TTConf
Tool for the Analysis and Configuration of TSN

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Methods Implemented by TTConf

Topology and Routing Optimization (TRO)

- Determines a fault-tolerant TSN topology
- Presented in [2]

AVB-aware Scheduling for TSN (AaS-TSN)

- Determines the Gate Control Lists (GCLs), the schedule tables for Time-Triggered (TT) streams, such that both TT and AVB streams are schedulable
- Presented in [1]

Schedulability Analysis for AVB (SA-AVB)

- Computes the worst-case end-to-end delay for AVB streams in the presence of TT traffic
- Presented in [3]

Topology and Routing Optimization

Method:

- Metaheuristic approach based on greedy randomized adaptive search procedure(GRASP)

Input:

- Components library and sets of end systems and streams
- For each stream: source, destination(s),
  size, period, deadline and redundancy level

Output:

- Network topology: number of network switches and physical links and how they are interconnected
- Routes of all streams incl. their redundant copies

Assumptions:

- Based on Urgency-Based Shaper (UBS) traffic type
- Mathematical model tailored to network switches built-in end systems
- Used at design time

AVB-aware Scheduling for TSN

Method:

- Metaheuristic approaches based on GRASP;
  used objectives:
  - TT latency: minimization of overall latency of TT streams
  - TT queues: minimization of queues used by TT traffic
  - TT + AVB: minimization of overall tardiness of AVB streams

Input:

- Network topology
- Sset of streams
- For each stream: source, destination, route,
  size, period and deadline

Output:

- Number of TT queues
- Mapping of TT streams to queues
- GCLs for TT streams

Assumptions:

- All end systems and network switches must synchronize their clocks
- Unicast communication
- Can be used at both design and running time

Schedulability Analysis for AVB

Method:

- Network calculus based method

Input:

- Network topology
- Set of streams
- For each stream: source, destination(s), route, size, period, deadline, idle slopes for AVB streams or GCLs for TT streams

Output:

- Worst-case end-to-end delay for AVB streams

Assumptions:

- All end systems and network switches must synchronize their clocks
- Works for both AVB traffic types, A and B
- Works with both preemptive and non-preemptive integration modes
- Can be used at both design and running time

Realistic Use Cases

Use case	Method	No. systems No. switches	No. streams	$\delta_{t\ exec}$
Automotive	TRO AaS-TSN SA-AVB	20 20	27 48 27	570 420 2
Orion1 Orion2	SA-AVB	31 15	49 134	5 5

Synthetic Use Cases

Use case	Method	No. systems No. switches	No. streams	$\delta_{t\ exec}$
UC1	TRO	15 15	30	210
UC2	AaS-TSN	256 146	879	730

References

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