEMS



Corporate Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 526-4100

European Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 20 357 1000
Fax: 31 0 20 357 1100

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-7660
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems, Inc.
Capital Tower
168 Robinson Road
#22-01 to #29-01
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

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