Annual Report **2016**

London Internet Exchange

LINX

Est. 1994

Membership
Just Got Better
Join LINX
Regional Networking
& Peering Panel
MANCHESTER
HOLLYWOOD LINX
PRODUCTION
DIRECTOR
CAMERA
DATE SCENE TAKE
11-14 APR-16 GPF 11
EPF11
Sofia, Bulgaria
19-21 September 2016
amsix
DE-CIX
LINX
Netnod
LINX
The London Internet Exchange
Number ONE
African Networks
ering in Europe
DAYTONA
WE DID IT
2016

Message from the Board

Letter from LINX Chairman, Murray Steele

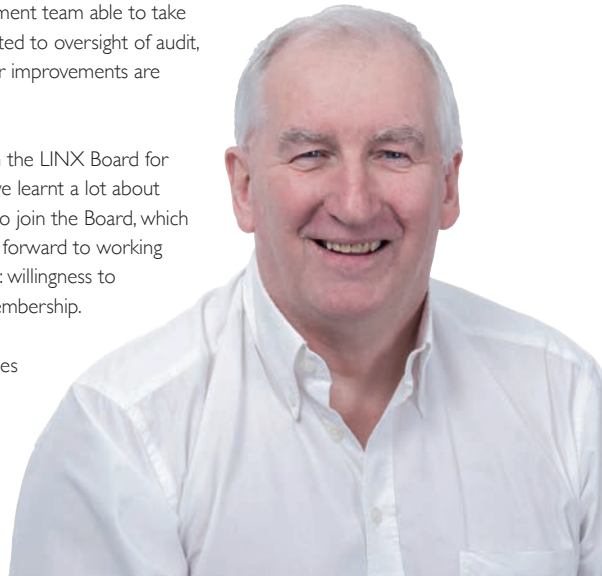
My first full calendar year on the LINX Board has certainly been an enlightening experience. LINX is an organisation founded on a strong commitment to a membership ethos, where all members are treated fairly and equally. Understanding that the trust this engenders underpins LINX's success for more than 20 years has been key to being an effective Chair. I recognise that same understanding permeating every level of the organisation.

As a mutual not-for-profit organisation, LINX operates quite differently to many organisations I have encountered throughout my career. The guiding principle is that the member always comes first and we are conscious that all decisions have to be driven with their interests at heart, both technically and financially. LINX has a history of cutting prices and has done so every year for a decade. In 2016 we went even better as fees were cut twice in just seven months. That delivers value for money today, but the members' long-term interests also demand investment for the future. We have certainly done that this year with the decision to introduce ground-breaking IXP technology on the LON2 network in London.

During the last year I have championed reforms to the Board's own working methods, to make us more efficient and more strategically focused now that we are supported by a strong management team able to take care of operational responsibilities. We now have Board sub-committees dedicated to oversight of audit, governance and remuneration, in line with recognised good practice, and further improvements are planned.

I would like to take this opportunity to thank Patrick Gilmore, whose service on the LINX Board for over ten years has clearly been an invaluable contribution, and from whom I have learnt a lot about the industry we serve. As I write this I see a good number of candidates eager to join the Board, which can only signal a vibrant and engaged membership community. Of course I look forward to working with whoever wins election, but for now my thanks go out to all who volunteer: willingness to participate is essential for the long-term health of any organisation based on membership.

As ever, I would like to reiterate my commitment to upholding LINX's core values during my chairmanship. It has been an exciting 18 months since I took on the role and I am proud to be part of such an admirable organisation, which I will continue to serve to the best of my ability in the future.



January 2016: IXCardiff celebrates first anniversary of passing traffic

CEO's Report

LINX can look back on 2016 with great pride. Connected capacity to our exchanges continued to grow, and we achieved new records on all of our key metrics.

On behalf of all our staff, we are particularly pleased to have delivered two price reductions for members during the year - one at the beginning and another one in August. Our ability to do this is intimately linked to a key decision that we made during the year. After member consultation and extensive research and testing, we decided to adopt a disaggregated model for the future of our LON2 network architecture in London. The new approach opens up the potential for new services and efficiencies, and changes the underlying cost base. That enabled us to make the 40% cut in port fees for LON2 announced in the second price cut of the year.

As a member organisation, LINX has always aimed to create value for members through community activities and joint representation in public affairs. As you would expect, 2016 was another busy year on this front. We led community activities in Europe as the co-host of another very successful European Peering Forum in Sofia, Bulgaria. Further afield, we jointly hosted the Global Peering Forum in Hollywood, California and also actively participated in community events around the world (e.g. NANOG, ITW, RIPE, Euro-IX). All of this aims to make ourselves visible to the community, as well as to facilitate peering and develop the best possible understanding of the needs of our members. The latter part feeds into our work on Internet governance and representing our members in the face of government regulatory development. Particular highlights to pick out in this area are our work on the UK government's Investigatory Powers Bill, where we succeeded in making improvements to the draft legislation, and our contribution to the completion of the transition of ICANN from the oversight of the US government.

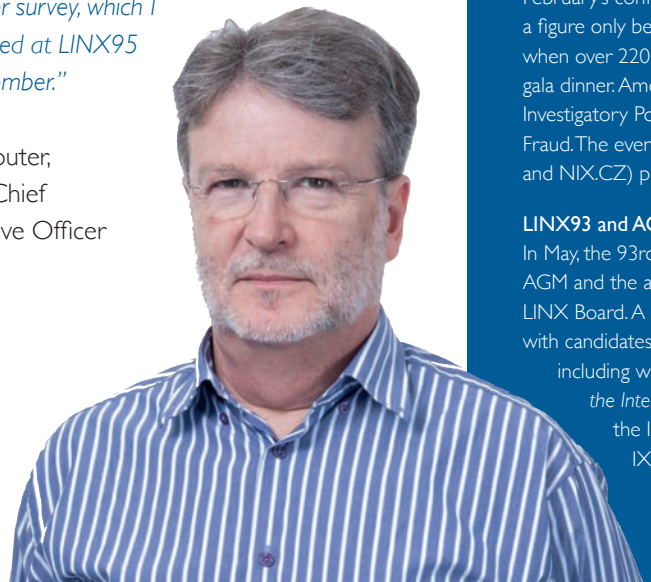
Whilst our London exchanges are recognised as amongst the largest and most important public peering points in the world, we have also been actively developing our exchanges in the UK regions and in North Virginia (NoVA), USA. IXManchester continues to be a showcase for UK regional peering, with an impressive 86 member ASNs now peering, and our NoVA exchange took its first 100G port order.

February 2016: LINX host Investigatory Powers Bill Workshop

At the close of 2016, LINX was operating six public peering LANs with points of presence in 19 colocation buildings, offering our members a wide choice from which they can interconnect to other networks. With our staff strengthened during 2016, and our automation initiative beginning to pay off, we can look forward confidently to the challenges 2017 is sure to bring.

"I am really pleased to see our established strategy bearing fruit. LINX is growing nicely, and our members clearly appreciate the public and private peering services that we offer. I was particularly pleased with the very positive feedback from our 2016 annual member survey, which I presented at LINX95 in November."

John Souter,
LINX Chief
Executive Officer



LINX Member Conferences

LINX member conferences are held four times a year and have been a key part of LINX community activities ever since LINX was founded in 1994. These gatherings provide members with a valuable opportunity to meet with peers, to share knowledge and ideas and also to keep up to date with technical and regulatory matters. General Meetings are held twice a year where members are able to vote on resolutions that govern the association on resolutions as well as elect directors to the LINX Board.

LINX92 - February
February's conference saw 218 people register to attend, a figure only bettered once before for a member meeting when over 220 signed up for LINX's 20th anniversary gala dinner. Among the topics discussed were the draft Investigatory Powers Bill, HTTP/2, 4K broadcasting, and VoIP Fraud. The event featured two guest IXP slots (France-IX and NIX.CZ) plus a specialist panel on route servers.

LINX93 and AGM - May
In May, the 93rd member conference featured the LINX AGM and the annual election of LINX directors to the LINX Board. A record eight candidates stood for election with candidates facing questions on a range of subjects including what LINX's ethos of acting *"for the good of the Internet"* meant to them and did they believe the IXP industry is consolidating (fewer, larger IXPs) or expanding (more *"regional"* IXPs).

LINX94 - August
Most LINX member conferences are staged in London but in August the event is taken out on the road. In 2016 the summer meeting was held in Birmingham at the International Conference Centre. The main programme included a talk by the BBC which gave a fascinating insight into Internet traffic levels during Euro2016 and the Rio Olympics. Another interesting panel session was held on fibre rollout which covered the key issues facing providers investing in fibre in the ground.

LINX95 and EGM - November
LINX95 was another extremely well attended event with over 200 registered for an extended two day programme. Among the topics discussed at this conference were BGP communities and next generation Ethernet. There was also a detailed explanation of developments with the LINX LON2 network, a talk by the National Crime Agency plus a session on IPv6 only hosting. A number of possible governance changes were also discussed at LINX95 in a session chaired by LINX Chairman, Murray Steele. The key aim of the consultation was to put forward the proposal that the LINX Board be expanded to include up to three Executive Directors in addition to the CEO. Murray explained that the role of elected non-executive directors should be protected to ensure LINX remains true to the principle of mutuality, and honours the interests of its members.

March 2016: New LINX website launched

The Year Ahead

Investing in the Future of LINX

As we look forward into 2017 the most exciting development of the year will see the deployment of the new architecture and disaggregated solution for the LON2 LAN in London.

Being the first large Internet Exchange to make use of a disaggregated architecture will be a challenge, but it is also an exciting opportunity for us. LINX has always strived to be a leader in the IXP community, and this deployment is in line with our long-term and forward-thinking approach of delivering increased value to our members. The decision to adopt a disaggregated LON2 solution also allowed us to implement a 40% price cut on LON2 ports in 2016, continuing the tradition of annual price reductions that goes back more than a decade.

In parallel to the work on the new architecture, there has been considerable work on automation during 2016 which will continue through 2017. This work will result in gradually increased ability for members and partners to self provision and maintain their LINX services. It will also allow us to provide new services for the members in the future. We have asked the membership for feedback on several of these at LINX96 and we are evaluating this feedback. Our aim is to present proposals for these new services to the membership in 2017.

Membership Consultation

Consulation with our members is very important and we have conducted a thorough membership survey for many years. Our survey in 2016 again gave us very positive feedback and it is rewarding to see that the membership values the work that goes into making LINX one of the largest and most reliable IXP platforms globally. For 2017, we plan to elaborate on the surveying process which will enable us to better understand what the membership wants from LINX and how we can continue to best provide value regardless of network size. We also want to better understand how we can improve dialogue and transparency with the membership of our plans and thinking, to ensure that LINX remains at the forefront of the IXP community.

A Focus on Regional Peering

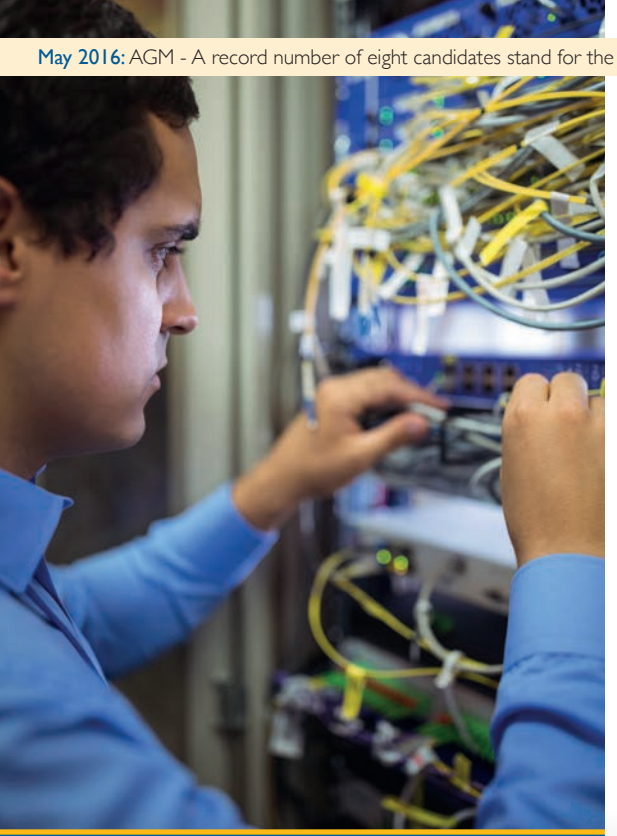
Another focus for us during 2017 will be our regional exchanges across the UK. Our first regional IXP, IXManchester, will be celebrating its fifth anniversary in 2017 and is closing in on 100 connected members. This makes it the largest Internet exchange in the UK outside of London, both in terms of participants and network traffic. The LINX member conference in August 2017 will be held in Manchester and will be a great opportunity to locally promote LINX services and meet with the local community.

During 2017, we will also be working with the Scottish government to facilitate the distribution of the funding made available to further peering in Scotland. This will see us expand IXScotland to include a second site, in Glasgow.

"Being the first large Internet Exchange to make use of the disaggregated architecture is a challenge, but also an exciting opportunity for us"

Kurtis Lindqvist,
LINX Chief Marketing Officer

May 2016: AGM - A record number of eight candidates stand for the LINX Board



"Edgecore Networks is proud to be an active partner with LINX as they migrate to this new open networking solution. With Edgecore's open networking switches and IP Infusion's robust, high function NOS, LINX will be able to deliver more services, at lower costs, in faster timeframes."

George Tchaparian,
CEO, Edgecore Networks

LINX Technology

Delivering a new LON2 network and our drive to automation

Our year in technology was shaped by three main developments: delivering a new exchange platform for our LON2 peering LAN, making good our systems to build network wide automation, and driving cost efficiency across our technology commitments to meet the fees structure for 2017 and beyond.

Let me start with a review of the LON2 peering LAN need. We have seen steady growth across the peering LAN throughout 2016, with 100G member orders continuing to flow into the order book. As we look to 2017 the Extreme Networks BlackDiamond X8 platform does not scale as we require, and does not give us a technology upgrade path to meet our resiliency or cost management goals. Hence, we decided to engage with a wide set of vendors during a feasibility study and consider a new technology solution for the exchange platform.

In that study, we ended up selecting a disaggregated network deployment model and new protocol solution and the goal is to deploy the new exchange platform for LON2 in mid-2017. This will be based on the Edgecore Networks AS5000 and AS7000 network switches, running IP Infusion's OcNOS software as the network operating system. We have asked IP Infusion to support the Ethernet VPN standard (RFC7432) so we can launch as the first IXP to use EVPN routing technology and the first running a fully disaggregated platform over a multi-site, metropolitan network scale deployment.

The selection of a disaggregated model, using a merchant silicon based bare metal switch coupled with that of our underlying transport network investment gives us a much better cost management model as we exit 2016. At the end of 2016 we partnered with Ciena by selecting their Waveserver product to manage our datacentre interconnection needs (DCI). This allows us to invest in multiple 100G wide area links running over coherent wave channel services, running over leased dark fibre. This also allows us to connect datacentres at scale but with a modular build and as such smaller incremental investment steps as we see member growth continue across the 11 London points of presence (PoPs) LINX maintains.

June 2016: LINX co-host the second UK&Ireland Peering forum in Dublin

Automation

The final area of focus and essential to the success of LON2 is automation. LINX is one of the oldest IXPs and in our lifetime we have seen various systems and data sources evolve over our long history. We have set out in 2016 to rationalise systems, map out the overall data model, move to integrate all systems and to deploy network automation on an 'infrastructure as code' approach.

We see the automation essential to support the disaggregated network model. We will first launch the network automation engine on the Juniper products LINX runs in the first half of 2017 which essentially covers LON1 and our NoVA deployment in the United States. Juniper continue to be a significant and important partner for LINX in delivering scale and innovation across our exchange platforms in London and the US.

"Deploying the latest technology allows us to raise standards even higher than before. Our new partners Edgecore Networks and IP Infusion are keen to participate in the LINX and IXP communities, which is important to us and our members."

Richard Petrie,
LINX Chief Technical Officer

July 2016: Price cuts of up to 40% announced on London LANs

Regional Peering

UK Exchanges

Keeping Internet traffic local is one of the keystones for a fast and efficient internet. In order to promote this ethos LINX has a regional development programme to build UK local Internet exchanges.

"We are regularly approached by local communities to build new regional exchanges. We have a clearly defined methodology and set of criteria that must be met when considering building new or extending existing exchanges"

Jo Fereday,
LINX Product Manager

There are three local exchanges in the UK outside London owned and operated by LINX. Each regional exchange will continue to exist as a stand-alone exchange and there are no plans to connect the regional exchanges together or to build any more exchanges outside of the UK.

IXManchester

The largest regional exchange in the group is IXManchester. It is a three node exchange and during 2016 regularly had peak traffic flow in excess of 40Gbps. It is supported by a vibrant local community reflecting the growth of the digital economy in Manchester. To celebrate the fourth birthday of the exchange a training day was held with a karting event afterwards to foster the community and facilitate networking and peering relationships.

IXScotland

In 2016 IXScotland grew to a total of 19 members. We had our first members connected at the exchange with 10GE ports, and one of these also used the colocation re-sales service. In September 2016 LINX took advantage of the local UKNOF meeting being held in Glasgow to organise an introduction to BGP tutorial. This was to raise the profile of the exchange and encourage new members to consider the advantages of peering. The Scottish Audit commission highlighted their vision for 'a world-class digital Scotland by 2020' with an Internet exchange being key for the growth of Scotland in 2017.

IXCardiff

IXCardiff saw traffic growth during 2016 and completed its second year of operation. The introduction of a content cache by one of the members increased traffic flow and provided a good learning experience for the steering committee.

August 2016: LINX exhibit at AfPIF 2016 in Mozambique

North America

LINX NoVA

LINX NoVA grew rapidly in 2016, with traffic more than doubling and nearly as many new participants. By the end of 2016, we had secured our first 100G member port order and 60% of the hyper-scale content networks had committed to the exchange. As such, we have now overcome the *"chicken and egg"* challenge faced by all brand new networks, where neither access nor content networks want to be the first mover. We go into 2017 having built momentum, and confidently expect growth to escalate further.

Future

We intend to make the exchange even easier to reach in the coming year with a minimum of one additional PoP in the roadmap. In addition, we will be extending the number of channel partners we have in North America giving members and prospective members more ways to connect from across the country.

The benefits to members that we have seen by having a local team on the ground since my arrival in the USA on 26th December 2015 are greater than our early expectations and I, along with the LINX America team, look forward to delivering even more benefits to members over the coming year.

"The year LINX NoVA turned two was also the year it began to walk and take real steps forward towards our ultimate objective of it being a self-sufficient IXP providing benefits to members in the region."

Ben Hedges,
LINX America,
Chief Executive Officer

September 2016: LINX lead host at the 11th European Peering Forum in Bulgaria - a record 300 attended

Exchange Growth

778 Member ASNs
72 Countries

Over 5.750 Tbs Peak Traffic inc.PI

17.464 Terabits of connected capacity

123 New LINX applications in 2016
78 Member-facing 100GigE ports

819 Member-facing 10GigE Ports

Connected 1773 member ports

"LINX now has membership from 72 countries, which makes us a truly diverse international networking community"

Kurtis Lindqvist,
LINX Chief Marketing Officer

Membership

2016 was another year of growth for LINX where we saw 123 new members join. We also saw a higher than expected churn rate of membership, but as we closed 2016 with more than 740 members this is to be expected. We grew the number of connected ASNs by 18% to almost 780. LINX now has membership from 72 countries, which makes us a truly diverse international networking community.

We saw a slower than expected growth of 100G ports, but still had a net growth of 32%. We also ended 2016 with a relatively large amount of orders for 100G ports, including the first 100G port outside London, and a 100G port order for NoVA. The slower growth on 100G ports were compensated for by a higher than expected growth rate of 10G ports of 9%. Total connected capacity grew by 18% during 2016. It is also worth mentioning IXManchester, where the number of 10G ports doubled during 2016.

October 2016: 100th membership application of the year received

Partners

2016 continued on from 2015 as a year of stable growth from the ConneXions programme. LINX ConneXions partners provide a remote peering facility for their customers who become remote members. Remote members are set up on VLANs over a reseller port.

To support the growth of the ConneXions programme and broader LINX partnership schemes, LINX hired a dedicated Channel Partner Manager, Emma Saunders, in 2016. The proportion of applications brought in by ConneXions partners increased from 36% in 2015 to 38% in 2016. The net number of ConneXions partners has increased from 28 to 34. Increasing interest and uptake from partner organisations in Africa, the US and Europe promotes the growth of LINX as a global peering destination.

Reseller partners are key for accessing new business on different continents. The majority of applications submitted by ConneXions partners were for networks in Europe. Remote members from the following countries were submitted in 2016: Bulgaria, Czech Republic, France, Hungary, Italy, Luxembourg, Poland, Russia, Spain, Sweden, The Netherlands, UK, Ukraine, Australia, Cambodia, Ghana, Hong Kong, Indonesia, Iraq, Singapore and the USA.

LINX has maintained joint marketing activities with both ConneXions, Branded VPoP and datacentre partners to increase market exposure and raise the profile of LINX to potential new members. Branded VPoP partners work hand in hand with LINX from Anywhere partners, by advertising to networks in their facility that resident carrier networks can provide a connection to LINX.

Products and Services by end of 2016

LINX Products

- **Public Peering**
  Network traffic exchange over a shared network
- **Private Interconnect**
  Member point-to-point connections
- **LINX from Anywhere**
  Remote Layer 2 connections
- **ConneXions**
  LINX connection via vLAN
- **New Member rack space**
  Rack space at PoPs available directly through LINX
- **vPoPs**
  Datacentres providing remote connections to a LINX peering LAN
  - **Branded PoPs**
    Via a LINX approved Layer-2 carrier
  - **Transmission PoP**
    Via a resilient DWDM connection
- **IXP Reseller NEW for 2016!**
  LINX connection from an existing (mutual or non-profit) Internet exchange

LINX Local Exchanges

- **IXManchester**
  Peering LAN in North West England
- **LINX NoVA**
  Peering LAN in Northern Virginia, USA
- **IXScotland**
  Peering LAN in Edinburgh, Scotland
- **IXCardiff**
  New peering LAN in Cardiff, Wales

LINX Services

- **Public Affairs**
  Membership representation on matters of public policy
- **Route Servers**
  Free peering service of member advertised routes
- **Time Servers**
  LINX time servers distribute high accuracy time

New products and services are developed in line with the LINX core values of openness, neutrality, transparency and mutuality. In 2016 LINX added another service to its product portfolio, labelled 'IXP Reseller'. This product offers networks a convenient connection to LINX via local Internet exchange points.

November 2016: Malcolm Hutty presented with Euro-IX award for public affairs services

Public Policy

Global Internet Governance

On 1st October 2016, ICANN (Internet Corporation for Assigned Names and Numbers) completed its transition from being subject to the authority of the US government to the exclusive oversight of the global multi-stakeholder community. ICANN is responsible for determining which generic top-level DNS domains exist, and who runs their registries and under what conditions.

NTIA announced its intention to conduct this transition in March 2014, a fulfilment of a policy commitment of the Clinton administration.

The US government had held ultimate authority over ICANN through a contract with NTIA, an agency of the US Department of Commerce, to perform the IANA technical functions. In practice, US government interference in ICANN's performance of the IANA function was non-existent, but the very existence of the contract enabled the NTIA to exert informal pressure. For example, in 2009 ICANN agreed an *"Affirmation of Commitments"* with NTIA that only alluded to the IANA functions, while focussing on ICANN's policy-making role.

The significance of this move should not be underestimated: the US government regards the reliable and robust operation of the Internet, and its operation free of the censorious expectations of foreign states, to be critical to its national security. It is therefore a remarkable statement of faith in the ICANN's multistakeholder structures, and in the global technical community, that it believes these are better protected by allowing them to mature on an equal basis rather than retaining its privileged position.

In order to reach this point, the ICANN community engaged in an exceptionally detailed preparation process over two years, involving hundreds of people and tens of thousands of man-hours of work. Key elements included both practical preparation for the ongoing fulfilment of the IANA technical functions, and reforms to ICANN's corporate governance processes to ensure that ICANN was effectively accountable to the global community when the US government was no longer capable of intervening.

LINX worked extensively on the governance and accountability portions of this process, particularly on sections that defined ICANN's mission and set the limits of the scope of ICANN's functions, and on mechanisms for challenge and independent review of ICANN decisions. The outcome, endorsed by a broad consensus of the multi-stakeholder community, ensures that ICANN enters the new era as a rules-based organisation with clearly defined objectives and enforceable mechanisms to prevent abuse.

In 2016 the transition of IANA from US government authority to global multi-stakeholder community control was completed

December 2016: CTO, Richard Petrie, speaks at MSK-IX peering forum in Moscow

Domestic and European Policy

The standout domestic policy event of 2016 was the passage of the Investigatory Powers Act, new legislation that consolidated and extended covert surveillance-related powers. Its provisions replaced existing interception and access to communications data powers, and expanded data retention obligations that had been contained in the EU Data Retention Directive that was annulled by the Court of Justice of the European Union.

The expansion of data retention has been a Home Office ambition – and a worry for the Internet industry – for many years through Labour, coalition and Conservative governments, and was the subject of draft legislation in 2012.

LINX's Public Affairs team was closely engaged with this subject throughout its long history. For the Investigatory Powers Act, we focussed on two areas. Firstly, we sought to narrow data retention provisions, to eliminate the possibility of Internet access providers being required to collect *"third party communications data"*, such as who messages whom using a social networking website. This had been a government objective under the Draft Communications Data Bill 2012, but was admitted to be no longer policy when the Draft Investigatory Powers Bill was published, although the Bill appeared to permit such orders to be given. At the conclusion of the legislative process, the Act as passed included text that explicitly excluded third party communications data from the scope of the data retention orders.

Our second area of focus was *"equipment interference"*, where our principal concern was to protect operators from accidental damage caused by government hacking. Here we were successful on two levels. The legislation itself now includes a requirement for public authorities to consider the public interest in the integrity and security of telecommunications systems. An accompanying Code of Practice further requires investigators to specifically consider risks to critical infrastructure before hacking it.

"For the Investigatory Powers Act, the Public Affairs team sought to narrow data retention provisions and also protect operators from accidental damage caused by government hacking."

Malcolm Hutty
LINX Head of Public Affairs

Investigatory Powers Act

As well as expanding data retention, the Investigatory Powers Act also introduced powers for investigators to hack computer systems (known by the euphemism *"Equipment Interference"*), and a suite of *"bulk"* powers to support mass surveillance, mostly in relation to people or computer systems outside the UK. Under one of the most notable new measures, a *"request filter"* will provide investigators with the means to combine, collate and filter communications data sets from multiple communications providers and systems, a search engine for communications data.

The Act balances these new powers with new oversight and approval arrangements: while the government rejected the idea of court approval for the use of covert powers, new *"Judicial Commissioners"* would review non-legislative decisions by the Secretary of State and approve numerous other warrants. An Investigatory Powers Commissioner will keep the operation of the regime under review, and make annual reports to the Prime Minister.

Financial Report

Statement of Income and Retained Earnings	2016 £	2015 £
Turnover	**15,148,821**	**14,264,079**
Distribution costs	(1,371,868)	(1,390,458)
Administrative expenses	(13,763,906)	(13,193,272)
Other operating income	208,842	63,336
Operating surplus	**221,889**	**(256,315)**
Interest receivable	6,794	9,264
Surplus / (deficit) before taxation	228,683	(247,051)
Tax on surplus from non-core activities	(2,797)	(1,854)
Surplus/ (deficit) after taxation	**225,886**	**(248,905)**
Retained earnings at beginning of year	11,475,583	11,724,488
Retained earnings at end of year	**11,701,469**	**11,475,583**

Income and Retained Earnings Overview

Our continuing policy of reducing prices resulted in a significant price reduction being made in the second half of 2016. This was earlier than originally planned and, although we still made a reasonable surplus, a consequential effect was our results were less than budgeted. The Directors consider that the company has continued to perform well during this financial year. Connected capacity and growth continued with a 17% increase to 17.6Tb/s by the end the year and revenue grew by 9%.

Additionally, good performance results were achieved across our measurement metrics. The classification of reseller income and expenditure has been changed this year to include such in turnover and distribution costs respectively. The 2015 comparative figures have been adjusted accordingly.

Balance Sheet	2016 £	2015 £
Fixed assets	**8,535,193**	**8,326,027**
Current assets	**6,166,597**	**6,072,674**
Current liabilities	**(3,000,321)**	**(2,923,118)**
Net assets	**11,701,469**	**11,475,583**

Balance Sheet Summary

We maintained a strong and healthy balance sheet with our net assets continuing to grow. Investment into expanding and improving our networks continued. However, this was not at the same pace as the previous year where extraordinary demand for 100Gb circuits necessitated a very high level of capital expenditure.

Our current assets include a significant amount of liquid funds. Our current liabilities include the prudent provision for unearned income based on in-advance billing.

Cash Flow	2016 £	2015 £
Cash and equivalents at beginning of year	**3,009,297**	**6,918,771**
Operating surplus/(deficit) for the year	221,889	(256,315)
Add-back depreciation charge	3,851,697	4,732,329
Add-back movement in debtors/creditors	71,005	(151,072)
Taxation paid	(1,013)	(15,026)
Cash flow from operating activities	**4,143,578**	**4,309,916**
Purchase of fixed assets	(4,043,098)	(8,223,502)
Foreign exchange movement on fixed assets	(17,766)	(5,152)
Interest receivable	6,794	9,264
Overall cash flow for the year	**89,508**	**(3,909,474)**
Cash and equivalents at end of year	**3,098,805**	**3,009,297**

Cash Flow Analysis

Despite the slowdown in the rate of increased demand, together with the mid-year price cuts, we still managed to significantly invest in our networks and generate a small overall positive cash flow.

In comparison with budget our operational and capital expenditure correspondingly fell with the reduced level of growth as we reacted to the changed circumstances.

Purchase of Fixed Assets	2016 £	2015 £
Network Assets	3,637,341	7,827,610
Leasehold property improvements	218,339	300,767
Computer equipment	187,418	95,125
Total fixed assets purchased	4,043,098	8,223,502

Summary of Fixed Assets

The rapid expansion of member capacity during 2015, principally the increase in 100Gb ports, was at a reduced pace during 2016 with a slowdown in growth. This change in demand resulted in a lower level of growth and investment in our network assets.

Despite the slowdown, we continued to invest in technology advancements. We have also continued the plan for improving our offices. In 2015, the focus was on our London office accommodation and towards the end of this year our improvement plans for our Peterborough offices commenced.

"A strong financial position was maintained during 2016 at the same time as offering members a significant price cut and continuing to invest in latest technology"

Malcolm Holt,
LINX Chief Finance Officer

LINX in the Wider World

Partners, Associates and Supporting Organisations

LINX has enjoyed a supportive and collaborative relationship with its community partners over many years. It is through these relationships within the Internet community level that LINX is able to afford members representation at a global level, the opportunity to benchmark performance, and offer a role in helping make the Internet a safer, more trusted space. It also offers members the chance to influence policies and procedures in the UK and overseas.

EuroISPA

A key partner for LINX is EuroISPA, the pan-European association for organisations representing the ISP industry. Working with EuroISPA allows us to influence policy and legislation at the EU level which LINX has done efficiently and effectively for many years. Malcolm Hutty, LINX's Head of Public Affairs, served as President of the association for five years. He is currently chair of the intermediary liability committee, and the global Internet governance committee.

Euro-IX

Euro-IX, the European Internet Exchange Association, currently has 80 member IXPs from around the world. LINX is a founder member and LINX CEO John Souter is the only person on the Euro-IX Board to have served continuously since the organisation formed in 2001. LINX regularly meets with the IXP community at Euro-IX conferences to discuss and share ideas and experiences for the mutual advantage of the membership. This is done via technical meetings, mailing lists and online resources. Euro-IX also gathers information on regulatory issues affecting member exchanges that could potentially impact the membership from within the European region, and other jurisdictions, in the future.

Internet Exchange Federation

IX-F, the Internet Exchange Federation, is a global platform for associated Internet Exchange Point Associations including Euro-IX. Its goal is for exchanges to collaborate *"to build a global IXP community and help the development of IXPs throughout the world"*. The IX-F Executive Board also includes LINX CEO John Souter amongst its members.

Internet Watch Foundation

LINX played a pivotal role in the creation and start-up of the Internet Watch Foundation (IWF). One of the roles of the organisation is to assist hosting providers identify and remove child abuse images hosted on their servers. In 2016 the IWF celebrated its 20th anniversary. In 1996, the UK hosted 18% of the world's known online child sexual abuse material. Today, it hosts just 0.2%.

The Internet Society

The policy and international engagement activities of the Internet Society (ISOC), are rooted in the organisation's fundamental belief that the Internet is for everyone and should be available to people everywhere. ISOC works with governments, national and international bodies, civil society organisations, the private sector, and other stakeholders to reach decisions about the Internet that conform to its core values. ISOC's mission to preserve and protect the open, collaborative, distributed, multi-stakeholder model is strongly supported by LINX and its stance has defined the successful development of the Internet for many years. As an *"Organisational Member"* of the Internet Society, membership enables LINX to influence Internet policy on a global stage, through international forums such as the IGF, the ITU and ICANN.

LINX

Est. 1994

Contact LINX

London Internet Exchange Ltd
5th Floor 24 Monument Street
London EC3R 8AJ United Kingdom

London Internet Exchange Ltd
Trinity Court Trinity Street
Peterborough PE1 IDA United Kingdom

Phone: +44 20 7645 3501
Fax: +44 20 7645 0720
Email: info@linx.net
Web: www.linx.net

LINX
Est. 1994

© London Internet Exchange 2017