Run-time test configurations for load testing

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Introduction

About TITANSim

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Introduction

- TITANSim is aimed at performance testing
  - With TTCN-3 as the specification language
  - With Ericsson's internal TTCN-3 Executor and Compiler tool
- Performance testing needs highly optimized test suite code
- Two contradicting requirements:
  - A framework shall be general → generalization
  - Optimization is task specific → specialization

Motivation for TITANSim

- TTCN-3 and TITAN is widely used for functional testing throughout Ericsson
- TITANSim aims to achieve cost savings via
  - reuse of the function test code base
  - reuse of testers' competence
  - reuse of existing, in-house tools
  - reuse of the new performance test solution by different projects through-out the company

Introduction

Functionalities and applications of TITANSim

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Functionality of TITANSim CLL

- Run-time interaction with the test suite
  - A dynamically configurable run-time GUI and …
  - …Parameters
  - …Statistics
- Generic support for common programming tasks
  - Memory management support: “resource” pools
  - Scheduling support
- A logging framework
- Generic support for distributed scheduling:
  - EventQueue data type + support functions
- Concrete support for central scheduling
  - Ready-made scheduler component for central scheduling
  - Load balancing, regulated load, external execution control, traffic-mixer and a graphical console for all these
- Other useful data types and algorithms:
  - Linked lists (FreeBusyQueue), hash tables, binary search tree (Red-Black trees)

Functionality of Application Libraries and Control logic

- Application libraries: simulated entity specific tasks
  - Protocol message handling
  - Inbound message routing in case of multiple generator PTC
  - Protocol specific TITANSim parameters and TITANSim statistics
  - Building blocks and state-machine support for Control Logic
- Control logic: realization of particular traffic cases

Introduction

The 3 perspectives of TITANSim

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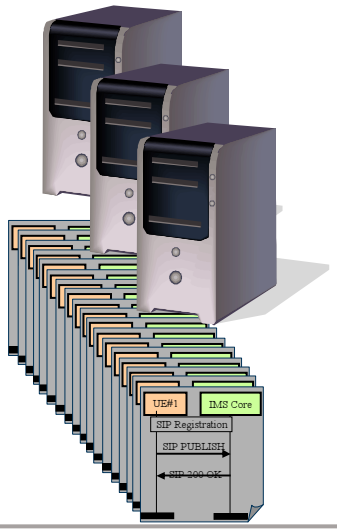
Views of a TTCN-3 load test library

- At least 3 perspectives have to be considered:
  1. HW perspective: which hardware to use?
  2. SW perspective: how to modularize your code?
  3. Run-time perspective: what is the best run-time test-configuration?

1. The HW perspective

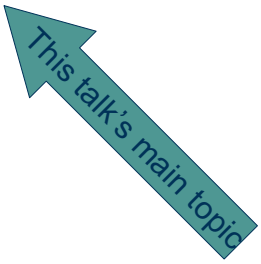
- SW and HW are separated
- One SW – many HW
- To expand load capacity only HW units shall be added



2. The SW perspective

- Three levels approach:
  - "Core Load Library" (CLL)
    - provides the generalization
  - "Application specific framework libraries" (AppLibs)
    - provides the "specialization"
    - code provided in-cooperation with project experts, relies on core library code
  - "Control logic": can provided by non-experts, as well
    - builds on both application specific and core libraries code

3 Run-time configuration perspective



- Careful trade-off must be made between
  - Efficiency
  - Resulted code complexity
- Load testing means concurrency handling:
  - Many(!) parallel traffic flows…
  - …over some shared resource pools!
- TTCN-3 has a special concurrency model
  - PTC-s are run concurrently
  - A PTC is a "single CPU system"
    - No concurrency support below PTC level by the language
  - PTC-s are run isolated from each other
    - no shared memory
- Our dilemma: on which level do we handle the concurrency?

Alternatives for run time configurations

- The "simple" approach is follow the "usual" TTCN-3 semantics
  - Concurrency is to be handled on PTC-level
  - A single PTC is responsible for a single transaction
- The "advanced" approach is to let a single PTC handle multiple concurrent transaction
  - Concurrency is to be handled ***below*** PTC-level
  - A single PTC is responsible for multiple transactions

TITANSim Run-time test configurations

Central scheduling

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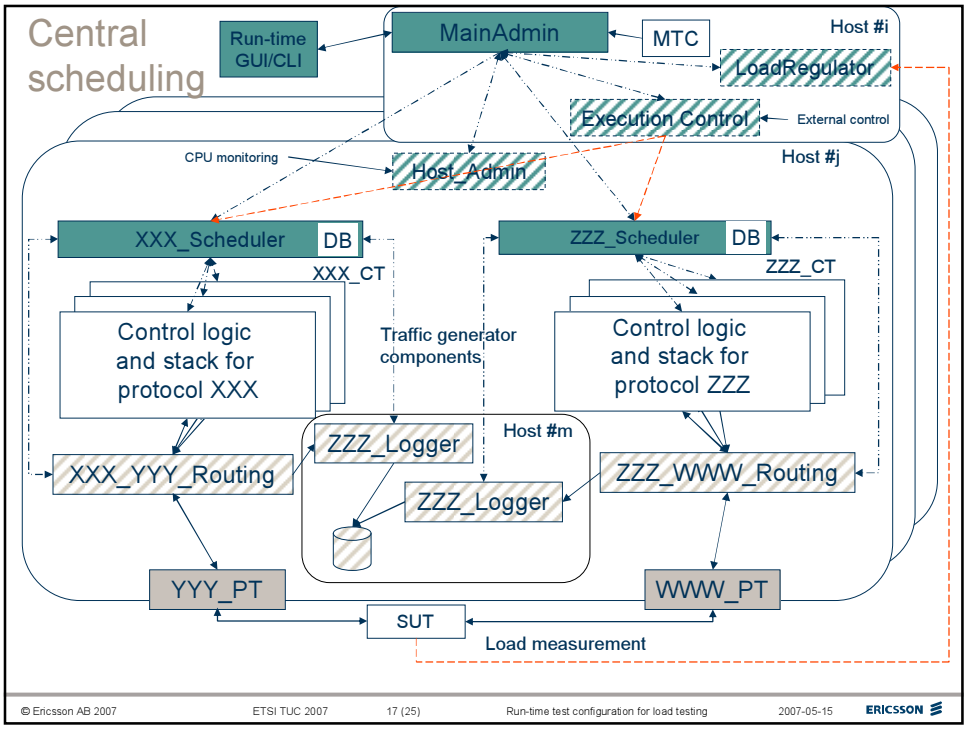

Central scheduling

- Pros
  - It is the *most user-friendly*
  - It *requires no coding-paradigm change* with respect to function tests
  - *Suitable for ad-hoc load testing* projects
  - It can be used *without an application library*
    - Can use ready-made scheduling functions that are totally *independent of load generator component-type*
- Cons
  - *Less efficient*
  - *Wrong scalability*
    - Each *traffic initiation requires internal communication* — with a single central entity: extra overheads and delays
    - Sharing data of a run-time database across traffic cases / entities is *difficult* and *inefficient*

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TITANSim Run-time test configurations

Local (distributed) scheduling

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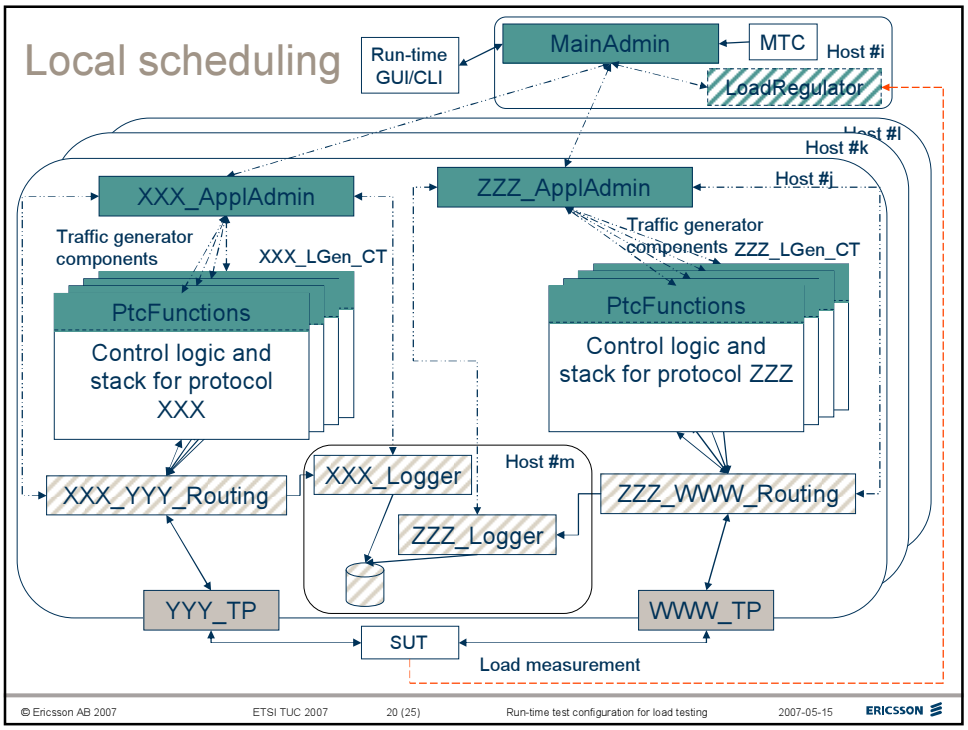

Local (distributed) scheduling

- Pros
  - It is the *most-efficient*
  - *Less dependent on OS-scheduler*
  - *Sharing data* of a run-time database across traffic cases of the same PTC can be *easy* and *efficient*
  - Load generator PTC-s schedule on their own
    - *no internal communication overhead* needed for load generation
    - They can run autonomously → *scalability!*
- Cons:
  - It *requires* some sort of an *application library:* Explicit concurrency handling shall be set up
  - It requires *coding-paradigm change* with respect to FT: *event-based logic*
  - Writing and using reusable ready-made scheduling algorithms requires dirty-tricks w.r.t. TTCN-3 language

Thank you for your attention!
Questions?

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