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| **Title** | **Video and Audio Compression Standard for Synchronous Distance Learning and Videoconferencing** |
| **Category** | **Video Architecture** |
| **Date Adopted** | **February 21, 2002** |
| **Date of Last Revision** | **January 8, 2002** |
| **Date of Next Review** | **January 2004** |

### *A. Authority*

Neb. Rev. Stat. Section 86-1506 (6). "(The Nebraska Information Technology Commission shall) adopt minimum technical standards, guidelines, and architectures upon recommendation by the technical panel created in Section 86-1511."

The Technical Panel established the Video Standard Work Group on January 9, 2001 to develop this standard.

### *B. Purpose and Objectives*

The purpose of this document is to establish video and audio standards that will enable all existing and future synchronous distance learning and videoconferencing facilities in Nebraska to achieve interoperability and an acceptable quality of service.

### *C. Standards*

| Compression Standard | Comments |
|---|---|
| MPEG-2 | • MPEG 2 is specifically intended for applications that require high quality video or "full motion video."<br>• Expected data rates include T-1 (1.5 Mbps) or higher. |
| H.263 video with G.722 audio | • Low data rate teleconference applications.<br>• Expected data rates less than T-1 (1.5 Mbps). |

### *D. Applicability*

These standards apply to synchronous distance learning and videoconferencing facilities as follows:

- If utilizing state owned or leased communications networks:
    - Any synchronous distance learning facility or videoconferencing application which utilizes state owned or leased communications networks must comply with the compression standards listed in Section C; or
    - The entity must provide, or arrange for, the necessary gateway technology to comply with the standards.

- If using state funding:

    - All **new** facilities or applications receiving state funding must comply with the compression standards listed in Section C, unless the facility is joining an existing, non-compliant consortium contract.
    - All **existing** facilities or applications receiving state funding for ongoing operations must convert to the standards listed in Section C as soon as fiscally prudent or upon renewal of any existing communications service contract, whichever comes first.

These standards **do not apply** to the following entities:

- University of Nebraska (relating to the university's academic research mission)
- Legislature
- Any entity which applies for, and receives, a waiver of these requirements from the Technical Panel of the NITC.

GENERAL STATEMENT ON APPLICABILITY

The Governing board or chief administrative officer of each organization is responsible for compliance with these standards. The NITC will consider adherence to technical standards as part of its evaluation and prioritization of funding requests

### *E. Implementation*

As part of the original planning process, the work group identified some questions to be considered when forming an implementation plan.

- How will new systems be integrated into the current system using the new standard as they come on line?
- How will existing systems be integrated into the new standard until replaced or upgraded?
- How will the existing system be upgraded to the new standard?
- What is the financial impact and what are ways to minimize it?

The largest impact of this migration will be to the K-12 distance learning consortia. In the case of these consortia it is the recommendation that each consortium upgrade as a group. They should do so when their current contracts expire. All new sites that install interactive distance learning facilities prior to that date should adopt the current technology used by the consortium they will join. Any new consortia installations should adopt the new standard.

When the consortia were originally built, each vendor had to install the CODEC and switching infrastructure to support the specific technology adopted at that time for that consortium. The vendor charged an up front "engineering" fee, which helped to absorb some of the cost of that equipment. Some portion of the on going monthly connectivity fee helps to pay for the rest of that capital cost as well as the maintenance and other operational costs over the life of the contract. Our suggestion is that when a consortium upgrades, it takes on a new contract and the vendor can then follow this same

methodology to cover its fiscal obligations. Though the cost of the new equipment will be different to some degree than the originally installed equipment, taken over the life of the contract, it should be a very similar.

An issue related to this concept are those sites who came on late in the contract who may not have paid their full share of the local CODEC and associated switch port costs. These will be relatively small in number, and the diminished scale of return will be minimal.

This plan eliminates the need for many gateways in the system. A single gateway would be needed only when passing between consortia, not at multiple sites within a single consortium. Each consortium could assess its need to share traffic with other consortia until they have each migrated to the new standard. In the interim some gateways already exist in the state and they would still be available as required until migration precludes the need.

### *F. Responsibility*

An effective program for video standards compliance involves cooperation of many different entities. Major participants and their responsibilities include:

1. Nebraska Information Technology Commission. The NITC provides strategic direction for state agencies and educational institutions in the area of information technology. The NITC also has statutory responsibility to adopt minimum technical standards and guidelines for acceptable and cost-effective use of information technology. Implicit in these requirements is the responsibility to promote adequate quality of service and uniformity for information systems through adoption of policies, standards, and guidelines.
2. Technical Panel Video Standards Work Group. The NITC Technical Panel, with advice from the Video Standards Work Group, has responsibility for recommending video standard policies and guidelines and making available best practices to operational entities.
3. Agency and Institutional Heads. The highest authority within an agency or institution is responsible for interoperability of information resources that are consistent with this policy. The authority may delegate this responsibility but delegation does not remove the accountability.
4. Information Technology Staff. Technical staff must be aware of the opportunities and responsibility to meet the goals of interoperability of information systems.

### *G. Resource and Background Materials*

See the Video Standards Work Group report, entitled A Video and Audio Standard for the Distance Learning Networks of the State of Nebraska, dated November 28, 2001. This document can be found on the NITC Web site at:
http://www.nitc.state.ne.us/standards/

The following resource materials are provided as a public service. Accuracy of content is neither implied nor guaranteed by the NITC or its advisory groups.

For background tutorial material on H.263, see:
http://www.4i2i.com/h263_video_codec.htm
For background material on MPEG-2, see:
http://www.bbc.co.uk/rd/pubs/papers/paper_14/paper_14.html and
http://www.crs4.it/~luigi/MPEG/mpeg2.html#What%20is%20MPEG-2

### *H. Glossary*

Bandwidth
In digital applications, this term refers to the speed at which data is transmitted. It is usually expressed in terms of bits per second. It is often used interchangeably with the term data rate.

CODEC
Stands for Encoder / Decoder or Coder / Decoder. This device changes outbound analog video and audio into data and inbound data into analog video and audio. It is a device that attaches directly to the video and audio source (the classroom).

Data Rate
This is the amount of digital information that a system can process and/or transmit. It is usually expressed in terms of bits per second. It is often used interchangeably with the term bandwidth.

Distance Learning
Distance learning is the delivery of educational experiences where the instructor(s) and student(s) are indifferent locations and engaging in learning at the same time (synchronously) or at different times (asynchronously). Synchronous distance learning typically involves 2-way interactive video delivered to two or more classrooms.

G.7xx
A family of audio protocols with varying specifications as developed by the ITU. Examples include:

| Standard | Req'd Bandwidth | Frequency Response |
|---|---|---|
| ITU-TG.711 | 56/64Kbps | 50Hz – 3.4KHz |
| ITU-TG.722 | 48/56/64Kbps | 50Hz – 7KHz |
| ITU-TG.728 | 16Kbps | 50Hz – 3.4KHz |

Gateway
As used in this document, this term refers to a device or system that allows a system using one protocol standard to communicate with a system using a different protocol standard

H.2xx
A family of video protocols with varying specifications as developed by the ITU. Examples include H.261 and H.263. They are differentiated by the specific algorithms used to encode and decode video.

H.3xx
A family of communications protocols with varying specifications as developed by the ITU. Each of these protocols have multiple options of video, audio and data protocols defined within them. Examples include:

H.320 for transportation on an ISDN network
H.321 for transportation on an ATM network
H.323 for transportation on an IP network

ITU
International Telecommunication Union, headquartered in Geneva, Switzerland is an international organization within the United Nations System where governments and the private sector coordinate global telecom networks and services. Website: http://www.itu.int/home/index.html

Mbps
Mega Bits Per Second – Millions of bits per second.

MPEG
Motion Picture Experts Group – A body that defines protocols for digitally encoding video and audio. Some of the protocols defined by this group include:

MPEG 1 – Designed to compress the data required to pass analog video and audio.
MPEG 2 – An improvement in efficiency over the algorithms of MPEG 1
MPEG 4 – Designed to incorporate voice, video and data as objects that can be transported interchangeably.
MPEG 7 – A meta data system used as a search engine for other MPEG files.

Network 3
The low bandwidth, satellite delivered, teleconference network operated by NET.

NVCN
The Nebraska Video Conference Network – A network of the DOC and operated by NET. It is a low bandwidth, terrestrially delivered, teleconference network.

Teleconference
A meeting held at two or more locations linked by means of technology.

## *I. Related Policies, Standards and Guidelines*

None.