Cassini: The Evolution of a New Breed of ATE

Philosophy | Graphical Programming | Optimization | Test Management | Workflow Structure

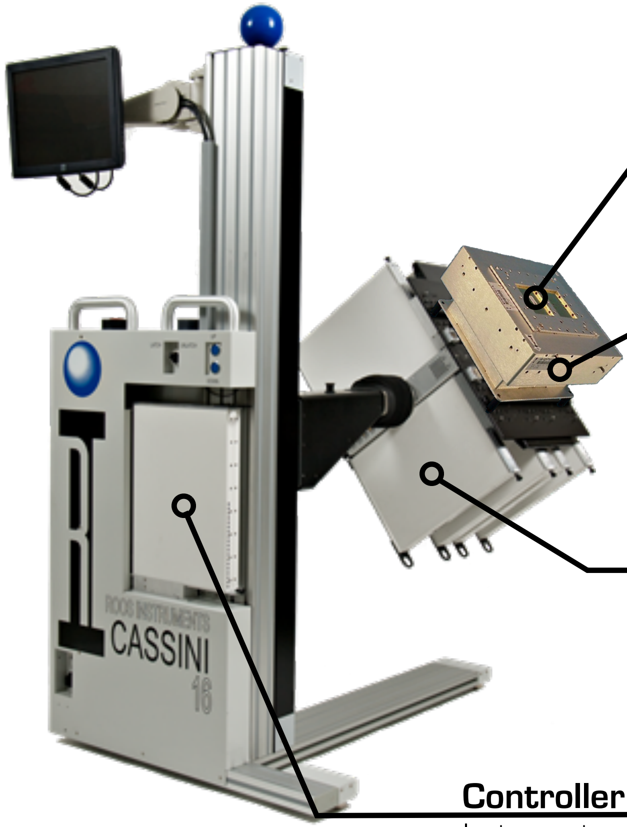
ATE Rebooted

Roos Instruments is a company founded by an engineer with a singular vision: to design a superior, high-frequency measurement system for automated test. At the time no current instrument existed with this capability, allowing his team of engineers to explore new ways of improving a tester, and the freedom to rethink what an ATE system could be. What came from this new line of thought became a core principle at the heart of each tester: "design in minimum." To make a system faster, more efficient, and easier to use, it must be simplified by removing the inessential. When it was no longer possible to improve the tester by subtraction, the remaining components became more focused, there was more synergy between hardware and software, and the work flow became more intuitive. The end result was an ATE system covering a range of applications from DC to 81 GHz with unparalleled speed, accuracy, and ease of use.

Introducing Cassini

Cassini is the evolution of that platform. With an innovative design, as well as an expanded set of capabilities, Cassini is the culmination of years of advanced research and engineering refinement. Building upon the technology of its predecessor while still adhering to the principles of design minimum have yielded a faster, more flexible infrastructure to support a wider range of RF, mixed-signal, and millimeter-wave applications without increasing the complexity of use. How Cassini makes this possible is not just in its hardware or software, but how the two work in concert. The following sections explore key components in Cassini's software and hardware anatomy, giving an overview how they provide the user with not just a powerful tool, but a powerful workflow for creating and executing production-quality microwave measurements.

Hardware Overview



DUT Interface Board(DIB)

12 mil, two layer PCB board that provides RF signal launches. The simple design minimizes parasitics, withstands the wear of large-volume handler landings, and provides low-cost replacement.

Fixture

Contains calibrated interconnect and software-controlled signal switching for microwave, mixed-signal and DC from the test instrument modules to the DUT interface board. Mounts to the RI test head and supports custom kits for specific customer needs.

Test Instrument Modules (TIMs)

Self-contained measurement hardware that are plug and play swappable to provide application specific test solutions. Modules provide simple and complex signal generation, modulation/demodulation and frequency/time analysis with operating ranges from DC to 81 GHz

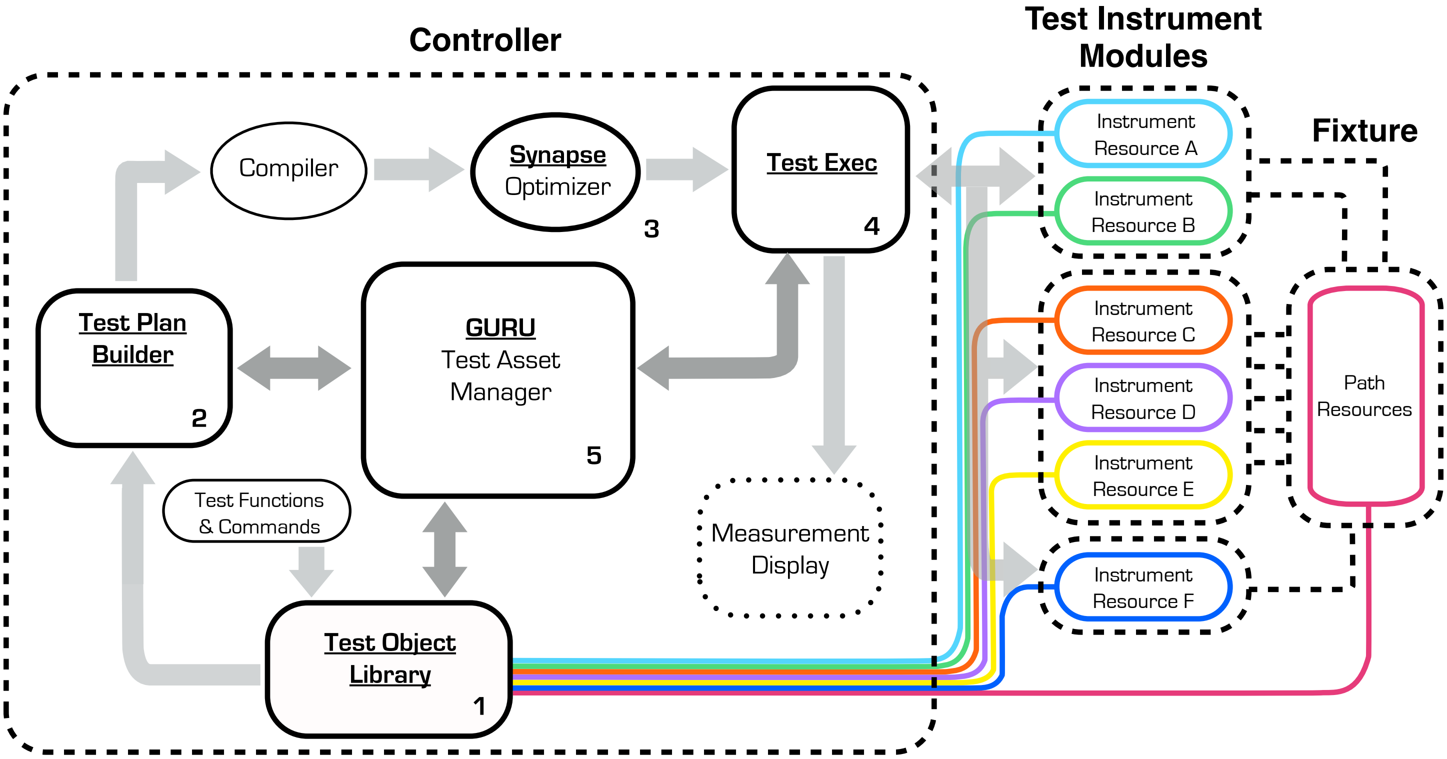
Controller

Instrument computer with ECom Station operating system and RI's unique graphical programming test plan software. Manages hardware and software resources of the tester, data processing, and local storage

Design Concepts

- The infrastructure has been simplified to provide a solid structural platform while keeping the tester footprint small
- By moving the measurement instruments closer to the DUT, RF paths have been shortened to reduce path loss, noise contributions, and the need for more and expensive signal conditioning.
- Modular architecture allows for quick and easy replacement or upgrade to RF, mixed-signal, or DC measurement capabilities without the user having to alter their setup or test plan.
- Universal module slots allow for multiple TIM placement configurations
- Combination of Fixtures and TIMs offer higher flexibility when routing control/test signals to and from the DUT.
- Fixture and DIB approach enables individual calibration of each component or coupled calibration. This guarantees measurement accuracy up to the device while keeping the calibration process easily managed in software and flexible in the hardware.
- Data and measurement information pass from the TIMs to the controller via a proprietary high-speed data bus (RIFL), that dramatically reduces packet overhead and transfer latency leading to faster computation and test times.

Software Architecture



1. Test Object Library	2. Test Plan Builder	3. Synapse	4. Test Exec	5. Guru
• Collection of fixture path definitions, user test commands, and measurement functions • Instrument commands and functionality are dynamically modified based on the connected TIMs	• Graphical programming environment that represents commands and measurements as system blocks that are linked together to build procedures and test plans	• Intelligent test plan optimizer that evaluates measurement procedure versus instrument execution cost to minimize test time.	• Executes test plans and incorporates handler configs, calibration info, fixture definitions, etc into the test procedure. • Passes measurement data back to user and saves in Guru.	• Repository for all test files, resources & data. • Serves as the central test management tool for file backup, recovery, software distribution, and version control.

Design Concept: State-Based Approach

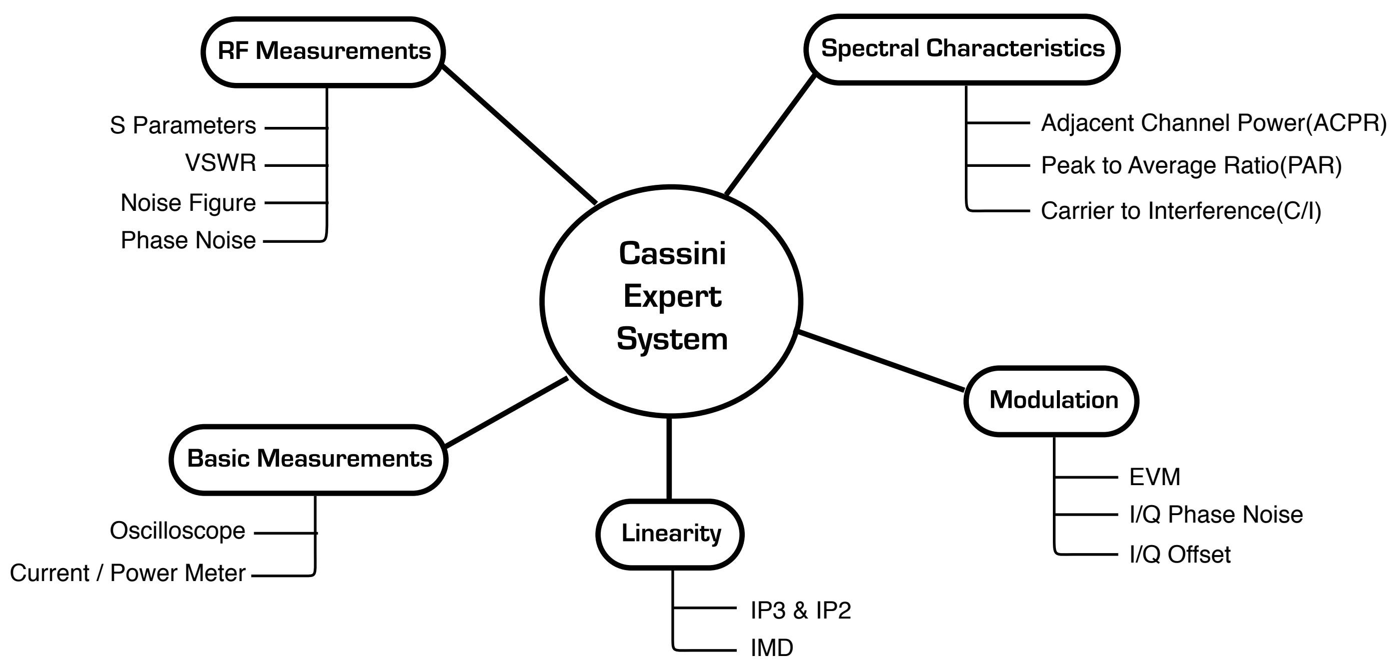
Regardless of the interface or programming language of an ATE system, input commands by the user have to be compiled into an instruction set for targeted hardware. These instructions control the measurement instruments by moving from hardware state to hardware state to execute a task or series of tasks in the order the commands were written. The problem with this method is that the hardware states are not transparent to the user making it difficult to write user commands that run efficiently on the hardware.

Cassini's software takes a different approach, using state-based objects in place of commands. These objects link both the user's test function/command and the hardware states associated with it, giving the RI software several advantages:

- Using state-based software commands, the system can simplify the execution of tasks in hardware.
- The compiler is aware of hardware time costs associated with executing a set of software commands. This can be used to optimize the order of operation.
- Able to identify multiple or redundant hardware states in the software commands in order to combine tasks and reduce test time.

Measurement Expert System

Accurate and repeatable measurements are made not only by having the right equipment, but by employing the right practices. This is especially true in production test where the added difficulty of insuring robust DUT interfaces, consistent calibration across multiple testers, and delivering fast measurement times are incorporated. Cassini achieves this by integrating a collection of 80 years of microwave expertise and techniques into the hardware and software workflow, creating an expert system of resources. This expert system provides a toolset of built-in advanced measurements, a powerful set of control commands and functions combined with a calibrated and robust hardware infrastructure, enabling a user with little to no RF experience to create and execute sophisticated microwave measurements with ease.



This section guide has provided a brief introduction of the Cassini system and some of the key design philosophies that have shaped its test features. More detailed information on hardware, software, and workflow tools, can be found in the subsequent series of documents listed at the top of page 1, and referenced below:

Graphical Programming	Introduction to the measurement and test plan builder software.
Optimization	A synopsis of the state-based test plan optimizer: RI Synapse.
Test Management	Provides an overview of the test management program: Guru.
Workflow Structure	Explains how user access and permission to applications are controlled within Cassini's software workflow.