Principle 4
INTEROPERABLE
The voting system is designed to support interoperability in its interfaces to external systems, its interfaces to internal components, its data, and its peripherals.

4.1 – Voting system data that is imported, exported, or otherwise reported, is in an interoperable format.

4.1-A – Data export and exchange format
Voting devices must include support for the NIST SP Common Data Format (CDF) specifications for data inputs and output:

1. Election programming and results reporting data, NIST SP 1500-100

2. Election event logging data, NIST SP 1500-101

3. Cast vote records, NIST SP 1500-102

4. Voter registration-related data, NIST SP 1500-104

Discussion

Manufacturers can use proprietary data formats but need to also include support for the NIST CDF specifications. Implementations that do this using translations or conversions from a proprietary format would be considered in conformance.

Applies to: voting system

4.1-B – Election programming data input and output
Election definition processes must include support for the NIST CDF specifications regarding:

1. Import and export of election programming data

2. Import and export of ballot programming data

Discussion

This requirement concerns import and export of pre-election data into an election definition device, such as for identification of political geography, contest, candidate, ballot data, and other pre-election information used to setup an election and produce ballots. This also includes reports of pre-

election data from the election definition device that can be used to verify the election programming setup.

Applies to: election definition

4.1-C – Tabulator report data

Tabulation processes must include support for the NIST CDF specifications for import and export of election results reporting data.

Discussion

Importing results data is required so as to provide support for aggregations of vote data from different election management systems such as what occurs during state roll-ups on election night and during the process of election results certification.

External reference:	URL to SP 1500-100, 102
Applies to:	tabulation, reporting

4.1-D – Exchange of cast vote records (CVRs)

Casting, tabulation, and audit processes that use CVRs must include support for the NIST CDF specifications for export and import of those records.

Applies to: casting, tabulation, audit

Discussion

Devices that export or import CVRs typically include voter-facing and batch-fed scanners, election management systems, and other devices used for adjudication or auditing.

4.1-E – Exchange of voting device election event logs

The voting devices comprising the voting system must include support for the NIST CDF specifications for import or export of election event log data.

Discussion

This requirement refers to election event logs and 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 conversion or translation from a native format into the CDF.

Applies to: voting system

4.1-F – Voting device event code documentation

Voting device and system manufacturers must include a specification for event codes used in their equipment and make this available upon request.

Discussion

Use of SP 1500-101 for election event logs only addresses the data format; it does not mandate a common lexicon for event codes. SP 1500-101 provides a separate schema for including documentation of event codes; manufactures may make this available publicly or upon request without condition.

Applies to: voting system

4.1-G – Specification of common format usage

Voting device and system manufacturers must include a specification describing how the manufacturer has implemented a NIST CDF specification for a particular device or function. This includes such items as descriptions of how elements and attributes are used, as well as any constraints or extensions.

Discussion

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

Applies to: voting system

4.2 - Standard, publicly-available formats for other types of data not addressed by NIST CDF specifications are used.

4.2-A – Standard formats

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

> **Discussion**
>
> Examples include the use of common data encodings such as bar or QR codes.

Applies to: voting system

4.2-B – Public documented manufacturer formats

Where it is not possible to meet requirement 4.1-A, manufacturers must include a publicly documented specification that describes the protocol or data format.

Applies to: Voting system

> **Discussion**
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> As an example, a manufacturer's algorithm or method for packing or compressing of data before encoding in a QR code will be documented so that its implementation and usage is available publicly.

Applies to: voting system

4.3 - Widely-used hardware interfaces and communications protocols are used.

4.3-A – Standard device interfaces

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

Discussion

Examples include using published communications protocols, such as, IEEE, and using common hardware interfaces, such as, USB, when connecting to printers, disks, and other devices.

Applies to: voting system

4.4 - Commercial-off-the-shelf (COTS) devices can be used if they meet all applicable VVSG requirements.

4.4-A – COTS devices meet applicable requirements

COTS devices, if used, must satisfy all applicable VVSG requirements.

Discussion

As an example, use of a COTS scanner to scan ballots is potentially possible, but there needs to be associated software to interpret the voter marks, create a cast vote record, and include support for the NIST CVR CDF. Together, the COTS scanner and associated software will meet applicable requirements for casting, counting, reporting, etc.

Applies to: voting system