ALCATEL

RESPONSE TO

INFOCOMM DEVELOPMENT AUTHORITY's

INVITATION FOR COMMENTS MADE IN

CONSULTATION DOCUMENT OF 16 February 2000

"*PROPOSED APPROACH TO FIXED-WIRELESS BROADBAND NETWORK DEVELOPMENT AND SERVICE PROVISIONING IN SINGAPORE*"

1. Alcatel welcomes IDA's open invitation for comments on the fixed wireless broadband network development and service offering in Singapore. We, on behalf of our colleagues at the HQ who support us, congratulate IDA for the high quality and forward-looking strength of your analysis in the document. Obviously, IDA is already well informed and has a very healthy attitude towards regulation.

2. Alcatel Singapore is pleased to provide herewith our response to the questions raised in the consultation document.

3. *Question (a) The potential of and benefits arising from the deployment of fixed-wireless broadband network, the likely services/applications to be deployed and the potential demand from business and consumers.*

   The fixed-wireless broadband network provides an alternative to wireline broadband access for both data and voice services. It allows faster deployment and low start-up cost. This is important to a newly liberalized market like Singapore.

   It is most suitable to address SME and SOHO (from few employees to low hundreds) market segments as this the one that is traditional under-serviced by incumbent operators. For large corporates of several hundreds and above, wireline solutions like optical fibre proves to be more suitable and necessary.

   In terms of services, fixed-wireless broadband network, as being envisioned or positioned in industry today, is not fundamentally different from fixed lease-circuits from an user's perspective. Typical customer interfaces provided are E1/T1 for voice over PABX/MUX and 10BT for data. However, in comparison with wireline access and point to point microwave radio links using permanently the spectrum with a pure multiplexing of services, fixed-wireless solution like LMDS allows statistical multiplexing among bursty data users and their related applications (including voice over IP). This leads to more efficient spectrum utilization.

4. *Question (b) The possible uses for the fixed-wireless broadband technology, and how the competing demands for the spectrum should be managed, including the allocation process, the timing of the process and criteria to be used. IDA also seeks comments on whether there are interconnection and access issues that may pose problems to achieving IDA's objective of transparent and seamless interconnection and open access; and how these may be practically and realistically addressed. IDA further seeks comments on the type and level of QOS standards, including both network and customer QOS standards, that would be appropriate to benchmark the quality of the network and services deployed.*

   In Para. 2.2.1 of the consultation document, IDA has shown a comprehensive list of possible use of the fixed-wireless broadband technology. This pretty much covers possible applications of the technology in the foreseeable future. Among the four areas of demand listed, we believe the major demand shall come from

first and third initially. Namely, the demand will be for alternative local loop access, and alternative to fibre, cable and ADSL for fast Internet access. The second application area of mobile infrastructure inter-connect is foreseeable but, it is our view that to deploy LMDS for this purpose alone may not be economically justifiable due to limited coverage area per base station for LMDS. But, for an operator with already deployed LMDS, using some of the capacities for mobile infrastructure inter-connect is a good by-product of LMDS. On the other hand, a cellular operator could use the lease line services over E1/fractE1 of his LMDS network to reshape his back-haul network (inter BSS/BSC links) AND could offer Internet access directly or together –by partnership- with an Internet service provider.

As for the application of cable TV broadcast, we are of the view that broadcast video can better be catered for by the introduction of Terrestrial Digital Video Broadcast (DVB). However, the demand for Video over IP on LMDS is foreseen in a near future as today the Voice over IP is already a basic requirement on LMDS. But, this is more for personalized video content as opposed to broadcast video.

We believe that operators should be given some room of freedom to use the spectrum according to market demand and business viability. As such, while we understand the rationale of IDA's intention to give priority to operators providing nationwide Interactive Broadband Multimedia (IBBMM) services, we are of the concern that IBBMM may not be commercially viable from day one, and operators need time to build up necessary know-how in operating the new fixed-wireless broadband networks and may depend on other factors like terminals and contents before IBBMM can be successful. We believe that "starting small and growing as the market needs" is perhaps the best approach to introducing any new technologies and services.

In terms of inter-connection, we are of the view that fixed-wireless broadband network is only an access alternative pretty much analogous to ADSL and Leased Lines. We don't foresee special issues pertaining to fixed-wireless access in this respect. There are two primary types of interfaces provided at fixed-wireless networks; circuits and data. For circuits, the inter-connect issue does not lie at the access level but at switching level. For data interface, the same principle currently governing ISP interconnect/peering applies.

In terms of QoS, at the ATM layer we are able to support standard ATM Forum QoS classes. At the transmission layer, quality of transmission –as defined in ITU-T and ITU-R recommendations- can be cross checked (during field trials and prior to deployment) together with the network dimensioning and the radio planning to take in account the propagation in weather zone P, the availability of links for a given bit error rate (BER), the size of the cell, the antenna patterns and power radiated from Base Station and Terminal Station antennas and the availability of equipment (hardware).

Classic calculation by operators from end-to-end, ITU recommendation to split down to the backbone and local loop systems are to be taken into account: for example ITU-T Recommendation G825 for SDH backbone link to the BS; ITU-T G821 and ITU-R F.1189 recommendations relevant for PDH backbone (n x E1)

from BS to PSTN/ISDN networks. Therefore, for the LMDS links to CPEs the compliance to ITU-T G826 is targeted with ITU-R CCIR Rep. 536-2 Rainfall region "P" statistics.

On the top of that it is commonly assumed that 50% of the subscriber link availability is related to propagation impairments (rain fall fading, noise & interference, etc) and 50% of the subscriber link availability is related to hardware reliability.

5. *Question (c) The amount of spectrum that should be made available for terrestrial fixed-wireless broadband and satellite services, including the timing for review of spectrum reservation and allocation, where appropriate.*

The current reservation made by IDA is a good start. In our comment to the next question, we shall elaborate on possible allocation to operators in the bands reserved. Further allocation should be reviewed when current allocation is nearly fully utilized. Timing of such reviews really depends on actual development and deployment in Singapore.

6. *Question (d) The optimal amount of spectrum to be allocated to each operator, including the detailed assumptions/basis/calculations used to derive the proposed spectrum bandwidth, and the timing of allocation where appropriate. IDA also seeks comments on the optimal number of operators that can be licensed, bearing in mind the growth of the broadband market in Singapore.*

Assuming the market to be served as a priority is the SME (Small and Medium Enterprises) which requires symmetrical traffic, per operator, we recommend a minimum of two duplex blocks of 112MHz each. This allows traffic of around one STM1 per base station (4 sectors of 32Mbit/s per sector, each sector using one duplex channel of 28MHz). Due to frequency interference limitation, the duplex separation must be at least 500MHz.

In the frequency ranges reserved by the IDA (25.25-27.00GHz, 27.50-28.60GHz, 29.10-29.50GHz, 31.00-31.30GHz), possible frequency sub-bands definition is as follows:

- **25.25-27.00GHz band** :

  We advice IDA to allow say 24.549-25.445/25.557-26.453 (1008GHz duplex separation) which is currently used in Western Europe. IDA is not currently reserving these sub-bands for LMDS. Moreover it is underlined that the lower the frequency is the better the propagation: that is for a given transmission power, BER (Bit Error Rate) and availability, the cell size and fading margin are improved compared to the ones obtained at say 28GHz.

  Note: The overall bandwidth will be defined with the number of licensees and the basic bandwidth allocated to each one.

For the currently reserved range, the following is possible:
25.450-25.870/26.305-26.725GHz (2 x 420MHz)
25.270-25.450/26.125-26.305GHz (2 x 180MHz)
25.945-26.125/28.800-26.980GHz (2 x 180MHz)
duplex separation = 855MHz

- **27.50-28.60GHz band:**

  27.50-27.85GHz / 28.00-28.35GHz (2 x 350MHz bandwidth, 500MHz duplex separation)

- **29.10-29.50GHz band:**

  This band can be paired with 27.5-28.6GHz. To avoid the 28.6-29.1GHz sub-band use, due to NGSO FSS spectrum provision, the following sub-band partition of the 27.5-28.6GHz + 29.1-29.5GHz bands is possible:

  - 27.50-27.85GHz / 28.25-28.60GHz (2 x 350 MHz bandwidth, 725 MHz duplex separation).
  - 27.85-28.25GHz / 29.10-29.50GHz (2 x 400MHz bandwidth, 1250 MHz duplex separation).

- **31.00-31.30GHz band:**
  Though this band is too small and that the duplex separation is less than our recommendation, the following sub-band is conceivable:

  31.000-31.075GHz / 31.225-31.300GHz (US block B: 2 x 75MHz bandwidth, 225MHz duplex separation)

The consideration of total allocation per operator is a compromise between assurance of future growth for the successful licensees and prevention of locking large chunks of spectrum for ones that do not fully utilize it. Fragmenting spectrum allocation to a single operator would increase operations complexity.

In general, the total overall spectrum to be allocated for broadband fixed wireless networks could be defined by an iterative process according to the spectrum requirement per licensee because their marketing targets and business plans might be different. At the end of the day, the Spectrum Management Agency (IDA) could solve the matter by combining different mix of sub-bands in the 26/28/38GHz to maximize the total capacity over the country and to satisfy the capacity requirements of each operator. This is easy said than done because it requires a lot of computation to simulate the deployment of multi-cell networks by network dimensioning and radio planning for selection of patterns of frequency re-use. This is the case in France where the agency is doing it for 60 cities prior to grant national and regional licenses.

7. *Question (e) The most appropriate licensing and spectrum allocation approach to adopt. Views are also sought on whether spectrum should be assigned in a phased manner or allocated fully to the operator at the grant of license. Should there be a separate component for license fees payable in addition to spectrum fees payable?*

We are of the view that auctioning would put new entrances in a disadvantages position. A beauty contest with closed monitoring with possible incremental (phased) allocation is perhaps the best approach. Per link and per need allocation is sound from the perspective of low start-up cost to operators, but it could be tedious administratively from both operators and regulators point of view.

Fee structure based on "license fee plus spectrum fee", if resulting in overall lower up-front cost to operator and yet does not cause too much administrative book-keeping and uncertainty, is a good approach.

8. *Question (f) Whether the proposed spectrum band in para 2.4.1 should be reserved primarily for IBBMM services or whether they should be assigned for broadcasters' usage.*

We are of the view that for broadcasting purpose, the existing analog TV spectrum (VHF, UHF) is more than enough if new digital technology is adopted. Allocating more to broadcasting without releasing VHF and UHF is hard to justify. At higher frequencies like 40GHz, the size of the cells is reduced because of propagation and the trade-off is given by the number of subscribers in such reduced cell for a given bandwidth.

9. *Question (g) The appropriate licence duration for the provision of fixed-wireless broadband services.*

We foresee that minimum 5 years preferably longer is needed to allow operators to establish the network and services. The "expiration" of the current license should be taken in the light that a review shall be made and conditions for revoking part or whole of spectrum allocation should be put up-front at the award, so that operators know from day one how to ensure a successful "renewal" after "expiration".

10. *Question (h) The timeframe for award of licence as well as the time needed by the operators to roll-out their networks and offer commercial services to the public.*

In view of the fact that several operators are engaging vendors for field trials, it is timely to award license as soon as possible to facilitate commercial roll out. In terms time needed to roll-out of network and services, we believe that it is fairly fast to build a network for specific users and targeted coverage areas. We are of the view that unlike cellular network and services, fixed-wireless broadband

network needs not to have nation-wide coverage to be of commercial value. Since the terminals are fixed - not mobile - coverage national-wide should NOT be a condition for assessing the operator's progress in service roll out. Coverage should be a commercial decision based on customer demand and physical constraints (such as availability of suitable site for line of sight).

11. *Question (i) How the issues of rain attenuation and compliance with QOS standards would be addressed.*

In general, lower frequency allocation can help reducing sensitivity to rain attenuation.

Quality of transmission is governed by ITU-T and ITU-R recommendations. It is coherent with the existing links in point-to-point PDH microwaves (34/45 Mbit/s) and/or SDH microwaves (155Mbit/s): one link in a Point Multi-Point LMDS cell is not different from a separate Point To Point link of same capacity and same carrier frequency.

QoS at the end to end network service level can be addressed in similar fashions as when microwave links are involved in such networks. See also discussion in response to Question (b) above.

12. *Question (j) How operators plan to install their own internal wiring, the potential difficulties faced and the cost of doing so. IDA also seeks comments on how these difficulties can be practically and realistically addressed by potential operators and how IDA can facilitate the installation*

Internal wiring could involve building cabling for i) implementation of LMDS indoor and outdoor equipment cabling (coax feeders) or ii) for indoor CPE to End-User cabling. There are different issues. In the first case, Alcatel had selected DAVIC standard to reuse existing cheap technology with specific cabling for LMDS.

For the second case, the fixed-wireless access broadband network is an access network and should be treated as a 'leased line' alternative. As such the same framework to facilitate competing wireline access operators in Singapore, should work for fixed-wireless access as well. Existing in-building wirings are re-useable for fixed-wireless network services.

In addition, other alternatives based on wireless (Wireless-LAN, Wireless-IP) and/or wireline (ADSL, FTTx) solutions could be explored.