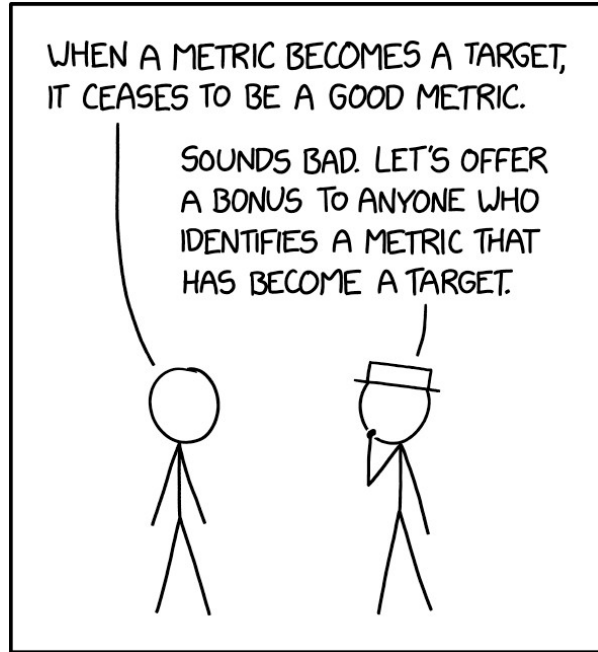


Core Facility Lunch and Learn



Metrics 101

Goals

- Define what a metric is (and is not)
- Understand basic tools to view metrics
- Understand our SLURM metric collection pipeline
- Live demo of our Grafana sites
- Avoid common misinterpretations

Why Metrics Matter

- Fast signals about system state and capacity
- Trends and baselines for planning
- Shared language between users and operators
- Early detection



What is a Metric?

- A numeric measurement over time
- Stored as a time series
- Enriched with labels/dimensions

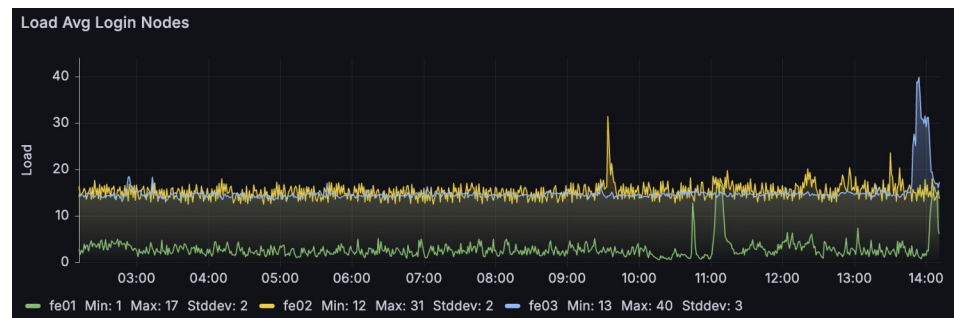
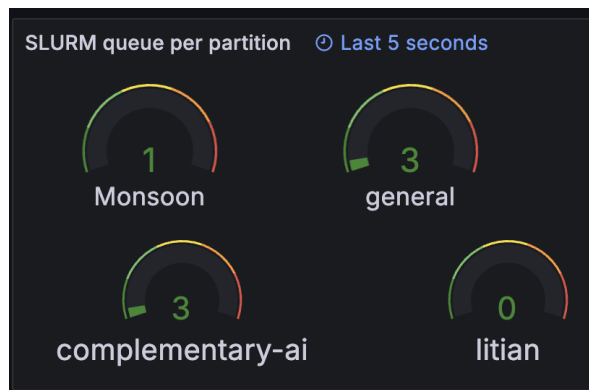
Anatomy of a Metric

- Name: what is being measured
- Timestamp: when it was measured
- Value: the measurement
- Labels: dimensions that slice the data
- Example
 - `Average_load(hostname="fe01.ds") 5 [TIMESTAMP]`,



Metric Visualization Types

- Counter: only increases
- Gauge: can go up or down
- Histogram: distribution of values



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What Metrics Are Not

- Logs: somewhat unstructured event records
 - “What happened?”
- Traces: end-to-end request flows
 - “Where did time go?”
- Dashboards: visualization of metrics
 - “What insights from the metrics can we see?”

Metric Pitfalls

- Metrics are proxies, not reality
- Aggregation can hide outliers
- High-cardinality labels can distort dashboards
- Missing metric collection can create blind spots

The Big Five

- CPU usage
 - How hard the computer is thinking
- Memory usage
 - How much working space programs are using
- Disk space
 - How full the storage is
- Network activity
 - How much data is moving in/out
- Errors / Failures
 - What is breaking and how often

Top

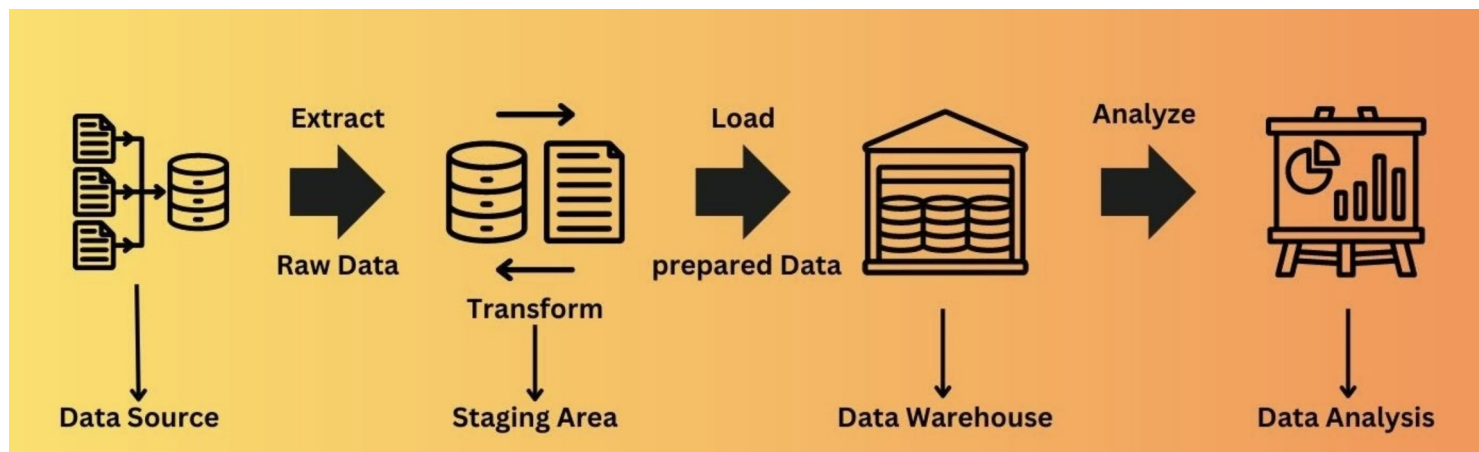
- Top command

```
top - 09:24:16 up 70 days, 16:57, 43 users, load average: 15.76, 14.83, 14.75
Tasks: 777 total, 6 running, 770 sleeping, 0 stopped, 1 zombie
%Cpu(s): 0.2 us, 2.4 sy, 0.1 ni, 96.9 id, 0.4 wa, 0.0 hi, 0.1 si, 0.0 st
MiB Mem : 128510.1 total, 28549.5 free, 68590.4 used, 31370.2 buff/cache
MiB Swap: 8192.0 total, 0.0 free, 8192.0 used. 58708.5 avail Mem
```

PID	USER	PR	NI	VIRT	RES	SHR	S	%CPU	%MEM	TIME+	COMMAND
39707	caom	32	12	23.7g	20.9g	0	S	42.4	16.6	3484:02	language_server
38206	caom	32	12	1197440	91696	1660	R	19.1	0.1	1407:30	node
36720	caom	32	12	11.3g	50912	1924	R	8.9	0.0	714:52.18	node
37083	caom	32	12	1217660	25780	2136	R	8.9	0.0	693:03.20	node
38171	caom	32	12	42.0g	186740	1664	R	8.6	0.1	753:21.35	node
659953	mingxua+	24	4	72.4g	557752	63740	S	4.3	0.4	25:35.17	node
4136278	heqiany+	32	12	32.0g	242352	22720	S	3.3	0.2	161:34.51	node
1265	root	20	0	6135008	1.6g	1.5g	S	3.0	1.3	2690:41	falcon-sensor-b
1517	alloy	20	0	4760480	91012	28652	S	1.6	0.1	1496:26	alloy
878268	annawoo+	20	0	11.3g	96128	45384	S	1.0	0.1	2:19.85	node
878499	annawoo+	20	0	72.3g	354620	62920	S	1.0	0.3	6:17.07	node
1864760	root	0	-20	0	0	0	I	1.0	0.0	0:09.02	kworker/u65:2-xprtiod
1896362	bennett4	20	0	20400	5656	4188	R	0.7	0.0	0:00.20	top
14	root	20	0	0	0	0	I	0.3	0.0	126:51.30	rcu_sched
2668	root	20	0	2355172	85676	8612	S	0.3	0.1	100:36.99	agentbeat
46738	caom	24	4	7636	3588	3384	S	0.3	0.0	19:19.43	bash
1234997	root	20	0	0	0	0	I	0.3	0.0	0:44.19	kworker/u64:13-rpciod
1751779	junsol	20	0	46760	10932	5960	S	0.3	0.0	0:22.67	sshd

Our Metric Collection Pipeline

- SLURM queries → Docker service → Prometheus → Grafana
- Prometheus scrapes by “Pulling”
- Docker service makes these metrics available under /metrics



Pipeline

- Data Sources
 - SLURM commands. Squeue, sinfo, sacctmgr
- Docker Service
 - Runs SLURM commands, normalizes and formats data, then exposes metrics on endpoint
- Prometheus
 - Scraps exposed data every 5 seconds and stores metrics
- Grafana
 - Queries Prometheus to render dashboards



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Live Demo

- Live walkthrough of graf.ds.uchicago.edu and graf.cs.uchicago.edu

Checklist for Trustworthy Metrics

- Do I understand the unit?
 - GB, Gb, and GiB
- Is this a rate or a total?
- Am I looking at the right time range?
- What labels should I be slicing by?
- What would confirm or contradict my view?

Q&A

- Has there even been a metric that you trusted that led you astray?
- What would make our dashboards more useful?
- Which metrics are confusing or missing?