3.1.4 Voting Method Variants
Section 3.1.4.3# N-OF-M

Overview

This specification section describes a model of the N-OF-M voting method variants[1].
The model was developed based on knowledge acquired by researching current legislation, local rules, and practice, for a representative set of election jurisdictions in the United States. The model we provides here is descriptive, rather than prescriptive, of the voting method as it is in use in the United States at the time of writing [2].

This N-OF-M model is designed to be sufficiently general to represent and be instantiated for the variety of N-OF-M voting method variants as they occur in practice in government operated elections in the United States.

Terminology

See NIST/TGDC Voting Glossary [https://pages.nist.gov/ElectionResultsReporting/#b-glossary] or the Election Assistance Commission (EAC) Voluntary Voting Systems Guidelines (VVSG) 2.0 glossary section.

N-OF-M Voting Methods Introduction

Tabulation Scenarios

Tabulation senarios that are supported for the execution of this N-OF-M voting method model include:

- **Batch**
- **Batch with Accumulation**
- **Contest**
- **Reporting Unit**
- **Aggregation**
- **Combinations of Batch and Contest variants with Accumulation and/or Aggregation**
- **Multiple voting method contests on a ballot**

[1] In this document, writings within footnotes, text titles, indexes, or keys of tables, charts, figures or appendices are for the purpose of information only and do not represent requirements to implement this standard.
[2] See "Voting Methods Universe" [insert link] for the legislative research and sources used in the domain modeling for this and other voting methods models.

Resources

The following resources shall be available as a precondition or as input to this process model to complete a tabulation of an N-OF-M contest:

- A vote selection data set of record in the form of a Cast Vote Record Report (CVRR) or set of CVRs Common Data Format (CDF) representing one more ballots.[3]
- A set of tabulation configuration parameters that indicate information about the contest, the candidates, and which specific options should be used during the tabulation to conform to a particular jurisdiction's variant of N-OF-M.
- Specialized local rules modules, if any, corresponding to the configuration parameters.
- A set of optional configuration parameters that specify user supplied, implementation specific business rules. For example, adjudication of ballot marks, encryption or other special security policies, specialized tie breaking rules, or other special locally required modules.

The reference implementation of this standard specification adopts the NIST Cast Vote Record (CVR) specification[3] as the vote selection data set Common Data Format (CDF), for the purpose of Data Interoperability. For the purpose of this standard, one or more Cast Vote Record Reports or sets of Cast Vote Records are assumed to be the vote selection data sets of record, irrespective of what medium or voting equipment was provided to voters to produce their marked ballots.

Nothing about this N-OF-M process model is intended to restrict the adopter of this standard as to the internal equipment format of a system that may produce vote selection data sets. As a Common Data Format, the NIST Cast Vote Record specification (CVR CDF) is general and flexible enough to apply to a the wide variety of voting methods, election instantiations, and use cases. The CVR specification provides XML and JSON formats to support translation into the CVR CDF.

This N-OF-M model specification supports variants of N-OF-M implementation where it is necessary to store the state of the CVRR or CVR set per common scenarios and use cases including audits. The output from this process model is composed of a CVRR representing the outcome of the tabulation process and may also optionally be combined to include corresponding sets of CVRRs or CVR sets in sequential order for each tabulation that was executed, either for parts of an aggregation or for subsequent retabulation of the same input,

[3] We specify "one of more ballots" to exclude the empty or null CVR/CVRR in normal operation, where tally or tabulation can occur. However, for L&A test cases a reference implementation of this specification supports input that does not result in tally and may consist of zero or more ballots or null or empty CVR/CVRR.

or subset extracts for auditing, in addition to output in the Election Results Reporting CDF.

The remainder of this section of this standard specification illustrates the descriptive process flow and provides details of the generic N-OF-M process and its common variants that are in use in jurisdictions in the United States. This section is organized by the N-OF-M process flow steps and in the order of numbering of the steps in process in the flow diagram Figure 1 (below).

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Section 3.1.4.3# N-OF-M Voting Method Variants

DIAGRAM

N-OF-M Process Steps

The following applies to all process steps of this N-OF-M process specification.

For each process step "Resources" described for that step shall be available as a prerequisite for execution of that process step.

This standard adopts the NIST Election Event Logging Specification 1500-101[5] for logging and tracing. Instantiations of this process model shall be implemented in accordance with NIST 1500-101. Nothing about this standard's requirement for compliance with NIST 1500-101 is intended to limit an adopter of this standard from implementing additional and more comprehensive event logging, above and beyond the requirements of NIST 1500-101.

When an alert, event or state transition configured to trigger a process suspension or an exit from the process at any process step, it shall be logged and the event handling shall be implemented in accordance with the NIST Election Event Logging Specification 1500-101.[5] The following conditions trigger either a suspension of the process, exit from a step, or termination of a tabulation process in this process model, according to governing legislation, local jurisdiction rules or practice:

- Adjudication Event
- Error Event
- Tie-Breaking Event

Process Flow Steps

Step 1

Flows:

See Also:

Resources:

Preconditions

Postconditions

Explanation:

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Variants:

Step 2

Flows:

See Also:

Resources:

Preconditions

Postconditions

Explanation:

Variants:

Step 3

Flows:

See Also:

Resources:

Preconditions

Postconditions

Explanation:

Variants:

Step 4

Flows:

See Also:

Resources:

Preconditions

Postconditions

Explanation:

Variants:

Step 5

Flows:

See Also:

Resources:

Preconditions

Postconditions

Explanation:

Variants:

Step 6

Flows:

See Also:

Resources:

Preconditions

Postconditions

Explanation:

Variants:

Step 7

Flows:

See Also:

Resources:

Preconditions

Postconditions

Explanation:

Variants:

Step 8

Flows:

See Also:

Resources:

Preconditions

Postconditions

Explanation:

Variants:

...

Step N

Flows:

See Also:

Resources:

Preconditions

Postconditions

Explanation:

Variants: