

at any desk and log into the phone, which instantly becomes their extension. They can also use VoIP phones at home or in hotel rooms, making and receiving calls just as though they were sitting at their desks. "It completely decouples us from location—my office is wherever I happen to be," says Peter Carbone of Nortel, via his VoIP phone. VoIP also allows call-centre operators to work from home, making it easier to match the number of workers to fluctuating demand.

If you can't beat 'em, join 'em

All of this is a decidedly mixed blessing for telecoms operators. On the one hand they have been able to reduce their own costs by adopting VoIP internally to carry calls around their networks. Telecom Italia, for example, began using VoIP for all phone calls between Rome and Milan in 2002, reducing costs by 60%, says Stefano Pileri, the company's chief technologist. Once BT completes its "21st Century Network" in 2009, all calls will travel across the network as VoIP calls, though customers will still be able to use their old telephones. Being able to handle voice calls cheaply, as just another stream of data, is one of the benefits of building a converged network.

On the other hand most operators still derive most of their revenues from voice calls, so the inexorable decline in voice revenue as consumers and companies adopt VoIP strikes right at the heart of their business. According to figures from Informa, a market-research firm, global revenues from fixed-line voice calls were around \$600 billion in 2005, and data revenues were \$202 billion. By 2010, it predicts, fixed-line calls will account for less than half of operators' revenues in the developed world. Instead, their new core product will be broadband internet access.

"This is the key dilemma for the tele-

coms industry," says Mr Odlyzko of the University of Minnesota. "Voice is still what matters the most, it is still 70-80% of revenues for the industry worldwide, and it's going to zero in price. So how do you handle that transition?" Forrester, a consultancy, reports that voice revenue is now falling by 10% a year at France Telecom, 6% at Deutsche Telekom and 5% at AT. The same sort of thing is happening in America, Japan and other developed countries.

Incumbent telecoms firms around the world have responded to VoIP in a number of ways. Some Middle Eastern countries have banned VoIP and blocked access to Skype's website, in order to protect their incumbent telecoms firms and ensure that phones can continue to be tapped (which is very difficult to do with VoIP). But in the developed world regulators take a dim view of such practices, so operators have had to respond in other ways. To start with they switched to new pricing structures, reducing their call charges and raising their monthly line-rental charges instead. Many operators have now done away with call charges altogether and instead offer unlimited local, national and even some international calls for a flat monthly fee.

Incumbent operators also reluctantly began launching low-cost VoIP services of their own, because their customers were defecting to VoIP providers, and a VoIP customer is better than no customer at all. "Obviously, even if it disturbs the business model of traditional voice, you cannot stop it—it's ridiculous to fight against progress," says France Telecom's Mr Lombard. Instead, he says, incumbents must now try to capture as much as possible of the new VoIP market. For example, France Telecom has differentiated itself from VoIP competitors by using the technology as the basis of its new "Voix Haute Définition" (high-definition voice) service, which enables hi-fi quality audio connections between subscribers. Other operators, including BT, have launched similar products. Operators around the world, including AT&T and Verizon in America, also offer VoIP services which customers can use over any broadband connection.

Bundling provides incumbent operators with another defence against VoIP. They might choose to offer subscribers a triple-play bundle in which voice is "free"—ie, the subscriber pays only for the broadband and television services at the usual rates. Some cable companies and alternative operators (which run fixed-line phone networks in competition with incumbents) are already doing this: Free Te-

lecom in France, for example, includes unlimited national calls to fixed-line phones, as well as a selection of free television channels, with its broadband service. Conversely, some firms offer free broadband to telephone subscribers. Of course, nothing is really free, insists BT's Mr Verwaayen. "Where voice, data and video are interchangeable, it's very difficult to allocate cost to one service or another," he says. "The word 'free' can only be used once, and you can randomly choose the component you make free."

Mr Wegleitner at Verizon thinks the threat from firms like Skype and Vonage is overstated, because they cannot offer the same range of services as a network operator. "I question the long-term viability of those solutions," he says. "Can a VoIP supplier really compete with a full-service provider like a telco or a cable company?" On this view, the real threat to incumbents comes more from cable operators offering cheap (or "free") VoIP services than from pure-play VoIP companies.

But Mr Zennström insists his company will stay ahead of the game. This has now moved on to enhancing communications in new ways, he says, by integrating voice calls with videoconferencing, instant messaging, "presence" services that show whether someone is available, file transfers and other social-networking and collaboration tools. "Beyond the zero price point you need to start offering better services, unleashing and enhancing telephony using IP networks," he says.

Trouble in the air

Even if their voice revenues vanish altogether, fixed-line operators do at least have a booming new business in the form of broadband internet access, global revenues from which will grow from \$202 billion in 2005 to \$410 billion by 2011, Informa predicts. That will help to make up for the decline of voice, and some operators believe that new broadband services such as television will actually enable them to increase their overall revenues. Mobile operators, however, are in a very different position. They rely even more heavily than fixed-line operators on revenue from voice calls, and despite years of effort and the construction of new high-speed "third-generation" (3G) networks, they have been unable to convince their subscribers to embrace data services.

This makes them extremely vulnerable to the spread of VoIP to mobile phones. Convergence of networks implies convergence of prices, argues Cyrus Mewawalla, >>

A business to get out of

Worldwide revenue per minute from fixed-line calls, 1964-2008

