

Huawei Answer to ARCEP's public consultation on the challenges tied to new frequency bands for electronic communication services access networks

July 2007 - 26 September 2007

Question no. 1:

What is your general view of the way in which the mobile communication services market will develop in the coming years? To what extent do you feel that the way mobile Internet access is currently evolving is comparable to the migration to broadband in the fixed access market over the past several years?

Huawei Response: Today we are already observing a high expansion of Mobile services dedicated to either personal or professional needs. The mobile content developers are showing more and more aggressive attitude in terms of new services development. After the SMS explosion that will still continue but more through multimedia messages (MMS), new applications such as Mobile TV, Games downloads, user generated content services and VoIP will know an important expansion through different categories of users.

Mobile Internet surfing and mobile e-mails are being already adopted by a large mobile consumers. According to several published surveys in Europe and Worldwide, users show more and more interest to other Mobile applications.

The advanced technologies such as HSPA, HSPA+, Wimax or LTE are evolving in the same direction. Offering high bitrates and short latencies, the efficiency of the network is maximized, the user perception is improved and the carrying costs are reduced.

In front of these facts: hungry users for new Mobile applications, and advanced technologies to ease carrying these services, the mobile communication services market expansion becomes obviousness.

If we go through the history of the fixed broadband market evolution, we could notice that the mobile services evolution today is similar to the one seen on the fixed network over the last years. The table bellow is presenting the analogy between both fixed access and mobile access evolution in terms of use and bitrates:

Wireless access	Fixed access
Voice service over 1 st generation and 2G	Analogue Voice
GPRS	Internet Low speed dial up connections
2.75G / 3G (e.g. EDGE / UMTSR99)	1 st DSL offers with average speed (128 to 512Kbps)
3G+ (e.g. HSPA, EvDo)	Current DSL offers (2-8Mbps)
3.5G /4G (HSPA+ , LTE ...)	DSL over Fibre

This similarity is not limited to access network evolution in terms of bitrates, but also to the carried services and content. Services already largely deployed over fixed broadband access such as IPTV and VoIP are having the same acceptability on the mobile access. Mobile TV and Mobile VoIP are being the focus of major mobile communication players: Operators and, equipment suppliers and Terminal vendors.

Question no. 2:

What types of service and bitrates are currently on offer? Using which technologies? To what extent can offers comparable to unlimited broadband Internet access be carried over to mobile?

Huawei Response: Today, European operators are offering mainly WAP, Mobile Internet and e-mail using the technologies GPRS, EDGE, UMTS and HSDPA bitrates up to 60kbps, 160kbps, 384 kbps and 3.6 Mbps respectively. The pricing models depend on the used technologies: typically depending on connexion duration in case of GPRS (comparable to voice prices), and depending on the downloading volume with more often unlimited access in the case of 3G access.

Even if the launch of Mobile broadband access services has started with limited and relatively expensive offers, this situation will not last for long. The emergence of HSPA+ (up to 28Mbps), LTE (up to 100Mbps) and Wimax (20Mbps) will be a revolution for operators in terms of data carrying costs and spectrum efficiency. The prices are expected to drop considerably. Thanks to HSDPA deployment, several European operators have already integrated offers such as unlimited Mobile Internet access (1Gbytes download limit) for less than 30€/month. Moreover, the Mobility as a big advantage will present an opportunity to develop further applications adapted mainly to mobility contexts.

In terms of content (provided by the carriers or other mobile Market players), the offers are converging to the ones offered over fixed access. Various services are offered over mobile such as music downloading, games, mobile TV, ring tones ...etc, with similar prices (e.g. Music track: 0.99€)

Mobile operators will themselves redirect their business to play more and more in the content offering domain. This will contribute to further prices decrease and provide more diversity in the offers combining both access and content services

Question no. 5:

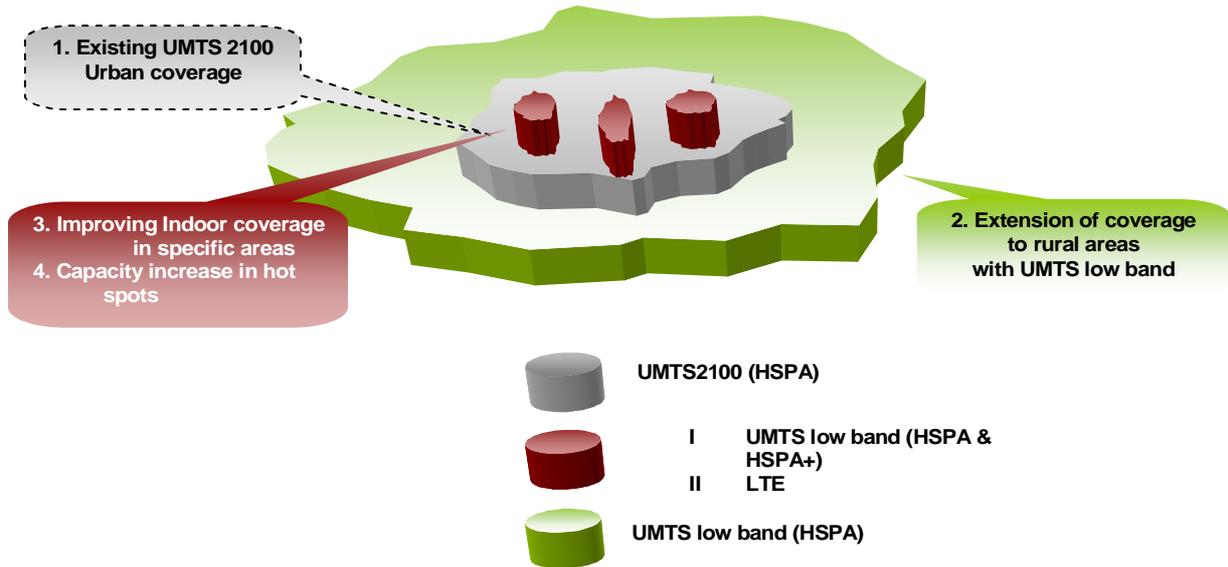
What can we expect in terms of the level of national coverage for mobile broadband access in the coming years? Please characterise these scenarios in terms of bitrate, coverage rate and indoor penetration. What conditions affect the feasibility of these different scenarios?

The mobile broadband nationwide coverage will depend mainly on two factors. One is the subscribers penetration and the profitability of the area, the second is the radio wave propagation behaviour.

Today the main used frequencies for the broadband access being high ones (over 1 GHz), the coverage is mainly ensured in dense areas. The deployment of this access in rural and suburban areas remains costly for the operators. The future technologies mentioned above will enable a large increase capacity (due to the increased spectrum efficiency). On the other hand, the opening of new frequencies in the low bands will be a key step for the coverage expansion. The propagation in these bands is much better than in the higher ones e.g. UMTS900 coverage is over 110% better than UMTS2100one in rural areas the number of needed sites for a given coverage can be reduces by more than 60%.

If we consider UMTS deployment (the broadband access the most deployed in Europe), most of operators have already deployed a full Outdoor Voice coverage in the dense urban and urban areas. Despite, this coverage is far from being nationwide especially when it comes to high bitrates data services or HSDPA. The low frequencies are thus getting more and more interest from operators because of their better free space propagation and indoor penetration. Low Bands like 900MHz are already standardized for IMT2000 and other low bands are following (450MHz and 800MHz).

The typical deployment scenario will be as shown in the figure bellow:



The milestones for the different phases especially 3 and 4 will depend on the traffic growth

Question no. 6:

To what extent is it feasible to plan on delivering speeds of several Mbps or higher nationwide?

Huawei Response: The radio link budget is basis for network planning. Good performance radio link reduces need for number of base stations.

Data speed and frequency are the two key parameters deciding radio link budget. Moving high data speed services up the spectrum is increasingly expensive with regard to RAN. Doubling the frequency is roughly a 7dB loss for the radio link, resulting in

- half the cell coverage area
- almost 3 times more base stations required

and thus a more expensive network.

It can be expected that for nationwide coverage, outside the cities, even a few MHz bandwidth will be sufficient for the requested traffic. Thus making bandwidth available in lower spectrum for the purpose of wide area (rural) coverage is a great advantage and because of limited bandwidth requirement, should not pose a big problem.

Looking into the future, the few MHz will not be sufficient, but if close to 100 MHz can be reserved, this is more than sufficient for the next decade network standards to be fully deployed nationwide.

Question no. 11:

Is it your view that additional low frequency band (<1000MHz) resources are required to achieve nationwide coverage for mobile broadband access services with very high data rates?etc

Huawei Response: As explained in our response to Q6, the spectrum <1000MHz is very valuable for nationwide mobile communication as it considerably lowers the necessary investment and thus give opportunity to widen coverage to reach more users. It is our view that nationwide coverage for mobile broadband access services does require low frequency band resources to become economically feasible.

Looking into current distribution of spectrum usage, there should be opportunities to reallocate spectrum in the range 798-862 MHz. With upcoming digitalization of broadcast TV, the possibilities to share the UHF spectrum between broadcast services and public mobile communication must be considered.

Spectrum in the lower range is certainly very suitable for broadband access services, also for very high data rates. As argued in response to question 6, total bandwidth should preferably be >100MHz to secure future demands, although initially a more limited spectrum will certainly also be beneficial. A larger bandwidth is also preferable to be able to distribute spectrum to several operators, as a too small bandwidth will limit the operators opportunity to deliver true broadband services to many simultaneous users, as the business case for operators to build denser and more expensive networks is not viable.

As newer standards are better fit to deliver wide area coverage and these standards are not expected to be widely deployed until first half of next decade, spectrum should be planned to be available in the timeframe 2010 – 2012. We recommend starting with a minimum bandwidth of 5 MHz per operator in lower spectrum. Use of BB services will probably not demand very large bandwidth from beginning. New spectrum can be made available in steps where a larger bandwidth is made available in the period 2015 – 2020.

Question no. 12:

In your opinion, how will the broadband access market evolve? What will be the medium-term trends in this market? What types of service will be offered, and over what speeds?

Huawei Response: As new radio standards deliver data more cost efficiently, end-users will also benefit by having faster response times and better use experience at similar cost as before. We can expect common wireless broadband services to be deployed to deliver an average access speed of 2Mbps, and peak speeds closing up to 10Mbps, within 3 years. This speed is more than enough for all services including internet surfing and video streaming for small screen viewing on handhelds and PCs. It will however not be very attractive to stream or download standard digital TV quality at this speed.

We generally expect mobile broadband users will use same services as on fixed broadband, but only after next generation mobile networks are introduced, offering less delays and increased speed.

- Telephony will continue to use same bandwidth, although traffic will move to IP-channels
- Simple data services (SMS) will also continue to use same bandwidth as today, and may increase as simple internet messaging will find use
- Advanced data service (Internet, mail, M2M) will increase over time, but total used bandwidth will increase relatively slowly as services are used intermittently and most often does not require more than a few 100kbps for good quality. We have however to remark that mail services are often used to attach large files such as pictures and video files, and then the last point in this list will apply.
- Streaming services (TV broadcast, radio broadcast, other streaming data) may also take a sudden jump when higher speed BB (500kbps and higher) and broadcast access are generally available with good quality and large coverage.
- On demand media (video, music, data files) may take a sudden jump when high speed BB (2Mbps and higher) and download products is offered at more attractive price and generally available with good quality and large coverage.

The prerequisite for a fast market development is the continuous improvement of operators cost efficiency, where availability and cost of spectrum play a key role.

Question no. 17:

Do you have any comments on the work being performed, particularly the efforts taking place at the European and global level? In your opinion, what specific characteristics of electronic communication services' low frequency band requirements should be underscored, compared to the needs of other services, with respect to accessing digital dividend spectrum?

Huawei Response: We would expect a more forceful acting in two areas:

1. An even greater re-farming of spectrum as mobile communication quickly increases its importance and economic weight in society.

Mobile communication usage is globally larger than fixed access usage, as mobile users are quickly closing up to 3 billions, and growth rate is higher than fixed access.

Wireless communication industry has a global turnover of more than 600 billion USD and thus a substantial contribution to global economy.

In spite of this, many other areas of society still master large portions of the limited natural resource that spectrum is (there are no factories to produce more spectrum)

2. We expect continued government regulation to achieve a much needed harmonization,

again because spectrum is a limited natural resource. Harmonization will make more efficient use of spectrum as well as gaining the advantage of volumes in industry.

We expect regulators also take into account that the fastest increase of mobile communication is now in emerging economies, and here we should also consider western economies rural areas. These users will have great advantage of the effects of harmonization of spectrum usage. We see today that USA are moving from the principles they have used before of largely leaving technology and use of spectrum to the license holder, as they experienced several negative experiences due to fragmented use of spectrum, resulting in diverse deployments but no advantage for the consumer.

It should be underscored that it is financially prohibitive to deploy a truly nationwide wireless broadband access system on high frequencies. As we have commented in several of our answers in this consultation, low frequency spectrum scarcity is becoming a limiting factor in the continued development of wide area mobile communications, so the change of regulations is urgent. It is also necessary to keep the global coordination to give users the benefit of large scale markets with a wide choice of affordable products and services.

The difficulty for network operators to build a sound business on truly nationwide wireless broadband access, impacts everybody in the value chain from network suppliers, terminal suppliers, service providers, all the way including the ultimate end user.

As a conclusion, we look forward to WRC07 to set a revised overall division of spectrum, adapted to the recent fast transformation of radio communication patterns and the modern society dependency on mobile wireless communications. We also expect WRC07 set the direction for the regional and national spectrum regulating authorities to expedite the changes.

Question no. 18:

In your opinion, how important is a relatively swift identification of additional low frequency bands for electronic communication services, and particularly the impact of digital dividend harmonization efforts on industrial policies in France and in Europe?

As argued in the answer to previous questions, spectrum scarcity is becoming a limiting factor in the continued development of mobile communications.

Following this, the services industry using telecommunications as means of delivery (most commonly over internet interface) cannot grow their user base beyond fixed terminal users and urban mobile users.

Technology is available and standards are set for high quality high data rate mobile communications to be delivered nationwide, but there is need for large bandwidth to deliver high speed data communication to a large amount of simultaneous users.

Wide band spectrum is available at higher frequencies, but it is financially prohibitive for a network operator to install enough many base stations for rural wide area coverage using high frequencies, because of the physical limitations to achieve enough coverage for high speed data communication from a single base station.

At lower frequencies where networks could be built and operated on sound business terms, there is not enough bandwidth available to deliver high speed data communication to a large amount of simultaneous users.

The digital dividend harmonization is necessary to create big enough markets for both broadcast and mobile communication equipment suppliers.

For both these industries, the user equipment has a higher aggregated value than the infrastructure, but is also more cost sensitive and dependent on large scale markets to be able to deliver a wide choice of affordable products.

We believe that the services business now taking advantage of being able to deliver “anywhere, anytime” access, for its further development also need ubiquitous coverage in its true sense of nation-wide and internationally.

Having swift access to lower frequencies will thus immediately have a positive impact on all the participants in the mobile communications value chain:

- Infrastructure providers
- User equipment providers
- Services and content providers
- Companies and private persons

Question no. 20 :

- a) **what is the status of industry developments in the low frequency bands, and what is the roadmap for standardization efforts?**
- b) **Under the hypothesis of sufficiently early identification of a sub-band in Europe, what systems would be focus of industrial developments**

Huawei Response: Current infrastructure product designs can easily be redesigned for new frequencies and would generally be possible to make available within a years timeframe. Certain components (e.g. filters) may however not be available for the new frequencies and may have a longer lead time to production that will in turn impact the infrastructure products. The industry will of course also need to identify a large enough market for these products, that otherwise would become unacceptably expensive. Thus we are back to the need for global harmonization to be able to deploy networks in new frequencies.

TBD Roadmap for standardization efforts?

- a) This would require feedback from operators regarding their intended use of such a spectrum, but we would anticipate WCDMA and LTE are the best candidates for such deployments. If timing is later than 2010, LTE is the more probable standard for such products to be deployed in Europe.

Question no. 21:

How big does the potential market need to be to generate return on investments made in developing equipment to operate in frequency bands below 1GHz? How important is degree of harmonization between states?

Huawei Response: If operators ask for products useful only in a small region, and thus forming a very small market, they will most certainly end up with only one supplier and no alternative as industry will only offer this network equipment made to order, but not as a standard product.

The next, and larger, issue is the operators ability to attract subscribers with a non standard service with most probably a very limited selection of terminals.

It is clear that new mobile users most often start to choose terminal, rather than operator, as they regard operators services are all similar.

We have seen several examples of this market behaviour in the attempts to offer UMA enabled services. They have failed, as there was a too limited choice of terminals. The availability of many different terminals to choose from is a key to mobile operator success. US operators decision to change to GSM is largely founded in the poor selection of CDMA terminals.

As an indication on the market size necessary for a standard product, we can look at the recent mergers among suppliers. The mergers were regarded required by the industry as the infrastructure market has become very mature with very standardized products giving limited profit margins. And to be able to continue to be competitive, each company regards it necessary to increase market share well beyond 10%. Total infrastructure market volume is in the range of 50billion USD.

Conclusion is that global harmonization is necessary to create a big enough market size for both infrastructure and terminals.

Question no. 23:

If harmonised frequencies below 1 GHz were identified, notably as a result of the work currently being performed at the European level (see Section 3), what players would be likely to deploy networks and services in these bands? Within what coverage zone? What type of service would they be likely to offer? What would the business model be? What type of applications can we expect to see develop?

Huawei Response: We have seen new operators being established in northern Europe, taking advantage of the availability of the recently released 450MHz bands. The market they are approaching is countryside mobile data users in agricultural, forestry and mining industry, and also households that cannot access fixed broadband services. These users reside where there is very low people density, and the professional users work with modern production methods asking for high data rate communication ability (i.e. better than GSM/EDGE).

As the available bandwidth was <5MHz, WCDMA was not an option, but CDMA2000 having the modulo 1.25 MHz was well fit.

If low frequency and harmonized spectrum become available with bandwidth >5MHz, current 3G operators would certainly welcome the opportunity to cover wide areas with less investment than necessary today.

If spectrum is offered with <5MHz bandwidth, this will be an opportunity for new operators deploying CDMA450 (an application of CDMA2000), or for operators planning deployment of newer standards that also fit within less bandwidth than 5MHz: Primarily LTE and WiMAX.

With a harmonized solution, terminal vendors may implement the new frequency as a complementary frequency in their terminal models. In this case, the operator can limit the deployment to new areas.

If terminals are restricted to the new frequency only or in other ways cannot access existing networks (as is the case for the Nordic CDMA450 terminals), the operator will have to build nation wide coverage including both urban and rural areas.

Service offers will not differ from other mobile operators, and notably, wireless broadband users use this in the same way as fixed broadband, only with the restrictions imposed by the higher costs.

Question no. 25:

What quantity of harmonized frequencies, and what technical specificities (duplexing mode, channelization etc.) will be required to enable the implementation of viable projects in the frequency bands below 1GHz?

Huawei Response: As low frequencies have their biggest advantage in the added coverage, they should be reserved for such technologies that are suitable for wide area coverage.

Paired spectrum is more advantageous for long range duplex communication. Single frequency will require time division multiplexing which become less efficient on long distances as silence must be maintained in the switch of direction, and the necessary period of silence is proportional to distance.

As responded to question 11, we see the expected traffic volumes will need at least 100MHz bandwidth below 1GHz within 10 years

Question no. 26:

Would interest in frequency bands below 1GHz be similar if they were available in only a fraction of the country, notably in sparsely-populated areas?

Huawei Response: The answer to this question follows the same logic as answers to previous questions.

If terminal market is big enough, i.e. standard terminals will include this frequency but normally use other standard frequency, fractional availability would be attractive for existing operators.

A fractional frequency availability where terminals cannot support the standard frequency is not of interest for any operator. Not even a niche market operator is probable to build a business on fractional frequency availability. In the previous example of CDMA450 professional users in agricultural, forestry and mining industry, network is planned for nationwide coverage, i.e. also urban areas.

Question no. 29:

Should harmonization efforts fail etc...

Huawei Response:

A failure in harmonization will make both infrastructure and user equipment more expensive for non-harmonized frequencies. How much, will be dependent on the global markets available for these products, and is not much dependent on spectrum usage in France's neighbouring countries.

The strict harmonization of GSM spectrum has been a key prerequisite for making GSM the dominant standard. More than anything else, it has made the choice of terminals abundant, and this is today widely accepted as the key to mobile service success.

As stated in earlier answers, this would affect the complete value chain.