

## **Integratability and Data Export/Interchange Interoperability DRAFT REQUIREMENTS for VVSG 2.0**

**November 29, 2017**

These general requirements have been developed as a starting point for discussion of interoperability in voting devices to be required in the forthcoming VVSG 2.0. It is intended that these requirements will be discussed within the VVSG Interoperability Working Group and subsequently modified as appropriate.

The requirements in this section deal with making voting device interfaces and data formats transparent and interoperable. The advantages of transparency and interoperability include that systems and devices may work across different manufacturers and that data can be conveniently aggregated and analyzed across different platforms. The requirements address (a) integratability of hardware and (b) common public formats for data. The requirements in this section do not address or mandate true interoperability of interfaces, however they reduce the barriers to interoperability.

Integratability deals with the physical and technical aspects of connections between systems and devices, which include hardware and firmware, protocols, etc. Basic integratability of devices is achieved through use of common, standard hardware interfaces and interface protocols such as USB. Thus, a printer port must not be proprietary; it must use a common hardware interface and interface protocol, with the goal being that printers of similar type should be interchangeable.

Systems and devices that are integratable are designed such that components of systems may be compatible or can be made compatible with each other through some moderate amount of effort, for example, by writing "glue code." For example, an audit device may be designed to work with an EMS, but it may require adaptations to protocols for signaling or data exchange. Adapting the audit interface to the EMS may require some amount of software modification but should still be within reasonable bounds.

The barriers to interoperability are further reduced if all systems support the same commonly agreed upon, publicly-available data formats for ballot definition, records and reports. The advantages of using common data formats include:

- Common formats for specifying election programming data such as ballot definition files promotes greater accuracy and reduces duplication;
- Common exported data formats can assist in aggregating results and conducting analyses and audits across among manufacturer systems (e.g., auditing statewide contests in states whose counties use election systems from different vendors); and
- Common formats for use in data reports can be mapped as necessary to locality-specific reports as opposed to requiring election systems to export reports in many different locality-specific formats.

The requirements in this section mandate the following:

- Common hardware interfaces;
- Non-restrictive, publicly available formats for data export and interchange; and
- Documentation for formats and for how each manufacturer has implemented them, including sample source code for reading different formats.

These requirements mandate support for Common Data Format (CDF) specifications developed by NIST and its public working groups on election data standards, including for exports and interchanges of:

- Election programming data
- Ballot definition data
- Cast vote records
- Voter registration-related data
- Election results data

Manufacturers may continue to use their own data export and interchange formats, but must also include support for the CDF specifications where appropriate, including documentation as to how the manufacturer has implemented each specification.

The requirements promote, but do not mandate true interoperability of all voting devices across different manufacturers.

#### **A. Integrability of systems and devices**

Systems SHALL maximize integrability with other systems and/or devices of other systems.

##### **DISCUSSION:**

This is a goal-oriented requirement to promote interoperability of voting system devices among and across manufacturers. Manufacturers are recommended to design and build voting devices such that they can interoperate with similar devices from other manufacturers or can be made to interoperate within reasonable bounds.

##### **A.1 Standard device interfaces**

Standard, common hardware interfaces and protocols SHALL be used to connect devices.

##### **DISCUSSION:**

This refers to use of USB and related protocols and hardware interfaces commonly used to connect printers, disks, and other devices.

##### **A.2 Standard protocols and algorithms**

Standard, publicly-available and publicly-documented protocols SHALL be used, where possible, for exchanging data or encoding data.

DISCUSSION:

This refers to using common protocols for wireless communications, e.g., Bluetooth, etc. It also refers to data encodings such as for bar and QR codes.

**A.3 Public documented manufacturer protocols**

Where it is not currently possible to meet requirement A.2, manufacturers SHALL use a publicly documented protocol.

DISCUSSION:

This refers to, for example, packing or compressing data before encoding in a QR code. If a manufacturer uses its own protocol or algorithm, it must publicly document its implementation and usage.

**B. Data export and exchange format**

Data that is exported and exchanged between systems and devices SHALL use the non-restrictive, publicly-available NIST SP Common Data Format specifications where possible:

1. Election programming data, NIST SP 1500-100
2. Ballot definition data, NIST SP 1500-XXX
3. Cast vote records, NIST SP 1500-103
4. Voter registration-related data, NIST SP 1500-102
5. Election results data, NIST SP 1500-100
6. Election event logging data, NIST SP 1500-101

DISCUSSION:

This requirement promotes interoperability of exported data and data exchanged between devices. For example, CVRs exported from different devices must use the same common format so that they can be easily aggregated for use in multi-jurisdiction vote tabulation audits. This requirement does not prohibit manufacturers from also using their native formats; Requirement B.5 deals with the public documentation of manufacturer native formats.

**B.1 Exchange of election programming data and reporting data**

EMSs SHALL support the NIST CDF specifications with respect to election programming data and report data (ballot definition-related data, the content of vote data reports, audit reports, election results, etc.).

DISCUSSION:

The purpose of this requirement is to further the use of common formats for (a) the specification of election definition files and other election programming, (b) for report data produced by EMSs such as for status and audit-related reports and for election results.

**B.2 Exchange of CVRs**

Devices that export or import CVRs SHALL support the NIST CDF specifications with respect to export and import of CVRs.

**DISCUSSION:**

The purpose of this requirement is to further the use of common formats for exported and imported CVRs. Devices that export or import CVRs typically include the EMS, optical scanners, vote-capture devices, audit devices, and audit software. The EAC has not made clear whether it shall be required or only recommended that optical scanners export in the CDF; depending on the outcome of their decision, this requirement may need to be amended.

**B.3 Exchange of voting device election logs**

All voting devices that comprise a voting system SHALL support the export or import of election log data using the NIST SP 1500-101 specification.

**DISCUSSION:**

This requirement refers to the election logs, not system logs provided by common operating systems such as Microsoft Windows or Apple IOS. This requirement does not mandate that manufacturers use the format for storing election log information; a manufacturer can meet this requirement by exporting from a native format into the NIST SP 1500-101 format.

**B.4 Specification of common format usage**

The voting device or election system manufacturer SHALL provide a specification describing how the manufacturer has implemented a NIST SP 1500 CDF specification with respect to the manufacturer's specific voting devices and data, including such items as descriptions of elements, attributes, constraints, extensions, syntax and semantics of the format, and definitions for data fields and schemas.

**DISCUSSION:**

Conformance to a common data format does not guarantee data interoperability. The manufacturer must document fully how it has interpreted and implemented a NIST CDF specification for its voting devices and the types of data exchanged/exported.

**B.5 Public specification of manufacturer native formats**

Where a NIST SP 1500 CDF Specification or other interoperable interchange specification does not exist for a particular area of data interchange, the voting device manufacturer SHALL provide a specification for its native format, describing how the manufacturer has implemented the native format with respect to the manufacturer's specific voting devices and data, including such items as descriptions of elements, attributes, constraints, extensions, syntax and semantics of the format, and definitions for data fields and schemas.

**DISCUSSION:**

This requirement is essentially the same as requirement B.4 but for the manufacturer's own native formats where a NIST CDF specification does not exist.

**B.6 Common data format across voting system**

Using NIST 1500 CDF specifications as much as possible, the voting device manufacturer SHALL ensure all devices comprising the voting system interoperate fully with respect to data.

DISCUSSION:

Conformance to a common data format does not guarantee data interoperability. The manufacturer must ensure that all devices interoperate fully with respect to data exchanged/exported using the NIST SP 1500 CDF specifications as possible.

**B.7 Common format across manufacturers**

The voting system manufacturer SHALL use the NIST SP 1500 CDF specifications for export and interchange of data and reports across its major device categories.

DISCUSSION:

Different equipment from the same manufacturer must be interoperable with the respect to data format. For example, a common ballot definition should apply to all manufacturer vote-capture devices and should not be specific to each device. Export of data (e.g., reports and CVRs) must use a common format across all devices.