The Learning Network Blueprint for Higher Education
April 2004 (revised September 2005)

Introduction

The Learning Network of Minnesota is the education component of the Integrated Statewide Network. The Learning Network began in 1993 as an effort to connect post-secondary institutions and, in 1995, was followed by an initiative to connect public school districts and libraries. In 2000, a Joint Powers Agreement formalized cooperation between the University of Minnesota, the Minnesota State Colleges and Universities (MnSCU) and the Minnesota Department of Administration.

The higher education portion of the Learning Network has two primary components:

- **Campus networks** developed and managed by the individual institutions with support from their respective systems.
- **The statewide network** developed and managed through a partnership of the University of Minnesota, the Minnesota State Colleges and Universities, private higher education institutions, the six higher education telecommunications regions, and the Minnesota Department of Administration.

The integration of telecommunications regions into the Learning Network provides for more institutional and campus-based decision making in the development and management of the statewide network. A Board of Directors representative of their member institutions governs each region.

During the past two years, the statewide network partners have formalized their mutual accountability: The chief information officers of the University of Minnesota and MnSCU, the six regional coordinators and the Learning Network grants administrator from the Higher Education Services Office meet quarterly and have expanded reporting requirements.

This report summarizes the current technology standards, outlines network goals and establishes standards for ongoing participation in the network.

Goals:

The goals of the blueprint are to insure the complete integration of the higher education portion of the Learning Network and to maximize efficiency within the existing federation of networks.

- Insure the complete integration of the higher education portion of the Learning Network, including the six telecommunications regions, MnSCU, University of Minnesota and private higher education institutions' networks.

- Recognize organizational autonomy.

- Encourage cooperation with private higher education institutions, K12 and state agencies.

- Encourage peering with other national or international education and research networks (e.g. Internet2).

- Encourage advancement of technology.

- Leverage resources of the Joint Powers, higher education telecommunications regions and private higher education institutions.

Meeting goals requires:

- Standardization of technology.

- Commitment to universal access to leading edge technology.

- Coordination of contracts.

    - Contract specifications shall be written to insure goals of standardization and integration are met.
    - Contracts will be coordinated to minimize cost.
    - Contract lengths shall be coordinated to allow orderly transition to future technology.
    - Plans for contracts for circuits and broad services will be reviewed by the Learning Network Management Group (comprised of the six higher education regional coordinators, the two system CIOs and the METC administrator).
    - Joint Powers Technical Committee shall be given adequate, advance notice of contracts and RFPs.

- Coordination of funding. Existing funding sources shall be spent in a coordinated manner to minimize duplication and maximize overall efficiency.

- Integration of higher education networks. Networks will share transport, facilities and technology where practical.

- Interoperability testing. New device types will be tested for interoperability prior to introduction to ensure compatibility with existing devices.

Future Technology Standards:

- Future technology standards will be approved by Joint Powers partners based on a collaborative process involving all interested parties, including MnSCU, the University of Minnesota, private higher education institutions, the higher education telecommunications regions and the Department of Administration.

- Future technologies will be tested for integration with existing technology.

- Future technologies will be reviewed by Joint Powers Technical Committee. (This committee has a standing monthly meeting and is comprised of representatives from MnSCU, the University of Minnesota, the Department of Administration and the higher education telecommunications regions.)

- Future technologies will be based on IETF, IEEE, ITU or other recognized standards.

Appendix A

Current Technology Standards:

- Integration: Higher Education entities share a common Wide Area Network backbone.
- Aggregation: Video, Voice and data aggregated onto common IP backbone.
- Network Transport, Local Area Networks: TCP/IP on Ethernet.
- Network Architecture, Local Area Networks: Network core capable of layer 3 routing, multicast. Network distribution VLAN capable. Network segmentation determined by traffic and security requirements. Packet filtering at network entry points.
- Network Transport, Wide Area Networks: TCP/IP on ATM, HDSL, PPP or Ethernet.
- Network Architecture, Wide Area Networks: Redundant ATM between hubs, Hardened hubs. 7x24 monitoring.
- Network Protocols: TCP/IP, BGP between autonomous systems. Multicast capable.
- Video: H.323 with QOS. Quality of service on WAN via RSVP, RSVP using Weighted Fair-Queuing or ATM SVC's depending on underlying network. QOS on LAN via 802.1p on Separate VLAN or separate physical networks for video.
- Voice: QoS for voice will use LLQ in WAN and 802.1p on separate VLAN, or separate physical network for LAN QoS.

Definitions:

Ethernet: 10, 100 or 1000 Mbps CSMA/CD networks as defined by IEEE 802.3.

VLAN: Separate logical networks on same physical network. Trunked segments tagged with 802.1q and prioritized with 802.1p.

BGP: IETF Border Gateway Protocol v4 as defined by RFC1771

H.323: ITU defined packet-based multimedia communications systems. Includes related standards for conferencing (T.120), call control (H.245) and framing (H.225)

Appendix B

Peering Standards:

These requirements apply to organizations that wish to peer with the Joint Powers Organizations. They do NOT apply among the individual Joint Powers Organizations.

"JPTECH" refers to the technical subgroup of the Joint Powers Organizations. This sub-group specifies technical interconnection standards.

Peering:

- Starts with IPv4 connectivity: all peering MUST include IPv4 and MAY do other levels.
- MUST use real IPv4 address blocks of size /24 or larger.
- May NOT use RFC1918 addresses.
- MAY use IPv6 addressing. IPv6 addressing must be coordinated with JPTECH.
- May NOT use non-IP protocols
- May NOT filter traffic within the peering point. (Filtering may, of course, happen once traffic has left the peering point and entered an organization's network.)
- Does not cover Internet2; those connections are subject to Internet2 rules.

If a peering organization wishes to peer at higher application levels, they may do so provided they follow the JPTECH standards. Examples of higher application levels include:

collaboration
instant messaging
news
video
voice
web conferencing

These examples are included for illustrative purposes: there is no assurance that JPTECH will establish peering standards in any of these (or similar) areas. However, if such standards are established, they will be offered to all peering organizations.

Requirements for peering partners:

- They must have their own Internet service (i.e., we are not their front door).
- They must connect at DS3 or better speeds.
- They must use BGP as the routing protocol.
- They must pay a one-time setup charge to cover infrastructure.
- They must have a 24x7 problem reporting and resolution service.
- They must have escalation procedures on file listing at least three different people and/or groups.