Interconnection Issues on 4G networks

Interconnection will be key to the formation of 4G networks. Both mobile communications and the Internet market have established various types of interconnection agreements to ensure connectivity between networks. An interconnection agreement ensures bilateral exchange of traffic between two networks according to specific conditions.

Based on the description of the access systems [1] that will be included in the future network, various scenarios on interconnection agreements can be envisaged. In this context, we will briefly present existing types of interconnection agreements and consider their applicability to the future network from two perspectives: the vertical, as an integrate network that provides services to the customer, and the horizontal as a structure of complementary access networks that need to be interconnected with each other and the core network.

When considering interconnection in mobile communications, where services used to be provided through circuit switched networking, agreements were more straightforward and related to the total amount of traffic exchanged between networks. However, the future seamless network will be based on packet switched technologies. The Internet market provides a suitable metaphor for analysis. Internet interconnection agreements are broadly classified into two categories: peering that involves exchange of traffic free of charge, and transit that involves usage based pricing. The new seamless network will have an IP based core network managed by Internet legacy key players such as backbone providers. Therefore, interconnection agreements, at least at the initial phase of future network development, will be Internet driven. However, issues related to mobility and roaming may be better handled by mobile operators that have already developed such core competences.

The new integrated market includes many players coming from the legacy markets of telecommunications and the Internet. Communication and network services between various networks will tend to become commodities, as technological innovation will lead to low cost provision. However, the various autonomous systems will need to collaborate and communicate closely in order to increase the overall efficiency of the future network and provide services to the customers. Interconnection between the various networks will be necessary. In order to minimize inefficiencies observed in the Internet (free riding, asymmetric information) a common framework for interconnection agreements is needed.

The main objective is to enable connectivity and universal access while mitigating adverse effects. Peering agreements may be suitable for networks of similar size whereas transit agreements may be more appropriate for networks of different size. However, experience has shown that these types of agreements are not sufficient for the Internet anymore. It is reasonable to expect that the complexities of 4G will soon render contemporary peering and transit agreements obsolete. Other forms of contracting on specific service levels will be needed. There is some initial evidence to this direction, especially when considering vertical interconnection between access networks with different characteristics. The value added of future network comes from mobility and from the ability to handle asymmetric services efficiently.

Therefore, providers that are able to offer this type of service to other networks through interconnection may charge premium prices.

When interconnecting, access providers face conflicting interests, which provide a basis for opportunistic behaviour. In addition, access providers have incomplete and asymmetric information regarding traffic conditions on each other's networks. All this, in combination with uncertainty about the future, complicates matters when it comes to negotiating interconnection agreements. In order to facilitate coordination and ensure collaboration for seamless service provision to the customer, access providers will have to devise novel incentive contracting schemes.

However, the various access networks may not be viable if they cannot generate sufficient revenue. This scenario would lead to horizontal and vertical mergers. Given the strong economies of scale and the externalities of 4G networks, a market structure involving local monopolies and an oligopoly of global backbone interconnection is quite likely. In addition, the high fixed costs associated with developing, managing and upgrading an access network, may lead mobile operators to open their financial position through borrowing. UMTS licensing has already led to such outcomes with significant uncertainty regarding payoff periods. In this highly dynamic environment regulators will have to rise to the challenges by intervening in order to mitigate the risks of monopolistic deviations and short-termism in investment.

Reference

[1] Wireless Strategic Initiative-IST Project (2000) "The Book of Visions 2000: Visions of the Wireless World, http:// www.ist-wsi.org.