



Managed Internet Network Services: *Making the Case for Schools*



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The BLE Group provides strategic planning and evaluation services for technology and publishing firms, and technology planning and management services for school systems. The BLE Group produces SuperTECH NEWS, a quarterly Web-based newsletter on technology for education decision-makers. The current issue of SuperTECH NEWS (www.blegroup.com/supertechnews/may05.htm) is on networking and provides a thorough discussion of managed network services.

Executive Summary

Managed Internet Network Services: Making the Case for Schools examines the value and benefits of having one company to plan, develop, and operate broadly distributed networks for large school systems or state education agencies. Networks have become the platform for the delivery of education and the operation of management and instructional systems. Managed Internet service is a means of ensuring that networks have adequate capacity, are resistant to intruders and rarely, if ever, stop functioning. The key findings of this report are:

- Education agencies can apply for E-rate funds to provide managed Internet network services as an alternative to applying for a large number of a la carte, individual network products and services. Managed services include the life cycle for network operations from planning, to implementation, to management, and monitoring. Educational agencies can purchase a continuum of services from outsourcing one service such as content filtering to a broad bundle of services including network management, firewall services, and e-mail.
- There may be a substantial financial benefit in using a Managed Internet Service Provider (MISP) as compared with purchasing a la carte, individual network products and services. ConnectTEN, a statewide education network managed by ENA, a MISP, is compared to the costs of a non-managed a la carte E-rate supported network in the Metropolis Public Schools system (a disguised, but actual large, urban school district). The data indicates that ConnectTEN network services have historically cost only one third as much as the Metropolis Public Schools system for comparable services.
- ConnectTEN is a case study of the operation of the Tennessee statewide managed network. It exemplifies a managed service provider approach that provides "soup-to-nuts" responsibility for schools' networks and offers a range of related services. It illustrates the eight essential principles of building, fully maintaining, and consistently improving a network to deliver education, run school districts, and meet accountability requirements.
- The process of deciding to purchase MISP Services. The rationale for buying MISP services rather than operating one's own services or purchasing a large number of a la carte, individual network products and services is described. In this disguised (but actual) case study of the Happy Valley School District, the factors that school systems have taken into account in choosing to purchase MISP services include: the need for reliability and redundancy of service, the specialized knowledge of outsourcers in planning and maintaining networks, the cost and quality of personnel, and the availability of 24/7 services such as help desk and network monitoring.
- We have included a worksheet to assist decision-makers in determining the range and cost of internet services that they are currently paying for or may want, relative to the managed services that are being provided in Tennessee. Tennessee's average cost of service over the last four years is \$27.82 per student per year. Recent upgrades of many schools to 100 Mb service and expanded use of the network for statewide student management system deployment find current costs at \$36.15 per student per year to meet significant new uses of the network. This worksheet will allow decision-makers to determine both quality and cost of managed services relative to their current services as measured against the range of historical and current costs in the Tennessee model.

1.0 Introduction and Context

Networks are the new foundation of education. Network-delivered applications such as student information systems, online assessment, finance systems, and instructional portals are essential elements to the daily operation of schools. At the same time, educational processes are migrating from paper and pencil to the Internet. If a school's network is not functioning adequately, school systems do not work.

Unfortunately, networks are often insufficient to the task of supporting education, as they are under funded, inadequately planned, and improperly managed. The task of running educational networks in schools is complex, as applications sometimes conflict with each other, and traffic has to be carefully managed. The purpose of this white paper is to provide an understanding of ENA's managed network services model as a means for cost-effectively delivering high-quality managed Internet services.

The analysis will be divided into five additional sections:

Section 2 describes how E-rate services are distributed and discusses the differences between managed products and services and customer purchased a la carte products and services.

Section 3 is a case study of what factors one district considered in making the decision to use managed Internet network services.

Section 4 is a case study of ConnectTEN, the Tennessee statewide education network that is managed by ENA, a MISP.

Section 5 provides a worksheet to help you determine the cost effectiveness of using a Managed Internet Service Provider.

Section 6 is an economic comparison of Metropolis — an E-rate supported, customer purchased a la carte network services district — to Tennessee's E-rate supported managed network services. Using conservative estimates, financial analysis shows that managed services in Tennessee cost only one third as much as the same services in Metropolis.

2.0 E-rate Supported Managed Internet Service Providers (MISPs) and E-rate Supported Customer Purchased a la Carte Network Services

K-12 education is in the early stages of transforming instructional and management processes through the use of information systems. This process is similar to the one that the financial services, healthcare, and manufacturing industries underwent 20 years ago. Robust networks are the foundation for this transformation, and the key funding mechanism has been the E-rate provision of the Universal Services program.

E-rate, which is administered by the Schools and Libraries Division (SLD) of the Universal Service Administrative Company (USAC), on behalf of the Federal Communications Commission (FCC), provides financial discounts to help schools obtain affordable telecommunications and Internet access. The purpose of E-rate is to ensure that every district can provide Internet access for its students and community. Since its inception in 1996, E-rate has allocated more than \$25 billion dollars to schools to develop a telecommunications infrastructure. It is the single most important program in providing web-based services in schools.

How Schools Receive E-Rate

Internet resources and vendor-hosted applications are now a core part of curriculum in most school systems. Reliable, secure, and efficient access to these resources is essential to meeting instructional goals and objectives. The ability to monitor network activity can help your planning and provide quantitative information to support the need for growing your network. Today's classrooms and offices are dependent upon networks to meet accountability requirements, manage operations, and improve instruction. Networks and the educational applications that reside on them are able to improve both instructional and management decision-making and access to resources to enhance student achievement.

The amount of E-rate funds a school receives is determined by the percentage of students eligible for free and reduced lunches.

- The higher the percentage of students eligible for free and reduced lunch, the higher the percentage of reimbursement the school receives on eligible telecommunication expenses.
- There are two distinct categories, Priority 1 and Priority 2, of E-rate eligibility. Schools must comply with conditions to obtain the reimbursements.
 - The product or service be eligible, and
 - The product must be put to an eligible use. Software and end-user equipment are not eligible.
 - Schools must have a technology plan approved by an SLD-certified technology plan approver that demonstrates how the technology and network services will address education.

Priority 1	All schools are eligible to apply their percentage discount against the following expenses. Funded before any Priority 2 applications.
Telecommunications Services	<p>Applies to leased, tariffed, contracted, or month-to-month services used to communicate information electronically between sites.</p> <p><u>Services must be provided by an eligible provider.</u></p> <p>Typically include basic telephone service—local and long distance operational costs for voice and data lines—cell phones, and ISP bandwidth, line lease costs, and video (including distance learning transmission services).</p>
Internet Access	<p>ISP Bandwidth or “basic conduit access” costs to access the Internet. Internet access provides access to the world-wide information resource of the Internet, and includes features typically provided for adequate functionality and performance, when included as a standard component of a vendor’s Internet access service.</p> <p>Eligibility: Internet access, regardless of technology platform, is eligible for discount. Such access may include transport of digital communication using any Internet-based protocols, including encapsulation of data, video, or voice so long as this is the most cost-effective way to access the Internet. In addition, features that are not themselves eligible, such as caching and filtering, can be included if an integral component part of the service, and the inclusion of these features meets the limitations given in the Special Eligibility Condition for “Ancillary Use.”</p>

Districts who receive E-rate discounts of 80 percent or greater (actual qualifying percentage varies each year) are typically eligible for Priority 2 funding. These reimbursements are funded out of what remains after all Priority 1 funds have been allocated. Because of this prioritization, not all applications for Priority 2 funding will be honored. The most disadvantaged schools will be funded first.

Priority 2	Eligibility for high-percentage schools only.
Internal Connections	<p>In addition to priority 1, priority 2 consists of internal connections that include wiring and components (network file servers/hubs/routers/PBX wireless LAN) that expand data access within a school.</p> <p>Basic installation and maintenance costs. These can be provided by any vendor.</p> <p>NOTE: Staff and student computers are NOT eligible.</p>

Should you consider a Managed Internet Service Provider (MISP)?

- Managing all the related components that qualify for E-rate reimbursement is a daunting task. Outsourcing the responsibilities associated with your voice and data operational costs and infrastructure build-out, reduced by your particular reimbursement level, may be more cost effective than using your own staff and resources. How services are bundled may determine eligibility, especially for districts that do not qualify for Internal Connections support, and the rules governing E-rate are arcane and in a constant state of flux.

- The intertwined complexity of networks, traffic flows, application interactions, and usage demand knowledge of the constantly changing technical environment, combined with an understanding of educational customer needs.

If schools choose to manage their own networks and E-rate tasks, the following needs to be addressed:

- Negotiation and management of contracts for:
 - voice and data communication line leases
 - Internet Service Provider and bandwidth
 - operational cost of voice and cell phone services

Management of these contracts demands up-to-date and thorough technical knowledge and school systems often lack the resources and personnel to do it cost effectively for themselves.

- Hiring staff to:
 - Provide ongoing technical maintenance to infrastructure components (servers, routers, hubs, WAN cabling).
 - Manage data and budgets to complete E-rate reimbursement application forms in a timely fashion.
 - Provide Help Desk services for voice and data.
- Establishment of an inventory of replacement parts to keep systems up and running.
- Provision of ongoing staff training to keep up with the technical changes in infrastructure components.

The skills necessary for school systems to provide these functions are hard to come by and usually quite costly. It is often more cost effective for school systems to outsource rather than operate some or all of these services.

The configuration and management of the network can determine which components are eligible for reimbursement. A good MISIP can make sure that your school system can implement reliable, cost-effective networking and operational strategies that are structured to qualify for maximum reimbursement typically fully qualifying under Priority 1 E-rate funding. The alternative is doing all of the work yourself.

- **A MISIP is a one-stop shop for network management.** A good MISIP is financially stable with both strong management and technical staff (Help Desk to Field Engineers) to customize a solution to meet your specific need. Just as one financial plan doesn't meet the unique needs of every family, there is no one-size-fits-all technology solution for all school systems. **An MISIP provides a single source of accountability for the school system across a range of services from planning through implementation, management, monitoring, and maintenance.** Under certain circumstances, your entire network infrastructure dedicated to Internet Access can be eligible for E-Rate reimbursements as a service or leased service under Internet Access category or under the Telecommunications category, if it is "leased, rather than purchased."

The district has to determine that an MISIP is E-rate eligible and can work with the district to plan growth strategies that will maximize your E-rate return. A good MISIP will have engineers with the ability to manage solutions with all viable technologies such as ISDN, ATM, Frame Relay, T1, T3, DSL, Wireless, and Fiber. Additionally, a good MISIP will keep up with technology change on your behalf and offer new technologies as they become reliable and available for use.

The benefits of outsourcing to an MISP are the potential to:

- Establish a known cost for defined services over the contract period.
- Leverage expertise of focused MISP to enhance reliability of mission critical Internet Access and web-based resources.
- Flexibly utilize best of breed technology over the life of the contract rather than just the best technology available at the beginning of the contract.
- Structure service offerings to maximize eligibility of E-rate reimbursement.
- Assist with preparing E-rate applications as allowed by USAC guidelines.
- Reduce the workload and training requirements for local technology staff.
- Reduce costs associated with managing contracts and servicing your network.
- Reduce up-front cost on both hardware and operational fees and providing vendor-neutral solutions to meet growing system needs.
- Reduce ongoing maintenance fees for network components and disaster recovery.
- Reduce technology staff requirements (including salary and benefits) most of which is not E-rate eligible.
- Provide proactive, 24/7 monitoring and reporting to assist with long-term planning and network security.
- Provide multiple services to enhance value of Internet Access/IP based service including E-Mail (others if desired)
- Provide guidance on improving network by collaborating on plans that will enable scalability as your system grows.
- Assist staff in planning for migration from legacy systems to IP standards.

Managed Services are a Continuum

There is a wide continuum of services under the umbrella of E-rate managed services. Depending on district size, reimbursement eligibility level (20 percent or 90 percent), and whether it qualifies for Priority 1 or Priority 2 reimbursements, a district may choose partial outsourcing of services (e.g., network maintenance and content filtering) rather than fully managed services. School systems that have sufficient, trained technical staff may indeed manage their own networks to the extent they desire (school LAN level, district WAN level) while still taking advantage of the values of managed services. Schools using MISPs have indicated that they are able to focus their staff resources on supporting education initiatives and educators versus connectivity.

3.0 Making the Decision to Utilize Managed Internet Services

Happy Valley Independent School District (not its real name, but an actual district), comprised of 32,000 students in a metropolitan area, has a wide area network (WAN) linking 32 schools to the district office for Internet access and other connectivity. The network is crucial to HVIDS, since it is a leading user of ASP-delivered instructional and management solutions. Put simply, this medium-size school system is highly dependent on its network for management operations and instructional delivery. Given the importance of its network, Happy Valley was concerned about security, redundancy, and protection. To ensure that these issues were handled properly, Happy Valley chose a Managed Internet Service Provider (MISP) to provide Internet Access from each school location including all monitoring and maintenance of the network service as well as to assist with E-Rate and future growth needs. Using a MISP has improved network reliability and — even better — saved the district time and money by eliminating the need to hire three costly and scarce network engineers. In terms of reliability, the network has gone down only twice during the year.

Happy Valley (HVIDS) had a difficult decision to make. It had to think carefully and thoroughly about managing the network on its own, or contracting with an MISP. To begin the process, HVIDS had to answer the following two questions:

- Were its needs better met by buying services or by handling it in-house?
- Would the district get a return on its investment?

To make an educated decision, the HVIDS leaderships considered six factors: the MISP's reliability, network capacity, scalability and flexibility, network redundancy, monitoring and maintenance, and cost. Let's look at these six considerations in detail.

- **Factor 1: the MISP's reliability.** A quality MISP will have records indicating both the down time and the repair time of the networks it manages. These records should indicate that it is truly providing 24/7 support and that problems have been resolved quickly and efficiently. Reliability is one of the top concerns when selecting an MISP, as most school systems lack sufficient staff and/or expertise to successfully keep their networks up and running properly.
- **Factor 2: network capacity.** HVIDS, like many school systems who manage their own networks, was concerned that it did not have sufficient capacity to meet its users' needs. Insufficient capacity and an inability to prioritize use of their limited bandwidth had resulted in network bottlenecks, slow computer access, and the occasional network crash. The MISP provided HVIDS with a monitoring of traffic and a carefully planned increase of capacity to prevent slowdowns and crashes.
- **Factor 3: scalability and flexibility.** HVIDS had seen its usage grow at an annual rate of 50 percent. Because the users became more proficient and the district invested in more powerful applications, the demands on the network continually increased. Therefore, the district needed a growth plan that would include hardware, software, and network capacity that would meet the increasing demands of its users. An experienced MISP has the knowledge to develop and implement a scalability plan that is flexible enough to adapt to any unforeseen changes. The district saw this as a benefit for its in-house staff, which could use the time saved from doing research to instead deliver more services.

- **Factor 4: maximize uptime.** Without redundant servers, switches, and lines, the failure of one component will typically bring the whole network down. School systems often lack the resources and insight to build multiple paths and necessary services to detect and prevent this type of network failure. Because of the network's mission-critical importance, HVISD decided that it would rather have a firm to hold accountable for the network service than to handle it internally. It also determined that since MISPs work with multiple institutions, they are better able to accommodate the cost of building in redundancy and are capable of guaranteeing necessary levels of uptime for the Internet Service and not just individual service components.
- **Factor 5: monitoring and maintenance.** HVISD knew that its Internet Access service had to be monitored seven days a week, twenty-four hours a day. Monitoring is more than just watching the WAN for network problems; it also involves managing firewall protection, virus screening, and preventing or investigating possible unauthorized intrusions. Having suffered from security problems in the past, Happy Valley concluded that the MISP could better protect its students, teachers, administrators, and parents from unwanted popup windows, hackers, and identity theft.
- **Factor 6: cost.** Initially, the Happy Valley business manager thought it was way too costly to outsource the network to an MISP. However, after making a thorough analysis and looking at the total cost of ownership over time, the HVISD senior management and board concluded that managed services were more cost effective and less expensive than managing their own networks.

Essentially, Happy Valley chose to purchase managed services for **two key reasons**:

1. The district would save \$100,000 a year in personnel costs.
2. The managed service provider guaranteed that the network service would function a high percentage of the time.

4.0 Case Study: ConnectTEN, the Managed Statewide Education Network for the State of Tennessee

ConnectTEN is a statewide K-12 network in Tennessee that provides Internet access, networking infrastructure and services, and educational technology solutions to school districts and local education agencies across the state, serving over one million students, teachers, and administrators. The state first established it in 1996 because it was seeking to make sure that every school in Tennessee would have Internet connectivity making them one of the first states to establish such a network.

Since the mid-1990s, ConnectTEN has developed into a much more complex program that has implemented and enhanced school systems' network connections and provided a range of technologies; including 24/7 proactive network monitoring, management of network resources and use, content-filtering abilities, and other tools and services to Tennessee schools. ENA, a company based in Nashville, Tennessee, helped to construct the original ConnectTEN network as general contractor and in 1997, won a bid to purchase and manage the ConnectTEN statewide education network as a MISP. In late 2001, it won a five-year contract to provide ConnectTEN services until June 30, 2007.

Eight Principles. As a statewide network, ConnectTEN is a huge endeavor, one that is much larger than that of regional consortiums or local districts. Though it's larger, we're examining it as a Best Practices example for consistently enhancing its network infrastructure for today's needs and technologies. Plus, it exemplifies the 8 Principles of building, improving, and maintaining a network that will fully support educational delivery. Having a network and IT solution such as ConnectTEN creates more enterprise planning, rather than making network and technology improvements one building at a time.

MISP Model. Second, ENA is a Managed Internet Service Provider (MISP), and we look at ConnectTEN because it's a model of using an MISP as a one-stop single point-of-contact with full responsibility for the K-12 schools' network.

Having an MISP is like hiring a general contractor to build a house. It's the single service provider responsible for making all of the networks and technology work together. As such, ENA does the following:

- It leverages existing infrastructure and works with multiple telecommunication providers and other communication vendors to build and enhance the network.
- It provides technology- and vendor-neutral solutions for ConnectTEN's school districts.
- It supports school districts through assistance with the process of filing for E-rate funds, as allowable.
- It ensures that the network service is maintained and proactively detects failures in the system.
- It works with individual districts to upgrade their networks, for example, to a fiber-optic network.
- Through a long-term, services based contract, ENA is able to offer the best available technologies to ConnectTEN's customers as they need to increase their service – rather than locking customers into a specific technology.

ConnectTEN provides Internet connectivity and networks more than 250,000 computers across Tennessee's schools and local education agencies. ConnectTEN provides a robust infrastructure and backbone that has "put Tennessee way ahead of the game," according to Dr. Tim Webb, Associate Commissioner for Resources and Support Services at the Tennessee Department of Education, as it takes the next major step using technology to improve student performance. It not only enables very fast and reliable connectivity, but links together state government, schools, and universities throughout the state.

The next major step Tennessee is taking: a Statewide Student Management System (SSMS) in a Web-based environment that will seek to standardize and interconnect all reporting of student data. Previously, the state's 900,000 student data reporting has been plagued by a silo effect, with information collected in redundant ways to different departments, some 80,000 duplicate student accounts, and vendors who couldn't talk to each other.

School districts have the option to participate in the SSMS; 114 school districts (out of 136 statewide) are participating. By June 30 of this year, the state will have 74 districts live with the SSMS. As to the districts not participating, several had already made sizable investments in Student Information Systems, and they did not want to make the conversation at this point. Some of them have indicated that they will participate once the SSMS is established and successfully operating.

Funding. ConnectTEN service is funded through state, district, and E-rate funds. Concerning the SSMS, the state will offer the student-management system software and training to participating districts, but the districts must have a secure, reliable network to transmit information. Because of this, districts are upgrading and must ensure that they have networks that will allow them to transmit data quickly, reliably, and safely in a centralized, Web-based system.

In addition, ed-tech software and services are available through ENA that schools can choose to purchase through the ENA statewide consortium. This saves money because of the economies of scale and can allow smaller districts to purchase services they would otherwise not be able to afford. Some of these services are in addition to the E-Rate supported Internet Access service and are made available based on customer feedback and needs.

These ENA consortium offerings include netTrekker, an academic search engine for schools with access to online resources aligned with state standards; Atomic Learning, Web-based software training through online tutorials; Brain POP, animated educational videos for grades K-8; and Gagglesafe e-mail for students.

Here is how ConnectTEN exemplifies the important principles in creating and maintaining a network.

Reliability

The performance of network connections and applications needs to be consistently reliable so that administrators, teachers, and students can rely on them when needed. No network is 100 percent perfect, but the Tennessee network's connectivity is so reliable it has allowed the state and local districts to be able to focus efforts on other areas. And something as mission-critical as student information records has to be supported by a highly reliable network.

Another indicator: Most trouble tickets are resolved prior to the district knowing there is a problem.

Planning networks from the foundation up also requires working with a reliable vendor who's involved in the entire process and has a stake in continually looking for ways to improve the network and educational delivery. One example of this within ConnectTEN is Maury County Schools in Tennessee, which was able to upgrade from a T1 line to a fiber-optic network over the summer of 2004. After conducting an evaluation of its existing network, ENA network engineers worked with the district to implement a new, state-of-the-art network that is faster, more efficient and more reliable than its old one to meet the needs of growing Internet usage.

Capacity

Through ConnectTEN, schools can use ENA's SNAP technology that helps schools vastly increase Internet capacity and prevent network bottlenecks. This service allows the storing of commonly used Web objects at the local or regional points of presence of ENA, rather than needing to call out to more distant and possibly more congested Internet locations. Downloads can be performed in significantly smaller time periods for commonly used websites and for multiple uses of the same site – such as in a classroom lesson.

The SNAP service, as part of a total Internet Service solution, decreases total bandwidth use between the end site and the Internet, permitting more bandwidth for users summoning fresh content from the Net. Schools in Tennessee have the option to purchase this service as part of their ConnectTEN services. This is particularly important to educators who often find important sites unavailable during busy hours.

Scalability

All of the network technologies, whether T1, T3, wireless, DSL, or fiber, are designed for scalability. The ConnectTEN network, for instance, has built-in scalability to readily get T1s to all districts, and to upgrade from T1s to T3s—which carry transmission about 29 times faster than the rate of a T1— or to fiber or wireless in others.

Redundancy

As the network provider for the ConnectTEN service, ENA has a statewide network built with multiple redundancies to ensure continuous service. These redundancies include use of multiple, regional aggregation points and multiple telecommunication carriers. These features benefit the ConnectTEN customer by minimizing single points of failure either in infrastructure, location or carriers. One example: ENA's Tennessee network is broken into regional, or SuperPOPs (Point of Presence, or access points to other tier 1 Internet providers). This network currently is cross-connected to ensure load balancing of traffic and to minimize potential for outages and the system is being enhanced so that should something happen to one regional platform; network transmissions can quickly switch to another regional POP.

Interconnectivity

In many K-12 district networks, schools are connected to a central point, and then data is channeled to regional or state backbone networks or to an individual district Internet Service Provider. ConnectTEN's deployment of a managed Internet service supports the interconnection of previously separately controlled networks, thereby creating a true, reliable, end-to-end connection. A single management structure oversees all connectivity and service from the end site to the ENA managed regional aggregation points to other tier 1 Internet Access providers so that interconnectivity is supported from end to end.

Safety and Security

Network safety and security is a critical component of the ConnectTEN environment. Given that schools are very susceptible to hackers, viruses, and worms, the components of network security include strong firewall services, acceptable-use policies, an enterprise-class antivirus solution, and a mechanism for updating the operating system with critical patches and upgrades. One step beyond that is 24/7 monitoring of the network service, the layer on top.

Through ConnectTEN, ENA can manage a district's firewall services, including all hardware, software, and support, and virus screening. Tennessee's schools can consult with ENA engineers on firewall devices. The service provider also helps districts customize the firewall to a specific network configuration. The MISP constantly monitors traffic and can tell if what is going over the network is legitimate school traffic or something being generated by attacks. On a network of 1,900 sites, there are a couple of million attacks repulsed daily, according to ENA President David Pierce.



ENA pioneered the use of content filtering statewide in Tennessee. In the summer of 2004, it implemented a new content-filtering solution for the entire ConnectTEN network. It's integrated into the core of the network service and has a capacity to filter over 15,000 Web requests per second. It is an enterprise-class solution that would probably be prohibitive for many districts if they were going it alone.

School districts have local choice of what gets filtered and what doesn't, and can select from nearly 40 different categories of what they would like blocked and unblocked. Hickman County Schools, for example, uses the content-filtering service to block Web access to free e-mail and similar e-mail offerings, which prevents students from passing e-mails on servers that the school can't control. The system also employs filtering to block sites that are known spyware intruders.

Cost Efficiency

Working with a Managed Internet Service Provider for a large network has enabled schools to take advantage of economies of scale, regardless of what type of Internet connectivity is used (wireless, fiber, etc.)

While ConnectTEN is state-funded, districts have the ability to purchase additional products and services. In Maury County schools, for instance, when the district purchased the netTrekker online-learning tool through ENA's statewide consortium, it was able to do so at a significant savings.

Monitoring and Maintenance

ConnectTEN has 24/7 network monitoring. ENA offers schools secure Internet access by managing firewall services and virus screening. Though districts don't have to purchase these services, they have an option to do so, and can take advantage of substantially lower costs than would be available to individual districts and schools for this level of coverage.



5.0 Worksheet for Making Decisions to Undertake Managed Internet Services

The purpose of the worksheet is to assist decision makers in determining the range and cost of Internet services that they are currently paying for or may want, relative to the managed services that are being provided in Tennessee. Tennessee's average cost of service over the last four years is \$27.82 per student per year. Recent upgrades of many schools to 100 Mb service and expanded use of the network for statewide student management system deployment find current costs at \$36.15 per student per year to meet significant new uses of the network. The list below will allow you to determine your current per-pupil cost and what it could cost you to gain all of the services you wish using your current a la carte method:

	Your Current Expenditures	Your Desired Services
1. <i>Circuit Provisioning & Support (Services to end sites with circuits)</i>	_____	_____
2. <i>Network Design (Field audit, site selection)</i>	_____	_____
3. <i>Training</i>	_____	_____
4. <i>24/7 Help Desk</i>	_____	_____
5. <i>Field Engineering Services (including site-based network Internet/Data routers)</i>	_____	_____
6. <i>Web-based Network Administration and Monitoring</i>	_____	_____
7. <i>Network Security (Spam/virus protection)</i>	_____	_____
8. <i>Field Account Management Service</i>	_____	_____
9. <i>E-mail, listserv, Web-mail</i>	_____	_____
10. <i>Content Filtering with Authorized Override – (CIPA compliance)</i>	_____	_____
11. <i>Network Redundancy</i>	_____	_____
12. <i>Capital Equipment (Routers, switches, cards, servers, etc.)</i>	_____	_____
13. <i>Maintenance on Equipment</i>	_____	_____
14. <i>E-Rate Consulting</i>	_____	_____
15. <i>Total Costs (sum lines 1-14)</i>	=====	=====
16. <i>Total Number of Students</i>	_____	_____
<i>Total Cost per Student (divide line 15 by line 16)</i>	=====	=====

6.0 A Financial Comparison of Managed Internet Service Providers to Customer Purchased a la Carte Services: Metropolis vs. Tennessee

This section will compare the cost of contracting E-rate-supported managed Internet service providers (MISPs) to the cost of implementing customer purchased a la carte E-rate network services grants. Do MISPs provide schools with more cost-effective services than non-MISP E-rate funded services? The analysis focuses on the cost of providing similar network management services, assuming comparable numbers of Internet-connected PCs per student. The goal is to determine whether MISPs or customer purchased a la carte services provide robust network management services at a lower cost per student. Both are supported by E-Rate funding.

Creating a fair and accurate comparison is difficult for several reasons:

- Where MISPs provide a bundle of services like network management, filtering, and e-mail across a large number of districts, customer purchased a la carte services are targeted at specific items such as Internet servers and network bandwidth.
- Figures available from the Schools and Library Division (SLD) include the amount originally requested by the district, the district's contribution for those requests, the amount of E-rate funds awarded, and the actual amount of each award that was spent. However, the information on how much of an award ultimately gets spent lags by several years, and even then, the final amount spent by the district is not known. Since one out of five dollars awarded by E-rate five years ago still have not been spent, these figures are important and, without them, it is hard to make comparisons.
- The districts with more than 75 percent of their students eligible for free and reduced lunch typically receive E-rate funding for internal connections (including local area networks or LANs), while other districts do not.
- E-rate grants also provide funding for services such as phone service that are not relevant in comparing managed and non-managed networks but are difficult to break out in analyzing the awards.

One very rough way to argue the likely cost-effectiveness of the MISP model is to compare the E-rate experience of the State of Tennessee, which has been dominated by an MISP model, and the experience of the nation as a whole which, while including Tennessee and other MISP experiences, has in general been characterized by customer purchased a la carte network products and services. According to the E-Rate program, the State of Tennessee received slightly lower per-student E-Rate funding commitments from 1998-2004 than the nation as a whole (\$269.6 million for just over 925,000 students, compared with \$13.95 billion for just under 47.7 million students). Since E-Rate funding is weighted heavily toward poverty concentrations and Tennessee has higher average poverty levels than the rest of the nation, this should indicate a relative lack of connectivity for Tennessee schools. However, Tennessee has slightly better ratios of students to Internet-connected classroom PCs than the nation as a whole, suggesting Tennessee has made better use of its E-rate funding than the rest of the nation, and it could be argued that the MISP model has been an important part of that. But this approach is inadequate, so what follows is an attempt to build a valid comparison between Tennessee's experience and a typical set of customer

purchased a la carte products and services as implemented by an actual large, urban school district E-rate recipient identified here as "Metropolis."

The following analysis compares ConnectTEN, the Tennessee E-rate supported MISIP, with the Metropolis service. Metropolis uses a district purchased and operated, E-rate supported network service. The comparison between Tennessee and Metropolis can be made because there is sufficient expenditure data for both entities. (The majority of cases lack the necessary data to make this type of comparison.)

Comparison in Context

The way to compare MISIP and customer purchased a la carte E-rate services is to understand the amount that school systems are paying for products and services. A district receives E-rate funds as a portion of what it has contracted to spend on the proposed product or service, based on the district's percentage of students receiving free or reduced lunch. School districts with 75 percent or more of their students eligible for free or reduced price lunch programs have qualified for E-rate funding of internal connections every year, and so have instead used their E-rate funding for most if not all of their network-related products and services.

- For the years 2000 through 2003, the top 50 E-rate recipients (predominantly 90 percent free-lunch districts) planned average expenditures of \$242 per student per year during that four-year period for all E-rate-supported products and services.
- ENA, by contrast, served the entire State of Tennessee under an MISIP model and Tennessee received an average of only \$57 per student per year (ENA itself only received an average of \$27.82 per student per year in E-rate funding and related district funds).

It is difficult to compare the \$242 to the \$57, because without detailed expense data there is no way to be sure that the products and services purchased for \$242 are comparable to what was provided in Tennessee for \$57. The following are contextual issues that need to be addressed in order to make a comparison:

- It often takes several years to spend E-rate funds, and many committed funds are never spent. Among the top 20 recipients of E-rate funds, 79 percent of the committed funds for 2000-2001 had been spent as of March 2005, but less than half of the committed funds for the 2003-2004 school year had been spent as of March 2005.
- Some E-rate funding is for products and services that exceed the benefits of the Tennessee MISIP contract. Districts with 80 percent free or reduced lunch eligible students can receive funding for local area networks or internal connections within buildings in addition to funding for the wide area networks that are the focus of MISIP offerings. To compare the MISIPs with customer purchased a la carte E-rate funding in districts with high percentage of free lunch recipients, it is necessary to separate out the internal connection cost from the WAN costs so that the comparison can be equitable.

- It is difficult to develop an apples-to-apples cost analysis between the Tennessee MISP model and customer purchased a la carte models using E-rate data only, because the data lacks detail on actual expenditures. A comparison can only be made where there is comprehensive historical data on expenditures.

However, the data suggests there are potential significant cost efficiencies in a MISP model that warrant consideration.

Apples to Apples: Metropolis and Tennessee

A comparison can be made between the Tennessee E-rate funding and Metropolis, one of the top 50 recipients for the years 2000-2004, because there is sufficient expenditure data available on how E-rate funds were used.

- Over a four-year period (school years 2000-2001 through 2003-2004), over \$430 per student per year (on average) was committed to Metropolis by the E-rate program, to be matched by an average of \$49 per student-year in district expense. An internal Metropolis projection is that the district will ultimately spend 72 percent of E-rate and district funds committed for those four years, or \$344 per student-year.
- Breaking that \$344 per student-year into MISP-comparable and "extra" products and services is difficult but not impossible. An internal district estimate based on an analysis of each of the district's separate E-rate funding requests for that four-year period suggests that approximately 20% of that \$344 per student is related to the WAN-oriented services that an MISP provides, and the district itself might have spent an average of \$14 per student-year on non-E-rate funded, MISP-related functions. **Therefore, over the four years of the study, it is estimated that the MISP-comparable services in the Metropolis district cost \$84 per student per year, more than three times what the State of Tennessee paid for MISP services.**

There are number of reasons for the high cost of E-rate services in Metropolis and other high-dollar E-rate recipients, many of which are loosely related to the choice of an MISP versus the direct purchase and management of products and services. Some examples of these issues are:

- As has been widely reported, some districts over-designed their networks (one was widely reported as having installed routers in each building that were robust enough to route traffic for the entire district).
- Other districts purchased equipment that was never installed and was later found in warehouses.
- Some districts initially negotiated poor contracts, partly because of E-rate procedures that made it difficult to attract competitive bids, and partly due to their lack of experience in managing networks. For example, Metropolis in 2001-2002 paid \$68 per student for network technical support; by 2003-2004, it was able to contract the same services for \$20 per student.
- Changes in network design requirements can result in expensive equipment substitutions. For

example, the state-level agencies Metropolis must comply with changed their requirements for network design, resulting in Metropolis replacing routers at every building.

In summary, a quick analysis of one district using a standard product and service approach rather than an MISP suggests that use of an MISP would have been more cost-effective for those services related to the network.

It must be emphasized that this comparison is an initial one-case look at how MISPs compare with customer purchased a la carte network services. The Metropolis-Tennessee comparison suggests that other districts should look at MISP-provided services. It is supported by the fact that one key cost in the Metropolis bundle of services – wide-area network connectivity and Internet access – cost the same amount as another large actual district (Metropolis and “Urbanville” both have averaged \$13 per student-year to provide connectivity and Internet access to schools).

To create true apples-to-apples comparisons of MISP and customer purchased a la carte, individual products and services, a thorough cost-accounting analysis should be done across several districts, and adjustments must be made for service level differences (e.g., bandwidth, network availability). **However, the overall E-rate data suggests that such comparisons will be favorable to the MISP in many places, and that a MISP can be a considerably more cost-effective approach to providing service than customer purchased a la carte products and services.**

In this section, we have provided an initial case showing the financial advantages of using MISPs. As illustrated in section 3 on decision-making and in section 4, the Tennessee case study, there are also significant reasons with respect to quality and reliability of service that independently justifies the choice of an MISP.

Final Word

Networks have become the platform for the delivery of education and the operation of management and instructional systems. In *Managed Internet Network Services: Making the Case for Schools* we are encouraging states and school systems to seriously consider using managed Internet services rather than purchasing a la carte network services. We believe that in many cases “one stop shopping for network services” provides value and benefits for large school systems and states in planning, developing and operating broadly distributed networks. Managed Internet service is a means of ensuring that networks have adequate capacity, are resistant to intruders and rarely, if ever, stop functioning. To make the case we have:

- Described the managed services provided by ENA, a MISP in Tennessee,
- Described the step by step process by which a medium size district decided to purchase the majority of its network services through a managed provider,
- Conducted a cost comparison between ConnectTEN the Tennessee network managed by ENA and a large urban school system,
- Provided a worksheet for any education agency to determine the cost and feature benefits of managed service versus the a la carte method.



About Education Networks of America (ENA)

This paper was sponsored by ENA, a leading Managed Internet Service Provider. ENA designs and provides managed network and technology solutions for schools and libraries across the nation. They have established a reputation as experts in the design, deployment, and operation of broadly distributed networks. Customers know ENA as a reliable partner with expert knowledge in Internet connectivity, E-Rate and other funding sources, and value-added customized services.

Through their experience and success, ENA has demonstrated that a MISP model is the most cost-effective and expeditious way to provide a cohesive and highly reliable, district and statewide education-centric network that best meets the current and future needs of SEAs and LEAs. If you would like to discuss your individual needs and how to potentially deploy this type of service in your area, please contact them.

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