SLI Compliance
Data, Software or TDP Minor Change Evaluation & Review Form

Vendor:	Hart InterCivic	Date:	03-06-2024
Change ID:	ECO-01645	System(s):	Verity 2.7 Voting System
Product:	Central Standalone, Central Server with a Central Client.	Relevant Application(s):	Central Standalone, Central Server with a Central Client.

Put an X in the appropriate box(es):

	TDP Change
	Data Change
x	**Software Change**

Change Summary Description

This ECO corrects an anomaly in the Verity Central workstation software where the time required to scan a batch, defined as the time to start a batch scan until the "Scan Complete" dialog appears, progressively increases as more ballots are scanned when the ballots have unique IDs and duplicate checking is enforced.

The changes do not impact the Base OS master image. No other Verity products or releases are impacted by this change.

The modification described in this ECO corrects an anomaly in Verity Central where the total time to scan a batch of ballots increases, noticeably after approximately 100,000 ballots, when the ballots contain unique identifiers and *Allow duplicate ballot IDs* is unchecked in the Election Preferences.
Note that this setting forces the system to check every ballot to make sure it is not a duplicate of any other ballot already in the database.

Hart's RCA identifies the root cause of the anomaly batch scan time progressively increases when Unique IDs are enforced due to the implementation in application C# code which must retrieve all the Unique IDs from the database and load them into the application memory each time, then perform a look up for the existence of the Unique ID in the application memory. While a primary key exists on the Unique ID, the implementation does not send it to the database engine for the database to look up.

To remedy this, the unique identifier duplicate detection functionality is moved from C# code to a more appropriate implementation as a SQL Server Stored Procedure. Implementation as a SQL Server Stored Procedure corrects the defect by eliminating the performance cost of retrieving all data from the database and loading it into the application memory, and by making use of the primary key index on the table to do the look up much faster.

Reference Documents:

EAC 2005 Voluntary Voting System Guidelines (VVSG) Vol. II, Sec. 1.7.2

EAC Voting System Testing and Certification Program Manual Ver. 3.0, Sec. 3.5.1. NOC 19-01: Software De Minimis Changes, 11-15-2019

Documentation used in SLI's Assessment:
ECO-01645 QA Test Report for Verity 2.7.7 4005833 A.00
ECO-01645 Summary - Verity 2.7 Central Batch Save Time Increase 4005832 A00
Hart RCA Central Batch Save Time Increase
SLI's ECO-01645 Verity 2.7 Central Batch Save Time Increase – TestRail
SLI's Verity ECO - 01645 Record of Trusted Build

Manufacturer Reasoning for Minor Change Determination
These changes do not materially alter the system's reliability, functionality, capability, or operation.

Put an X in the appropriate box:

	Change Evaluation	Comments
	The change affects the form, fit or function of the voting system component(s) and therefore requires further testing to be performed.	N/A
	Minor change: a change to a certified voting system's data and/or TDP, the nature of which will not materially alter the system's reliability, functionality, capability, or operation	N/A
X	**Software Minor change:** a change to the system's software that meets the EAC requirements as identified below.	The changes do not impact the Base OS master image. No other Verity products or releases are impacted by this change.

Software minor changes should have the following general characteristics:

(1) Update a discrete component of the system and do not impact overall system functionality. (2) Do not modify the counting or tally logic of a component or the system (formatting changes to reports are allowable). (3) Do not affect the accuracy of the component or system. (4) Do not negatively impact the functionality, performance, accessibility, usability, safety, or security of a component or system. (5) Do not alter the overall configuration of the certified system (e.g. adding ballot marking device functionality to a previously certified DRE component). (6) Can be reviewed and/or tested by VSTL personnel in a short amount of time (approximately less than 100 hours)

SLI Evaluation and Minor Change Determination
ECO-01645 affects Verity 2.7 only. Central software is updated to 2.7.7 to accommodate the change. The testing, as detailed in Hart's internal 'ECO-01645 QA Test Report for Verity 2.7.7 4005833 A.00' provides sufficient coverage to accommodate this modification including up to 2 million unique identifiers under various conditions (e.g. multiple elections, multiple runs, paper sizes, folded and unfolded). The volume test results showed that the modification made to address the anomaly successfully resolved it by correcting the performance of scan times at volumes larger than 100,000 ballots for ballots with unique identifiers. The regression testing performed confirmed that no new issues were introduced.

Source Code Review verified that all changes found were related to how the system handled ballot image serial ID's as indicated by the change notes. Review also identified changes to 11 files and 467 lines, the update impacts only Central.

The Trusted Build was witnessed by SLI Compliance via Teams

SLI Compliance performed additional analysis / testing by ….

- Two test configurations:
  - Central Standalone. Load it up with an election archive that already has ~175,000 ballots scanned, each with a unique ID, in one task.
  - Central Server with a Central Client. Load it up with the Server with an election archive that already has ~175,000 ballots scanned, each with a unique ID, in one task.
- Scanning 1500 pre-marked ballots, in 5 batches of 300 each, all with different unique identifiers than the ballots already scanned. These can be scanned in the existing Standalone and the Client tasks to add on to the ballots that have already been scanned. One ballot was scanned that had unique identifier that was a duplicate of a ballot already in the database.
- Scanning same 1500 pre-marked ballots in new task of same election as a control group without the 175,000 ballots previously scanned. Performed on both configurations.
- All four groups displayed the same time frame from 'Scan' button press to appearance of the 'Scan Complete'. 3 minutes and 09 – 12 seconds.
- All four groups displayed the same time frame from 'Save Batch' button press to 'Batch saved' message. 11 – 13 seconds.

Please see 'ECO-01645 Verity 2.7 Central Batch Save Time Increase – TestRail' for additional details.

As required under section 3.5.1 of the EAC's Voting System Testing and Certification Program Manual Version 3.0, and in accordance with the instruction provided in *NOC 19-01: Software De Minimis Changes*, SLI Compliance considers the nature of ECO-01619 to be minor and therefore not to affect the Federal certification status for the Verity Voting 2.7 system. No additional testing is required.

For Software minor changes only: Summary of Test Results (attach any additional documentation)
See ECO-01645 QA Test Report for Verity 2.7.7 4005833 A.00
SLI's ECO-01645 Verity 2.7 Central Batch Save Time Increase - TestRail

	Approved by/Title	Signature:	Date:
SLI COMPLIANCE	Steve Ramage Hardware Test Engineer	*Steve Ramage*	03-06-2024
	Michael D. Santos Director	*Michael D. Santos*	03-06-2024