



APT REPORT ON
APPLICATION OF IMT-2000 TECHNOLOGIES FOR FIXED
WIRELESS ACCESS APPLICATION

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1. INTRODUCTION

Most Developing Countries are characterized by low teledensity of its telecommunication service, including fixed line (PSTN) service. This has been driven by scarcity of capital – the huge up-front investment needed for rolling out copper-based access network and difficulty to install physical lines to individual customer premises.

Fixed Wireless Access (FWA) provides an alternative solution with a cheaper cost of deployment and speed to deploy. Combined with a decrease in price of customer terminal, this could be the future of telecommunication in developing countries.

Today many technologies have been used for FWA applications, in particular, using technologies from cellular platforms . The majority of which are 1st and 2nd generation. However , now is emerging FWA that utilizes terrestrial 3rd generation IMT-2000 technology as its radio interface and is called here IMT-2000 FWA[

Even though IMT-2000 technology is conceived primarily for mobile communications, it also is capable for providing economical and effective alternative to wireline access network. Used as IMT-2000 FWA, it can substantially reduce the up-front investment necessary for PSTN new lines and speed up the expansion of the telephone service, which in turn will ease the present digital divide in those countries. Furthermore IMT-2000 FWA has the capability of providing broadband service needed to enable developing countries to undertake their inclusion in the information society

The APT Wireless Forum Task Group 2 (AWF TG-2) has been established to assess how the developing countries provide cost effective communication and information infrastructure through introduction of various radio communication technologies, specifically for the use of the IMT-2000 technology to replace wireline PSTN.

A survey upon the APT members was conducted by TG-2 in July 2004 in order to be informed of their existing situations and plans of implementing IMT-2000 radio interface, such as CDMA2000 1X, as IMT-2000 FWA. A survey also sent to some vendors on the availability of the network infrastructure and the terminals. Another survey as a follow-up was conducted again by TG-2 between AWF1 Interim and AWF2 Meetings in 2005.

This report is aimed to provide a summary of the responses gathered from the surveys and input given by vendors on the availability of the equipment and presentation during the AWF meetings.

2. DEFINITION

This report uses terms and terminologies, which are defined as follows.

wireless access end-user radio connection to core network

fixed wireless access (FWA) wireless access with PSTN/ISDN the core networks

IMT-2000 FWA	FWA that uses IMT-2000 access interface
convergence	coordinated evolution of formerly discrete networks towards uniformity in support of services and applications
Fixed Mobile Convergence (FMC)	mechanism by which an IMT-2000 user can have his basic voice as well as other services through a fixed network as per his subscription options and capability of the access technology
mobility	ability to provide services irrespective of changes that may occur by user/terminal's activities; the user is able to change his network access point, as he moves, without interrupting his current service session, i.e., handovers are possible. In some situations, the handover may lead to a briefly suspended service session or it may require a change in the level of service provided as a consequence of the capabilities of the new access point to which the user has become connected through the handover process
Nomadism	Ability of the user to change his network access point after moving; when changing the network access point, the user's service session is completely stopped and then started again, i.e., there is no handover possible. It is assumed that normal usage pattern is that users shutdown their service session before moving to another access point or changing terminal. This is the mobility alluded to in the case of fixed mobile convergence
Personal Mobility	Ability of a user to access telecommunication services at any terminal on the basis of a personal identifier, and the capability of the network to provide those services according to the user's service profile. Note: Personal mobility involves the network capability to locate the terminal associated with the user for the purposes of addressing, routing and charging of the user's calls
Roaming	ability to provide service to a user through access from a network different than the network he has subscribed to. This defines the visited and the home networks respectively

Terminal Mobility	ability of a terminal to access telecommunication services from different locations and while in motion, and the capability of the network to identify and locate that terminal
Universal Personal Telecommunication (UPT)	Is a service concept that deploys IN capabilities to provide personal mobility to end users

3. STRUCTURE OF THE REPORT

This report is structured as two sections. The first section is about methodology applied for in the survey and the second section is the responses summarized from the survey.

The report also has several Annexes, which are:

- Annex 1 : Survey Question -1 IMT-2000 technology for fixed wireless access (fwa) applications
- Annex 2 A - H : Survey Result

4. METHODOLOGY

The methodology used by TG -2 is by distributing a set of questionnaire to the APT members and requesting them and several telecommunications vendors to fill in the set of questionnaires which already distributed after the AWF Interim 1 Meeting in Bangkok, May 2005

The Questionnaires addresses:

1. State of Deployment, Timeframe & take-up of an IMT 2000 technology as FWA in the member countries.
2. How the FWA position in relation to provision of Broadband Service
3. The standards, frequency spectrum & manufacturers
4. Cost per subscriber compared with PSTN.

5. SURVEY RESULT

Responses received from from 4 administrations i.e. Indonesia, Pakistan, Japan, and Singapore.

Detail of their responses can be referenced in annexes as listed in this table:

No	Respondent	Annex	Reference
1	Indonesia	2 A	AWF-2/23 rev

2	Japan	2 B	AWF – 2/19
3	Singapore	2 C	AWF-2/21
4	Pakistan	2 D	AWF-2/22

Responses on the availability of the infrastructure were received from 3 vendors, Qualcomm, Huawei and Samsung.

No	Respondent	Annex	Reference
1	Huawei	2E	As reported In TG-2 Report AWF- 1/ , Annex
2	Qualcomm	2F	
3	Samsung	2H	

Responses were also received from the CDG association and 3 manufactures including Huawei, Lucent, and Siemens.

No	Respondent	Reference
1	CDG	AWF-2/ 20
2	Huawei	AWF – 2/24
3	Lucent	AWF-2/25
4	Siemens	AWF-2/26

Summary of the survey is as follows:

a) State of deployment, time frame and take- up of FWA

Several members have deployed the IMT-2000 technology to provide Fixed Wireless Access to gradually replace the conventional copperwire PSTN.

The members are developing countries which have a relatively low fixed line penetration.

These members are Indonesia and Pakistan.

The more advanced members with high rate of fixed line penetration are either technology neutral (Singapore) or have no intention to deploy the IMT-2000 as a fixed wireless access solution (Japan).

For those members who already deployed IMT 2000 FWA,

Pakistan just granted licenses for IMT-2000 FWA in 14 regions to 24 operators. All of them are still in deployment stages of the network, and there is no prediction of the take- up of this technology by the time the questionnaire was filled. As of March

2006¹, there are four operators serving the local Market, with another new operator expected to start the commercial service in the next quarter. Takes up are still rather slow, mainly due to low awareness, low quality of service, and a rather high cost of connection from the rural point of view. The number of Subscribers in March 2006 is 650 thousand.

Indonesia already deployed IMT 2000 FWA with subscribers up to 3.5 million by July 2005.

Singapore is allowing their broadband spectrum licensees in 2.3 GHz and 2.5 GHz to explore IMT 2000 fixed wireless access. The licensee will have to deploy the network within 36 months and 18 months respectively from June 1 2005.

The table below shows the adoption of IMT 2000 FWA in the Asia Pacific Region ²

Country	Operator	Network Status	Frequency Band	Network Type	Type of System
Fiji	Telecom Fiji Limited	Launch 4Q 2006	800 MHz	WLL,	3G - CDMA2000 1xEV-DO & 3G CDMA 2000 1x
India	Bharat Sanchar Nigam Limited (BSNL)	Commercial	800 MHz	WLL,	3G - CDMA2000 1X
India	HFCL Infotel Limited	Commercial	800 MHz	WLL,	3G - CDMA2000 1X
India	Mahangar Telephone Nigam Ltd. (MTNL)	Commercial	800 MHz	WLL,	3G - CDMA2000 1X
Indonesia	PT Bakrie Telecom	Launch TBA	800 MHz	WLL,	3G - CDMA2000 1xEV-DO
Indonesia	PT Bakrie Telecom	Commercial	800 MHz	WLL,	3G - CDMA2000 1X
Indonesia	PT Indosat	Commercial	800 / 1900 MHz	WLL,	3G - CDMA2000 1X
Indonesia	PT TELKOM Indonesia	Commercial	800 MHz	WLL	3G - CDMA2000 1X
Malaysia	Telekom Malaysia	Launch TBA	800 MHz	WLL,	3G - CDMA2000 1X

¹ Pakistan Telecommunication Authority – Telecom Quarterly Review, March 2006

² CDMA Development Group – CDMA Worldwide Database, www..cdg.org

Pakistan	DVCOM	Launch 4Q 2006	1900 MHz	PCS/W LL,	3G - CDMA2000 1xEV-DO
Pakistan	DVCOM	Launch 4Q 2006	1900 MHz	PCS/W LL,	3G - CDMA2000 1X
Pakistan	Pakistan Telecommunication Company Limited (PTCL)	Launch TBA	1900 MHz	PCS/W LL,	3G - CDMA2000 1xEV-DO & 3G - CDMA2000 1X
Pakistan	TeleCard Limited	Commerci al	1900 MHz	WLL,	3G - CDMA2000 1X
Pakistan	Worldcall	Commerci al	1900 MHz	WLL,	3G - CDMA2000 1X
Sri Lanka	Lanka Bell	Commerci al	1900 MHz	WLL,	3G - CDMA2000 1X
Sri Lanka	Sri Lanka Telecom Limited	Commerci al	800 MHz	WLL,	3G - CDMA2000 1X
Sri Lanka	Suntel	Trial	800 MHz	WLL,	3G - CDMA2000 1xEV-DO
Sri Lanka	Suntel	Commerci al	800 MHz	WLL,	3G - CDMA2000 1X
Vietnam	S Telecom	Launch TBA	800 MHz	WLL,	3G - CDMA2000 1xEV-DO
Vietnam	S Telecom	Commerci al	800 MHz	WLL,	3G - CDMA2000 1X

b) Positioning of FWA in Broadband and Mobility

Following are the readily available IMT 2000 terrestrial Radio Access Interface standards as stated by the manufacturers:

1. CDMA2000 1X (IS-2000)
2. CDMA2000 1xEV-DO (IS-856)
3. WCDMA (UMTS)

CDMA2000 1X is a 3G evolutionary path for the second generation CDMA systems (IS-95 A/B) and it supports both circuit switched voice & data as well as packet switched data services. Whereas, CDMA2000 1xEV-DO is standard developed and optimized exclusively for packet data services. WCDMA is an air interface standard specially designed as a 3G path for the second generation GSM systems. Basically, all these standards are designed to handle both Fixed as well as Mobile Wireless Access services.

All manufacturers do not differentiate Fixed wireless access or Mobile wireless access since they believe the IMT-2000 infrastructure is capable in providing both of them to both fixed terminal or mobile terminal. The differentiation of Fixed Wireless Access and Mobile Wireless Access will not be in technology; rather it will be in the maximum range of mobility as requested by the telecommunications providers as allowed by the Regulator in the country.

In providing a Fixed Wireless Access, the provider simply impose a mobility restrictions by BTS / Cell level by using the neighbouring cell list blocking method or using Network

ID / Cell ID blocking method. Once the limitation mechanism is revoked and the terminal is replaced with a mobile terminal, the service is changed into a Mobile Wireless Access.

Another IMT-2000 technology deployed in the lower bands of spectrum of 450 MHz bands is called CDMA450. This technology has been deployed throughout the world to provide voice and data services to users in urban as well as remote areas. Just like the other family of IMT 2000 technologies, CDMA450 networks can be deployed in either fixed wireless, limited mobility wireless or fully mobile wireless settings depending on the applications.

The table below shows the adoption of FWA CDMA450 in the Asia Pacific Region ³

Country	Operator	Network Status	Frequency Band	Network Type	Type of System
Cambodia	Cambodia Shinawatra Co. Ltd.	Commercial 3Q 2004	450	WLL & Limited Mobility	CDMA 1X
China	China Telecom	Commercial 1H 2003	450	WLL	CDMA 1X
Laos	LTC	Commercial 10/1/2004	450	WLL and Limited Mobility	CDMA1X

Country	Operator	Network status	Frequency Band	Network Type	Type of System
Laos	LTC	TBA	450	WLL & Limited Mobility	CDMA 1xEV-DO
Pakistan	Great Bear International	Commercial 5/2005	450	WLL	CDMA 1X
Pakistan	Great Bear International	3Q 2005	450	WLL	CDMA 1xEV-DO
Pakistan	Pakistan Telecom Company Limited	Commercial 5/2004	450	Mobile & WLL	CDMA 1X
Vietnam	Vietnam Power Telecom (VP Telecom)	Pre-commercial 4/12/2005	450	Mobile, WLL	1X
Vietnam	Vietnam Power	Q3 2005	450	Mobile, WLL	1xEV-DO

³ CDMA Development Group - Response to AWF Task Group 2 Questionnaire on Usage of Lower Frequency Band(s) (below 600 MHz) in the AP region

	Telecom (VP Telecom)				
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Despite the ability of broadband and mobility services for all IMT-2000 technology, the implementation adopted by the member countries varies:

The members which adopt IMT-2000 FWA positioned it as a solution to increase basic telephony services and did not impose the obligation to provide broadband services.

The limitation of Mobility differs in each member.

Indonesia: The mobility is restricted within 1 local charging area, which could be as wide as a city. It is not restricted to a single base station. Some of the operators provide sim card with several numbers embedded to it, one for each charging area.

Pakistan: The mobility is restricted for a single base station in one telecommunication region only.

On the other hand, **Singapore**, has not deployed IMT-2000 FWA in their network, however for those who received frequency spectrum for BWA in 2.3 and 2.5 GHz band is allowed to deploy IEEE 802.16 (WiMAX) or other proprietary system including IMT-2000 (technology neutral) to provide FWA before January 1, 2006, with mobility up to 10 km/h.

(c) Standard, Frequency Spectrum & Manufacturer

As mentioned above, the vendors use various standards and support all spectrum bands presently allocated for mobile wireless communications.

The CDMA2000 1X (IS 2000) system is designed to operate in the 13 band classes as follows:

- a. Band Class ‘0’ : NA Cellular band (824 to 849 & 869 to 894 MHz)
- b. Band Class ‘1’ : NA PCS band (1850 to 1910 & 1930 to 1990 MHz)
- c. Band Class ‘2’ : TACS band (872 to 888 & 917 to 933 MHz and variants)
- d. Band Class ‘3’ : JTACS band (parts of 887 to 925 & 832 to 870 MHz)
- e. Band Class ‘4’ : Korean PCS band (1750 to 1780 & 1840 to 1870 MHz)
- f. Band Class ‘5’ : NMT 450 band (452.5 to 457.475 & 462.5 to 467.475 MHz & other variants)
- g. Band Class ‘6’ : IMT2000/UMTS band (1920 to 1980 & 2110 to 2170 MHz)
- h. Band Class ‘7’ : 700 MHz band (776 to 794 & 746 to 764 MHz)
- i. Band Class ‘8’ : 1800 MHz DCS band (1710 to 1785 & 1805 to 1880 MHz)
- j. Band Class ‘9’ : 900 MHz band (880 to 915 & 925 to 960 MHz)
- k. Band Class ‘10’ : Secondary 800 MHz band (806 to 824 & 851 to 869 MHz and 896 to 901 & 935 to 940 MHz)
- l. Band Class ‘11’ : European PAMR (450 MHz) band with 6 sub-classes
- m. Band Class ‘12’ : 800 MHz PAMR band (870 to 876 & 915 to 921 MHz)

The CDMA2000 1X (IS-2000) & CDMA2000 1X –EV-DO (IS-856) equipment is available in the following frequency bands:

- a. Band Class ‘0’ : NA Cellular band (824 to 849 & 869 to 894 MHz)
- b. Band Class ‘1’ : NA PCS band (1850 to 1910 & 1930 to 1990 MHz)
- c. Band Class ‘3’ : JTACS band (parts of 887 to 925 & 832 to 870 MHz)
- d. Band Class ‘4’ : Korean PCS band (1750 to 1780 & 1840 to 1870 MHz)
- e. Band Class ‘5’ : NMT 450 ‘A’ band (452.5 to 457.475 & 462.5 to 467.475 MHz)

The WCDMA equipment is available in the following frequency bands:

- a. Band Class ‘1’ : NA PCS band (1850 to 1910 & 1930 to 1990 MHz)
- b. Band Class ‘6’ : IMT2000/UMTS band (1920 to 1980 & 2110 to 2170 MHz)

The CDMA2000: Band Class 5 Frequency Plan (CDMA450)

System Designator	Band Subclass	Transmit Frequency Band (MHz)	
		Mobile Station	Base Station
A	0	452.500-457.475	462.500-467.475
B	1	452.000-456.475	462.000-466.475
C	2	450.000-454.800	460.000-464.800
System Designator	Band Subclass	Transmit Frequency Band (MHz)	
		Mobile Station	Base Station
D	3	411.675-415.850	421.675-425.850
E	4	415.500-419.975	425.500-429.975
F	5	479.000-483.480	489.000-493.480
G	6	455.230-459.990	465.230-469.990

H	7	451.310-455.730	461.310-465.730
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*Note: The Band Class specification for CDMA2000 spread spectrum systems is being updated to include modifications to Band Class 5, Band Class 11, and Band Class 12. The proposal being considered by 3GPP2 is to create new blocks (band subclasses) with a 25 kHz frequency spacing to supplement those blocks with 20 kHz frequency spacing.

For CDMA2000 1X (IS 2000), CDMA2000 1X EV-DO (IS 856) & WCDMA There are 50 vendors providing 500 models of terminals (mobile phones, fixed phones, PCMCIA cards, etc).

For CDMA 450, there are five manufacturers offering CDMA450 network equipment (Huawei, Hyundai Syscomm, Lucent Technologies, Nortel Networks, and ZTE), with ten manufacturers offering CDMA450 terminals.

All the IMT-2000 fixed wireless networks are also designed to support mobility aspects. The evolutionary path of each IMT-2000 systems is given below:

- IS-2000: CDMA2000 1X Release 0, Release A, Release B, Release C and the Release D (1xEV-DV)
- IS-856: CDMA2000 1xEV-DO Release 0 and the Release A
- WCDMA: Revision 99, Revision 4 and the Revision 5 (HSDPA)

Indonesia uses CDMA 2000 – 1X with frequency spectrum of 800 MHz and 450 MHz. Currently Indonesia also has deployed CDMA 2000 – 1X in 1900 MHz, which will be reallocated to 800 MHz.

Currently various manufacturer support the deployment such as Samsung, Motorola, Ericsson, ZTE and Huawei. Indonesia is suggesting AWF to have further study between MWA & FWA.

Pakistan does not designate any specific adoption of the technology; however the licensees intend to implement CDMA 2000. No exclusive vendor are selected. Spectrum bands used are as follows:

S. No.	Frequency Bands auctioned for FWA
1	452.5 – 457.6 / 462.5 – 467.6 MHz
2	479.0 – 483.480 / 489.0 – 493.480 MHz
3	1880 – 1885 / 1960 – 1965 MHz
4	1890 – 1895 / 1970 – 1975 MHz
5	1895 – 1900 / 1975 – 1980 MHz
6	3.4 – 3.6 GHz

Singapore is allowing the broadband spectrum licensees in 2.3 GHz & 2.5 GHz to provide standard IEEE 802.16 (WiMAX) as well as IMT-2000 fixed wireless access under technology neutral arrangement.

d) Cost per subscriber compared with PSTN and its Maintenance Cost.

Most of the members that gave responses have not fully deployed the IMT2000 FWA, except Indonesia; hence the data is only received from Indonesia.

The Integrated Cost per subscriber (exclude spectrum fee) is USD 100 compared with USD 500 of copper wire, with expectation to decline further. Average network operation and maintenance cost is approximately USD 20 – USD 30 / subscriber / year.

e) Convergence of existing fixed networks and IMT-2000 mobile networks

About FMC (Fixed Mobile Convergence) ETSI noted as follows: "... An important feature of FMC is the separation of the subscriptions and services from individual access points and terminals and to allow users to access a consistent set of services from any fixed or mobile terminal via any compatible access point. An important extension of this principle is related to inter-network roaming; users should be able to roam between different networks and to be able to use the same consistent set of services through those visited networks".

Previously we had ISDN (Integrated System Digital Network) where the communication network was tried to be intergrated rather than convergence . Even though at the beginning the idea has been well received, but soon the fact was recognized that building a unique all-encompassing network is not feasible, due to economy and complexity. The line of thinking starts to change from integration to convergence

Among phenomena in the process of change, FMC is one phenomenon that we are going to focus at. FMC will be a reality in sight. The evidences are:

- the emergence of IMT-2000 FWA where mobile communication networks have the same access network as fixed network;
- SMS inter-working between fixed and mobile networks;
- the same mobile terminal could be used to access mobile network and FWA;
- prepaid subscription in mobile as well as in fixed networks;
- how the goals of increasing teledensity and providing broadband service with IMT-2000 technologies could be linked together in fixed networks with IMT-2000 FWA;
- mobility features in both kind of networks as long as regulation permits;
- single subscription to fixed and mobile networks with and seamless GSM/fixed handover (Bluephone in UK) .

But the strongest evidence that evolution of FMC is already in an advanced status is the recent issuance of Recommendation ITU-T Q.1761 "Principles and Requirements for Convergence of Fixed and Existing IMT-2000 Systems" including its revision.

Recommendation ITU-T Q.1761 "Principles and Requirements for Convergence of Fixed and Existing IMT-2000 Systems" [2] addresses the opportunities in the *near to medium term* that may be enabled by providing capabilities to enable IMT-2000 roaming users to access their basic and enhanced services, possibly excluding terminal mobility, in environments where IMT 2000 is not yet deployed. The draft new Recommendation Rec. FMC-IMS "Fixed Mobile Convergence with a common IMS session control domain" [3] moves on from Q.1761 to address the *longer-term* fixed-mobile convergence opportunities offered by IMS-based Networks.

6. RECOMMENDATION ITU-T Q.1741

The objective of the Recommendation is to provide guidance for and the identification of a situation where a mobile IMT-2000 user roams to a fixed network such that the IMT-2000 user may obtain basic services plus access to the user's services per the subscription profile. This situation provides personal mobility to IMT-2000 user to access a fixed network that excludes terminal mobility. The mechanism of mobility in the situation describes in the Recommendation is as it was initially defined for UPT.

However it is conceivable that personal as well as terminal mobility could be provided to IMT-2000 user to access a fixed network that uses IMT-2000 FWA, on the ground that both networks have the same kind of radio access system. In this last situation, we are closer to the realization of FMC.

7. HARMONIZATION OF SPECTRUM FOR THE USE OF IMT-2000 FWA

IMT-2000 FWA uses the same access interface as mobile wireless access (MWA) system of IMT-2000. Normally, such FWA systems are designed in the same frequency band as the MWA systems to enhance the manufacturing efficiency. Therefore it is an urgent and critical subject to study the sharing criteria and the particularly necessary geographical separation, between both systems. We are pleased to note that AWF SWG has included in its work plan the study of the criteria of interference conditions for such cases. TG-2 would be happy to collaborate with SWG in their study on this subject.

8. REGULATORY IMPLICATIONS OF FMC

Operators of IMT-2000 FWA are normally allowed by the regulation to provide limited mobility, which normally is confined within a local charging zone. It will not create technical problem, since the mobility restrictions can be implemented/achieved at BTS level or even at zonal level by using the neighbour list blocking method or by programming the HLR with zonal restriction information. Network ID/System ID or Cell ID/Sector ID etc., can also be used to limit mobility (see ANNEX 2).

However, the complication arises at the level of competition between mobile and FWA operators, as the former dispute the "quasi subsidized" pricing of spectrum for IMT-2000 FWA that enable the latter to offer lower subscriber rate. Obviously, the "subsidy" was justified by the function of the latter to address low teledensity in rural areas.

There is a variety of regulator's answer to the dispute. It ranges from outright prohibition of the use of mobile terminals for FWA to the application of unified licensing. Before the application of unified licensing towards the real long term FMC-IMS, regulator should solve the issue of numbering of the geographic (fixed services) and non-geographic services (mobile services).

9. CONCLUDING REMARKS

Fixed Wireless Access (FWA) utilizes IMT-2000 technology as its radio interface provides an alternative solution with a cheaper cost of deployment and speed to deploy. Combined with a decrease in price of customer terminal, this is one of the future telecommunication in developing countries.

Even though IMT-2000 technology is conceived primarily for mobile communications, it also is capable for providing economical and effective alternative to wireline access network as alternative solution for the developing countries with a relatively low penetration of fixed line (PSTN). Used as IMT-2000 FWA, it can substantially reduce the up-front investment necessary for PSTN new lines and speed up the expansion of the telephone service, which in turn will ease the present digital divide in those countries. Furthermore IMT-2000 FWA has the capability of providing broadband service needed to enable developing countries to undertake their inclusion in the information society. It can provide the whole range of services closely related to mobile such as location based service, SMS, MMS etc. The differentiation mainly is in the limitation of mobility due to regulation.

The mobility varies between countries, from just 1 BTS to as wide as 1 city (one charging area). The challenge therefore for the regulators of these countries are to determine the borderline where such service is viewed as a Fixed Wireless Access (to substitute the capital extensive PSTN) or as a Mobile Wireless Access where it competes for all services with Mobile Operators.

The IMT-2000 FWA in these countries viewed as a replacement of a copper based PSTN to provide basic telephony was not intended to provide a broadband service, however, it is more likely that the FWA will evolve and ultimately provide broadband services as demanded by the market.

This is the beginning of evolution of FMC (Fixed Mobile Convergence) and the the strongest evidence that evolution of FMC is already in an advanced status is the recent issuance of Recommendation ITU-T Q.1761 “Principles and Requirements for Convergence of Fixed and Existing IMT-2000 Systems” including its revision. The issues of spectrum pricing and the numbering that has been discussed earlier should be discussed and resolved .

ANNEX 1

SURVEY QUESTIONNAIRES -1

IMT-2000 Technology for Fixed Wireless Access (FWA) Applications

List of Inquiries

A. Definition

In this questionnaire the following terminologies are used.

1. *Wireless Access*: End-user radio connection to core network.
2. *Fixed Wireless Access (FWA)*: wireless access application in which the core networks are typically PSTN or ISDN.
3. *IMT-2000 FWA*: FWAs that use IMT-2000 radio interface as the wireless access.

Note – Though ITU standards recognized a number of IMT-2000 terrestrial radio interfaces, this survey is interested only those that most likely be employed in the APT region. These are IMT-2000 CDMA DS (WCDMA) and IMT-2000 MC (CDMA 2000 1X).

B. Survey Questions

1. Do you deploy or intend to deploy IMT-2000 FWA in your existing fixed network?
2. If you have deployed IMT-2000 FWA, what is the number of IMT-2000 FWA subscribers at present and what you intend to reach around 5 years from now?
3. What is the standard of the IMT-2000 wireless access employed by and who are the manufacturers of IMT-2000 FWA systems that are in use in your country?
4. If you intend to deploy IMT-2000 FWA, what is the intended time frame, the IMT-2000 standard for the wireless access and quantity of deployment?
5. Are broadband services necessary to be supported by the IMT-2000 FWA in your country?
6. What is or would be the required minimum bit rate for broadband services?
7. Is there restricted mobility on the IMT-2000 FWA? If so, what are the requirements?
8. If you have deployed IMT-2000 FWA, what are the frequency spectrum bands which are currently in use for this FWA?
9. If you intend to deploy IMT-2000 FWA, do you plan to allocate specific frequency bands for this FWA or to use IMT-2000 band according to WRC 2000?
10. What is the comparative integrated cost per subscriber access to the service provider/operator between wireline access and wireless access by IMT-2000 FWA for providing fixed services: Also, what are the target costs for these in your country? (Assuming blocking of 1% and near wireline quality).
11. What is the average network operation and maintenance cost per subscriber access to IMT-2000 FWA compared to wireline access?

RESULT OF SURVEY – INDONESIA

QUESTIONNAIRE -1 (Up-dated August 2005)

1. Do you deploy or intend to deploy IMT-2000 FWA in your existing fixed network?

Answer: Yes, Indonesia has deployed FWA using CDMA 2000 1X technology.

2. If you have deployed IMT-2000 FWA, what is the number of IMT-2000 FWA subscribers at present and what you intend to reach around 5 years from now?

Answer: three and half million as per end of July 2005 and by December 2008 is targeted to be 15 million.

3. What is the standard of the IMT-2000 wireless access employed by and who are the manufacturers of IMT-2000 FWA systems that are in use in your country?

Answer:

Operator	Technology	Frequency Band	Manufacturer
PT. TELKOM	CDMA 2000 1X	800 MHz	Samsung, Motorola, and Ericsson
	CDMA 2000 1X	1900 MHz	Ericsson, and Motorola
PT. INDOSAT	CDMA 2000 1X	800 MHz	ZTE China
	CDMA 2000 1X	1900 MHz	ZTE China Huawei,China
PT. BAKRIE TELEKOM	CDMA 2000 1X	800 MHz	Huawei China
PT MANDARA	CDMA 20001X (for USO porposes)	450 MHz	Huawei, China

4. If you intend to deploy IMT-2000 FWA, what is the intended time frame, the IMT-2000 standard for the wireless access and quantity of deployment?

Answer: See no.1

5. Are broadband services necessary to be supported by the IMT-2000 FWA in your country?

Answer: Up to the market. However most likely that the operator will provide broadband services.

6. What is or would be the required minimum bit rate for broadband services?

Answer: 144 kbps

7. Is there restricted mobility on the IMT-2000 FWA? If so, what are the requirements?

Answer: IMT-2000 FWA is allowed to have limited mobility within the local charging area. No roaming. However some operator provide services for a number of local charging area using the same handset and SIM card but using different number for each charging area.

8. If you have deployed IMT-2000 FWA, what are the frequency spectrum bands which are currently in use for this FWA?

Answer: See No. 3

9. If you intend to deploy IMT-2000 FWA, do you plan to allocate specific frequency bands for this FWA or to use IMT-2000 band according to WRC 2000?

Answer: Suggest that AWF make a study on frequency sharing between Mobile Wireless Access (MWA) and Fixed Wireless Access (FWA).

10. What is the comparative integrated cost per subscriber access to the service provider/operator between wireline access and wireless access by IMT-2000 FWA for providing fixed services: Also, what are the target costs for these in your country? (Assuming blocking of 1% and near wireline quality).

Answer: Less than USD 50 (excluded spectrum cost) compare with more than USD 500 for fixed wireline. The recent tender on CDMA2000 FWA fell about USD 25

11. What is the average network operation and maintenance cost per subscriber access to IMT-2000 FWA compared to wireline access?

Answer: Approximately USD 20 - 30 /subscriber/year.

RESULT OF SURVEY – JAPAN

Q.1 IMT-2000 technology for Fixed Wireless Access (FWA) applications

Answer 1

No.

IMT-2000 FWA has not been deployed as the wireless access to the core network in Japan and there is no intention to deploy it in the future.

Answer 2

Since the IMT-2000 FWA has not been deployed as the wireless access to the core network in Japan and there is no intention to deploy it in the future, it is not possible to answer this question. This goes same for the following Question 3~5 and 7~11.

Answer 6

The required minimum bit rate for broadband services is not defined in Japan, thought, services which are provided through FTTH, DSL, CATV internet, etc. are called as broadband service.

Q.2 Usage of lower frequency band(s) (below 600 MHz)in the AP region

Answer 1

Please see the following sites.

Principal Uses and Characteristics of Radio Wave

<http://www.tele.soumu.go.jp/e/search/myuse/summary.htm>

Current Situations of Spectrum Use in Japan

<http://www.tele.soumu.go.jp/e/search/myuse/use0303/index.htm>

Answer 2 - 4

No comment.

Q.3 Survey of (other) technologiesthat can be used for FWA application

Answer 1 - 6

No answer.

ANNEX 2C

RESULT OF SURVEY - SINGAPORE

QUESTIONNAIRE 1

IMT-2000 technology for Fixed Wireless Access (FWA) applications

Introduction

In July 2004, AWF TG-2 conducted a survey of APT membership to determine their existing situations and their plans for implementing IMT-2000 radio interface — such as WCDMA or IMT-2000 1X — as IMT-2000 FWA. The original survey is now reissued to gather updated information as well as responses from additional administrations and members. Therefore this questionnaire contains the following. (see meeting document AWF-1/41R1).

Survey Questions

1. Do you deploy or intend to deploy IMT-2000 FWA in your existing fixed network?
[IDA] Yes, IMT-2000 FWA is allowed in Singapore.
2. If you have deployed IMT-2000 FWA, what is the number of IMT-2000 FWA subscribers at present and what you intend to reach around 5 years from now?
3. What is the standard of the IMT-2000 wireless access employed by and who are the manufacturers of IMT-2000 FWA systems that are in use in your country? [IDA] Proprietary standards (e.g Aperto, Soma Networks, Motorola) are expected to be deployed along with the IEE802.16 standard.
4. If you intend to deploy IMT-2000 FWA, what is the intended time frame, the IMT-2000 standard for the wireless access and quantity of deployment?
[IDA] The 2.3 GHz and 2.5 GHz spectrum licensees have to deploy their Wireless Broadband Access (WBA) networks within 36 months and 18 months respectively from 1 June 2005.
5. Are broadband services necessary to be supported by the IMT-2000 FWA in your country?
[IDA] No, IEEE 802.16 (standard promoted by WiMAX) and other proprietary systems can support broadband services.
6. What is or would be the required minimum bit rate for broadband services?
7. Is there restricted mobility on the IMT-2000 FWA? If so, what are the requirements?
[IDA] The restriction is that before 1 January 2006 only stationary fixed services with limited mobility end-user speeds up to 10km/h is allowed.
8. If you have deployed IMT-2000 FWA, what are the frequency spectrum bands which are currently in use for this FWA?
[IDA] Spectrum in the 2.3 GHz and 2.5 GHz has been allocated for WBA. These bands can be used for IMT-2000 FWA. please refer to the following URL for the details:<http://www.ida.gov.sg/idaweb/pnr/infopage.jsp?infopagecategory=spectrum:pnr&versionid=2&infopageid=I3284>
9. If you intend to deploy IMT-2000 FWA, do you plan to allocate specific frequency bands for this FWA or to use IMT-2000 band according to WRC 2000?
10. What is the comparative integrated cost per subscriber access to the service provider/operator between wireline access and wireless access by IMT-2000 FWA for

APT/AWF/REP-3

providing fixed services: Also, what are the target costs for these in your country?
(Assuming blocking of 1% and near wireline quality).

11. What is the average network operation and maintenance cost per subscriber access to IMT-2000 FWA compared to wireline access? .

RESULT OF SURVEY - PAKISTAN

QUESTIONNAIRE 1

IMT-2000 technology for Fixed Wireless Access (FWA) applications

Question No. 1: Do you deploy or intend to deploy IMT-2000 FWA in your existing fixed network?

Answer: In Pakistan, licenses have recently been granted for the introduction of FWA to the successful bidders of spectrum. This has paved way for the introduction of IMT-2000 FWA in terms of CDMA2000 based networks.

Question No. 2: If you have deployed IMT-2000 FWA, what is the number of IMT-2000 FWA subscribers at present and what you intend to reach around 5 years from now?

Answer: Licenses for IMT-2000 FWA have recently been granted and the network roll out is in the initial stages. Prediction of subscribers in this regard in five years from now is difficult.

Question No. 3: What is the standard of the IMT-2000 wireless access employed by and who are the manufacturers of IMT-2000 FWA systems that are in use in your country?

Answer: Recent licensing in Pakistan for FWA is technology neutral. However, licensed operators intend to implement CDMA2000 for their networks. Different vendors/manufacturers are being selected by the operators in this regard including ZTE, Samsung, Huawei etc.

Question No. 4: If you intend to deploy IMT-2000 FWA, what is the intended time frame, the IMT-2000 standard for the wireless access and quantity of deployment?

Answer: A total of 24 operators have been issued licenses in 14 telecom regions in Pakistan in various bands. All these operators are in initial stage of their network roll out. However, operation has already been started by some companies in major cities of the country.

Question No. 5: Are broadband services necessary to be supported by the IMT-2000 FWA in your country?

Answer: The initial goal of the telecom de-regulation is to provide basic telephony and broadband services are not necessary to be supported by IMT-2000.

Question No. 6: What is or would be the required minimum bit rate for broadband services?

Answer: The bit rate shall comply with the definitions of ITU-R Recommendations, i.e. 2.048 Mbps.

Question No. 7: Is there restricted mobility on the IMT-2000 FWA? If so, what are the requirements?

Answer: Separate licenses have been issued in 14 telecom regions. Recent licensing for the FWA is based on Limited Mobility Communication Service i.e. customer's terminal equipment may obtain access to the mobile communication service using a single pre-defined network base station and the same is restricted to one telecommunication region.

Question No. 8: If you have deployed IMT-2000 FWA, what are the frequency spectrum bands which are currently in use for this FWA?

Answer: The frequency bands auctioned for FWA are attached as Annex-A.

Question No. 9: If you intend to deploy IMT-2000 FWA, do you plan to allocate specific frequency bands for this FWA or to use IMT-2000 band according to WRC 2000?

Answer: Portions of spectrum in PCS 1900 MHz Band have been auctioned in Pakistan for FWA, which are inline with the bands identified by ITU. However, two other standardized bands of CDMA (NMT) in 450 MHz Range have also been auctioned for the same.

Question No. 10: What is the comparative integrated cost per subscriber access to the service provider/operator between wireline access and wireless access by IMT-2000

FWA for providing fixed services: Also, what are the target costs for these in your country? (Assuming blocking of 1% and near wireline quality).

Answer: The systems are being rolled out at this juncture, therefore comparison cannot be made.

Question No. 11: What is the average network operation and maintenance cost per subscriber access to IMT-2000 FWA compared to wireline access?

Answer: The systems are being rolled out at this juncture, therefore comparison cannot be made.

ANNEX - A

S. No.	Frequency Bands auctioned for FWA
1	452.5 – 457.6 / 462.5 – 467.6 MHz
2	479.0 – 483.480 / 489.0 – 493.480 MHz
3	1880 – 1885 / 1960 – 1965 MHz
4	1890 – 1895 / 1970 – 1975 MHz
5	1895 – 1900 / 1975 – 1980 MHz
6	3.4 – 3.6 GHz

RESULT OF SURVEY - HUAWEI

QUESTIONNAIRE 1**IMT-2000 technology for Fixed Wireless Access (FWA) applications**

Q.1. Do you deploy or intend to deploy IMT-2000 FWA in your existing fixed network?

Huawei: There are particular cases in our country with IMT-2000 FWA deployment up to now. (Among the FWA product manufactured and deployed by Huawei Technologies, the radio wireless access interface is mainly from CDMA2000, with further scalability to CDMA 1XEV-DO. eg. Product deployed in Ethiopia)

Q.2. If you have deployed IMT-2000 FWA, what is the number of IMT-2000 FWA subscribers at present and what you intend to reach around 5 years from now?

Huawei: expect to be confirmed.

Q.3. What is the standard of the IMT-2000 wireless access employed by and who are the manufacturers of IMT-2000 FWA systems that are in use in your country?

Huawei : no answer

Q.4. If you intend to deploy IMT-2000 FWA, what is the intended time frame, the IMT-2000 standard for the wireless access and quantity of deployment?

Huawei: Actually the IMT-2000 FWA products already have been deployed in the overseas market, eg. Ethiopia, Algeria etc. Presently the products are based on CDMA 2000 standard and the network quality is reflected stable and smooth by our customers.

Q.5. Are broadband services necessary to be supported by the IMT-2000 FWA in your country?

Huawei: still in survey without immediate response.

Q.6. What is or would be the required minimum bit rate for broadband services?

Huawei: 144 kbps at minimum.

Q.7. Is there restricted mobility on the IMT-2000 FWA? If so, what are the requirements?

Huawei: Since IMT-2000 FWA is basically only replacing the wire line fixed access function its mobility shall be restricted within the PSTN/ISDN local charging area in order not to distort the competition of cellular against fixed service.

Q.8. If you have deployed IMT-2000 FWA, what are the frequency spectrum bands which are currently in use for this FWA?

Huawei: CDMA 450MHz/800MHz

Q.9. If you intend to deploy IMT-2000 FWA, do you plan to allocate specific frequency bands for this FWA or to use IMT-2000 band according to WRC 2000?

Huawei: In principle, the allocation shall be in compliance with the latest definition by WRC and eliminate any inconsistency especially interference to others.

Q.10. What is the comparative integrated cost per subscriber access to the service provider/operator between wireline access and wireless access by IMT-2000 FWA for providing fixed services: Also, what are the target costs for these in your country? (Assuming blocking of 1% and near wireline quality).

Huawei: to be surveyed.

Q.11. What is the average network operation and maintenance cost per subscriber access to IMT-2000 FWA compared to wireline access?

Huawei: to be surveyed.

RESULT OF SURVEY ON AVAILABILITY OF IMT-2000 FWA.

(Action: To have a further survey by Huawei)

Survey responses

The following summarizes the consolidated survey responses. It is listed according to the sequence of the questions in the circular letter.

Q1. Which IMT-2000 terrestrial radio access interface is supported by your IMT-2000 FWA?

ANS) Following are the readily available IMT 2000 terrestrial Radio Access Interface standards.

4. CDMA2000 1X (IS-2000)

5. CDMA2000 1xEV-DO (IS-856)
6. WCDMA (UMTS)

CDMA2000 1X is a 3G evolutionary path for the second generation CDMA systems (IS-95 A/B) and it supports both circuit switched voice & data as well as packet switched data services. Where as, CDMA2000 1xEV-DO is standard developed and optimized exclusively for packet data services.

WCDMA is an air interface standard specially designed as a 3G path for the second generation GSM systems

Basically, all these standards are designed to handle both Fixed as well as Mobile Wireless Access services.

Q.2. In which frequency band is your IMT-2000 FWA system designed to operate?

ANS) The IS 2000 systems are designed to operate in the following 13 frequency bands (band classes):

- n. Band Class '0' : NA Cellular band (824 to 849 & 869 to 894 MHz)
- o. Band Class '1' : NA PCS band (1850 to 1910 & 1930 to 1990 MHz)
- p. Band Class '2' : TACS band (872 to 888 & 917 to 933 MHz and variants)
- q. Band Class '3' : JTACS band (parts of 887 to 925 & 832 to 870 MHz)
- r. Band Class '4' : Korean PCS band (1750 to 1780 & 1840 to 1870 MHz)
- s. Band Class '5' : NMT 450 band (452.5 to 457.475 & 462.5 to 467.475 MHz and other variants)
- t. Band Class '6' : IMT2000/UMTS band (1920 to 1980 & 2110 to 2170 MHz)
- u. Band Class '7' : 700 MHz band (776 to 794 & 746 to 764 MHz)
- v. Band Class '8' : 1800 MHz DCS band (1710 to 1785 & 1805 to 1880 MHz)
- w. Band Class '9' : 900 MHz band (880 to 915 & 925 to 960 MHz)_
- x. Band Class '10' : Secondary 800 MHz band (806 to 824 & 851 to 869 MHz and 896 to 901 & 935 to 940 MHz)
- y. Band Class '11' : European PAMR (450 MHz) band with 6 sub-classes
- z. Band Class '12' : 800 MHz PAMR band (870 to 876 & 915 to 921 MHz)

This shows that the standard supports all the cellular bands presently allocated for mobile wireless communications.

Presently, the IS-2000 & IS-856 equipment is available in the following frequency bands:

- f) Band Class '0' : NA Cellular band (824 to 849 & 869 to 894 MHz)
- g) Band Class '1' : NA PCS band (1850 to 1910 & 1930 to 1990 MHz)
- h) Band Class '3' : JTACS band (parts of 887 to 925 & 832 to 870 MHz)
- i) Band Class '4' : Korean PCS band (1750 to 1780 & 1840 to 1870 MHz)
- j) Band Class '5' : NMT 450 'A' band (452.5 to 457.475 & 462.5 to 467.475 MHz)

Also the WCDMA equipment is available in the following frequency bands:

- c. Band Class '1' : NA PCS band (1850 to 1910 & 1930 to 1990 MHz)
- d. Band Class '6' : IMT2000/UMTS band (1920 to 1980 & 2110 to 2170 MHz)

Comments:

In aim to realize the scale of economy in FWA, for example, in CDMA450MHz band, we suggest to allocate additional band and complementary band etc. below 600MHz, eg.410-430MHz in the AP and other regions.

Q.3. What is the spectrum requirement of your IMT-2000 FWA when coexisting with IMT-2000 mobile communications systems using the same type of radio access interface?

ANS) There is no difference in the spectrum requirement for fixed or mobile access. Also, the same carrier can support both Fixed Wireless and Mobile Wireless Access terminals.

Each IS-2000 or IS-856 carrier utilizes 1.25 MHz of bandwidth and each WCDMA carrier utilizes 5 MHz of bandwidth.

Q.4. Please discuss the functional overview of your IMT-2000 FWA.

ANS) The following entities are involved in the IMT-2000 Fixed Wireless Access operations:

- Fixed Wireless Terminals (PCMCIA cards, Phones)
- Radio Access Network entities (Base Transceiver System (BTS), Base Station Controller (BSC), Packet Control Function (PCF))
- Over the air Function (OTAF)
- ANSI-41 circuit switched core network entities (Mobile Switching Center (MSC), Home Location Register/Authentication Center (HLR/AuC), Visitor Location Register (VLR), Billing Platform, Simple Messaging Service Center (SMSC), Network / Operations management Center (NMC/OMC), Voice Mail Services (VMS), Inter Working Function (IWF))

- ANSI-41 packet switched core network entities (Packet Data Services Node / Foreign Agent (PDSN/FA), Home Agent (HA), Authentication Authorization and Accounting (AAA))

Q.5. Please identify the services or service features supported by your IMT-2000 FWA in terms of...

Voice:

Bit rate for data services:

SMS:

Prepaid subscription:

Limit of mobility or the maximum radius of the service area:

Support to different kind of payphones:

Etc.:

ANS) Voice:

IMT-2000 systems also support most of the call features (such as Caller ID, Call Forwarding, 3-way calling etc.,) that are supported by PSTN (wired world).

The following vocoders being supported:

Vocoder support for IS-2000: 13K QCELP, 8K QCELP (optional) and EVRC

Vocoder support for WCDMA: AMR 12.2 and AMR 7.95

Bit rates for data services:

Data services such as Internet Browsing, email downloads, Location Based Services (LBS), Push-to-talk (PTT) applications, Gaming, File Transfers etc., are being supported by IMT-2000 systems.

Peak data rates for IS-2000, release 0: 153.2 kbps & release A is 307.2 kbps

Peak data rates for IS-856, revision 0: 2.4 Mbps & revision A is 3.1 Mbps

Peak data rates for WCDMA, release 99: 384 kbps (in Mobility). 2.4 Mbps (Stationary)

SMS:

All IMT-2000 systems also support both originated and terminated SMS, EMS and MMS services

Pre-paid Subscription:

All IMT-2000 systems also support Pre-paid services

Limit of Mobility or the maximum radius of the service area:

The mobility restrictions can be implemented / achieved at BTS level or even at zonal level by using the neighbour list blocking method or by programming the HLR with zonal restriction information. Network ID/System ID or Cell ID/Sector ID etc., can also be used to limit mobility.

Support to different kind of payphones:

IMT-2000 technologies support payphone services. Polarity reversals, 16 kHz tone etc., for billing purposes are also supported but, their implementation is vendor dependent / optional.

ETC.,:

Other functions supported by IMT-2000 systems include:

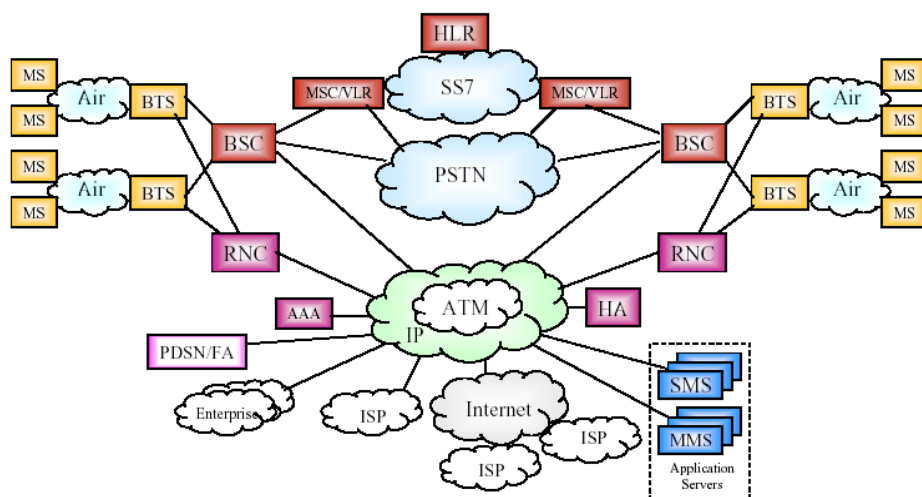
- Over the air service activation / provisioning (OTASP)
- Over the air service parameter administration (OTAPA)
- Over the air software download (OTASD)
- Over the air diagnostics (line testing, battery level testing, etc.)
- Connectivity support: USB, RS-232 & RJ-11

Q.6. Availability of subscriber terminals either mobile or fixed.

ANS) There is a large variety of subscriber terminal availability in the market today for all types of IMT-2000 systems. There are almost 500 models and more than 50 vendors that make mobile terminals (phones, PCMCIA cards etc.) for IMT-2000 systems.

Q.7. Please sketch an example of typical systems architecture of your IMT-2000 FWA

ANS) Given below is an example of a typical IS-2000 / IS-856 system architecture with Radio Access and Core network features



Q.8. If you currently plan to supply IMT-2000 FWA systems, in what time frame do you target the availability of your system.

ANS) Systems are available today.

There are many vendors such as Lucent, Nortel, Ericsson, Samsung, LG, ZTE, Huawei, Motorola, Nokia etc., who make infrastructure and Terminals for IMT-2000 systems.

Q.9. Please provide your view on possible evolution of public fixed network that uses IMT-2000

ANS) All the IMT-2000 fixed wireless networks are also designed to support mobility aspects. The evolutionary path of each IMT-2000 systems is given below:

- IS-2000: CDMA2000 1X Release 0, Release A, Release B, Release C and the Release D (1xEV-DV)
- IS-856: CDMA2000 1xEV-DO Release 0 and the Release A
- WCDMA: Revision 99, Revision 4 and the Revision 5 (HSDPA)

Q.10. This survey also seeks comment on how existing and evolving public fixed networks will be evolved as converged core networks to support IMT-2000 capabilities.

ANS) IMT-2000 FWA network will be providing toll-quality voice, unified messaging, fax, Internet access, multimedia services, broadcast television, pay-per-view programming, etc.

ANNEX 2 F

RESULT OF SURVEY - QUALCOMM

RESPONSE BY QUALCOMM on Availability of IMT-2000

1. Which IMT-2000 terrestrial radio access interface is supported by your IMT-2000 FWA?

ANS) Following are the readily available IMT 2000 terrestrial Radio Access Interface standards.

7. CDMA2000 1X (IS-2000)
8. CDMA2000 1xEV-DO (IS-856)
9. WCDMA (UMTS)

CDMA2000 1X is a 3G evolutionary path for the second generation CDMA systems (IS-95 A/B) and it supports both circuit switched voice & data as well as packet switched data services. Where as, CDMA2000 1xEV-DO is standard developed and optimized exclusively for packet data services.

WCDMA is an air interface standard specially designed as a 3G path for the second generation GSM systems

Basically, all these standards are designed to handle both Fixed as well as Mobile Wireless Access services.

Qualcomm makes chipsets for CDMA2000 1X, 1xEV-DO and WCDMA Mobiles as well as FWTs (Fixed Wireless Terminals).

2. In which frequency band is your IMT-2000 FWA system designed to operate?

ANS) The IS 2000 systems are designed to operate in the following 13 frequency bands (band classes):

- aa. Band Class '0' : NA Cellular band (824 to 849 & 869 to 894 MHz)
- bb. Band Class '1' : NA PCS band (1850 to 1910 & 1930 to 1990 MHz)
- cc. Band Class '2' : TACS band (872 to 888 & 917 to 933 MHz and variants)
- dd. Band Class '3' : JTACS band (parts of 887 to 925 & 832 to 870 MHz)
- ee. Band Class '4' : Korean PCS band (1750 to 1780 & 1840 to 1870 MHz)
- ff. Band Class '5' : NMT 450 band (452.5 to 457.475 & 462.5 to 467.475 MHz and other variants)

- gg. Band Class '6' : IMT2000/UMTS band (1920 to 1980 & 2110 to 2170 MHz)
- hh. Band Class '7' : 700 MHz band (776 to 794 & 746 to 764 MHz)
- ii. Band Class '8' : 1800 MHz DCS band (1710 to 1785 & 1805 to 1880 MHz)
- jj. Band Class '9' : 900 MHz band (880 to 915 & 925 to 960 MHz)
ASIA-PACIFIC TELECOMMUNITY

- kk. Band Class '10' : Secondary 800 MHz band (806 to 824 & 851 to 869 MHz and 896 to 901 & 935 to 940 MHz)
- ll. Band Class '11' : European PAMR (450 MHz) band with 6 sub-classes
- mm. Band Class '12' : 800 MHz PAMR band (870 to 876 & 915 to 921 MHz)

This shows that the standard supports all the cellular bands presently allocated for mobile wireless communications.

Presently, the IS-2000 & IS-856 equipment is available in the following frequency bands:

- k) Band Class '0' : NA Cellular band (824 to 849 & 869 to 894 MHz)
- l) Band Class '1' : NA PCS band (1850 to 1910 & 1930 to 1990 MHz)
- m) Band Class '3' : JTACS band (parts of 887 to 925 & 832 to 870 MHz)
- n) Band Class '4' : Korean PCS band (1750 to 1780 & 1840 to 1870 MHz)
- o) Band Class '5' : NMT 450 'A' band (452.5 to 457.475 & 462.5 to 467.475 MHz)

Also the WCDMA equipment is available in the following frequency bands:

- e. Band Class '1' : NA PCS band (1850 to 1910 & 1930 to 1990 MHz)
- f. Band Class '6' : IMT2000/UMTS band (1920 to 1980 & 2110 to 2170 MHz)

3. What is the spectrum requirement of your IMT-2000 FWA when coexisting with IMT-2000 mobile communications systems using the same type of radio access interface?

ANS) There is no difference in the spectrum requirement for fixed or mobile access. Also, the same carrier can support both Fixed Wireless and Mobile Wireless Access terminals.

Each IS-2000 or IS-856 carrier utilizes 1.25 MHz of bandwidth and each WCDMA carrier utilizes 5 MHz of bandwidth.

4. Please discuss the functional overview of your IMT-2000 FWA.

ANS) The following entities are involved in the IMT-2000 Fixed Wireless Access operations:

- Fixed Wireless Terminals (PCMCIA cards, Phones)
- Radio Access Network entities (Base Transceiver System (BTS), Base Station Controller (BSC), Packet Control Function (PCF))
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- ANSI-41 packet switched core network entities (Packet Data Services Node / Foreign Agent (PDSN/FA), Home Agent (HA), Authentication Authorization and Accounting (AAA))

5. Please identify the services or service features supported by your IMT-2000 FWA in terms of...

Voice:

Bit rate for data services:

SMS:

Prepaid subscription:

Limit of mobility or the maximum radius of the service area:

Support to different kind of payphones:

Etc.:

ANS) **Voice:**

IMT-2000 systems also support most of the call features (such as Caller ID, Call Forwarding, 3-way calling etc.,) that are supported by PSTN (wired world).

The following vocoders being supported:

Vocoder support for IS-2000: 13K QCELP, 8K QCELP (optional) and EVRC

Vocoder support for WCDMA: AMR 12.2 and AMR 7.95

Bit rates for data services:

Data services such as Internet Browsing, email downloads, Location Based Services (LBS), Push-to-talk (PTT) applications, Gaming, File Transfers etc., are being supported by IMT-2000 systems.

Peak data rates for IS-2000, release 0: 153.2 kbps & release A is 307.2 kbps

Peak data rates for IS-856, revision 0: 2.4 Mbps & revision A is 3.1 Mbps

Peak data rates for WCDMA, release 99: 384 kbps (in Mobility). 2.4 Mbps (Stationary)

SMS:

All IMT-2000 systems also support both originated and terminated SMS, EMS and MMS services

Pre-paid Subscription:

All IMT-2000 systems also support Pre-paid services

Limit of Mobility or the maximum radius of the service area:

The mobility restrictions can be implemented / achieved at BTS level or even at zonal level by using the neighbor list blocking method or by programming the HLR with zonal restriction information. Network ID/System ID or Cell ID/Sector ID etc., can also be used to limit mobility.

Support to different kind of payphones:

IMT-2000 technologies support payphone services. Polarity reversals, 16 kHz tone etc., for billing purposes are also supported but, their implementation is vendor dependent / optional.

ETC.,:

Other functions supported by IMT-2000 systems include:

- Over the air service activation / provisioning (OTASP)
- Over the air service parameter administration (OTAPA)
- Over the air software download (OTASD)
- Over the air diagnostics (line testing, battery level testing, etc.)
- Connectivity support: USB, RS-232 & RJ-11

6. Availability of subscriber terminals either mobile or fixed.

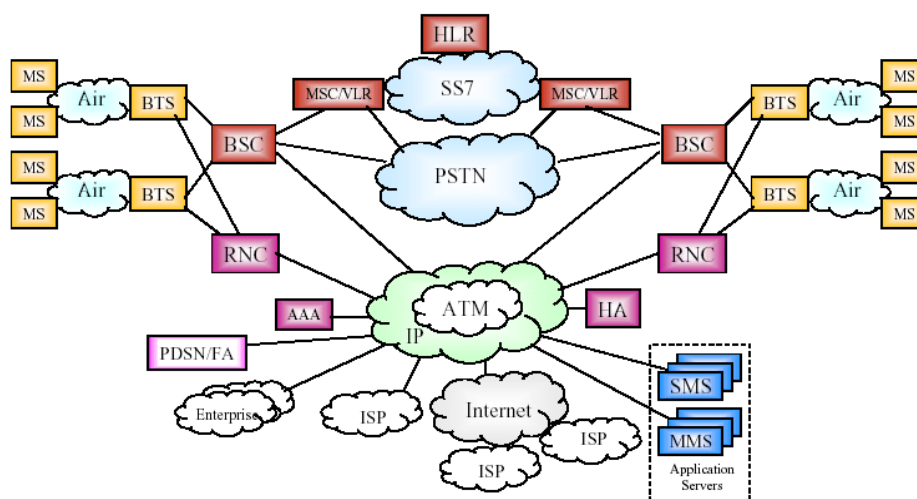
ANS) There is a large variety of subscriber terminal availability in the market today for all types of IMT-2000 systems. For example, these are the vendors for IS-2000 fixed wireless terminals (FWTs):

1. Axesstel (ASW-P800B & 1900B)
2. Hyundai Curitel (HWP 120/221 & HWT 120/220)
3. Kison
4. Land Cellular (CP800 1X & CP900 1X)
5. LGIC (LSP-200/2001 & 230/2301)
6. Motorola (TX-800C & FX-800C)
7. NEC
8. Samsung (SCW-F2000 & R5000)
9. Synertek (SCW-200W, HSW-310/3100-s & SSW-300/3000-s)
10. Telular (Phonecell SX4E, SX4P, SX4T & SX5P)
11. Westech (DTP-810/1910 & DTT-810/1910)

There are almost 500 models and more than 50 vendors that make mobile terminals (phones, PCMCIA cards etc.) for IMT-2000 systems.

7. Please sketch an example of typical systems architecture of your IMT-2000 FWA

ANS) Given below is an example of a typical IS-2000 / IS-856 system architecture with Radio Access and Core network features



8. If you currently plan to supply IMT-2000 FWA systems, in what time frame do you target the availability of your system.

ANS) Systems are available today.

There are many vendors such as Lucent, Nortel, Ericsson, Samsung, LG, ZTE, Huawei, Motorola, Nokia etc., who make infrastructure and Terminals for IMT-2000 systems.

Qualcomm makes CDMA chipsets that are the 'brains and application engines' for the Fixed Wireless Terminals, Mobile phones and the CDMA infrastructure.

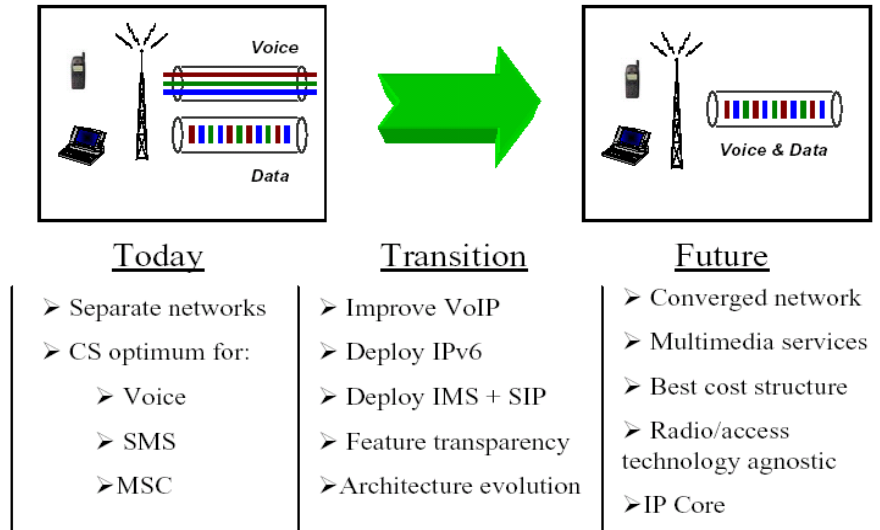
9. Please provide your view on possible evolution of public fixed network that uses IMT-2000

ANS) All the IMT-2000 fixed wireless networks are also designed to support mobility aspects. The evolutionary path of each IMT-2000 systems is given below:

- IS-2000: CDMA2000 1X Release 0, Release A, Release B, Release C and the Release D (1xEV-DV)
- IS-856: CDMA2000 1xEV-DO Release 0 and the Release A
- WCDMA: Revision 99, Revision 4 and the Revision 5 (HSDPA)

10. This survey also seeks comment on how existing and evolving public fixed networks will be evolved as converged core networks to support IMT-2000 capabilities.

ANS) IMT-2000 FWA network will be providing toll-quality voice, unified messaging, fax, Internet access, multimedia services, broadcast television, pay-per-view programming, etc.



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