Utilizing Atlassian JIRA for Large-Scale Software Development Management

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Some background details on ICCS and JIRA

• ICCS is the Integrated Computer Control System for the National Ignition Facility (NIF)

• 3.5+ million source code lines
  — Includes Java, Ada, C, XML, SQL

• NIF regularly receives ICCS software updates
  — ~6 major releases a year, ~200 change requests each
  — Patches about once/week

• ICCS development began in 1997
  — A homegrown system was used

• Atlassian JIRA for issue tracking started in 2006
  — Existing data was transferred with JIRA data migration tools
Atlassian JIRA is a flexible issue tracking system

- JIRA is highly customizable:
  - Issue types
  - Workflows
  - Custom fields
  - Notifications
  - User entry screens
JIRA is widely used at NIF, and not just for software

90,108 Issues on 10/1/2013

Other Projects, 9641, 11%

- ICCS, 39737, 44%
- SAVI Frameworks, 1076, 1%
- Lab Systems, 1243, 1%
- Shot Planning and Analysis Tools (SPLAT), 1718, 2%
- SAVI (old), 1722, 2%
- RQ, 1848, 2%
- SMaRT, 2007, 2%
- SAVI Analysis, 2452, 3%
- TDS Instrument Based Controls, 2682, 3%
- Shot Setup, 3217, 4%
- Information Systems, 3993, 4%
- ICCS Test, 4427, 5%
- Calibration and Configuration, 6850, 8%
- SCM Help Desk, 7463, 8%
Fields used for each JIRA issue

**Triaging**
- Project
- Type (Change, Problem, Enhancement)
- Components
- Environment
- Environment
- Category
- Origin
- Priority
- Keywords
- Applicable DB Environments
- Rank

**Work Execution**
- Assignee
- Due Date
- Original Estimate
- Fix Version

**Quality Control**
- Final Verification Environment
- Final Verification Type
- QA Verifier
- Test Database
- Test Instance
- Test Release

**Documentation**
- Summary
- Description
- Reporter
- Recommendation
- Affects Versions
- LoCoS #
- Release Notes
- Resolution Notes
- Root Cause of Defect
- Process Restart Required
- Process Restart Details
- End-User Release Notes
- End-User Description

**Review**
- Requirements Review
- Desk Checker
- Integration Requirement
- Integration Checked
- SCCB Approval Date

**Configuration Management**
- Wrap-around
- CM Release
- CM Snapshot
The NIF software workflow implemented in JIRA

- Open
  - Assign Issue
  - Start Progress
  - Complete Work
  - Ready for Desk Check
  - Fail Desk Check
  - Start Progress
  - Re-test (undo Failure)
  - Ready for Test
  - Pass Desk Check
  - Final Verification Environment: Development, Integration, QA, Production

- Assigned
  - Start Progress
  - Stop Progress
  - Ready for Desk Check

- In Progress
  - Complete Work
  - Restart Progress

- Restart Progress
  - Stop Progress

- Re-Open
  - Closed
  - ALL STATES
Quality Assurance uses a risk-based approach

- **IPRB (Integrated Product Review Board) Reviews**
  - The formal review process for large NIF Engineering projects

- **Formal Software Design and Code Reviews**
  - The need for a review is assessed by higher level management
  - Reviews are expected for:
    - Fundamentally new software design or functionality
    - Software with significant risk or impact
    - Existing software that has encountered a significant failure

- **Desk check**
  - A secondary developer reviews code changes and JIRA content
  - Required for all JIRA issues
Formal reviews are tracked in JIRA

- Formal reviews are tracked in JIRA
  - Issues are assigned to software releases

- JIRA issue content includes
  - A pointer to the review materials
  - A list of participants
  - Results of the review

- Action items are tracked in JIRA
  - Resolution Notes (minor rework)
  - JIRA subtasks
    - Future work
    - External scope
    - Major problems

- The scribe for the review is the QA Verifier in the JIRA workflow
A desk check is required for every code change

- If the desk checker approves changes
  - Transition issue to “Ready for Test”

- If significant problems were found
  - Add explanation comment to JIRA issue
  - Transition issue to “Desk Check Failed”

- If only minor problems were found
  - Add explanation comment to JIRA issue
  - Transition issue to “Ready for Test”

### Code Assessment Criteria

<table>
<thead>
<tr>
<th>Code Assessment Criteria</th>
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<tbody>
<tr>
<td>Are requirements and design implemented</td>
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<tr>
<td>Does JIRA documentation reflect changes</td>
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<tr>
<td>Robustness</td>
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<tr>
<td>Conformance to architecture/frameworks</td>
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<tr>
<td>Extendibility, maintainability, simplicity</td>
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<tr>
<td>Proper commenting</td>
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<tr>
<td>Exception handling</td>
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<tr>
<td>Concurrency</td>
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Quality CM tools enable reliable deployments

• Most all NIF projects use AccuRev for a version control system

• AccuRev provides high-end capabilities
  — Stream-based architecture
  — Automatic merging and inheriting between code streams
  — Advanced GUI to visualize codebase

• CM Team uses AccuBridge and in-house tools for connecting AccuRev and JIRA

AccuRev details are Stored in JIRA issues

Release Notes:

Modified Java sources [ICCS_13.4.0_CM]:
\src\java\srcicc\base\corba\ICCSParse\OR.java
ICCS_win32_working_stout/1
\src\java\srcicc\base\corba\ICCSTimedInvoker.java
ICCS_win32_working_stout/2

Deliverables:
ICCS_FW.jar
Limitations and Workarounds

• No support for field-level permissions
  — Some fields are exclusively for CM Team, Integration Leads, etc
  — Workarounds:
    – Control access to certain screens through workflow permissions
    – Field-level history of all changes

• Limited tools for managing workload and tracking releases
  — No way to visually trend software release progress over time
  — Limited charting capabilities
  — Workarounds:
    – ICCS developed homegrown tools to address JIRA limitations
ICCS tracks software releases using historical data

- JIRA data is periodically exported to an Excel file for historical trending
- The chart below tracks issue resolution, desk checks, integration testing, and QA for a specific software release
ICCS Managers can browse developer workload

- ICCS leverages Splunk (a “big data” analysis tool) to mine JIRA’s MySQL database

- This dashboard allows interactive investigation of upcoming work
  - Open issues for all active releases
  - Remaining days work by developer
  - All work currently assigned to developer

- See poster THPPC082 for much more on ICCS and Splunk
Future Plans with JIRA for NIF

- Upgrade from JIRA 4.1.1 to 6.1
  - Streamlined interface
  - Support for mobile devices
  - Compatibility with newest plug-ins

- Other Upgrades
  - Migrate database from MySQL to Oracle
  - Migrate from bare metal server to an Oracle Virtual Machine
  - AccuRev’s AccuSync JIRA server and AccuRev to 6.0