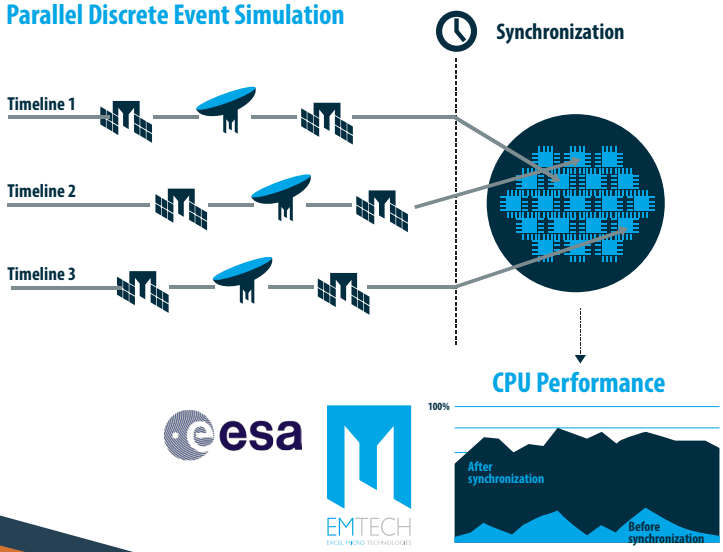
EMTECH
SPACE SOFTWARE

Performance Optimization

of Spacecraft Simulators

Future, high complexity, spacecraft simulators will incorporate higher-fidelity models, several processor emulators and spacecraft clusters, all together running in the same co-simulation environment. Today, EMTECH answers the question of how to take advantage of multi-core processors, by introducing parallelization and synchronization in models' execution.



Operations & Services

PCOF – Performance Control & Optimization Framework

A set of performance measurements and reporting tools, plus a well-defined methodology targeting to:

- Identify Parallelization possibilities, execution bottlenecks and poor code implementations
- Monitor and acquire performance metrics at runtime
- Statistical analysis of acquired data
- Correlate simulation actions and performance measurements
- User-friendly methodology to define and enable metrics
- Minimum introduced overhead during measurements

C-PDES – Conservative Parallel Discrete Event Scheduler

Support spacecraft operational simulators with:

- Parallel execution of simulation models
- Multi-process and multi-threaded arrangements
- Flexible synchronization scheme

C-PDES AND PCOF MAKE A POWERFUL COMBINATION TO ADDRESS PERFORMANCE OPTIMIZATION AND PARALLELIZATION OF SPACECRAFT SIMULATORS

EMTech has evaluated the performance of the Cryosat2, Aeolus and Herschel-Planck operational simulators (OpSims). Furthermore the performance of GAIA OpSim was analyzed and improvements were made that resulted in an 80% speed up.

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Specifications*

PCOF Features

External Profiling Tools (EPT)

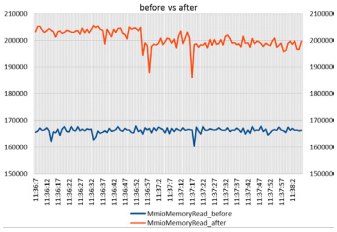
- Interface Oprofile and Linux Kernel Metrics
- Statistical performance measurement
- Categorization of CPU load according to user defined sets
- No code modifications and re-compilation required
- Interface Linux kernel acquiring general system information during simulation run-time (Total CPU/ core, Memory, IO transactions, etc.)

Event Reporting System (ERS)

- Function and Event call graphs useful for analysis of software structure
- Several graph perspectives (Event graphs, Model graph, Logical Process graph, etc.)
- Easy generation of injected code using external GUI tool or EGOS-MF design methodology

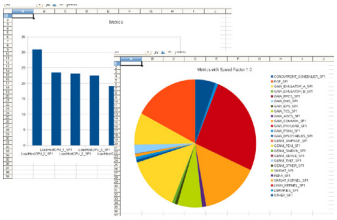
Metrics Acquisition (IPM/SPM)

- Performance metrics for SIMSAT kernel components (SPM tool)
- Performance metrics for SMP2 models (IPM tool)
- Control of metric acquisition during runtime
- Logging messages, Script engine performance etc.



Reporting

- Interface with Open Office Calc and Graphviz for user friendly visualization
- Single line charts, Double line charts, pie charts, bar charts
- Statistical information process

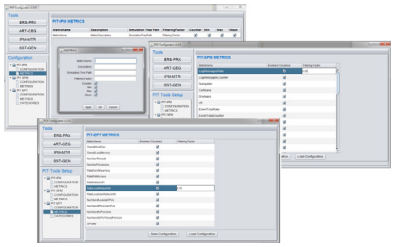


C-PDES Features

Highly parallelized multi-threaded & multi-process execution

- Multiple Time Horizons based on both processes and threads
- Backwards compatible with previous scheduler
- Supports distributed simulation setup (SIMSAT master/site scheduler architecture)

User friendly configuration/ management



- GUI external application to generate XML configuration file
- Efficient monitoring and management methods provided via scripting

Extendable and powerful synchronization schemes

- Three synchronization layers: Logical Process, Logical Process Group, Global
- Configurable synchronization policies
- Interface to extend synchronization policies with user defined schemes

Communication techniques

- Fast local node communication using OS shared memory
- Remote communication based on CORBA calls

*Contents are subject to change without prior notice

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