



**IV&V Workshop 2010:
IV&V MADE Testbed Requirements and
Configurations**

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L-3 Communications**

Agenda



- **IV&V Testbed Requirements**
- **ISS Space Station**
 - Description of 1553 Architecture (3-tier system)
- **MADE Testbed Environment**
 - Description of MADE system
- **IV&V Testbed Configurations**

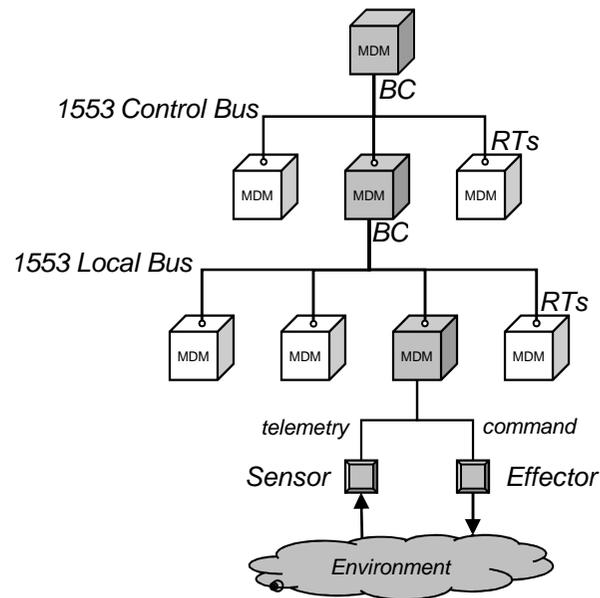
IV&V Testbed Requirements



- **Simulate single-CSCI and multi-CSCI configurations**
- **Simulate the CSCIs that are in-scope for IV&V**
- **Provide test script development and execution**
- **Compatible with ISS developer's test environments**
- **Run on standard PC computers (Windows)**
 - Remote connection for remote users

An ISS CSCI (computer software configuration item) is simply an ISS flight software program that is loaded in one of the ISS flight computers.

Simplistic View of ISS System Hierarchy



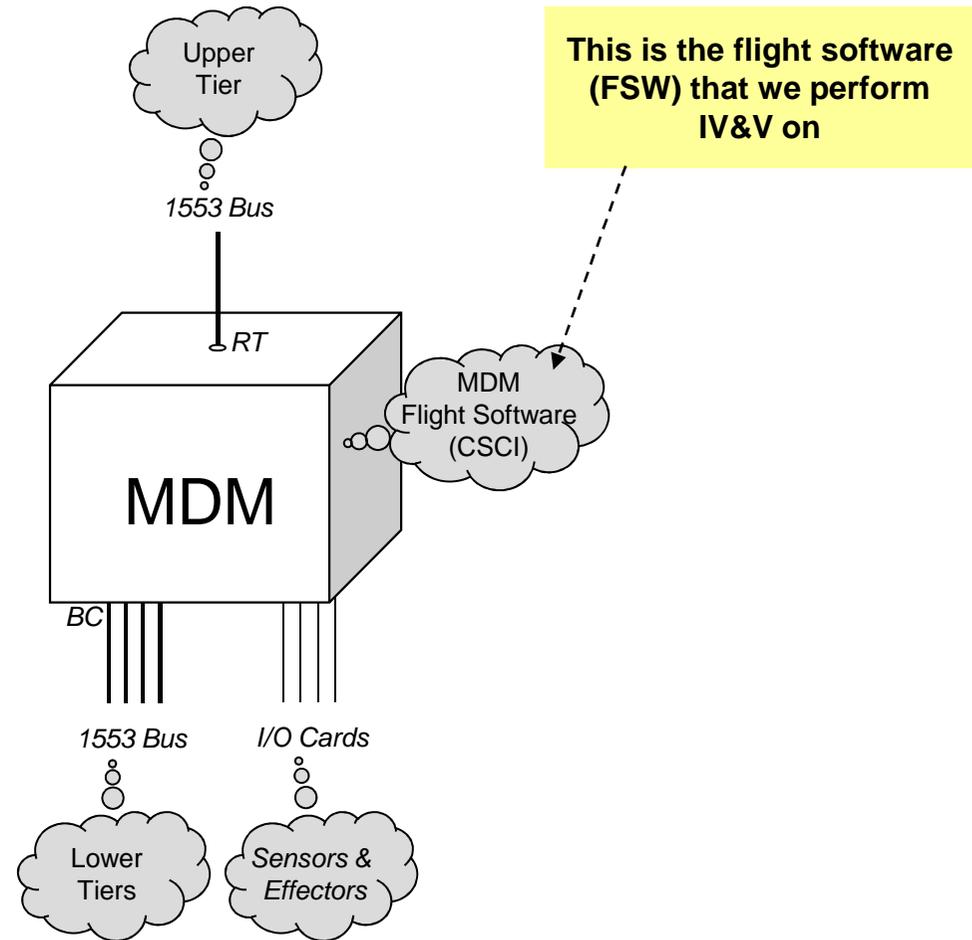
Tier 1

Tier 2

Tier 3

An MDM (multiplexer de-
multiplexer) is an ISS
flight computer.

Generic MDM Configuration



*MDM = ISS flight computer
CSCI = ISS flight software*

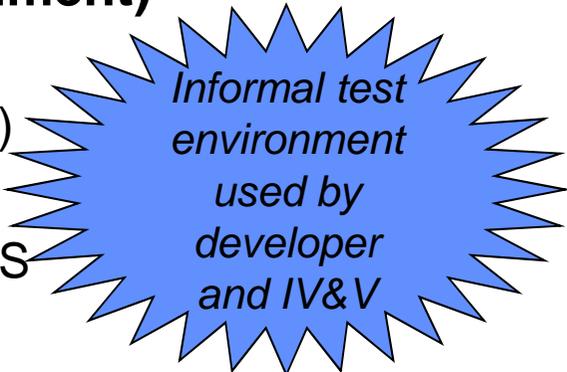
MATE versus MADE



- **MATE (MDM Application Test Environment)**
 - Uses flight-equivalent MDM and 1553 hardware
 - Runs actual MDM FSW
 - ISS environment, sensors, and effectors simulated
 - Executes C-scripts (test scripts)
 - Real-time and concurrent
- **MADE (MDM Application Development Environment)**
 - Runs on PC's (Windows)
 - Runs actual MDM FSW (small mods to startup code)
 - 1553 buses emulated using TCP/IP
 - Reuses MATE simulators and configuration data (ISS environment, sensors, effectors, etc.)
 - Executes C-scripts (test scripts)
 - Not real-time, sequential

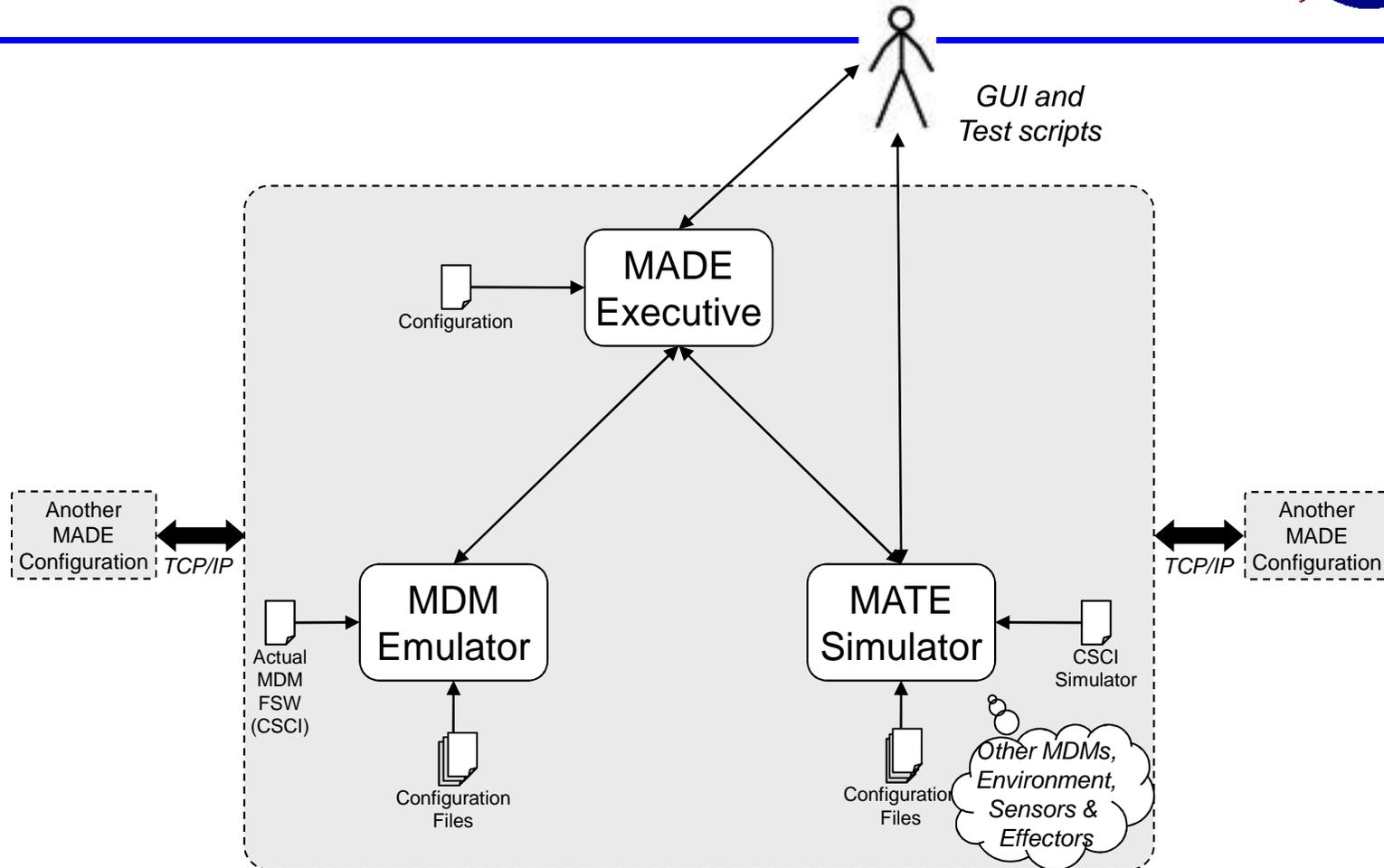


Formal test environment used by the developer



Informal test environment used by developer and IV&V

Generic MADE Configuration



MADE Configuration File



Configuration **2000+ lines**

```
-- LAB_T3_SIM_RTIOIP_1 Simulation Server Definition
--
START_SIM LAB_T3_SIM_RTIOIP_1
PATH Z:\SVF_MADE_CCUCscript
TYPE MATE
HOST 191.199.27.115
COMMAND MATE_Executive.exe
START_PARAMS
  DESCRIPTION Scenario file name
  TYPE FILENAME
  VALUE ..\Simulations\RTIOIP_1_TCE_X2_S0R3\made_ft_AC_r3v16_svf_m4.scn
  DESCRIPTION Simulator Wrapper
  TYPE FILENAME
  VALUE voss_c_crtmain_IA.bat
END_PARAMS
END_SIM

-- Airlock MDM Definition
--
START_SIM Airlock
PATH Z:\SVF_MADE_CCUC\Flight_Software\Airlock
TYPE MDM
HOST 191.199.27.108
COMMAND layer_1.exe
START_PARAMS
  DESCRIPTION MDM Simulator Config File
  TYPE FILENAME
  VALUE ALSYSR3V20_20A_REVA_AL1.mdm
END_PARAMS
END_SIM
```

Host computer to run simulation specified by IP address

MDM FSW file to load is specified

Bus connections between simulations are specified

```
--Bus Type Bus Name
1553_BUS LB_SYS-HAB-2
-- Sim Name Connector
INT_SIM_RTIOIP_3 7
INT1 5 2
INT2 5 2
Airlock BIA
END_BUS
--
--Bus Type Bus Name
1553_BUS UB_LA_3
-- Sim Name Connector
LAB_T3_SIM_RTIOIP_1 0
LSYS3 0 1
END_BUS
```

IV&V Testbed Configurations



- **Vertical**
 - Single-MDM configuration (FQT configurations)
 - « Acquired after a CSCI release (post-FQT)
 - « Acquired from CSCI developer
 - Loaded onto single-desktop
 - Meets IV&V's need to independently test CSCI releases
 - Primarily tested using test scripts developed by IV&V
 - Small foot-print to run and execute (one computer)
- **Horizontal**
 - Multi-MDM configuration that simulates complete ISS system
 - « Acquired after a Stage release (post-integration)
 - « Acquired from the Stage integrators (developer)
 - Loaded into IV&V testbed computers (lab)
 - Meets IV&V's needs to independently test HSI (Stage) releases
 - Primarily tested using PCS and MADE graphical user interfaces (GUI)
 - Large foot-print to run and execute (13 computers)
- **Diagonal**
 - Multi-MDM configuration developed by IV&V from FQT single-MDM configurations
 - Meets IV&V's need to test multi-MDM configuration with latest CSCI releases (prior to HSI release)
 - Can be loaded and run in the IV&V testbed lab or single-desktop
 - Primarily tested using test scripts developed by IV&V
 - Medium foot-print to run and execute (one to many computers)



Diagonal
Testbed
Demonstration

Next