

Strategic Review of Telecommunications

Phase 2 consultation document

Annex Q: Review of access technologies

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Review of access technologies

Q.1 In assessing the various regulatory options, Ofcom has assessed the prospects for further infrastructure-based competition to the existing PSTN, cable, and mobile networks in the UK.

Q.2 It is possible that new technology may make the task of building a large scale access network much less expensive, or allow new types of service to be delivered. This annex summaries the main classes of technologies considered in this context.

Technology	Description	Type*	Comments
Proprietary wireless (below 10 GHz)	Usually point-to-multipoint (PMP) architecture and outdoor customer antenna.	Wireless, Fixed	Well established technology used in many small and some large scale deployments. Some systems use point-to-point (PTP) and/or antennas integrated into the customer's indoor equipment. Systems available delivering voice, narrowband, broadband and leased line services to residential and business customers
Proprietary wireless (above 10 GHz)	Usually PMP or PTP architecture and always outdoor customer antenna.	Wireless, Fixed	Well established technology used in many small scale deployments. Currently best suited to business applications due to relatively high equipment costs. Generally used for broadband and leased line services.
Proprietary mobile	Systems specifically designed for users with mobile terminals. Primarily aimed at data applications	Wireless, Mobile	Sophisticated radio technology is used to achieve high data rates and spectral efficiency. Systems in trial and early commercial deployment offering today's broadband data rates. Capable of delivering current generation broadband services.
Standardised Wireless Local Area Networks (WLAN)	Designed for connecting computers to an office network without cables	Wireless, Fixed	Examples are 802.11/Wi-Fi and HIPERLAN standards. Very widely deployed, low cost technology. Increasingly used for public access networks. Very limited range – usually less than 100m although this can be extended using directional antennas. Capable of delivering current and next generation broadband services.

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Technology	Description	Type*	Comments
Standardised Wireless Metropolitan Area Networks (WMAN)	Designed as 'last mile' data access networks	Wireless, Fixed	Examples are 802.16/WiMAX and HIPERMAN/HIPERACCESS. Emerging standardised versions of the many proprietary systems available. Generally provide greater range, security, quality of service control and network management capabilities than WLAN systems. Capable of delivering current and next generation broadband services.
Standardised mobile	Systems specifically designed for users with mobile terminals	Wireless, Mobile	Examples are GSM, UMTS FDD & TDD and 802.20. Current systems capable of delivering voice, narrowband and in some cases broadband services. Emerging systems are increasing broadband speeds and future standards may allow next generation broadband services.
Mesh wireless	An alternative to the usual PMP and PTP architectures	Wireless, Fixed	Can be applied to a range of wireless technologies such as WLAN and WMAN at high or low frequencies. Potential to reduce deployment costs and increase performance. Small scale deployments of early systems in place with much development still ongoing, including standardisation.
Satellite	One-way systems with PSTN or ISDN reverse connection and two-way systems available.	Wireless, Fixed	Very large coverage areas giving access to almost 100% of homes and offices. Expensive satellite capacity and customer equipment (especially for two-way) limits application mainly to business customers and shared bandwidth. High latency affects some applications. Capable of delivering many of today's broadband services.
High Altitude Platforms (HAPS)	Effectively a very low flying satellite, using airships or planes in the atmosphere as the "satellite"	Wireless, Fixed / Mobile	An emerging technology in the concept / early trial phase. Potential to offer rapid and relatively low cost deployment of a wide range of wireless technologies offering localised or countrywide coverage. Most likely applications appear to be temporary, e.g. disaster recovery and additional network capacity for large events.

Technology	Description	Type*	Comments
Broadcast wireless	Data services delivered using established technology such as Digital Audio (DAB) or Digital Video (DVB) Broadcast	Wireless, Fixed / Mobile	An emerging solution for delivering certain types of commonly used data service such as news or sport highlights. Caching in the users terminal can mimic an on-demand service. Another technology, such as GPRS, is required for the reverse connection if a fully interactive service is required. Potentially capable of delivering a limited range of current, and possibly also next generation, broadband services.
Free Space Optics (FSO)	Usually PTP, but PMP and mesh architectures also possible. Uses light (usually infrared) instead of radio	Wireless, Fixed	All current systems are proprietary. High reliability links are limited to short ranges due to weather effects. Architecture and equipment cost limits application to businesses. No radio spectrum required. Capable of delivering very high 'fibre-like' data rates for leased line and LAN-interconnect services.
Powerline Comms (PLC)	Delivery of data services over mains distribution wiring	Wired, Fixed	Benefits from a readymade access connection to almost every home and office. Radio interference has hindered deployment and uncertainty remains. Capable of delivering current generation broadband services.
Future DSL (Digital Subscriber Loop)	Higher speed versions of today's ADSL technology	Wired, Fixed	Versions of ADSL are already available which offer higher data rates at the expense of reduced range and hence reduced household and office coverage. VDSL replaces part of the copper network with fibre allowing much higher data rates and better coverage. Capable of delivering broadband and potentially next generation broadband services.
Future Cable	Higher speed versions of today's cable modem technology	Wired, Fixed	Cable access networks already partly consist of fibre although the resultant high data rates are shared between many users. Improvements in technology have the potential to increase the data rates available to end customers. Capable of delivering broadband and potentially next generation broadband services.

Technology	Description	Type*	Comments
Fibre	Fibre optic cable which may be used in PTP or Passive Optical Network (PON) architectures	Wired, Fixed	Widely deployed as an access technology for large business customers. Architectures for serving residential customers have been available for some time, but the high civil cost of new wired build has resulted in almost no UK deployment. Capable of delivering broadband, next generation broadband and near limitless data rate leased line services.

* Wireless technologies are categorised here as fixed or mobile depending on their original design purpose. Many of the technologies mentioned are beginning to blur this sharp distinction. For example:

- **WLAN** Originally designed to be used in a fixed location, but to allow the user equipment to be nomadic, i.e. easily relocated when required. Over time the technology is being adapted to offer more of the features of a fully mobile network such as seamless 'handover' of a user as they move between coverage areas while using a service. Mobile phones offering WLAN as an alternative access technology to their usual GSM or 3G are expected to be available soon;
- **WMAN** The distinction between some 'fixed' WMAN and mobile systems is also blurring. For example, 802.16 was originally conceived as a fixed technology and this will be the format of first commercially available systems. However the standard has now been extended to offer 'low speed' mobility and if this is successful, operators may demand further extensions; and
- **GSM** Many standardised mobile voice systems such as GSM are used with fixed terminals, for instance to provide voice services to customers in remote areas of developing countries.