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PS overview

PS ID:	PS-UK-3746
Status:	pending
Date of Creation:	2009-10-05 12:28
Date of last Modification:	2009-10-05 17:21
Quality Label:	This PS has not been Quality labeled

Call Identifier:	ICT Call 5 (FP7-ICT-2009-5)
Challenge:	Challenge 1: Pervasive and Trusted Network and Service Infrastructures
Objective:	1.1 The Network of the Future
Funding Schemes:	STREP
Evaluation Scheme:	One Step
Closure Date:	26/10/2009
Country:	United Kingdom

PS details

PROPOSAL AT A GLANCE

Proposal name:

Edge Interconnect

Subject:

Maximising efficiency, speed and quality of Europe's consumer Internet experience

By interconnecting ISPs at the edge of the network, Edge Interconnect will allow the most popular media traffic to move to P2P without incurring backhaul bandwidth costs. For popular on demand or live material this will bring massive savings for both ISPs and content providers whilst dramatically improving the consumer experience by allowing higher-bandwidth content to be viewed and exchanged. Novel Internet architectures and technologies will be employed to maximise the efficiency, speed and quality of Europe's consumer Internet experience.

PROJECT DESCRIPTION

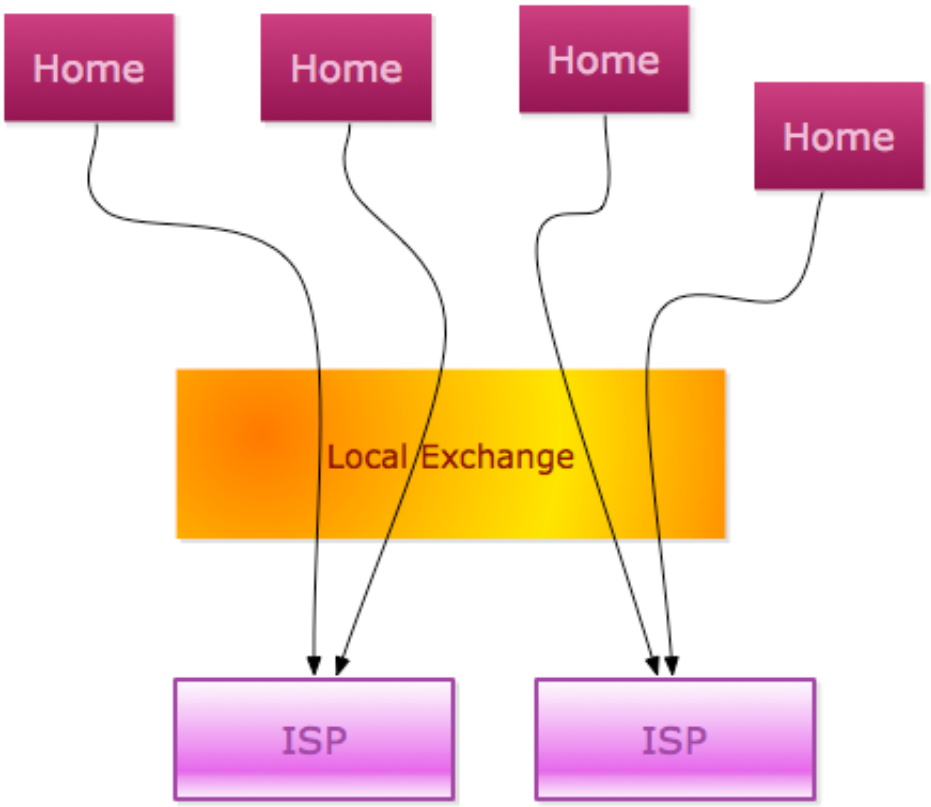
Proposal Outline:

Current Problem

The current trend is that audiovisual media is moving to the Internet at an ever-increasing rate. The resulting bandwidth crisis threatens the viability of whole consumer ISP business.

Backhaul bandwidth is the single largest cost that consumer ISPs have. Popular video and P2P content accounts for a large amount of the overall ISP backhaul traffic and thus cost.

Current Approaches

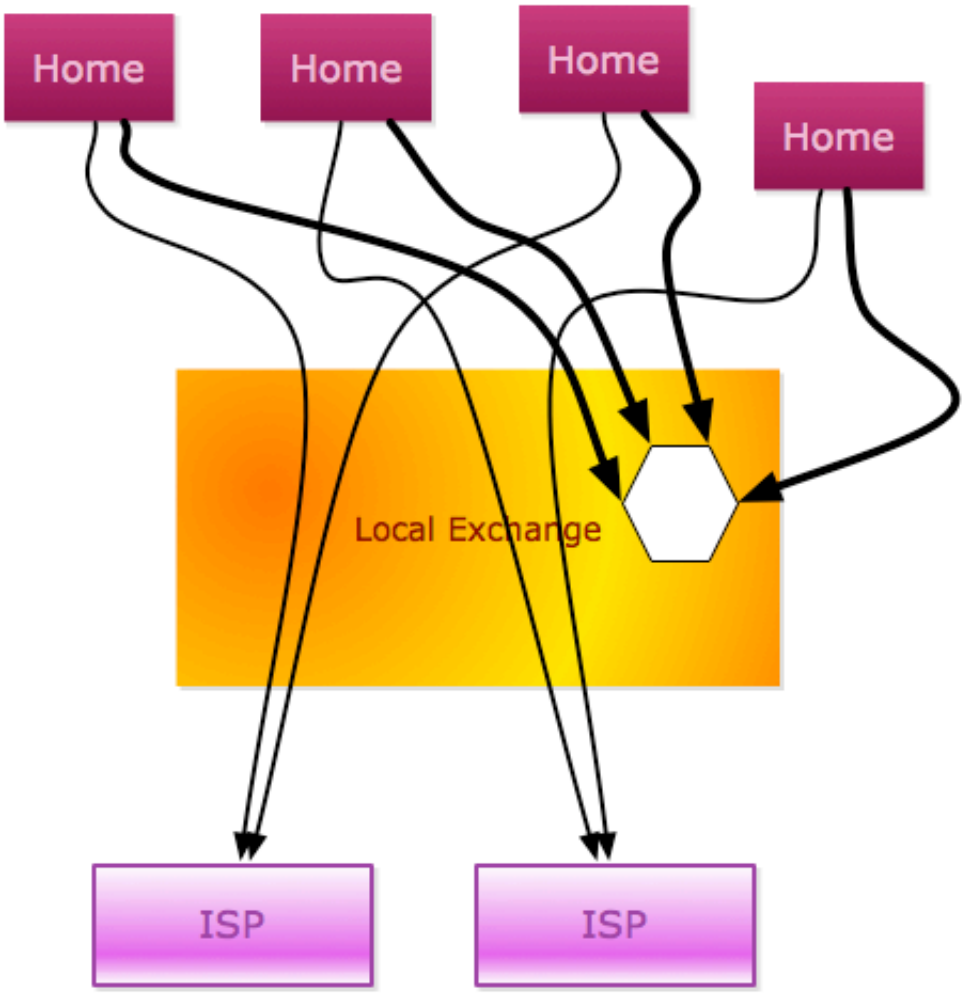


ISPs have attempted to solve this problem by introducing bandwidth caps to get rid of excessive bandwidth customers. However, this approach is failing because heavy bandwidth users are becoming the majority and punitive bandwidth charges are unpopular with customers.

Content delivery networks can reduce ISP interconnect charges but do not reduce exchange backhaul costs. Putting large amounts of storage at the edge of the network is not only difficult to manage but also raises legal and other commercial issues for ISPs.

At the moment P2P offers advantages to consumers but not ISPs. In fact, P2P makes overall traffic consumption increase, and as a result some ISPs have attempted to actively discourage P2P traffic on their networks by a variety of means.

Proposed Solution



Edge Interconnect consists of providing shortcut interconnections at the local exchange (or exchange area) level. Exploiting the fact that a single fibre optic cable between two racks within the same exchange can provide gigabits per second of bandwidth at a tiny fraction of the cost of hauling that same bandwidth over tens or hundreds of kilometres over existing transmission networks.

Edge Interconnect will allow the most popular media traffic to move to P2P without incurring backhaul bandwidth costs. For popular on demand or live material this will bring massive savings for both ISPs and content providers whilst dramatically improving the consumer experience by allowing higher-bandwidth content to be viewed and exchanged.

In the past, this approach has been considered and rejected because the commercial benefits did not outweigh its costs, and the necessary level of cooperation between providers required to implement this approach did not exist. We believe that the current crisis has changed the landscape of the ISP business sufficiently to warrant that this approach be re-examined.

Although implementing Edge Interconnect requires the resolution of numerous technical issues, the real challenge is to summon the political and commercial will on a pan-European scale.

Similar initiatives have worked in the past at the ISP network core level, with the spontaneous creation of Internet exchanges. However, the regulatory situation at

the network edge prevents this kind of spontaneous initiative by providing a set of perverse incentives that act to preserve the current high-cost low-profit environment.

Another advantage is that Edge Interconnect only requires network equipment at the exchange. Media content is not stored nor is there any need to allocate or manage storage resources.

Technical Approach

From the consumer viewpoint they would see both their normal connection to the public Internet and also a local cloud. This local cloud would typically be ten of thousands of potential peers in size, sufficient that most popular content would already be on at least one of those peers.

The local cloud would be shared across all users a particular exchange regardless of which ISP they use to connect to wider Internet. Use of the local cloud would require consumers to opt in via special software and settings in their ADSL router. Existing Internet users would not be affected in any way.

The entire system only requires changes to the home ADSL router and the local exchange equipment. Since the shortcut interconnect would not affect normal ISP routing or network architecture the costs to ISPs would be minimal. All other ISP operations would remain unchanged and the traffic would not touch the ISPs' networks.

The utility of this local cloud would be proportional to the square of the number of peers active on it at any given time. Obviously this system only makes economic sense in any given exchange area once it has achieved critical mass within that area. However, there is no requirement for critical mass on a national or international basis. This system can therefore be trialed and rolled out incrementally as desired reducing investment costs and risk. In particular allowing a pilot project to realistically evaluate the effectiveness of this solution without requiring a large scale rollout.

Expanding Overlay Topology

The overlay topology can be expanded to a mesh while maintaining IP locality. The simplest implementation of Edge Interconnect sets up local islands of connectivity within each exchange area, without any connection to either the Internet or one another. They are thus only useful for sharing content that is already available on another peer within the same cloud, which necessarily means that the content must already have better than (say) 0.01% reach, for an island with 10,000 active peers.

It may be worth investigating the addition of limited-range routing between islands, for example by only one IP hop between islands, so peers on any given island can see only the other peers on their own island and its immediate island

neighbours. (For example, each pair of exchanges might be linked by a single short-range link on a single wavelength on a single fibre pair: note that the inherent failure-tolerance of p2p networks obviates any need for protection circuits. If the wavelength or fibre pair is taken from pre-existing WDM or physical fibre infrastructure between exchanges, the marginal cost can be quite low.)

Not only would this instantly increase the utility of the system by increasing the number of peers visible from any host, it would also potentially greatly expand the effectiveness of the entire p2p overlay network, by allowing wide-area diffusion of p2p content from neighbour island to neighbour island, while not providing wide-area IP transit (which is explicitly not a goal of this system: that's what the Internet is for, provided by the respective ISP networks).

Keywords:

Increasing Internet efficiency
Novel Internet Architectures And Technologies
Dynamic, Efficient And Scalable Network Protocols
Quality Of Service
Point-To-Point Distribution
Point-To-Multipoint Distribution
Future Service Architectures
Rich Media Networking
Machine-To-Machine Communication
Dynamic Peering
End-To-End Content Delivery Techniques
P2P
Peer-To-Peer
Peering
Edge Interconnect
Content Delivery Networks

PARTNER PROFILE SOUGHT

Required skills and Expertise:

There needs to be a box in the exchange: some kind of router or switch:

• Router / switch manufacturers...

The box needs to connect to the DSLAM by some means... (which may or may not affect the DSLAM: for example, ATM-only DSLAMs may not need any change at all. Other possible handoffs include L2TP...

• DSLAM manufacturers

And needs to provide various network services in a secure way...

• Systems integrators, network protocol experts

And be controlled remotely...

• Systems integrators

The consumer-end ADSL router needs special firmware in order to be able to support multiple PPP sessions on the same link, or connections over two different ATM VCs simultaneously -- or something else...

• Home router manufacturers

The whole thing needs to be carefully designed to be compatible with existing P2P software; possibly also work on tuning P2P software so as to be aware of bandwidth opportunities. The whole system needs to be designed in such a way that it does not present problems for either existing hosts or ISP networks. The system probably needs to work in a different way over IPv6 as opposed to IPv4. Things like the limited-horizon reachability stuff need to be thought about.

• Network researchers from both manufacturers and academia. P2P software developers

ISPs need to trial the system, and various parties need to assess its commercial impact and engineering effectiveness, and economic performance of the entire system; also the economic tradeoffs of adding, for example, inter-island interconnects, vs. the added costs.

• ISPs, telco consultancy companies, economists, telco regulators

Who pays for the extra cost? The ISPs, broadcasters, the consumer? Can the costs be made back from savings in backhaul bandwidth? If these savings are bigger than the costs, who gets the remaining savings? Is government subsidy -- or quasi subsidy such as long-term low-interest loans -- appropriate for such a scheme?

• Economists, telco regulators

What impact is there on privacy, network neutrality, etc. etc?

• Telco regulators, civil liberties groups, other interested parties

Broadcasters need to evaluate the effectiveness of the system for putting, for example, peak-time broadcast on the system.

• Broadcasters

Possible other approaches, such as reliable multicast, could be investigated.

Description of work to be carried out by the partner(s) sought:

See "Required skills and Expertise".

Type of partner(s) sought:

• Router / switch manufacturers...
• DSLAM manufacturers
• Systems integrators, network protocol experts
• Systems integrators
• Home router manufacturers
• Network researchers from both manufacturers and academia. P2P software developers
• ISPs, telco consultancy companies, economists, telco regulators
• Economists, telco regulators
• Telco regulators, civil liberties groups, other interested parties
• Broadcasters

"Edge Interconnect" is an idea from Kendra Initiative:

Kendra Initiative (hosted and managed by Kendra Foundation) is an international media, technology, academic and industry alliance. The mission is to foster an open distributed marketplace for digital media (including films, music, images, games and text). The initiative researches, recommends and develops enhancements to the digital media marketplace that facilitate interoperability between and revenue generation for content owners and service providers; to enable consumers to use any device or application to browse, search and purchase content from any content catalogue, seamlessly. Its goals are to:

• Simplify and streamline buying and selling digital content by driving industry adoption of open protocols.

• Enable interoperability between service providers, media applications and devices - every link in the
• content value chain.
• Build a system where consumers can use any device or application to browse, search and purchase from the globally distributed collection of content catalogues.
• Create a more pleasurable buying experience for consumers and increase reach and revenue for content owners.

Kendra is currently working on the following funded EU and UK projects:
• P2P-Next (Next Generation Peer-to-Peer Content Delivery Platform) EC FP7 IP commenced early 2008
• Valid (Video Access and Licensing Identity Database for Education) UK TSB commenced mid 2009
• Saracen (Socially Aware, collaboRative, scAlable Coding mEdia distribution) EC FP7 STREP to commence early 2010

The Proposer is looking for a Coordinator:

Yes

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Department:	Research And Development		
How did you find out about us?:	Friends and colleagues		

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