
TESTADVANCE TEST-SYSTEM DESIGN SERVICES (TSD)

Related Documents:

Testadvance Test-System Engineering

Testadvance Test-System Specification (TSS)

Testadvance Test-System Optimisation (TSO)

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Assessment

Test-System Concept

Test-Architecture

Test-System Instrumentation

Test-Plan

SW Functional Design

System Design Specification (SDS)

- Reduce lead-times, overheads, risk and re-work
- Minimise iterations in planning, budgeting and design
- Reduce effort in design, integration and verification
- Relieve 'critical path'
- Design for optimisation, reliability and re-use

Testadvance Test-Design services help engineers and managers accelerate engineering cycles and provide independent, complete and timely 'ready-for-build' design-specifications for testing

1 Introduction

Testadvance Test-Engineering Services provide test-engineers and managers with specification, design and optimization of Functional Test. The services integrate with the client's 'Test Life-Cycle'.

- Test-Specification
 - Requirements Analysis, Functional Design, System Requirements Specification
- **Test-System Design**
 - **System-Concept, Test-Architecture, System-Instrumentation, Test-Plan**
- Test-Optimisation
 - Scope, Analysis, Measures, Execution, Review

Services	Product/Service	Test-Engineering work-elements and deliverables	Production/Operation
▲ <i>Test-System / Test-Plan Optimisation</i>	<i>Feedback</i> <i>Test-data</i>	<i>Benchmark & Review</i> <i>Plan and execute implementation</i> <i>Design optimisation</i> <i>Analyse Test-System/-Stage</i> <i>Scope Optimisation</i>	<i>Monitor, leverage</i> <i>Outcomes</i> <i>Measures</i> <i>Test-Plan, Test-Data</i> <i>Target, extent</i>
▲ Test-System / Test-Plan Design	Product /Service Test-specification Test-Methods & Procedures	Benchmark performance Develop Implementation briefs (opt) Compile Test-Plan Design Test-Sequences, -Routines, -Cases et al Test-Layout Compile Test-System Specification Design Test-Architecture Design System Infrastructure/Interfaces Design Non-Measurement Sub-Systems Design Measurement Interface(s) Design Measurement Sub-System	Metrics, requirements build, deploy, ramp-up Production/Operation Test-specification Test-Process
▲ <i>Test-System / Test-Plan Specification</i>	<i>Test-Set-ups & prototype testing</i> <i>Product Test-specification</i> <i>Measurements</i> <i>Design-verification</i>	<i>Design System Concept</i> <i>Plan and budget (opt)</i> <i>Compile System Requirement Specification</i> <i>Design Functional Requirements</i> <i>Analyse Requirements</i>	<i>Operations Test-specification</i> <i>Sourcing</i> <i>Operations Test-specification</i> <i>Test-concept</i> <i>Volume, yields, cycle infrastructure et al</i>

Table 1 Test-System Engineering in operations

2 Deliverables: System Design Specification (SDS)

1. Scope of Engagement (SoE/SOW Section 1)
 - Framework
 - Measurement Interface
 - Non-Measurement Sub-Systems
2. Test-System Concept
 - Capabilities, capacities and concept
 - Alternatives, Cost/Benefit Assessment
 - System Infrastructure
 - System Interfaces
3. Test-System Architecture
 - Test-Methods and Cases
 - Test-Set-ups
4. Test-System Instrumentation
 - Measurement Sub-System
5. Test-Plan
 - Test-Layout
 - Test-Routines
 - Non-Test-Routines
 - Test-Sequences
6. SW Functional Design
7. Planning and Budgeting

3 Test-System Design Process (TSDP)

Test-System Design services address the second key phase of the Test Life-Cycle.

SLC	Client Operations/Product Life-cycle(s)			
	Client Test Life-Cycle			
	Plan/Specify ►	Design ►	Build ►	Implement / Deploy ► Operate / Maintain
	▲	▲		▲
	Test-Specification	Test-Design		Test-Optimisation
Execution	Compile SRS	Test-Plan		Execution
Design	Functional/Performance Requirements	Instrumentation		Design
Analysis	Requirements Analysis	Architecture		Analysis
Scope	Scope	Scope/Concept		Scope

Table 2 Test-System Design in the Test Life-Cycle

A Scope of Engagement ensures proper alignment with the client's operations, timelines and desired outcomes. The Scope is provided prior to a financial commitment. Communication and change management are managed within the delivery process. Client staff/teams can be involved. Work is executed as concurrently as feasible and applies practices from Dynamic Systems Development Method (DSDM), Rapid Application Development (RAD) and Structured Analysis and Design (SA/SD). Test-Design services further consider optimisation, modularity and re-use, integration and forward testing, monitoring, reliability, utilisation and 'up-time'.

- i. Assessment**
 - i. Define needs and outcomes
 - ii. Evaluate/interpret SRS
 - iii. Define System-Concept
 - iv. Assess alternatives, weigh cost/benefits
- ii. Design Test-Architecture**
 - i. Define key measurements/test-methods
 - ii. Draft Test-Set-ups, instrumentation
 - iii. Draft system/Sub-System layout
 - iv. Draft Measurement Sub-System
 - v. Draft Measurement Interface
- vi. Correlate Test-Architecture, SRS and cost/benefits**
- iii. Design Test-System Instrumentation**
 - i. Design Test-Methods, Set-ups, Cases
 - ii. Design Measurement Sub-System
 - iii. Design Measurement Interface
 - iv. Design Non-Measurement Sub-System(s)
 - v. Design System Interfaces
 - vi. Design System Infrastructure
 - vii. Verify designs against SRS

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| <ul style="list-style-type: none">iv. Design Test-Plan<ul style="list-style-type: none">i. Design Test-Layoutii. Design Test-Routinesiii. Design Test-Sequencesiv. Design System/Test Controlv. Confirm Cost/Benefitsvi. Verify Test-Routine/Sub-System integrityvii. Verify Test-Sequence/Layout/Process integrity and integration | <ul style="list-style-type: none">v. Develop SW Functional Designvi. Develop implementation briefs & Planning & Budgetingvii. Compile System Design Specification<ul style="list-style-type: none">i. Verify completeness and correctnessii. Verify Sub-System integrationiii. Verify system control and automationiv. Verify system integrityv. Verify integration in target operation |
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Table 3 Test-System Design Process (TSDP) Overview

3.1 Assessment

The Assessment establishes the client's objectives, priorities and constraints. It defines the work to be delivered, the operational and technical areas and context. The outcome is the Scope of Engagement (SoE). The SoE forms the basis of the Statement of Work (SOW) and is provided prior to a financial commitment from the client. The SoE includes a System Concept and describes how Test-Design integrates with the client's operations, teams and processes. The System Concept outlines a test-system that will meet the requirements of the existing SRS. The concept is defined to a feasible level of detail, e.g. key Sub-Systems and instruments. Capabilities and capacities are allocated to Sub-Systems, e.g. a power-measurement to the Measurement Sub-System, a switching-matrix to the Measurement Interface. Where requirements are unambiguous, specific instruments can be defined, e.g. a format-specific signal-analyser. Where multiple solutions are feasible, care is taken to limit the number of alternatives sensibly.

3.2 Test-Architecture (TA)

The Test-Architecture is based on the System-Concept, yet the emphasis lies on how testing is realised in operations. The primary focus is on sufficiently defining the Measurement Sub-System and Measurement Interface capable of providing the core functions without a complete system-design. First, executable tests are drafted from the measurement and functional requirements stated in the SRS. Each is defined in Test-Method, Test-Set-Up and Test-Case(s). 'Executable' refers to the ability to execute the capabilities to the required capacities within the target-environment of the test-system/-process. E.g. a RF Power measurement on a production-line is different to a test-set-up in a lab. Core Measurement functions are defined first and initially independent of capacity requirements. Tests are defined starting at the DUT, then to the boundaries of the test-system, therein to the Sub-Systems, therein to the known instruments and/or elements and so on, down to a level where a sensible design is no longer possible at this stage of development. Each Test is only designed as far as possible. 'Black box' substitutes with defined I/O parameters are defined where e.g. instruments are still to be specified. Example: A RF Power Measurement is assigned to a format-specific analyser, yet the measurement of the demodulated payload is assigned to a 'black-box' as a specific method or instrument is yet to be defined. Key signal paths and characteristics are defined concurrent to the definition of each Test. These in turn provide the design-parameter for the Measurement Interface. Outstanding or incomplete requirements, such as incomplete Test-Methods and/or non-measurement functions are captured. Alternatives are captured and cost/benefit weighed. The completed Test-Architecture defines the core measurements and functions, Sub-Systems and key instruments of the Test-System.

3.3 Test-System Instrumentation

The Test-System Instrumentation details the complete design of the Test-System, from core measurement devices to individual components. Test-System Instrumentation builds on and is concurrent to the development of the Test-Architecture. In essence, whenever a Test-Method, Set-Up/Case is sufficiently defined, the detailed design of the relevant Sub-System progresses. Test-System Instrumentation is also developed concurrently to the Test-Plan and its elements.

First, the Measurement Sub-System and Interface are completed in conjunction with the development of the Test-Routines (Test-Methods, Set-Ups/Cases) of the Test-Plan. The Measurement Sub-System and Measurement Interface are detailed to individual elements, typically instruments, switching and discrete components and ports.

The development of the other Sub-Systems such as Non-Measurement (Auxiliary) Sub-Systems, System-Infrastructure and System-Interfaces progresses 'outward' from the Measurement Sub-System and Interface. During the development of each Sub-System we capture needs that determine the design of the System Infrastructure and System Interfaces. Design-specifications are defined to the required level and tolerances respectively uncertainties provided. Measurement uncertainty analyses can be provided. The outcome is a complete, structured and 'ready-to-build Test-System blueprint'.

3.4 Test-Plan

The Test-Plan details the complete testing, from core measurements over adjustments and non-measurement functions to test-sequences and test-layout. The design of the Test-Plan builds on and is concurrent to the development of the Test-Architecture. Whenever a Test-Method, Set-Up/Case is sufficiently defined, the detailed design of the relevant Test-Routine progresses. The Test-Plan is also concurrent to Test-System Instrumentation and Test-Routines, Set-Ups and -Cases detailed based on the final design of the applicable Sub-System and interface.

The Test Plan comprises three concurrent paths: Test-Layout, Test-Sequences and Test-Routines. The test-layout aligns testing within the operational test-process. Test-Sequences define the order of execution of Test-Routines, system-functions etc. Test-Routines (routines) are in essence functions. Test-Routines are specific to a test, typically measurements and set-ups. Non-Test-Routines are basically all other functions, such as system tasks, data-handling etc. Test- and Non-Test-Routines use the same modular structure:

- Method defines the procedure by which the measurement or function is executed
- Set-up defines the devices and configuration with which the measurement or function is executed
- Cases define the conditions, variables, parameters, instrument settings, and device states, etc. used
- Criteria specify nominal values, tolerances, e.g. pass/fail tolerances etc.

Test-Routines are optimised according to their function, e.g. measurements for speed and accuracy. Special routines can be designed for monitoring and analysis, system self-test and for process and quality control. Each routine is checked with the elements of the test-system it uses.

3.5 Functional SW design

A functional SW design-specification can be provided. The SW-specification provides a Requirement Specification for SW-Development, including e.g. pseudo-code to describe critical instrument control and measurement functions for SW developers.

3.6 Planning & Budgeting

Planning and budgeting information including estimated project costs, budgetary sourcing, planning and schedules can be provided. Implementation briefs describing integration and verification procedures as well as operation and user-documentation can be provided

3.7 Compile the System Design Specification

Each Sub-System is designed individually and with the appropriate interface to ensure interoperability and integrity of the system overall. Each Sub-System receives a specific design and integration 'check-list' and procedure. The Sub-Systems are then checked for their interoperability and integration in the test-system. Each Test-Sequence and Test-Routine is designed individually. Each Test-Routine and its Test-Method and Set-up/Case is confirmed against the SRS. Where needed, these are tested in a comparative test-set-up.

Completeness and correctness of the SDS is reviewed and verified against both SRS and high-level objectives and needs. Verification is detached from design work. Functions, integration and control/automation are if needed verified by simulating/replicating key test-scenarios. The verification procedures and results can be provided as a draft integration and verification plan for the test-system build and deployment.

4 Appendix – TSDP Flowcharts







