

SECTION 5

INFRASTRUCTURE

Overview

The components and systems addressed in this section have been identified as essential to support the goals and objectives identified in the Curriculum and Instruction and Professional Development plans. As with these previous sections, evaluation of district needs and strategic planning for infrastructure, hardware, technical support and software has been guided by a Vision of implementing technology which will either directly or indirectly facilitate the meeting of academic standards and desired learning outcomes throughout the district.

Implementation Timelines

In order to ensure that resources are maximized to support teaching and learning, timelines for implementation of Curriculum and Instruction and Professional Development Objectives will be coordinated with budget and funding availability for the acquisition of hardware, software, technology support and infrastructure resources.

Total Cost of Ownership

Previous technology planning has addressed many of the identified needs for hardware, software, and network support. At this revision, with district wide networking infrastructure completed and growing site and district inventories, issues have surfaced around hardware support, replacement costs, retrofitting of older network systems, professional development, software support, and connectivity. Existing practices with respect to Total Cost of Ownership need to ensure adequate budgeting is being provided to address the following areas:

- Upgrading of electrical capacity;
- Improvement of heating, cooling, and ventilation systems;
- Ongoing staff training;
- Network management software;
- Computer-Base curriculum materials;
- Applications and productivity software;
- Network maintenance staff;
- Replacement of computers and peripherals;

On-going connectivity costs.

Infrastructure Needs and Resources

SCHOOL TECHNOLOGY PROFILES

A district inventory system is in place and is updated annually. However, in keeping with the site based management model of this large urban district the 95+ individual sites maintain technology inventories reported yearly in the school tech survey. Further, as shown by the diagram on page 41, the schools annually review data and develop plans which will move them toward improved student access and technology use to improve student performance. As part of the assessment of hardware needs for this plan, a more detailed inventory is conducted at each site to both verify the district mainframe inventory and to provide additional information needed for planning. Site inventories of computers, personal digital assistants, televisions, digital and video cameras, scanners, and printers are compared to target school profiles developed for each level to provide a broad view of hardware needs and site-based planning information.

Access to this level of information regarding alignment with target technology profiles will be used to determine timelines for purchase, replacement, professional development and integration plans. This information will also assist in assessing options for re-purposing existing hardware and development of grant proposals.

In order to implement the strategies identified in Curriculum and Instruction and to ensure equitable access for students and staff district, schools and classrooms must be equipped with the following tools:

Teacher Tools

- Laptop/desktop w/ DVD drive
- LCD Projector

Classroom

- A minimum of 10:1 up-to-date and homogeneous computers
- Speaker system
- Internet connection (wired or wifi)

School

- Sufficient Bandwidth for applications
- Streaming servers
- At least one lab (mobile or stationary) for every 15 classrooms
- Library/ Media Center

School site suggested technology profiles, which are still in revision, will provide a more specific guide for each site.

Each district location will be equipped with hardware necessary to support district wide software applications and maintain a fully operational local area network, video distribution system, and voice communications system.

In addition, centralized hardware will be in place to support information technology needs of the district, in the areas of data management, business services, and maintenance and operations.

Two functional computer labs, and two laptop labs available at the Center for Professional Development currently support professional development. A need has been identified to provide additional hardware at sites for implementing curriculum integration activities such as wireless access, video conferencing, and digital video capabilities.

Minimum specifications for technology procurement have been jointly developed by the district's Maintenance & Operations Department, Purchasing Department, and Technology Services Department. Master specifications for local area network data cabling equipment, wireless local area network systems, telephone systems, integrated communications and clock systems, and television distribution systems are continually updated and revised. Specifications for computer and video equipment and peripherals are identified and updated four times annually by purchasing and technology services staff. The need to provide ease of access to recommended specifications and configurations for teacher, administrative and student workstations has been identified and addressed in this plan.

In some cases, there are sites and classrooms where existing electrical systems need to be upgraded before additional hardware can be used. The district has identified this need to provide upgraded electrical systems and is addressing this need through various means. In some cases, where cost effective and critical, individual classrooms are being upgraded and each school

undergoing modernization will address this need during that process. Finally, funding to address the need for additional electrical upgrades has been identified and included in a successful district bond measure that will provide relief over the next 10 years.

The intent of this plan is to provide all students, staff and parents in Fresno Unified District with access to technology tools and electronic resources. This will be accomplished by providing every site and classroom in the district with access to Internet, video, and voice applications, minimum standards hardware and identified software tools.

All district sites have received adaptive technologies to support the identified needs of students, including computers for all Special Education teachers, a minimum of 5 AlphaSmart keyboards for each elementary and 10 for every secondary site.

Accessibility to parents and students outside of school hours is being provided through expanded school site operations at selected sites, and through neighborhood resource centers. Further access is needed and planned through partnerships with community and the business community.

This plan ensures that technology is accessible to teachers, library media teachers, and administrators by providing access to hardware, software, video, and voice communication systems in every district classroom.

ELECTRONIC LEARNING RESOURCES

Electronic Learning resources will be evaluated as part of the work to be completed by the content-based technology integration committees.

Tools and evaluation rubrics available through CTAP and the CLRN site will assist in ensuring that all resources meet minimum standards are grade level appropriate and support the academic content standards. Consideration will also be given to ensure that these tools promote accessibility and individual learning needs. Coordination with the Adaptive Technology specialist will prevent

duplication of efforts and purchases as each Special Education teacher receives identified adaptive software tools.

Electronic learning resources are for the most part housed and managed by individual sites, most often by the library media teachers or technicians, however many of the resources that can be provided through the Internet will be linked to the district site as part of this plan.

A need for an enterprise based student information and data management systems has been identified and is being addressed. This system will provide access to these tools and information from locations outside the district Wide Area Network (WAN) and will allow access for parents to student specific information.

Business and Human Relations software is currently provided by the mainframe based Advantage Financial and Advantage Human Resources systems. The migration to enterprise-based applications is addressed in the Curriculum and Instruction section of this plan.

Further assessment of current use of electronic resources at each site will be done as a part of the content specific curriculum planning.

NETWORKING AND TELECOMMUNICATIONS INFRASTRUCTURE

Infrastructure encompasses all telecommunications services in FUSD including the wide-area network that provides the system-wide communications backbone, the local-area networks (LANs) in schools and offices, and Technology Services. It also includes the technical support and maintenance of those systems.

With every classroom connected to the Wide Area Network in Fresno Unified, we find that very quickly these networks are becoming a critical part of conducting daily instruction and business. Schools and departments depend upon stable, reliable network operations. This dependency is continuing to grow rapidly. Plans to expand Library services, student information and data management services, business systems and to add video applications, demand a robust wide-

area network and strong security measures to meet privacy, licensing, and copyright requirements. As video and audio are further integrated, bandwidth requirements will rise exponentially. As technology integration grows across the district, adequate bandwidth will be provided to support connectivity.

LOCAL AREA NETWORKS

As a result of E-Rate funding, each school site has a fully operational Ethernet local area network operating that supports data transmission rates of 10Mb/s, 100 Mb/s, and 1 GB/s (1000 Mb/s). Each school site has received a Local Area Network with all related network devices such as switches, routers, servers, Category 5 and Fiber Optic cabling that is connected to the district's wide area network.

Each school's local area network configuration consists of connecting every classroom, computer labs, libraries, and administrative offices by Category 5 data cabling to the building's Intermediate Distribution Frame (IDF). Each IDF provides an individual port on a high capacity network switch to each Category 5 data drop. A fiber optic backbone connects outlying IDF locations to the Main Distribution Frame (MDF) that provide the interface to the district's wide area network via T-1 (1.54 Mb/s) and DS-3 (45 Mb/s) connections.

Implementing these local area network designs has been accomplished utilizing district funds, Measure A bond funds, and E-Rate funding.

The target bandwidth on each school site's local area network to classrooms and library/media centers has been 10/100 Mb/s to the desktop with a 1 G/b/s fiber optic backbone. Wide Area Network target bandwidth for elementary and middle schools is 1.54 Mb/s (T-1) and 45 Mb/s (DS-3) for high school locations.

The district's wide area network consists of a combination of T-1 (1.54 Mb/s) lines feeding into a wireless Asynchronous Transfer Mode (ATM) DS-3 (45 Mb/s) in a star configuration. The best configuration for the network consists of using a combination of T-1 (1.54 Mb/s) and DS-3 (45 Mb/s).

Access to the Internet is accomplished through central access via an (ATM) DS-3 to the commercially contracted Internet Service Provider.

Every district classroom has been provided with the ability to make local calls to outside numbers and voice mail.

Implementing these wide area network designs has been accomplished utilizing district funds, Measure A bond funds, and E-Rate funding.

Connecting the district's wide area network to community centers, libraries, museums, schools, and institutions of higher learning, and wireless networking applications are being considered at this time.

Security to protect confidential data to maintain the integrity of the system is being accomplished by the Technology Services staff. A partnership with Pacific Bell is in the process of assessing vulnerability in the system so corrective actions can be taken. In addition, a firewall has been implemented to provide a barrier that monitors and controls the flow of Internet traffic.

Appropriate filtering software is in place and will continue to be used to prevent district staff and students access to inappropriate Internet content. Review and certification of filtering software will take place on an annual basis to ensure that all requirements of the Children's Internet Protection Act, enacted by Congress, will be met.

Once fully implemented, the new student information system will allow authorized outside access to teachers, parents, students, and administrators.

Physical Plant- Electrical
The district has identified the need to provide upgraded electrical systems at each school site as a result of technology infrastructure installations and hardware acquisitions. Several projects are currently underway to address this need. As district sites undergo modernization, electrical needs are being upgraded to adequately meet the identified technology needs for each room and the site as a

whole. In addition to modernization projects, funding to address needed electrical upgrades have been identified through a district bond measure that will provide relief over the next 10 years.

Technology infrastructure, hardware, and networking equipment that is located in storage rooms and classrooms has been designed in a manner that provides the necessary security against vandalism and environmental factors.

Each school site's local area network hardware and ancillary wiring has been configured in a way that is safe for students and staff to move about without creating a fire or safety hazard.

All work and materials are in full accordance with the latest rules and regulations of the following codes, industry standards, and references:

State of California:
Title 24, Building Standards, State of California
Occupational Safety and Health Act (OSHA)
California Electric Code (CEC)
Title 8, Electrical Safety, State of California
Title 19, California Code of Regulations
Telecommunications Industry Association / Electronics Industry Association (TIA/EIA)
TIA/EIA- 568, Commercial Building Telecommunications Cabling Standard
TIA/EIA- 607, Commercial Building Grounding and Bond Requirements for Telecommunications
TIA/EIA- 606, The Administration Standard for Telecommunications for The Telecommunications Infrastructure of Commercial Buildings
TIA/EIA- 569, Commercial Building Standards for Telecommunications For Telecommunications Pathways and Spaces.
TIA/EIA TSB-72, Centralized Optical Fiber Cabling Guidelines.
TIA/EIA TSB-67, Transmission Performance Specifications for Field Testing of Twisted Pair Cabling Systems.

All publicly bid technology infrastructure projects are processed by the District's Purchasing Department. The Purchasing Department is responsible for screening contractors and checking references prior to commencement of any work being done.

As modernization projects progress, facilities and network management departments are coordinating to ensure efficiency of efforts.

TECHNICAL SUPPORT

The rapid growth in technology requires adequate technical support staff. To meet those needs there are currently several models in place to provide that support across the district through telecommunication and personnel.

Software and hardware trouble shooting is handled by the Technology Services "Help Desk" personnel.

Microcomputer Specialists, assigned to each district site provide the next level of support. They currently support approximately 500 computers each and site administrators report that support current levels are not adequate to meet their needs.

The ultimate target for technology support is the industry standard of 1 technology support person for each 100 computers.

Many tasks are being centrally accomplished with automated technology, supported by a centralized help desk and technology and network operations centers.

Expert advice is sought regularly. State and regional support is provided for technology and e-rate plan development. The county office provides leadership in this area and meetings are attended regularly to ensure a good flow of information between FUSD and these outside guiding agencies. Other districts and nearby industry organizations have been contacted regarding their hardware, software, or networking standards and that information has contributed to the development of this plan

TECHNOLOGY INFRASTRUCTURE ACQUISITION AND REPURPOSING PLAN

HARDWARE

1. Define and implement an annual equipment replacement plan will provide for the upgrading of

administrative and teacher workstations on a five year rotating basis.

TECHNICAL SUPPORT

1. Increase site based support and training to keep pace with increasing numbers of computers with the goal of reducing the ratio of computers to support
2. Develop written protocols for repetitive technical tasks.

SOFTWARE

1. Complete migration to one district email system by June 2010.
2. Update district web sites to include grade level and content specific links to standards-based lesson plans and grade level appropriate electronic resources as those resources are identified by the content coordinators and curriculum committees.

INFRASTRUCTURE

1. Continue the process of assessing and upgrading Wide Area and Local Area Networks to meet increasing instructional and professional development needs for video and audio.

EVALUATION

While monitoring of most of these objectives is built into other plan components, the ongoing monitoring of infrastructure, bandwidth, and networking needs is accomplished through the utilization of network management software and weekly department meetings. Technology support needs are monitored and evaluated through work order tracking and department review.