

# New Internet Economics Might Not Make It to the Edge

Greg Goth



One central tenet of open source software development is, “Given enough eyeballs, all bugs are shallow.”

Numerous eyeballs are now also affecting the central engineering and economic foundations of the Internet’s architecture. The traditional schematics of a hierarchical network began with a large base of last-mile customers – both enterprise and consumer connections – which led to regional ISPs, then to exchange points, and eventually to the top of the pyramid: the tier-1 ISPs with either a global presence or enough clout to command free transit (peering) worldwide. Bits would flow from edge to edge through the top of the pyramid and back.

However, numerous network analysts think the Internet has entered a new era in which those who provide content and those who provide eyeballs – that is, customers – are creating new exchange and peering architectures that could effectively cut out those entities that provide neither. At the October meeting of the North American Network Operators Group (NANOG), representatives from Arbor Networks, the University of Michigan, and Merit Networks presented a report that showed tremendous consolidation of traffic origin and a change in the type of organizations behind that traffic ([www.nanog.org/meetings/nanog47/presentations/Monday/Labovitz\\_ObserveReport\\_N47\\_Mon.pdf](http://www.nanog.org/meetings/nanog47/presentations/Monday/Labovitz_ObserveReport_N47_Mon.pdf)).

“I think one of the points of our

paper was the degree to which the nature of the Internet is changing,” says Craig Labovitz, chief scientist at Arbor. “It’s no longer about bits or connectivity. It’s about access to services and content.”

A prime example of this new model, Labovitz says, is Comcast. The Philadelphia-based company is the largest provider of cable television service in the US, serving 23.8 million cable customers, 15.7 million broadband customers, and 7.4 million voice customers. However, it has also joined Google in the Arbor/Merit/Michigan report’s top 10 carriers of Internet traffic; as Labovitz and his colleagues pointed out in their report, the two content giants have entered space previously occupied exclusively by tier-1 carriers such as Sprint, Level3, Global Crossing, and Japan’s NTT.

In December 2009, Comcast closed on a deal with General Electric and French media corporation Vivendi that would give it controlling ownership of entertainment conglomerate NBC Universal. The deal illustrates a further concentration of strength, and should it pass regulatory scrutiny, Comcast will own content creation, backbone, and last-mile assets, through which it will have even stronger negotiating leverage with other network participants.

## No More Lines in the Sand

“For 100 years we had nice lines in the sand we could draw between a national carrier and a consumer

access provider, or a cable operator and voice carrier, and until recently we could draw a line between a content-delivery network [CDN] and a transit provider,” Labovitz says, “and these are all becoming increasingly not meaningful. Transit carriers offer CDN services, CDN’s offer transit. Content owners like Google have their own global backbone.”

“We have a situation where the broadband providers have a tremendous amount of traffic, and content providers have a tremendous amount of traffic,” says Dan Golding, vice president and research director at analyst firm Tier1 Research. “They have just peered with each other, and if you are a traditional tier 1 who is not in one of those two categories, you’re sort of dying on the vine. I coined the term that describes it as ‘donut peering,’ where you have traditional tier 1’s in the middle and all the other folks are peering around them. They can’t get 100 percent of their traffic to its destination without touching a traditional tier 1, but they can probably get 50 to 75 percent through.”

Golding says that the benefits to the ultimate customers of these newly defined connections are likely to be more aesthetic than economic, though the traffic carriers will see definite economic returns.

“Because these arrangements are being made, the economic inefficiencies are being driven out of the routing system. That’s allowing content providers to much more inexpen-

## News in Brief

**Lorenzo Colitti** and **Erik Kline**, both engineers at **Google**, were honored in November with the **Internet Society's** first annual **Itojun Service Award** for their outstanding contributions to IPv6 development and deployment. The award, which was presented to Colitti and Kline at the **IETF's** meeting in **Hiroshima**, honors the memory of **Jun-ichiro "itojun" Hagino** and recognizes his extraordinary dedication to IPv6.

More information is available at [www.isoc.org/itojun](http://www.isoc.org/itojun).

The **Electronic Frontier Foundation (EFF)** has launched "**Act on ACTA**," an effort aimed at the **Anti-Counterfeiting Trade Agreement (ACTA)**, which the EFF says includes a disturbing absence of discussion on individual consumer rights and "threatens to shift the balance of copyright law across the world" with little legal oversight. The agreement's scope is broad, going far beyond physical goods to include Internet distribution and IT tools. **Australia, Canada, Europe, Japan, and the US** are among the nations negotiating ACTA behind closed doors. Information emerging from these sessions indicates that an entire section of the treaty is devoted to **rights management and the Internet**, suggesting, says the EFF, a willful ignorance of digital rights management's failure in the market.

More information is available at [www.eff.org/issues/acta](http://www.eff.org/issues/acta).

In **Symantec's** year-end assessment of **2009 and 2010 trends to watch**, the security software vendor noted a nine-fold increase in **malware-bearing spam** at the end of last year, with more than 2 percent of emails sent between

September and October carrying malware attachments. The report also discussed **10 upcoming issues** for system security, including that antivirus software alone will no longer offer sufficient security protection and that third-party social networking applications will offer attackers increasing opportunities for fraud.

More information is available at [www.symantec.com/about/news/resources/press\\_kits/detail.jsp?pkid=security\\_storage](http://www.symantec.com/about/news/resources/press_kits/detail.jsp?pkid=security_storage).

The London-based **Open Rights Group (ORG)** has issued a briefing to the UK's House of Lords regarding the proposed **Digital Economy Bill** and launched an "**Adopt Your MP**" campaign in protest of the bill's proposal to disconnect users accused of copyright infringement without sufficient due process. Among ORG's other complaints are that the bill gives the government "extremely wide powers" to revise copyright law.

More information is available at [www.openrightsgroup.org/ourwork/reports/digital-economy-bill-briefing](http://www.openrightsgroup.org/ourwork/reports/digital-economy-bill-briefing).

The **International Telecommunications Union** has announced agreement on two new IPTV standards aimed at enhancing interactivity. The **Application Event Handling for IPTV Service (H.740)** recommendation enables improved two-way communication in IPTV services by providing an application event-handling framework to support interactive services such as voting and e-commerce. The **Lightweight Interactive Multimedia Framework (H.762)** provides a subset of HTML and JavaScript for use on resource-limited IPTV terminals, such as televisions.

More information is available at [www.itu.int/ITU-T/newslog/New+Standards+Bring+Interactivity+To+IPTV.aspx](http://www.itu.int/ITU-T/newslog/New+Standards+Bring+Interactivity+To+IPTV.aspx).

sources tell him that the new truncated network topology is indeed increasing performance, using Comcast as an example.

"Comcast now has a paid peering service (partial transit, in which one network provider pays another a fee that is usually lower than traditional transit rates to gain access to that entity's network), so content companies and CDNs can be topologically right on the Comcast network," he says. "As a result, some of my sources estimate the delivery of that content to be up to twice as fast."

### Flexible Peering, Meet Regulatory Uncertainty

Although consolidation and increased negotiating and peering power have resulted in a new economic and engineering topology in the network core, some observers are concerned that this new topology's future could be greatly affected by the net neutrality issue, which is currently being explored in a US Federal Communications Commission (FCC) Notice of Proposed Rule Making (NPRM).

Some industry observers are fearful that the FCC means to curtail paid peering arrangements, especially in paragraph 106 of the NPRM, which states, "We understand the term 'nondiscriminatory' to mean that a broadband Internet access service provider may not charge a content, application, or service provider for enhanced or prioritized access to the subscribers of the broadband Internet access service provider [...]. We propose that this rule would not prevent a broadband Internet access service provider from charging subscribers different prices for different services" (see [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-09-93A1.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-09-93A1.pdf)).

Richard Steenbergen, chief technical officer of Chicago-based nLayer, a wholesale access provider, says that though he dislikes any business climate that allows

sively provide more content. The old hierarchical pyramid is really inefficient. That pyramid has been short-circuited. The new model won't make your broadband bill any smaller, but

it probably means the additional content you want will be available for the same price."

Peering expert Bill Norton, former chairman of NANOG, says his

any powerful network participant to exact a premium for service levels that should be available through equitable agreement, he's also fearful that overly strict regulation of paid peering agreements could stifle flexibility.

"I'm actually a customer of paid peering, and it makes economic sense in some instances," Steenberg says. "Paid peering is actually not a bad thing in itself; it's buying partial transit. It can be a way to buy something [where] the other side knows they're making money from both sides of the bit, so they can charge you a cheaper price. It only applies to big networks, but if you are a big network, and if you don't meet another's peering requirements – but can give them some money – it can be cheaper than buying full transit."

### What's in It for the Edge?

How reengineering the network's peering architecture will benefit the last mile remains a vexing issue. Although numerous incentives might aim to truncate bit-hauling architectures between carriers, the incentives for last-mile customers and their providers remain – in many instances – antagonistically aligned. Last-mile infrastructure is expensive, and customer choice in many areas is limited to one or two providers. On a small scale, however, research and education (R&E) networks might offer a glimpse into the possibilities of more smaller players offering competition.

Though even the most ardent of R&E network champions don't claim they can offer enough last-mile presence to compete with commercial carriers, some R&E networks have been able to create peering arrangements that save their customers, such as universities, 40 to 50 percent of transit costs, according to Bill St. Arnaud, chief research officer for Canarie, Canada's national R&E network.

In some places, St. Arnaud says, R&E networks are facilitating middle-mile access. For example, British Columbia's BCNet offers local and regional ISPs peering access at its Vancouver Transit Exchange. These smaller carriers save costs by directly connecting with each other instead of sending bits through upstream providers and back.

The operators of another R&E network, the North Carolina Research and Education Network (NCREN), have applied for US\$28.1 million in federal broadband stimulus funding to build 600 miles of middle-mile fiber (see [www.ncrecover.gov/news/PressReleaseDetail.aspx?newsItemID=62](http://www.ncrecover.gov/news/PressReleaseDetail.aspx?newsItemID=62)). Theoretically, such public investments in the middle mile can lower last-mile operators' costs and encourage investment and expansion. And, despite the conventional wisdom that R&E networks are too small and lack the technical capacity to compete with their commercial counterparts, myriad customers remain served by connections that lag far behind the state-of-the-art, operated by commercial carriers reluctant to invest in last-mile infrastructure in many areas. This segment of the market could be served if R&E networks expand.


"Some local R&E networks have stayed away from community development, whereas others consider it an important part of their mission," St. Arnaud says. "If they wanted to, they could be active there and work with municipalities, establishing peering points that are often at universities' facilities or in a local municipal building. That's really up to the regional networks."

Though Tier1's Golding says he's not an advocate of publicly run fiber networks, he does think wireless networks run over reserved spectrum for low-power radio could offer some sort of alternative over five- to 10-mile areas. Such an approach, he says, could be a cata-

lyst for increased investment from commercial carriers.

"You probably can't compete, but at least you're keeping them honest," he says. "Once you start rattling your saber about setting up something like that, they become much more involved for two reasons; they don't want the competition, and they also say, 'Hey, maybe there's a business case here, and we didn't realize it.'" □

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