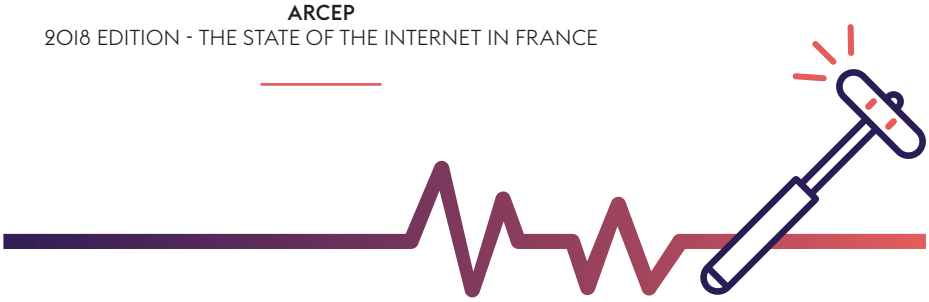

DATA INTERCONNECTION FOR DUMMIES

Stéphane BORTZMEYER, Internet expert,

answers the most frequently asked questions on data interconnection.

What does interconnection do?

A customer of SFR obviously doesn't want to interact only with other SFR customers. They want access to the entire Internet. So operators need to interact with one another, i.e. to interconnect, and it is these interconnections that create the Internet, this network of networks.

What does an interconnection look like, physically?

It is an optical fibre that runs between the two operators' machines. To streamline the process, operators typically take advantage of being in the same data-centre where what are called meet-me rooms, dedicated to interconnection, are located. Or they interconnect at an Internet exchange point (IXP), those dedicated interconnection services where a new connection no longer has to even pass through a new fibre.

When two players want to interconnect, how do they go about it?

Connecting to one another physically is only part of the process. There needs to be an agreement between the two operators, so that each one can send the other their data, and relay the data they receive. Such an agreement is above all a business decision, rather than a technical one. Aside from a few countries, there are no national or international laws governing these agreements. Although the term "agreement" makes one think of a written and signed contract, many interconnection agreements are informal agreements, sealed with a handshake.
There are two main types of agreement: peering and transit. As the name suggests, peering occurs between two peers, i.e. two players of comparable size, no money changes hands and each only gives access to its own network, so not to any third party's network. Every operator has a peering policy (which is often formalised in a, possibly publicly available, text) that defines the players it agrees to consider its peers. This policy may, for instance, indicate a minimum bitrate threshold (large operators do not like peering with small ones).
But peering is not enough to cover everything, as two operators may simply be too far from one another for it to be possible. If a Free customer in France wants to visit Colombia's national university's website, for instance, it is likely that Free and the network that connects the university to the Web do not have a way to interconnect physically. Here is where what are called transit providers, which have a much broader global footprint, come in. When an operator connects to the transit provider, it is the one who is "buying transit" by paying the transit provider. Here, the contract is almost always a formal one, and the transit provider gives the operator access to the entire Internet. The different transit providers interconnect with one another through peering agreements, and it all comes full circle. So anyone can visit the Colombian university's website.

How do they choose between peering and transit?

Remember, this is above all a business decision. Let's take the example of a small ISP. It is in its best interest to negotiate a maximum number of free peering agreements, to secure advantageous interconnection possibilities. But this will not give the ISP access to either the biggest operators' networks (they will refuse to peer with this small player, and will demand it become a paying customer) or to far-off networks in other countries (the transit provider will not do it a favour for free). So our little ISP will need to pay one or several transit providers.
In some instances, the big operators charge their peers while only providing access to their own network (contrary to transit provider). This is referred to as paid peering, and depends entirely on the balance of power.
Peering policies may include a symmetry criterion, i.e. approximately the same number of bits going in and coming out. And they may require the agreement switch to a paid peering if traffic becomes too asymmetrical.
Generally speaking, asymmetry creates negative pressure on the relationship, hence the importance of peer-to-peer exchanges, to increase symmetry.
It is worth mentioning that there is no official equalisation mechanism between operators, as was the case with telephony.

And do CDNs change the situation in any way?

A CDN (Content Delivery Network) is a service that delivers content in advance to many locations close to future customers. The closest one is of course on their ISP's own premises, which are referred to as on-net CDNs. These servers, which are managed by the company that owns the CDN but installed on the ISP's network, are beneficial for the content provider (since located closer to its customers) and for the ISP (as they decrease the need for interconnection). However, they also lead to tough negotiations to determine whether one of the two parties will pay to host the service.