

NOMADS: OCSE Scope of IV&V Assessment Review Update

1. Introduction

1.1 BACKGROUND

As a result of missing the October 1, 1997 deadline for achieving federal certification for system modification to meet the requirements of the Family Support Act of 1988, the State of Nevada's automated Child Support Enforcement System became subject to mandatory provisions of 45 CFR 307.15(b)(10). These provisions require an entity independent of the State Title IV-D agency and of the NOMADS project management structure to review all technical and managerial aspects of the project. An assessment of the scope of Independent Verification and Validation (IV&V) required for the Nevada Operations of Multi-Automated Data Systems (NOMADS) was conducted on November 17-19, 1998 by representatives from the Office of Child Support Enforcement (OCSE).

The report containing OCSE's findings was issued to the State of Nevada on February 4, 1999. On April 7, 1999 the State provided OCSE with responses to these findings. While, for the most part, there was agreement on these findings, there were some areas of contention. There were also some findings which, according to the State's response, have changed since the November review. After some discussion between OCSE and State personnel, it was decided to meet from April 19 through April 21, 1999 to further discuss these findings. The purpose of this report is to provide an update of OCSE's findings based on the State's written responses and discussions held with State personnel.

1.2 OVERVIEW

Overall, OCSE is encouraged by the State's responses to our findings from the November 1998 review. They have made organizational changes in response to OCSE's concerns about project management. They have also begun to provide documentation that did not exist in November 1998. While this documentation is very preliminary in nature, State staff indicated during the April 19-21, 1999 meetings that plans exist to improve these documents using the Software Engineering Institute's Capability Maturity Model (CMM) guidelines.

The overall finding from OCSE's November 1998 review was that the State must obtain an IV&V contractor to perform their IV&V review. This requirement has not changed. The State's IV&V review must address the requirements addressed in paragraph E.5 of the Addendum to State Systems APD Guide for Child Support Enforcement Systems, OCSE-AT-99-03, as well as the findings from OCSE's February 1999 report. The exception, which is discussed in more detail in this report, is the IV&V is no longer required to include a study of the feasibility of implementing the IV-D portion of the NOMADS system separately from the rest of the system. All IV&V contractor reports must be submitted to OCSE at the same time they are submitted to the State's project management.

1.3 FORMAT OF THIS REPORT

This report provides updates to OCSE's findings from the November 1998 Scope of IV&V Assessment Review. The original November 1998 findings are duplicated in this report. Under the "Update" heading, the reader will find a summary of the State's written response to that finding, a summary of discussions held during the April 19-21, 1999 meetings, and any changes to the finding based upon these discussions. Please refer to the original Scope of IV&V Assessment Review report and the original State responses for more detail.

2 Findings

2.1 PROJECT MANAGEMENT

2.1.1 Project Initiation

November 1998 Finding 1:

The State has assigned overall project management responsibility to IBM. This must be the responsibility of State personnel. An organization has been established with an IBM project manager, an NSWAD Administrator, and a DoIT Director forming an executive management team. However all team managers under that executive management team report directly to the IBM project manager, who has the authority to make project decisions.

Update:

We are encouraged that the State has taken measures since our November 1998 review to begin transitioning project management to State personnel. The organizational changes described in the State's response to the Scope of IV&V Assessment Review, dated April 7, 1999, coupled with the cooperation we have received from State personnel, indicate a commitment to infuse more State control into the project. We continue to require the State's IV&V review to address organizational structure.

The State's response also indicated they are beginning to take measures to move forward with the skills transition process to move from vendor dependencies to full State administration. Again, this is encouraging and OCSE would like to receive a copy of the State's skills transition plan once it is completed.

The State's response indicated several organizational changes. However, the organizational chart provided in the April 7 response letter does not reflect these changes. OCSE would like to see an updated organizational chart that reflects these changes. This organizational structure must be part of the State's Corrective Compliance Plan (CCP). It is essential that these organizational changes demonstrate the State has direct Project Management to ensure federal approval of the CCP.

November 1998 Finding 2:

It appears to be that support from local District Attorney (DA) offices for the NOMADS project has diminished. DA's are requiring the State to make enhancements not needed for certification as a condition of allowing statewide rollout. One example is requiring local form flexibility. As reported, DA's are also asking about alternative configurations for their counties.

Update:

The State's response to our comment indicates there has been an increase in cooperation by the District Attorneys offices since the November 1998 review. However, there appears to be some concern remaining. OCSE will continue to monitor this issue closely.

We continue to stress that the State must limit system requirement changes to those items that will enable them to meet federal certification requirements. Requests for additional enhancements from the county DA offices may be documented in Work Items by the State, but unless required for certification, must be deferred until a certified, statewide system is operational. Upon completion of federal certification, the State is encouraged to move forward to make enhancements to the system.

2.1.2 Project Planning and Reporting

November 1998 Finding 1:

The State indicated the IV-D portion of the system has completed initial development, however this was not verified by this assessment. The State is delaying implementation until the entire integrated NOMADS system is completed. The State must use the IV&V to consider the option of bringing up the IV-D portion of the system independent of the rest of the system to allow them to accelerate certification.

Update:

The State's response to this finding indicated further study of this issue has been conducted and that the time to analyze and implement this option would greatly exceed the time required to complete NOMADS as an integrated system. Judging from the apparent progress made in the development of the NOMADS program since our November 1998 review; OCSE is inclined to agree with this assessment. As a result, OCSE no longer requires the State's IV&V to consider this option.

November 1998 Finding 2:

The financial FFP accounting reports do not reconcile with total claims submitted. Based on claims submitted, it appears that the State has overdrawn approved NOMADS funds. However, the State believes there are sufficient approved funds remaining. As an explanation, project fiscal personnel stated that there is a possibility that non-NOMADS data processing costs have been claimed as NOMADS costs and that they are investigating this Finding.

Update:

The State's written response to this finding indicated this remains an open issue. OCSE provided assistance to the State to look at this finding in detail during the April 19-21, 1999 meetings.

November 1998 Finding 3:

The State has not supplied requested cost adjustments for disallowed time periods of IBM contract amendments 7 & 8. OCSE disallowed FFP because the State failed to submit both amendments for approval prior to their execution in accordance with 45 CFR 95.611.

Update:

The State's written response indicated this also remains an open issue. Costs incurred for the disallowed periods was provided during the April 19-21, 1999 meetings and are in review. This Office will provide our decision regarding the disallowance/adjustment of FFP under separate correspondence.

November 1998 Finding 4:

The Computer Business Systems Incorporated (CBSI) contract for data center hardware may have needed prior approval. CBSI was originally a subcontractor to IBM. Upon IBM's termination of this subcontract, DoIT contracted CBSI under a DoIT master services agreement contract.

Update:

The services supplied by CBSI are for programming and technical support. The State's response indicated the CBSI services are part of a Master Services Agreement (MSA) contract. Based on Federal regulations at 45CFR95.611 and policy interpretations contracts [Statements of Work (SOWs)] acquired under an MSA, the CBSI contract(s) to support the NOMADS project required the Departments prior written approval. This Office will provide additional information regarding this issue under separate correspondence.

2.1.3 Project Estimating and Scheduling

November 1998 Finding 1:

There has been little or no anticipation in the planning and estimation phase of the program to account for the likelihood that when the system goes in to a test or pilot phase, there will be changes required due to problems or enhancement requests. As a result, whenever a change is required, it impacts the schedule and cost of the overall project. The State should have collected enough historical data by now to anticipate and plan for the amount of change required for future test and pilot phases. There should also be up-front planning to ensure flexibility in NOMADS to accommodate inevitable Federal and State regulation changes that will impact the NOMADS program.

Update:

The State's response indicated past experiences have led them to recognize the need for advance planning for the likelihood of system fixes and modifications. This is reflected in their January 29, 1999 APDU. We are encouraged by the apparent improvement in the State's planning activities since our November 1998 review.

November 1998 Finding 2:

There is no definite system completion date in the project plan. The State and IBM indicated that the earliest date for Phase II implementation statewide would be October 2000. This depends on the current schedule being met (which is highly unlikely, based on project history). Note that Phase II includes only FSA 88 requirements. It appears that the State has little chance of implementing PRWORA system requirements by October 2000, since these are not yet identified in the project plan.

Update:

The State's response took issue with this finding and referred to a schedule in the January 29, 1999 APDU. This finding was based upon a review conducted by OCSE personnel in November 1998 during which the review team was presented with two contradictory schedules with completion dates nine months apart. Again, we are encouraged by the apparent improvement in the State's planning activities since our last review.

November 1998 Finding 3:

IBM is on a time and materials contract. Amendment 8 runs through June 30, 1999, although State staff indicated that the contract hours would be used by May. The cost for IBM alone averages \$5-7 million annually for total NOMADS development. At the current pace, at least 2 more years of development will be needed. Cost overruns will also extend to State staff and State data center use.

Update:

The State's response indicated they are taking measures to extend monies remaining on the IBM contract to support key IBM personnel through June 30 and possibly beyond. The details of which personnel will be maintained, and for how long, remain in the planning stages. OCSE strongly urges the State to ensure that the personnel maintained be chosen with the primary goal of completing system development and achieving certification.

November 1998 Finding 4:

State staff indicated there would never be a break-even point for NOMADS. Based on current projected costs and benefits, costs will always exceed benefits. This must be considered during the IV&V review.

Update:

This finding was based on verbal information provided at OCSE's November 1998 review. The State's response to this finding provides a reference to the January 1999 APDU that indicates a break-even point in FY 2012. The response does not explain what occurred between November 1998 and January 1999 to change the State's view on break-even. In either case, break-even must be a consideration during the State's IV&V review.

November 1998 Finding 5:

It is unclear if an analysis has been conducted to examine areas of NOMADS where Family Support Act certification requirements are either superseded by, or conflict with, PRWORA automation requirements. This analysis could potentially prevent duplication of effort.

Update:

We thank the State for clarifying they are attempting to economize by considering PRWORA automation requirements in their on-going development effort. This area was not discussed in detail at the November 1998 review. It was included in our findings to ensure the IV&V provider considers future PRWORA requirements when conducting their detailed review.

November 1998 Finding 6:

There is no planning or scheduling for how to more effectively and efficiently train staff on NOMADS functionality.

Update:

First, this comment was meant to refer only to development staff. As the State explained in their response and during our November 1998 review, end user training is on going.

The State's response to this finding also indicated a comprehensive skills transition plan is being developed to address movement of the NOMADS project from vendor dependencies to State personnel. The transition to State personnel will be completed by June 30, 1999. OCSE is concerned whether this date is too ambitious and would like to know when the skills transition plan will be completed. This plan was still in development during the April 19-21, 1999 meetings. The State must provide a copy of the skills transition plan to OCSE upon its completion.

2.1.4 Project Personnel

November 1998 Finding:

The State indicated a difficulty exists in obtaining and keeping personnel with the appropriate background and experience levels for this project. The heavy turnover rate is detrimental to the project as a whole and detrimental to plans for eventual turnover of the program from IBM to the State. The State project manager has resigned. State and vendor management have many disagreements. In addition, skill transition training to State and other contractor personnel has not occurred to allow for future turnover of the system to the State. A personnel initiative program is in the planning stages to attract and keep personnel, however it is unknown when any of this program will be approved and funded by the legislature.

Update:

The State's response reiterated that steps are being taken to transition State staff and to present employee incentive programs to the legislature. OCSE continues to require the IV&V review of the NOMADS system to include an examination of the project's organization to determine its impact on personnel performance

2.1.5 Project Organization

November 1998 Finding:

The organizational structure utilized for this project was developed to encourage cross training and cooperation among the various state and contractor groups. However, it also makes the lines of reporting unclear and forces competition for very limited resources. Also, there is no separation of functions, particularly in the area of software testing. The test manager indicated that the personnel performing testing at all levels were the same personnel who performed design and code. As a result there is no independent testing performed on the software.

Update:

The State's response reiterated that the organizational structure for the project does encourage cross training. This was never at issue. The issue from the November 1998 review was that the organizational structure made the lines of reporting unclear and forces competition for limited resources. OCSE continues to require the IV&V review to include an examination of the effectiveness of the project organization to determine its impact on personnel performance

The State's response also discussed the statement that personnel performing testing at all levels were the same personnel who performed design and code. This finding was based upon the State's responses to OCSE questions concerning test methodology during the November 1998 Scope of IV&V review. In an attempt to clear up this issue, OCSE interviewed personnel responsible for system integration and acceptance testing during the April 19-21, 1999 meetings. It was clear from this interview that these personnel are independent from the personnel who perform design and code.

2.2 TRAINING

November 1998 Finding:

State staff is expected to take over maintenance and operations of NOMADS once development is completed. There is a requirement for IBM to perform skill transition training to State and other contractor personnel to allow for future turnover of the system to the State. However, this training has not been initiated and no formal plan exists to perform this skill transition training. According to State personnel, this skill transition is occurring only partially through on-the-job training at this point. Based upon OCSE observations, if IBM left NOMADS tomorrow, State staff could not assume responsibility.

Update:

The State did not provide a written response to this finding. Training was discussed with State personnel during the April 19-21, 1999 meetings. The training requirements for the State may be divided into three areas: User Training, Skills Transition Training, and Developer Training.

- User Training is on going. The State provided a preliminary Training Plan in their written response which defined User Training. OCSE comments to this preliminary document are provided in section 2.3 below.
- Skills Transition Training is training the State indicates is needed from IBM personnel before termination of the IBM contract in June. A Skills Transition Plan, which will define this training, remains in development. As stated earlier, the State must supply OCSE with a copy of this plan upon its completion. OCSE is concerned that time is short to complete a Skills Transition Plan and to perform the actual training prior to June 30, 1999. The State must give completion of this training its highest priority.
- Developer Training has not been planned. As the State takes over maintenance of NOMADS, they will expect see turnover of personnel. The Training Plan must be augmented to include developer training requirements, particularly training for new personnel. Again, the comments to the preliminary Training Plan in section 2.3 should be applied.

2.3 PROCESS DEFINITION AND PRODUCT STANDARDS

November 1998 Finding:

While the State was able to provide a verbal description of many of their processes, in most cases these processes are not documented. Examples where documentation is required include the Training Plan, Software Development Plan, Test Plan, Security, Quality Assurance (QA), and Configuration Management.

Update:

The State's response is that these documents do exist and copies of the Training Plan, Software Development Plan, Test Plan, Security Plan, Quality Assurance Plan, and Configuration Management Plan are attached to their response letter. Since the State was unable to provide copies of these documents during the November 1998 review, we assume they have created the documents since that review was conducted. The preliminary nature of these documents also leads us to this assumption. However, we are encouraged that our November review has prompted action on the State's part to begin documenting some of their processes. Further discussion during the April 19-21, 1999 meetings revealed the State is planning to utilize the Software Engineering Institute's Capability Maturity Model (CMM) guidelines for further development of this documentation. We feel the CMM guidelines are a good choice for much of this process definition and documentation. OCSE urges the State to maintain this plan. As stated in the November 1998 Scope of IV&V Assessment Report, a detailed review of these documents must be included in the State's IV&V review.

2.4 QUALITY ASSURANCE

November 1998 Finding:

There is no formal Quality Assurance plan. The State has hired Maximus to assist with project management and APDUs. In addition, DoIT provides one technical staff member assigned for oversight. Although these people can monitor processes, they do not have time to assess quality. It is also not clear if the current QA staff is sufficient to assess a project of this cost/scope/risk.

Update:

The State's written response indicated they are attempting to increase QA. During the April 19-21, 1999 meetings, State personnel indicated they are attempting to determine the amount of QA support needed and the "mix" of vendor and State personnel which should provide that support. While OCSE cannot recommend State vs. vendor support, it is clear as reflected in our November 1998 finding that additional support in this area would be beneficial.

In determining their staff requirements for QA, the State may consider the following information. QA should address three primary areas: the quality of the software products, the project's compliance with the defined software development processes, and assessment of the capability of the defined software development processes. When well defined processes, which include product peer reviews, is in place, much of the QA work can be performed by the project management and engineering staff. Unfortunately, the NOMADS project does not have these processes in place yet. That is why it is important for the State to begin defining these processes.

Once the State has processes and product review methodologies defined and in place, the QA job will consist primarily of ensuring the processes are followed, measuring product quality, and working on improvement of the processes in order to further improve product quality. This is ultimately the responsibility of the software project manager. However, because the software project manager has other responsibilities, some these QA responsibilities may be designated to engineering staff, through the use of product peer reviews and process reviews. Again, NOMADS must have processes in place for these reviews before this methodology will work. The software project manager will still ultimately be responsible for ensuring these reviews are being conducted and that all project processes are being followed. In an organization where the software project manager and/or the engineering staff are unable to spend the appropriate time for these activities, augmenting project staff with QA staff who report to the software project manager is necessary.

2.5 CONFIGURATION MANAGEMENT

November 1998 Finding 1:

While a viable configuration management process appears to be in place, there is no formal configuration management plan to provide a written description of this process.

Update:

As discussed above under “Process Definition and Product Standards”, the State supplied a copy of a CM Plan with their response. It appears to do a good job in describing their CM processes. Use of CMM guidelines for further development of this document is recommended.

November 1998 Finding 2:

Configuration management for the system utilizes a form called a “Work Item”. This form includes an indicator, “Impact to Training”. While this indicator appears to be utilized as designed to note training impact and to ensure the change is reported to training personnel, this process is not tracked to completion. Once the training material has been updated in response to a Work Item change, the Work Item form is not updated to reflect the training update as completed. While the training group maintains their own separate record showing completion of the Work Item, this must be incorporated back into the actual Work Item.

Update:

The State’s response indicated this remains an issue. This issue must be addressed during the State’s IV&V review. User training and System Developer training requirements must be fully integrated into the Work Item management process to ensure all training materials are kept up to date as changes are made to the system.

2.6 REQUIREMENTS MANAGEMENT

November 1998 Finding:

There is no requirements document for the NOMADS system. Changes to the system are documented in Work Items. These are tracked to completion. However the changes documented in these Work Items only exist separately and do not appear in an overall system document. Any changes affecting the user end of the program at the design level are updated in the detailed design document, but this level of detail is not sufficient to document all changes. See the section on Detailed Design for more description.

Update:

The State's written response indicated that the original requirements document consisted of six volumes. Changes to the requirements are maintained as separate Work Items. They went on to explain that these Work Items are then placed on their CMTS tool at which point they are no longer separate items. The issue of software documentation was discussed in detail during the April 19-21, 1999 meetings. Our observation during these discussions and through our review of the documentation is that no single, complete, and up-to-date document representing NOMADS software requirements or design exists. As a clarification, the six volume document mentioned in the State's written response is actually the requirements document for an old proposed transfer system which is no longer applicable to the NOMADS system. A discussion of OCSE's understanding of what software documentation currently exists for the NOMADS project and where we feel the State is deficient in maintaining software documentation can be found in the white paper in Attachment A to this report.

2.7 SYSTEM SECURITY

November 1998 Finding:

While an informal process for maintaining system security exists, there is no formal system security plan.

Update:

As discussed above under "Process Definition and Product Standards", the State supplied a copy of a Security Plan with their response. However this document does not fully cover the Security and Privacy requirements of the federal certification guide. A copy of section H of the certification guide containing the security requirements was provided to State personnel during the April 19-21, 1999 meetings.

2.8 SYSTEM CAPACITY

November 1998 Finding:

The last capacity study was performed over a year ago. The data from this study was provided to the OCSE assessment team in terms of millions of instructions per second (MIPS). This alone is not necessarily reflective of the actual software performance in terms of core usage and application run times. Significant changes have occurred since the study was completed. The State plans to replace the current mainframe in the near future. No IV&V has been performed or is planned to assess this new system environment.

Update:

The State's response agrees this needs to be part of the IV&V scope of work. The State's IV&V review must include an analysis of system capacity data along with a study of any plans the State has to replace the current mainframe.

2.9 REQUIREMENTS ANALYSIS

November 1998 Finding 1:

There is no up-to-date software requirements document for the system. This is an essential element of the software development process. By maintaining this document through the change control process, it provides a historical record of what changes were made, why they were made, and who approved them. It is also unclear how the State is able to review and approve changes to the system requirements when no initial requirements document exists. The software requirements documentation should be the first step prior to developing the software design documentation. It should also be the guiding document for the development of test cases and test plans and procedures at the system level of testing. A complete, up-to-date software requirements document is essential before the State can support maintenance and operations for NOMADS

Update:

The State's response reiterated what they told the OCSE review team in November 1998. The issue of software documentation was discussed in detail during the April 19-21, 1999 meetings. Our observation during these discussions and through our review of the documentation is that no single, complete, and up-to-date document representing NOMADS software requirements or design exists. A discussion of OCSE's understanding of what software documentation currently exists for the NOMADS project and where we feel the State is deficient in maintaining software documentation can be found in the white paper in Attachment A to this report.

November 1998 Finding 2:

Additional changes continue to be made beyond the original project scope. Meanwhile, Nevada's Title IV-D program penalties for missing Family Support Act of 1988 systems deadline continue to accrue. In addition, NOMADS is missing PRWORA program requirements (i.e. Distribution) where Nevada is still subject to the State Plan disapproval process. Priority does not seem to be given to finishing automation for Child Support and thus mitigating these penalties.

Update:

The State's response indicated their primary focus is development of functionality required to meet IV-D certification and, where feasible, areas where PRWORA requirements supercede or conflict with certification requirements. As stated earlier, OCSE remains concerned about District Attorney influence on NOMADS requirements. Requests for additional enhancements from the county DA offices may be documented in Work Items by the State, but unless required for certification, must be deferred until a certified, statewide system is operational. Upon completion of federal certification, the State is encouraged to move forward to make enhancements to the system.

2.10 SYSTEM HARDWARE

November 1998 Finding:

The current end user equipment configuration was installed in 1995. To date, this equipment has been used for training. It is nearing the end of its life cycle. The State claims that hardware, network, and software versions have been kept up-to-date so they will support NOMADS.

Update:

The State's response indicates this equipment fully supports NOMADS activities and that Nevada "has absolutely no concerns about end user hardware. Equipment in place now is providing the functionality necessary to effectively access and work with NOMADS applications." However OCSE understands Clark County is now requesting \$1M for equipment, some of which is for replacement of NOMADS equipment purchased in 1995. This appears to conflict with the State's response to this finding. During the April 19-21, 1999 meetings, State staff indicated the Clark county request occurred after the written response had been generated. As stated in our original November 1998 finding, OCSE continues to require the State's IV&V review to ensure the current hardware and operating environment will support the system once implemented statewide. Our concern is strengthened by Clark County's request.

2.11 DATABASE MANAGEMENT

2.11.1 Data Conversion

November 1998 Finding:

Case clean-up of financial information has not started in most counties. If NOMADS were to be completed tomorrow, it would still take 12 months for the State to enter all cases to the database. The State wants to enter full data only on currently paying cases, and add financial information for non-paying cases gradually. This would not meet certification requirements, nor would it be sufficient for a conditional certification.

Update:

The State's written response provided a detailed description of how the State and counties are approaching the data conversion issue. However, this response did not clarify whether the State is now planning for full conversion of all cases. This was discussed during OCSE's technical support visit the week of April 19, 1999. Governor Guinn stressed during these meetings that all counties will be converting all data. OCSE agreed to look into providing technical assistance from another state that has successfully converted their cases.

2.11.2 Database Design

November 1998 Finding:

The database is shared by Child Support (both IV-D and non IV-D cases), and the Family Assistance programs, including TANF, Food Stamps, and Medicaid. As stated in paragraph 2.1.2 above, the State must explore the option of bringing up the IV-D portion of the system independent of the rest of the system to allow them to escalate certification. As part of the Finding, the State needs to consider what modifications, if any, would be required to enter and maintain all client data in the IV-D system alone.

Update:

The State's response reiterated that studies made subsequent to the November 1998 review indicate separating out the IV-D functionality would be too complex and time consuming. As stated earlier, judging from the apparent progress made in the development of the NOMADS program since our November 1998 review, OCSE is inclined to agree with this assessment and removes the requirement for this study from the scope of the State's IV&V review.

2.12 DEVELOPMENT SOFTWARE

November 1998 Finding:

The programming language used is CSP (Cross System Product), which is an antiquated language which is no longer supported by IBM. Development personnel typically require training to use this language. Some of the code has been converted to COBOL, primarily for the screen displays. There is a method available to convert CSP code to another IBM supported language (VisualAge Generator), but the feasibility and cost benefit of making this change would have to be studied prior to taking this step. IBM public relations (Internet web page) claims hundreds of current VisualAge Generator customers have migrated from CSP with relative ease.

Update:

The State's response indicated CSP remains an effective application development tool and that migration to another tool would only add further delays to their system development at this time. We agree, given the current status of NOMADS development, that the timing is not appropriate to perform such a migration. This finding was included in our original report because the State indicated this migration had been under consideration. We agree with the State's assessment that this may be something they would consider for a new enhancement in the future. Since this is typically something an IV&V review would include, we continue to recommend the State's IV&V review include a study of the development software.

2.13 SOFTWARE ARCHITECTURE

2.13.1 High-Level Software Design

November 1998 Finding:

There is no high-level design document. Like the requirements documentation, this is an essential element of the software development process. Again, it provides a baseline for where the software design began. By maintaining this document through the change control process, it also provides a historical record of what changes were made, why they were made, and who approved them. A complete high-level design document is essential before the State can support maintenance and operations for NOMADS

Update:

The State's response indicated a high level General System Design (GSD) document exists, but is not being updated. Changes are tracked through the Design Notes. The issue of software documentation was discussed in detail during the April 19-21, 1999 meetings. Our observation during these discussions and through our review of the documentation is that no single, complete, and up-to-date document representing NOMADS software requirements or design exists. A discussion of OCSE's understanding of what software documentation currently exists for the NOMADS project and where we feel the State is deficient in maintaining software documentation can be found in the white paper in Attachment A to this report.

2.13.2 Detailed Design

November 1998 Finding:

The detailed design document is maintained only for user-end items (screen displays, keyboard entries, etc.). This document was initiated for the rest of the program but has not been maintained and is therefore outdated. As a result, the only way to track changes to a particular portion of code is by looking through all of the individual change records from the various Work Items. A complete detailed design document is essential before the State can support maintenance and operations for NOMADS.

Update:

The State's response indicates design changes are tracked automatically and that several hard-copy documents are utilized to maintain product detail. They feel this is sufficient to provide a solid resource library for system maintenance. The issue of software documentation was discussed in detail during the April 19-21, 1999 meetings. Our observation during these discussions and through our review of the documentation is that no single, complete, and up-to-date document representing NOMADS software requirements or design exists. As a clarification, State staff was unable to produce the hard-copy documents utilized to maintain product detail during the April 19-21, 1999 meetings. They indicated they felt this written response was probably referring to the Work Items or Design Notes, however both of these products are available in soft-copy form, so this is unlikely. A discussion of OCSE's understanding of what software documentation currently exists for the NOMADS project and where we feel the State is deficient in maintaining software documentation can be found in the white paper in Attachment A to this report.

2.14 TESTING

November 1998 Finding:

There is no independent test group in the NOMADS project organization. The team manager for testing indicated the same people who do design and code typically also perform testing for a given segment of code. There needs to be some phase of testing, typically at the integration or system level, which is performed independently from the design and code.

Update:

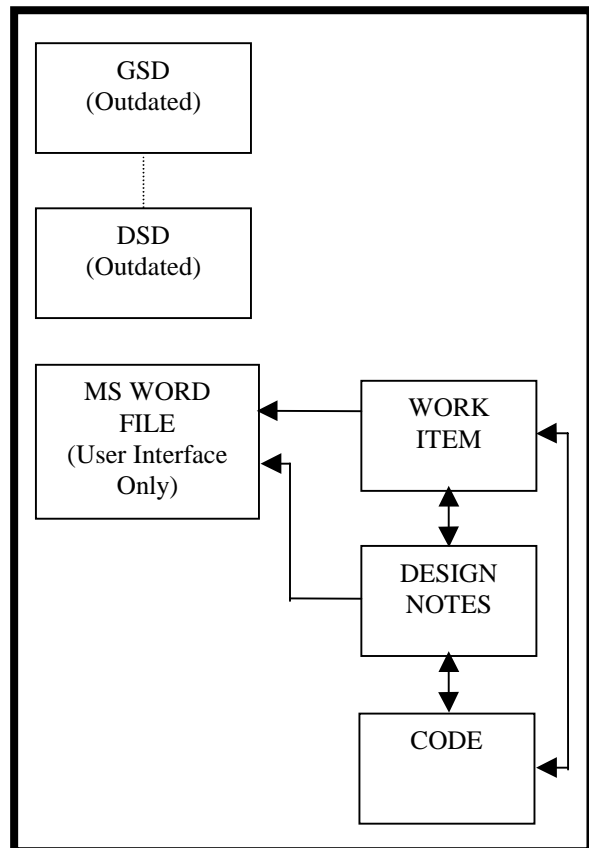
As stated earlier, the State's response indicates the test team does not consist of the same individuals who design and code. This conflicts with statements made during OCSE's November 1998 review. In an attempt to clear up this discrepancy, OCSE interviewed personnel responsible for system integration and acceptance testing during the April 19-21, 1999 meetings. It was clear from this interview that these personnel are independent from the personnel who perform design and code.

Attachment A

Discussion of NOMADS Software Documentation

During meetings between OCSE and Nevada State staff during the week of April 19, 1999, the subject of software documentation was discussed in detail. These discussions also included interviews with vendor staff. This attachment will define OCSE's understanding of what software documentation currently exists for the NOMADS project and where we feel the State is deficient in maintaining software documentation.

The NOMADS documentation is structured in several levels as represented in the diagram on the right. The highest level document is the General Systems Design (GSD) document. The next, more detailed document is the Detailed System Design (DSD) document. Both of these documents exist as hardcopies, but are not updated. The highest level document that is still being updated is a separate Microsoft Word file. This file is used to maintain up-to-date documentation for the design of the User Interface portion of the NOMADS program. This consists primarily of screen displays and keyboard commands.



When a change is required to the NOMADS software which also impacts system requirements, a Work Item is created to document the requirement. A Work Item is the basic form used in the NOMADS Configuration Management process to document problems, enhancements, etc. to the system. A Work Item must be approved by the Change Integration Board (CIB). Once approved and assigned, the responsible programmer may also create design notes for the changes. The decision whether to create design notes is a function of the complexity of the change. Upon implementation of the change in the code, the programmer will notate the comments area of the code with the Work Item number corresponding to the change. If there is impact to the user interface, the Microsoft Word file is updated from the information in the Work Item and Design Notes.

While the process described above does provide a record of changes to the NOMADS system and an up-to-date document for User Interface requirements/design, OCSE remains concerned that no single document exists which provides a total requirements/design package for NOMADS software. When asked the best way to determine if a requirement from the GSD had changed, both test personnel and development personnel indicated the only way is to look it up in the code. State staff indicated the programmers typically notate, in the code comments, the Work Item reference number when entering a code change. Unfortunately, there is no written process, coding standards, or training material to show this is required of all programmers.

Using the code as the only complete source for the latest version of the requirements/design of the NOMADS system is not acceptable software development practice. The State must begin looking at options on how to best develop at least one complete document representing NOMADS software requirements/design. Options may include backfitting Work Items and Design Notes which impact system requirements into the GSD or the DSD. Since the GSD is the smaller and more manageable document and since the Design Notes we saw appeared to contain cross references to the GSD, this appears to be the better choice. Another option might be to expand the Microsoft Word file for the user interface to include all functionality of the NOMADS program. The State may consider these types of activities for use in providing on-the-job training of new development personnel and for skills transition training of State personnel attempting to learn NOMADS design. Consideration of these and other options must be part of the State's IV&V review.