



Motorola Comments on the OFTA Consultation Paper
“Licensing Framework for Third Generation Mobile
Services, An Industry Consultation Paper, 21 March, 2000”

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Motorola compliments OFTA on its decision to obtain a broad input from the industry prior to setting policy and establishing regulations and is pleased to provide these comments to OFTA. This paper responds specifically to the points included in the OFTA paper *Licensing Framework for Third Generation (3G) Mobile Services – An Industry Consultation Paper (OFTA Paper)*.

In general, we believe that **evolution, not revolution** will characterize the implementation of third generation cellular services in Hong Kong and elsewhere. Voice, as a special case of data in digital systems, will remain the predominant application for the short to medium term. Generally, data applications will grow and systems will grow commensurately; in other words, the operators will be looking for market pull before committing to massive investment. In a few dense, small and developed countries or region, like Hong Kong, some systems may roll out more quickly and provide some technology pull.

Section 1 of this paper introduces Motorola's view of 3G technology. The remaining sections respond to the OFTA request for input to the points and concerns in the Consultation Paper posed by OFTA.

1 Introduction – Motorola's view of Third Generation Technology

1.1 Standards

Motorola manufactures the broadest range of radio communication equipment in the world. We manufacture to nearly every open standard, to many standards licensed from other companies and to our own proprietary standards. We try to be partners with our customers, not merely a supplier. Therefore, we intend to develop the equipment to implement 3G to support both our existing and our new customers worldwide, not just some of them. Motorola actively supports open standards and our third generation systems are being designed so that they can be blended seamlessly at standardised interfaces with existing equipment from other suppliers.

Although we are arguably the most technology neutral of the telecommunication equipment manufacturers, **we believe that WCDMA-DS will emerge as the most popular version of the third-generation standard.** It will be the air interface standard of choice for the GSM/MAP operators. CDMA operators may choose technology beyond IS95C 1X such as WCDMA-MC or 1XTREME, as they offer certain migration path opportunities for legacy cdmaOne/ANSI-41 second generation systems. 1XTREME is Motorola recently proposed cdma technology, which can provide up to 5 Mbit/s in a 1.25 MHz spectrum and is backward compatible with IS95A, IS95B and IS95C 1X. CdmaOne operators may also select WCDMA-DS with hooks and extensions for support of an ANSI-41 core network.

1.2 Industry Convergence on Internet Protocol

The convergence of the computer, media and telecommunication industries is becoming apparent, characterized by the adoption of Internet Protocol (IP) as a common standard.

The computer industry is already extensively IP based, with both business and consumer applications that are built upon IP. The industry is now looking for mobility to extend the reach of computing to people on the move, and is also demanding ever-faster access speeds to allow more complex multimedia data to be interchanged.

Third generation systems will eventually be built around a broadband core transporting voice, data and multimedia traffic over a common network.

1.3 Networks

We believe that 3G systems will eventually be built on a common modular high availability platforms, creating a distributed peer-to-peer network solution where functions may be located to best address the needs of a particular network. This will enable features such as local PSTN interconnection, optimal routing and advanced wireless enterprise solutions for corporate customers. The platforms will be scaleable, allowing operators to deploy networks where core equipment is centralized or highly distributed, thus allowing operators to reduce their backhaul and interconnect charges. Motorola's cell site equipment will be designed so that, over time, operators will be able to deploy both second and third generation radios on the same platform.



We believe that second and third generation technology should be seen as complimentary, not competitive. Nor should third generation be seen as eliminating second-generation systems. Rather, there will be evolution. The UMTS Forum, for example, has called upon regulators to consider re-farming the 900 and 1800 MHz bands into third generation. The FCC in U.S. already considers the existing operators of first and second generation cellular to be empowered to move towards or to third generation technology, within their existing frequency assignments, at will.

Motorola envisions second-generation systems continuing to provide high quality voice and low to medium speed data communication, while the higher bandwidth capability of third generation will be predominantly harnessed to offer multimedia and high value data services whilst still supporting many of the second generation services.

1.3.1 Integration of 2G

Third generation networks will evolve from today's second-generation networks, encompassing both existing and new network elements working together to provide seamless service delivery to customers whether they are using a second or third generation air interface.

The second-generation components of the network will be upgraded. This will enable operators to build on their existing second-generation network investment and customer base and will provide the consumers with a smooth upgrade path from second to third generation services. For GSM operators, GPRS will allow new multimedia-orientated services to be deployed prior to the introduction of a third generation air interface. Motorola's GPRS solution enables the operators to smoothly move towards third generation services and reuse most of the upper layers of their network.

GPRS, which is based on packet transmission, is designed to cope with a growth of data traffic that is today still very low in GSM networks. This new mode will help the operators to fully utilise their spectrum resources in dense urban area. HSCSD, high speed circuit switched data, on the other hand will increase speed for any one link, but will not help the operators to develop new services while optimizing their spectrum resources, as it is very resource intensive.

High Speed Packet Data (HSPD) is also becoming available for the CDMA systems (IS-95-B). Thus, second generation CDMA systems can grow to 2.5G in a like manner to GSM systems. IS95C and 1XTREME will be other alternatives to provide 3G high-speed packet data services in 2G spectrum.

1.3.2 Data rate

Third generation data rates will be dependent on the mobility of the user. The demand for higher data rate is one of the drivers for third generation systems. The others are, the spectrum limitations in some very dense urban areas and continuous strong growth of cellular.

Today's GSM data rate is usually 9.6 kbps and is moving to 14.4 kbps. New techniques such as GPRS will enable higher rates of up to 171 kbps. Another evolution of GSM is Enhanced Data Rates for Global Evolution, or EDGE, promising speeds up to 384 kbps or higher. EDGE and GPRS can be combined, and can serve to offer multimedia services effectively and efficiently. The situation with CDMA is similar, as the implementation of IS-95-B provides essentially the same benefits, and IS-95C and 1XTREME will provide data rate comparable to WCDMA.

1.3.3 Architecture

A further benefit of the broadband core is the ability to support a distributed rather than hierarchical network structure resulting in superior network resilience when handling traffic peaks and improved network availability by routing around network failures. The network will also support optimal routing resulting in lower operational costs.

There are three independent components of third generation systems architecture:

- A service platform that offers end-users the same service features regardless of the underlying access technology, thus providing the "Virtual Home Environment"
- A transport network that supports voice and data efficiently and provides mobility management and other core functions
- A series of access networks that could include both the new third generation air interface, capable of supporting high-speed data and multimedia services, and other wireless and wire line techniques.

The key objectives of the architecture that is outlined here are:

- Smooth, commercially successful migration path for current operators, allowing for continued inter-working with other mobile and fixed networks
- Cost effective implementation (both capital and operating cost)
- Fast, flexible development of distinctive, operator-specific features for market differentiation

1.3.4 Coverage

Second generation cell radius can range up to 35 km, and even up to 120 km using enhancement techniques such as “Extended Cell Range”. With third generation, the cell radius will be much shorter; this will be a function of data rate/ bandwidth and location/loading. Motorola’s simulations have shown that a cell radius of less than 5 km for speech users should be reached, and one of less than 2 km for data users. The cell size for nomadic use, which is expected to require several Mbps of data speed, is likely to be even less.

In our opinion, there will be no such thing as a countrywide or even citywide 3G system, especially at the onset. 3G systems will not be popping up here and there all over Asia. There will be some exceptions; however none will provide the ubiquitous coverage that 2G does. Some countries, Japan for example, will be among the first to build 3G systems in major cities, as their existing systems are full to capacity. Hong Kong will be an early adopter and will roll out quickly, due to its size, density and technology leadership.

At the higher frequencies, one does not get the same coverage as one does at the lower frequencies. Added to this will be a bandwidth and data speed problem. It will take an average of 7.7 sites to provide 384 kbps to cover the same area as a single 9600 bps site. The denser the traffic area, the greater the needed bandwidth, and the higher the average data speed, the smaller the 3G footprints will have to be. A 2 Mbps signal will occupy a lot of the infrastructure resource, regardless of the technology used.

So, 3G, meaning the gee-whiz new services and high data speeds will normally exist in islands of coverage, not across whole nations, with augmented second-generation systems providing the wider area coverage for new services, to the extent possible. New “3G” operators, that is those without 2G systems, therefore, will either have to form alliances, buy 2G services to remarket, or will serve only niche markets.

1.4 User Terminals

Motorola believes that most of the terminals on the market in Asia and Europe, especially at the onset, will be GSM/W-CDMA dual mode and multiple bands. This will allow roaming between second and third generation networks. When roaming to a 2G network, 3G users will still be able to have access to most of the third generation services but, with reduced bandwidth, performance for some will not be up to 3G standards. A few of the third generation services will be not accessible in 2G networks.

1.5 Likely Services

Motorola thinks 3G-cellular will become a success if the following services and applications are offered:

- **Virtual Home Environment**
The implementation of the Virtual Home Environment will give consumers the same seamless service regardless of serving network type. This means that consumers can access their personalized service profile through a range of networks and terminals, optimize the display of information and simplify access to the services that they use most. This programmable personality will be stored in the SIM card, and this will enable the subscribed services to be available on any phone anywhere in the world, subject to the capability of the phone.
- **High speed data services**
The 3G-cellular network will provide cost-effective data transmission with the flexibility to remain on-line at all times, whilst only paying for the amount of data received or transmitted. Terminals can always be connected to the network, e-mails can be received as soon as they arrive and access to Intranets and the Internet will be immediately available all the time with no set-up delay. All this will be available at even higher data rates than those offered by GPRS systems.
- **Multimedia services**
New multimedia services could include video conferencing, interactive entertainment, and video transport in the case of an emergency or disaster. Multimedia messaging technology will also make it possible to offer electronic magazines or newspapers complete with graphics and video clips.
- **New innovative applications**

The involvement of new Value Added Service Providers in the 3G-cellular commercial model provides the opportunity for a wide range of new applications to be offered. Examples are supplementary features for traditional voice callers such as location-based services.

- **Telematics**
Building on GPRS and IS-95-B services, third generation systems will support machine-to-machine communication in a range of applications such as vending machine monitoring.
- **Increased integration between fixed and mobile telephony services**
The increased integration of these services potentially makes telephony easier to use and less expensive.
- **Increased choice of services**
The opening up of the market for service provision and the simplification of service creation will provide consumers with an increased menu of services from which to select. The increase in competition in the market is also expected to ensure that these services are offered to the consumer at an affordable price.

1.6 Demand from Business and Consumers

Market studies show that speech will remain the dominant service up to the year 2005 for existing fixed and mobile telephone networks. Users will demand low cost high quality speech from third generation systems, however the opportunity for increased revenue over today's systems will come from offering advanced data and information services. Long term, industry forecasts for UMTS, for example, show a strongly growing multimedia subscriber base by the year 2010.

The markets for mobility and for fixed multimedia are already large and growing rapidly. Customers will want to combine mobility with multimedia, resulting in higher demand for bandwidth and creating a significant shift towards new data services. For Europe alone, this new market is estimated to be as large in 2005 as the whole mobile market is today, given appropriate political and regulatory environment.

The following table¹ provides one view of the potential.

Users in millions at year end	1995	2000	2005	2010	2015
EU 15	22	113	200	260	300
North America	36	127	190	220	230
Asia Pacific	22	149	400	850	1400
Rest of World	7	37	150	400	800
Total	87	426	940	1730	2730

2 Standards Issues

(Response to OFTA paper, section 2 – Standards Issues)

Motorola supports that OFTA adopt a technology-neutral solution, whereby the regulator allows the operators to select the third generation standard that suits their intended business plan.

We believe that operators should ultimately have at their disposal a combination of second generation, third generation and expanded third generation spectrum. Motorola urges OFTA to assign spectrum in this manner and to permit operators to use the spectrum assigned to them in the manner that best suits their operation. Motorola further urges OFTA to support the view that expansion spectrum should be, to the degree possible, earmarked on a worldwide basis; with some popular band choices designated as “preferred” choices at WRC-2000.

Motorola recommends that operators be given unfettered access to use IP throughout their networks.

¹ Source UMTS forum

3 Spectrum Issues

(Response to OFTA paper, section 3 – Spectrum Issues)

Since the spectrum is already allocated to the Land Mobile Service (in the ITU sense), we take “allocation” to mean licensing or frequency assignment in the context of the OFTA paper.

Motorola recommends that the spectrum be allotted into multiple blocks, without guard bands. Licensees should be required to co-ordinate optimum frequency deployment, interference minimisation, and co-site arrangements without government intervention. A mechanism to resolve disputes, however, is recommended.

Taking into consideration present Hong Kong spectrum allocation, roaming benefits and guard band requirements, Motorola supports OFTA’s view on the selection of 3G band plan in compliance with the ITU IMT-2000 allocation in Hong Kong.

Motorola also believes that present 2G operators, in order to remain competitive, should be allowed to upgrade their network in the 2G spectrums to provide advanced 3G services.

It is recommended that the allocation of spectrum in Hong Kong be compatible with that of mainland China as far as possible with a view to minimising interference and maximizing compatibility.

3.1 Additional ITU IMT-2000 Spectrum Allocation

Due to the tremendous growth in mobile communication since WARC-92, WRC ‘97 decided that WRC 2000 should review IMT-2000 spectrum and regulatory issues. Accordingly, WRC 2000 Agenda Item 1.6.1 calls for the review of spectrum and regulatory issues for IMT-2000, with priority given to identifying additional terrestrial spectrum for IMT-2000. The CPM-99 Report forecasts that 160 MHz of additional spectrum may be needed for the expansion of the terrestrial component of IMT-2000.

Motorola supports the additional spectrum requirement of 160 MHz for terrestrial IMT-2000 services by 2010 as well as global harmonisation of IMT-2000 spectrum to the extent possible. Therefore, Motorola agrees with the view expressed by OFTA in section 3.12 of the Consultation Paper that Hong Kong should adopt a 3G band plan consistent with the ITU IMT-2000 allocations. Since it is anticipated that WRC-2000 will identify more than one potential IMT-2000 expansion band, OFTA will need to undertake additional study of the 3G spectrum landscape after the Conference with an eye toward selecting the band that is most likely to yield the benefits of harmonization (e.g., lower equipment prices, facilitate roaming).

3.2 Spectrum Requirements per Operator

At WARC ‘92, a total of 230 MHz of spectrum was identified for IMT-2000, which was stated in a footnote² of the ITU Radio Regulations with reference to Resolution 212. Since then, 60 + 60 MHz of spectrum (i.e., the UMTS band) has emerged as the de facto core band worldwide, except for the USA and a few other Region-2 countries.

The proper amount of spectrum per operator, is a matter of service and competition requirements. In a country with only one operator, and assuming an aggressive business plan, that operator would need the entire core spectrum. On the other hand, in the more, typical competitive environment, the spectrum needs to be shared among the operators. The practical lower limit is about 10 + 10 MHz³, below which it becomes uneconomical to offer broadband services. Most recent estimates favour 15 + 15 MHz, which will also allow the implementation of multi-layer (macro, micro and pico) hierarchical network.

² RR No. S5.388

³ For FDD spectrum, both the base-to-mobile and the reverse path are specified. Thus, 10 + 10 MHz means ten MHz outbound and 10 MHz inbound.

We can see no particular merit in holding back any spectrum from operators. To do so would require reducing the award per operator at the onset, followed by some sort of application and assignment process, which would make system planning more difficult.

3.3 Allocation of TDD Spectrum

At the onset, operators will be providing cellular-like services. These are characterized by symmetrical transmit and receive bands. Many of the new Broad Band Multi Media services, however, will require more spectrum inbound than they do outbound. Here are some examples:

- **High speed data services**
Most of the high-speed data services are highly asymmetrical, like e-mail, or WEB browsing. In most of the applications, the downlink data traffic is much higher than the uplink data traffic.
- **Multimedia services**
These services could be offered in one-way direction or bi-directional, such as interactive entertainment or video conferencing.
- **New innovative applications**
New services such as location based services will be mainly downlink, as information will be provided to the subscriber depending on his location (i.e. list of hotels when arriving in a new city, traffic jam in the area, etc...).
- **Telematics**
Most of the telematics services will be on the opposite uplink, with equipments sending at regular moment in time some data to a central system. The amount of data though will be highly variable depending on the application: from an inventory level of a distribution machine to bank account management.

The overall degree of asymmetry in the traffic generated by third generation services is difficult to estimate, as it is highly dependent on the mix of services and use of these services by the end user. Studies and experience gained from fixed networks show that a ratio of 1 to 10 between uplink and downlink traffic is a good estimate. On the other hand, the UMTS forum, on report 5, cautiously recommends 2x15 MHz (paired) + 5 MHz (unpaired) as the preferred minimum spectrum requirement per public UMTS operator in the initial phase.

We note that OFTA is aware, as described in the Consultation Paper, of the need for asymmetrical spectrum or TDD spectrum. We believe that the first applications of third generation cellular will indeed be symmetrical, but that asymmetrical and stand-alone TDD applications will emerge in time. Motorola therefore believes that OFTA's consideration of earmarking additional spectrum for the next phase of third generation cellular implementation is wise (3.21 in the Paper). Guard band may be required to avoid interference between TDD and FDD service. Motorola recommends that this guard band be taken from the TDD band (below 1920 MHz band edge) to maximize FDD band utilization.

4 Licensing Issues

(Response to OFTA paper, section 4 – Licensing Issues)

Because of the wide range and depth of services that can be offered using third generation technology, **Motorola recommends that the scope of the licences be as broad a possible.** This will encourage innovation and competition.

We further recommend that no additional permission or licence should be required each time a network operator wishes to provide some sort of innovation. Likewise, network operators need to be able to provide service to Service Providers and to Value Added Service/Content Providers, who should be encouraged to emerge in their own right.

This is an area where leadership by OFTA will lead to a dynamic telecommunication environment in Hong Kong, rather than one rooted to the past regulatory environment, which was nearly devoid of convergence and where in some countries, innovation and convergence is subject to pushback by other operators on "regulatory grounds".

4.1 Optimal Number of Operators

It is our opinion that the optimum number is that which provides true competition, and a wide and deep choice of services to the customer. Motorola has no opinion as to the precise number that would result in this condition.

With the allocation of both IMT-2000 FDD and TDD spectrum, there is sufficient spectrum in the OFTA allocation to provide equal and sufficient spectrum for up to four to six operators. This would provide additional spectrum for the existing network operators and it could provide spectrum for some new operators.

It is our opinion that a new operator would be forced to develop new and innovative marketing and service approaches. To offer a balanced service, such an operator would have to develop alliances or service arrangements with some or all of the other mobile operators.

4.2 Approach for Licensing

Motorola in general agrees with OFTA that new operator(s) require more spectrums to compete with existing operators. However, the key benefit of giving a new 3G-only operator extra spectrum is providing more capacity after the system is installed and loaded to the point where more capacity is needed. In the initial 3G deployment, it is of little or no advantage in competing with operators that have established systems .

Given that there are already 6 cellular operators in Hong Kong, we believe the introduction of new operator should be based on benefits to normal subscribers. Both new entrants and present operators should be of the same priority and be given an equal opportunity. We therefore do not recommend reserving part of the 3G spectrum for new entrants.

As spectrum is public resource, operator selection should therefore be based on the benefits to the public. Motorola does not recommend spectrum auctioning as it increases the cost of 3G services and will result in higher fee to service subscribers. Selection by evaluation of the merits of application will provide OFTA more flexibility to take care of the public interest.

4.3 Timing of Services launch

There is no particular reason to hold back on or advance service provision, providing that all of the spectrums go to existing operators. This is really a matter of competition in a free marketplace.

However, should OFTA license a new operator(s), then there may need to be some sort of moratorium on building and turning up third generation services, as the existing operators will have an enormous advantage over the new operator(s).

Ultimately, however, Motorola believes in a “use-it-or-loose-it” philosophy. Consequently, operators that have been given awards should be required to load their spectrum to reasonable levels over some period of time. Once the spectrum becomes loaded, the operators that have not demonstrated that they will use their entire award should loose some of the spectrum to other operators that need it.

5 Regulatory Issues

(Response to OFTA paper, section 5 – Regulatory Issues)

Motorola believes that 3G is a topic of business model evolution as well as technology evolution.

5.1 Fixed/Mobile Convergence

Liberalisation in Asia has already allowed some operators to offer a combined subscription for fixed and mobile services. Whilst this is primarily limited to billing at present, we can expect the more innovative third generation operators and service providers to offer converged services through both access methods. Leadership by Hong Kong, as a WTO member, in setting out regulations that break down the now-artificial fixed and mobile barriers is needed to propel neighbouring countries into a new and nurturing regulatory environment.

5.2 Domestic Roaming between 2G and 3G Networks

Motorola supports OFTA's view in promoting effective competition between new entrants and existing operators during initial period, when new entrants are selected. We believe the 3G to 2G mandatory roaming arrangement is required. Moreover, 2G operator who fail to get 3G license might still want to provide 3G services to its subscribers. 2G to 3G roaming arrangement therefore might also need to be considered. It is expected that the needs for domestic 2G/3G roaming will vanish as 2G operators migrate their 2G networks to 3G capable and 3G operators improve their RF coverage.

5.3 Separation of Service Provision from Network Operation

The great scope of third generation technologies supports a new commercial model where a number of enterprises work together in both competitive and co-operative relationships to provide services to the subscribers.

This scenario does not preclude an enterprise from fulfilling more than one role (i.e. existing cellular operators can continue to provide services as they do today). However the market is opened up to new entrants to specialize in one of the roles and offer services in competition to those already existing in the market.

The roles are outlined below:

- **Network Operators** - responsible for the core third generation network
Indications are that all existing operators are candidates for third generation spectrum licenses in most countries. Some operators may decide to specialize in providing efficient bulk transport—much like Internet Service Providers today—while others are likely to act as Service Providers in addition to their role as Network Operators.

- **Service Providers** - responsible for the relationship with the customer
The Service Provider's role is quite different from today's definition. This is no longer simply a reseller role, but involves developing products and services to be offered via various different serving networks. Many service providers are expected to be new entrants to the mobile marketplace. These could include any organisation with good customer care facilities such as credit card companies, banks, supermarket chains and utilities.

The service provider will issue the SIM card, run Home Location Registers (HLR), and may arrange to have multiple operators deliver airtime to subscribers. Service providers may also contract with fixed line network operators, to deliver services for those customers that want to integrate their mobile and landline services.

In addition, the Service Provider's role will require rapid development and deployment of personalized telecom services, service management and control and features which are transparent to the underlying serving network.

- **Value Added Service/Content Providers** - offering new services
Including this role recognises the importance of additional services and features to the end user. The new role allows for existing services such as messaging, but also provides for a vast new range of applications and content from a wide range of suppliers. The market entry as a content provider should be as easy as setting up a website on the Internet.

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