# CHAPTER 5

# CURRENT STATUS OF TELECOMMUNICATION FACILITIES

# CHAPTER 5 CURRENT STATUS OF TELECOMMUNICATION FACILITIES

## 5.1 Existing Switching Network

### 5.1.1 Telephone Network Structure

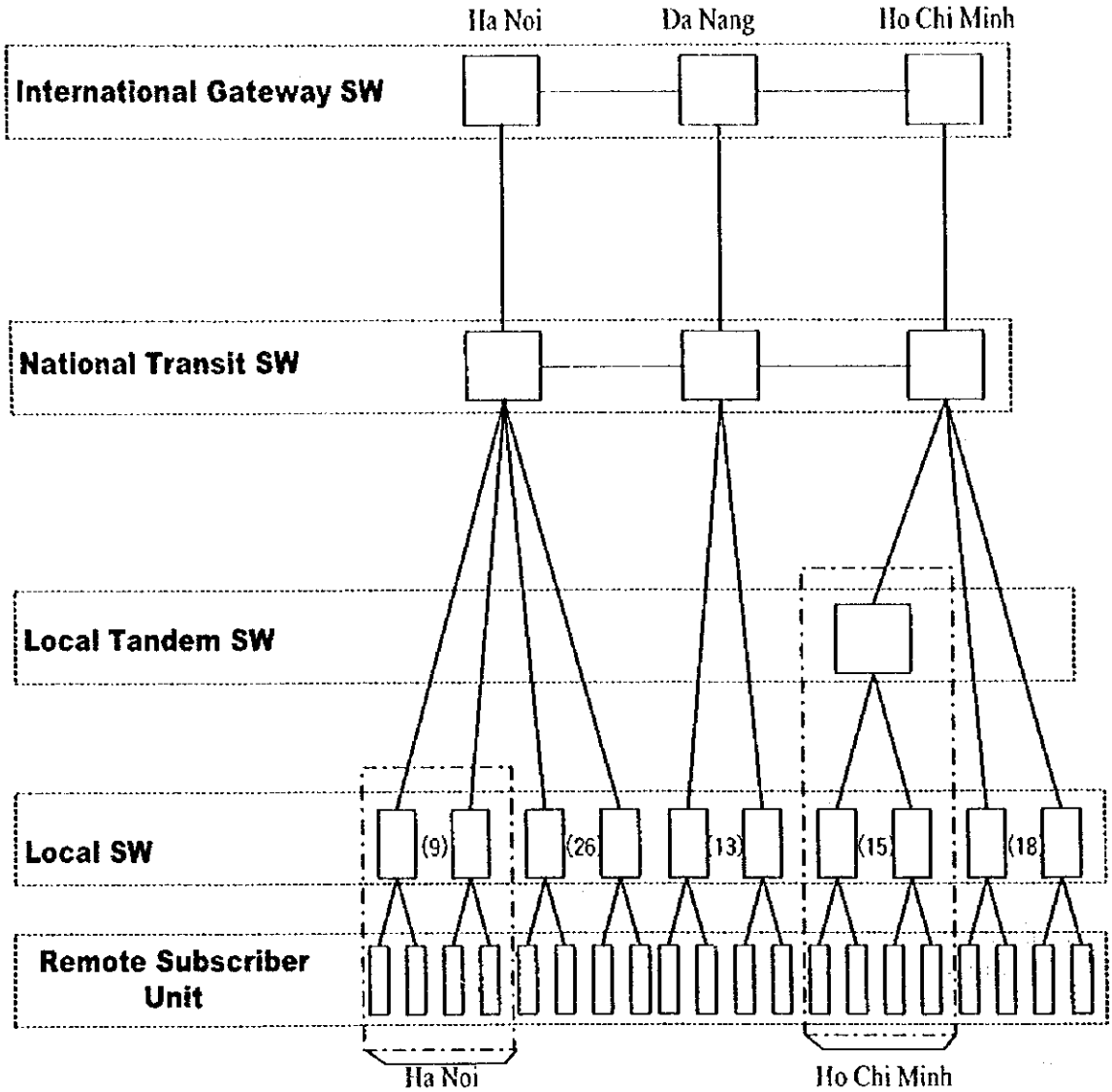
The telephone network structure in Vietnam is shown in Figure 5.1.1-1.
The telephone network hierarchy in Vietnam consists of four (4) levels as follows:

- International Gateway Switch
- National Transit Switch
- Local Tandem Switch
- Local Switch

International gateway switch is located in 3 places, Hanoi, Ho Chi Minh City and Da Nang. The detailed international network is described in Chapter 6.

Domestic network consists of National Transit Switch, Local Tandem Switch and Local Switch. National Transit Switch is located in Hanoi, Ho Chi Minh City and Da Nang. One (1) Local Tandem Switch is located in Ho Chi Minh City. This switch handles local traffic and has circuits to National Transit Switch. One (1) or more Local Switching Centers are located in the capital of each province except Binh Phuc, Hung Yen and Binh Phuoc provinces.

In addition to above-mentioned four (4) levels, RSUs (Remote Subscriber Unit) are installed in each district. These are accommodated to Local Switching Center (provincial Host Switch) in capital.




Source: DGPT

**Figure 5.1.1-1 Telephone Network Structure**

### 5.1.2 Existing Switch

(1) National Transit Switch

Five (5) units of National Transit Switches are working in three (3) places. Present status of National Transit Switch is shown in Table 5.1.2-1.

**Table 5.1.2-1 Present Status of National Transit Switch in 1998**

| No | Province | Exchange Type | Channel Capacity | | Remarks |
|---|---|---|---|---|---|
| | | | Incoming | Outgoing | |
| 1 | Ha Noi | AXE-10 | 6,636 | 6,801 | |
| 2 | Ha Noi | TDX-10 | 2,966 | 2,744 | |
| 3 | Da Nang | AXE-10 | 4,056 | 4,080 | |
| 4 | Ho Chi Minh | AXE-10 | 8,575 | 8,686 | |
| 5 | Ho Chi Minh | TDX-10 | 4,840 | 4,680 | |
| *Grand Total* | | *5 units* | *27,073* | *26,991* | |

Source: DGPT

(2) Local Tandem Switch

One (1) Local Tandem Switch has been installed in Ho Chi Minh City. This switch handles local traffic and has circuits to National Transit Switch. Besides this switch, there are combined switches having both local and local tandem switching function in Ha Noi, Hai Phong and Can Tho.

Present status of Local Tandem Switch is shown in Table 5.1.2-2.

**Table 5.1.2-2 Present Status of Local Tandem Switch in 1998**

| No | Province | Location | Exchange Model | Channel Capacity | | Remarks |
|---|---|---|---|---|---|---|
| | | | | Incoming | Outgoing | |
| 1 | Ho Chi Minh | Hai Ba Trung | EWSD | 10,221 | 9,556 | |
| 2 | Ho Chi Minh | Hai Ba Trung | 1000-E10* | 4,133 | 4,139 | |
| *Grand Total* | | | *2 units* | *14,354* | *13,695* | |

Note: *combined with Local Switch
Source: DGPT

(3) Local Switch

81 units of Local Switches are working in Vietnam. The total capacity is 2,050 thousand lines and 1,550 thousand lines are working. Among them, the capacity of RSU is 1,390 thousand lines and working lines are 990 thousand lines. Local

Switch capacity and working lines are shown in Table 5.1.2-3 - Table 5.1.2-5.

**Table 5.1.2-3 Local Switch Capacity and Working Lines in Ha Noi Area in 1998**

| No | Province | Location | Exchange Model | Capacity and Working Lines | | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Host + Remote | | Host | | Remote | | |
| | | | | Capacity | Working | Capacity | Working | Capacity | Working | |
| 1 | Ha Noi | DinhTienHoang | 1000-E10 | 61,553 | 49,108 | 18,615 | 14,595 | 42,938 | 34,513 | |
| 2 | Ha Noi | Gia Lam | 1000-E10 | 34,981 | 23,018 | 4,845 | 3,698 | 30,136 | 19,320 | |
| 3 | Ha Noi | Tran Khat Chan | 1000-E10 | 27,030 | 17,547 | 9,180 | 8,132 | 17,850 | 9,415 | |
| 4 | Ha Noi | Hug Vuong | 1000-E10 | 39,015 | 33,156 | 15,555 | 13,873 | 23,460 | 19,283 | |
| 5 | Ha Noi | TuLiem | 1000-E10 | 63,961 | 47,884 | 5,355 | 5,034 | 58,606 | 42,850 | |
| 6 | Ha Noi | Thuong Dinh | EWSD | 51,545 | 38,460 | 6,964 | 6,534 | 44,581 | 31,926 | |
| 7 | Ha Noi | Duoi ca | NEAX-61 | 27,108 | 21,601 | 7,012 | 5,927 | 20,096 | 15,674 | |
| 8 | Ha Noi | O Cho dua | EWSD | 27,947 | 21,386 | 10,011 | 6,662 | 17,936 | 14,724 | |
| 9 | Ha Noi | Mai Huong | NEAX-61 | 26,020 | 16,588 | 4,000 | 870 | 22,020 | 15,718 | |
| 10 | Hoa Binh | TX Hoa Binh | TDX-1B | 10,880 | 6,313 | 3,840 | 2,501 | 7,040 | 3,812 | |
| 11 | Lao Cai | T.Lao Cai | 1000-E10 | 8,900 | 6,049 | 3,200 | 2,882 | 5,700 | 3,167 | |
| 12 | Lang Son | T. Lang Son | TDX-1B | 14,516 | 9,707 | 8,748 | 6,280 | 5,768 | 3,427 | |
| 13 | Bac ninh | TX.Bac ninh | STAREX-VXX | 13,888 | 11,294 | 4,096 | 4,127 | 9,792 | 7,167 | |
| 14 | Bac Giang | TX. Bac Giang | TDX-1B | 18,324 | 11,835 | 8,960 | 5,865 | 9,364 | 5,970 | |
| 15 | Cao Bang | T. Cao Bang | TDX-1B | 6,532 | 3,779 | 3,584 | 2,589 | 2,948 | 1,190 | |
| 16 | Thai Nguyen | TP. Thai Nguyen | TDX-1B | 18,468 | 13,523 | 7,680 | 6,305 | 10,788 | 7,218 | |
| 17 | Bac Can | T. Bac can | NEAX-61 | 3,752 | 1,902 | 1,024 | 741 | 2,728 | 1,161 | |
| 18 | PhuTho | TP.Viet tri | TDX-1B | 27,333 | 20,902 | 6,659 | 6,581 | 20,674 | 14,321 | |
| 19 | Vinh Phuc | | *Remote* | | | | | (11,662) | (8,631) | PhuTho |
| 20 | Tuyen Quang | T. Tuyen Quang | TDX-1B | 8,434 | 4,912 | 5,120 | 3,068 | 3,314 | 1,844 | |
| 21 | Yen Bai | T. Yen Bai | TDX-1B | 10,156 | 5,995 | 3,584 | 2,639 | 6,572 | 3,356 | |
| 22 | Son La | T.Son La | TDX-1B | 9,056 | 6,049 | 3,072 | 2,815 | 5,984 | 3,234 | |
| 23 | Lai Chau | TX. Dien Bien ph | STAREX-VK | 6,110 | 3,934 | 3,500 | 2,515 | 2,610 | 1,419 | |
| 24 | Ha Giang | T.Ha Giang | NEAX-61XS | 4,960 | 3,849 | 2,000 | 2,156 | 2,960 | 1,693 | |
| 25 | Ha Tay | T. Ha Dong | TDX-1B | 32,846 | 25,963 | 9,216 | 7,991 | 23,630 | 17,972 | |
| 26 | Ha nam | T.Ha nam | S-12 | 10,896 | 5,658 | 2,048 | 1,924 | 8,848 | 3,734 | |
| 27 | Nam Dinh | TP. Nam Dinh | TDX-1B | 21,456 | 17,330 | 10,752 | 10,752 | 10,704 | 6,578 | |
| 28 | Thai Binh | T.Thai binh | TDX-1B | 18,106 | 13,387 | 8,960 | 7,143 | 9,146 | 6,244 | |
| 29 | Hai duong | T. Hai Duong | TDX-1B | 33,812 | 27,607 | 9,984 | 9,373 | 23,828 | 18,234 | |
| 30 | Hung yen | | *Remote* | | | | | (11,472) | (7,513) | Hai Duong |
| 31 | Hai Phong | TP.Hai phong | DMS-100 | 40,192 | 30,898 | 4,480 | 4,344 | 35,712 | 26,554 | |
| 32 | Hai Phong | Su4 Lach Tray | TDX-1B | 10,240 | 9,182 | 8,192 | 7,661 | 2,048 | 1,521 | |
| 33 | Quang Ninh | TP. Ha long | TDX-1B | 39,580 | 24,643 | 6,656 | 6,366 | 32,924 | 18,277 | |
| 34 | Ninh Binh | T.Ninh Binh | TDX-1B | 10,560 | 6,250 | 5,376 | 3,271 | 5,184 | 2,979 | |
| 35 | Thanh Hoa | TP. Thanh hoa | TDX-1B | 28,336 | 20,011 | 11,008 | 9,226 | 17,328 | 10,785 | |
| 36 | Nghe An | TP.Vinh | NEAX-61 | 59,894 | 37,084 | 25,872 | 16,099 | 34,022 | 20,985 | |
| 37 | Ha Tinh | TX Ha tinh | NEAX-61E | 13,088 | 7,849 | 4,000 | 2,848 | 9,088 | 5,001 | |
| *Hanoi Area Total* | | | *35 units* | *839,475* | *604,653* | *253,148* | *203,387* | *586,327* | *401,266* | |

Table 5.1.2-4 Local Switch Capacity and Working Lines in Da Nang Area in 1998

| No | Province | Location | Exchange Model | Capacity and Working Lines | | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Host + Remote | | Host | | Remote | | |
| | | | | Total | Working | Total | Working | Total | Working | |
| 38 | Quang Binh | T. Dong Hoi | NEAX-61 | 12,924 | 9,006 | 5,072 | 3,914 | 7,852 | 5,092 | |
| 39 | Quang Tri | T. Dong Ha | NEAX-61 | 13,802 | 9,700 | 5,500 | 4,675 | 8,302 | 5,025 | |
| 40 | T.T Hue | Thanh phuHue | 1000-E10 | 23,592 | 20,761 | 7,146 | 7,057 | 16,446 | 13,704 | |
| 41 | Da nang | TP. Da Nang | 1000-E10 | 15,616 | 14,935 | 10,240 | 9,931 | 5,376 | 5,004 | |
| 42 | Da nang | KV. 2/9 | 1000-E10 | 19,667 | 17,486 | 3,072 | 2,324 | 16,595 | 15,162 | |
| 43 | Quang Nam | T.Tam K | 1000-E10 | 19,060 | 13,731 | 2,048 | 2,025 | 17,012 | 11,706 | |
| 44 | Quang Ngai | T.Quang ngai | NEAX-61E | 17,696 | 15,423 | 6,832 | 6,598 | 10,864 | 8,825 | |
| 45 | Binh dinh | TP. Qui Nhon | FETEX | 29,972 | 23,232 | 11,500 | 10,371 | 18,472 | 12,861 | |
| 46 | Gia Lai | T. PLaycu | AXE-10 | 19,734 | 13,411 | 8,064 | 7,254 | 11,670 | 6,157 | |
| 47 | Dac Lac | Buon ma thuot | AXE-10 | 22,580 | 12,699 | 2,048 | 866 | 20,532 | 11,833 | |
| 48 | PhuYen | T.Tuy Hoa | FETEX-150 | 16,600 | 9,561 | 8,000 | 4,812 | 8,600 | 4,749 | |
| 49 | Khanh Hoa | TP.Nha Trang | FETEX-150 | 40,471 | 32,371 | 13,800 | 13,117 | 26,671 | 19,254 | |
| 50 | Kon Tum | TX. Kontum | AXE-10 | 6,072 | 4,487 | 3,000 | 3,031 | 3,072 | 1,456 | |
| *Da Nang Area Total* | | | *13 units* | *257,786* | *196,803* | *86,322* | *75,975* | *171,464* | *120,828* | |

**Table 5.1.2-5 Local Switch Capacity and Working Lines in Ho Chi Minh City Area in 1998**

| No | Province | Location | Exchange Model | Capacity and Working Lines | | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Host + Remote | | Host | | Remote | | |
| | | | | Total | Working | Total | Working | Total | Working | |
| 51 | Lam Dong | TP. Da Lat | EWSD | 33,834 | 28,048 | 11,250 | 10,209 | 22,584 | 17,839 | |
| 52 | Binh Thuan | T. Phan Thiet | S-12 | 28,009 | 21,008 | 5,120 | 4,779 | 22,889 | 16,229 | |
| 53 | Ninh Thuan | T. Phan Rang | S-12 | 14,790 | 10,294 | 7,168 | 5,434 | 7,622 | 4,860 | |
| 54 | TP H.C.M | TOLL Sai Gon | EWSD | 18,332 | 16,342 | 17,820 | 15,870 | 512 | 472 | |
| 55 | TP H.C.M | Hai ba trung | E10-OCB | 49,578 | 42,355 | 24,439 | 23,766 | 25,139 | 18,589 | |
| 56 | TP H.C.M | Khanh hoi 2 | E10-OCB | 22,168 | 17,349 | 4,000 | 3,166 | 18,168 | 14,183 | |
| 57 | TP H.C.M | KV. Gia Dinh | E10-OCB | 46,636 | 42,793 | 23,248 | 22,578 | 23,388 | 20,215 | |
| 58 | TP H.C.M | Binh Thanh | E10-OCB | 36,944 | 32,575 | 13,648 | 13,425 | 23,296 | 19,150 | |
| 59 | TP H.C.M | ChoLon | EWSD | 49,522 | 45,787 | 27,008 | 26,976 | 22,514 | 18,811 | |
| 60 | TP H.C.M | Pham The Hien | EWSD | 11,264 | 6,930 | 6,074 | 4,329 | 5,190 | 2,601 | |
| 61 | TP H.C.M | An duong vuong | EWSD | 16,508 | 15,166 | 6,008 | 5,461 | 10,500 | 9,705 | |
| 62 | TP H.C.M | Hug vuong | EWSD | 41,252 | 30,014 | 27,454 | 24,538 | 13,798 | 5,476 | |
| 63 | TP H.C.M | Tran hung Dao1 | EWSD | 15,494 | 11,653 | 9,048 | 7,585 | 6,446 | 4,068 | |
| 64 | TP H.C.M | KV. Tan Binh | EWSD | 35,948 | 30,969 | 18,498 | 18,089 | 17,450 | 12,880 | |
| 65 | TP H.C.M | KV. An nhon | NEAX-61 | 38,829 | 29,433 | 4,000 | 2,705 | 34,829 | 26,728 | |
| 66 | TP H.C.M | KV.Thuduc | EWSD | 16,810 | 14,053 | 4,027 | 3,833 | 12,783 | 10,220 | |
| 67 | TP H.C.M | KV.Thuduc | Nortel DMS | 15,750 | 7,822 | 2,250 | 2,052 | 13,500 | 5,770 | |
| 68 | Dong Nai | TP. Bien Hoa | Linea-UT | 61,104 | 46,120 | 8,768 | 8,387 | 52,336 | 37,733 | |
| 69 | Binh Duong | T.ThuDau Mot | EWSD | 39,180 | 26,826 | 9,912 | 8,398 | 29,268 | 18,428 | |
| 70 | Binh phuoc | | *Remote* | | | | | (7,872) | (6,336) | Binh Duong |
| 71 | Tay Ninh | T. Tay Ninh | EWSD | 23,668 | 18,127 | 6,992 | 5,547 | 16,676 | 12,580 | |
| 72 | BaRia-Vung Tau | TP. Vung Tau | 1000-E10 | 34,278 | 28,009 | 9,216 | 8,069 | 75,062 | 19,940 | |
| 73 | Long An | T. Tan An | EWSD | 24,341 | 19,384 | 7,778 | 6,168 | 16,563 | 13,216 | |
| 74 | Tien Giang | TP. MuTho | EWSD | 27,482 | 21,101 | 9,330 | 7,607 | 18,152 | 13,494 | |
| 75 | Ben Tre | T. Ben Tre | TDX-1B | 26,176 | 16,881 | 7,936 | 5,668 | 18,240 | 11,213 | |
| 76 | Tra Vinh | T.Tra Vinh | TDX-1B | 16,220 | 10,843 | 5,632 | 4,430 | 10,588 | 6,413 | |
| 77 | Vinh Long | T.Vinh Long | EWSD | 15,006 | 11,952 | 5,312 | 5,253 | 9,694 | 6,699 | |
| 78 | Can Tho | TP. Can Tho | 1000-E10 | 37,352 | 29,674 | 9,216 | 8,861 | 28,136 | 20,813 | |
| 79 | Dong Thap | T. Cao lanh | S-12 | 26,484 | 17,190 | 3,072 | 2,996 | 23,412 | 14,194 | |
| 80 | An Giang | T. Long Xuyen | TDX-1B | 40,609 | 31,028 | 5,120 | 3,917 | 35,489 | 27,111 | |
| 81 | Kien Giang | T. Rach Gia | TDX-1B | 35,826 | 27,266 | 7,936 | 7,505 | 27,890 | 19,761 | |
| 82 | Ca mau | T. Ca Mau | TDX-1B | 21,761 | 13,844 | 9,216 | 7,903 | 12,545 | 5,941 | |
| 83 | Bac Lieu | T.Bac lieu | EWSD | 12,714 | 10,033 | 4,834 | 4,694 | 7,880 | 5,339 | |
| 84 | Soc Trang | T. Soc Trang | FETEX-150 | 18,757 | 12,922 | 6,144 | 5,522 | 12,613 | 7,400 | |
| *Ho Chi Min Area Total* | | | *33 units* | *952,626* | *743,791* | *318,258* | *287,651* | *634,368* | *456,140* | |
| *Grand Total* | | | *81 units* | *2,049,887* | *1,545,247* | *657,728* | *567,013* | *1,392,159* | *978,234* | |

The number of units, switch capacity and working lines by exchange model are shown in Table 5.1.2-6.

**Table 5.1.2-6 Present Status of Local Switch by Exchange Model in 1998**

| Exchange Model | No of Units | Capacity | | Capacity (Host) | | Remarks |
|---|---|---|---|---|---|---|
| | | Total | Working | Total | Working | |
| STAREX-VK | 2 | 19,998 | 15,228 | 7,596 | 6,647 | LG |
| TDX-1B | 22 | 459,227 | 327,250 | 157,231 | 129,849 | LG |
| EWSD | 17 | 460,847 | 366,231 | 188,320 | 167,753 | SIEMENS |
| 1000-E10 | 16 | 540,331 | 436,430 | 153,807 | 141,347 | ALCATEL |
| NEAX-61 | 9 | 213,113 | 148,586 | 63,312 | 44,377 | NEC |
| NEAX-61XS | 1 | 4,960 | 3,849 | 2,000 | 2,156 | NEC |
| AXE-10 | 3 | 48,386 | 30,597 | 13,112 | 11,151 | ERICSSON |
| FETEX-150 | 4 | 105,800 | 78,086 | 39,444 | 33,822 | FUJITSU |
| S-12 | 4 | 80,179 | 54,150 | 17,408 | 15,133 | ST |
| DMS-100 | 1 | 40,192 | 30,898 | 4,480 | 4,344 | NORTEL |
| DMS-10 | 1 | 15,750 | 7,822 | 2,250 | 2,052 | NORTEL |
| Linea-UT | 1 | 61,104 | 46,120 | 8,768 | 8,387 | ITALTEL |

(4) Remote Subscriber Unit (RSU)

Remote Subscriber Units have 67% of total switch capacity. About 80 kinds of RSU models have been introduced in Vietnam. The number of units, line capacity and working lines by RSU model are shown in Table 5.1.2-7.

Table 5.1.2-7 The Number of Units, Capacity and Working Lines by RSU Model in 1998

| No. | Name of Manufacture | Exchange Model | No. of Units | Line Capacity | Working Lines | Remarks |
|---|---|---|---|---|---|---|
| 1 | ALCATEL | 1000 E | 1 | 5,000 | 144 | |
| 2 | ALCATEL | CSND | 151 | 366,704 | 292,471 | |
| 3 | ALCATEL | CNE | 21 | 7,166 | 4,715 | |
| 4 | ALCATEL | ALCATEL | 3 | 664 | 255 | |
| 5 | SIEMENS | DLU | 20 | 61,193 | 41,527 | |
| 6 | SIEMENS | RDLU | 99 | 163,938 | 123,135 | |
| 7 | SIEMENS | EWSD | 14 | 21,732 | 15,484 | |
| 8 | SIEMENS | SDE | 106 | 70,511 | 47,279 | |
| 9 | SIEMENS | IHCOM | 61 | 17,654 | 11,641 | |
| 10 | NEC | RLU | 69 | 118,158 | 85,251 | |
| 11 | NEC | NEAX-61XS | 36 | 40,736 | 25,475 | |
| 12 | NEC | NEC - 2400 | 2 | 1,100 | 139 | |
| 13 | LG | RS-VKX | 6 | 8,192 | 6,122 | |
| 14 | LG | RSS | 99 | 100,207 | 73,407 | |
| 15 | LG | RSS-CM | 40 | 27,392 | 15,944 | |
| 16 | LG | STAREX-IMS | 70 | 44,698 | 30,328 | |
| 17 | LG | STAREX-APR | 8 | 4,096 | 3,248 | |
| 18 | LG | STAREX-PR | 2 | 1,024 | 412 | |
| 19 | LG | STAREX | 21 | 8,783 | 7,311 | |
| 20 | LG | SRSS | 39 | 11,340 | 7,453 | |
| 21 | LG | STAREX-SRX | 82 | 19,303 | 10,069 | |
| 22 | LG | SRX | 32 | 4,960 | 2,241 | |
| 23 | Nortel | DMS-Cellsite | 6 | 13,500 | 5,770 | |
| 24 | Nortel | DMS-10 | 8 | 4,079 | 3,780 | |
| 25 | Nortel | DMS-2 | 2 | 120 | 70 | |
| 26 | ITALTEL | RSU-LUT | 14 | 33,616 | 25,040 | |
| 27 | FUJITSU | RLC | 37 | 32,113 | 21,758 | |
| 28 | VIETNAM | VX-500 | 17 | 7,532 | 4,771 | |
| 29 | VIETNAM | VX | 53 | 15,290 | 9,022 | |
| 30 | VIETNAM | DTS | 108 | 25,514 | 14,166 | |
| 31 | Others | | 470 | 158,261 | 97,637 | 53 types of models |

## 5.1.3 Network Configuration

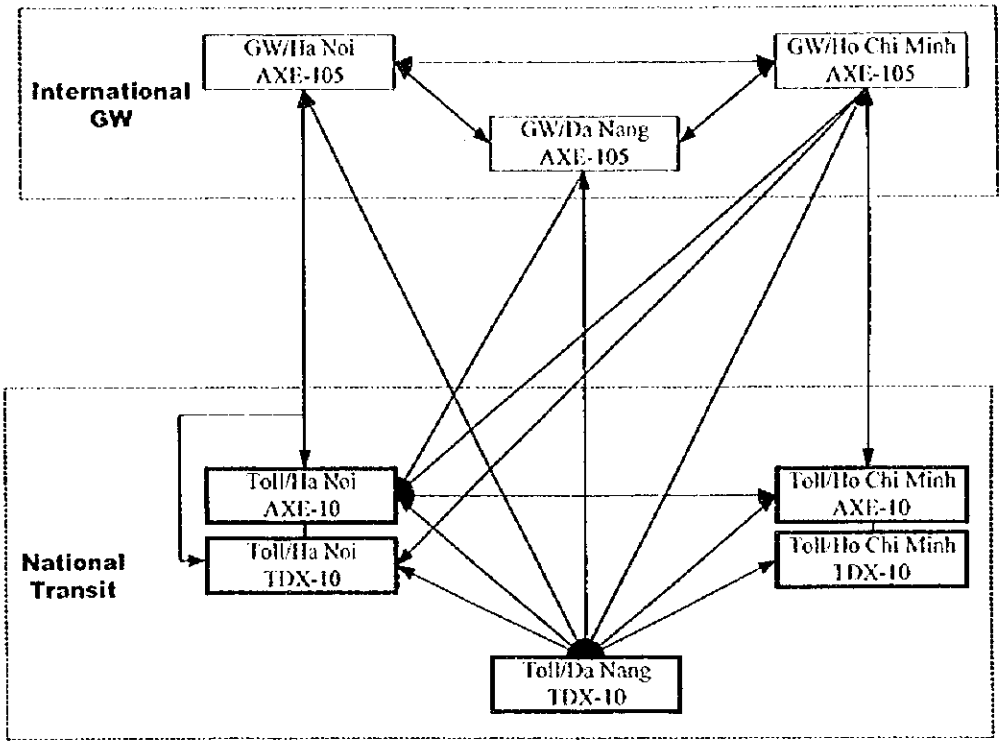
Present network configuration for International Gateway Switch, National Transit Switch, Local Tandem Switch and Local Switch are described as follows:

(1) International Gateway Switch and National Transit Switch

The network configuration of International Gateway Switch and National Transit Switch is shown in Figure 5.1.3-1 and circuit matrix for these switches is shown in Table 5.1.3-1.

There are three (3) International Gateway Switches which are located in Ha Noi, Da

Nang and Ho Chi Minh City. These are connected each other with mesh network. There are five (5) National Transit Switches :m two (2) units in Hanoi, one (1) unit in Da Nang and two (2) units in Ho Chi Minh City. These are connected each other with mesh network.




Source: DGPT

**Figure 5.1.3-1 Network Configuration for International Gateway Switch and National Transit Switch**

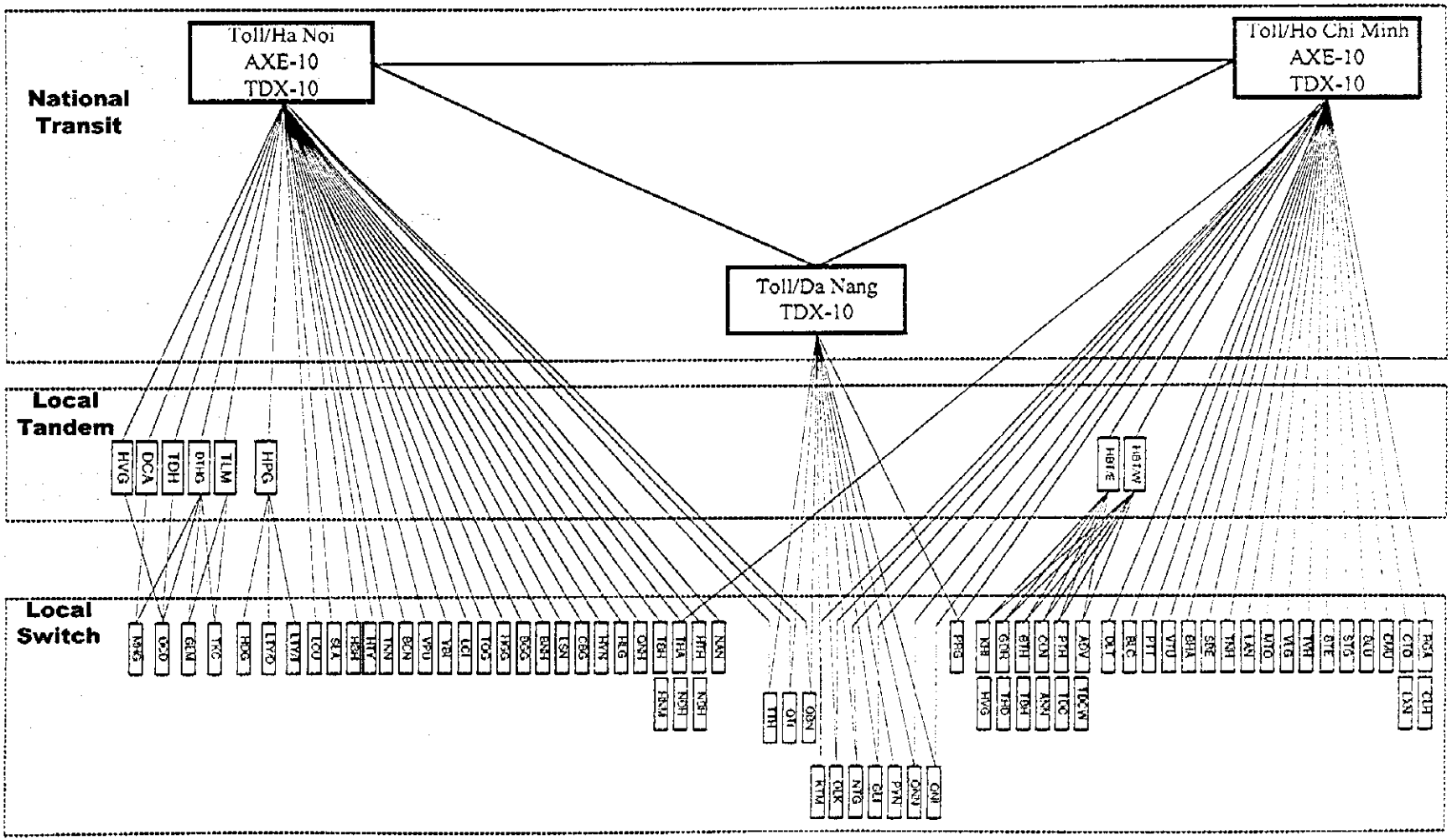
**Table 5.1.3-1 Circuit Matrix for International Gateway Switch and National Transit Switch**

| | | | Province | HNI | HNI | DNG | HCM | HCM | HNI | DNG | HCM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Level | Toll | Toll | Toll | Toll | Toll | GW | GW | GW |
| Province | Level | Model | Abbr. | HNI | HNI | DNG | HCM | HCM | HNI | DNG | HCM |
| HNI | Toll | AXE-10 | HNI | | 136 | 309 | 959 | 491 | 484 | 0 | 0 |
| HNI | Toll | TDX-10 | HNI | 166 | | 122 | 153 | 153 | 131 | | 0 |
| DNG | Toll | AXE-10 | DNG | 309 | 122 | | 619 | 183 | 123 | 183 | 61 |
| HCM | Toll | AXE-10 | HCM | 959 | 153 | 619 | | 153 | | | 1238 |
| HCM | Toll | TDX-10 | HCM | 491 | 153 | 273 | 153 | | | | |
| HNI | GW | AXE-105 | HNI | 484 | 111 | 123 | | | | | |
| DNG | GW | AXE-105 | DNG | 61 | | 183 | | | | | |
| HCM | GW | AXE-105 | HCM | 62 | 62 | 61 | 1238 | | | | |

(2) Local Switch and National Transit Switch

The network configuration of Local Switch and National Transit Switch is shown in Figure 5.1.3-2 and circuit matrix is shown in Appendix I-5-1.

Local Switches are connected to National Transit Switches directly or via Local Tandem Switches.




Source: DGPT

**Figure 5.1.3-2 Local Switch and Local Tandem Switch**

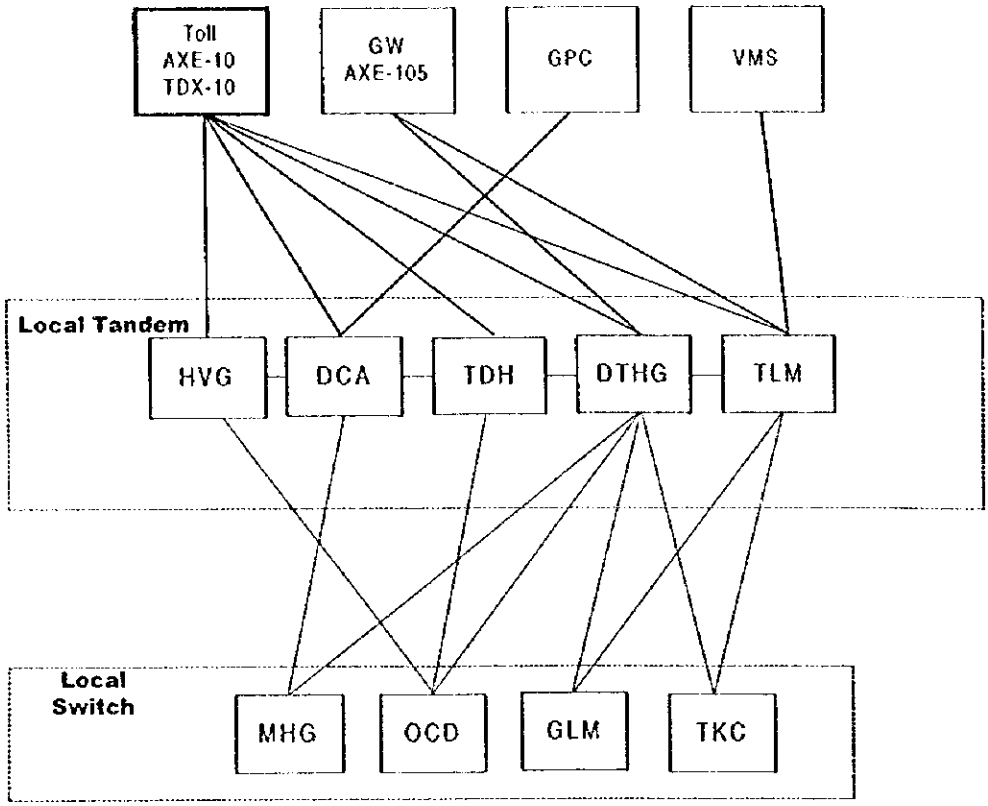
(3) Local Tandem Switch

Local network configurations in Ha Noi and Ho Chi Minh City are shown below:

(a) Ha Noi Local Network Configuration

Local network configuration in Ha Noi is shown in Figure 5.1.3-3 and circuit matrix is shown in Table 5.1.3-2.

There are five (5) combined switches having both local and local tandem functions in Ha Noi. These switches are not called Local Tandem Switch, but functionally called Local Tandem Switch. These five (5) switches accommodate subscribers and Remote Subscriber Units and have direct circuits to International Gateway Switch, GPC and VMS.




Source: DGPT

**Figure 5.1.3-3 Network Configuration of Ha Noi City**

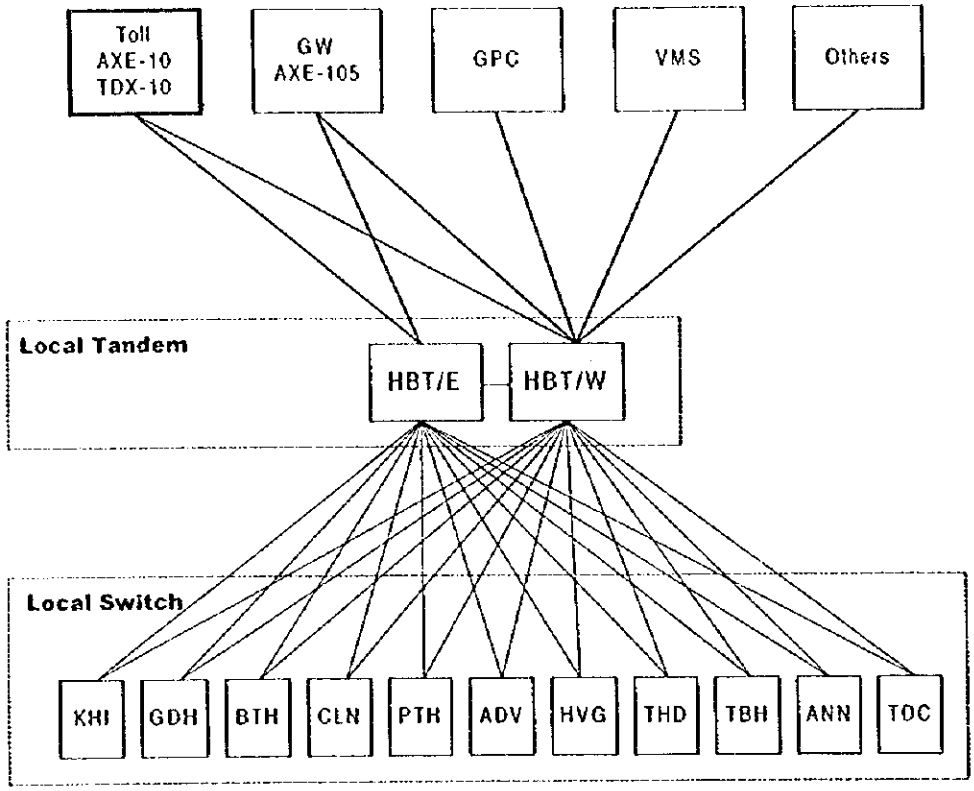
## Table 5.1.3-2 Circuit Matrix of Local Tandem

| | | | | Province | HNI | HNI | DNG | HCM | HCM | HNI | HNI | HNI | HNI | HNI | HNI | HNI | HNI | HNI | HCM | HCM | HCM | HCM | HCM | HCM | HCM | HCM | HCM | HCM | HCM | HCM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Level | Toll | Toll | Toll | Toll | Toll | LE | LE | LE | LE | LE | LE | LE | LE | LE | Tandem | LE | LE | LE | LE | LE | LE | LE | LE | LE | LE | LE |
| Province | Level | Eq_type | Location | Abbr | HNI | HNI | DNG | HCM | HCM | DTHG | GLM | TKC | HVG | TLM | TDH | DCA | OCD | MHG | tmrw | tmrw | KHI | GDH | BTH | CLN | PTH | ADV | HVG | THD | TBH | ANN | TDC |
| HNI | Toll | AXE-10 | HNI | HNI | | 136 | 309 | 959 | 491 | 804 | | | 246 | 215 | 150 | 135 | | | | | | | | | | | | | | | |
| HNI | Toll | TDX-10 | HNI | HNI | 166 | | 122 | 153 | 153 | 444 | | | 105 | 90 | 105 | 105 | | | | | | | | | | | | | | | |
| DNG | Toll | AXE-10 | DNG | DNG | 309 | 122 | | 619 | 183 | | | | | | | | | | | | | 15 | | | | | | | | | |
| HCM | Toll | AXE-10 | HCM | HCM | 959 | 153 | 619 | | 153 | | | | | | | | | | 990 | 649 | | | | | | | | | | | |
| HCM | Toll | TDX-10 | HCM | HCM | 491 | 153 | 273 | 153 | | | | | | | | | | | 810 | 345 | | | | | | | | | | | |
| HNI | LE | 1000-E10 | Dinh Tien Hoang | DTHG | 804 | 444 | | | | | 366 | 340 | 463 | 340 | 390 | 390 | 185 | 300 | | | | | | | | | | | | | |
| HNI | LE | 1000-E10 | Gia Lam | GLM | | | | | | 356 | | | | 325 | | | | | | | | | | | | | | | | | |
| HNI | LE | 1000-E10 | Tran Khat Chan | TKC | | | | | | 340 | | | | 247 | | | | | | | | | | | | | | | | | |
| HNI | LE | 1000-E10 | Hung Vuong | HVG | 246 | 105 | | | | 463 | | | | 278 | 165 | | 240 | | | | | | | | | | | | | | |
| HNI | LE | 1000-E10 | Tu Liem | TLM | 215 | 90 | | | | 339 | 324 | 247 | 278 | | 270 | 195 | | | | | | | | | | | | | | | |
| HNI | LE | EWSD | Thuong Dinh | TDH | 150 | 105 | | | | 390 | | | 165 | 270 | | 255 | 285 | | | | | | | | | | | | | | |
| HNI | LE | NEAX-61 | Duoi ca | DCA | 135 | 105 | | | | 390 | | | | 195 | 255 | | | 180 | | | | | | | | | | | | | |
| HNI | LE | EWSD | O Cho dua | OCD | | | | | | 185 | | | 240 | | 285 | | | | | | | | | | | | | | | | |
| HNI | LE | NEAX-61 | Mai Huong | MHG | | | | | | 300 | | | | | | 180 | | | | | | | | | | | | | | | |
| HCM | Tandem | EWSD | HCM | tmrw | | | | 780 | 660 | | | | | | | | | | | 510 | na | 600 | 525 | 555 | na | na | 525 | na | 405 | 375 | 390 |
| HCM | LE | E10-OCB | KV. Hai Ba Trung | tmrw | | | | 649 | 255 | | | | | | | | | | 510 | | na | 387 | 258 | 223 | na | na | 342 | na | 178 | | 104 |
| HCM | LE | E10-OCB | KV. Khanh Hoi 2 | KHI | | | | | | | | | | | | | | | na | na | | | | | | | | | | | |
| HCM | LE | E10-OCB | KV. Gia Dinh | GDH | | | | | | | | | | | | | | | 540 | 305 | | | | | | | | | | | |
| HCM | LE | E10-OCB | Binh Thanh | BTH | | | 15 | | | | | | | | | | | | 555 | 259 | | | | | | | | | | | |
| HCM | LE | EWSD | KV. Cho Lon | CLN | | | | | | | | | | | | | | | 615 | 276 | | | | | | | | | | | |
| HCM | LE | EWSD | KV. Pham The Hien | PTH | | | | | | | | | | | | | | | na | na | | | | | | | | | | | |
| HCM | LE | EWSD | KV. An Duong Vuon | ADV | | | | | | | | | | | | | | | na | na | | | | | | | | | | | |
| HCM | LE | EWSD | KV. Hung Vuong | HVG | | | | | | | | | | | | | | | 585 | 371 | | | | | | | | | | | |
| HCM | LE | EWSD | KV. Tran Hung Dao | THD | | | | | | | | | | | | | | | na | na | | | | | | | | | | | |
| HCM | LE | EWSD | KV. Tan Binh | TBH | | | | | | | | | | | | | | | 405 | 179 | | | | | | | | | | | |
| HCM | LE | NEAX-61 | KV. An nhon | ANN | | | | | | | | | | | | | | | 249 | | | | | | | | | | | | |
| HCM | LE | EWSD | KV. Thu Duc | TDC | | | | | | | | | | | | | | | 420 | 72 | | | | | | | | | | | |

(b) Ho Chi Minh City Local Network Configuration

Local network configuration in Ho Chi Minh City is shown in Figure 5.1.3-4 and circuit matrix is shown in Table 5.1.3-2.

Two (2) Local Tandem Switches are located in Hai Ba Trung in Ho Chi Minh City. One is EWSD which is exclusively used as Local tandem Switch and has direct circuits to International Gateway Switch, GPC and VMS. The other is TDX-10 which is combined switch having both local and local tandem functions and accommodates subscribers and Remote Subscriber Units.




Source: DGPT

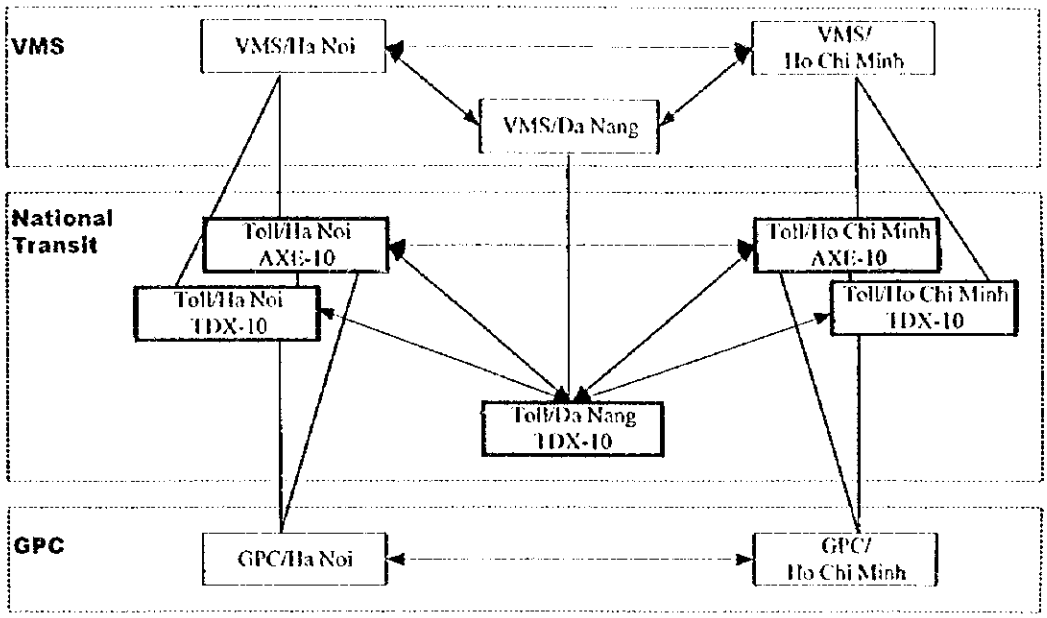
**Figure 5.1.3-4 Network Configuration in Ho Chi Minh City**

(4) Other Networks

Other Networks include the network of Mobile Phone for VMS and GPC.

The network structures are shown in Figure 5.1.3-5 and Circuit Matrix is shown in Table 5.1.3-3.

The switches in Ha Noi, Ho Chi Minh City and Da Nang mainly carry the interconnection traffic between these networks.




Source: DGPT

**Figure 5.1.3-5 Network Configuration of Other Networks**

**Table 5.1.3-3 Circuit Matrix for Other Network**

| | | | Province | HNI | HNI | DNG | HCM | HCM | HNI | DNG | HCM | HNI | DNG | HCM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Level | Toll | Toll | Toll | Toll | Toll | VMS | VMS | VMS | GPC | GPC | GPC |
| Province | Level | Eq_type | Abbr | HNI | HNI | DNG | HCM | HCM | HNI | DNG | HCM | HNI | DNG | HCM |
| HNI | Toll | AXE-10 | HNI | | 136 | 309 | 959 | 491 | 154 | | | 278 | | |
| HNI | Toll | TDX-10 | HNI | 166 | | 122 | 153 | 153 | 92 | | | 30 | | |
| DNG | Toll | AXE-10 | DNG | 309 | 122 | | 619 | 183 | | 61 | | | 91 | |
| HCM | Toll | AXE-10 | HCM | 959 | 153 | 619 | | 153 | | | 525 | | | 371 |
| HCM | Toll | TDX-10 | HCM | 491 | 153 | 273 | 153 | | | | 247 | | | 15 |
| HNI | VMS | | HNI | 154 | 92 | | | | | | | | | |
| DNG | VMS | | DNG | | | | | | | | | | | |
| HCM | VMS | | HCM | | | | 525 | 247 | | | | | | |
| HNI | GPC | | HNI | 278 | 30 | | | | | | | | | |
| DNG | GPC | | DNG | | | 91 | | | | | | | | |
| HCM | GPC | | HCM | | | | 371 | 15 | | | | | | |

## 5.2 Transmission Facilities

Transmission facilities are classified into two (2) hierarchical level, one is the Inter-Provincial Network which carries the traffic between the all provinces, and the other is called Intra-Provincial Network, which covers all traffic within a Province.
Overall Existing Transmission Facility is shown in Figure 5.2-1.

### 5.2.1 Inter-Provincial Network

(1) OFC Transmission Network

(a) General

Three regions are divided at Hatinh and Nha Tran, however especially Inter-provincial network including of 3 large national telecom centers (Hanoi, Danang and Ho Chi Minh) is so-called Backbone Network.

The Backbone Network is the most important Transmission Network and its amount of the traffic carried occupies almost **80%** of the total traffic in Vietnam.

In northern are area and also southern area, Radio transmission system is working as the major transmission system and quite little OFC transmission system is installed currently. However presently these small capacity radio systems will be replaced by OFC transmission system due to big demand for communication.

(b) OFC Transmission system

The Inter-provincial OFC transmission system applies the SDH type of STM 4 and STM-16 from their flexibility and upgradability. Additionally, All NEs (Network Elements) are supervised via network management system.

- STM-1, 155Mb/s, Capacity 63E1
- STM-4, 622Mb/s, Capacity 252E1 (4-Fiber Mode)
- STM-16, 2.5Gb/s, Capacity 1008E1 (4-Fiber Mode)

In the past time, Backbone route uses PDH 34Mb/s OFC transmission system. Now these PDH routes have been replaced by SDH transmission system and the PDH equipment had been transferred to P&T for intra-provincial route.
The PDH OFC Transmission system is still used at present as mentioned below, however these systems will be replaced by SDH system.

Hanoi – Phu Ly – Nam Dinh OFC 34M(1+1)

Danang -- Tamky OFC 34M(1+1)

i). Backbone

The 4,000Km length SDH rings consist of four (4) self-healing rings, which are connected sequentially at Ha Tinh, Danang and Qui Nhon from Hanoi to Ho Chi Min. The system configuration is shown in Figure 5.2-2. Additional detailed information is:

①. The transmission type is STM-16/2F-BSHR with capacity 504E1, however the capacity will be 100% occupied by end of this year (1999).

②. The system is up-graded from PDH 34Mb/s to SDH STM-16 installed by Northern Telcom.l in Nov, 1996.

③. The system contains two (2) transmission system,
- OFC Transmission system with 8 cores on the National high way.
- OFC Transmission system with 10 cores on the 500KV Electric Power Line.

④. Capital cities Kon Tum and Da Lat are neglected from Backbone Network.

ii). Other OFC Transmission systems (see Figure 5.2-3)

The OFC transmission routes are already established in key economic zones with large traffic to socio-economic development, which are as follows.

①. OFC Transmission (Hanoi – Hai Phong)
- STM-4 4F-BSHR (Flat Ring)
- 24-core optical fiber cable is used
- Manufactured by Bosch Telcom(SIEMENS)

②. OFC Transmission (Hanoi -- Hoa Binh)
- STM-4F Linea
- 20-core optical fiber cable is used
- Manufactured by Bosch Telcom(SIEMENS)

③. OFC Transmission (Hanoi – Voung Tau)
- STM-4 4F-BSHR (Flat Ring)
- 16-core optical fiber cable is used
- Manufactured by SIEMENS

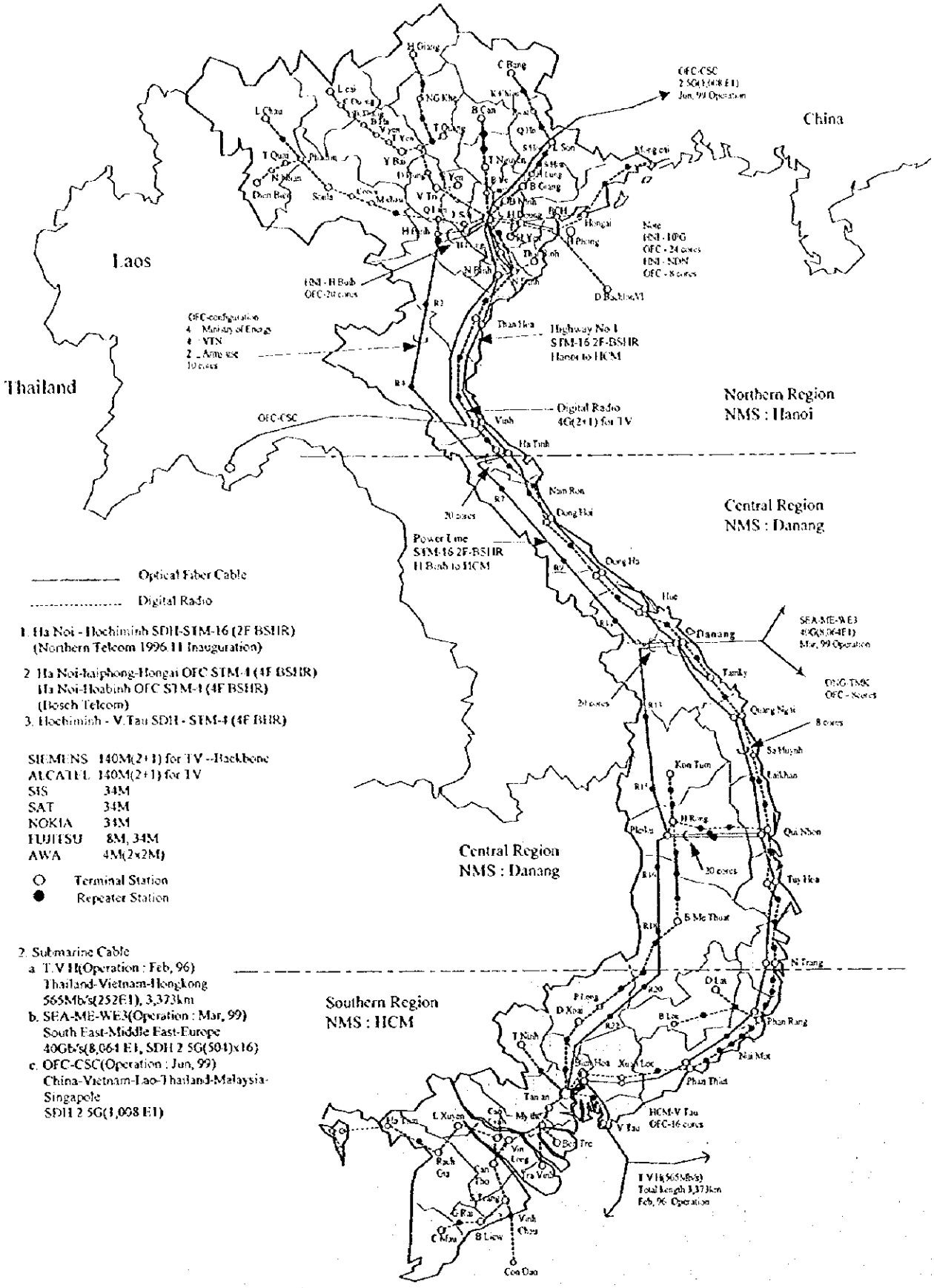



**Figure 5.2-1 Existing Transmission Facilities**

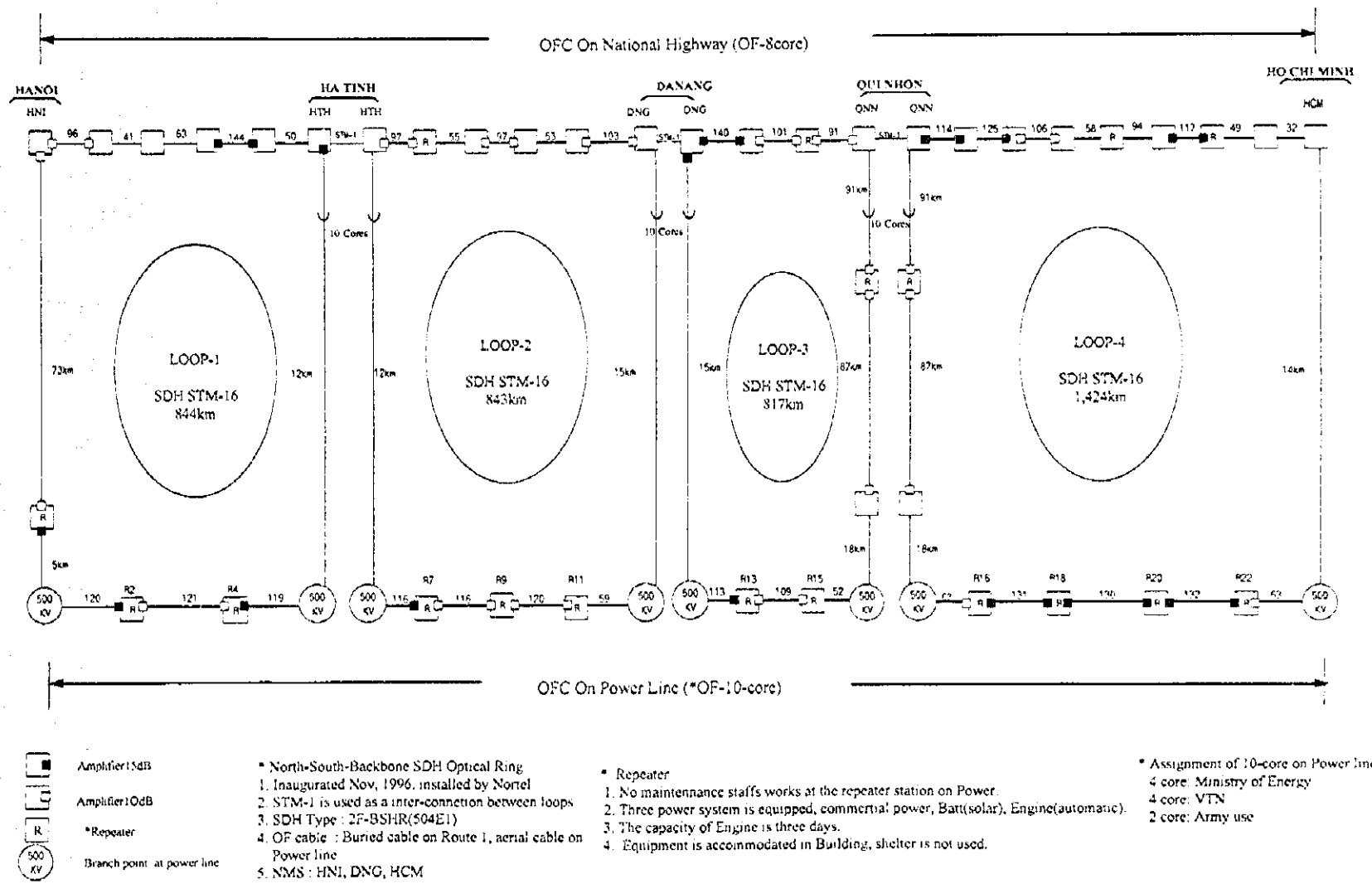
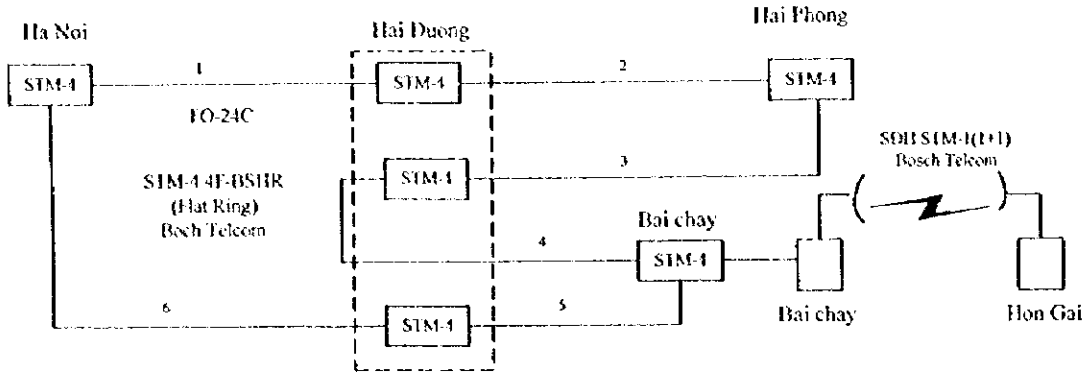


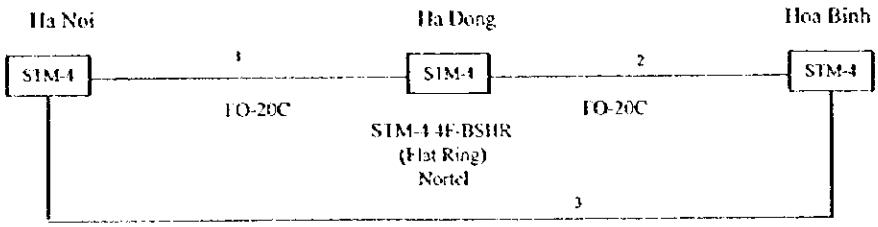

**Figure 5.2.1-1 OFC Transmission System Configuration (1)**

## North – South Backbone

1. OFC Transmission (Ha Noi - Hai Phong)




2. OFC Transmission (Ha Noi - Hoa Binh)




3. OFC Transmission (Ho Chi Minh - Vung Tau)

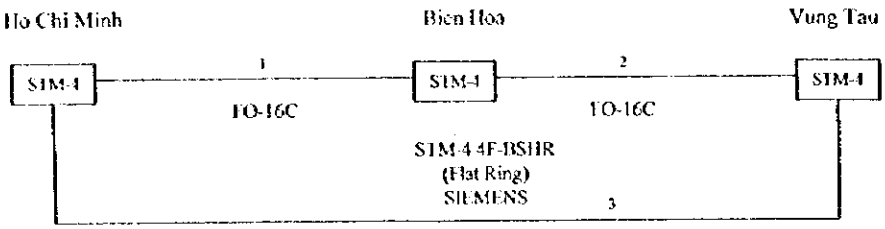
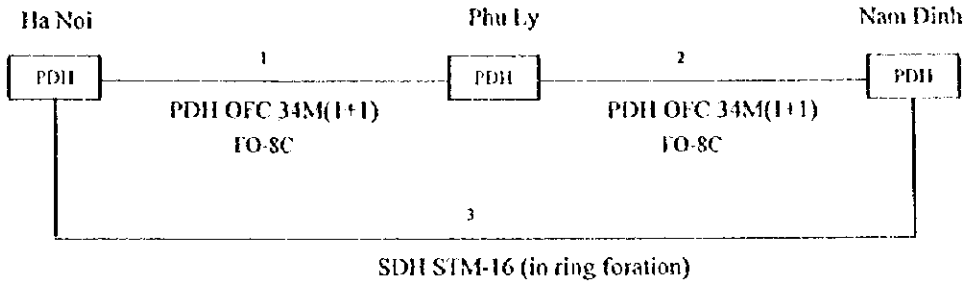



**Figure 5.2.1-2 OFC Transmission System Configuration (2)**

4. OFC Transmission (Ha Noi - Phu Ly - Nam Dinh)




5. OFC Transmission (Da Nang - Tam Ky)

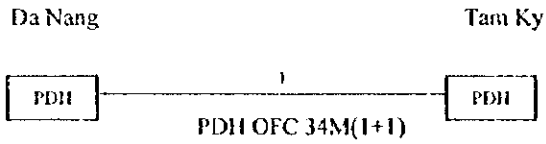



**Figure 5.2.1-3 OFC Transmission System Configuration (3)**

(2) Radio Transmission Network

(a) General

Most of backbone networks are composed of optical fiber systems, so microwave systems are used as their back-up system, inter-provincial network or relay network for television program in Vietnam.

According to the increasing of transmission capacity, microwave systems may be replaced by optical fiber cable systems, and these microwave systems may be relocated to another routes. By the frequent relocation of the system, in some routes the system configuration such as redundancy scheme is abnormal, i.e., without standby system.

All repeater stations of microwave systems are attended by maintenance staff, because in case of power failure it is required to switch over between power supply systems by manual.

(b) Radio System

In the inter-provincial network, microwave systems are used in inter-provincial routes and television relay systems. The type of microwave systems are SDH (STM-1) and PDH systems with capacities of 4, 16, 34, 140 Mbps. SDH

microwave system is used only in one (1) link. Most of systems are those manufactured by Siemens, Alcatel, Fujitsu, NEC, SIS, SAT, AWA.

The inter-provincial microwave systems applies the radio frequencies of 1.8, 2, 4, 7 GHz bands. The inter-provincial microwave systems are shown below:

i) Back-up of backbone network and TV relay

PDH microwave systems are applied to these networks as follows:

- Ha Noi – Ho Chi Minh : 7 GHz-140 Mbps, 2 +1 systems

ii) Inter-provincial network

A SDH microwave system and PDH microwave systems are used for inter-provincial network as follows:

- Hai Phong (Bai Chay) – Hon Gai : SDH (STM-1)
- Ha Noi – Dien Bien Phu : 2 GHz-16 / 34 Mbps, 7 GHz-34 Mbps
- Ha Noi – Lao Cai / Ha Giang : 2 GHz-4 / 16 Mbps / 7 GHz-34 Mbps
- Ha Noi – Cao Bang : 2 GHz-16Mbps / 7 GHz-34 Mbps
- Ha Noi – Bac Can : 2 GHz-34 Mbps
- Ha Noi – Hon Gai : 2 GHz-34 Mbps
- Ho Chi Minh – Kon Tum / Quy Nhon
  1.8 GHz-8 Mbps, 2 GHz-4 Mbps, 2 GHz-34 Mbps, 7 GHz-34 Mbps
- Phan Rang – Da Lat : 2 GHz-34 Mbps
- Ho Chi Minh – Vung Tau : 4 GHz-140 Mbps
- Ho Chi Minh – Tay Ninh : 2 GHz-34 Mbps
- Ho Chi Minh – Rach Gia / Ca Mau / Ben Tre / Tra Vinh
  2 GHz-34 Mbps, 4 GHz-140 Mbps

(c) Supporting Facilities

i) Antenna tower

In general, antenna towers for inter-provincial network is of self-standing, and their heights are 50 m – 130 m. Most of antenna towers for backbone route are made in Russia.

ii) Building

Radio equipment for a repeater is usually accommodated in buildings. (A shelter is not utilized in Vietnam.)

iii) Power supply system

Power supply system for a repeater is classified into the following types:

- Commercial power and Rectifier + Batteries (capacity: 8 hours)
- Engine generator (single standby) and Rectifier + Batteries (capacity: 8 hours)

- Solar power system including Batteries (capacity: 48 hours – max. 1 week)

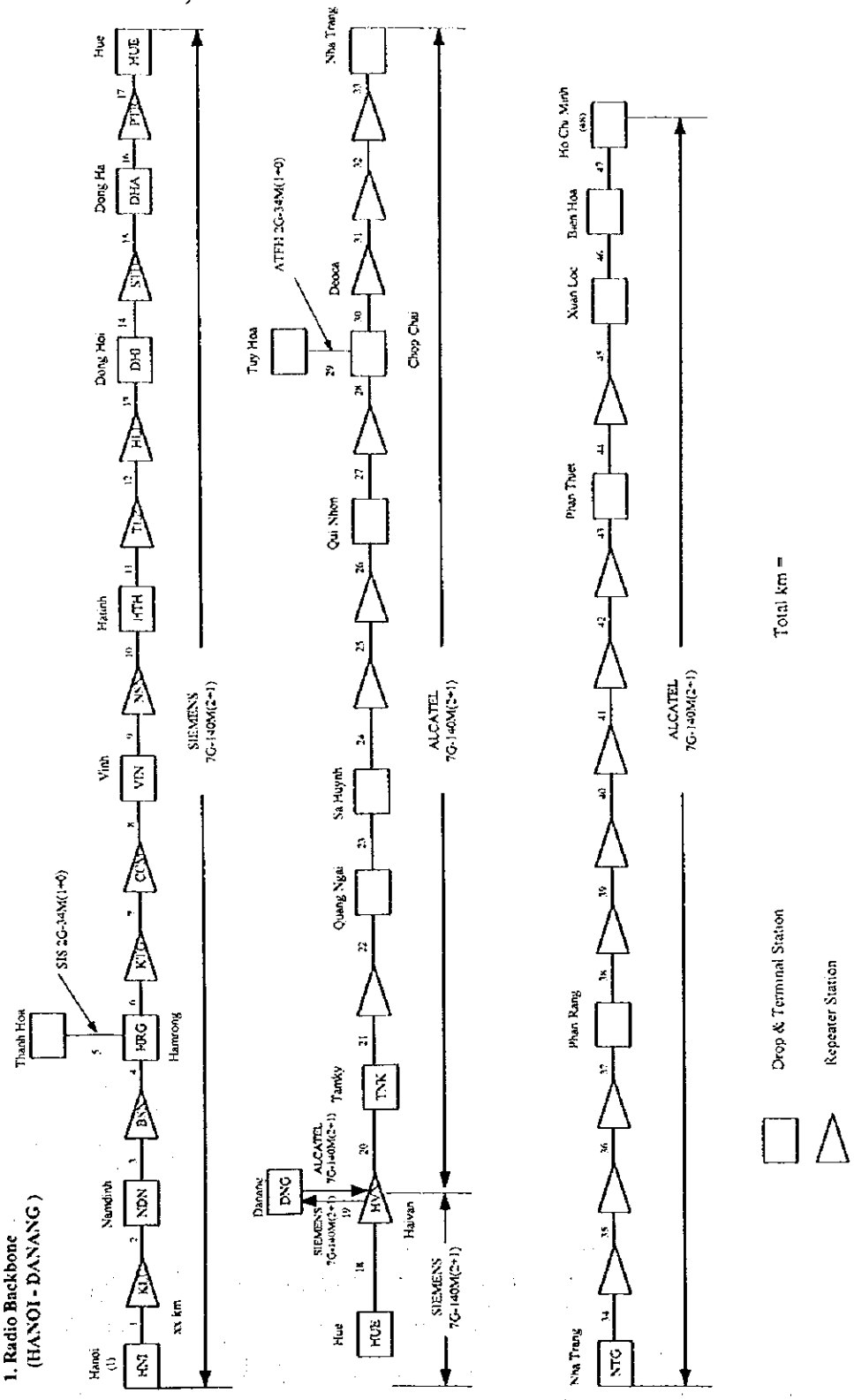
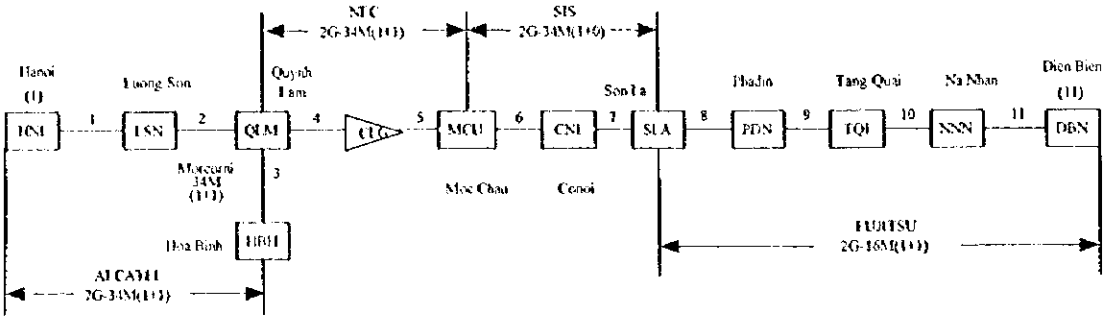


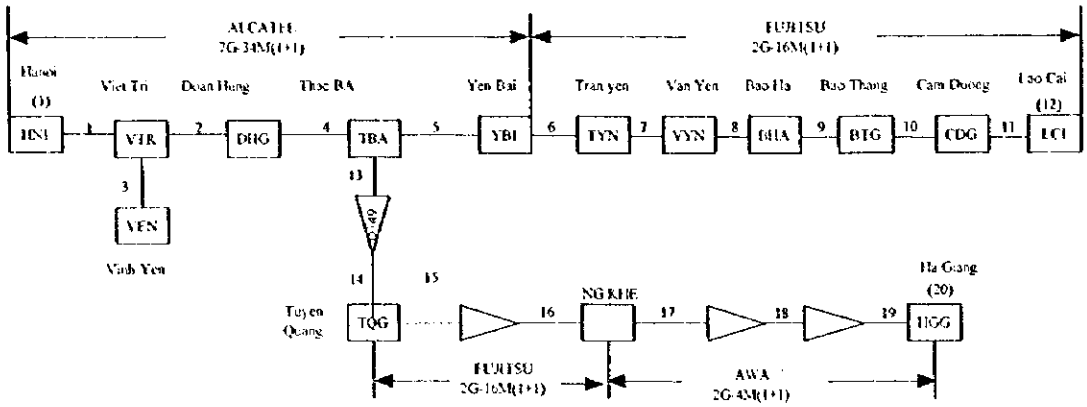

**Figure 5.2.1-4 Radio Transmission System Configuration (1)**

## (North-South-Backbone Radio System)

2. Radio (Hanoi - Dien Bien)
VIBA ATEH 34Mb/S - DM1000 16Mb/s




3. Radio (Hanoi - Lao Cai)
VIBA ATEH 34Mb/S - DM1000 16Mb/s




4. Radio (Hanoi - Cao Bang)
VIBA ATEH 34Mb/S - DM1000 16Mb/s (HNI-CBG)

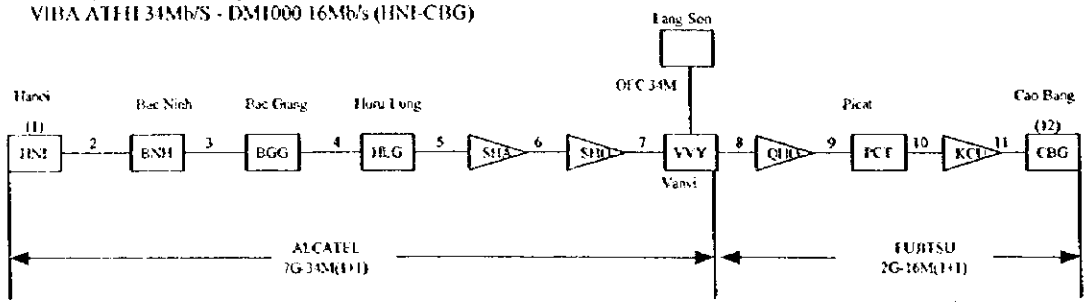
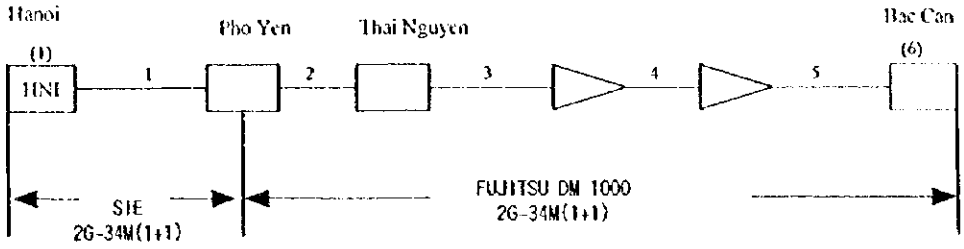



**Figure 5.2.1-5 Radio Transmission System Configuration (2)**
**(Northern Area)**

5. Radio (Hanoi - Bac Can)
VIBA (HNI-BCN)




6. Radio (Hanoi - Hon Gai)
VIBA (HNI-MCI)

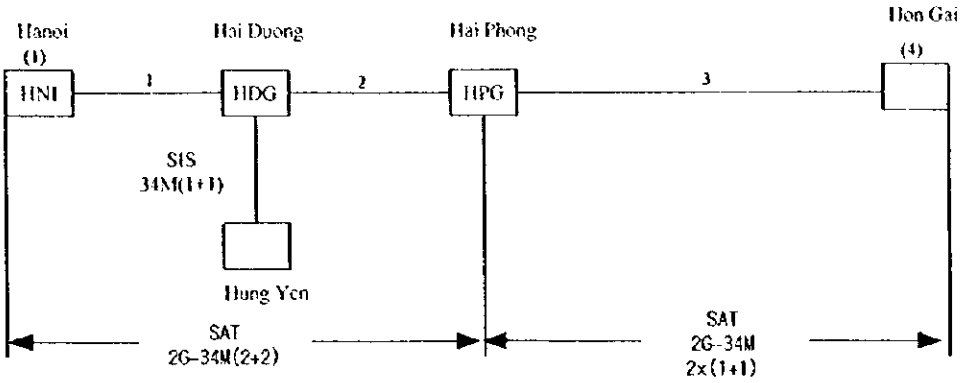



**Figure 5.2.1-6 Radio Transmission System Configuration (3)**
**(Northern Area)**

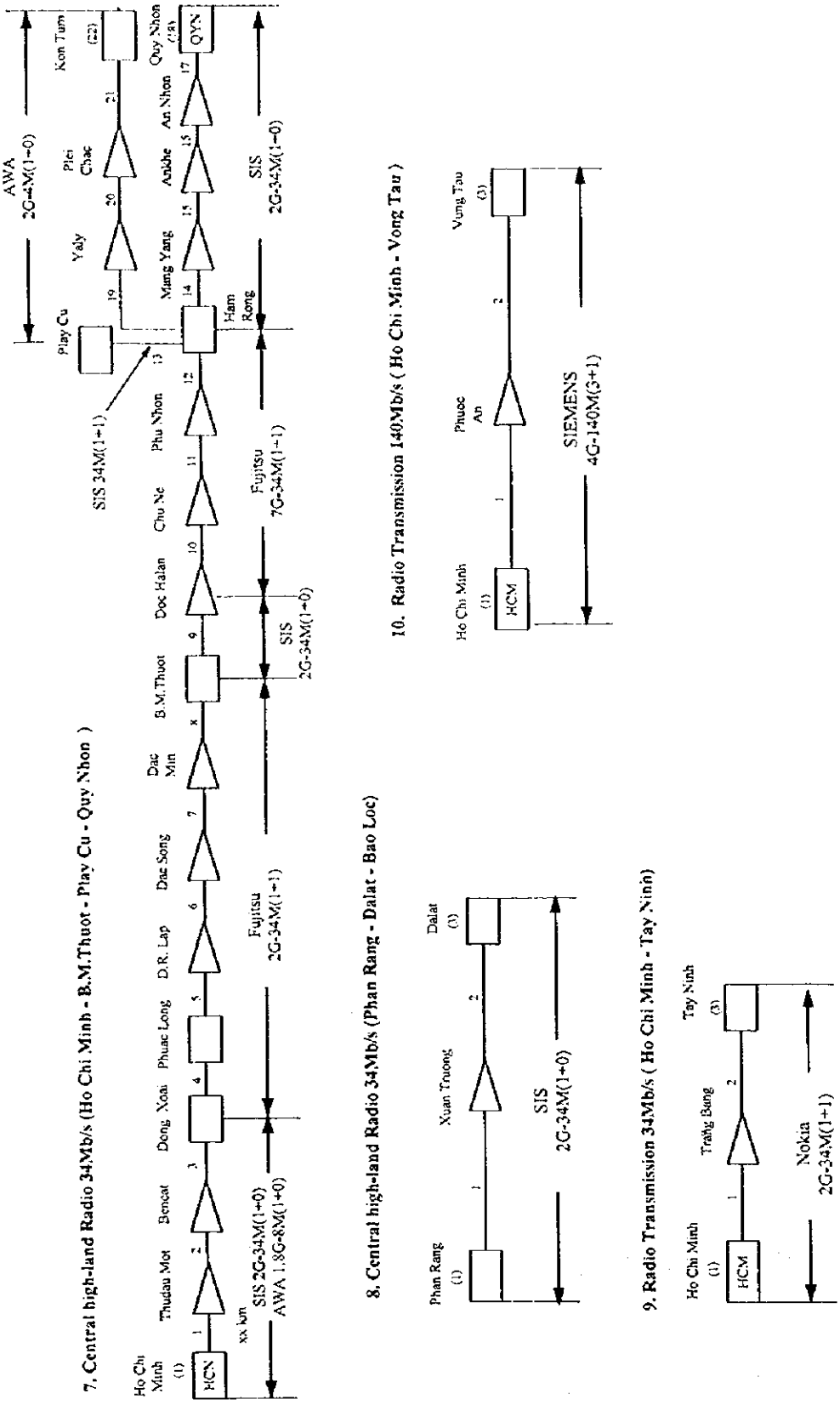



**Figure 5.2.1-7 Radio Transmission System Configuration (4)**
**(Central Highland and Southern Area)**

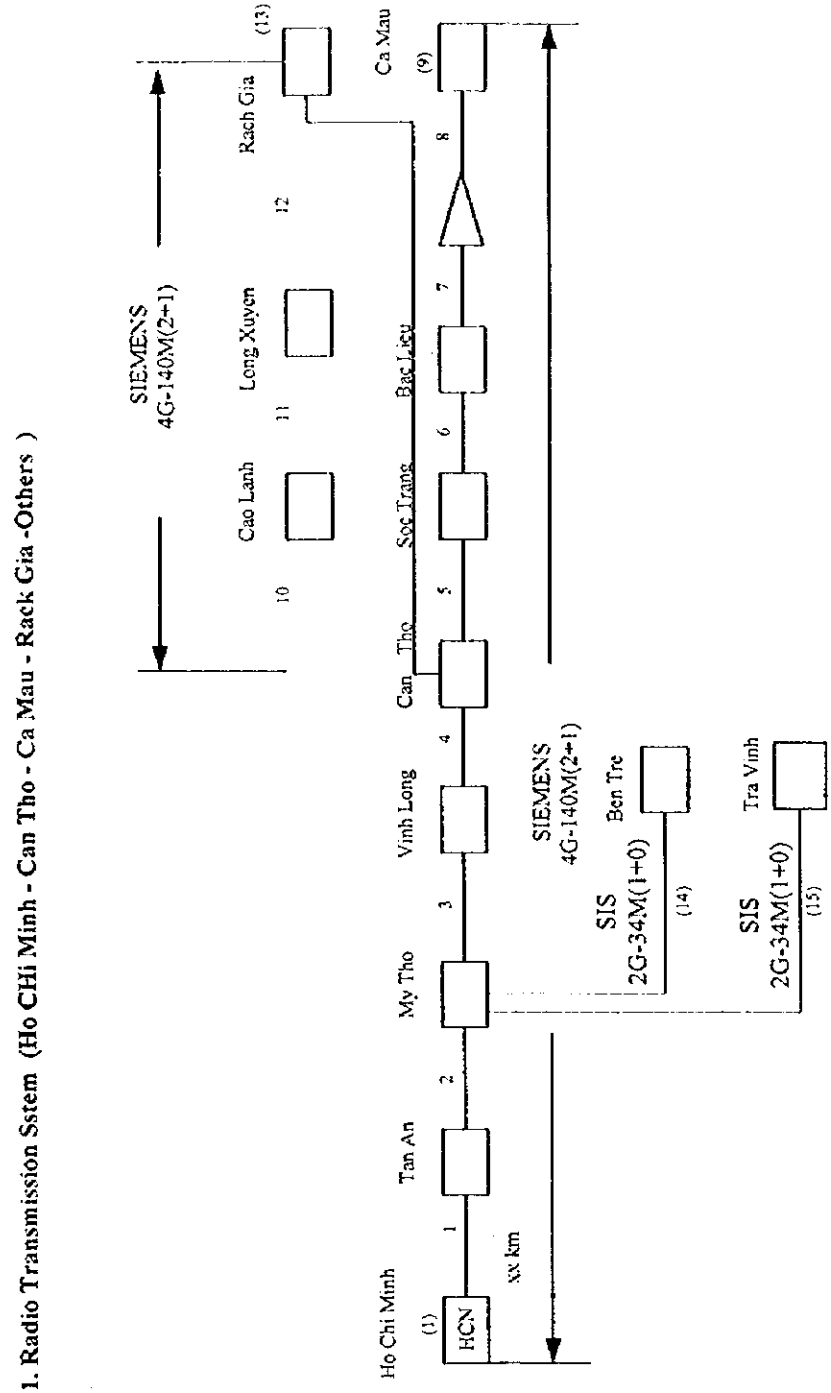



**Figure 5.2.1-8 Radio Trausmission System Configuration (5)**
**(Southern Area)**

### 5.2.2 Intra-Provincial Network

The present intra-provincial networks in several provinces are attached in Appendix I-5-2.

(1) OFC Transmission Network

(a) General

Recently the Intra-Provincial OFC transmission network has been intensively developed and expanded as well as Inter-Provincial Network. However, still small capacity of microwave system is mainly used between MSU and RLU.

(b) OFC Transmission system

The transmission network planned by Nghe An province shows the typical Intra-Provincial network planning.

The construction work OFC transmission system (STM-1 & 4) with ring configuration is designed and 80% of links are use commercially.

On the other hand, the replacement plan of radio system with OFC transmission system is also proceeding, which will be completed by year-2000.

The Nghe An Intra-provincial network is shown in Figure 5.2.2-1.

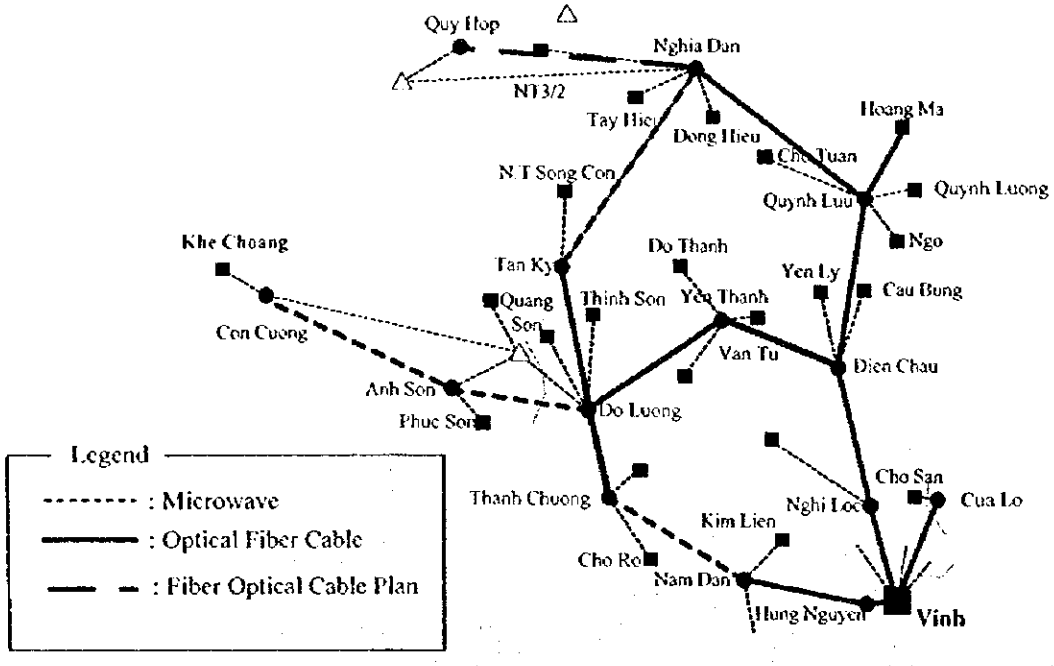



**Figure 5.2.2-1 Nghe An Intra-provincial Network**

The OFC Transmission systems, which use in Province, are mainly STM-1 or STM-4 as shown below.

a. SIMENS : STM-1 & 4
b. ALCATEL : STM-1 & 4
c. NORTEL : STM-1 & 4
d. Other

(2) Radio Transmission Network

(a) General

Intra-provincial networks are composed of radio (microwave) systems, which is approximately 88 % of the intra-provincial networks, and cable systems (about 12 %) in Vietnam. The utilization of radio systems in Vietnam has the following features:

i) Star network configuration

Microwave systems connect between MSUs and RLUs, and most of their network configurations are of star-configuration. The average link length of the intra-provincial network is about 28 km.

ii) Various kinds of radio systems

Many kinds of radio systems are used in Vietnam, and the utilized radio systems are different hop by hop. For operation and maintenance, this condition is not efficient, because it requires skilled staff to them and many spare parts.

iii) Small capacity system

The capacities of used radio systems are generally small such as a few channels and 1 E1 (30 channels), and the average accommodation ratio (utilization/capacity) is approx. 70 %. The system capacity may be decided only considering the near future demand (short-term utilization), without consideration of long term utilization due to economical reason. Therefore, the capacity may become insufficient within a few years after installation, and its replacement by larger capacity system may immediately be required.

iv) Reuse and relocation of radio system

According to the increasing of transmission capacity, radio system may be replaced by larger capacity system such as optical fiber cable system, and the radio system may be relocated to another route.

v) Attendant maintenance and operation in repeater station

All repeater stations of radio system are attended for the purpose of switching over the power supply systems by maintenance staff in case of power failure.

(b) Radio System

The many types of radio systems and cable systems such as optical fiber cable, OW (open wire) and HDSL are utilized for intra-provincial network in Vietnam. The major radio systems for intra-provincial network are as follows:

**Table 5.2.2-1 Radio Systems for Intra-Provincial Network**

| System | Manufacturer | Radio Frequency | Capacity | Remarks |
|---|---|---|---|---|
| AWA1504 (RMD1504) | Australia | 1.5 GHz band (1427-1535 MHz) | 2 EI | Most used systems assembled in Vietnam for intra-provincial network in Vietnam. |
| AWA1808 (RMD1808) | Australia | 1.8 GHz band (1700-1900 MHz) | 4 EI | |
| CTR 210 | Siemens, Germany | 1.97- 2.3 GHz | 4 EI – 8 EI | |
| DM-1000 | Fujitsu, Japan | 2 GHz band (1900-2300 MHz) / 7 GHz band (7400-7700 MHz) | 4 EI – 16 EI | |
| DXR-100 | New Zealand | 430 – 512 MHz | 4 EI | |
| MDS | USA | 450 MHz band | 22 channels | |
| MITEC | Australia | 10 – 10.5 GHz | 1 EI | |
| NOKIA | Finland | 1.9 – 2.1 GHz | 16 EI | |
| PS-02 (PS phone) | | 400 MHz band | 1 channel | |
| SIS | Taiwan | 1.9 – 2.3 GHz | 16 EI | |
| VH301 | Hungary | 320 – 420 MHz | 1 channel | |
| 3JDD | China | 140 – 160 MHz | 3 channels | |
| 6JDE | China | 364 – 372 MHz | 6 channels | |
| 6RU10 | Vietnam | 622 – 712 MHz | 10 channels | |
| 6RU10CT | Vietnam | 622 – 712 MHz | 1 EI | |

About half of the used radio systems are AWA systems with small capacity (30 – 60 channels).

(c) Supporting Facilities

i) Antenna tower

In general, antenna tower higher than 60 m applies self-standing tower and that lower than 60 m applies guyed tower, and most of antenna towers are local products.

ii) Building

Radio equipment for a repeater is usually accommodated in buildings. (A

shelter is not utilized in Vietnam.)

iii) Power supply system

Power supply system for a repeater is classified into the following types:

- Commercial power and Rectifier + Batteries (capacity: 8 hours)
- Engine generator (single standby) and Rectifier + Batteries (capacity: 8 hours)
- Solar power system including Batteries (capacity: 48 hours -- max. 1 week)

## 5.3 Access Network

The existing access networks in Vietnam are observed in the following categories ;

1) Outside Plant
   - Metallic Cable Network
   - Optical Access Network
2) Radio Subscriber System
3) VSAT System

### 5.3.1 Outside Plant

In this section, the existing outside plant networks consisting of metallic cable networks and optical access networks are mentioned.

The appeared statistical data and technical information in this context are collected and analyzed in line with the observations during field survey, advance questionnaires, the relevant reports/documents and hearing with VNPT, local P&Ts and the related business companies in Vietnam.

(1) Metallic Cable Network and Duct System

(a) Designing Principle and Existing Facilities

As a fundamental designing principle, the following parameters are prescribed and authorized in Vietnam :

(i) Transmission Loss

The maximum transmission loss for subscriber cable network is generally specified as ;

7 dB

In case that the user is located far from local exchange, the maximum transmission loss is allowed up to ;

10 dB.

The cable transmission losses measured at frequency of 1kHz and environmental temperature of 20°C, are specified according to the cable wire diameters as shown in Table 5.3.1-1 ;

**Table 5.3.1-1 Cable Transmission Loss**

| Cable Wire Diameter (mm) | Transmission Loss (dB/km) |
|---|---|
| 0.32 | 2.3 |
| 0.4 | 1.8 |
| 0.5 | 1.4 |
| 0.65 | 1.1 |
| 0.7 | 0.95 |
| 0.9 | 0.8 |

Source : Specification 68-TCN-132-94

In the cable design, the uni-gauge system is employed basically and the wire diameter of 0.5mm is used as a first choice.
In spite of such a design principle, still combination of wire gauges has been employed widely.

(ii) Cable Loop Resistance

The maximum cable loop resistance is prescribed under the switching systems as follows ;

**Table 5.3.1-2 Maximum Loop Resistance**

| Switching Systems | Max. Loop Resistance (Ω) |
|---|---|
| Manual (magnet type) | 2,000 |
| Manual (common battery system) | 800 |
| Step-by-Step | 1,000 |
| Cross-bar | 1,000 |
| Electronic switching system | 1,000 |

Source : VNPT

In case that the user is located far from local exchange, the maximum loop resistance is allowed up to ;

1,300Ω.

The cable loop resistances are specified according to the cable wire diameters as shown in Table 5.3.1-3 ;

**Table 5.3.1-3 Cable Loop Resistance**

| Cable Wire Diameter (mm) | Loop Resistance (Ω/km) |
|---|---|
| 0.32 | 478 |
| 0.4 | 296 |
| 0.5 | 188 |
| 0.65 | 113 |
| 0.7 | 96 |
| 0.9 | 58 |

Source : Specification 68-TCN-132-94

(iii) Provisioning periods for Planning

The provisioning periods for new installation have not been defined clearly in VNPT yet.

The volumes of the necessary outside plants are designed according to the existing demand by each P&T. Accordingly the cable expansion plans are laid every year and the provisioning period of the duct system is provided at the designer's own discretion.

For the purpose of the network volume estimation in planning, especially for the primary cables, the distribution factor is provided as ;

(primary cable pairs terminated on MDF) / (switch line units) = 1.4

As an estimation factor of the secondary cable volume, the occupancy rate of DP to be designed is provided as ;

80% of DP capacity

The existing metallic cable networks in Vietnam are basically so designed as to be composed of the primary and secondary cables, cross connection cabinets (Cabinet), distribution boxes or distribution points (DP) and duct systems as illustrated in Figure 5.3.1-1.

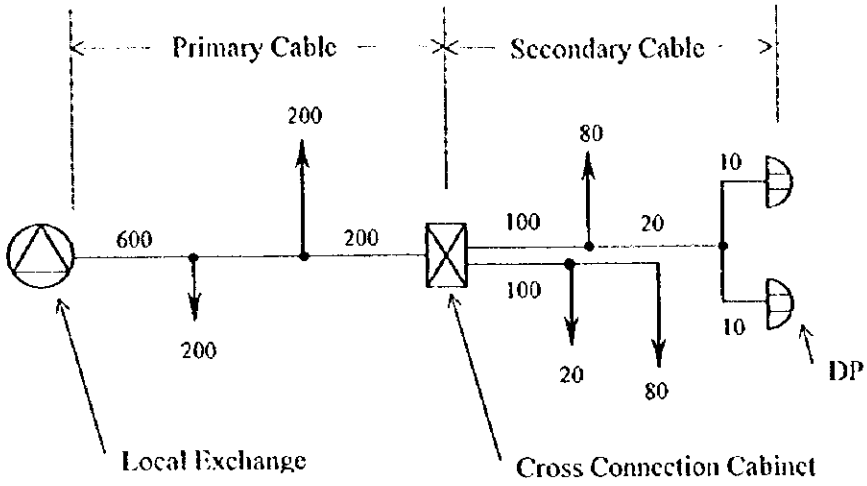



**Figure 5.3.1-1 Metallic Cable Network**

The primary and secondary cables are jointed ;

- inside the jointing boxes (pole mounted type) for the aerial cables and
- in the enclosures for the duct/direct buried cables, and

the termination manners are as follows ;

- soldering type which remained in rural/remote areas and
- Insulation Displacement Contact (IDC) type utilized in urban/city areas.

The grounding facilities are equipped only for the cabinets.

In some past cases, a cable distribution house has been employed besides cross connection cabinets in order to reduce the distribution loss in the primary cable network (see Figure 5.3.1-2). Although the cable distribution house obviously enhances the flexibility of the limited primary cable pairs, it may cause troublesomeness in the maintenance activities and facility management.

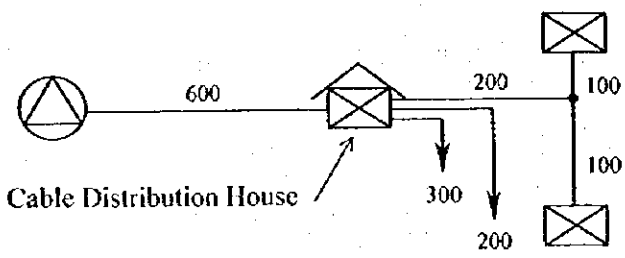



**Figure 5.3.1-2 Cable Distribution House**

As a distribution method of secondary cable network, recently a rigid distribution system is employed and so far not only the system but also link and/or flexible distribution systems have been utilized.
In the area where those vestigial distribution methods are intermingled, the subscriber lines are established in linking several cable sections with cross connected jumper wires at MDF, cable distribution house, cabinet and several distribution boxes (DPs). In that case, it would be very difficult for the workers of maintenance and subscriber connection to identify the objective subscriber line number due to the complicated jumper wiring and multiple pair numbers appeared on the boxes.

The metallic cables in subscriber or junction network are specified as a technical standard "68-TCN-132-94" by DGPT.
The specification provides that the cables have PE sheath and copper core with capacity up to 2,400 pairs, and the insulation materials of the core are paper or PE, PVC.

Under a general design method in VNPT, PE insulated jelly filled copper cables are employed for primary and secondary cable networks, and optical fiber cable is employed for junction cable network.

In case of primary cable plan/design, so far the provisioning periods has not been considered into the determination of the cable capacities. The necessary primary cable capacities to be installed have been planned according to the number of the waiting list or the potential demand at that time. In consequence, the numbers of small size cables, i.e. up to 600 pairs, have been drawn into the MDF room all over the country.

In the regional central office, it was observed that several 100 to 300-pair cables have been laid into the MDF room through the trough and the existing cable conduits, and the numbers of small cables occupy the manholes in jamming.

The network plan based on the provisioning periods may require the use of larger size of cables, 2,000-pair, 1,800-pair, 1,000-pair etc. which will bring the merits of saving the material cost and efficient ducts use in the long-term view.

Under the circumstance of existing small cubic contents of manholes and cable vaults, however, it is likely difficult to secure their sufficient cable bending radiuses.

In due course, additional new primary cables will be installed increasingly as the telephone demand grown up and it may bring some concerns on cable congestion, remarkably in urban areas. For the appropriate cable installation, it is indispensable to review the existing duct system on the technical specifications as well as the design method.
On the other hand, the optical access network system can solve the concerned issues technically because of its smaller and lighter optical fiber cable with large line capacity. In addition, the optical access network system will greatly decrease the occupied space in MDF room. However at this stage, since the investment cost of the system is still expensive as compared with the conventional copper cables, it can not be replaced straightaway.

Accordingly, the long term network development plans as basis of planning works shall be issued with due consideration of the future demand and the strategic deployment plan of the optical access networks for all Provinces and Districts.

(b) Upgrading Existing OSP Facilities

The upgrading activities of the OSP facilities are being carried out in order enhancing the network service qualities.

(i) Relocation of Aerial Cables to Underground

So far the aerial cables have been installed widely rather than the underground cables, especially in the secondary cable network.
The length percentage of the aerial portion in the total cable length is assumed roughly as ;

(Secondary Cable Network)

- Urban Area : Approx. 40%
- Suburban Area : Approx. 75%
- Local City (central area) : 10% or so
- Rural/Remote Area : Almost 90% to 100%

(Primary Cable Network)

- City Area : Almost 0%
- Rural/Remote Area : Un-known but low percentage

According to Hue P&T, almost all primary cables have been laid into the ducts or directly buried at any provinces in Vietnam.

The existing aerial cables sometimes give poor impressions of ;

- too close to electric power lines
  (the minimum separations from the power lines have been standardized in VNPT)
- insufficient height at road crossing
  (the minimum heights over the road/side-walk have been standardized in VNPT)
- over-loaded poles (5 to 6 cables hung on)
- cables hung on trees.

The cable relocation activities from aerial to underground are being proceeded nationwide by regional P&T mainly in urban city area because that is required for his maintenance purpose and from the public point of view (from the esthetic point of view), as well.

(ii) Renewal of Conventional Facilities

Existing old OSP facilities have to be renewed or up-graded in order to keep the stable quality in telecommunications services.

For the purpose of that, recently regional P&T gets into actions according to his plan as follows ;

- to replace the old typed DPs with the reinforced plastic ones,
- to replace the deteriorate drop wires.

These old/deteriorated facilities cause numbers of faults, e.g. in Ha Noi, approximately 90% of total faults have been found in these parts.

As for the open wire in subscriber access networks, all the facilities have been replaced with the cables yet.

(c) Duct System

(i) Specification

The current duct system in Vietnam is reviewed and the optimum system

is studied by RIPT. On the other hand, the regional P&T concerns independently the use of new manholes specified in the other countries.
The appropriate manhole specifications, the economical manhole spacing and the installation standards shall be considered systematically in the review.

(ii) Construction

During construction works of the duct system, there are hardships for P&T and his design/construction companies to go through, i.e. it to obtain the digging permission from the road administrator. The construction section is obliged to wait the permission for several months and sometimes the permitted working hours are restricted only within midnight hours. In Ha Noi and Ho Chi Minh City areas, they are serious bottlenecks in their construction works.
As the car traffic getting greater, such official restrictions will become much more serious and spread to local cities.

While the lifeline sectors such as telecom-carriers, water suppliers and so on, request the digging permissions according to their own construction schedules independently, it is essential for the road administrators to decrease the digging.
In order for P&T construction sections to obtain the digging permissions smoothly, they shall consider the preparatory construction of duct systems prior to road construction/maintenance activities. The provision shall have sufficient capacity to meet the future requirement of the additional cables, i.e. to be designed with appropriate provisioning period.
In some areas, such preparatory construction activities have already been started but not nationwide.

Further more the regional planning sections have to issue the long-term duct system plans not only for new constructions/expansions but also modifications and they shall have regular meetings with the regional road administrators and other relevant lifeline sectors, in which their digging plans/schedules are arranged/adjusted each other.
See Figure 5.3.1-3

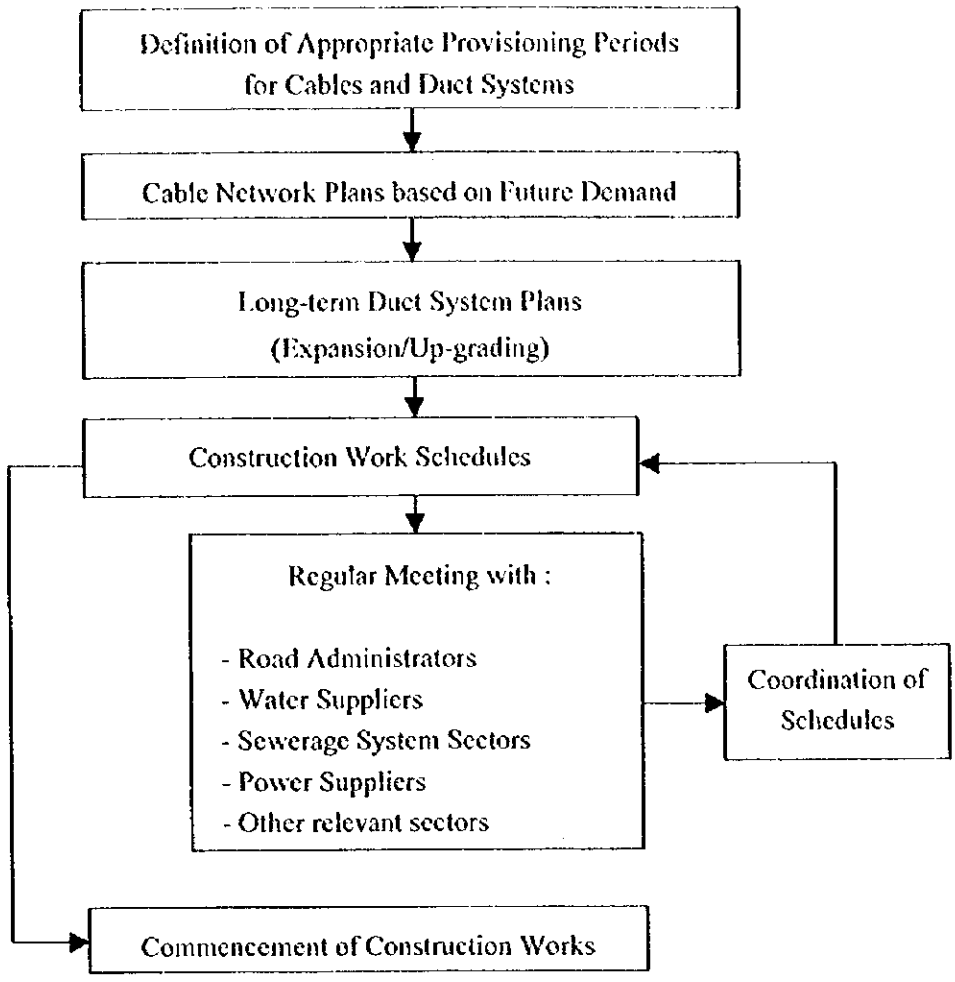



**Figure 5.3.1-3 Preparatory Construction Flow of the Duct System**

(2) Optical Access Networks

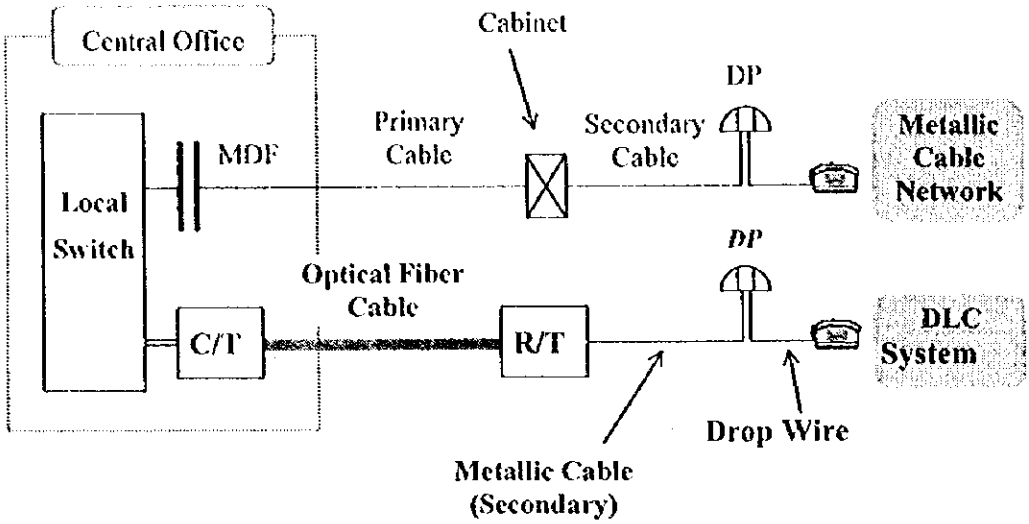
The existing Optical Access Networks (OAN) are very few.

In metropolitan areas, several optical transmission systems are equipped and put in service tentatively.

- 2 systems in Ho Chi Minh City
- 2 systems in Ha Noi

The employed system is a digital subscriber multiplexing system, so-called Digital Loop Carrier system (DLC).

Figure 5.3.1-3 shows the DLC optical system configuration.




Note : C/T (Central Terminal)
R/T (Remote Terminal)

**Figure 5.3.1-3 DLC System in Service**

Subsequently further constructions of numbers of OANs have been planned especially at Ha Noi and Ho Chi Minh urban/suburban areas.
They are supposed to be constructed in a couple of years.

In this stage, any single users who require a form of Fiber To The Home (FTTH) have not been reported yet in Vietnam. For the current users in Leased Circuit service, the bit-rate up to 64kbps is enough in their usage, which can be served on the current metallic access networks. In other words, now there is no user who requires the high-speed digital circuit to be provided through the optical access system.
Exceptionally 2,048kbps optical fiber links between VNPT and VDC centers at Ha Noi, Da Nang and Ho Chi Minh are reported.

### 5.3.2 Radio Subscriber Systems

(1) General

There are many types of radio subscriber systems such as point-to-multipoint TDMA systems and Wireless Local Loop (WLL) systems in the world.

These systems can provide telephone lines to subscribers with reasonable cost compared with conventional metallic cable systems.

The radio subscriber systems are usually utilized as the following measures:

(a) Supplementary Access System to Cable System

The radio subscriber systems are utilized as a supplementary access system to cable system in areas, where demand can not be satisfied by cable systems in time/from economical viewpoint. For the purpose, the systems are usually utilized in urban areas such as Ha Noi and Ho Chi Minh.

(b) Main Access System in Rural/Remote Area

The radio subscriber system is utilized as a main access system in areas, where the cable construction is difficult from the geographical/economical viewpoints.

In Vietnam, several types of radio access systems are utilized. These radio subscriber systems are utilized in Ha Noi, Ho Chi Minh and other provinces.

The radio subscriber systems are utilized for the following purposes in Vietnam.

(a) Trial of Radio Subscriber Systems

Some of radio subscriber systems are utilized as trial in urban areas. Based on the result of trial, the system will be expanded nationwide.

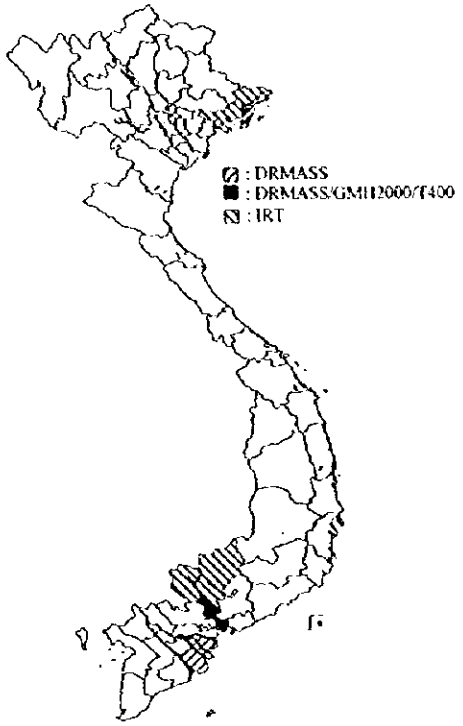
(b) Supplementary Utilization in Urban Areas

Some systems are utilized as supplementary systems to cable network in urban areas and a few systems are used in rural/remote areas.

(c) Utilization in Rural/Remote Areas

At present, the systems are utilized as main access systems in only a few provinces. Considering the features of radio subscriber systems mentioned above, the radio subscriber systems may be expanded to rural/remote areas, where cable network is ineffective, as a main access system in the future.

The major radio access systems utilized in Vietnam are as follows:




(a) DRMASS
(b) GMH 2000
(c) IRT-2000
(d) T400 (PROXIMITY)

The areas, where radio subscriber systems are utilized, are shown in Figure 5.3.2-1.
This figure shows that the systems are used mainly in urban and plain areas, and are used only in a few rural/remote areas in Vietnam.
The utilization conditions of each radio subscriber system are mentioned in detail as follows:

Source: DGPT

**Figure 5.3.2-1 Introduced Areas of Radio Subscriber System**

(2) DRMASS

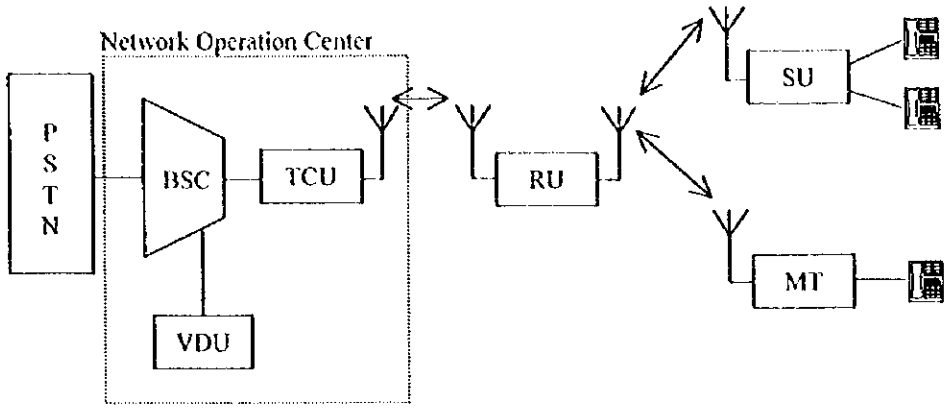
(a) System Outline

DRMASS (Digital Radio Multiple Access Subscriber System) is a system manufactured by NEC (Japan), and has the following system parameters:

**Table 5.3.2-1 DRMASS System Parameters**

| Items | Specification | Remarks |
|---|---|---|
| Type of System | Point-to-Multipoint | |
| Radio Frequency | 2.4 GHz Band (2300-2500 MHz) | |
| Access Scheme | TDM / TDMA | |
| Number of subscribers | Max. 1,024 | |
| Number of subscriber lines/terminal | Max. 256 | |

The system configuration of DRMASS is shown in Figure 5.3.2-2.



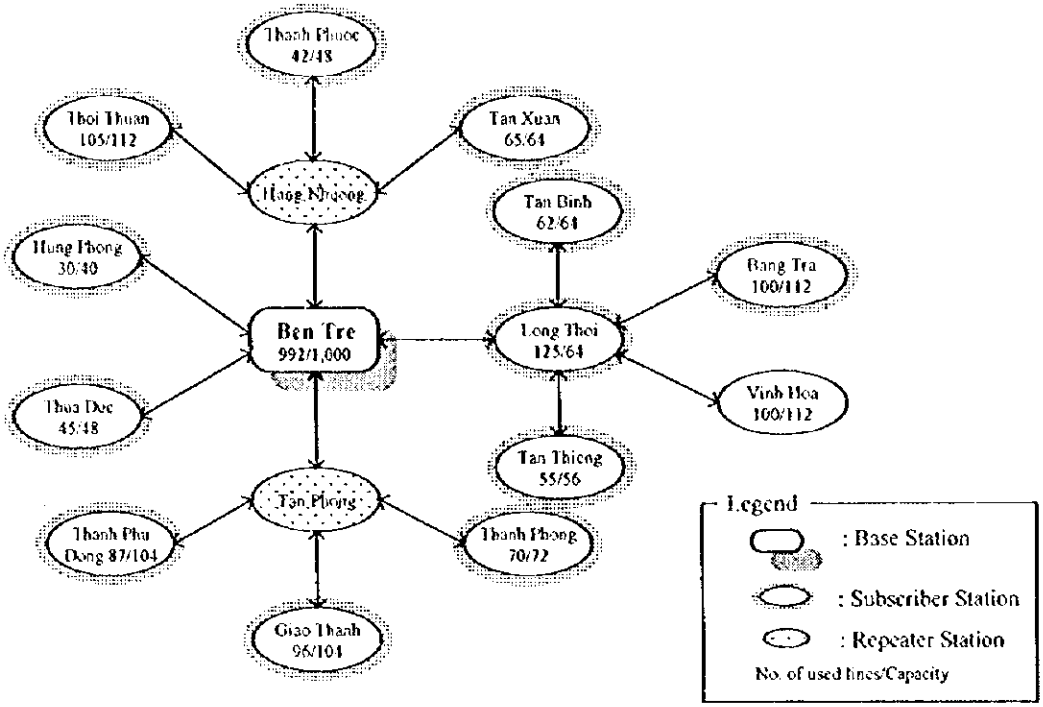

BSC: Base Station Controller
VDU: Visual Display Unit
SU: Subscriber Unit
TCU: TDM Control Unit
RU: Repeater Unit
MT: Mini Terminal

**Figure 5.3.2-2 DRMASS System Configuration**

(b) Utilization Conditions

DRMASSs are introduced and accommodated telephone lines in the following areas:

| | | |
|---|---|---|
| - Ha Noi | : | 800 lines |
| - Ho Chi Minh City | : | 1,024 lines |
| - Tien Giang | : | 898 lines |
| - Ben Tre | : | 1,002 lines |
| Total (4 areas) | | 3,724 lines |




DRMASS in Ben Tre Province

Source: DGPT

**Figure 5.3.2-3 Utilization of DRMASS**

(3) GMH 2000

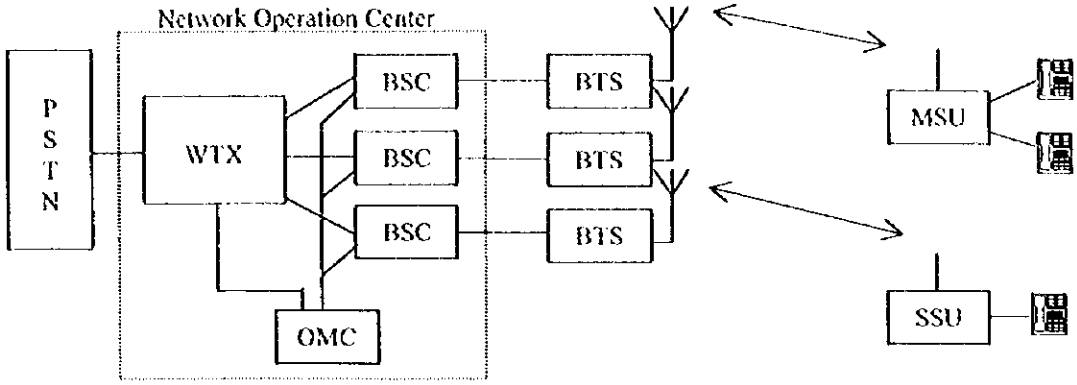
(a) System Outline

GMH 2000 system is a system manufactured by Hughes (USA). The major system parameters are shown in Table 5.3.2-2.

**Table 5.3.2-2 GMH2000 System Parameters**

| Items | Specification | Remarks |
|---|---|---|
| Type of System | Point-to-Multipoint | |
| Radio Frequency | Down : 869 – 874 MHz<br>Up : 824 – 829 MHz | |
| Access Scheme | E-TDMA | |
| Number of subscribers | Max. 20,000 | |
| Number of subscriber lines/terminal | Max. 96 | |

The system configuration of GMH 2000 is shown in Figure 5.3.2-4.




WTX: Wireless Telephone Exchange BSC: Base Station Controller
BTS: Base Transceiver Station OMC: Operation and Maintenance Center
MSU: Multi Subscriber Unit SSU: Single Subscriber Unit

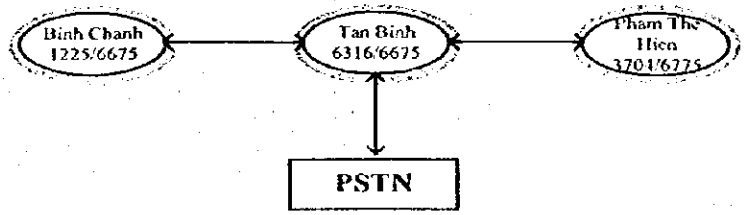
**Figure 5.3.2-4 GMH 2000 System Configuration**

(b) Utilization Conditions

GMH 2000 systems are utilized in Ho Chi Minh City (District 1, 5, 6, 8, 10, 11, 14, 20) in October 1996. The upgrading of software is under-taken for improvement of the system quality. The system is utilized under the following conditions:

- Type of WTX : NEAX 61 E
- Assigned radio frequency bandwidth : 5 MHz
- Number of BSC : 3 BSCs (Tan Binh, Binh Chanh, Pham The Hien)
- Number of MSUs : approx. 5,300
- Number of SSUs : approx. 6,000
- Number of utilized lines and capacity

| | | |
|---|---|---|
| Tan Binh | : | 6,316 lines / Capacity 6,675 lines |
| Binh Chanh | : | 1,225 lines / Capacity 6,675 lines |
| Pham The Hien | : | 3,704 lines / Capacity 6,675 lines |
| Total | : | 11,245 lines / Capacity 20,025 lines |




Source: DGPT

**Figure 5.3.2-5 Utilization of GMH 2000**

(4) IRT-2000

(a) System Outline

IRT-2000 is a system manufactured by TRT (French).

The major system parameters are shown in Table 5.3.2-3.

**Table 5.3.2-3 IRT-2000 System Parameters**

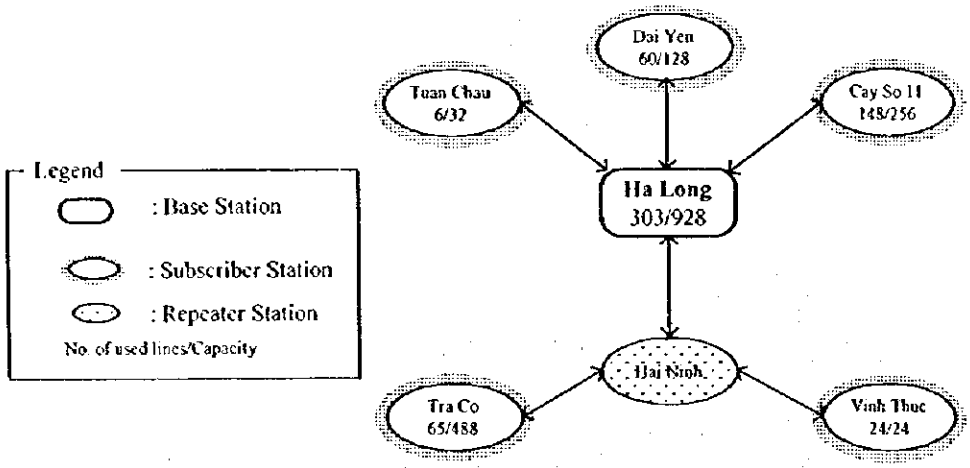
| Items | Specification | Remarks |
|---|---|---|
| Type of System | Point-to-Multipoint | |
| Radio Frequency | 2.4 GHz Band (2300-2500/2500-2700 MHz) | |
| Access Scheme | TDMA | |
| Number of subscribers | Max. 480 | |
| Number of subscriber lines/terminal | Max. 128 | |

(b) Utilization Conditions

IRT systems are utilized in the following four (4) provinces:

- Quang Ninh : 303 lines / Capacity 928 lines
- Tay Ninh : 368 lines / Capacity 746 lines
- Binh Duong : 471 lines / Capacity 624 lines
- Binh Phuoc : 372 lines

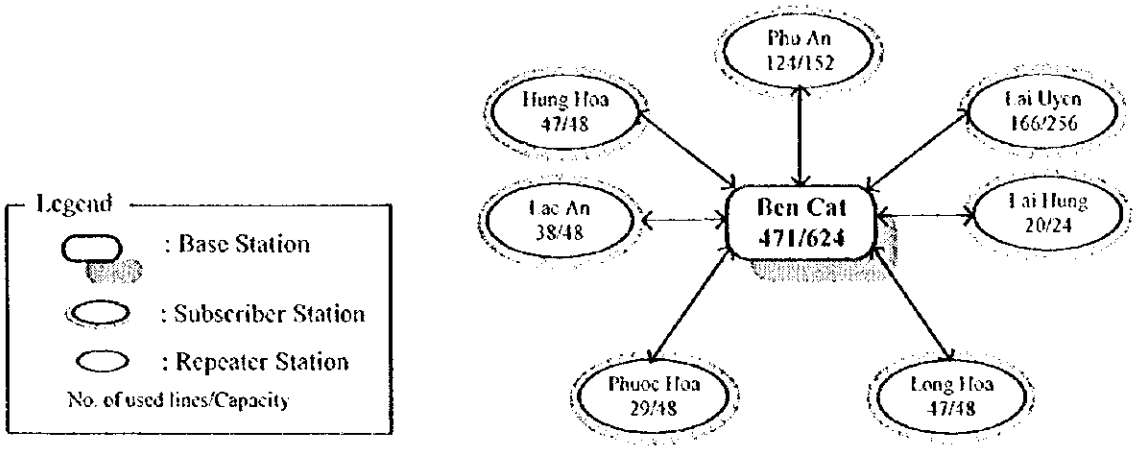
Total (4 provinces): 1,514 lines




IRT-2000 in Quang Ninh Province

Source: DGPT

**Figure 5.3.2-6 Utilization of IRT-2000 (1/2)**




IRT-2000 in Binh Duong Province

Source: DGPT

**Figure 5.3.2-7 Utilization of IRT (2/2)**

(5) T 400

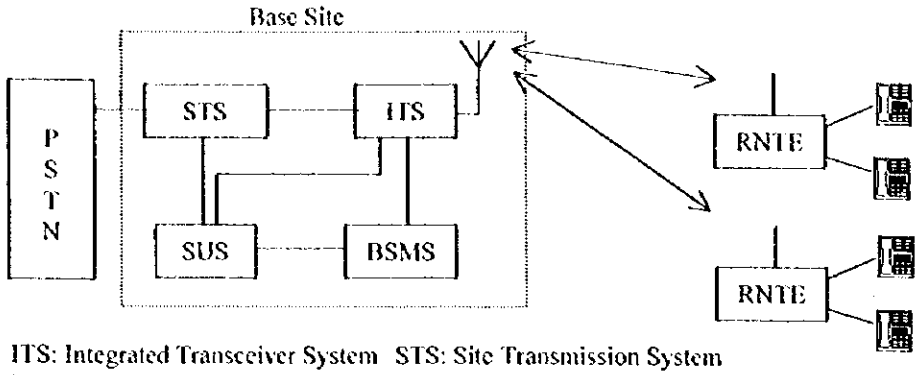
(a) System Outline

T 400 (PROXIMITY) system, which is manufactured by Northern Telecom, is based on the TDMA digital cellular technology. The system parameters of T 400 are shown in Table 5.3.2-4.

**Table 5.3.2-4 T 400 System Parameters**

| Item | Parameter | Remarks |
|---|---|---|
| Frequency Band | 440 - 450 / 485 – 495 MHz Band | |
| No. of Radio Channels | 54 | |
| Modulation Scheme | $\pi$ /4 D QPSK | |
| Base Station | 6 radio channels / sector<br>60 traffic channels / sector<br>667 subscribers / sector<br>(GOS: 1%, 69 mE/subscriber) | |
| Customer Premise Equipment | 96 kbps<br>(3 simultaneous timeslots x 32 kbps) | |

The typical system configuration is shown in Figure 5.3.2-8.




ITS: Integrated Transceiver System STS: Site Transmission System
BSMS: Base Site Management System SUS: Site Utility System

**Figure 5.3.2-8 T 400 System Configuration**

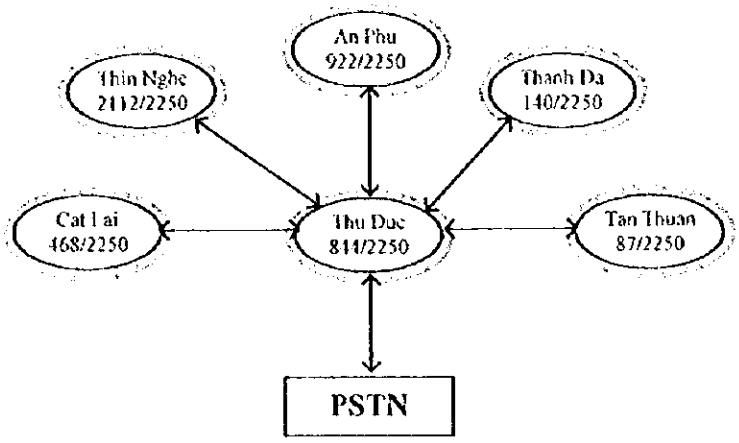
(b) Utilization Conditions

T 400 system, which is utilized as trial in Ho Chi Minh City from May 1997. The utilization conditions are as follows:

- Number of cell sites : 6 cell sites (Cat Lai, Tan Thuan, Thi Nghe, Thu Duc, An Phu, Thanh Da)
- Number of utilized lines and capacity

| | |
|---|---|
| Cat Lai | : 468 lines / 2,250 lines |
| Tan Thuan | : 871 lines / 2,250 lines |
| Thi Nghe | : 2,112 lines / 2,250 lines |
| Thu Duc | : 844 lines / 2,250 lines |
| An Phu | : 922 lines / 2,250 lines |
| Thanh Da | : 140 lines / 2,250 lines |
| Total | 4,700 lines / 13,500 lines |

The utilization conditions are indicated in Figure 5.3.2-9.




Source: DGPT

**Figure 5.3.2-9 Utilization of T 400**

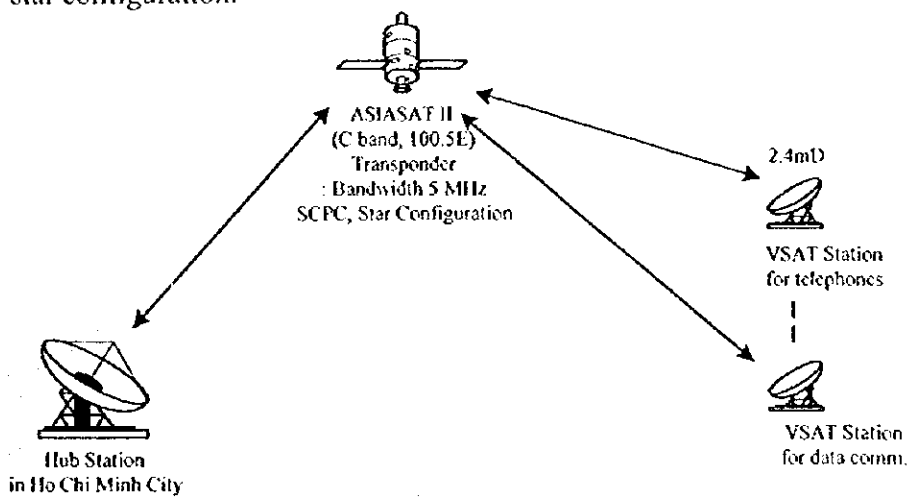
### 5.3.3 VSAT System

(1) System Outline

In Vietnam, VSAT systems are utilized for telephone in rural/remote areas and isolated areas such as islands and data communications.

(a) System Configuration

The VSAT system is composed of a hub station, VSAT stations and space segment (satellite) as shown in Figure 5.3.3-1. The system applies SCPC and star configuration.




Source: DGPT

**Figure 5.3.3-1 VSAT System Configuration**

The major system parameters are shown in Table 5.3.3-1.

**Table 5.3.3-1 Major System Parameters**

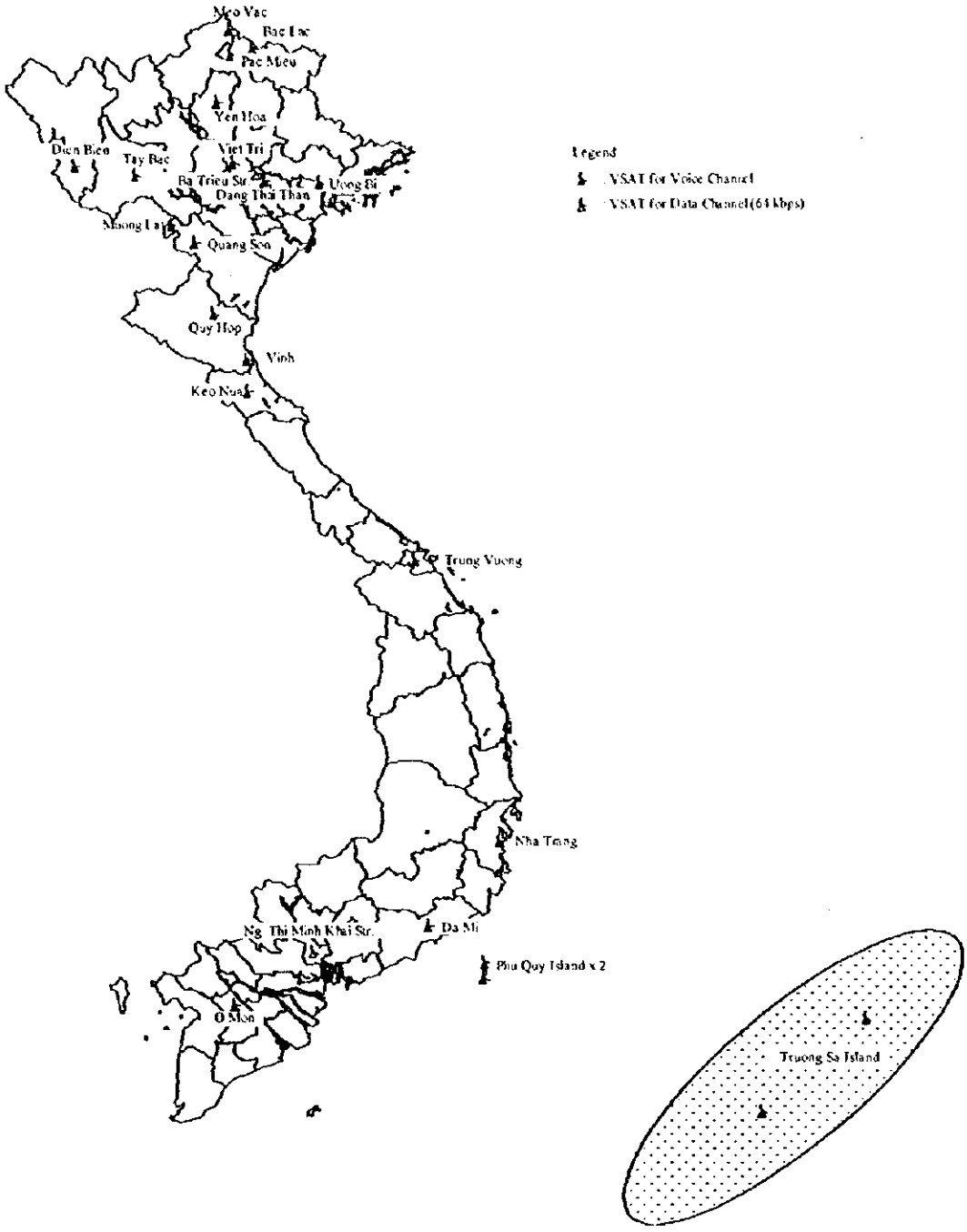
| Item | Specification | Remarks |
|---|---|---|
| Satellite | ASIASAT II | |
| Radio Frequency | C band (4 / 6 GHz band) | |
| Network Configuration | Star Network | |
| Assignment | Demand Assigned Multiple Access (DAMA) | |
| Hub Station | In Ho Chi Minh City | |
| VSAT Station | 2.4 mD Antenna | |

Source: DGPT

(2) Utilization Conditions

(a) VSAT Application

VSAT systems are applied not only to telecommunications in rural/remote areas, but also to data communications for leased line. The total numbers of VSAT earth stations and channels are 24 stations and 39 channels, respectively. These numbers are not so large considering the features of VSAT system and the geographical conditions in Vietnam. The present situation of VSAT system is shown in Table 5.3.3-2 and Figure 5.3.3-2.




Source: DGPT

**Figure 5.3.3-2 Location of VSATs in Vietnam**

Table 5.3.3-2 VSAT Stations in Vietnam

| Province | No. of Stations | Location | No. of Channels | Type | Remarks |
|---|---|---|---|---|---|
| Ha Giang | 1 | Meo Vac | 2 | Voice | |
| Tuyen Quang | 1 | Yen Hoa | 2 | Voice | |
| Cao Bang | 2 | Bao Lac | 2 | Voice | |
| | | Pac Mieu | 2 | Voice | |
| Lai Chau | 1 | Dien Bien | 2 | Voice | |
| Son La | 1 | Tay Bac | 1 | Voice | |
| Quang Ninh | 1 | Uong Bi | 2 | Voice | |
| Vinh Phuc | 1 | Viet Tri | 1 | Voice | |
| Ha Noi | 2 | Ba Trieu Str. | 1 | Data | 64 kbps |
| | | Dang Thai Than | 1 | Voice | |
| Thanh Hoa | 2 | Quan Son | 2 | Voice | |
| | | Muong Lat | 2 | Voice | |
| Nghe An | 2 | Quy Hop | 2 | Voice | |
| | | Vinh | 1 | Voice | |
| Ha Tinh | 1 | Keo Nua | 2 | Voice | |
| Da Nang | 1 | Trung Vuong | 1 | Voice | |
| Khanh Hoa | 3 | Truong Sa Island | 3 | Voice | |
| | | Truong Sa Island | 3 | Voice | |
| | | Nha Trang | 1 | Voice | |
| Binh Thuan | 3 | Phu Quy Island | 4 | Voice | |
| | | Phu Quy Island | 4 | Voice | |
| | | Da Mi | 4 | Voice | |
| Ho Chi Minh | 1 | Ng. Thi Minh Khai Str. | 1 | Data | 64 kbps |
| Can Tho | 1 | O Mon | 4 | Voice | |
| Total | 24 | | 39 | Voice: 37<br>Data: 2 | |

Source: DGPT

(b) Facilities Conditions

i) Satellite

The rural and remote telecommunications systems apply VSAT systems, which use ASIASAT II (C band, longitude 100.5° E).

The bandwidth of transponder is about 5 MHz.

ii) Hub station

Hub station for VSAT system is located in Ho Chi Minh City.

iii) VSAT stations

The total number of VSAT stations is 24 earth stations nationwide. The locations of VSAT stations are shown in Figure 5.3.3-2 and Table 5.3.3-2. Most of VSAT stations apply 2.4 m antenna in diameter, and communicate voice and data. Voice signal is applied to public pay phone, and data channel transmits 64 kbps.

The VSAT station applies commercial power or solar power system.

## 5.4 Mobile Communications Systems

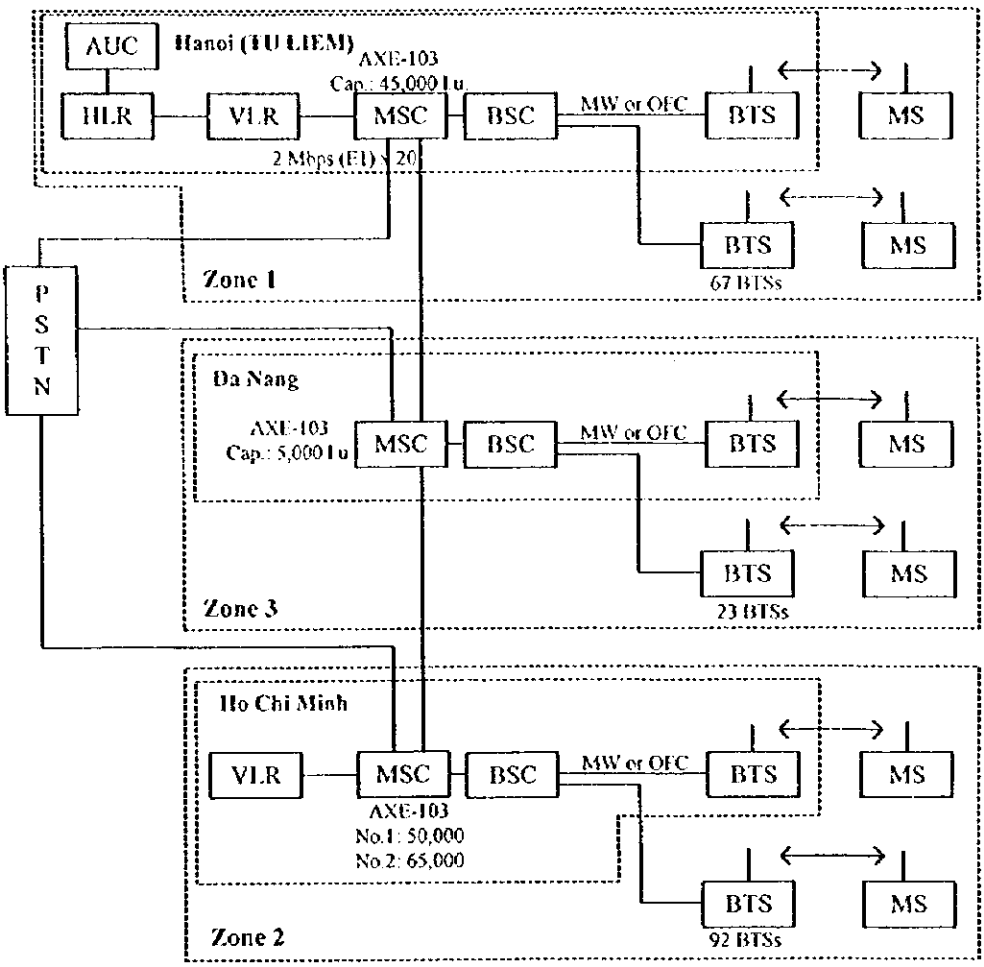
### 5.4.1 Cellular Mobile Systems

The facilities conditions of cellular mobile systems are shown below provider by provider:

(1) MobiFone system

(a) System Configuration

The system configuration of MobiFone by VMS is shown in Figure 5.4.1-1.




MSC: Mobile service Switching Center
BTS: Base Transceiver Station
VLR: Visitors' Location Register
AUC: Authentication Center
BSC: Base Station Controller
MS: Mobile Station
HLR: Home Location Register
PSTN: Public Switched Telephone Network

Source: DGPT

**Figure 5.4.1-1 MobiFone System Configuration**

(b) Facilities Conditions

The facilities of MobiFone system are summarized in Table 5.4.1-1.

**Table 5.4.1-1 Conditions of MobiFone System**

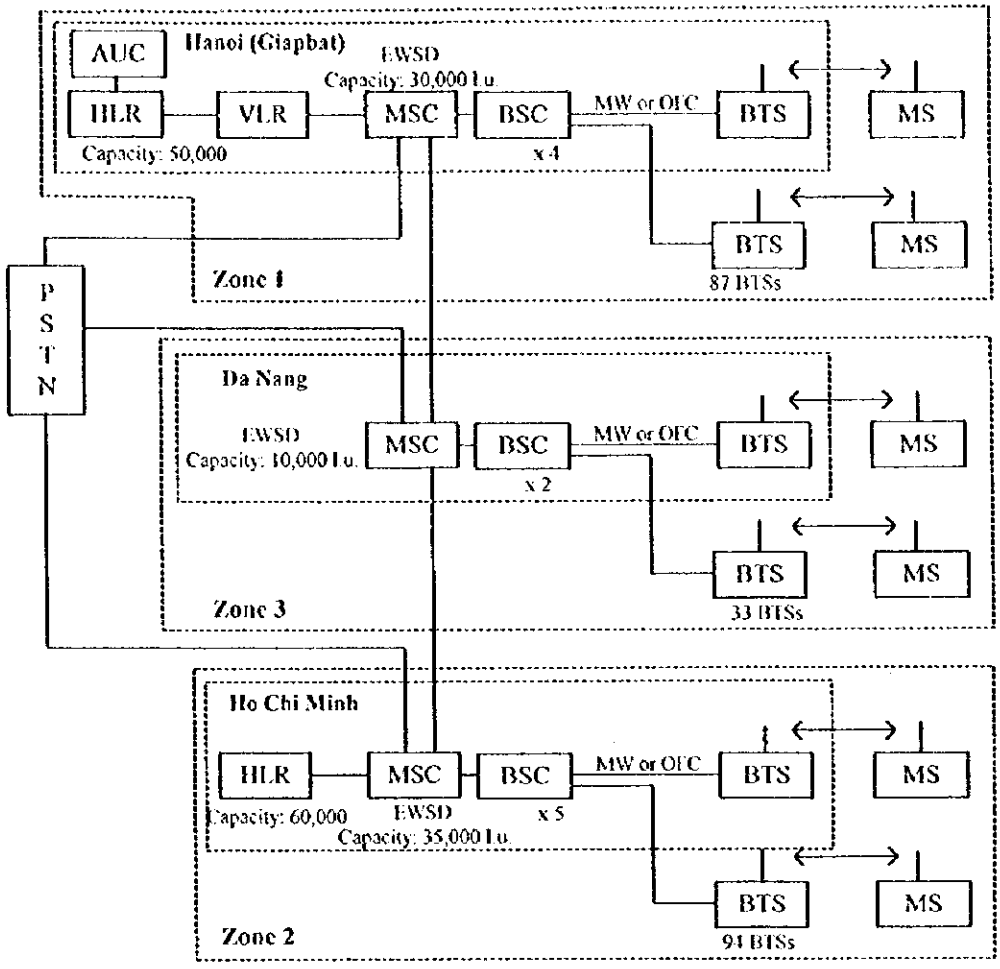
| Item | Conditions | Remarks |
|---|---|---|
| Mobile Service Switching | AXE-103 (ERICSSON) x 4<br>Ha Noi: 45,000 l.u.<br>Ho Chi Minh: No.1: 50,000 l.u.<br>No.2: 65,000 l.u.<br>Da Nang: 5,000 l.u. | |
| Base Station Controller | Total : 10<br>Ha Noi: 7<br>Ho Chi Minh: 2<br>Da Nang: 1 | |
| Base Station | Total : 182<br>Ha Noi: 67 (138)<br>Ho Chi Minh: 92 (235)<br>Da Nang: 23 (32) | ( ): No. of sectors |
| Approach Link between BSC and BTS | Microwave systems<br>(15 GHz band)<br>or<br>Optical fiber cable systems. | |

Source: DGPT

(2) VinaPhone System

(a) System Configuration

The VinaPhone by GPC applies the GSM system and system configuration is nearly same as that of MobiFone in Figure 5.4.1-2.




MSC: Mobile service Switching Center
BTS: Base Transceiver Station
VLR: Visitors' Location Register
AUC: Authentication Center
BSC: Base Station Controller
MS: Mobile Station
HLR: Home Location Register
PSTN: Public Switched Telephone Network

Source: DGPT

**Figure 5.4.1-2 VinaPhone System Configuration**

(b) Facilities Conditions

The facilities of VinaPhone system are stated in Table 5.4.1-2.

Table 5.4.1-2 Conditions of VinaPhone System

| Item | Conditions | Remarks |
|---|---|---|
| Mobile Service Switching | EWSD (SIEMENS) x 3<br>Ha Noi: 30,000 l.u.<br>Ho Chi Minh: 35,000 l.u.<br>Da Nang: 10,000 l.u. | |
| Base Station Controller | Total : 13<br>Ha Noi: 4<br>Ho Chi Minh: 5<br>Da Nang: 2 | |
| Base Station | Total : 214<br>Ha Noi: 87<br>Ho Chi Minh: 94<br>Da Nang: 33 | |
| Approach link between BSC and BTS | Microwave system<br>or<br>Optical fiber cable system | |

Source: DGPT

(3) Call Link System

Call Link applies the analog AMPS system, and its service is limited in Ho Chi Minh and its surrounding areas. Recently Call Link introduced the digital AMPS (D-AMPS), but the system is only the replacement of the analog AMPS. The data and information regarding system configuration and facilities conditions of Call Link could not be obtained during the study.

### 5.4.2 Maritime Mobile Systems

In Vietnam, there are five (5) internationally registered stations and other stations along the country. However, these facilities/equipment are old and their functions are limited, so the system may be upgraded by the loan of foreign countries such as Japan and England. The stations and facilities for maritime mobile system are summarized in Table 5.4.2-1 and Figure 5.4.2-1.

**Table 5.4.2-1 Coastal Radio Stations**

| Station | Type | Functions | Remarks |
|---|---|---|---|
| Mong Cai | North-East gateway between Vietnam and China | VHF/TP, RXA.W | |
| Cam Pha | Port Authority's control Exporting coal | VHF/TP, TRX/TP | |
| Ha Long | Stand alone station | VHF/TP, TRX/TP, RXA.W | |
| Hai Phong | Main station in the north Operation center | VHF/TP,TX MF/TG, TRX/TP, TX HF/TG, TX HF/TP, RXA.W, RX | Internationally registered |
| Thanh Hoa | Automatic VHF/DSC station (Not public coastal station) | TRX/TP, RXA.W | |
| Ben Thuy | Port Authority's control (Maritime safety in the Gulf of Tonkin) | VHF/TP, TRX/TP, RXA.W | |
| Da Nang | Important coastal radio station (Central of Eastern sea) | VHF/TP, TX MF/TG, TRX/TP, TX HF/TG, RXA.W, RX | Internationally registered |
| Qui Nhon | Port Authority's control Main station in the central | VHF/TP, TRX/TP, RXA.W | |
| Nha Trang | Port of tourists | VHF/TP, TX MF/TG, TRX/TP, TX HF/TG, RXA.W, RX | Internationally registered |
| Vung Tau | Gateway of the busiest maritime activities at Eastern sea | VHF/TP, TRX/TP, RXA.W, RX | Internationally registered |
| Ho Chi Minh City | Main station in the south | VHF/TP, TX MF/TG, TRX/TP, TX HF/TG, TX HF/TP, RXA.W, RX | Internationally registered |
| Can Tho | Main station in Mekong River Delta | VHF/TP, TRX/TP, RXA.W | |
| Kien Giang (Hon Chong) | Port Authority's control Gateway for maritime safety of South-West area | VHF/TP, TRX/TP, RXA.W | |
| Other stations | | VHF/TP, TRX/TP | My Thoi, Dong Nai, Nam Can |

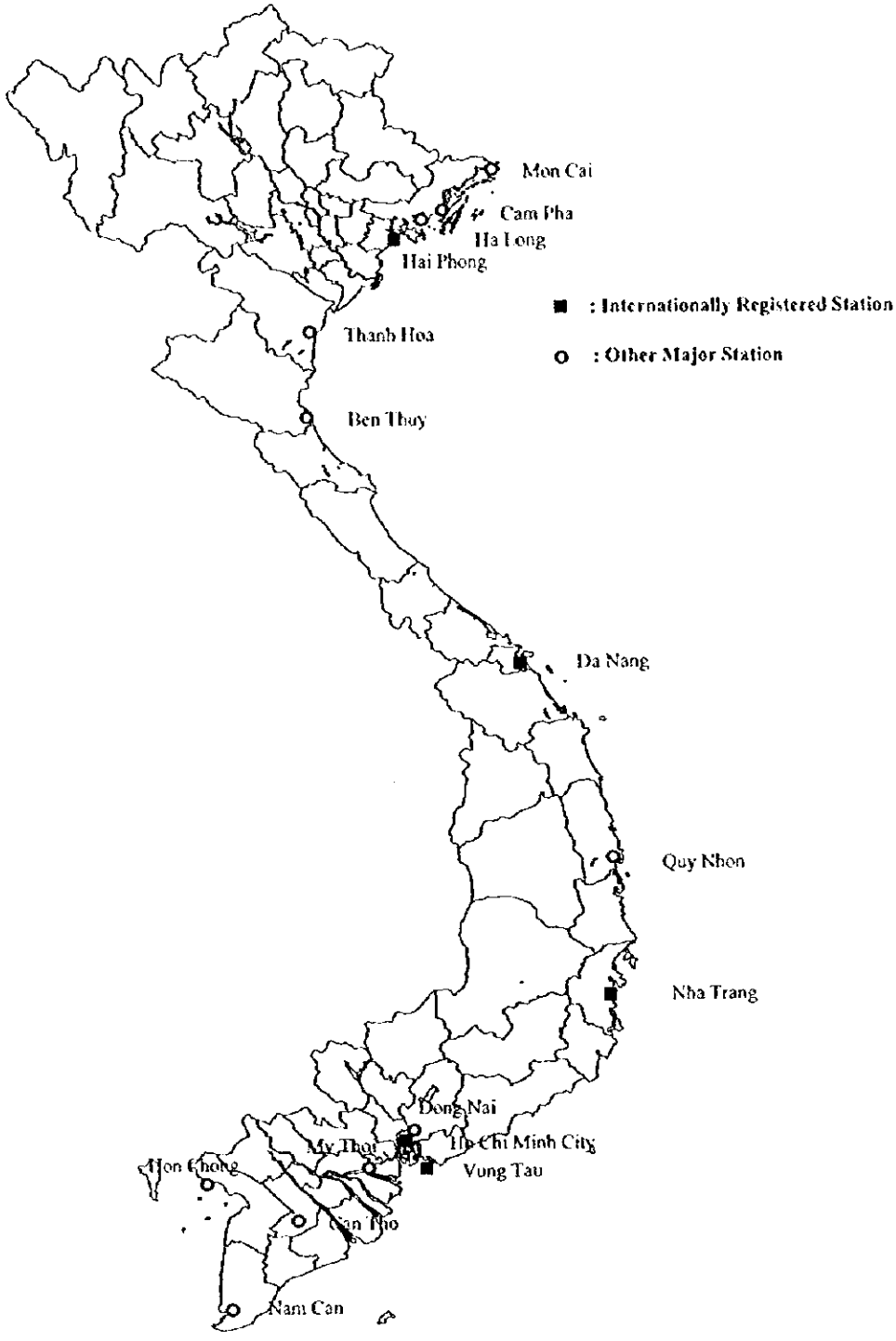
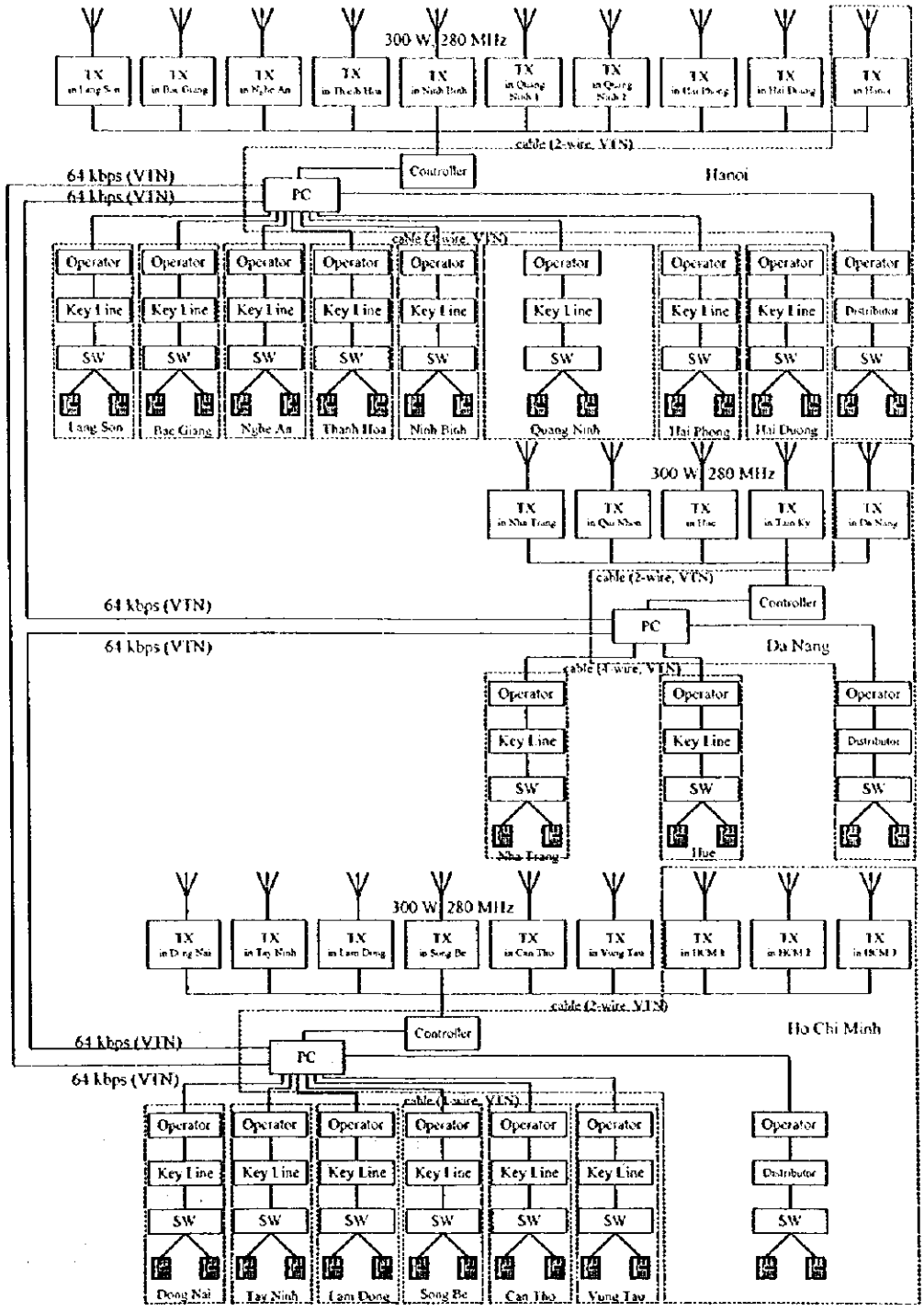



**Figure 5.4.2-1 Coastal Radio Stations in Vietnam**

### 5.4.3 Paging Systems

The paging system by Vietnam Paging Center (GPC), is indicated as one of paging systems in Vietnam in Figure 5.4.3-1.




Source: DGPT

**Figure 5.4.3-1 Paging System Configuration (Vietnam Paging Center)**

The major system parameters and utilization conditions of Vietnam Paging Center's system are mentioned in Table 5.4.3-1.

**Table 5.4.3-1 System Parameters and Utilization Conditions of Paging System (Vietnam Co.)**

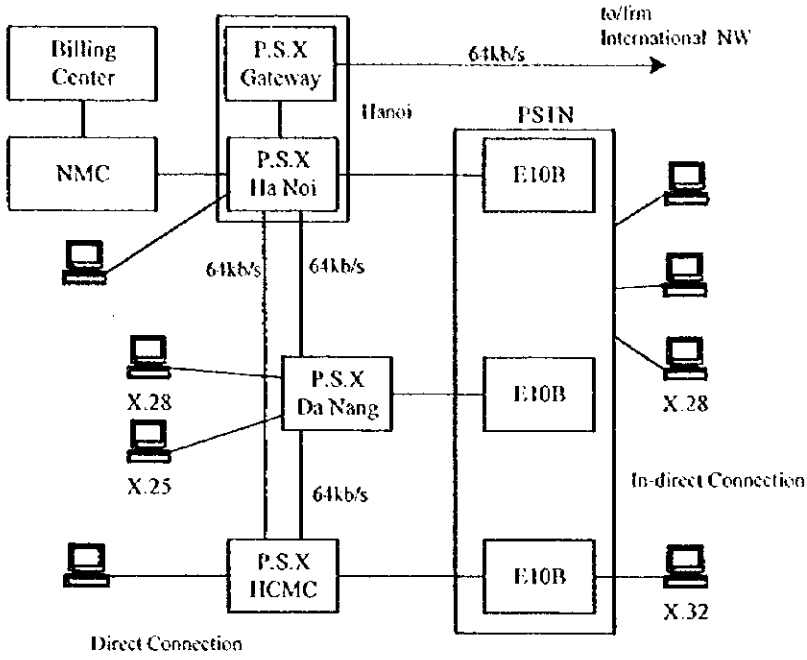
| Item | Specification | Remarks |
|---|---|---|
| Type of System | POCSAG | |
| Radio Frequency | 280 MHz band | |
| Transmitter Power | 300 W | |
| No. of Base Stations | Total: 24<br>Ha Noi: 10<br>HCM: 9<br>Da Nang: 5 | |
| Approach Link | Controller – TX<br>2-wire cable<br>PC – Operator<br>4-wire<br>PC – PC: 64 kbps | |
| Manufacturer | Transmitter Motorola | |
| | Controller Motorola | |
| | PC Cubix | |
| | Distributor Harris | |
| | Key Line NEC | |

Source: DGPT

## 5.5 Non-Voice Communications Systems

### 5.5.1 Packet Network

The present packet network in Vietnam is shown in Figure 5.5.1-1.




Source: DGPT

**Figure 5.5.1-1 Packet Network**

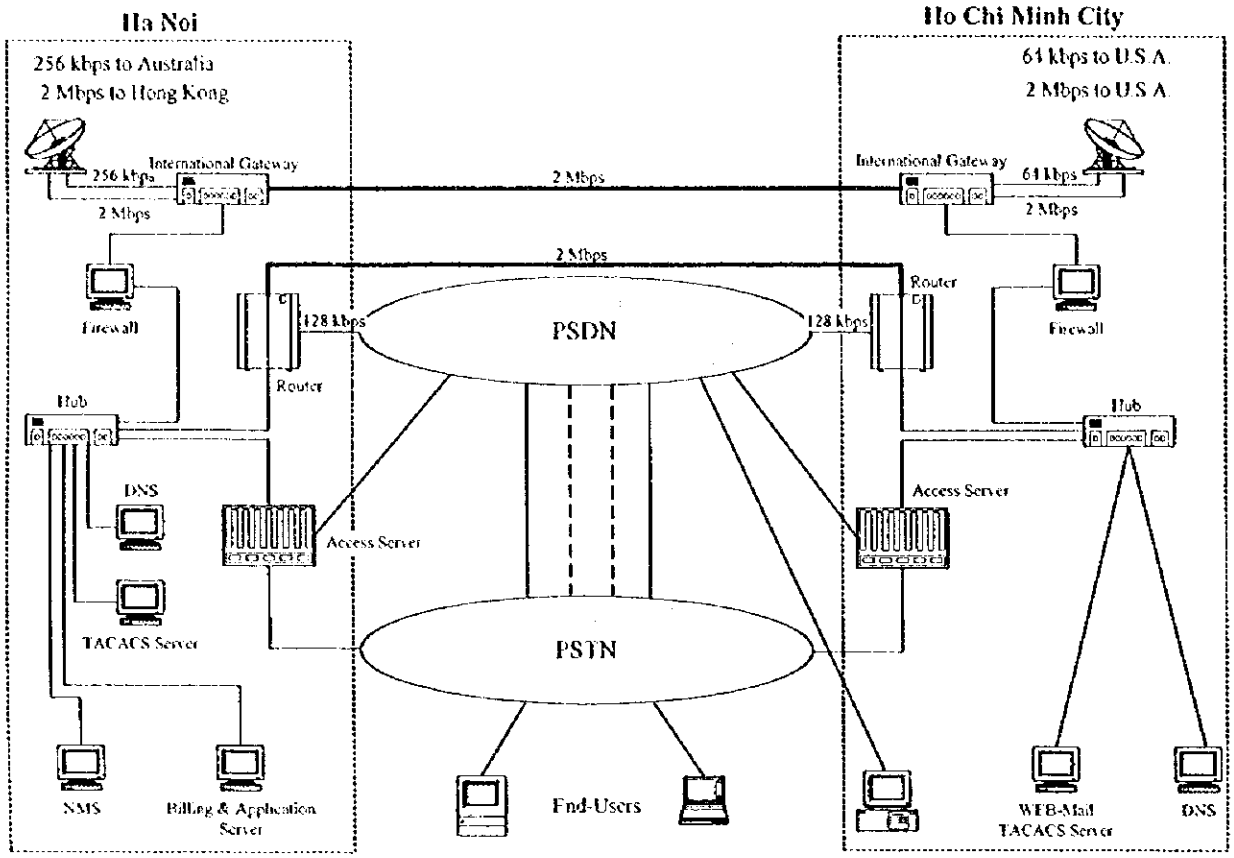
In Ha Noi, packet exchanges apply ALCATEL 1100 TPX (64 kbps, 2 units for gateway, 2 units for domestic), which were installed in 1995.

### 5.5.2 Internet

Internet Access Provider (IAP) is limited to VDC in Vietnam, so the access facilities of Internet are provided by VDC.

There are several regional internet backbones (A-Bone (by AIII), Net Plus (by Hong Kong Telecom Ltd.), Internet KDD (by KDD), Singtel-IX (by Singapore Telecom Ltd.) and Big Pond (by Telestra Corp.) in Southeast Asia.

The network of Internet by VDC is shown in Figure 5.5.2-1.




256 kbps to Australia: through Big Pond Backbone (Telestra)
2 Mbps to Hong Kong: through Net Plus (Hong Kong Telecom)

Source: DGPT, as of June 1998

**Figure 5.5.2-1 Internet Network Configuration by VDC**

A router for VDC Internet in Ha Noi applies the following equipment:

- Gateway router : CISCO 4000 (2 Mbps)
- PSTN dial-up (X.25) : CISCO 7500 (19.2 kbps)

# CHAPTER 6

# CURRENT STATUS OF INTERNATIONAL COMMUNICATIONS

# CHAPTER 6 CURRENT STATUS OF INTERNATONAL TELECOMMUNICATIONS

## 6.1 Telecommunications Network System

### 6.1.1 Networks

The international telecommunication network has been intensively developed and increasingly extended. International telephone traffic has increased from 82.9 million minutes in 1993 to 390 million minutes in 1998 (Refer to Table 6.1.1-1).

**Table 6.1.1-1 International Telephone Traffic**

| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|
| Out Going (M.M) | 2.7 | 14.3 | 19.9 | 32.8 | 44.5 | 52.4 | 53.5 | 53.0 |
| In Coming(M.M) | 11.3 | 27.2 | 63 | 111.2 | 163 | 220.6 | 290.5 | 337 |
| Total (M.M) | 12.7 | 41.5 | 82.9 | 144 | 207.5 | 273 | 344 | 390 |

At present, VTI has three gateway exchanges (International Telecom Center), five earth stations via INTELSAT and one earth station via INTERSPUTNIK and two submarine cable landing stations via T-V-H and SEA-ME-WE3 optical submarine cables. VTI is currently establishing 109 E1 bearer lines (of which 69 E1 bearer lines are via submarine cable system and 40 E1 bearer lines are via satellite system) to link nearly 30 separate countries with 5,013 direct telephone circuits and transit to more than 200 countries as of end of 1998 (Refer to Table 6.1.1-2).

**Table 6.1.1-2 Number of International Direct Telephone Circuits**

| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|
| No. of Circuits | 659 | 950 | 1,647 | 2,972 | 4,285 | 4,836 | 5,013 |

Three of the gateway exchanges are AXE-105, supplied by Ericsson and built by Telstra Australia, in Ha Noi, Ho Chi Minh and Da Nang City respectively.
The latest gateway was inaugurated in Da Nang City on June 1996.

Since December 1995, the T-V-H (Thailand-Vietnam-Hong Kong) fiber optical submarine cable with total length of 3,373 Km and capacity of 565 Mbps (equivalent to 7,560 standard telephone channels in each direction) has been in service. In July 1999, the optical submarine cable SEA-ME-WE3 that links Southeast Asia, Middle East and the European countries will be put into service in Vietnam.

As a result, the Vietnamese telecommunication network will be able to meet many more demand to the European Countries and cable accommodation ratio will be increased remarkably. CSC international Optical Fiber Cable over the land in Vietnam will be brought into service in the 3rd Quarter in 1999. The cable will be connected with six countries (China-Vietnam-Lao-Thailand-Malaysia-Singapore) by means of the SDH system, the total capacity is 2.5 Gbps (30,240 channels based on 64 Kbps). The capacity will enable VNPT to meet the demand for the future multimedia-related services in both domestic and international telecommunications market.

### 6.1.2 Facilities

(1) Earth Stations

The total satellite communication channels at the end of 1997 were 2,972 channels connecting directly to nearly 26 countries in the world (Refer to Table 6.1.2-1& Figure 6.1.2-3). Currently the accommodation ratio between via routing satellite and via routing cable is 40 % for satellite and 60% for cable.

**Table-6.1.2-1 Direct Satellite Links via INTELSAT or INTERSPUTNIK**

(As of End of 1998)

| Gateway | Earth Station | Destination |
|---|---|---|
| Northern International Gateway ITC-1 (Ha Noi) | LOTUS-1 IOR-80° E (INTERSPUTNIK, STATIONAR-13) | Australia, Canada, China, France, Germany, Hongkong, India, Italy, Japan, Norway, Philippines, Poland, Russia, Korea, Singapore, Taiwan, Thailand, U.K., USA (19) |
| | HAN-1A IOR-60° E (INTELSAT) | |
| Central International Gateway ITC-3 (Da Nang) | DAN－1B POR-177° E (INTELSAT) | USA, Australia, Korea, Taiwan (4) |
| Southern International Gateway ITC-2 (Ho Chi Minh) | SBE-1A POR-174° E SBE-2A IOR- 66° E SBE-3A APR-157° E (INTELSAT) | Australia, Cambodia, Canada, China, France, Germany, Hongkong, Indonesia, Japan, Laos, Malaysia, Newzealand, Norway, Philippines, Korea, Singapore, Taiwan, Thailand, U.K., USA (20) |

VTI has five INTELSAT earth stations and one INTERSPUTNIK earth station. The INTELSAT network consists of a Standard-A earth station in Song Be City (SBE- 1A) operating since 1995 via the 174 degrees East satellite, the 2nd Standard-A earth station in Song Be City (SBE-2A) operating since February 1996 via the 66 degrees East satellite, a Standard-B earth station in Da Nang

operating since 1990 via the 177 degrees East satellite and a Standard-A earth station in Ha Noi (HAN-1A) operating since 1990 via the 60 degrees East satellite. One Standard-A earth station in Song Be City (SBE-3A) which will access on the INTELSAT 157 degrees East satellite is available for restoration purpose in the event of the T-V-H submarine cable failure. The INTERSPUTNIK network consists of Lotus Station 1(HS1) in Ha Noi, operational since 1990, and Lotus Station 2(HS2) in Ho Chi Minh City which has operated since 1994 on the Russian communication satellite at 80 degrees East. In 1998 the Lotus Station 2(HS2) has stopped the operation and the INTERSPUTNIK satellite circuits were moved to the cable path.
At present, Vietnam is using the INTELSAT satellite, Asiasat II satellite and INTERSPUTNIK satellite for nationwide television broadcasts 18 hours a day and there are more than 200 TVRO stations to receive TV programs from those satellites.

Domestic satellite telecommunications network by the access to the Asiasat II satellite is configured with the Very Small Aperture Terminal (VSAT's) and the network control HUB earth station located at Ho Chi Minh.
VTI is currently providing a telephony earth station to improve telecommunication service in rural areas while holding down costs, thanks to the economies of VSAT technology. The Australian telecommunications carrier Telstra based on the BCC contract with VNPT is now operating the VSAT network and has already made provision the 24 TES terminals with 39 channels and Ho Chi Minh-based hub earth station has been formed the backbone of the fixed telephone network.
In 1996, VSAT service was started to interconnect national communications network with Truong Sa, Phu Quy islands and Keo Nua bordergate. The VSAT enabled VTI to interconnection with Bach Long Vy Island also.

In June 1996, it was reported that Vietnam started the research of the launch of its own telecommunications satellite (VINASAT). The VINASAT project is expected to be completed in three years with the satellite launch expected to be completed in 2001. VNPT will be responsible for the study and operating the satellite.
The Vietnam Economic Review quoted Mai Liem Truc, General Director of the General Department of Post and Telecommunication, as saying Vietnam population and land area makes it necessary to acquire own satellite.

The main reason is that such an arrangement would incur less expense than renting foreign satellites. At present Vietnam is overdependent on INTERSPUTNIK, Asiasat, Thaicom, Palapa and INTELSAT whose communications services Vietnam is renting. If Vietnam has its own satellite, Vietnam can serve the customers much better, and also, doing business in satellite is more gainful than other services.
Multimedia-related telecommunication services would be useful to build the National Information Infrastructure if Vietnam had its own satellite. The cost of the project was estimated at between $200-250 million dollars. This project is still understudy not implementation phase.

HAN-1A earth station and Lotus Station 1 (LS1) earth station are connected with the ITC-1 in Ha Noi.
The INTERSPUTNIK Earth station, which is 70 Km far from the ITC-1, linked by digital microwave with the capacity of 34 Mbps. This earth station carries the international traffic for the Russia, Slovakia, Lao and Cambodia. One INTELSAT standard B Earth station is connected with the ITC-3 in Da Nang. This earth station is linked to USA, Australia, Republic of Korea, Taiwan and the domestic backbone trunk between Ha Noi and Ho Chi Minh.

SBE-1A and SBE-2A earth station are connected with the ITC-2 in Ho Chi Minh. Song Be earth stations are 80 Km far from Ho Chi Minh City and the transmission lines have been duplicated by optical fiber cable (SDH) and digital microwave link (PDH).

(2) Submarine Cable Landing Station

There have been 4,836 international circuits at the end of 1997, of which 2837 ones are via the T-V-H submarine optical fiber system. Constructed at a total cost of 166 Million US$, of which Vietnam invested about 30 Million US$, the T-V-H cable is the first optical fiber submarine cable landed in Vietnam. The Construction and Maintenance Agreement for the T-V-H Cable was signed on March 17, 1994 by 22 carriers from 13 countries and territories, including VNPT, CAT and HKTI. The cable landing station located at Vung Tau is now served as the gateway linking domestic transmission routes and the T-V-H optical submarine cable. Vung Tau submarine cable landing station is connected with the ITC-2 using Optical Fiber Cable and the digital microwave line. The transmission capacity of the Optical Fiber Cable is 622 Mbps and

the transmission system configuration of the digital microwave link is three plus one system with 140 Mbps. The Siemens provided both systems.

New cable landing station linked to the SEA-ME-WE3 optical submarine cable was newly built at the beach site in Da Nang. On October 1st, 1998, the SEA-ME-WE3 was landed in Hoang Hai Sea, Ngu Hanh Son district, Da Nang city. The approach OFC transmission line between the submarine cable landing station and the ITC-3 has been constructed at the rate of the SDH 2.5 Gbps with 4-ring configuration. The SEA-ME-WE3 optical submarine cable uses the Synchronous Digital Hierarchy with capacity of 40 Gbps (2.5Gbps x 8 WDM (Wavelength Division Multiplexing) x 2, 241,920 channels based on 64 Kbps), allowing to simultaneously transmit from the main submarine SMW 3 backbone into Vietnam landing station (which is one of 40 landing points of the whole system) over 700 km long, linking Viet Nam to Global information super-highway, enabling Vietnam to meet international traffic demands in forthcoming 21st century. The SEA-ME-WE3 will be planned to put into operation in July 1999.

The planned overland OFC-CSC links up with six countries, China (Shanghai), Vietnam (by way of the cities of Lang Son, Ha Noi and Vinh), Lao (Vientiane), Thailand, Malaysia and Singapore. The OFC section in Vietnam is used not only for carrying international traffic but also for domestic traffic. The OFC-CSC will be brought into service by 3rd Quarter in 1999. The total capacity will be 2.5 Gbps with SDH system (30,240 Channels based at 64Kbps)

(3) International Telecom Center

VTI's three International Telecom Centers are the nucleus of the Company's international telecommunications services. These centers contain advanced digital equipment and systems for transmission, switching and operation connecting telecommunications from around the world. These centers-the ITC-1 in Ha Noi, the ITC-2 in Ho Chi Minh and the ITC-3 in Da Nang, are linked mutually by optical fiber cable with bi-directional self-healing ring configuration.

In order to secure the communication under the network failure such as total system down of either one switching or one transmission, distribution of switching systems and route diversity countermeasures have been considered. Consequently, if a breakdown occurs at one of the centers, calls are automatically rerouted to another two centers, preventing any serious disruption

of service. Switching equipment plays a critical role in the functioning of the International Telecommunications Centers with ITU C7 signaling system, immediately selecting and connecting the appropriate circuit for incoming calls and sending the necessary information to the receiving country's switch to complete the calls.

The same type of international transit switch equipment (AXE-105) is now used for the ITC-1, ITC-2 and ITC-3 respectively. This switch, which employs advanced digital and information processing technologies to facilitate high-speed processing and reliable transmission of data, is capable to develop an international Integrated Services Digital Network (ISDN), the IN (Intelligent Network) services and the Internet gateway services as the nucleus of VTI's operations in future. (Refer to Table 6.1.2 -2 & 3, Figure 6.1.2-1 & 2).

**Table 6.1.2-2 Number of Direct International Telephone Circuits And Destination Countries** (As of end of 1998)

| Destination Countries | ITC-1 (Ha Noi) | ITC-2 (Ho Chi Minh) | ITC-3 (Da Nang) | Total |
|---|---|---|---|---|
| Australia | 200 (65) | 254 (225) | 30 (15) | 484 (305) |
| Cambodia | 0 | 28 (18) | 0 | 28 (18) |
| Canada | 30 (19) | 89 (40) | 0 | 119 (59) |
| China | 45 (16) | 59 (35) | 0 | 104 (51) |
| France | 60 (28) | 56 (46) | 0 | 116 (74) |
| Germany | 89 (44) | 90 (58) | 0 | 179 (102) |
| Hongkong | 119 (30) | 89 (66) | 0 | 208 (96) |
| India | 59 (12) | 0 | 0 | 59 (12) |
| Indonesia | 0 | 38 (20) | 0 | 38(20) |
| Italy | 16 (13) | 0 | 0 | 16 (13) |
| Japan | 117 (71) | 182 (105) | 0 | 299 (176) |
| Laos | 0 | 16 (11) | 0 | 16 (11) |
| Malaysia | 0 | 42 (32) | 0 | 42 (32) |
| Newzealand | 0 | 5 (10) | 0 | 5 (10) |
| Norway | 29 (9) | 15 (11) | 0 | 44 (20) |
| Philippines | 30 (14) | 7 (4) | 0 | 37 (18) |
| Poland | 60 (97) | 0 | 0 | 60 (97) |
| Russia | 26 (13) | 0 | 0 | 26 (13) |
| Republic of Korea | 108 (69) | 115 (102) | 30 (26) | 253 (197) |
| Singapore | 85 (38) | 119 (88) | 0 | 204 (126) |
| Switzerland | 59 (24) | 25 (13) | 0 | 84 (37) |
| Taiwan | 59 (32) | 119 (90) | 30 (11) | 208 (133) |
| Thailand | 29 (23) | 54 (37) | 0 | 83 (60) |
| U.K. | 45 (41) | 55 (52) | 0 | 100 (93) |
| U.S.A. | 401(191) | 1,440 (862) | 360(92) | 2,201 (1,145) |
| Total | 1,666 (849) | 2,897 (1,925) | 450(144) | 5,013 (2,918) |

Note: ( ) a parenthesized figure shows required number of circuits which is calculated by estimated Erlangs according to the chargeable minutes data of the year 1997 obtained from VNPT

**Table 6.1.2-3 Present Situation of International Switching System**

| Gateway | Location | Type | Capacity | No. of Trunk | Manufacture | Service-In-Date |
|---|---|---|---|---|---|---|
| VTI | Ha Noi ITC-1 | AXE105 | 40,000 BHC* | 5,040 | Ericsson | 1-10-95 |
| | TP HCM ITC-2 | AXE105 | 40,000 BHC* | 8,790 | Ericsson | 1-10-95 |
| | Da Nang ITC-3 | AXE105 | 40,000 BHC* | 1,650 | Ericsson | 6-96 |

Note: BHC (Busy Hour Calls)

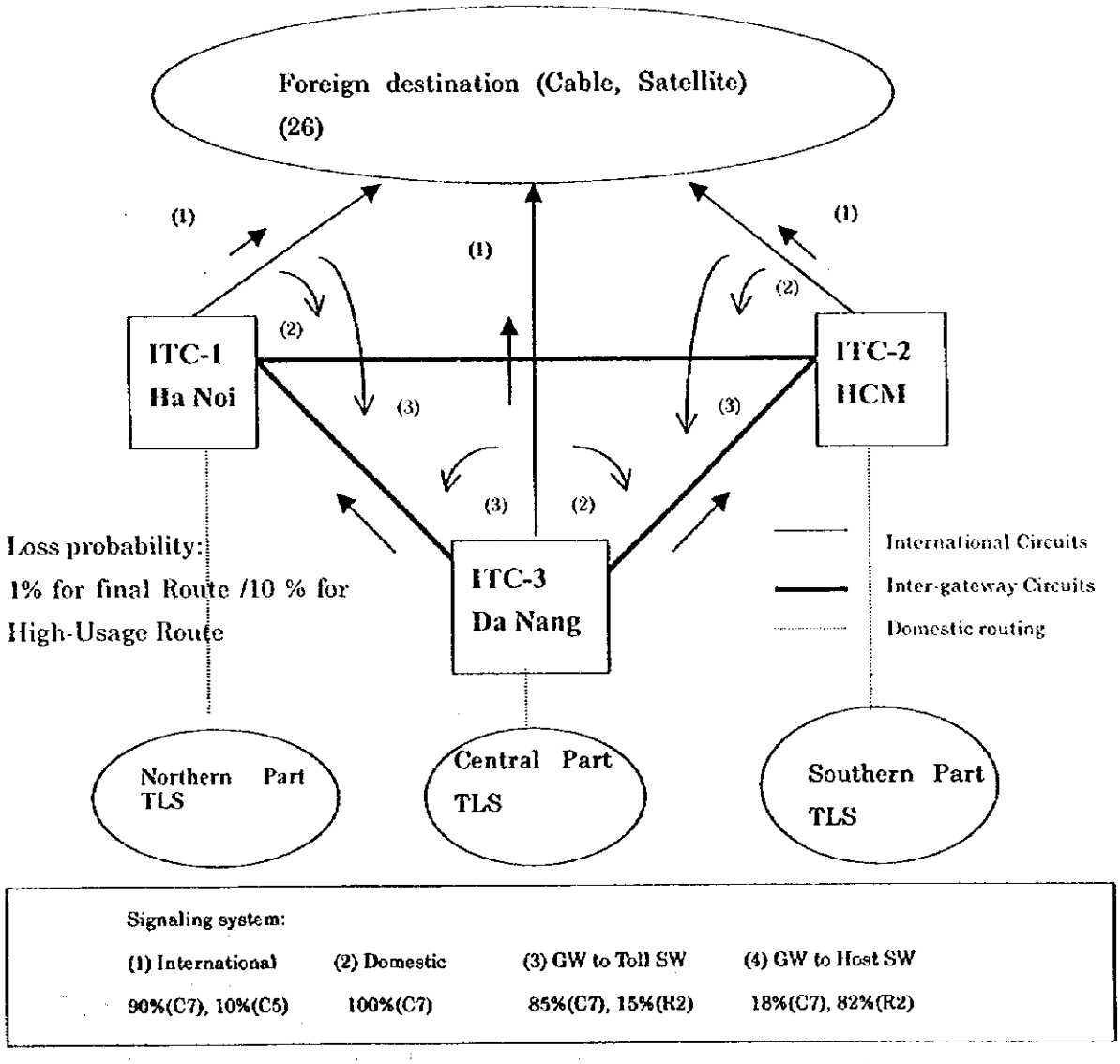



**Figure 6.1.2-1 VTI International Telephone Traffic Routing**

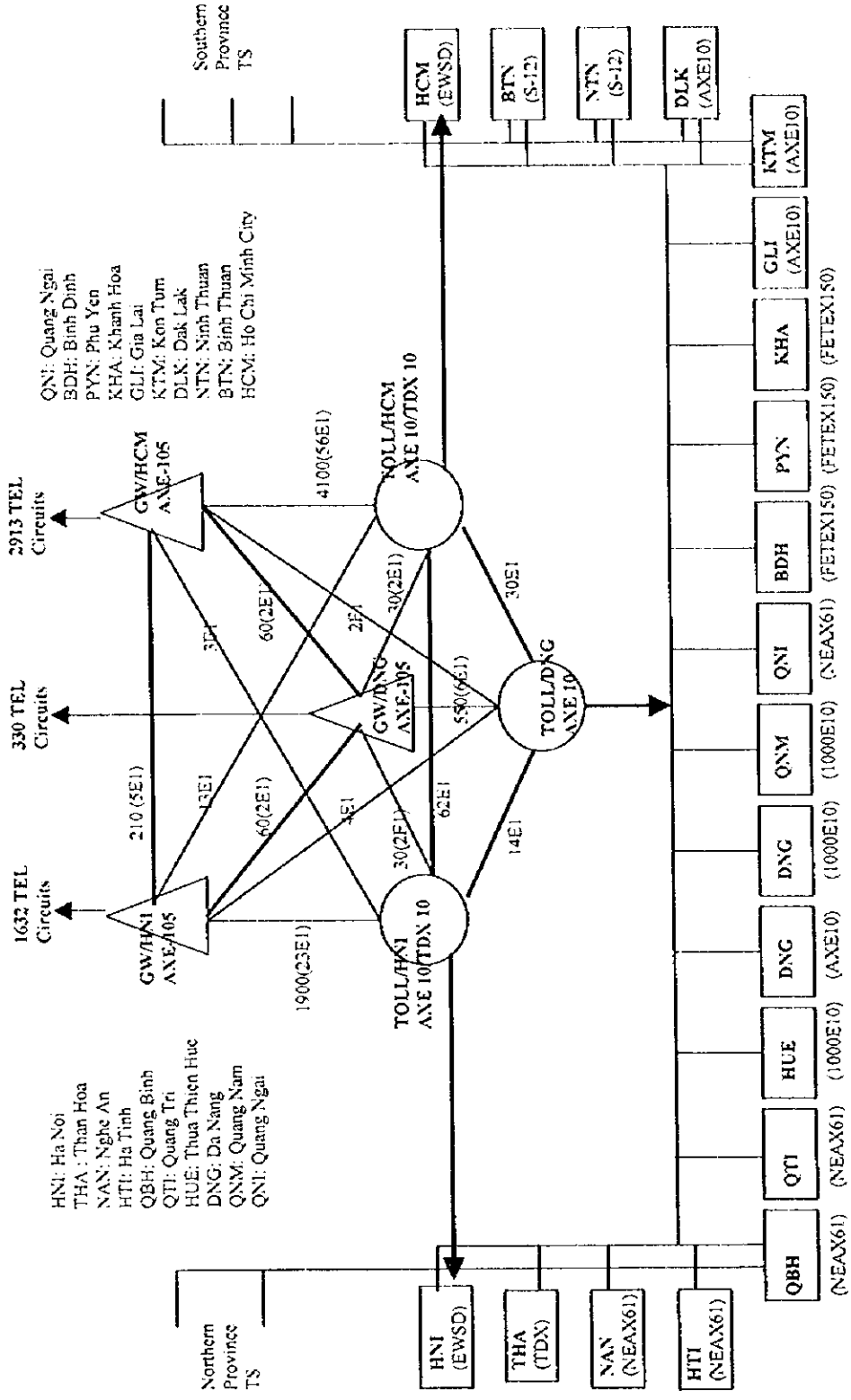



**Figure 6.1.2-2 Domestic Telephone Switching Network of VTI and VTN (As of July 1998)**

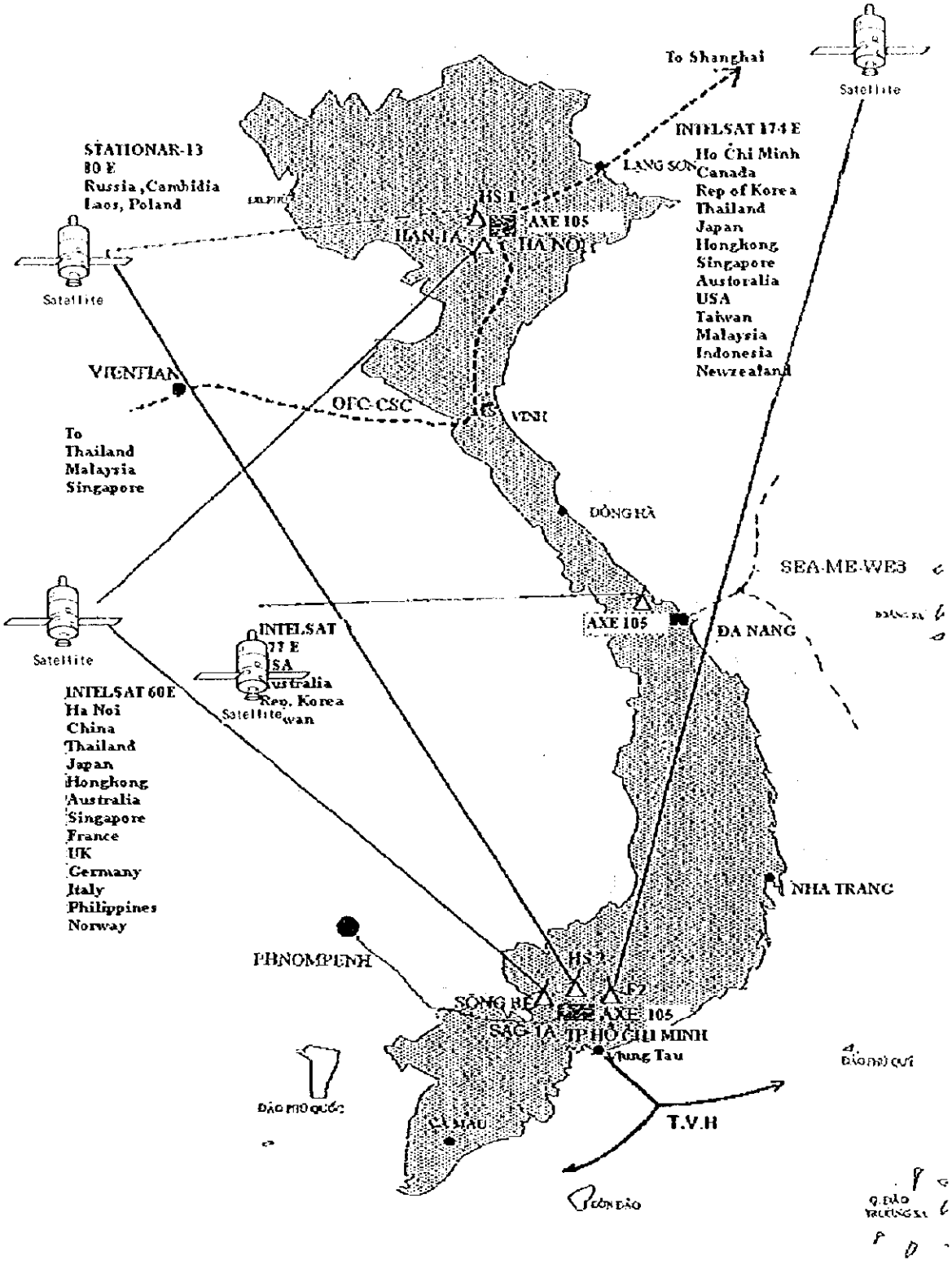



**Figure 6.1.2-3 VTI International Telecommunication Network (Existing)**

### 6.1.3 International Telecommunications Services

Vietnam Telecom International (VTI) was founded on March 31, 1990. VTI is a 100% owned subsidiary company of Vietnam Posts and Telecommunications (VNPT), and was founded to build, manage, operate the Vietnam International telecommunications network and to provide International Telecommunications Services. VTI has direct international links to many countries in the world. VTI's advanced telecommunications infrastructure consists of 3 AXE-105 gateway exchanges, 8 satellite earth stations, T-V-H optical submarine cable system, SEA-ME-WE3 optical submarine cable system, CSC optical land cable system, VSAT system and international data transmission system.

VTI now provides all services, such as:

- International Direct Dialing services, Facsimile and Telex
- Home Country Direct (HCD)
- International Private Leased Circuits (IPLC) and Telehousing
- International Television Transmission
- Very Small Aperture Terminal (VSAT)
- INMARSAT services
- Teleconferencing, Videoconferencing and ISDN

(1) International Direct Dialing (IDD)

IDD service of VTI was started on March 31, 1990. During the period of 5 years from 1992, VTI's IDD service has made rapid progress in parallel with Vietnam's economic growth. IDD is now available with around 250 areas, covering nearly all of major countries throughout the world. Because of convenience and economy of IDD to customers, IDD calls show sharp increase, and VTI is taking measures to further stimulate utilization of IDD. Among them is a discount tariff system where reduced rates are applied to calls during off-peak time such as everyday during the period from 23 o'clock to 7 o'clock, whole day on Sunday and Public Holidays.

(2) Home country direct – HCD

In 1995 the HCD (Home Country Direct) service was introduced in Ha Noi and HCMC to Australia. The HCD service from Vietnam to 7 countries (USA, Australia, Canada, South Korea, Singapore, Japan and Switzerland) can be now made internationally. Using VTI's Home Country Direct Service, travelers in

Vietnam can communicate directly with operators in their home country, thereby eliminating any language difficulties. Call charges are debited directly to the credit card or calling cards, and the home network supplier sets the tariffs. HCD service is accessible from General Post Offices in Ha Noi, Ho Chi Minh, Da Nang, Hai Phong, Quang Ninh & other cities. At the airport, railway stations and ports and in selected hotels of major cities the HCD service is also available.

(3) International Private Leased Circuit services (IPLC)

International Private Leased Circuits services (IPLC) are used for point to point transmission by international companies that have a requirement for high performance data transmission between the head office and the branch office.
On top of the list of successful multi-national corporations in Vietnam that are making advantages of VTI IPLC services, seen: IBM, BP, Sumitomo, Ericsson, Motorola... since they are well aware of their right to possess the whole circuit with state-of-the art technology and high security.

IPLCs are able to offer a range of speeds from 1200 bps to 2Mbps to the customers premises with speeds of 64 Kbps or higher capable of handling voice and fax, as well as data. This allows better utilization of a company's business communications needs leading to a reduction in overall costs for services. At present the data network has been focused in a small number of areas including Ha Noi, Ho Chi Minh City and some cities and provinces that have established industrial areas or Export & Processing Zones.

IPLC's are also provided for customers in Vietnam by Wireless Local Loop (WLL) or by VSAT communication into remote areas of the country that do not as yet have access to the optical fiber or copper cable network.
IPLC's are also connected to other countries by either satellite link or submarine optical fiber cable. These circuits are of very high quality and are backed up in the event of a transmission failure. Along with the highly qualified staff that maintains the network it ensures that the circuit has a high performance low error rate allowing the customer to fully utilize their communications links. As of the year-end of 1997, VTI is providing the IPLC with a number of circuits of 120 (of which ITC-1 is establishing 48 circuits and ITC-2 is establishing 72 circuits)

The IPLC service is expanding remarkably and it will be planned to increase by 213 circuits based on 64 Kbps in 1998. Table 6.1.3-1 shows the service class and the number of IPLC as of 30 June, 1998. Figure 6.1.3-1 shows VTI IPLC network configuration.

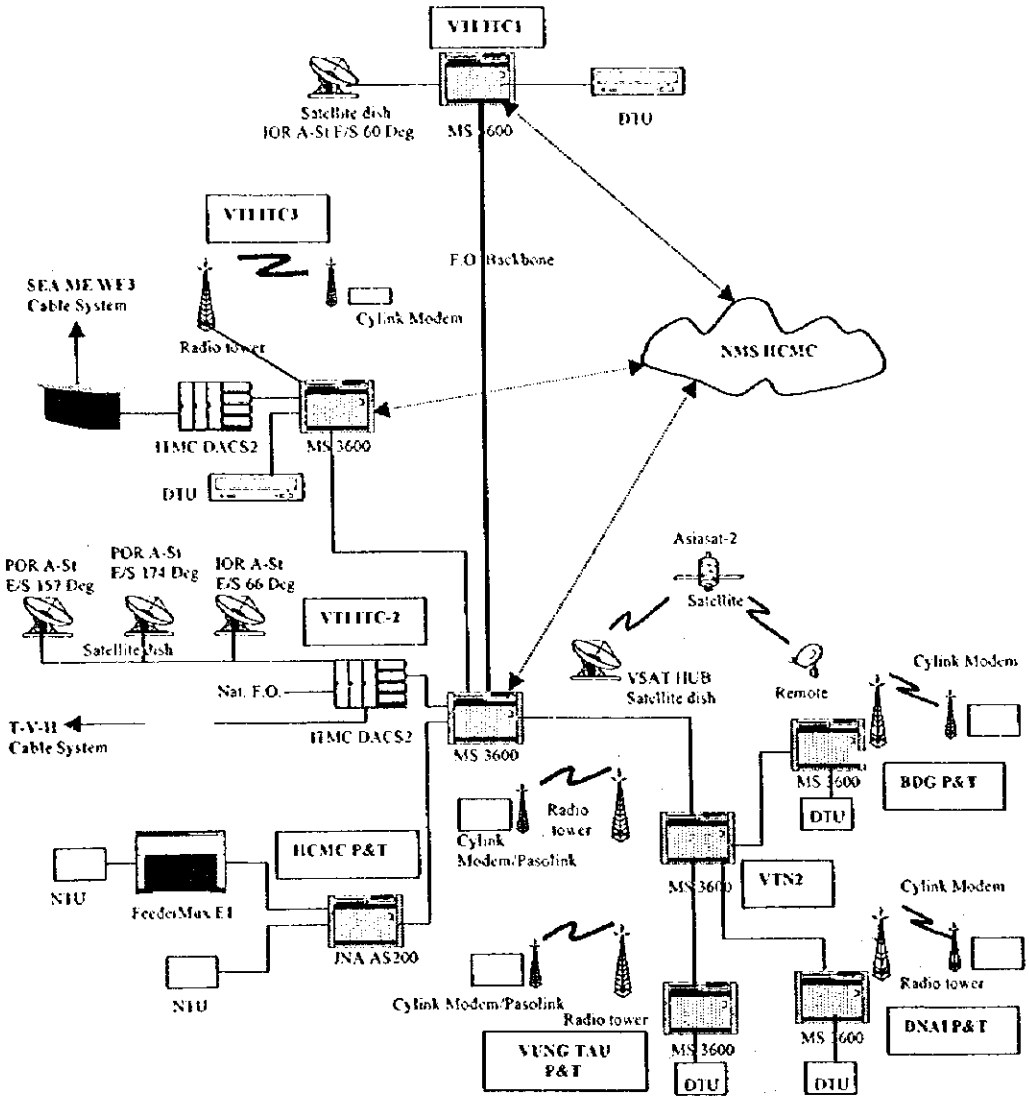



**Figure 6.1.3-1 VTI IPLC Network**

**Table 6.1.3-1 Number of International Private Leased Circuit**

(As of 30 June, 1998)

| Service Grade | Class and Speed | No. of IPLC |
|---|---|---|
| Voice | M1040 | 11 |
| Low Speed Data | 50 bps to 9600 bps | 31 |
| High Speed Data | 64 Kbps | 68 |
| | 128 Kbps | 6 |
| | 256 Kbps | 2 |
| | 768 Kbps | 1 |
| | 1536 Kbps | 1 |
| | 1984 Kbps | 1 |
| Total Number of IPLC (equivalent at 64 Kbps) | | 168 |

(4) ISDN (Teleconferencing, Videoconferencing)

The objective of ISDN (Integrated Services Digital Network) is to handle a full range of telecommunications services within a single common network by integrating networks set up separately for various services such as telephone, telex, data services. With the completion of this network, VTI will enable to have enough flexibility to meet customer needs that are being diversified as the information-oriented society evolves.

ISDN will be realized by digitizing switching systems and subscriber's loops linking customer premises to switching systems, and by utilizing them for any telecommunications services. The co-use of facilities will reduce plant and equipment investment as well as operation and maintenance cost, so that a variety of services can be provided more economically.

On 30/11/1996, the existing PSTN network was successfully changed into a newly integrated digital network. The first ISDN service has been put into operation since 1997. The Videoconferencing service equipment has been installed in Ha Noi, Ho Chi Minh and Da Nang ITC's. The services supported by ISDN are expected to expand remarkably with the development of information infrastructure and multimedia demand in Vietnam.

(5) International Television Transmission

VTI's International Television Transmission service provides a satellite communications network capable of transmitting and receiving both audio and video signals between Vietnam and the world. This service allows direct broadcast of economic news, political issues, festivals and sports....

This service is provided at VTI's International Television Transmission Centers

in Hanoi, Danang and Hochiminh City, and provides Broadcasting and Television firms a vitally important facility to update current international news and pictures.

VTI provides a high quality service to countries worldwide through a modern network of Earth Stations communicating with INTELSAT Satellites in the Pacific Ocean Region (POR-174°E, POR-177°E) and Indian Ocean Region (IOR-60°E, IOR-64°E). VTI's skilled and experienced staff is ready and available to serve the customers 24 hours every day of the year.

(6) VSAT Service

Telecommunications system via satellite is connected to one or many Very Small Aperture Terminal (VSATs) that are connected through the network control HUB station.

VTI's VSAT (typically 2.4-meter antenna) architecture provides a flexible networking platform to support C-band Satellite services for a variety of applications. Currently, VTI is the exclusive provider of VSAT service in Vietnam, referring to the Decision No.377/GP-CSBD dated August 21st, 1996 of DGPT and the Decision No. 3443/QD/VT dated October 4th, 1996 of VNPT.

VSAT is ideal for:

- Emergency Communications
- Providing Telephone services to rural areas, remote islands, off-shore rigs, territorial border...
- Point to Point Data links
- Corporate Networks
- Multiservice: data transmission, voice, fax, video, ISDN...

For offshore communications, VTI can provide a stabilized satellite communications system for applications such as oil platforms and ocean going vessels. VSAT system provides an ideal solution if the normal telecommunications infrastructure is not yet in place.

(7) INMARSAT Services and Coastal Maritime Communications Services

On April 26,1996, Vietnamese Government decided the Master Plan for Development of Maritime Communications System of Vietnam up to year 2000 and towards to year 2010 with following objectives:

(a) To upgrade and develop Maritime Communication system of Vietnam up

to year 2000, in order to meet the all requirements of Global Maritime Distress Safety System (GMDSS).

(b) Towards year 2010, controlling the area maritime communications to serve all required traffic volume by any kind of technical means (HF, MF, VHF and Satellite).

INMARSAT satellite telephone services using INMARSAT-M portable terminal has been put into operation by VTI since 1997.

In 1998, Vietnam has joined INMARSAT, the global mobile satellite organization, becoming its 82nd member country. The national signatory will be the Vietnam Maritime Communications and Electronics Company (VISHIPEL). The VISHIPEL is now planning to set up a comprehensive new coastal communications system and it is expected that new GMDSS to help Vietnam to meet its commitments to the Safety of Life at the Sea Convention will be put into services around 2000 and the first INMARSAT LES (Land Earth Station) will be also available for the provision of global mobile satellite communications for commercial and distress and safety applications at sea, in the air, and on land.

Vietnam Maritime Communications and Electronics Company – VISHIPEL, under Vietnam National Maritime Bureau, Ministry of Transport has been approved, in accordance with the Decision No. 117/1998/QD/KHDT dated 20/01/1998, to be the state owned company providing public activities. Functions and Responsibilities of VISHIPEL are as follows:

(a) Managing and operating Coastal Communication Station, ensuring control and keeping communication with all ships at sea.
(b) Ensuring the communication for maritime search and rescue activities, communication relating to the safety of ships at sea and the national security protection in territorial waters belongs to Vietnamese sovereignty.
(c) Supplying Maritime public communication services.
(d) Supplying, designing, installing and repairing communication equipment, maritime electronic and electric equipment and providing other maritime electronic and electric services.
(e) Trading, importing, exporting directly communication equipment, maritime electronic and electric equipment.
(f) Under the approval of Vietnamese Government and INMARSAT

Organization, VISHPEL is the sole National Routing Organization in Vietnam, which is responsible for registration of identification code of Inmarsat equipment in Vietnam.

(g) VISHPEL is the Signatory of INMARSAT.

(h) VISHPEL is an INMARSAT Land Earth Station Operator (LESO) to provide INMARSAT-B, C and mini-M services (from the year of 2000)

(8) Value Added Services and Data Communications

VDC is a subsidiary company of Vietnam Posts and Telecommunications (VNPT) specialized on information technology, data network, Internet and Value Added Services.

VDC provides domestic and international data services all over the country. Internet is the global network, which has been using by millions of people. Internet Users in the world as of February 1998 is 112,750,000.

There are 171 countries and 29,670,000 hosts connected to the Internet at the late February 1998.

VNN (VietNam Net) is the Internet Service Network of VNPT, the backbone network in Vietnam and the Internet Gateway. VDC is the provider of Value Added Services on VNN. As of the end of 1997, number of the dial-up VNN users are 6,000 and number of the VNMAIL users is 3,000. The demand forecasting of the VNN will be 15,000 users in 1998 and 150,000 users in 1999 and 500,000 users in 2002. VTI and VTN have provided the necessary transmission lines for the backbone of the VDC network without accessing charges. VTI now provides the Internet gateway backbone transmission lines with U.S.A and Hong Kong at the speed of 2 Mbps respectively.

VDC services and products are as follows:

(a) VIETPAC: Packet Switched Services – X25, X28---

(b) VNN-Internet Service: Backbone network and International gateways – IAP, ISP

(c) VNMAIL: E-mail service

(d) Telepublishing and Newspaper Teleprinting

(e) Networking integration: WAN, LAN, INTRANET---

(f) Homepage, WEB, Bulletin board,----

(g) Application software: billing systems, network management systems, database, and business information system---

(h) Directory: pages and electronic
(i) Equipment

## 6.2 Operation and Maintenance

### 6.2.1 Organization Structure of Operations and Maintenance Management

In Vietnam three level maintenance structure has been applied. The first level maintenance center (MC-1) is located in three big cities, Ha Noi, Ho Chi Minh and Da Nang respectively. The MC-1 is responsible for operating and maintaining network facilities and ranks top of its network management. The MC-1 receives the failure report from the 2nd level Maintenance Center (MC-2) and provides for the centralized network monitoring and transmission route supervision. The MC-2 is placed in province or district and is responsible for operation and maintenance of the communications path or circuit equipment and receives the failure report from the 3rd level Maintenance Center (MC-3). The MC-3 is placed in the remote or rural area and handles maintenance works for customer's terminal equipment, for example, localizing the failure of VSAT terminal equipment. Local offices and stations are responsible for operation and maintenance of communications equipment, while the telecom division of VNPT headquarters is responsible for maintenance management. VNPT administration bureau telecom division shall collect all of the failure reports from the telecommunication operators (VTN, VTI, VDC, VMS and etc.), however, statistical data processing is not performed. This kind of three level maintenance control method is applied in common not only for the VTI but also for the VTN, VDC and VMS.

The organizational structure of VTI is shown in the Figure 6.2.1-1.
The management goal set for equipment maintenance is to maintain the desired level of equipment stability at the lowest cost for as long as possible.

Figure 6.2.1-2 shows an example in the overall maintenance management system that should apply for maintenance activities in Vietnam.

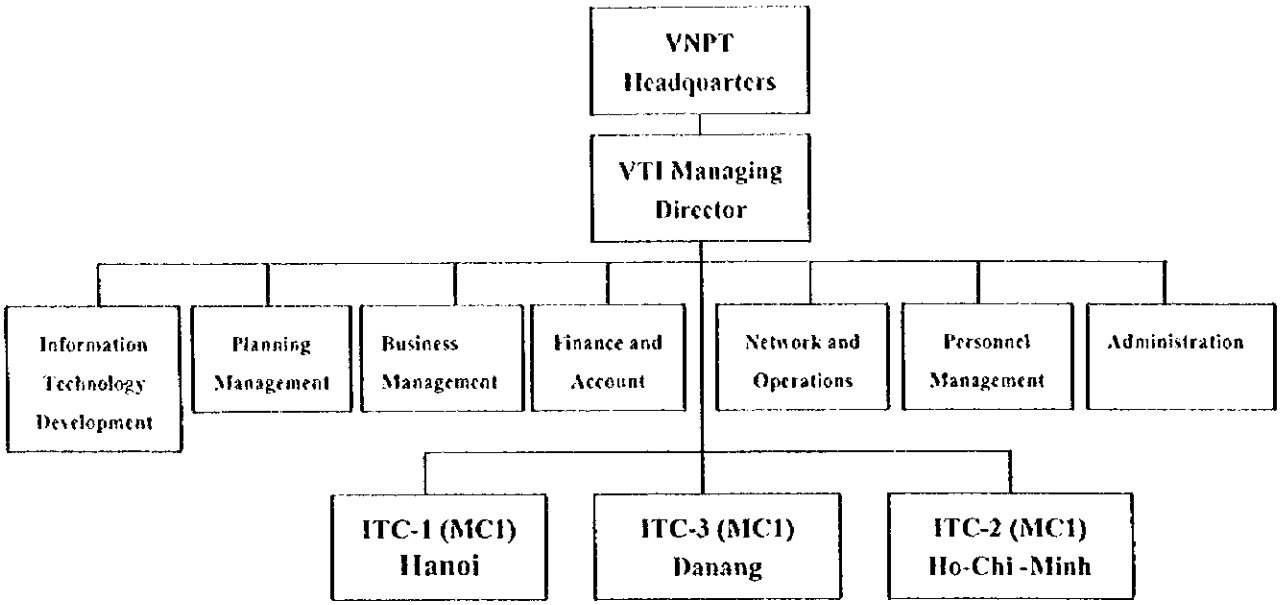



**Figure 6.2.1-1 VTI Maintenance Organization Structure**

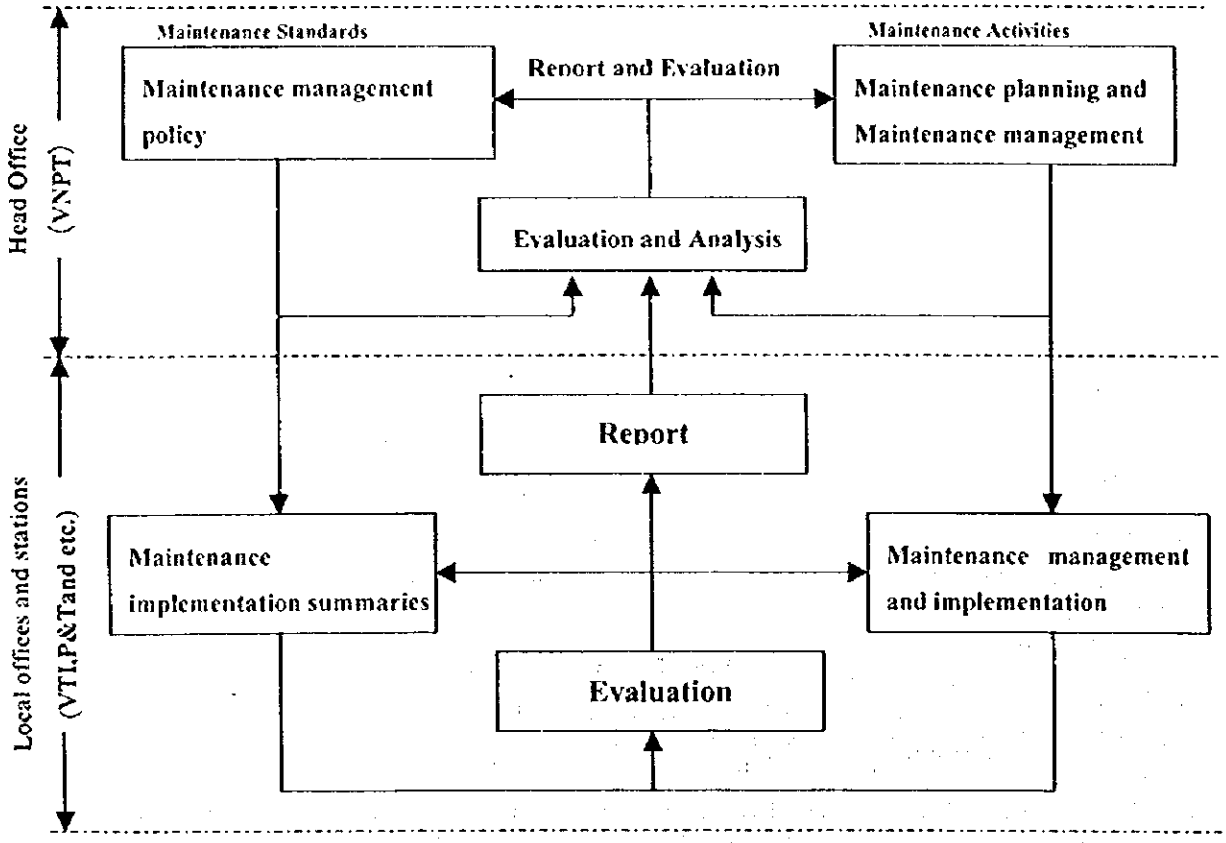



**Figure 6.2.1-2 Maintenance Management System**

### 6.2.2 International Network Management

(1) Network Management Objective

The objective of network management is to enable as many calls as possible to be successfully completed. This objective is met by maximizing the use of all-available equipment and facilities in any situation that may occur.

(2) Principles of Network Management

Network management actions must be taken during overload situations before network service is degraded.

When network management actions are required, certain principles must be observed. A network management control action that cannot demonstrate the application of at least one of the following network management principles would most likely be inappropriate.

(a) Keep all circuits filled with successful call

When events occur that cause an unusual increase in short holding-time calls (which are calls that do not complete), the number of completed calls in the network decrease as the ineffective call attempts occupy more circuit capacity. Identifying these calls which are likely to be ineffective and reducing them as far back in the network as possible will allow circuit capacity to handle more calls that can complete.

(b) Utilize all available circuits

When the level of traffic demand exceeds call-carrying capacity of a route or to a destination, network managers can take temporary action to divert some amount of this unusually heavy traffic to lightly loaded portion of the network at the time.

(c) Give priority to calls requiring a minimum number of circuits to form a connection when all available circuits are in use

As the traffic loads increase above the engineered level in the network, the ability of the network to carry effective calls will decrease, since an increased number of call attempts require two or more circuits to form a connection. The uses of additional circuits increase the possibility of one multi-link call blocking several potential calls. Thus automatic alternating routing should be restricted to give preference to direct routed traffic during periods of abnormally high demand.

(d) Inhibit switching congestion and prevent its spread

Normally, the switching capability of an exchange is limited by the capacity of its circuits. Abnormal increase of inefficient attempt calls, however, affect adversely the switching capability of common control equipment and will result in internal congestion in the exchanges and spread rapidly in the network, resulting in further degradation of the network. Network controls should be applied which inhibit congestion by removing call attempts from the congested exchange.

(3) Construction of International Network Management Center

Currently, each 1st level maintenance center (e.g. ITC) in Vietnam is capable to operate and maintain its individual network facilities but unable to manage the whole international telecommunication network. In the event of one of the three ITC centers failing, the other two ITC centers may act as a backup by the command of the international network management center. The integrated network management strategies is required to carry out the following functions:

(a) To keep traffic flowing smoothly through the network by ensuring the maximum use of available circuits and exchanges when there is a failure in the network and a sudden increase in traffic

(b) To maintain and improve services by continuously monitoring the flow of traffic

(c) To collect traffic data necessary for planning new circuits and facilities

(d) To monitor the status and performance of the network on a real-time basis

(e) To collect and analyze network performance data

(f) To detect abnormal network conditions

(g) To investigate and identify the reasons for abnormal network conditions

(h) To initiate corrective action and/or control

(i) To cooperate and coordinate actions with other centers on matters concerned with network management and service restoration

(j) To issue reports of abnormal network situations, action taken and results obtained to higher authority and other involved departments and administrations, as requested

(k) To provide advance planning for known or predictable network situations

In order to carry out the function of the centralized network management, it is recommended to build the integrated International Network Management Center in the ITC-2 Ho Chi Minh and during the period of the time frame 2000-2005.

### 6.2.3 Billing System

International telephone charges are billed and collected by each Province P&T. VTI is only making an international account settlement with the foreign telecommunications carriers.

Billing data is made from the billing equipment in each exchange system. The billing support system has been operated separately in the gateway office. The view of the telecommunications world is now changing from a network-centric to a customer-centric view. Once looking at the customer-centric view of telecommunications, the role of customer care and billing becomes apparent. The customer care and billing care system holds the key to a range of new opportunities ranging from consolidated billing and in-language billing manners of increasingly customer-centric service offerings such as tailored discounting schemes and pre-paid services. To enable such opportunities to become reality, VNPT's customer care and billing system must be:

(a) Convergent - supporting the ordering and billing of the multiple services and operator may offer (wired or wireless, voice or data) while handling the divergent requirements of each service;

(b) Interoperable - allowing for tight integration between the network systems and operations support systems, which enables an operator to take full advantage of today's network technology advancements;

(c) Adaptable - allowing an operator to quickly adapt to changing market or customer demands, such as competitor pricing changes or customer tailored discount plans;

(d) Multinational - supporting the increasing demand for global services that require in-language and in-currency billing; and

(e) Flexible- providing multiple customers service options such as pre-or post-paid billing or consolidated bills.

To ensure the desired grade of services at the lowest possible costs and unify call detail information generated during the associated call processing to provide formatted records containing the usage data, the centralized Operations Support System is requested to install in Ho-Chi-Minh after the year of 2000. Accounting management includes billing data, information for fraud detection and subscribers' profiles (i.e. authorization to charge, etc.). Figure 6.2.2 -1 shows the conceptual configuration of centralized Operations Support System.

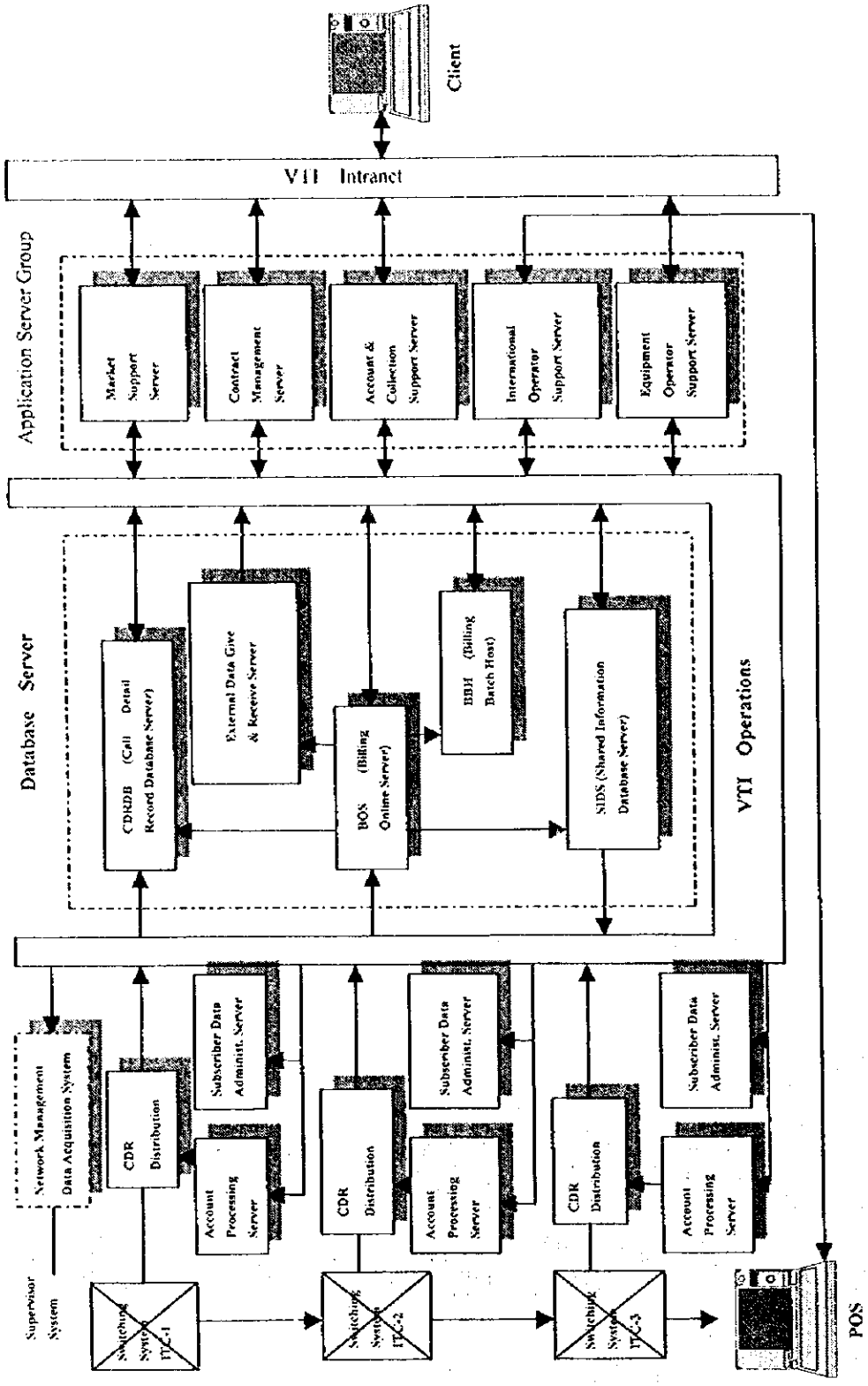



**Figure 6.2.2-1 Centralized Operations Support System**

### 6.2.4 Problems on Operation and Maintenance

(1) Lack of Spare Package Unit or Card Unit

In Vietnam many different type equipment with different manufacture are operated, therefore, it is requested to provide the spare unit individually according to the type of the manufacture, however, suitable quantity of the spare unit is not arranged and very difficult to manage the central stock of the spare units and parts (circuits board etc.) for their respective type of switching system including initiation of repair.

(a) Spare circuit board stock keeping is to be optimized in such a way

- that spare circuit boards are available when and where they are needed and in the amount they are needed, and
- that the capital bound in the spare circuit board stock is kept to a minimum.

A multi-level spare circuit board stock keeping system may help to keep the stock at exchange and transmission node level at an absolute minimum due to common (regional and central) stock buffers, which could be smaller than the total of all full scale local stocks. However, this will require a very efficient spare circuit board exchange cycle.

(b) A spare circuit board exchange cycle for changing faulty boards against repaired/new ones has to be organized and kept going. The individual spare circuit board stocks can be kept the smaller, the faster the cycle works.

(c) Repair and/or discarding and replacement of faulty circuit boards have to be organized.

(2) Maintenance Tools

Shortage of tools, test equipment and required effective use of vehicles is generating serious problems in connection with customers' services, lower productivity and cause of potential faults because the fault locations are being executed by cut-and-try method instead of measurement by fault location. Difficulty to provide the proper maintenance tools and test equipment is due to the financial problem.

(3) Maintenance Ability of Telecommunications Staff

Lack of expertise persons to be able to do the maintenance for the digital and computerized equipment is a major problem in the telecommunications sector and to secure the well - trained personnel is indispensable to sustain good quality of international telecommunications services.

(4) Training

In order to develop the human resource of maintenance staff it is requested to expand and enhance the function of the corporate training center in the telecommunication sector.

### 6.2.5 Modernization of Network Maintenance

Telecommunication network technologies, including electronic and digital exchanges, facsimile and packet data exchange networks, continue their advance. It is important that maintenance technology keeps pace with these advances, particularly since the larger and more complex the facilities become, the more seriously they are affected when trouble arises. Needless to say, every effort must be made to secure communications systems against failure. Furthermore, key technical skills must be continuously upgraded to ensure rapid, effective response to exchange system failures. The following improvement actions regarding modernization of network maintenance are recommended.

(1) Rationalization of Maintenance Center

The cable landing station, satellite earth station, transmission center, switching center, etc. will also function as maintenance centers. High reliability electronic components will be used for the telecommunications facilities, a redundant system structure will be adopted to ensure high reliability overall. The introduction of computers will provide effective automatic monitoring and remote operation of the facility, which consequently will allow these maintenance centers to be consolidated. These consolidated centers can be either unattended, or staffed at a minimum personnel level. The consolidation of the centers will also allow for the effective reduction of the cost of introducing automation, through efficient utilization of maintenance facilities, etc. In addition, the mode of maintenance can be advanced from equipment-by-equipment level to overall communication system level to improve the compatibility of the maintenance system with the generation of the ISDN, ATM

and SDH-based system.

(2) Maintenance Activities based on Quality Of Service (QOS)

Telecommunication business environment will be changed gradually from monopoly to competition in Vietnam. Under the competition era, quality improvement shall be focused to increase the customer satisfaction through pro-active network quality improvement actions.

(a) Survey of Customer Requirement

Customer requirements are surveyed through three sources: information from sales/marketing persons, customer interview and customer complaints.

Sales and marketing persons always contact with customers and can get a variety of requirements such as current QOS degradation that compared with the competitors and new service requirements. These valuable information are stored in a database, with which customer's requirement is addressed to an appropriate divisions internally for future QOS improvement action. Customer interview also indicates a guideline for QOS improvement direction. There are a lot of network factors that can effect on customer perception of quality. For example, call completion ratio, noise, echo, transmission delay and so forth. The customer interview clearly indicates a priority of these network factors. The improvement of call completion is given a higher priority for low quality countries and echo is the most important factor for high call completion destination. Sometimes customer interview reflects a dis-satisfaction on tariff. The third source is a customer complaint, customer can directly access to the trouble shooting group with a special free access code.

(b) Establishment of Advanced Network Operation

Real-time traffic management is required for higher call completion ratio. Non-intrusive monitoring is required for capturing quality level. Cooperation with foreign counterpart is important for quick trouble shooting of end to end services. Real-time traffic management has two functions: supervision and control. VTI's planned International Network Management Center (Fig. 6.2.5 -1 shows the Example) shall supervise a variety of parameters, e.g. completion ratio to each destination call, completion ratio on route, circuits trouble ratio, overflow ratio, resource usage of switching systems and so forth. If traffic is heavily offered,

restrictive action is taken to minimize the damage from uncontrollable traffic demand.

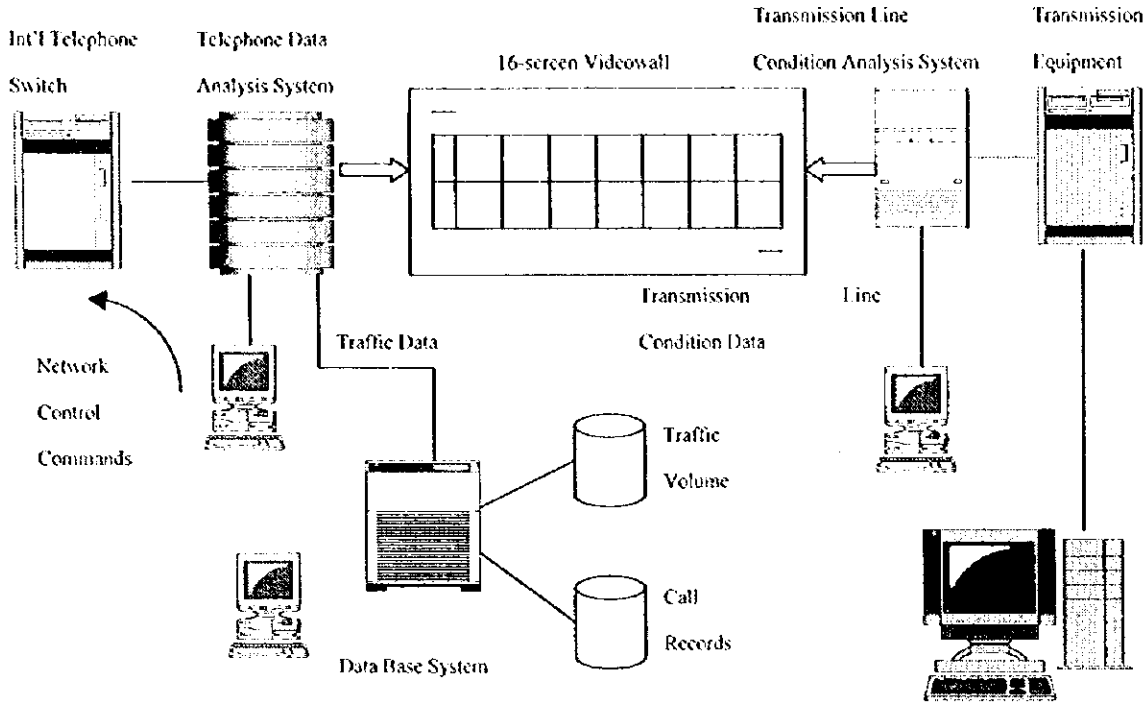



**Fig.6.2.5 -1 Example of Network Management System**

(c) Improvement of QOS

The most important action for QOS is to resolve customer complaints and to improve the existing network. It is recommended to take three approaches: (i) end-to-end trouble management, (ii) pro-active quality improvement activities and (iii) Service Level Agreement with foreign carriers.

In the past, all carriers tried to solve the trouble only in their responsible sections, and to leave the trouble beyond his responsibility to the other carrier. Now, in competitive era, carriers are responsible for end to end trouble shooting.

To find out low quality portion earlier than customer complaints, it is required to introduce a QOS measurement system on a test call basis, which is placed at ends, one in Vietnam and another in foreign country.

Carrier Service Level Agreement (SLA) is a new systematic approach. Under the agreement, quality data is regularly exchanged and reviewed on a bilateral basis. A target figure is set and checks the difference between

the target and measured figures, and takes necessary action if necessary.

(3) Construction of High Quality Network

High quality network is a base for providing high quality telecommunication services. Technically, high quality international network can be established through optical fiber submarine cables, digital switching and transmission facilities and enough international circuit capacity with all countries.

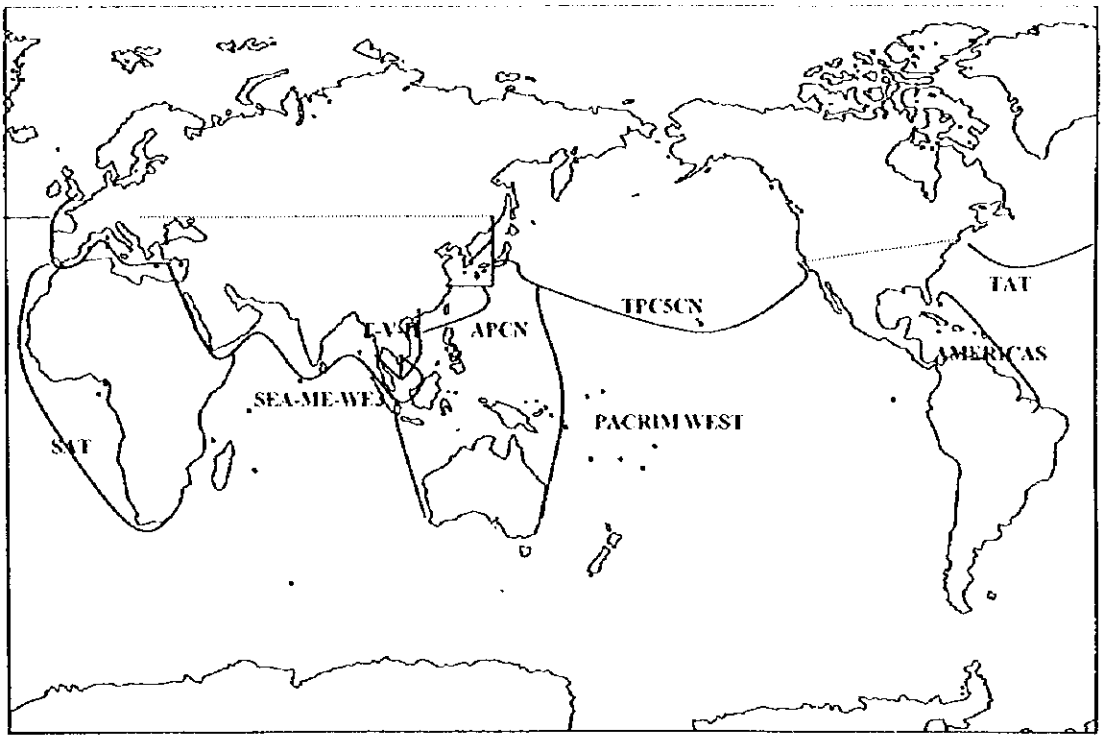



**Fig.6.2.5 -2 International Optical Submarine Cable**

As shown in Fig.6.2.5 -2, it is capable to construct the high quality network using the optical fiber submarine cable in Vietnam. A submarine cable has two merits against satellite, that is, low transmission delay and relatively low bit error rate. In two-way voice communication, customers prefer a short transmission delay and low noise. At the beginning stage of cable introduction, satellite has been used for back up for optical fiber cable failure. However, customer always prefers fiber cable link. So, fiber to fiber back-up system will become dominant back-up method in the future. Digitalization of facilities can give low noise, low distortion services and flexibility to new services. International circuits capacity can be a possible bottleneck of international quality, especially for call completion ratio. Based on this way

of thinking to realize the high quality network, and also, to meet the traffic demand for the multimedia society, it is required to increase the dependence rate on the optical submarine cable. The negotiation with the foreign carriers becomes important to purchase the IRU (Indefeasible Right of User) of optical submarine cable. The success of T-V-H, SEA-ME-WE3 optical-fiber submarine cables and CSC optical-fiber land cable in Vietnam will secure the transition of many direct circuits from the satellite to the cable.

(4) Diversity, Restoration and Support system

Even though physical circuit facility is not upgraded, advanced maintenance and operation can result in better quality of services and reliability of telecommunications. There are three different approaches: diversity, restoration and support system.

Diversity is an effective and traditional measure for improving survivability. From network viewpoint, there are three kinds of diversity, route, site and transmission media. For route, plural routes on different transmission media toward the same destination are suggested. For site, currently there are five earth station, two cable landing stations and three telecommunication centers. It is suggested to keep more than 70 % call handling capability even if one of three telecommunication centers is damaged by natural disaster, terrorism etc. For media, it is suggested to configure with loop transmission media which be adopted in both international and national network. Although customers in case of private leased circuits finally decide introduction of diversity measure, it is recommended to provide the diversity circuit at lower rate.

Restoration is a speedy measure to restore services but it requires spare network capacity. It is necessary to have dedicated spare capacity under the agreement with foreign carriers. Establishment of hot-standby circuit capabilities with some carriers and changeover system is also effective for a restoration purpose.

Phased introduction of support system is recommended for improving quality. The disruption of international telecommunication services could potentially cause confusion throughout society. To establish the centralized network management center to monitor conditions all over the network in real time is important. With every year the network becomes larger and move complicated. To deal with the complexity for network maintenance, it is

required to develop some expert system which helps network managers respond to problems as soon as they arise. It contains intelligence required to perform the following kinds of tasks: detection of network irregularities, selection of priority tasks, traffic data retrieval, identification of probable causes, suggestion of countermeasures.

For restoration, Digital Cross Connection Operating System that is for a changeover from failed transmission system to spare system by commands is useful.
For improvement of on-time provisioning, Management Information System for network that shows on-going process towards service-in; customer order, service-in dates of end to end circuit, local circuit section, international circuit section and so forth is recommended to introduce.

Telephone Traffic Information Measurement and Evaluation System enables to store telephone traffic data, completion ratio to each destination call, completion ratio on route, conversation time to each destination call etc. It is used to prove of sufficient capacity and supervise of network quality.

Quality Information Processing System is a support tool to monitor the error performance of circuit without interruption. Those support systems are required to make phased installation with the network becomes larger and more complicated.