Automatic, Fast & Thorough
Test Automation of Flash Memory Cards

SanDisk Israel QA laboratory uses TestShell

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Agenda

Review QualiSystems' Automation platform by presenting SanDisk's test case solution

- Problem Description
- Solution – High level
- Solution – In depth
- Conclusion

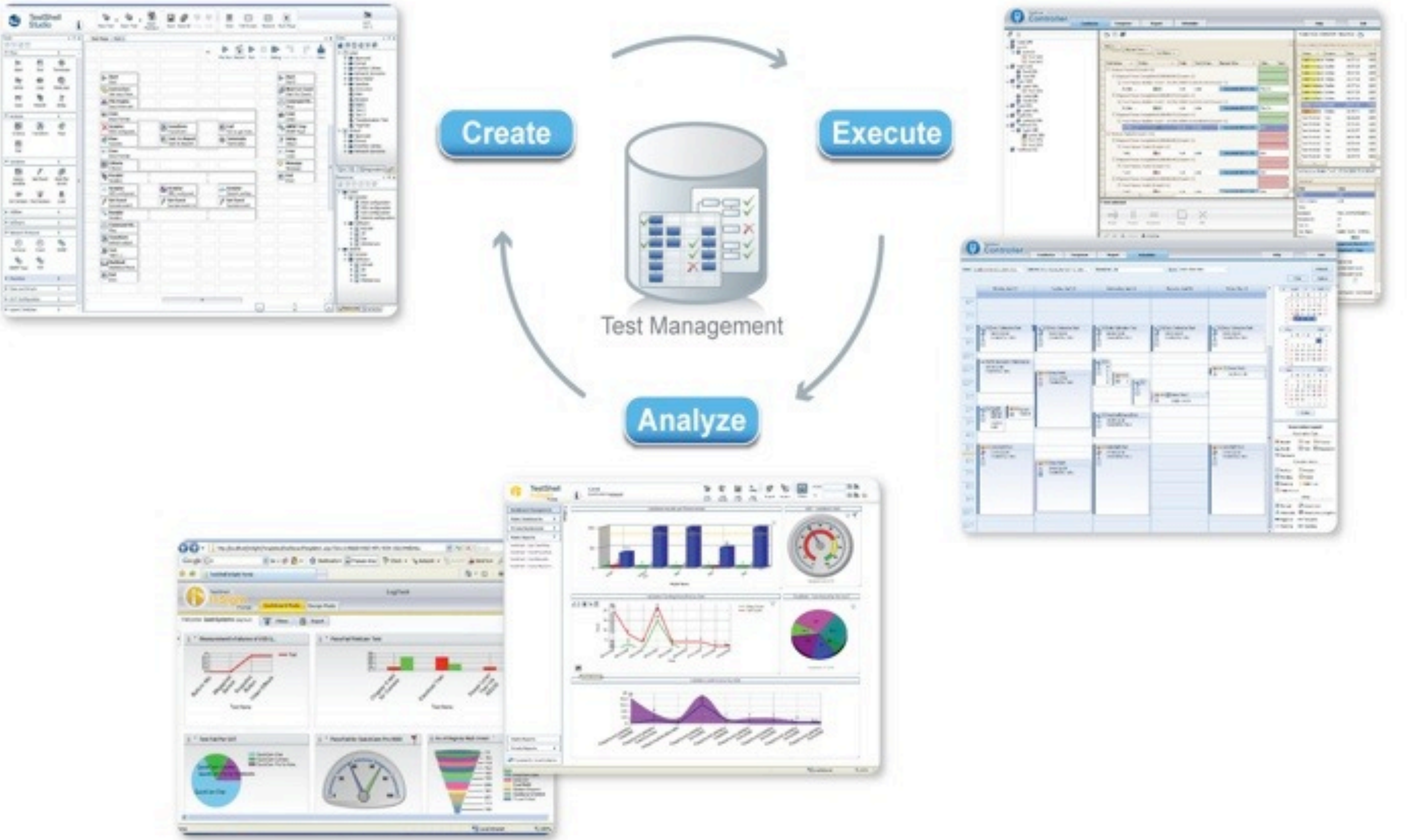
Problem Description

- Testing Flash memory cards and Chips
- Testing procedures include: (partial list)
  - Format / Partition
  - Firmware setting
  - Hardware measurements (i.e. Power dissipation)
  - Data read / write cycles error and timing read
  - API Software tests
  - Performance tests
  - Stress tests
  - Test on Customer/Partner platforms

Problem Description cont.

- Single test cycle duration can take days
- Complete test cycle **can reach a month** per product
- Combination of software and hardware in tests forced manual intervention
- Manual result collection (from ~60 stations)
- Manual troubleshooting of run failures
- Manual data aggregation and reporting (up to an additional week)

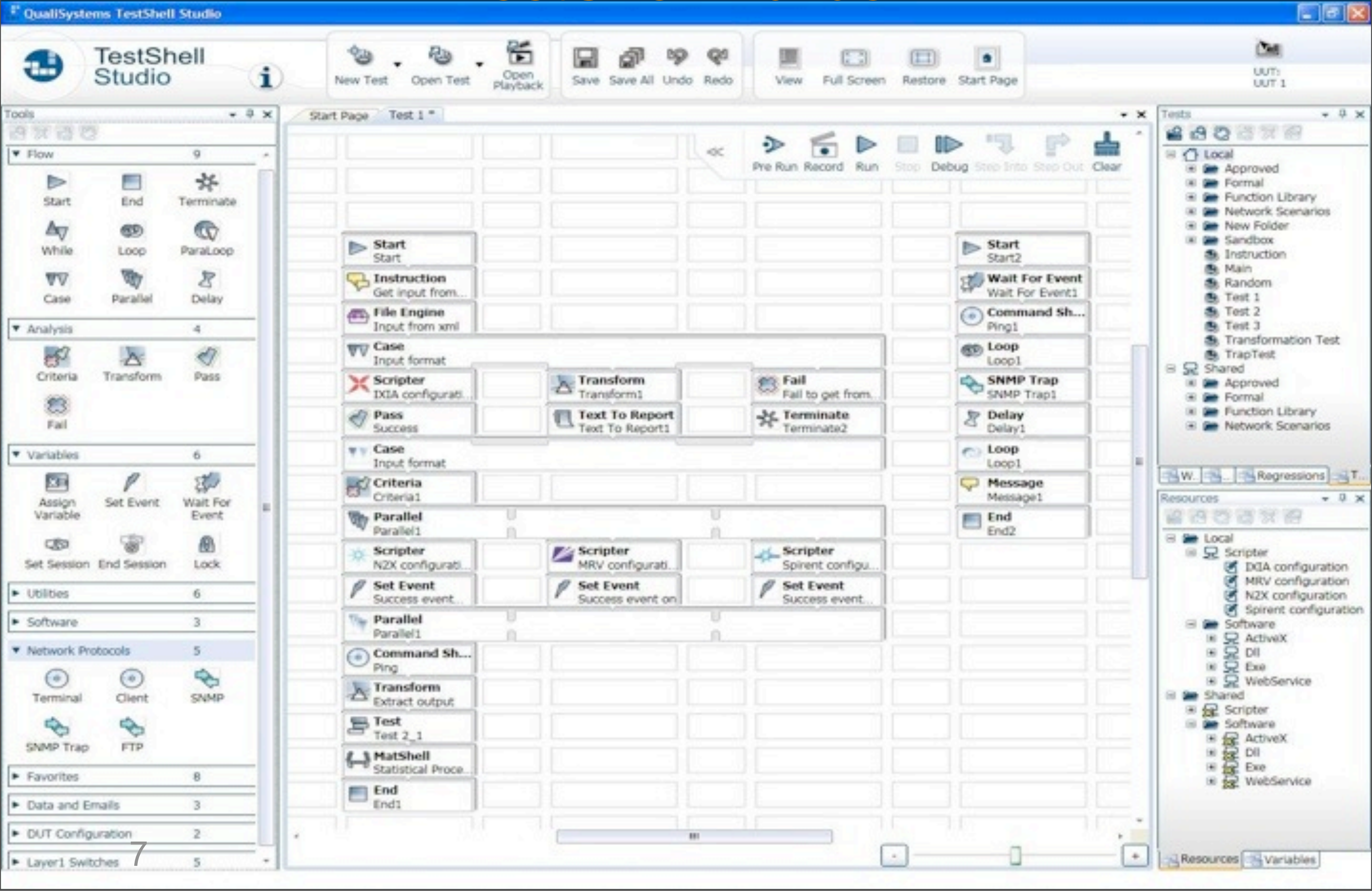
TestShell Solution – High Level



Solution – High Level

- Cover all test types through **one system**
- Manage all tests in a **central repository**
- Set up **multiple, parallel** testing stations
- **Smart test allocation** to run the cycle
- Automatically **collect all results** to the database
- Allocate **manpower** to create & improve tests, rather than execute & document their results

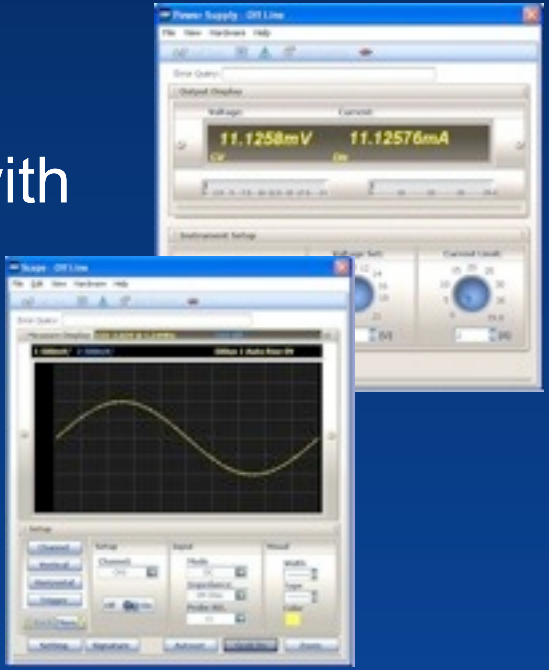
TestShell Builder



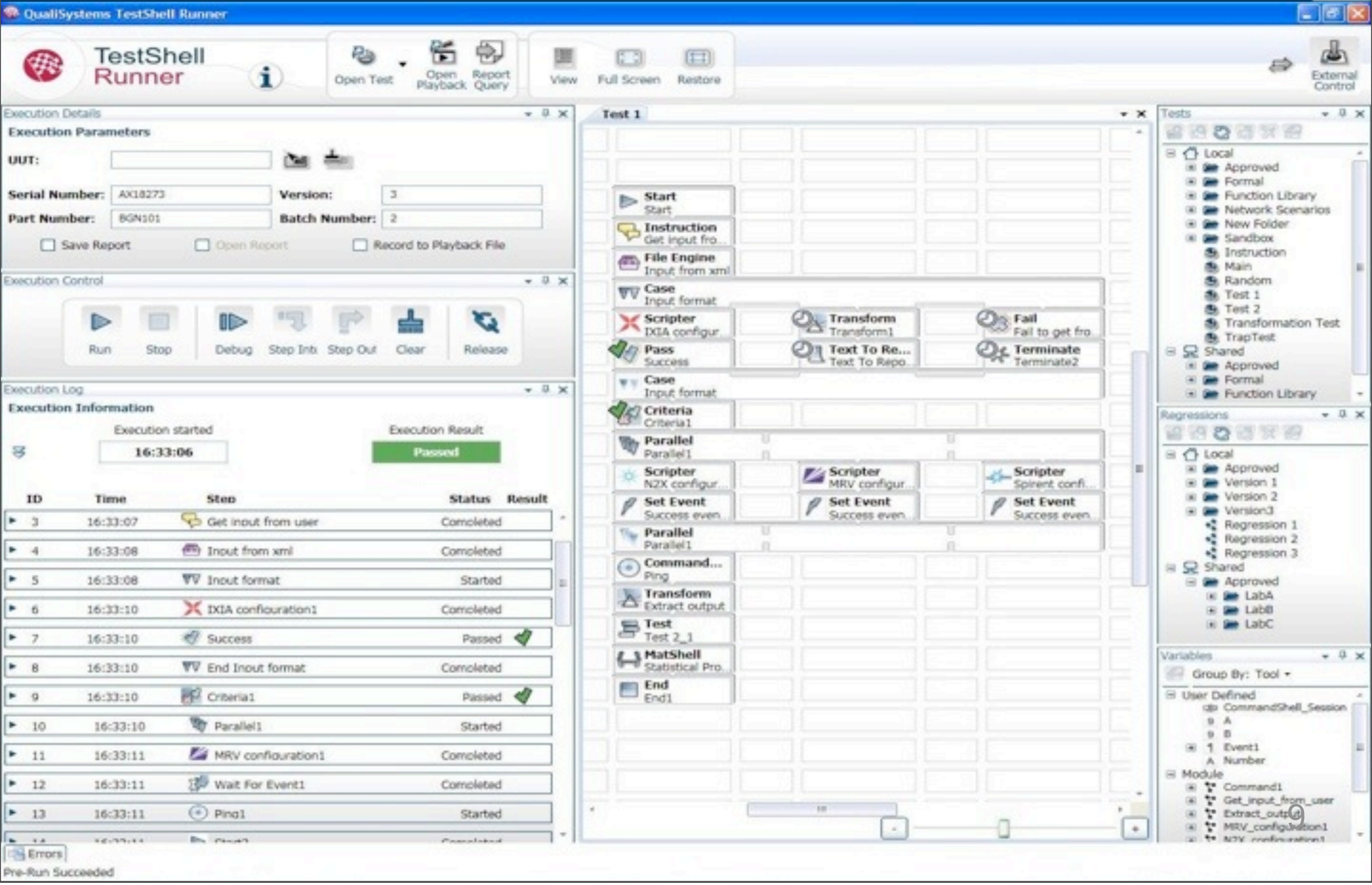
TestShell Builder

Wizard-driven, Point-and-Click Test Creator

- At SanDisk
  - Set test sequences which interface with
    - – Power measurement
    - – Scope
    - – Logic analyzer
    - – Pattern generator
    - – Partner\customer platform
  - Interfaces with SanDisk’s API DLL
  - Define logic, loops, variables and more…
  - Define troubleshooting procedures



TestShell Runner



Execution Parameters

UUT:

Serial Number: AX18273 Version: 3

Part Number: BGN101 Batch Number: 2

□ Save Report □ Open Report □ Record to Playback File

Execution Information

Execution started: 16:33:06

Execution Result: Passed

ID	Time	Step	Status	Result
3	16:33:07	Get input from user	Completed	
4	16:33:08	Input from xml	Completed	
5	16:33:08	Input format	Started	
6	16:33:10	IXIA configuration1	Completed	
7	16:33:10	Success	Passed	✓
8	16:33:10	End Input format	Completed	
9	16:33:10	Criteria1	Passed	✓
10	16:33:10	Parallel1	Started	
11	16:33:11	MRV configuration1	Completed	
12	16:33:11	Wait For Event1	Completed	
13	16:33:11	Ping1	Started	
14	16:33:11	Start2	Completed	

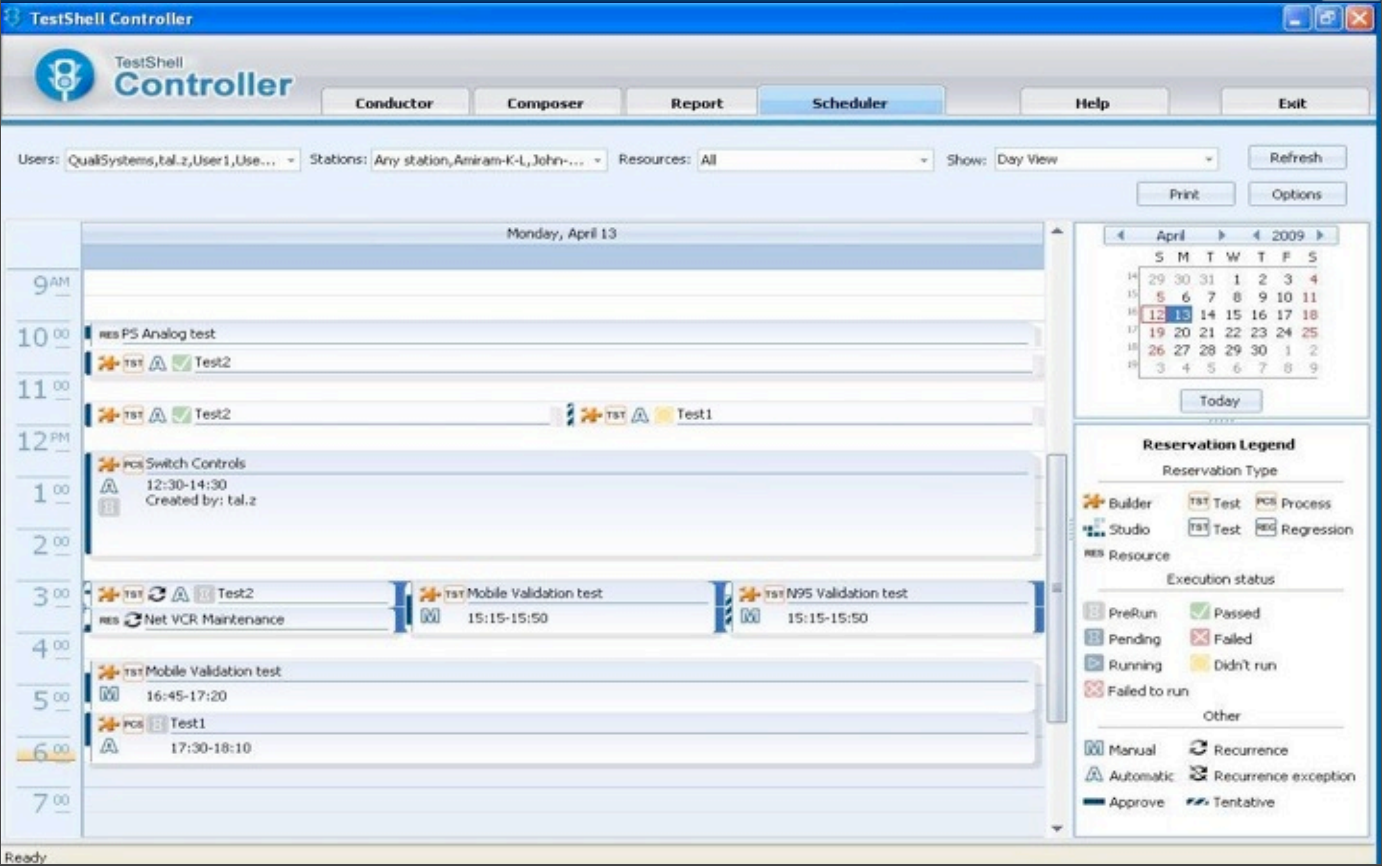
TestShell Runner

Fast, Fully Automated, Test Runner

- At SanDisk
  - Set & measure current consumption with Power Testing Equipment
  - Set & measure signal and timing behavior through Scope Testing Equipment
  - Activate additional equipment
  - Initiate SanDisk DLLs to format, partition, read, write and more.
  - Collect all results and logs

Reduced test duration from an entire month to 2 days!

TestShell Controller



Users: QualiSystems,tal.z,User1,Use... Stations: Any station,Amiram-K-L,John-... Resources: All Show: Day View

Monday, April 13

9 AM

10 00 RES PS Analog test

TST Test2

11 00 TST Test2 | TST Test1

12 PM PCS Switch Controls
12:30-14:30
Created by: tal.z

1 00

2 00

3 00 TST Test2 | TST Mobile Validation test 15:15-15:50 | TST N95 Validation test 15:15-15:50

RES Net VCR Maintenance

4 00 TST Mobile Validation test
16:45-17:20

5 00 PCS Test1
17:30-18:10

6 00

7 00

April 2009

	S	M	T	W	T	F	S
14	29	30	31	1	2	3	4
15	5	6	7	8	9	10	11
16	12	13	14	15	16	17	18
17	19	20	21	22	23	24	25
18	26	27	28	29	30	1	2
19	3	4	5	6	7	8	9

Reservation Legend

Reservation Type

Builder TST Test PCS Process
Studio TST Test REG Regression
RES Resource

Execution status

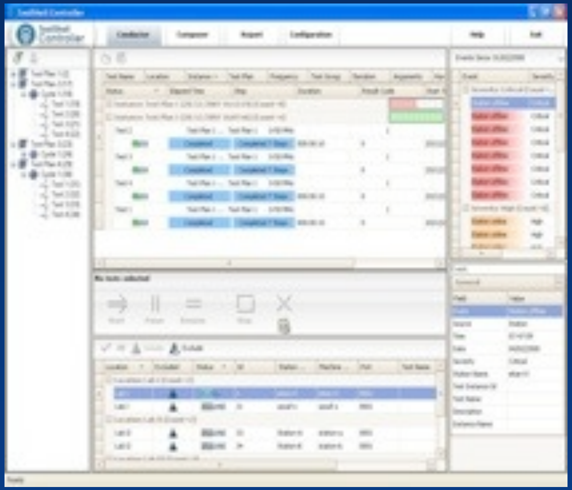
PreRun ✓ Passed
Pending ☒ Failed
Running Didn't run
Failed to run

Other

Manual Recurrence
Automatic Recurrence exception
Approve Tentative

TestShell Controller

Multiple Testing Station Manager, Executor & Optimizer



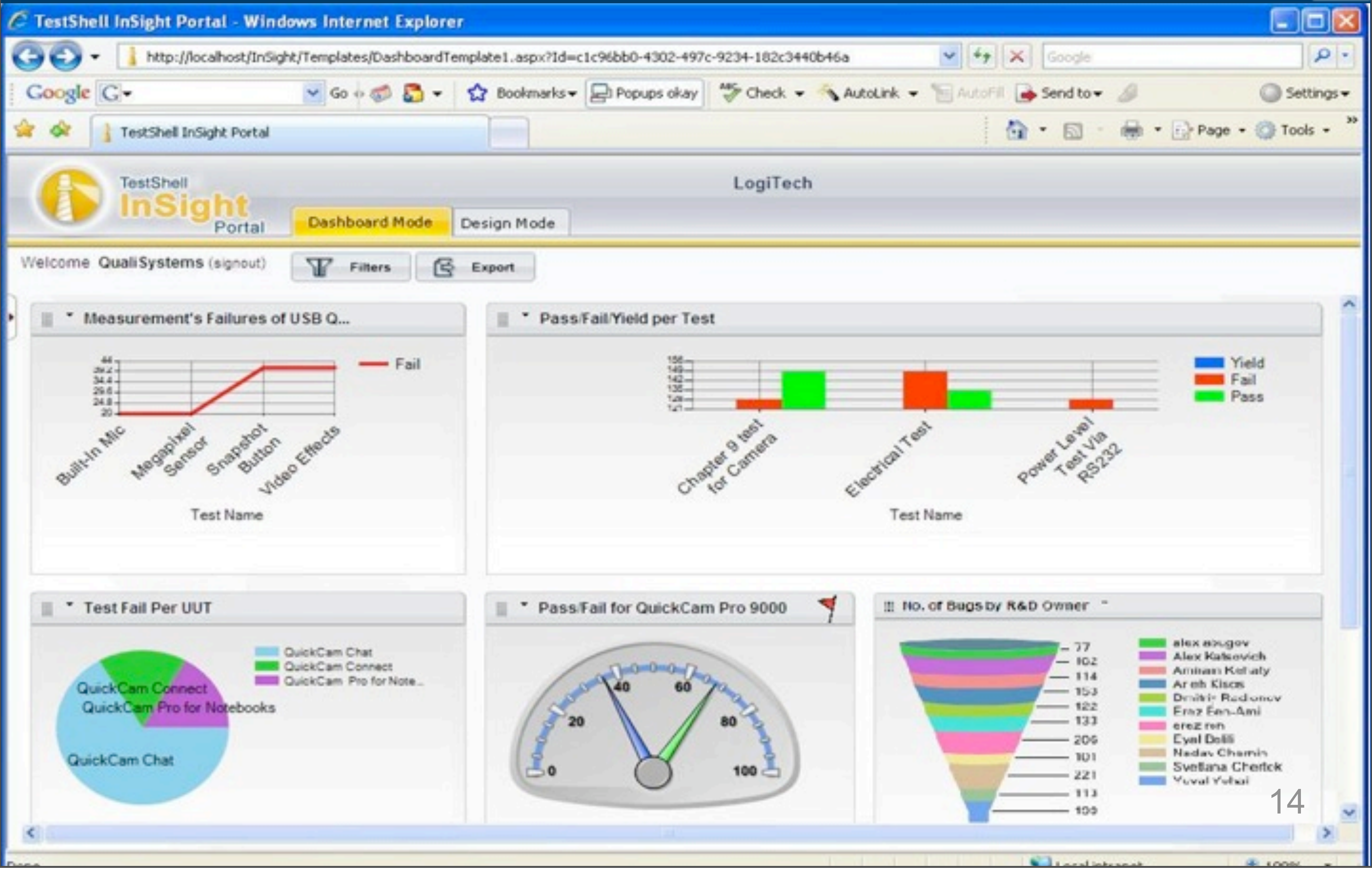
- At SanDisk
  - Split tests to sub-components and run them on duplicate stations
  - Generates execution results & reports
  - Automatically correlate tests to stations according to their capabilities and requirements
  - Monitor and respond to Events
  - Allows remote connectivity to

TestShell Controller

Multiple Testing Station Manager, Executor & Optimizer

TestShell InSight

Test Reporting, Business Intelligence & Decision Support Generator



TestShell InSight Portal - Windows Internet Explorer

http://localhost/InSight/Templates/DashboardTemplate1.aspx?Id=c1c96bb0-4302-497c-9234-182c3440b46a

Welcome QualiSystems (signout)

TestShell InSight

Test Reporting, Business Intelligence & Decision Support Generator

- At SanDisk
  - Query the main Data Base to collect results and stats from the multiple test stations
  - Analyze the results to generate summaries, tables and advanced plots.
  - Generate Complex customizable reports per UUT
  - Generate customizable browser-base dashboards

Conclusion

- Reduction of test duration through automation
- Reduction of cycle duration through parallel testing and monitoring automation
- Increase in testing complexity
- Complete executive coverage of testing

Approximate tripling of testing productivity!

“Truly the Next Generation of Test Automation!”

“QualiSystems’ TestShell helped us to address our key challenges, **significantly accelerating our testing process** and increasing productivity of my team. QualiSystems and its TestShell test automation suite allowed us to make **a major leap**. We are able now to **develop complex tests using sophisticated test instruments in a matter of hours**”.

Shahar Bar-Or
R&D Director
SanDisk MHV

SanDisk

Thank you

Visit our website:
www.qualisystems.com

QualiSystems

TestShell Solution – High Level

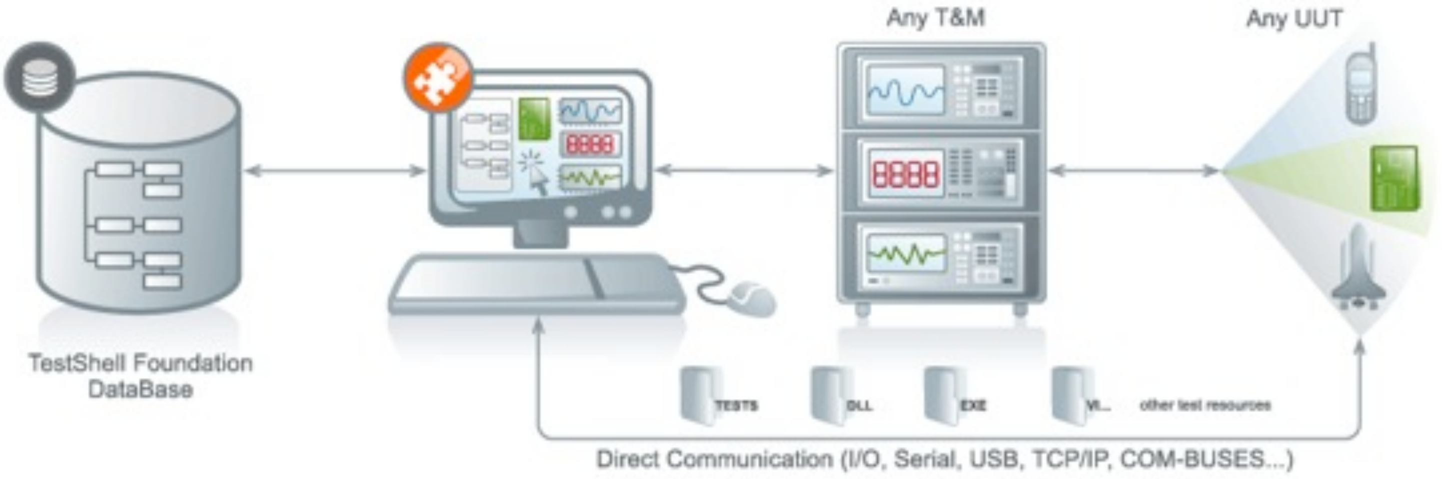
TestShell Builder TestShell Runner TestShell Controller TestShell InSight TestShell Foundation

- Set of software applications
- Completely integrated
- Out-of-the-box interfaces with testing equipment
- Cover all software and hardware testing use cases
- Cover all test-related procedures
- Aggregates results to a standard Data Base

TestShell Builder

Wizard-driven, Point-and-Click Test Creator

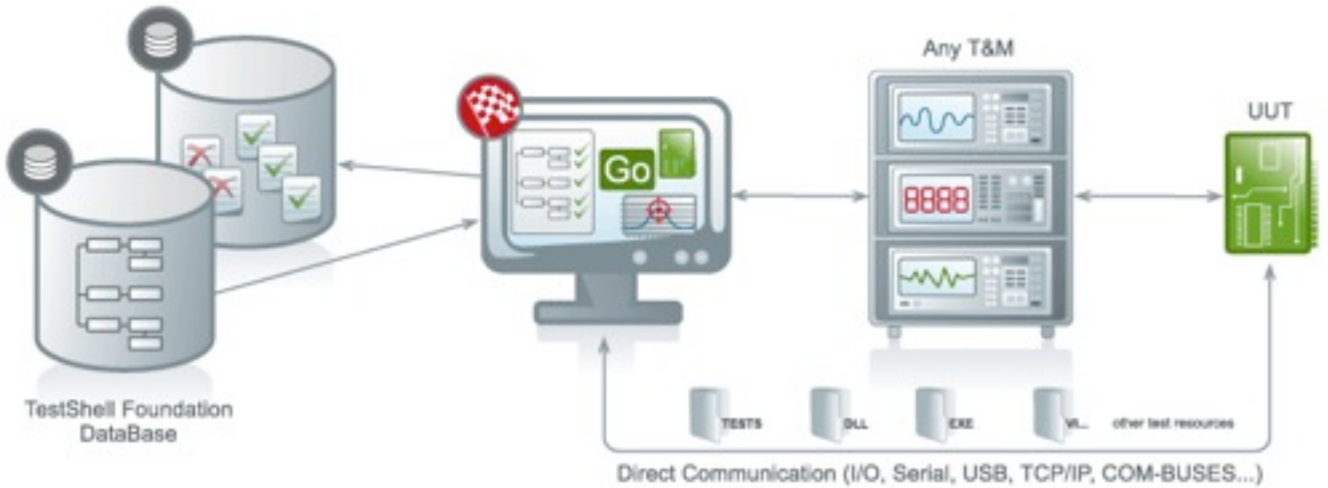
- Quickly and easily create re-usable standardized functional tests scenarios
- Integrate with Any T&M / Software / Interface
- Develop with no need for programming skills


Any T&M
Any UUT
8888
8888
TestShell Foundation DataBase
TESTS
DLL
EXE
VI...
other test resources
Direct Communication (I/O, Serial, USB, TCP/IP, COM-BUSES...)

TestShell Runner

Fast, Fully Automated, Test Runner

- Execute tests in-house or at **any outsource location**
- **Ensures standardization** by **preventing unauthorized modifications** to test specifications
- Displays & Collect **all** test results to the central Data Base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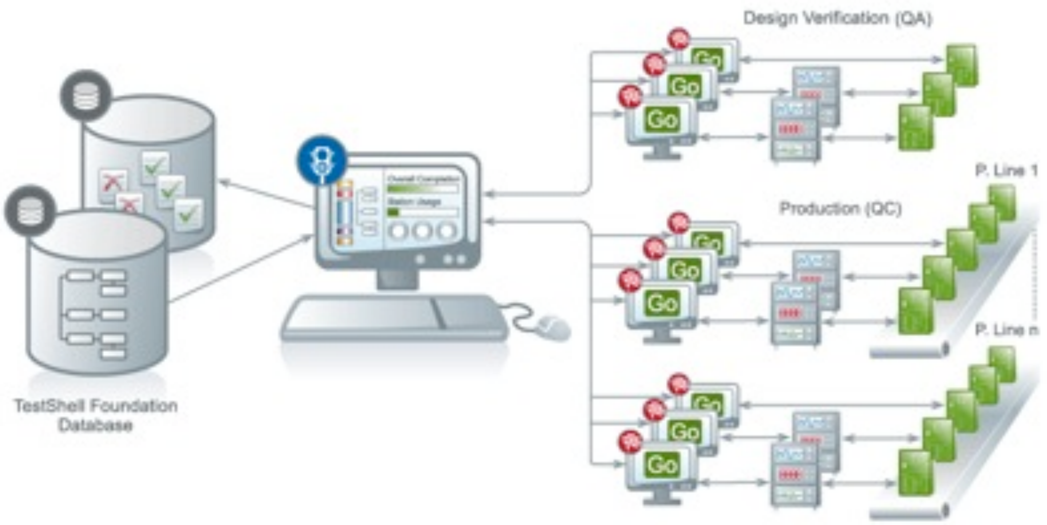
TestShell Controller

Multiple Testing Station Manager, Executor & Optimizer

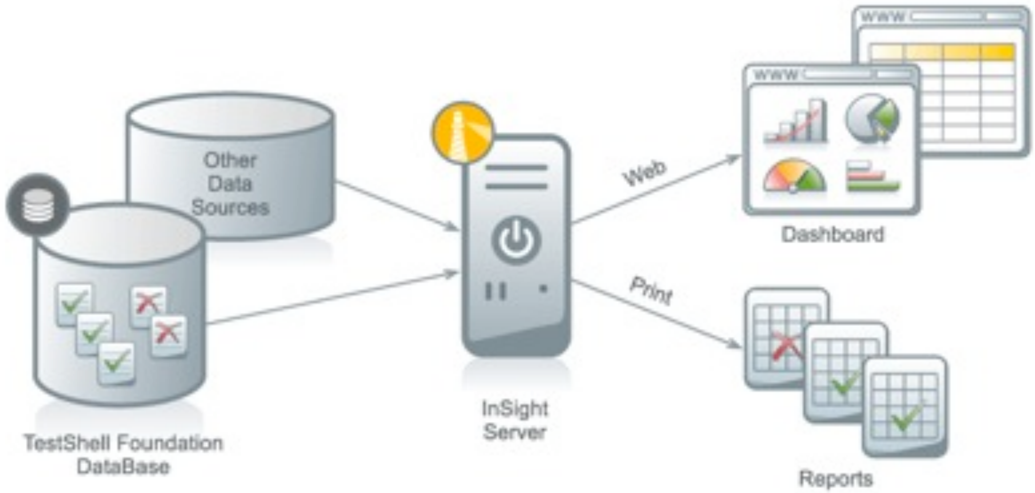
- Run and coordinate tests among multiple stations 24/7
- Optimizes test duration & maximizes station utilization
- Track testing station performance



TestShell InSight

Test Reporting, Business Intelligence & Decision Support Generator

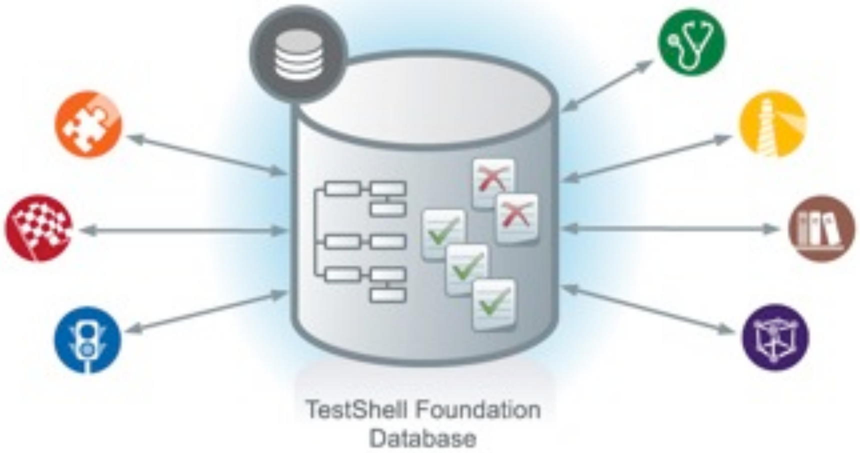
- Display and convey test results and trends on-line and in real-time, running any type of query
- Highly customizable web dashboards and reports



TestShell Foundation

The Heart of the TestShell Suite

- Scalable core engine and central database enabling all TestShell applications to work together
- An essential element in any TestShell implementation


TestShell Foundation Database