NSF/IUCRC CAC PROJECT

MONITORING, VISUALIZING, AND PREDICTING HEALTH STATUS OF HPC CENTERS

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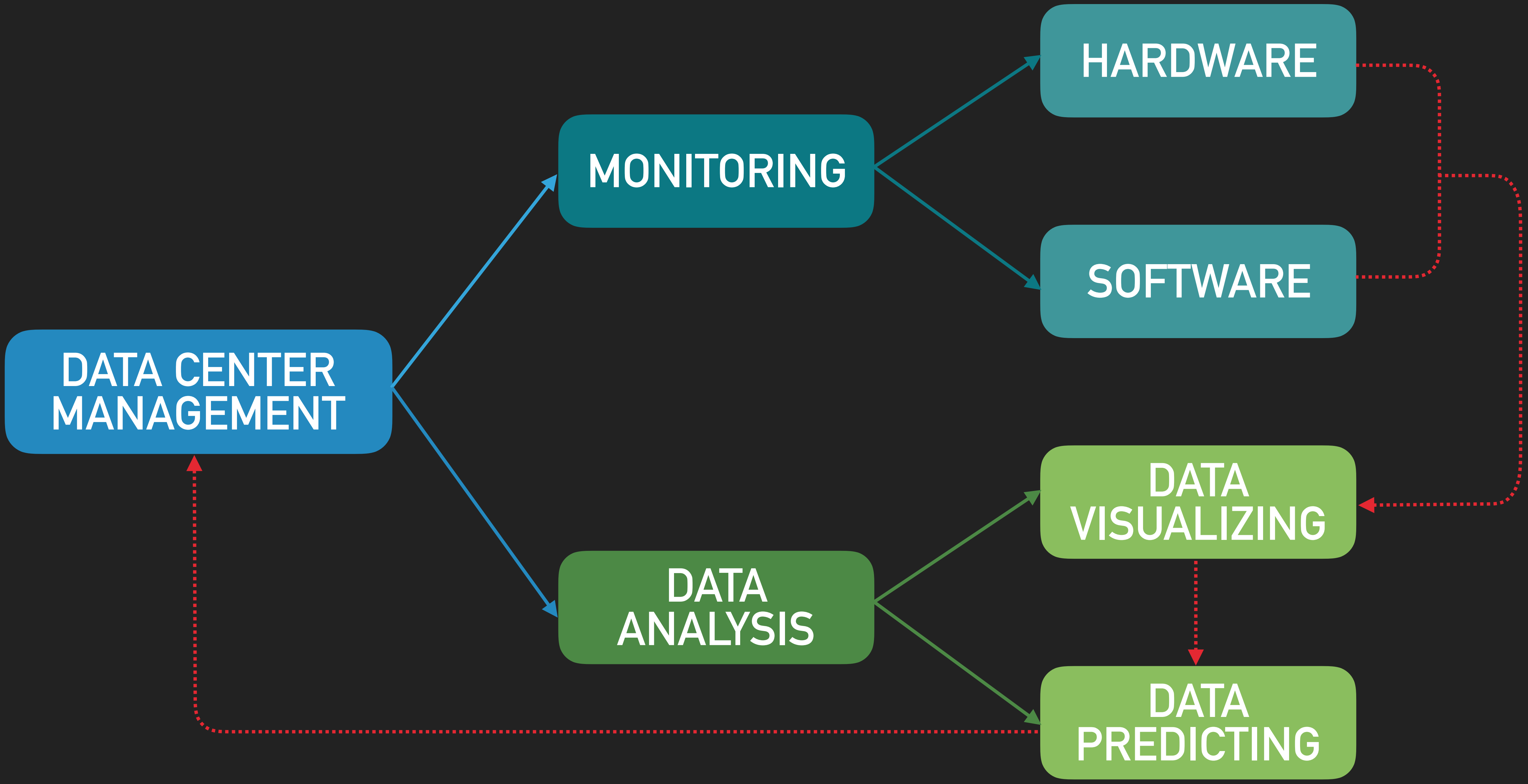
AGENDA

- Overview of the project
- Interleaving software metrics with hardware metrics

OVERVIEW



DATA CENTER MANAGEMENT

MONITORING

DATA ANALYSIS

HARDWARE

SOFTWARE

DATA VISUALIZING

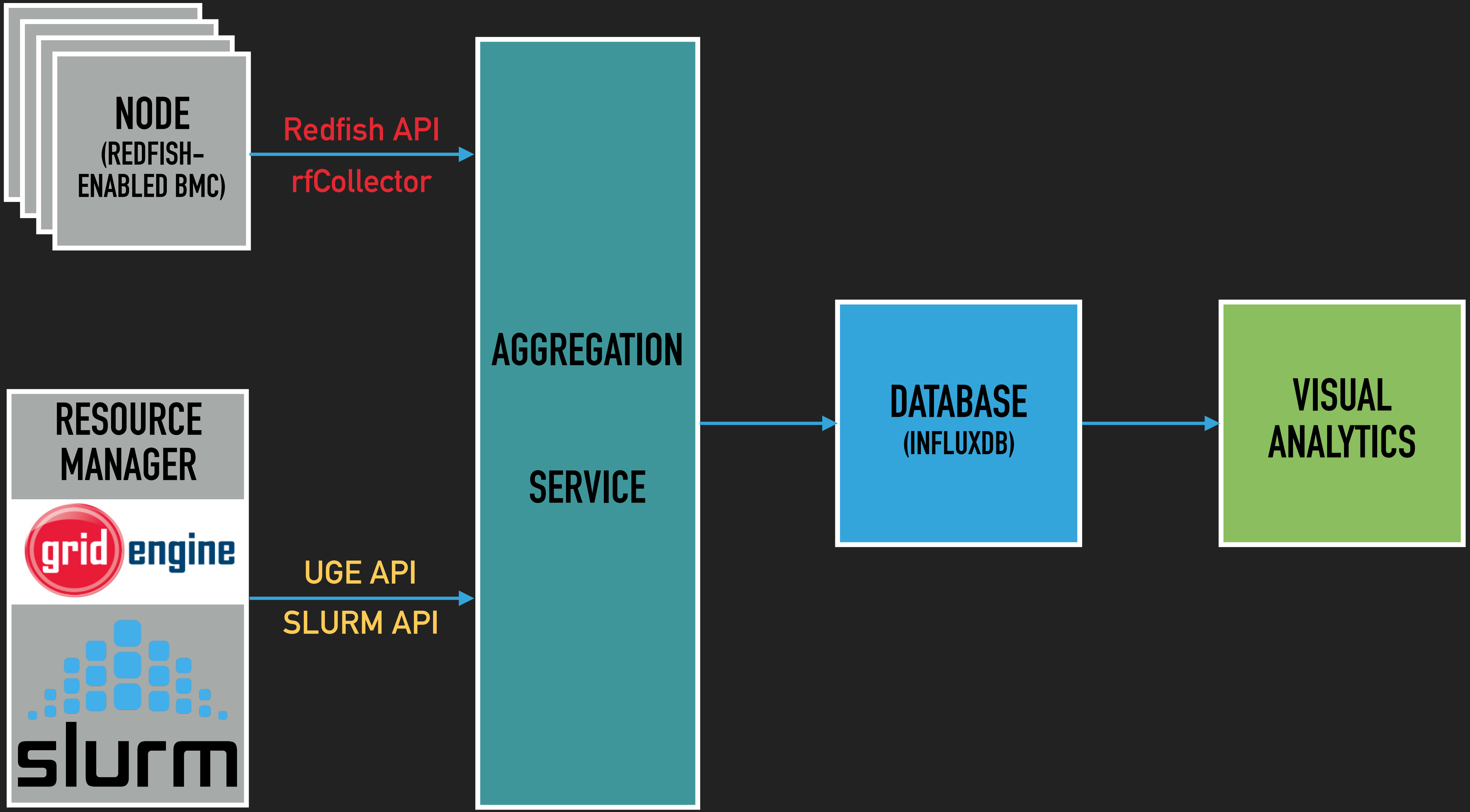
DATA PREDICTING

MONITORING

- IMPROVE the ways in which systems and applications operate
- Measured in terms of performance, reliability, power usage, the ability to meet service level agreements, and similar metrics important to applications and IT infrastructure providers
- Operate across multiple time scales, across different size systems, and at multiple level of abstraction(application-centric, infrastructure-centric)
- Understand and analyze captured data, in addition to support intelligent problem determination methods, as needed by subsequent management actions. [1]

Ref: [1] Mahendra Kutare et al. Monalytics: Online Monitoring and Analytics for Managing Large Scale Data Centers. ICAC, 2010

MONITORING FRAMEWORK



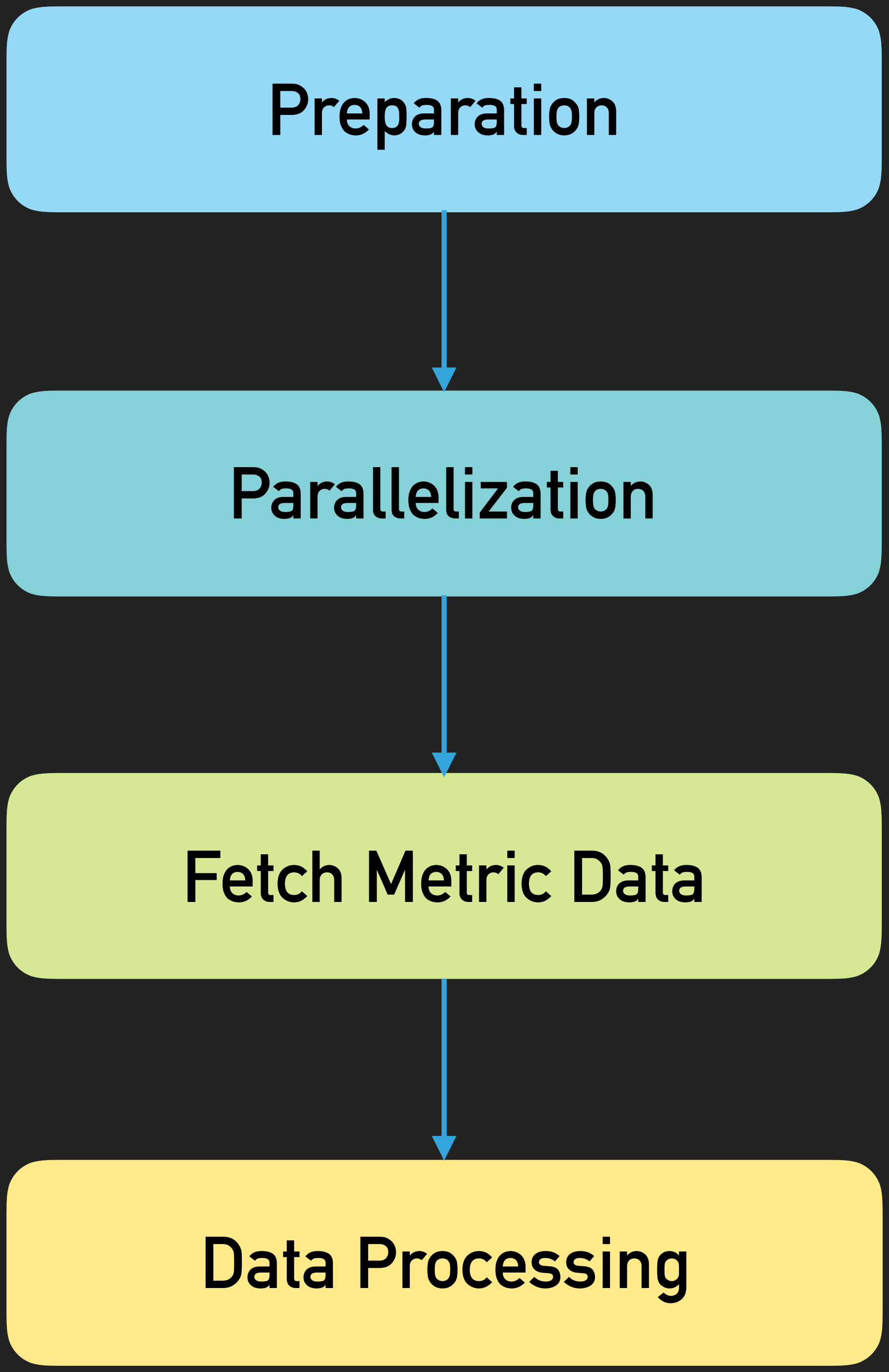
AGGREGATION SERVICE

AGGREGATION

SERVICE

- Queries and Collects data across the entire cluster
- Builds metrics after receiving the monitoring data
- Interleaving BMC metrics with Resource Manager metrics
- Stores metrics in database(InfluxDB)

AGGREGATION SERVICE


Preparation

Parallelization

Fetch Metric Data

Data Processing

- Builds the monitoring workload according to a given number of nodes and metrics
- Scatters the monitoring tasks evenly across the available CPU cores as a multi-threaded code and Gathers the responses
- Each thread Queries and Collects monitoring data from monitored entities
- Interleaves BMC metrics (hardware data) with Resource Manager metrics (software data), and Writes metrics to InfluxDB

INTERLEAVING

Data Processing

- Interleaves BMC metrics (hardware data) with Resource Manager metrics (software data), and Writes metrics to InfluxDB

At what time interval should we interleave the software data with hardware data?

INTERLEAVING

- At the same time interval with one we fetch hardware data ? i.e. about 6 secs
  - Not necessary, the software data may not change as frequently as hardware data
  - May cause extra overhead on the resource manager(UGE/SLURM)
- At a relatively large time interval, e.g. 1mins, 5mins
  - Not accurate, some jobs may start and finish during this large time interval
  - The interleaved metrics are affected by how we choose the time interval

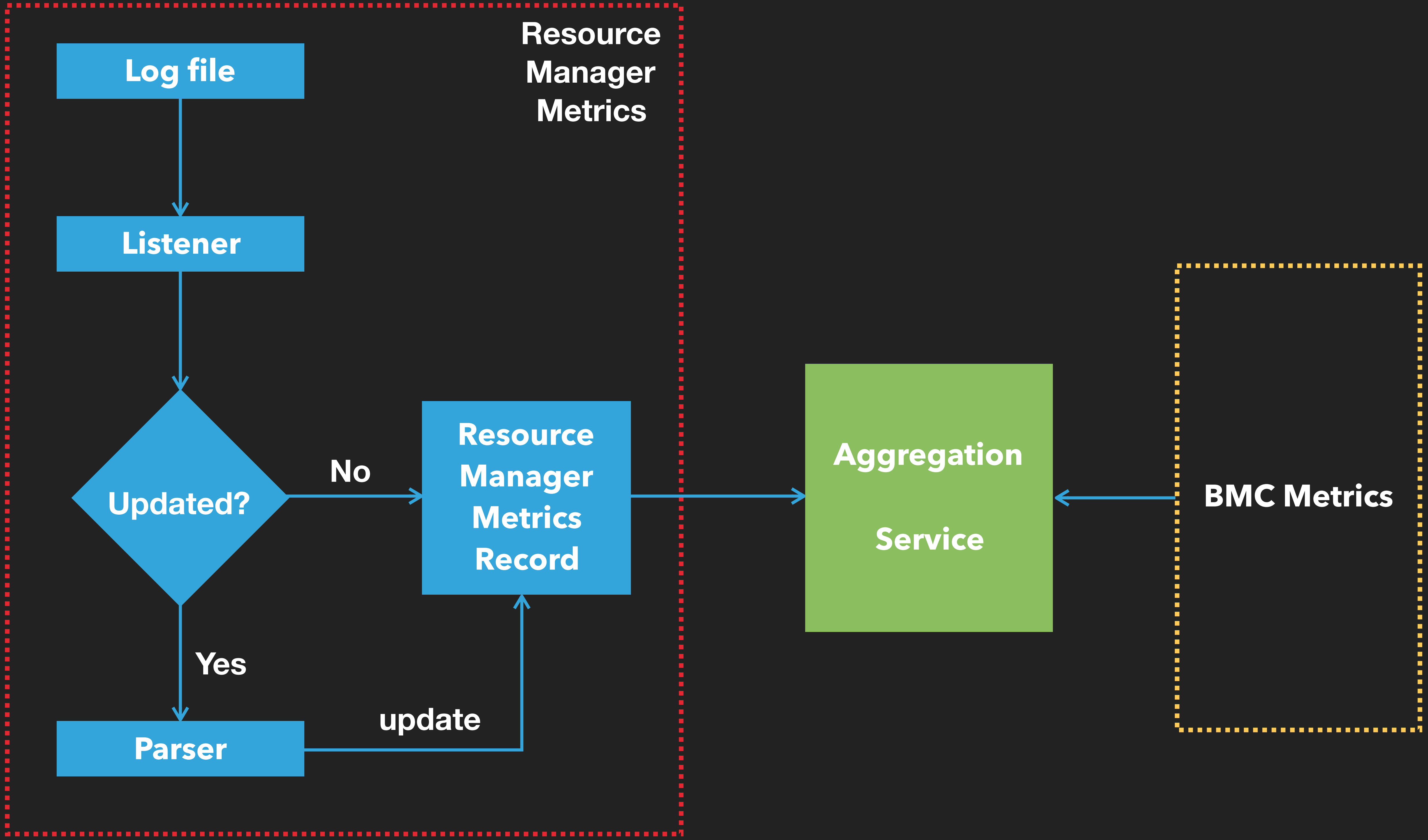
INTERLEAVING

- Interleaving software data with hardware data as needed
- Retrieve data from log file directly instead of from resource manager database
  - Includes resource snapshots of running jobs and other cluster statics
  - All information is time related, whenever there’s change, such as a new job submission or a job is finished, these kinds of info are logged into the reporting file

  - Reporting file (UGE)[1]
  - Job accounting log file (SLURM)[2]

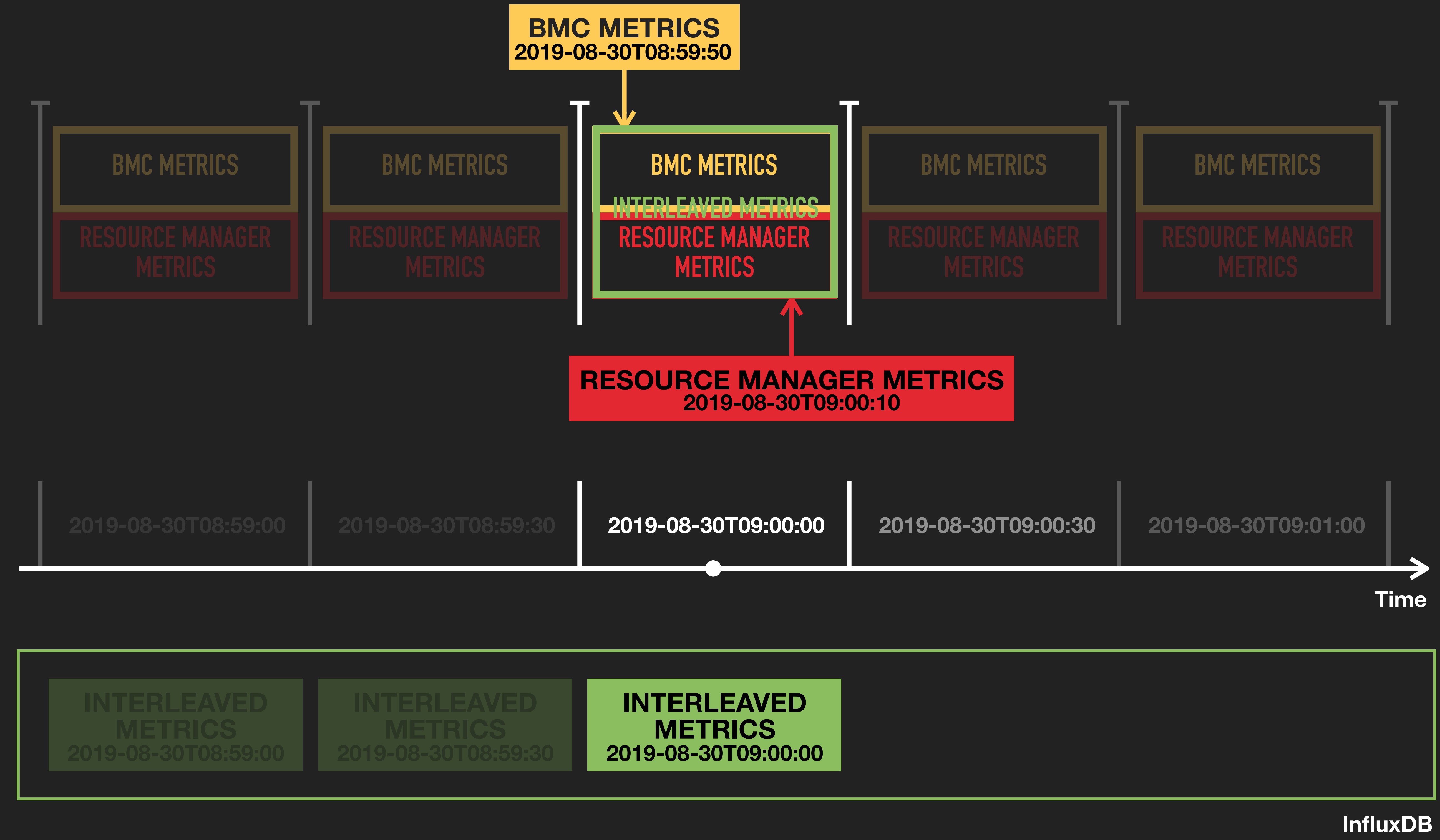
Ref: [1] http://www.gridengine.eu/mangridengine/htmlman5/reporting.html, [2] https://www.mankier.com/1/sacct

WORKFLOW



Resource Manager Metrics
Log file
Listener
Updated?
No
Resource Manager Metrics Record
Yes
Parser
update
Aggregation Service
BMC Metrics

AGGREGATION



BMC METRICS
2019-08-30T08:59:50

BMC METRICS

RESOURCE MANAGER METRICS

BMC METRICS

RESOURCE MANAGER METRICS

BMC METRICS

INTERLEAVED METRICS

RESOURCE MANAGER METRICS

BMC METRICS

RESOURCE MANAGER METRICS

BMC METRICS

RESOURCE MANAGER METRICS

RESOURCE MANAGER METRICS
2019-08-30T09:00:10

2019-08-30T08:59:00

2019-08-30T08:59:30

2019-08-30T09:00:00

2019-08-30T09:00:30

2019-08-30T09:01:00

Time

INTERLEAVED METRICS
2019-08-30T08:59:00

INTERLEAVED METRICS
2019-08-30T08:59:30

INTERLEAVED METRICS
2019-08-30T09:00:00

InfluxDB

QUESTIONS?/COMMENTS?