Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matters of	)	
	)	
Deployment of Wireline Services Offering Advanced Telecommunications Capability	)	CC Docket No. 98-147
	)	
and	)	
	)	
Implementation of the Local Competition Provisions of the Telecommunications Act of 1996	)	CC Docket No. 96-98

COMMENTS OF TACHION NETWORKS, INC.

Tachion Networks, Inc., is a privately held designer and manufacturer of central office systems focused in significant part on the CLEC marketplace and is a small entity for purposes of the Regulatory Flexibility Act.

In its Second Further Notice of Propose Rulemaking in Docket 98-147 and Fifth Further Notice of Propose Rulemaking in Docket 96-98 (the "Notice"), the Commission, *inter alia*, has asked manufacturers to

> "describe their telecommunications equipment offerings that are intended to be used for interconnection or access to unbundled network elements, the various features, functions, and capabilities of such equipment, and any advantages of including these features, functions, and capabilities in collocated equipment. We seek comment on whether or the extent to which we should consider whether it might be more efficient for manufacturers to design equipment with functions in addition to those needed for interconnection and access to unbundled network elements."

TECHNOLOGY IS DRIVING TOWARDS MORE FULLY INTEGRATED FUNCTIONALITY AND CARRIERS WILL NEED THE ABILITY TO COLLOCATE AND FULLY UTILIZE THOSE DEVICES TO EFFECTIVELY COMPETE

Tachion is one of a number of companies working to develop the most efficient and effective telecommunications equipment for the competitive carrier marketplace. Tachion's innovative product design takes advantage of advances in integration and processing capabilities, as well as a new, nontraditional approach to switch architecture, to combine a wide range of functionality previously requiring numerous pieces of interconnected equipment into a single fully integrated chassis. A single Tachion Fusion 5000™ switch combines switching, routing, transport, digital access cross connect system ("DACS"), signaling, and service creation functionality in a single standard central office rack.[1] This set of functionality, does not come from combining separate devices in a single chassis, but rather comprises a fully integrated design, from the ground up. Within the Fusion 5000 a single board (typically duplicated in each chassis to provide complete redundancy and network reliability), called a switching and processing module ("SPM"), performs call processing, switching, signaling, network management, clocking and network access and trunking and includes ATM and TDM switching fabrics, integrated processors for call processing and service execution, and trunking interfaces to unbundled network elements. The SPM is tightly integrated with a number of service access modules ("SAM"), boards which provide multiple port and service interfaces at

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[1] A marketing data sheet that describes the features anticipated to be included in Fusion 5000 is contained in Attachment A. A next generation "collapsed central office" includes a Fusion 5000, a DSLAM, a router, and servers for applications like email and content distribution in one seven foot rack.

speeds varying from DS1 to OC3. The SAMs in turn interconnect with DSLAMs, multiplexers and customer premises equipment. A next generation soft switch architecture is implemented via a distributed call processing architecture on the SAMs and SPMs.[2] The enormous cost and space benefits of this fully integrated design will help CLECs and other carriers to roll out service rapidly to new cities and to minimize their costs for equipment, real estate , including collocation space, and for environmental requirements. These benefits are especially important in a collocation setting, where space is at a premium, where costs are likely to be high to the CLEC and where acquiring space is almost always costly and time consuming. The efficiencies of combining these multiple functions are not limited to manufacturing and development and are not limited to initial cost and space requirements. The integration of various functionality into a single product reduces maintenance and upgrade expense. Software upgrades and changes do not require complex regression testing of a multiplicity of standalone products, with the concomitant costs and risks. The complete integration of these broad sets of functionality provide CLECs with the opportunity to rapidly and inexpensively deploy service and customize service for their customers, and thereby enhances competition and benefits consumers.

The integrated functionality of a Fusion 5000 reduces the ongoing operational expenses of a traditional central office. Tachion's preliminary estimates of the ongoing operational savings of deploying a Fusion 5000 collapsed central office indicate it can provide a 10:1 benefit over traditional solutions when deployed in a collocation space.

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[2] Attachment B provides a typical call scenario, showing how a Fusion 5000 utilizes unbundled network elements to process a call.

Although some CLECs will use next generation switches in either their own central office space or in carrier hotels, in all cases it is necessary for the collapsed central office to have access to unbundled network elements for currently planned applications such as Bundled Broadband Services, POTS, Centrex or Unified Messaging, as well as for future services that will be deployed in the service creation environment. Attachment C describes how a Fusion 5000 utilizes unbundled network elements to provide broadband bundled services.

THE REVISED RULES SHOULD PERMIT LIBERAL COLLOCATION AND NOT LIMIT SHOULD USE OF ANY INSTALLED FUNCTIONALITY

In the Notice, the Commission further asks:

> "...in particular, whether section 251(c)(6) permits us to require that an incumbent LEC allow the collocation of such multi-functional equipment even though aspects of that equipment are not, as the statute mandates, necessary for interconnection or access to unbundled network elements."

Tachion believes firmly that ILECs should be required to collocate multi-functional equipment to promote technological innovation by all carriers. Artificially "dis-integrating" technology or forcing new carriers to not use available functionality in collocated products would create an enormous barrier to competition by CLECs. Any artificial constraint on technology will inevitably result in higher prices to consumers and be contrary to Congress's express goal of fostering competition to promote more efficient, cheaper, and better phone service. See H.R. Rep. No. 104-204 at 89 (1995).

It is Tachion's belief that the order of the Court of Appeals does not necessitate the Commission's dramatically altering its original proposed rules. Rather, it is

consistent with the mandate of the Court of Appeals in *GTE Service Corp. v. FCC*, 205 F.3d 416 (D.C. Cir. 2000) for the Commission to promulgate rules which enable competitive carriers to require collocation except in those cases where the benefit of collocation would be limited to minor cost savings. Moreover, it is plain that equipment should be deemed "necessary" for interconnection to the network and access to unbundled network elements in any case where the CLEC would otherwise incur the costs of avoidable backhaul, because in such instances the barrier to competition would inevitably be high.

Next generation switching equipment reverses the traditional paradigm between switching and transmission. In the old world, switching was expensive and transmission was cheap. Next generation switching equipment, like the Fusion 5000, can dramatically reduce switching costs, using highly integrated technology, and thereby reduce total costs to consumers. For CLECs to effectively compete in the broadband ecosystem they need the ability to connect to subscribers where it makes economic sense and with equipment that takes advantage of technological progress. The rules promulgated by the Commission should not permit ILECs to create a huge barrier to CLECs taking advantage of the benefits of improved technology and thereby being competitive.

The Commission has asked commenters to "suggest "limiting standard[s]" we might employ to determine which functions are "unnecessary" and, therefore, should not be permitted in collocated equipment." Notice §79. Once equipment is found to be necessary, no "limiting standard" is appropriate for the use of that equipment. In *AT&T Communications, Inc. v. Bell Atlantic-Virginia, Inc.*, 197 F.3d 663 (4th Cir. 1999), the Court addressed the issue of limiting usage for Remote Switching Modules. The logic of

that decision recognized the absurdity of permitting collocation but requiring features of the collocated equipment to be kept dark. The defendant ILEC had sought to prohibit the CLECs from using the very limited switching capability in an RSM, a perfect example of .an attempt to subvert the procompetitive purpose of collocation. The Court rejected this approach, correctly noting that "[w]hile the Act requires that the collocated equipment be "necessary" for one of the two specified purposes (interconnection or access to network elements), the equipment is not rendered 'unnecessary' because it can perform other functions such as switching." 197 F. 3d at 669. There the Court ultimately did not have to decide the issue because it could defer to the Commission's rules which were later rejected by the D.C. Circuit, but its logic is both compelling and independent of the rejected rules. Once equipment is installed, its use should not be artificially constrained, particularly as such constraint would serve no purpose but to raise a barrier to competition.

The Court of Appeals decision in *GTE Service Corp. v. FCC* was explicitly based on the decision of the United States Supreme Court in *AT&T v. Iowa Utilities Board,* 525 U.S. 366 (1999):

> "As is clear from the Court's judgment in Iowa Utilities Board, a statutory reference to "necessary" must be construed in a fashion that is consistent with the ordinary and fair meaning of the word, i.e., so as to limit "necessary" to that which is required to achieve a desired goal." 205 F.3d at 423.

However, construing the Court of Appeals order to eliminate all but minimal collocation is overreaching and beyond a fair reading of either the Court of Appeals or the Supreme Court in *AT&T v. Iowa Utilities Board.* Far from finding that the statute is

clear as written, the Supreme Court said, and the Commission well knows, "It would be gross understatement to say that the Telecommunications Act of 1996 is not a model of clarity. It is in many important respects a model of ambiguity or indeed even self-contradiction." 525 U.S. at 397.

More specifically, the Supreme Court did not say that the rules must be limited to equipment absolutely necessary for interconnection. Rather, dealing with the language of Section 251(d), it said that "the Act requires the FCC to apply *some limiting standard*, rationally related to the goals of the Act, which it has simply failed to do."(emphasis supplied). The Court further said that the statute "requires the Commission to determine on a rational basis which network elements must be made available, taking into account the objectives of the Act and giving *some* substance to the 'necessary' and 'impair'" requirements."(emphasis supplied). And after discussing the ambiguous nature of the statute, the Court noted that "Congress is well aware that the ambiguities it chooses to produce in a statute will be resolved by the implementing agency...." 525 U.S. at 397.

Thus, the Court's approach is to require the Commission to reasonably balance two divergent objectives: giving some meaning to the word "necessary" in the Communications Act while acting consistently with the stated objective of the Act to promote competition and collocation.

CONCLUSION

The final shape of these rules will have a profound effect on the ability of CLECs to collocate equipment which takes advantage of the increasing degree of integration available and which provides them with the most efficient and effective means of competing, and will also help determine whether future network architecture is

determined based on artificial competitive barriers or the most efficient and effective equipment design. For manufacturers of equipment, in turn, the final rules will not only determine the shape of the market and the viability of the players, but may well constrain their incentive to maximize the natural benefits of technological trends. The Commission should retain the maximum liberality in permitting both collocation and use of all of the features and efficiencies which advancing technology can supply.

Respectfully submitted,

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Attachment A - Broadband Services Switch Data Sheet

The Fusion 5000 switch provides the basis for a Collapsed Central Office, the building block of next generation networks. Fusion introduces time, cost and management advantages by combining elements of new and traditional Central Office networks.

Switching

Fusion features dual non-blocking ATM and TDM switch fabrics. The ATM switching fabric is 5 Gbps and can be scaled to over 100 Gbps. Traffic can be switched in native format or can be seamlessly interworked between TDM and ATM or ATM and TDM.

Routing

Fusion performs IP edge routing with support for IP-based services based on industry standard routing protocols and standards that support VPN transport such as MPLS and DiffServ. Fusion also supports PNNI routing based on ATM Forum PNNI specifications allowing internetworking with other vendors' ATM switches.

Transport

Integrated SONET VP Ring, Add-Drop Multiplexing capability (ADM) enables direct attachment to dark fiber for cost-effective regional fiber ring build-out.

Signaling

With integrated SS7/C7 ISUP and TCAP capabilities, Fusion supports the service

provider's need to enter new cities with competitive bundled service offerings. Among these are 1-800 services, Local Number Portability (LNP) services and key Centrex features. The Fusion 5000 also provides multi-frequency (MF) signaling needed to comply with E-911 and other mandates for Local Exchange Carrier status.

With the signaling interworking between SS7 and PRI, Fusion offers a cost-effective way to offload Internet traffic from the carrier's network. It also allows service providers to offer high-speed connection to customer premise-based PBXs. The platform supports ATM user signaling as specified by ATM Forum UNI 4.0 specification. Fusion also provides Frame Relay user and network interfaces as specified by Frame Relay Forum specifications FRF.1 and FRF.2.

Digital Access Cross-connect System

For added value, Fusion incorporates software-based non-blocking DACS functionality. This further reduces equipment costs and network complexity in the Central Office.

Footprint

Fusion's compact 16-slot chassis is designed for a standard 19" or 23" rack in the Central Office. This small footprint reduces Central Office real estate and environmental costs as well as costs associated with testing, configuring and maintaining multiple platforms in multiple cities.

Any Port/Any Service Scalability

The Fusion architecture lets providers assign service profiles down to the DSO levels, thereby matching capital investment to revenue growth. Tachion's channelized Service Adaptation Modules (SAMs) for T1 and T3 mean carriers can use any physical port on Fusion for their choice of voice and data services for SS7/C7 signaling (A/E/F) links. Any port, any service flexibility means carriers no longer need to forecast service-specific platforms or line cards for inventory, growth demand or sparing.

Maximum Reliability

Fusion 5000 employs a dual-star architecture. Configured for the ultimate in network and switch resiliency, two Fusion Switching & Processing Modules (SPMs) provide seamless fault-tolerance, dual processing every call. Both SPMs run "hot" so that, should the card designated as the primary fail, the other seamlessly assumes the function without service interruption. The Fusion architecture offers 1:1 resiliency for common equipment and 1:N resiliency for all line/trunk cards.

With full Stratum 3-E clocking and strict adherence to NEBS-3 standards, the Fusion 5000 is the cornerstone of next-generation networks and business models.

CLASS Features

The Fusion 5000 platform supports dozens of key business CLASS voice features including:

- Multiple NPAs/switch
- Multi-line hunt group (customer lines)
- Incoming Trunk Group hunting
- LNP and LNR
- Launch 800, LIDB etc. queries
- E911, directory assistance (411)
- 900, 976 Call; Call blocking
- Account code capture
- Toll restriction (allow 800, 555-1212, etc.)
- Multiple directory number
- DID
- DNIS and ANI Delivery
- Caller Name and Number Delivery
- Caller Name and Number blocking; per line and per call
- Caller ID
- Per line blocking, Per call blocking
- Call waiting; CID on call waiting; cancel call waiting
- Call forwarding
- 3-way calling, call conferencing
- Call transfer, disconnect on call transfer
- Call hold

Physical Design

- Size: 24" x 17.1" x 19" (HxWxD)
- Slot Capacity: 16
- Rack Capacity: 3 chassis in a 7' rack. 19"/23" EIA rack mount
- Power (Dual Feed)
- DC Power: -36 VDC to -72 VDC

Services and Protocols

ATM Forum 4.0:

ATM PVC/Soft PVC/SVC

CBR/VBR-nrt/VBR-rt/UBR QoS Support

Full OA&M Support

ATM Forum PNNI Signaling and Routing

ATM Forum Inverse Multiplexing over ATM

2-8 T1's (IMA)

TDM

- PRI, IMT
- Integrated SS7/C7
- Programmable voice compression (G.726, G.729)
- MF Signaling for E.911 and directory assistance
- Echo Cancellation
- Programmable intercepts and announcements

Frame Relay

ANSI and ITU LMI

IP

RIP, OSPF

CIDR addressing

IP QoS, DiffServ and MPLS

Dialing Plans

7/10 digit NANP

011 (international routing)

1010xxx

Directory assistance (e.g. 411)

0+

1+

Interworking

Including:

ATM UNI Q2931 to SS7

PRI ISUP signaling to SS7 . Multi-Protocol Encapsulation over AAL5 (RFC2684, formerly RFC 1483)

Classical IP and ARP over ATM (RFC 2225)

Frame Relay/ATM Network Interworking (FRF.5)

Frame Relay/ATM Service Interworking (FRF.8)

SONET ADM

Implementation compliant with GR-2837-CORE

Adding and dropping ATM traffic with traffic

policing

ATM VP level switching, grooming and management

Hybrid VP UPSR with < 50 ms automatic protection switching

Third-party Feature Support

AIN TCAP-based triggers for existing SCPs

JAIN/PARLAY-based API for new Feature Execution Environment

Network Management

JAVA based platform independent element management system

GUI and Command Line Interface

Configuration/Provisioning Management

Fault logging and reporting

Multi-level Security for access and audits

Query and reporting of current and historical performance data

Gathering and logging of billing statistics

SNMP V2

Certification

NEBS

FCC

UL

- SS7

- Feature and Service Creation

  Call for rollout/availability

Attachment B – Typical Call Flow for Bundled Broadband Services

For voice and data integration, service providers can deploy an Integrated Access Device, (IAD) at the customers premises. In the Collocation space a carrier would deploy a Fusion 5000, a DSLAM, a router and application servers in a seven foot rack. The IAD can be connected to the collocated central office via an unbundled network element T1 or a DSL loop. High speed access to the Internet would be provided by an ATM PVC (permanent virtual circuit) connection that would be provisioned over the unbundled local loop from the IAD to the DSLAM for DSL or directly to the Fusion for a T1 endpoint. The Fusion 5000 would be connected to a router. The router would be connected by an unbundled DS3 to the public Internet. The IAD converts the IP packets at the premises into ATM cells which are transmitted to the Fusion. The Fusion switches the ATM cells to an ATM port on an IP router. The router then routes the packets into the Internet. Email or content servers may be deployed locally in the central office to provide better performance for the end users.

A voice call to the PSTN is completed in the following manner. The end user goes off hook. The IAD provides dial tone to the end user and collects the dialed digits. The IAD then sends an ATM SVC call setup message to the Fusion 5000 via the unbundled T1. Alternatively, if the IAD is connected through DSL, the DSLAM multiplexes the call to the Fusion. In both cases, the Fusion accepts the ATM SVC call from the IAD. The Fusion will then issue an LNP, (local number Portability) query to the LNP data base via an SS7 connection. When the LNP query returns the Fusion will interwork the ATM

SVC call to an SS7 ISUP call setup message. It will translate the ATM cells into PSTN time slots for completion to the PSTN. The call will be completed via IMTs, (inter machine trunks).

Bandwidth is dynamically allocated by the ATM connection from the IAD and the Fusion to support high-speed access to the Internet and quality of service voice calls. The same architecture can be used to deploy to support advanced services like Centrex and unified messaging. Service creation environments between the Fusion and application servers will allow consumers to define their own services.

Attachment C

Attachment C provides the detailed signaling messages that are used to complete a bundled broadband services voice call.

Bundled Services Voice Call Flow