



**This document provides a response to a paper published by our competitors in regard to 100VG AnyLAN. The paper entitled “Ethernet vs Ethernot” is being widely distributed by our competitors.**

**This paper serves to clear up any confusion in regard to the 100VG AnyLAN technology**

**To read this :**

**The text in normal font is from the “Ethernet vs. Ethernot” paper.**

***The text in italics and shaded is the HP response.***

## Introduction

Network managers have a number of choices in "fast" LAN technologies, FDDI, ATM, Fast Ethernet, 100VG AnyLAN and other emerging technologies present customers with choices as well as confusion. In many cases they are competitive. The purpose of this document is to clear up confusion between 100Base-T and 100VG-AnyLAN.

*There are a number of choices in "fast" LAN technologies. Considerations such as cost, standards, availability of solutions, protection of existing investment and simplicity will be the driving factors for users' choice. In most cases technologies are complementary. The confusion on competing technologies will be cleared up with some facts in this paper*

## Ethernet: The Next Generation

10Mbps Ethernet is clearly underpowered for some emerging applications. Powerful new PCs and "super server" technologies are easily capable of filling a 10Mbps network. In more and more companies, the network is becoming a bottleneck.

*10Mbps Ethernet is clearly underpowered for some emerging applications.*

*Many of today's applications are already requiring more bandwidth such as CAD and Client-Server applications. Multimedia and video based applications are clearly the emerging technologies that have the need for more bandwidth.*

*The two main reasons why the network is becoming a bottleneck are a) the available bandwidth (10mbit/s) and b) the underlying technology for 10mbit/s LANs.*

*An access method based on CSMA/CD (ie carrier sense multiple access with collision detection) is a major contributing factor to the network itself becoming the bottleneck. It is understood by network managers, that 10Mbps networks can be used upto approximately 30-40% utilisation within a given segment. Higher utilisation within a segment can cause performance degradation.*

*Higher throughput rates are uncommon because of the limitations of CSMA/CD. Switching is a means to overcome this limitation by dedicating "pipes" (ie; 10Mbps) to highly saturated segments or network devices such as a server. Although switching helps to remove bottlenecks, it still provides a maximum of 10Mbit/s and 20Mbit/s in full duplex mode.*

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*Most applications cannot address full-duplex modes and new emerging applications are still limited by 10 Mbit/s.*

*Under special conditions, 10Mbps CSMA/CD networks can achieve 60-70% utilization, but performance for many users and applications is unacceptable. Again this is due to the overhead caused from collisions in a CSMA/CD network!*

This document will prove that 100Base-T is the only reasonable alternative for Ethernet environments that need a performance boost.

*100BaseT is not the only reasonable alternative. In fact, it is an alternative that has limitations that 10BaseT does not have. These limitations will be discussed in detail in this paper.*

### Fast Ethernet versus 100VG AnyLAN

*100VG AnyLAN is Fast Ethernet and Fast Token Ring.*

The 100Base-T proposal is being standardised by the 802.3 committee. This proposal retains the same frame format and MAC protocol that is used in 10Mbps Ethernet but runs at 100Mbps. The same committee that standardised 10Base-T, 10Base2, 10Base-F and other popular media types including fiber, UTP cat5 and 3 and STP. Proven signalling methods such as the ANSI FDDI PHY will be leveraged.

*The 100Base-T proposal is being standardised by the 802.3u committee because it only provides support for Ethernet frames. The 100VG AnyLAN standard being standardised in IEEE802.12 is in a new committee to provide a natural evolution for Ethernet networks and Token Ring networks. 100VG AnyLAN provides support for both Ethernet and Token Ring frames.*

*In further submissions to the IEEE802.12, standards are also being developed to allow the transmission of ATM packets over a 100VG AnyLAN network. It is expected that this will facilitate a painless migration for users from 100VG to the ATM world.*

*Maintaining the same committee alone does not define standardisation.*

*100Base T will support popular media types such as fiber, UTP CAT 5, CAT 3 and STP. What is not discussed, is that the ANSI FDDI PHY signalling method will only be supported with Cat 5 and fiber. A different signalling method is used to support Cat 3. In fact the two signalling methods will not interwork, as the Cat 3 signalling method (4T+) is based on*

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*four pairs. The 100Base-TX (Cat 5) solution is based on the ANSI FDDI PHY which works on two pairs. Separate adapter cards will be needed based on what cable type is being utilized.*

*No vendors to date have announced products that are cross compatible. In reviewing the 3COM press release for the new products, this is quite clear.*

*2 pair Cat 5 products.*

*The announcement shows 10/100-TX EISA and PCI adapters that are compatible with SuperStack 100Base-TX hub.*

*4 pair Cat 3 products.*

*It also shows 10/100Base-T4 adapters and a SuperStack 100Base-T4 hub.*

*Synoptics and Intel have announced products based on 100Base-TX only. The Intel adapters do not support Cat 3.*

*Will a 10/100-TX adapter work with a 100Base-T4 hub? Why is there a difference?*

*100VG AnyLAN provides a signalling method for Cat 3, Cat 4, Cat5, fiber and STP. There is only one set of products for Cat 3 and Cat 5 because the signalling is the same.*

Synoptics, along with other leading Ethernet vendors such as 3Com Corp., Cabletron Systems, Cnet, Cypress Semiconductor, DAVID Systems, Digital Equipment Corp., DuPont, Exar, Grand Junction Networks, Hughes LAN Systems, Hyundai Electronics, IMC Networks, Intel Corp., Interphase Corp., JLP Associates, LAN Media Corp., LANNET, Network, Olympic Technology Group, Packet Engines Inc., Racal Datacomm, SEEQ, SMC, Sun Microsystems, Unisys and Wellfleet is supporting the 100Base-T proposal. Synoptics is a member of the Fast Ethernet Alliance and Synoptics' own Peter Tarrant, director of connectivity and internetworking, is chairing the 100Base-T committee for the IEEE.

*100VG AnyLAN is being standardised in IEEE 802.12 and is supported by the biggest computer, communications and software companies in the world. These include HP, IBM, AT&T microelectronics, CISCO, Compaq, SMC, UB, Kalpana, NEC, Proteon, Optical Data Systems, Texas Instruments, Plaintree Systems, Newbridge Networks, Alfa Inc., Katron Technologies, N.T.T., Multimedia LANs, Racore Systems, Ragula Systems, Alantec, Starlight Networks, Thomas Conrad, Interphase Corp., Compex, D-Link, Xyplex, Novell, Microsoft and Banyan.*

*HP's Pat Thaler chairs the IEEE802.12 with IBM as deputy chair. In addition HP was a founding member of the VG Forum. The VG Forum is a vendor independent organisation*



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*who serves to disseminate information about 100VG AnyLAN, provide status report on standards activities and makes recommendations for interoperability testing.*

The competing technology, 100VG AnyLAN is being standardised in a new committee, called 802.12. This protocol is totally new. It uses a new access method called "demand priority" and it uses a new signalling called "Quartet". It also runs at 100Mbps.

*The new committee serves to standardise both Ethernet and Token Ring for 100Mbps. The protocol is new and more efficient, it removes collisions from Ethernet and the Token Handling from Token Ring. It also adds a priority scheme that ensures deterministic delivery of multimedia information. The Demand Priority protocol will provide upto 98% utilisation of the 100Mbps bandwidth in a Token Ring network and 97.3% utilization in an Ethernet network.*

*The Quartet signalling is new and provides 100Mbps over 4 pair UTP Cat 3, 4, & 5 cable.*

*Note that the signalling methodology for Cat 3 100Base-T4 is new.*

100VG AnyLAN is touted as unique with respect to 100BaseT for three reasons: 1) Operation over voice-grade (cat 3) cable. 2) Support for multimedia applications and 3) Ability to accommodate Ethernet and Token Ring frames. Only #3 is true. 100 Base-T has a section for cat 3 cable and supports multimedia applications as well.

*100VG AnyLAN is unique with respect to 100BaseT.*

*1. It provides seamless integration of signalling standards for Cat 3, Cat 4, Cat5. The section in the standard for cat 3 is the same one as that for cat 5. In 100Base-T signalling for cat 3 and cat 5 are different.*

*2. 100VG supports multimedia by providing deterministic latency in a shared or switched 100VG AnyLAN network. By design, demand priority protocol is simple, efficient and removes collision management to provide deterministic latency.*

*Similar to 10BaseT today, providing deterministic latency with collisions in a 100BaseT shared environment will be difficult.*

*The approaches discussed to support multimedia in a "collision based" 100Mbit/s network, are to add buffers to devices (NICs and Hubs) or to provide dedicated switched ports. Both these approaches will add significant cost*

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***3. 100VG AnyLAN supports Ethernet and Token Ring.***

The 100VG AnyLAN alliance includes HP, AT&T microelectronics, IBM, Ungermann Bass and a few other vendors, but only HP has released detailed product plans. Whereas with fast Ethernet, 100Base T, many, many vendors have disclosed product plans and will be delivering products this year, if not already.

*Over 25 vendors demonstrated product interoperability at Interop. Products and plans from vendors such as HP, Cisco, AT&T, Kalpana, Compaq, Newbridge Networks, Proteon, NEC, D-Link, Texas Instruments, Starlight Networks and Multimedi Labs have been announced.*

*The VG Forum based in California provides interoperability testing, standards information and product dissemination for the industry.*

*HP has been delivering since November 94. HP has customers in Australia who have chosen AdvanceStack 100VG products, due to the technology superiority and are enthusiastically running their business on these products. Products are available in volume now.*

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**100Base-T**

**100VG AnyLAN**

<b>Standards Committee</b>	<b>IEEE802.3</b>	<b>IEEE 802.12</b>
<b>Vendor Support</b>	SynOptics, Cabletron, 3Com, SMC, Intel, National, Sun, DEC, Grand Junction + many others.	HP, AT&T Microelectronics, Ungermann Bass
<b>Speed/Type</b>	100Mbps Switched and Shared.	100Mbps Shared
<b>Switch Availability</b>	NOW	1995
<b>Frame Support</b>	Ethernet	802LLC - Ethernet and Token Ring
<b>Access Method</b>	CSMA/CD	Demand Priority two levels of priority - new access method
<b>Full Duplex Support</b>	Yes	No
<b>Media Support</b>	UTP Cat3,5, MM Fiber, STP	UTP Cat3,5, MM Fiber, STP
<b>Stability</b>	Proven protocol.	Totally new protocols.
<b>Recommended Applications</b>	Client/Server workgroups with switches, backbones. protocol.	Cost effective client/server workgroups using shared or switched 100VG solutions. Multimedia applications. Backbone solutions.



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	<b>100Base-T</b>	<b>100VG AnyLAN</b>
<b>Standards Committee</b>	IEEE802.3u	IEEE 802.12
<b>Vendor Support</b>	SynOptics, Cabletron, 3Com, SMC, Intel, National, Sun, DEC, Grand Junction + many others.	HP, AT&T, IBM, CISCO, Compaq, Cisco, SMC, UB, Kalpana, Newbridge Networks, Proteon, Texas Instruments, Novell, + many others.
<b>Speed/Type</b>	100Mbps Switched and Shared.	100Mbps Shared and Switched.
<b>Switch Availability</b>	NOW When are the shared products available ?	1995
<b>Frame Support</b>	Ethernet	Ethernet and Token Ring Support for ATM packets is being developed.
<b>Access Method</b>	CSMA/CD (based on collision management)	Demand Priority (No collisions, two levels of priority, deterministic latency.)
<b>Full Duplex Support</b>	Yes (How will applications use full duplex ?)	Half Duplex
<b>Media Support</b>	UTP Cat3,5, MM Fiber, STP	UTP Cat3,5, MM Fiber, STP Higher speeds than 100Mbit/s for Fiber are being developed.
<b>Stability</b>	Proven protocol.	Proven in customer environments.
<b>Recommended Applications</b>	Client/Server workgroups with switches, backbones. protocol.	Cost effective client/server workgroups using shared or switched 100VG solutions. Multimedia applications. Backbone solutions.

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**Other considerations.**

	<b>100Base-T</b>	<b>100VG AnyLAN</b>	<b>10Base-T</b>
<b>Cascading</b>	<b>NO.</b>	<b>YES (Same as 10Base-</b>	<b>YES</b>
<b>Topology (Network Diameter)</b>	<b>Limited to less than 10Base-T 210metres</b>	<b>More than 10Base-T</b>	
<b>Cable distances</b>	<b>Hub to Hub distance is 10 metres.</b>	<b>Hub to Hub with full cascading upto 200metres.</b>	<b>Hub to Hub with cascading upto 100metres with UTP.</b>
<b>Signalling Methods</b>	<b>ANSI FDDI PHY for Cat 5 4T+ for Cat 3</b>	<b>Quartet Signalling for Cat 3,4,5</b>	<b>Manchester Encoding</b>
<b>Utilisation</b>	<b>40%-50% typical 70-80% special conditions</b>	<b>95% as there is no overhead with collisions</b>	<b>40%-50% typical 70-80% special conditions</b>
<b>No Collisions</b>	<b>NO (collisions removed with switching)</b>	<b>YES</b>	<b>NO (collisions removed with switching)</b>
<b>Priorities</b>	<b>NO</b>	<b>YES</b>	<b>NO</b>
<b>Token Ring Support</b>		<b>YES</b>	
<b>Private Mode Security</b>	<b>NO</b>	<b>YES (part of the protocol)</b>	<b>NO (available with specialised hardware)</b>
<b>Software Drivers for 10Mbps and 100Mbps on cards.</b>	<b>? (Depends on implementation)</b>	<b>YES (today)</b>	<b>n/a</b>



## Objections to Fast Ethernet

**Objection:** Fast Ethernet is unproven.

**Response:** 100Base-T is being standardised by the 802.3 committee within IEEE - the same committee that standardised 10Base-T, 10Base2, 10Base5, and AUI. 100BaseT is little more than 10Base-T Ethernet 10 times faster. There are a few tricks to operate at higher speeds over different cables, but the task force is wisely combining proven approaches to create the signalling specifications. For instance, 100Mbps over cat 5 uses proven FDDI signalling. The MAC layers has been around for well over a decade. There's no question about it, 100BaseT will work.

*Maintaining the same committee alone does not define standardisation. The few tricks that are being combined are two different signalling methodologies, one for cat 3 cable and a different one for cat 5 cable. The cat 3 signalling methodology is new. How will the two signalling methodologies inter-operate ?*

*100Mbps over category 5 UTP uses proven FDDI signalling.*

*What signalling does category 3 UTP use ? Is it the same ?*

**Objection:** Ethernet products are not widely available.

**Response:** There are a few products available today, but within just a few months, there will be a flood of 100BaseT products on the market - including hubs, repeaters, bridges, routers, adapter cards, transceivers, custom integrated circuits and a variety of other components.

*There are a few products available today. Lan Magazine in Oct 1994 suggests of the Synoptics products " Originally scheduled for a December or January release, they may not be seen until the middle of next year".*

*HP is delivering 100VG adapters and cards now and customers have already implemented in a number of sites in Australia.*

**Objection:** Fast Ethernet Interoperability is unproven.

**Response:** Because 100BaseT is using known protocols interoperability will be straight forward. The Fast Ethernet alliance (see long list of member companies above) is already using a large state of the art interoperability testing lab in Santa Clara, CA. called the Technology Research Interoperability Lab. (TRIL). This lab has a proven history of verifying interoperability for 16Mbps Token Ring products. The Fast Ethernet Alliance demonstrated interoperability between 10 different vendors at Interop in May 1994.

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100VG technology is proven. The products are available now and multi-vendor interoperability is being verified by the VG Forum. Many vendors have demonstrated interoperability at Interop.

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**Objection:** Ethernet switching cannot support multimedia.

**Response:** Multimedia applications require deterministic latency. The applications must expect packets to arrive at regular intervals of time with little variance. This is even more important than super high bandwidth, although reasonable bandwidth is required. Ethernet's CSMA/CD protocol upsets this model because a collision or a busy line can unexpectedly delay traffic. However, Ethernet switches establish dedicated connections between stations reducing or eliminating (in properly designed networks) the possibility for collisions or delays.

*It is true that Ethernet's CSMA/CD protocol upsets the model for deterministic latency because a collision or a busy line can unexpectedly delay traffic. Switching will remove collisions in properly designed networks. Switching to every multimedia workstation adds cost.*

*100VG AnyLAN does not require switching to be deterministic. It provides deterministic latency (no collisions) with shared or switched implementations.*

**Objection:** 100Base-T does not prioritize traffic.

**Response:** Traffic prioritisation has little value in switched LANs (Synoptics' approach to fast Ethernet). If the network is properly designed with dedicated pipes to user stations and "big pipes" to servers each station would get maximum quality of service all the time. Traffic prioritisation would have little value in this case.

*Priorities are important in a shared 100Mbit/s network. Priorities avoid the need to burden each user with the cost of a 100Mbit/s switched port. A switched connection to every user will be clearly more expensive than a shared 100Mbps.*

*100VG AnyLAN can be shared and switched, products will be available to provide switched "big pipes" to servers. To provide high speed to the desktop, quality of service for clients and servers, 100VG does not insist on the use of switching.*

**Objection:** 100Base-T is too expensive.

**Response:** 100 Base-T is more expensive than 10Base-T. However, 100 Base-T delivers 10 times the performance of 10Base-T at about 2-3 times the connection price (including the

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adapter card). From a price/performance standpoint, 100Base-T, especially Synoptics' switched 10/100 product, is ver attractive.

*The HP AdvanceStack Hub 15 provides 15 x 100Mbit/s connections at \$5465. The 10/100 Selectable ISA Card is priced at \$410 and the 10/100 Selectable EISA Card is priced at \$626.*

*The Synoptics 28000 switch with 2 x 100Mbit/s does not sell for less than \$10,000. Compare the pricing.*