NSF/IUCRC CAC PROJECT

MONITORING, VISUALIZING, AND PREDICTING HEALTH STATUS OF HPC CENTERS

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AGENDA

- Reducing data volume
- Rethinking monitoring framework

PROBLEM

	A	B	C	D	E	F	G	H	I	J	
1	time	10.101.1.1-jobID	10.101.1.1-CPUCores	10.101.1.1-cpuusage	0.101.1.1-memoryusage	10.101.1.1-CPU1_temp	10.101.1.1-CPU2_temp	10.101.1.1-inlet_temp	10.101.1.1-powerusage_watts	10.101.1.1-fan1_speed	10.
2	2019-08-02T16:37:11.950503	qu_873372	36	0.500556	11.981	51	40	19	237	9870	
3	2019-08-02T16:38:11.622927	qu_873372	36	0.500556	11.981	51	41	18	300	9800	
4	2019-08-02T16:39:11.549110	qu_873372	36	0.500556	11.979	52	41	18	236	9310	
5	2019-08-02T16:40:12.073863	qu_873372	36	0.500556	11.979	51	40	18	235	9870	
6	2019-08-02T16:41:11.628206	qu_873372	36	0.500417	11.981	52	41	18	234	9870	
7	2019-08-02T16:42:12.229688	qu_873372	36	0.500417	11.981	51	40	19	233	9800	
8	2019-08-02T16:43:12.382215	qu_873372	36	0.500139	12.045	51	40	19	233	9870	
9	2019-08-02T16:44:11.915567	qu_873372	36	0.500139	11.979	51	41	19	234	9800	
10	2019-08-02T16:45:12.021142	qu_873372	36	0.500139	11.982	51	40	19	235	9870	
11	2019-08-02T16:46:12.180885	qu_873372	36	0.500139	11.982	51	40	19	235	9800	
12	2019-08-02T16:47:12.031833	qu_873372	36	0.500139	11.981	51	40	19	236	9870	
13	2019-08-02T16:48:11.974953	qu_873372	36	0.500139	11.981	51	40	18	233	9870	
14	2019-08-02T16:49:12.074115	qu_873372	36	0.500417	11.98	51	40	19	234	9870	
15	2019-08-02T16:50:11.599026	qu_873372	36	0.500556	11.979	51	40	19	233	9870	
16	2019-08-02T16:51:12.010404	qu_873372	36	0.500556	11.979	51	40	18	233	9870	
17	2019-08-02T16:52:11.737167	qu_873372	36	0.499444	11.985	51	40	19	233	9870	
18	2019-08-02T16:53:12.187245	qu_873372	36	0.499861	11.983	51	40	19	234	9870	
19	2019-08-02T16:54:12.029520	qu_873372	36	0.499861	11.979	51	40	19	233	9870	
20	2019-08-02T16:55:11.561868	qu_873372	36	0.499861	11.98	51	40	19	233	9870	
21	2019-08-02T16:56:12.051115	qu_873372	36	0.499861	11.978	51	40	19	233	9870	
22	2019-08-02T16:57:11.633163	qu_873372	36	0.499861	11.979	52	40	18	235	9870	
23	2019-08-02T16:58:11.485031	qu_873372	36	0.499861	11.978	51	40	19	233	9800	
24	2019-08-02T16:59:11.654085	qu_873372	36	0.499861	11.98	52	40	19	233	9800	
25	2019-08-02T17:00:11.482204	qu_873372	36	0.499861	11.978	51	40	19	235	9870	
26	2019-08-02T17:01:11.939165	qu_873372	36	0.5	11.991	51	40	18	235	9800	

- The state of cpu usage changes very slightly(~0.11%) that can be ignored
- This kind of metrics stored in every timestamp increase data volume significantly
- Do we have a more efficient way to store the raw data?

FILTERING[1]

- Filter the incoming data streams or filter the values already recorded in the database
- Retain only those values that differ significantly from the previously logged values
- Reduce the amount of data that is stored in the database, improving scalability

Ref: [1] Justin Moore et al. Data Center Workload Monitoring, Analysis, and Emulation.

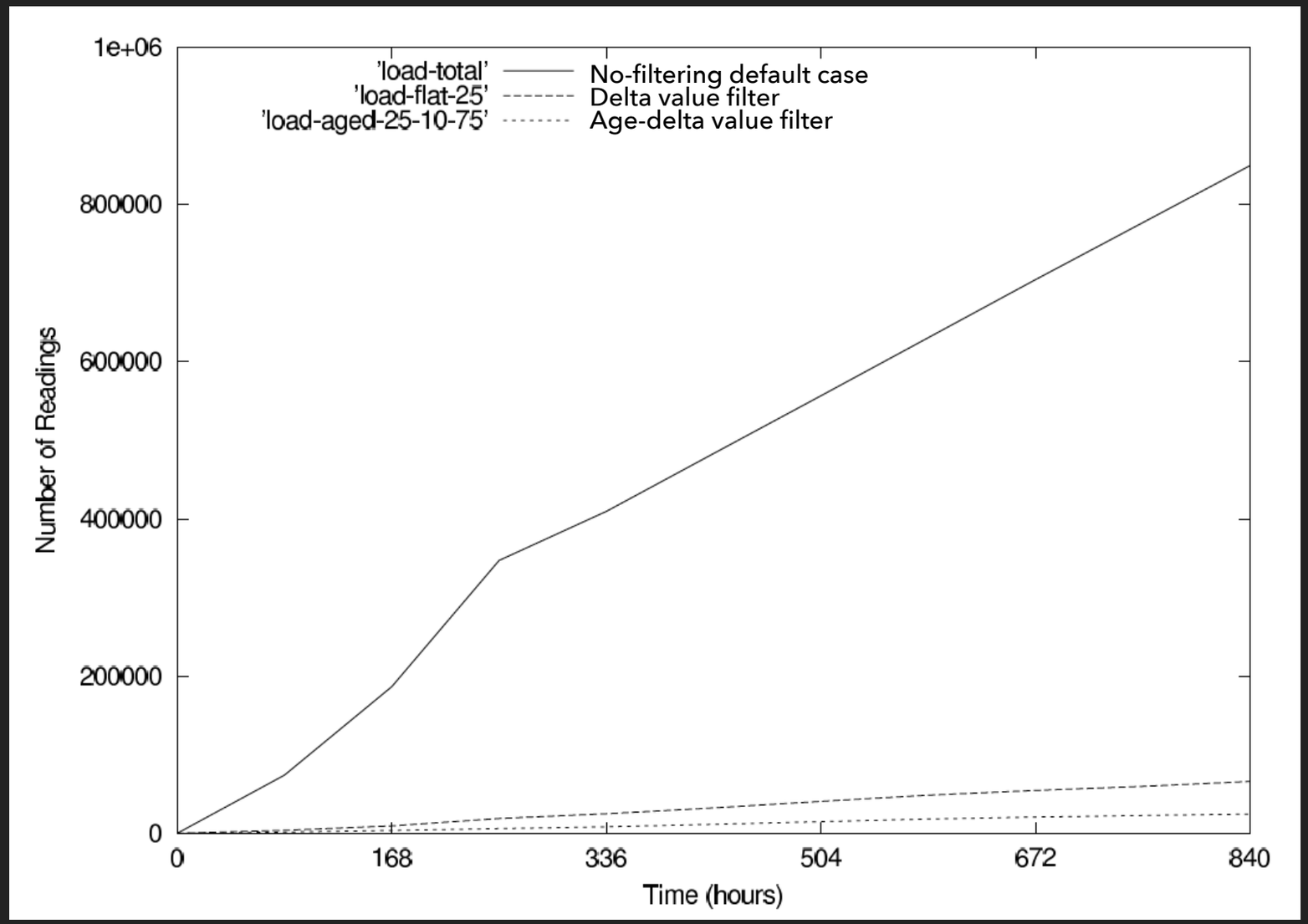
FILTERING[1]

- Delta-value filter:
  - If difference between the new value and the old values is less than some threshold, we discard the new value. If they are sufficiently different, we add the new value to the database
  - We trade perfect accuracy- defined as logging every reading arriving at the database- for scalability
- Age-delta value filter:
  - Similar to delta-value filter
  - With addition of a postprocessing filter

Ref: [1] Justin Moore et al. Data Center Workload Monitoring, Analysis, and Emulation.

FILTERING[1]

- Default case: logged every two minutes
- Delta value filter reduces the number of readings by almost 85%(using a delta-value-threshold of 0.25)
- Age-delta value approach accomplishes better compression



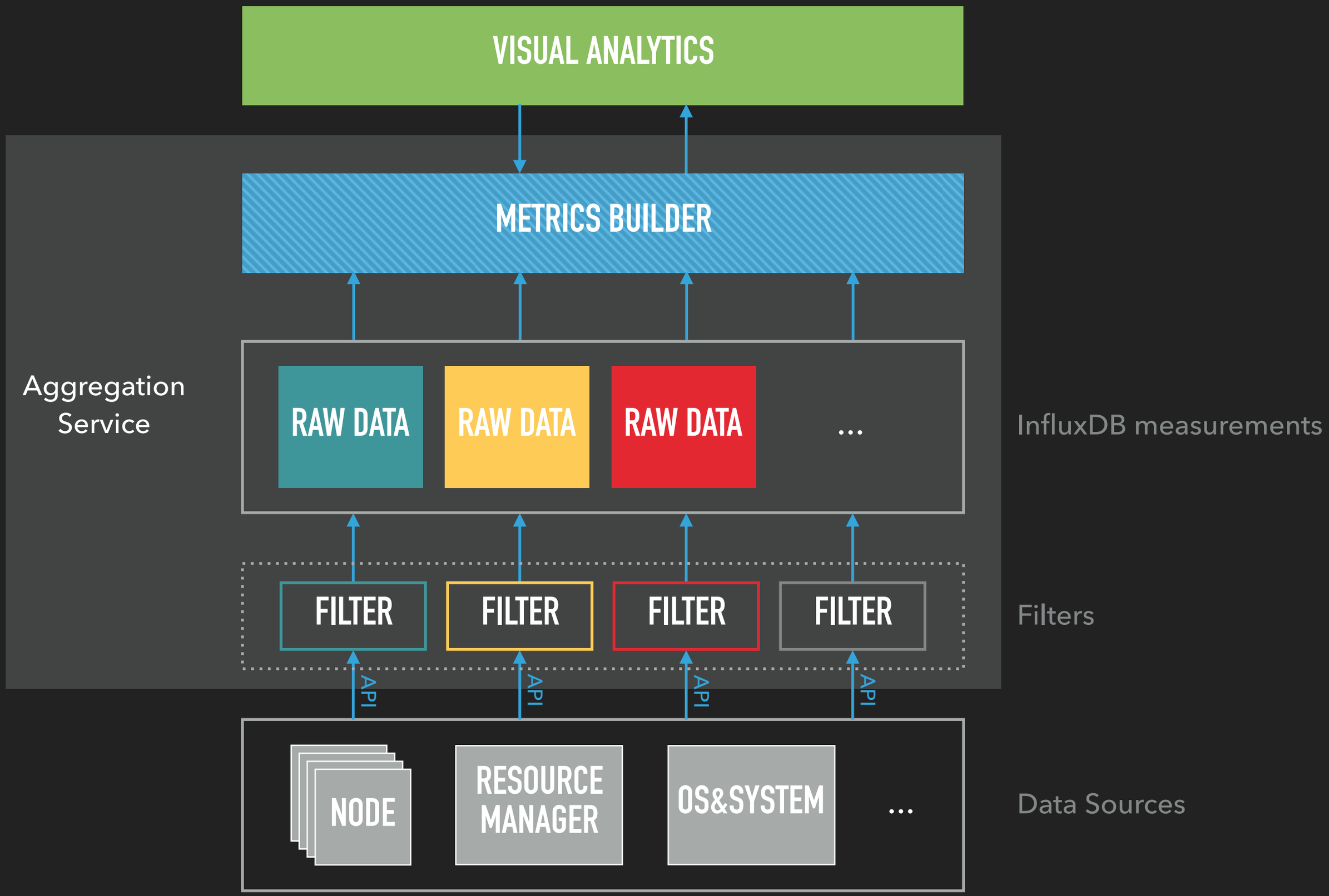
One-minute CPU load average

Ref: [1] Justin Moore et al. Data Center Workload Monitoring, Analysis, and Emulation.

APPROACH

- Several measurements(tables) in InfluxDB, record raw data
  - Measurement stores information that rarely changes, such as the physical memory size of a system etc.
  - Measurement stores information that frequently changes, such as power consumption and CPU utilization of the system
- Metrics builder
  - Query the database based on the timestamp, time interval, and aggregation type(mean, min, max, etc.) requested by users, build the aggregated metrics

MONITORING FRAMEWORK



QUESTIONS?/COMMENTS?