Event-Driven Multithreading Execution Platform for Real-Time On-Board Software Systems

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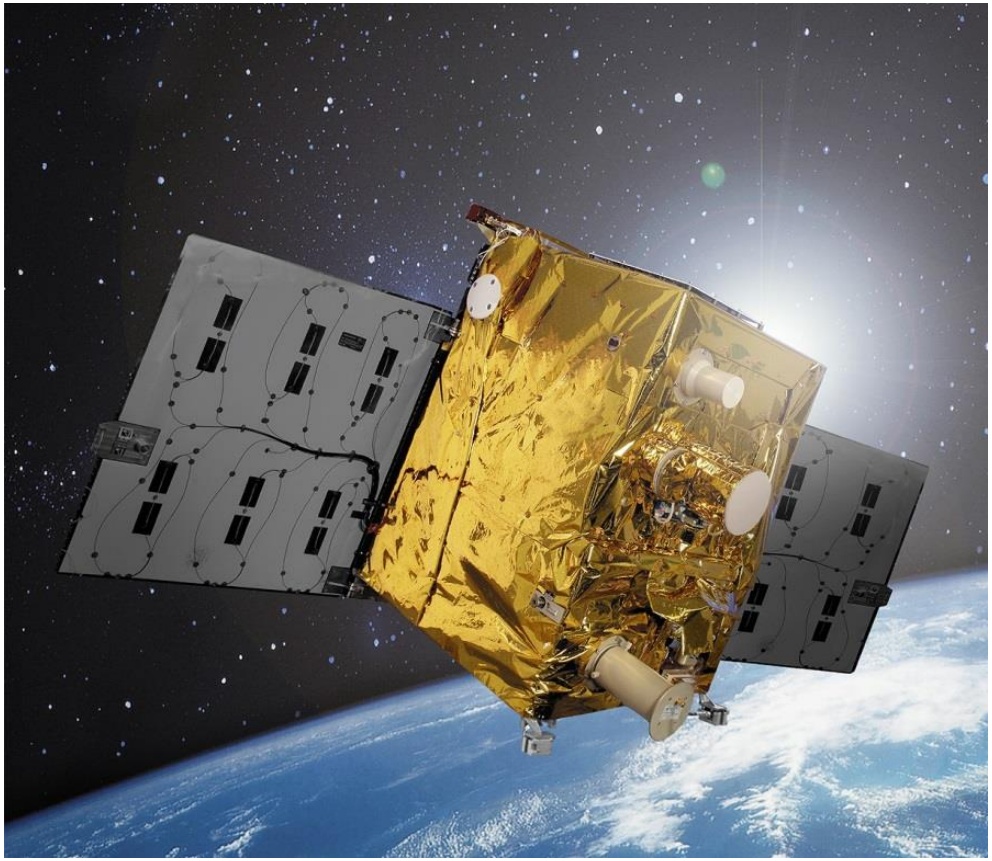
DLR

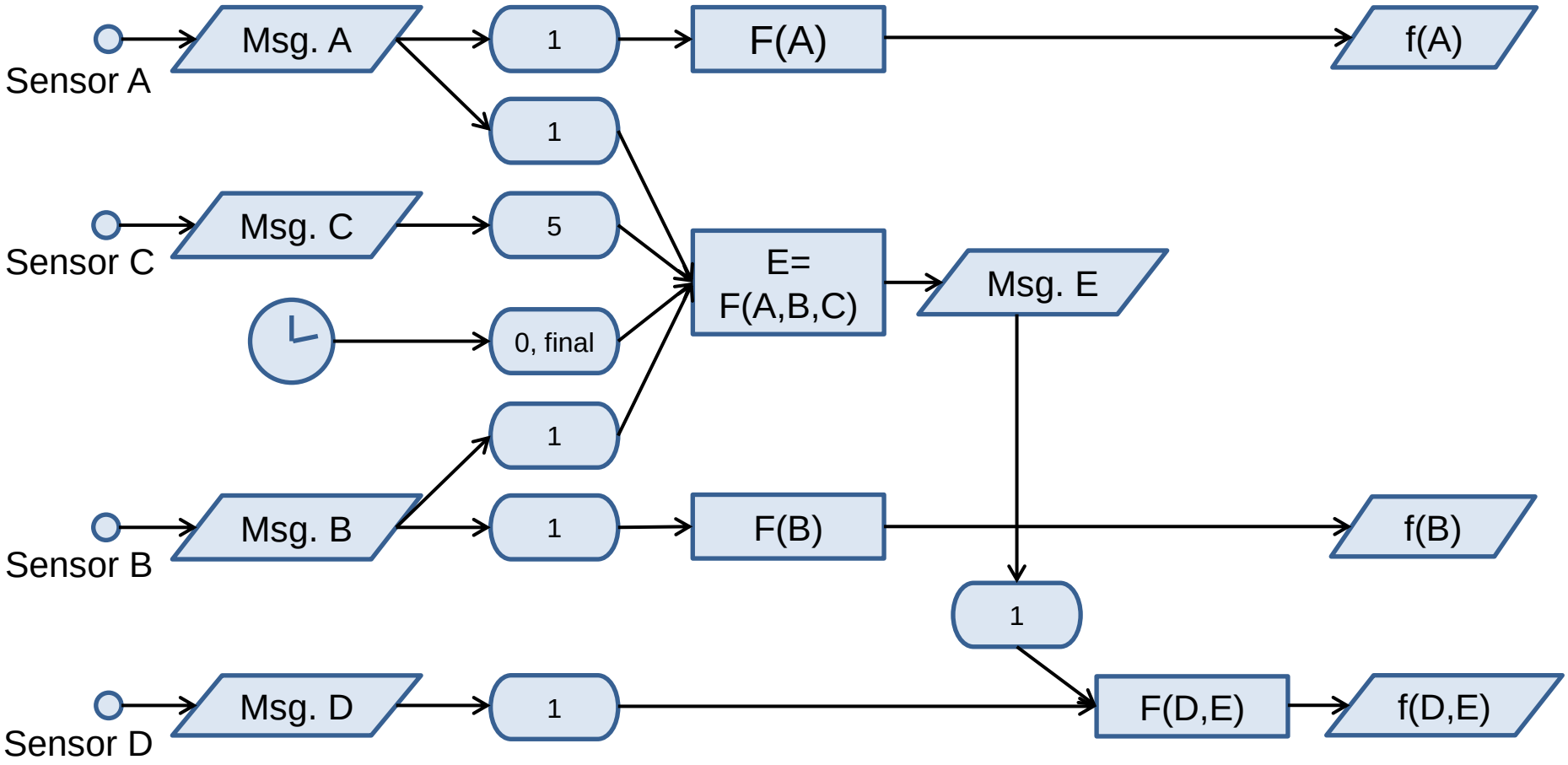
Sensor Data Fusion in BIRD (TET, BIROS) AOCS



Bispectral **I**nfra-**R**ed **D**etection

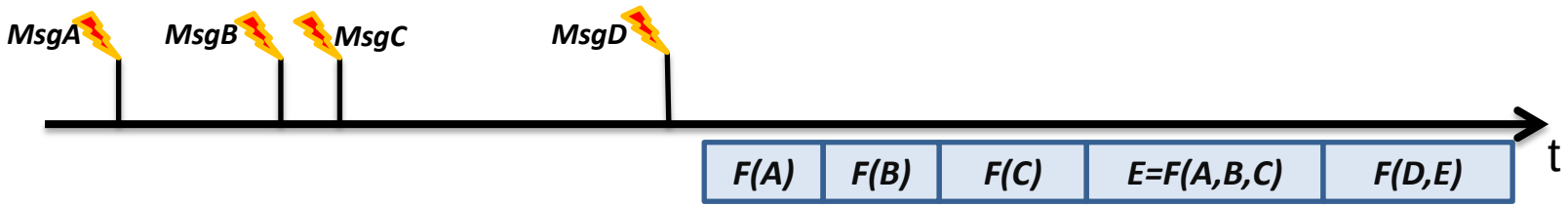
- Single-core
- Many sensors
- On-board data processing
- Main developer
- Launch: 2001

Sensor Data Fusion in BIRD (TET, BIROS) AOCS

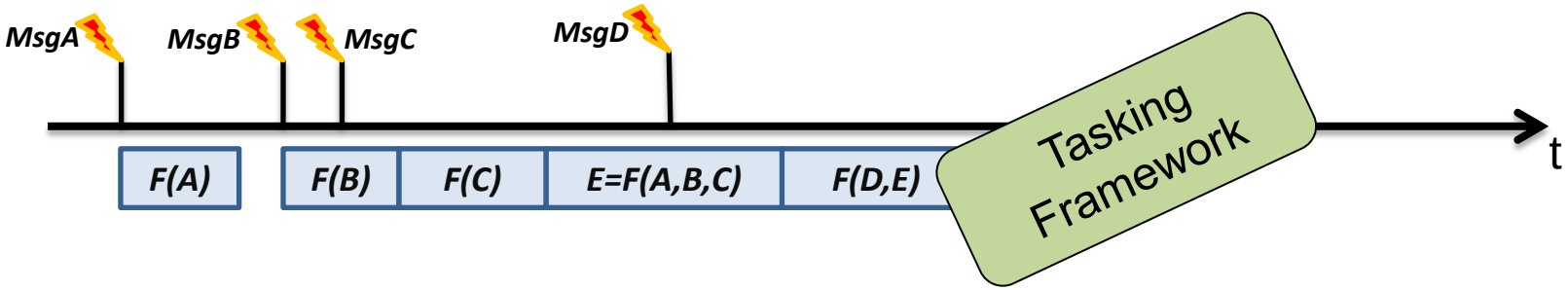


Introduction: ASAP scheduling

Conservative scheduling in one code block:



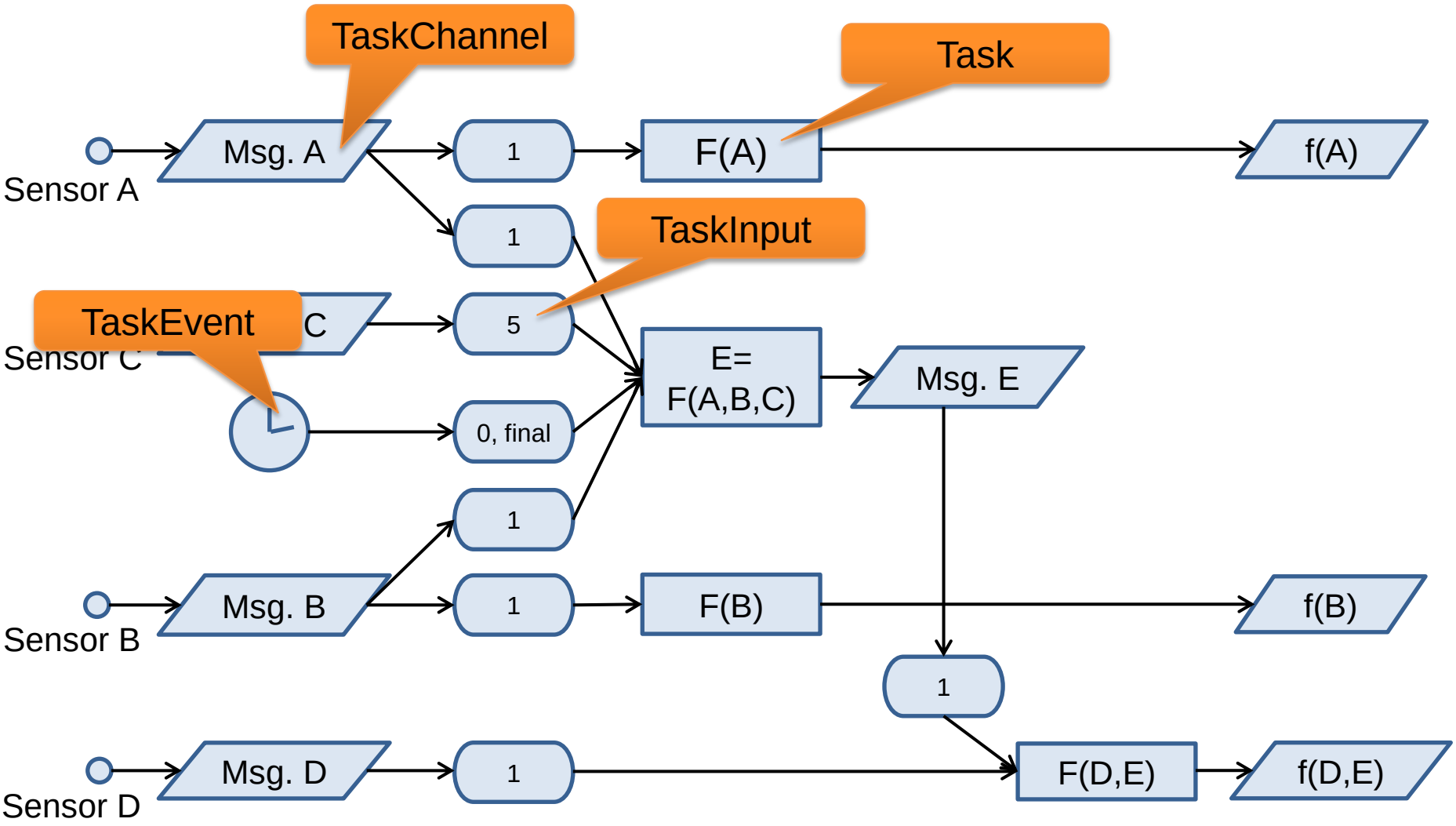
Tasks with ASAP scheduling:



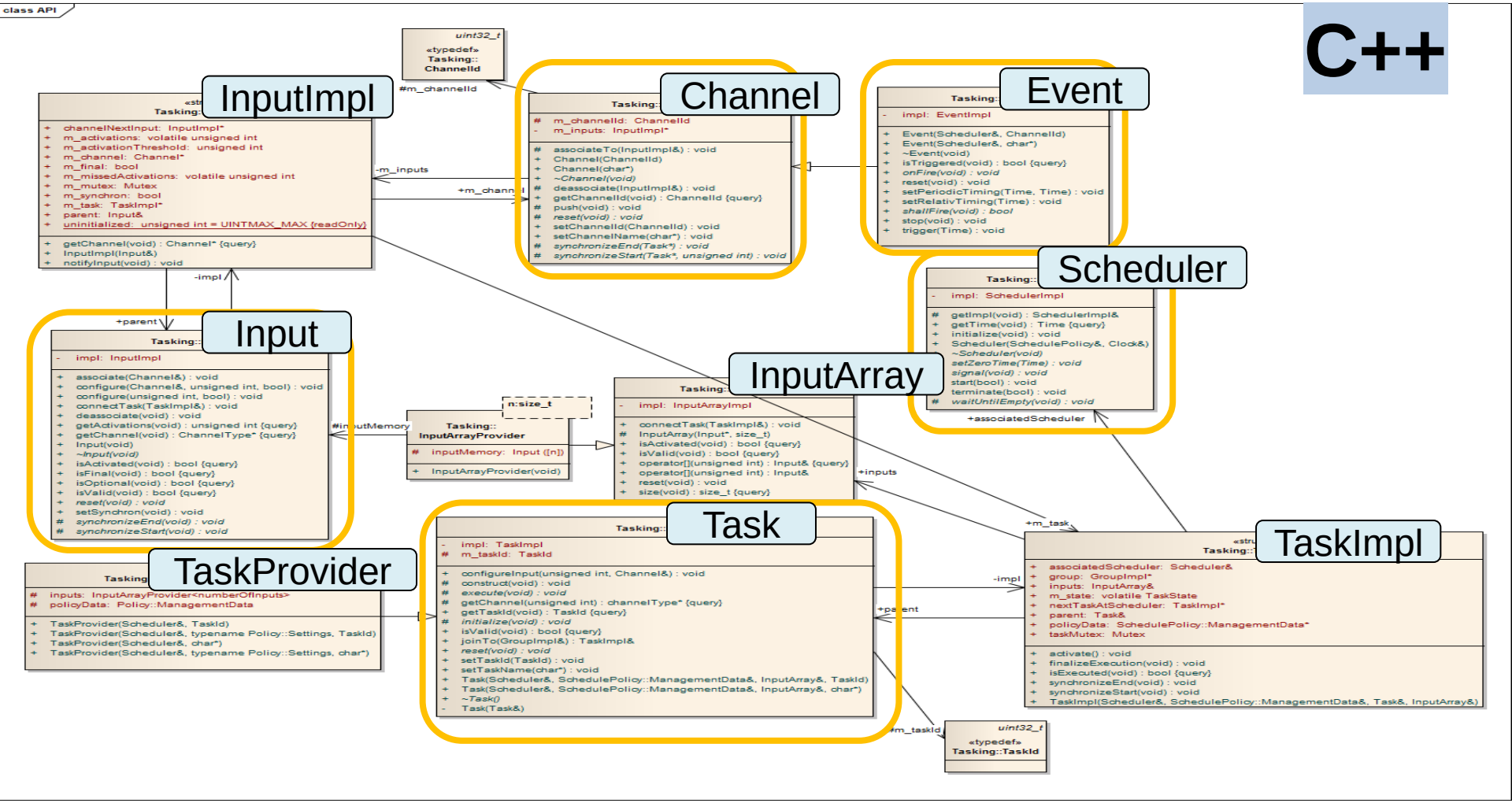
Outline

- Tasking Framework
  - API
  - Activation model
  - Call semantics
- Execution model
  - Scheduling and priority handling
- Tasking Modeling Language (TML)
- Outlook & Conclusion

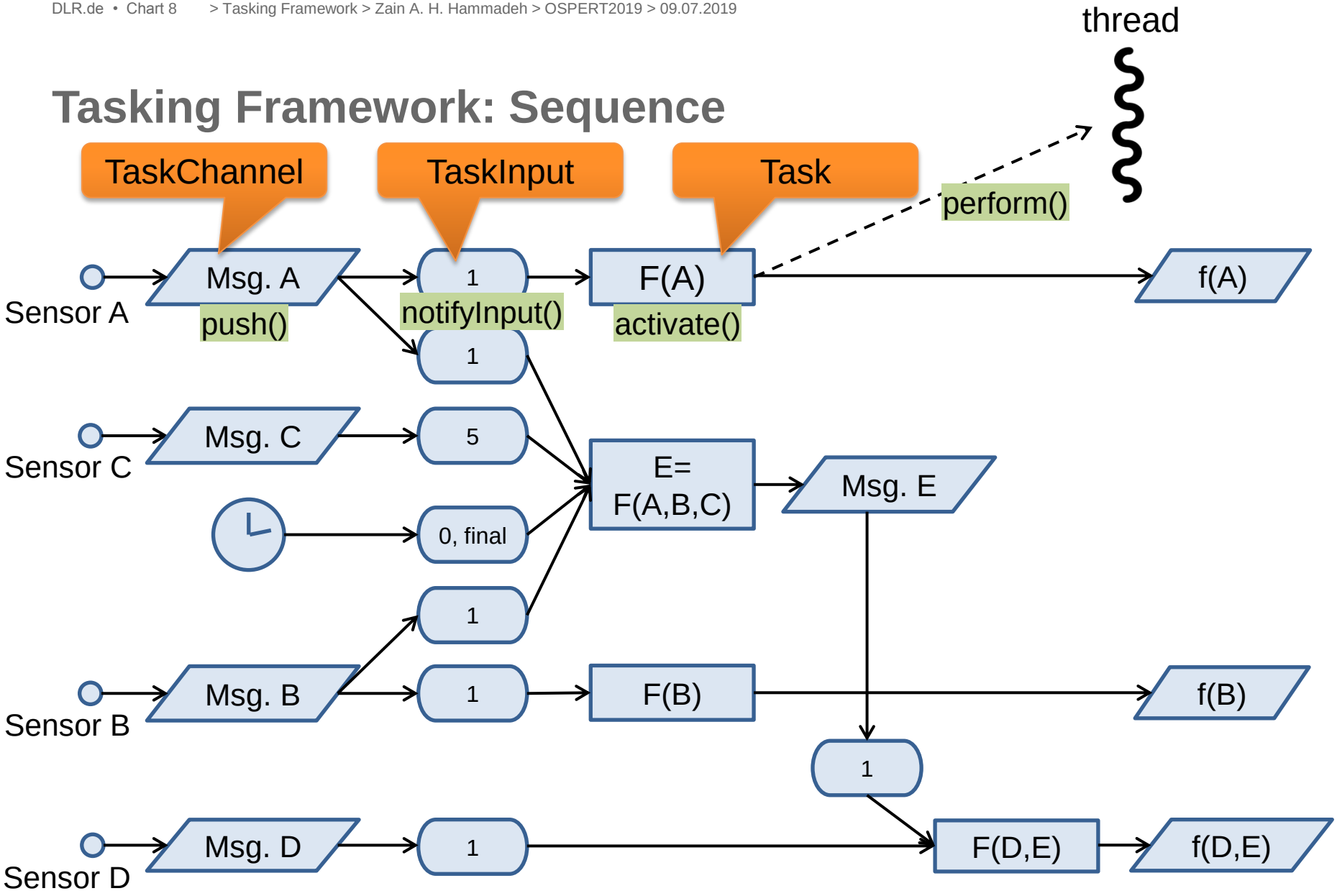
Tasking Framework: Elements



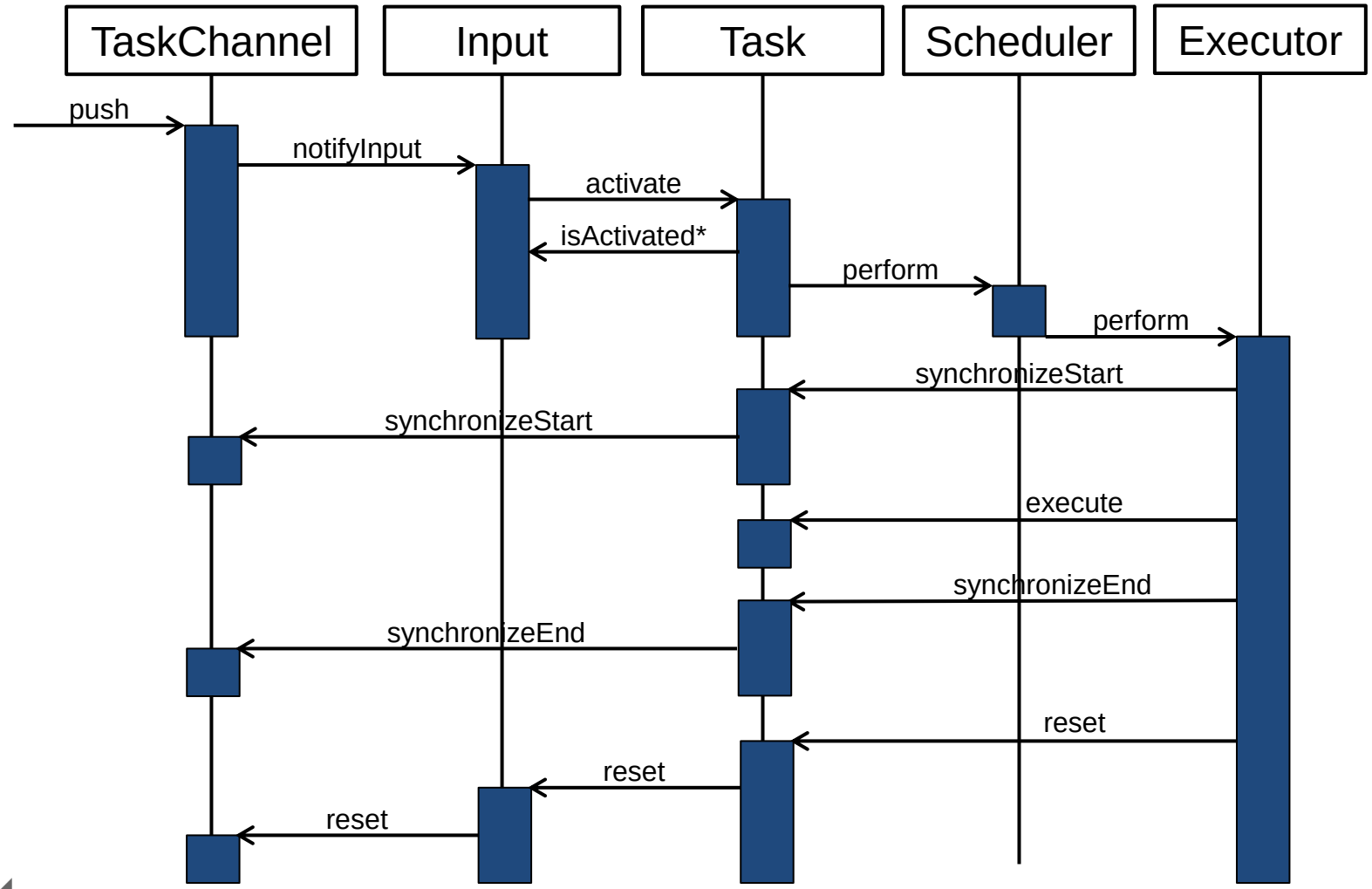
Tasking Framework: API



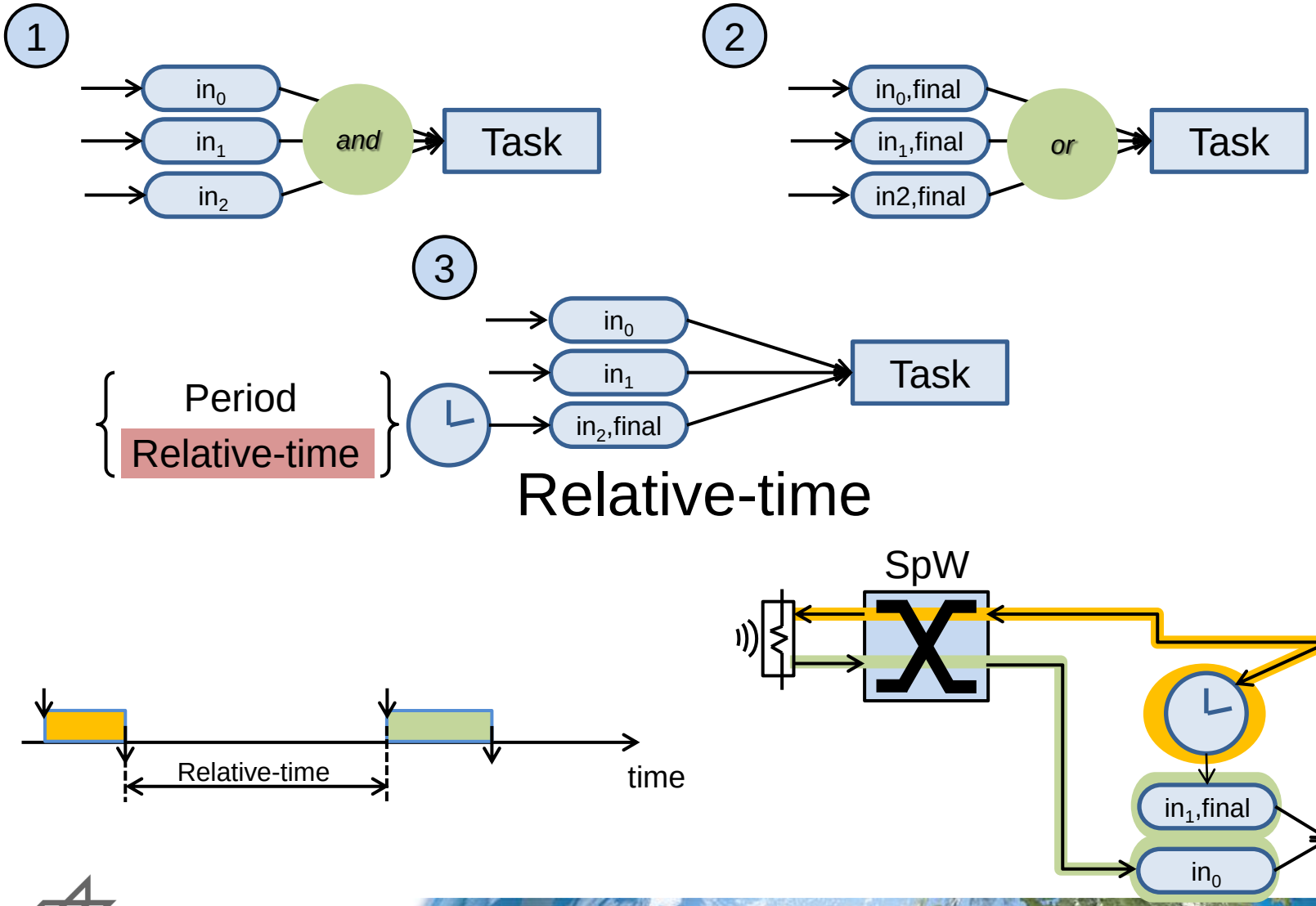
Tasking Framework: Sequence



Tasking Framework: Sequence cont'd

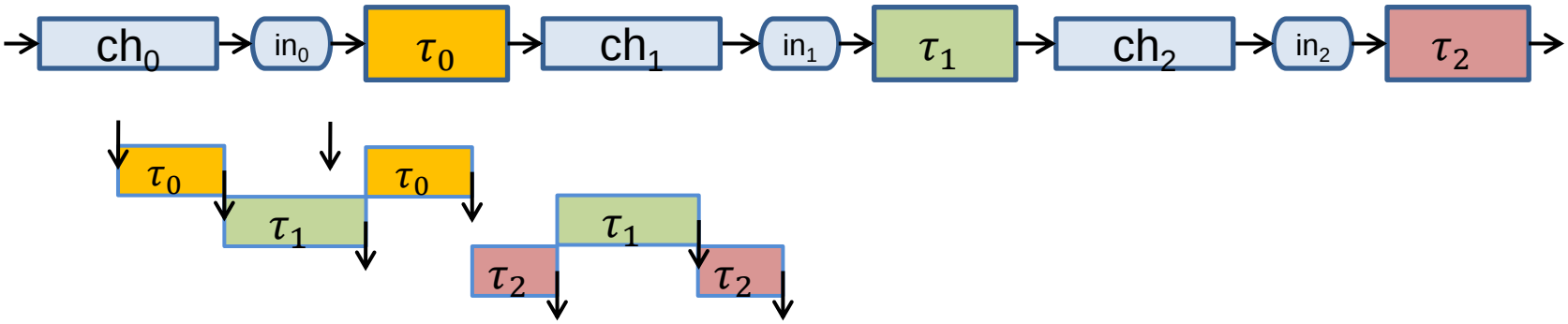


Activation model

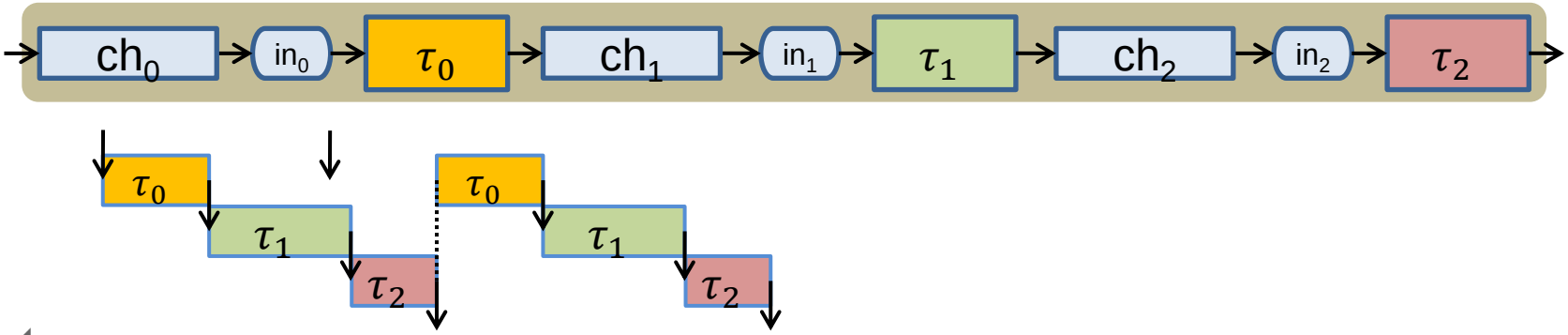


Call semantics

1 Asynchronous (Default)



2 Synchronous (Tasking::Group)



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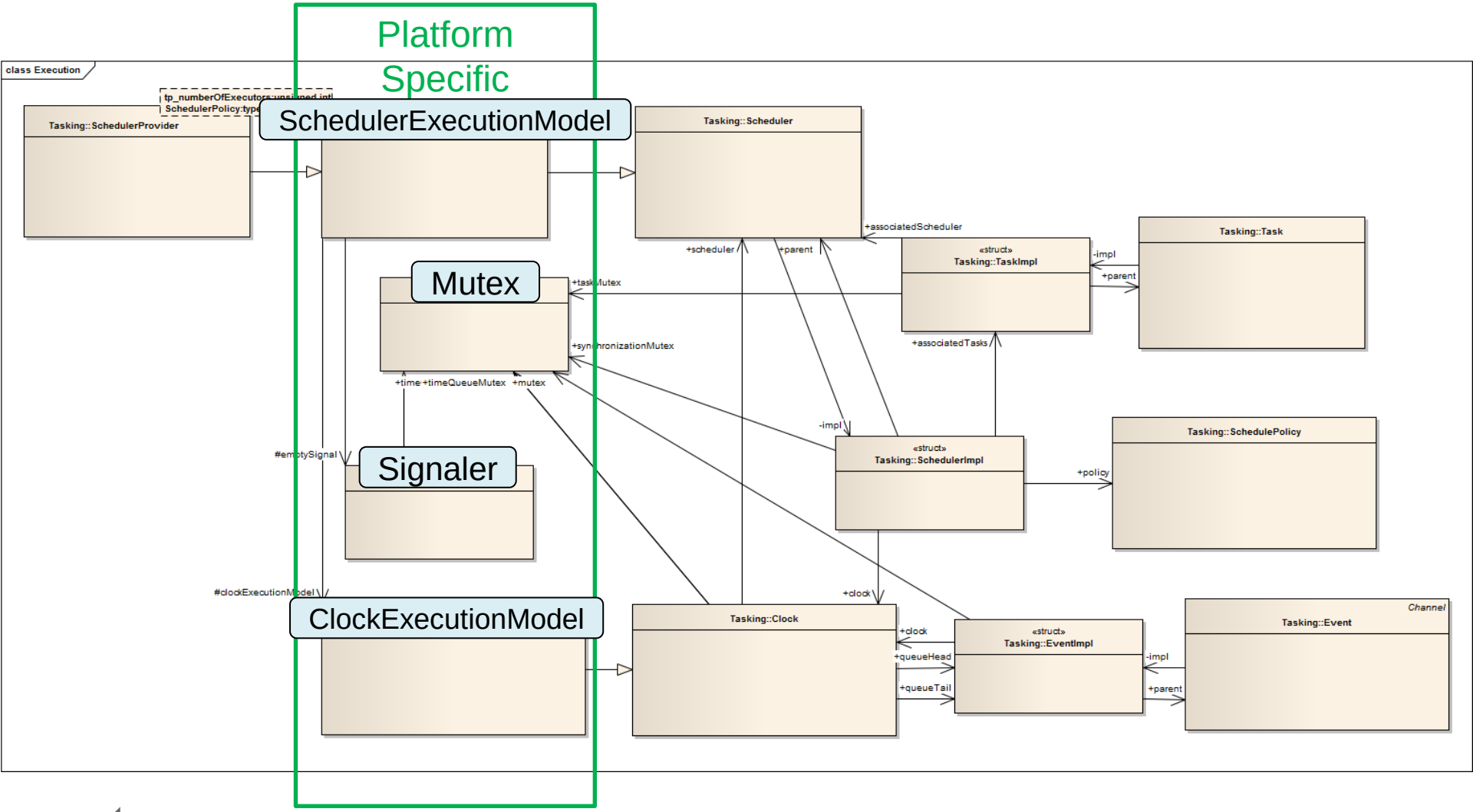
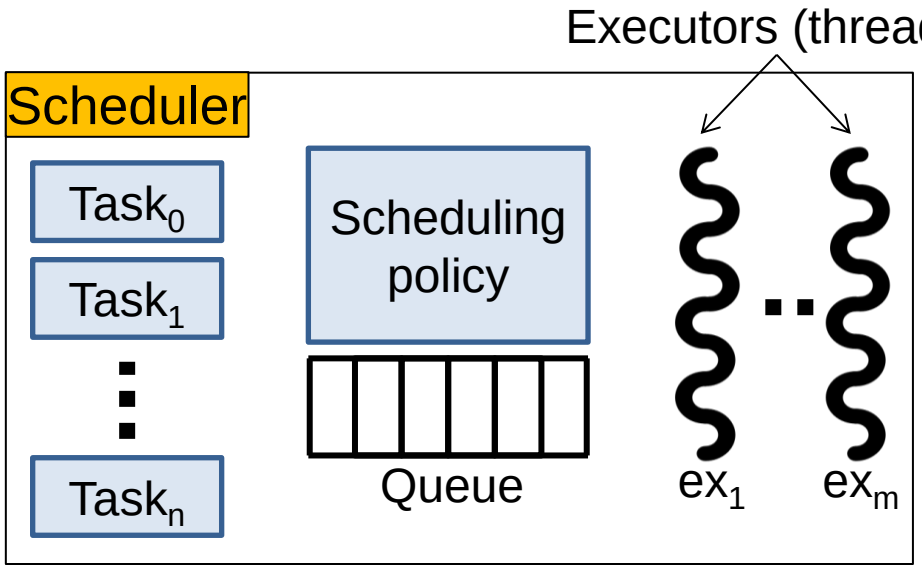
Execution Platform

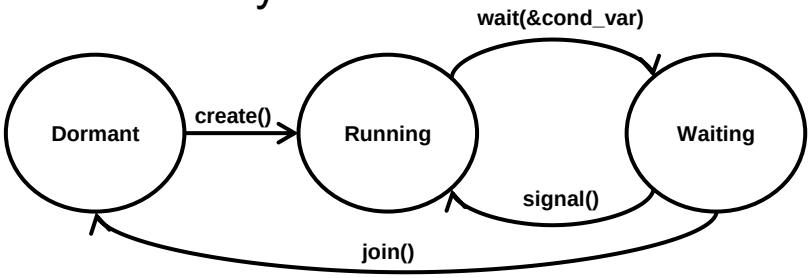


Execution model

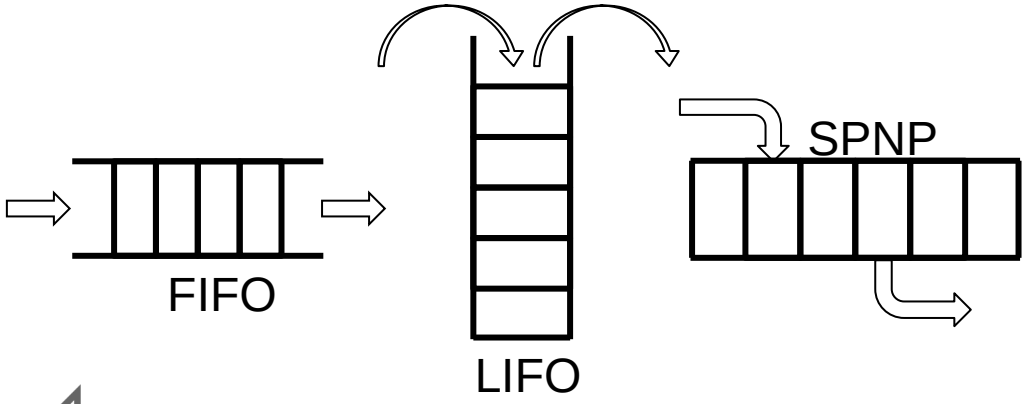


- Work-conserving scheduling
- The load is balanced on the available executors

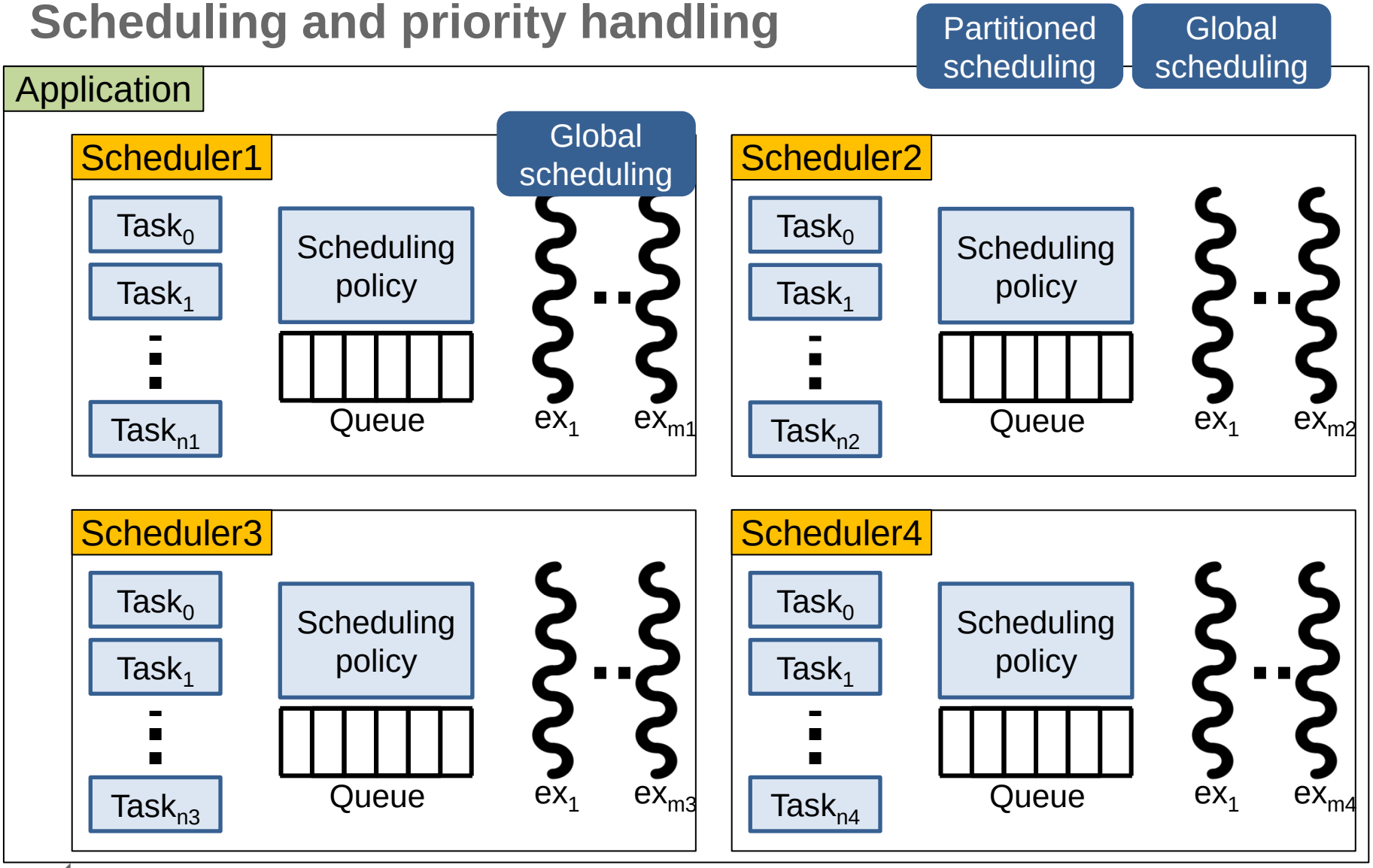
Thread's life cycle:



Scheduling policies:



Scheduling and priority handling



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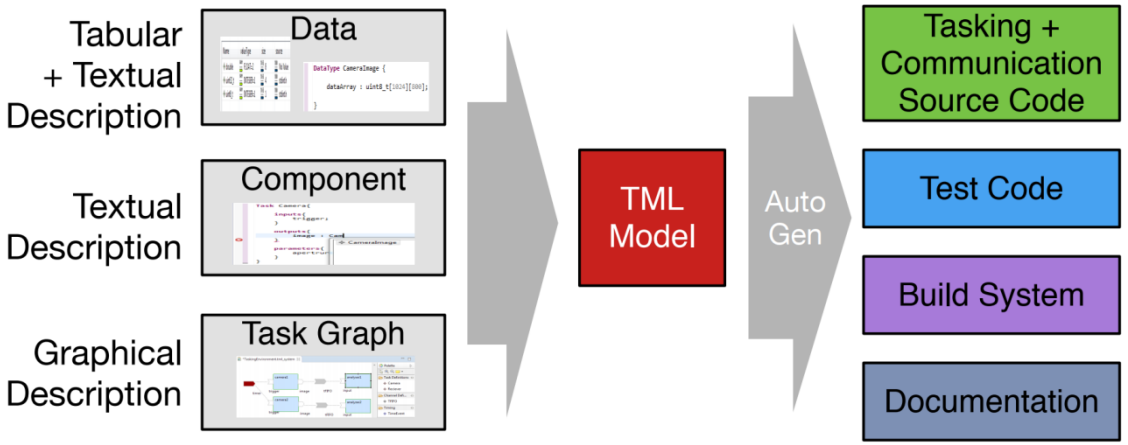
Tasking Modelling Language (TML)

- Advanced editor with modeling support + Integration into Eclipse IDE
- Modeling Workflow
  1. Data types
  2. Component types
  3. Component connection
- Artifact generation



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Outlook

- Work stealing
- Open source:
  - introducing releases
  - contribution rules
  - legal regulations
- Bare-metal

Conclusion

- Tasking Framework
  - software development library
  - event-driven multithreading execution platform
  - C++
  - compatible with the POSIX-based RTOS
  - dedicated for data-driven on-board software systems
- Interested?

Website: https://www.dlr.de/sc/srv

ResearchGate: OSS