Avinta Communications, Inc.

White Paper

Unified Voice & Data Networking

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1.0 The Communications Network Market for Home and Small Office

This document introduces a networking concept, AvintaNET, that provides a series of unified voice and data switching / routing devices for SOHO (Small Office Home Office) environment.

1.1 Tele-communication Market Demand for Enhanced Telephone

For many years, the communications industry has attempted unsuccessfully to invent a technology that allows the user to install a phone network with Private Branch eXchange (PBX) functions without utilizing complex central switching units, expensive wiring or proprietary phone sets. With the emergence of business-at-home, and the small business need for inexpensive phone networking solutions, the market is growing very fast.

The market demand for these products is driven by a variety of needs:

- Homes needing single line networking for business purposes while allocating other lines for personal use.
- Homes needing networking of phones to eliminate multi-person crowding of single line use; i.e., messages, multiple phones ringing on all calls, lack of message privacy.
- The need for home based businesses and small offices to appear to the outside world as a large business, with PBX, Auto Attendant, and Voice Mail capabilities.

With annual worldwide new telephone set sales at a rate of 270 million units, rising to over 300 million units in 2003, overall networking phone unit potential is projected to reach 24 to 30 million units by 2003.

1.2 Data-Communication Market Demand for Personal Networking

As more and more Personal Computers (PCs) are deployed in residential and SOHO environments, the need of networking them becomes very desirable. Because the unique physical limitations, techniques developed for enterprises are not necessarily directly applicable to these settings. Many approaches have been in competing development, such as phone line based HomePNA, radio based Bluetooth, Infra-Red and PLC (Power Line Carrier). Each has its unique advantages and certain limitations.

The market for home and small office data networking has been a recognized emerging market. In the US Market alone, there are 20 million homes with multiple computers in 1999 (Cahners In-Stat), rising to over 32 million homes Mid-2000 (CBS NEWS – Aug ‘00). This creates a tremendous demand for simple home data networking technology. Over 100 companies actively pursuing products in this market have embraced the HomePNA technology which currently offers the most consistent infrastructure for the SOHO environment.

1.3 Market for Voice and Data Combined Network

In the modern society, simultaneous voice and data communications have become a natural trend, not just at work places, but also in private life styles:

- Inexpensive PCs and telephones demand for network solutions without additional phone-line subscription or Internet connection costs.
- The need for “user-installable” solution eliminating the cost of expensive consultants, installers and service technicians.
- The emergence of broadband (Cable, DSL, Fiber Optics, Wireless) transmission and the consumer’s need to maximize the value by accessing additional digital bandwidth and networking among phones and computers.
- The need for service providers (PacBell, MCI, ATT, Concentric, Bell Atlantic, US West, Earthlink, etc.) to offer complementary equipment to their subscribers to sustain the life of the subscription.
- The need to base data networking technology within a phone set, eliminating the hesitation of consumers to use the unfamiliar and intimidating computer for communications.
- Alleviate the QoS (Quality of Service) issues in the computer based voice communications.
- Interactive PC game users need room to room networking as well as voice communication simultaneous with game play on the same line.

1.4 Overall Market Trends

- Volume growth of Cable, DSL, Fiber Optic, and Wireless communication for data connection to homes and small offices increasing the bandwidth for Internet and data transfer activity.
- Emergence of broadband connections for increasing analog phone channels utilizing digital data stream.
- Increased use of the phone line as the key path for voice and data communications within the home or office.
- Continued increase in multi-PC and home businesses.
- Continued demand for more features based within the telephone set.
- Explosive growth of multi-person dwelling network solutions for phones as well as computers.

2.0 Avinta Technology and Products

2.1 Basic Avinta Technology

The Public Switched Telephone Network (PSTN) is made up with many switching machines interconnected with transmission links. These form a sophisticated system with alternate routing and backup capabilities. Not only does this require a special level of knowledge to install, operate and maintain, its importance to daily life has also made PSTN into a unique class of business, namely, public utilities. At the edge of the PSTN, telephone cables are used to extend the services to individual subscribers. As far as PSTN operators are concerned, each pair of the telephone wire represents one subscriber. All subscribers are basically equal, and each is assigned a telephone directory number.

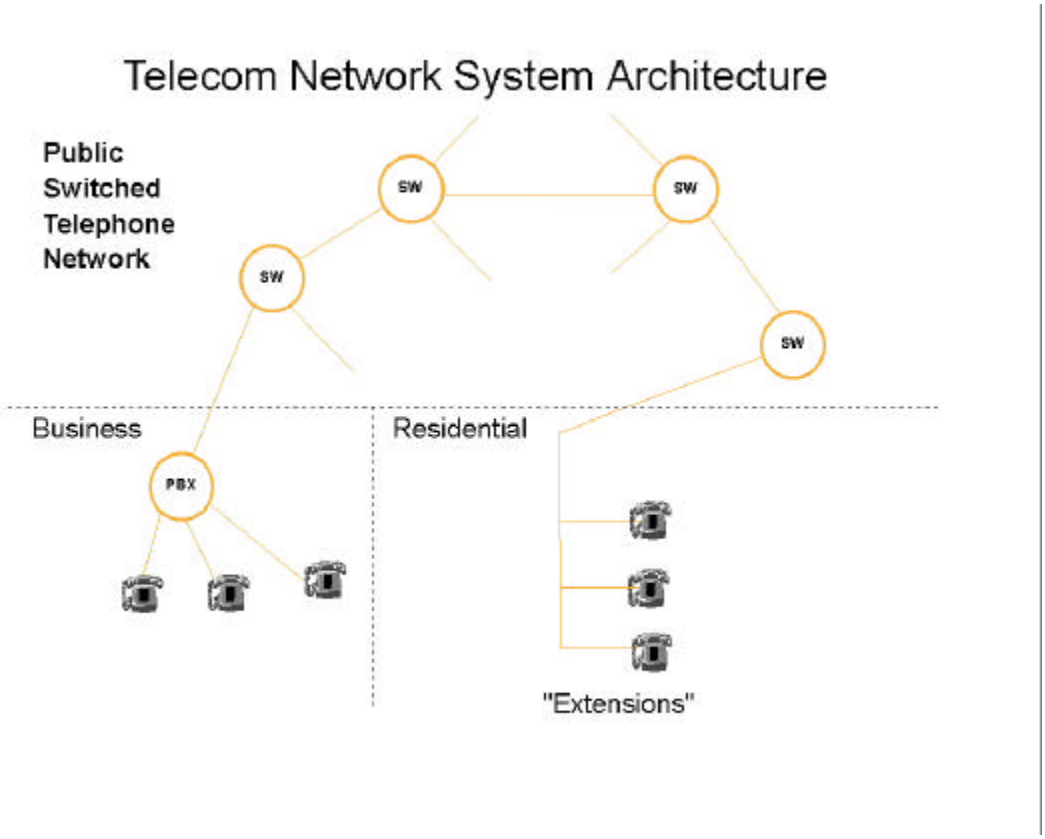

Figure 2.1

For a business with more than a few people, having individual phone line and number to each worker is not cost effective. For example, the PSTN operator may charge intercom calls between co-workers. Consequently, corporations have been using PBX (a smaller version of the telephone switch used by PSTN). This essentially provides another level of local switching and routing function. Each telephone set in a business is therefore assigned an extension number. The smallest PBX may have only one line service from PSTN. The relationship between PSTN and subscribers is shown in Figure 2.1

In a residential setting, multiple telephone sets are connected to the same phone line. They serve the purpose of providing convenience in making outgoing calls from different rooms.

However, without a switch such as PBX to manage the "Extension" phones, routing incoming calls is cumbersome in a SOHO environment. And, Intercom calls among the “Extension” phones are not possible. Furthermore, privacy protection for projecting a professional image is difficult to realize. However, re-wiring that is necessary to connect individual telephone stations to a central location to be served by a traditional PBX has discouraged most would-be customers because it is prohibitively complex and expensive.

2.2 Avinta Technology for Voice Networking

Avinta's Distributed Automatic PBX (dPABX) technology eliminates this drawback by providing the key functionality of a PABX to SOHO telephones without requiring the re-wiring of the premise (Figure 2.2).

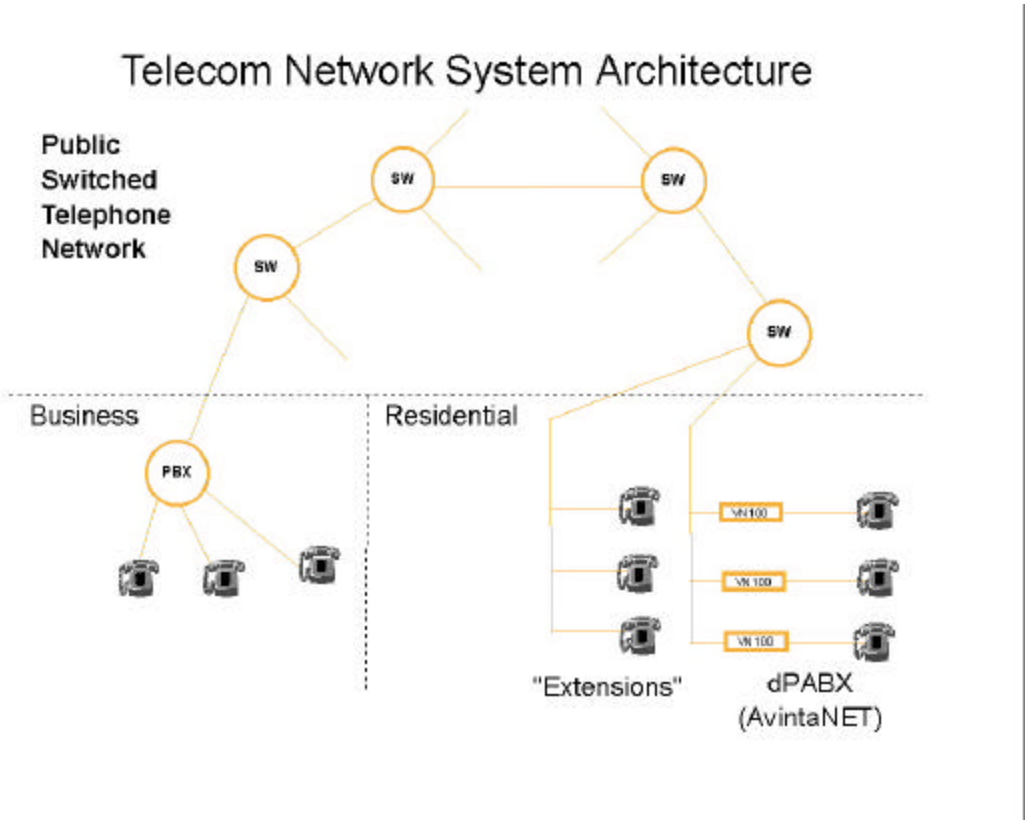

Figure 2. 2

Avinta's patented dPABX technology is based on the concept of enhancing each telephone station instrument with the ability to perform switching functions pertaining to that station. Once a station instrument is equipped with an AvintaNET control module (VN100), it becomes part of an intelligent telephone switching system. This allows the intercom, transfer, and conference functions to operate among all AvintaNET (VN100) equipped extensions in the network. The physical telephone wiring inside of the walls does not need be handled. Yet, another layer of switching and routing functions have been realized. This is a significant technology breakthrough in voice communication networking.

2.3 Avinta Technology for Data Networking

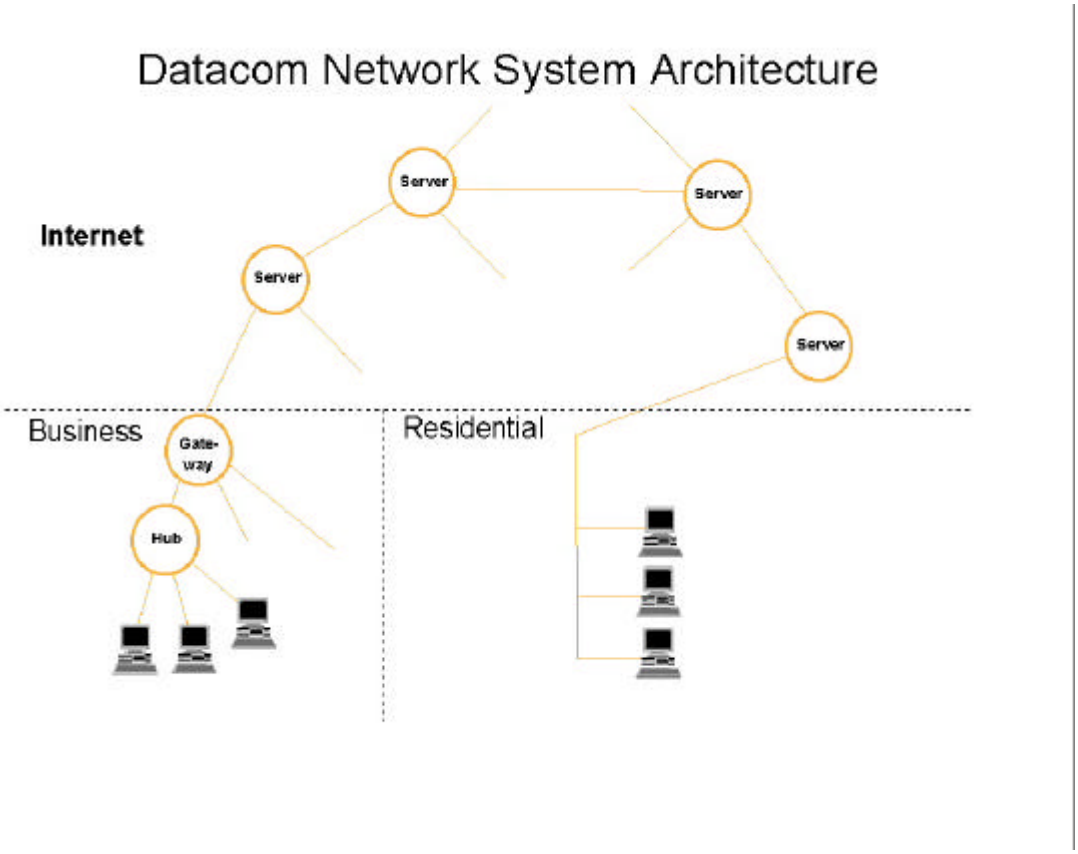

Figure 2. 3

The Internet, which is the datacom equivalent of telecom's Wide Area Network (WAN) consists of computers (Servers) interconnected with transmission facilities. (In reality, much of the Internet facilities are "leased" from PSTN.) At the edge of the Internet, various forms of transmission techniques are used to connect to the end users. The simplest form is via V.90 (56 Kbps) analog modem on standard telephone lines. To distinguish local and remote data traffic, a Gateway device is used at a business. Hubs are used to concentrate traffic among local groups of users (Figure 2.3). In the residential environment, personal computers have been accessing Internet utilizing V.90 modems installed with individual personal computers. Similar to the "Extension Phone" situation in voice service, this configuration is fine, as long as there is only one user who wishes to access Internet at any given moment. Otherwise, for many small offices and homes, where multiple computers are installed with multiple users, the contention among modems would render the communication useless. Also, incoming data calls would have a hard time to find the destination computer.

Avinta's Data Networking, (Figure 2.4), utilizing the phone line based transmission technology HomePNA, provides a coordinated Internet access protocol among the networked PCs. One PC is designated as the Gateway. When it is active, all Internet access from any PC is funneled through this computer. When it is turned off, other PCs will utilize their respective built-in modems to access the Internet.

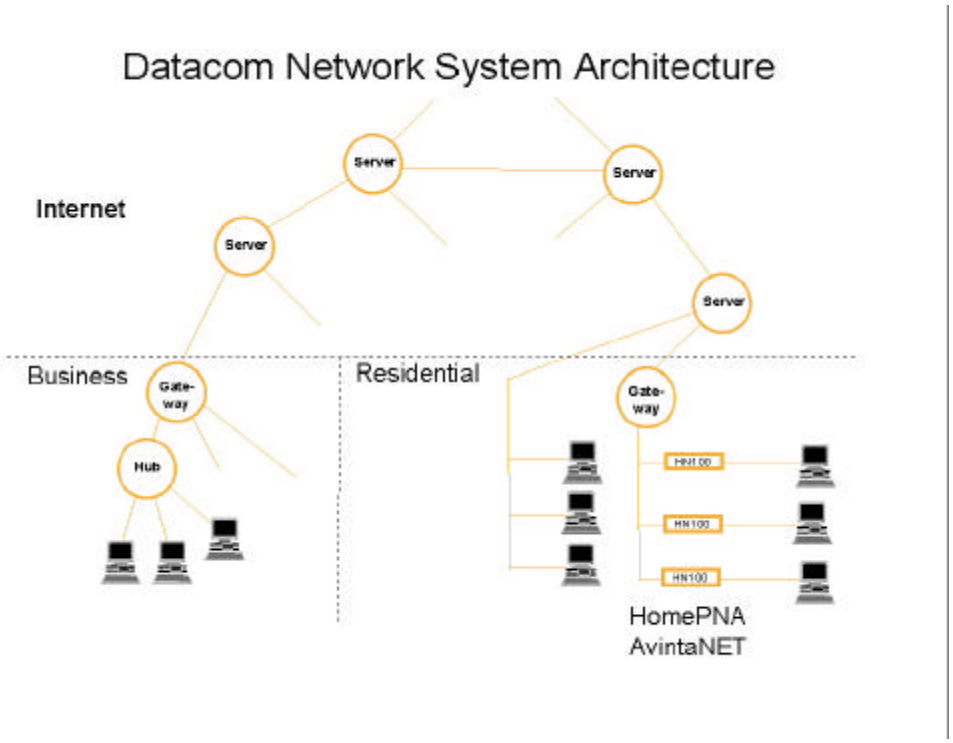

Figure 2. 4

2.4 Avinta Technology for Voice and Data Convergence

By examining Figures 2.2, & 2.4, it is apparent that dPABX and HomePNA networks possess identical interconnect architecture (peer-to-peer) as well as sharing the same physical medium (single pair of telephone wires). It is then logical to attempt combining the two into one integrated system.

Avinta's pending patents deal with the details of implementing this goal of Telephony Computer Integration (TCI), as shown in Figure 2.5. That is, it utilizes the patented dPABX technology as the system configuration reference. Since dPABX is based on Plain Old Telephone Set (POTS), user interface has been time tested. The data networking is treated as an add-on application, which will be installed only at where it is needed.

Note that the Gateway device that converts signals between xDSL and HomePNA would be physically collocated within the traditional Telephone Network Interface Device which currently encloses lightning protection and loop continuity test modules.

In comparison, the commonly known Computer Telephony Integration (CTI) (Figure 2.6) assumes that a station has been networked first with data processing equipment. Telecom service is provided as an application. Since human communication begins with voice telecom which has over one hundred years of reliable operational experience, Avinta's TCI approach serves human needs much more naturally. Furthermore, TCI technology keeps

data processing equipment, which is the most complicated and the least reliable module in a networked voice and data communication system, as the last and optional equipment for a work station.

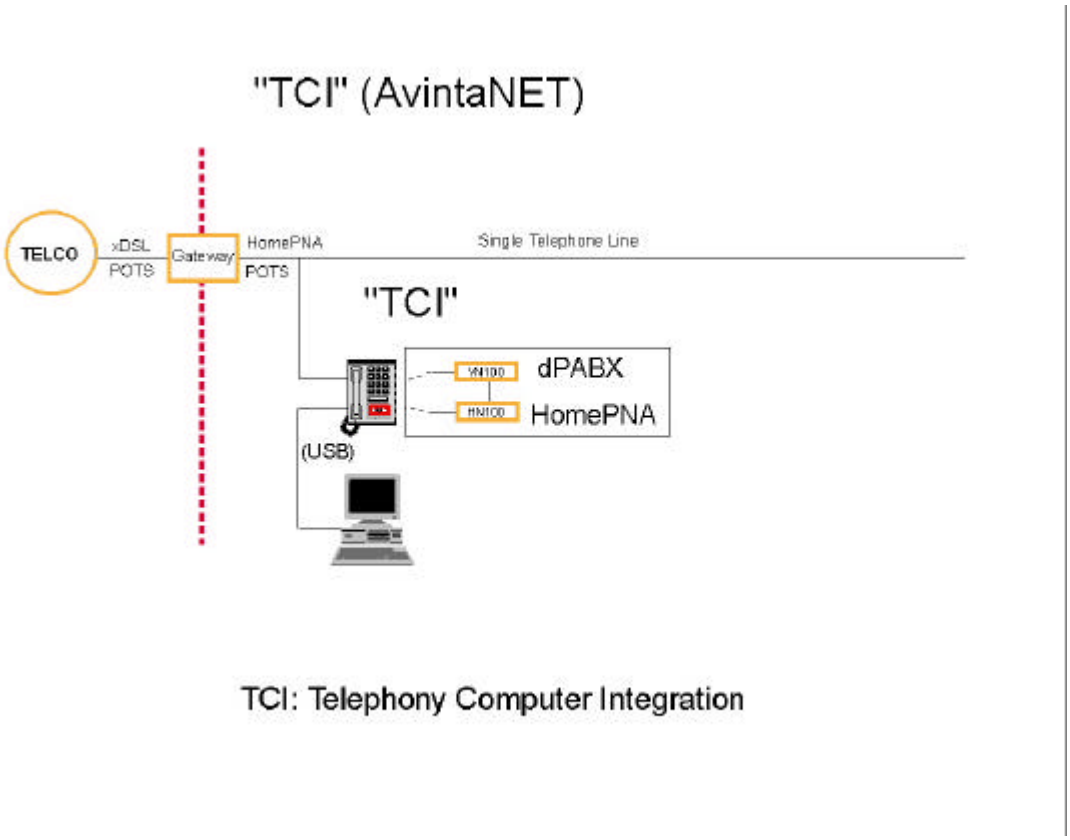

Figure 2. 5

Once TCI is accomplished, the voice channels that may be carried in the broadband data stream can be utilized as additional virtual phone lines. Therefore, a N (lines) by M (stations) dPABX can be realized on a single pair of phone wires without being restricted by physical wiring architecture, where “N” is limited by the number of voice channels available through broadband data transmission, “M” is determined by how many station instruments that are allowed on one single pair of phone wires considering the loading effects.

2.5 Unique Features of AvintaNET TCI Architecture

While normal operation of an integrated voice and data network based on either TCI or CTI approach may appear to be very much the same, there are notable advantages that TCI offers to SOHO market where installation and maintenance are to be avoided whenever possible:

A. TCI technology utilizes POTS as the basis of networking to satisfy the first requirement of human communication which is by voice. Until voice communication is established, other forms of communication with advanced technology and broad bandwidth transmission facilities are difficult to deploy. For example, in corporate environment, coordination required to set up and to maintain a computer network is normally supported by the pre-existing PBX.

B. By starting the networking based on dPABX technology, the setup procedures are simple and intuitive. This allows consumers with limited knowledge of modern technology to handle TCI components like everyday small appliances.

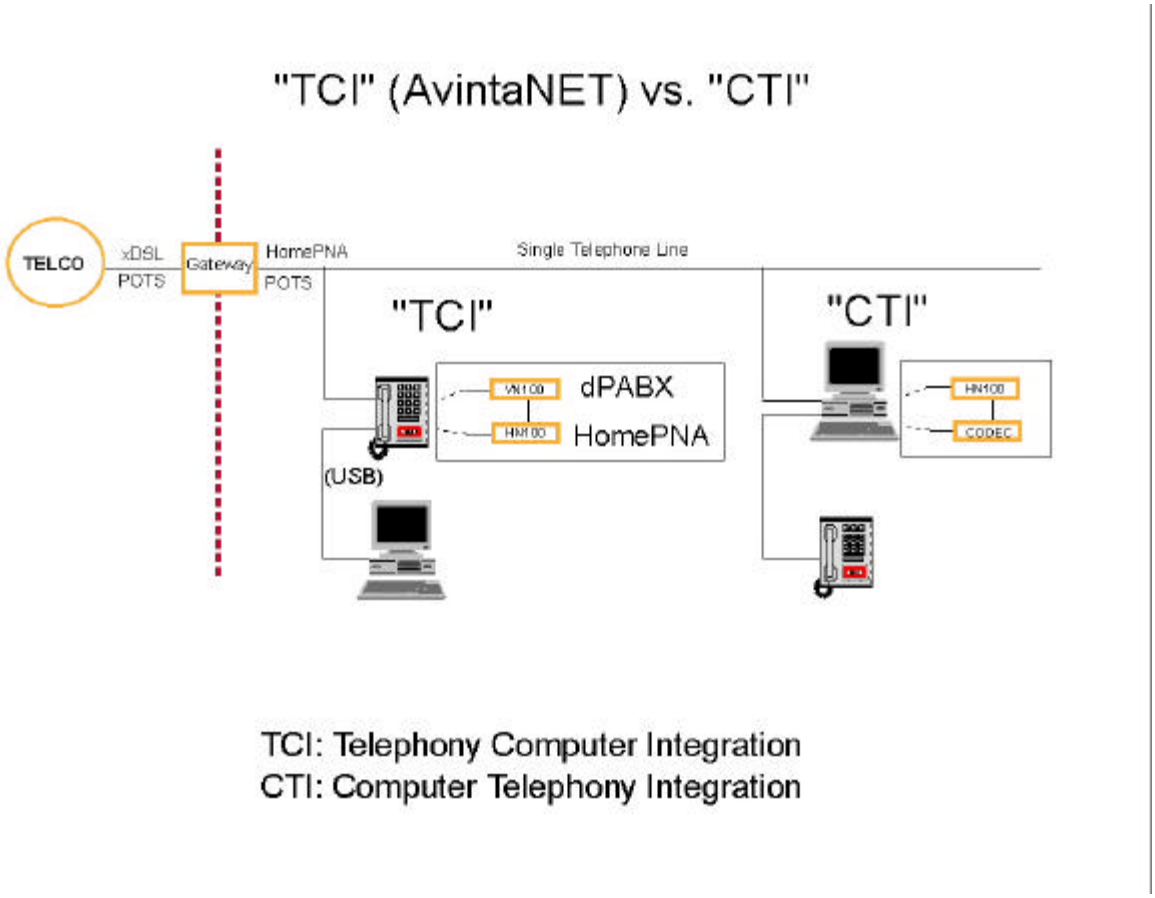

Figure 2. 6

C. The TCI concept networks voice and data by utilizing dPABX and HomePNA technologies. Then, the service is verified by applications in voice communication. The complexity and the unreliability of PC are thus avoided.

D. With a peer-to-peer modular unit construction, reassigning a node to take over another node's function is straightforward. This allows the temporary substitution of a malfunctioning station by a less important one, thus significantly de-emphasizes the urgency of maintenance and repair. In most cases, replacement unit can be purchased from a nearby retail store. With "AvintaNET Built-In" convention become popular (See Section 3.), the replacement unit even does not need be the same model or from the same manufacturer. The failed unit can be scheduled for repair without impacting the ongoing business.

E. An ultimate simple network diagnostic procedure is implemented – If you have a dial tone, you a have a physical connection! Sources of operation difficulty would most likely be in one of the modules.

F. Since all modules are identical, as long as there are one or more modules that are communicating properly, the troubleshooting can be focused on the non-functional module.

G. If voice functions are normal, the attention can be narrowed to the external, added-on data processing equipment.

2.6 Implication of AvintaNET to the Communication Infrastructure

As shown in Figure 2.7:

A. The Wide Area Network (WAN) operations are handled by professional teams. This is true for both the traditional PSTN and the contemporary Internet.

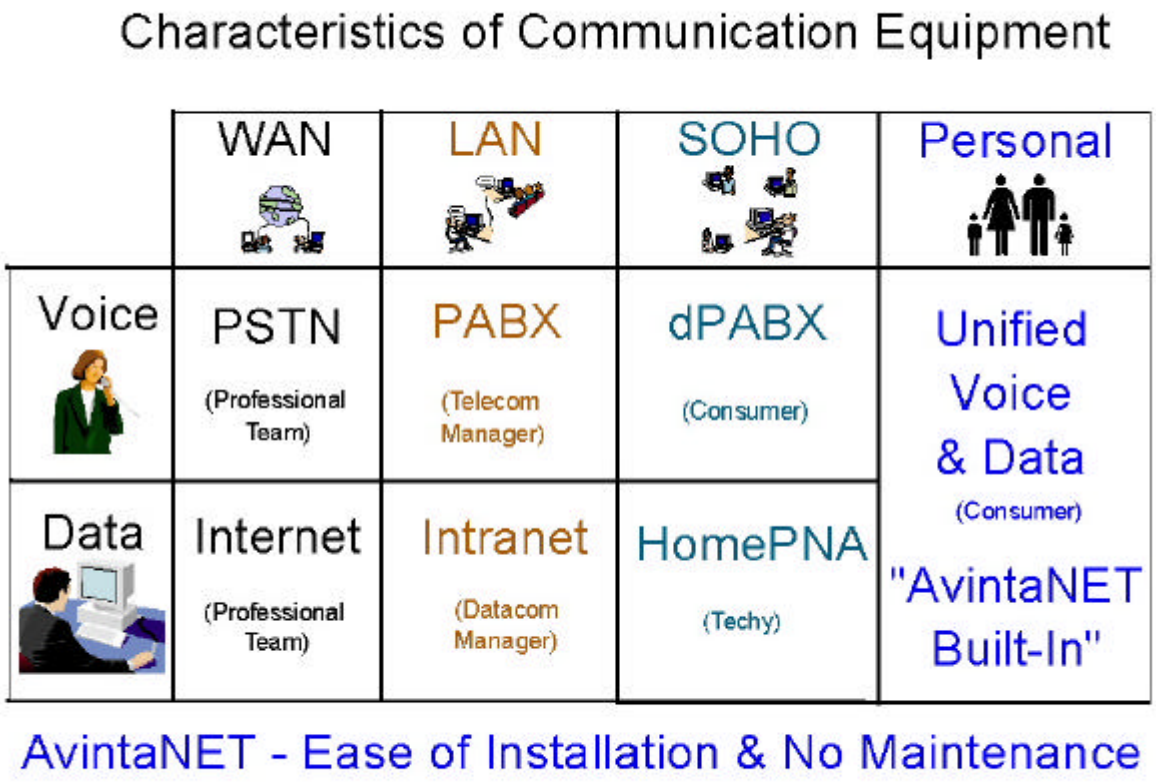

Figure 2.7

B. In business Local Area Network (LAN), Telecom manager is required to maintain the PABX while Datacom manager is in high demand to keep corporate Intranet functioning.

C. In SOHO arena, Avinta's dPABX has put the consumer in charge of the voice networking, while the HomePNA products are still at a stage requiring knowledgeable owner/user.

D. The "AvintaNET Built-In" concept is to unify voice and data networking based on the philosophy of dPABX technology, so that a "Personal" networking becomes reality.

E. With the potential to expand to larger system configurations, AvintaNET will then serve the SOHO market. Eventually, AvintaNET technology could be scaled upward to serve part of LAN market.

2.7 Role of AvintaNET with Respect to the Overall Communication Architecture

Figure 2.8 presents Avinta's general product plan:

A. The first phase of deployment is to implement AvintaNET utilizing dPABX & HomePNA for LAN and PSTN & xDSL for WAN to provide the full range of communication services.

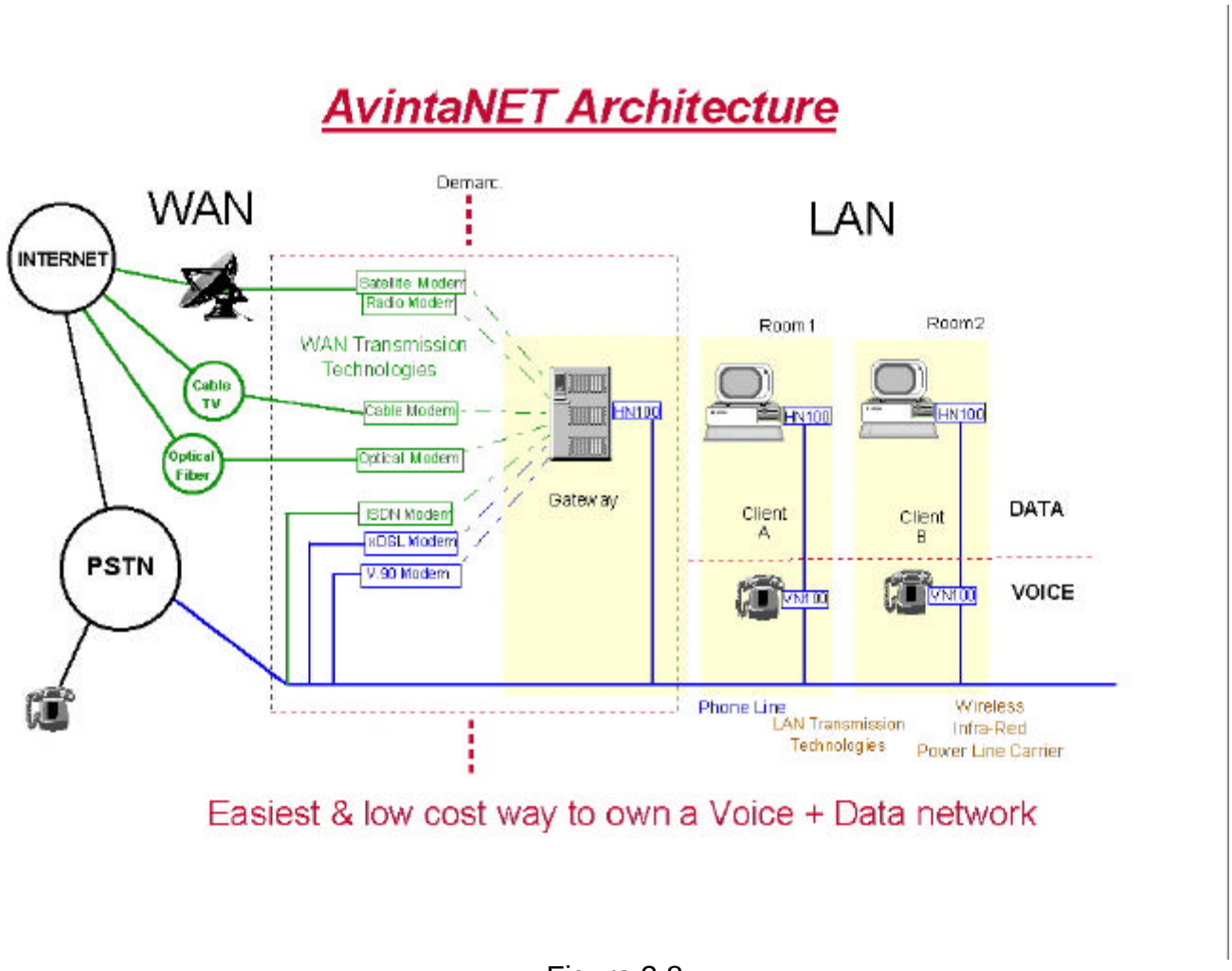

Figure 2.8

B. The second phase is to interface with other broadband WAN Transmission Technologies, such as ISDN, Cable, Optical Fiber, Radio, Satellite, etc. which are

currently interfaced to Ethernet, but direct transition to HomePNA is quickly becoming popular. This allows utilizing any available WAN service which may be varying geographically.

C. The third phase is to inter-work with other LAN Transmission Technologies, such as Wireless, Infra-Red, Power Line Carrier, etc. so that AvintaNET can be customized for unique applications.

Figure 2.9 is a pictorial view of the AvintaNET in a customer premise with devices of various technologies inter-operating together.

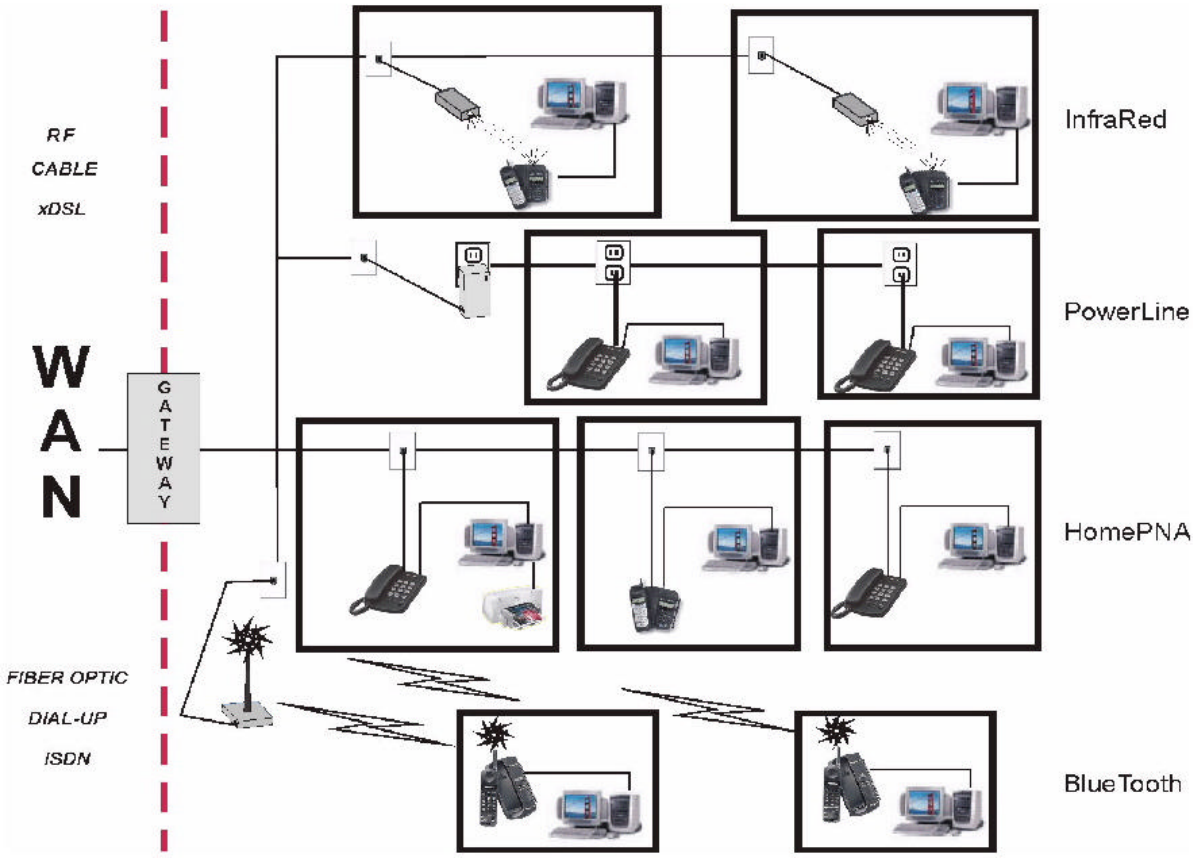

Figure 2.9

3.0 Avinta's Unique Approach to Deploying AvintaNET

AvintaNET technology based on dPABX solves the dilemma of providing voice and data networking to SOHO market which is quite different from the enterprise environment. Simplicity is the first criterion for SOHO customers. This applies to all aspects of

installation, operation and maintenance. Equipment designed for SOHO would be significantly different in system configuration and feature content as compared to those for enterprise, although operation procedure for the same function should be very similar.

The natural deployment vehicle for SOHO is the traditional telephone station instruments. They have been accepted in our daily life. Their physical size has been optimized for human handling, while the interior has become quite empty due to the continued miniaturization of electronics. The addition of AvintaNET electronics could be realized without affecting their external appearance. This allows the user to simply plug a familiar looking telephone instrument into the telephone line and to begin enjoying the benefit of both voice and data networking.

By enhancing the basic analog POTS to serve PABX functions (or, be voice networked), customer acceptance is assured. Next, the implementation of data networking based on already networked voice instrument wherever it is needed, minimizes customer's anxiety. Furthermore, utilizing voice channels in broadband data stream to expand voice services provides a smooth expansion of the system capability which is practically transparent to end users.

When this technology is deployed with a premise telephone unit, it replaces the computer's position as the focal point of network connection. This creates a much less intimidating product to satisfy the user's data and voice network needs.

Contrary to products in the Computer and Telephone Integration (CTI) market, that emphasize the capabilities of computers, AvintaNET design concept uses a unique approach by focusing on the implementation of intelligent components into the POTS to achieve TCI (Telephony and Computer Integration). Voice communication verifies the networking (both voice and data). Then, the actual data communication can be conducted after PC or other data terminal is networked through AvintaNET.

An integral part of the deploying this technology is the use of "AvintaNET Built-In" as a logo on the retail package. This identifies the product and it's functions with the Avinta technology. This creates a "snowball" effect as each brand is approached and sold. As multiple brands using AvintaNET become evident in the market to end-users and re-sellers, buyers for additional extension phones will look for "AvintaNET Built-In".

The key to the strategy is to have different branded station instruments using AvintaNET, so that the end user can buy any brand and have multiple choices of styles, colors, and features when looking for the AvintaNET functionality. The result is establishing a "standard" for Voice and Data Networking built into the telephone instruments.

AvintaNET concept is intended to improve the interoperatability among products and the acceptance by customers:

A. Telephone manufacturers can benefit from this approach because AvintaNET revitalizes the POTS.

B. In the SOHO arena, AvintaNET approach helps to reduce the technical know-how requirements on the customers who are both installers, end users and service crew.

C. Because the ease of the above two applications, WAN service providers can take advantage of AvintaNET technology for delivering broadband digital information stream into customer premise.

4.0 Avinta's Long Term Vision

Avinta has developed a unique technology as the provider of voice and data networking products based within the POTS. In the meantime, Avinta seeks to establish its core technology AvintaNET as a basic building block in POTS with all other communication transmission technologies, such as Radio Frequency (RF), Infra Red (IR), Power Line Carrier (PLC), etc. Avinta’s ultimate vision is to establish our technology as a worldwide standard element in premise telephone station instruments that are compatible with all transmission technologies for multi-media applications; Voice, Data, Audio, Video, and Home Automation.