

The Broadband Revolution: Innovation and the Threat of Government Regulation

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Executive summary

The social, cultural and economic implications of information and communication technology (ICT) are profound. From information aggregators, social networking sites and search engines to Business to Business (B2B) exchanges, online banking and retail websites, the Internet has changed and is changing our lives. ICT is estimated to be responsible for as much as 40 per cent of annual increases in European productivity. Meanwhile, although it represents only about 5 per cent of European GDP, ICT represents over 25 per cent of the continent's research and development outlays.

The potential for future innovation is in principle unlimited. However, innovation might be seriously curtailed by government regulation of telecommunications networks. We are particularly concerned with certain proposed regulations currently being considered by the European Union, which threaten to prevent broadband access providers (BAPs) from providing the kinds of differentiated services that would benefit consumers.

Such regulations, ostensibly intended to promote "net neutrality," would diminish the quality of service (QoS) provided to many customers. Bottlenecks would become worse, connection speeds would falter, urgent calls would fail to go through, Internet connections would be dropped at crucial times, and so on. Instead of providing the backbone of future productivity growth and new products and services, the Internet would increasingly become a source of frustration.

BAPs and other Internet Service Providers (ISPs) operating in a competitive environment have strong incentives to provide the bandwidth and QoS demanded by the range of end users that exist. The best approach

to improving the provision of broadband access is to ensure that the environment in which BAPs operate is competitive. That means removing regulatory and other government-imposed barriers to competition, *not* creating new barriers in the form of restrictions on differentiation and mandatory QoS.

Introduction

Modern telecommunications have transformed European businesses and changed the lives of European consumers for the better. Improvements in telecommunications over the past decade have made businesses more productive, more competitive and more customer-oriented. New business models have been developed based entirely around the Internet – from B2B exchanges, to web-based retail. Social networking sites enable people to interact with one another in ways previously unimagined, offering opportunities for cultural development and the emergence of new forms of community, while also offering new ways to market products to narrowly defined groups.

Advances in ICT are estimated to be responsible for a significant share of European growth. The use of ICT was responsible for as much as half of Europe's economic growth between 1995 and 2005.² Vivianne Reding, the EU Commissioner for Information Society and Media recently stated that ICT was responsible for 40 per cent of annual increases in European productivity.³ The use of ICT is enabling European business to be more competitive and more innovative. In the EU, 32 per cent of companies reported innovations, with ICT enabling half the product innovations and 75 per cent of the process innovations. Meanwhile, at least one quarter of all European research and development activity takes place in the ICT sector.⁴

The potential for future innovation is in principle unlimited. However, this potential may be seriously curtailed by the regulation of telecommunications networks under proposals currently being considered by the EU. This paper considers the implications of those proposals.

The broadband revolution

Demand for broadband services has increased dramatically over the past decade and looks set to continue to increase with the emergence of a number of bandwidth-intensive applications, from voice-over IP telephony (VOIP) to video on demand (VOD). However, demand varies widely, with the majority of users consuming relatively small amounts of bandwidth and a small proportion of users consuming vast quantities. Moreover, demand for quality of service (QoS) varies significantly, with some users requiring very low latency (i.e. they need timely delivery of data) – for example, VOIP users, online gamers, and those performing surgical operations remotely.

In order effectively to service these widely disparate demands, BAPs and other ISPs use complex network management tools. As demand for bandwidth increases, both generally and specifically for low-latency services, the need to expand supply and manage the network will increase. To get some idea of the scale of the changes under way, consider that in 2007, YouTube, the video-sharing website, consumed as much bandwidth as the entire Internet consumed in the year 2000. The infrastructure that made access to the Internet possible in 2000 simply would not have been able to support the bandwidth demanded by YouTube users in 2007.

The UK regulator for telecommunications, OFCOM, predicts that British ISPs will have to invest £830 million in order to handle the extra demand for bandwidth created by the BBC's iPlayer alone.⁵ Given that many Internet users will not use the BBC's iPlayer, and many that do will only use it infrequently, it does not seem fair effectively to force everyone to pay the same amount towards this expansion of bandwidth. To do so effectively allows the minority of heavy users to free ride on the majority of light users. Moreover, even if bandwidth is increased, it is quite possible that at times

of particularly widespread use, all users will experience degradation of service if the BAPs and ISPs are not able to charge more to the customers who use the service more heavily.

But simply increasing bandwidth is unlikely to be sufficient – network management is also necessary. The Internet consists of a complex web of networks, each of which comprises various data pipes (fibre-optic cable, coaxial cable, twisted pair copper wires, and so on). These data pipes connect to one another at nodes. So, for example, a typical home is connected to the local exchange, a node, by either coax or copper wires; the local exchange is connected to national and transcontinental nodes by fibre-optic cable or in some cases microwave links; transcontinental nodes are connected by submarine cable or satellite (the national and international pipes constitute what is known as the 'backbone'). Note that the pathways along which data travels are not predetermined: once packets of data enter the network at the local exchange, they are then routed through what is commonly known as "the cloud", which comprises all of the above pipes and nodes.

The overall capacity of a network (i.e. the amount of data that can flow across it at any one time) depends in complex ways on a combination of the capacity of the pipes, the capacity of the nodes, and the structure of the network (i.e. where the nodes and pipes are in relation to one another). At times of high demand, networks can become congested, especially at the nodes, and rates of data transfer are reduced. To overcome some of these congestion problems, BAPs ensure that some types of data travel end-to-end faster than other types. By so doing, they ensure that important or time-sensitive data reaches its destination in a timely manner.

Note that congestion already occurs and this results in data packets being dropped at random. Given that fact, would it not be better to make those who want priority pay extra for that priority and to offer discounts to people willing to accept a comparatively degraded service – instead of giving plain vanilla to everyone? The key concern is to make sure that those whose QoS is worsened in comparison with the current best-efforts are aware of it and receive a discount for it (and are in principle able to obtain higher QoS if their needs change). The Commission proposals addressed this more

than adequately with their transparency obligation. Anything beyond that would be premature.

In sum, as demand for bandwidth-intensive applications and services grows, the capacity of the pipes will have to increase and network management will have to improve. If not, we could face horrendous levels of congestion and disruption to services. As long as consumers are adequately informed of the nature of the service being offered, it seems quite unnecessary to impose constraints on the types of service that may be offered.

Building a bigger, better broadband network

If present trends continue, the amount of data flowing across the Internet is likely to increase by 50 times or more in the next decade. The kind of network across which that data flows, its reliability and speed, will depend on the incentives faced by BAPs and other ISPs – both incumbents and those that might come into existence in the future.

Since demand for bandwidth varies widely, it makes sense for BAPs to prioritise the supply of high bandwidth connections to those who have the greatest willingness to pay for them. If BAPs are able to charge more for such premium services, they will have a stronger incentive to make them available to those who are willing to pay. If BAPs are not able to distinguish between customers in this way, then they will have less incentive to meet the demands of Internet users with high bandwidth demands.

Likewise, demand for QoS also varies widely, with some consumers needing very clean, low-latency data transfers, while others are willing to accept some latency and noise (unsolicited transfer of data packets). VOIP telephony, for example, is extremely intolerant of latency in the transmission of data packets; such delays result in broken-up conversations. Likewise, telemedicine – in which surgeons perform operations using remote imaging and robotic technologies – require absolutely the minimum possible delay between transmission and receipt; they also require essentially no noise.

In order for network providers to guarantee the QoS required by low-latency and high bandwidth

applications, it is important that they be able to prioritise the flow of data. Such prioritisation enables BAPs to reduce congestion and ensure that those who need higher QoS are able to obtain it.

Vivianne Reding, the European Commissioner for the Information Society, has acknowledged that “traffic prioritisation can sometimes be an important driver of value and growth for operators. The Commission’s vision of an open and competitive digital market does allow for traffic prioritisation, especially for providing more innovative services or managing networks effectively.”⁶

If BAPs were permitted to contract with individual users without interference from government, those BAPs would have strong commercial incentives to ensure that the wide range of end-user bandwidth and QoS expectations could be satisfied as efficiently as possible. End-users with high bandwidth and high QoS requirements would pay more. End-users requiring low bandwidth who are willing to put up with latency and noise, such as those whose primary use of the Internet is to send and receive non-urgent e-mails, would pay less; i.e. they would not be forced to bear the higher costs of providing more sophisticated connections to other users. By enabling BAPs to make low-cost offerings, government would ensure that BAPs are better able to bridge the broadband “divide” that exists in Europe.

It clearly makes sense for BAPs to be able to derive some revenue from QoS differentiation. The alternative is slower broadband deployment or broadband subsidised from the public purse – which again would effectively mean high bandwidth and high QoS broadband users free riding on low bandwidth, low QoS broadband users, which hardly seems fair.

Restricting access to harmful and illegal content

In addition to the need to be able to offer high QoS and wide bandwidth, end users benefit from BAPs’ ability to discriminate against the transmission of harmful or illegal content, applications and services. So, for example, some malicious end users might attempt to upload viruses to the network, causing damage to other end users and even to the network itself. Meanwhile, other end users may seek to profit from the sale of

counterfeit products, be they medicines, music or movies.

While end users can guard themselves against malicious and other unwanted content, applications and services using local firewalls, spam filters and other technologies, they are greatly assisted by BAPs, which are able to capture and prohibit such data before it reaches end-users. In addition, the ability for BAPs in principle to monitor and restrict the distribution of illegal content greatly enhances the ability of musicians, movie makers and other providers of content to protect themselves against piracy.⁷ Without effective network management strategies on the part of BAPs, this would be substantially more difficult.

Would broadband access providers abuse their dominant positions?

Some proponents of regulation argue that without some combination of mandatory access requirements, price controls and prohibitions on discrimination, BAPs would act against the interests of consumers. In the terminology of competition law, they assert that BAPs with a “dominant position” would price their services at monopolistic levels and restrict access to content, services and applications, except those specifically approved by the BAP.

The potential for such abuse certainly exists – especially where there is limited or no competition in the supply of broadband access. Indeed, in some cases BAPs have imposed restrictions on users that had little merit in terms of network management, either for maintaining QoS or for the prevention of harmful or illegal content.

However, in many parts of Europe there is already effective competition not only from fixed-line suppliers, but also increasingly from mobile operators. Moreover, most BAPs have seen that it is not in their interests to restrict access to services, applications and content – since consumers would then choose to switch to other providers. Nevertheless, there are some European countries that are at the other end of the spectrum. Romania, for example, has broadband penetration rate of only 8 per cent.⁸

In this context, the policy most likely to improve access

would be one that encourages competition – for example by reducing regulatory and other government-imposed barriers to entry in the provision of broadband access. This might include, for example, expanding the number of licenses available for mobile broadband.

Competition will not instantaneously bring about broadband nirvana. But it will incentivise BAPs, other ISPs and other companies to innovate new offerings. And it will keep in check the tendency to impose restrictions on access that have little merit in terms of network management.

By contrast, interference in network management, whether by mandating access or prohibiting differentiation in the supply of services, content or applications, might well be counterproductive. Such interference would drive up the average cost of supplying services and likely diminish QoS for the majority of users.

Broadband policy in the European Union

In the past decade, both demand for and supply of broadband services has been driven largely by the private sector, operating within the context of the relatively light existing regulatory framework.

Innovations in the services and applications that require broadband connectivity have come almost entirely from private entrepreneurs. Demand has come largely from private users, be they individuals or businesses. And the data pipes have for the most part been supplied by private companies.⁹

The current regulatory framework imposes certain limits on the freedom of action of both BAPs and end users, reflecting a view on the part of legislators and regulators that the market for such services would otherwise be subject to abuse by BAPs with significant market power. Given that telecommunications in Europe were historically dominated by state monopolies and given that these monopolies were mostly privatised intact, such concerns were probably justified – at least during the 1980s and 1990s. However, over time the market in most countries has become increasingly competitive, so there is a need for regulations to adapt to this new reality.

To the extent that broadband provision remains insufficiently open to competition, especially as a result of government ownership, control or regulations, one approach would be for DG Competition to use its powers to prohibit such interventions by member states. Aside from competition law, the main regulations affecting BAPs in the EU relevant for the present discussion are the Common Regulatory Framework for Electronic Communications Networks and Services (hereinafter, the “Framework Directive”)¹⁰ and the Universal Service Directive.¹¹

Under the Framework Directive, network management, including differentiation, is considered acceptable practice.¹² Moreover, the European Commission has recognised the utility of differentiation and network management in a competitive marketplace:

“product differentiation has been considered generally beneficial for the market so long as users have choice to access the transmission capabilities and services they want.”¹³

i2010 and proposed amendments to the Framework Directive

In June 2005, the European Commission launched an initiative called i2010, which would bring together “all European Union policies, initiatives and actions that aim to boost the development and the use of digital technologies in every day working and private life.”¹⁴

i2010 aims to: 1. establish a single European information space; 2. reinforce innovation and investment in ICT research; 3. promote inclusion, public services and quality of life.¹⁵

Under i2010, the EU hopes to ensure that at least 30 per cent of Europe’s population has access to broadband by 2010.¹⁶ (Approximately 20 per cent of Europe’s population currently has broadband access.¹⁷)

As part of its strategy for improving broadband access, the European Commission recently proposed to amend the Framework Directive.¹⁸ The stated intentions of the amendments are: “more competition”, “better regulation”, to “strengthen the internal market”, and better to “protect consumers.” These are generally laudable aims and the Commission’s version of the

amendments are generally supportive of those aims. However, some of the amendments proposed by the Parliament would be counterproductive.

The Commission also proposed amendments to the Universal Service and Users’ Rights Directive. Again, while many of these were quite reasonable, the Parliament has transformed them in such a way as to render them harmful to the interests of European consumers and producers.

Of particular concern are proposed amendments pertaining to the concept of “Network Neutrality” (NN), which are reflected in the Parliament’s proposed amendments to the Universal Service and Users’ Rights Directive numbers 10, 11, 101, 190 and 193¹⁹ and amendments 58 and 121 to the Framework Directive.²⁰

NN comprises several concerns but central is the threat of discrimination. In particular, NN proponents claim that regulatory intervention is necessary in order to prevent BAPs from restricting access to certain content, applications or services, charging content providers, or charging differential fees for QoS (so-called “access tiering”). Underlying these elements is the presumption that the Internet is and should remain an ‘end-to-end’ system, in which data packets are transmitted from one end to the other without discrimination.

For example, the European Parliament’s amendments to reform the Universal Service and Users’ Rights Directive states:

“Where there is a lack of effective competition, national regulatory authorities should use the remedies available to them under the [existing] Directives ... to ensure that users’ access to particular types of content or applications is not unreasonably restricted.”

The implications of proposed NN rules

In 2006, the Director of Policy Development at OFCOM (the UK telecoms regulator), Dougal Scott, said that “Regulation should not be developed to prospectively address hypotheticals. The discriminatory practices alleged are not occurring in the market, but if or when they do, EU regulators already have the tools to address them quickly and decisively.”²¹

Yet the Parliament's proposed amendments would do exactly what Scott says should not be done, namely empower National Regulatory Agencies (NRAs) to introduce a series of ex-ante regulations in order to address various hypothetical problems. For example, NRAs would have the power to ensure that "access to particular types of content or applications is not unreasonably restricted."²² This would prohibit BAPs from discriminating against certain content and applications, even when such discrimination is beneficial to the operation of the network and to consumers.

The precise impact of this rule would depend on the interpretation of "unreasonably restricted". NRAs could, for example, interpret many forms of traffic prioritisation to be "unreasonable restrictions" on access. If they did, the impacts on QoS could be serious. Even if exceptions are granted for communications to and from emergency services and other vital communications, such as telemedicine and health monitoring, other QoS-sensitive applications, such as VOIP, electronic trading platforms, and online gaming, might be adversely affected. At the very least, the wording should be made more precise in order to preclude such a clearly undesirable, unfair outcome.

Perhaps understanding that there would be negative impacts on QoS, the Parliament includes a proposal for mandating a minimum QoS: Amendment 193 to reform the Universal Service and Users' Rights Directive proposes that:

"A national regulatory authority may issue guidelines setting minimum quality of service requirements, take other measures, in order to prevent degradation of service and slowing of traffic over networks, and to ensure that the ability of users to access or distribute content or to run applications and services of their choice is not unreasonably restricted..."

There are two problems with this proposition. First, it is likely that the minimum QoS will not be sufficient for many applications, so consumers needing high QoS would still be better off if QoS-differentiated services could be offered. Second, mandatory QoS will inevitably drive up the costs of providing access to consumers with lower QoS requirements, so many consumers will pay

more than necessary for access. Meanwhile, some consumers who would have paid for less expensive, lower QoS broadband will choose not to purchase broadband access at all – so the rate of broadband uptake would be reduced.

Moreover, such amendments would actually undermine competition between BAPs: the combination of restrictions on prioritisation and minimum QoS would mean that BAPs could only realistically compete on the basis of price. This would undermine innovation and further slow down the roll out of broadband. This is clearly antithetical to the interests of both consumers and producers in Europe and would have knock-on effects in the areas of content, applications and services.

According to industry estimates, at least €300 billion of investment would be required to meet the optimistic targets to deploy next-generation-networks across Europe.²³ While this may be on the high side (it comes from an industry lobby group, after all), even if it is an order of magnitude out, that would mean €30 billion would need to be spent. Under the proposed NN rules, BAPs will not be able to justify the massive costs involved with developing and deploying new network infrastructure.

The overall result would be that in the name of ensuring that everyone has access to the same applications, content and services, the EU ends up preventing large numbers of people from being able to access any content, applications or services! Now that would be truly perverse.

Conclusions

Substantively, NN proponents make two claims in support of their push for an end-to-end system: first, that it is essential for the promotion of innovation; second, that it is essential for freedom of speech. On reflection neither claim stands up. As we have observed, attempts to regulate the provision of broadband access would actually inhibit, not promote innovation. Meanwhile, the mere fact that BAPs and other ISPs might be able to limit access to certain kinds of content – and hence inhibit free speech – does not mean that they will.

We have argued that it will in general be in the interests of BAPs to enable end users to access whatever content, applications and services they want. Indeed, several major BAPs have asserted “that consumers should be able to access any content on the internet, and run any application and device that they choose.”²⁴ In our opinion, if the BAPs abide by that commitment, it would essentially both guarantee free speech and create the right incentives for innovation of content, applications and services. Moreover, if BAPs are able to provide differentiated offerings in terms of bandwidth and QoS, they will have stronger incentives to roll out broadband access, thereby enhancing the reach of speech and the potential for innovation.

The European Commission recently stated that “Liberalisation in the telecoms sector in the EU, launched in the mid 1980s, has brought significant benefits for consumers. The price of telecoms services have fallen, on average, by around 30% in the past decade. Moreover, the introduction of competition has raised standards of service all round, making former monopolies much more respondent to the needs of consumers.”²⁵

In principle, these benefits should grow as communications technology improves, the broadband network is expanded, and the range of services, applications and content increases. But for this to happen, BAPs – and consumers – will become increasingly reliant on network management, as demand for bandwidth and QoS rises and becomes more differentiated. Unfortunately, the Parliament’s proposed amendments to the Framework Directive and Universal Service and Users’ Rights Directive would provide excessive scope for NRAs to interfere with the way in which BAPs operate, limiting network management, and disincentivising innovation. They would, if implemented, undermine broadband Internet access both generally and for those seeking low-latency and other types of higher QoS.

Moreover, while the stated intentions of the Parliament’s proposed amendments are to improve competition, they would most likely have the very opposite effect. Partly as a consequence, they would also likely undermine objectives of the Commission’s i2010 initiative that seeks to encourage the growth of and the investment in

ICT. Furthermore, they also contradict the objectives of other agreements, including the Lisbon Agreement, under which Europe was supposed to become the world’s leading knowledge economy by 2010.

As we have shown, there are many instances in which deviations from NN are beneficial. In particular, the ability to offer services differentiated by bandwidth and QoS appears to offer substantial benefits in terms of enhancing access, improving QoS for end-users, and reducing the degree to which bandwidth hogs are able to free ride on other users. Ultimately, prohibitions on the supply of differentiated services would be unfair.

At the very least, this suggests that ex-ante NN regulation should be discarded. Instead, regulators should focus on government-created barriers to access, such as limits on competition in the supply of both wired and wireless broadband access. In the case of wired broadband, government ownership and control continues to exert undue influence in many countries. In the case of wireless, government allocation of licenses has in many cases limited competition and resulted in high costs for consumers.

Notes

1. Julian Morris is Executive Director of International Policy Network, a development charity based in London that specialises in health, trade, technology and sustainable development. Alec van Gelder is Network Director of International Policy Network.
2. Atkinson, R., “Boosting European Prosperity Through the Widespread Use of ICT”, The Information Technology & Innovation Foundation, 11/2007. Available at: <http://www.itif.org/files/EuropeanProductivity.pdf>
3. Reding, V., “ICT research and telecoms: Europe’s opportunity to lead global competition”, Speech at European Policy Centre, 3/10/2008, available at http://ec.europa.eu/commission_barroso/reding/docs/speeches/2008/brussels-20081003.pdf.
4. Atkinson, R., “Boosting European Prosperity Through the Widespread Use of ICT”, The Information Technology & Innovation Foundation,

- 11/2007. Available at: <http://www.itif.org/files/EuropeanProductivity.pdf>
5. Renda, A., "Keep the Internet Free", Wall Street Journal Europe, 23/10/2008.
 6. Reding, V., "Net Neutrality and Open Networks – Towards a European Approach", Speech to "Network Neutrality – Implications for Innovation and Business Online Conference in Copenhagen, 30/09/2008, available at: <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/08/473&format=HTML&aged=0&language=EN&guiLanguage=nl>.
 7. Note that we are not advocating the removal of the current general immunity BAPs and other ISPs have from liability for distribution of such illegal content. Rather, we are saying that the potential to monitor such content enables ISPs voluntarily to assist content providers in tracking such content, so that those content providers can then take action.
 8. Maria Smihily: "Internet Usage in 2007: Households and Individuals," Eurostat report 23/2007, available at: http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-QA-07-023/EN/KS-QA-07-023-EN.PDF
 9. However it should be noted that many of these were previously government-run enterprises that were privatised in a less than ideal way, inhibiting competition both through the structure of the privatisation and the form of subsequent regulation.
 10. 2002/21/EC: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:108:0033:0050:EN:PDF>
 11. 2002/22/EC: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:108:0051:0077:EN:PDF>
 12. For example, article 2(e) in Article 12 in Directive 2002/19/EC specifically states that intellectual property rights must be taken into account.
 13. Commission Staff Working Document – Impact Assessment of the Commission's proposals COM(2007)697, COM(2007)698, COM(2007)699, SEC(2007)1473 [SEC(2007)1472, page 91]
 14. i2010 fact sheet: http://ec.europa.eu/information_society/doc/factsheets/035-i2010-en.pdf
 15. *ibid.*
 16. *ibid.*
 17. The most recent European broadband statistics are from: "i2010 Mid Term Review", available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0199:FIN:EN:PDF>
 18. Reforming the currently telecom rules, http://ec.europa.eu/information_society/policy/ecomm/tomorrow/index_en.htm
 19. Amendments 10,11, 101, 190 and 193 to the Universal Service and Users' Rights Directive: <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2008-0452+0+DOC+XML+V0//EN&language=EN>
 20. Amendments 58 and 121 to the Electronic Communication Network and Services Directive: <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2008-0449+0+DOC+XML+V0//EN&language=EN>.
 21. Dougal Scott, speaking at London Business School, May 2006.
 22. Amendment 12, amending section 14 a of the Universal Service and Users Rights Directive, available at: <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2008-0452+0+DOC+XML+V0//EN&language=EN>.
 23. "EP vote on the EU Telecoms Package", European Telecommunications Network Operators Association, available at: <http://www.etno.be/Default.aspx?tabid=2093>
 24. "Ensuring Network Stability in Competitive Markets," http://blog.quintarelli.it/blog/files/network_management_coalition_stmt__031008_final_.pdf
 25. "Reforming the current telecoms rules", European Information Society, available at: http://ec.europa.eu/information_society/policy/ecomm/tomorrow/index_en.htm

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