Network Strategy for Convergence

Currently there are several major networks that serve state and local government and the educational community. These include a multi-protocol data network for state agencies, a full motion video distance education network for the educational community, and voice Centrex and long distance networks for state, university and local government customers. The state owns and directly manages a significant portion of the infrastructure for the data network. The other networks are provided via vendor service contracts managed by the state.

Each of these networks has a life cycle, and over time the services and supporting technologies need to be replaced with the current generation version. The data network contract ends in February 2005, with three possible extension years. The video network contract ends in December 2005, and a procurement process is underway for its replacement. The long distance voice contract ends in June 2005, with two possible extension years, and the Centrex voice contract ends in August 2006 with no possible extension.

This strategy document provides guidance when making technology architecture and service replacement decisions. It is intended to provide guidance for the coming 3-to-5-year timeframe. Planning needs to be an on-going activity, since both business needs and technology options change over time. This strategy is at a high enough level so that it should remain useful over the current planning horizon.

Briefly stated, the strategy involves migrating the state's major networks, over time, to a common, standard IP data network. The popular term for this is "network convergence". The potential benefits for doing this include cost savings, improved manageability, and increased functionality. This of course is only a strategy. When each opportunity presents itself, the decision to converge must be carefully analyzed and weighed against measures of success. Cost and service quality are two critically important measures. For example, if converging a network can't save money vs. a separate implementation, or if the service quality required cannot be met, then it would not make sense to converge just for the sake of converging.

The following bullet points provide further detail behind this basic strategy.

- Migrate to a single-protocol, standards-based IP network Infrastructure.

  While most data network traffic on BadgerNet uses IP as the transport protocol, there are still other protocols being used to carry data across the wide area network. These include NetBIOS/NetBEUI, DECnet, IPX, and encapsulated SNA.

  A single network-layer protocol has many advantages. It requires a less expensive routing infrastructure, is simpler and easier to maintain, and is generally more reliable because of the reduced complexity. In addition, no special adaptations (tunneling, encapsulation, gateways, etc.) are required for applications using native IP.

The following steps will be required to accomplish this:

1. Eliminate SNA-based 3174 controllers from the network.
2. Eliminate the legacy leased line CDN network.
3. Eliminate the SNA protocol entirely from the WAN.
4. Eliminate other non-IP protocols from the network.

- Ensure that the future IP network has adequate bandwidth to support data, video and voice.

  Every application that runs on the network, whether it is data, video, or voice oriented, requires a certain level of bandwidth to function effectively. The network must be engineered so that adequate capacity is available to meet those application needs. In addition, the network should be flexible enough so that additional bandwidth can be allocated with relative ease to meet changing requirements.

- Ensure that the future IP network has adequate Quality of Service (QoS) to support data, video and voice.

  In addition to bandwidth requirements, some applications need to operate within a maximum network time delay to run effectively. The network must have mechanisms in place to provide the right QoS for each application. For example, it may be acceptable for a file transfer to have low bandwidth and a high time delay. It will just take longer to transfer the file, but eventually the entire file will make it to its destination. However, real-time video would typically require high bandwidth, low delay, and low variation in delay. For example, if the video is being transmitted at 30 frames per second, there must be enough overall bandwidth to send those 30 frames in one second, and the delays in sending each frame must be low, and consistent, so that jitter is avoided.

- Identify and evaluate opportunities to converge data, video, and voice services onto a common IP network.

  The possible benefits of convergence can include cost savings, ease of management, and enhanced functionality made possible by running on a common protocol. *However, convergence will only be done if clear cost savings can be demonstrated, and/or mandatory new functionality is required.*

- Determine the timing of migration of network applications to IP.

  The timing of when it is appropriate to migrate an application to IP depends on several factors, as discussed under the previous bullet. The following is a brief analysis of the data, video, and voice areas:

Data – The data network contract ends in February 2005, with three possible extension years. Many data applications in production today already use IP as the WAN transport protocol. Any new applications, per existing DOA standards, must use IP. The current applications not using IP today will need to be addressed by the four steps identified in the first bullet of this document. The target for conversion to IP is the end of calendar year 2005.

Video – The video distance education network contract ends in December 2005, and a procurement process is underway for its replacement. Video today primarily runs on non-IP networks. The full motion distance education video runs on a proprietary, dedicated network. Compressed video for video conferencing typically uses switched ISDN services. The general industry trend reflects a movement towards using IP networks to carry the kinds of video that in the past were carried on dedicated networks. H.323 is one popular standard for transmitting real-time video over an IP network, which many states have either adopted, or are seriously looking at. The next procurement for a distance education network will be a potential opportunity to move to IP based transport for video. While the procurement will not mandate any particular technology, it will call for a standards-based network with adequate bandwidth and QoS. However, cost and functionality will ultimately determine the solution that will be implemented.

Voice – The state's current voice services are provided primarily through two contracts. AT&T provides long distance services, and SBC Ameritech provides Centrex and related local services. The long distance voice contract ends in June 2005, with two possible extension years, and the Centrex voice contract ends in August 2006 with no possible extension. The voice services are provided via traditional telco networks that have evolved over many years and are highly optimized and efficient for voice transmissions.

Traditional Centrex based services will continue to meet the needs of the majority of BadgerNet customers for at least the next several years. From a cost perspective, the current Centrex based solution continues to be much more cost effective, on an enterprise basis, than Voice over IP. This is due in part to the strategy of establishing high volume voice services procurements that all agencies participate in.

IP telephony technology has improved significantly over the last several years, and will undoubtedly continue to improve, offering new applications and functionality. We will need to be positioned to take advantage of the technology when and where it makes sense.

The new Centrex contract establishes IP telephony as an optional service that the state may order on a flexible, line-by-line basis. Mass migration to Voice over IP would not be required. Individual IP Centrex lines could be installed and coexist with traditional Centrex lines. This will provide the state with the ability to explore IP telephony without having to commit large capital expenditures. Remote sites not currently served by Centrex might possibly benefit from this service.