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## **The Commercial Internet eXchange (CIX) Router 1991-2001.**

To summarize the importance of the CIX Router, it represents:

- The first arrangement between commercial Internet Service Providers (ISPs) for the exchange of traffic
- It was a novel, non-traditional use of router technology allowing users of competing ISPs to exchange traffic allowing the customers of the interconnected networks access to each other.
- It was the first commercial implementation of a zero settlement economic model breaking the traditional telephony approach to monetary settlement for the exchange of traffic.
- The setting up of the CIX was central to the breaking the de facto monopoly of the ANS/NSFNET arrangement and the restriction of the Acceptable Use Policy that was maintained by the NSF.

The CIX was the first commercial Internet eXchange (IX) point, it helped foster the creation of many other IX's and to provide a framework for the interconnection architecture that the NSF defined to replace the NSFNET. There are more than one hundred and fifty IXPs distributed across the world in every country and region today. And these are essential to the ability of Internet users to be able to communicate with each other no matter who is the ISP or the country or region in which they operate.

The CIX as the first Internet eXchange point helped establish the contemporary context of interconnection arrangements for Internet services worldwide. In so doing it ran against and sustained challenges from traditional telephony models. It helped define and establish the principles of operation for IX's covering issues such as Security, reliability, ubiquity, types of service that remain very relevant today

The CIX established the business models for interconnection and exchange of traffic between ISPs allowing for an open competitive environment and over a thousand ISPs were launched in the US alone in the period from the founding of the CIX as a commercial interconnect point in March 1991 and the turning down of the NSFNET in the Fall of 1994. The traffic exchange models based on multi-lateral and bi-lateral "peering" were adopted internationally and remain the basis of traffic exchange arrangements ("peering agreements") between ISPs today.

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## Description of the CIX Router

### Supporting Documentary Material

#### **CIX Router and the Privatization of the Internet**

The best self contained discussion of the controversy surrounding the transition of the government subsidized Internet services supported by the NSFNET to commercial services provided by Internet Service Providers [ISPs] is set out in the Cook Report on the Internet<sup>1</sup>

There is a good discussion of the role that the CIX and the Router played in the rather lengthy account of the NSFNET vs privatization story here. I've spoken with Gordon Cook about what I've been trying to do regarding the CIX Router and he's said he's willing to offer his account of the Privatization of the Internet. I've provided it on CD in the package with the other documentary materials.

#### **The rationale for founding the CIX and other documentary material**

With the help of Barbara Dooley, the last Executive President of the CIX and William Schrader I've been able to gather documentary material (some of which I've been able to share with you already) that covers:

1. Handwritten notes from an early planning discussion of the rationale for a commercial exchange point for Internet traffic between PSInet, CERFnet, and UUNET. These notes appear to be in Susan Estrada's hand.
2. The original articles of association, terms of membership and connection to the Router
3. The original drafts and final Press Announcement in March of 1991 announcing the formation of the CIX between PSInet, CERFNET, and Uunet.
4. The original agreement between ANS and the CIX under which ANS agreed to exchange traffic with CIX member networks.
5. The original routing plan between the CIX and ANS and a number of other key drawings of network topology showing the role of the CIX router.
6. Lists of the attached networks at the formation of the CIX including charging structures and first invoices for service provided.
7. Lists of the attached networks at the peak of membership (1997) as well as other membership related material.
8. Shutdown notification of the Router December 1, 2001

I have gathered and organized all the documentary material (roughly 100 pages in file folders, and a CD with the Cook Report on Privatization). It all fits loosely into a two inch deep FedEx shipping box.

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## **Persons Associated with the Foundation of the CIX**

William Schrader (who together with Susan Estrada and Rick Adams founded the CIX), has provided some of the documentary material and based on our discussion this summer, would be happy to meet to discuss the details of the documentary material.

Also I've identified the people below as having an involvement with the CIX and or the router. These would be good a good further resource to take both an oral account of the events at the time as well as request that they look around for additional documentary material especially photographs etc.

### **Contact information for the people who have had relevant involvement with CIX router at different stages of its history.**

Though I have not contacted all of them regarding this project, I could do so if you would like me to help in this regard. I'd added a short description as to the person's specific role during the CIX router's history.

### **CIX Router Engineering and Operation**

#### **Paul Vixie,**

Vixie Associates

paul@vix.com

mobile: 650 222 6501

Internet engineer managed the router for most of the time it was operational

### **PSI**

#### **Mark Fedor**

Mark Fedor

703.637.0780 - office ph and fax

fedor@schoffstall.com

fedor@north-gate.com

Worked for PSI and was involved in the initial setting up of the router to

interconnect UUNET, PSI and CERFNET the first commercial ISPs other than ANS which was funded by the NSF.

#### **Marty Schoffstall**

Internet engineer (Mark Fedor worked for him) as the senior engineer took a major part in determining how the interconnection of multiple commercial service would be first established

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**Bill Schrader**, former CEO PSI

"William L. Schrader" <wls@inter.net>

Key to setting up the CIX and remained involved with the organization for many years.

## **UUNET**

**Rick Adams**

Very reclusive CEO of UUNET

**Andrew Partan**

**Mike O'Dell**

Mike O'Dell <mo@ccr.org>

Internet engineer the senior engineer for UUNET

## **CERFNET**

**Susan Estrada**

President and CEO, Aldea Communications

Executive Director CNEC

2380 Camino Vida Roble, Suite A

Carlsbad, CA 92009

619-929-0580

1-760.929.0580 (phone and fax)

sestrada@aldea.com, susan@aldea.com

<http://www.aldea.com/susan.home.html>

<http://www.inmotionmagazine.com/estrada.html>

With Bill Schrader and Rick Adams helped set up the CIX.

## **Sprint**

**Bob Collet** <bobcollet@att.com>

Also was one of the leading lights of the early days of the CIX and brought

Sprint into CIX membership making Sprint the first traditional telephony carrier to join the CIX router.

## **Sprint and subsequently MCI**

**Farooq Hussain**

At Sprint the National Science Foundation's Principal Investigator for the

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Network Access Point (NAPs) that were to form the basis of commercial Internet interconnection post the NSFNET transition. Moved to MCI in 1996 where he was responsible for peering policy including international interconnection.

## **ANS**

### **Allan H. Weis, Jordan Becker, Guy Almes**

President of ANS and Internet engineer respectively. ANS was funded by NSF to run the NSFNET. ANS fought against interconnecting with other commercial service providers in an attempt to maintain dominance in the market place when Internet Service Providers were just emerging.

## **NSFNET**

Steve Wolf, NSFNET Director  
Currently with Cisco, Office of the CTO

swolff@cisco.com

## **CIX Executive Directors:**

### **Bill Washburn**

Email: bill.washburn@xns.org Tel: +1 650-248-6113 (business hours, Pacific time)

<http://www.xns.org/pages/management-and-counsel.html>

### **Susan Fitzgerald**

### **Barbara Dooley**

bdooley@attglobal.net

These three Executive Directors presided over the implementation and operation of the router at different times over the period 1991 - 2001.

### **John Montjoy**

JohnMontjoy@aol.com

Board Chairman of CIX at its handover to Steptoe and Johnson, in January 2002 the organization adopted a new name USISPA (US ISP Association) a subsidiary organization that had been earlier established by the CIX.

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## CIX Router Recent Photographs



**Photo 1: Router (back view)**

PC terminal keyboard included in the photo is an accessory not a key component of the router. A CSU/DSU is also included and was used to connect the router to the PACBELL SMDS service. For many years smaller ISPs accessed the router over this SMDS service while the larger ISPs maintained direct connections from their own collocated routers at the PAIX using a DEC Gigaswitch, FDDI, Ethernet and Fast Ethernet services as available



**Photo 2: Router (front view)**

The Cisco 7500 Router manufactured in 1994 was the leading edge technology. The use of a router for the specific and exclusive purpose of exchanging traffic between different commercial (and competing) Internet Service Providers was novel and specific to the arrangement where multiple members of the CIX all shared their Internet routes by accessing this router and sending and receiving traffic from it.

The initial router is believed to have been a Cisco AGS, this router was required to be replaced because of the spectacular growth in the number of member networks of the CIX and the aggregate volume of traffic being exchanged.



**Photo 3: Router Identity**

This Cisco 7500 was the workhorse router for the majority of the CIX's operation as an Internet eXchange point. It was physically identified only by the label on the back of the router marked: "CIX PALO ALTO"

During its operation the CIX Router was allocated IP Address Space and the operated under the domain CIX.NET with the Autonomous System Name: CIX-AS1 and Autonomous System Number: 1280 with the IP Address block: 149.20.00/16

The router has a height and depth of approximately 36". It has a width of 19" consistent with being able to be fitted in a standard rack for telecommunications equipment. The router itself was never rack mounted being situated instead as a floor standing device in the central Palo Alto Internet eXchange (PAIX) controlled floor area [therefore not accessible only to personnel authorized to manage it].



**Photo 4: CSU/DSU**

The packaged CSU/DSU can be seen placed on top of the router where it would have been located during the router's functional operation.

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The CIX Router is currently located in Reston, VA, and stored in a Cisco palette/crate at the offices of Equinix, it was previously kept by Telia International Carrier.

Several people involved with the operation and maintenance of the router have offered to help re-create the specific immediate environment including cabling etc. The original routing tables and some graphical representation of the router statistics showing the exchange of traffic between peers is also possible. Representation of the rate of traffic growth from the establishment of the CIX router in 1991 to its shutdown in December 2001 can be shown [including reference to misperceptions during the late 1990's ]. It is also possible to provide a visual display of several "Looking Glass" servers that observe the traffic exchanges at IX's worldwide today.

## Notes

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<sup>i</sup> Cook, Gordon, "Cook Report on the Internet" [archived document on the NSFNET vs "Privatization" debate] <http://www.cookreport.com/p.index.shtml>