

On-the-Fly Calculation of Performance Metrics with Adaptive Time Resolution for HPC Compute Jobs

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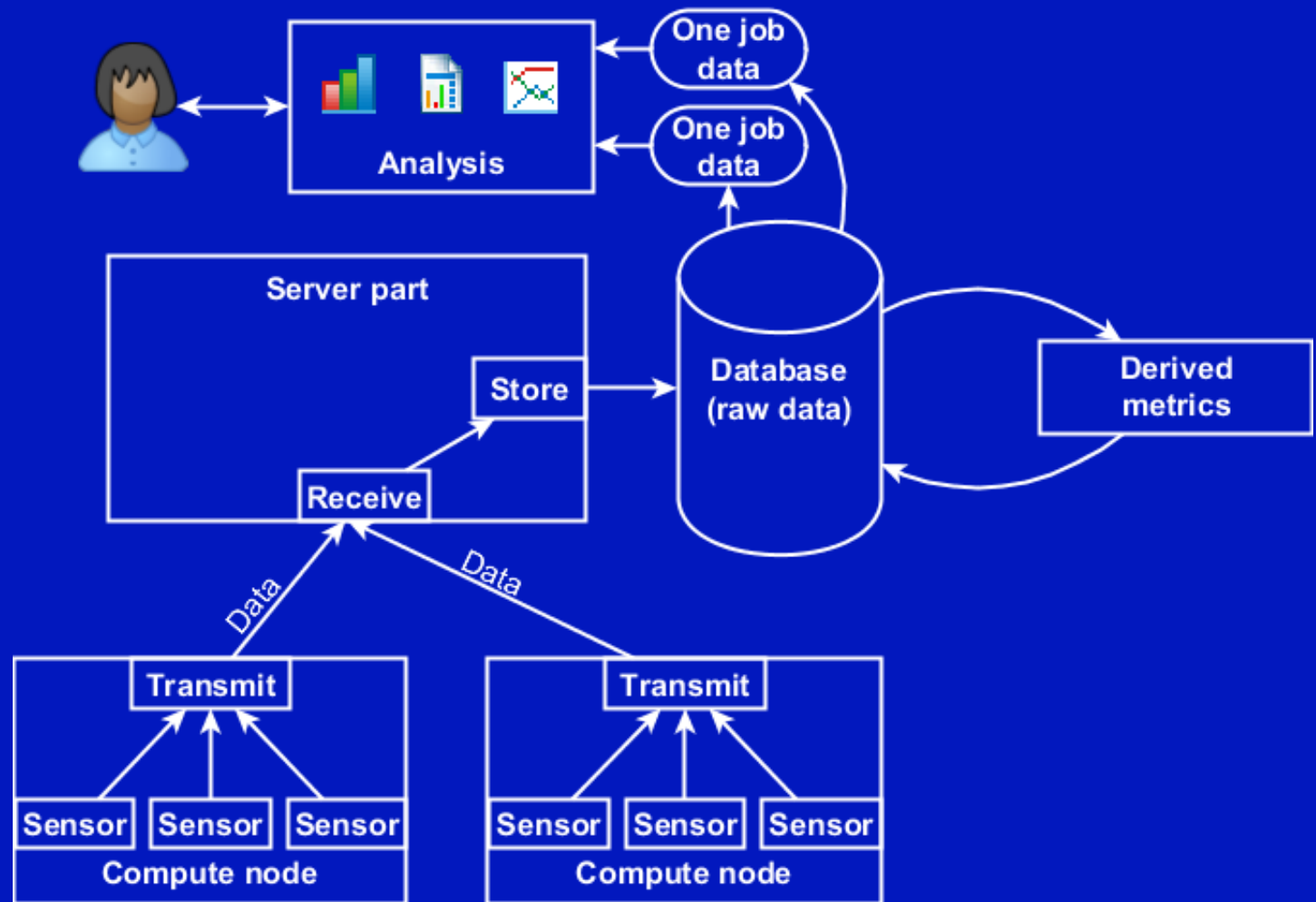
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Performance Monitoring

- Basic object (job) is dynamic – need to select related data from the whole stream
- Data volume is huge:
 - Poll frequency – the more HZ the better
 - Many different sensors (CPU load, LoadAvg, flops, network counters etc.)
- Much of the data are used only once (calculating aggregates for finished job)

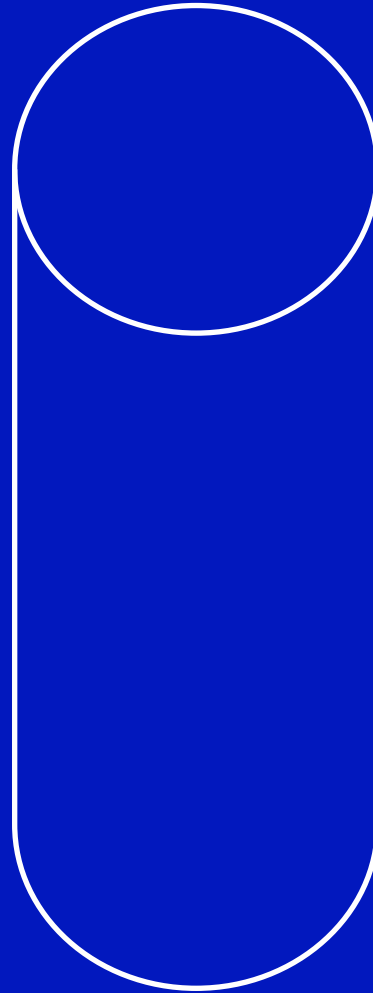
On-the-fly Calculation of Performance Metrics

Performance Monitoring: Common Approach



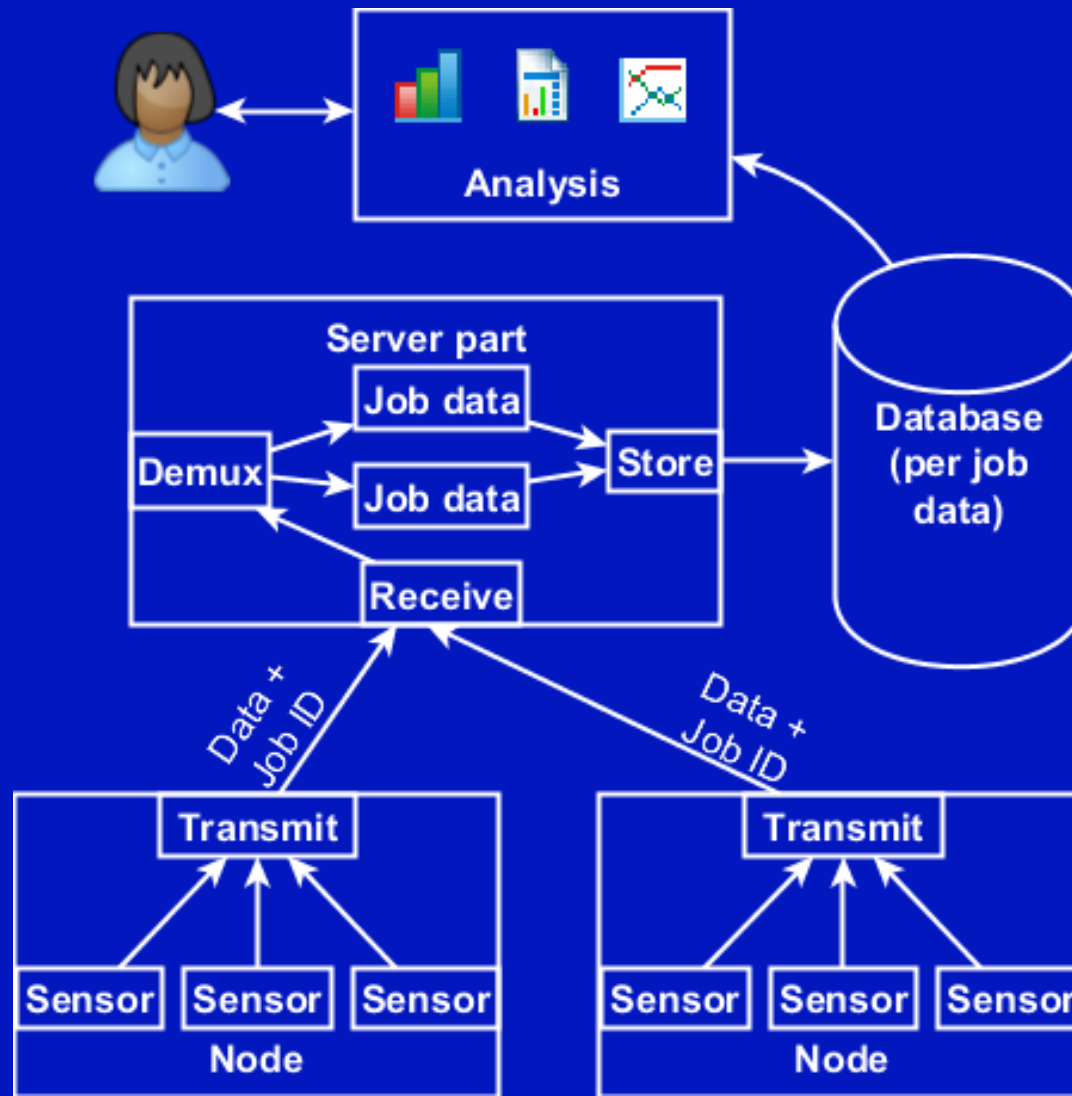
Performance Data Stream: Random IO

Time	Node	Sensor	Value
21:34:45	1	CPUload	45
		IB bytes in	2679
	2	CPUload	49
		IB bytes in	2179
	3	CPUload	35
		IB bytes in	1629
	4	CPUload	45
		IB bytes in	1629
21:34:55	1	CPUload	45
		IB bytes in	2679
	2	CPUload	45
		IB bytes in	2679
	3	CPUload	45
		IB bytes in	2679
	4	CPUload	45
		IB bytes in	2679

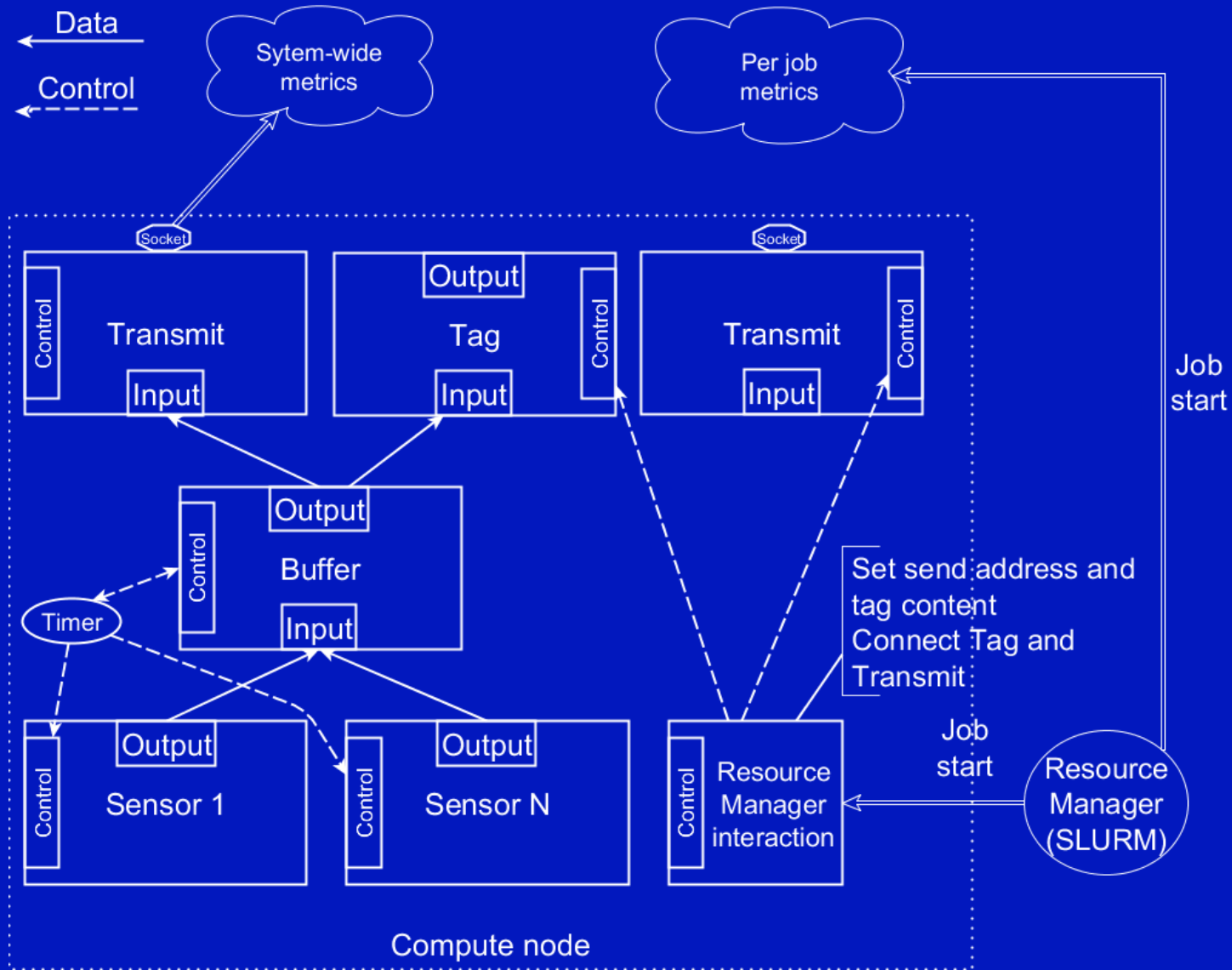


Job	Start	Finish	Nodes
1	20:30:07	21:34:50	1, 3
2	21:05:37	21:48:23	2, 4
3	21:34:53	22:08:21	1, 3

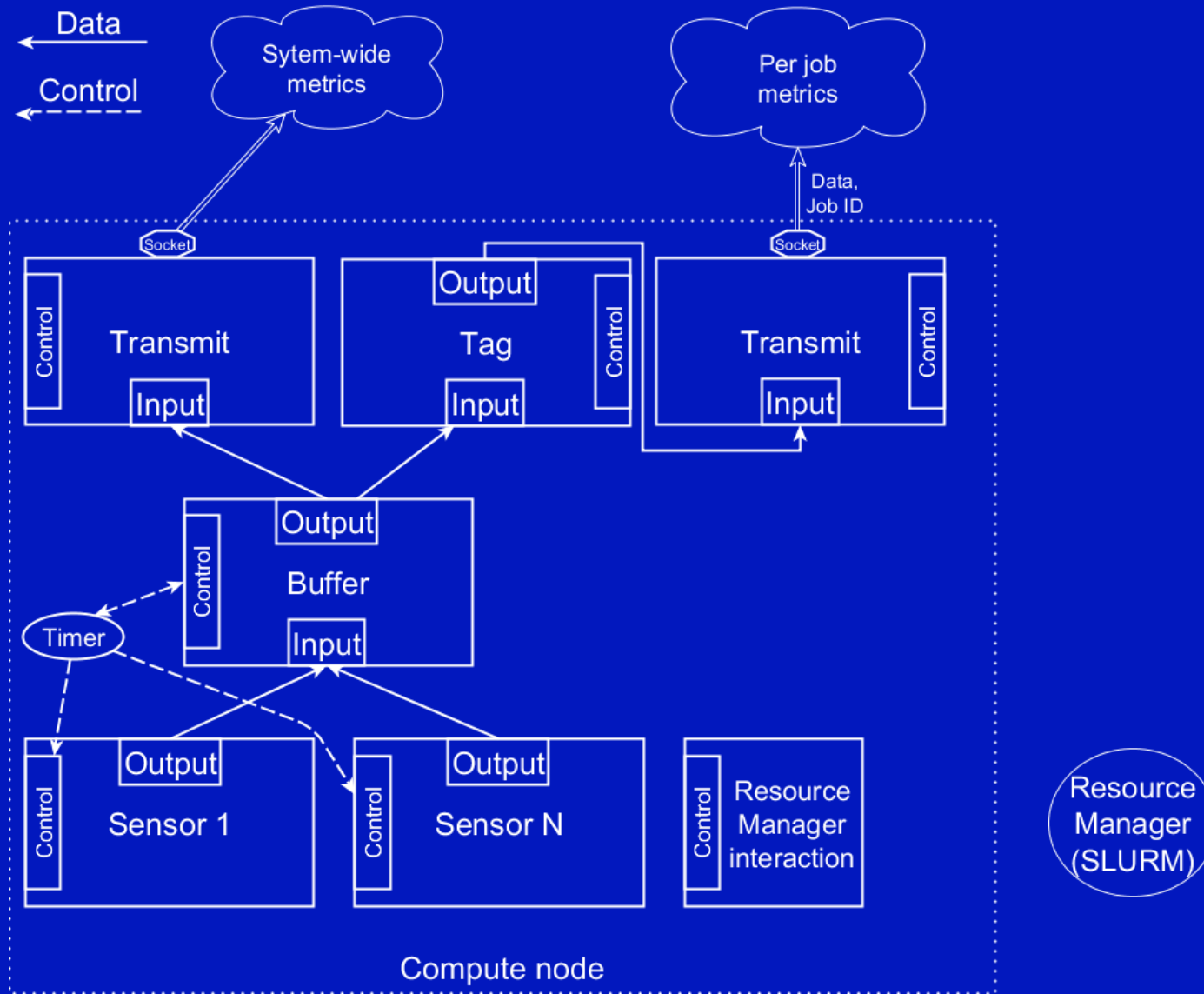
Performance Monitoring: Proposed Approach



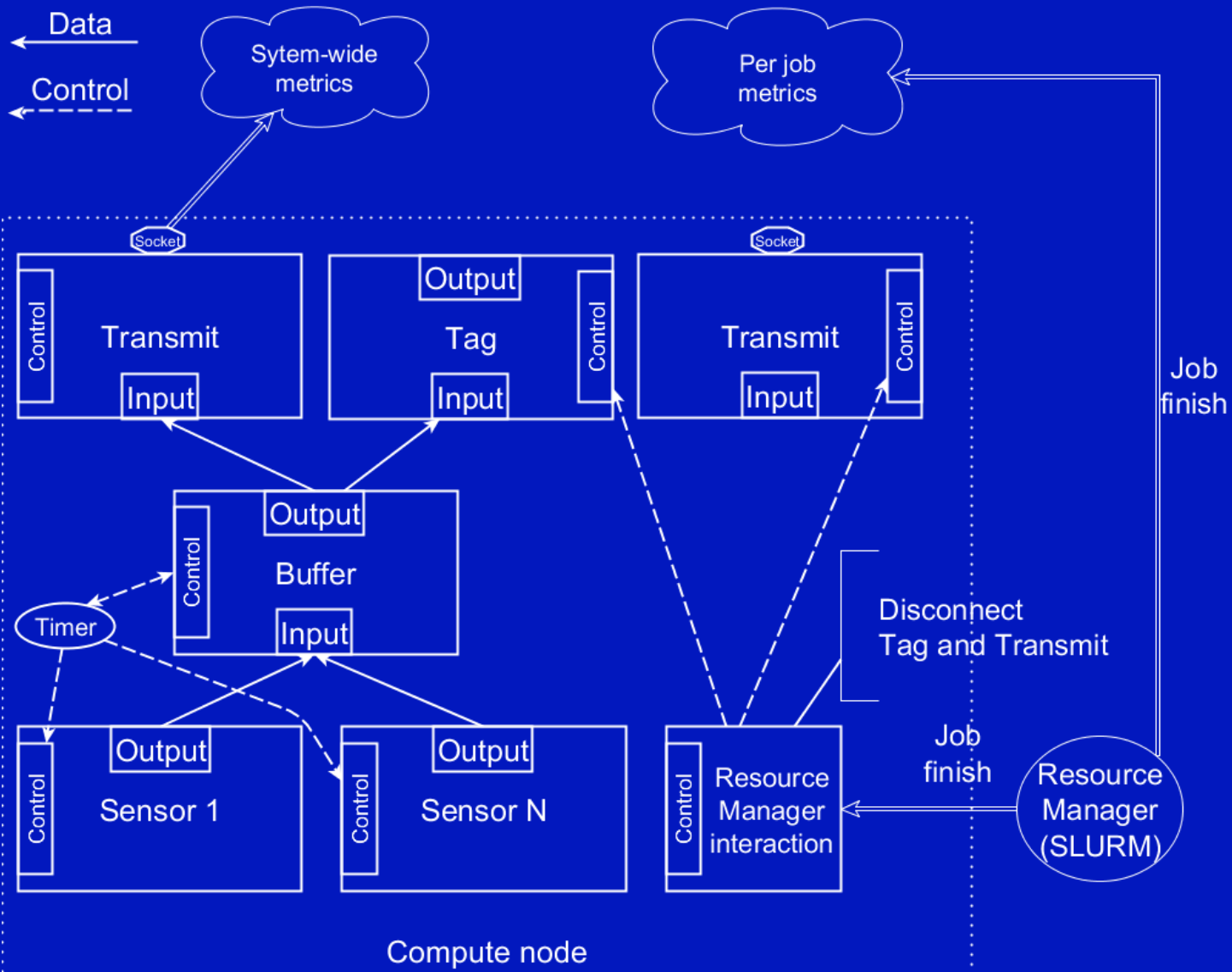
Reconfiguring on-the-fly to Calculate per-Job Metrics: Job Start



Reconfiguring on-the-fly to Calculate per-Job Metrics: Job Running



Reconfiguring on-the-fly to Calculate per-Job Metrics: Job finish



Issue:

Restart Monitoring System Parts

- Restart is a big issue:
 - Node agent saves node ID
 - Server part saves job data after the job is finished

Issue:

Restart Node Agent

- Restart is done after a job is finished from a system-wide SLURM epilog script

Issue:

Restart Server Part

(not implemented yet)

- 2 server parts, both have the same data
 - Main part works as described above, save the data right after the job is finished
 - Standby part tries to save job data in 30s after the job is finished
 - If the record for the job is already there, the data are discarded
- Restart both parts with interval longer than the job time limit

Making Time Resolution Adaptive

Problem description and solution

- The more data points the better (especially for short jobs)
- Graphs with many data points are hard to visualize
- Need a trade-off
- Make dynamic resolution:
 - Fine for short jobs
 - Coarse for long jobs

Short Job

Time	23:00:01	23:00:02	23:00:03	23:00:04							
CPU user, %	100	94	90	90							

...

Time	23:00:01	23:00:02	23:00:03	23:00:04	...					23:16:39	23:16:40
CPU user, %	100	94	90	90						50	55

Not-so-Short Job

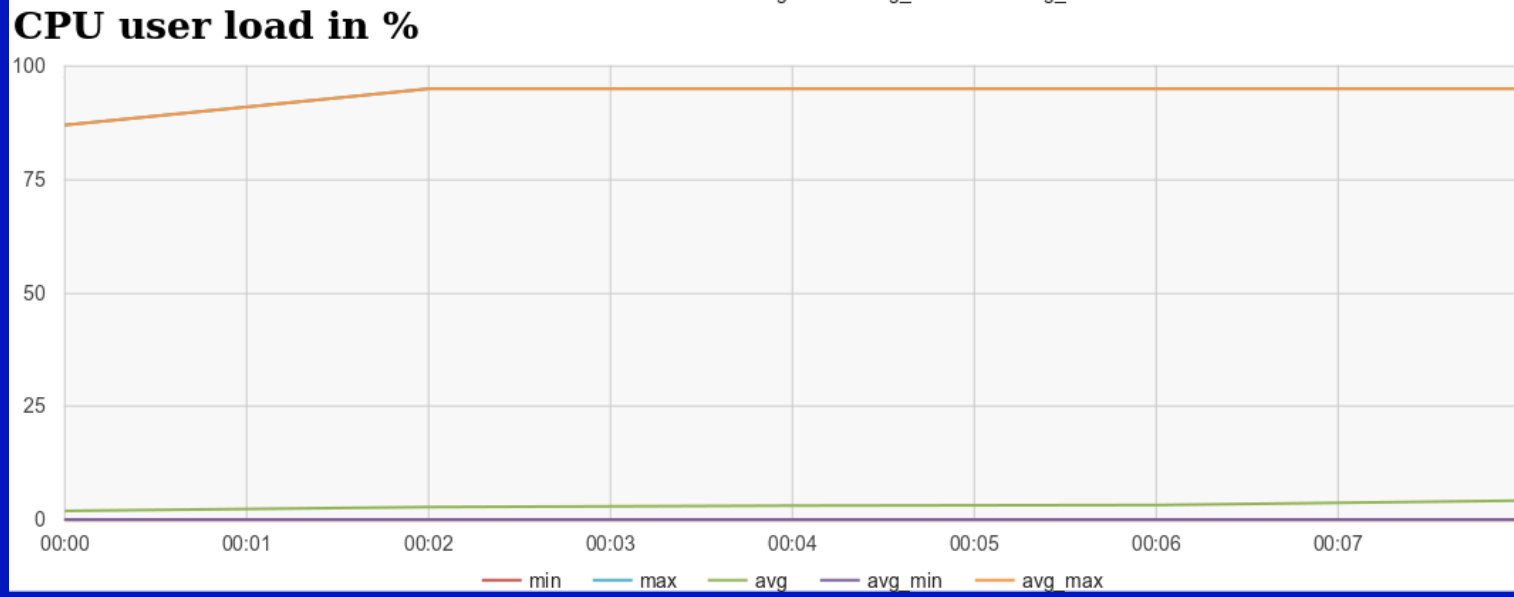
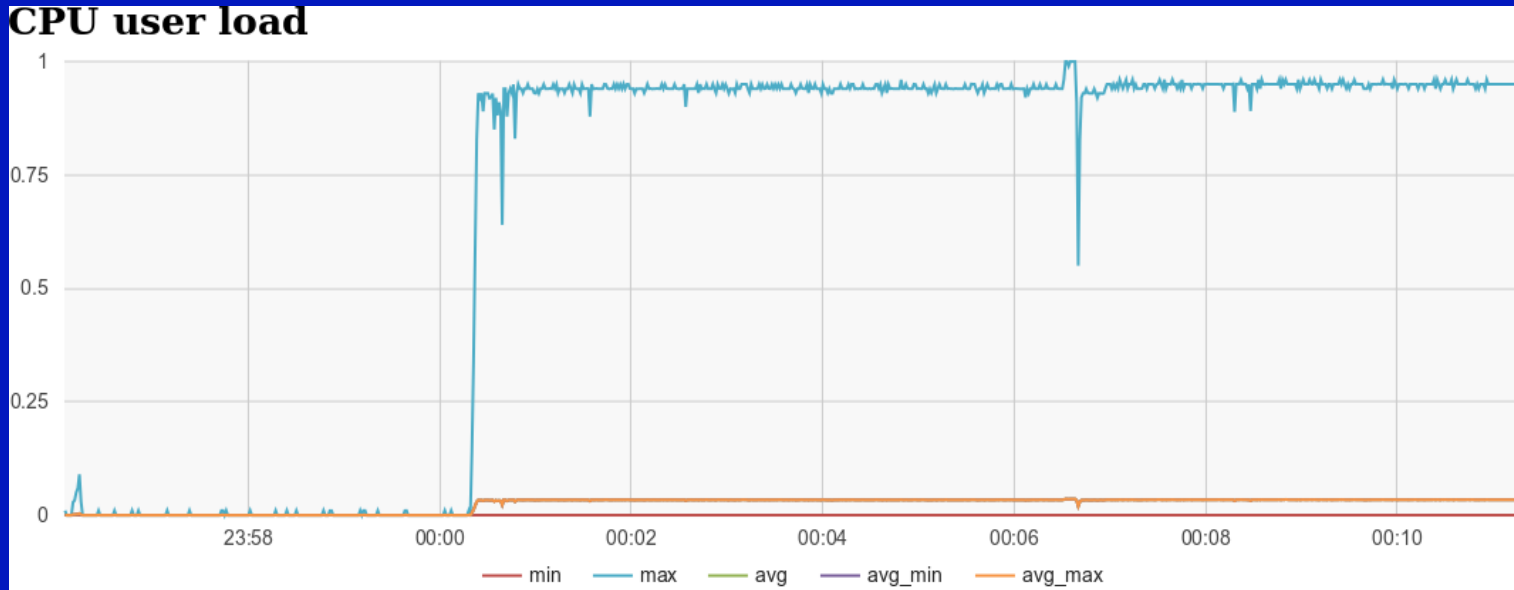
Time	23:00:01	23:00:02	23:00:03	23:00:04	...					23:16:39	23:16:40
CPU user, %	100	94	90	90						50	55



Time	23:00:01	23:00:03	...		23:16:39						
CPU user, %	97	90			52,5						

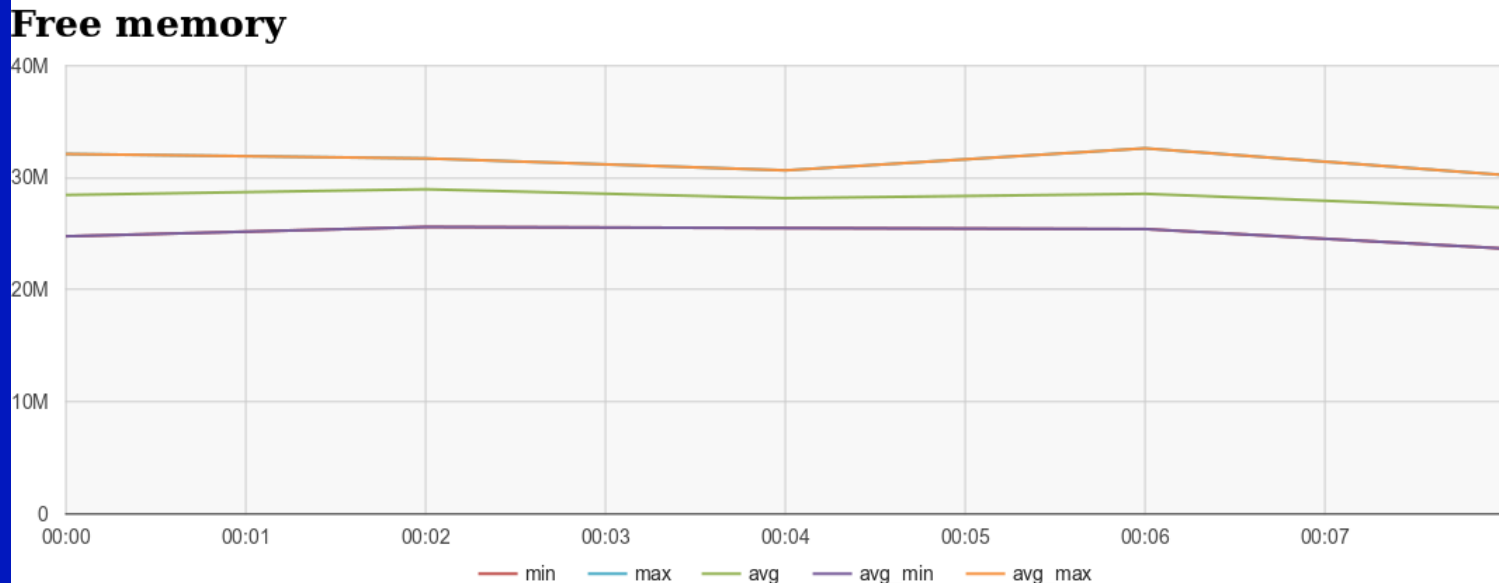
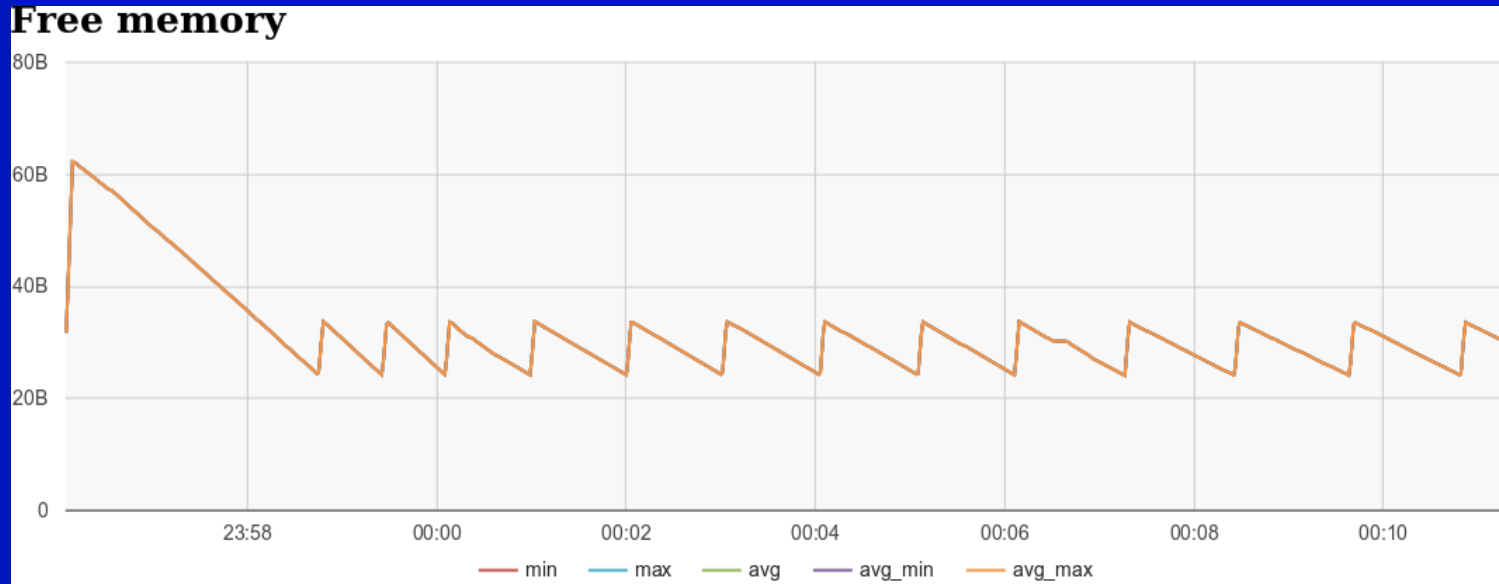
Results:

Dynamic vs Fixed (2 min) Resolution



Results:

Dynamic vs Fixed (2 min) Resolution



Thank you for your attention