

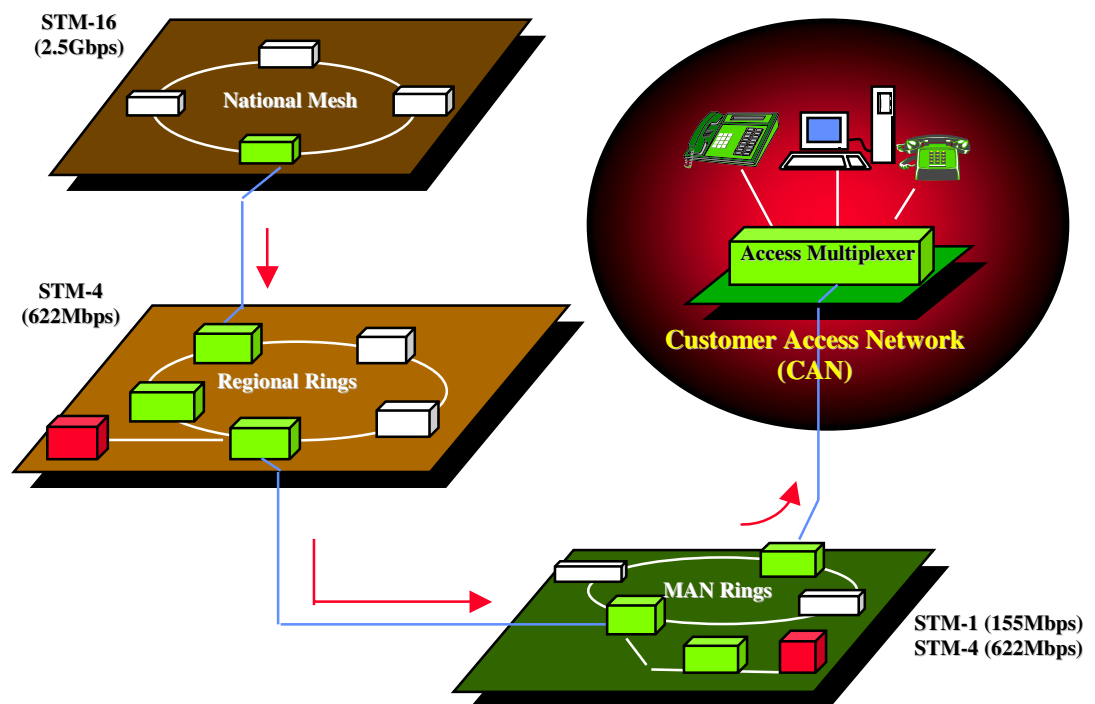
## 13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS

### 13.1 Main Features of the Telecommunications Network

TIME dotCom Group's network relates to the facilities made available based on the licences issued to the TIME dotCom Group, which includes the International Gateway Licence, Fibre-Optics Network Licence, Domestic Operators Licence, Personal Communication Network Licence and Public Telephone Licence, Data Communication Licence and Internet Service Provider Licence. The main features of the telecommunications network are as follows:-

#### Network Architecture

- **TT dotCom's Network Layer**



#### (i) Fixed Line

##### *National Trunk Network*

TT dotCom's national trunk network consists of 3,600 km of cable route linking the major cities of Peninsular Malaysia, 8 trunk switching nodes and 2 international gateways. The main fibre route along the NSE belongs to PLUS. Other routes connect Port Klang, Melaka, Kuala Terengganu and Kota Bharu. The 1,600 km submarine festoon system completes the national network. The combination of submarine and terrestrial cables amounting to 5,200 km provides resiliency along most routes.

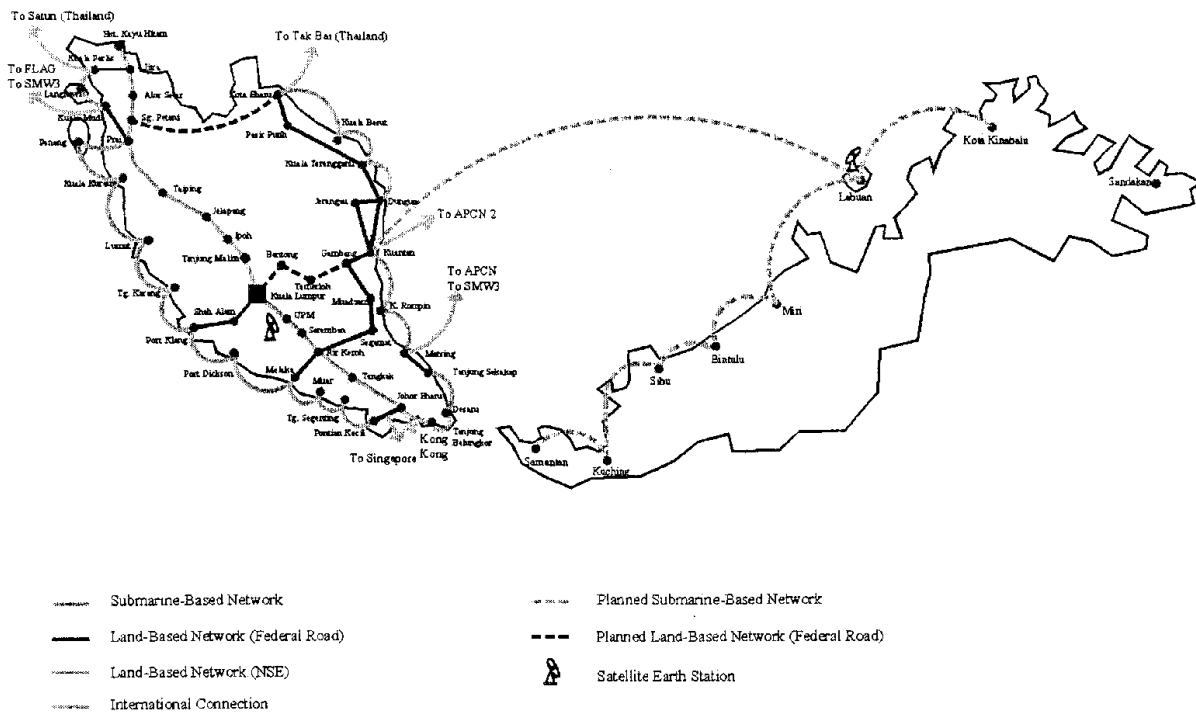
The national network nodes and trunk switches are located in Prai, Ipoh, Labuan, Shah Alam, Serdang, Melaka, Kuantan and Johor Bahru. The network also covers other cities including Alor Setar, Penang, Seremban, Kuala Terengganu and Kota Bharu.

13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)

The trunk transmission is provided by an STM-16 mesh network and 7 STM-4 ring systems. The STM-16 links the major cities while the STM-4 is used to reach outlying areas. The 8 switches each have a capacity of 23,000 trunk circuits. Remote line units hosted on these switches may be used to provide an initial capacity of up to 100,000 lines per switch.

In East Malaysia, the network comprises of a MAN and a switching network in the Federal Territory of Labuan. The network in East Malaysia ties to Peninsular Malaysia via leased circuits.

TT DOTCOM'S NETWORK MAP



Metropolitan Area Networks

The MANs provide fibre based distribution within the central business districts of major cities. The MANs consist of a four (4) way duct infrastructure linking a series of hub sites located in key commercial properties within each city. Each hub comprises a remote line unit providing PSTN services, access multiplex for leased line services and other broadband services, and SDH ring systems linking the hubs to the trunk switches and national network. Over 1,000 kms of urban duct construction have been completed, predominantly in Kuala Lumpur and Johor Bahru, but also in Penang, Prai, Alor Setar, Ipoh, Melaka, and Kuantan. Over 100 hub sites are currently in service.

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**13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)**

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*Customer Access Networks*

Each MAN hub sits at the center of a customer service area which typically consists of 5 to 10 buildings located within a one (1) to four (4) kilometre radius. The copper and fibre cables from the hub to the customer buildings, as well as any necessary CPE, are referred to as the CAN. The CAN cables share the same duct infrastructure as the MANs. Copper cables support PSTN, basic rate ISDN and some leased lines. Point to point fibre transmission is used to support higher bandwidth services and the use of microwave has been very limited. As at todate, over 800 buildings have been accessed.

*International*

TT dotCom has established two (2) international gateways to support the international traffic business with resiliency. The gateways are located in the International Technical Maintenance Centre, Glenmarie and in the Earth Station Center in Serdang.

In the north, TT dotCom and Telephone Organization of Thailand has jointly constructed sub-marine fibre optic cable to link the two countries. This connection forms a loop from Kota Bahru to Tak Bai in the East Coast and Kuala Perlis to Satun in the West Coast.

TT dotCom has also dual connectivity into Singapore through the causeway and the second crossing respectively. This terrestrial fibre optic network has strengthened TT dotCom's international coverage into Singapore and it is connected directly with Singapore Telecom Pte. Ltd. and StarHub Pte. Ltd..

TT dotCom has made a significant investment in the international sub-marine cable system to link its international gateways to foreign partners. The cable system are Asia Pacific Cable Network ("APCN"), South East Asia - Middle East - Western Europe ("SMW3") and Asia Pacific Cable Network 2 ("APCN2"). Through APCN and SMW3 cable system, TT dotCom is connected to Hong Kong, Japan, Australia, United Kingdom, Philippines, Indonesia, Korea, United States of America and Brunei. TT dotCom has established an extensive global connectivity especially in the Asia Pacific Region. The connectivity is mainly for international bilateral business with foreign carriers, international private leased circuit and internet backbone service to support ISPs' need.

APCN2, the new broadband cable system, is an ideal platform for TT dotCom to offer broadband ATM services and IP technology to meet the increasing demand for internet backbone connectivity. This system is targeted to be commissioned in fourth quarter of 2001.

*Points of Interconnection*

TT dotCom has established Points of Interconnection ("POI") with all other domestic operators. Interconnect is achieved either through a mid-span fibre meet or through facilities owned by TT dotCom. There are presently 8 POIs with Telekom Malaysia connecting to 18 Telekom Malaysia's switches, 4 interconnections between the TWSB's PCN 1800 network and TT dotCom's trunk network, and an average of 3 POIs for the other licensed operators.

### 13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)

#### Network Operations Centre

A National Network Operations Centre has been established in Kuala Lumpur from where a 24-hour watch is kept over the operational status of the network and repair teams can be despatched day or night to attend to any network problems. This centre is in the process of being moved to a permanent facility co-located with the Subang trunk switching node. The new building in Glenmarie presently has a PSTN switch and an international switch and in future, a mobile switch as well.

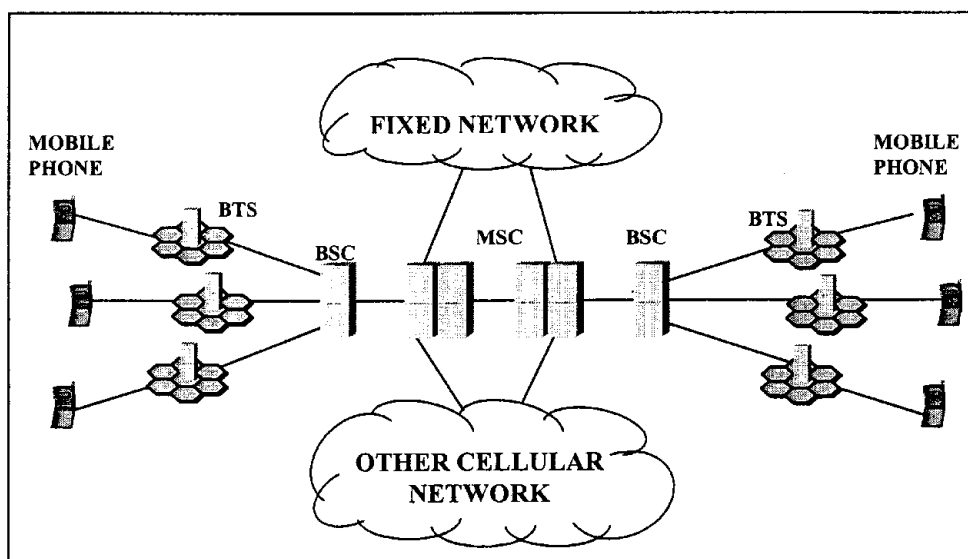
#### (ii) Cellular

TWSB cellular's network is based on the GSM 1800 standard. TWSB operates on the 1800 MHz frequency band. The Ministry of Energy Telecommunications and Posts (*now known as Ministry of Energy, Communications and Multimedia*) has on 26 September 1994 approved the use of a 25 MHz band (1710 MHz to 1735 MHz and from 1805 MHz to 1830 MHz) for TWSB's GSM network.

#### The GSM Network

The basic infrastructure of GSM is similar to all other cellular radio networks.

#### Cellular Network Infrastructure



The system is realised as a network of continuous radio cells, together providing a complete coverage of the service area. Each cell has a Base Transceiver Station operating on a dedicated set of radio channels which are different from the channels used in adjacent cells.

Base Transceiver Stations are logically grouped together and controlled by a Base Station Controller for functions such as handover and power control. A group of Base Station Controllers is served by a Mobile Switching Centre which routes calls to and from other telecommunications networks.

#### Mobile Switching Centre ("MSC")

The MSC is the heart of a cellular radio system. It is responsible for routing, or switching, calls from the originator to its destination.

It also acts as the interface between the GSM network and the public telephony and data networks. The MSC may also be connected to other MSCs on the same network and to other GSM networks.

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**13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)**

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*Data Bases*

Several important data bases store information about subscribers. The Home Location Register ("HLR") stores information relating the subscriber to its network. This includes information for each subscriber on subscription levels, supplementary services and the current or most recently used network and location area.

The Visitor Location Register ("VLR") stores information about subscription levels, supplementary services and location area for a subscriber currently, or most recently, in that "visited" area.

*Base Station Controller ("BSC")*

The primary function of the BSC is call maintenance. As a subscriber moves around, he is likely to move out of one cell and into the area of another. The process by which the call is maintained without a noticeable break is known as handover, and on GSM, during a call, the mobile station "listens out" to all surrounding base stations of the same network and gives a continuous report of their signal quality to the BSC. This allows the BSC to make decision on when to initiate a handover, and to which new cell.

*Base Transceiver Station ("BTS")*

The primary function of the BTS is provide the base station radio transmission and reception. The BTS may contain one or more transceivers, to provide the required capacity. A cell site may be omni-directional, or be split into typically three (3) directional cells.

*Security Features*

High levels of security are provided to protect against misuse of the network by the impersonation of a genuine mobile or eavesdropping of information passed over the air.

The types of information where impersonation and eavesdropping security is provided are:-

- Subscriber identity confidentiality (using the International Mobile Subscriber Identity ("IMSI"))
- Subscriber identity authentication (using the IMSI)
- Subscriber data transfer confidentiality
- Signalling information confidentiality

The provision of security in all these areas is mandatory for all GSM network operators that are signatories of the Memorandum of Understanding.

The IMSI is the number used within the network to uniquely identify a mobile subscriber. The directory telephone number is not used within the network, since it is not always uniquely identifiable on an international basis. The security applied to the IMSI ensures that it is not made available or disclosed to unauthorised individuals or entities.

The IMSI is not normally transmitted over the air interface. It is protected against disclosure by the issue of a temporary number on a random dynamic basis, and this is used over the air interface. Also, since this Temporary Mobile Subscriber Identity may be randomly allocated each time the mobile is turned on or changes area, the tracing of the subscriber's location is protected.

### 13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)

Subscriber identity authentication is the procedure which checks if the identity of the subscriber transferred over the radio path corresponds with the details held in the network. This protects against impersonation of authorised users and fraudulent use of the network.

Security is also provided over the air interface to prevent the information sent from being understood. This is done by encrypting the data transmitted, and it applies to any user data, i.e. voice, data, fax etc..

A summary of the various network elements is set out below:-

	MSC	BSC	BTS	HLR	SMSC	VMS
North	1	8	122	-	-	1
Central	2	17	349	3	2	1
South	1	6	114	-	-	1
East Coast	1	4	38	-	-	-
Sabah	1	3	21	-	-	-
Sarawak	1	4	45	-	-	1
NSE	0	0	58	-	-	-
<b>Total</b>	<b>7</b>	<b>42</b>	<b>747</b>	<b>3</b>	<b>2</b>	<b>4</b>

*SMSC - Short Message Switching Centre*

*VMS - Voice Message System*

Transmission plays a major role in interconnecting all the various network elements such as the MSC, BSC, BTS and POI with other operators.

TWSB transmission network primarily consists of the following transmission media:-

- MSC to MSC : predominantly fibre optic leased lines from TT dotCom;
- MSC to BSC : predominantly fibre optic leased lines from TT dotCom;
- BSC to BTS : predominantly TWSB's own microwave and a few leased lines (fibre optics and/or microwave) from TT dotCom, Telekom Malaysia and Celcom; and
- MSC to POI : a mixture of leased lines and microwave.

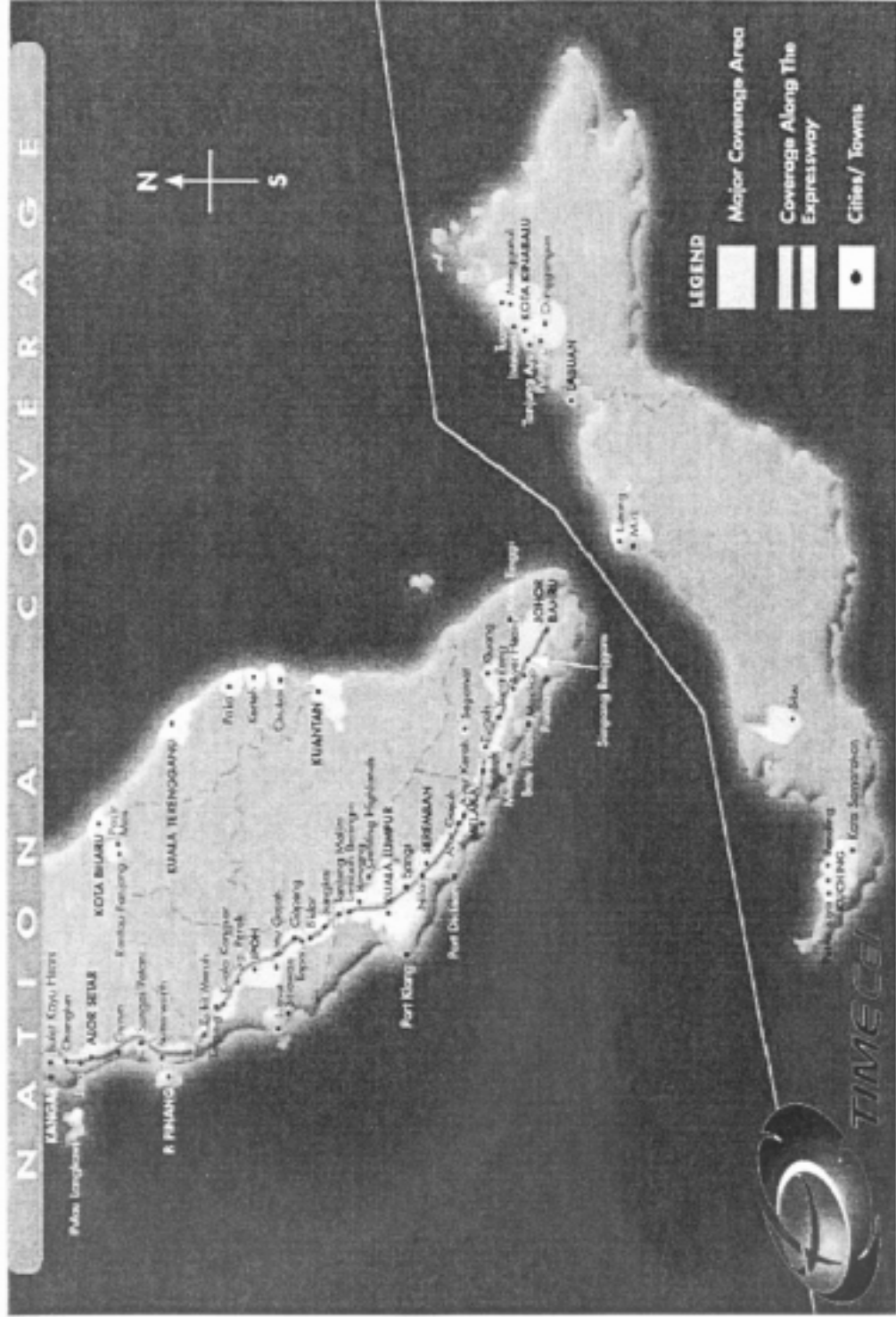
The network coverage extends to all state capitals, major towns, commercial and industrial areas, resorts, golf courses, airports and seaports in West Malaysia and key population centres in East Malaysia.

As part of the integration efforts of the Group, TWSB has been using TT dotCom's fibre optic network for its own requirements and for coverage of the NSE. The NSE is the backbone supporting all economic activities in the West Coast of Peninsular Malaysia as the NSE links all major towns, key transport routes, commercial and industrial areas along the West Coast.

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13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)

**TIMECEL NETWORK COVERAGE**



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**13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)**

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**(iii) Payphones**

TRSB provides payphone services throughout Malaysia, with the primary focus being in the urban areas of Peninsular Malaysia.

In principle, payphone is similar to the ordinary subscriber's telephone set that has a basic telephony circuitry to transmit and receive voice signals. Since it is meant for public use, payphone is equipped with the prepaid payment mechanism to accept and validate coin or card as payment medium.

Payphone works on both fixed lines provided by the PSTN as well as on wireless via cellular network. Payphone connected to fixed line via PSTN works similar to the ordinary subscriber's telephone where a call made will be routed through various stages of network parameters transparent to the user, before it is terminated to the called party.

When a call is initiated from a payphone connected to the fixed line, the voice signal will be routed via a single pair copper wire that is connected to the Distribution Box ("DP"). A single DP normally accommodates a 10-pair overhead cable hooked onto the telephone pole serving smaller customer area. All these DPs are connected to the Cabinet Distribution Point ("CDP") which normally accommodates 500 to 1,000 lines serving larger service area. All CDPs are then connected to the local switch (or exchange) via underground cables. Cables from various service areas are then centrally connected to Distribution Frame located in the local switch building. Depending on where it will be terminated, the call will be processed before it will be further routed. If the call is local, it will be routed back locally within the same switch or the adjacent switches. If it is a long distance call, it will be routed to the tandem switch before it is assigned to the nearest switch where such call is to be terminated via a coax cable or microwave.

Payphone could also operate on wireless using a cellular technology. Under this arrangement, payphone requires a radio interface module called Fixed Access Unit ("FAU"). FAU is a basic cellular telephony circuitry that comes with a SIM. When a call is made, a voice signal is transmitted to the nearest BTS which later route the call to the designated cellular switch via a microwave or fibre leased line. Depending where the call is to be terminated, it will then be transferred to the nearest cellular switch before it is routed back to the PSTN.

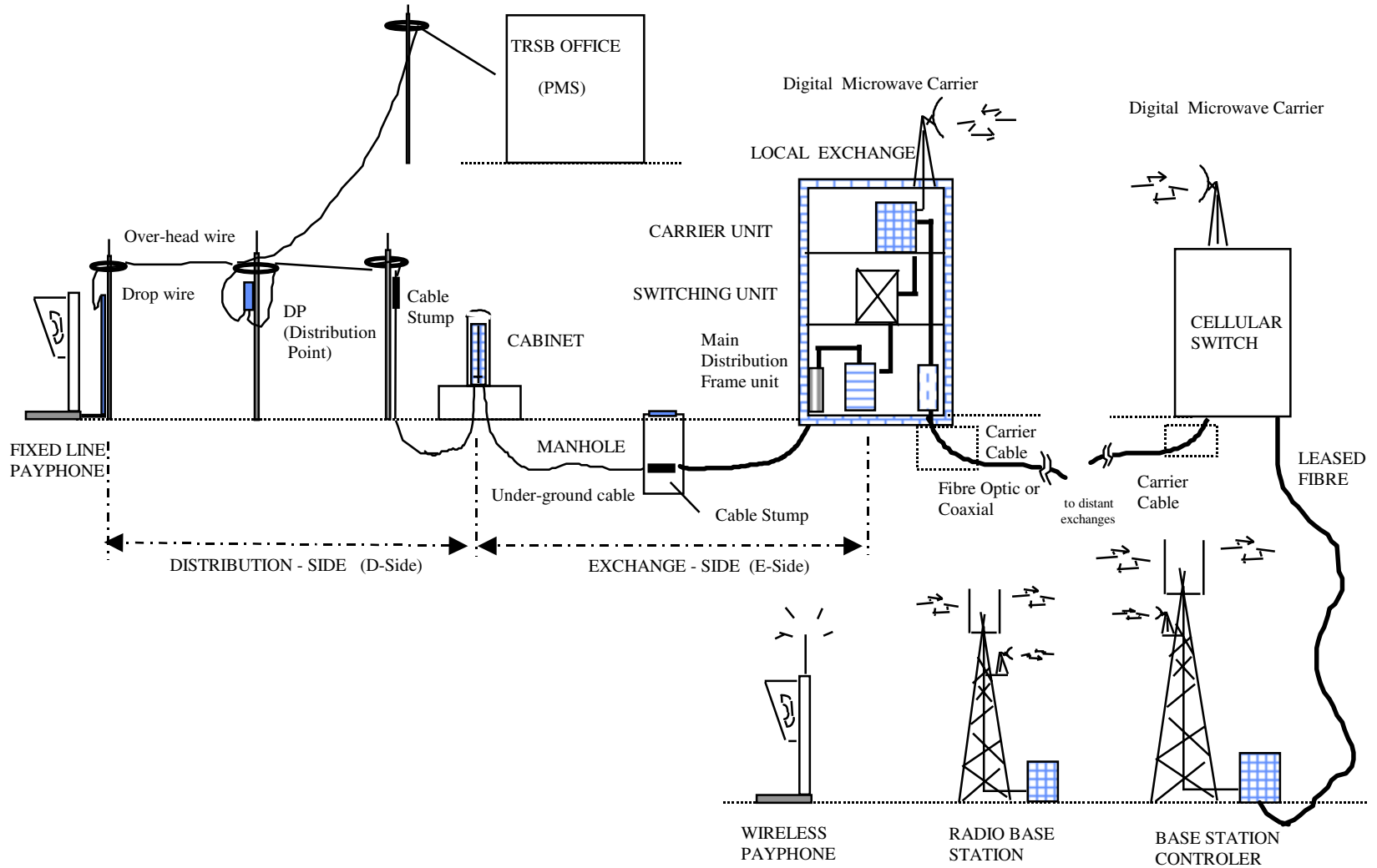
All TRSB's payphones are connected to a real-time management system called Payphone Management System ("PMS"). This is a linked network that is capable of managing the total payphone status remotely. This system will generate the usage and maintenance report to ensure the efficient management of payphone service level.



13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)

The diagram below illustrates the overall payphone network infrastructure:-

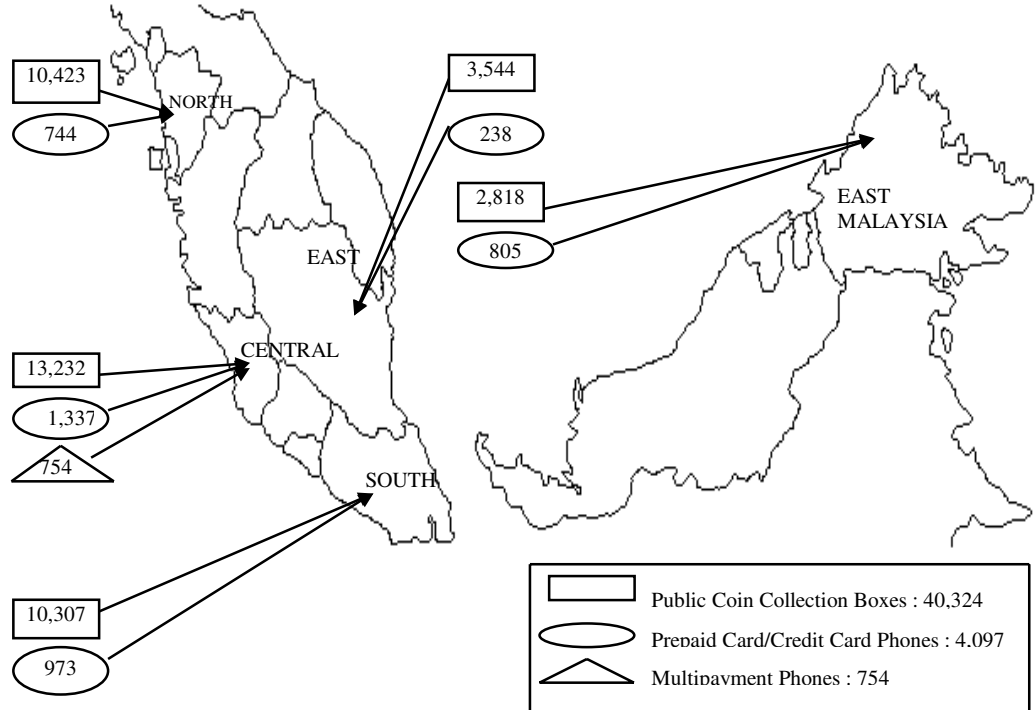
**PAYPHONE NETWORK INFRASTRUCTURE**



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**13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)**


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**Regional Distribution of TRSB's Payphones as at 8 January 2001**

***TIME dotNet***

The main features of TIME dotNet's IP infrastructure are as follows:-

***National Backbone Network***

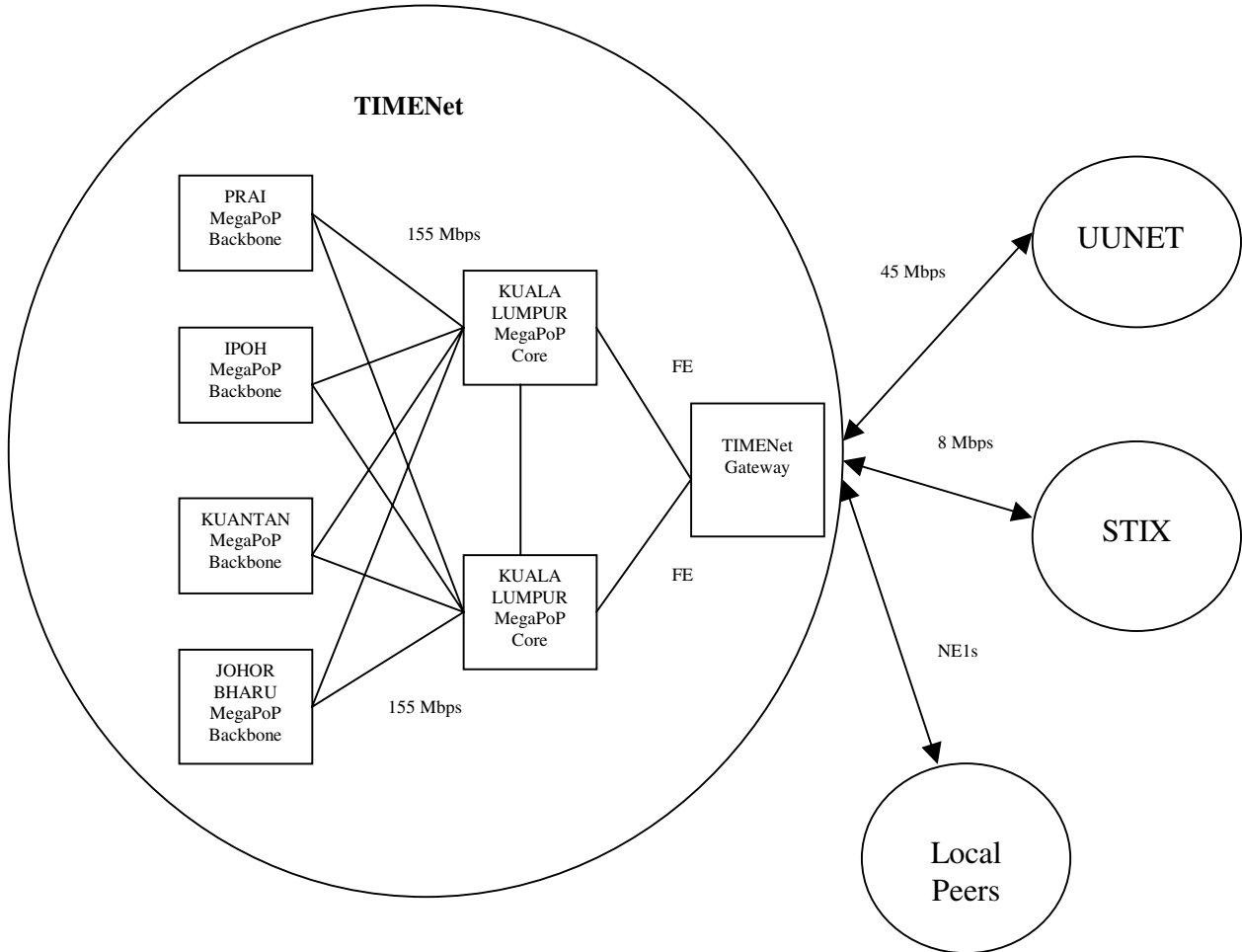
TIME dotNet's national backbone network consists of 5 Mega Points of Presence ("MegaPoPs") linking major cities in Peninsular Malaysia. These MegaPoPs located in Kuala Lumpur, Penang, Ipoh, Kuantan and Johor Bharu are linked via two independent 155 Mbps circuits.

The name MegaPoP arises from the fact that all of TIME dotNet's PoPs are connected via an aggregated bandwidth of 310 Mbps and handles a large coverage area for TIME dotNet's Local Access Dial-up services. Thus TIME dotNet's national backbone network is capable of handling and sustaining high speed traffic, and its high level of redundancy substantially reduces potential data loss and avoids congestion. The national backbone network also puts TIME dotNet in a steady position to provide broadband services and content.

TIME dotNet is also privately peered with ISPs in Malaysia via high-speed links to the Kuala Lumpur MegaPoP thus reducing latency between different ISP networks in Malaysia.

**13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)**

*TIMENet Backbone Network*



- UUNet - An internet carrier
- STIX - Singapore Telecommunications Internet Exchange
- FE - Fast Ethernet is a high speed version of Ethernet. Ethernet is normally a shared Local Area Networking. All stations on segment share the total bandwidth, which is either 10 Mbps (Ethernet), 100 Mbps (Fast Ethernet) or 1,000 Mbps (Gigabit Ethernet). With switched Ethernet, each sender and receiver pair have the full bandwidth.
- E1 - E1 is a classification of digital circuits which transmits at 2 Mbps
- Local Peer - The act of one local internet backbone provider accepting and passing traffic from another local internet provider.

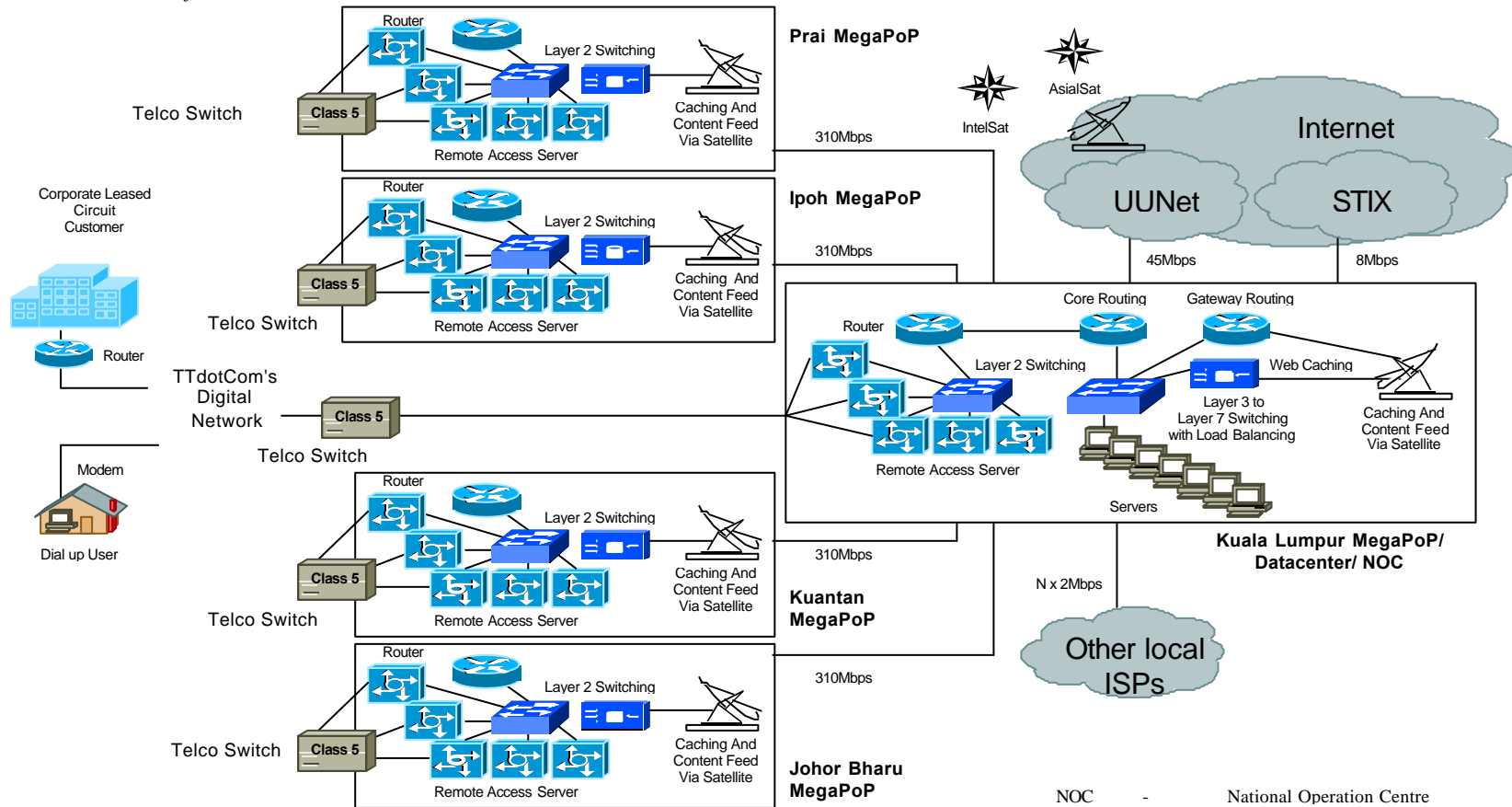
13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)

**MegaPoPs**

TIMENet's MegaPoPs comprises of Remote Access Servers ("RAS") with the latest standard digital modems providing up to 56 Kbps modem access and ISDN services and routers for leased circuit customer access.

All RAS and routers are physically fully redundant. In turn, these physically redundant systems are then made logically redundant with the usage of a robust network architecture that minimizes downtime, if any. Thus, in the event of a module failure, only a small number of ports will be affected, if at all.

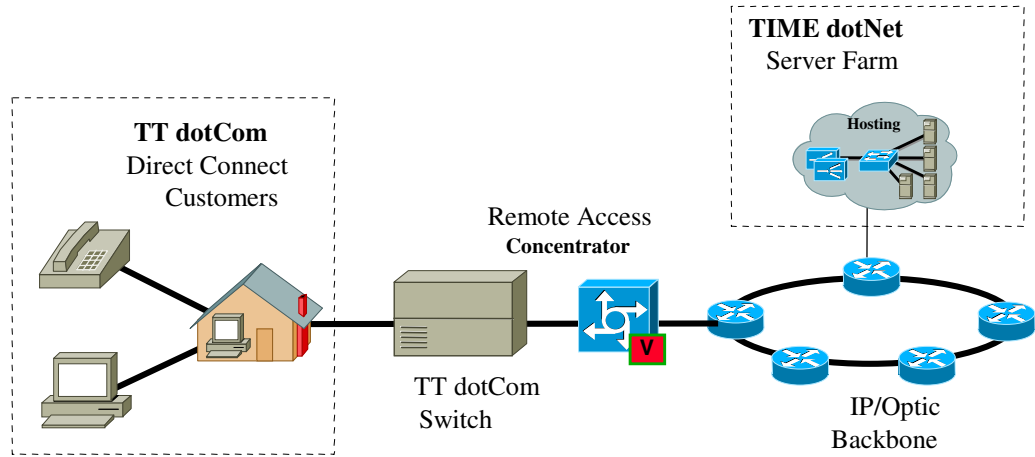
*TIMENet's IP Infrastructure*



13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)

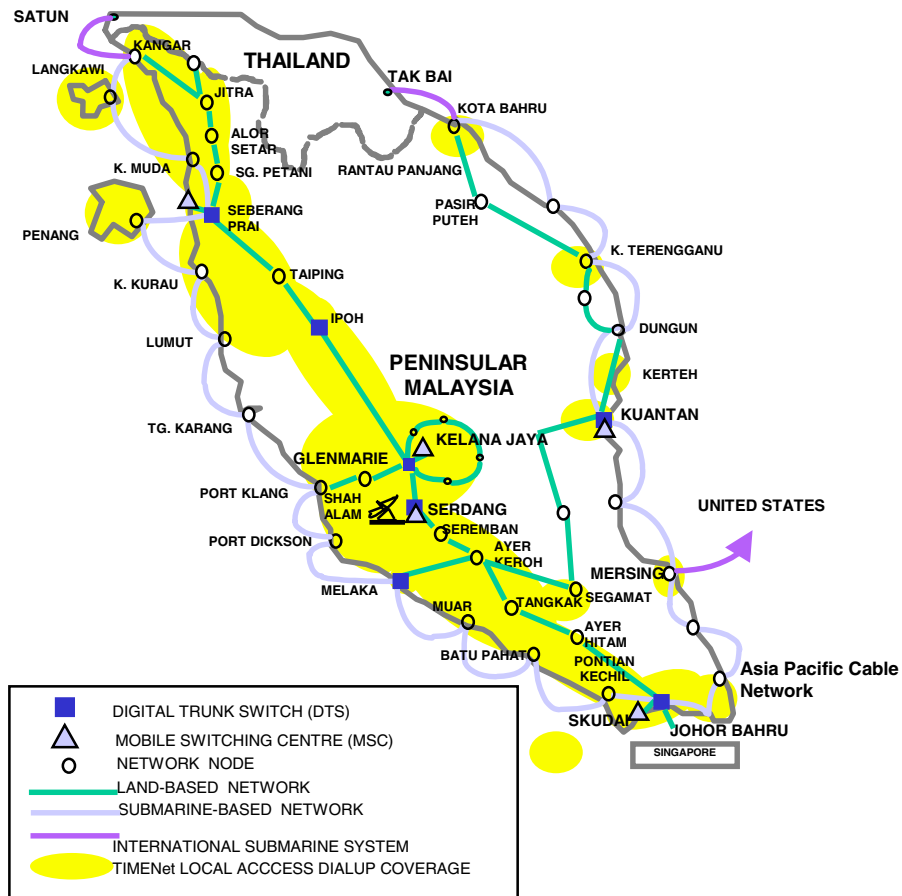
In total, TIMENet has an installed base of 23,940 RAS ports nationwide. The RAS that TIMENet has installed may be upgraded for future services like VoIP and Unified Messaging via the upload of software codes to support these services. It may also form the basis of future broadband services, as the chassis is a common chassis for ADSL line cards.

*Dial-up for TT dotCom's Direct Connect Customers*



The MegaPoPs are directly connected to the telecommunications infrastructure of TT dotCom. This thus gives TIMENet access to TT dotCom's extensive network of POIs to other fixed line carriers such as Telekom Malaysia and Maxis.

TIMENet Access Dial-up Coverage



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**13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)**

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The five (5) MegaPoPs enables TIME dotNet's access dial-up service to cover 80% of Peninsular Malaysia's populated areas and is accessible via any telephone line.

**International Backbone Network**

TIME dotNet's national backbone network is connected to the internet through two independent international circuits going into the Kuala Lumpur MegaPoP. The international backbone network comprises of:-

- A 45 Mbps full duplex submarine fibre link to UUNet. UUNet was the first company to commercialize the internet and is today arguably the biggest internet carrier in the world. This gives TIME dotNet direct access to other large internet carriers via UUNet's private peering arrangements; and
- An 8Mbps link to STIX. STIX is an Asia-wide internet exchange with high speed connectivity to Asian countries and also an aggregated bandwidth of 777 Mbps to the US. This thus provides extensive Asia wide coverage and also a redundant link to the US.

TIME dotNet has configured its network to maximize efficient use of expensive international bandwidth. TIME dotNet applies routing policies that distribute its traffic load at any given time as evenly as possible. This generally means that most internet traffic from the US is routed via the 45 Mbps link whilst most of the Asia traffic is routed via the 8 Mbps link. This combination thus makes TIME dotNet's international backbone a low hop, low latency infrastructure.

**Data Centre**

The Data Centre that houses all of TIME dotNet's servers is co-located with the Kuala Lumpur MegaPoP. This Class A Data Centre occupies approximately 5,000 square feet in TT dotCom's Glenmarie Exchange building. The facility is backed up by an intelligent uninterruptible power supply with surge protection with online automatic diesel generators that are capable of providing power backup indefinitely. Temperature and humidity control within the facility is controlled via redundant precision air conditioners.

The Data Centre is at the very hub of TIME dotNet's extensive IP infrastructure. This makes for fast access to the servers for TIME dotNet's main portal, web-based email services and a host of other services. The Data Centre houses the Domain Name System servers, web servers, chat and forum servers, a centralized remote authentication dial in user service system, an advanced IP billing system and all network element monitoring servers. The Data Centre also houses a server collocation room where customers may rent out rack space to place their servers in.

**Network Operations Center ("NOC")**

TIME dotNet operates a centralized NOC situated within the Data Centre. This facility is responsible for continuous monitoring of the status of all Data Centre facilities, network and systems components and applications deployed throughout TIME dotNet's infrastructure. The NOC is responsible for all operational communications between the internal operations departments as well as external communications with external parties.

The NOC has Network Element Managers which monitors individual components of the infrastructure. On top of this, TIME dotNet deploys a customized Network Management System ("NMS") which enables a one screen outlook at the whole of TIME dotNet's infrastructure. The NOC also deploys a network health monitoring system which proactively detects and predicts problems before they may occur. TIME dotNet's NMS thus provides real-time monitoring of each component and application

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**13. INFORMATION ON THE TELECOMMUNICATIONS BUSINESS (Cont'd)**


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**Technology Platform**

A summary of the technology used in the telecommunications business of the TIME dotCom Group is set out below:-

Technology	<-----Service Type----->				
	Voice	Data	Multimedia	Internet	Value added services
<b>Current</b>					
SDH	✓	✓	✓	✓	✓
PSTN	✓	✓		✓	✓
ISDN	✓	✓	✓	✓	✓
Satellite	✓	✓	✓	✓	✓
Service Node					✓
Fixed wireless	✓				
Internet Protocol		✓	✓	✓	
AIN	✓				✓
GPRS	✓	✓	✓	✓	
GSM	✓	✓	✓	✓	✓
<b>Plan</b>					
Frame Relay/ATM	✓	✓	✓	✓	
DSL	✓	✓	✓	✓	

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