Smart Scheduling of Streaming Software Applications via Timed Automata

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1. Motivation

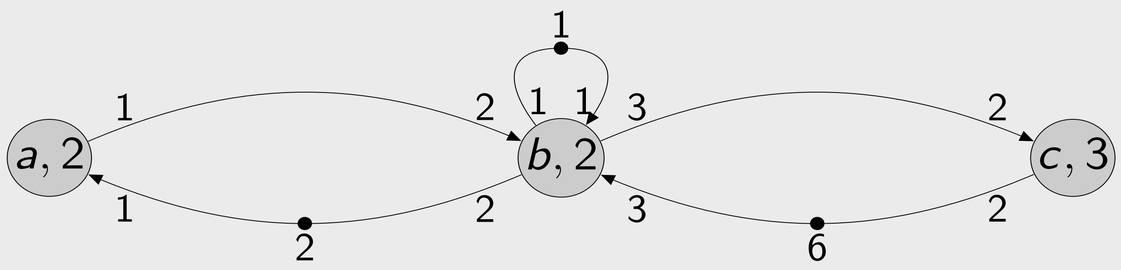
How to achieve:
- a fast video-in-video stream,
- a self energy-supporting software defined radio,
- a low-power EnergyBus and
- an energy autonomous nano-satellite.

2. Challenges

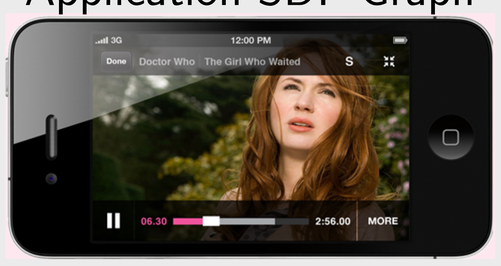
- Modern multimedia applications: high demands on system performance.
- Resource usage must be minimal.
- Hence: trade-off between resource usage and performance.

3. Synchronous Dataflow Graphs

- Popular dataflow computational models.
- Novel analysis methods needed.



4. Methodology

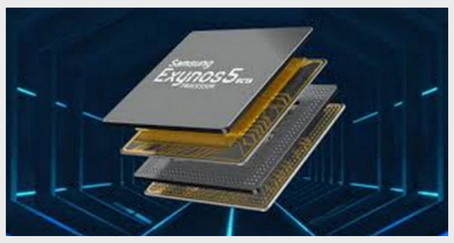


Application SDF Graph

Translation to TA

Application Model

Architecture



Translation to TA

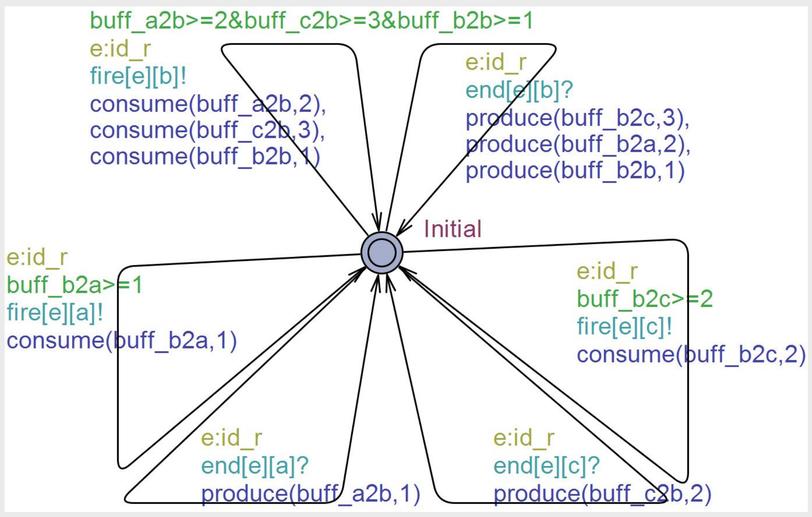
Architecture Model

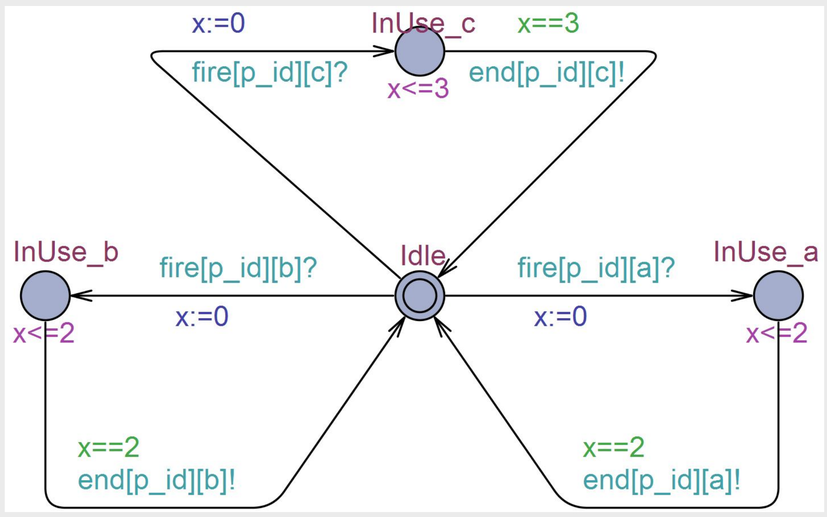
Mapping

Measures of Interest

Performance Analysis

5. Translation of SDF Graphs and Architecture to Timed Automata

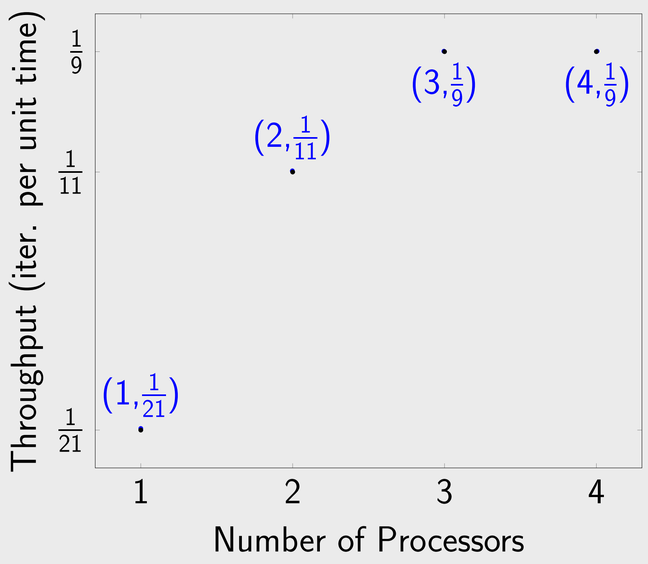




Results

- Derives an automatic schedule that
  - fits on a given number of processors
  - maximises the throughput.
- Handles heterogeneous platforms.
- Quantitative model-checking.

6. Experimental Performance Evaluation



- Efficient Scheduling
- Throughput vs Number of Processors Trade-off

7. Future Work

- Energy optimal synthesis.
- Translation to Energy-Aware Automata.
- Reduction techniques of energy models.
- Extension with stochastic and energy costs.
- Cost optimal reachability analysis.
- Multi-core LTL model checking.
- Dynamic Power Management.

8. Acknowledgement

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NO ENERGY VAMPIRES ALLOWED!

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Formal Methods & Tools

predict prioritise prevent TREsPASS

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