

Volume I, Section 5

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Telecommunications

5.1 Scope

This section contains the performance, design, and maintenance characteristics of the telecommunications components of voting systems and the acceptable levels of performance against these characteristics. For the purpose of the Standards, telecommunications is defined as the capability to transmit and receive data electronically using hardware and software components over distances both within and external to a polling place.

The requirements in this section represent acceptable levels of combined telecommunications hardware and software function and performance for the transmission of data that is used to operate the system and report election results. Where applicable, this section specifies minimum values for critical performance and functional attributes involving telecommunications hardware and software components.

This section does not apply to other means of moving data, such as the physical transport of data recorded on paper-based media, or the transport of physical devices, such as memory cards, that store data in electronic form.

Voting systems may include network hardware and software to transfer data among systems. Major network components are local area networks (LANs), wide area networks (WANs), workstations (desktop computers), servers, data, and applications. Workstations include voting stations, precinct tabulation systems, and voting supervisory terminals. Servers include systems that provide registration forms and ballots and accumulate and process voter registrations and cast ballots.

Desirable network characteristics include simplicity, flexibility (especially in routing, to maintain good response times) and maintainability (including availability, provided primarily through redundancy of resources and connections, particularly of connections to public infrastructure).

A wide area network (WAN) public telecommunications component consists of the hardware and software to transport information, over shared, public (i.e., commercial or governmental) circuitry, or among private systems. For voting systems, the

telecommunications boundaries are defined as the transport circuitry, on one side of which exists the public telecommunications infrastructure, outside the control of voting system supervisors. On the other side of the transport circuitry are the local area network (LAN) resources, workstations, servers, data and applications controlled by voting system supervisors.

Local area network (LAN) components consist of the hardware and software infrastructure used to transport information between users in a local environment, typically a building or group of buildings. Typically a LAN connects workstations, perhaps with a local server.

An application may be a single program or a group of programs that work together to provide a function to an end user, who may be a voter or an election administrator. Voter programs may include voter registration, balloting, and status checking. Administrator programs may include ballot preparation, registration for preparation, registration approval, ballot vetting, ballot processing, and election processing.

This Section is intended to compliment the network security requirements found in Volume I Section 6, which include requirements for voter and administrator access, availability of network service, data confidentiality, and data integrity. Most importantly, security services will restrict access to local election system components from public resources, and these services will also restrict access to voting system data while it is in transit across public resources. (This is corollary to voting supervisors controlling local election systems and not assuming control over public resources.)

5.1.1 Types of Components

This section addresses telecommunications hardware and software across a broad range of technologies including, but not limited to:

- ◆ Dial-up communications technologies:
 - Standard landline;
 - Wireless;
 - Microwave;
 - Very Small Aperture Terminal (VSAT);
 - Integrated Services Digital Network (ISDN); and
 - Digital Subscriber Line (DSL);
- ◆ High-speed telecommunications lines (public and private):
 - FT-1, T-1, T-3;

- Frame Relay; and
- Private line;
- ◆ Cabling technologies:
 - Universal Twisted Pair (UTP) cable (CAT 5 or higher);
 - Ethernet hub/switch; and
 - Wireless connections (Radio Frequency (RF) and Infrared);
- ◆ Communications routers;
- ◆ Modems, whether internal and external to personal computers, computer servers, and other voting system components (whether installed at the polling place or central count location);
- ◆ Modem drivers, dial-up networking software;
- ◆ Channel service units (CSU)/Data service units (DSU) (whether installed at the polling place or central count location); and
- ◆ Dial-up networking applications software.

5.1.2 Telecommunications Operations and Providers

This section applies to voting-related transmissions over public networks, such as those provided by regional telephone companies and long distance carriers. This section also applies to private networks regardless of whether the network is owned and operated by the election jurisdiction.

For systems that transmit official data over public networks, this Section applies to telecommunications components installed and operated at settings supervised by election officials, such as polling places or central offices. These standards apply to:

- ◆ Components acquired by the jurisdiction for the purpose of voting, including components installed at the poll site or a central office (including central site facilities operated by vendors or contractors); and
- ◆ Components acquired by others (such as school systems, libraries, military installations and other public organizations) that are used at settings supervised by election officials, including minimum configuration components required by the vendor but that the vendor permits to be acquired from third party sources not under the vendor's control (e.g., router or modem card manufacturer or supplier)

5.1.3 Data Transmissions

These requirements apply to the use of telecommunications to transmit data for the preparation of the system for an election, the execution of an election, and the preservation of the system data and audit trails during and following an election. While this section does not assume a specific model of voting system operations and does not assume a specific model for the use of telecommunications to support such operations, it does address the following types of data, where applicable:

- ◆ **Voter Authentication:** Coded information that confirms the identity of a voter for security purposes for a system that transmits votes individually over a public network;
- ◆ **Ballot Definition:** Information that describes to a voting machine the content and appearance of the ballots to be used in an election;
- ◆ **Vote Transmission:** For systems that transmit votes individually over a public network, the transmission of a single vote within a network at a polling place and to the county (or contractor) for consolidation with other county vote data;
- ◆ **Vote Count:** Information representing the tabulation of votes at any level within the control of the jurisdiction, such as the polling place, precinct, or central count; and
- ◆ **List of Voters:** A listing of the individual voters who have cast ballots in a specific election.

Additional data transmissions used to operate a voting system in the conduct of an election, but not explicitly listed above, are also subject to the standards of this section.

For systems that transmit data using public networks, this section applies to telecommunications hardware and software for transmissions within and among all combinations of senders and receivers indicated below:

- ◆ Polling places;
- ◆ Precinct count facilities; and
- ◆ Central count facilities (whether operated by the jurisdiction or a contractor).

5.2 Design, Construction, and Maintenance Requirements

Design, construction, and maintenance requirements for telecommunications represent the operational capability of both system hardware and software. These capabilities shall be considered basic to all data transmissions.

5.2.1 Accuracy

The telecommunications components of all voting systems shall meet the accuracy requirements of Section 3.2.1.

5.2.2 Durability

The telecommunications components of all voting systems shall meet the durability requirements of Section 3.4.2.

5.2.3 Reliability

The telecommunications components of all voting systems shall meet the reliability requirements of Section 3.4.3.

5.2.4 Maintainability

The telecommunications components of all voting systems shall meet the maintainability requirements of Section 3.4.4.

5.2.5 Availability

The telecommunications components of all voting systems shall meet the availability requirements of Section 3.4.5.

5.2.6 Integrity

For WANs using public telecommunications, boundary definition and implementation shall meet the following requirements.

- a. Outside service providers and subscribers of such providers shall not be given direct access or control of any resource inside the boundary;
- b. Voting system administrators shall not require any type of control of resources outside this boundary. Typically, an end point of a telecommunications circuit will be a subscriber termination on a Digital Service Unit/Customer Service Unit (DSU/CSU) (though the precise technology may vary, being such things as cable modems or routers). Regardless of the technology used, the boundary point must ensure that everything on one side is locally configured and controlled while everything on the other side is controlled by an outside service provider; and
- c. The system shall be designed and configured such that it is not vulnerable to a single point of failure in the connection to the public network causing total loss of voting capabilities at any polling place.

5.2.7 Confirmation

Confirmation occurs when the system notifies the user of the successful or unsuccessful completion of the data transmission, where successful completion is defined as accurate receipt of the transmitted data. To provide confirmation, the telecommunications components of a voting system shall:

- d. Notify the user of the successful or unsuccessful completion of the data transmission; and
- e. In the event of unsuccessful transmission, notify the user of the action to be taken.