

# MBAL—The Model-based Assurance Lab

## Model-based testing reference environment for real-time reactive systems

The Model-based Assurance Lab is a reference environment expected to improve cyber-physical system reliability by 10x and cut testing cycle time by half.

Although hardware-in-the-loop (HIL) is widely used for virtualization, testing is often limited to hand-coded test scripts and primitive test asset management. MBAL integrates MBT (model-based testing), HIL, and model-based systems engineering (MBSE).

**MBT tools Spec Explorer and QuickCheck generate end-to-end test suites that drive abstract adapters implemented in the TestStand test harness and control a Veristand HIL/FPGA chassis running sensor/actuator emulation code generated in MatLab.**

Jira and Github are integrated with a scalable test asset management system (TAMS). MQTT publishers/listeners and a testable joystick user interface integrate IoT and HCI elements in the test framework.

The Pan-Tilt-Sense (PTS) reference system under test (SUT) is coded on Wintel desktop and cross-compiled for a Debian/Beagle Bone Black (BBB) stack. Virtualization allows real-time remote debugging. The PTS controller commands servo motors moving an iPhone gyroscope monitored by an app using Kalman-filtered quaternions to report position over WiFi to the controller.

The MBAL tool chain and demo repositories will be containerized for rapid deployment.

