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**Centers for Medicare & Medicaid Services  
Office of Information Services  
Consumer Information and  
Insurance Systems Group**

**Technical Assistance Report For:  
Oregon Health Insurance Marketplace**



**For Limited Distribution**

**Version 1.0**

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## 1. Introduction

### 1.1. Background

To implement the provisions of the Patient Protection and Affordable Care Act (PPACA), the state of Oregon is creating the Oregon Health Exchange, a new State-based Marketplace. The Oregon Health Marketplace is independently operated by Cover Oregon (CO) and is to act as the common front door that citizens use to gain access to affordable health insurance and Medicaid based on Modified Adjusted Gross Income (MAGI). The Oregon Health Authority (OHA) administers the State's Medicaid Program. To implement the information technology (IT) system that supports the Marketplace, Oregon was awarded an Early Innovator Grant from the Centers for Medicare and Medicaid Services (CMS). Oregon chose to act as its own system integrator and partnered with Oracle to develop their solution in June 2011.

### 1.2. ACA Implementation in Oregon

ACA requires that States implementing a Marketplace first determine eligibility for Medicaid or CHIP based on current Modified Adjusted Gross Income (MAGI). If the applicant is ineligible for Medicaid or CHIP, the State must then determine eligibility for subsidized coverage (also known as an Advance Premium Tax Credit – APTC) before offering unsubsidized coverage through a process that allows the applicant to compare plans and select the one they prefer.

CO has chosen to build a single web-based portal that will make eligibility determinations and allow citizens to shop for plans. Applicants considered eligible for Medicaid or CHIP are enrolled through Oregon's Medicaid Management Information Systems (MMIS). Applicants eligible for subsidized coverage and those who want to purchase unsubsidized plans are enrolled in plans through the Health Insurance Marketplace.

In addition to determining program eligibility and supporting enrollment, the Marketplace offers key functions such as plan management, financial management, Small Business Health Options Program (SHOP), customer service, and outreach and reporting.

### 1.3. CO HIX Implementation Issues

Oregon's Marketplace solution consists of a suite of mostly Oracle, commercial off-the-shelf software. Throughout the project, there have been challenges in that Oregon has continued to be behind schedule with the delivery of artifacts, demonstrating key functionality and meeting CMS testing timelines.

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Prior to October 1, 2013, CO, realizing that full functionality would not be ready, started focusing on implementing a Day 1 contingency plan which consisted of full functionality via an “internal portal” for community partners and agents. Through a public facing external website individuals can complete anonymous browsing of plans and locate a community partner/agent for further assistance. Individuals contact the community partner/agent and the community partner/agent completes the application with the individual, via the internal portal. However, throughout the month of October, the internal portal available to community partners/agents suffered issues as well and eventually the functionality was scaled back so that only paper applications were accepted and routed to customer service representatives (CSR) to enter application data into the back office Siebel system. Additional functionality to determine eligibility was launched in early November for the internal portal only. Because of the huge manual processes, additional CSR staff was brought in to support the manual processes. Also, the Oregon Health Authority (OHA) provided staff to assist with this process.

CO has set target dates for a full launch in October, November, December, and January, but has missed these dates due to unresolved critical defects, performance issues in the various environments and incomplete deliverables such as additional infrastructure environments, performance tuning and performance testing results.

### 1.4. Scope of Work

CMS has requested IT and systems engineering assistance from its partnership with The MITRE Corporation through the CMS Alliance to Modernize Healthcare (CAMH) Federally Funded Research and Development Center (FFRDC). MITRE has had substantive knowledge and understanding of the CO’s systems development life cycle. Additionally, MITRE has also provided technical guidance and assistance through its engagement with CO in supporting and assessing various stages of development through gate reviews.

The goal for the FRRDC technical assistance effort was for MITRE to provide technical expertise and advice to CO regarding the technical design and development work being performed by CO’s systems developer, Oracle.

This work consisted of the following activities:

1. Review of known technical defects, issues and weaknesses within the implemented solution stack.
2. Evaluate existing technical artifacts specifically focused on the use of Oracle OPA, Web Center and Siebel. Artifacts to be reviewed included the Marketplace System Design

Document, ICDs, Database Design documents, and any relevant detailed design documents.

3. Collaborate with both CO, and the development team to understand the context in which design decisions are being made, and the constraints of their Marketplace solution.
4. Make recommendations (based on analysis) to CO regarding approaches to resolving technical problems and risks related to the design.

## **1.5. Purpose of This Document**

This document provides the findings and recommendations from the CMS State Engagement (SE) Team's review and assessment of the CO HIX System. The SE team consisted of representation from CCHIO, OIS and MITRE. This document contains the approach used for capturing observations based on inputs from the CO stakeholders and provides suggested actions to CO on how to improve specific areas of the system engineering solution.

CO remains responsible for the disposition of recommendations herein - IT direction, decisions and funding - in working collaboration with CMS.

## **1.6. Approach**

The CMS SE Team executed a methodology utilized with other states who have recently requested detailed technical assistance. This methodology is based on a series of workshops and interviews designed to facilitate the collection of information from specific stakeholders in the targeted topic areas. The CMS SE team captured observations during meetings which occurred January 13 – 16, 2014. The CMS SE team collaborated with CO to compose an agenda for the four-day technical assistance (TA) series of sessions and demonstrations around the topic areas specified by CMS/MITRE. The following core topics in the agenda were:

- IV&V Observations and IV&V Tool Demonstration
- Infrastructure
- Change Management/Configuration Management/Environment Management
- Testing Methodology
- Software Development Methodology
- Release Planning and Management

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- Daily Scrum Meetings (Eligibility & Enrollment and Plan Selection)
- Performance Test Report Review
- Architecture Review
- System Demonstration
- Disaster Recovery and Continuity of Operations Plan (COOP)

The CMS SE team participated in various types of engagement with CO:

- Workshop style sessions with Subject Matter Experts (SME)
- 1:1 meetings with specific individuals as needed (usually as a result of specific items being identified in the workshop sessions)
- Attending standing CO project meetings

During the engagement sessions, the CMS SE team had the flexibility to probe and to conduct in-depth conversations with the participants.

Each session was conducted in an open and collaborative atmosphere. The non-CMS SE participants were technical individuals from the CO IV&V team, various representatives from Oracle Consulting Services (OCS), CO independent contractors, and CO management. The meeting participants were encouraged to be forthright and forthcoming. The main focus of each meeting was on collecting and verifying information and not on casting blame for the current state of Oregon's Marketplace solution. Participants demonstrated significant commitment, respect, and recognition related to the fluid nature of the session agendas and support for the ad hoc discussions that evolved.

## 2. Concerns Identified Prior to the Assessment

During initial level-setting discussions prior to the assessment, the CMS SE Team expressed several concerns. Broadly speaking, these concerns involved the stability of CO's solution, system performance, changes of projected dates for delivering full functionality, and overall management of the project. The following subsections present a brief list of composite topics identified by the CMS SE Team.

### 2.1. Project Management

- There are limited resources dedicated to the Project Management Office (PMO) functions. The primary focus is on the IT build and little attention is given to other areas such as communication and training which is essential when implementing a system of this scope. Other key roles and responsibilities found in a traditional PMO appear to be lacking.
- The schedule is deficient in that it lacks high-level and/or low-level details highlighting overall project activities other than IT.
- There is no detailed implementation plan for each release.
- There is a lack of transparency in the CO's project management. The delivery of outstanding artifacts to CMS is and has not been a CO priority.

### 2.2. Contract Management

- There have been challenges with CO being able to hold Oracle accountable for needed deliverables by key dates.
- There is no visibility by CO into OCS' activities. Therefore, there is a substantial dependency on OCS for almost everything that is time sensitive (e.g. schedule, fixes, releases, etc.).
- There are collaboration and communication issues between CO and the OCS.

### 2.3. Software Management

- CO uses JIRA, an Atlassian issue tracking product, to capture, track and report on all defects and change requests which appears to meet the needs of Cover Oregon. However, there are concerns with Cover Oregon's overall processes for managing defects and change requests due to the reoccurrence of previously corrected defects in higher level environments. There is no sign of a robust release management process. Each migration of code to a new environment is often followed with downtime due to release issues.
- Configuration management is difficult and complex as Siebel has no code branching (revision control) capabilities. If there are any problems with a build installation, the system cannot be restored to the previous state in an efficient manner for Siebel.



## **2.4. System Environments**

- The CO solution stack is comprised of almost every single component/product in the Oracle product portfolio. While there are other State Based Marketplaces utilizing elements of the Oracle product portfolio, CO has, without doubt, the most complex mix. As such, there are myriad Oracle technical resources required to maintain and support the system.
- With respect to system performance, load, sustainability and functional (end to end) testing, OCS, to date, has not provided CO with a comprehensive suite of test results/reports.
- With respect to the CO production environment, OMCS has provided very little insight into their disaster recovery and continuity of operations test plan. To date, OCS has not provided any corresponding results from DR testing.
- The system environments are not stable and are affecting testing, development and activities.
- There is no true development or true test integration environments for developers and testers to properly test their code and test cases respectively. This creates an issue with untested code being introduced into the production environment; without first being migrated through the UDEV/FTS/Pre-Prod environments.

## 3. Findings

This section contains the basic findings from the CMS SE Team technical assistance review of January 13 – 16, 2014. Observation details used to support the findings listed in this section are found in appendix A. At the time of this review, the CMS SE Team learned that CO had implemented and improved some key processes within the past three months and that they were targeting to implement Release 1.1 by February 1, 2014. Even with the improvements implemented over the past three months, these findings still remain. The following sections summarize the key areas:

### 3.1. Project Management

#### 3.1.1. Project Management Team

CO has staffed an IT project management team, but there is no overarching dedicated Project Manager who should be responsible for overseeing the project to drive overall project activities and keep everyone on track with targeted deliverables. Without a dedicated Project Manager in place, while the IT PM team is able to produce a very high level schedule of key targeted dates for the system, there is no integrated project schedule (or master project schedule) with key dependencies and milestones (consisting of critical IT and non-IT milestones) of all of the teams and stakeholders needed to roll out a release. Also, without a dedicated Project Manager, there is no obvious person within the organization responsible to ensure that all OCS deliverables and activities are performed according to the contract terms (further detailed in section 3.2). Without a dedicated Project Manager there is little, or no, ability to escalate schedule and scope deviations of development, testing, releases, etc. to the CO leadership team.

#### 3.1.2. Project Management Tools

Daily technical sync meetings occur between CO and OCS to go over the status of key areas such as critical JIRA cases, system environment configuration updates, and testing. CO uses standard Microsoft Office tools such as PowerPoint, and Excel to track action items and/or issues. However, CO is not employing Microsoft Project (or any other mainstream project management tool) in order to track schedule, etc. As such, the overall project tracking process is cumbersome and difficult for data analysis or to trace any history of updates.

### 3.2. Contract/Vendor Management

There is no evidence that CO has established good contract administration processes, or that OCS' activities are being closely monitored to make sure that they are fulfilling the requirements of the contract. This, in conjunction with the findings in section 3.1.1, speaks to a significant portion of the root cause for the delay in the CO solution.

CO has limited visibility into OCS' activities and it appears that there is not a clear understanding between Cover Oregon and OCS as to what the expected deliverables are. An example of this is the misunderstanding on the performance testing task. CO was expecting performance testing results and OCS was working on a performance tuning report.

There is a substantial dependency on OCS for time sensitive deliverables (e.g. schedule, fixes, releases, etc.). However, it appears that CO does not have any leverage in their contract to make OCS accountable for missing key deliverables.

There is a prominent presence of OCS staff onsite. Moreover, there is a significant number of OCS developers dedicated to each of the functional areas of the overall development effort. It is suggested that there may be a lack of appropriate skillset involved in the makeup of the development teams (a possible example of throwing bodies rather than skillset at a problem).

With this significant footprint of onsite developers, the related expenses associated with accommodating onsite gives rise to the increase in the projected burn rate, it is suggested that this approach may not be cost effective as this will impact the availability of funding to complete development of additional functionality needed for the open enrollment period in 2015.

### 3.3. System Environments

During the on-site visit, it was noted that CO recognized that a number of testing and subsequent production issues have been born out of inconsistent configuration management across the various system environments. CO had initiated an effort to synchronize the configuration content of the test, performance and pre-prod environments. A subsequent effort would also synchronize the production environment configuration. However, there is still a need for additional environments: true development and true integration test. Not having these separate environments affects the developers and testers abilities to conduct thorough and consistent testing across the suite of environments.

During interviews with CO staff, it was stated by the senior CO contractors that the production system experiences memory and performance issues at least once a day which affects the productivity of users. The fix for this problem is to reboot the system which further interrupts

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the availability of the system. Ideally, the system environment should be up 24/7 with periodic scheduled maintenance windows.

There is a lack of communication regarding system availability which has a negative effect on testers' ability to test cleanly and efficiently with respect to knowing when the system is available to them for testing purposes. There was no evidence that OCS has provided a copy of any variance reports which will help testers to identify the changes in a release that need to be tested. CO testers have requested these reports, but as of the writing of this report, have not received them.

During the review, a demonstration of system functionality was provided. During the demonstration, there were noticeable delays in the calls to the Federal Data Hub Services and the navigation through Plan Selection.

### 3.4. Software Management

The tracking of configuration management history is an industry standard and best practice with respect to monitoring and tracking changes of a system. It is not known whether or not OCS is following these standards. However, CO does not have visibility into the configuration management history of their system environments. While OCS does utilize SVN for code management, there is no formal tool in place for system build configuration management. Without this insight into the environments, CO faces challenges in being able to manage their own system and/or bringing other vendors on board if a future decision to terminate the OCS contract is made.

The functional team leads (the "mini project managers" from each of the OCS development teams) daily agile scrum meetings were initiated in mid-October, 2013 and were continuing to take place during the on-site visit. The scrum meetings consist of a review of open JIRA cases with the OCS developers and the business analysts/testers. The scrum meetings have helped CO's ability to communicate with the developers, but CO could benefit from having a trained scrum master familiar with true agile scrum processes.

CO is facing challenges with any release that includes Siebel changes. Siebel has no code branching (revision control) capabilities. If there are any problems with a build installation, the system cannot be restored to the previous state in an efficient manner. Rather, the Siebel environment has to be re-built and deployed to the previous version which, in its own right, has not been seen to operate in a consistent manner.

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As reported by CO, the OCS staff is using a software version control tool, Subversion (SVN), to analyze changes in the various software versions. However, CO does not have available to them the analysis report nor access to the tool to create its own change analysis reports. While CO has requested these reports from OCS, they have not been produced. This issue speaks to further concerns around contract and vendor management (section 3.2).

With the provision of an on-site release manager, CO has been able to get visibility into the OCS release management plan. The release manager gains knowledge of all of the JIRA case updates and system configuration activities via the daily tech sync meetings. Also, there is evidence that OCS is sharing the release notes with CO. This is unquestionably a positive action.

### 3.5. Testing

The testing team has a standard set of 23 scenarios used for regression testing. These test scenarios do not appear to be sufficient to adequately conduct regression testing for the Marketplace system.

There is no evidence that formal processes such as the writing of test cases and/or scripts and mapping these test cases to use cases and requirements are being followed. This was evident from the demonstration of how JIRA cases are recorded with no references to use cases or requirements.

### 3.6. Additional Items

The following additional issues are also of note:

**Dependency on OCS resources** – there is a significant dependency on OCS’ staff members; many of whom do not have extensive knowledge and experience in a formal software development life cycle. The lack of any formal SDLC has had a significant contribution to the root cause of the delay in the delivery of the CO solution.

**Onsite technical resources** – CO has two technical contractors (contracted by CO directly) onsite who are knowledgeable in Oracle and Siebel products. However, CO faces challenges with recruiting geographically local experienced IT staff.

**Funding Issues** – In missing the October 1, 2013 full launch, CO is burning their funding rapidly with the addition of staff hired to assist with the manual processes and has not planned anything beyond the full individual launch Release 1.1. CO communicated that funding additional tasks (e.g. a re-architecture effort) will be financially challenging for the state;

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however, CMS is committed to working with States to ensure that individuals get health insurance coverage which may include additional funding for IT development.

## 4. Suggested Actions for Consideration

From interviews with the CO team, improvements in various areas around system development practices and infrastructure environment configuration management for the Oregon Health Insurance Marketplace have been made since the ORR (September 12 & 13, 2013). Oracle has made progress in several systems engineering areas as evidenced by recent releases being delivered on time, and a stabilization of the system which has allowed CO to provide successful demonstrations of full functionality to stakeholders. However, there are still significant performance issues with the system such that, while the core functionality exists, the end user experience would be significantly diminished. Engaging in these improvements, while clearly showing progress, were not begun soon enough in the overall program timeline.

Based on the observations from the week of engagement, and based on prior knowledge of the CO program, the CMS SE Team suggests CO consider the following actions to address the known issues with the CO Marketplace solution and to aid in being able to move forward with a full launch of functionality and to respond to required changes in the system to support the mandates of the PPACA program. If CO is interested in implementing any of the suggestions herein - IT direction, decisions and funding – CMS is poised to provide technical assistance as necessary to effectuate the change.

### 4.1. Configuration Management

- *Create an environment product map*  
As part of the environment sync effort, CO should ensure that OCS provides and maintains an environment product map for each discrete environment. It is highly recommended, and consistent with industry best practices, to track the product versions installed in each environment.
- *Transfer configuration management responsibility*  
CO should consider taking ownership from OCS of the overall configuration management process and execution. This will give CO a better perception and comprehension of what is configured and will assist in more accurate program timeline estimates.
- *Request configuration report of system environments*  
CO should request from Oracle, configuration reports for each of the system environments. This information is crucial for CO to troubleshoot environmental issues especially in the production environment which cannot afford to have unplanned system downtime.

## 4.2. Change Management

- *Analyze data and utilize it to isolate problem areas*  
CO should acquire and/or develop additional data analysis reports on various aspects of the system and understand their subsequent usage. JIRA is one source of information that can be utilized to identify problem areas. By utilizing the available information in JIRA, problem areas can be better isolated. IT releases can be prioritized, and resources can be enhanced.
- *Conduct a detailed analysis into the existing OCS change management process*  
CO should perform a detailed analysis of the current OCS change management process and determine the steps necessary to institute a single, streamlined process to improve the control and management of the overall change management function.
- *Transparency into the OCS SVN environment*  
OCS should provide CO access to the SVN environment. At a minimum, OCS should provide CO with detailed reports specific to code management.

## 4.3. Release Management

- *Continue to improve the release management process*  
CO should be more involved in Oracle's release management process. This is especially important when OCS revises the process to align with CO's expectations.
- *Add a step to the release management process to create a rollback plan*  
As mentioned in section 2.3, the OCS code versioning does not allow for branching and as a result some unwanted code elements are included in certain software builds. Therefore, it is suggested that OCS provides a rollback plan for every release so the system can be restored to the previous state in an efficient manner.
- *Take control of direct process execution*  
It is suggested that if CO were directing the process execution, inconsistent migrations of code updates can be minimized (e.g. moving from FTS into Prod without first going through Pre-Prod).

## 4.4. Testing

The recommendations in this section are for both the IV&V testing and integration testing teams.

- *Improve inter-team testing information sharing*  
As part of the overall development and testing methodology, CO should institute the ability for the test teams to gain access to the developer unit test results. This may reside within the data in the JIRA environment.
- *Communicate timelines and availability of environments that affect testing*



The CO testing teams would be more effective if they were fully informed of system availability and build deployment schedules. Information about environment availability and timelines for testing should be shared between the infrastructure and testing teams.

- *Request that OCS share specific information with the IV&V contractor*

To enable accurate IV&V assessments, CO should request that OCS share variance and other reports with the IV&V contractor on a regular basis.

#### **4.5. Performance and Load Testing**

- *Develop a performance testing strategy*

CO should immediately work with Oracle on a performance testing strategy. This should include the short-term goal of assessing the break point (in terms of concurrent users) of the solution. CO should initiate discussions with Oracle on performance testing and identify options/recommendations for improvement. CO should review the current contract with Oracle to make sure that there is a clear understanding of what is expected for the various deliverables from Oracle.

- *Enable Oracle and the CO IV&V team to collaborate and cooperate on testing*

CO leadership should open discussions with the CO IV&V team and Oracle to jointly execute the required load and performance tests.

#### **4.6. Disaster Recovery and Continuity of Operations Plan (COOP)**

- *Obtain failover test results and establish a failover test schedule*

CO should obtain from OMCS the results from the failover test performed in September 2013. In accordance with the OMCS contract, CO should require OMCS to establish a failover test schedule and plan with the first test occurring within the first two weeks after full production operation is implemented.

#### **4.7. Architecture**

- *Optimize system architecture*

Based on the team's observations, the CO architecture and data model deserve significant review and re-work. CO should perform an in-depth analysis of the current architecture to identify opportunities for reducing complexity. After this is completed, CO should endeavor to simplify and streamline the architecture by reducing the Oracle product footprint, reducing the number of integration points, and simplifying the overall structure and deployment without inhibiting the overall functionality of the system.

- *Transition and ownership of the system architecture from OCS*

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CO should transition control and ownership of the system architecture away from OCS. This will allow CO to more easily consider alternative solutions and mitigate resource turnover. This could be achieved by hiring a system architect or by further engaging the current independent technical contractors (i.e. Tom McIvor, and Garrett Reynolds) currently working with CO.

### 4.8. Project Management

- *Consider establishing a formal, centralized program management office (PMO) and a dedicated Project Manager*

CO would reap significant benefit from having a formal, centralized PMO to oversee the Exchange program management responsibilities. In addition, establishing an overarching and dedicated project manager (a role not currently in place) who would perform every aspect of project management, e.g., maintaining an integrated program schedule, ensuring artifacts/documentation are up to date, necessary communication/coordination is occurring among program stakeholders, etc. The PMO and project manager would be primarily concerned with ensuring all interdependent tasks can be performed in parallel in order to meet the schedule timelines.
- *Transition of program roles and responsibilities*

Due to the history of issues with OCS' performance and transparency<sup>1</sup>, reinforced by observations during the TA workshops, CO should examine other roles and responsibilities held by OCS and consider transitioning some or all of them to CO resources, or other technology partners. CO should take steps to assume overall control of project and development activities from OCS, including the managing of the CO project timeline and its implementation. As with the system architecture responsibilities, CO should develop an internal transition plan for targeted roles and responsibilities held by OCS and begin efforts to identify and acquire development and other resources that report directly to CO.
- *Adopt a project management tool with more functionality to track action items/issues*

As noted in section 3.1.2, CO is using standard Microsoft tools such as PowerPoint and Excel to track action items and issues. CO would benefit from adopting a tool with additional functionality to give them the capability to track history of action items and/or issues.

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<sup>1</sup> In addition to issues previously reported by CO, the CMS State Engagement Team has observed this pattern of behavior from OCS on prior Lifecycle Consult engagements with CO. These observations are not included in this Technical Assistance report but are referenced in support of the suggested action.

## 4.9. Development / Agile Process

- *Engage a formal agile development methodology*

As CO obtains greater control over the development resources and project management, CO should consider embracing an agile methodology in a more formal manner. This could be achieved in part by having one or more resources formally trained as a Scrum Master to plan and facilitate the daily scrum meetings. Subsequently, engaging in formal agile methodology training for others on the CO team would instill more discipline to the overall process and would help mature the home grown processes currently in place.

## 4.10. Additional Items

In addition to the core areas suggested for consideration, the CMS SE team also suggests the following actions:

- *Modify roles and responsibilities of independent contractors*

Giving more decision authority to independent contractors (i.e. Tom McIvor and Garrett Reynolds), would assist CO in progressing faster in their IT development and solution.

- *Examine the long-term future of the Cover Oregon Marketplace implementation*

CO should examine the long-term future of the Marketplace implementation in terms of cost and the necessary skillsets for overall program management and operations. This will help CO prioritize their list of necessary actions in terms of resource management and improving their system architecture; along with maturing the long-term plan for supporting the system in terms of funding, people, tools, processes, etc.

- *Begin forming a transition plan*

CO has already initiated a transition plan to replace OCS. It is highly recommended to further identify a more appropriate technology partner(s) for specific program roles and responsibilities

- *Share information needed prior to meeting*

CO should impress upon the contractors a behavior of sharing information in a timely manner with the tech sync meeting facilitator/administrator. This will ensure all the latest issues that are blocking progress are discussed in the meeting and obtain commitment for improvement from the right individuals.

- *Establish a single facilitator to lead the daily tech sync meeting*

It was not clear who was the facilitator in the daily tech sync meetings. Due to the dynamic nature of the participants present in the meeting, a formal facilitator is needed to bring control and discipline to the meeting. If the facilitator is in a remote location, a designee who can be physically present in the meeting should be appointed.

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## **Acronyms**

<b>CAMH</b>	CMS Alliance to Modernize Healthcare
<b>CCB</b>	Change Control Board
<b>CI</b>	Continuous Integration
<b>CMS</b>	Centers for Medicare & Medicaid Services
<b>CO</b>	Cover Oregon
<b>COOP</b>	Continuity of Operations
<b>DR</b>	Disaster Recovery
<b>FFRDC</b>	Federally Funded Research and Development Center
<b>HHS</b>	Department of Health and Human Services
<b>IT</b>	Information Technology
<b>IV&amp;V</b>	Independent Verification and Validation
<b>OATS</b>	Oracle Application Testing Suite
<b>OCM</b>	Oracle Configuration Management
<b>OCS</b>	Oracle Consulting Services
<b>OEM</b>	Oracle Enterprise Manager
<b>OMCS</b>	Oracle Managed Cloud Services
<b>OPA</b>	Oracle Policy Automation
<b>PMO</b>	Program Management Office
<b>RAC</b>	Real Application Cluster
<b>RPO</b>	Recovery Point Objective
<b>RTO</b>	Recovery Time Objective
<b>SI</b>	System Integrator
<b>SDLC</b>	Software Development Life Cycle
<b>SME</b>	Subject Matter Expert
<b>SOA</b>	Service Oriented Architecture

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<b>SVN</b>	Apache Subversion
<b>TA</b>	Technical Assistance

## A. Observations during Assessment

This section contains observations captured during the CMS SE Team technical assistance review conducted on January 13 – 16, 2014. These observations were used to support the findings and suggested actions for consideration listed in sections 3.0 and 4.0 of this document.

Significant transparency issues exist between CO and OCS and it appears to be a contract management issue. Examples of this are:

1. There are instances (e.g., performance testing) where CO has a significant gap in their work expectation from OCS vs. the actual work OCS is performing.
2. OCS did not present any evidence to demonstrate that they are managing the scope of functionality in their releases.
3. When asked to present or report on the progress of various deliverables and activities, OCS indicated to CO that this is not within the scope of their contracts.

CO demonstrated a significant lack of confidence in OCS' performance based on a variety of evidence, i.e.:

- An overall lack of timeliness and quality with regards to solution delivery
- The clear and obvious lack of transparency
- The lack of cooperation with other contractors (e.g. the IV&V contractor)
- The associated financial burdens which have been placed on the program.

### A.1. Configuration Management

#### A.1.1. System Environment

CO conducts weekly operational meetings with Oracle Managed Cloud Services (OMCS) where software and infrastructure configuration management decisions are made regarding the patches and products that will be released into the various environments. CO currently has six system environments that are maintained by OMCS:

- UDEV – Used for development and unit testing.
- FTS - Used for functional, integration and IV&V testing.

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- Pre-Prod – This environment is a mirror of the production environment and is used for regression testing of code prior to migrating code to production.
- PERF – Used for performance testing.
- Prod – This is the production environment.
- DR – Used for disaster recovery and is a mirror of Prod.

Two additional environments are planned for the future: one will serve as a true development environment and the other a true testing environment. Currently, the FTS environment is being shared between the testing teams for functional, integration and IV&V testing. Typically, these environments are separate. As a result, the testers are facing challenges to test their test cases successfully because the various testing activities interfere with each other. The issue could be code or environmental issues where developers promote code changes to the same environment while testing activities are in progress.

In November 2013, CO added a pre-production system environment (Pre-Prod) which mirrors the existing production environment. The utilization of this environment allows CO to perform regression testing prior to migrating code to Production, to minimize the number of unanticipated and unforeseen production issues.

During the onsite visit, the environment configurations (component and product versions) for FTS, PERF and the Pre-Prod environments were not in sync; however, CO communicated plans to sync these environments by January 18, 2014. The production environment would be included in the configuration sync plan by January 27, 2014. (Confirmation on the syncing of these environments was provided on February 3, 2014.)

### **A.1.2. Software Migration**

Prior to September 2013, OCS was in a mode of delivering large code drops into the test environment with little notice or information for the test teams to work with. Once the test teams were able to test, the number of new defects identified was growing faster than the number of defects cleared. This resulted in the number of defects in new or open statuses continuing to rise rather than decline.

Post September 2013, CO/OCS adopted a more iterative methodology such that there was more frequent code migration process from UDEV to the FTS environment. With smaller changes in content and function between drops, this reduced the code cycle time between unit testing and integration testing as fewer defects and configuration changes needed to be addressed.



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However, OMCS/OCS does not provide CO sufficient visibility into the configuration history of the various environments. This observation is based on responses given during individual sessions with the senior CO contractors responsible for the engagement with OMCS. There have been instances when code has been pushed from UDEV to the FTS environment without CO's knowledge. CO does not have access to the SVN tool to do delta analysis on the code base. CO and OCS have initiated a joint effort to improve the overall configuration management process.

### A.2. Change Management

With JIRA as CO's change management core, CO now has a robust method for defect and change request logging, tracking, assessment, prioritization, and management.

While the level of data capture is highly detailed, there are still opportunities for extended reporting, specifically around the history of changes at the component and product level. However, CO is not currently analyzing or reporting data/information collected through JIRA to isolate a problem area (e.g. code modules which are frequently subject to "check-out" [X] "check-in" [X] "check-out" [X] "check-in" [X] etc., across multiple defects and also when defects move from "open" [X] "closed" [X] "open" [X] "closed", etc.)

OCS is performing some data analysis but is not providing CO with the results. Such data analysis would help CO identify areas of their system that need more attention and possibly, this information could possibly be used to enhance their resource management as well.

From CO's demonstration of JIRA, it is clear that they are utilizing the tool astutely to improve their change management processes. However, in the demonstration, there was no mention of JIRA cases being referenced back to requirements or use cases to verify if the requested change to the code is within scope.

CO's Change Control Board (CCB) meets weekly, at a minimum. It is recommended that there should be joint involvement from both the business stakeholders as well as IT to determine priority of the JIRA cases in order to meet the overall business needs.

CO has no visibility into the OCS change management environment. CO has no details on how OCS is managing their code base. OCS uses a source code version control tool, SVN for its code management, but CO does not have access to the SVN environment or full exposure to the changes being made. If CO had insight into the code management details, they could potentially better identify and understand the root causes for certain code issues. Without this insight, CO is completely dependent on OCS for the explanation of the issues. Moving forward, CO should consider taking control of the system engineering processes and tools.

### **A.3. Release Management**

OCS is in charge of CO's release management. CO stated that their release management process has improved since they brought a full-time release manager (provided by OCS) on-site to work more closely with the team. The release manager is responsible for scheduling and managing code migrations between the three environments – FTS, Pre-production, and Production.

There are two types of code migration, specifically releases and surgical, from one environment to another. The releases are planned large code migrations whereas surgical code pushes result from urgent JIRA cases related to isolated defects within an existing release. The environments are backed up on a daily basis.

CO's release process has improved since the introduction of a formal release manager, however the software build process is still at an immature stage. The OCS code management and software build processes do not allow for version branching. As a result, there are frequent instances of code elements which in a build which should not have been included. OCS creates release notes for their releases but there was no indication that they create a release rollback plan. Because OCS, rather than CO, has full control of the release management process, CO is frequently in a position to choose between a moving a release to the next step, or following good release management processes.

One of CO's independent contractors (Tom McKiver) conducts weekly product and infrastructure release meetings. Oracle is sharing the release notes for migrations from Pre-prod to Prod and from FTS to Pre-prod. These activities have led to improvements in the release management process.

Despite the improvements in the release management process, the communications to the testing team regarding system availability and what is being deployed in each environment is still inconsistent. The daily tech sync meeting with OCS, IV&V, and the independent contractors, in part, includes discussions around the system environments and code migration plans. These daily meetings provide an opportunity to improve on the communications noted above.

CO is starting to see some improvements in the environment management process as well and, as a result, is seeing less environment related surprises.

## A.4. Testing

### A.4.1. IV&V and Quality Assurance

CO has a strong and knowledgeable IV&V team. The IV&V team is concerned with the instability of the testing environment and different system environmental configurations. It has been a challenge for them to test in the FTS environment which is configured differently than the pre-production environment. Therefore, some JIRA cases which pass testing in FTS could fail testing in the Pre-prod environment. The IV&V team emphasized the importance of having a separate TEST environment which would be utilized before code migrates to FTS. They reported that OCS testers often do not have enough time to perform robust testing. The current development and integration testing methodology does not allow for the sharing of developers' unit test results with the testing team. This can result in a lack of validation/revalidation of test cases and can cause unnecessary defect tickets.

Another issue reported is that there is a lack of communication on when code is migrated from one environment to another, in terms of what fixes are included in each code push. Repeatedly, the IV&V team has requested a variance report from Oracle. To date, they have not received it.

The IV&V team presented a concept for Continuous Integration (CI) and test automation and has developed a strategy to implement elements of this within the CO environment. The IV&V team also presented their recently developed automation toolset - primarily Selenium, Jenkins and integration with the Oracle Application Testing Suite (OATS). This toolset includes a real-time dashboard that has hooks into most layers of the system and has the capability to target performance testing, user interface (UI) testing, custom code testing and web services testing. The tool was developed using open source components and coded in Java. As a result, it is very portable and could be easily shared with other states. The IV&V team is willing to give a demonstration of this tool to other states upon CMS's request. The IV&V team expressed a willingness to collaborate with OCS to develop an overall CI and test capability. The IV&V team stated that OCS has yet to demonstrate a willingness to fully collaborate on this effort.

### A.4.2. Functional Testing

CO's integration testing team is well organized and structured. Testers are delegated specific roles and responsibilities across each of the major functional areas. The integration testing team meets daily to discuss the latest testing updates. The integration testing lead uses this opportunity to address any issues that prevent the team from resolving defects.

It appears that CO's integration testing team and the IV&V team are collaborating and cooperating in the testing activities. The integration testing lead attends the daily tech sync

meetings. In addition to being able to update the team with what is coming next, the test lead also gains insight into the bigger picture of what other activities and efforts are occurring for an upcoming release.

The integration testing team is facing the same issues with OCS as is the IV&V team (refer to section A.4.1).

### **A.5. Performance and Load Testing**

OCS provided a walkthrough of their performance testing report. The information presented by OCS demonstrated that OCS had been engaged in performance tuning rather than performance testing. CO was expecting to see evidence that the system could handle up to 10,000 concurrent users – a targeted performance requirement. The report did not provide CO with the specific performance metrics needed to plan for any necessary mitigation with respect to user volumes. CO has various hardware/software options (which were discussed during the workshop) to limit/throttle/divert traffic into the system. However, without the specific performance metrics, CO cannot move on a strategy.

During the IV&V's demonstration of their testing tool, they expressed a willingness to collaborate and cooperate with OCS to conduct performance and load testing. They have the required tools and skillsets in place to immediately start work on this testing effort. CO should consider making use of this resource.

### **A.6. Disaster Recovery and Continuity of Operations (COOP)**

OMCS has implemented a full disaster recovery (DR) capability for both the data and the application tiers of the solution. In accordance with best practices, the DR solution is instantiated within a separate data center from the primary infrastructure location. The DR solution is configured to provide a Recovery Time Objective (RTO) of four hours and a Recovery Point Objective (RPO) of one hour.

As part of the OMCS contract, CO is entitled to two failover tests per year. Oracle has stated that they performed a failover test in September 2013; however, CO did not have a report from OMCS documenting the results of the test. OMCS stated that they do not currently have a failover test scheduled which they can share with CO. OMCS plans to resume DR/failover testing after the full public launch. At the writing of this report, the full launch remains unscheduled.

## **A.7. Architecture**

CO demonstrated an awareness of the flaws and complexities present in the system architecture; however, actions need to be taken to remedy the situation. CO and its independent contractors indicated that the data model and other significant portions of the system architecture contain significant design weaknesses which will require major redesign or removal.

CO has a complex technical architecture. The solution is built entirely on Oracle technology components. In addition to using Oracle Enterprise Manager (OEM), CO also purchased a monitoring capability to monitor the Oracle Managed Cloud Service independent of OMCS. Discussions during the workshop reiterated that OCS is lacking in resources with expertise in Oracle Configuration Management (OCM), which has contributed to the delays experienced at the outset of the CO implementation.

One of the primary challenges with the CO solution is the management of the many sessions created by Siebel, Oracle Real Application Clusters (RAC), Service Oriented Architecture (SOA) and Web Center that consume a significant amount of CPU and memory. As a consequence, CO is concerned about the need for repeated rebooting of their system due to system performance issues. During the sessions, CO indicated that the code review conducted by CO in May 2013 revealed a number of issues (e.g. design, data modeling, coding practices, etc.) including wide spread memory leaks in the code base. CO indicated that their long-term strategy to mitigate memory leaks and other low level issues is to perform stringent code reviews. CO plans to conduct another code review in the near future to assess the impacts on the code base from the many surgical code pushes over the past several months. The CO architecture contractor and others on the CO team asserted, based on their independent review, that the CO data model and corresponding physical schema is highly flawed and needs significant attention.

CO shared a proposed simplified solution of their OPA Interview (CS Web App) architecture to mitigate some of the issues in the application tier. CO stated that they have demonstrated the proof-of-concept to the business stakeholders who are optimistic about the solution. However, the architecture team is projecting approximately two to three months before any action can be taken since CO is focusing solely on the next release and subsequent releases to get the system to function at its optimal level and to meet CMS requirements.

CO does not have its own senior technical resources within the CO direct staff. Independent contractors are very knowledgeable staff extenders of the CO senior technical staff. These individuals have a great deal of responsibility, but do not have decision making authority. CO should consider taking full advantage of these resources as if they were “on staff” and engage them in detailed, authoritative technical discussions with OCS and OMCS.

## **A.8. Project Management**

There is no evidence that CO has a formal, centralized project management office (PMO) function performing the necessary level of oversight and resource control across the full spectrum of the CO project. CO relies heavily on its contractors to complete the majority of the day-to-day task and while various individuals own such things as schedules and release plans, there is no single person identified to manage the overall project.

While CO does have an IT technical project manager with demonstrated ability to manage many of the moving parts, there is a clear need for a full-time dedicated overarching project manager. The benefit of such a person would be the ability to produce a fully integrated overall schedule for tracking progress against milestones. Currently, as stated by CO, such a schedule does not exist.

## **A.9. Development / Agile Process**

Since September 2013, CO has been utilizing a home grown development process which is based upon agile methodologies. There are seven functional areas within the process, referred to as tables, with each table having a dedicated table lead (a mini project manager) and a dedicated business analyst. This process appears to be well orchestrated. Each morning there are daily “scrum” meetings for the different functional areas. While not rigidly adhering to the formal agile scrum format, these meetings serve a valuable purpose in providing a regular opportunity for various parties from a functional area to provide the latest updates on the progress across the outstanding major defects/issues. Information is communicated from the development teams to the other project teams using JIRA. JIRA is a tool used to store defect status and development resolutions/fixes.