SAND2021-9150PE

Sandia National Laboratories

# Software Verification, Validation and Integration

Verification Validation & Integration Dynamics

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Org 6616 High Confidence System Environments

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U.S. DEPARTMENT OF ENERGY NNSA

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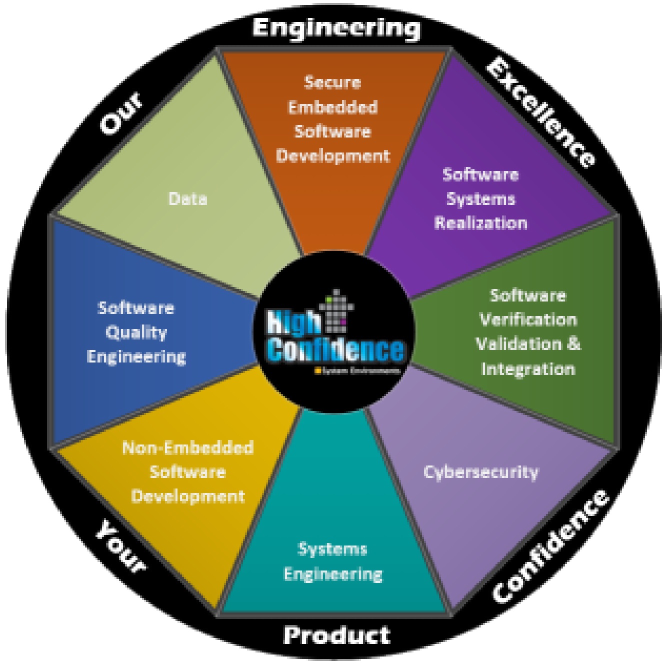
# ViVID Team

- ViVID stands for Verification, Validation and Integration Dynamics
- Develops and executes test procedures to verify Use Control software
- Performs testing on Use Control products
  - Types of testing: integration, regression, black box, and product testing
- Integrates hardware and software elements
- Works collaboratively with other departments


Engineering
Excellence
Confidence
Product
Your
Our
Secure Embedded Software Development
Software Systems Realization
Software Verification Validation & Integration
Cybersecurity
Systems Engineering
Non-Embedded Software Development
Software Quality Engineering
Data
High Confidence

# What is Use Control?

- Coded control: assures authorized use of nuclear weapons
- Use denial: prevents or delays unauthorized use of nuclear weapons
- To ensure proper measures are being taken, the following are taken into consideration:
    - weapon system design features
    - operational procedures
    - security and system safety rules

# ViVID Team Tested Products

- Tests CMS (Coded Management System) software products
  - Host Processor Software
  - Cryptographic Processor (CP)

- Tests other supporting products such as SIFTer kits
  - SIFTer stands for System Interface Tester. It is used to emulate software from a product
- Contributes to rigorous software qualification process where products from Sandia are released to external clients. Testing is included in this process.

# Daily Roles and Responsibilities

- Applies Agile/Scrum practices
    - Daily standups to account for status updates for tasks and projects
- Updates test plans and reviews testing requirements
- Performs product and interface testing on the product/system
- Automates user interface testing on the Host Processor software through TestComplete

# Testing Automation

- We utilize an automated testing platform developed by SmartBear called TestComplete
- TestComplete is used for Desktop, Web, and Mobile application testing
- Supporting features include:
  - keyword testing
  - scripted testing
  - data validation
  - record and playback modes
  - report generation
- TestComplete generates test results that are used as evidence for testing qualifications
- Scripts are developed to automate user interface testing

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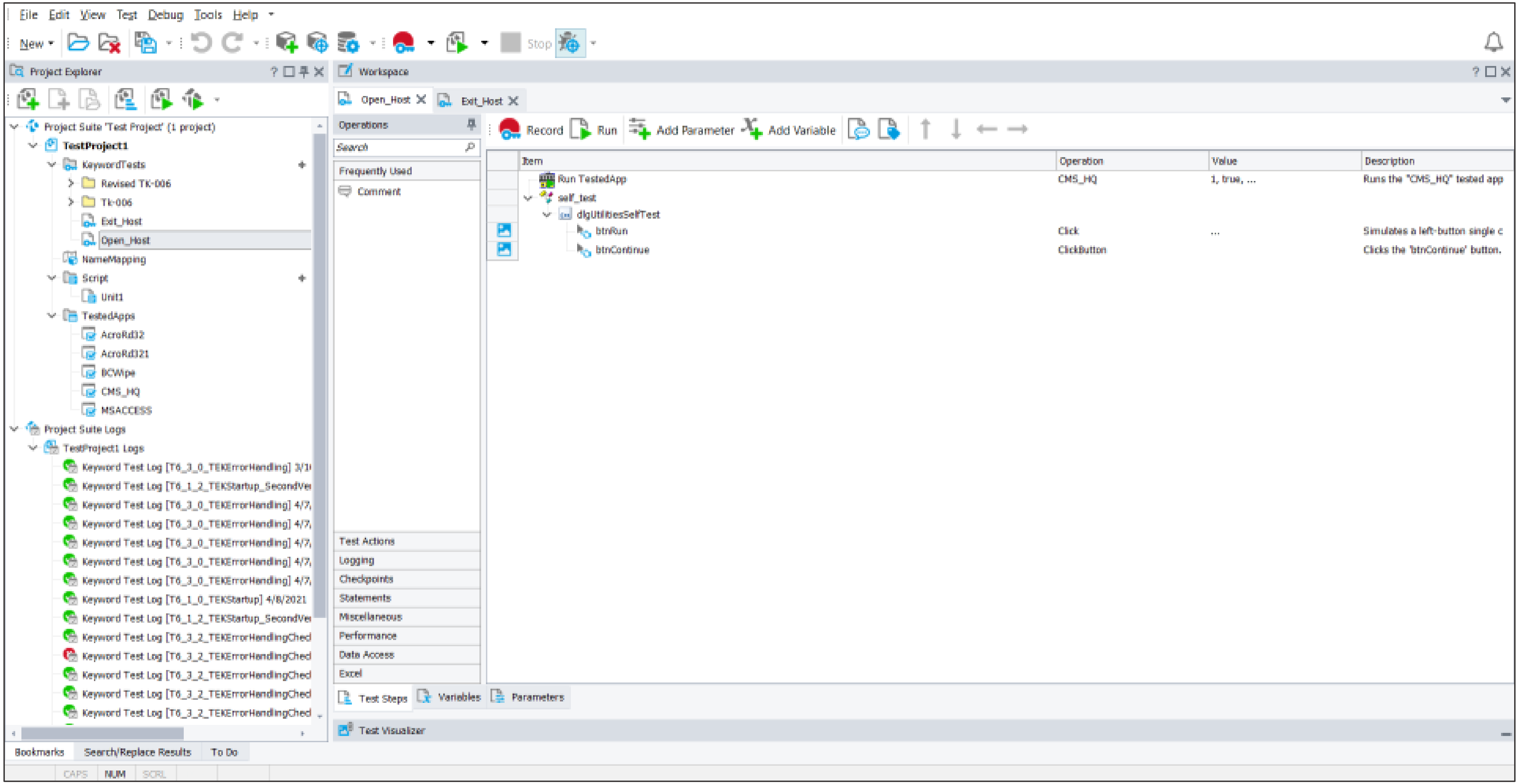
# Testing Automation Benefits

- Software testing is currently a manual task, making it very time-consuming
  - Multiple test plans are involved with one product. This could take approximately 10 days with 4 -5 personnel to complete
  - Goal is to decrease time spent on manual testing
  - TestComplete can increase efficiency and usability and reduce human error
  - Testing can become very efficient and innovative through testing automation
- <u>Recent test plan automation reduced manual testing time of 1 hour to ~7 minutes</u>

# TestComplete UI


File Edit View Test Debug Tools Help
New
Stop
Project Explorer
Workspace
Project Suite 'Test Project' (1 project)
TestProject1
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NameMapping
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Unit1
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AcroRd32
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Statements
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Performance
Data Access
Excel
Record
Run
Add Parameter
Add Variable
Test Steps
Variables
Parameters
Test Visualizer
Bookmarks
Search/Replace Results
To Do
CAPS
NUM
SCRL

| Item | Operation | Value | Description |
|---|---|---|---|
| Run TestedApp | CMS_HQ | 1, true, ... | Runs the "CMS_HQ" tested app |
| self_test | | | |
| dlgUtilitiesSelfTest | | | |
| btnRun | Click | ... | Simulates a left-button single c |
| btnContinue | ClickButton | | Clicks the 'btnContinue' button. |

# Thank you!