

Final Report for the European Commission  
September 2003

Policy Implications of  
Convergence of  
Naming, Numbering and Addressing

An Orientation

Executive Summary

By



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**Executive Summary**

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**The opinions expressed in this report are those of the authors, and do not  
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## TABLE OF CONTENTS

<b>REGULATION OF IDENTIFIERS.....</b>	<b>4</b>
<b>REGULATION OF NUMBERING .....</b>	<b>4</b>
<b>REGULATION OF INTERNET NAMING AND NUMBERING .....</b>	<b>5</b>
<b>INTERNATIONAL REGULATORY BODIES.....</b>	<b>5</b>
<b>CHALLENGES OF CONVERGENCE .....</b>	<b>6</b>
<b>KEY CONVERGENCE TECHNOLOGIES.....</b>	<b>7</b>
<b>PUBLIC POLICY CHALLENGES .....</b>	<b>9</b>
<b>IMPLICATIONS OF CONVERGENCE .....</b>	<b>10</b>
<b>CONCLUSIONS.....</b>	<b>11</b>

## 0 EXECUTIVE SUMMARY AND CONCLUSIONS

The worlds of traditional telephony and Internet are very different and until recently, have been separate markets. Telephony has traditionally been quite strictly regulated by government on a national level and by the ITU on a global level. It has followed a relatively stable model with predictable market structures. The Internet, on the other hand, has rapidly and spontaneously developed into a globally competitive marketplace that is substantially free of government intervention either via investment or regulation.

### Regulation of identifiers

The key issue related to the significance of current Internet naming and telephone numbering practice is that the supply of both names and numbers is, for one reason or another, finite, i.e. the resources are – in economic terms – scarce, and thus changes to naming and numbering schemes requires investment. For a global naming or addressing system to function, the names or addresses must be unique, which, in turn, necessitates some form of control system. As is the case of any resource where the allocation of property rights or usage rights is needed, the lack of a coherent strategy with regard to regulation of naming and numbering can have significant consequences for regulatory policy objectives, such as upholding the integrity of the system.

Furthermore, in the case of the telecommunications and Internet sectors, where all levels of service provision (whether basic access or higher level value-added) depend on names and numbers for connecting and identifying users, lack of strategy for managing identifiers could have a crippling effect on competition, which could in turn ultimately damage progress and innovation, increase prices and reduce consumer choice.

As convergence technologies start becoming more widespread, and names and numbers begin to overlap, as is the case with ENUM, for example, questions may arise regarding the coherence of the management strategy and application of pre-existing policy principles.

### Regulation of numbering

In general, governance of the traditional telephone numbering system has posed few problems globally, either with respect to implementation of policy, jurisdiction or dispute settlement. For example, the European Commission's 8<sup>th</sup> Implementation report states that in Europe, "*the management of numbers does not seem to raise concerns from market players or consumer organizations*<sup>1</sup>" (This refers to E.164 numbers and not, for example, access codes for carrier pre-selection<sup>2</sup>).

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<sup>1</sup>Eighth Report from the Commission on the Implementation of the Telecommunications Regulatory Package, European Commission, 3 December 2002.

<sup>2</sup>Carrier pre-selection involves selecting a telephone provider other than the local loop operator for telephony services. This can either be automatic, where the local loop provider automatically routes all calls onto the network of the other provider, or manual, where the consumer dials a code before the phone

The existing situation whereby national regulatory authorities have responsibility for number allocation is continued by Article 10(1) of the Framework Directive<sup>3</sup>, which will require Member States to “ensure that national regulatory authorities control the assignment of all national numbering resources and the management of the national numbering plans.” The issue of number portability, for example, illustrates the challenges national regulatory authorities face in fulfilling their responsibilities in managing the national numbering plan according to current principles. They will have to constantly adapt the national system according to changes in technologies and market structures, whilst taking account of their fundamental public policy objectives.

These challenges are set to increase as numbering is increasingly used for purposes other than traditional switched telephony. This is particularly true if regulators want to strike a balance between guarding the status quo of the numbering plan and not inhibiting innovation and take up of emerging technologies such as Voice over IP (“VoIP”). Ambiguities and contradictions can and will arise: this is illustrated, for example, by the apparent contradiction between the non-discrimination principle embedded in the EU’s new regulatory package, and ITU Recommendation E.212 in relation to SMS-to-fixed line services (See case study 3). As the matter stands, it seems that implementing the wording of Recommendation E.212 would constitute a breach of EU law.

### **Regulation of Internet Naming and Numbering**

Governance of the Domain Name System (DNS) is a very different story in terms of organisation, public involvement, self-regulation and history from that of the organised, hierarchical system of E.164 management. The system comprises complex but loose interactions of organisations such as ICANN, IANA, VeriSign, IAB, IETF, IAD, ISOC, as well as ccTLD registries which have managed to keep the DNS and the Internet running reasonably well. ICANN has a limited technical role in the management of generic TLDs; while ccTLDs are managed at the national level where the relationship between the government and the registry varies between being strongly interventionist to very liberal. The TLD registries generally follow the principles of good governance such as transparency, non-discrimination and fairness. Company commercial practice further guides development, subject to scrutiny under competition rules which, to date, have given government the capacity to address anti-competitive behaviour and unfair competition practices.

### **International regulatory bodies**

While the ITU has been traditionally effective in the management of numbering resources worldwide, and the management of generic top-level domain names by ICANN has successfully been carried out by industry self-regulation, neither has had to deal with the enormous scope and complexity of issues raised by convergence.

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number in order to instruct the local loop provider on a case-by-case basis. The local loop is the part of the phone network connecting a consumer to the local telephone exchange.

<sup>3</sup>Directive 2002/21/EC

For example, the ITU has been supportive of user ENUM<sup>4</sup> while opposing the creation of a top-level domain for IP telephony, even though its justification (fear that control of the naming resource would give control of the corresponding market) should also prevent it from supporting ENUM. Similarly, its inability to get past endless and ultimately pointless discussions on peering and transit on Internet networks, in order to talk about the core problem (supporting network infrastructure roll-out in developing countries), shows a fundamental flaw in its ability to either identify and address problems in a timely or decisive manner. Likewise, even without addressing the wide-ranging criticisms of ICANN's management structures, the self-regulatory system is under significant pressure and may appear ineffective in dealing, for example, with VeriSign's unilateral alterations to the DNS in order to promote its own Internationalised Domain Name software. This example shows that its powers and procedures are far from robust<sup>5</sup>. In brief, neither the ITU nor ICANN inspire confidence in the ability of existing international communications governing bodies to manage the challenges of convergence. This in turn raises the question as regards the extent to which industry self-regulation, based on the principles of transparency, uniqueness and fair competition to name but a few, could play a role in this policy area.

### **Challenges of convergence**

Convergence is a complex set of processes. It is taking place at a technological, market and regulatory level, and its drivers and consequences are equally complex. Many consumers have already experienced the beginnings of the coming wave of converged services. However, while the Internet world has been expanding and moving towards "offline" technologies (such as Instant Messaging to SMS and PC to phone), there has, up until now at least, been very little movement in the opposite direction, namely from traditional PSTN systems to interoperability either with advanced mobile services or Internet-based services. Bearing in mind the substantially one-sided nature of convergence to date, the first big step forward in convergence of traditional telephony and the Internet world is inevitably going to be embraced enthusiastically by the former incumbent monopoly providers of voice telephony services. This fact alone is enough to explain the enthusiasm of traditional telephone companies for ENUM.

We need to be conscious of the fact that existing telecommunications legislation is very much based on the concept of control of essential infrastructure. Technologies which push the market back into the domain of traditional telephony providers require us to ask questions about whether or not existing legislation is sufficient to cope with new pressures or, indeed, if it is necessary to take a look at how existing legislation can be implemented in a way which ensures maximum competition. The new EU Regulatory Framework, through its use of technology neutrality, makes this task a great deal easier for European regulators.

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<sup>4</sup>See section 6.4.

<sup>5</sup>See case study 5

### ***Challenges in the competitive environment***

Convergence of communications technologies complicates the management of identifier resources. It raises regulatory questions on a number of levels, such as finding the right balance between a desirable level of fair competition on the one hand, and the risk of over-regulation or inappropriate regulation on the other. Current industry players have particular needs and interests in naming and numbering administration developing in a way that will benefit them, and they will unsurprisingly wish to influence regulatory developments to their ends. In-built inertia requires fundamental questions to be asked about how openness and competition can best be achieved. The consensus amongst governments at the moment appears to favour relying on competition law to reach this end.

It is of utmost importance for future progress, as convergence is gaining momentum, that regulators understand the technological and market developments that are happening now and have coherent views on how to safeguard policy objectives, such as competition and respect for privacy in the converging marketplace. With regard to competition, it is particularly important that action can be taken sufficiently quickly to ensure that permanent damage is not done to the marketplace by any abuses.

### **Key convergence technologies**

The most important “convergence technologies”, those most relevant to the naming and numbering convergence issue discussed in this report are SIP, user ENUM, Instant Messaging and GPRS<sup>6</sup>. The particularities of these various technologies illustrate the multitude of different issues that convergence is creating.

#### ***SIP***

SIP (Session Initiation Protocol) is a protocol that helps establish a connection and then plays no further part in the communication. It is addressing system independent and therefore raises no competition concerns, other than those potentially raised by patent claims. Moreover, it does not raise any significant privacy concerns. It is being implemented by corporate networks for a variety of functions, is incorporated in Windows XP, is being used by the IETF in its work on Instant Messaging interoperability and is taking over a range of functions for corporate users that were previously carried out by the ITU-developed H.323 set of protocols.

#### ***User ENUM***

User ENUM<sup>7</sup>, on the other hand, raises serious competition concerns at almost every step of implementation<sup>8</sup>. Control of the user database gives incumbent operators control over

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<sup>6</sup>Please note that all of these technologies are explained in detail in the annexes to the report.

<sup>7</sup> For practical purposes, there are three kinds of ENUM – “user or subscriber ENUM”, “operator ENUM” and “infrastructure ENUM”. See Annex 7, or page 16 for a definition.

any number of authentication processes that may be implemented - as the incumbent is usually the telecommunications company that provides the telephone number to the consumer in the first place, it will be in a privileged position to sell user ENUM services to the mass market. Added to the huge advantages of the incumbent telephone operator, the global “root” of the ENUM system (.arpa) will be a monopoly, the national “root” of the system will be a monopoly and the authentication system for registration of telephone numbers is likely to be a monopoly. In terms of privacy, it also raises serious concerns. The basic user ENUM service involves the consumer placing whichever contact details they wish to use within ENUM unprotected onto the Internet. It is doubtful whether it is permissible under EU data protection legislation to provide a service that requires the consumer to abandon their privacy in this manner. Furthermore, some EU countries prohibit reverse look-ups (using the telephone number to obtain details regarding the user of that number), which would be facilitated by user ENUM. User ENUM is still in a very undeveloped state, with no clear concept emerging from industry regarding what services might persuade consumers to use it (indeed, there exist still only nascent ideas regarding how to avoid costly and expensive authentication systems for registration), nor regarding how to have an open and competitive market. Apart from one insightful paper<sup>9</sup>, which did not get the attention it deserved, very little work has been done on dealing with the privacy problems of user ENUM, apart from attempts to explain that they do not really exist.

### ***Instant Messaging (IM)***

IM is already very widely used all over the globe, giving it considerable “first mover advantage” in the converged marketplace. Its user-friendliness and functionality mean that once more devices (TVs and mobile phones, for example) become IP enabled and connected to high-speed services, and once the various IM products can interoperate, the potential for IM is huge. However, IM has unfortunately been a textbook example of competition concerns caused by the presence of strong network effects. There are only four major players in the IM field (AOL, Microsoft, Lotus and Yahoo!), which is obviously of concern for competition. If policy-makers decide to rely wholly on competition law in such markets, they must be certain that action against abuses is rapid and decisive enough to prevent any long-term damage to the market and that penalties are sufficient to act as a deterrent. If this is not the case, the results are easy to foresee.

It should become increasingly obvious to these companies that, for IM to stake its claim for a significant part of the market for converged services, interoperability is paramount. It is thus to be expected and hoped that IM providers appreciate the huge potential of their product and that, as a result, interoperability will be implemented sooner rather than later. This interoperability will be supported by the work of the IETF, which is also currently working on this problem.

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<sup>8</sup> In addition to the regulatory concerns about ENUM raised in this study, operators have also signaled concerns regarding intellectual property rights: in particular, the risk of being unduly burdened by IPR obligations and a limited number of suppliers once the first steps are made in deploying ENUM.

<sup>9</sup>Shockey, Richard, “*Privacy and Security Concerns in ENUM*”, October, 2002.

The growth of IM is set to further accelerate as IM capabilities start being offered on mobile devices. Although this would put IM in direct competition with the SMS/MMS market, IM employs a completely different business model to SMS, and the technology and cost of providing the service is radically different. IM, therefore, can ultimately offer the customer a cheaper and more functional means of communication.

Unfortunately, while there are no significant privacy concerns inherent in IM, providers have not been able to resist using its popularity to gain more information on its users. So, for example, cookies are placed on user terminals via AOL's ICQ product, and users are not able to use Microsoft's product without signing up to their .NET identity service.

### ***GPRS***

GPRS has been widely implemented in countries like Korea and Japan and is currently being implemented in a number of EU countries. GPRS raises numerous competition concerns, particularly with regards to the mobile operators' control of the bottleneck facility connecting the consumer to the wider Internet. Bearing in mind existing problems with, for example, fixed to mobile termination rates and international roaming, there is cause for concern as regards how operators will handle their control of subscribers' Internet access. GPRS does not have significant privacy concerns beyond those in pre-existing Internet access systems. However, as described below in greater detail, the operator has a much greater control over access to the network in GPRS than traditional communications technologies – a control that is so beneficial to the network operator that it is imaginable that this model would be taken on board by other types of communications networks.

### **Public policy challenges**

The wide range of convergence technologies – SIP, fixed line SMS, Instant Messaging and the various types of ENUM, for example, all essentially raise the same question – how can existing, agreed principles of public policy be adapted to the new communications environment? This is not simply an academic exercise – failure to adapt existing regulation to new convergence technologies will result in services not being available to consumers and business models being destroyed before they can even emerge from their development stage. For example, under existing legislation, can fixed line operators be blocked from having access to IMSI numbers for use in SMS services because the relevant ITU regulation explicitly says that they are to be used exclusively for mobile services, or do the non-discrimination provisions of the EU Framework Directive<sup>10</sup> mean that they have to be made available? Clearly, the Framework Directive has precedence over ITU Recommendations, providing a good example of the difficulties that the ITU faces in maintaining its role in the face of convergence. Similarly, should user ENUM be permitted to breach the principles of EU legislation on data protection, whilst innovative IP telephony providers like Vonage (see case study 2) be barred from

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<sup>10</sup>Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services (OJ/L 108, 24 April 2002, P.33).

having access to numbering resources because of existing rules, thereby preventing consumers from benefiting from new converged communications services? Obviously not - but these are the kinds of questions that must be dealt with immediately in order to prevent anomalies and barriers to either innovation or the achievement of public policy objectives.

For a global telecommunications system to function end-users must have unique identifiers and these identifiers must be controlled either collectively by the companies providing the system (which has obvious inherent dangers) or by an independent body such as the ITU or ICANN. The disadvantages of having a communications system with no corresponding global control of naming and addressing are all too clear when one looks at the current Instant Messaging Market.

In essence, we need to arrive at a situation where policy objectives are achieved insofar as possible in an environment of self-regulation where scarce numbering and naming resources are available on a competitively neutral basis.

### **Implications of convergence**

Resolving the issues highlighted in this study may, in some cases, come down to a choice of fundamental proportions: for example, if the national numbering plans within the framework of the E.164 system become an obstacle to innovation and the emergence of new markets, what are the arguments *for* rigidly upholding the system at such a cost? Should allocation of numbers be reorganised so as to give wider access to numbering resources? Should national numbering plans add digits in order to utilise the full number available from the E.164 system so there are additional numbering resources to allocate? Furthermore, from a European perspective, would failure to adapt to permit new services be “*objective, transparent and non-discriminatory*” as required by the Framework Directive, or will the strict rules relating to the right to allocate numbers hamper competition or even innovation? If, for example, companies like Vonage, who do not operate their own networks, were unable to obtain numbering resources, they could argue that fixed and mobile network operators were being granted a “special right” as defined in Article 6.2 of Directive 2002/77/EC<sup>11</sup>. While these issues have not been addressed in any detail in the EU, new services in the US have resulted in traditional telephony providers reacting in a predictable way to the threat (to their revenue) that VoIP providers pose. (See case study 2).

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<sup>11</sup> Directive 2002/77/EC of the European Parliament and of the Council of 16 September 2002 on competition in the markets for electronic communications networks and services (OJ/L 249, 17 September 2002, P.21).

## Conclusions

The conclusions to be drawn from the report's case studies and description of issues arising from convergence are in the form of questions rather than answers. Generally speaking, it is safe to say that new ground is being broken in the electronic communications field on a variety of levels: the technical, market and governance. Crucially, it is important for regulators to appreciate the size of the change in the communications market brought about by convergence.

Breaking new ground means running into new challenges. The players (or at least the *set* of players), the environment and the dynamics are all new. Keeping up with shifting control points and other threats to healthy market development means, first and foremost, understanding the system. Most particularly, this means that regulators, and indeed governments, need to be aware of the strategic value of converged naming and addressing and to avoid making decisions which favour one technology over another – a point which appears to have been understood by both the US and the EU. Indeed, the first (and perhaps most challenging) step is understanding and getting to grips with it all.

Whether public-led or private-led, some form of management or oversight is necessary. This raises fundamental questions: How do we go about setting and applying principles (management and otherwise) coherently and consistently in a co-regulated world and to ensure that they are transparent and adhere to competition principles? And, while the need for public intervention of some form is evident from the case studies in this study, what exactly *is* the role of government? Do governments have the expertise, the structures and the ability to keep pace with the new environment – are they expert enough to act quickly to ensure that emerging control points are not illegally exploited? Are the incentives, checks and balances in place for extensive “self-regulation” by industry, and how much government oversight is needed? How should public and private stakeholders interact - how will responsibilities be divided, and/or shared? In essence, what kind of governance model is both desirable *and* possible? Indeed, in-depth reflection on the public/private relationship and their respective roles is direly needed.

These are serious and complicated tasks. However, as the case studies of this report have illustrated, this is a subject that governments and industry need to address with some urgency. It is particularly important for policy goals to be set independent of current market conditions and to be technologically neutral.

As so much is happening, the myriad interlinkages raise many questions. For example, how will control over key identifiers influence market dynamics and shape the market structure of the Information Society? What will be the role of converged identity services for delivering aspects of the Information Society, such as e-authentication, e-signatures, and location data? Considering the rising privacy implications (among others), how will appropriate intellectual property rights to identifiers be allocated between users, operators and identity service providers?

Assuming that public authorities do have a managerial role, or at least a responsibility to monitor developments, will *ex post* guards such as general competition law be sufficient, for instance to address network effects stemming from the leveraging of specific systems into new markets or the collective dominance of, to take just one example, identity services? Or, as such decisions affect market structure and behaviour, is there issue for ex-ante intervention? On balance, what would be the consequences of legal uncertainty in this field for market development (e.g. would it hamper new capital investment)? What options do governments have, in reality, for removing this uncertainty?

As has been repeated on numerous occasions in this report, the fundamental principles with respect to management of identifiers should be transparency, non-discrimination, fair competition, legal certainty, coordination, competition neutrality and uniqueness. The challenge is to provide clarity and to ensure certainty regarding the coherent and consistent application of key principles.

Apart from this very basic conclusion about the need to adhere to fundamental principles, this report has perhaps raised more questions on how to apply these principles in a competitively diverse, self-regulated environment than it has provided answers. Indeed, this report is a contribution to the first step in understanding and grasping the full picture. But much work remains.

Now that some of the policy implications of naming and numbering have been defined and articulated here, there is a pressing urgency to begin reflection on possible answers and solutions to the unanswered questions, both the fundamental and the practical.

The study team strongly recommends further in-depth study at European level into some of the individual issues introduced and illustrated in these case studies – such as issues surrounding customer identification systems. The team also strongly encourages active discussion between governments as well as debate between all stakeholders, public and private, relating to the effect of converged identifiers on the shape and health of the emerging Information Society.