Advanced Technical Test Analyst

A Technically Enlightened Way to Test Systems

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ISTQB Advanced Technical Test Analyst

- The ISTQB Advanced Syllabus includes three modules:
  - Advanced Test Manager (ATM, CTAL-TM)
  - Advanced Test Analyst (ATA, CTAL-TA
  - Advanced Technical Test Analyst (ATTA, CTAL-TTA)
  - Extra certification for all three modules (CTAL-FULL)
- There are fewer CTAL-TTAs than the other modules, but that is starting to change with the arrival of more accredited training
- Let's see what ATTA involves, including a training course excerpt, an example of the kind of problem a certificate-holder can solve, and a sample exam question

Advanced Syllabus: The Ten Chapters

1. Basic aspects of software testing
2. **Testing processes**
3. Test management (including **risk based testing**)
4. **Test techniques**
5. **Testing of software characteristics**
6. **Reviews**
7. **Incident (defect) management**
8. Standards and test process improvement
9. **Test tools and automation**
10. People skills (team composition)

Advanced Syllabus by the Numbers

- Number of pages: 114
- Number of learning objectives
  - Test Manager:
    - 64 total
    - 43 K2, 12 K3, 9 K4
  - Test Analyst:
    - 29 total
    - 18 K2, 7 K3, 4 K4
  - Technical Test Analyst:
    - 44 total
    - 25 K2, 11 K3, 8 K4
- Referenced books: 21
- Referenced standards: 7

Learning Objectives

- The Foundation and Advanced exams are based on learning objectives, which state what you should be able to do
- The learning objectives are at four levels of increasing sophistication
  - K1: remember basic facts, techniques, and standards
  - K2: understand the facts, techniques, and standards and how they inter-relate
  - K3: apply facts, techniques, and standards to your projects
  - K4: analyze facts, techniques, and standards, and adapt or select them for your project
- For the Advanced exams, the entire Advanced syllabus is implicitly covered at the K1 level
- Each module (test manager, test analyst, technical test analyst) has its own set of K2, K3, and K4 learning objectives defined against each chapter

Advanced Exam Questions

- The lower levels, K1 and K2, may be covered implicitly within higher level questions
- Unlike the Foundation exam, the Advanced exams are heavily focused on K3 and K4 questions
- Many exam questions consider a scenario
  - Scenario described
  - Sequence of questions about scenario asked
  - Simulates real-world use of various advanced testing concepts
- The **entire** Foundation syllabus is also examinable
- Cross-section questions, including joining Foundation and Advanced sections, are allowed

Advanced Training Courses

- **Must** cover all learning objectives defined for the module (test manager, test analyst, or technical test analyst)
- **No** common LOs between the TM and the other modules (i.e., there is **no** "common module")
- **Must** be at least five days long (for live, instructor-led courses)
- **Must** include real-world examples for all K2, K3, and K4 learning objectives
- **Must** include realistic exercise for all K3 and K4 learning objectives (which must be done in class for live, instructor-led courses)

Training Course Breakdown

	Test Manager		Test Analyst		Tech Test Analyst	
Chapter	Hours	Percent	Hours	Percent	Hours	Percent
Intro	1.0	3%	1.0	3%	1.0	3%
1	2.5	7%	0.5	1%	0.5	1%
2	2.0	6%	3.0	9%	3.0	9%
3	18.7	53%	2.0	6%	2.0	6%
4	0.0	0%	18.0	51%	15.5	44%
5	0.0	0%	3.5	10%	4.0	11%
6	2.0	6%	3.0	9%	3.0	9%
7	1.3	4%	2.0	6%	2.0	6%
8	2.0	6%	0.0	0%	0.0	0%
9	1.5	4%	1.5	4%	3.5	10%
10	4.0	11%	0.5	1%	0.5	1%
Total	35.0	100.0%	35.0	100%	35.0	100%

Requirements for Advanced Certificates

- To earn a certificate, one must:
  - Hold a Foundation Level certificate issued by an ISTQB-recognized Exam Board or Member Board
  - Have appropriate experience in software testing or development, between 2-5 years, depending on degree held and certificate(s) sought
  - Subscribe to the Code of Ethics in the syllabus
- Accredited training is recommended but not required

Being an Advanced Technical Test Analyst

- You should be able to:
  - Structure the tasks defined in the test strategy in terms of technical requirements
  - Analyze the internal structure of the system in sufficient detail to meet the expected quality level
  - Evaluate the system in terms of technical quality attributes such as performance, security, etc.
  - Prepare and execute adequate testing and report on progress
  - Conduct technical testing activities
  - Provide the necessary evidence to support evaluations
  - Implement the necessary tools and techniques
- Advanced Technical Test Analyst exams (and courses) focus on these main concepts
- Let's look at sample course content and an exam question

Efficiency

- Efficiency is the capability of the software product to provide appropriate performance relative to the amount of resources used, under stated conditions
- Resources may include other software products, the software and hardware configuration of the system, and materials.
- One of the most important quality in use characteristics of software along with functionality, reliability and usability
- Efficiency testing is extremely tool-centric. These tools will be discussed in chapter 9
- Performance testing myths
  - It is done to break the system
  - It can only be done at the end of the SDLC
  - Performance testing only consists of scripting for the tool

General Objectives for Efficiency Testing

- To ensure and measure
  - Ability of the system to handle multiple concurrent users
  - Ability to maintain the functional integrity of multiple sessions
  - Efficient time behavior of multiple sessions
  - Efficient resource behavior while supporting multiple sessions
- There are many different types of tests that can be used to measure the different facets of efficiency
  - Performance
  - Load
  - Stress
  - Endurance (Soak)
  - Spike
  - Scalability
  - Resource Utilization
  - Reliability
  - Background
  - Tip-over

Modeling the System

- Essential requirements that must be discovered before testing:
  - Scope: what subsystems, interfaces and components are to be tested?
  - The number of concurrent users (normal vs. peak)
  - What configuration(s) must be tested?
  - Application workload mix
  - System workload mix: are different concurrent workloads to be tested?
  - What are time requirements for backend batch processes (normal vs. peak)
  - How closely will the test environment match production?

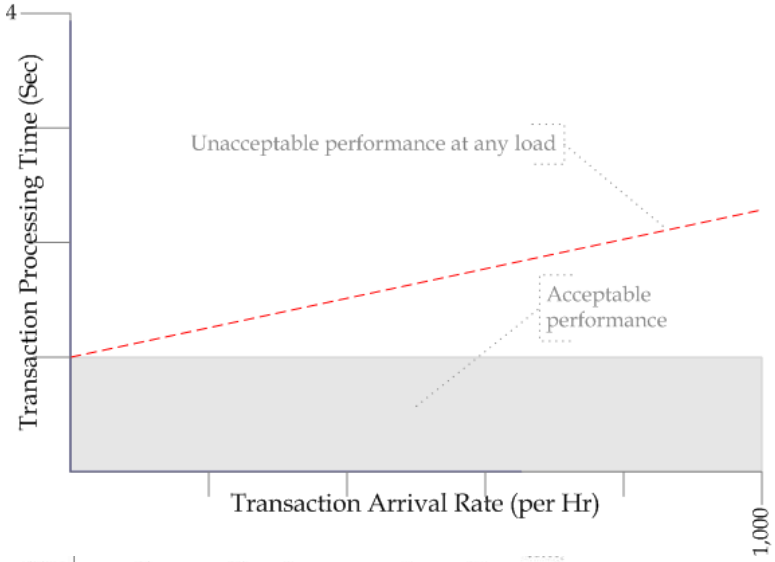
Efficiency is Quantifiable (Sort of)

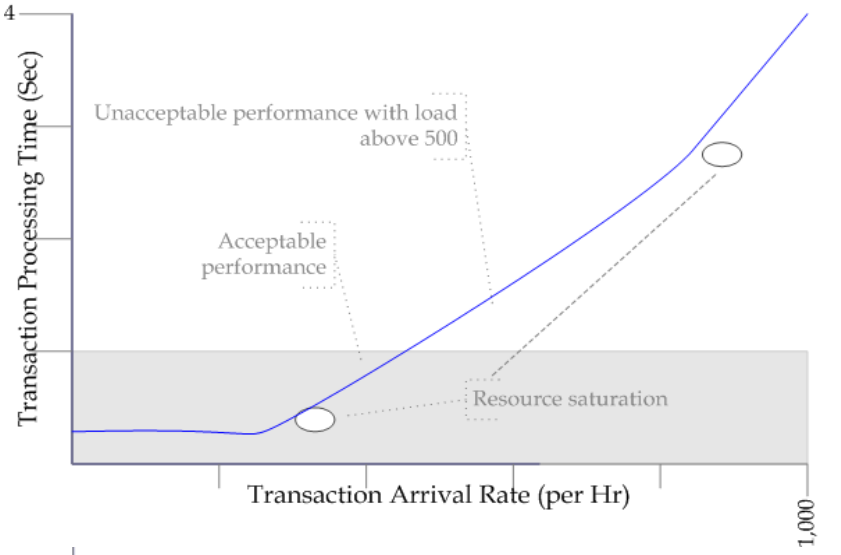
- More than some of the other quality characteristics, efficiency is directly measurable.
- Need to average multiple run's measurements
  - CPU and memory loading
  - Load or processing data
  - Number of connecting sites
- Key metrics include:
  - Processor utilization %
  - Available memory
  - Memory page usage
  - Top *n* processes active
  - Context switches
  - Queue length(processor, disk, etc.)
  - Disk saturation and usage
  - Network errors
  - Network packet round-trip time
  - Client data presentation time

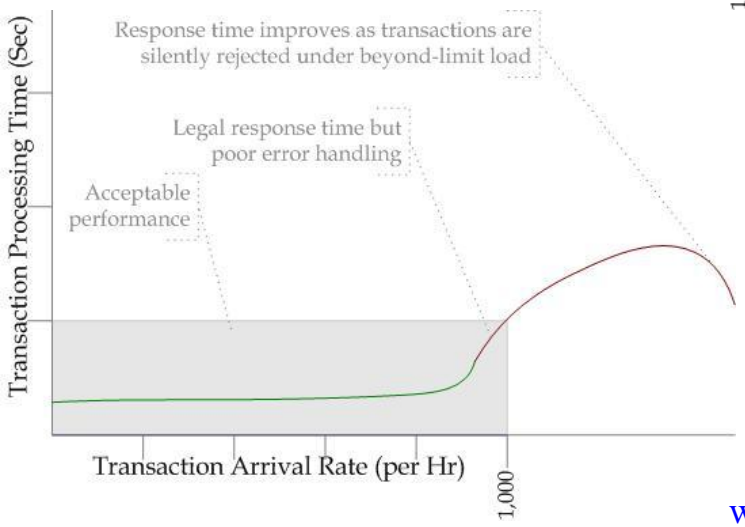
When to Test Efficiency?

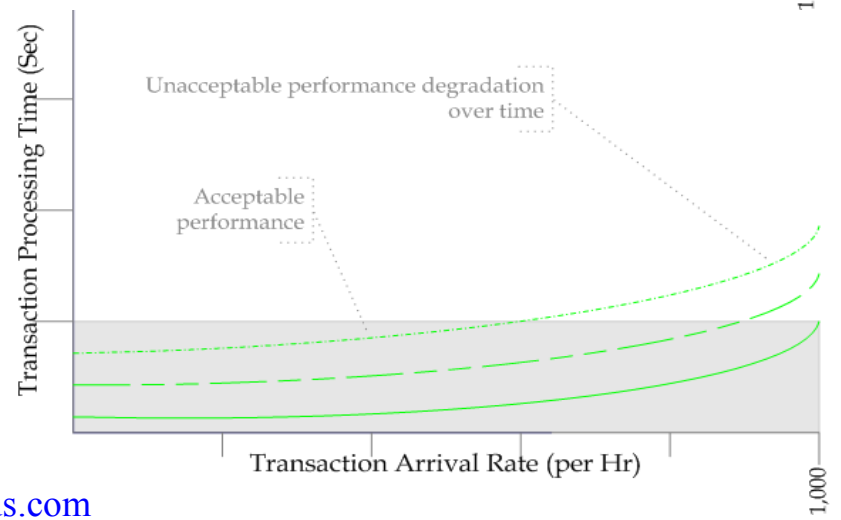
- Efficiency faults often mean degradation of the system instead of total failure
- There are so many different ways that this degradation can happen that efficiency testing must be an important emphasis throughout the SDLC
- Unit testing must ensure that message and exception handling is efficient; each message stands to be a bottleneck
- Integration testing must ensure the effective and efficient transfer of data between modules
- Tools can often be applied to sub-systems early

Example: Typical Performance Problems









Efficiency Internal Metrics

- For time behavior:
  - Response time
  - Throughput time
  - Turnaround time
- For resource utilization:
  - I/O utilization
  - I/O utilization message density
  - Memory utilization
  - Memory utilization message density
  - Transmission utilization

Efficiency External Metrics

- For time behavior
  - Response time
  - Mean time to response
  - Worst case response time
  - Throughput
  - Mean amount of throughput
  - Worst case throughput ratio
  - Turnaround time
  - Mean time for turnaround
  - Worst case turnaround time
- For resource utilization
  - I/O device utilization
  - I/O loading limits
  - I/O related errors
  - Mean I/O fulfillment ratio
  - User waiting time of I/O devices utilization
  - Maximum memory utilization
  - Mean occurrence of memory error
  - Ratio of memory error/time
  - Maximum transmission utilization
  - Media device utilization balancing
  - Mean occurrence of transmission error
  - Mean of transmission error per time
  - Transmission capacity utilization

Sample Exam Question

You have run your performance test and you are now evaluating the metrics that you captured. Every 10 seconds, you notice that the CPU utilization on the server jumps up to 80% for about 30 milliseconds and then drops back to 40%. Since your SLA requires less than 80% CPU utilization, this is a concern. What should be your next logical step?

A. Determine if there is background loading on the system by checking the top active processes at the time of the spikes
B. Check for memory leaks on the server
C. Check the Mean Occurrence of Error metric over the run
D. Ensure that the Transmission Capacity Utilization metric on the server does not drop

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