Temperature Monitoring System Architecture

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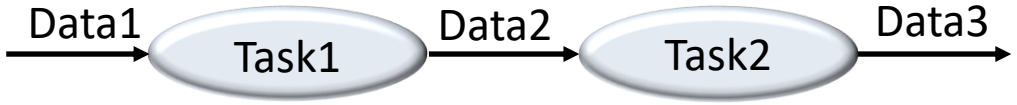
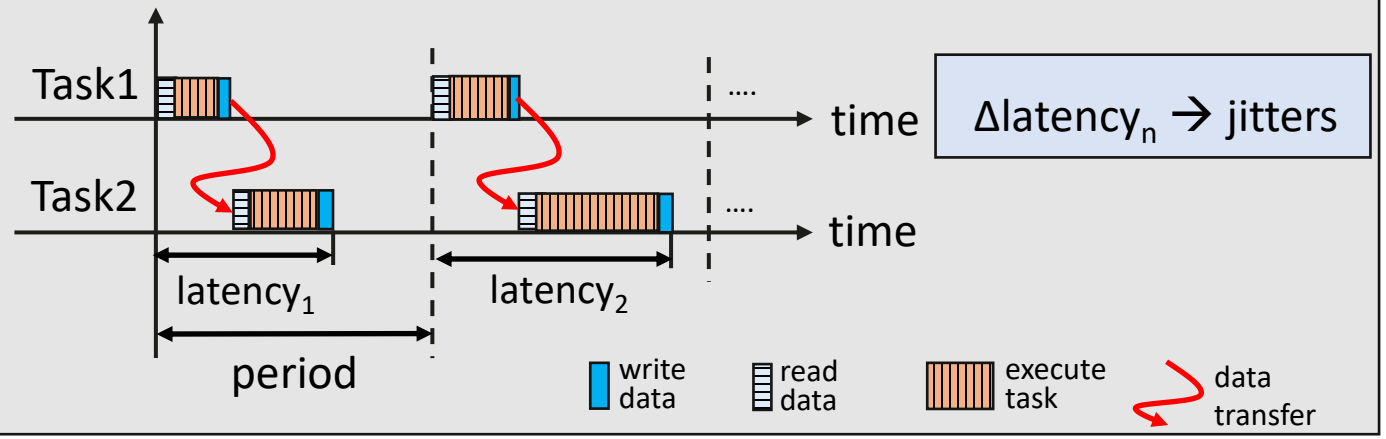
High-level idea (Scalable, Extendable Architecture)

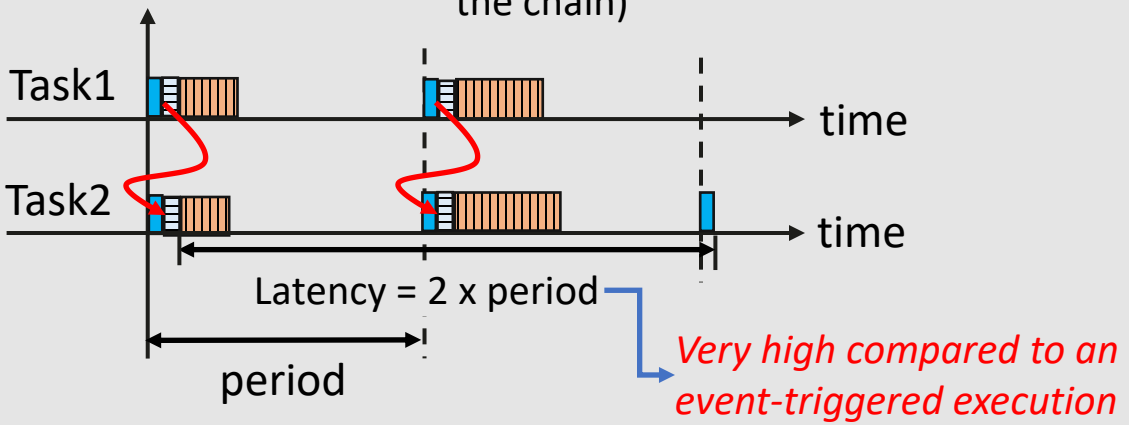


System LET

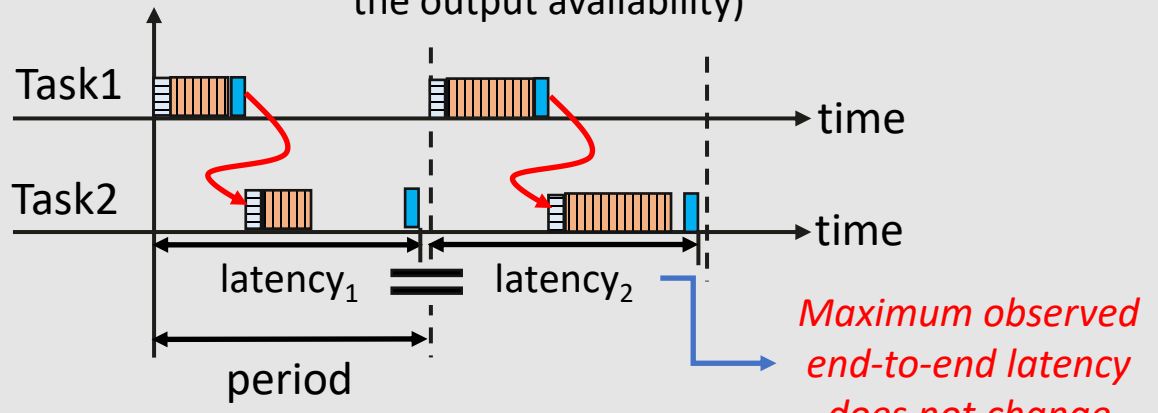
Event-triggered execution: *no time control over data read/write*



Logical execution time (LET) execution (publish at the end of the chain)

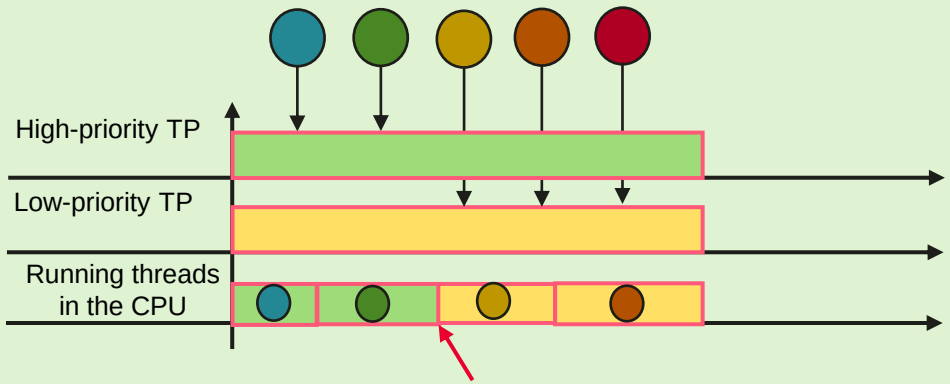


Flexible and practical LET execution (control over the output availability)



Flexible LET-based pub-sub architecture

Time Partitioning is a classic OS-level abstraction that limits interference between processes by bounding their resource consumption.

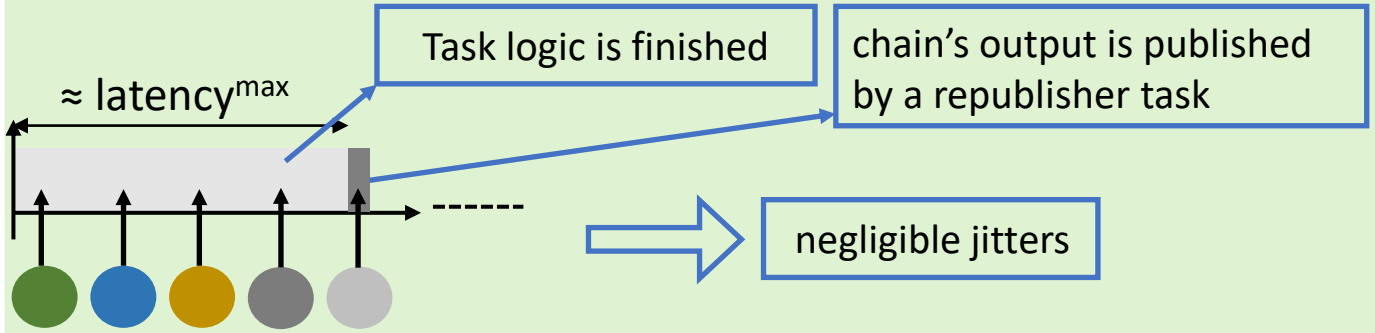


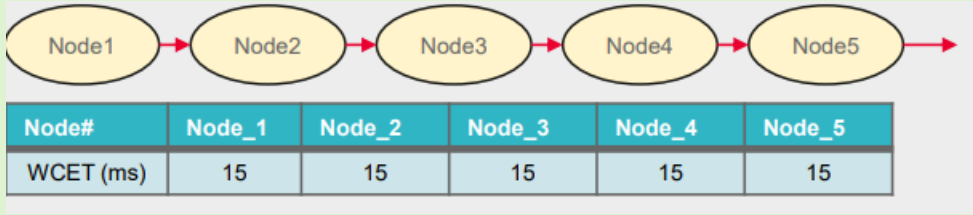
- No threads are ready-to-run in high-priority reservation server
- Threads from low-priority reservation server can run

Advantages:

- Precise control over threads' timings
- Good utilization for mixed-criticality workloads

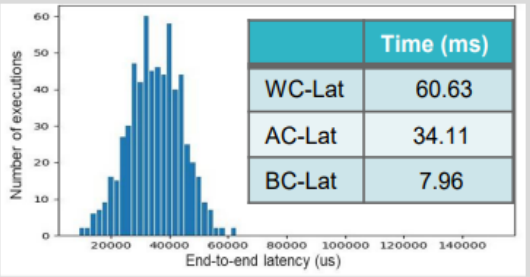
Flexible Logical Execution Time.





Node#	Node_1	Node_2	Node_3	Node_4	Node_5
WCET (ms)	15	15	15	15	15

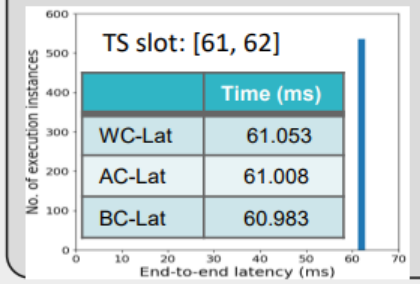
(1) With FIFO, with interference



	Time (ms)
WC-Lat	60.63
AC-Lat	34.11
BC-Lat	7.96

Large variation (50+ ms) in end-to-end latency

(2) Using time shaper with 1 slot per period



	Time (ms)
WC-Lat	61.053
AC-Lat	61.008
BC-Lat	60.983

Compared to (1):

a) Worst-case end-to-end latency increases slightly;

b) jitter reduces significantly

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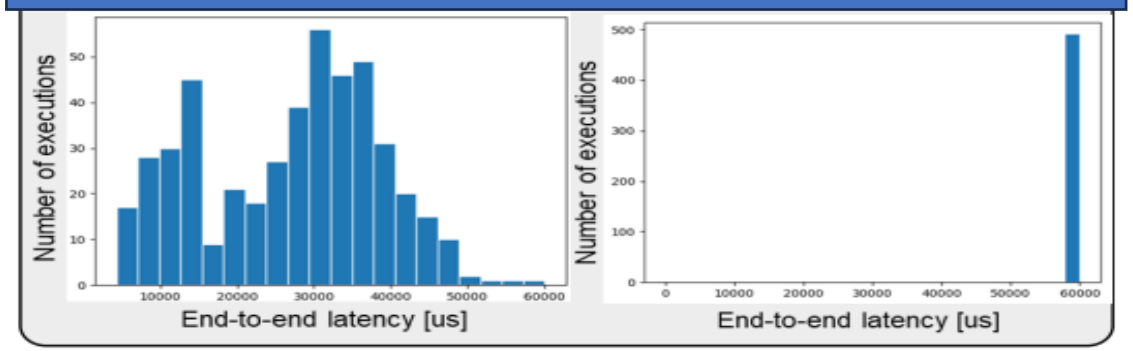
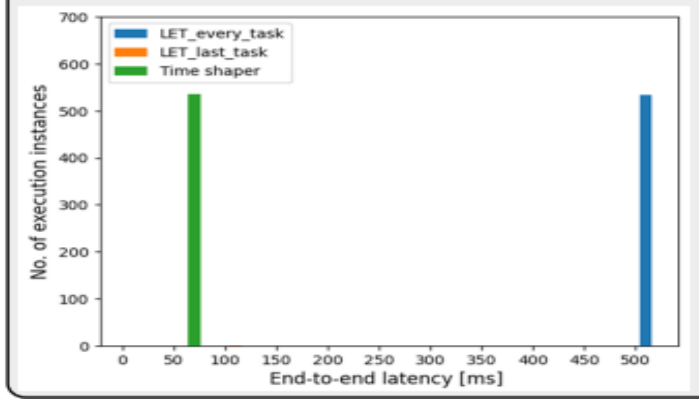
Performance With and Without LET

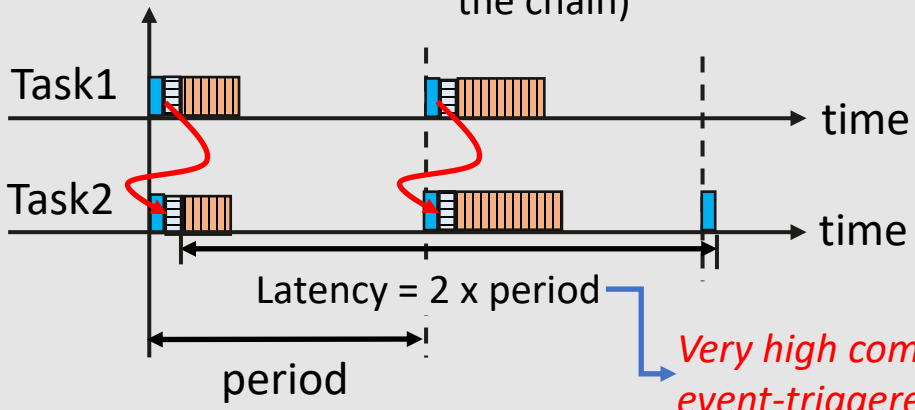


Comparing with Logical Execution Time (LET)



Time shaper offers tighter worst-case end-to-end latency and lower average end-to-end latency compared to LET implementations

Logical execution time (LET) execution (publish at the end of the chain)



Flexible and practical LET execution (control over the output availability)