

they want it," says Mark Wegleitner, chief technologist at Verizon. "We want to bring simplicity to our customers, the first step towards digital paradise!" exclaims Didier Lombard, the chairman of France Telecom.

In fact, although the industry likes to depict convergence as a great boon for customers, it actually involves a technological shift that, in the first instance at least, will primarily benefit network operators. At its heart, convergence is the result of the telecoms industry's embrace of internet technology, which provides a cheaper, more efficient way to move data around on networks. On the internet everything travels in the form of "packets" of data, encoded using internet protocol, or IP. The same system can also be used to encode phone conversations, text and photo messages, video calls and television channels—and indeed anything else.

It is only relatively recently that IP technology has matured to the point that it can carry these other services reliably and efficiently, says Basil Alwan, the president of IP activities at Alcatel. But now that it has happened, operators can replace a jumble of different networks for services such as voice, data and video—each with its own order-entry, billing and fault-reporting systems—with a single network on which everything travels as interleaved streams of IP packets. "The ultimate goal is to have one IP infrastructure, and services running on that infrastructure," says Mr Alwan.

This convergence affects not only wireline networks, but wireless ones too. Today, operators run separate but interconnected networks for fixed and mobile phones. But the new converged networks are "access agnostic". In short, a single core network may have a variety of devices connected to its edges via different technologies. Traditional fixed-line phones might be connected via wires; mobile phones via base stations; and televisions or computers via broadband telephone lines or Wi-Fi links.

Access agnosticism should enable a mobile phone, say, to connect to the core network via Wi-Fi in the home and then switch seamlessly to a traditional cellular connection outdoors. The core network remains untouched as new access technologies (such as fibre-optic links or new kinds of high-speed wireless data technology) are added to its edges. In an industry that loves obscure acronyms, the framework for linking everything up in this way is known as IMS, TISPAN or NGN.

"IP in a converged world enables one network, many services, any access," says

Robert Lloyd of Cisco. A converged, all-IP network of this kind has two immediate technical advantages for network operators, he says. The first is that it costs less to run, thanks to its far simpler architecture and the economies of scale associated with internet standards. AT&T, a firm widely regarded as a pioneer in the switch to next-generation networks, expects its operating expenses to fall by 30% once its new "21st Century Network" (21CN) is completed in 2009. "By 2010 you will have to look very hard to find a fixed or mobile operator that is not running its traffic over an IP core," says Mr Lloyd.

The second advantage is that in theory, new services can be added far more quickly and easily, without the need to add any new network infrastructure. Adding a new service amounts to little more than adding software to the core of the network and perhaps some new access technologies around the edges.

### The rise of the quadruple play

Because of the convergence on IP networks, companies that used to be in separate industries—telephone operators, internet-service providers and cable-TV firms—suddenly find themselves in the same business. Cable companies now offer broadband internet and voice services over networks that used to carry just television, and telecoms firms have upgraded their networks to carry television signals. In the new converged world any firm that can deliver an IP stream to customers over its network can offer any or all of these services. And offering several of them together, many operators believe, is a winning strategy.

Hence the current scramble to offer the "quadruple play"—the name given to the combination of fixed and mobile telephony, broadband internet access and

multichannel television. This explains many of the deals that have taken place in recent months. AT&T, which is already rolling out a fast new network to carry TV signals, bought BellSouth in order to win full control of Cingular, its wireless joint venture, and complete the quadruple-play package. Softbank, which already offers television, voice calling and internet access over fixed broadband links under the Yahoo! BB brand, bought Vodafone Japan to add mobile to the mix. Similarly, NTL bought Virgin Mobile, and America's big cable operators last year struck a deal with Sprint Nextel, a wireless operator.

The desire to offer a one-stop shop for quadruple-play services has also prompted several national incumbent operators to reabsorb their previously separate wireless operations. And it has hastened consolidation among telecoms-equipment vendors, such as the Alcatel-Lucent and Nokia-Siemens deals. Large operators have concluded that buying as much as possible from a single equipment-maker increases their bargaining power and avoids problems with integrating equipment from different suppliers.

Operators claim that selling all four services together as a bundle makes life easier and more convenient for customers. "Customers in our experience really want that," says Ed Whitacre, the swashbuckling Texan boss of AT&T and one of the most vocal proponents of the merits of bundling, "and we can give them a better price." The average American household spends \$176 a month on telephone, broadband and television services, according to figures from Parks Associates, a consultancy. Mr Whitacre's stated aim is to reduce costs by building a converged network, and to offer the quadruple play for as little as \$100 a month.

There is indeed evidence that customers like the discounts associated with bundles and the convenience of a single bill. "Customers are much more open to purchasing via the bundle," says Mikal Ham, vice-president of consumer marketing at AT&T. For the incumbent telecoms operators, however, the quadruple play is all about protecting their core business of fixed-line voice calls, which still accounts for the bulk of their revenues.

Their problem is that fixed-line subscribers are being lured away by cable operators and voice-over-internet firms, or are getting rid of their fixed lines in favour of mobile phones. During 2005, for example, the number of fixed telephone lines operated by Verizon, America's second-

