



Verity Cast Vote Record (CVR) Structure

Introduction

The purpose of this document is to provide a brief overview of the structure of Cast Vote Records (CVRs) as stored on vDrives in Verity Voting.

Overview

A cast vote record is defined as a permanent record of voter selections as made on a DRE, or as contained on each sheet of a paper ballot.

CVRs are only located on vDrives used by applications that store voters' cast ballots, such as Controller, Scan and Central. Although Touch Writer uses a vDrive to produce voters' marked ballots, it does not retain any records of voter marks.

CVRs are found on vDrives inside the folder named with the vDrive's unique identifier (which is located in the **root** folder). Inside this folder, among other files, may be one or more CVR Archives in ZIP file format. These ZIP files contain one or more CVR files with the XML extension. Each XML file represents one CVR. In circumstances where the polls on a device are not closed, there may be XML files that are not contained in a CVR Archive.

All CVRs are digitally signed, so there may be a SIG file associated with each XML and/or ZIP file. The system uses this SIG file to validate that the CVRs have not been modified outside of the system.

CVR Archives Naming Convention

The format of the archive name is:

"CVRArchive_C_S_E_T.zip" where:

- 'C' is the number of CVRs contained in the Archive.
- 'S' is the number of cast sheet 1s.
- 'E' is the number of cast electronic ballots.
- 'T' is a timestamp used to make the archive name unique.

The signature of a CVR Archive also secures the name of the CVR Archive, to prevent altering archive metadata.

CVR Structure

General

CVR data is recorded in XML file format, and can be viewed using a number of applications, such as **Windows Notepad** and **Internet Explorer**. However, applications designed to work specifically with XML, such as **XML Notepad**, may simplify the presentation of the XML data.

XML files may need to be extracted from the ZIP file before being viewed. Once extracted, the "Open with" command may be used to view the XML in the desired application.

CVR File Naming Convention

Each CVR file name uses the convention "S_G.xml", where:

- 'S' is the CVR type identifier
 - "1" if paper ballot sheet 1, blank for all other sheets
 - "e" for DRE ballot
 - "p" for Provisional ballot
- 'G' is the GUID of the CVR

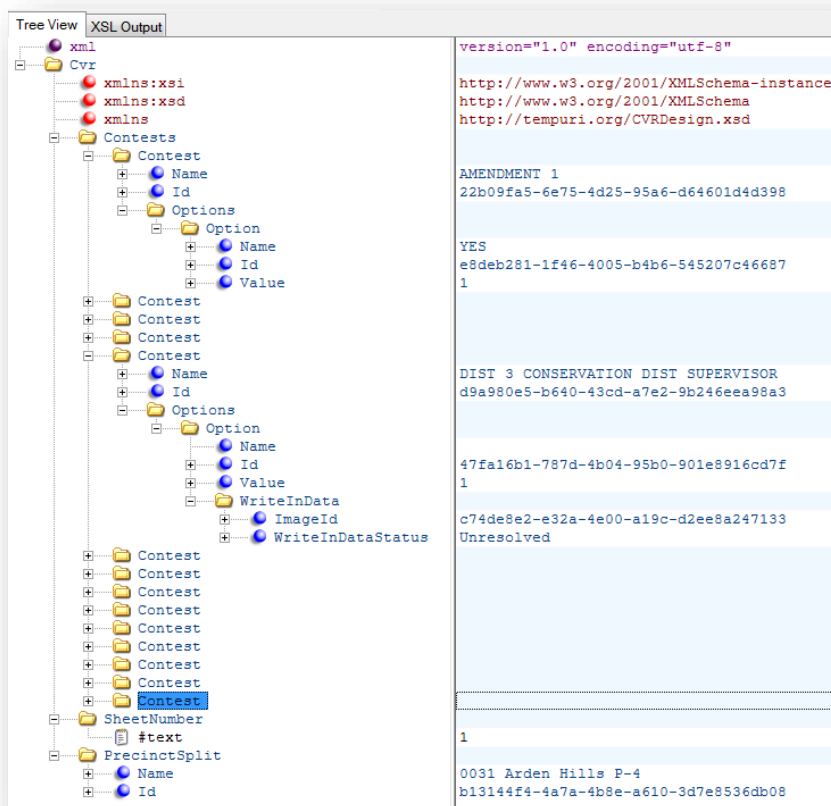
For example, `1_c7db3cf2-c1a2-4773-971c-337ea2d198d7.xml`, or `50810795-95d4-4c0c-a6dc-0d5333e99c5a.xml`.

Viewing CVR Contents

The following is a general example of a CVR as viewed in **Internet Explorer**, showing two contests expanded:

```
<?xml version="1.0" encoding="UTF-8"?>
- <Cvr xmlns="http://tempuri.org/CVRDesign.xsd"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  - <Contests>
    - <Contest>
      <Name>AMENDMENT 1</Name>
      <Id>22b09fa5-6e75-4d25-95a6-d64601d4d398</Id>
      - <Options>
        - <Option>
          <Name>YES</Name>
          <Id>e8deb281-1f46-4005-b4b6-545207c46687</Id>
          <Value>1</Value>
        </Option>
      </Options>
    </Contest>
    + <Contest>
    + <Contest>
    + <Contest>
    - <Contest>
      <Name>DIST 3 CONSERVATION DIST SUPERVISOR</Name>
      <Id>d9a980e5-b640-43cd-a7e2-9b246eea98a3</Id>
      - <Options>
        - <Option>
          <Name/>
          <Id>47fa16b1-787d-4b04-95b0-901e8916cd7f</Id>
          <Value>1</Value>
          - <WriteInData>
            <ImageId>c74de8e2-e32a-4e00-a19c-d2ee8a247133</ImageId>
            <WriteInDataStatus>Unresolved</WriteInDataStatus>
          </WriteInData>
        </Option>
      </Options>
    </Contest>
    + <Contest>
    + <Contest>
    + <Contest>
    + <Contest>
    + <Contest>
    + <Contest>
    + <Contest>
    + <Contest>
    + <Contest>
  </Contests>
  <SheetNumber>1</SheetNumber>
  - <PrecinctSplit>
    <Name>0031 Arden Hills P-4</Name>
    <Id>b13144f4-4a7a-4b8e-a610-3d7e8536db08</Id>
  </PrecinctSplit>
</Cvr>
```

Here is the same section of the previous CVR as viewed in **XML Notepad**:



Structure

Each CVR accounts for all contests available to the voter for that ballot style (precinct-split/party/sheet combination), including a voter's marked choice(s), any remaining Undervotes, or for unmarked contests in an Open Primary, a "No vote" tag.

Marked choices are viewable in plain text. For marked write-ins, an ID is provided to cross-reference with a folder containing images of each write-in.

The following example combines all election types—General, Closed Primary, and Open Primary—into a “master” structure; not all fields will be present for all election types, and will be indicated appropriately.

CVR Elements

- **CVR** (top-level folder)
 - **Contests** (contains all contests for this ballot or sheet)
 - **Contest** (random order of contests—Verity 1.0)
 - **Name** (Title of contest; includes Party designation for Closed and Open Primaries)
 - **ID** (Globally Unique ID [GUID] of contest)
 - **Options** (contains each marked Choice for this contest)
 - **Option** (empty if contest is completely undervoted)
 - **Name** (Choice name, or blank if Write-in)
 - **ID** (GUID of Choice)
 - **Value** (1 if marked; 100000 or similar, where the position of the 1 indicates a ranking mark in Ranked Choice contests, or to indicate one or more marks in a Cumulative contests)
 - **WriteInData** (only present when Write-in Choice is marked)
 - **Text** (Central vDrives only; text of Write-in, if resolved)
 - **ImageID** (GUID of Write-in Image, and name of file located in “Write In Images” folder)
 - **WriteInDataStatus** (“Unresolved” for all Scan write-ins; “Unresolved”, “Resolved” or “Rejected” for all Central write-ins)
 - **Undervotes** (quantity of undervotes)
 - **Overvoted** (only present if contest is also overvoted)
 - **NoVote** (Open Primaries only; indicates the contest was not voted in)
 - **InvalidVote** (Open Primaries only; only present if contests of different party affiliations are voted in)
 - **BatchSequence** (Central vDrives only; indicates the sheet’s sequence within the batch number, below)
 - **IsElectronic** (True/False; indicates whether the vote was cast with a DRE)
 - **SheetNumber** (sheet indicator of paper ballot)
 - **PrecinctSplit**
 - **Name** (name of the voted Precinct-Split)
 - **ID** (GUID of Precinct-Split)
 - **Party** (Closed Primaries only; indicates party affiliation of ballot)
 - **Name** (name of Party)
 - **ID** (GUID of Party)
 - **BatchNumber** (Central vDrives only; indicates the Batch ID)
 - **DeviceSerialNumber** (Verity 1.0: Central vDrives only; indicates the vDrive ID)
 - **RetrievalCode** (Unique Retrieval Ballot Code for this CVR, if applicable)
 - **ProvisionalCode** (Unique Provisional Ballot Code for this CVR, if applicable)
 - **CvrGuid** (GUID of CVR)