How Telecommunications Have Evolved Over Time II

6.1 The Policy and Regulatory Players

Natrually as telecommunications has evolved so to has the policies that govern them.

At the global level, there are a number of international bodies that govern or make recommendations about telecommunications policy and regulation. In addition to the ITU and the European Commission, there are various standards bodies (for example, Institute of Electrical and Electronics Engineers [IEEE], European Telecommunications Standards Institute [ETSI], American National Standards Institute [ANSI], the Telecommunication Technology Committee [TTC]) and industry associations (for example, the European Competitive Telecommunications Association [ECTA], the Telecommunications Industry Association [TIA]). Representatives of national governments and regulatory authorities meet formally (for example, ITU World Radio Conferences, where many countries are represented) and informally (for example, Europe's National Regulatory Authorities [NRAs] exchange views at Independent Regulators Group [IRG] meetings). Other organizations, such as the World Trade Organization (WTO) and regional bodies, also influence telecommunications policy and regulation at the international level.

At the national level, several parts of central government are generally involved, and there can sometimes be more than one regulatory body for a nation. Some of these organizations are major players; others play less prominent, but nevertheless influential, roles. In the United States, for example, the Federal Communications Commission (FCC) is the national regulatory body, and public utility commissions regulate at the state level. The U.S. State Department coordinates policy regarding international bodies such as the ITU. The White House, the Department of Commerce, largely through the National Telecommunications and Information Administration (NTIA), the Justice Department, the Trade Representative, and the Department of Defense are among the various parts of the administration that set or contribute to telecommunications policy. The U.S. Congress and the U.S. government's legislative branch also play important roles. In addition, industry associations, policy "think tanks," regulatory affairs departments within companies, telecommunications lawyers, and lobbyists all contribute to policy debates and influence the shape of the regulatory environment.

Other countries organize their policy and regulatory activities differently from the United States. For example, in the United Kingdom, the Office of

Telecommunications (OFTEL) mainly regulates what in the United States would be known as "common carrier" matters, whereas the Radio communications Agency (RA) deals with radio and spectrum matters. However, at the time of writing, it has been proposed that OFTEL and RA be combined into a new Office of Communications (OFCOM). In Hong Kong, telecommunications regulation was previously dealt with by the post office, but now the Office of the Telecommunications Authority (OFTA) is the regulatory body. So, not only do regulatory environments change, but so, too, do the regulatory players.

6.2 The Main Regulatory Issues

Let's look briefly at what regulators do. Again, this varies somewhat from country to country and over time. In the early years of liberalization, much time would typically be spent in licensing new entrants and in putting in place regulations designed to keep a former monopoly telco from abusing its position by, for example, stifling its new competitors or by charging inappropriately high prices to its customers. Here the regulator is acting as a proxy for market forces. As effective competition takes root, the role of the regulator changes somewhat. Much of the work then typically involves ensuring that all licensed operators or service providers meet their license obligations and taking steps to encourage the development of the market such that consumers benefit.

The focus of most regulatory bodies is, or should be, primarily on looking after the interests of the various end users of telecommunications. However, most regulators would recognize that this can be achieved only if there is a healthy and vibrant industry to deliver the products and services. So while there are often natural tensions between a regulator and the companies being regulated, it is at the same time important for cooperation between the regulator and the industry to take place. In Ireland, for example, the role of the regulator is encapsulated by the following mission statement: "The purpose of the Office of the Director of Telecommunications Regulation is to regulate with integrity, impartiality, and expertise to facilitate rapid development of a competitive leading-edge telecommunications sector that provides the best in price, choice, and quality to the end user, attracts business investment, and supports ongoing social and economic growth."

Flowing from regulators' high-level objectives are a range of activities such as licensing, price control, service-level agreements, interconnection, radio spectrum management, and access to infrastructure. Often, regulatory bodies consult formally with the industry, consumers, and other interested parties on major issues before introducing regulatory changes. A more detailed appreciation of what telecommunications regulators do and what their priorities are can be obtained by looking at the various reports, consultation papers, and speeches at regulatory bodies' Web sites.

6.3The New Public Network

Given the revolutionary changes in telecommunications, it is clear that we are moving toward a new public network. The new public network needs to have end-to-end digitalization. We began implementing digital technology in the early 1960s, and we've done quite well at getting it deployed throughout the various backbone networks. Worldwide, probably some 80% of backbones are now digitalized. However, the local loop—that is, the last mile between the subscriber and the network—is still largely analog. Only around 7% of the subscriber lines today are digital, so the vast majority of users are functionally limited to analog usage.

We face an incredible modernization task to digitalize the local loop and to truly make the network digital from end-to-end. However, the even greater challenge rests in the "last mile" economics and politics. The regulatory and political issues are critical indeed. Without broadband access, the Internet can't grow, advanced applications can't take off, revenues can't be realized, and we can't progress. The local loop is largely in the control of the incumbent telephone companies worldwide, and they do not seem to have the political and economic incentive to make end-to-end digitalization happen. There's lots of discussion on how to resolve this—by regulation, by enforcement, by market forces. When we find some resolution, the telecommunications industry will blossom like never before.

6.4 "Telecommunications Technology Fundamentals,"

Another factor that affects the new public network is that we are now in the last years of the electronic era and in the first years of a new generation of optical, or photonic, networking. Conversions between electrical and optical signals reduce the data rates and introduce the potential for distortion; hence, they affect the data stream. To eliminate these conversions, we need to work toward achieving an end-to-end optical networking scenario.

The new public network must also be an intelligent programmable network. That is, we want to distribute service logic via databases on a network-wide basis so that anywhere in the world, you can access any service or feature you want, regardless of the network provider or network platform that you are connected to. This intelligent programmable network requires some form of communication between the network elements. In the public switched telephone network (PSTN), this communication is done through the use of high-speed common-channel signaling systems that allow real-time communications between the network elements. In essence, it's like a private subnetwork. No voice, data, or image traffic is carried on these channels—only the signaling information that dictates who's calling, what rights they have, what features and services they want to use, and so on. Because there are many manufacturers and providers of network platforms, it's important that the programmable platforms use open application programming interfaces.

The new public network requires a new broadband infrastructure that has very high capacities and offers multichannel service (that is, one physical medium can carry multiple conversations). The two dominant media types in the broadband arena are high-speed fiber (run as close as possible to the customer) and broadband wireless (over the last few feet or meters to the customer, if needed).

It is very important that the new public network be a low-latency network. Humans cannot suffer much delay—on the order of 650 milliseconds—in receiving information before it becomes unintelligible. To give you some perspective on this, on a satellite call, the delay between the time you say hi to the time you hear the response is annoying, but it lasts only 500 milliseconds. Current infrastructures, such as the Internet, may impart as much as 1,000 or 2,000 milliseconds of delay. They therefore play havoc with any type of traffic that is delay sensitive—and voice, video, and multimedia are all very delay sensitive. So when we say we want to build low-latency networks for the future, we mean networks that impose no delays that result from congestion points.

Another characteristic of the new public network is that, in contrast to today's world, where we have separate platforms for each of the traffic types, the platforms need to be multi-service—they have to accommodate voice, data, and video streams, as well as any streams invented in the future.

The new public network should also be agnostic. That is, it should not follow only one protocol, but it should understand that the universe truly is multi-protocol and we will always have multiple protocols to deal with. The best way to create an agnostic network is to have a box that enables interfaces for the most prevalent of the data protocols.

The new public network also needs to include a new generation of telephony services, one that makes use of packet-switching technologies to derive transmission efficiencies, while also allowing voice to be bundled in with more standard data applications, to provide for more robust environments.

Quality of Service (QoS) guarantees are an absolute prerequisite for the new public network. The network must be able to distinguish between the various traffic types so that it can apply the appropriate network resources and ensure that the latency requirements are being met, that the loss requirements are being met, and that the bandwidth required is being allocated.

Finally, encryption and security services are necessary in telecommunications devices and networks. Once upon a time, this was a separate function within the company, but now it is an essential element of telecom service.

Convergence

In the new public network, we are moving from a narrowband to a broadband world, meaning we are going from single-channel to multichannel arrangements, and we are also moving from low bandwidth to high bandwidth. We're also shifting from a circuit-switched environment to a packet-switched environment. Circuit switching implies the use of an exclusive channel—one channel, one conversation for the duration of that call—whereas packet switching allows multiple conversations to share one channel.

We're also quickly departing from an era in which we try to force data to run over a network that was largely built for voice. We're moving toward a network where we're applying voice to data applications so that they can run over the higher-quality digital networks. We're shifting from electronic networks to all-optical networking. This transition will take some time, perhaps three to five years.

Another shift is from single media to multimedia (that is, multiple media types and personal control over what you view, when you view it, and in what combination). The shift continues, from just voice to multimodal combinations (that is, combinations in which you have further control in selecting exactly what appeals to your cognitive map). For example, some people would rather see the movie than read the book, and others prefer the book, so not everybody responds to things the same way. People think in different ways, and we need to provide all the modalities that enable individual choice over the various media formats.

We're also shifting from a fixed environment to a mobile environment, and that will have a dramatic impact on the types of applications we want served over wireless networks. This shift goes a step further: from portable computers to wearable computers, from unresponsive stand-alone devices to affective, wearable friends.

Because of all these forces, convergence is occurring in many different areas.

Convergence occurs in networks, where the PSTN, the Internet, wireless alternatives, broadcast networks, and cable TV, as well as the back-office functions that support them, are all coming together to service the same sets of traffic and to deliver the same types of features and services. Network services are converging because customers prefer bundled services. They want one bill, one provider for local, long distance, wireless, Internet access, hosting, applications partnering, security features, firewall protection, conversions from legacy systems, and settlement processes.

Convergence also occurs in devices, such as televisions, telephones, computers, smart appliances, intelligent clothing and jewelry, and smart tattoos.

Convergence occurs in applications as well. Communications, information services, entertainment, e-commerce and m-commerce, and affective computing are all overlapping and blending with one another to create new generations of traditional applications such as edutainment and infotainment. Going forward, we're relying on the bright young minds that have been born into a digital economy to fantasize about brilliant new applications that are beyond the traditional forms.

Convergence happens in industries. Today industries share digital technology as a common denominator, so biotechnology, computing, consumer electronics, entertainment, publishing, power utilities, and telecommunications are all coming together and finding reasons and synergies for why they should work together or become one.

Finally, convergence occurs in humans and machines. Today we have artificial limbs and organs, and we have intelligent implants. Tomorrow, we may see neural interfaces and artificial life.

As you can see, telecommunications is much more than just a set of technologies or business plans, and it's more than an industry in which you can guarantee success and early retirement. It's a way of life—and the more you understand that, the more fun you'll have learning the technical details.