What if – the Internet Died?

Much of the LINX 35 meeting of members in London in November focused on disaster planning and related infrastructure issues. It was the largest-ever meeting of LINX members and there was a series of wide-ranging presentations and debates.

Disaster Planning – is there any point?

Richard Clayton of Thus started the review of possible disasters and contingency plans by presenting a number of scenarios which could cause what he described as 'total chaos'. Among them he listed:

- A worm which infects users rather than servers – and which is widespread before a patch is available.
- Border gateway protocol (BGP) problems which lead to unchecked spreading of invalid information.
- A widespread distributed denial of service (DDoS) attack which produces high volumes of traffic that are difficult to filter.

If this type of threat ever became a reality then a typical response by an individual ISP would be to take down its peering with others – either to protect itself or to protect the rest of the Net from its customers. Either way, the action would have a significant effect upon peering and, Richard suggested, it would be far harder to re-establish peering than it was to dismantle it.

LINX itself could play a role in combating these threats, he continued, by pooling and disseminating information and perhaps by disconnecting members with affected networks. There may also be benefits in working with other Internet exchange points to plan responses on an international basis.

On the other hand, Richard pointed out: "We did all this for Year 2k and it turned out to be a damp squib. We prepared disaster plans and never used them."

'And every event will be different. Is there any point in planning for a disaster when we do not know what it will be?'

This debate is continuing. LINX, however, is doing a number of things which will help to reduce future risks and is keeping the options for further action under review. Some of the current planning and activity is reported in this issue of HotLINX.

Disaster Testing

LINX staff are expecting a disaster on the exchange any day now – not a real one but a surprise exercise to test the plans which the organisation has put in place.

Chief executive John Souter told LINX 35 that he has authorised engineering support manager Pui Hang Miles to spring a surprise test on LINX.

"It is no good waiting until we have a real problem to find out that our plans are flawed," John said. "We need to be sure we know what to do in a real emergency".
What worked – and what didn't

Sean Donelan of American infrastructure consultancy Donelan.com shared with members at LINX 35 some of the lessons learned by ISPs and others in the USA as a result of the terrorist attack on New York on 11 September.

Although it was primarily a human tragedy and not an attack directed at the Internet it did have significant repercussions for ISPs around the world.

One of the most significant facts to emerge, looking back at events after a few weeks, is that most of the Internet problems only arose hours or even days after the attack. Often it was not the attack itself but the response to it which caused networks to fail.

One of the biggest lessons to be learned, suggested Sean, is the critical importance of back-up electric power and automated systems. Electric power back-up systems often failed to work as planned. When they did, the lack of physical access to buildings around the impact area prevented staff switching from short-term to long-term emergency power supplies. The inability to deliver fuel for generators meant some systems, which were initially working, subsequently failed.

Many systems failed because they were not fully automated – they still relied on someone being available to push a button. They would have worked if staff had been able to gain access.

Older software and systems often fared better than newer ones, said Sean, because they were designed to cope with an unreliable Internet.

"Newer software would just seek once for a connection, find none and give up," said Sean. "Older software would continue trying until eventually a connection was made."

Among the key lessons which Sean believes ISPs should learn from the New York disaster is the need to plan for total unattended operation in buildings which may be physically unaffected by an incident but from which staff are excluded because the area is evacuated.

ISPs should also plan ahead and make sure key staff are on the lists maintained by emergency authorities of those who need to be allowed into exclusion zones. They should also ensure that their priority for fuel supplies is on a par with that given to other utilities.

The biggest lesson, however, is the importance of diversity in both plans and infrastructure. For example, the emergency communication plan should not just rely on the Internet – there should be a back-up system using phone and/or fax.

"To sum it up," said Sean, "What is needed is three things – diversity, diversity and diversity!"

Network Split Nears Completion

As this issue of HotLINX goes to press the splitting of the exchange into two separate 'clouds' is on schedule for completion at the end of February 2002.

Each cloud will use hardware from a single vendor – either Foundry or Extreme – to reduce any risk of inter-operability problems and will be spread over several LINX locations. Dividing the networks in this way will increase redundancy and resilience.

Other actions aimed at the same objectives are also being implemented. Better network management and monitoring tools and protocols are being introduced and LINX is improving its internal communications (including its internal telephone network). At the same time, LINX is putting procedures in place to ensure that there is good communication with members during any outage or other problem.

NOC, NOC – Who's There?

An audit carried out by LINX staff during November found that around 30 per cent of network operating centre (NOC) contact telephone numbers listed at LINX are not answered at a weekend.

LINX sales and marketing manager Vanessa Evans reminded members at LINX 35 that providing a current NOC out-of-hours number is a requirement of membership. It ensures that engineering staff at LINX and at other members can make contact at any time if there are urgent network problems.

Vanessa and her team are now mounting a 'campaign' to get the list brought up-to-date – and then maintained in that state.
LINX head of project development Chris Fletcher briefed members on the Internet problems created by the Code Red and Nimda worms and possible future responses to similar threats.

Chris said that analysis of traffic data showed evidence of border gateway protocol (BGP) instability caused by the worms and he reported on a couple of hypotheses which have been developed to explain this. He also suggested a number of defensive tactics to help suppress future similar attacks.

One such tactic is the creation of address resolution protocol (ARP) ‘sponges’ to soak up ARP traffic by creating virtual machines.

When the virus in an infected machine is seeking to replicate itself by taking over another machine it randomly selects another machine to attack. If there is no reply it generates another query on another address. When the worm tries to contact a non-existent machine the router tries to find it by sending out a broadcast packet on the local network. If there is a large number of infected machines probing a lot of non-existent addresses the large amount of broadcast traffic can fill the local network.

An ARP sponge responds to the ARP queries with a reply from a ‘virtual’ machine so that the queries do not need to be repeated. It therefore stops the broadcast traffic.

Deploying an ARP sponge therefore protects a local network but allows the worm to swiftly move on to the next address unless a tar pit is also deployed. This responds to the worm’s random probes such that the attacking machine sees an apparently open connection and sends data – and then waits for a response which never comes. Eventually the attacker ‘times out’ and looks for another victim but in the interim it has effectively been held by the ‘tar pit’ virtual machine, slowing down its search for real machines to infect.

Chris told members: "This technology does not prevent the spread of the infection but, if it is widely deployed, will slow it down."

Global IP Carriers
LINX is the endorsing body for the Global IP Carriers 2002 conference and exhibition which takes place at the Royal Garden Hotel, London, from 17 to 19 April 2002.

The arrangement between LINX and the organisers means that LINX members will be able to claim a discount on the normal admission price. Details will be posted shortly on the LINX website.

The conference has been billed as ‘A window into tomorrow’s Internet infrastructure’ and will tackle the strategic and technical issues confronting the IP value chain. Key issues to be examined will include IP capacity demand forecasting and trading, strategic IP business model evaluation, colocation and hosting, value added services and the infrastructure requirements of ASP & multi-media networks.

For more information visit: http://www.carriersworld.com/GlobalIP_2002/.

BCP For Problem Solving Agreed
LINX members have agreed a best current practice (BCP) guide to resolving technical problems which can arise between peers at an exchange point.

"The level of interconnected-ness in the Internet is growing," said LINX network architect Mike Hughes. "With this growth comes an increased need for ISPs to cooperate when trying to solve problems which are affecting their peers."

LINX launched a first draft of the BCP some months ago in response to concerns expressed by members that attempts to resolve problems by working with peers are sometimes blocked by inappropriate procedures or systems adopted by some ISPs. In particular, it is often difficult for peers to make contact with someone who can take action to investigate and resolve problems.

The BCP therefore lays stress on the necessity for peers to provide contact information to one another which allows technical staff within one organisation to make direct contact with their opposite numbers in the other. It also makes clear that ISPs should check their own equipment for faults before contacting either their peers or exchange points such as LINX.

Details of the latest BCP can be found at: http://www.linx.net/private/members/meetings/linx35/privacy-bcp/peering-escalation-bcp-05.html

What if – the Internet died?
NIMDA, Code Red, BGP and Tar Pits
"This technology does not prevent the spread of the infection but, if it is widely deployed, will slow it down."

Chris Fletcher

And, of course, it will not be long before there is a new generation of worms which have timeouts that will prevent tar pits from working effectively."
MaNAP Offers to Linx Members Aims to Boost Resilience

Members of Manchester Network Access Point (MaNAP) a not-for-profit Internet exchange point which serves the north and midlands of England have voted unanimously to offer LINX members a year of free peering in Manchester.

Nick Whittaker, MaNAP chairman, said: "We are keen to encourage geographic diversity and resilience in the UK Internet infrastructure. We are not aiming to compete with LINX but to supplement it by providing an alternative peering point within the UK.

A number of LINX members ensure the resiliency of their network by duplicating some of their LINX peerings at AMSIX or elsewhere. Peering at MaNAP is another option and we hope that this offer to reduce costs will prove attractive to ISPs."

Manchester is the UK's second largest city in terms of the volume of Internet traffic being generated, although substantially smaller than London. MaNAP aims to reflect this by becoming the UK's second largest Internet hub.

LINX members taking up the MaNAP offer will not have to pay the £12,000 per year normally charged for a 1 Gbit port at Manchester during their first year of membership, although they will still need to find the £2,000 MaNAP joining fee.

LINX Offers IPv6 Network Access

LINX is to allow the new Internet protocol IPv6 onto its network. This will allow members to directly exchange traffic from their new IPv6 networks and services at LINX.

Router vendors are still developing support for the new protocol and ISPs are therefore at present typically using separate routers for IPv4 and IPv6. LINX will provide a special low-cost service to permit members to connect their IPv6 equipment.

The LINX network can already accept both IPv4 and IPv6 on any port. It is therefore ready for members to deploy future models of router which will themselves handle both protocols.

The new IPv6 service was among a number of changes to the Memorandum of Understanding and the Service Definition approved by LINX members at an extraordinary general meeting in November.

Going Private at LINX

The infrastructure to support private interconnection between members at LINX is now in place and the first agreements should be signed shortly, chief executive John Seuter told LINX 35.

Seven members have expressed interest in linking their networks directly to those of certain other members, by-passing the LINX exchange. A private interconnection 'meet you' page has been established on the LINX website to facilitate the establishment of private peering arrangements.

Connection facilities are available at Telehouse North and Telehouse East and links can be provided between these locations as required. Facilities at other LINX sites will be provided if there is a demand from members located there.

Currently LINX is offering the installation and maintenance of 16-core fibre bundles between the LINX private peering rack and the rack of any member at either Telehouse location for £5,000 per year. Provision and maintenance of a pair of single mode fibres between the two Telehouse buildings is available at £2,500 per year.
3G Mobiles, Broadband and Home Video will Increase Internet Traffic Ten-Fold

New third generation (3G) mobile telephones and the growing availability of broadband connectivity – which will bring with it new Internet-based services such as video on demand – could lead to a ten-fold increase in traffic at LINX within two years.

This was the prediction which LINX chief executive John Souter gave to journalists attending a press briefing at the seventh birthday celebrations in London on 1 November. He said: "We have taken a realistic look at the future development of the Internet in the UK and, on the basis of these figures, are planning for a ten-fold increase in traffic in 24 months."

"Our peak traffic flows now are three times what they were at this time last year. The continuing roll-out of broadband, increasing business use of the Internet and the development of new Internet-based consumer services such as video on demand will see more and more demand for bandwidth at the exchange. We see no reason to believe the rate of growth will drop, even given predictions of a slow-down in economic activity."

Management and engineering staff at LINX have drawn up a 'technology roadmap' to ensure that the exchange continues to have the capacity necessary to handle the growth in traffic. The plan is to be updated every three months to take account of actual and predicted traffic growth.

As well as looking at expanding the use of existing technology to handle growing demand, the roadmap has plans for the deployment of new technologies such as 10 gigabit Ethernet and IPv6 – and the introduction of new services such as private peering.

Euro-IX Developing its Role

EURO-IX, the international European grouping of exchange points, has made some major steps forward over the past few weeks.

It held its first general meeting and elections for an executive committee to guide it through its first two years of operation during the RIPE meeting in Prague in October. Arnold Nipper of the German exchange point DE-CIX was elected as president. Job Wittman of AMS-IX as secretary and John Souter, chief executive of LINX, as treasurer.

There are now 19 exchange points in membership with almost 700 connected ISPs – many of them, of course, peering at several EURO-IX members.

EURO-IX aims to provide a portal web site with key information about Internet exchange points. It will also assist with sharing information and best practice relating to the operation of exchange points and will help to co-ordinate members' responses to regulation of peering and interconnection.

Some practical benefits have already begun to flow from the establishment of EURO-IX. The organisation has established a diary of maintenance operations to ensure that planned outages at different exchanges do not overlap.

Building for the Future

LINX had 'a healthy financial surplus' at the end of the financial year in November 2001 according to chief executive John Souter – and the new year has started well.

In his quarterly report to members at LINX 35 he gave an update on a number of projects and initiatives, the staffing situation, the current financial position and plans for future service improvements.

Information on EURO-IX is available from its website at http://www.euro-ix.net.
LINX Sets High Standards for Internet Technicians

The new fast-track training programme for the LINX Accredited Internet Technician (LAIT) qualification has enforced rigorous standards by setting minimum 70 per cent pass grades.

The LAIT programme aims to increase the number and competence of people who build and maintain the UK's vital Internet infrastructure. The course - consisting of three modules each lasting five days - is designed primarily for people who already have IT engineering skills but need additional training in Internet-specific technologies.

LINX initiated the programme in October 2001 with the first LAIT I course. The first course for LAIT II ran in November 2001 and the first LAIT III course takes place in February 2002.

Only three of the eight participants in the first LAIT I course reached the required pass mark. The other five participants passed the 55 per cent threshold needed to qualify for places on the LAIT II module, however - subject to them securing a 70 per cent mark in a 'resit' of the LAIT I exam.

LINX training manager Hugh Spencer said: "The ability of the UK Internet infrastructure to support the demands of users ultimately depends upon the skills of the engineers and technicians who construct and maintain the network. LINX accreditation of Internet technicians must maintain the highest levels of competency.

Redhill-based Systems & Network Training Ltd is delivering the LAIT training programmes. Founder Steve Groombridge said: 'We could have easily set a lower pass score but that would only have devalued the qualification. LINX is widely respected as being at the heart of the UK Internet and this accreditation will establish high standards of technical competence.'

The three modules cover everything from fundamental networking and routing skills through to advanced techniques such as border gateway protocol (BGP) and multi-protocol label switching (MPLS). The programme was created after LINX members recognised that a shortage of skilled network engineers could impede growth in Internet use and the development of e-commerce in the UK.

Now LINX is developing plans for a Master LAIT qualification which will be awarded after a rigorous one-day practical laboratory examination to prove that technicians can put into practice what they have learned on the LAIT courses.

All relevant LINX staff are being put through all three existing LAIT modules and will be expected to acquire the Master LAIT qualification once it becomes available.

Meanwhile, LINX is co-operating with UK universities to ensure that Internet computing degree syllabuses match the industry's needs for Internet engineers. It is also planning to develop a web-based bulletin board to co-ordinate work experience placements for undergraduates who want careers in the Internet industry.

Bookings are now being taken for future LAIT courses.
Details from Systems & Network Training Ltd on 01737 821590 or http://www.s-nt.co.uk.

Prices:
- LAIT I course and exam – £1,495
- LAIT II course and exam – £1,795
- LAIT III course and exam – £1,795
Exam only – £75 (all levels)
Prices exclude VAT

Requirements for LAIT courses
Entry to the LAIT II course requires one of the following:
- LAIT I 70 per cent exam pass
- LAIT I attendance with at least 55% in LAIT I exam (70% LAIT I exam pass required during LAIT II course)
- Cisco Certified Network Associate (CCNA) and pass LAIT I exam (70%) while on LAIT II course

Entry to the LAIT III course requires one of the following:
- LAIT I and LAIT II 70% exam passes
- LAIT II attendance with at least 55 per cent in LAIT II exam (70% LAIT II exam pass required during LAIT III course)
- Cisco Certified Network Professional (CCNP) and pass LAIT I and LAIT II exams (70%) while on LAIT III course

“The ability of the UK Internet infrastructure to support the demands of users ultimately depends upon the skills of the engineers and technicians who construct and maintain the network.”
RIPE NCC Training

As a part of its members' activities, RIPE NCC is delivering training courses to the personnel of Local Internet Registries. It is important that the LIRs are informed and remain up-to-date with the policies and procedures surrounding IP address allocation and assignment.

- The LIR course is a full day course (9-5), and is "free" of charge, since the costs are covered by the membership contributions.

- Due to a limited number of seats, it is possible to register only 'two' persons from each LIR (if more people are interested, they will be placed on the waiting list).

- Please note that you need to be a registered LIR contact person to be admitted to the course (if not, confirmation will be asked from other LIR contact persons from your registry).

In the near future, RIPE NCC is organising two courses in the UK: Edinburgh and London.

Friday, 22 February, Edinburgh (APEX European Hotel) (code: LIR20020009) & Friday, 19 April, London (hotel to be determined later) (code:LIR20020023)

If Friday courses fill up quickly, an extra Monday course can be organised on the same venue (25 February Edinburgh & 22 April London).

To register, please either use the web form (see URLs below), or write to training@ripe.net, specifying your Registry-ID (e.g. uk.linx), and the course code (or place & date) which you would like to attend.

Registration: http://www.ripe.net/cgi-bin/trainingform.pl.cgi

More information (including list of other dates and venues, the course material, overview, the objectives and the policies regarding LIR courses):
http://www.ripe.net/training/

Farewell to Carole

After nearly 5 years working for LINX, Carole Cole is leaving to run a fishing business in Ireland, with her husband David.

Carole started working for LINX in May 1997, and has seen it grow from 30 members, a couple of engineers, Keith Mitchell and herself to its current membership of over 120 members and 22 staff.

Carole says, I have enjoyed my time with the LINX immensely and when I first started never imagined the changes I would see in the office or indeed the industry. I will miss my colleagues and the membership but am looking forward to the challenge my husband and myself face in Ireland.

All the staff and Board would like to wish Carole well and thank her for all her help and commitment to LINX.

Membership Grows increasingly international

Despite continuing Internet industry consolidation the number of LINX members continues to rise – and an increasing proportion of members are from overseas.

LINX membership now stands at 123 following the admission of two new members in recent weeks.

"Seemingly as fast as we acquire new members, though, existing members merge," said sales and marketing manager Vanessa Evans. "Within the past few weeks, for example, Equant and Globalone have merged, as have Ebone and Netcom. As a consequence, the total number of members is increasing very slowly.

"The total number of routes which our members now operate, however, continues to rise rapidly. More than 50,000 Internet routes – almost 50 per cent of the global total – can now be accessed through LINX."

Negotiations are currently taking place with ten potential new members, four of which are based overseas. Vanessa said: "Increasingly, we are finding that overseas ISPs are looking to join LINX to improve the service which they can offer to their customers and to cut their transmission costs."

Members by Country

[Diagram showing members by country]
LINX Invited to Join Governments E-Economy Think-Tank

LINX has been invited to join a think-tank of industry leaders that is advising the government on ways to make the UK a leading environment for e-commerce.

"We are further pleased to see the development and maintenance of LINX as a mutual ownership organisation - allowing freemarketing competition among ISPs and technological innovation."

LINX chief executive John Soutter reinforced the same point in his own speech to the party when he said:

"As a mutual organisation, LINX draws strength from its members. They are commercial rivals but within LINX they co-operate for the benefit of the whole Internet industry and, ultimately, for their customers - the Internet users."

John announced that in the month that it was celebrating its birthday, LINX had switched its 220 trillionth (220,000,000,000) packet of data since its foundation in 1994.

In 1995 LINX switched only 640,575,000,000 packets of data during the year on behalf of its initial five members. It estimates that it has switched 47,000,000,000,000 over the past 12 months - an increased annual rate of over 7,300 per cent.

Founded in November 1994 by the UK’s five biggest Internet service providers, LINX is the largest exchange point outside the USA and now has a membership of more than 120 ISPs and content delivery service providers.

LINX Engineers Move to New London Base

Engineering staff from LINX are moving to new central offices from which to maintain the organisation’s switching and routing facilities.

The new facilities will include a dedicated test and evaluation centre which the engineers will use to investigate emerging technologies and new equipment.

The 1,700 square foot (150 square metre) offices at Tooley Street, near London Bridge Underground station, are close to all LINX’s co-location facilities. Previously, the engineers had used office space at different tele-hotels or facilities at one of LINX’s ISP members.

"Operating duplicate facilities in different locations helps guarantee the security of our service," said LINX chief executive John Soutter. "Our engineers need to be centrally based so that they can reach any of our facilities with equal speed. These new offices answer that need."

LINX management and administration personnel will continue to be based in Peterborough.