Reserve Component Automation System Database Assessment

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1.0 PROBLEM STATEMENT

This paper reports on the MITRE Corporation's assessment of the Reserve Component Automation System's (RCAS) enterprise database that is under development. In October 1996 MITRE was tasked to complete an independent assessment of the development of the RCAS integrated database. The assessment included both the database engineering products and processes.

2.0 BACKGROUND

RCAS will be an organized collection of systems serving the U.S. Army Reserve (USAR) and the Army National Guard (ARNG). RCAS will support commanders, staff, and functional managers in mobilization planning and administration of the Army's Reserve Component (RC) forces.

According to the RCAS Operational Concept Description (OCD) [1], the origin of RCAS goes back to the mid 1980s when the Army identified a need to improve automation of the mobilization function during large mobilization exercises directed by the Joint Chiefs of Staff. RCAS was restructured in 1995 to ensure usage of new information management technology, increase user satisfaction, and lower overall cost. The RCAS when fully deployed will provide an integrated database deployed at the State Area Commands (STARCs) and Regional Support Centers (RSCs).

Figure 1 depicts the RCAS enterprise database. The shading around boxes indicates multiple copies of the database. For example, the integrated database will be distributed at multiple STARCs and RSCs. The National Guard Bureau (NGB) and US Army Reserve Command (USARC) will each have a roll-up, read-only copy of selected databases from the STARCs and RSCs within their chains-of-command.

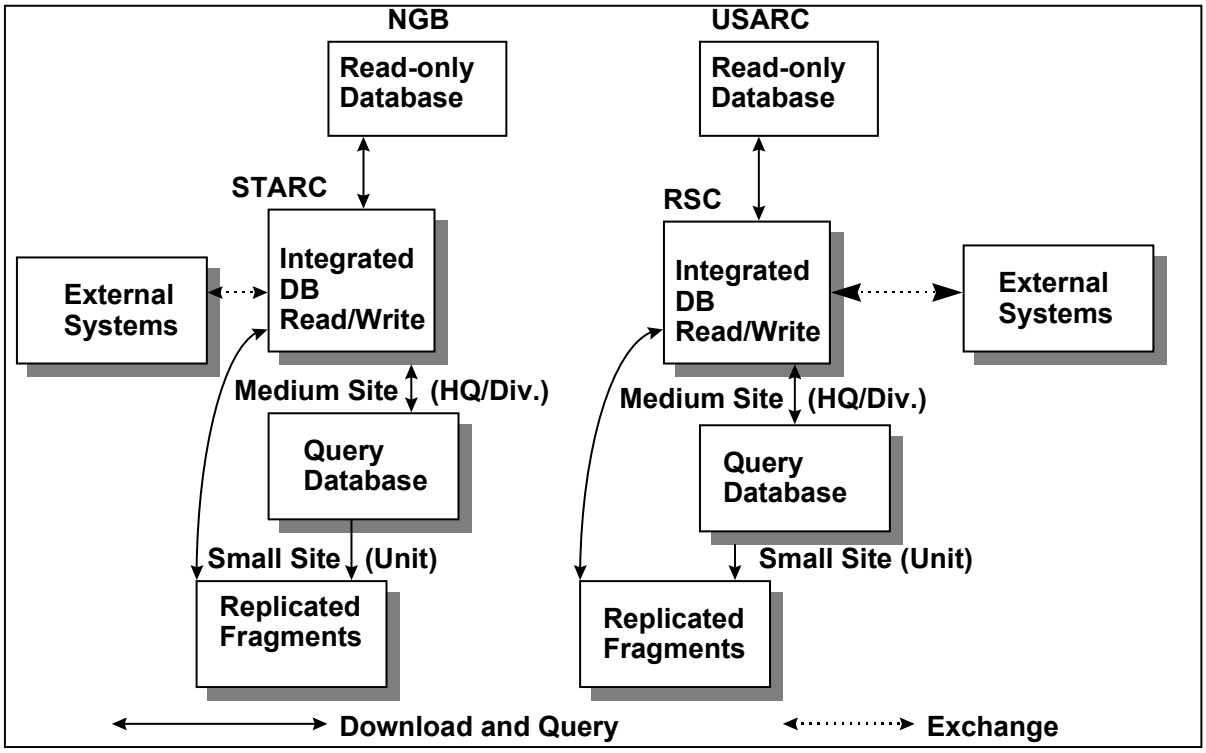

Figure 1. Planned RCAS Enterprise Database

3.0 SCOPE

The scope of the database assessment effort applied to the integrated database being developed for fielding at the STARCs and RSCs (see figure 1) as well as the processes and methodology used to develop the database. The assessment included the following general goals:

- Establish an understanding of the RCAS enterprise database.
- Review and analyze the database processes.
- Assess the quality of the processes.
- Make recommendations that will enhance the RCAS database development and fielding.

4.0 STUDY METHODOLOGY

The database assessment methodology included the following steps:

- Determine if all data requirements have been fulfilled.
- Determine if developers identified what data each functional requirement needs.
- Determine if developers identified processing needed for each data requirement. Assess the sufficiency of the processing.
- Trace processing to specific design and implementation items.
- Trace each requirement through all data models and subject area data.
- Trace each requirement to a specific implementation.
- Identify documentation for all data management procedures. Assess accessibility, completeness, comprehension, usefulness for system/database maintenance.
- Identify all technical and operational data and application subsystem requirements. Determine if there is a process in place to implement the requirements.
- Assess the RCAS database security plan.
- Assess the impact of very large-scale Government-off-the Shelf (GOTS) rehosting on database processing.
- Assess the RCAS enterprise metadata repository.
- Assess the impact of the high use of point-to-point interfaces in RCAS.
- Assess units-to-integrated-database connectivity.

Each step resulted in findings and recommendations.

5.0 STUDY RESULTS

The results of the assessment are summarized below in the form of an assessment item followed by findings and recommendations:

1. Determine if all data requirements were identified.

   - Findings: The RCAS data requirements are defined by the external databases and the subject area data. Each functional process has been mapped to both subject area data and external databases.

- Recommendations: The mappings found should serve as basic plans of actions for the database development.

2. Determine if developers identified what data each functional requirement needs.

   - Findings: Each functional requirement has preliminary assignment of both external databases or systems and subject area data. In addition, data elements (attributes) have been identified for the functional processes associated with releases that are currently under development.

   - Recommendations: It would be useful for long-range planning to make a preliminary assignment of subject area *data elements* to functional processes. This would be helpful in planning the direction of the database.

3. Determine if developers identified processing needed for each data requirement. Assess the sufficiency of the processes.

   - Findings: High-level data requirements have been identified for all functional processes. In addition, detailed data requirements have been provided for releases under development. Given the RCAS approach of incremental development, the information provided is sufficient.

   - Recommendations: None.

4. Trace processing to specific design and implementation items.

   - Findings: Each functional process has been prioritized and tentatively mapped to code units within specific releases. The tracing has been done very well. The information provided is sufficient.

   - Recommendations: None.

5. Trace each requirement through all data models and subject area data.

   - Findings: A physical data model exists for release 1. Interface agreements are in place for eight of the 97 external interfaces. The interface agreements include record layouts and descriptions. This represents approximately 8.2 percent of the external interface data for approximately 9.5 percent of the total RCAS development. In addition, the enterprise data model addresses eight, or 36 percent, of the subject areas.

   - Recommendations: This is reasonable progress, but we recommend an acceleration of the interface agreements process for external interfaces.

6. Trace each requirement to a specific release.

- Findings: Functional requirements are traced to releases. For data requirements, external interfaces are indirectly traceable to releases via their association with functional processes; and subject areas are traceable to releases. The tracing of functional requirements is excellent.

- Recommendations: As a general guide and for planning purposes, a data element level tracing of subject area data would be useful.

7. Identify documentation for all data management procedures. Assess accessibility, completeness, comprehension, usefulness for system/database maintenance.

- Findings: Some critical documents appeared not to be accessible in soft copy form at the contractor's premises.

- Recommendations: Make critical documents accessible at contractor's premises in both hard and soft copy.

8. Identify all technical and operational data and application subsystem requirements. Determine if there is a process in place to implement the requirements.

- Findings: RCAS technical and operational data and application subsystem requirements are commonly termed Needs. All Needs have been identified. Needs are assigned to releases when a project plan for the release is under development. Approximately six of a total 36 Needs have been assigned to releases 1 and 2. This represents about 17 percent of the Needs. RCAS is making good progress in assigning Needs to releases.

- Recommendations: It would be a useful planning tool to do a preliminary assignment of Needs to future releases in order to estimate when the requirements will be implemented.

9. Assess the RCAS database security plan.

- Findings: RCAS security planning to date includes a script for how to create roles, create new users in the database, and assign roles to users. It also includes a description of audit policies.
- Recommendations: A definition of capabilities provided to each role, a description of objects which can be accessed by "public" (as a user gets public access by default) may help. It should be made clear in the policy that public grants to database objects should be as limited as possible. The security plan should include backup and recovery policies for the database.

10. Assess the impact of very large-scale Government-off-the Shelf (GOTS) rehosting on database processing.

- Findings: The GOTS selected for rehosting in RCAS were not originally developed with reuse in mind. They are replete with instances of machine, device, and operating system dependence. The old GOTS must interact with a new database, which implies code changes. The GOTS applications will not enforce data integrity.

- Recommendations: As a long-term solution reengineer the GOTS applications using the design and architecture of the GOTS software. Do not rehost the old code.

11. Assess the RCAS enterprise metadata repository.

- Findings: It is a very good and impressive repository approach. Once the learning curve for the tool (Rochade) in which the repository is implemented is overcome, it should prove to be a very good tool to drive an integrated database and propagate to the rest of the Army.

- Recommendations: Demonstrate and present the RCAS repository at conferences and workshops. In addition to this recommendation, the assessment team made detailed recommendations to enhance the implementation of the repository. The following summarizes those recommendations: 1) The repository developers should define a process for assuring the quality of the repository and its contents. 2) The repository developers should document a repeatable configuration management process. 3) The repository developers should synchronize the repository's metadata and metamodel. 4) We recommend the maintenance of additional metadata.

12. Assess the impact of the high use of point-to-point interfaces in RCAS.

13. Assess units-to-integrated-database connectivity.

- The assessments of the high use of point-to-point interfaces in RCAS and the units-to-integrated-database connectivity present considerable technology challenges. We found that these challenges require more extensive investigation than could be addressed during the course of this study. We, therefore, deferred further work in this area to a follow-on project of evaluating database web servers. In that context the connectivity and integration required in the two areas can be addressed through simulation of the RCAS environment

6.0 CONCLUSIONS

Overwhelmingly, this assessment has determined that critical products and processes are present in the RCAS development. They are critical to both the successful development and fielding of an integrated database. These critical products and processes exist in RCAS and are more than sufficient to meet the needs, especially in light of the RCAS approach of incremental development. For example, the developer is successfully employing an iterative approach to enterprise modeling. This approach began with initial enterprise activity and data models. Before each of twenty-one data and application releases, logical and physical data models were developed, and the enterprise data model was updated. The activity models were also engineered in more detail during the development for a release.

One example of the products and processes being implemented for RCAS, the enterprise metadata repository, stands out as a high quality, excellent tool. The metadata repository contains all the project metadata including process and activity models metadata and the logical and physical data models. This tool could be used by several database development efforts in the Army, and it could contribute to sharing of models and other information. The RCAS program manager is receptive to demonstrating and sharing the metadata repository with other developments. For more information on the RCAS project, please contact LTC Pete Blakney at (703) 821-6476 or Mr. Richard Mantyla at (703) 761-3734.

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