WICOMO at Raytheon: Modifications and Configuration Control in a Multidivisional Company

Tom Lydon
Brian Poynton
Suzanne Dubois-Rodriques

Raytheon MSD
Bedford, Massachusetts
Last year we reported on

RAYTHEON three-part plan:

- Cosmetic changes

- Control of versions

- 'RAYCOMO' calibration based on our data
Raytheon – A Fortune 100 Company

- Multidivisional environment
- A mix of computers
- A mix of applications
- A software tool environment

This is Missile System
WICOMO Modifications at Raytheon in the Past Year

- Regroup Cost Drivers to improve data entry
- Allow cost input as a matrix of phases and personnel
- Allow input for adapted code
- Provide a dynamic display of productivity in DSI/MM
- Shorten WICOMO system start-up time
- Provide a single command to print all three reports
- Improve and update the help messages
Cost drivers are regrouped by:

- System level
- Subsystem level
- Module level

<table>
<thead>
<tr>
<th>Component Name: demo</th>
<th>Level: 1</th>
<th>Component of: DEMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM LEVEL</td>
<td>SUBSYSTEM LEVEL</td>
<td>MODULE LEVEL</td>
</tr>
<tr>
<td>VIRT:* nominal</td>
<td>TIME:* nominal</td>
<td>CPLX:* nominal</td>
</tr>
<tr>
<td>TURN:* nominal</td>
<td>STOR:* nominal</td>
<td>PCAP:* nominal</td>
</tr>
<tr>
<td>MODP:* nominal</td>
<td>REL.T:* nominal</td>
<td>VEXP:* nominal</td>
</tr>
<tr>
<td>TOOL:* nominal</td>
<td>DATA:* nominal</td>
<td>LEXP:* nominal</td>
</tr>
<tr>
<td>SCED:* nominal</td>
<td>ACAP:* nominal</td>
<td></td>
</tr>
<tr>
<td>MODE:* organic</td>
<td>AEXP:* nominal</td>
<td></td>
</tr>
</tbody>
</table>

DSI: 55000 TYPE: new

Enter a command >
Allow cost input as a matrix of phases and personnel

<table>
<thead>
<tr>
<th>Consulting Engineer</th>
<th>Percentage distribution of each type of engineer per software development phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principal Engineer</td>
<td></td>
</tr>
<tr>
<td>Senior Engineer</td>
<td></td>
</tr>
<tr>
<td>Associate Engineer</td>
<td></td>
</tr>
<tr>
<td>Engineering Aide</td>
<td></td>
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</tbody>
</table>

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<td>SUBSYSTEM LEVEL</td>
<td>MODULE LEVEL</td>
</tr>
<tr>
<td>VIRT: nominal</td>
<td>TIME: nominal</td>
<td>CPLX: nominal</td>
</tr>
<tr>
<td>TURN: nominal</td>
<td>STOP: nominal</td>
<td>PCAP: nominal</td>
</tr>
<tr>
<td>SOP: nominal</td>
<td>RELY: nominal</td>
<td>VEXP: nominal</td>
</tr>
<tr>
<td>TOOL: nominal</td>
<td>DATA: nominal</td>
<td>LEXP: nominal</td>
</tr>
<tr>
<td>SCED: nominal</td>
<td>ACAP: nominal</td>
<td></td>
</tr>
<tr>
<td>MODE: organic</td>
<td>AEXP: nominal</td>
<td></td>
</tr>
</tbody>
</table>

DSI: $50000 TYPE: New

Enter a command >

DSI/MM: 258
Allow input for Adapted Code

Yields an estimated DSI (EDSI) upon which calculations are made

Component Name: demo
Level: 2 Component of: demo

SYSTEM LEVEL SUBSYSTEM LEVEL MODULE LEVEL % PD DD CUT IT
VIRT:* nominal TIME:* nominal CPLX:* nominal Ce 0 0 0 0 0
TURN:* nominal STOR:* nominal PCAP:* nominal Pe 5 5 5 5 5
MODP:* nominal RELY:* nominal VEXP:* nominal Sr 30 30 20 20
TOOL:* nominal DATA:* nominal LEXP:* nominal En 50 50 50 50 50
SCED:* nominal AEXP:* nominal As 15 15 25 25 25
MODE:* organic ACAP:* nominal Ad 0 0 0 0 0


Enter a command >

DSI/MM: 303
Dynamic display of productivity in DSI/MM whenever enough information is available to compute it.

<table>
<thead>
<tr>
<th>Component Level</th>
<th>Subsystem Level</th>
<th>Module Level</th>
<th>%</th>
<th>PD</th>
<th>DD</th>
<th>CUT</th>
<th>IT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSTEM</td>
<td>VIRT: nominal</td>
<td>CPLX: nominal</td>
<td>Ce</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>TIME: nominal</td>
<td>PCAP: nominal</td>
<td>Pe</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>TURN: nominal</td>
<td>VEXP: nominal</td>
<td>Sr</td>
<td>30</td>
<td>30</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>MDP: nominal</td>
<td>DELY: nominal</td>
<td>Sn</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>TOOL: nominal</td>
<td>LEXP: nominal</td>
<td>As</td>
<td>15</td>
<td>15</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>SCED: nominal</td>
<td></td>
<td>Ad</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>NODE: organic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>


Enter a command > DSI/MM: 303
Shorten WICOMO system start-up time

- Some of our users were being timed out while waiting for WICOMO to read in the parameter file and check it against the template file

- Move support files to protected library

- Eliminate check against template file

- Eliminate data type conversion
Provide a single command to print all three reports:

`prta1 [filename]`

Replaces:

- `display summary`
- `print [filename]`
- `display schedule`
- `print`
- `display results`
- `print`
Eliminate automatic HELP if entry is misspelled

Add or update the HELP messages
to reflect the aforementioned changes

**Format**: TYPE project-type

This command allows the user to set the module type to ADAPTED or NEW. If the type is new, then calculations for that module will pertain to new code. If the type is adapted, then the user will be allowed to enter the percentages of modified design, code and integration that will have to be made to update the system. The Estimated Delivered Source Instructions (EDSI) is computed from the DSI and the Adaptation Adjustment Factor (AAF), using the following formula:

$$ EDSI = DSI \times (AAF) / 100 $$

and the adaptation adjustment factor (AAF) is computed as follows:

$$ AAF = 0.4(MODDES) + 0.3(MODCODE) + 0.3(MODINT) $$

For more information, see help for MODDES, MODCODE and MODINT.
Maintaining Configuration Control

of WICOMO

in a Multidivisional Environment
- Eliminate Unix 4.1 version since Ultrix version will run on Unix 4.1

- Move the Ultrix and VMS version as close together as possible

- Modify source to allow incremental compilations

- Isolate operating system dependencies

- This allows updates and changes to be made much more easily

![Diagram showing relationships between Unix, Ultrix, and VMS with 1985 modifications indicated.]
In Summary:

- Screen Modifications

- Have put under Configuration Control and are continuing to do so