

Interconnection of Mobile to Fixed:  
The Case of Malaysia

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## Malaysia – Mobile Interconnection Case Study

### **Part 1: Introduction**

Malaysia is a middle-income developing country (GDP per capita of US\$4,360) with a population of 21 million people distributed across the eleven states of Peninsular Malaysia and the two states (Sabah and Sarawak) of Eastern Malaysia on the island of Borneo, including the off-shore financial centre of Labuan island. Malaysia is also a multi-ethnic, multi-cultural society of majority Malays, and substantial minorities of Chinese and Indians. Population density is naturally greatest in the urban areas, and especially along the western side of Peninsular Malaysia, from Johor Bahru in the south to Penang in the north.

The highest concentrations of people, and those with the highest average per capita incomes, live in and around the capital city Kuala Lumpur, and its satellite city of Petaling Jaya, or along the Klang Valley leading to KL's port city of Klang. This has implications for advanced telecommunications and media services because most of Malaysia's Internet users are also concentrated in these districts and Malaysia's only cable television network offers service to these areas.

In recent years the Multimedia Super Corridor had become central to Malaysia's strategic national development plan, *Vision 2020*. The Multimedia Super Corridor (MSC) is being promoted as a high technology research and development, design and production zone to attract international investment, particularly in the area of information technologies. Special laws have been enacted which grant companies investing in the MSC exemption from certain duties and taxes and from restrictions on the importation of goods, services and skilled workers, and on the repatriation of earnings. The MSC, which has been sculptured largely out of extensive palm oil plantations, begins with the gleaming twin towers of the Petronas building in the city centre of KL, and stretches south alongside the KL-Johor-Singapore motorway towards KL's new international airport at Sepang. Cyberjaya is the administrative centre of the MSC, and nearby is Malaysia's new administrative capital city of Putrajaya where the Prime Minister's residence and ministries are now located.

#### *1.1 Development and Telecommunications Reform*

These developments embody the hopes and aspirations of Malaysia's drive to become a developed economy by the year 2020. The point is not just rhetoric. Whatever difficulties of economic or social development Malaysia faces, the country has clearly charted a course of development, and this becomes an important explanatory factor in looking at a sector like telecommunications. Even by the early 1980s Malaysia recognized the strategic importance of information technologies to the economic and social growth

process.<sup>1</sup> Originally this focused upon the assembly and later the design of information technology parts and components, and then on the embodiment of these into technology products and applications. Alongside this industrial planning in the 1980s went the beginnings of telecommunications reform and liberalization. Prior to 1984 responsibility for operating national telecommunications was passed from the Jabatan Telekom Malaysia or JTM (Department of Telecommunications) of the Ministry of Energy, Telecommunications and Posts (METP) to the newly incorporated Syarikat Telekom Malaysia (STM). In 1987 STM was privatized and floated on the stock market in November 1990 as Telekom Malaysia Berhad (TMB) with the Ministry of Financial owning 76 per cent of shares.

The creation of STM and its subsequent partial privatization as TMB placed the Jabatan Telekom Malaysia (JTM) in the role of regulator. A regulator's task is to supervise the conduction of the industry. This includes, for example, spectrum management to minimize interference between users, the prevention of illegal or non-authorized use of equipment, the enforcement of compliance with licence conditions, and cracking down on anti-competitive behaviour that is damaging to the public interest. But making a shift towards a more competitive and liberal market structure is not always a straightforward process. One problem that can arise is the blurring of lines of authority, especially when the policy making and regulatory processes are not sufficiently clearly defined in law and lack transparency in practice. In Malaysia's case these problems manifest themselves in the way licences were issued. There was no clearly laid out policy on how many licences should be issued, for example for mobile phone operators, or on the scope and conditions attached to the licences, for example whether they would or would not include the right to operate an international gateway in competition with TMB. The terms and conditions of the licences were not made available for public scrutiny. There was even some confusion as to who should issue licences, only the JTM or also the Ministry.

The result by the mid-1990s was, in the view of the current Minister, Datuk Leo Moggie, that there may be too many licences for the size of Malaysia's market.

### *1.2 Mobile Telephony and Competitive Markets*

By the mid-1990s the shift towards more open and competitive telecommunications markets had become a world phenomenon, not least because of the very rapid spread of mobile telephony and also of the Internet. In many economies cellular mobile services were the first significant sectors of the telecommunications market to open to new entrants. Cellular telephony was seen as having relatively low capital-intensity compared with fixed public network telecommunications services (PSTN) and therefore ideally suited to new players entering the market. It was also seen as more of a luxury than a necessity for most people, and therefore was not subject to a universal service obligation.

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<sup>1</sup> See V.Lowe (1994) 'Malaysia and Indonesia: telecommunications restructuring'. In Noam, E. and S.Komatsuzaki, D.A.Conn (eds.) *Telecommunications in the Pacific Basin: An Evolutionary Approach*. Oxford: Oxford University Press.

It was also seen in part as a substitute for a fixed line telephone where a chronic shortage existed, which would be particularly useful in the central business districts (CBDs) of cities and large towns serving commercial communities. Perhaps most important of all, cellular mobile telephony was seen as immensely profitable. Profit provided incentives to build out the networks, and also sources of taxation and licensing revenues for the State.

Naturally, the incumbent operators, such as TMB, want to dominate the cellular market if possible, but for two reasons this was not possible. First, large corporate organizations are not necessarily as agile on their feet in marketing or in service innovation as new entrants who are dedicated to the task. Second, state-owned enterprises, even after they have been partially privatized, remain subject to a variety of pressures which does not help them to make independent decisions based upon practical commercial considerations. This point needs to be clarified. The incumbent operator has certain obligations, such as universal service, which need to be funded somehow. Typically, in a non-competitive environment, the source of funding is cross-subsidy from profit-making activities. This cannot survive a shift to a totally open and competitive market. Another source of pressure is the need of the national treasury for funds. In a developing country where funds, especially foreign currency, are in short supply the taxation and share dividends paid by a state-owned telecommunications company are important, and no financial ministry is enthusiastic about losing that source of revenue. In Malaysia, as elsewhere, where this problem has had to be faced and worked through, the understanding is that the best way to grow the industry in its modern stage of development is through open and competitive markets. These will stimulate demand for new services and lay the foundations for new businesses, and national revenues will benefit as a result.

### *1.3 Obstacles to Development*

There are other issues that arise during periods of transition towards open and free or open and well-regulated markets. Equipment suppliers are very anxious to secure customers in both fixed and mobile markets, and they are able to offer attractive financial arrangements, such as soft loans, to win their business. They also have the expertise and training facilities to provide backup, and they also have to make decisions as to where they locate their own manufacturing facilities, or where to source components. Industrial policy and planning issues are involved at this level which are far wider than the purely service considerations of the national telecommunications company. The governments of all developing countries are forced to balance, on the one hand, the short-term advantages that may arise from giving contracts to particular equipment suppliers, and on the other hand, with the objective of developing a commercially self-sustaining and competitive telecommunications sector. Being the largest user of equipment, the state-owned incumbent operator therefore may be forced to compromise on the equipment type they buy, but this can then lead them into two problems. First, they have too many different types of equipment, each requiring its own spare parts, each requiring different specialist knowledge on the part of the maintenance workers, each possibly presenting protocol problems making inter-operability a nightmare. For example, according the Malaysian

Communications and Multimedia Commission (MCMC), there are five different types of switches used in the PSTN. Second, in an area such as cellular mobile the incumbent may end up with not the best system to compete with the new entrants.

#### *1.4 Malaysia's New Path Towards Competitive Markets*

Malaysia is no different from other developing economies in having experienced most of these problems to some extent. But now Malaysia has done something about it. Since 1996 Malaysia has embarked on a radically new path towards an open and competitive market in telecommunications and multimedia services in an effort to bring about a more rational structure to the industry and a more rational way to regulate it.

Following a growing pattern worldwide, but also reflecting local conditions, and in particular the strategic role of a commitment to multimedia development in Malaysia, legislation has been passed creating a new regulatory body, the Malaysian Communications and Multimedia Commission (MCMC) under the policy direction of the renamed Ministry of Energy, Communications and Multimedia (MECM). The new body brings telecommunications, information technology and broadcasting policy under one roof. And the Communications and Multimedia Act 1998 completely overhauled the licensing regime. Most value-added service providers will merely need to register themselves, and a class licensing system will deregulate many other service areas. And, in echo of the Australian model, a private industry body is being established which will run a number of forums to make recommendations to the regulator and the Ministry.

Malaysia's step forward in this area is part of an overall adjustment to revitalize the policy aims and objectives of *Vision 2020*, and it represents a restatement of the importance telecommunications is to play in economic and social development.

## Part 2: The Mobile Market and the Need to Interconnect

### 2.1 Teledensity

By early 2000 there were around 4.5 million direct exchange lines in Malaysia, since 1998 all of them digital, and a penetration rate of fixed wireline telephones of 22 per cent. In addition there were 2.5 million cellular telephone subscribers, a cellular penetration rate of 10.2 per cent, or nearly half the fixed rate. From 1990-98 fixed lines grew at a compound annual rate of 14.8 per cent, whereas from 1996-1999 cellular has grown much faster, at 63 per cent per year. (Ministry of Energy, Communications and Multimedia Malaysia, at [www.ktkm.gov.my](http://www.ktkm.gov.my).)

The first cellular systems were analogue. In the 1980s TMB was using the Nordic system NMT450 for wide area coverage. In 1989 Celcom became the second operator, using ETACS 900 to provide service in urban areas. Celcom's entry into the market was the first of several private sector companies, so when an interconnection arrangement became necessary to provide access between cellular customers and TMB, naturally it was with Celcom (see below). Table 1 lists the current cellular licence holders and their systems.

Table 1

Cellular Company and dial code	Technology	Transmission Mode
Telekom Malaysia (TMB) – 011	NMT 450	Analogue
TM Touch (TMB) – 013	1800 PCN	Digital
Mobikom (TMB) – 018	AMPS 800	Analogue
Mobikom (TMB) – 018	AMPS 800	Digital
Celcom – 010	ETACS 900	Analogue
Celcom – 019	GSM 900	Digital
Maxis – 012	GSM 900	Digital
Digi.com – 016	PCN 1800	Digital
Time.com – 017	PCN 1800	Digital

Towards the end of 2000 estimates of cellular subscribers had risen to around 4 million, which means the teledensity of cellular mobile phones is close to 19 per 100 population, or nearly that of fixed line teledensity. Market shares estimated very approximately as follows: Celcom at 32 per cent, Maxis at 24 per cent, Digi and TM Touch at 17 per cent each, Time.com and Mobikom around 5 per cent each.

The Asian economic recession of the late 1990s impacted upon Malaysia's cellphone industry as it did everywhere. Bad debts went up, average revenues per user (APRU) went down, while capital expenditure on network improvements and rollout went on

hold, and only in 2000 has the industry begun to recover. The bad debt problem was partly resolved by cutting off non-paying customers, but also by the growing use of pre-paid cards which one estimate from within the industry placed at between 55 and 65 per cent of total cellular traffic. The surcharge on pre-paid calls is around 50 per cent so these represents a very profitable side of the business, but it does not build customer loyalty. It is pure “churn” unless customers can be persuaded to reload their cards.

The growth in mobile customers and traffic over recent years is reflected in traffic patterns. In the early 1990s most mobile calls were made to fixed telephone lines, but the proportions have been changing. One of the smaller operators estimated that - in very round numbers - now 40 per cent of traffic carried on their network was from mobile-to-fixed, 20 per cent was fixed-to-mobile, and 30 per cent mobile-to-mobile. A larger operator estimated that perhaps 60 per cent of traffic was between mobile and fixed, and forty per cent between mobile and mobile. It should be stressed these proportions are estimates, not calibrated against actual traffic, and it seems that no central statistics covering all operators are kept at this point in time.

## *2.2 Interconnection as a Public Good*

The message however is clear. The use of mobile phones has gone well beyond luxury. They are almost as common as fixed line phones, and while they are more expensive they represent added value in terms of the function of mobility, including the potential for roaming, and convenience. It follows that interconnection with the PSTN takes on a public good aspect as well as increasing the value of the network itself. A public good is one that is not depleted through its use. The ability of any two people to interconnect does not diminish the ability or value for any other two people to interconnect, so the provisioning of a network with points of interconnection (POIs) enhances public welfare, allowing any-to-any communications.

It also has the benefit of externality. Externality arises when the activities of one person or set of persons impacts upon the welfare of others who are not directly involved. Interconnection obviously raises the value of the smaller network by widening the number of possible connections its subscribers can make, but it simultaneously widens the number of connections subscribers to the interconnected network can make. The incumbent network operator may take some convincing of this because it makes a rival network look more attractive than before the interconnection agreement, but if the total market grows as a result of interconnection then both networks gain. How convincing is this argument? Will the market grow? And is there an option of not interconnecting?

1. Even on static assumptions that demand at current levels of income and commerce remains constant, it is reasonable to assume that one call generates others. For example, someone calls and leaves a message. A return call is likely. A caller makes a suggestion to a called party, and the called party may then wish to consult or inform

or check with others, and so on. It therefore follows that the more persons (called parties) the subscriber (calling party) has available, more calls will be generated.

2. But above all else in the future, as broadband and Internet communications by telephone begin to take off, a network operator or service provider who does not offer interconnection will simply lose customers to those who do. The market will lead the process, and this is a very different world from the one in which incumbent operators began their life. Interconnection, instead of being something to be resisted by the incumbent as a zero-sum-game, becomes a benefit and a commercial requirement for every operator.

### *2.3 The First Interconnection Agreement*

The earliest mobile networks were TMB's NMT 450 and, in late 1989, Celcom's ETAC 900 system followed in 1994 by Mobikom using D-AMPS 800 technology. In 1995 five more licences were issued, two for the operation of GSM networks and three for the operation of PCN or GSM 1800 networks. In the early days there were no formal agreements governing interconnection, but from 1990 onwards interim agreements were reached between the parties focusing solely upon the commercial arrangements.

#### **Commercial Arrangement between Telekom Malaysia and Celcom, 1990**

1. For all calls destined for TMB's network, Celcom paid TMB the full PSTN rate. (Note: untimed local calls, which retailed at 10¢, made up 70 per cent of traffic)
2. For all calls destined for Celcom's network, TMB paid Celcom 5¢ for every 20-second block.
3. The nett account paid by Celcom =  $(2.3.1 - 2.3.2)/2$
4. Celcom to establish a point of interconnection (POI) in every area code.
5. Celcom to bear the cost of both incoming and outgoing circuits, and the associated POI hardware and software costs.

Note: Celcom also operated an international gateway, so only a small percentage of its international traffic passed through TMB's gateway

In 1994 an interim agreement for 6 months was reached with Mobikom, pending a more substantial agreement for mobile operators.

#### **Commercial Arrangement between Telekom Malaysia and Mobikom, 1994**

1. For all calls destined for TMB's network, Mobikom paid TMB 13¢ plus 5¢ per minute (this payment in respect of the USO)
2. For all calls destined to Mobikom's network, TMB paid Mobikom 13¢ per minute.
3. For international calls, Mobikom paid TMB a discounted retail rate (less 10%) for carrying such calls.

Note: Mobikom receives a lower payment than Celcom and has a smaller network. Unlike Celcom, Mobikom also has no international gateway.

#### *2.4 The Second Interconnection Agreement*

As traffic built up, and with new licences being issued, the need for more detailed technical and commercial arrangements became obvious. The first step in this direction came in May 1995 with an agreement with Celcom that would be the basis of agreements with other mobile operators.

#### **Commercial Arrangement between Telekom Malaysia and Celcom, 1995 – basis for general agreement with all mobile operators**

##### **Scope**

- Interconnecting TM's network to the network facilities of the other party
- Supplying requested telecommunications services to the other party
- Making available to the other party the services, facilities and information as required by law or as specified in the licences.
- Includes
  - a) Point of Interconnection (the cost of establishment bundled into the interconnection fee)
  - b) Delivery of calls depending upon whether they involve near-end or far-end handover.
  - c) Interconnection capacity in terms of circuits made available measured in 2 Mbps units.
- d) Access by TMB to the premises of mobile operator to establish the connection.

##### **Commercial**

- Revenue sharing
- Near-end and Far-end handover of calls (mobile operator keeps 35 per cent of revenue for near-end handover of long-distance calls; the terminating party keeps 30

per cent of revenues for far-end handover of calls; the long-distance carrier receives 35 per cent of revenue.)

- Special discounted rate for interconnection capacity

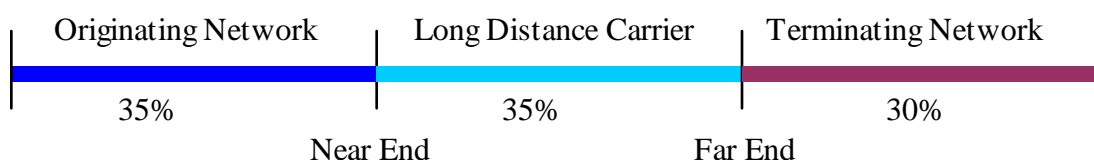
### **Billing and Settlement**

- Billing period is on a monthly calendar basis
- Due date is 30 days after relevant invoice
- Dispute notification period expires 30 days after date of invoice
- Invoice date is the date on which the invoice is dispatched
- Payment to be by electronic transfer or exceptionally by cheque is agreed by the invoicing carrier
- Billing disputes procedure (these could arise from glitches in software, and mostly involved customer disputes over international calls and call charges).

### **Other**

- Interconnection terms and conditions, which are commercially agreed bilaterally, should be on a non-discriminatory basis.
- Interconnection agreements with mobile operators would remain confidential, but available to the regulator. (This allows the regulator to ensure the terms and conditions are non-discriminatory).
- Disputes resolution provides for a committee representing TMB and the Other Licensed Network Operators (OLNOs) to resolve issues, backed up by the Arbitration Act No.93 (Revised 1972) of Malaysia. (Most disputes arise over billing issues, and none has ever required the use of the Arbitration Act, nor reference to the regulator.)
- Interconnect Steering Group (ISG) established to coordinate the activities of the Carriers, the operation of the agreement, and matters referred to it. Representation not below General Manager level agreed, around five representatives per Carrier.

This was an agreement to revenue-share on long-distance calls where Celcom either originated or terminated the call and TMB provided the long distance trunk transmission network. The revenue split was in three parts, the near-end or originating segment, the middle or trunk segment and the far-end or terminating segment, which respectively accounted for 35 per cent, 35 per cent and 30 per cent of the revenue split as illustrated below.





would be suspicious that the cost allocation method was unjust or arbitrary. This would result in a demand for regulatory intervention. In 1995 the JTM did not have the resources at its disposal to carry out such an interventionist exercise, so it would need to rely upon outside expertise from consultants. In itself that is not a problem because it is a widespread practice for most regulators, but it is consuming of both time and money. Thereafter it also requires the regulator to formulate a process for bringing the parties together and agreeing the cost allocation principles, and, if necessary, the regulator has to be in a position to make a determination, assuming the legal authority of the regulator gives the power to do so.

It also needs to be remembered that Celcom's network was still in the process of build-out, and the market for cellular services was no where near maturity. What Celcom needed was a timely interconnection arrangement, and this would also serve the public interest. Under these circumstances, the revenue-sharing arrangement was simple, timely and acceptable to all parties. It was therefore a highly practicable arrangement and it seems to have worked well. It was followed by a second agreement, between TMB and Mutiara, now renamed Digi.

## 2.5 Comparative Study: the Case of India

The ITU has several case studies of interconnection agreements; two are which are for Asia, covering China and Hong Kong, and India. The Indian experience is quite close to Malaysia's in the sense that India also used revenue sharing as a basis for interconnection charges as a means to facilitate the process.

However, unlike Malaysia where the process was generally accepted by all parties, in India it was highly contested, not just by the incumbent domestic fixed line operator, Mahanagar Telephone Nigam Ltd (MTNL) which is part owned by the Government of India and the Department of Telecommunications (DOT), but the DOT itself also opposed the proposals of the Telecommunications Regulatory Authority of India (TRAI) to bring about (a) calling party pays (CPP) and (b) multiple points of interconnection so mobile operators could avoid unnecessary long-distance interconnection charges.

Eventually, after various options were considered, a revenue-sharing agreement for fixed to mobile calls was established of Rs.1.60 (US\$0.034) for the first minute and Rs.0.80 for each subsequent minute. "This represented 33.67 per cent share between fixed and mobile operators. The TRAI reiterated that this arrangement was temporary and would be replaced the following year by a cost-based access charge." See *Fixed-Mobile Interconnection: The Case of India*, ITU, 2000 ([www.itu.int/interconnect](http://www.itu.int/interconnect))

### **Part 3: General Framework for Interconnection and Access (GFIA)**

Malaysia launched upon a radical reform of the telecommunications sector from 1996 onwards, beginning with the issuing of the *General Framework for Interconnection and Access* (GFIA) by the Director General of Telecommunications, the head of the JTM. The General Framework “sets out the operational guidelines and principles to govern the interconnection and access between telecommunications networks in Malaysia.” (para 1) It covers both fixed and mobile operators, and covers local, long-distance and international traffic.

#### *3.1 Objectives*

The following objectives have been established to “to govern the implementation of efficient and equitable interconnection agreements:

- a) All network operators should contribute towards the achievement of the national objective of extending the availability and usage of telecommunications services and the provision of quality services which meet the diverse needs of all Malaysians;
- b) All network operators should be encouraged to deploy high quality and advanced telecommunications infrastructure to serve the diverse needs of different customer groups in an environment of strong growth and demand for advanced telecommunications products and services within a high growth economy;
- c) The deployment and optimum usage of the sector’s infrastructure and resources should be directed towards the development of an economically efficient telecommunications industry, and should not only minimize the uneconomic duplication of infrastructure facilities but encourage the shared usage of common infrastructure facilities;
- d) All network operators should fulfill the national and public service obligations as stipulated in their Licences; and
- e) Clarity, stability, and transparency in the interconnection relationship between network operators must be established in order to ensure that users enjoy the full benefits of competition, including choice, convenience, and a variety of high quality services at the lowest possible prices.”

Paraphrasing the above, all service providers are to be judged according to their contributions to rolling out basic voice services to as wide a community as possible, to making advanced services available (mobile Internet access would be a good example for the future) where there is an effective demand for them, and providing these services in the most efficient manner possible, which means keeping prices as low as possible. This last point is perhaps the most thorny of issues. In developing economies, achieving efficiency and an efficient use of resources, is a major challenge, and yet given the relative scarcity of resources there is a compelling case to be made. One way to achieve efficiency is by sharing facilities (c) such as duct space, hill stations, and inbuilding block wiring.

But another is by introducing greater transparency (e) into the business. Without transparency inefficiencies remain hidden are therefore less easily addressed. Transparency is also important to interconnection agreements because without transparency it will be difficult to establish trust between the interconnecting parties. And without trust, no commercial agreements can be very successful.

The emphasis of the GFIA is upon private commercial negotiation and agreement before any regulatory intervention takes place. An interview for this case study with a former senior JTM official confirmed that the Australian approach to regulation had been an influence in designing the new policy. Where regulatory intervention on interconnection issues does become necessary, the GFIA stipulates the following considerations will be taken into account:

- The Government's national policy objectives for telecommunications
- The rights and obligations of operators in terms of their Licences
- The promotion of economic and technical efficiency
- The interests of consumers and the community
- The need to provide competitive safeguards against abuse of market power
- The overall reasonableness and stated requirements of each party

Consultation with the parties concerned to facilitate private agreements and reference to international best practice will form the basis of the regulator's interventions and determinations. This will include, for example, the level of unbundling of network elements for interconnection purposes, according to "the general practice in industry" and "appropriate within the Malaysian context." (para. 52).

The GFIA acknowledges that as the industry develops the commercial and technical issues of interconnection will inevitably change, so agreements "should therefore:

- a) be based, initially, on the premise that newly licensed network operators are in a start-up phase; and
- b) be revisited annually, or, in accordance with the review provisions in each interconnection agreement, to ensure that the interests of the customer, the licencees, and the country at large continue to be optimized."

### *3.2 Technical and Commercial Guidelines*

The GFIA then goes on to specify the principal technical and commercial considerations governing interconnection agreements.

a) *Technical*: these include, on the technical side:

- compliance, wherever feasible, with international standards and recommendations

- offering technical and operational interconnection facilities on the basis of suitably unbundled system components, in accordance with general practice in the industry
- ensuring that all network operators' switching and transmission facilities have the capacity to interconnect with other networks
- preserving network integrity and security
- reasonable lead times in network provisioning for interconnection
- provisions and requirements for the national numbering plan
- allowances for differences in the interconnecting networks
- the application of good engineering principles and practices
- timely and efficient deployment of sufficient numbers and capacity links to support the required grades of service for customers

b) *Commercial*: and on the commercial side:

- The fundamental principle is that all licensees should be fairly compensated for the cost incurred in the provision of interconnection.
- The structure and level of charges should be related to the direct costs incurred by each network operator. Charges should generally be in proportion to the extent and nature of the interconnection service or facility being supplied, within the total economics of the delivery of an end-to-end service.
- Where charges are determined in relation to direct cost components, these cost elements must be capable of being objectively identified and allocated against specific activities. The costs must be consistent with, and capable of reconciliation against, an overall Chart of Accounts for the licensee based on standardized cost allocation rules.
- Cost based charges should be based on the directly attributable costs of the interconnection service or facility in question.

c) *General Principles*: the GFIA then sets out the general principles governing interconnection:

- The purpose of this General Framework is to ensure that any customer of a telecommunications network can communicate with any customer in another telecommunications network efficiently and without unnecessary impediments.
- Interconnection arrangements should be based on the fundamental principle of symmetrical arrangements and reciprocity as between operators.
- Interconnection and access between network operators shall be on an equitable and non-discriminatory basis.
- A dominant network operator in any particular market segment shall not abuse its market power to limit access to essential or bottleneck facilities for interconnection.
- Charges for interconnection facilities or services should be fair and equitable, having regard to each network operator's relative contribution to the provision of customer services.

- The technical quality of interconnect facilities and services provided by a network operator shall be of no less quality and no less favourable type than that provided within the operator's own network.
- The network operator which provides the customer's access connection should bill the customer except as provided for in paragraph 78 (*which refers to a second carrier chosen by the customer under the equal access rules - ed.*)
- The charging structure should be clear and unbundled. In general, the charging regime should be consistent with practice world-wide that distinguishes between:
  - appropriate fixed charges for the provision and operation of the points of interconnection;
  - variable traffic based usage charges;
  - charges for supplementary and support activities such as billing, directories, enquiries, or emergency services;
  - separate pricing and provisioning arrangements for leased transmission links on the basis of cost of provision plus a reasonable return on investment; and
  - interconnect and related charges should comprise of the cost of provision, plus a reasonable rate of return on the assets deployed.
- Interconnection charges will be set so as to:
  - promote efficient and sustainable competition for the benefit of customers; and
  - encourage the use of an existing network when to do so is economically efficient, rather than encourage the wasteful duplication of resources.
- There should be no cross-subsidization between carriers through a carrier charging less than the costs incurred. To ensure that no cross-subsidization occurs, no one carrier should be asked to carry an inequitable share of the universal service obligations out of proportion to its market share.
- Interconnection and access shall be established on the basis of the timely provision of relevant information between interconnecting network operators.

d) *Scope of the Interconnection Agreement (ICA)*: finally, the GFIA outlines that ICAs shall at least cover the following:

- a) scope and definition of services;
- b) interconnection and POI requirements and principles;
- c) provision of information;
- d) interconnection provisioning procedures;
- e) network and transmission capacity requirements;
- f) technical service level commitments;
- g) technical specifications and standards;
- h) transmission and performance standards;
- i) fault reporting and resolution procedures;
- j) network management, maintenance and measurement;
- k) network safety, protection and related matters;

- l) call handling and operations procedures;
- m) access to interconnection facilities and sharing of infrastructure;
- n) charging mechanisms, billing and settlement procedures;
- o) transmission of calling line identification (CLI information);
- p) operator assisted services, directory information and assistance;
- q) commercial terms and conditions;
- r) the universal service contribution of operators;
- s) provision for contribution to the cost of local access;
- t) network numbering;
- u) confidentiality of information;
- v) liability and indemnities;
- w) force majeure;
- x) intellectual property rights;
- y) provision for an ICA liaison and co-ordination Management Committee;  
and
- z) review periods and terms for review.

## Part 4: Mobile Interconnection

### 4.1 Cost-Based Interconnection Charges

The GFIA covers all Licenced Network Operators, fixed and wireless, as appropriate. It was accompanied by a policy of Equal Access among fixed line operators allowing customers of one fixed network to select another fixed operator to make long distance and international calls. Selection was on a call-by-call basis from the beginning of 1999, and additionally on a pre-selection basis from the beginning of 2000 with full implementation from the beginning of 2001. The two policies together constitute a major reform of the regulation of telecommunications in Malaysia and a decisive shift towards competitive service markets.

In preparation for the implementation of the GFIA, the JTM commissioned a study by the consultancy company *Analysys* to examine costs. The costs of the consultancy were borne by all the operators in a move to ensure absolute independence. In a *Statement on the Implementation Plan of Equal Access and Cost-Based Interconnection Pricing In Malaysia*, (10 April 1998) the Minister, Datuk Leo Moggie, announced that fixed line interconnection charges would be set “closer to fully allocated cost” for an the interim period. On the other hand, interconnection charges for mobile networks (mobile-to-mobile and mobile-to-fixed) “will be set closer to long run incremental cost.”

*Analysys* used TMB’s costs to estimate average fixed line costs, and Celcom’s costs to estimate incremental costs for mobile operators. The final determination was made by the JTM in document TRD 006/98 *Determination of Cost-Based Interconnect Prices and the Cost of Universal Service Obligation*, 15 July 1998. The following principles were established:

- All Licensed Network Operators (LNO’s) have the right to purchase interconnection services from each other. Other organizations, such as Public Access Mobile Radio (PAMR) operators, service providers, will be treated as follows:
  - PAMR operators will be allowed to connect to LNO’s for breakout into a public network. However they will not be able to interconnect under the same terms and conditions as LNOs. Instead, interconnection will be treated as a matter of commercial negotiation between an LNO and a PAMR operator. The Director General has the power to intervene if the PAMR operator and the LNO’s are unable to arrive at a commercial agreement. Under these conditions, the Director General will determine a reasonable price.
  - Service providers do not have the right to purchase interconnect services at cost-based prices. If in the future service providers are allowed in the market, the terms

will be a matter of commercial negotiation, and, as with the PAMR operators, there will be the possibility of recourse to a regulatory ruling.

The reference in the last bullet point to service providers is a reference to the new licensing categories and procedures introduced by the Communications and Multimedia Act, 1998. Under the Act an industrial Access Forum is to be established which, in the case of unanimous decisions, can make recommendations as to which network elements should be included in network unbundling. The JTM's TRD 006/98 document establishes the criteria for those network elements which will be subject to cost-based interconnection as "well-established" and "essential or bottleneck" facilities, and if "the facilities required for interconnection are not a bottleneck, then the interconnection is not subject to cost-based pricing for any service." Furthermore, if the facilities are bottleneck but not well established they are not subject to cost-based pricing.

A bottleneck is defined "as the control by a single or limited number of operators over an essential facility required for interconnection" and a service is well-established if "it has a well-established demand characteristic, and the investment required to provide it is therefore legitimately regarded as not being an unusually high-risk investment." Among mobile operators the Mobile Switching Centre (MSC) is considered as bottleneck facilities. In fixed line networks the local and tandem exchanges and the local loop portions of private circuits are considered bottlenecks and private circuits as well established.

The Determination also defined the origination and termination of services for fixed-to-fixed and fixed-to-mobile. The latter were defined as follows:

- Single tandem termination: This applies when the B (called) party is within the same Closed Number Area (PSTN) or Automatic Telephone Using Radio (Mobile) Exchange area as the POI at which the call is presented for termination, unless the local call termination charge applies. This payment category will be used for terminating all calls (fixed to fixed, mobile to fixed, incoming international) - in the case of cellular this includes MSC to Base Station Controller (BSC) and/or Base Transceiver System (BTS)
- Double tandem termination: This applies when the B (called) party is in a different Closed Number Area (PSTN) or Automatic Telephone Using Radio (Mobile) Exchange area as the POI at which the call is presented for termination, unless the local call termination charge applies. This payment category will be used for terminating all calls (fixed to fixed, mobile to fixed, incoming international) - two MSCs in the case of a cellular system.

The exceptions to these rules are CNA 09 which covers three states (Pahang, Terengganu and Kelantan) is considered double tandem, the use of submarine cable links between

Peninsular Malaysia and Eastern Malaysia (Sabah and Sarawak) to which an extra charge will be added to the double tandem charge, and special CNAs specified in the National Numbering Plan, such as 03, 04, 081, 082, etc. Refer to Map in Appendix A.

All interconnection agreements negotiated prior to Determination TRD 006/98 were reviewed by the end of 1998 towards compliance with the Determination for cost-based charges to be introduced from January 1999.

#### 4.2 Benchmark Interconnection Charges

JTM established benchmark interconnection charges between fixed and mobile, mobile and fixed, and mobile and mobile, which distinguish between just two types of call termination: when call termination from the POI is in the called-party's home area, and when it is outside the called party's home area.

Calling party pays (CPP) applies in all cases, and the direction of the interconnection payment is therefore from the network of call origination to the network of call termination. The home areas are termed the Automatic Telephone Using Radio (ATUR) exchange areas. Table 2 provides the details (with a US\$ conversion ratio of RM3.8)

Table 2

<b>Interconnection charges per minute for fixed – mobile, mobile – fixed, and mobile – mobile</b>	<b>Peak</b>	<b>Off-Peak</b>
Call attempt from a POI within the same Automatic Telephone Using Radio (ATUR) exchange area	13¢ (3.42¢ US)	6¢ (1.58¢ US)
Call attempt from a POI outside the same Automatic Telephone Using Radio (ATUR) exchange area	18¢ (4.74¢ US)	8¢ (2.11¢ US)

The interconnection charges of 3.42¢ US for local calls and 4.74¢ US for long distance calls compares with a country average for calling party pays (CPP) administrations of 13.8¢ US (see ITU *Fixed-Mobile Interconnection Workshop Briefing Paper*, 22-22 September, 2000, Geneva, [www.itu.int/interconnect](http://www.itu.int/interconnect)). The 1999 average for OECD countries for mobile-to-fixed is 2.32¢ US and for fixed-to-mobile 25.97¢ US, with these prices averaged over distances of 5km, 20km, 50km and 200km. The price of interconnection for fixed to mobile varied within the OECD from 15¢ US to 36¢ US. See OECD (2000) *Cellular Mobile Pricing Structures and Trends* (<http://www.oecd.org/dsti/sti/it/index.htm>)

For comparison purposes, table 3 provides mobile retail prices, which apply equally to fixed-to-mobile, mobile-to-fixed and mobile-to-mobile. (This contrasts with data from the OECD where "it is, on average, more expensive to call from a fixed network to a mobile network than in the opposite direction." (pp.45-46). The average difference being a ratio of 1.28:1.) However mobile prices in Malaysia were deregulated from 1 August 2000 and

since then new competitive tariffs have been introduced. Details are available from the websites of the operators.

Table 3

<b>Mobile – mobile retail tariffs @ 10¢ per unit</b>	<b>Peak (7am – 7pm)</b>		<b>Off-Peak (7pm – 7am)</b>	
	<b>Seconds per unit</b>	<b>Price per minute</b>	<b>Seconds per unit</b>	<b>Price per minute</b>
Same area	20	30¢	40	15¢
Adjacent area	7.5	80¢	15	40¢
Non-adjacent area	4	RM 1.50	8	75¢

Note: Pre-paid calls account for more than 50 per cent of the total, and are charged a premium of 50 per cent or more.

At peak hours mobile operators have been making a margin of 17¢ per minute for local calls and up to RM 1.32 for long-distance calls. Off-peak margins range from 11¢ per minute to 67¢ per minute. As charges fall through the deregulation of retail prices, these margins will fall also, and revenue for voice services will come to depend upon price and income elasticities of market demand.

Again, for the sake of comparison, the following two tables give details of the benchmark interconnection rates for fixed line and retail prices.

Table 4

<b>Interconnection charges per minute for fixed – fixed</b>	<b>Peak</b>	<b>Off-Peak</b>
Local termination	2¢	2¢
Long-distance using transmitting through a single tandem <sup>1</sup>	8.5¢	3¢
Long-distance using transmitting through a double tandem	18¢	8¢
Long-distance using transmitting through a double tandem and submarine cable	26¢	11¢

Note 1: exceptions are the large- area states of Pahang, Terengganu and Kelantan where double-tandem rates will apply.

Table 5

<b>Bands of fixed retail tariffs</b>	<b>Peak – 13¢ unit</b>	<b>Price per minute</b>	<b>Off Peak – 13¢ unit</b>	<b>Price per minute</b>
Local: same/adjacent charge areas	60 seconds	13¢	90 seconds	8.7¢
Band A: 50k 150k	20 seconds	39¢	40 seconds	19.5¢

Band B: 150k 550k	7.5 seconds	RM 1.04	15 seconds	52¢
Band C: > 550k	4 seconds	RM 1.95	8 seconds	97.5¢
Band D: Sabah/Sarawak	3 seconds	RM 2.60	6 seconds	RM 1.30

The contrast with mobile is that while interconnection charges are lower for local calls and similar for long-distance (18¢ for double tandem) retail charges are significantly lower until Band C. For mobile operators transmitting calls between Eastern Malaysia and Peninsular Malaysia there are significant charges from TMB for the use of submarine cable capacity, so most operators prefer to lease satellite transponder capacity. By contrast, leasing capacity on fibre within Peninsular Malaysia is now much more competitive.

#### *4.3 Comparative Study: The Cases of China and Hong Kong, SAR*

In China, the incumbent operator, China Telecom, was directly under the old Ministry of Posts and Telecommunications (MPT) while the new entrant, China Unicom was the primary responsibility of the old Ministry of Electronic Industries (MEI). Since the merger of the two ministries in 1998 into the Ministry of Information Industries (MII), the operations of China Telecom have been separated from direct Ministry control and China Unicom has been given greater scope to build mobile and fixed networks. Interconnection, however, has always been a problem for China Unicom, as the ITU study *Fixed-Mobile Interconnection: The Case of China and Hong Kong, SAR* ([www.itu.int/interconnect](http://www.itu.int/interconnect)) explains.

Since the formation of the MII, interconnection has been mandated. China Unicom must pay China Telecom 0.08 Yuan (US\$0.0096) for every three-minute call originating from its mobile subscribers to China Telecom's local fixed telephone customers. China Telecom pays China Unicom 0.01 Yuan (US\$0.0012) for every three-minute call originating on its fixed network to China Unicom's mobile subscribers. Mobile-to-mobile calls between the two networks are on a sender-keeps-all basis. For long-distance calls, 92 per cent of the revenue should go to the network providing the long-distance transmission.

These charges are far lower than those in Malaysia, but they are derived from China Telecom's retail charges which have remained unchanged for years and are very low to start with. Over the past year or two, China has begun to reduce significantly its international call charges, and local tariff rebalancing will effect these interconnection charges. So will the shift to calling party pays. Currently in China, as in Hong Kong, both calling and receiving party pays.

In Hong Kong interconnection charges are cost-based. Mobile operators pay fixed line operators HK\$79 per month line charges (US\$10) and, since October 2000, HK 5.1¢ per minute usage charges, know locally as PNETS charges or public non-exclusive

telecommunications service charges. There are no fixed line local call charges in Hong Kong, so the PSTN is compensated according to relative usage through the PNETS charge. Internet Service Providers (ISPs) are charged HK 2.3¢ per minute usage. The difference is due to the longer average duration of Internet calls, which therefore spreads the initial call setup costs. Mobile-to-mobile interconnected in Hong Kong on a sender-keeps-all basis, but the introduction of mobile number portability (MNP) now also requires operators who do not maintain their own ported numbers databases to pay a "dipping fee" to the incumbent operator, Hongkong Telecom, for use of the database. (For Hong Kong data see [www.ofta.gov.hk](http://www.ofta.gov.hk). See also the ITU's Centre of Excellence (CoE) module on Interconnection, a case study on Hong Kong.)

#### *4.4 Universal Service Obligation*

Each fixed and mobile carrier contributes to the USO according to their proportion of the industry's total revenue as determined by the formula:

A x local revenues  
 B x Long distance and international revenues  
 C x mobile revenues  
 D x other revenues

Where: A = 0, B = 1, C = 0.5, and D = 1.

So the contribution of mobile revenues is weighted by 50 per cent of the carrier's total relevant revenues and these are then estimated as a proportion of the industry's total relevant revenue. Local revenues are obviously excluded to ensure TMB is fully compensated for the burden of aiming to provide universal local service. The Ministry estimated the Universal service obligation at RM 300 million for 1999, but the figures are to be reviewed for subsequent years.

## Part 5: Discussion

### 5.1 Context

The decision to embark on the General Framework for Interconnection and Access (GFIA) came as part of a wider objective to shift the emphasis from regulation dominated by state intervention to one of industry self-regulation. This could only take place if (a) market liberalization had already created new entry opportunities, and (b) if the new entrants were effectively competitive. To be effectively competitive there must be (c) no industry collusion, and (d) competitors must be economically viable. Malaysia began the process of liberalization from the late 1980s, licensing new operators for both mobile and fixed line services, including long distance and international gateways. TMB operated one of the mobile networks and is a stakeholder in another (Mobikom) but neither has dominated the market, which is led by Celcom and Maxis.

Rather than collusion there has been competition between these companies. This matches the finding of the report from the OECD (2000) *Cellular Mobile Pricing Structures and Trends* (<http://www.oecd.org/dsti/sti/it/index.htm>) that the level of competition becomes significantly greater in economies where there are four or more cellular operators.

Like all incumbents TMB was at first resistant to interconnection. In the first agreement in 1990, Celcom had to pay TMB the full PSTN rate, while in the second agreement in 1995 the commercial arrangement was confined to revenue sharing. The shift to cost-based interconnection charges was brought about when the JTM (the forerunner of the CMC) called the industry players together to jointly fund inquiries into the costs of equal access (PSTN) and interconnection (fixed and mobile). At the same time the cost of TMB's universal service obligation was estimated and the formula introduced to pay for it. The cost of introducing Equal Access was estimated at RM 26 million by a technical committee chaired by Time Telecom, and this represented the first attempt to move to cost-based charges in Malaysia. Celcom provided the chair for the interconnection inquiry, which lasted several months and involved 4 workshops. The costing model was presented in spreadsheet form, but it is understood the level of detail was not great which reflects the fact that collecting accurate data on costs is a difficult and lengthy process.

### 5.2 Building a Consensus out of Conflict

By bringing the industry players together in this way, the JTM set about building the basis of consensus within the telecoms sector. This was important because competition tends to produce an antagonistic environment as commercially so much is at stake. In Malaysia there are no industry associations and no telecommunications user groups who can act as informed or disinterested parties and provide neutral forums for debate and discussion of issues. For this reason, the Communications and Multimedia Act, 1998 proposed the establishment of an industry forum to strengthen industry consultation and the involvement of the private sector.

One important issue is the right of the interconnecting service provider to have access to a POI which is commercially optimal, that is near-end when required, or far-end when the mobile operator also has its own trunk backbone network. This was determined in the case of Malaysia by TRD 006/98. This also permits equitable equal access arrangements by allowing trunk-side interconnection, so customers of the incumbent can access the long-distance carrier of their choice. See, World Bank (2000) *Telecommunications Regulation Handbook: Module 3 – Interconnection*.

The means by which the network elements open to interconnection, that are considered bottleneck facilities and well-established, are determined is an important part of regulation. The authority of the regulator needs to be clearly established in law, and the good intentions of the law understood and respected within the industry. The *Malaysia Communications and Multimedia Commission Act of 1998* and the *Communications and Multimedia Act, 1998* are important steps in this direction. Chapter 3 of the Act specifies *Access to Services*, which are to be made available to interconnecting licensed network operators. They are to be specified in an Access List and will be mandatory. Network facilities and the Access Forum may add services to the Access List.

The Commission shall determine that the recommended network facilities or class of network facilities or network service or class of network services be included in the access list, if it is satisfied that the access forum has consulted with persons who have an interest in the recommendation, and that the access forum was unanimous in supporting the recommendation. (*Communications and Multimedia Act, 1998, Section 147.2*)

In reality, bringing about good working relations between competitors is not a simple task, and the industry forum has spent its early months bogged down in procedural wrangles over voting rights (should they be proportional or equal?) and working procedures (how are items added to or taken off the agenda of meeting?)

### *5.3 Interconnection Agreements*

The benchmark interconnection prices determined under 006/98 were designed to be ceiling prices, although all the operators have accepted them. Any privately negotiated agreements can undercut them, and will remain commercially confidential, but must be registered with the CMC, which can compare agreements to ensure no anti-competitive practices are in place.

These prices are provisional. Later, when costs are better established, prices may be adjusted closer to long run incremental cost, and separate charges for call setup and call duration may be introduced. De-averaging of prices is so far confined to Eastern and Peninsular Malaysia.

How will the CMC tackle the issue of costs in the future? The consultant, Analysys, carried out a benchmarking exercise across companies as one method of determining what is a reasonable cost. Only TMB has the detailed data for a bottom-up estimate of the cost of providing universal service fixed line, and in the recent past Celcom's costs have been used to benchmark cellular charges. Given the big differences between fixed line and mobile network costs, and the substantial historical cost involved in TMB's network, different costing principles have been applied to fixed and mobile services, the former adopting fully allocating cost and the latter "closer" to long run average incremental cost. Will commercial agreement be sufficient to bring down interconnection charges in the future, or will the CMC need to devote resources and expertise to this area? This is one of the challenging issues yet to be faced.

#### *5.4 Broadband*

Inevitably there are issues not included in the interconnection agreement that some operators would like to see included. For example, there is no direct link to TMB's director inquiries (DQ) service. Nor are there direct routes for others services, for example a customer cannot report a fixed line fault to TMB using a mobile phone. Intelligent Network (IN) services are not interconnected, and among operators there is no interconnection for Short Messaging Services (SMS).

These services which are not interconnected may be thought of as mostly value-added rather than basic, but as narrowband telecommunications gives way to broadband these, or comparable services, may come to dominate network traffic. The issue of broadband interconnection has been the subject of an ITU study on behalf of the CMC, and is now under review. The issues will include possible interconnection of cable TV, which currently only serves the Klang Valley area, satellite delivery of fast Internet and interactive TV, and digital subscriber line access. Third generation mobile telephony will also be a candidate for debate, and a public consultation on policy towards the issuing of 3G licences, *Concepts and Proposed Principles on the Implementation of IMT-2000 Mobile Cellular Service in Malaysia*, dated 10 November 2000, was posted on the Communications and Multimedia Commission website (see [www.cmc.gov.my](http://www.cmc.gov.my)).

Cellular systems also cover between 60 and 70 per cent of Malaysia, including coverage in East Malaysia where only one company, Maxis, had not started building a network by late 2000.

## 6.1 References:

*Concepts and Proposed Principles on the Implementation of IMT-2000 Mobile Cellular Service in Malaysia*, dated 10 November 2000, MCMC (see [www.cmc.gov.my](http://www.cmc.gov.my)).

*Communications and Multimedia Act*, 1998

General Agreement for Interconnection and Access (GFIA) – Director General of Telecommunications, Malaysia, 17 May 1996

OECD (2000) *Cellular Mobile Pricing Structures and Trends*, <http://www.oecd.org/dsti/sti/it/index.htm>

ITU *Fixed-Mobile Interconnection Workshop Briefing Paper*, 22-22 September, 2000, Geneva, [www.itu.int/interconnect](http://www.itu.int/interconnect))

ITU: *Fixed-Mobile Interconnection: The Case of India*, ITU, 2000 ([www.itu.int/interconnect](http://www.itu.int/interconnect))

ITU: *Fixed-Mobile Interconnection: The Case of China and Hong Kong SAR*, ITU, 2000 ([www.itu.int/interconnect](http://www.itu.int/interconnect))

The *Malaysia Communications and Multimedia Commission Act of 1998*

Minister of Posts, Energy and Telecommunications (MEPT) *Minister's Statement on the Implementation Plan of Equal Access and Cost-Based Interconnection Pricing in Malaysia*, (10 April 1998)

World Bank, 2000, *Telecommunications Regulation Handbook: Module 3 – Interconnection* (forthcoming)

## 6.2 Useful sites:

### **Malaysia**

Ministry of Energy, Communications and Multimedia Malaysia - [www.ktkm.gov.my](http://www.ktkm.gov.my)

Malaysia Communications and Multimedia Commission - [www.cmc.gov.my](http://www.cmc.gov.my)

Celcom - [www.celcom.com.my](http://www.celcom.com.my)

Digi Telecom - [www.digi.com.my](http://www.digi.com.my)

Maxis - [www.maxis.com.my](http://www.maxis.com.my)

Telekom Malaysia - [www.telekom.com.my](http://www.telekom.com.my)

Time Telecom - [www.time.com.my](http://www.time.com.my)

### **China**

Ministry of Information Industries: [www.mii.gov.cn](http://www.mii.gov.cn)

### **Hong Kong, SAR**

Office of the Telecommunications Authority (OFTA) Hong Kong, SAR: [www.ofta.gov.hk](http://www.ofta.gov.hk)

### **India**

Telecommunications Regulatory Authority of India: [www.trai.gov.in](http://www.trai.gov.in)