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TECHNICAL
REPORT

Ofcom: the effectiveness of converged regulation

Emily Scraggs, Jonathan Cave, Christian van Stolk, Dimitris Potoglou, Simo Goshev, Mihaly Fazekas, Siobhán Ní Chonaill, Barbara Janta, Laura Brereton

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1200 South Hayes Street, Arlington, VA 22202-5050
4570 Fifth Avenue, Suite 600, Pittsburgh, PA 15213-2665
Westbrook Centre, Milton Road, Cambridge CB4 1YG, United Kingdom
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Preface

As part of a wider study to evaluate the effectiveness of Ofcom as a converged regulator, the National Audit Office commissioned RAND Europe to undertake comparative research on Ofcom in relation to communications regulators in other jurisdictions. This work began in February 2010 and was completed in July 2010. This report presents the findings of the research conducted on five case study areas as follows:

- Next generation access networks (NGAN)
- Access in the context of local loop unbundling (LLU)
- Access to emergency services over voice-over internet protocol (VOIP)
- Spectrum planning at the Olympics
- Management of mobile mis-selling.

The report consists of the following parts:

- Executive summary which focuses on the key findings and conclusions
- Synthesis and analysis of the key themes emerging from the case study analysis
- Detailed description of the key findings in each of the case studies (in the appendices).

The findings are based on a review of the relevant literature in each country and follow-up interactions with experts in those countries.

The study will be of interest to those researching communications regulation in the UK and internationally.

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For more information about RAND Europe or this document, please contact:

Dr Emily Scraggs or Dr Christian van Stolk
RAND Europe
Westbrook Centre
Milton Road
Cambridge CB4 1YG
United Kingdom
Tel. +44 (1223) 353 329
escraggs@rand.org

Contents

List of figures and tables

Summary

This report provides some indications of the performance of Ofcom compared to other national communications regulators

This report sets out the findings of research commissioned by the National Audit Office (NAO) and undertaken by RAND Europe between February and July 2010.

The main focus of this research was to provide an assessment of the success with which Ofcom has delivered regulatory outcomes by comparing them with other national communications regulators in other countries. The purpose of the research was to put the performance of Ofcom in an international context and to see whether Ofcom can draw any lessons from the approaches taken and operational capacities developed by other regulators.

The findings of the report are based on a series of specific case studies reflecting particular policy areas. These were jointly selected by the NAO, the study team and Ofcom; as a result they do not represent either a comprehensive or a random sample of the areas in which Ofcom is active. The case studies are instead indicative of Ofcom's performance, and consist of the following:

- Next generation access networks (NGAN)
- Access in the context of local loop unbundling (LLU)
- Access to emergency services over voice-over internet protocol (VOIP)
- Spectrum planning for the London 2012 Olympics
- Management of mobile mis-selling,

National regulators play varied roles reflecting different remits and responsibilities

Ofcom was formed as a single converged regulator, overseeing the broader communications market, including access, distribution, content and price and co-ordination of all the relevant regulatory activity.

Many jurisdictions have adopted various different converged forms of regulation that adapt to the challenges posed by convergence through different mechanisms (varying by issue and country). These typically involve merging telecommunications and content regulation (e.g. in Australia, Canada, Finland, Iceland, Italy, Japan, Luxemburg, the United Kingdom

and the United States). Increasingly, there is a trend to include other regulatory areas as well, especially as regulatory concerns arising in one sector spill over into others. There is a variety of models, including the following:

- Converged regulators – regulatory entities that oversee a range of services which include telecommunications and information and communications technologies, including broadcasting.
- Multi-sector regulatory authorities – these regulate various industry sectors that are considered public utilities, such as telecommunications, water, electricity and transportation.
- Use of general regulatory powers (e.g. competition) to provide the primary regulatory oversight over the telecommunications and related sectors.

The strategies chosen by Ofcom often reflect its distinct remit and the particularities of the UK market and European regulatory environments

Relatively few regulators cover the same range of sectors and issues as Ofcom; therefore direct comparisons must be placed in context. In particular, Ofcom evolved as a converged regulator simultaneously with the convergence of the sector(s) involved, the successive refinement and reform of the overall EU Telecommunications Regulatory Framework and the development of alternative forms of regulatory convergence in European Member States.

Ofcom's performance and influence on UK/EU markets can thus be seen in the structure as well as the conduct and performance of UK telecommunications and in the broader European regulatory and market environment. This external influence addresses Ofcom's statutory duties by altering the Europe-wide sector context within which are both UK-based firms and firms based elsewhere in Europe but operating or offering services in the UK.

Case study findings

Next generation access networks

NGAN is the network through which we access communication technology; NGANs refer broadly to the development of new network technologies, and to access infrastructures and even services – but narrowly to a specific network architecture (and related equipment) that uses a common internet protocol (IP) core network for all (past, present and future) access networks.

In terms of strategic planning for NGANs, Sweden and France are pursuing explicit planned strategies, while the UK and The Netherlands are allowing the market to lead the direction. This may produce at least short-term variation in the mix of technologies (and capabilities) used. Ofcom is consulting broadly on the issues involved. There is no geographical coverage plan in place in the UK. While the UK does not have a specific planned direction for NGANs, at present it is not unduly disadvantaged by this. However, there are fears of a digital divide growing between rural and urban communities.

Local loop unbundling

LLU refers to a variety of methods intended to facilitate competition. It may take various forms, ranging from full unbundling to IP-based (bitstream) access. There are various measures of the extent to which LLU has been achieved (in terms of, e.g., number and percentage of lines 'unbundled' in the full, shared-line or bitstream senses, proportions of traffic) and relatively few data showing the subsequent impact in terms of competition, price reductions and/or quality improvements.

Germany and France were ahead in the adoption of LLU, having introduced LLU prior to EU enforcement. Despite this, more providers have taken advantage of LLU in the UK than in other countries. In terms of opening access via LLU, the UK lagged well behind its European Commission (EC) competitors in LLU (if bitstream is excluded), though it was well in the lead throughout this period if bitstream is included. Overall, Ofcom had the advantage of observing the decisions taken by other national regulatory authorities (NRAs). The infrastructural investment implications of this have yet to be determined.

VOIP access to emergency services

VOIP refers in general to the carriage of voice telephony over IP networks. Because our focus here is on emergency service access, we primarily consider VOIP providers offering connections to the public switched telephone network (PSTN). VOIP emergency service access forms a part of the more general issue of regulating VOIP services.

The USA has led the way in imposing emergency call access and location information requirements, despite treating VOIP as an information service. Many of the other countries considered have treated VOIP as a telephone service, but have adopted a light-touch regulatory regime. France was one of the pioneers in developing VOIP policy, but this did not translate into leadership in relation to emergency access. Ofcom stood out not only in explicitly considering emergency service access, but also in developing an interim forbearance policy that encouraged entrants to provide emergency service access and only later added location information requirements.

The current EC regulatory framework follows the UK lead in the sense that it emphasises a light regulatory touch, taking into account the emerging nature of the technology, whilst preserving consumer interests – especially in relation to emergency service access. Ofcom has therefore played a leadership role here to some extent.

Spectrum planning for Olympics

In each of the four Olympic Games included in this analysis (London 2012, Vancouver 2010, Beijing 2008 and Athens 2004) spectrum provision plans were put in place ahead of time.

We can see that as the Olympics progress, the planning, organisation and management of spectrum-related issues is becoming more elaborate and more comprehensive. Increasingly, collaboration is needed across groups of stakeholders and the NRAs are becoming more critical in the role that they play.

Ofcom is dealing with more spectrum demand and more complexity for London 2012 than has been required for any previous Olympic Games. The planning and extent of the testing show that Ofcom has learned where possible from previous events and is well positioned for the challenges ahead.

Mobile mis-selling

For the purposes of this study, mobile mis-selling is defined (based on a UK definition) as having three main elements. These are, first, general mis-selling in which, for example, a customer is given false information; secondly, 'slamming', which relates to a substantial contract or provider change without informed consent; and, thirdly, cashback offers, in which the customer is promised refunds after the purchase that are impossible to get.

Looking at the extent of these mis-selling problems, in the UK we can see that there has been a dramatic reduction in the number of instances between 2007 and 2009.

From the perspective of the consumer, in the UK mobile mis-selling is a reducing problem and therefore the public is less exposed to these specific issues. In Australia problems remain for consumers although there is awareness of them on the part of the Telecommunications Industry Ombudsman (TIO) and the regulators. In Israel the consumer protection approach seems to be working by keeping track of complaints and suggesting specific changes to the processes, as needed.

Cross-cutting findings

The case studies broadly indicate that Ofcom performs well compared to other national regulators, though a few areas of concern remain.

Despite these limitations, the case studies yielded the following cross-cutting findings:

- Ofcom is one of the thought leaders internationally in mobile mis-selling and emergency access to VOIP areas;
- Ofcom stands out in its ability to engage with stakeholders and draw lessons from previous Olympics as it plans spectrum allocation for London 2012;
- Ofcom's decisions in LLU and NGAN to follow the market initially rather than have a planned strategy to drive these in a particular direction have up to this point not disadvantaged the UK, though the implications for long-term investment in infrastructure and provision of services to remote areas remain unclear.

CHAPTER 1 Introduction

This report sets out the findings of research commissioned by the NAO and undertaken by RAND Europe between February and April 2010.[1]

The main focus of this research was to provide an assessment of the success with which Ofcom has delivered regulatory outcomes by comparing them with the activities of other communications regulators in other countries. The purpose of the research was to put the performance of Ofcom in an international context and to see whether Ofcom can draw any lessons from the approaches taken and operational capacities developed by other regulators. The comparison provided here was not meant to be comprehensive but instead indicative, focusing on a number of regulatory areas.

Ofcom was created in 2002 and vested in 2003, as the product of a merger of five legacy regulators that were in related fields, with some overlapping responsibilities. Since then it has had two main areas of responsibility: to further the interests of citizens in relation to communication matters and to further the interests of consumers in relevant markets where appropriate through competition. The NAO published a study in 2006[2] on the costs and challenges arising from the creation of Ofcom. That study reviewed the decision-making process behind the creation of Ofcom and how the merger was carried out, and undertook an early review of the extent to which it had achieved its high-level objectives. The present research updates the previous assessment of Ofcom as a converged regulator with a particular focus on the regulatory outcomes delivered.

1.1 Ofcom as a single converged regulator oversees access, distribution, content and price in the communications sector

Ofcom was intended to be a single converged regulator, overseeing the broader communications market, including access, distribution, content and price. With the communications sector generating revenue of £36 billion in 2003 and modes of communication increasingly overlapping, it was a logical step to create a new style regulator that would co-ordinate all the relevant regulatory activity.

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[1] A glossary is provided in Appendix A that contains explanations of all relevant acronyms and terms used in the report.

[2] NAO (2006) *The creation of Ofcom: wider lessons for public-sector mergers of regulatory agencies*, HC: 1175 2005–2006, The Stationery Office.

This new converged communications environment was a significant shift from what had gone before. In the past, broadcast and telecommunications were clearly separate markets, based on different technologies, with distinct governance and regulatory frameworks. Broadcasting often had a strong public-sector interest, driven by concerns about free speech, diversity of supply, decency, programming (cultural content, sports and major events), advertisements, objective information provision, protection of minors and so on. Public broadcasters were supervised by content boards or similar institutions, ensuring that the supply of content services complied with the desired societal objectives. Through media ownership restrictions and other rules these were extended to commercial broadcasting services. Telecommunications markets were ruled by economic and technical issues, including network access; the public interest was the derived goal of ensuring affordable services to everyone. Telecommunication markets, which were mostly liberalised in the 1990s, usually had a regulator to ensure that neither the natural monopoly nor the technical characteristics of incumbent operator(s) would be used to restrict network access or otherwise be exploited to create and abuse significant market power.

1.2 Regulators play varied roles reflecting different remits and responsibilities

Across the countries included in the case studies within this research, regulators play a varied role with a number of different responsibilities and remits. The extent to which there is separation of functions in the context of communications regulation in the main case study countries is presented in Table 1.1 below (a full table with regulatory competences is provided in Appendix B; see Table B.2).

Table 1.1: Separation of communication regulation functions in main case study countries[3]

Country	Telecom carriage	Telecom spectrum	Broadcast carriage	Broadcast spectrum	Content
Australia	ACMA				
France	ARCEP	ARCEP	Conseil supérieur de l'audiovisuel (CSA)	CSA	
Germany	BNETZA	BNETZA	BNETZA, Association of Regulatory Authorities for Broadcasting (ALM), Commission on Concentration in the Media	BNETZA, ALM	ALM
Netherlands	OPTA	Radio-communications Agency Netherlands	Dutch Media Authority (CVDM)	Radio-communications Agency Netherlands	CVDM
Sweden	PTS	PTS	Radio and Television Authority	PTS	Broadcasting Commission
United States	FCC, Public Utilities Commissions[4]	FCC	FCC, local government for cable franchises	FCC	FCC, FTC, DoJ
United Kingdom	Ofcom	Ofcom	Ofcom, DCMS	Ofcom	Ofcom

Source: OECD 2006

1.3 Many jurisdictions have adopted converged forms of regulation with slight differences in institutional set-up

Many jurisdictions have adopted more-or-less converged forms of regulation. These typically involve merging telecommunications and content regulation (e.g. in Australia, Canada, Finland, Iceland, Italy, Japan, Luxemburg, the United Kingdom and the United States). Increasingly, there is a trend to include other regulatory areas as well, especially as concerns arising in one sector spill over into others. There is a variety of models, including the following:

- Converged regulators – regulatory entities that oversee a range of services which include telecommunications and information and communications technologies, along with broadcasting. In addition to Ofcom, examples include Australia, Austria, Finland,

[3] OECD (2006) Telecommunications regulatory institutional structures and responsibilities, report DSTI/ICCP/TISP(2005)6/FINAL; ITU data from the ICT regulation toolkit at: http://www.ictregulationtoolkit.org/en/index.html; and information from EC (2007) The regulation of broadcasting issues under the new regulatory framework, Annex C1, at http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/reg_bc_issues_under_nrf/broadcasting_tables_topics_2007.pdf. In Germany, The Netherlands, France and Sweden there has been a reallocation of responsibilities since 2006.

[4] These are multi-sector rather than converged regulators.

Italy, The Netherlands, the USA and the mandate of the Information Society and Media Directorate General of the European Commission (EC DGINFSO) itself. The United States Federal Communications Commission (FCC) has always been a converged regulator, but Australia and the UK adopted this model after having single-sector regulators. The French telecommunications regulator, Autorité de regulation des communications électroniques et des postes (ARCEP), is not converged.

- Multi-sector regulatory authorities – these regulate various industry sectors that are considered public utilities (e.g. telecommunications, water, electricity and transportation). Germany (Bundesnetzagentur – BNETZA) is the most developed European example, although The Netherlands also has some elements of this model.
- Use of general regulatory powers (e.g. competition) to provide the primary regulatory oversight over the telecommunications and related sectors.

These governance structures adapt to the challenges posed by convergence through different mechanisms (varying by issue and country). There are .three main approaches to dealing with these challenges:

- Modifying legislation to respond to or anticipate convergence. For example, the EU's new regulatory framework (NRF) modified the treatment of VOIP to allow it to be treated explicitly (by providers) as either an electronic communication service (i.e. information service) or a voice service. Prior to that, VOIP was exclusively regarded as a data transmission service, which was not wholly satisfactory in terms of, for example, Universal Service Obligations, numbering and so on. The USA treats VOIP as an unregulated information service rather than a telecommunications service, but the FCC has indicated that VOIP may present characteristics of a telecommunications service when consumers regard it as a substitute for a traditional voice service offered through the PSTN and when it uses numbering. This situation was changed by an FCC rulemaking procedure which began in 2005 to determine the appropriate regulatory classification of a broad range of IP-enabled services, including whether certain types of VOIP services should be regulated.[5]
- Modifying existing regulations or instituting new regulations to address new technologies. This approach was used in the USA to respond to power line communications (PLC)[6] and in Spain to modify the (implemented) NRF to respond to the growth in IP-based services by moving from time-based to capacity-based interconnection rules.

[5] See EC (2004) Consultation document on the treatment of voice over internet protocol (VOIP) under the EU regulatory framework, 14 June. http://ec.europa.eu/information_society/policy/ecomm/doc/library/working_docs/406_14_voip_consult_paper_v2_1.pdf; and FCC (2004) In the matter of IP-enabled services, notice of proposed rulemaking, WC docket no. 04-36, at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-28A1.pdf.

[6] FCC (2004) In the matter of IP-enabled services, notice of proposed rulemaking, WC docket no. 04-36 (2004) at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-04-28A1.pdf.

- Developing convergence policy through *ad-hoc* or existing self-regulatory or co-regulatory bodies normally involving government agencies, industry representatives and other stakeholders. Australia has several self-regulatory bodies, including the Australian Communications Industry Forum (ACIF), which addressed convergence in a December 2004 meeting on VOIP self-regulatory activities. This highlighted issues of consumer information on VOIP and established the next generation networks (NGN) Future Operations Group to discuss and analyse NGN implementation issues.[7]

The advantages and drawbacks of these approaches depend on the scope of the change required, the range of parties involved, the speed of response required and the importance of different parties' information and powers of action.[8] Convergence changes these elements (in particular, it changes the range of private sector and civil society parties who must be consulted) and this, in turn, influences the way new issues are handled and the levels of compliance, burden and effectiveness that result. Therefore it is vital to consider which of these models has been adopted when analysing the comparative performance of governance structures and policy responses to convergence-related issues.

1.4 This report sets out to provide some indications of the comparative performance of Ofcom

This report sets out the findings of the case study research. In Chapter 2, a brief outline of the methodology used in the research is presented (with additional detail provided in the appendices). In Chapter 3, we present our thematic review of each case study; and in the appendices, we present a glossary, additional methodological detail and background information, followed by a discussion of each of the case studies.

[7] The group approved a report on policy and regulatory considerations for new and emerging services for formal communication to the ministry responsible, the Department of Communications, Information Technology and Arts, at http://www.acif.org.au/__data/page/275/Policy_&_Regulatory_report_final.pdf

[8] See, e.g.: Cave *et al.* (2008) Options for and effectiveness of internet self- and co-regulation, RAND TR-566-EC, at http://www.rand.org/pubs/technical_reports/TR566.html

CHAPTER 2 Methodology

The methodology applied to this research involved the development of five case studies in five topic areas. The case studies consisted of a comparison between approaches in a number of countries. Each of the areas and countries to be included for comparative purposes was agreed in advance with the NAO (and reviewed by the NAO with Ofcom). The areas were selected from a long list of potentially interesting areas that could have been included in the study. The long list was developed on the basis of the areas of interest of the NAO, technological developments in the sector, public interest and the potential future impact of the area. The case studies that were chosen were selected on the basis of additional criteria, including the likelihood of accessing interesting data, considerations around the NAO audit programme in this area, and comparability with other national communications regulators.

In each case study, different benchmarks are used in relation to the measurement of Ofcom. These benchmarks are not hard quantifiable indicators, but instead criteria on which the performance of an NRA may be judged. The benchmarks were agreed between the RAND Europe and NAO project teams and reflect what each case study is likely to tell us about the performance of a regulator. This is inevitably variable since each case study is different (although in some cases connected) and is indicative, rather than giving a comprehensive assessment of the performance of a regulator. A summary of the benchmarks applied to each area is provided in Table 2.1 below.

Table 2.1: Benchmarks for each case study area

Case study area	Benchmark measurement
Next generation access (NGA)	Strategic planning Long-term investment Provision of services in remote areas
LLU	Increased customer access Greater competition in the marketplace Reduced prices for customers Consideration of the long-term impacts of LLU on investment
VOIP	Imposition of emergency call access by providers Ability to access location information Extent of consideration and planning for the issues
Spectrum planning for the 2012 London Olympics	Planning and preparation Testing of equipment and procedures
Mobile mis-selling	Reduction in customer complaints

In terms of the methodological processes applied to the development of these case studies, a number of steps were taken, as follows:

- **Clarification meeting with NAO, RAND Europe and Ofcom:** Once a short list of case studies had been developed, a meeting was held with the NAO, RAND Europe and specialists from Ofcom in each case study area. A full discussion on each of the options was held and clarification reached on the specific topic that would be covered. As the project progressed, further discussions with Ofcom were held, as required.
- **Development of research templates:** In order to guide the research in each of the case study areas, a template of questions for each area was developed. This was designed to ensure that as far as possible consistent information was collected across all of the case study countries. These templates were then reviewed by the NAO and Ofcom, edited and finalised.
- **Documentary analysis:** Once the research templates were finalised, they were populated with relevant data. Documents used in the research included materials from all relevant NRAs, international research sources and academic studies, reports and reviews.
- **Follow-up interactions with NRAs:** Once these templates were populated as far as possible with information from documentary sources, relevant NRAs were contacted and asked to provide clarification and additional information where possible.
- **Synthesis and analysis:** All data collected were reviewed and analysed. Where needed, further data were sourced to provide input to the various case studies.

In undertaking the case study analyses, it was necessary to take into account the different market and regulatory environments in which regulators in other countries are working. Since the job of the regulator is different in every country, undertaking an international comparison is not necessarily a matter of comparing like-with-like. Therefore, areas such as levels of compliance and the degree of self- or co-regulatory assistance vary from region to region.

The overall methodology, including the process of selecting the case studies for the research, is set out in more detail in Appendix B.

CHAPTER 3 Synthesis of key findings in case studies

3.1 Introduction

This chapter sets out the key themes which emerged from our comparative case studies. In each case, specific countries were included for comparison on the basis of their relevance and usefulness. In each case detailed below, we present a short summary of the key issues in the area, and state why it is of interest and what countries have been included in the analysis.

3.2 Next generation access (NGA)

Focus of the case study	*NGA is a network through which we access communication technology. Specifically, NGA refers to a packet switching (IP)-based access network reaching from multi-functional access and aggregation nodes to the end-users and made of fibre, copper using xDSL technologies, coaxial cable, power line communications, wireless technologies or hybrids. It is a qualitative rather than a quantitative description (so cannot be defined as simply speed of access, for example).*
Why it is important	*NGA networks are critical to our ability to participate and utilise effectively the newest and fastest communication technologies. They provide the hard wiring that may be put in place in order to benefit from future innovation. They require considerable investment and forward planning.*
Benchmarks used to measure performance	• *Strategic planning* • *Long-term investment* • *Provision of services in remote areas.*
Countries included in the review	*UK, Sweden, France, The Netherlands.*

3.2.1 It is difficult to pin down exactly what is meant by NGAN, but the term broadly reflects a modernisation of infrastructure

The terms 'NGN' and 'NGA' have an evolving range of meanings. For present purposes, it is useful to distinguish 'next generation' core and access networks. The former is part of incumbents' modernisation programmes and largely proceeds without the need for extensive changes in regulatory governance; the access part is much more complex. We therefore concentrate on "Next Generation Access Networks" (NGANs). A description of the relevant characteristics of some of the main NGAN technologies is presented in Appendix D.

NGAN can also be interpreted in different ways and there is no universal agreement on the correct definition. Published sources clearly differ on this issue and are divided broadly in terms of whether NGAN should be classified in terms of technological development (i.e. new network technologies, access infrastructures and services) or of speed of access. According to the International Telecommunications Union (ITU), a next generation network is defined by technological advancement – they say it is:[9]

> *a packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport related technologies. It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.*

The internet protocol (IP) plays a vital role because it allows separation of network and service layers. Ofcom defines NGAN in terms of speed.

For this study, we have adopted the ITU definition and have used NGAN narrowly to indicate a specific network architecture (and related equipment) that uses a common IP core network for all (past, present and future) access networks. Within this definition, it is useful to distinguish core networks from those used for access, and to distinguish between the network itself and access as objects of regulatory interest.

3.2.2 NGAN has some specific characteristics ranging from convergence of previously separated communications and extensive investment requirements

NGANs primarily re-use existing telephone (xDSL) and cable infrastructure, although they are beginning to be replaced by technically superior fibre to the home. The re-use of existing physical infrastructure at very low additional deployment cost gives legacy technologies and infrastructure operators strong advantages that will probably limit change until fibre takes over. Thus regulators need to be concerned with the potential contributions of private sector competition and the transition (in market power and regulatory traction) from copper-line and cable providers to (possibly new) fibre providers. The same 'overhang' of legacy technologies and operators affects *fixed wireless* (e.g. WiMAX) NGANs. Finally, converged regulators need to address as well the needs and contributions of incumbents and entrants offering NGA over *satellites*, *digital broadcast* and *new mobile infrastructures*.

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[9] The definition by ITU-T is taken from the ITU website, at: http://www.itu.int/ITU-D/treg/publications/trends07.html

NGANs require extensive investment. This plays out differently under different NGAN technologies. In respect of fibre, for example, some powerful incumbents have threatened not to invest in fibre infrastructure if they would then be forced to open this to rivals. Some have even chosen NGAN topologies that only allow wholesale bitstream access, thus potentially preventing effective competition (as noted above, there may appear to be many resellers, but their power to put pressure on the incumbent and their ability and incentive to invest in their own facilities are both limited).

A further investment problem that arises in NGANs is the fact that many NGAN technologies do not require the large main distribution frame (MDF) facilities at which entrants locate the equipment used to connect to unbundled local loops.[10] Some regulators have required incumbents to maintain MDFs in order to preserve LLU at least during the transition to NGANs. Some regulators such as KPN and Onafhankelijke Post en Telecommunicatie Autoriteit (OPTA) have developed policies to manage the transition. The regulatory problem is sharpened by the rapid pace of change; regulatory uncertainty at this stage may distort investment for some time to come.

3.2.3 Some countries have a policy-led NGAN strategy while others including the UK have taken a market-led approach

The NGAN case study looked at overall future plans because they provide a common denominator across countries' different ways of addressing these issues. In terms of strategic planning, Sweden[11] and France[12] are pursuing explicit strategies, while the UK and The Netherlands are – for the moment – content to let the market lead, keeping instead a watching brief in relation to statutory responsibilities and conducting ongoing analysis to identify emergent issues. This may produce at least short-term variation on the mix of technologies (and capabilities) used. This refers particularly to NGAN and next generation core networks (NGCNs) using a variety of technologies which are rapidly becoming a reality even in market-led regimes like the UK (BT's 21CN) and The Netherlands (where the dominant operator, KPN, plans to deploy an all-IP network within four years).

For the reasons mentioned above, these market-led solutions may isolate smaller and more remote areas (though this is a minimal concern in The Netherlands with its high density). This was also pointed out in a 2008 Organisation for Economic Co-operation and Development (OECD) report, in which it was stated that while 'the private sector should take the lead in developing well-functioning broadband markets … there are clearly some circumstances in which government intervention is justified [such as] connecting

[10] See OPTA (1999), 'Richtsnoeren met betrekking tot ontbundelde toegang tot de aansluitlijn' ("MDF-access"), J/99/1443, 12 March.

[11] Swedish government policy: 'The Swedish Government presents a Broadband Strategy for Sweden that clarifies the policy focus: a broadband policy adapted to the situation and challenges we face. The Government is continuing its efforts to improve competition and conditions for market players through its broadband strategy'; Ministry of Enterprise, Energy and Communications (2009) 2010, at http://sweden.gov.se/sb/d/12103/a/134543 (last updated 10 December 2009).

[12] French government policy: ÉricBesson (2008) France Numerique-2012, plan de développement de l'économie numérique, Premier Ministre, France, at http://www.ladocumentationfrancaise.fr/rapports-publics/084000664/index.shtml

underserved areas and promoting efficient markets'.[13] In the UK, this situation is becoming a problem for many and it is now estimated that 2.5 million homes in the UK have a broadband speed up to less than 2 Mbps.[14] Several remote parts of the country are forming their own telecom schemes in order to access super-fast broadband that BT would not deliver to them (e.g. the recent Rutland Telecom scheme in Lyddington). However, it is unlikely that these bottom-up initiatives will take place in great numbers and so provide super-fast broadband services to those not served by BT.

Surprisingly, in part as a consequence of its different history (Minitel) and the desire to enlist the willing investment of key private sector players, France has chosen to ensure only basic broadband coverage, with high-speed access concentrated on the (most profitable) urban areas.

Beyond government plans and priorities, there are significant differences in the roles (and impacts) of external stakeholders – in the market-led countries, development is driven by existing incumbents strengthening their positions by extending and improving their networks, with at least the tacit support of the NRA.

Further investigation is needed to determine whether it is foreseen that any enhanced market power will be countered or controlled by other means (regulation, open access to rival providers, etc.) or accepted as the price of progress – certainly, the willingness of incumbents to build out the network suggests that they are, at least, hopeful of a suitable return on their investment (taking revenues and regulation into joint account). In both cases, however, these efforts are complemented by a range of pilot initiatives driven by local authorities. The French approach also gives the driving seat to incumbents, but not necessarily to those dominating current provision, and not accompanied to the same degree by 'local fibre' experiments. In Sweden, where the main government plan involves a market-led choice of technology, supported by active (pro-innovation) spectrum policy, there is a range of technology-specific initiatives by users from the public (rural local authority) and private (banking) spheres.

3.2.4 Ofcom has been particularly rigorous in working with other parties to further NGN/NGA policy

A final area of valid comparison concerns the way the NRA worked with other parties to further NGN/NGA policy. Not surprisingly, the UK and The Netherlands approached this as they do other issues; the UK used its typically outgoing and rigorous approach,[15] while OPTA, having a much narrower brief and range of discretion, largely continued its prior regulation. One slightly odd aspect is that OPTA seemed to rely on facilities-based competition (between alternative infrastructures) – it has recently become concerned that this may not be as effective as the more 'competition-policy-based' stance laid out in the EC Telecommunications Regulatory Framework (though it lacks the competition

[13] OECD (2008) Broadband growth and policies in OECD countries, at http://www.oecd.org/dataoecd/32/57/40629067.pdf (p. 12).

[14] BBC News, 14 April 2010.

[15] Ofcom conducts more consultations and provides more feedback and visible response than all other EC NRAs, and has led the way in applying better regulation principles such as impact assessments.

authority powers available to, for example, Ofcom). In France and Sweden, the overt and collective policy was accompanied by a much greater level of cross-department co-ordination – led by the NRA in France. The relationship between the regulatory activity and the prevailing market environment is one which is particularly relevant in this study. This creates a specific dynamic in which it may be difficult to determine what is driving the performance – the actions of the regulator or the actions of the market.

3.2.5 A market-led approach has not unduly disadvantaged the UK, but questions remain about the provision of services to remote areas

Therefore, in summary, in terms of strategic planning Sweden and France are pursuing explicit planned strategies, while the UK and The Netherlands are allowing the market to drive the direction of NGN/NGA. This may produce at least short-term variation in the mix of technologies (and capabilities) used. It also shows slightly different approaches to producing long-term investment. Because of the market focus, there is no specific plan in the UK for dealing with areas of low population that are less profit producing. France, within their articulated plan, has chosen to ensure only basic broadband coverage, with high-speed access concentrated on urban areas.

Table 3.1: Summary of next generation access networks case study

Key trends: NGANs refer broadly to the development of new network technologies, access infrastructures and even services, but narrowly to a specific network architecture (and related equipment) that uses a common IP core network for all (past, present and future) access networks. NGANs allow access for users to networks and to competing service providers and/or services of their choice. They support generalised mobility which will allow provision of services to users.
International comparisons: In terms of strategic planning for NGANs, Sweden and France are pursuing explicit strategies, while the UK and The Netherlands are allowing the market to lead the direction. This may produce at least short-term variation in the mix of technologies (and capabilities) used.
Ofcom: UK is market led. Ofcom is consulting broadly on the issues involved. No geographical coverage plan in place.
Conclusion: While the UK does not have a specific plan for NGANs, at present it is not unduly disadvantaged by this. However, allowing the market to drive forwards the agenda for NGANs means that the less profit-making areas are not attractive and may be excluded. Therefore, there is a risk of a digital divide growing between rural and urban communities.

3.3 Local loop unbundling

Focus of the case study	*The local loop is the local access network which provides a set of wires going into people's houses and other premises, thereby enabling the use of communication technologies. LLU provides access to*

	the local loop for alternative providers to offer services to end users. LLU can take various forms, ranging from full unbundling to IP-based (bitstream) access.[16]
Why it is important	*Unbundling the local loop introduces competition to the provision of technological access so that the market is not dominated by one incumbent provider. The extent to which the local loop has been unbundled has price and access implications for consumers.*
Benchmarks used to measure performance	• *Increased customer access* • *Greater competition in the marketplace* • *Reduced prices for customers* • *Consideration of the long-term impacts of LLU on investment.*
Countries included in the review	*UK, Germany, France, Australia.*

3.3.1 LLU intends to weaken the monopoly of the dominant provider

LLU allows other operators to use the bottleneck 'last-mile' access connections, thus facilitating competition in the downstream markets and preventing the operator with significant market share (SMP) from leveraging its market power into those markets. It is intended to weaken the bottleneck monopoly power of the provider of 'last-mile' access. Its net impact and longer-term consequences depend on how it is achieved. The main alternatives are full unbundling and shared-line access. Bottleneck power can also be limited by forcing the local loop operator to offer wholesale broadband to resellers who compete with the incumbent to offer retail services to end-users, as in IP-based bitstream access.

The underlying tension between current competition and future investment applies across all these models; full unbundling is the most expensive for new entrants, but leaves them relatively immune to later incumbent strategic behaviour because they have more control. The lower-entry costs of shared-line access allow more entry (or entry by newer or smaller

[16] There is some dispute about whether bitstream constitutes LLU in a strict sense. Our definition above is based upon a body of literature in this field, such as the well-respected view of Bourreau and Dogan (2004) 'Service-based vs facility-based competition in local access networks', *Information Economics and Policy*, 16(2): 287–306.. It is worth repeating their specific definition here: 'Unbundling of the local loop refers to a series of regulatory offers. The most fundamental one is raw copper unbundling. With raw copper unbundling, the incumbent provides access to its copper lines. The entrant then co-locates in the incumbent's facilities and installs its own equipment (either for telephony or DSL). With line sharing or shared access to the local loop, the same local loop is used both by the incumbent and the entrant. The incumbent rents the high frequency band to the entrant for DSL services, while it keeps the low-frequency band for analog telephony services. Finally, with bitstream access, the incumbent leases access to its high bandwidth architecture. The incumbent chooses the technology and decides on its investment plan.'

players), but leave the incumbent with more power. Entry costs are lowest and incumbent market power is highest with bitstream access, which is why it has been the first response of incumbents faced with legal mandates for LLU.

3.3.2 There are various measures of the extent to which LLU has been achieved

Measurement of LLU has been done in a variety of ways: in terms of, for example, number and percentage of lines unbundled in the full, shared-line or bitstream senses, proportions of traffic and so on. However, there are relatively sparse data showing the subsequent impact in terms of competition, price reductions and/or quality improvements.

Although it was not one of the case study countries, it is worth noting that the USA have thus far relied primarily on facilities-based competition among telephone, cable TV and other new infrastructure providers rather than forcing LLU. Australian policy has promoted LLU since 2006 and prices have been regulated since 2008; 506 local exchanges are able to offer full unbundling – only 10% of local exchanges, representing 4% of subscriber main lines. As of 2007, new entrants made up only 2.2% of total fixed analogue subscriber lines.

French unbundling policy, which began before the EC mandate, was further extended to include networks created by local governments and wholesale 'fibre liaison' networks linking geographically separated switches. French regulation has also promoted quality of service (QoS) over access lines. Overall, almost 70% of subscriber lines are available for full unbundling. However, this makes up less than 25% of exchanges, and is heavily concentrated in urban areas.

In Germany, the initial attempt by Deutsche Telekom (DT) to meet its LLU requirements by bitstream was stopped by the regulator after protests from rivals. In consequence, Germany has remarkably little bitstream traffic. Indeed, all of Germany's MDFs are capable of supporting full unbundling. Actual uptake is more modest; rivals have equipment at approximately 45% of MDFs, giving them access to about 75% of subscriber access lines. However, this dependence on the maintenance of MDFs – as discussed above – attracted adverse comment and by mid-2007 the regulator (BNetzA) forced DT to open up its cable ducts to competitors and – where there was no spare duct capacity – to offer rivals access to dark fibre. This had the effect of letting entrants connect to customers at a point much closer than the MDF (and making them independent of DT technology changes that might eliminate MDFs).

3.3.3 The UK was one of the last countries to adopt LLU

The case study countries (Germany, France and Australia) differ in the date at which LLU began and the pace of its realisation. Factors influencing this decision include the relationship between the NRA and the dominant local loop incumbent, the availability of alternative access infrastructures, the level of demand for broadband services and the density of end-users relative to copper-line and alternative infrastructures – thus the data cannot be directly compared. Nonetheless, it is fair to say that Germany were one of the first countries to adopt LLU (in 1996), that Germany and France introduced LLU in some form before the EU telecom regulatory package enforced LLU on all European NRAs in

2001[17] (though compliance is not yet perfect) and that the UK followed after this point. On the other hand, more providers (approximately 20) have taken advantage of LLU in the UK than in other countries: Germany has 11, France 9 and Australia 10.

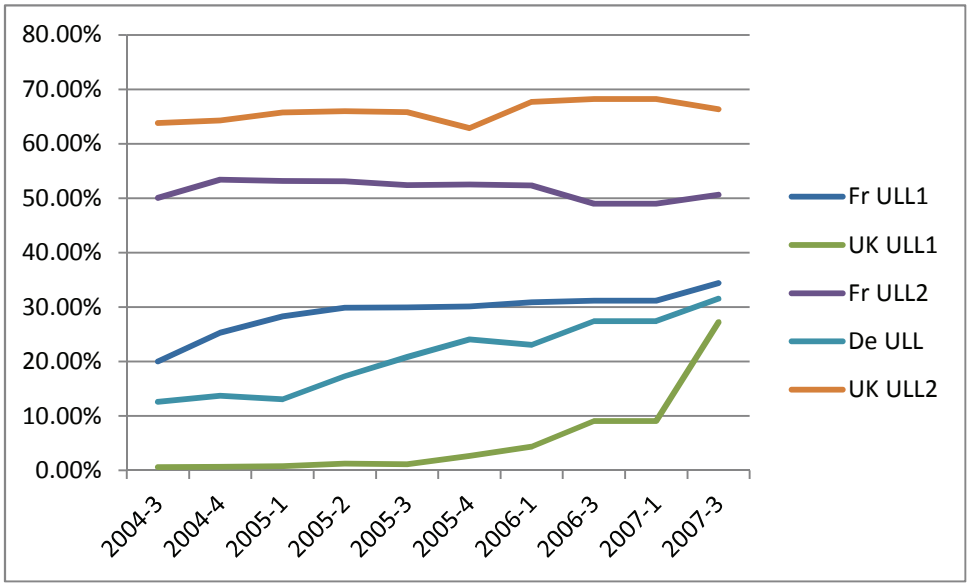
The two main process elements are the mandating of access and control of LLU access prices. In the UK Ofcom's initial strategic review endorsed the principle of 'equivalence of input', equalising the positions of BT and its rivals. To implement this, the Enterprise Act (rather than the Communications Act) was used to negotiate functional separation (establishing Openreach as a separate entity to provide equivalent services to all operators).[18] In Germany, the resistance of DT (which responded to the law by proposing bitstream access only) was overcome by regulatory insistence without structural measures, and followed up with cost-based price regulation. Once the full- and shared-line LLU facilities had been established, Germany finally (in 2008) approved IP and asynchronous transfer mode (ATM) bitstream offers.

Data on the comparative performance of the case study countries in terms of the relative impacts of their LLU strategic decisions are not uniformly available. However, indications may be gained (for the EU countries considered) from data from the European Competitive Telecommunications Association (ECTA) broadband scorecards, showing the evolution of the percentage of digital subscriber lines (DSL) offered via full and shared unbundling of the local loop (ULL) – the ULL1 series – and via full, shared and bitstream (combining IP and ATM – the ULL2 series). This is presented in Figure 3.1 below.

[17] It is worth noting that LLU was mandated by a European regulation rather than a directive – a regulation is meant to have immediate effect across the EU, while directives must be transposed into national legislative frameworks.

[18] As an additional benefit, Openreach produces a wealth of detailed tracking (weekly) data, giving a much stronger empirical evidence base for analysing UK LLU performance than is available in most other countries. This is complemented by quarterly analyses from the Office of the Telecommunications Adjudicator (http://www.offta.org.uk/index.htm). Because comparable data are not available for the other cases, we have not analysed them here; however, it is fair to compare outcomes and to consider whether 'equivalence of access' might inhibit innovation and improvement incentives.

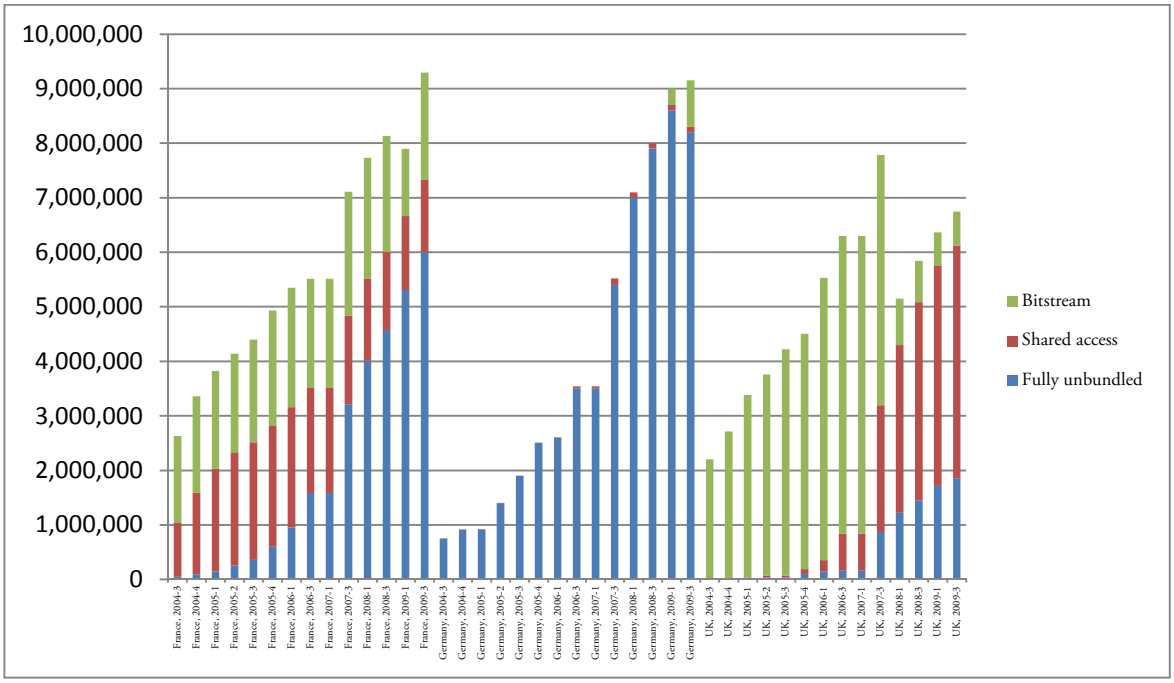
Figure 3.1: Evolution of local loop unbundling in the EU case studies



3.3.4 Despite the late adoption of LLU, the UK caught up quickly

These data show clearly that the UK lagged well behind its EC competitors in LLU (if bitstream is excluded), though it was catching up rapidly following the Openreach decision. On the other hand, it was well in the lead throughout this period if bitstream is included. A full series of data on the number (not percentage) of unbundled lines is given in Figure 3.2, which shows that bitstream access was largely replaced in the UK by shared-line access, to an extent unmatched in either of the other EU cases.

Figure 3.2: Number of unbundled lines



Source: ECTA broadband scorecards

3.3.5 The UK compares favourably to other countries on penetration and price

In terms of broadband penetration, in 2008 the OECD set out the numbers of broadband subscribers per 100 inhabitants. The UK was marginally higher in terms of penetration than the other countries included in this comparative review.[19]

On pricing, France and Germany followed different regulatory strategies, with different results. Both started with national post, telephone and telegraph administrations (PTTs). ARCEP, the French regulator, allowed the incumbent (France Telecom) to discriminate between interconnectors with their own networks and those without (who paid more). This gave rivals an incentive to build out the overall network and to compete for the vertical market.

In contrast, Germany required DT not to discriminate, but to price access equally; this gave an advantage to (bitstream) resellers competing in the retail market, and provided consumers with the advantages of simplicity and low-switching cost (call-by-call competition).

As a result, German fees fell much faster (to 42% of the average of other countries' fees immediately; 90% by year's end), lost nearly 14% of market value in a few days and lost 32% of market share to 51 rivals within a year. On the other hand, France Telecom rates fell much less; market value more than doubled in the first year and market share fell by 3%.

In terms of price impact directly on consumers, over time the price of residential phone charges has come down in OECD countries. The decrease has been pronounced in the price of calls and less so in the cost of fixed line rental. When looking at the OECD 2009 data on medium use, UK prices are below average. The revenue per fixed line in the UK has fallen overall over the years from 2003 to 2008, access revenue has increased by 1.4% and usage has decreased by 8.8%. The last of these figures indicates a fall in price and in the use of fixed-line telephony. In terms of broadband prices, the UK has some of the lowest prices for the medium use basket (OECD 2009).

3.3.6 The UK's late adoption has worked well in terms of consumer access and price, but issues remain around long-term investment in new infrastructure

In summary we can see that Germany and France were ahead in adoption of LLU, having introduced LLU prior to EU enforcement in 2001. Despite this, more providers have taken advantage of LLU in the UK than in any other country. In terms of opening access via LLU, the UK lagged well behind its EC competitors in 'strict' LLU, though it was well in the lead throughout this period if bitstream is included. The extent of adoption of LLU in the UK may, however, have infrastructural investment implications. Although incumbents have additional revenue from the unbundling process, there is an intrinsic disincentive to invest in the building of new infrastructure since they then have to share it with others to at least some extent. Therefore, the short-term impact of LLU may be reduced pricing and better access for consumers, but in the longer term there may be less choice or less access to newer technologies as the market environment changes.

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[19] OECD (2008) Broadband growth and policies in OECD countries at http://www.oecd.org/dataoecd/32/57/40629067.pdf (p. 25).

Table 3.2: Summary of local loop unbundling case study

Key trends: LLU can take various forms, ranging from full unbundling to IP-based (bitstream) access. An EU telecom regulatory package enforced LLU on all European NRAs in 2001.
International comparisons: Germany and France introduced LLU in some form prior to the EU regulations being put in place. This positioned them well competitively and brought advantages in access and price to their consumers.
Ofcom: The UK was one of the later countries to introduce LLU. However, coming late to LLU has brought them the specific advantage of having observed the evolving competitive environment in other countries. More providers have taken advantage of LLU in the UK than in other countries. Bitstream access was largely replaced in the UK by shared-line access, to an extent unmatched in other EU cases.
Conclusion: The take-up of LLU in the UK was slower than in some EU Member States, but this has worked well up to now overall in terms of access and price impact for consumers. The infrastructural investment implications have yet to be determined.

3.4 Voice-over internet protocol access to emergency services

Focus of the case study	*VOIP refers to the carriage of digitised voice telephony over IP networks. In certain situations, users may need to access emergency services using their VOIP service. The extent to which this is possible is considered in this case study.*
Why it is important	*As more of the population become users of VOIP, there is a greater likelihood that they may not retain a traditional fixed line. Since VOIP relies on the availability of a network and on electrical connectivity, this raises the risk that emergency access may not be possible when it is most needed.*
Benchmarks used to measure performance	• *Imposition of emergency call access by providers* • *Ability to access location information* • *Extent of consideration and planning for the issues.*
Countries included in the review	*UK, Germany, France, USA, Australia.*

3.4.1 The USA led the way on VOIP access to emergency services, but significant differences exist between NRAs in the legal and regulatory treatment

'VOIP refers in general to the carriage of voice telephony over IP networks. A 2001 ITU report distinguished IP telephony (VOIP irrespective of ownership) from VOIP service, taken to refer to the provision of voice services over networks competing with incumbent

operators.[20] Because our focus here is on emergency service access, we primarily consider VOIP providers offering connections to the PSTN.

Most countries seem to follow the US lead in relation to emergency access over (paid) VOIP lines that connect to the PSTN system. However, significant differences in the legal and regulatory treatment of VOIP *per se* – and possibly differences in regulatory philosophy or other factors – mean that few go as far. For the USA, as Frieden notes:[21]

> *The FCC gladly deregulated all forms of wireline and wireless broadband access, but has not extended this regulatory forbearance to Voice over the Internet Protocol (VOIP) telephony and Internet Protocol Television (IPTV). These services seamlessly blend telecommunications transmission links with information services, but the FCC appears inclined to avoid applying the unregulated information services classification, because these services compete directly with pre-existing (legacy) common carrier telephone and television service. Rather than treat VOIP carriers with the same sort of regulatory forbearance it applies to wireless telephone service, and increasingly to wireline service, the FCC has saddled VOIP service with regulatory burdens that make VOIP service more like conventional telephone service, at the expense of reducing VOIP's competitive cost advantage. VOIP service providers, which offer subscribers telephone calling access to the conventional wireline public switched telephone network (PSTN), must contribute to universal service funding, reconfigure their service to provide wiretapping capabilities to law enforcement authorities, provide caller location identification and emergency 911 access and offer service to disabled users.*

This equivalence between VOIP and PSTN telecom providers is broadly replicated in the other case study countries. However, the obligation to provide emergency access and location information is different. All countries examined formally impose emergency access on type 4 VOIP suppliers (users can both call and receive calls from the PSTN system), but Australia has yet to impose it on type 2 (only calls to the PSTN network are enabled) voice services platforms (VSPs). The UK formally imposed the obligation via a statement by Ofcom in December 2007 requiring VOIP providers to provide emergency service access by 8 September 2008, but has not enforced compliance. Only in the USA are customers unable to opt out – in many other countries, VSPs offer subscriptions with and without emergency access. The latter is not necessarily worse; the dependence of VOIP connectivity on both household power and internet availability makes emergency access far less secure than the PSTN alternative. In the USA, the UK and Australia, the NRA warns subscribers of this danger (but subscribers may not read the warning), while in France the VSP is obliged to notify subscribers at point of sale (the German situation is unclear).

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[20] ITU (2001) IP telephony, at http://www.itu.int/osg/spu/ni/iptel/; Table 1.1 in ITU (2007) The status of voice over internet protocol (VOIP) worldwide, 2006, at http://www.itu.int/osg/spu/ni/voice/papers/FoV-VoIP-Biggs-Draft.pdf, provides a classification of definitions in terms of: quality of service, equipment used, network architecture, functionality, numbering system, provision over IP/PSTN system, service and/or users.

[21] Frieden (2009) 'Lockdown behind the third screen', *Berkeley Technology Law Journal*, 24: 819.

3.4.2 Data on the relative effectiveness of different approaches to VOIP emergency access are not freely available

An assessment of the impact of these differences depends on quantitative data: how many (what percentage of) emergency calls are made via VOIP, how many of those users also have a PSTN connection, how many are nomadic or otherwise unable automatically to provide caller location information (CLI), how many are using business (private branch exchange – PBX) systems that do not locate them precisely and so on. These data are not uniformly and consistently available, but in principle (for an entity with suitable access) could be obtained from the emergency services in various ways – that they are not raises an interesting question, since it suggests that the costly and possible unsafe requirement to offer services (of very different reliability and 'informativeness') cannot be linked to an objective measure of effectiveness. Indirect indications may be obtained by considering the degree to which, for example, location information is routinely and automatically available, or whether its unavailability is clearly indicated to the emergency service operators. For VOIP callers from fixed IP addresses this is highest in the UK and Australia (in each of which a VOIP flag is set). For nomadic VOIP use (moveable but always connecting through – never far from – a geographically fixed access point), none of the case study countries provides location information. Temporary IP addresses are traceable via the IP address owner (the ISP, if not the VSP) – this longer chain may weaken reliability – but the flags set in the UK and Australian systems at least notify the emergency operator to ask the caller. In terms of coverage, only a few operators offer emergency access to non-subscribers (unlike most mobile and fixed-line telephones); there does not seem to be any legal basis for this or intention to institute such a requirement.

3.4.3 Ofcom stood out in considering emergency service access over VOIP, and the UK sets the tone for regulation in this area in Europe

In summary, VOIP emergency service access forms a part of the more general issue of regulating VOIP services. The USA has led the way in imposing emergency call access and location information requirements, despite treating VOIP as an information service. Many of the other countries considered have treated VOIP as a telephone service, but adopted a light-touch regulatory regime. France was one of the pioneers in developing VOIP policy, but this did not translate into leadership in relation to emergency access. Ofcom stood out not only in explicitly considering emergency service access, but also in developing an interim forbearance policy that encouraged entrants to provide emergency service access and only later added location information requirements. The current EC regulatory framework follows the UK lead in the sense that it emphasises a light regulatory touch, taking into account the emerging nature of the technology, whilst preserving consumer interests – especially in relation to emergency service access. Ofcom has therefore played a leadership role here to some extent.

Table 3.3: Summary of voice-over internet protocol emergency service access case study

Key trends: VOIP refers in general to the carriage of voice telephony over IP networks. Because our focus here is on emergency service access, we primarily consider VOIP providers offering connections to the PSTN.
International comparisons: The USA has led the way in imposing emergency call access and location information requirements, despite treating VOIP as an information service. Many of the other countries considered have treated VOIP as a telephone service, but adopted a light-touch regulatory regime. France was one of the pioneers in developing VOIP policy, but this did not translate into leadership in relation to emergency access.
Ofcom: Ofcom stood out in explicitly considering emergency service access, and in developing an interim forbearance policy that encouraged entrants to provide emergency service access, and only later added location information requirements. The current EC regulatory framework follows the UK lead in emphasising a light regulatory touch.
Conclusion: Ofcom has performed well in planning for emergency access over VOIP. The steps they have taken have resulted in this important issue being dealt with and planned for with a light regulatory touch. This has proved to be an effective approach for dealing with this issue.

3.5 Spectrum planning for the 2012 London Olympics

Focus of the case study	*Spectrum planning for the Olympic Games requires consideration of many complex requirements and technical specifications. The needs of television and radio broadcasters, mobile and fixed telephony users and internet users involve balancing of and planning for many different requirements.*
Why it is important	*The success of the Olympic Games depends on the ability to communicate the happenings of the competition live to as many people globally as possible. This puts enormous strain on the spectrum provision.*
Benchmark used to measure performance	• *Planning and preparation.*
Countries included in the review	*2012 London Olympics (referring to the whole of the UK)* *Vancouver 2010 Winter Olympics* *Beijing 2008 Olympics* *Athens 2004 Olympics.*

3.5.1 Spectrum planning for the Olympics has increasingly included government guarantees, and planning for London 2012 is no exception

Looking first at the planning and preparation for the Olympic Games, we can see that in the case of the London 2012 Olympics, a government commitment was provided to support the bid for the Games. As part of London's bid, the then Secretary of State for Trade and Industry gave a guarantee to the International Olympic Committee (IOC) that the UK government would provide the frequencies required for the organisation of the Games. A guarantee was also given that the UK government would waive any fees payable for these allocated frequencies. Ofcom was therefore given the responsibility from the outset to organise a full spectrum plan for the London Games and to arrange all the spectrum licences ahead of time to support the plan. Spectrum provision planning for the London Games was started six years ahead of the event.[22]

Similarly, in the Vancouver 2010 Winter Olympic Games, a government guarantee was issued. The government agency Industry Canada's involvement began in October 2002 with the commitment to provide spectrum management support to the Vancouver bid. This commitment became a part of the Canadian government's overall pledge of support to the Vancouver bid, which was formalised in a multi-party agreement signed in November 2002. Soon after Vancouver's bid was successful, Industry Canada began

[22] http://www.ofcom.org.uk/consult/condocs/spectrum2012/condoc.pdf (accessed March/April 2010).

drawing up plans to meet its spectrum commitment and ensure the right staff and tools would be in place and ready. During 2007–8, Industry Canada developed a two-stage Winter Games spectrum management plan for pre-Games and Games-time operations.[23] By contrast, the Beijing 2008 and Athens 2004 Games did not offer government guarantees although extensive planning was done. The Beijing 2008 Olympic Action Plan was published in 2003 and contained plans to apply 'information technology extensively to urban development to build a "digital Beijing"'. This plan also refers to the 'digital Olympics' programme and the building of telecommunications infrastructure and network systems to create a favourable IT environment and provide excellent information services. It was planned that by 2008 information services would be 'inexpensive, rich in content, free of language barrier, personalised, and available for anyone, at anytime and anywhere'.[24] For the Athens 2004 event, Hellenic Telecommunications and Post Commission (EETT) began drafting their spectrum plans in 2002 as part of an 'operational plan for the provision of a secure and reliable radio communications environment'. As part of these plans, EETT drafted a monitoring guide which defines in detail the spectrum's legal use, monitoring interference problems and management procedures, as well as the responsibilities of each body involved.

Overall in relation to planning, at Athens 2004, Vancouver 2010 and in the planning for London 2012 we may see that there is more of a focus on the legalities, management procedures and responsibilities. There is also a developing pattern for the provision of government guarantees (Vancouver 2010 and London 2012) to support the bidding of cities to win the hosting of the Olympic Games. In the case of Beijing 2008 the focus was more on infrastructure and the building and development of network systems than on spectrum planning. Ofcom published its draft spectrum plan for consultation with stakeholders in May 2009 and its statement setting out the spectrum plan for the London Games in October 2009. This was earlier than other NRAs had done. Stakeholders were grateful for this early publication of the spectrum plan and for the opportunity to comment through consultation on the draft. Ofcom's approach gave more time than other NRAs did for stakeholders to plan their usage and more opportunity for them to have their views heard about which bands would be most suitable. In each of the four Olympic Games included in this analysis spectrum provision plans were put in place ahead of time. In the more recent Olympic Games, more time has been given to the planning issues. This is inevitable due to the increasing complexity of the spectrum demands of the Games in conjunction with the existing demands of the host country. We can see that in these three cases, there is broad collaboration and an effort to maximise the input into the planning.

With regard to the responsibility for ensuring the successful spectrum management at the Olympic Games, lines of responsibility were clear in Greece, Canada and the UK (data on Beijing are unavailable). For London 2012 it is Ofcom that holds the ultimate responsibility for delivery of the spectrum plans.[25] In Vancouver 2010 it was Industry

[23] Vanoc spectrum management communications plan, 11 February 2009, at http://www.trewaudio.com/PDF/vanoc_spectrum_comm_plan_v2.16.pdf

[24] Beijing Olympics Action Plan (2003), at http://en.beijing2008.cn/59/80/column211718059.shtml

[25] http://www.ofcom.org.uk/consult/condocs/spectrum2012/condoc.pdf (accessed March/April 2010); http://www.ote.gr/grsp/english/ipiresies.htm (accessed March/April 2010)

Canada that was responsible for the planning and provision of spectrum, while in Athens 2004 the Greek regulator EETT had overall responsibility.

3.5.2 Ofcom has clearly taken on board lessons from previous Olympics

Turning to allocation of spectrum, it is clear that Ofcom has maximised its learning from previous events. In Vancouver 2010 spectrum requests received through the relevant portal were directed to Industry Canada for processing, while spectrum co-ordination requests were directed to the VANOC programme manager for action. Industry Canada made assignments, specifying operating parameters including frequency, bandwidth, transmitter power and so on. VANOC co-ordinated the spectrum use inside venues by specifying the channels for wireless microphones and squelch tone for land mobile radios and so on. After a spectrum request application was processed, Industry Canada notified the VANOC programme manager whether an application had been approved or refused. The programme manager acted as liaison between the applicant and Industry Canada to recommend appropriate options in the case of the application being refused.[26] For Athens 2004 the Greek regulator EETT issued 2,004 licences for handheld radio systems and 56 licences for land mobile radio systems.[27] EETT made agreements for the temporary granting of spectrum by main users and in particular the armed forces, the Hellenic Telecommunications Organisation (OTE) and radio amateurs. In addition, EETT assigned specific operational frequencies to support the security forces. For London 2012, Ofcom and the London Organising Committee for the Olympic Games and Paralympic Games (LOCOG) will jointly be putting in place a new computer system that would validate the identity of the applicant as well as recording users' requirements for spectrum. This process was to start in early 2011.[28]

In terms of regulation of spectrum, in the UK for London 2012 Ofcom is responsible for providing the spectrum needed for the Games. The Cabinet Official Committee on UK Spectrum Strategy (UKSSC) is responsible for co-ordinating public-sector spectrum use, and its subcommittee Spectrum Planning Group for the London 2012 Olympic Games and Paralympic Games (SPGOG), chaired by Ofcom, for co-ordinating the loan of spectrum by the public sector and for public-sector requirements for additional spectrum for the Games (Ofcom 2010[29]). For Athens 2004, in order to service frequency demands, EETT designed and the Athens 2004 Olympic Games Organising Committee (ATHOC) implemented the 'e-spectrum' network application. Through this application, interested radio frequency users could obtain information on the current radio frequency licensing status for the Olympic Games, submit their applications and monitor their progress via the internet.[30] For Vancouver 2010, after the user had submitted their frequency request VANOC levied a co-ordination fee of $150.00 per frequency. Industry Canada processed the frequency application and once approval was granted the authorised rate card user received their temporary licence to operate radio frequency. Payment of the VANOC co-ordination fee was to be through the VANOC Rate Card Ordering System portal. Frequency and channel assignments were not issued until payment had been received.

[26] http://www.trewaudio.com/PDF/vanoc_spectrum_comm_plan_v2.16.pdf
[27] http://www.ofcom.org.uk/consult/condocs/spectrum2012/condoc.pdf
[28] http://www.ofcom.org.uk/consult/condocs/spectrum2012/condoc.pdf
[29] Clarification of responsibilities provided directly by Ofcom, 2010.
[30] http://www.eett.gr/opencms/export/sites/default/EETT_EN/publications/proceedings/actions.pdf

Users could not sell, trade, loan or re-assign channels. Assigned frequencies and channels could be used only within co-ordinated zones.[31] For London, LOCOG is designing the application portal. Ofcom has built and tested the back-end licence-assignment system to support all Games needs.

In each of the Olympic Games, specific challenges arose and were dealt with. The success or not of dealing with these as they arose depended upon the forward planning of each country in anticipating what the issues might be.

At Athens 2004, the most important challenges faced were in relation to problems with providers – such as, for example, delays in ordering telecommunications infrastructures, as well as delays due to bureaucratic procedures during the installation of telecommunications infrastructures. In addition, there were a significant number of unauthorised transmissions, which could have had an impact on the smooth operation of the Olympic Games. Overall, it was found that the preparation of providers and the implementation of the Emergency Operational Plan resulted in the uninterrupted operation of telecommunications networks during the Games. Also, during the Games, an Olympic Monitoring Centre (OMC) was operating on a 24-hour basis at the EETT headquarters for the co-ordination of the spectrum protection project, the resolution of any interference problems and the provision of support services to Olympic users. In parallel, technical units were constantly present and monitored all sports venues in Athens and the remaining Olympic cities. Upon completion of the pre-assignment of frequencies, a proactive control of all Olympic frequencies and clearing from harmful interference was made for all services using bands, managed by EETT.[32]

For Vancouver 2010, from Industry Canada's perspective the size and scope of the spectrum services required for the Games far exceeded the department's local spectrum management capacity. As a consequence of the Games themselves, the current licensed radio population grew by more than 50% in the following 18 months. This was in addition to the many more consumer wireless devices that were in use. Requests for radio licences increased from the normal 1,200 annually to more than 3,200 in the year prior to the Games. In dealing with this, Industry Canada and VANOC's spectrum plan outlined their strategy to cope with the huge demand for spectrum during the Winter Games. Key to VANOC's strategy was the need to partner with municipal, provincial and federal government agencies as well as adhering to a 'robust, comprehensive, and diligently executed Spectrum Management Plan'. The spectrum management plan depended on a co-ordinated effort from Industry Canada and VANOC, as well as on the co-operation of other stakeholder groups and national bodies.[33]

In the case of London 2012, Ofcom commenced detailed spectrum planning earlier than previous host regulators did. This has given users and spectrum providers more time to plan. It is subject to change because it is difficult to make an accurate assessment of the spectrum requirements of the London Games when the task of planning has begun far in advance. The difficulty exists because not all users – such as rights-holding broadcasters

[31] http://www.trewaudio.com/PDF/vanoc_spectrum_comm_plan_v2.16.pdf (accessed March/April 2010).
[32] http://www.eett.gr/opencms/export/sites/default/EETT_EN/publications/proceedings/actions.pdf
[33] http://www.trewaudio.com/PDF/vanoc_spectrum_comm_plan_v2.16.pdf

(RHBs) and partners – have been selected or identified, many known users have been involved with the Vancouver 2010 Winter Olympic Games and Paralympic Games and have not yet considered their requirements for the London Games, technological developments cannot be reliably foreseen and some technological choices have not yet been made. The main technological challenges arising from the 2012 Olympics relate to the scale and complexity of the Games rather than the use of cutting-edge technologies. The emphasis will be on tried and tested technology. Ofcom also face the problem of increased demand for spectrum, particularly in an area such as London where demand is already high. In order to manage this, Ofcom will borrow spectrum from public bodies such as the Ministry of Defence (MoD) and the Civil Aviation Authority to meet the demands posed by the Games. Ofcom has said it will source the required spectrum in four main ways: by borrowing spectrum on a short-term basis from public-sector bodies, encouraging more efficient use of civil spectrum, making use of spectrum freed up by the digital switchover, and using licence-exempt spectrum.[34] Ofcom has gone further than previous host regulators in joining up their spectrum plan with international organisations, including the North Atlantic Treaty Organisation (NATO).

3.5.3 Ofcom's planning for the Olympics is clearly in line with previous games and it is well positioned for facing the challenges ahead

Overall, then, we can see that as the Olympics progress the planning, organisation and management of spectrum-related issues is becoming more elaborate but more comprehensive. Increasingly, collaboration is needed across groups of stakeholders, and the NRAs are becoming more significant in the role that they play. Ofcom is dealing with more spectrum demand and more complexity than has been required for any previous Olympic Games. The planning of spectrum allocation and management, however, shows that Ofcom has learned where possible from previous events and is well positioned for the challenges ahead.

[34] http://www.eweekeurope.co.uk/news/news-it-infrastructure/ofcom-details-plan-to-borrow-spectrum-for-london-olympics-2156

Table 3.4: Summary of Olympic spectrum policy case study

Key trends: In the four Olympic Games included in this analysis (UK 2012, Vancouver 2010, Beijing 2008 and Athens 2004) spectrum provision plans were put in place ahead of time. In the more recent Olympic Games, more time has been given to the planning issues, and Ofcom published its spectrum plan well in advance to help users plan their requirements. This is helpful because of the increasing complexity of the spectrum demands of the Games, alongside the existing demands of the host country.
International comparisons: In the case of Beijing 2008, the focus was more on infrastructure and the building and development of network systems than on spectrum planning. In the Athens 2004 and Vancouver 2010 Games and the planning for London 2012, we can see that there is more of a focus on the legalities, management procedures and responsibilities. There is also now a developing pattern in the provision of government guarantees (in Vancouver 2010 and in London 2012) to support the bidding of countries to win the hosting of the Olympic Games.
Ofcom: As for Athens 2004 and Vancouver 2010, in the planning for London 2012 we can see that there is more of a focus on the legalities, management procedures and responsibilities (full details of which are provided in the appendices). A government guarantee was provided for delivery of spectrum. Ofcom has built upon learning from previous events in spectrum allocation, management, testing and planning.
Conclusion: Ofcom is dealing with more spectrum demand and more complexity than has been required for any previous Olympic Games. The comprehensive planning and extent of the testing, however, show that Ofcom has learned where possible from previous Games and is well positioned for the challenges of 2012.

3.6 Mobile mis-selling

Focus of the case study	*Defined as having three main elements:* ***general mis-selling*** *– a customer is given false information* ***'slamming'*** *– which relates to a substantial contract or provider change without informed consent* ***cashback*** *issues – in which the customer is promised refunds after the purchase that are impossible to get.*
Why it is important	*This has been a growing problem for consumers in the UK.*
Benchmarks used to measure performance	*Reduction in customer complaints in relation to the three areas above.*
Countries included in the review	*Germany, Australia, USA, New Zealand, Israel.*

3.6.1 Mobile mis-selling is not seen as a major problem or the responsibility of NRAs in all countries

For the purposes of this study, mobile mis-selling is defined (based on a UK definition) as having three main elements. These are, first, general mis-selling in which, for example, a customer is given false information; secondly, 'slamming' – which relates to a substantial contract or provider change without informed consent; and, thirdly, cashback issues in

which the customer is promised refunds after the purchase that are impossible to get.[35] While this is the definition applied to the research, for comparative purposes it was important to ensure that where possible a similar definition of general or other types of mis-selling was used. In three of the comparative countries (Germany, USA and New Zealand), relevant information on mis-selling was not available. In the other comparative countries (Australia and Israel), limited information only was available. Therefore it was not possible to line up a direct comparison with Ofcom. However, where possible relevant information has been collected and pertinent observations made about the management of mobile mis-selling in the UK compared to Israel and Australia.

Looking at the extent of the mis-selling problems, in the UK we can see that there has been a dramatic reduction in the number of instances between 2007 and 2009.[36] In Australia (the only country with any directly relevant comparable data on this issue) there was a dramatic increase in the number of instances.[37] In Israel the Israeli Ministry of Communications (which directly provided information for the study) indicated 'we are seeing a gradual decrease in problems regarding mobile mis-selling although it's difficult to say if this is because the public is getting more savvy as time goes on, or whether it's a result of our regulatory initiatives'.[38]

In the UK complaints about mis-selling increased significantly between 2005 and 2006, and in spring 2007 this area had become an escalating problem, especially in relation to cashback issues.[39] In response to the rising complaints, most network operators in the UK made a set of voluntary undertakings to Ofcom on a range of matters including sales and marketing. The industry later also agreed a self-regulatory voluntary code of practice aimed at stamping out misleading sales and marketing practices. This code was published in July 2007.

Shortly after the industry published its voluntary code of practice, Ofcom started a consultation exercise with the aim of introducing a new General Condition (GC) on sales and marketing practices. This GC was confirmed 18 months later on 17 March 2007. The document sets out the additional enforcement powers Ofcom is able to use to investigate rule breaches formally and impose sanctions against offending companies.[40]

In Australia, by contrast, the management of mobile mis-selling has remained a matter for consumer affairs organisations rather than becoming a matter for the regulators. Consumer complaints related to mobile phones that cannot be resolved between the parties are escalated to the TIO. The regulators, the Australian Competition and Consumer Commission (ACCC) and the Australian Communications and Media Authority (ACMA)

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[35] Boyfield and Mather (2009) *Regulating mobile phones – a fresh look – a fresh look*, European Policy Forum, 29–32.

[36] General mis-selling complaints reduced from 2,536 in 2007 to 1,363 in 2009 (Ofcom data provided to RAND Europe in March–April 2010).

[37] There was an increase in general complaints relating to mobiles from 2,344 in 2007 to 7,510 in 2009; see http://www.tio.com.au/Quarterley%20statistics/december_qtr_2009.html#mpsi

[38] Interaction with Mr Yair Hakak, Israel Ministry of Communications / Economics Division, 8 April 2010.

[39] Boyfield and Mather (2009) *Regulating mobile phones – a fresh look*, European Policy Forum, 29–32.

[40] Boyfield and Mather (2009) *Regulating mobile phones – a fresh look*, European Policy Forum, 29–32.

act in this context as stakeholders to the TIO. The ACCC is the federal agency responsible for regulating most aspects of the Trade Practices Act.[41]

In Israel, mobile mis-selling is dealt with by a government ministry rather than by a regulator or by a consumer organisation. In broad terms, the sector is governed by main legislation, secondary legislation or in administrative orders relating to licences, permits or service portfolios of the issue at hand. These are adjusted according to the problem. The Ministry of Communications provides recommendations for consumers on dealing with issues with telecommunications service providers.[42]

3.6.2 It is hard to judge the comparative effectiveness of interventions given the fundamental difference in approach between countries and the type of data collected

In terms of the effectiveness of the strategies adopted in the three countries, a variation in outcomes may be seen. In the UK, despite criticism that the rapid intervention by Ofcom failed to give enough time for the industry's own self-regulatory response to show results, the number of mobile mis-selling complaints fell sharply (detailed above).[43] In Australia, under the TIO's remit the number of complaints has continued to rise. In Israel there is believed to be a gradual decrease in problems related to mobile mis-selling, mainly due to action on limiting the length of mobile contracts to 18 months.[44]

3.6.3 In the UK, it seems clear that mobile mis-selling is a reducing problem for consumers

In summary, from the perspective of the consumer in the UK mobile mis-selling is a reducing problem and therefore the public is less exposed to these specific issues than formerly. In Australia these problems remain for consumers although the TIO and the regulators are aware of them. In Israel the consumer protection approach of keeping track of complaints and suggesting specific changes to the processes as needed seems to be working.

In the UK Ofcom's interventions have produced a dramatically reduced problem with mobile mis-selling overall. While the regulatory approach is obviously not the only one that works, the data show that there has been a major improvement. In Australia, where this matter is dealt with by the TIO, there is an ongoing increase in complaints and problems. In Israel, under the guidance of the Ministry of Communications, there is thought to be an improvement. Based on the relatively limited data available on this issue, we can observe that Ofcom is producing the desired results efficiently and effectively. Whether they could have done this equally well without regulation is currently unclear.

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[41] Interaction with Mr Grant Caine, Senior Director, Performance Audit Services Group, Australian Communications and Media Authority, 3 April 2010.

[42] Consumer Service Supervision Department, Supervision and Enforcement Division (October 2007), Consumer tips, October, at http://www.moc.gov.il/sip_storage/FILES/3/1223.pdf

[43] Boyfield and Mather (2009) *Regulating mobile phones – a fresh look*, European Policy Forum, 29–32.

[44] Interaction with Mr Yair Hakak, Israel Ministry of Communications / Economics Division, 8 April 2010.

Table 3.5: Summary of mobile mis-selling case study

Key trends: For the purposes of this study, mobile mis-selling is defined (based on a UK definition) as having three main elements. These are, first, general mis-selling in which, for example, a customer is given false information; secondly, 'slamming', which relates to a substantial contract or provider change without informed consent; and, thirdly, cashback issues in which the customer is promised refunds after the purchase that are impossible to get.
International comparisons: In Australia (under the management of a consumer protection agency) there was a dramatic increase in the number of instances. In Israel (with management by a government ministry), the number of instances is going down.
Ofcom: In the UK there has been a dramatic reduction in the number of instances of problems between 2007 and 2009.
Conclusion: The UK has dealt with mobile mis-selling aggressively and has successfully reduced the problem for consumers. Some other countries have not even accurately defined or measured the problem. The UK is making better progress than the two comparative countries included in this analysis.

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APPENDICES

Appendix A: Acronyms, glossary, regulators and other organisations

Table A.1: Acronyms and glossary

Acronym	Full title	Glossary
ADSL	asymmetric digital subscriber line	Protocol for carrying voice, slow-speed upload and high-speed download traffic simultaneously over a copper telephone line.
ADSL2	asymmetric digital subscriber line – advanced version	Enhanced version of ADSL offering better capacity and speed, quality of service (QoS) control, (slightly) improved coverage, lower power consumption and better monitoring.
AM	amplitude modulation	
ATM	asynchronous transfer mode	Switching technique for telecommunication networks.
ATSC	Advanced Television Systems Committee	Set of standards developed by the Advanced Television Systems Committee for digital television transmission.
CA	conditional access	The protection of content by requiring certain criteria to be met before granting access to this content.
CALEA	Communications Assistance for Law Enforcement Act 1994	This law defines the existing statutory obligation of telecommunications carriers to provide assistance to law enforcement agencies in executing electronic surveillance pursuant to court order or other lawful authorisation in the USA.
CATV	cable television	A system for distributing content over coax cable, now used to carry high-speed internet traffic.

CLI	caller location information	Automated reporting of the point of origin of emergency service calls.
DAB	Digital Audio Broadcasting	Digital radio technology for broadcasting radio stations.
DB	digital broadcasting	Broadcasting in digital format.
DOCSIS	data over cable service interface specification	
DSL	digital subscriber line	Group of technologies that provides digital data transmission over the wires of a local telephone network.
DSLAM	digital subscriber line access	Allows telephone lines to make faster connections to the internet.
DVB	Digital Video Broadcasting	Effort to reproduce DAB in a video environment.
EMC	electromagnetic compatibility	
EPG	electronic programming guide	Index to digital services.
ESA	exchange service area	Term used to describe a geographical area in which all customers' phone numbers are in the same number range or ranges and phone calls are charged at the same rates.
FTTC	fibre-to-the-cabinet	Fibre optic cable installed from the telephone exchange to the street side telephone cabinet, used to deliver communications such as broadband, digital TV and telephone.
FTTH	fibre-to-the-home	Fibre optic cable installed from the telephone exchange to the home.
FttX	fibre to the x	General term for any broadband network architecture that uses optical fibre to replace all or part of the usual metal local loop used for the last mile of telecommunications.
Gbps	Gigabits per second	Data transfer speed measurement for high-speed networks.
GC	General Condition	General Conditions set the minimum performance requirements and usually include the rights and responsibilities of the parties involved.

ICT	information and communication technology	
IP	internet protocol	Protocol used for communicating data and handling lower-level transmissions from computer to computer as a message makes its way across the internet.
IPDC	internet protocol data cast	
IPND	integrated public number database	Industry-wide repository of all public numbers. Data providers are required to provide public number customer data to the IPND.
IPTV	internet protocol television	System through which internet television services are delivered using the architecture and networking methods of the internet protocol suite over a packet-switched network infrastructure (e.g. internet and broadband internet access networks), instead of being delivered through traditional radio frequency broadcast, satellite signal and cable television formats.
ISDB	Integrated Services Digital Broadcasting	Japanese standard for digital television (DTV) and digital radio used by the country's radio and television stations. Replaced the previously used MUSE *Hi-vision* analogue high-definition (HDTV) system.
ISDN	Integrated Services Digital Network	Set of communications standards for simultaneous digital transmission of voice, video, data and other network services over the traditional circuits of the public switched telephone network (PSTN).
ISM	industrial, science and medical (band)	
LLU/ULL	Local loop unbundling / unbundling of local loop	The local loop is the local access network that provides a set of wires going into houses and other premises, enabling the use of communication technologies. Local loop unbundling provides access to the local loop for alternative providers to offer services to end-users; it can take various

		forms, ranging from full unbundling to IP-based (bitstream) access.
LRIC	long run incremental cost	
LTE	long term evolution	4G wireless broadband technology developed by an industry trade group.
Mbps	Megabits per second	Measure of bandwidth (the total information flow over a given time) on a telecommunications medium.
MDF	main distribution frame	
MHz	Megahertz	Unit of radio-spectrum frequency.
MPEG-2	Moving Pictures Expert Group-2	Second of several standards developed by the Moving Pictures Expert Group, widely used as the format of digital television signals that are broadcast by terrestrial (over-the-air), cable and direct broadcast satellite television systems. This is the core compression standard embedded in all digital broadcast standards.
NGA	next generation access	Packet switching (IP)-based access network reaching from multi-functional access and aggregation nodes to the end-users and made of fibre, copper using xDSL technologies, coaxial cable, power line communications (PLC), wireless technologies or hybrids.
NGAN	next generation access networks	
NGCN	next generation core network	IP-based backbone network used to transport packets between points at which end-user traffic is collected.
NGN	next generation network	Packet-based network able to provide telecommunication services and to use multiple broadband, QoS-enabled transport technologies, with independent service-related functions and transport-related technologies. Gives users unrestricted access to different service providers and supports generalised mobility

		that allows consistent and ubiquitous service provision.[45]
NRA	national regulatory authority	National body responsible for regulation.
NRF	new regulatory framework	Overall framework for electronic communications in the European Union. Takes effect from 26 May 2011, amending the framework imposed since 25 July 2003. It comprises a number of directives that all Member States are obliged to implement via national legislation.
OB	outside broadcasting	Production of television or radio programmes (typically to cover news and sports events) from a mobile television studio.
PBX	private branch exchange	
PLC	power line communications	Broadband carried over electrical lines within or between buildings.
PSAP	public safety answering (or access) point	Call centre responsible for answering calls to an emergency telephone number for police, firefighting and ambulance services.
PSTN	public switched telephone network	Network of the world's public circuit-switched telephone networks. Originally a network of fixed-line analog telephone systems, it is now almost entirely digital in its core and includes mobile as well as fixed telephones.
PTT	post, telephone and telegraph administrations	Precursors to modern NRAs, they operated the national telecommunications infrastructures until the 1980s.
QoS	quality of service	Ability to provide different priority to different applications, users or data flows, or to guarantee a certain level of performance for voice or data traffic.
RHB	rights-holding broadcasters	Broadcasters who hold specific rights to show certain events.
SMART	Specific, measurable, achievable, realistic and time-bound	SMART is a performance measurement tool used for evaluating objectives.

[45] ITU-T Recommendation Y.2001.

SMPF	shared metallic path facility	
TD-SCDMA	Time Division Synchronous Code Division Multiple Access	Also called UTRA/UMTS-TDD 1.28 Mcps Low Chip Rate (LCR)[1][2],this is an air interface[1] found in UMTS mobile telecommunications networks in China as an alternative to W-CDMA.
TES	technical, economic, societal	Domains and tools of NRAs may be divided between technical regulation (e.g. operating limits, standards), economic regulation (pricing, mergers) and societal regulation (content controls, Universal Service).
TOC	technical operation centre	Hub for management of technical operations during a major event.
V/UDSL	very high / unidirectional digital subscriber line	Advanced form of DSL offering symmetric high-speed traffic over (short) copper lines.
VOIP	voice-over internet protocol	Refers to the carriage of digitised voice telephony over IP networks.
VSAT	very small aperture terminal	
VSP	voice services platform	Platform upon which services such as VOIP are provided.
WiMAX	Worldwide Interoperability for Microwave Access	Wireless telecommunications technology that provides fixed and fully mobile internet access.
Wi-Fi	wireless fidelity	Wireless network standard using unlicensed spectrum.
WLAN	wholesale line rental	
WLR	wireless local area network	
xDSL	Digital subscriber lines (all types)	Family of technologies that provides digital data transmission over the wires of a local telephone network.

Table A.2: Regulators and other international/domestic organisations

ACCC	Australian Competition and Consumer Commission
ACIF	Australian Communications Industry Forum
ACMA	Australian Communications and Media

	Authority
ALM	Association of Regulatory Authorities for Broadcasting
ARCEP	Autorité de régulation des communications électroniques et des postes (French regulator)
ATHOC	Athens 2004 Olympic Games Organising Committee
BNETZA	Bundesnetzagentur (German regulator for industries: telecommunications, postal services, railways, electricity)
CRTC	Canadian Radio Television and Telecommunications Commission
CSA	Conseil supérieur de l'audiovisuel
CVDM	Dutch Media Authority
DCMS	Department for Culture, Media and Sport (UK)
DND	Department of National Defence (Canada)
DoJ	Department of Justice (USA)
DT	Deutsche Telekom
EC	European Commission
EC DGINFSO	Information Society and Media Directorate General of the European Commission
ECTA	European Competitive Telecommunications Association
EETT	Hellenic Telecommunications and Post Commission
FCC	Federal Communications Commission (USA)
FCT	Federal Trade Commission (USA)
IBC	International Broadcast Centre (Beijing)
IEEE	Institute of Electrical and Electronic Engineers
IOC	International Olympic Committee
ISU-V	Integrated Security Unit – Vancouver
ITU	International Telecommunications Union
KPN	Koninklijke KPN N.V. / Royal KPN N.V.
LOCOG	London Organising Committee for the

	Olympic Games and Paralympic Games
MII	Ministry of Information Industry (Chinese regulator)
MoD	Ministry of Defence (UK)
NAO	National Audit Office
NICC	Network Interoperability Consultative Committee
NITA	National IT / Telecom Agency (Denmark)
NZV	Netzzugangsverordnung Verordnung über besondere Netzzugänge / Network Access Ordinance (Germany)
OBSV	Olympic Broadcasting Services Vancouver
OECD	Organisation for Economic Co-operation and Development
OPTA	Onafhankelijke Post en Telecommunicatie Autoriteit / Independent Post and Telecommunications Authority (Netherlands)
OTA2	Office of the Telecommunications Adjudicator
OTE	Hellenic Telecommunications Organisation
PTS	Post and Telecoms Agency (Sweden)
Reg TP	Telecoms Regulatory Expertise Europe (German regulator)
SPGOG	Spectrum Planning Group for the London 2012 Olympic Games and Paralympic Games
TIO	Telecommunications Industry Ombudsman (Australia)
UKSSC	Cabinet Official Committee on UK Spectrum Strategy
VANOC	Vancouver Organising Committee for the 2010 Olympic and Paralympic Winter Games

Appendix B: Methodology

At the core of this research was the development of five international case studies in five topic areas. This required the use of a range of research methods including the development of templates, documentary analysis, interviews and discussions with NRAs and a synthesis/analysis of the data collected.

Each of the case study areas and countries to be included for comparative purposes was agreed in advance with the NAO (and reviewed by the NAO with Ofcom). The case study areas were selected from a long list of potentially interesting areas that could have been included in the study. The value that each case study area would add to the study and the countries for inclusion were considered in some detail. Table B.1 below summarises these aspects of the case study selection.

Table B.1: Case studies and countries

	Aust	De	Fr	Nl	Sw	US	Can	Gre	Chi	New Z	Israel
Spectrum											
Allocation	■		■	■	■	■	■	■	■		
Transition			■			■	■	■	■		
Deregulation	■	■		■		■					
Trading	■					■					
Access											
LLU	■	■	■	■		■					
Wholesale		■	■								
Broadband		■		■	■	■					
NGN/NGA			■	■	■						
VOIP											
Societal											
Privacy		■	■	■		■				■	■
Portability		■	■	■	■					■	■
Universal Service		■	■	■		■				■	■
Transparency	■	■		■	■	■				■	■
QoS	■									■	■
Directory		■		■		■					

In addition to this analysis, a further review was carried out of the characteristics of regulation in each of the countries relative to the case studies under consideration. Table B.2 shows the legal situation and engagement with regulatory issues within those countries as recorded from existing OECD, EU and ITU reports.

Table B.2: Characteristics of potential case studies[46]

	Reports to	Funding	Licensing	Mergers	Interconnect	LLU	Spectrum plan	Spectrum allocation	Numbering plan	Number allocation	Pricing (type, who)	Price reg. covers	Univ. Service (estimates, allocates)	QOS
Australia (ACMA)	Legislature	Appropriation	R	C	C	C	R	R	R	R	Cap; C	PTO retail	R, M	R
Denmark National IT / Telecom Agency (NITA)	Ministry	Appropriation	R (mobile)	C	R	R	M, R	R	R	R	Cap; R	PTO, USO	R, R	R
France Autorité de Régulation des Communications Electroniques et des Postes (ARCEP)	Government, legislature	Appropriation	R	C	R	R	Agence Nationale des Fréquences	R	R	R	Tariff, R	USO	R, R	R
Germany (BNETZA)	Legislature	Fees, appropriation, operators	R	C, R	R	R	R	R, Gov't.	R	R	Cap, tariff; R	Not end-user	R, R	R
Korea (MIC/KCC)	None	Appropriation	M	C, M	M	R (KCC)	M	M	M	M	Tariff; M	KT (fixed), SKT (mobile)	M, M	M
Netherlands (OPTA, RAN)	Ministry	Appropriation (and fees for RAN)	OPTA (fixed), RAN (mobile)	C, R	R	R	R (RAN)	R (RAN)	M	R	Squeeze, tariff; R	SMP end-user	No funding mech.	R
Portugal (ANACOM)	Government, legislature	Fees	R	C, R	R	R	R	R	R	R	Tariff; R	USO, SMP	R, M	R
Sweden (PTS)	Ministry	Fees, Appropriation, operators	R	C	R	R	R	R	R	R	Tariff; R	PTO (many aspects), Other (interconnect)	unclear	R
United Kingdom (Ofcom)	Legislature	Fees, appropriation, operators	R	C, R	R	R	R	R	R	R	Cap; R	BT residential	R, -	R
United States (FCC)	Legislature	Fees, appropriation	R	C, R	R	R, PUC	M (NTIA), R	M, R	R	R	Cap, rate of return; R	Interstate incumbents	R, R	R

Note: C = Competition authority; Cap = price cap (or basket); M = ministry; NITA = National Telecommunications and Information Administration; PTO = dominant incumbent; R = regulator; Squeeze = margin squeeze regulation; Tariff = tariff approval; USO = universal service

[46] OECD (2006) Telecommunication regulatory institutional structures and responsibilities. Report DSTI/ICCP/TISP (2005) 6/final. ITU data from its ICT regulation toolkit, at http://www.ictregulationtoolkit.org/en/index.html; EC information from the 2007 report, The regulation of broadcasting issues under the new regulatory framework, Annex C1 at: http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/reg_bc_issues_under_nrf/broadcasting_tables_topics_2007.pdf

Following the selection of the case study areas and the countries to be included in the case study analyses, a number of methodological steps were undertaken:

- **Clarification meeting with NAO, RAND Europe and Ofcom:** Once a short list of case studies was developed, a meeting was held with the NAO, RAND Europe and specialists from Ofcom in each case study area. A full discussion on each of the options was held and clarification reached on the specific topic that would be covered. As the project progressed, further discussions with Ofcom were held as required.
- **Development of research templates:** In order to guide the research in each of the case study areas, a template of questions for each area was developed. This was designed to ensure that as far as possible consistent information was collected across all of the case study countries. These templates were then reviewed by the NAO and Ofcom, edited and finalised. The main topics covered in each of the templates are summarised in Table B.3 below.

Table B.3: Topics covered within templates

NGA	VOIP	Spectrum Olympics	LLU	Mobile mis-selling
Plans in place for NGN Geographical coverage Key organisations/ sectors involved Role of the NRA Funding of NGAN Role of existing service providers State-aid regulations Problems encountered Anticipated impacts Policies Strategies Assessment of performance	Definitions of VOIP Extent of planning for access to emergency services Ways of determining extent of emergency calls on VOIP Current usage Problems encountered Problems managed Caller location information Obligations of operators Issues with/without subscriber information Extent of regulation	Planning for each event Extent of collaboration Responsibilities for operation and implementation Spectrum allocation Spectrum regulation Legacy issues Security and emergency planning New physical infrastructure Range of provision made available Testing Evaluation of potential problems	Extent of LLU Alternative network operators Evaluation of LLU strategy Price impact of LLU Access impact of LLU Impact on network investment	Main types of mis-selling Extent of mis-selling Role of regulator Collaboration between regulator and other agencies Policies Strategies Assessment of performance Improvement in mis-selling Results of actions taken

- **Documentary analysis:** Once the research templates were finalised, they were populated with relevant data. Documents used in the research included materials from

all relevant NRAs, international research sources and academic studies, reports and reviews.

- **Follow-up interactions with NRAs:** Once the templates were populated as far as possible with information from documentary sources, relevant NRAs were contacted and asked to provide clarification and additional information where possible.
- **Synthesis and analysis:** All data collected were reviewed and analysed. Where needed, further data were sourced to provide input to the various case studies.

It was necessary in undertaking the case study analyses to take into account the different market and regulatory environments in which regulators in other countries are working. Since the job of the regulator is different in every country, undertaking an international comparison is not necessarily comparing like-with-like. Therefore areas such as levels of compliance and the degree of self- or co-regulatory assistance vary from region to region.

Appendix C: Background and context

Convergence

Through a number of technological advances – especially the increase of processing speed, storage capacity, transmission speed, compression techniques and standardisation – the well-organised and segregated situation in the communication sector changed, allowing for a single or similar set of services to be offered over different platforms (e.g. cable, satellite and telecommunication networks) and for the bundling of distinct services on to a single platform (triple and quadruple play). This process of change is usually referred to as 'convergence'. It challenged the previous *modus vivendi* because new forms of competition by unregulated players tended to undercut the implicit subsidies of the old model and to disrupt long-term governance relations.

The convergence trend is painting a new and much more diffused picture, which can be (temporarily) captured in an image of an integrated 'information delivery' chain running from the information (or content) source, through publishers and broadcasters, search agents, connection providers and devices to the ultimate consumer of the information. In the converged situation none of these elements of the delivery chain is stable and many of the established players are experiencing the impact of disruptive technologies and business models. New services and new entrants are emerging, while established players are vertically integrating or even exiting the market.

It should be noted that this is a very dynamic situation in which suppliers to one market consistently try to expand into adjoining fields and absorb the market that exists between the functions. Information sources try to bypass publishers by gaining access to search agents and the consuming public. Producers/publishers try to integrate forwards by providing search capabilities of their own and sometimes also by offering competing information sources. Software and hardware producers try to enter the information delivery chain on the understanding that this is the area where added value will grow. Search engines are investing in mobile devices and operating systems. Connection providers, who realise that the added value of transmission services can only decrease as bandwidth supply increases, are actively trying to integrate upwards into additional search and publishing/producing activities. Thus the chain should be seen as a heuristic to help visualise the new converged reality, whilst acknowledging that in practice it is neither linear nor clearly defined.

Regulatory responses

Traditional broadcasting and telecommunication regulations are driven by a mix of technical, economic and societal (TES) objectives. The evolving context leads to a convergence on the regulatory side – as the values and policy objectives of one policy field flow into the other when the regulation (and the regulator) follows the platform into new service areas where traditionally regulated services are being provided through other (unregulated) channels.

Administrations, business and consumers/customers/citizens are affected, at different levels and in different degrees, by convergence. Administrations and regulatory authorities are forced to converge in response to markets, and to reinvent themselves to enable 'joined-up' coherent policies and responses to the new market realities. Business sees opportunities and challenges, depending on where in the delivery chain they have traditionally provided their services. Consumers are presented with a wide supply of affordable services and an overflow of information – including indecent, harmful and/or illegal content that is hard to counter and against which the authorities cannot provide adequate protection. At the same time, they have increasing opportunities to take on the roles of content creator, distributor and even regulator, alone or in partnership with business and government.

The choice of when to regulate balances need, burden and efficacy considerations. Regulation at one part of the value chain has impacts elsewhere, in either traditional or converged set-ups, raising the question of where to regulate.[47] If convergence affects the distribution of need, burden and/or efficacy through the chain, it challenges both decisions.

Unlike the apparent risks of a traditionally fragmented regulatory approach (such as weakening the effectiveness of regulation if alternative providers in other channels cannot be regulated, distortion of competition between regulated and alternative providers, reduced supply or increased cost of bundled goods and services benefiting from internal subsidies), a converged regulatory approach may result in the following challenges in addition to the increased complexity of regulating multiple delivery channels:

- Loss of regulatory effectiveness and of potential economic returns due to *regulatory flight* – firms move or are taken over by firms outside the regulator's jurisdiction. This is exacerbated if convergence gives less-regulated foreign firms a cost advantage.
- *Regulatory competition* – globalisation threatens a regulatory 'race to the bottom' and convergence may create competition among regulators in the same country.

Taking the whole information delivery chain into account is essential to address these challenges. Policy makers must rethink lines of responsibility and governance, forms of intervention and the associated operational objectives. Examples of changes include increased scope for self-regulation and market-assisted methods such as spectrum trading to support and complement traditional regulation and competition policy.

[47] This includes the use of existing regulatory relationships to encourage the co-operation of, for example, service providers in the governance of activity originating or ending at other parts of the chain (e.g. file-sharing).

Wider economic and political context

The new EC confirmed on 9 February 2010 has a mandate for the 'SMART regulation' agenda under the personal direction of President Barroso. The new electronic communications reforms of December 2009 embrace significant change in the environment by increasing information transparency and reducing switching costs for consumers.

Tools for better regulation were developed in some EU Member States (notably the UK, The Netherlands and Sweden) and spread by diffusion and adoption at EU level. This triggered further elaborations and legal/administrative expressions in Member States (new tools and information, legal requirements for new rules, establishment of offices to support better regulation and other changes in governance and implementation). Competition and exchange within the EU reinforced this, though the measureable impact of some of the key elements (e.g. impact assessment and standard cost models) was difficult to verify. In addition, some regulatory failures damaged the reputation of better regulation, and pushed reform down the agenda compared to coercive (and possibly heavy) regulation in certain key sectors. But several durable elements remain and may be (or arguably may be) increasing in importance.

The better regulation agenda, in various incarnations, has received growing emphasis in many countries in recent years. General drivers include financial uncertainty; pressure on government budgets and increased public and business pressure for greater transparency, accountability, effectiveness and flexibility; together with specific calls for reduction of the burden of reallocation. Additional impetus has been provided (especially in certain sectors) by market developments challenging traditional forms and mechanisms for regulation (such as convergence, globalisation and vertical integration). Finally, advances in (primarily economic and legal) analysis and a growing body of experience have laid the foundation for 'SMARTer' forms of regulation and ways of sharing governance across parties affected.

Because regulations and the sectors affected continue to evolve, there is a degree of path dependence. Thus experience from other contexts and countries may not always be directly applicable, while the impact of reform proposals should be seen as a real option reflecting induced changes in the mutual dependence of regulators and regulated.[48] Other dynamic factors[49] affecting reform include the path dependence of industrial development[50] behaviour; overlaps in market power or jurisdiction;[51] and, on a more positive note, learning by trying (e.g. adventurous regulatory experiments that attracted economists and other regulators, thus generating useful data) which has an often positive option value.

Regulatory reform occurs in a broader political context as well, and is thus subject to considerations arising from other sectors or ministries, or global economic competition. The

[48] Static capture/foreclosure, excessive alignment of regulatory and industry objectives, inappropriate sharing of power or information, creation of ineffective (Potemkin) regulations, etc.

[49] Further aspects noted in the scholarly literature include other sources of path dependence such as the choice of an *ex post* or an *ex ante* stance, black-letter vs rule of reason implementation, a shifting balance between competition and regulation (in particular whether regulation strengthens or weakens competition), the use of tools from one regulatory domain (e.g. technical, economic, societal) to achieve objectives in another and the coalescence or convergence of regulatory remit on one hand and sectoral market structure on the other.

[50] Investment, innovation, market structure, conduct and performance, etc.

[51] Due to convergence, regulatory creep, etc.

resulting dynamics[52] of regulatory evolution are driven by a combination of design, experiment, (regulatory) competition, co-operation and lock-in. This evolution is further affected by information and analysis (e.g. the monitoring, evaluation and disclosure of performance information) and by the context (especially the extent of regulatory discretion in relation to statutory duties and powers) and changes in the modalities of regulation (especially self-limiting or shared regulation).

Telecommunications regulation has some special characteristics. These include the importance attached to sector-specific vs general (especially competition) regulation; this is reflected in the standing of some (by no means all) telecommunications regulators as competition authorities in their own right and in the two-way relationship between competition policy and other objectives.[53] Another is the potential for mission creep; as telecommunications converges with information and communication technology (ICT), it is increasingly true that an unregulated internet may undermine effective telecommunications regulation and also that effective telecommunications regulation may have greater regulatory purchase in relation to, for example, privacy, content control, anti-fraud and so on than the tools traditionally used to tackle such issues.

[52] The evolutionary analysis of dynamic markets applies to regulatory 'markets' as well. This was reflected in the gradual replacement of normative theories of regulation by 'capture theory', the Becker/Peltzman/Olson 'economic' theory of regulation and the currently dominant mechanism design approach. This perspective is concerned with innovation and diffusion of both regulation and compliance/evasion behaviour, and with the consequences of endogeneity of information.

[53] This may involve conflict (e.g. the need to maintain large infrastructures and/or universal service, which may militate against aggressive anti-trust enforcement) or synergy (e.g. the use of competition to elicit information and motivate innovation towards higher quality of service or the synergies between consumer protection and competition, which may be particularly strong in the telecommunications domain).

Appendix D: Next generation access case study

Introduction

This case study sets out a comparative study of Ofcom in the UK against three other countries: Sweden, France and The Netherlands. Publicly available documentation from the regulatory bodies within these countries, as well as outside the regulatory sector, was reviewed in the analysis. In addition, follow-up communications and clarifications were undertaken with each of the NRAs where this was needed to supplement or replace the information derived from documentation.

Defining next generation networks and next generation access

In order to facilitate understanding of the area of NGN and how this relates to NGA, we set out here a clarification of the technologies involved. The following considerations give a sense of the regulatory issues and why they are of particular interest in relation to converged regulators. This has two aspects. The first is that NGANs are primarily IP enabled, which allows the separation of the network and service layers and in particular lets the regulator engage with QoS in the access network. The second concerns a set of specific regulatory issues arising in relation to the access network.

The ITU identifies the following regulatory issues associated with NGNs:

i. interconnection – the eventual separation of network and service interconnection, and the consequent need to replace current time- and line-based indicators of need by technology-neutral capacity-based measures;

ii. licensing – again, technological neutrality is a challenge;

iii. universal service – currently defined in terms of specific services, this will need to be reformulated in terms of NGN access and allocated appropriately (e.g. by auctions) due to the anticipated larger number of plausible providers);

iv. developing sector-neutral regulation to respond to the convergence of many types of service onto the NGN;

v. recasting competition regulation to reflect the possibilities of infrastructure vs service competition;

vi. QoS – to ensure that customers understand and regulation promotes adequate QoS as circuit-switched (PSTN) telephony gives way to the packet-switched carriage characteristic of NGNs.

This in turn opens up a set of broader regulatory issues (e.g. net neutrality). These are far-reaching, complex and far from settled; we therefore did not pursue them in the current review. Indeed, we do not consider the specific issues listed above in detail. Rather, we consider the overall differences in regulatory response and the contextual issues that help to explain differences in the way NRAs tackled these issues – to what extent, in what order and by what means. Much of this reflects legal contexts (in particular the EU regulatory framework) and national situations. Countries with extensive existing cable infrastructures had less need to rely on improvements to the telephone network to produce faster broadband in the short term, so many of the issues raised by ultrafast broadband could be deferred or at least managed in the short term using existing regulatory tools. Countries with concentrated populations and a density of (typically business) demand for ultrafast broadband had a much easier business case for investment in, for example, fibre access network infrastructures, generally by incumbents with existing regulatory relationships. In this situation, the resolution of NGA issues lies at least in part with the interconnection of the core and (alternative) access networks, whether by LLU (considered separately) or other means.

The main fixed-line and wireless technologies involved in NGANs are detailed in Table D.1 below.

Table D.1: Next generation fixed-line access network technologies

ADSL	ADSL is standardised so that the frequency bandwidth of regular telephony (below 4 KHz) on the access lines remains for telephony service. Broadband is transmitted on two other frequency bands – a low-speed upstream channel (25 KHz to 138 KHz) and a high-speed downstream channel (139 KHz to 1.1 MHz). The theoretical maximum is 8.1 Mbps (set by standard), but real bit rates depend on, e.g., distance to the backbone as the high-frequency band of the copper line is strongly attenuated by distance. This means that some households simply cannot be reached by ADSL, even though they have access to PSTN infrastructures. Even in a country such as Denmark, which has quite an advanced PSTN infrastructure, in mid-2004 about 5% of households could not be reached by any ADSL service and only 70% of the population could get a 2 Mbps connection.
ADSL2, etc.	ADSL2 uses advanced technologies to improve capacity and speed, establish QoS and (slightly) improve coverage. It also improves power consumption, monitoring, etc. Extended monitoring and control give operators a tool to adjust utilisation and thus deliver reliable capacity in spite of, e.g., 'cross talk' and noise.
V/UDSL	A very high or unidirectional digital subscriber line enables capacities of about 52 Mbps, higher than the ADSL standards, by including more high-frequency bandwidth in copper cables and using more efficient modulation. It also enables *symmetrical* high-speed connections, which are more appropriate for future NGAN uses that are less reliant on downloading large blocks of content from servers to end-users and involve more high-quality interactive communication. VDSL coverage is very short – below 1.3 km by standard and in practice even shorter (due to copper-line attenuation); at maximum distance speed is at most 13 Mbps. This means that existing infrastructure may be used only in the last part of the network (from street cabinets to households); a new backbone network infrastructure must be deployed to supply street cabinets, mainly based on optical fibre technology. Hence deployment cost is much higher (and more concentrated) than with ADSL. VDSL also suffers interference from ADSL and amplitude modulation (AM) radio, and the street cabinets require electricity supply (unlike ADSL/telephony).
Cable	Cable television (CATV) infrastructure has a huge installed base and great potential for broadband delivery. Penetration varies from country to country. A CATV system is a distributive system whose resources are organised in 8 MHz channels TV distribution. Such systems have huge capacity, but usable capacity depends on the age of the system (which determines how much of the coax frequency bandwidth is used). An 8 MHz CATV channel carries 27–56 Mbps depending on modulation technology, error correction, etc. More IP/broadband capacity can be obtained by: i) new standards; ii) using more CATV frequencies (channels); iii) reallocating channels from TV to broadband; iv) digitising the distribution system to reduce the 'footprint' of TV services; and v) ending dedicated TV transmission in favour of IPTV. CATV is currently in the lead where coverage permits, because it can be used for triple/multi-play services. Other broadband infrastructures find it much harder to deliver broadcast TV. The main weakness of CATV for broadband is the sharing of network segments, combined with the difficulty of opening cable networks to third-party operators to foster competition (due to 'shared medium' and lack of standardisation). An important factor is / will be that of VOIP with QoS support. Particularly in data over cable service interface specification (DOCSIS) 1.1, specific procedures are described to prioritise traffic to minimise delay and jitter – these are essential for VOIP (and to some extent for gaming). The difficulties of opening the network mean that 'best effort' VOIP operators cannot use these QoS-improving measures.
Powerline	In some jurisdictions, the establishment of new access infrastructures has been seen as vital to promoting competition; broadband over power lines (PLC) has been discussed, especially in Europe, for many years. It uses frequencies over 1 MHz in existing power line infrastructures, above the 50–60 MHz used for electricity supply. PLC can match DSL for speed, and uses an effectively ubiquitous physical infrastructure, even inside the home/office. PLC has suffered noise and interference problems, but these are now largely resolved at least in the local (low voltage) part of the infrastructure. At EU level, the electromagnetic compatibility (EMC) directive is the only regulatory tool to assess interference and there is no agreement for harmonising interference requirements within power lines (or other fixed infrastructures such as xDSL). The EU has urged Member States to remove barriers to the development of services over PLC. Despite this, there has been little market enthusiasm and it is losing out to FttX (below), perhaps because it cannot match performance level, involves 'outside incumbents', etc. It may have a future for high-speed distribution *inside* premises served by FttB.
FttX	The speed of optical fibre is measured in Gbps rather than Mbps, over distances of up to 10 km from distribution points. However, this performance is not generally available to end-users due to a combination of termination cost, resource planning and service-provider pricing issues. Different acronyms denote how far the fibre reaches from the backbone (FttHome, FttArea, FttCabinet, FttCurb, FttBuilding, etc.). It costs more to deploy fibre infrastructure, but the products that can be offered are qualitatively superior. Implementation is becoming more and more viable and power companies and local authorities have been particularly active; this is mainly due to the falling costs of fibre (especially. compared to copper) and termination equipment as well as general regulatory liberalisation and triple/multi-play possibilities.

Source: ITU (2010) ICT regulation toolkit, at http://www.ictregulationtoolkit.org/en/Section.1773.html

Table D.2: Next generation wireless access network technologies

Wi-Fi	The wireless network standard 802.11 was published by the Institute of Electrical and Electronic Engineers (IEEE) in 1999. The best known of subsequent variations is IEEE 802.11b, better known as Wi-Fi (wireless fidelity), which uses the *unlicensed* industrial, science and medical (ISM) band. The absence of licensing barriers and the simplicity and cost effectiveness of the technology meant Wi-Fi networks developed rapidly in industrialised and developing countries. Indoor coverage of 50–100m is normal and, depending on the standard, rates of 11–54 Mbps (in some proprietary versions even more) are possible. Net data capacity is far less. Furthermore, wireless local area network (WLAN) capacity is shared; available capacity per user depends on the number of users connected to the access point. Wi-Fi coverage can be extended using outdoor antennas, and point-to-point connections can also be established using Wi-Fi.
WiMAX	WiMAX (Worldwide Interoperability for Microwave Access) is IEEE802.16, which is used to provide fixed wireless broadband for business users and in the backbone network. The current lack of success in access networks is due to, e.g., lack of open standards and line-of-sight installation requirements. WiMAX is becoming mobile with the allocation of suitable spectrum (e.g. 2.6 GHz). Coverage of 50 km and speeds of around 70 Mbps are already possible, though long-distance capacity is a fraction of the maximum. WiMAX access technology over 5–10 km will compete with / complement traditional broadband. Note also that 70 Mbps speeds require licence blocks of 20 MHz from local authorities; many current allocations assign smaller frequency bands to the potential WiMAX operators.
LTE	A wireless broadband technology/standard derived from 3G/3.5G mobile telephony, offering symmetric up-link and down-link capacities over paired spectral bands 120 MHz apart.
Satellite	Arthur C. Clarke, writing in the British magazine *Wireless World*, noted that a geostationary satellite 36,000 km above the earth would have line of sight coverage of 40% of the earth, allowing the entire planet to be covered with only three satellites. By the time the USA launched the first geostationary satellite in 1963 (to handle high-speed international telephone traffic), fibre optic cable was beginning to develop, offering competitive capability at lower cost. Instead, satellites were used for broadcast traffic between transmitters and relay stations and as a means of sending content directly to end-users. Used for broadband, satellites can send content down to end-users using the internet protocol data cast (IPDC) technology, but of course the return signals must be channelled via other (e.g. PSTN) networks. IPDC can also be used for terrestrial broadcast networks and is seen by some as a viable way to offer mobile broadband services over existing mobile networks. Two-way ground-to-satellite links can be provided via the very small aperture terminal (VSAT) technology; because of its (currently) much higher cost, it is primarily used for backbone traffic and business access in regions far from the fibre infrastructure – e.g. in developing countries.
Digital broadcast	Digital broadcasting (DB) is replacing analogue broadcasting in most developed countries. It has associated standards intended to ensure that broadcast signals are distributed in a specific (and uniform) way – they make explicit provision for transmission of data services (either in association with programmes or as stand-alone offerings). Digital broadcast standards are not yet worldwide: Europe uses Digital Audio Broadcasting (DAB) and Digital Video Broadcasting (DVB); the USA uses Advanced Television Systems Committee (ATSC) and Japan uses Integrated Services Digital Broadcasting (ISDB). However, most share the same core – the MPEG-2 video compression standard. Differences reflect (in addition to a possible desire to limit competition) specific characteristics of different infrastructures. This is more properly considered as NGA rather than NGN; the European DVB standard (widely used in many other countries) has different versions for each current infrastructure (cable, satellite and terrestrial). In some markets, combinations of different standards are also used. In addition to ensuring adequate interoperability and access (i.e. that end-users can gain meaningful access regardless of infrastructure choice), regulators may be concerned about the level of competition between (service providers using different) infrastructures, across regional boundaries and vertically through the value chain (access to consumers). Subscriber mobility and QoS are further potential regulatory objectives at play in this form of NGA. In particular, DB simplifies ubiquitous access. Each analogue TV programme needs its own set of frequencies in order to cover the country (because each local transmitter's signal gradually attenuates rather than stopping abruptly beyond a specific distance). This does not arise with digital programmes, which can share a given set of frequencies. Indeed DB gives users better (in most cases) technical quality, more programmes and services[54] (on a specific block of frequencies) and multi-media and interactive services as elements from different media and domains converge on the digital signal. However, the shift to DB raises interrelated economic, political and technical challenges, some of which are specific to satellite, cable or (especially)

[54] e.g. enhanced TV text services, software downloads (especially at low-utilisation times), eCommerce, newspapers and b books, Internet Protocol Television (IPTV), etc.

	terrestrial infrastructure. Indeed, while per-capita capacity limits prevent full Internet access, an attenuated Internet could be 'broadcast', in the process partially overcoming digital divides arising from unequal access to equipment or high-speed lines. Because the technology is already available almost everywhere, this approach raises specific regulatory concerns. One example is Public Service Broadcasting – most countries accord special status (protections and responsibilities) to a small number of designated broadcasters. But the new services could, some argue, obviate the need for such providers' special position. This is not the same as the Universal Service Obligation, because public broadcast regulation emphasises content. Another cluster of new regulatory is concerned with *new* elements (use of multiplexing to govern frequency sharing in place of traditional 'gifted' spectrum ownership). Electronic programming guides (EPGs) are most users' index to digital services and are thus essential for niche services (including language- and culture-specific programming) and conditional access (CA), which controls service access via entrance codes on removable cards. Users would argue for standardised access control that operates uniformly (at a minimum with the same hardware) across content and service providers.
Wireless mesh	In a Mesh network, all connected terminals also relay information to other users. Traditionally used in military contexts, Mesh networks are gaining commercial ground; Ofcom has published a report analysing the prospects and giving a range of examples.

Source: ITU (2010) ICT regulation toolkit, at http://www.ictregulationtoolkit.org/en/Section.1773.html

Plans for the NGANs

Looking across the four countries included in this analysis, we can see that there is a divide between those countries that have specifically articulated plans in place for the roll-out of NGANs and those that do not. Sweden and France are in the former category while the UK and The Netherlands are in the latter. In Sweden there is an explicit plan which has been consulted upon and is now in the implementation phase.[55] Similarly, in France the plan has been consulted upon and is now being implemented. It contains concrete steps, measurements and delivery plans. A fundamental goal is that all French people should have broadband access by 2012.[56]

In the UK and The Netherlands plans are not in place. In the UK there is no explicit plan yet for government intervention or a roadmap of the next stage of NGANs. A statement outlines the regulatory principles, approaches and positions that have been arrived at following consultation and engagement with a broad range of stakeholders. It is likely that this will be dealt with as another form of market regulation. However, further consultation on regulation is ongoing.[57] In The Netherlands there is no specific plan in place, but OPTA does set out its approach to the regulation of NGANs and how it aims to ensure sufficient investment in infrastructure.[58] Therefore the picture is mixed across the countries, with some being more organised than others in their planning for NGANs.

In terms of what specifically is included in the planning or general approach to this area, all of the countries included in this analysis rely on the market to define the best area of technological investment (i.e. there is no speculative investment in this area – the market indicates what is working well and what is most promising). In the UK Ofcom's regulatory

[55] http://www.sweden.gov.se/sb/d/12103/a/134543
[56] France Numerique-2012. Plan de développement de l'économie numérique.
[57] http://www.ofcom.org.uk/consult/condocs/nga_future_broadband/statement/
[58] http://www.opta.nl/en/news/all-publications/publication/?id=2649

focus and investment activity is oriented around upgrading the fixed network fibre-to-the-cabinet (FTTC) and transition from copper to fibre is unlikely in the short term.[59] In Sweden the focus is on improving wireless access and increasing access to broadband in remote areas. The efforts to improve wireless access are supported by improving the spectrum allocation mechanism. Investment in broadband access in remote areas is partially driven by the public sector, where are specific preferred technologies.[60] In France the main plans concern fibre-to-the-home (FTTH) as FTTC would result in too low a speed (since street cabinets are approximately a mile away from clients' homes on average).[61]

The geographical coverage of the NGANs varies considerably across the four countries. In the UK there is no particular geographical coverage plan. The major companies (BT and Virgin Media) decide on their own investment/development plans. Smaller scale local deployments are pursued in rural regions based on partial public funding (i.e. UK/EU funds).[62] In Sweden there is an objective that 90% of all households and businesses should have minimum broadband access of 100 Mbps by 2020. There is, in addition, specific public support for rural areas.[63] In France the planned NGN network concentrates heavily on Paris and other major cities.[64] By contrast with the other countries, The Netherlands already has broad coverage (e.g. ADSL2+ coverage is 50-60%; copper network coverage is 99%, cable coverage is 94%) and future plans focus on making this coverage faster.[65] Therefore the geographical focus is not uniform across these countries. The Netherlands is already well advanced with its NGN/NGA, while Sweden has ambitious plans to deliver access. In France the focus is on the main cities, while in the UK the main companies decide on the direction and focus of the network.

Drivers of the NGANs

Across the four countries, the major incumbent companies are the main drivers of the new network (although, as noted above, this takes place in the context of a planned strategy in Sweden and France). Therefore the market demands ultimately result in the new network being delivered. In the UK the major incumbents BT and Virgin Media are driving the NGANs infrastructure investment by upgrading their existing network.[66] In Sweden the banking sector has played a significant role in encouraging the development of dark fibre and, again, the incumbent broadband and telecommunications companies have been the key

[59] http://www.ofcom.org.uk/consult/condocs/nga_future_broadband/statement/

[60] http://www.sweden.gov.se/sb/d/12103/a/134543

[61] Czernich *et al.* (2008) Regulierung in Telekommunikationsmarkten: Technologische Dynamik und Wettbewerbspotenziale, *Beitrage zur Wirtschaftsforschung*, 32; and http://www.arcep.fr/index.php?id=8650&L=1# Czernich

[62] http://www.ofcom.org.uk/consult/condocs/nga_future_broadband/statement/

[63] http://www.sweden.gov.se/sb/d/12103/a/134543

[64] Elixmann *et al.* (2008) WIK Consult (Study for the EC), at http://www.google.com/search?ie=UTF-8&oe=UTF-8&sourceid=deskbar&q=Elixmann+The+economics+of+next+generation+access+final+report

[65] http://www.opta.nl/en/news/all-publications/publication/?id=2649 and http://www.canavents.com/its2008/abstracts/220.pdf and http://mpra.ub.uni-muenchen.de/8822/1/MPRA_paper_8822.pdf

[66] http://www.ofcom.org.uk/consult/condocs/nga_future_broadband/statement/

investors.[67] Similarly in France and The Netherlands, the major players are driving the NGN development forwards – in France this includes France Telecom, Numericable and Free/Illiad,[68] and in The Netherlands this includes KPN (incumbent), Reggefiber (investing in fibre network), UPC and Ziggo.[69]

Key regulatory priorities in NGANs

Across the four countries in this comparative analysis, regulatory priorities were access and ensuring effective competition. Compared to the other countries, the UK is relatively unregulated in this sector. There is no specific investment support scheme or particular price regulation policy.[70] In Sweden the Swedish Post and Telecom Agency can order the functional separation of network operator and service provider. It is required to conduct regular market analyses and forward-looking planning exercises.[71]

In France there is a strong reliance on the existing strong competition and regulatory framework. In particular, three key aspects are prioritised in regulation: access to ducts and sewerage systems, wiring inside buildings and the municipalities' role (they provide information on their infrastructure – e.g. the sewerage systems – and civil engineering works to lower infrastructure investment costs).[72] In The Netherlands there is stringent regulation of access and wholesale pricing, which also takes into account the costs of investing in the infrastructure. Duct access is also regulated. However, fibre optic connections are not subject to the same stringent wholesale broadband access regulation in order to facilitate ongoing competition in infrastructure development.[73]

Roll-out of NGANs

In each of the four countries under consideration in this case study, the roll-out of the NGN/NGA is being financed and run by private companies. In the UK, Sweden and The Netherlands the NRAs are responsible to some extent for the relevant regulation and for keeping a level playing field in place for all the participants. However, the funding remains

[67] ERG (2009) Report on next generation access – economic analyses and regulatory principles, ERG (09) 17, at http://erg.eu.int/doc/publications/erg_09_17_nga_economic_analysis_regulatory_principles_report_090603_v1.pdf

[68] Elixmann *et al.* (2008) WIK Consult (Study for the EC), at http://www.google.com/search?ie=UTF-8&oe=UTF-8&sourceid=deskbar&q=Elixmann+The+economics+of+next+generation+access+final+report

[69] ERG (2009) Report on next generation access – economic analyses and regulatory principles, ERG (09) 17, at http://erg.eu.int/doc/publications/erg_09_17_nga_economic_analysis_regulatory_principles_report_090603_v1.pdf

[70] http://www.ofcom.org.uk/consult/condocs/nga_future_broadband/statement/

[71] http://www.sweden.gov.se/sb/d/12103/a/134543

[72] Czernich *et al.* (2008): 'Regulierung in Telekommunikationsmarkten: Technologische Dynamik und Wettbewerbspotenziale', *Beitrage zur Wirtschaftsforschung*, 32.

[73] http://www.opta.nl/en/news/all-publications/publication/?id=2649

the responsibility of the private sector. In France there is a little more regulation in NGN/NGA, and the municipalities also take part in the funding and roll-out aspects.[74]

In each of the four countries in this case study, the existing service providers are investors in the infrastructure and also NGN/NGA operators. State-aid restrictions imposed by the EU do not appear to be making any impact in this area, mainly because it is being driven by the private sector and so this issue does not come into play. Where there is some small state investment the occurrences are minor and do not involve any state-aid regulation.

In terms of obstacles to the effective roll-out of the NGN, across the four countries there do not appear to be any major issues.

Impact of NGANs on consumers

In relation to the impact on consumers, NGN/NGA in the UK is feared to result in a further deepening of the digital divide between urban and rural communities.[75] This is also potentially the case in France. While coverage is good overall in Sweden, there remains a worry that remote and rural areas could be disadvantaged in the future roll-out.[76]

Regulation strategy on NGANs

From a regulation policy perspective, all four countries utilised their standard regulatory procedures such as consultation, impact assessment and reviews. In Sweden and France joined-up working was overtly present between the regulator, the government, the municipalities and the main market players. All countries appear to have been making good progress towards the achievement of the NGN/NGA, reflecting the fact that their specific approaches appear to be working. In the UK, for example, although there is no specific regulatory plan that is being worked towards, progress is made – as evidenced by the fact that super-broadband availability was expected to have reached 50% of all UK homes in mid-2009.[77]

Overall conclusion

NGANs refer broadly to the development of new network technologies, access infrastructures and services but narrowly to a specific network architecture (and related equipment) that uses a common IP-core network for all (past, present and future) access networks. NGN/NGA allows access for users to networks and to competing service providers and/or services of their choice. It supports generalised mobility which will allow provision of services to users. In terms of strategic planning for NGN/NGA, Sweden and France are

[74] ERG (2009) Report on next generation access – economic analyses and regulatory principles, ERG (09) 17, at http://erg.eu.int/doc/publications/erg_09_17_nga_economic_analysis_regulatory_principles_report_090603_v1.pdf

[75] http://www.ofcom.org.uk/consult/condocs/nga_future_broadband/statement/

[76] http://www.sweden.gov.se/sb/d/12103/a/134543; http://www.pts.se/en-gb/Documents/Reports/Internet/2009/Broadband-Survey-2008---PTS-ER-20098/

[77] http://www.ofcom.org.uk/consult/condocs/nga_future_broadband/statement/

pursuing explicit planned strategies, while the UK and The Netherlands are allowing the market to lead the direction.

This may produce at least short-term variation in the mix of technologies (and capabilities) used. The UK is led more by the market. Ofcom is consulting broadly on the issues involved. No geographical coverage plan is in place. While the UK does not have a specific plan for NGANs, at present it is not unduly disadvantaged by this. There are fears of a digital divide growing between rural and urban communities.

Appendix E: Access – local loop unbundling case study

Introduction

This case study sets out a comparative review of Ofcom in the UK along with three other countries Germany, France and Australia. Publicly available documentation from the regulatory bodies within these countries, as well as outside the regulatory sector, was reviewed in the analysis. In addition, follow-up communications and clarification were undertaken with each of the NRAs where this was needed to supplement or replace the information derived from documentation.

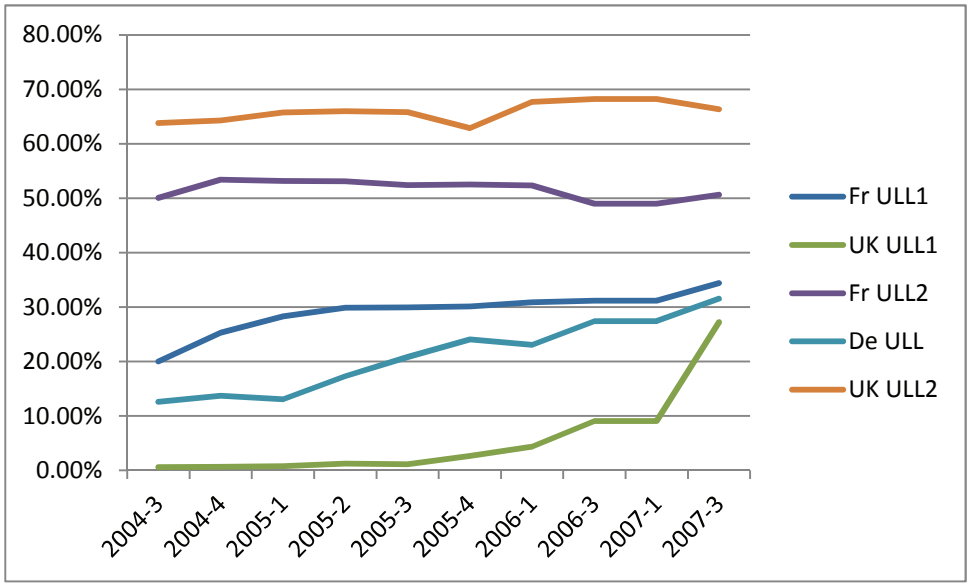
Extent of LLU

In terms of process, the two main elements are the mandating of access and control of LLU access prices. In the UK, Ofcom's initial strategic review endorsed the principle of 'equivalence of input', equalising the positions of BT and its rivals. To implement this, the Enterprise Act (rather than the Telecommunications Act) was used to negotiate functional separation (establishing Openreach as a separate entity to provide equivalent services to all operators).[78]

In this context, useful information for the EU countries considered may be gained from the following data: from the ECTA broadband scorecards, showing the evolution of the percentage of DSL lines offered via full and shared ULL – the ULL1 series – and via full, shared and bitstream (combining IP and ATM – the ULL2 series). This is presented in Figure E.1 below.

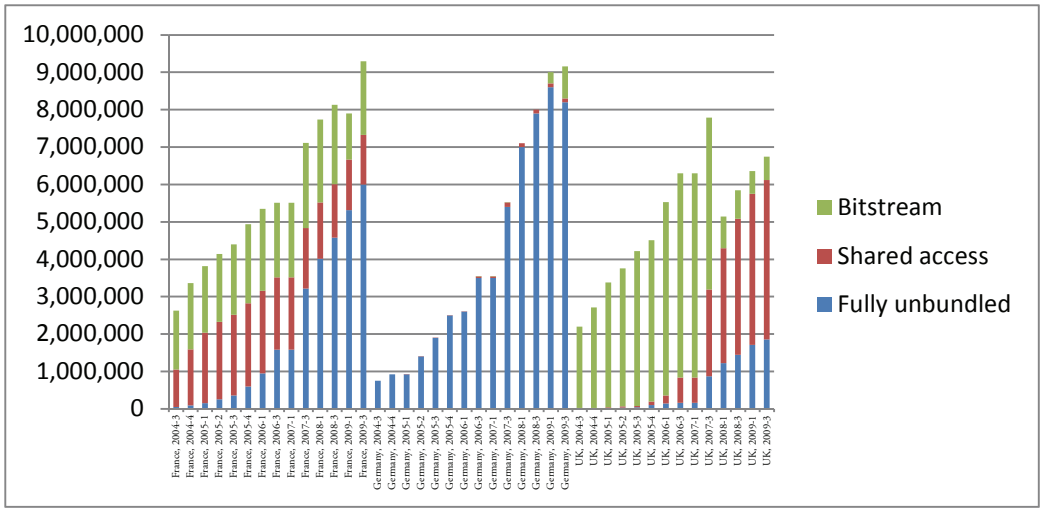
[78] As an additional benefit, Openreach produces a wealth of detailed tracking (weekly) data, giving a much stronger empirical evidence base for analysing UK LLU performance than is available in most other countries. This is complemented by quarterly analyses from the Office of the Telecommunications Adjudicator (http://www.offta.org.uk/index.htm). Because comparable data are not available for the other cases, we have not analysed them here; however, it is fair to compare outcomes and to consider whether 'equivalence of access' might inhibit innovation and improvement incentives.

Figure E.1: Evolution of local loop unbundling in the EU case studies



These data show clearly that the UK lagged well behind its EC competitors in LLU (if bitstream is excluded), though it was catching up rapidly following the Openreach decision. On the other hand, it was well in the lead throughout this period if bitstream is included. A full series of data on the number (not percentage) of unbundled lines is given in the Figure E.2. It shows that bitstream access was largely replaced in the UK by shared-line access, to an extent unmatched in either of the other EU cases.

Figure E.2: Number of unbundled lines



Source: ECTA broadband scorecards

Context of LLU development

LLU became an important EU policy issue in the late 1990s as a substitute for facilities-based competition, particularly where the costs of duplicate networks would be too high compared to societal benefits, and as a means of giving those network operators who had already invested in backbones (i.e. national rather than local parts of the network) a chance to reach end-users directly. Before the EU regulatory framework came into being, LLU was left to Member States; unbundling was required in Germany in 1996, Denmark in 1998 and The Netherlands in 1999. In 2000 (2002 for implementation) this picture changed and LLU became part of the overall EU regulatory framework. The early documents noted:

> *The high cost of duplicating the local access infrastructure is ruling out new market entrants. This is affecting the level of competition, which the Regulation is intended to increase by offering unbundled access to the local loop, i.e. by enabling new competitors to offer high bit-rate data transmission services for continuous Internet access and for multi-media applications based on digital subscriber line technology as well as voice telephony services …*[79]

Mandatory unbundling applied only to operators identified by NRAs as having significant market power (SMP). Moreover, access prices (local loop line rental) had to be transparent, non-discriminatory, fair and cost-based. To facilitate this, NRAs were allowed to intervene in the market by, for example, setting LLU prices. The 'cost-based' concept was not specified, but NRAs typically include common cost components and a rate of return on investments for the incumbent (in line with the New Regulatory Framework). Interfering at the wholesale level, especially for pricing, is a temporary measure. Indeed, when the local access market is seen as sufficiently competitive, incumbent operators are no longer required to provide access at cost-orientated wholesale prices.[80]

In the context of our analysis, the UK, Germany and France operate under the EU regulatory framework, and therefore there was much LLU activity after 2002. Australia began the unbundling process a little later. Germany were among the first in Europe to unbundle the local loop under the network access ordinance (NZV) of October 1996. In response DT proposed bitstream access in early 1997. This was rejected by a number of competitors, who instead wanted physical access.[81] France entered the unbundling arena in 2001 – the deployment of operators on France Telecom sites started quite quickly and effective unbundling of subscriber lines remains underway.[82] In the UK the LLU process moved forwards in 2005 when BT Group offered and Ofcom accepted a set of undertakings including the commitment to establish a new organisation, Openreach, which was separated from the rest of BT. Openreach was required to provide, first, wholesale line rental (WLR); secondly, LLU, which includes fully unbundled lines (or managed package framework) and

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[79] European Parliament and Council (2000)

[80] 'When the national regulatory authority determines that the local access market is sufficiently competitive, it shall relieve the notified operators of the obligation laid down … for prices to be set on the basis of cost-orientation'. *European Parliament and Council* (2000),7.

[81] Information Society annual reports, Germany, at http://ec.europa.eu/information_society/policy/ecomm/doc/implementation_enforcement/annualreports/14threport/de.pdf

[82] http://www.arcep.fr/index.php?id=8577&L=1#11

shared unbundled lines; and, thirdly, Ethernet services.[83] In Australia in 2006, the ACCC issued a final decision to 'declare' the unconditioned local loop services (ULLS/LLU). The decision to declare ULLS followed a public inquiry into the regulation of fixed network services. The ULLS was declared in August 1999 and offered competitors an alternative to purchasing wholesale services from Telstra, by allowing them to deploy their own infrastructure directly in Telstra's local telephone exchanges.[84]

Regulatory activity in relation to LLU

Looking across the four countries included in this review, we can see that all of them have been involved actively in taking significant actions in terms of regulations. In the UK the principal objective of Ofcom is to secure the availability throughout the UK of a wide range of electronic communications services under the Communications Act 2003. In 2004 Ofcom appointed an independent telecommunications adjudicator to work with industry in order to accelerate the implementation and delivery of fit-for-purpose and appropriately industrialised LLU products and processes. The work of the adjudicator was intended to provide a positive environment for LLU to succeed in the UK. Also in 2004, Ofcom announced the reduction of BT's LLU prices for fully unbundled lines and shared access. In 2005 Openreach was established (as mentioned above) to provide wholesale access services. including LLU. to all communication providers. BT – which was determined to have SMP – is subject to a number of SMP conditions including price controls and cost orientation obligations in relation to wholesale line rental and LLU.[85]

In Germany, in response to the 1996 ordinance (NZV), DT proposed bitstream access in early 1997. This was rejected by a number of competitors, who instead wanted physical access. The German regulator (RegTP) agreed with complaints lodged by the competitors to DT. Since 2002 prices for ULL have been required to be cost-based and based on a long run incremental cost (LRIC) model. In 2008 the national regulator approved an IP bitstream reference offer, including stand-alone bitstream, and also approved an ATM bitstream reference offer. In 2009 the Federal Network Agency (BNETZA) lowered the fee by about 15 cents to 10.50 Euros per month.[86]

In France in 2002 the French regulator ARCEP imposed a strict tenure on LLU, imposing price reductions on the incumbent and, in 2003, a requirement for France Telecom to offer

[83] http://www.ofcom.org.uk/consult/condocs/openreach/openreachcondoc.pdf

[84] ACCA (2008) Unconditioned local loop service – pricing principles and indicative prices, at http://www.accc.gov.au/content/item.phtml?itemId=830403&nodeId=29d9593257bf0c30365af049f90b4a87&fn=Final%20indicative%20prices%20and%20pricing%20principles%20for%20ULLS.pdf

[85] Ofcom (2009) A new pricing framework for Openreach – statement 2009, at http://www.ofcom.org.uk/consult/condocs/openreachframework/statement/statement.pdf

[86] Doyle, Local loop unbundling and regulatory risk, at http://www.cdoyle.com/papers/llurisk.pdf; Neylan et al. (2009) TELSTRA ULLS undertaking – ULLS international benchmarking (appendix), Ovum project no. CON 2939, Ovum Consulting. http://www.accc.gov.au/content/item.phtml?itemId=890094&nodeId=dc46e00d80837da8452ad6940a2b8681&fn=Ovum%20ULLS%20report.pdf; DSLWEB (2009) DSLWEB special: DSL market report Germany – The German market for DSL in Q1 of 2009', DSLWEB Magazine, at http://www.dslweb.de/dsl-market-report-germany-2009-1.php

co-location space in its exchanges for competitors' DSLAM equipment. The role of ARCEP was strengthened by the French government in April 2004.[87]

In Australia, in March 2004 the ACCC issued a competition notice, and resolved the LLU dispute in early 2005 with the primary objective of ensuring that Telstra's wholesale and retail pricing allowed for a competitive environment. In November 2007 the ACCC made its final ULLS/LLU pricing principles determination as required by s152AQA of the Trade Practices Act 1974. The ACCC may therefore specify indicative prices for a declared service. These are described in the 'Unconditional local loop service (ULLS) final pricing principles – Nov' (2007). On 23 April 2008 the ACCC released the draft 2008 ULLS pricing principles and indicative prices determination, and received submissions from six interested parties. Indicative prices for 2008 were set out on the basis of the 2008 draft and on submissions received.[88]

In terms of assessing the effectiveness of these regulatory activities in the context of LLU, the increased access to a wide variety of providers indicates that there has been an impact. In conjunction with this, prices have gone down for line rental and usage for customers (see below for specific data).

Impact of LLU on consumers

In terms of the impact of LLU on consumers, one significant measure is the degree to which prices have been reduced. In the UK and Germany, where data on subscription costs are available, we can see that in both countries the costs have gone down. In the UK in 2009 the prices for services with headline speeds of up to 8 Mbs had fallen from £30 per month to £10 per month.[89] In Germany The cost of basic 'first generation' broadband packages has decreased significantly since 2001, falling from around €60–70 per month for 0.7 Mbs service in 2001 to around €20 per month for a 1 or 2 Mbs service. With regard to residential 'second generation' broadband services, in December 2005 6 Mbps services were available throughout the country costing around €25–40 per month. Within some unbundled areas 16 Mbps services were available via ADSL2+ technology at a cost of approximately €60 per month.[90]

A further measure of the success of the regulation in the LLU area is the extent to which access has been increased for consumers. In the UK we can see that the overall increases in subscriber numbers for fixed line and broadband services (from 50% in 2006 to 61% in 2008) are in proportion to the number of customers with access to broadband (from 41% in 2005 to 60% in 2008) and the number of households with access to at least one LLU operator (from 43% in 2005 to 80% in 2008) – all point to an ongoing improvement from

[87] ARCEP (2005) France broadband market report (2005), at http://www.bbwo.org.uk/broadband-3053
[88] Unconditioned local loop services (2008) http://www.accc.gov.au/content/item.phtml?itemId=830403&nodeId=29d9593257bf0c30365af049f90b4a87&fn=Final%20indicative%20prices%20and%20pricing%20principles%20for%20ULLS.pdf
[89] Ofcom (2007) Impact of the telecoms strategic review – evaluation, at http://stakeholders.ofcom.org.uk/telecoms/policy/bt-undertakings/impact-strategic-review/ http://www.ofcom.org.uk/telecoms/btundertakings/oir/tsr_statement/tsr_statement.pdf; Ofcom (2009) Impact of the strategic review on telecoms (2009), at http://www.ofcom.org.uk/telecoms/btundertakings/impact_srt
[90] BBWO (2005) Germany broadband market report, at http://www.bbwo.org.uk/broadband-3323

the perspective of the consumer.[91] In Australia, where the best comparative data were found, take-up rates of regulated unbundled services (LLS/ULLS) also saw an increase in broadband subscribers of more than 30% (from 4.3 to 5.7 million) between 2007 and 2008. In terms of geographical coverage changes, as a result of LLU in Australia as of June 2008 98% of homes and businesses were located in exchange service areas (ESAs) where DSL had been enabled.[92]

Impact of LLU on network investment

We can see from data for the UK and France that investment has continued in the LLU and in the broader NGN. In the UK between 2005 and 2008 the number of operators investing in LLU increased threefold and the number of LLU-enabled exchanges increased twofold. Furthermore, BT has been investing in its NGN for the 21st Century. By April 2010 BT had aimed for ADSL2+ services to reach 55% of the population.[93] There are fears, however, that there will not be enough investment for the long term and that LLU has been a disincentive to ongoing investment due to the need to share access with others.

In France, following ARCEP's intervention to restrict France Telecom's high prices, Neuf and Cegetel were merged in May 2005 creating Neuf Cegetel, the competitor with the largest share of the broadband market after the incumbent. In addition, Telecom Italia (another LLU operator in France) had announced plans to invest €350 million in France by 2007 in order to unbundle 650 exchanges in around 100 cities, increasing LLU coverage to 46% of the market.[94]

Overall conclusion

LLU may take various forms, ranging from full unbundling to IP-based (bitstream) access. An EU telecom regulatory package enforced LLU on all European NRAs in 2001. Germany and France introduced LLU in some form prior to the EU regulations being put in place. The UK was one of the later countries to introduce LLU. Despite this, more providers have taken advantage of LLU in the UK than in other countries. Bitstream access was largely replaced in the UK by shared-line access, to an extent unmatched in other EU cases. The UK has caught up on the other NRAs from a position of being behind in terms of developing LLU so that there is a positive impact for consumers in price and access. The infrastructural investment implications have yet to be determined.

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[91] Ofcom (2009) Impact of the strategic review on telecoms, at http://www.ofcom.org.uk/telecoms/btundertakings/impact_srt/

[92] ACCC (2009) Telecommunications competitive safeguards for 2007–8, at http://www.accc.gov.au/content/item.phtml?itemId=877087&nodeId=685c33e98ae9b709d3b520de9378387b&fn=ACCC%20telecommunications%20reports%202007%E2%80%9308.pdf

[93] Ofcom (2009) Impact of the strategic review on telecoms (2009), at http://www.ofcom.org.uk/telecoms/btundertakings/impact_srt/

[94] France broadband market report (2005), at http://www.bbwo.org.uk/broadband-3053

Appendix F: Voice-over internet protocol case study

Introduction

This case study sets out a comparative review of Ofcom in the UK along with four other countries: Germany, France, the USA and Australia. Publicly available documentation from the regulatory bodies within these countries, as well as outside the regulatory sector, were reviewed in the analysis. In addition, follow-up communications and clarifications were undertaken with each of the NRAs where this was needed to supplement or replace the information derived from documentation.

Definitions of VOIP for regulatory purposes

Each of the five regulatory bodies defines VOIP in a slightly different way. In the UK (once Ofcom required access to emergency services to be offered) Ofcom defines type 4 VOIP providers as publicly available telephone services and type 2 VOIP providers as public electronic communications services.[95] Under the current EU regulatory framework, players (including VOIP providers) are free to enter the market for electronic communications services without prior authorisation, provided they abide by the conditions of the general authorisation applicable in each Member State. VOIP providers will face obligations under the EU framework depending on the service, rather than the technology used to provide it. The EU aims to adopt a light regulatory touch, taking into account the emerging nature of the technology while preserving consumer interests – especially in relation to emergency service access.

France published one of the earliest public consultations, with a public call for comments on VOIP in 1999. VOIP operators have been subject to the general authorisation framework since 25 July 2004, along with other telecom providers, and have to notify the regulator. The French regulator has consulted on numbering for VOIP services and was one of the first regulators to publish official statistics for the number of VOIP subscribers, which amounted to 1.5 million at the end of March 2005, accounting for 1.5 billion minutes or 6% of total traffic.

[95] Ofcom (2009) Regulation of VOIP services – statement and publication, statutory notifications under section 48(1) of the Communication Act 2003 modifying General Conditions 14 and 18, at www.ofcom.org.uk/consult/condocs/voipregulation/voipstatement/voipstatement.pdf

In Germany VOIP was not regarded as a voice telephony service as defined in the Telecommunication Act. Therefore VOIP providers are not subject to a licence.

In the UK Ofcom's September 2004 public consultation issued interim guidance, including an interim forbearance policy allowing VOIP providers to offer emergency services without the other regulatory requirements for PATS – in effect this phased in the more difficult requirements (e.g. provision of location information) in order not to create regulatory barriers that might have the effect of discouraging emergency service access over entrants' VOIP services. After a second consultation in 2006, providers offering VOIP services to the public had to comply with the requirements applicable to any voice service. This ended the interim forbearance policy and introduced a mandatory code of practice for consumer information, to be observed by VOIP providers.

Australia distinguishes services with different levels of integration:

i. peer-to-peer VOIP services for on-net calls (not connected to the PSTN) provided online, requiring the user to have a separately sourced broadband connection;
ii. VOIP over broadband services provide interconnection with other types of voice services (typically provided by online providers, with the user having a separately sourced broadband connection);
iii. vertically integrated VOIP services offering interconnection with other voice services, bundled with both a broadband connection and an ISP service;
iv. corporate or enterprise VOIP services providing the highest QoS of all the VOIP service types, with interconnection to other types of voice services.

The USA did not treat VOIP as a traditional telephone service, but as a computer-based 'information service' (as defined by the 1996 Telecommunication Act, which distinguishes telephone services from information services). Despite this, VOIP is subject to a comprehensive series of regulatory constraints more closely resembling those on voice telephony than those for other information and data services. After 2005 all VOIP providers connecting to the PSTN must provide emergency service access.

Overall planning for access to emergency services using VOIP

In all of the countries under consideration for this study, planning has been formulated for how to access emergency services over VOIP (i.e. being able to access 112/999/911). In the UK, under Ofcom, access to emergency services is obligatory for providers of type 2 (providing out services) and type 4 (providing in and out services) VOIP services since September 2008. While Ofcom has not extended the deadline for compliance beyond 8 September 2008, it has extended the enforcement programme in order to make sure new entrants comply with the obligations from day 1.[96]

In Germany compliance has been required since 1 January 2009. Similarly, French legislation indicates that providers of electronic communications must provide access to emergency services. This is also the case in the USA, where the FCC requires all interconnected VOIP service operators to provide access to emergency numbers. This is a

[96] Ofcom (2010) Landline, mobile and broadband complaints, at www.ofcom.org.uk/bulletins/comp_bull_index/comp_bull_ocases/open_all/cw_996/

mandatory feature of VOIP in the USA – customers are not allowed to opt out of it. In Australia type 4 VOIP service providers are required to provide access to the emergency call service numbers, and whether type 2 VOIP providers should be similarly obliged is still under discussion.

In addition to being able to reach and connect with emergency services using VOIP, the issue of what happens when the power fails is an important one in this context (since service will in general totally fail without electrical power). Across all the countries included in this benchmarking exercise (with the exception of Germany, where data were unclear) the response to this problem was similar. All of the NRAs provided an advisory service in this regard but did not set out or attempt to create a legal requirement. In each case advice was issued that providers must ensure that customers are aware of the situation. In the UK Ofcom introduced an obligation by General Condition, explicitly stating that providers must make it clear during the sales process if a VOIP service depends on the home power supply for operation.[97] In France the general terms and conditions of VOIP service clearly state that if the network does not function, then no calls will be carried, including emergency calls.[98] In the USA consumers are warned of this problem through a consumer advisory statement that if the power is out or the internet connection is down, then the VOIP service will not work. It suggests to consumers that they consider having a back-up plan (such as installing an alternative power supply, maintaining a traditional phone line or having a wireless phone as a back-up).[99] Similarly, in Australia ACMA has set out the risks for customers if the power goes down and makes a recommendation that people should have a regular, non-portable fixed line phone as a back-up measure.[100] These data indicate that Ofcom and all of the comparators (excluding Germany) are taking this issue seriously and are issuing advice to consumers that they should be aware of the issue. Some have made suggestions to mitigate the risks involved. The convergence of regulator activity in this context is at present to inform of the risks (and facilitate consumer choices to mitigate risks – such as having a mobile phone, a standard non-powered fixed phone or both as a back-up) rather than trying to legislate in this area. As the technology evolves, this area will inevitably develop further.

Extent of usage of VOIP for access to emergency services

In relation to this aspect of VOIP, there are two main aspects to consider. First, there is the issue of whether or not it is possible to determine how many emergency calls are made by VOIP; secondly, based on this, is the estimation of the extent to which VOIP is used to access emergency services. In all countries included in this analysis, we can identify ways in which it is possible to determine how many calls are made by VOIP.

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[97] Ofcom (2007) Regulation of VOIP services – statement and publication, statutory notifications under section 48(1) of the Communications Act 2003 modifying General Conditions 14 and 18, at http://www.ofcom.org.uk/consult/condocs/voipregulation/voipstatement/voipstatement.pdf

[98] http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/voip_f_f_master_19mar08_fin_vers.pdf

[99] FCC (2011) FCC consumer advisory VOIP and 911 service, FCC Consumer and Governmental Affairs Bureau, at http://www.fcc.gov/cgb/consumerfacts/voip911.pdf

[100] ACMA (2010) Key issues to consider before getting VOIP, Australian government, at http://www.acma.gov.au/web/standard/pc=PC_310761

Reviewing these briefly, we can see that in the UK the VOIP service providers provide the physical address of their customer to the emergency service database accompanied by a VOIP flag to alert the emergency handling operator that they need to ask the caller to confirm their location. In addition, besides interconnecting directly, providers may route calls via a third party with BT, Cable and Wireless and Kingston.[101] Hence, there appear to be (at least) three possible ways of identifying how many emergency calls are made by VOIP: through the emergency call service statistics, the VOIP provider's own call statistics and the third-party statistics. Ofcom has these data but they are unpublished owing to commercial confidentiality. However, we can see that – as noted in the *Competition and Consumer Enforcement Bulletin* update on the GC4 enforcement programme – 'the number of calls to the emergency services using VoIP has grown by 43% during the course of the programme'.[102] In France, under French law, the VOIP operator is obliged to route emergency calls to the emergency centre.[103] Hence there appear to be (at least) two possible ways of identifying how many emergency calls are made by VOIP: through the emergency call service statistics (based on the routing information) and VOIP provider's own call statistics.

In Germany it is unclear from the data how this is specifically done. However, considering that VOIP operators are obliged to route emergency calls to the emergency centre, it is logical to assume that the procedure is likely to be similar to the one in France. In the USA interconnected VOIP providers are required to route emergency calls to the nearest public safety answering point (PSAP) and provide a call-back number and location (standard E-911) based on the information they have in their system about the current physical address of their customer (this information is provided at subscription and may be updated later by the customer).[104] Hence there appear to be (at least) two ways to identify how many emergency calls are made by VOIP: based on VOIP provider's routing data and through the emergency call service by capturing the call routing information. In Australia type 4 VOIP operators are required by law to register their customers with the integrated public number database (IPND) used by the emergency call service, and to flag their records suitably to indicate VOIP service. In addition, there is a numbering plan that sets out the numbering arrangements for the supply of carriage services to the public. VOIP accounts that are considered nomadic (or nomadic on occasion) are given a 0550 number range that clearly flags the caller as VOIP.[105] Hence, there appear to be (at least) two possible ways of identifying how many emergency calls are made by VOIP: through the emergency call

[101] Ofcom (2009) Regulation of VOIP services – statement and publication, statutory notifications under section 48(1) of the Communication Act 2003 modifying General Conditions 14 and 18, at http://www.ofcom.org.uk/consult/condocs/voip/voipstatement/voipstatement.pdf; http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/voip_f_f_master_19mar08_fin_vers.pdf

[102] Ofcom (2010) Landline, mobile and broadband complaints. http://www.ofcom.org.uk/bulletins/comp_bull_index/comp_bull_ocases/open_all/cw_996/

[103] http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/voip_f_f_master_19mar08_fin_vers.pdf

[104] VON http://www.von.org/usr_files/911%20VON%20White%20Paper%201-12-05%20final.pdf

[105] ACMA http://www.acma.gov.au/webwr/_assets/main/lib310648/ecs_disc_paper.pdf; ACMA http://www.acma.gov.au/web/standard/pc=PC_310257

service statistics and the VOIP provider's own call statistics. We can see that it is possible to determine how many emergency calls are made by VOIP.

However, turning to the second issue mentioned above, although we can see that it is possible to determine how many calls are made by VOIP, our review of these comparator countries have shown that the actual numbers indicating the extent of usage of VOIP for accessing emergency services are not available in the public domain. Some more informal information on the extent of usage suggests unsurprisingly that VOIP is not heavily used in this regard. For example, in the UK John Medland, BT 999 Policy Manager, indicates in an interview for *BAPCO Journal* (January 2008) that 'VOIP only makes up a relatively small percentage of the calls that come through to emergency centre control rooms – about 1,000 a month compared to 2.4 million a month from fixed and mobile numbers'.[106] However, as noted above, there has been some increase in VOIP call volumes. Also, in the USA there is some proxy evidence based on projections and city/county reports that VOIP emergency calls are no more than 2% of all emergency calls (in 2006).[107]

Main problems associated with VOIP access to emergency services

The biggest and most frequently highlighted problem reported by all countries is the lack of technical capability to identify the precise location of nomadic service users. While all countries are researching potential solutions, they have come up with temporary (though partial) solutions to this problem. At present across all the countries in this analysis, if problems are encountered by the consumer they can contact the regulator and file a complaint.

In addition to the issue of localisation of nomadic service users, power outage and network failures as potential problems for access to emergency services are mentioned in all the comparator countries. Also, in the UK Ofcom research indicates that a large percentage of VOIP users assume that their VOIP provider supports emergency calls, although in reality that may not be true.[108]

In terms of dealing with these problems, in the UK the VOIP service providers may provide the physical address of their customer to the emergency service database accompanied by a VOIP flag to alert the emergency handling operator to ask the caller to confirm their location. In addition, CLI is transferred when technically feasible, along with the emergency call.[109] In relation to emergency service provision and power/network failure there is in general an advisory notice to customers and an obligation for providers to inform their subscribers at the point of signature (i.e. agreement on service provision) about the features

[106] *BAPCO Journal*, at http://www.bapcojournal.com/news/fullstory.php/aid/1110/VOIP_-_out_with_the_old_in_with_the_new.html
[107] VON http://www.von.org/usr_files/911%20VON%20White%20Paper%201-12-05%20final.pdf
City of San Francisco, Office of the Controller
http://www.sfgov.org/site/uploadedfiles/controller/reports/911FeeRpt0708.pdf
Midland 911 http://www.midland911.org/callstats.php
[108] Ofcom http://www.ofcom.org.uk/consult/condocs/voipregulation/voipstatement/voipstatement.pdf
[109] Ofcom http://www.ofcom.org.uk/consult/condocs/voipregulation/voipstatement/voipstatement.pdf

of emergency service provision and any potential hazards.[110] In addition, the Network Interoperability Consultative Committee (NICC – the technical forum for UK interoperability standards) has issued a document setting out a practical solution for providing location information on DSL networks (but not other technologies).[111]

In Germany the VOIP service providers are obliged to flag nomadic users to the public safety answering point so operators can confirm caller location. As well, VOIP providers are required to provide CLI.[112]

In France the VOIP service providers are obliged to provide caller location data 'where the network equipment at its disposal makes it possible'. In relation to power/network failure an advisory notice to customers is provided and there is an obligation for providers to inform their subscribers at the point of contract signature of these potential hazards.[113]

In the USA the VOIP service providers are obliged to provide the physical address of their customer to the proper public safety access point. The FCC also requires that the provider enables the user to update their location information. The FCC advises users to update this information when they change location. In relation to emergency service provision and power/network failure, VOIP providers must issue an advisory notice to customers and there is an obligation for providers to inform their subscribers at the point of contract agreement of any potential hazards in accessing emergency services.[114]

In Australia type 4 VOIP operators are required by law to register their customers with the integrated public number database (used by the emergency call service) and flag their records suitably to indicate VOIP service. In addition, there is a numbering plan that sets out the numbering arrangements for the supply of carriage services to the public. VOIP accounts that are considered nomadic (or nomadic on occasion) are given a 0550 number range that automatically alerts the emergency handling operator to ask the caller to confirm their location. In relation to emergency service provision and power/network failure an advisory notice is issued to customers, and there is an obligation for providers to inform their subscribers at the point of contract signature about any potential hazards in accessing emergency services.[115]

Looking across all comparator countries in relation to the identification of the physical location of the caller by emergency services, it is clear that when the caller is using VOIP from a fixed or a temporary IP address and is registered with the VOIP provider (this is not

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[110] Elixmann *et al.* (2008) WIK Consult (Study for the EC), at http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/voip_f_f_master_19mar08_fin_vers.pdf

[111] www.niccstandards.org.uk/files/current/ND1638%20V1.1.1.pdf?type=pdf

[112] Elixmann *et al.* (2008) WIK Consult (Study for the EC), at http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/voip_f_f_master_19mar08_fin_vers.pdf

[113] Elixmann *et al.* (2008) WIK Consult (Study for the EC), at http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/voip_f_f_master_19mar08_fin_vers.pdf

[114] FCC http://www.fcc.gov/cgb/consumerfacts/voip911.pdf

[115] ACMA http://www.acma.gov.au/webwr/_assets/main/lib310648/ecs_disc_paper.pdf;
ACMA http://www.acma.gov.au/web/standard/pc=PC_310257;
ACMA http://www.acma.gov.au/web/standard/pc=PC_310761

necessarily a subscription relationship), then the location can be found. Not all VOIP providers allow registration in this way, and as a result there is variation in each country depending on the willingness of providers to register the physical location of users. In the UK and Australia, in addition, the operator asks the caller to confirm their location.[116] However, in the case of nomadic use of VOIP and mobile use of VOIP, the location cannot be identified in any of the countries unless the operator asks the caller.

Extent of regulation

In terms of the extent of regulation in each of the countries, in the EU a clear statement of relatively liberal policy is the European Regulator Group's Common Statement for VOIP regulatory approaches.[117] Each European country also has its own specific legislation which VOIP providers must abide by.

In the USA specific regulations are in place in relation to VOIP. In June 2005 the FCC imposed emergency service access obligations on providers of 'interconnected' VOIP services – VOIP services that allow users generally to make calls to and receive calls from the regular telephone network. In addition, the FCC requires interconnected VOIP providers to comply with the Communications Assistance for Law Enforcement Act (CALEA) of 1994 and to contribute to the Universal Service Fund, which supports communications services in high-cost areas and for income-eligible telephone subscribers.[118]

In Australia VOIP providers must follow the national legislation and industry codes.[119]

Overall conclusion

Looking across the issues in relation to accessing emergency services over VOIP, we can see that all of the countries included in this comparative review are dealing with similar challenges. There is a clear convergence among the regulators in how they are dealing with the issues involved. There is a common problem of precisely identifying the location of nomadic VOIP users; this can be dealt with only by the operator asking the caller to identify their location (obviously a less than optimal solution). Users of VOIP from a temporary or fixed IP address can (in some cases) register their details with the VOIP provider, which ensures that if they require emergency services they can be located. The variation in provision of service in this area is clearly a cause for concern amongst regulators in all of the countries and work continues to try to mitigate against the risks involved.

In summary, VOIP emergency service access forms a part of the more general issue of regulating VOIP services. The USA have led the way in imposing emergency call access and location information requirements, despite treating VOIP as an information service. Many of the other countries considered have treated VOIP as a telephone service, but adopted a light-touch regulatory regime. France were one of the pioneers in developing VOIP policy, but

[116] EC http://ec.europa.eu/information_society/activities/112/ms/index_en.htm; http://kn.theiet.org/magazine/rateit/communications/e999-connexon.cfm

[117] http://www.erg.eu.int/doc/publications/erg0512_voip_common_statement.pdf

[118] FCC http://www.fcc.gov/voip/

[119] ACMA http://www.acma.gov.au/web/standard/pc=PC_311047

this did not translate into leadership in relation to emergency access. Ofcom stood out not only in explicitly considering emergency service access, but also in developing an interim forbearance policy that encouraged entrants to provide emergency service access and only later added location information requirements. The current EC regulatory framework follows the UK lead in the sense that it emphasises a light regulatory touch, taking into account the emerging nature of the technology, whilst preserving consumer interests – especially in relation to emergency service access. Ofcom has therefore played a leadership role here to some extent.

Appendix G: Spectrum Olympics case study

Introduction

This case study sets out a comparative review relating to Ofcom in the UK with regard to the planning and preparation for the spectrum requirements for the 2012 London Olympics. Comparison was made with the Vancouver 2010 Winter Olympics, the Beijing 2008 Summer Olympics and the Athens 2004 Summer Olympics. It was originally intended to include the Turin 2006 Winter Olympics as well in this research, but the lack of data for these Games meant that this was precluded. Publicly available documentation from the regulatory bodies within the relevant countries, as well as outside the regulatory sector, was reviewed in the analysis. In addition, follow-up communications and clarification were undertaken with each of the NRAs where this was needed to supplement or replace the information derived from documentation.

Spectrum planning for each event

Looking first at the planning and preparation for the Olympic Games, we can see that a UK government commitment was provided to support the bid for the London 2012 Olympic Games. The then Secretary of State for Trade and Industry gave a guarantee to the IOC that the UK government would provide the frequencies required for the organisation of the Games. A guarantee was also given that the UK government would waive any fees payable for the frequencies allocated. Ofcom was given the responsibility from the outset to organise a full spectrum plan for the London Games and to arrange all the spectrum licences ahead of time in order to support the plan. Spectrum provision planning for the London Games was started six years ahead of the event.[120]

Similarly, a government guarantee was issued for the Vancouver 2010 Winter Olympic Games. Industry Canada's involvement began in October 2002 with the commitment to provide spectrum management support to the Vancouver bid. This commitment became a part of the Canadian government's overall pledge of support for the Vancouver bid, which was formalised in a multi-party agreement signed in November 2002. Soon after Vancouver's bid succeeded, Industry Canada began drawing up plans to meet its spectrum commitment and ensure that the right staff and tools would be in place and ready. During 2007–8, Industry Canada developed a two-stage Winter Games spectrum management plan

[120] http://www.ofcom.org.uk/consult/condocs/spectrum2012/condoc.pdf (accessed March/April 2010).

for pre-Games and Games-time operations.[121] In contrast, the Beijing 2008 and Athens 2004 Games did not feature government guarantees, although extensive planning was done. The Beijing 2008 Olympic Action Plan was published in 2003 and included the aim to apply 'information technology extensively to urban development to build a "digital Beijing"'. The plan also refers to the 'digital Olympics' programme and the building of telecommunications infrastructure and network systems to create a favourable IT environment and provide excellent information services. It was planned that by 2008 information services would be 'inexpensive, rich in content, free of language barrier, personalized, and available for anyone, at anytime and anywhere'.[122] For the Athens 2004 Games, EETT began drafting their spectrum plans in 2002 as part of their 'Operational plan for the provision of a secure and reliable radio communications environment'. As part of these plans, EETT drafted a monitoring guide which defines in detail the spectrum's legal use, monitoring interference problems and management procedures, as well as the responsibilities of each body involved.

Overall in relation to planning for Athens 2004, Vancouver 2010 and London 2012, we can see that there is a focus on the legalities, management procedures and responsibilities. There is also a developing pattern of provision of government guarantees (in Vancouver 2010 and in London 2012) to support the bidding of countries to win the hosting of the Olympic Games. In the case of Beijing 2008 the focus was more on infrastructure and the building and development of network systems than on spectrum planning. Ofcom is therefore in line with previous events in terms of planning. In each of the four Olympic Games included in this analysis spectrum provision plans were put in place ahead of time. In the more recent Olympic Games, more time has been given to the planning issues. This is inevitably due to the increasing complexity of the spectrum demands of the event in conjunction with the existing demands of the host country. We can see that in these three cases there is broad collaboration and an effort to maximise the input into the planning for the Games.

Collaboration in spectrum policy development

Looking across Athens 2004, Vancouver 2010 and the planning for the London 2012 Olympic Games (Beijing 2008 did not have information available on this specific issue), we can see that in all three cases there was a considerable amount of collaboration on the strategic development of the spectrum policy. For Athens 2004 the EETT collaborated with a number of bodies, including the ATHOC 2004 Technology Division, the IOC, the Olympic Games Security Division and the Olympic Games Radio Spectrum Working Group.

For Vancouver 2010 the spectrum policy was developed and managed by Industry Canada, the Vancouver Organising Committee for the 2010 Olympic and Paralympic Winter Games (VANOC), Olympic/Paralympic Radio Users Committee and the Olympic Broadcasting Services Vancouver (OBSV). In addition Industry Canada and VANOC collaborated with the following groups: Royal Canadian Mounted Police, E-COMM, Department of National Defence (DND), Integrated Security Unit-Vancouver (ISU-V), Western Washington

[121] Vanoc (2009) Spectrum management communications plan, 11 February 2009, at http://www.trewaudio.com/PDF/vanoc_spectrum_comm_plan_v2.16.pdf

[122] Beijing Olympics Action Plan2008 (2003), at http://en.beijing2008.cn/59/80/column211718059.shtml

Communications Interference Committee, Society of Broadcast Engineers, Western Canada Association of Broadcasters and UBC/SFU, and also radio amateurs.[123]

For the London 2012 Olympics, Ofcom, UKSSC, SPGOG and the Olympic Board are all collaborating on the strategic development of spectrum policy and provision.[124]

We can see that in these three cases there is broad collaboration and an effort to maximise the input into the planning for the Games. With regard to the responsibility for ensuring the successful spectrum management, lines of responsibility were clear in Greece, Canada and the UK (data on Beijing being unavailable). For London 2012 it is Ofcom that holds the ultimate responsibility for delivery of the spectrum policy plans.[125] For Vancouver 2010 it was Industry Canada (a federal government department) that was responsible for the planning and provision of spectrum, while for Athens 2004 the Greek regulator EETT had overall responsibility.[126] The institutional responsibility is in itself notable and the differences arising from responsibility being part of the remit of a regulator rather than that of a government department are of interest.

Spectrum allocation and regulation

Turning to allocation of spectrum, it is clear that Ofcom has maximised its learning from previous events. For Vancouver 2010 spectrum requests received through the relevant portal were directed to Industry Canada for processing, while spectrum co-ordination requests were directed to the VANOC programme manager for action. Industry Canada made assignments, specifying operating parameters including frequency, bandwidth, transmitter power and so on. VANOC co-ordinated the spectrum use inside venues by specifying the channels for wireless microphones and squelch tone for land mobile radios and so on. After a spectrum request application was processed, Industry Canada notified the VANOC programme manager about whether an application had been approved or refused. The programme manager acted as liaison between the applicant and Industry Canada in recommending appropriate options in the event of the application being refused.[127] For Athens 2004 the Greek regulator EETT issued 2,004 licences for handheld radio systems and 56 licences for land mobile radio systems.[128] EETT made agreements for the temporary granting of spectrum by main users, in particular the armed forces, OTE and radio amateurs. In addition, EETT assigned specific operational frequencies to support the security forces. For London 2012 Ofcom proposed putting in place a new computer system that would validate the identity of the applicant. This process would start in early 2011.[129]

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[123] http://www.trewaudio.com/PDF/vanoc_spectrum_comm_plan_v2.16.pdf; http://www.thetelecomblog.com/2010/03/02/bell-olympics-telecommunications-the-numbers-game/

[124] http://www.ofcom.org.uk/consult/condocs/spectrum2012/condoc.pdf

[125] http://www.ofcom.org.uk/consult/condocs/spectrum2012/condoc.pdf (accessed March/April 2010) http://www.ote.gr/grsp/english/ipiresies.htm (accessed March/April 2010).

[126] http://www.ofcom.org.uk/consult/condocs/spectrum2012/condoc.pdf; http://www.ote.gr/grsp/english/ipiresies.htm

[127] http://www.trewaudio.com/PDF/vanoc_spectrum_comm_plan_v2.16.pdf

[128] http://www.ofcom.org.uk/consult/condocs/spectrum2012/condoc.pdf

[129] http://www.ofcom.org.uk/consult/condocs/spectrum2012/condoc.pdf

In terms of regulation of spectrum, for London 2012 Ofcom is responsible for providing the spectrum needed for the Games. The UKSSC is responsible for co-ordinating public-sector spectrum use and its subcommittee SPGOG (chaired by Ofcom) for co-ordinating the loan of spectrum by the public sector and for public-sector requirements for additional spectrum for the Games.[130] For Athens 2004, in order to service frequency demands, EETT designed and ATHOC implemented the 'e-spectrum' network application. Through this application interested radio frequency users could obtain information on the current radio frequency licensing status for the Olympic Games, submit their applications and monitor their progress via the internet.[131] For Vancouver 2010, after the user had submitted their frequency request VANOC levied a co-ordination fee of $150.00 per frequency. Industry Canada processed the frequency application, and once approval was granted the authorised rate card user received their temporary licence to operate radio frequency. Payment of the VANOC co-ordination fee was through the VANOC rate card ordering system portal. Frequency and channel assignments were not issued until payment had been received. Users could not sell, trade, loan or re-assign channels; and assigned frequencies and channels could be used only within co-ordinated zones.[132]

Spectrum use in emergency situations

On looking at Athens 2004 and Vancouver 2010 (data are unavailable for Beijing 2008 and London 2012), we can see that both made plans to deal with the possibility of emergency situations arising and the spectrum requirements that might be needed in those situations.

For Athens 2004 EETT prepared an operational plan for telecommunications emergencies. The plan provided for the setting up of working groups with representations from all providers involved as well as EETT. The plan stated that representatives of the groups should be on standby on a 24-hour basis throughout the Games, in order to deal immediately and efficiently with any problems that might arise.[133]

For Vancouver 2010 there was a secured agreement that E-COMM would provide access to their wide area of radio frequency coverage. Included in this was access to all emergency services, security and potential use of unused allocated radio frequencies for Games transportation and operations as required. The city of Vancouver's Emergency Operations Centre was to be made available and existing protocols dealing with communications would be enhanced to serve the security requirements. Major federal government sponsorship of the bid and a high level of co-operation ensured that there would be no difficulty in receiving extra channels if required. In order to ensure the security and availability of the network and web portal, Bell Canada incorporated a managed firewall solution to secure the network perimeter and a content distribution network of 30,000 servers worldwide to guarantee fast uptime for visitors to the vancouver2010.com portal.[134]

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[130] Clarification of responsibilities provided by Ofcom, 2010.

[131] http://www.eett.gr/opencms/export/sites/default/EETT_EN/publications/proceedings/actions.pdf

[132] http://www.trewaudio.com/PDF/vanoc_spectrum_comm_plan_v2.16.pdf (accessed March/April 2010).

[133] http://www.eett.gr/opencms/export/sites/default/EETT_EN/publications/proceedings/regulating.pdf

[134] http://www.canada2010.gc.ca/docs/Vancouver_2010_Bid_Book_-_Volume_3.pdf; http://www.vancouver.bell.ca/en/games/backbone/

For the London 2012 Olympics, Ofcom does not have lead responsibility for emergency planning and therefore further information is not available about this.

Physical infrastructure requirements to facilitate spectrum

In terms of what was physically required for each of the Olympic Games in order to meet the spectrum requirements, a range of different facilities has been needed. For Athens 2004 the EETT established a nationwide spectrum management and monitoring system. This consisted of five fixed stations (three in the Athens area and two in the Thessalonica area) and seven test vehicles, plus several portable and transportable systems. National headquarters and a regional control centre were set up in the Athens area. EETT planned this new system and held an international Invitation to Tender for potential providers. Rohde & Schwarz won the commission for implementing the infrastructure in November 2002, and became the overall project leader. The project was implemented in close co-operation with the company's Greek representative, Mercury. The subcontractor L S telecom supplied the entire spectrum management system.[135]

For the Beijing 2008 Olympics, in line with the Beijing Olympic Action Plan some landmark IT buildings were planned to serve as multi-function centres for the Games. To provide frequencies for the Games, the plan was to strengthen the overall planning and management of radio frequencies. A technical support system for radio management was established in Beijing to facilitate the overall improvement of frequency management, radio signal monitoring, radio interference analysis and radio equipment testing ability. The 90,000 sq m International Broadcast Centre (IBC) was purpose built for the venue-wide broadcast infrastructure network. In addition, China's telecom regulator, the Ministry of Information Industry (MII), planned to roll out 150 WiMAX base stations, covering 90% of Beijing's commercial and residential areas, in time for the Olympics. According to the plan, the WiMAX technology would be used to meet the need for high-speed data applications such as video streaming, with TD-SCDMA (China's home-grown 3G standard) reserved for voice and less bandwidth-hungry data. The engineering and technical operations team implemented the broadcast infrastructure – from the venue cabling and the high-definition outside broadcasting (OB) vans in the broadcast compounds, to the technical operation centres (TOCs) linked to the IBC and beyond – was operational 24 hours a day. This involved establishing and maintaining fibre-optic, radio frequency, microwave and satellite links, as well as ensuring that power, video, audio and data feeds from the venue and airborne cameras remained uninterrupted.[136]

For Vancouver 2010, planned by Industry Canada and VANOC, a broad range of technology equipment and infrastructure requirements for the games was identified and put in place. The provision included venue technology (equipment and infrastructure to support the timing and scoring systems, video and scoreboards, security, broadcast and media requirements), telecom systems (including an extensive telecommunications network to

[135] http://www.rohde-schwarz.dk/WWW/Publicat.nsf/article/n185_argus-it/$file/n185_argus-it.pdf

[136] http://www.telecomengine.com/article.asp?HH_ID=AR_3195;
http://en.beijing2008.cn/news/dynamics/headlines/n214204287.shtml;
http://www.broadcastaustralia.com.au/assets/files/Media/2008%2010%20-%20Olympic%20Games%20drive%20broadcast%20change.pdf

support the venues and interconnect them to the broadcast centre and VANOC, headquarters and data centre) and a wireless telecommunications infrastructure (for cellular traffic, Wi-Fi access and support for two-way radios).

Also in Vancouver, all Olympic venue sites were to be linked by fibre optic cable and access was to be provided at all venues for uses such as broadcast, local area network and internet connectivity. The technology proposed would incorporate near-surface fibre and wireless modems to reduce the impact on the environment while providing the high level of telecommunications needed for the games operations. All telecom systems for the Games were to be delivered by Bell Canada, a premier national partner.[137]

For the London 2012 Olympics, while Ofcom has responsibility for planning the spectrum requirements, LOCOG will lead the co-ordination, planning and provision of any temporary radio-distribution infrastructure required. Temporary radio-distribution infrastructure will be required within venues; this will primarily be for emergency services and its own operational requirements but may incorporate public mobile communication coverage if requested by the mobile network operators.[138]

Testing of spectrum planning for the Olympics

Testing of the spectrum planning for the Olympic Games is necessary to ensure that the plans and equipment will work according to the specifications and requirements. Data from Beijing 2008 indicate that mobile operator China Unicom was reportedly testing WiMAX on business and select residential users in five cities, while fixed-line players China Telecom and China Netcom ordered WiMAX equipment based on the 802.16d 'fixed' standard with the intention of conducting trials. China mobile, the sole mobile telecommunications services partner for the Beijing Games, carried out testing of the roaming terminal and basis business of 384 overseas operators in all the Olympic cities in advance of the games.[139] For Vancouver 2010 VANOC carried out equipment validation tests, but there is no information available on more general spectrum management testing.[140]

For London 2012 Ofcom plans to test its spectrum plan at a number of special events prior to the Games. It will commission further technical work to test and confirm assumptions about demand for spectrum for wireless microphones and in-ear monitors. Ofcom also plans to test the equipment, systems and end-to-end business processes. It expects the level of testing to build during 2010 and to include participation in LOCOG's formal test events during 2011. Ofcom is working closely with LOCOG to ensure that the appropriate level of testing is successfully completed ahead of the Games. A number of test events will be held to test different competition venues and infrastructure; they will vary from full international competitions – including Olympic and Paralympic sports – to technical rehearsals. They will

[137] http://www.vancouver2010.com/dl/00/08/84/07-05-08-vanoc-business-plan-en-e_14d-dW.pdf; http://www.canada2010.gc.ca/docs/Vancouver_2010_Bid_Book_-_Volume_3.pdf
[138] http://www.ofcom.org.uk/consult/condocs/london2012/statement/statement.pdf; http://www.iop.org/activity/policy/POST%20fellowship/file_40816.pdf
139 http://www.telecomengine.com/article.asp?HH_ID=AR_3195; http://www.chinamobileltd.com/op.php?menu=2
[140] http://www.trewaudio.com/PDF/vanoc_spectrum_comm_plan_v2.16.pdf

take place from April 2011 until just prior to the Olympic Games. These test events will inform the spectrum plan for the London 2012 Games. In relation to testing for the Games themselves, installing and testing the equipment and infrastructure required is challenging, particularly because some venues – such as Wimbledon – will not be accessible until a month before the Games start. Equipment testing will begin in early 2010 and run right through to the Games. This will initially focus on individual pieces of equipment, and then move on to testing infrastructure across a whole venue and trialling specific sporting events. Finally, 'technical rehearsals' will be held in which operational testing will occur at all venues at once, to simulate the busiest days of the Games. A range of situations, from staff shortage to food poisoning, will be simulated.[141]

Event-specific problems and solutions

In each of the Olympic Games studied, specific challenges arose and were dealt with. The success or not of dealing with these as they arose depended upon the forward planning of each country in anticipating what the issues might be.

At Athens 2004 the most important challenges faced were in relation to problems with providers – such as, for example, delays in orders for telecommunications infrastructures – as well as delays due to bureaucratic procedures during the installation of telecommunications infrastructures. In addition, there was a significant number of unauthorised transmissions, which could have had an impact on the smooth operation of the Games. Overall, it was found that the preparation of providers and the implementation of the Emergency Operational Plan resulted in the uninterrupted operation of telecommunications networks during the Games. Also, during the Games the Olympic Monitoring Centre was operating on a 24-hour basis at the EETT headquarters for the co-ordination of the spectrum protection project, the resolution of any interference problems and the provision of support services to Olympic users. In parallel technical units monitored all sports venues in Athens and the other Olympic cities. Upon completion of the pre-assignment of frequencies, proactive control of all Olympic frequencies and clearing from harmful interference was undertaken for all services using bands; this was managed by EETT.[142]

At Vancouver 2010, from Industry Canada's perspective the size and scope of the spectrum services required for the Games far exceeded the department's local spectrum management capacity. As a consequence of the Games themselves, the current licensed radio population grew by more than 50% over 18 months. This was in addition to the many more consumer wireless devices that were in use. Requests for radio licences increased from the normal 1,200 annually to more than 3,200 in the year prior to the Games. In dealing with this, Industry Canada and VANOC's spectrum plan outlined the way in which they would cope with the huge demands for spectrum during the Winter Games. Key to VANOC's strategy was the need to partner with municipal, provincial and federal government agencies as well as adhering to a 'robust, comprehensive, and diligently executed Spectrum Management Plan'. The Spectrum Management Plan depended on a co-ordinated effort from Industry Canada

[141] http://www.ofcom.org.uk/consult/condocs/london2012/statement/statement.pdf ; http://www.iop.org/activity/policy/POST%20fellowship/file_40816.pdf

[142] http://www.eett.gr/opencms/export/sites/default/EETT_EN/publications/proceedings/actions.pdf

and VANOC, as well as on the co-operation of other stakeholder groups and national bodies.[143]

For London 2012 one of the challenges that Ofcom is facing is that it is especially difficult to make an accurate assessment of the spectrum requirements of London Games because the task of planning has begun so far in advance. This difficulty exists because not all users (e.g. RHBs and partners) have been selected or identified, many known users have been involved with the Vancouver 2010 Winter Olympic Games and Paralympic Games and have not yet considered their requirements for the London Games, technological developments cannot be reliably foreseen and technological choices have not yet been made. The main technological challenges arising from the 2012 Olympics relate to the scale and complexity of the Games rather than the use of cutting-edge technologies. The emphasis will be on tried and tested technology. Ofcom also faces the problem of increased demand for spectrum, particularly in an area such as London where demand is already high. In order to meet the demands posed by the Games, Ofcom will borrow spectrum from public bodies such as the MoD and the Civil Aviation Authority. Ofcom has said it will source the required spectrum in four main ways: by borrowing spectrum on a short-term basis from public-sector bodies, encouraging more efficient use of civil spectrum, making use of spectrum freed up by the digital switchover and using licence-exempt spectrum.[144]

In conclusion, in the four Olympic Games included in this analysis (UK 2012, Vancouver 2010, Beijing 2008 and Athens 2004) spectrum provision plans were put in place ahead of time. In the more recent Olympic Games, more time has been given to the planning issues. This is inevitable, due to the increasing complexity of the spectrum demands of the event in conjunction with the existing demands of the host country. At Beijing 2008 the focus was more on infrastructure and the building and development of network systems than on spectrum planning. At Athens 2004 and Vancouver 2010 and in the planning for London 2012, there is more of a focus on the legalities, management procedures and responsibilities. There is also now a developing pattern of provision of government guarantees (Vancouver 2010 and London 2012) to support the bidding of countries to win the hosting of the Olympic Games. As in Athens 2004 and Vancouver 2010, in the planning for London 2012 there is more of a focus on the legalities, management procedures and responsibilities. In the UK a government guarantee is provided. Ofcom is dealing with more spectrum demand and more complexity than has been required for any previous Olympic Games. The planning and extent of the testing, however, show that Ofcom has learned where possible from previous events and is well positioned for the challenges of 2012.

[143] http://www.trewaudio.com/PDF/vanoc_spectrum_comm_plan_v2.16.pdf

[144] http://www.eweekeurope.co.uk/news/news-it-infrastructure/ofcom-details-plan-to-borrow-spectrum-for-london-olympics-2156

Appendix H: Mobile mis-selling case study

Introduction

This case study comprises an international comparative review of Ofcom in the UK in relation to the mis-selling of mobile phones. The original plan was to compare Ofcom's performance in this area with that of Germany, Australia the USA and New Zealand. However, it was soon found that there was very little available documentation on this topic for those countries, and therefore the review was widened to consider other countries that have dealt with this issue. Where it was possible, publicly available documentation from the regulatory bodies or other relevant organisations within these countries was reviewed for the analysis. Direct communications and clarification were undertaken with each of the NRAs and other bodies to provide relevant information.

Definitions of mis-selling and extent of the problem

For the purposes of this study, mobile mis-selling is defined (based on a UK definition) as having three main elements. These are, first, general mis-selling in which, for example, a customer is given false information; secondly, 'slamming', which relates to a substantial contract or provider change without informed consent; and, third, cashback issues in which the customer is promised refunds after the purchase that are impossible to get. While this is the definition applied to the research, for comparative purposes it was important to ensure that where possible a similar definition of general or other types of mis-selling was used. In some countries only partial comparative information was available.

Looking at the extent of the mis-selling problems, in the UK we can see that there has been a dramatic reduction in the number of instances. In 2007 there were 2,536 complaints to Ofcom about general mis-selling and by 2009 this had reduced to 1,363. Even more dramatically, the instances of cashback-related complaints reduced from 3,643 in 2007 to 153 in 2009. Cases of 'slamming', however, increased from 115 in 2007 to 358 in 2009.[145]

The only country with any relevant comparable data on this issue was Australia. These data are not collected by the regulators in Australia ((ACMA and ACCC) but by the TIO, to which small business and residential consumers in Australia can make a complaint about their telephone or internet service. The TIO records quarterly statistics on mobile phone issues including complaints about billing and payments, complaint handling, contracts, credit management, customer service, disability, faults, transfers and other matters. Looking

[145] Ofcom data provided to RAND Europe in March 2010.

at the types of issues included in this study, in terms of general complaints related to mobile phones in 2007 there were 2,344 instances, which grew to 7,510 by 2009. In relation to contractual mobile phone complaints (closest to 'slamming') there were 3,492 complaints in 2007 and this total grew to 7,886 by 2009. However, complaints relating to mobile premium services (information and entertainment services delivering content to mobile phones) reduced from 4,148 in 2007 to 2,358 in 2009.[146]

In Israel discussions with the Ministry of Communications informed the study. It was indicated that mobile mis-selling is a problem in Israel, and that there have been problems in particular in relation to contractual disputes and/or fraudulent takeovers ('slamming') and cashback. Measuring the extent of the problem is not possible because mobile mis-selling is not separated out from general mis-selling across all segments. When asked whether the situation is improving or getting worse, the Ministry of Communications responded that 'we are seeing a gradual decrease in problems regarding mobile mis-selling although it's difficult to say if this is because the public is getting more savvy as time goes on, or whether it's a result of our regulatory initiatives'.[147]

Data on this topic from other countries (Germany, New Zealand, the USA and France) were sought but were not available.

Regulator involvement with mis-selling

In the UK complaints about mis-selling increased significantly between 2005 and 2006, and in spring 2007 this area had become an escalating problem, especially in relation to cashback.[148] In response to the rising complaints some network operators in the UK made a set of voluntary undertakings to Ofcom on a range of matters including sales and marketing The industry later also agreed a self-regulatory voluntary code of practice aimed at stamping out misleading sales and marketing practices. This code was published in July 2007.

Shortly after the industry published its voluntary code of practice, Ofcom started a consultation exercise with the aim of introducing a new GC on sales and marketing practices. This was confirmed 18 months later, on 17 March 2007. The document sets out the additional enforcement powers Ofcom is able to use to investigate rule breaches formally and impose sanctions against offending companies.[149]

In Australia, by contrast, the management of mobile mis-selling has remained a matter for consumer affairs organisations rather than becoming a matter for the regulators. Consumer complaints related to mobile phones that cannot be resolved between the parties are escalated to the TIO. The regulators – the ACCC – and the ACMA act in this context as stakeholders to the TIO. The ACCC is the federal agency responsible for regulating most aspects of the Trade Practices Act.[150]

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[146] http://www.tio.com.au/Quarterley%20statistics/december_qtr_2009.html#mpsi

[147] Interaction with Mr Yair Hakak, Israel Ministry of Communications / Economics Division, 8 April 2010.

[148] Boyfield and Mather (2009) *Regulating mobile phones – a fresh look*, European Policy Forum, 29–32.

[149] Boyfield and Mather (2009) *Regulating mobile phones – a fresh look*, European Policy Forum, 29–32.

[150] Interaction with Mr Grant Caine, Senior Director, Performance Audit Services Group, Australian Communications and Media Authority, 3 April 2010.

In Israel mobile mis-selling is dealt with by a government ministry rather than by a regulator or by a consumer organisation. In broad terms, the sector is governed by main legislation, secondary legislation or administrative orders relating to licences, permits or service portfolios of the issue at hand. These are adjusted according to the situation. For example, in March 2010 the Israeli Ministry of Communications proposed 16 amendments to mobile licences based on consumer complaints. These amendments included simplifying contracts for consumers and ensuring that they have enough time to consider the details of the contract.[151] The Ministry of Communications provides recommendations for consumers on dealing with issues with telecommunications service providers.[152]

In terms of the effectiveness of the strategies adopted in the three countries, a variety of outcomes may be seen. In the UK, despite criticism that the rapid intervention by Ofcom failed to give enough time for the industry's own self-regulatory response to show results, the number of mobile mis-selling complaints fell sharply (detailed above).[153] In Australia, under the TIO, the number of complaints has continued to rise. In Israel there is believed to be a gradual decrease in problems related to mobile mis-selling, mainly due to actions on limiting the length of mobile contracts to 18 months.[154]

Consumer impact of intervention

From the perspective of the consumer, in the UK mobile mis-selling is a reducing problem and therefore the public is less exposed to these specific issues than it was. In Australia problems remain for consumers, although there is awareness of them among the TIO and the regulators. In Israel the consumer protection approach seems to be working by keeping track of complaints and suggesting specific changes to the processes, as needed.

Conclusions

In the UK Ofcom's interventions have produced a dramatically reduced problem with mobile mis-selling overall. While the regulatory approach is obviously not the only one that works, the data show that there has been a major improvement in the situation. In Australia, where this matter is dealt with by the TIO, there is an ongoing increase in complaints and problems. However, in Israel there is believed to be an improvement under the guidance of the Ministry of Communications. Based on the relatively limited data available on this issue, we observe that Ofcom is producing the desired results efficiently and effectively. Whether they could have done this equally well without regulation is currently unclear.

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[151] Israeli Ministry of Communications (2010), Consultation document. Israeli Ministry of Communications (2010), at http://ec.europa.eu/information_society/activities/roaming/docs/phase2/israel.pdf

[152] Consumer Service Supervision Department, Supervision and Enforcement Division (2007) Consumer tips, at http://www.moc.gov.il/sip_storage/FILES/3/1223.pdf

[153] Boyfield and Mather (2009) *Regulating mobile phones – a fresh look*, European Policy Forum, 29–32.

[154] Interaction with Mr Yair Hakak, Israel Ministry of Communications / Economics Division, 8 April 2010.