System Integration, Test & Launch Engineering Internship

Peter J. Bloch
Honors College, Oregon State University

21 Aug 2019
Who Am I?

• Oregon State University
  - Honors Bachelor of Science
  - Computer Science Major, Applied option with an intended focus on Robotic Intelligence
  - Graduating June 2022
  - Oregon State University Men’s Lacrosse Club
NISAR (NASA ISRO Synthetic Aperture Radar)

• Systems Integration, Test & Launch Operations, Group 313B
System I&T Projects

• Test automation with Robot Framework

• 306 Hi-bay cable management & application development

• Smaller projects:
  - Scripting
  - NISAR SIT 3/4 wiki page development
• Keyword-based test automation framework (Python)
  - Allows for automated procedure execution
  - Allows access to powerful software libraries without extensive programming knowledge
Implementation on Workstation Test Set

- WSTS
  - Benefits: Test reporting, **output.xml** file – important.
Example Robot Test Suite

```plaintext
*** Settings ***
Library ....Process
Resource .../Libraries/Keywords.robot

*** Test Cases ***
Start WSTS
......Start WSTS
Wait until Cutecom is detected to be running
......Wait Until Cutecom is Running
Wait until the "ETLES.Sync.all.done" EVR appears in Cutecom
......Wait Until Files Have Synced
Initialize MTAK Connection
......Import ATLORobotLibrary
Send Test Command to Cutecom
......Send Command: VxWorks.....A.....Hello...World
Close WSTS
......Close WSTS
```
What is Suite-to-docx?
Suite-to-docx Capabilities

A template test suit. Setup opens WSTS and spins until file sync is complete. Tear down closes WSTS.

Without a [Documentation] flag, the only documentation for the test will be the test name.

The code below supports the functionality of "Send Command," however, this is not the same as documenting user instructions. To give user instructions, use the [Documentation] flag followed by "your text here" to bold a section (see output).

```
Send Command
[Documentation] These arguments passed are hyphenated last_word_is_connected_with_arrow-(antiquated_syntax)
```

Note: the keywords "WARNING" and "CAUTION" will trigger a textbox when between asterisks.

CAUTION
This creates a giant warning box that will show up on the document.

WARNING
This should also do something similar.

Line afterwards will still put inside box.

Note: This will create a bold line.
1. Took the Mars2020 code, updated it, and implemented it for NISAR
2. Instructing my team and others how to use it, and the potential benefits
3. Writing a Graphical User Interface (GUI)
4. Configuring Python Virtual Environments
5. Documentation

Shown: GUI for Suite to Docx
5 MISSION TESTBED STARTUP PROCEDURE

If the racks are powered off refer to Appendix A (POWER SEE RACKS) to power on the racks.

5-1 SSD
On the SSD workstations, open a new Terminal window and verify that "CommandBlockGen" is not running, by issuing the following command and observing that "CommandBlockGen" is not listed as one of the running java programs:

`ps -ef | grep java`

5-2 SSD
On the SSD workstations, open a new Terminal window and verify that "mapserverbase" is not running, by issuing the following command and observing that "mapserverbase" is not listed as one of the running python programs:

`ps -ef | grep python`

5.2 Initialize Simulation and Support Equipment (SSE)

5-3 SSE
On the SSE workstations, to reinitialize the racks before software initialization, via the Terminal window, use:

```
$ /proj/misr/see/CWB crackdown_gen
```

NOTE: SNAP had a third rack, but NISAR does not. So, pc1 will stay red, as it is KIA.

5-4 SSE
In the Rack Monitor Window, verify that pull and pull chs for Racks 1 and 21 are green.

$$$$

5-5 SSE
Via the Terminal window, use:

```
$ /proj/misr/see/tools/ss/note/pccore230 &
```

The CMM window will pop up.

2 MISSION TESTBED STARTUP PROCEDURE

If the racks are powered off refer to Appendix A (POWER SEE RACKS) to power on the racks.

2.1 Setup

2-1 SSD
On the SSD workstations, open a new Terminal window and verify that "CommandBlockGen" is not running, by issuing the following command:

`ps -ef | grep CommandBlockGen`

NOTE: alternatively, `ps -ef | grep java` would show the user all of the running java applications...

2-2 SSE
On the SSE workstations, open a new Terminal window and verify that "mapserverbase" is not running, by issuing the following command:

`ps -ef | grep python | grep mapserverbase`

NOTE: alternatively, `ps -ef | grep python` would show the user all of the running python applications...

2.2 Initialize Simulation and Support Equipment (SSE)

2-3 SSE
On the SSE workstations, to reinitialize the racks before SSE software initialization, via the Terminal window, use:

```
$ /proj/misr/see/CWB crackdown_gen
```

```
$ /proj/misr/see/tools/ss/note/pccore230 &
```

**Figure 1-1:** Image one caption

2-4 SSE
In the Rack Monitor Window, verify that pull and pull chs for Racks 3 and 21 are GREEN.
Challenges with Suite-to-docx

• Learning what was “under the hood”

• Operating Systems

• Documentation of code

• Execution on different systems with different Python environments
  - Package Installation
  - Virtual Environments
SIT Scripting - Microsoft Visio

- Procedurally updating Microsoft Visio File to reflect the output of Institutional Mate/Demate Tool
- Tracing the data
- Locating integration of Mate/Demate Data
- Identifying which shape must be updated
- Updating that color
Challenges with Visio Script

- Lack of solid documentation on Microsoft Visio structure
  - Word vs. Visio

- File Corruption during save due to imperfect encoding

- Time

- Next steps determined
Cable Management & Inventory

• Built an inventory for SIT Breakout Box (BOB) Cables
  - Buzzed out & organized new cables
    • Verified continuity, no shorts, and proper isolation.

  - Updated which cables we were missing
    • Allowed team to determine what was still needed

  - Created an online database.
Cable Management & Inventory

- BOB Cable Inventory & checkout system
  - Released the current inventory document to EPDM and placed a physical copy in 306 Hi-bay
  - Wrote a Python application to manage inventory and update changes on the database
  - Will be used to automate BOB Checkout between the various NISAR testbed locations.
Raspberry Pi Inventory ("Pinventory")

<table>
<thead>
<tr>
<th>Name</th>
<th>Connector</th>
<th>Version</th>
<th>QR Code</th>
<th>Barcode 128</th>
</tr>
</thead>
<tbody>
<tr>
<td>W20674001</td>
<td>W20674001</td>
<td>J001</td>
<td>2.11</td>
<td></td>
</tr>
<tr>
<td>W20674002</td>
<td>W20674002</td>
<td>J010</td>
<td>1.01</td>
<td></td>
</tr>
<tr>
<td>W20674003</td>
<td>W20674003</td>
<td>J011</td>
<td>1.03</td>
<td></td>
</tr>
</tbody>
</table>

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply its endorsement by the United States Government or the Jet Propulsion Laboratory, California Institute of Technology.
Application for BOB Cable Checkout

BOB Cable Checkout

8/19/19 3:50 PM

JPL ID

Place cursor in box and scan cable tag:

Inventory Scan

Reset Check In Check Out
Wiki – One Stop Shop for Test Engineers

- Created, populated, and managed Wiki
- Centralized all the tools and calendars for the team
- Added links to important documentation
Lessons Learned

- **Time Management**
- **Effective Communication**
- **How to ask for help**
Technical Skills Learned

- Robot Framework
- Raspbian Application Development
- Building a GUI in Python
- Microsoft Visio

- Improved my abilities:
  - Python Scripting
  - Excel
Acknowledgements

• Victor Mora, Mentor and SIT 3/4 Manager
• David Lopez, Deputy SIT 3/4 Manager
• Eisha Tyler, SIT Electrical Lead
• Toni Feldman, EP V&V Lead
• James Roberts, EGSE Software Lead
• Ronald Kinslow, Group Supervisor 313
• Robert Castillo, M2020 POC
• Nick Zhao, Fellow Intern
• Blaire Weinberg, Fellow Intern

• Everyone not listed from NISAR SIT & MTB team
Acknowledgements

Jet Propulsion Laboratory
California Institute of Technology