

TELECOM

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NTT & DoCoMo's M&A

NTT Group Explores U.S. and European Markets

Nippon Telegraph and Telephone Corp. (NTT) Group carriers are gearing up their overseas investment strategies. On May 9, two major group carriers — NTT Communications Corp. (NTT Com) and NTT DoCoMo, Inc. (DoCoMo) — announced they will invest a total of 1.1-trillion yen into foreign carriers. Upon NTT's reorganization last July (1999), NTT Group carriers, with the exceptions of NTT East and NTT West, NTT's incumbent regional carriers, were allowed to enter the international market. In response to these two investments, other carriers are seen exploring overseas markets even more aggressively.

The two carriers investing overseas will finance their purchases with cash, borrowed from banks. It is because NTT does not want Group carriers to raise money by issuing bonds or to be listed on any overseas stock exchange markets. Some market watchers point out that these two carriers may have to

bear large investment risk. Standard & Poor's Ratings Group warned that it might downgrade NTT's credit rating.

NTT DoCoMo, NTT Group's mobile unit, on May 9 announced that it would pay 500 billion yen for a 15% stake in KPN Mobile N.V., currently a wholly-owned subsidiary of KPN N.V. of the Netherlands. By winning a minor stake in the Dutch operator, NTT DoCoMo will gain a stronghold within the European telecommunications market. The European telecommunications market is one of the hottest telecommunications markets in the world where a number of major carriers and vendors are headquartered.

Dr. Keiji Tachikawa, president of NTT DoCoMo, has repeatedly said that NTT DoCoMo will explore overseas market, focusing on Asia. However, the investment this time suggests that NTT DoCoMo has changed its overseas investment strategies.

The tie-up garnered much attention because these two partnering carriers are believed to be bidding jointly for Orange plc, the third largest mobile operator in the U.K.

Although Dr. Tachikawa denied such speculation at the May 9 press conference, some market watchers are still talking about the joint bid for Orange plc. KPN Mobile has demonstrated its interest in taking over Orange plc. Orange plc has already won one of the five 3G (the third-generation mobile system) licenses in the U.K. However,

Orange Mobile is to be sold out by Mannesmann AG as a result of the merger with Vodafone AirTouch plc.

By gaining shares in KPN, NTT DoCoMo now has an opportunity to expand its i-Mode services in Europe.

NTT DoCoMo at the end of last year acquired a 19% stake in Hutchison Telecommunications Ltd., the largest mobile operator in Hong Kong.

Asked about further investment in foreign operators, Tachikawa replied that the firm would consider making "small investments" in foreign operators through which NTT DoCoMo can involve itself in management. According to the MoU with KPN Mobile, NTT DoCoMo will send an executive to the Dutch carrier and will be involved in the carrier's European business.

NTT DoCoMo's deal comes a day after NTT Com, an international unit of NTT Group, announced that it would purchase Verio Inc., an Internet service provider in the U.S., at \$5.5 billion (600 billion yen). NTT Com's takeover of Verio will be the third biggest case of foreign M&A for Japan following Japan Tobacco Inc.'s RJR Nabisco Holdings Corp. last May at 940 billion yen, and Matsushita Electric Industrial Co., Ltd.'s MCA at 780 billion yen.

NTT Com in 1998 acquired 10% of the stake in Verio and is the largest shareholder of the ISP which was established in March 1996. Verio claims to be the world's largest web hosting business with 400,000 corporate customers in 127 countries around the world. The firm's revenues in FY1999 were \$258 million. The firm is listed on the national market of NASDAQ. The firm's Internet-related business includes server rental, data center, security and settlement for the Internet business.

NTT Com will start purchasing Verio on May 17, targeting to complete the purchase in four months. After purchasing, NTT Com is going to merge Verio into NTT Com's U.S. subsidiary. NTT Com decided to purchase Verio in order to purchase "time" to launch its U.S. business on a large scale and provide seamless services in the "hot" Internet-related market. The NTT Law had barred NTT Group carriers from overseas business. Upon reorganization of NTT (following the revision of NTT Law), NTT

Shared FTTH

NTT's FTTH Service to Be Launched in Autumn

Nippon Telegraph and Telephone Corp. (NTT) Group companies will launch a type of fiber-to-the-home (FTTH) service this upcoming autumn on a trial basis.

Users of the service, called "High-Speed IP Access Service," receive up to 10-Mbps high-speed data transmission service with a monthly flat rate of 10,000 yen.

In its mid-term business plan released in 1996, NTT declared that it would realize technologies for providing the high-speed communications service by 2005.

The "High-Speed IP Access Service" was announced in the NTT's mid-term business plan released in April. Junichiro Miyazu, President of NTT, said: "We decided to provide the new service based

on fiber-optic networks ("High-Speed IP Access Service") earlier than we had targeted because the environment surrounding Internet access services has been changing rapidly."

In Japan, new common carriers (NCCs) as well as NTT Group carriers launched their ADSL services, with a data transmission speed of up to 640 kbps, at a monthly rate of as low as 5,500 yen.

Many cable TV operators launched high-speed data transmission services using their cable TV networks.

Some other carriers as well as non-telecommunications carriers have launched or are planning to launch their Wireless Local Loop (WLL) services.

In order to provide the services,

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Business Results

Carriers Rely More on Mobile Business and the Internet

Japanese telecommunications businesses have been shifting their business focus from fixed lines to mobile and voice to data, and "mobile" and "Internet" are the two key words for their success, it was clearly illustrated in their business results for FY1999 released last week.

The trend seems to be further accelerated in FY2000. Thanks to mushrooming demands for cellular and data services, all of the Japanese major carriers

except NTT Group are expecting to expand both of their revenues and profits in FY 2000. But competition among these carriers seems to be harsher in FY 2000 partly due to scheduled merger of DDI Corp., IDO Corp. and KDD Corp.

All of the Japanese major carriers are expecting to expand both of their revenues and profits in FY 2000, except NTT Group.

NTT Group is expecting to produce the largest revenues in history of 10.8

trillion yen, a 3.9% increase from a year ago, for FY 2000.

However, the carrier's concurrent profits for FY 2000 is expected to be 675 billion yen, an 18.2% drop from a year ago. NTT DoCoMo Inc., the mobile business sector of NTT Group, is expected to rapidly expand its profits in FY2000; but the gain seems to be slashed out by NTT West Corp.'s large deficit. NTT West is expected to ex-

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DSLAM

DSLAM Market to Take Off

NTT Corp., which occupies 96% of the Japanese incumbent local access market, has long resisted opening its facilities to its rival carriers for letting them provide DSL services using copper wire. But due to a decision by MPT, NTT at last agreed to open its nationwide facilities for ADSL carriers from this coming summer.

Many carriers including NTT East Corp., NTT West Corp, Tokyo Metallic Communications Corp. and E-Access already have launched their ADSL services on an experimental basis.

DSLAM venders, which have developed products specially designed for the unique Japanese market, are expecting that the market will at last take off.

NTT said that since Japanese ISDN is based on a unique "Ping Pong" system, conventional ADSL system might cause interference with ISDN signals. In order to avoid the interference with ISDN signals, Japanese venders worked out new specifications for ADSL called Annex C in cooperation with NTT and the government.

At present two Japanese venders – NEC Corp. and Sumitomo Electric Industries Ltd., -- are providing their ADSL system based on Annex C.

NEC Corp. is providing two types of DSLAM systems: "AM30" and "AS30R."

Both were designed for fitting in a standardized 19-inch rack.

Each system can carry up to 12 line cards, each of which deals with eight circuits.

Since one standardized rack can carry up to five AM30 or AS30R with one splitter, up to 480 circuits will be dealt with one rack of the system.

NEC is scheduled to release a new version of the system with higher port density in the fall of 2000. Since one line card of the new version can deal with 16 circuits, then one rack of the system will be able to deal with 960 circuits.

As part of the ADSL system, NEC is proving a controlling system. The present system consisting of three servers can control up to 180,000 subscriber's lines. But NEC is going to release a new version, which will be able to deal with up to 540,000 subscriber's lines in the near future.

The vender is providing four types of remote devices (a device to be settled at each household) with four different interfaces. At the moment, there is no interoperability with other makers' remote devices. But NEC is going to make them to have interoperability with other vender's products in the future.

Market price per line is around \$500.

NEC has provided the DSLAM for 80,000 circuits in Hong Kong. But sales in Japan are still small.

Yoshitaka Shimada, Director of Access Business Division of NEC, said that he is expecting that the DSL market will expand rapidly once NTT opens its facilities for NCCs in summer.

NEC has developed VDSL system mainly targeting the Hong Kong market. Since some carriers in Hong Kong are transmitting video over DSL networks, VDSL, which has larger data transmission speed, is largely demanded in Hong Kong. Specifications for VDSL have not been worked out at the ITU. Once the specifications are worked out at the international organization, then NEC is going to release the ITU spec. version of VDSL.

Shimada said that compared with its competitor's products, the NEC system can deal with bigger number of subscription lines, has bigger controlling function and can deal with motion pictures (with VDSL). NEC is targeting to win 50 billion yen revenues from the ADSL business worldwide for coming five years. Shimada is expecting that even in Japan about 10% of the DSL users may shift to VSDL in the future.

Sumitomo Electric Industries is offering Annex C based ADSL system called MegaBit Gear. Their DSLAM system what they call CU-3 can carry up to 12 line cards each of which can deal with eight circuits. The domestic version of the CU-3 supports OC-3 and the international version supports both OC-3 and E1/T1.

Since one 19-inch standardized rack can carry up to four CU-3 systems as well as two splitters (SF/2), a rack of the system can support up to 384 subscribers lines.

According to Yoshikazu Nishiwaki, General Manager of Information & Network Systems Division of Sumitomo, his firm has the largest market share for DLAM in Japan. The firm has sold units for several tens thousands lines for some carriers including E-Access and KDD. The vender is also selling the DSLAM (Annex A type) overseas. In 1999, Sumitomo sold units for a total of 240,000 lines to Dish Net, a major ISP in India.

Sumitomo is also planning to release a new version with higher port density in the fall of 2000. In addition the firm is going to release new products based on Annex H by the end of 2000 targeting corporate users. The Annex H is also Japanese unique specifications, which can provide up to 1.6 Mbps for both ascendant and descendant lines.

Nishiwaki said that their product following the Japanese standard should appeal in the Japanese market. "Since DSL technologies were initially developed in the United States, foreign venders have advantage. But we developed world first products based on Annex C which is the most suitable for Japanese market," he said.

Sumitomo is providing only one DSL modem called TE/4. Nishiwaki said that the firm is going to provide more a variety of terminal units in cooperation with other makers.

"Our main business is DSLAM, so we will let our partnering makers produce more a variety of terminal units and we will concentrate on DSLAM business," he said.

Nortel Networks started selling ADSL system in the Japanese market last spring (1999). The system "Universal Edge Intelligent Multiservice Access System" (UE IMAS) was developed by Promatory Communications, a Silicon Valley start-up specialized on ADSL systems. Nortel acquired Promatory in October 1999.

According to Mitsuru Maekawa, Marketing Manager of Nortel Networks Japan, compared with competitor's devices, their UE IMAS is less expensive and provide higher data transmission speed of 6 Mbps for descendant lines.

UE IMAS has two versions: one for a 19-inch rack and the other one for a 23-inch rack.

The former one can carry up to 14 line cards and the latter one can carry up to 18 line cards. Each line card has 20 ports (in case of G. Lite and ADSL).

In addition, users for the UE IMAS can accommodate up to several thousands subscribers' line by integrating seven IMAS together. (When six IMASs are placed under one main IMAS, they work as one machine)

In June Nortel provided the IMAS systems for a total of 60,000 lines for Tokyo Metallic Communications. At present Nortel Networks is providing DLASM based on Annex A. But the firm is planning to release Annex C version in the summer of 2000.

Nortel has provided the IMAS systems for 200,000 subscribers line to @Link in the United States and the same units for 90,000 subscribers lines for Korean Telecom.

Maekawa said that compared with competitor's

machines, their IMAS can provide services to more users, has unique ATM switching capabilities, and can provide QoS services.

According to MPT, the number of DSL users in Japan as of the end of April 2000 was 399. But the figure is expected to expand rapidly.

A source close to the market said he is expecting that 70-80% of the 50 million Japanese households (35-40 million) may have Internet access in the future, and a half of them (17-20 million) may choose flat rate services. "Then CATV and DSL services might become their choices," he said. "If so, there are 10 million potential market for DSL services in Japan."

Meanwhile, Turnstone Systems, a Silicon Valley start-up, is providing its unique solution for DSL carriers.

According to John Loiacono, Vice President of Business Development of Turnstone, their flagship product of the Copper CrossConnect CX100 allows DSL carriers to remotely control, test and manage copper local loop infrastructure.

With this system, the vender said, the DSL carriers will be able to slash its management costs because they do not need to send any personnel to their facility sites.

Major carriers including riodata in Germany and US West are using the product, the firm said.

IT Industry

NTT Com and Verio Announce Completion of Merger

On September 11, 2000, NTT Communications Corp. and Verio Inc. announced that a subsidiary of NTT Communications has merged with and into Verio, with Verio surviving as an indirect wholly owned subsidiary of NTT Communications.

Pursuant to the merger, each share of Verio common stock, preferred stock and certain warrants not purchased in the recently completed tender offer by NTT Communications have been converted into the right to receive cash, as provided in the merger agreement entered into by NTT Communications and Verio. Payment will be made upon presentation of certificates representing shares or warrants of Verio stock to the paying agent for the merger, together with a properly completed letter of transmittal. As a result of the merger, Verio is indirectly wholly owned by NTT Communications and its shares are no longer publicly traded.

About NTT Communications

NTT Communications, a subsidiary of Nippon Telegraph and Telephone Corporation, provides long-distance and international telecommunications reaching over 200 countries worldwide. Headquartered in Tokyo, NTT Communications' Arcstar services operate in about 50 countries and have significant presence in Asia Pacific, North America and Europe. Arcstar global services provide managed data, multimedia and Internet services to some of the largest companies in the world. NTT Communications, with the OCN brand, is already one of the largest ISPs in Japan. NTT Communications and Verio will rank among the top IP service providers globally. Together, NTT Communications and Verio will immediately provide customers of all sizes in the U.S., Japan, and throughout Asia with a complete range of Internet-based business services – from high-quality IP network services including global connectivity, network management and IP-VPN, to advanced Web-based business solutions, including Web-hosting and e-commerce platforms.

DoCoMo M&A:

Continued from Page 1

Com was established in May 1999 as a business unit for exploring overseas market. Both NTT DoCoMo and NTT Com will pay the purchasing cost by borrowing money from banks.

It is because NTT, the holding company of NTT Group, does not want any NTT Group carriers to raise fund by issuing bonds or being listed to any overseas stock exchange market. NTT DoCoMo's Tachikawa last summer said that his carrier is planning to be listed to NYSE, but later his remark was toned down after President Miyazu expressed his resentment over NTT

DoCoMo's listing plan.

This investment in time can be double-edged.

After JT purchased Nabisco's overseas business, the JT stock price declined because of market concerns about the large investment burden. Different from tobacco industry, telecommunications industry has been rapidly expanding; but on the other hand, the business requires huge initial investment for the infrastructure.

Both NTT carriers will have to pour huge additional investments if they promote infrastructure-based business in these overseas markets. Their overseas strategy skill is being tested.

Tokyo Web Link Inc.

Tokyo Web Link Struggle to Rebuild its Business

The Japanese pager market has been shrinking while the cellular market has been expanding rapidly riding on a big success of i-Mode. According to the Telecommunications Carrier's Association (TCA), the number of pager users as of the end of March 2000 was 2.07 million. During its heydays between 1995-1996, the subscribers exceeded 10 million. Since service prices for PHS and cellular phones have dropped drastically, young users who used to be the typical users for paging services have shifted to PHS or cellular phones which provide a wider variety of services.

Under such severe circumstances, Tokyo Web Link Inc. (former Tokyo Telemesssage Inc.) is now struggling to reconstruct its business focusing on corporate users. Tokyo Telemesssage in May 1999 filed for court protection from creditors under the Corporate Rehabilitation Law, saddled with liabilities of 25 billion yen. The pager carrier is going to rehabilitate itself under the lead of major shareholder Japan Telecom Co., Ltd., also a new common carrier. The carrier changed its name into Tokyo Web Link in May 2000.

According to Kenji Takagi, Senior Executive Manager of Tokyo Web Link, the carrier is planning to revitalize its ailing business with three strategies: shifting its target from previous individual users to corporate users; trying to make consumer appliances to wear a pager; and launching new Internet-based business.

"Fully utilizing pager's features such as simultaneous transmission, strong signal penetration power and inexpensive service charges, we will sell our services targeting corporate users," Takagi said. Their new targets are kindergartens, hospitals and fire brigades.

At some kindergartens in the Tokyo Metropolitan area, mothers of kindergarden children are using Web Link's pagers for receiving emergency notice and daily reports. "Using our service, these kindergarden staff can send, for instance, special event information to all of the kids' mothers simultaneously, or send a message to a mother of a kid who gets ill asking her to pick the kid up as soon as possible," he explained. Now Web Link sales staff are visiting 3,300 kindergartens in the Tokyo Metropolitan area for selling the system.

Some hospitals also have introduced

Web Link's pager system for letting their patients spend their waiting time until their consultation with doctor comfortably. At most Japanese hospitals, patients have to wait for a long time, occasionally 2-3 hours, in a noisy waiting space in front of the consulting room. But being given a pager, Takagi said, these patients can spend the time anywhere, even outside the hospital. Large hospitals such as Keio University Hospital have introduced the system.

Web Link's pager system is now used by some fire departments, too. Some municipalities in the Tokyo Metropolitan area have self supporting fire fighting organizations whose members usually work for their own jobs and are summoned when a fire occurs. Given a pager, he explained, these fire fighters not only can receive the order swiftly, but also can easily get any changes or cancellation in orders.

Web Link is now selling the software for the system "TouchCall" at 50,000 yen. Customization services are also available for 50,000 yen - 2 million yen depending on the conditions.

Web Link is now trying to apply its pager on consumer electronics. For instance, if an air conditioner is equipped with a pager, users can make a call to their home 10 minutes before they arrive at their home for switching on the air conditioner (so they can arrive nice cool home). According to Takagi, consumer electronics manufacturers are interested in such services in order to differentiate their air conditioners from others. "By doing so, we can let them use our infrastructure and users can enjoy benefit," he explained.

The carrier is also preparing for launching a new Internet based business. "We have three vital properties: infrastructure, bandwidth and talented people. Fully utilizing these properties we will launch new Internet business in cooperation with a venture business," Takagi said. While promoting its business with these strategies, Web Link will gear up its sales effort for the Zero Plan. The Zero Plan is a service that called parties pay for the call. Web Link launched the service in September 1999 and now has 20,000 users. The carrier is targeting to win 100,000 users for the service by 2003. Including the conventional service plan users (callers pay for the call), the carrier is aimed at winning a total of 250,000 pager users by 2003.

But the market for pager service is limited. So Web Link is planing to shift its major revenue source to the new Internet service to be launched later this year. Takagi said the new business will address up to 2 million users.

At the moment, Web Link is promoting corporate rehabilitation procedures under the leadership of Kiyoshi Nakamura, the rehabilitation program administrator and Koichi Sakata, Chairman of Japan Telecom who has been assigned to the business administrator. Japan Telecom has committed itself to continued support for Web Link with other major shareholders such as Mitsui & Co., Ltd., and Tokyo Electric Power Co., Ltd.

The rehabilitation plan is still undergoing processing. However, according to Takagi, the firm will commit to pay a portion of the 25 billion-yen deficit and will write off the rest.

At its peak day in June 1995 Web Link had 1.3 million subscribers. Then Web Link established its infrastructure, which can facilitate 2 million subscribers. "So we have unnecessary, extra facilities. If we can reduce our deficit to one tenth, for instance, we will be able to rebuild our business," Takagi said.

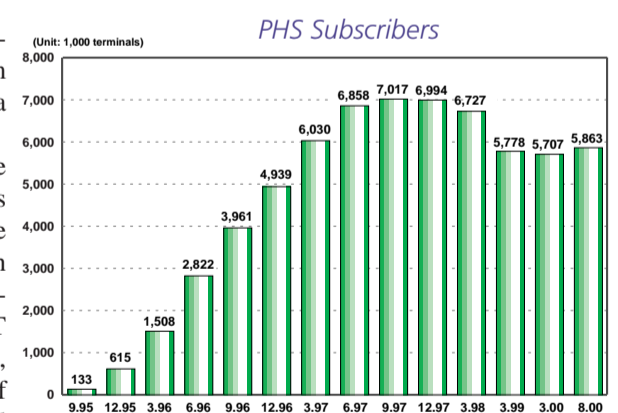
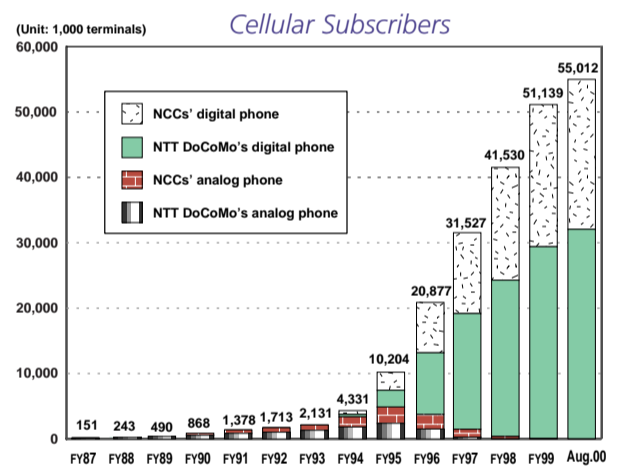
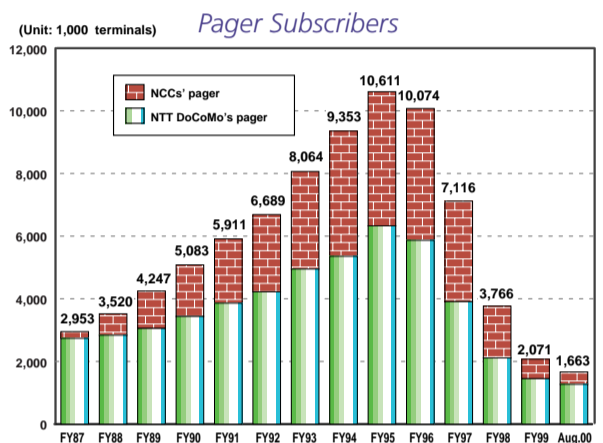
According to the Telemesssage Network of Japan, an association for NCC pager operators, merely five pager carriers are going to continue to provide their pager services. The remaining 26 carriers have already withdrawn from the market or declared a halt to their services.

But Takagi said since there are much demands for pager services in the Tokyo Metropolitan area, Web Link can survive. "In addition, NTT DoCoMo Inc., our rival, has taken over most of the former users of failed

NCCs. Since DoCoMo has to run their business even in rural areas (where only limited demand exists), we have an advantage," he said.

Takagi said that the carrier is going to sell their services, which fully utilize the carrier's infrastructure, and pager is just a device for selling these services.

Since pager terminals manufactured by Japanese firms cost 6,000 yen - 10,000 yen, the carrier is planning to shift production to the Republic of Korea and Taiwan. According to Maki Kobayashi, a spokesperson of Web Link, manufacturing cost at Korean and Taiwan makers are less than a half of the costs of Japanese manufacturers.



IT Industry

KDDI Announces New Post-Merger Organization

DDI Corp. (DDI), KDD Corp. (KDD) and IDO Corp. (IDO) announced a new consolidated organization formed when these three companies merge on October 1.

The post-merger company, KDDI (DDI Corp.) will have the structure shown in the Attachment.

1. Basic Concept

Corporate Management Sector, Global Strategy & Business Development Sector, Mobile Communications Sector, NW Communications Sector, and

IP Business Sector will be newly created, forming a structure to pursue comprehensive telecommunications business globally and seamlessly in all areas of mobile, domestic and international markets with an axis toward "Mobile & IP."

2. Outline of Organization

(1) Corporate Management Sector

With a view to facilitating quicker decision making, "Corporate Management Sector" will be created, consisting of Business Administration Division, Corporate Purchasing Division, and General Administration Division.

(2) Global Strategy & Business Development Sector

Corporate Strategy Division and Global Business Division will make up "Glo-

bal Strategy & Business Development Sector," which will develop corporate strategies of KDDI Group as well as control financial conditions of domestic and overseas subsidiaries and affiliates.

(3) Mobile Communications Sector

Mobile communications businesses of KDDI Group (IMT-2000, "au," DDI Pocket and TU-KA) will be efficiently and strategically carried on under "Mobile Communications Sector" including Mobile Communications Strategic Planning Division, Mobile Communications Engineering Division and "au" Business Division.

(4) NW Communications Sector

"NW Communications Sector" will be made up of NW Sales Division, NW

Fiber Optics Network Construction Division, NW Engineering Division, and NW Operation & Maintenance Division and will perform aggressive sales activities for consolidated domestic and international telephone and leased circuit services, Internet-related services, systems integration (SI) and other business, and will facilitate establishment and operation of high-quality, low-cost networks extending to domestic and international points.

(5) IP Business Sector

"IP Business Sector" will be created to perform aggressive and efficient operation and promotion of IP business.

3. Effective Date

October 1, 2000

FPGA

Fabless U.S. Makers Lead FPGA Market Tie-up with Asian Foundries

The Semiconductor Industry Association (SIA) reported that worldwide sales of semiconductors reached an all time high of \$14.96 billion in March 2000, up 33.8% from a year ago. Among all kinds, flexible field programmable gate array (FPGA) market has been expanding at annual rate of 30%. In order to keep this momentum, major fabless FPGA makers have been offering more advanced products by tie-up with Asian foundries.

The FPGA market is up because it attracts more communications vendors and former ASIC users are now switching to FPGA.

As the number of Internet users increases rapidly and demands for bandwidth are surging, all of the communications vendors are now required to develop faster and more sophisticated machines in a shorter period.

Being placed under the circumstances, more vendors are opting for more flexible FPGA rather than rigid ASIC. The FPGA gives more advantage to these vendors: it is easily upgraded, can correct bugs and add new future. Like other chip products, unit price (price per gate) has been decreasing; however, major FPGA manufacturers, in cooperation with foundries, are successfully expanding their revenues by offering more advanced products including, 0.18 micron line widths, multi-layers and copper metallization ones.

Xilinx Inc. is the leading FPGA firm having 35% share in the world FPGA

market of \$2.6 billion. With its Virtex series that the San Jose-based firm released in the fall of 1998, the firm won more than 90% of the high-end FPGA market. The firm on May 22 released details of the new FPGA architecture that could be the first FPGA product to provide 10 million gates or 500 million transistors.

Xilinx is planning to ship the first product of the "Virtex II" platform by the end of this year. According to Bruce Weyer, Senior Director of Marketing Advanced Products Group at Xilinx, the Virtex II platform will "usher FPGAs into market and applications previously addressed only by ASIC solutions."

The new multimillion-gate product will be based on eight-layer interconnect and copper technology and will have enhanced configurable logic block (CLB) structure. The firm said the architecture would easily be migrated to 100 nm process technology.

Other remarkable features of the new architecture include: large amount of memory resources and capabilities, new arithmetic resources, enhanced clock management support, new I/O technology and next-generation deep-submicron process technology.

Xilinx Foundation Series and Alliance Series software version 3.1i will support the architecture. The firm said the new FPGA based on the new architecture would be applied for complex networking, wireless base stations, mass storage and high-end video servers.

One of the strengths of Xilinx is its extensive customer services. In order to facilitate its services to 5,000 customers worldwide, Xilinx maintains 300 field application engineers rather than core support team at factories. Wim Roelandts, President and CEO of Xilinx, said that the firm will greatly increase the supporting staff in a short time.

Xilinx reported record highest revenues for fiscal 2000 with a total revenue of \$1.02 billion, a 54% up from a year ago. Up to 39% of it came from its communications business and another 26% came from networking business.

Although communications business is the major revenue resources for FPGA vendors, they are trying to expand their consumer business. Then the Japanese market is one of their major targets. Now all of major FPGA vendors are putting an emphasis on Japanese business.

Xilinx established its Japanese firm "Xilinx K.K." in 1989. Since then, the Japanese firm has successfully expanded its sales and its scale. The firm's revenues for FY2000 (ending March 2000) were 12.2 billion yen, a 27% increase from a year ago. Xilinx is targeting to increase the sales in Japan to 20 billion yen in the following year by doubling its sales and technical staff. Japan is also a key production basis for Xilinx. Seiko Epson, a machinery manufacturer based on Tokyo, is a foundry for the firm.

The other major foundry of the firm is United Microelectronics Corporation

(UMC) in Taiwan. Last March Xilinx and UMC announced that they have developed the first FPGA product using copper process technology. The new Virtex Extended Memory (Virtex EM) based on the technology is scheduled to be marketed in the second half of 2000.

Altera Corp., the second largest FPGA firm, is also putting an emphasis on Japanese market. The firm successfully increased its revenues in the fiscal year ending December 1999 by 34% from a year ago. The firm is reportedly planning to double its employees in Japan to 50 by the end of this year.

Lattice Inc., the third largest FPGA firm, is also gearing up its business in Japan mainly putting emphasis on ispPAC family FPGA. The firm is also reportedly targeting to double its sales in Japan in three years to 12 billion yen.

Actel Corp., the fourth largest FPGA maker, opened its Japanese office four years ago. The firm's revenues in the Japanese market for the fiscal year ending December 1999 was \$10 million, mostly coming from communications and "Hirel" (high reliability) products. Teshu Naka, Regional Sales Manager of Actel Corp., said that the firm is targeting to win 25% of the market share in the Japanese FPGA market of \$270 million by expanding its consumer electronics business. Actel is scheduled to start sample shipping of flash-based, reprogrammable FPGA rather than the firm's antifuse FPGA in the autumn of 2000.

Syndeo

U.S., Japanese Vendors Are Developing Voice-data Integrated Solution

Syndeo Corp., a Cupertino-based start-up, has developed its first product which, the firm said, will let carriers deliver next-generation telephony and multimedia applications to any kind of platform for about one third of the cost of legacy systems.

As competitions among carriers have been harsher and demand for integrated services of voice and data has been mushrooming, demands for a cost-efficient, integrated platform for next generation services have been increasing.

Ted Griggs, President & CEO of Syndeo, said that their Broadband Services System (BSS) would meet all of such demands from carriers.

The firm said that it is going to launch beta tests for the BSS within three weeks with three carriers, including Zyan Communications. The firm is scheduled to launch commercial shipment of the BSS in late August 2000. The initial product will run on Sun Solaris system, but the firm later this year will release another which will run on Linux system. The price will be starting from \$250,000 for a two-node system including Sun Microsystems Netra platforms and as-

sociated routing and switching equipment.

The Broadband Services System is a broadband Class 5 softswitch.

According to the firm, the product has full interoperability with any systems such as MGCP/MEGACO, SIP, H.323 and SS7, is highly tolerant with "no single point of failure," scalable to millions of subscribers, and has interfaces to any type of end user devices and terminals. "This voice-over IP and voice-over-ATM system lets carriers create differentiated services offering features unavailable in traditional TDM network environment," Griggs said.

According to the Yankee Group, the worldwide softswitch market will be \$631 million by 2001 and \$4.3 billion by 2004.

The firm is targeting Data CLEC, Large ISP, Voice CLEC and PTTs/ILECs.

Some big manufacturers such as Lucent Technologies and Cisco Systems are providing soft switches. However, Griggs said that other firms are mostly focusing on Class 4 switches, different from Syndeo, which is exclusively fo-

cus on Class 5 switches.

The firm is determined to explore international market aggressively. Griggs said the firm would open an office in Europe and Asia within three months.

Syndeo was founded in May 1999. Unusual as a small start-up with around 70 employees, Syndeo has already won an ISO 9001 Certificate. The firm has just completed the second round funding in which it raised \$18 million. With the first round of \$5 million, the firm raised a total of 23 million.

The name of Syndeo comes from a Greek word of "syndein" meaning "the shape or manner in which things come together and a connection is made."

Meanwhile, in Japan two traditional telecom vendors -- Oki Electric Industry Co., Ltd. and Iwatsu Electric Co., Ltd. -- are gearing up their effort to develop and provide VoIP products in cooperation with U.S. big names -- Cisco Systems and Lucent Technologies.

Oki Electric Industry in April tied up with Cisco Systems in the field of VoIP. Under the business alliance agreement, both firms are going to develop new

products and solution, jointly sell their products both in the U.S. and Japan, and promote interoperability between their products.

It is said that Japanese VoIP market is around 50 billion yen in 2000 and will be 250 billion yen by 2002. Both firms are aimed at jointly winning up to 80% of the market share in Japan.

Cisco Systems is advocating a new concept for next-generation integrated architecture called AVVID (Architecture for Voice, Video, and Integrated Data). Both firms are going to promote interoperability among both firms' products under the concept.

Oki is now providing Internet Voice Gateway series: BV1250 Internet Voice Gateway, BV2000 Internet Voice Gateway and VoIP-TA Internet Telephony Adapter.

BV1250 is the newest product released on Jan. 20, 2000. The product with four ports was developed to be placed at a local office or a branch of a company. BV2000 is the high end product with 92 channels. The product is suitable for headquarters of a large firm. VoIP-TA has one port, suitable for

SOHO or individual users.

Kenji Yamamoto, sub-product manager of Network System Company of Oki, said that with these product lines, the firm is providing solution for any type of firm which needs only one line to several thousand of lines.

All of these products have advanced features such as good voice quality, Auto Gain Control, automatic switching of codex system, real-time G3 Fax and a variety of interfaces.

The firm is planning to sell 50,000 units of BV1250, the main VoIP product, a year gaining several billion yen revenues. BV1250 is selling at 480,000

yen per unit, while BV2000 is starting at 7 million yen and VoIP-TA is 88,000 yen.

In addition, Oki started shipping an IP PBX called "IP Stage" in January 2000. According to Oki, the product is the first IP PBX marketed in Japan.

The IP Stage with 192 ports enables user firm to use any kinds of communications services with the sole LAN or WAN line. When equipped with a Line Unit, an ordinary telephone, a fax machine and a PHS can be connected with the LAN or WAN.

A model system with 70 lines costs 6 million yen. Oki said that a dozen of

firms are currently using the system.

Yamamoto said that there is no competitor in Japan in the market.

Asked about the reason for Oki's dominant presence in the market, Yamamoto said that Oki has been offering these kinds of products since 1996 and has accumulated much know how and skill.

Iwatsu Electric and Lucent Technologies have released two new VoIP products called "Office Gate" and "INDeX" in April. Iwatsu Electric will start selling the Office Gate in June and INDeX in August.

Both firms concluded a strategic alliance agreement last September in order

to jointly develop products in the field of voice and data integrated communications system.

The Office Gate is an integrated platform. Equipped with a VoIP gateway, the system will support from LAN/WAN networks to a small call center. The price for a basic system will be 2 million yen (except terminals).

The INDeX is a CTI multi-platform. The price for a basic system with 10 operators starts from 3 million yen. Iwatsu is targeting to get 10-15 billion yen revenues from these two products in FY2002.

DWDM

Vendors Produce More DWDM to Provide More Bandwidth

Due to recent rapid expansion of the Internet, data traffic has been expanding at an annual rate of 20-30%. To meet such rapidly expanding traffic, all of the carriers in the world are being forced to expand their network capacity. However, construction of optical fiber networks costs a lot and takes time. That's why the WDM technologies are winning much attention.

The Wavelength Division Multiplexing (WDM) is a technology that sends multiple wavelengths of light over a single fiber connection.

It is said that the worldwide WDM market will be \$6 billion in 2003.

Not only large vendors such as Nortel Network and Cisco Systems, but also many start-ups are providing products based on the key technology of WDM.

Ditech Communications Corp., a Mountain View-based start-up, is one of them. The firm is now providing optical subsystems based on WDM.

Marc Schwager, Vice President of Marketing of Ditech, said that the firm sees great opportunity for their business since the market has been changing very rapidly due to far expanding demands for data transmission capacity and entrant of new generation networks.

Ditech's "subsystem" is especially vital for new common carriers, which can not develop necessary systems and devices by themselves; but large vendors, which have both module/components and systems but not subsystems, are also purchasing their customers, according to Schwager. He said that the

firm's current customers include Lucent Technologies, Cisco, Fujitsu and ABB.

The firm's optical subsystem product line includes: WDM Multiplexer, DWDM Monitor, Optical Telemetry System (OTS), and Optical Amplifiers.

The DWDM Monitor, which was released last December, is what the firm says the first product in the world that can be remotely deployed. Due to the feature, the firm said, carriers can largely save time and expense for sending support engineers to remote facilities.

The Optical Amplifiers are based on erbium doped fiber amplifier technology. Equipped with the advanced technology, the firm said that the amplifier can let optical signals to travel longer distances without degradation, which as a result reduces the cost of carriers.

The Optical Telemetry System supports multiple standard interfaces, has excess bandwidth to facilitate remote monitoring and control of other site equipment and employs bi-directional optical supervisory channel.

According to the Gardner Group, there will be 24 billion addressable market for optical subsystem products over next five years.

But WDM is one of the two business lines of Ditech Communications. Actually up to 90% of the firm's revenues come from echo cancellation equipment business where Ditech has 30% of the world market share. The major customers for the business include: Qwest, Sprint, MCI Worldcom and GTE Tele-

com. The firm is targeting to further expand the market share by exploring the VoIP, wireless and international market.

Ditech Communications was founded in 1987. The firm, with some 150 employees, in June 1999 very successfully conducted its IPO.

Japanese vendors are also putting an emphasis on WDM product line. Hitachi Ltd., a leading vendor in Japan, has been strengthening its WDM line-up.

On May 9, the firm announced three new WDM products and an advanced version of the current high-end WDM product. Hitachi is offering AMN6100, that multiplexes 32 channels of 10 Gbps, targeting carriers, ISP and large corporations.

According to Yoshihiro Sugeta, Assistant Manager of DWDM Systems Department of Hitachi, the product has superior features: it is compact, provides stable data transmission of 10 Gbps fully utilizing the automatic gain control technologies, and realize the maximum data transmission distance of 450 kilometers.

The firm in the fourth quarter of 2000 will offer a new version of AMN6100 that multiplexes 64 channels of 10 Gbps - providing for a total of 640 Gbps data transmission - and be equipped with Optical Add/Drop Multiplexer (OADM) function.

The firm is planning to add higher function on the product in the future: in the first quarter of 2001 the firm will increase the data transmission distance

of the AMN6100 to over 1,200 kilometers, and in the first half of 2001 the AMN6100 will multiplex 128 channels of 20 Gbps.

For small to medium corporate users, Hitachi will offer AMN 601S, which multiplexes 32 channels of 2.4 Gbps, and AMN 601A, which multiplexes 16 channels of 2.4 Gbps, from October 1, 2000. Hitachi is targeting not only the Japanese market but also the North American market. In 1999 Hitachi provided its AMN6100 to Global Crossing Ltd.

NEC Corp., a leading vendor, on May 29 released a new WDM data transmission system, which provides a total data transmission of 1.6 terabits per second (1.6 Tbps). The product called "SpectralWave 160" is scheduled to be put on the market in the fourth quarter of FY 2000. According to NEC, it is the first product in the world, which multiplexes 160 channels of 10 Gbps. NEC said that the firm is planning to release an advanced version of the product, which deal with up to 3.2 Tbps by the end of December 2001.

With the new "SpectralWave 160," NEC is targeting to increase the market share in the WDM market from present 8% to more than 20%. NEC last year provided "SpectralWave 32" (a currently available WDM data transmission system which multiplexes 32 channels of 10 Gbps) to AT&T.

MPT's CRL Develops World's Fast 40-Gbps Photonic Network Gateway

The Communications Research Laboratory (CRL) of MPT, in cooperation with Osaka University, verified the functionality of the world's first photonic gateway, a key component that realizes ultrafast photonic networks. In the verification experiment, CRL achieved the conversion and reconversion of different multiplexing formats (namely, between optical time division multiplexing (OTDM) and wavelength division multiplexing (WDM) systems), and the photonic packet compression and decompression at speeds of 40Gbps and 10Gbps.

With the rapid rise in the use of the Internet, a demand for large transmission capacity in info-communications networks has been increasing drastically. However, there are many differ-

ent optical transmission systems with different multiplexing methods such as optical time division multiplexing (OTDM) and wavelength division multiplexing (WDM); furthermore, there are different transmission speeds. In response to the backlog, it is necessary to develop technologies which enable high-speed interconnection between photonic networks with different multiplexing methods and transmission speeds, in addition to optical transmission technology which increases network transmission capacities tremendously. In existing photonic networks, upon transferring information between optical networks, optical signals are converted to electrical signals for processing (OE conversion); then, electrical signals are converted to optical signals for trans-

mission (EO conversion). This process caused a problem in realizing a high-speed photonic network.

This time, CRL verified the functionality of 40-Gbps photonic gateway that functions as a node for interconnecting different photonic networks without OE/EO conversions. Developed under this verification experiment were two network interconnection functions: 1) the conversion and reconversion of different multiplexing formats between OTDM and WDM and 2) the photonic packet compression and decompression. In realizing these functions, the ultrafast photonic processing method is applied in wavelength and time domains. In the wavelength domain, optical signals are copied in different wavelengths through a spectrum slicing method that utilizes the optical signal supercontinuum generation technology and multiple wavelength filters. In the time domain, nec-

essary optical signals are extracted by time shifting and time gating that utilize a delay line and a saturable absorber. The 40-Gbps optical signal processing is realized in the wavelength and time domains through a combination of those technologies.

As the photonic gateway can convert multiplexing systems and transmission speeds without OE/EO conversions, it is anticipated that the gateway will realize Terabit-class signal processing. In addition to OTDM and WDM, any conversion and reconversion of different multiplexing formats will be possible including an optical code division multiplexing (OCDM) system. Utilizing these technologies, photonic networks from Pbps-class backbone networks to Gbps-class access networks connecting residential users will be realized in an all-optical manner without OE/EO conversions.

Optical solution

U.S., Japanese Vendors Developing Optical Solution to Meet Demands for Data Traffic

As the Internet has been further spreading out, demands for broadband networks have been increasing. Carriers are gearing up their effort to construct more broadband networks in order to meet the mushrooming demands. Finding some limitation in their conventional electricity-based technologies, both U.S. and Japanese vendors are developing next-generation machines and devices based on optical technologies.

BrightLink Networks Inc., a Sunnyvale-based start-up, has developed what they call "multi-terabit optical switching system" targeting inter-city backbone carriers.

According to Harry V. Quackenboss, President & CEO of BrightLink, their multi-terabit optical switching system based on patent pending Hypertorus mesh fabric architecture is scalable from 16 to 1024 OC-48 SONET/SDH ports or from four to 256 OC-192 ports.

BrightLink's original Network Management System (NMS) and Element Management System (EMS) manage the system.

Quackenboss said that their product allows carriers to migrate the existing SONET ring infrastructure to a true optical network. "Unfortunately the present ring-based SONET architectures using add-drop multiplexers, digital cross connects and optical cross connects have not been able to keep the pace of the Internet. Our switch system will interconnect DWDM systems displacing traditional SONET, ADMS, DCS and OCS," he said.

BrightLink is planning to launch their first lab trial in the third quarter of 2000 and commercial shipping in the fourth quarter of 2000.

Some other firms are also offering similar optical solutions including Ciena Corp.'s Core Director, Sycamore's SN 16000 and Aurora's optical cross connect.

But Gary Law, Vice President of Marketing of BrightLink, said that these firms are providing up to 512 ports system, while his firm developed a system which can be the basis of a 1,000-port system today. The firm is planning to develop a product, which supports up to 160 Tbps in the future.

According to the Communications Industry Research, the market for very large-scale optical switches will be \$105 million in 2001, and \$7.06 billion in 2004.

BrightLink started operation in October, 1998 under the name of Corvia Networks Inc. The firm changed its name to BrightLink Networks in March 2000. The firm, with around 120 employees, has recently concluded its third round funding with \$58.3 million winning fund from venture capitals such as Goldman Sachs, CS First Boston, Mitsui & Co. and Vision Capital.

Alidian Networks Inc., a Mountain View-based start-up, has developed its Optical Service Network (OSN) Solution for bridging "metro gap."

According to Ted Rado, Director of Marketing of Alidian Networks, their Optical Service Network (OSN) products -- entry level OSN 4100/4200 and high-end OSN 4800 -- will be able to offer optimal solution for the metropolitan area network (MAN) environment.

The present MAN environment is largely dominated by legacy voice-oriented SONET equipment. There are gaps between optical fiber oriented, broadband trunk networks and dynamic data-service driven access networks.

The firm said that by using the OSN family products, carriers will be able to bridge the gaps and provide a variety of services at a lower cost, keeping high QoS and CoS. "Neither traditional SONET equipment nor DWDM is alone sufficient for the MAN," Rado said. Their targeting customers are CLECs, ILECs and IXCs.

The two key technologies are WavePack and

WaveSwitch. WavePack, a patent pending technology, allows multiple protocols and services to share each SONET/SHD framed wavelength. Since all services are transported in their native protocols, cost burden for carriers is largely reduced. WaveSwitch, also a patent pending technology, moves services between wavelengths and permits the adding and dropping of individual services.

Another remarkable feature of their system is that their OSN uses a thin layer of SONET in order to fully utilize restoration and protection mechanisms of SONET. If a fiber is cut off, the highest priority services are moved to the working fiber within 50 milliseconds.

The firm is scheduled to launch a customer trial for OSN 4100/4200 in May 2000 and commercial deployment in July 2000. For the high-end OSN 4800, the firm will launch customer trial in October 2000 and commercial deployment in December 2000. Two carriers, Enkido and Everest Broadband Networks have committed to conduct trials on the OSN products.

Alidian Networks was founded in August 1998. The privately held firm raised funding from Institutional Venture Partners, Accel Partners, WorldView Technology Partners and Pequot Capital.

In Japan, firms are gearing up their effort for developing optical switches from different aspects.

Fuji Xerox Co., Ltd., a leading photocopy machine maker in Japan, has developed optical sheet bus that the firm said could be applied for optical coupler and backplane bus.

Masao Funada, Project Manager of Optical System Technology Development Unit of Fuji Xerox, explained that optical interconnection technologies are winning attention because conventional electrical bus systems are checking further improvement of devices although capacity of both CPU and memory have been drastically expanded.

Funada said that their optical sheet bus could clear these problems of legacy bus.

Since the sheet bus is tiny (measuring 4 mm x 20 mm x 1 mm) and made of PMMA, it is cheap and easy to manufacture. With sheet like shape, the optical sheet bus can achieve broadcasting, simultaneous bi-directional transmission and multicast transmission. Unlike most of other similar devices, the optical bus is alignment free.

Fuji Xerox is going to apply the device for optical coupler for automobile LAN or home LAN and for backplane bus.

"Compared with other maker's optical couplers, for instance, our optical coupler made by optical sheet bus merely costs one tenth or one hundredth," Funada said.

Funada suggested that the sheet bus has many other potential applications: PC, server, printer and RAID.

Fuji Xerox developed the optical sheet bus as part of its effort to diversify its business since their main business of photocopiers and printers are being saturated.

NTT Corp., the Japanese dominant carrier, has developed several kinds of optical switches. The most recent and more remarkable one is an optical switch based on thermally induced capillarity.

Mitsuhiro Makihara, Senior Research Engineer of Telecommunications Mechatronics Research Group at NTT Telecommunications Energy Laboratories, said that their optical switches are tiny, reliable and suitable for mass production although the switching speed is a little bit slow. Makihara said that the lab developed the optical switch targeting for reserve unit, which does not require high speed.

The optical switch is consisting of intersecting waveguide substrate having a slit, which is filled with silicon oil at the crossing point.

When oil is located at the crossing point, the optical

signals pass straight through the slit. When the oil moves out from the crossing point, then the signal is switched into the crossing waveguide by the total internal reflection on the slit.

Applying a voltage to the heater located beside the slit moves the silicon oil. The thermo capillary action causes the oil to move to the low temperature side in the driving slit.

The lab has developed a prototype of 8:1 optical switch, which the lab describes suitable for sharing a reserve optical subscriber unit. NTT East Corp. and NTT West Corp. will launch so-called optical fiber service using shared access technologies upcoming autumn (2000). The lab proposed the optical switch for the standby system for the shared access services. Practical application has not been decided yet.

Technical Information Disclosure

Tokyo Telecommunication Network Co., Inc. (TTNet)

On April 27, 2000, TTNet made changes to technical documentation concerning its high-speed digital transmission service and Type I TTNet computer network service. TTNet revised the documentation as it starts to use its own optical fiber and metallic cables for high-speed digital transmission service's economy and simple classes. Documentation was also revised because the company renamed its "Computer Network Service" to "Type I TTNet Computer Network Service" (TTCN) since it added new services as well as high-speed digital and ATM-specialized circuits.

For further information, contact: Administration Group, Technical Engineering Dept., Tokyo Telecommunication Network Co., Inc. (TTNet)

Shibaura Square Bldg., 9-25, Shibaura 4-chome, Minato-City, Tokyo, 108-8525, Japan
Tel: +81-3-4555-3111
Fax: +81-3-4555-4881

Tohoku Intelligent Telecommunication Co., Inc. (TOHKnet)

On May 26, 2000, TOHKnet disclosed interface conditions for "Smart Access," the company's new service in its TOHKnet Computer Network (TOCN).

For further information, contact: Technology Dept., Tohoku Intelligent Telecommunication Co., Inc. (TOHKnet), City Bldg. Sendai, 2-4-40, Renbou, Wakabayashi-ku, Sendai City, Miyagi, 984-0052, Japan

Tel: +81-22-799-4221
Fax: +81-22-799-4229

Hokuriku Telecommunication Network Co. (HTNet)

HTNet disclosed technical documents pertaining to its planned "Optical LAN Service (provisional name)" and "2.4-Gbps Digital Line Service (provisional name)" as of June 2000. These documents describe interface specifications of terminal equipment to be connected to the service facilities.

Those wishing to obtain copies of the documents should provide the following information on a postcard, by fax or via e-mail: a) Company name, address, telephone and fax numbers; b) Name of person in charge; c) E-mail address; and d) Number of copies (limited to three copies per company free of charge)

For further information, contact: Technology Dept. (Planning), Hokuriku Telecommunication Network Co. (HTNet), 26, Gobancho, Shimo-Hondamachi, Kanazawa City, 920-0993, Japan

Tel: +81-76-209-5510
Fax: +81-76-209-5518
E-mail: sakai-s@htnet.co.jp

Chubu Telecommunications Co., Inc. (CTC)

On July 1, 2000, Chubu Telecommunications Co., Inc. (CTC) began to disclose technical information including specifications on interconnection conditions, for its "600Mbps Digital Line Service" and "Chubu Telecommunications Computer Network (CTCN) the 5th Class Service." CTC has technical documents on above services (Japa-

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Shared FTTH:*Continued from Page 1*

Nippon Telegraph and Telephone East Corp. (NTT East) and Nippon Telegraph and Telephone West Corp. (NTT West) first deployed fiber-optic networks from an NTT local office to each of the user's premise as well as put an OLT (optical line terminal) at each of these NTT local offices and an ONU (optical network unit) at each subscriber's premise just like conventional FTTH services.

But what differentiates the new service from conventional fiber-optic services is the Shared Access technology developed by NTT Access Network Service Systems Laboratories.

The technology lets up to 32 users share one optical fiber. By doing so, the cost burden per user will be lightened greatly.

The technology is also called PDS (passive double star) because one optical fiber is divided at two phases.

The first step is inside the OLT. Each of hundreds of OSU placed inside the OLT holds a piece of optical fiber.

The second step is outside the OLT. Each optical fiber coming out of the OLT is divided into up to 32 users at a splitter.

The FTTH networks, using the conventional fiber-optic system, have not been promoted so rapidly, in part due to

high OSU cost.

But the new service may not be very cheap.

According to Miyazu, the user's fee for the new service will be as low as 10,000 yen per month. However, the monthly charge represents only the cost between each household (ONU) and the NTT local office (OLT).

To get Internet access, users have to subscribe services from an ISP paying additional Internet access charges on top of the monthly basic fee of 10,000 yen.

NTT has not released any system design for the service. In case of "IP Access Services," the flat-rate Internet access services that NTT is providing for ISDN users, most of ISPs connect their networks with NTT's local networks at POI. ISPs are expected to connect their networks with NTT local network at POI for this new service. If so, the total charges for users including fiber-optic service, NTT's local IP network and ISP's access charges are likely to exceed 20,000 yen.

Like NTT's IP Access Services based on ISDN, NTT may lower its service charges later.

NTT East and NTT West started providing the IP Access Services at a monthly flat-rate of 8,000 yen; however, both carriers will lower charges to 4,500 yen from May 11 because they

have received much criticism from foreign carriers and Japanese NCCs for the service rates.

However, this time NTT Group carriers may not be able to reduce the service price drastically. According to some recent reports, each optical fiber costs NTT 7,090 yen per month.

Unless NTT can reduce the cost, it will be difficult for the carrier to keep the new service charges below 7,090 yen per month.

Meanwhile NTT, in cooperation with the Matsushita Group, will launch another FTTH trial in Kanazawa on May 18, 2000. The trial called "FTTH Kanazawa Trial" will employ the shared access technologies.

About 150 participants of the trial will receive a variety of content through the fiber-optic network with a maximum data transmission speed of 10 Mbps.

Toru Manishi, a spokesperson at NTT West, said that the carrier is planning to launch commercial services after the one-year experiment.

NTT decided to provide the new fiber-optic service because competition among carriers in the access network market has become harsher.

The ADSL market in Japan was liberalized in December 1999. Since then many NCCs such as Tokyo Metallic Communications and E-Access as well as NTT carriers have launched their

ADSL services.

In particular, NCCs are expanding their business aggressively. Tokyo Metallic Communications is going to launch its ADSL services in Osaka and Nagoya in November 2000, while E-Access is going to launch its ADSL services in Nagoya and Fukuoka in the latter half of 2001. Major carriers such as KDD, DDI and Japan Telecom have launched their services on a trial basis.

Cable TV operators are also entering the market. An operator will construct broadband networks in 28 areas around Japan in order to provide high-speed data communications services.

WLL is another tool for exploring the market. Sony Corp. will launch its WLL services in July 2000. According to the firm, the new service called "bit drive" will provide 1.5-Mbps high-speed data transmission services at a monthly flat-rate of 150,000 yen, closed area LAN services at 1.5 Mbps (best-effort type) will be provided at a monthly flat-rate of 150,000 yen. The service area will be initially limited to six major cities, but the firm will launch nationwide services by the end of 2000.

Japan Telecom Co., Ltd. will launch its WLL service this coming summer. The carrier is planning to provide its 1.5-Mbps service at 99,000 yen per month.

Continued from page 6

nese Only).

For further information, please contact: Technical Engineering Dept., Chubu Telecommunications Co., Inc. 2-2-5, Naka-ku, Naogya city, Aichi prefecture 460-0008 Japan

Tel: +81-52-740-8013

Fax: +81-52-740-8932

Email: tech_info@ctc.co.jp

Osaka Media Port Corp. (OMP)

OMP disclosed revised technical documents pertaining to its "Optical LAN Service (provisional name)" and "2.4-Gbps Digital Line Service (provisional name)" on July 6. These two documents were originally disclosed on January 27, 2000; these describe interface specifications of terminal equipment to be connected to the service facilities.

Those wishing to obtain copies of the documents should provide the following information on a postcard, by fax or via e-mail: a) Company name, address, telephone and fax numbers; b) Name of person in charge; c) E-mail address; and d) Number of copies (limited to three copies per company free of charge)

For further information, contact: Osaka Media Port Corp. (OMP) WCN System Center 5th Fl., Nakanoshima INTES Bldg., 6-2-40, Nakanoshima, Kita-ku, Osaka City, Osaka, 530-0005, Japan

Tel: +81-6-7501-0613

Fax: +81-6-7501-0686

E-mail: tecref@omp.ad.jp

or, OMP Tokyo Office (regarding 2.4-Gbps Digital Line Service only): 9th Fl., Toranomon Yoshiara Bldg., 1-6-13, Nishi-Shimbashi, Minato-ku, Tokyo, 105-0003, Japan

Tel: +81-3-3508-1146

Fax: +81-3-3508-1148

Tokyo Telecommunication Network Co., Inc. (TTNet)

On July 10, TTNet disclosed technical documents concerning its "High-speed Digital Line Service (Ver. 5)," "TTNet Computer Communications Network Services Utilizing Wireless Local Loop (Ver. 1)" and "Optical LAN

Interconnection Services (Ver. 1)."

Those wishing to obtain copies of the documents should provide the following information on a postcard, by fax or via e-mail: a) Company name, address, telephone and fax numbers; b) Name of person in charge; c) E-mail address; and d) Number of copies (limited to three copies per company free of charge)

For further information, contact: Tokyo Telecommunication Network Co., Inc. (TTNet): Administration Group, Technical Engineering Dept. Shibaura Square Bldg., 9-25, Shibaura 4-chome, Minato-City, Tokyo, 108-8525, Japan

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Sikoku Information and Telecommunication Network Co., Inc. (STNet)

STNet disclosed revised functional specifications concerning its "Circuit terminal device for computer network service" and "Circuit terminal device for high-speed digital transmission service" on July 14, 2000. The documents describe the interface conditions of these services.

Those who wish to obtain copies of the documents should provide the following information via fax or on a postcard:

- Company name, address, telephone and fax numbers
- Name of person in charge
- Number of copies (limited to three copies per company)

For further information, contact: Shikoku Information and Telecommunication Network Co., Inc. (STNet): Telecommunication System Dept. 1735-3, Kasuga cho, Takamatsu City, Kagawa Prefecture, 761-0195, Japan

Tel: +81-87-887-2405

Fax: +81-87-887-2453

Cable Network Yachiyo Co., Ltd.

On July 24, 2000, Cable Network Yachiyo Co., Ltd. (CTC) disclosed technical document for "Waiwai Net," the company's data communication service using its cable network. The document describes the interface conditions of the

service.

For further information, please contact: Technology Dept. Cable Network Yachiyo Co., Ltd.: 719 Kayada-cho, Yachiyo City Chiba Prefecture, 276-0044, Japan

Tel: +81-47-487-8455

Fax: +81-47-482-0948

Tokyo Telecommunication Network Co., Inc. (TTNet)

On July 31, 2000, TTNet disclosed technical documentation concerning its 150 Mbps and 600 Mbps digital circuit services. The services provide digital circuit services with circuit speeds 150 Mbps and 600 Mbps.

For further information, contact: Administration Group, Technical Engineering Dept., Tokyo Telecommunication Network Co., Inc. (TTNet) Shibaura Square Bldg., 9-25, Shibaura 4-chome, Minato-City, Tokyo, 108-8525, Japan

Tel: +81-3-4555-3114

Fax: +81-3-4555-4881

OKAYAMA NETWORK INC. (oniNet)

On August 1, 2000, oniNet disclosed technical documents pertaining to its Internet connection service, as the company obtained the license for the Type I telecommunications service. The document describes the interface conditions of the service.

For further information, contact: OKAYAMA NETWORK INC. (oniNet) Planning and Engineering Dept. 5-8-8, Noda, Okayama City, Okayama Prefecture, 700-0971, Japan

Tel: +81-86-245-4951

Fax: +81-86-245-4966

E-mail: oni-ki@mxl.oni.co.jp

Hokuriku Tsushin Network (HTNet)

On August 30, 2000, HTNet disclosed revised technical documents concerning its "HTNet Computer Communication Network Service" (HTCN). The revision was made because HTNet added "economy type (non-ATM method)" and "ATM method" to the service.

For further information, contact: Hokuriku Tsushin Network Co., Inc.

Technical Engineering Dept.

5-26, Shimohonda-machi, Kanazawa City, Ishikawa Prefecture, 920-0993, Japan

Tel: +81-76-209-5510

Fax: +81-76-209-5518

Tokyo Telecommunication Network Co., Inc. (TTNet)

On August 31, 2000, TTNet disclosed technical documentation concerning its Computer Communication Network (TTCN). TTCN provides Internet connection service for the customers of its housing service through Ethernet.

For further information, contact:

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Carrier**NTT DoCoMo to Set Up UK Subsidiary, German Research Lab**

On September 29, 2000, NTT DoCoMo, Inc. will establish a subsidiary in London, tentatively named DoCoMo Europe (UK) Ltd., to develop new businesses for the European market. The subsidiary will enable NTT DoCoMo to carry out prompt and efficient exchange and cooperation programs concerning mobile multimedia and W-CDMA-based IMT-2000 service-related technologies with European mobile telecommunications operators, including KPN Mobile N.V. and Hutchison 3G UK Holding Ltd. in which NTT DoCoMo is invested.

In addition, NTT DoCoMo will establish a research facility in Germany, tentatively named DoCoMo Communications Laboratories Europe, to conduct advanced research into the latest network infrastructure technologies in Europe.

Business Results:

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pand its deficits to 99 billion yen in FY2000, from 43 billion yen for FY1999.

The new DDI is expected to generate 3.02 trillion yen in revenues in FY 2000, 40% of which will come from its mobile business and 30% from data business. (The new DDI is scheduled to be established in October 2000 upon merger of DDI, IDO and KDD.)

DDI Corp., the surviving company, in fact was run in red in FY 1999. However, DDI said that due to the scheduled merger these three firms will be able to slash out their investment burden by 20 billion yen for the first year, and sales control cost and information system will be slashed out by 20 billion yen each for five years.

According to its mid-term business plan, the new DDI is aimed at generating 3.9 trillion yen in revenues and 330 billion yen in profits in FY 2004, by putting an emphasis on mobile and Internet business.

Japan Telecom Co., Ltd., the third largest carrier in Japan, is expected to expand its concurrent profits to 105 billion yen in FY2000, a 90.9% up from year ago, due to good business results of J-Phone, the mobile business sector of JT Group.

Tokyo Telecommunications Network Co., Ltd., (TTNet), a regional operator based on the Tokyo Metropolitan area, is expected to turn into black in FY 2000 due to shrinking of deficit in its PHS business.

The locomotive for these good business results is mobile business. Most carriers are relying on their mobile business.

NTT Group, for instance, is heavily

relying on NTT DoCoMo. In FY2000, profits of NTT DoCoMo (574 billion yen) is accounting for 85% of the profits of NTT Group (675 billion yen).

Japan Telecom is also relying on J-Phone Group. J-Phone's estimated profits of 108 billion yen in FY2000 is larger than JT's (105 billion yen).

But mobile market has been saturated as the population penetration rate is reaching 50%.

The number of cellular phone subscribers has increased by more than 10 million per year for the past three years. However, in FY 1999 the increase number was 9.61 million, failed to reach 10 million. Market watchers believe that the increase figure will remain around 7-8 million in FY 2000.

However Internet access services such as "i-Mode services" are very popular and have been attracting new subscribers.

So all of the carriers are putting an emphasis on data services including Internet access services.

Most of the major carriers released good business results for FY 1999 last week, except DDI Group and TTNet. DDI invested much money for constructing infrastructure for cdmaOne services and TTNet failed to revitalize its ailing PHS business.

NTT Group became the most profitable firm in Japan by reporting 825 billion yen in concurrent profits for FY 1999, a 27.1% up from a year ago. The carrier also reported 10.4 trillion yen, a 7.1% up from a year ago, for FY1999. It was the first time for NTT Group to generate more than 10 trillion yen revenues.

The locomotive for the good results was NTT DoCoMo, the mobile sector of NTT Group.

Both NTT East and NTT West sur-

prised market watchers by reporting much better business results for FY 1999 than previous announcement.

NTT East's concurrent profits for FY 1999 were 56.7 billion yen, expanding from the previous estimate of 29 billion yen. NTT West's concurrent deficits for the same period were 43 billion yen, shrinking from the previously announced figure of 70 billion yen.

Asked about the reason for the large gaps between the previous estimate and the results, Junichiro Miyazu, President of NTT Corp., reportedly said that the carrier is now examining the cause for miscalculation.

NTT Corp., repeatedly had said that the carrier can not accept large reduction in its interconnection rates because if such significant reduction is implemented, the carrier's already fragile business should have large damage. Japanese government supported the NTT's discussion and turned down the U.S. government request for large reduction in NTT's interconnection rates. Since NTT Group released such a good business result this time, the Japanese government seems to be forced to accept a larger reduction in the rates at upcoming bilateral talks between the U.S. government and Japanese government.

NTT DoCoMo reported the largest net profits of 252 billion yen for FY 1999 due to a big success in its i-Mode services.

The number of subscribers of NTT DoCoMo's cellular phone was 29.36 million as of the end of March 2000, a 23% up from a year ago. Among them, i-Mode subscribers reached 5.6 million. The consolidated revenues in FY 1999 was 3.71 trillion yen, a 19% up from a year ago, and concurrent profits for FY 1999 was 503 billion yen, a 43.6% up

from a year ago. Among the 3.71 trillion yen revenues, 2.97 trillion yen comes from voice services, while data services including i-Mode services produced 71.6 billion yen.

However, revenues from i-Mode data services are accounting for merely 1% of the total revenues. It seems that i-Mode services helped expansion of NTT DoCoMo's customer bases, which as a result pushed up the carrier's revenues from voice services.

The carrier's operational revenues from cellular business for FY 1999 reached 695.7 billion yen, a 16% up from a year ago. On the other hand, the carrier's deficits for both PHS and pager business expanded.

J-Phone also released good business results for FY 1999 due to a successful advertisement campaign using popular actress Norika Fujiwara. The carrier reported 885 billion yen in revenues, a 33.4% up from a year ago, and 106 billion yen in concurrent profits for FY 1999. The carrier reported 1.9 billion yen deficit in FY 1998.

DDI Cellular Group, on the other hand, reported 38.1 billion yen deficit for FY 1999 partly due to large investment for its cdmaOne services. The carrier also reported 26 billion yen for removing infrastructure for legacy analogue services as part of its effort to make its finance healthier before the scheduled merger.

Meanwhile, NTT DoCoMo last week announced that the carrier would lift its self-restriction on its sales for popular i-Mode terminals on June 1. The carrier has been halving its sales for i-Mode terminals since mid April after a series of connection troubles occurred on its i-Mode services.

Carrier

NTT DoCoMo and America Online Announce Strategic Alliance

NTT DoCoMo to Join AOL Japan Joint Venture

On September 27, 2000, America Online, Inc., the world's leading interactive services company (NYSE: AOL), and NTT DoCoMo, Inc., the world leader in mobile Internet services, announced a strategic alliance to further the growth of their Internet services in Japan and the convergence of PC-based and mobile Internet services worldwide.

To enable mass market consumers in Japan and around the world to access convenient and easy-to-use interactive features and content anywhere, anytime and any way they choose, this alliance will:

- Launch a senior level working group initiative and establish an investment committee to drive the development of next-generation technologies to seamlessly integrate fixed-line and wireless services.
- Make NTT DoCoMo a partner in the AOL Japan joint venture with America Online, Mitsui & Co., Ltd. and Nihon Keizai Shimbun, Inc. (Nikkei);
- Feature AOL Mail and AOL Instant Messenger on NTT DoCoMo's i-mode mobile Internet service; and
- Cross-promote the AOL and i-mode Internet services in Japan.

Dr. Keiji Tachikawa, President and Chief Executive Officer of NTT DoCoMo, said: "We are truly excited about the great potential of this global strategic alliance with America Online. As the world's leader in PC-based services and a pioneer in extending their convenience to new devices, America Online is the ideal partner to pursue our shared vision of seamlessly integrated Internet services -- Fixed Mobile Convergence (FMC) -- across both fixed-line and wireless platforms. This alliance will become a key element of our global strategy to lead the convergence of PC-based and mobile services to benefit consumers worldwide. Through this alliance, we will work together to create brand new services in the field of Fixed-Mobile Convergence -- with our joint venture, AOL Japan, as the first testing ground -- and to extend them around the world."

Bob Pittman, President and Chief Operating Officer of America Online, said: "NTT DoCoMo's success with its i-mode mobile Internet service has been nothing short of extraordinary, and we are delighted that this world-class company has chosen America Online as its partner. This strategic alliance joins two tremendous brands and marks a major step for both our Japanese joint venture and our AOL Anywhere strategy. Building on AOL Japan's strong foundation, NTT DoCoMo will be the catalyst for taking the service to the next level of success in one of the world's biggest and fastest-growing Internet markets. We are just as focused on developing next-generation convergence technologies that will make the

Internet experience even more convenient, easy to use and central to people's everyday lives."

<Senior-Level Working Group Initiative/Investment Committee>

NTT DoCoMo and America Online said that they will launch a joint working group initiative to focus on creating an AOL-NTT DoCoMo gateway portal for wireless carriers and developing next-generation convergence technologies, applications and services worldwide.

The companies are also establishing an Investment Committee, which will invest in the cutting-edge companies that are driving the convergence of fixed-line and mobile platforms.

The companies said that both the senior level working group initiative and Investment Committee will be a complement to their already existing wireless alliances and any future partnerships worldwide.

<AOL Japan Joint Venture>

Under a new agreement, NTT DoCoMo becomes an AOL Japan partner, with equity ownership of 42.3%, which includes a cash contribution of approximately US\$100M for shares of AOL Japan.

In addition to the purchase of equity in AOL Japan, NTT DoCoMo will also feature AOL Mail and AOL Instant Messenger on its i-mode service with more than 12 million subscribers. And, NTT DoCoMo will market AOL Japan as its preferred ISP in its popular DoCoMo shops nationwide and cross-promote AOL Japan to NTT DoCoMo's wireless voice and data subscribers through a full range of innovative initiatives.

In addition to NTT DoCoMo's 42.3%

holding, America Online will now hold 40.3% in the AOL Japan joint venture, with 17.4% being shared between the original joint venture partners, Mitsui and Nikkei.

About NTT DoCoMo

NTT DoCoMo is Japan's largest mobile communications company with a market capitalization of US\$279 billion. As of August 2000, the Company had more than 32 million cellular subscribers. It had consolidated operating revenue of 3.7 trillion yen (approximately US\$34.7 billion) in fiscal 1999 (year ended March 31, 2000). NTT DoCoMo was formed in July 1992 to take over the mobile communications operations and sales of Nippon Telegraph and Telephone (NTT). NTT DoCoMo provides nationwide services, including cellular, PHS, paging, satellite mobile communications and in-flight telephone services. NTT DoCoMo also has subsidiaries in the United States, France and Brazil. In February 1999 NTT DoCoMo launched its i-mode service, which provides continuous connection with the Internet via mobile phones. The number of subscribers to the service exceeded 12 million by August 2000. NTT DoCoMo plans to introduce third-generation mobile communications services based on its W-CDMA system in May 2001. The UMTS services planned to be introduced in Europe will be based upon NTT DoCoMo's W-CDMA technology.

About America Online, Inc.

Founded in 1985, America Online, Inc. is the world's leader in interactive services, Web brands, Internet technologies and e-commerce services.