FRAMEWORK FOR THIRD GENERATION (3G) CELLULAR NETWORK DEPLOYMENT AND SERVICES OFFERING IN SINGAPORE

RESPONSE FROM SIEMENS

Executive Summary

The key messages, related to the regulation of UMTS that we would like to express to the IDA can be summarised as follows:

The UMTS market is considered to be a truly new market characterised by mobile multimedia services that will be available for the mass market. The regulatory framework must facilitate and stimulate the development of this market.

Spectrum packaging as proposed by the UMTS Forum is recommended. License lots should contain a package of both paired and unpaired spectrum.

The license exempt spectrum should be released in parallel to the licensed spectrum.

Synchronised introduction of UMTS service in the parts of the world is an important prerequisite.

We believe that in general the existing regulatory framework is adequate. The regulation for content provisioning should be separated from the telecommunications specific regulation to the extent possible.

The UMTS license conditions should be as minimal as possible. However, some license conditions should be imposed in order to guarantee the early deployment of true mobile multimedia services.

General Considerations

The Siemens Vision on UMTS

Before commenting the IDA consultation document, it seems appropriate to summarise the Siemens view on UMTS. UMTS will integrate the current separate worlds of fixed and mobile telecommunications services in a digital data environment to serve the user as a comprehensive personal tool for unlimited communications. This means that the user can and will conduct any and all telecommunications activities, going from voice over fax and e-mail to multimedia services, from a mobile platform, receiving similar services regardless of location or environment.

UMTS is **the** platform for mobile communications at the beginning of the next millennium
The market for UMTS is considered to be a truly new market.
UMTS user's needs evolve out of current initial trends in the telecommunications, Internet, computing and entertainment industries.
UMTS must therefore provide full flexibility to cope with future user's needs determined by a high increase of user density, airtime per user and net information throughput per user.
The ETSI made decisions on UMTS terrestrial radio air interface (UTRA). UTRA offers the opportunity to overcome GSM limitations by deploying seamless user services via two adaptive

modes. Both modes target at overlapping applications, deploy additional spectrum at enlarged efficiency and are accepted by globally acting operators and vendors.

UMTS operators will often be GSM operators and have a strong need for the re-use of existing networks.

Applications for UMTS

The UMTS story is beginning today with early adopters of future broadband telecommunications services. GSM capabilities will be extended to higher data rate services with efficient use of transport resources. Specifically, the two new GSM data services, HSCSD and GPRS, can be seen as an "intermediate step" towards UMTS, targeted at different applications.

HSCSD (High Speed Circuit Switched Data) is a circuit-switched service aimed at applications, which require higher bandwidth and continuous data streams, making it an ideal solution for services, which require a constant delay.

GPRS (General Packet Radio Service) is targeted at a wide range of applications. As a packet-switched service, it is oriented towards applications requiring bulky and burst data transfer. GPRS is an ideal solution for Internet applications (e.g. Internet surfing), e-mail, traffic telematics, telemetry and fleet management.

UMTS will be a further evolutionary step to enrich the mobile telecom user's service world. Future market needs will be determined by:
- the maturity of the mass mobile market
- the convergence of information technology and telecommunication
- the personalised communication and/or information management applications.

Besides the improvements concerning data throughput and interworking, UMTS will lead to additional spectrum for the operators. Also the increase of spectrum efficiency will give the operator more output of the limited resource.

UMTS will support the full range of services from voice over narrowband up to wideband services. Packet data traffic will be the platform for the wideband services. In comparison to GSM 2+, and in compliance with the ETSI requirements, UMTS supports data rate capabilities with:
- at least 384 kbit/s with high mobility (<= 120 km/h) in suburban outdoor environments and
- at least 2 Mbit/s with low mobility (<= 10 km/h) in indoor and low range outdoor environments.

These allow for the introduction of new applications. The relationship between computing and transmission of information will become closer and closer and will get more and more personalised.

The ongoing technology standardisation process has led to the incorporation of two air interface technologies defined in two operational modes, Frequency Division Duplex (FDD) and Time Division Duplex (TDD). Both technologies in parallel provide the end-user with the benefits of both radio access principles in either overlapping or distinct environments:

The FDD mode (using W-CDMA) is better suited for application in the bigger cells (public macro and micro cell environments). It can handle symmetrical traffic with data transfer rates up to 384 kbit/s with high mobility.

The TDD mode (using TD-CDMA) is ideally suited for application in the smaller cells (public micro and pico cell environments and for indoor coverage). Furthermore it is thé technology for public wireless local loop and for unlicensed private cordless networks. Only the TDD mode is suited for very high data rates up to 2 Mbit/s (in the low mobility environment) and for the **increasing asymmetrical traffic demand.**

The primary advantages to network operators and mobile telecom users are increased capacity and higher data transfer rates. The higher data rates ultimately mean that UMTS services can be delivered seamlessly from residential indoor environments to the global roaming area. In situations where seamlessness is neither adequate nor feasible, a close service interworking on network level will be achieved. **Only TDD/FDD dual mode operation supports all these UMTS market requirements.**

The Changed Value Chain

In UMTS, besides the network operators that will act as pure traffic transporters, service providers and content providers will play an important role.
Network operators carry bits and bytes between 2 points.
Service providers develop, deliver and sell applications for the end users, e.g. daily weather forecast. They are the main point of contact for the users.
Content providers deliver the content for those applications developed by the service providers, e.g. the weather information required for the daily weather forecast service.

The Role of Siemens in 3G

Siemens is fully engaged in UMTS and is committed to making true mobile multimedia a reality.
To this purpose:
- We actively participate in all important standardisation bodies that are involved in the UMTS standardisation
- We co-operate in the UMTS Forum.
- We promote the opportunities of high-bandwidth services.
Therefore we invite operators to take part in our testing activities related to UMTS and for this purpose we have developed demonstrators for both modes of propagation (FDD and TDD).

As a supplier, Siemens has also adapted itself to the new environment in 3G:
- we will continue to deliver equipment for the network operators
- we will provide the applications required by the service providers
- we will provide the gateways and network functionality (middleware) required by the content providers for supplying their content.

In approaching this new mobile era, Siemens offer its customers competence and consultancy across the entire mobile network operator field.

Point-to-point Answers

(a) an assessment of the development of 3G cellular technology, the likely services being developed
and the potential demand from business and consumers;
(b) the potential of 3G technology and the scope of the 3G licence;

The vision of Siemens is that UMTS will integrate and converge currently separate worlds of fixed and mobile telecommunication services in a digital data environment to serve the user as a comprehensive personal tool for unlimited communications. This means that the user can and will conduct any and all telecommunications activities, going from voice over fax and e-mail to multimedia services, from a mobile platform, receiving similar services regardless of location or environment.

With UMTS a truly new market will be established. The development of this mobile multimedia market will happen in a phased approach with a limited set of functionalities already being offered by 2G services.

Siemens envisions that the 3rd generation mobile networks will introduce in a phased approach the full scope of value-added multimedia and broadband applications in the mobile environment. In an evolutionary path the existing 2nd generation mobile networks will evolve towards 3rd generation mobile multimedia and broadband networks.

Siemens has identified the following classes of applications and services that will be available with UMTS:
Communication Services
Information Services
Financial Services
Entertainment services
Education Services
Mobile office Services
Specific Services

Concerning traffic asymmetry, we believe that the <u>average</u> traffic asymmetry will be around 5 to 1 in 2005:
Access to Internet/Intranet yields traffic asymmetry up to 200:1 (DL:UL)
Mobile Office applications yield traffic asymmetry up to 40:1 (DL:UL)
Video telephony yield a traffic asymmetry of 1:1 (DL:UL)
The exact amount of traffic asymmetry is highly dependent on the offered (and used) services in the network.

Although business users will most probably be the early adopters of UMTS, we expect that already in 2005, the share of residential users will equal the share of business users. Looking at the services and applications that are envisaged, it is clear that UMTS aims at becoming a mass-market technology.
In order to enable the early development of the mobile multimedia market by the business segment, it is imperative that also the licensed exempt spectrum is being deployed from the beginning.

Siemens believes that the existing 2nd generation mobile networks will evolve in an evolutionary path towards 3rd generation mobile multimedia and broadband networks. Also the services that are offered on these networks will evolve as the underlying technology improves.

Nevertheless, some factors clearly set UMTS above second generation mobile systems:

♦ Its potential to support 2 Mbit/s data rates for users from the initial date of UMTS deployment (only when TDD mode is being deployed).
♦ Higher spectrum efficiency which is especially valid for TDD (since only one 5 MHz carrier is used for DL & UL together)
♦ Its better performance (negotiated QoS) and greater cost-effectiveness
♦ Its capabilities to offer a subscriber multiple connections at the same time

These capabilities, together with the inherent Internet Protocol support of UMTS, are a powerful combination to deliver interactive multimedia services as well as other new wideband applications such as video telephony and video conferencing.

By 2002, the smart card industry will be able to offer cards with greater memory capacity, faster CPU performance, contactless operation and greater capability for encryption. These advances will allow the UMTS SIM to add to the UMTS service package by providing portable high security data storage and transmission for users. As well as configuration software for the operation of any UMTS terminal, images, signatures, personal files, fingerprint or other biometrics data could be stored, down- or uploaded to or from the card.

It is expected that all fixed and mobile networks will adopt the same or compatible lower-layer standards for their subscriber identity cards to enable UMTS SIM roaming on all networks and universal user access to all services. Electronic commerce and banking using smart cards will soon become widespread and users will expect to be able to use the same cards on any terminal over any network.

New memory technologies can be expected to increase card memory sizes making larger programmes and more data storage feasible. Several applications and service providers could be accommodated on one card. In theory the user could decide which applications/services he wants on the card, much as he does for his computer's hard disk. This is the challenge and opportunity for service industries which evolving smart card technology presents.

With respect to regulatory issues on fixed mobile converging services, Siemens shares the viewpoints of the UMTS forum. The vision for the future of communications must start with the consumer who will want to communicate at any time, anywhere, with the same ease and facilities as if "at home". The term "virtual home environment" (VHE) was invented to encompass the full range of the Universal Mobile Telecommunications System (UMTS) concept wherein the network the customer uses is transparent and any distinction between "fixed" and "mobile" will be increasingly blurred if not eliminated. The "Information Society" will be a society on the move and the customer will want a seamless service, not only in terms of networking, roaming and handover, but also in relation to customer management activities such as billing.

> (c) the spectrum allocation mechanism and the spectrum requirements per operator;
> (d) the optimal number of operators to licence;

Siemens, according to the recommendations of the UMTS Forum, considers the 2x15 MHz + 5 MHz scenario as minimum lot size for a license holder for full UMTS service capabilities, i.e.:2x15 MHz in the paired bands plus 5 MHz in the unpaired band.

This amount of spectrum per operator is justified because of the amount of traffic that is forecasted (refer to the UMTS Forum reports) and to provide an operator with enough flexibility to build a

hierarchical three-layer radio coverage that is required when high bandwidth demanding services are implemented. In this context we would like to repeat the recommendation from the UMTS Forum that a separate frequency carrier should be reserved for low-mobility users: pedestrians and quasi-stationary users will generate a substantial portion of the expected traffic in UMTS especially in urban areas.

Note: Siemens preferred that the proportion of spectrum in the unpaired band would have been higher in order to be in line with the type of traffic that can be expected in a mobile multimedia network.

This spectrum allocation would allow for four national licenses which is intended in many European countries having already 3 GSM networks in place. Bringing in an additional/new operator will stimulate competition.

15 MHz spare spectrum remains in the unpaired band that could be allocated for license-exempt use. We believe it is essential for the development of the UMTS market to enable this license-exempt use as soon as technically feasible. Preferably the frequencies for license exempt use should be harmonised and should be released at the same time as the licensed frequencies.

(e) the approach for licensing additional 3G service providers;
(f) how existing mobile phone operators should be treated;
(g) the timing for award of 3G licenses and services launch dates

In general, different lot sizes have an impact on the number of subscribers that a certain network can support. Equal licensing conditions promote market competitiveness.
Being the general opinion that UMTS and GSM networks – though being operated possibly by a same company – should be kept as separate businesses, Siemens believes that no differentiation should be made between new and existing license holders.
Siemens therefore recommends that the awarded UMTS licenses should be as similar as possible. This also implies that national licenses should be considered in favour of regional ones.

The main steps depicted by UMTS forum are summarised in the following:
♦ licensing conditions available until the end of 1999
♦ award of the UMTS licenses in 2000
♦ start of the commercial UMTS service until the beginning of 2002.

Given
♦ the current status of 3GPP standardisation of UMTS Phase 1 ,
♦ the current status of network infrastructure development, mobile terminal development and UMTS demonstrator availability,

We would like to emphasise however that the award of the UMTS licenses should not be delayed and should preferably be finalised until mid 2000. The rationale behind this recommendation is that:
Operators will require some time to get familiar with the new technology. It is advisory that operators can plan a substantial internal trial phase using UMTS demonstrators. Planning: 2nd half of 2000.
Operators need time to implement a 3G coverage that allows commercial launch. Planning: 2000-2001

Finally, pre-commercial market trials will be required to decide upon the services to be launched. Planning: 2nd half of 2001.

FDD versus TDD
The ETSI/3GPP has designated two different and complementary transmission modes for UMTS:
◆ FDD with W-CDMA in the paired bands
◆ TDD with TD-CDMA in the unpaired bands.

Siemens believes that each of both modes is better suited for certain types of applications: FDD is more appropriate for the bigger cells (macro and micro) and symmetric traffic up to 384 kbit/s, whereas TDD better matches the requirements of small cells (micro, pico and indoor), very high bandwidth traffic up to 2 Mbit/s and asymmetric traffic. We would like to emphasise the **superior properties of TDD** to handle the asymmetric traffic in a very efficient way: with TDD a wide range of asymmetry flexibility from 14:1 to 2:13 (DL:UL) can be achieved.

In this way, when an UMTS operator should be able to offer UMTS services in any kind of environment – from indoor to outdoor, from low to very high data bit rates – **both transmission modes should be implemented**. And this implementation, again, depends on the frequencies allocated.

Siemens therefore recommends the **linkage of paired and unpaired spectrum on the same lot**.

Note: The usage of allocated spectrum is currently under discussion, e.g. the dedication of paired and unpaired frequency band to FDD and TDD mode. It is the opinion of Siemens that flexible use of the paired band and the usage of TDD in case of traffic asymmetry provides maximum flexibility for operators and regulatory institutions, which is necessary to react to changing market requirements. Siemens therefore promotes that TDD mode is also allowed in the paired band and that for future spectrum allocation, care must be taken that more unpaired spectrum for TDD is allocated to be able to handle the ever increasing traffic symmetry in an economical way.