Thirty Billion Metrics a Day:

Large-Scale Performance Metrics with Ganglia

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usenix LISA15

November 8–13, 2015 | Washington, D.C.
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~~Thirty~~ Billion Metrics a Day: Forty

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- 7,000,000 unique metrics collected every 15 sec
- from 1000s of machines
- 480,000 metrics/second
- 41,000,000,000 (billion) metrics/day

How many machines do we need for this?

Two.

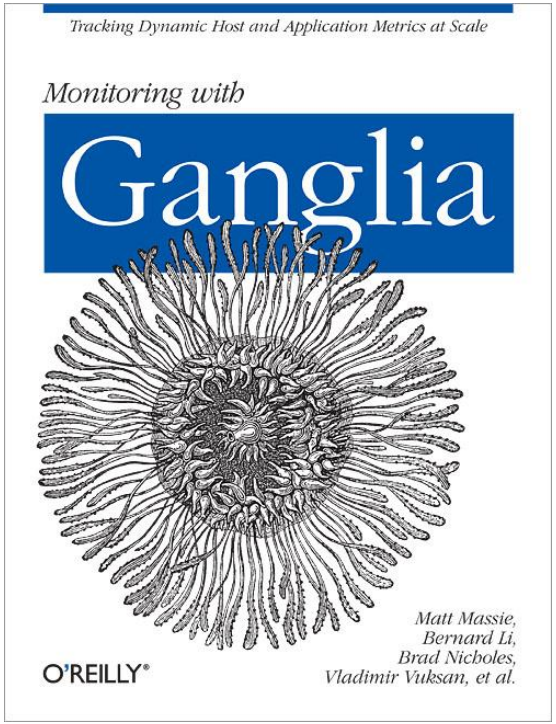
Who am I?

quantcast

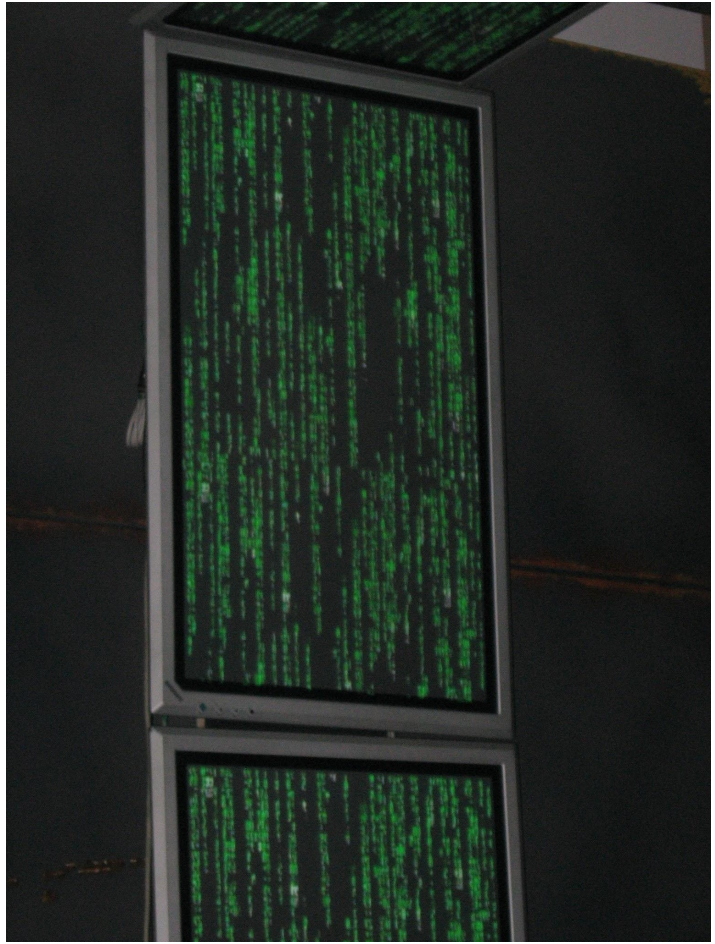
- **What is Ganglia?**
- How Ganglia works
- Inputs
- Outputs
- Scaling
- What’s next

What is Ganglia?

"Ganglia is a scalable distributed monitoring system for high-performance computing systems"



What does “monitoring” mean?



What is Ganglia - monitoring vs. metrics

performance metrics: regular, numeric, time-series data

monitoring: scheduled checks (of metrics, processes, endpoints, etc.) to identify anomalous behavior

alerting: getting a human's attention

visualization: charts and graphs

By these definitions,

Ganglia **collects**, **aggregates**, and **visualizes** performance metrics.

What is Ganglia not?

- No monitoring
- No alerting
- No asset database
- No Julienne fries

- What is Ganglia?
- **How Ganglia works**
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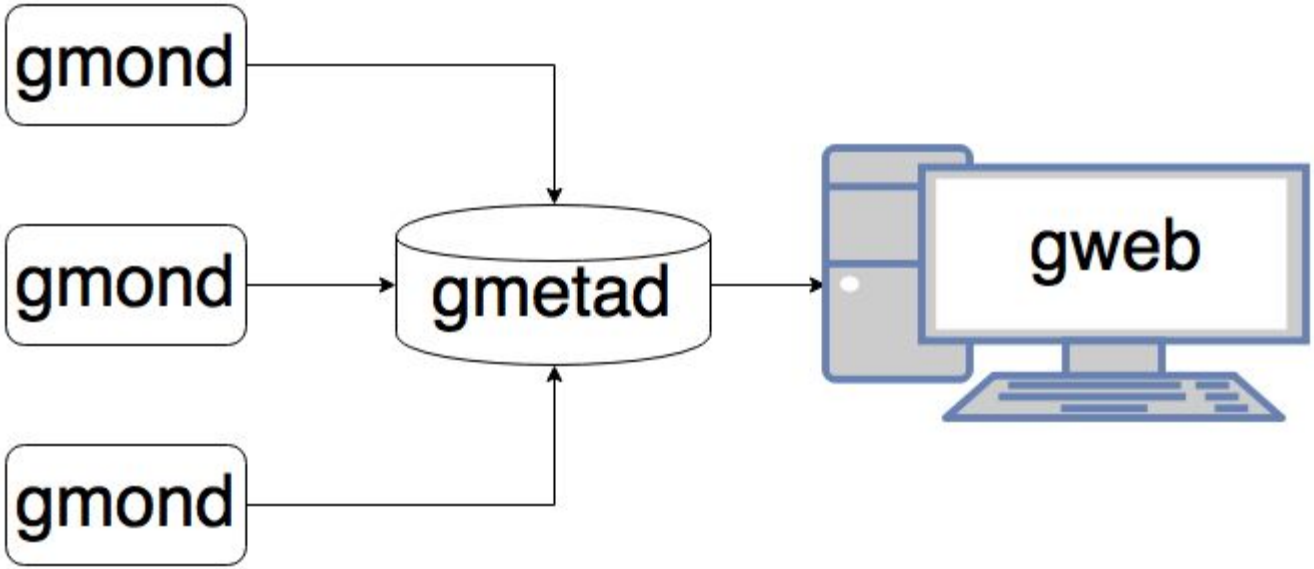
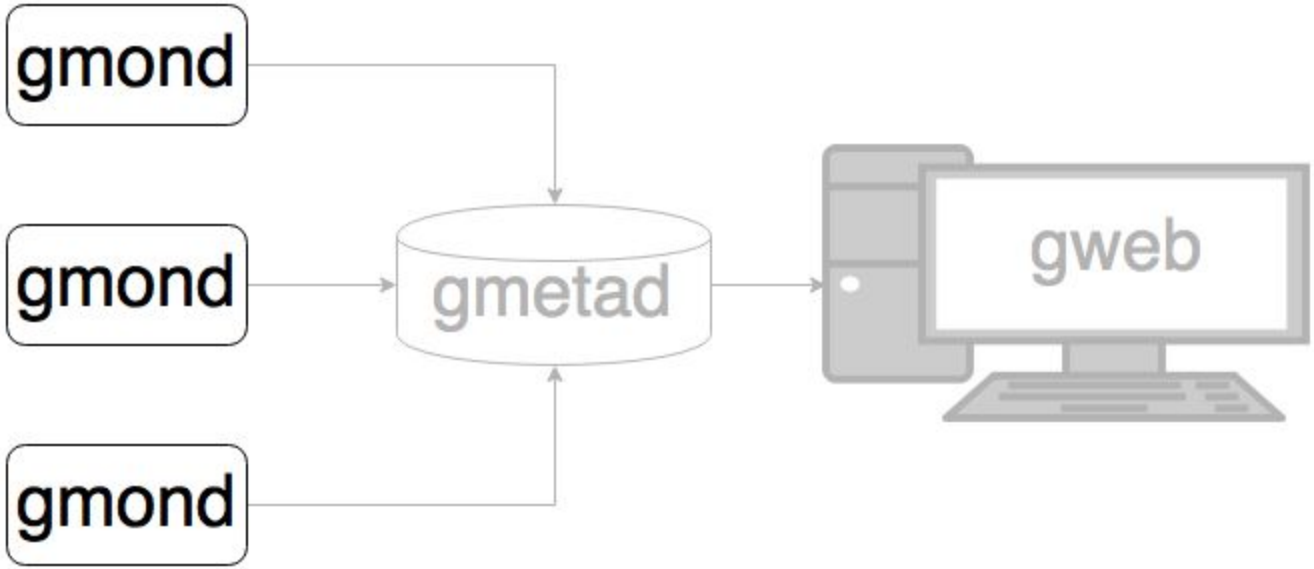
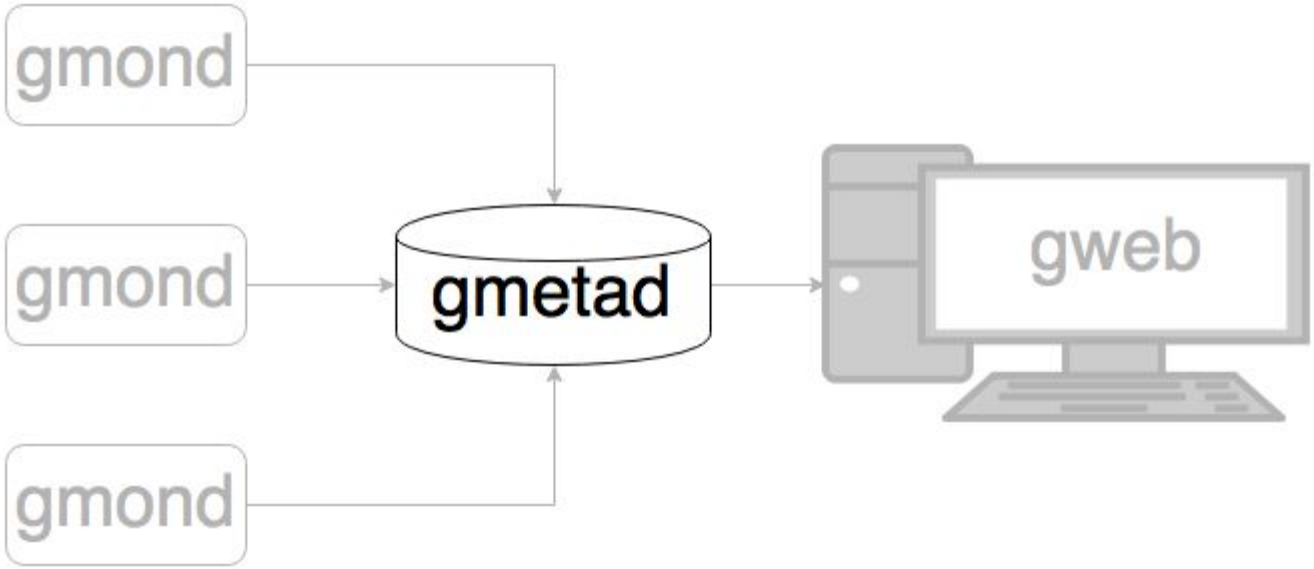
How Ganglia works



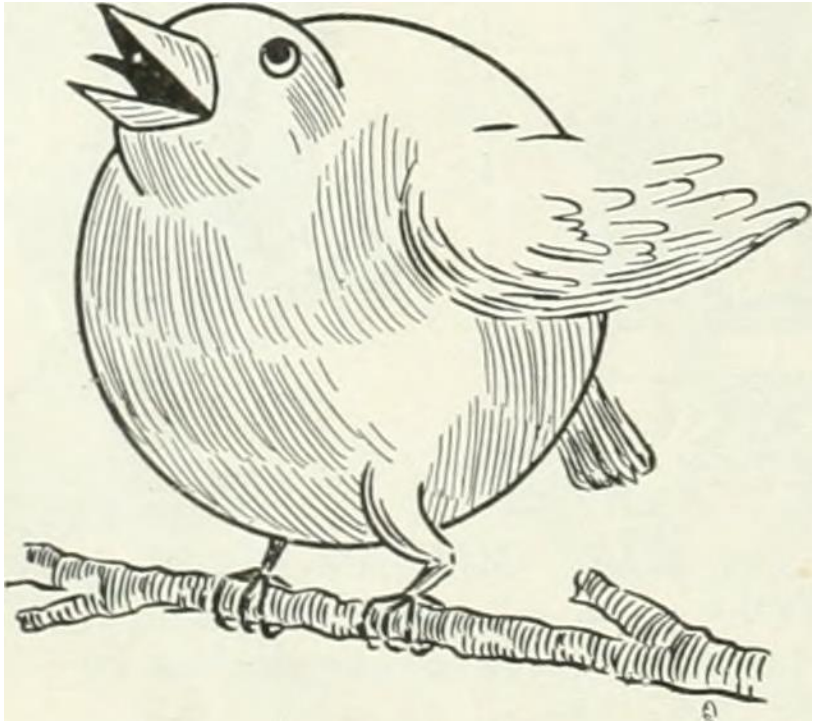
How Ganglia works - gmond



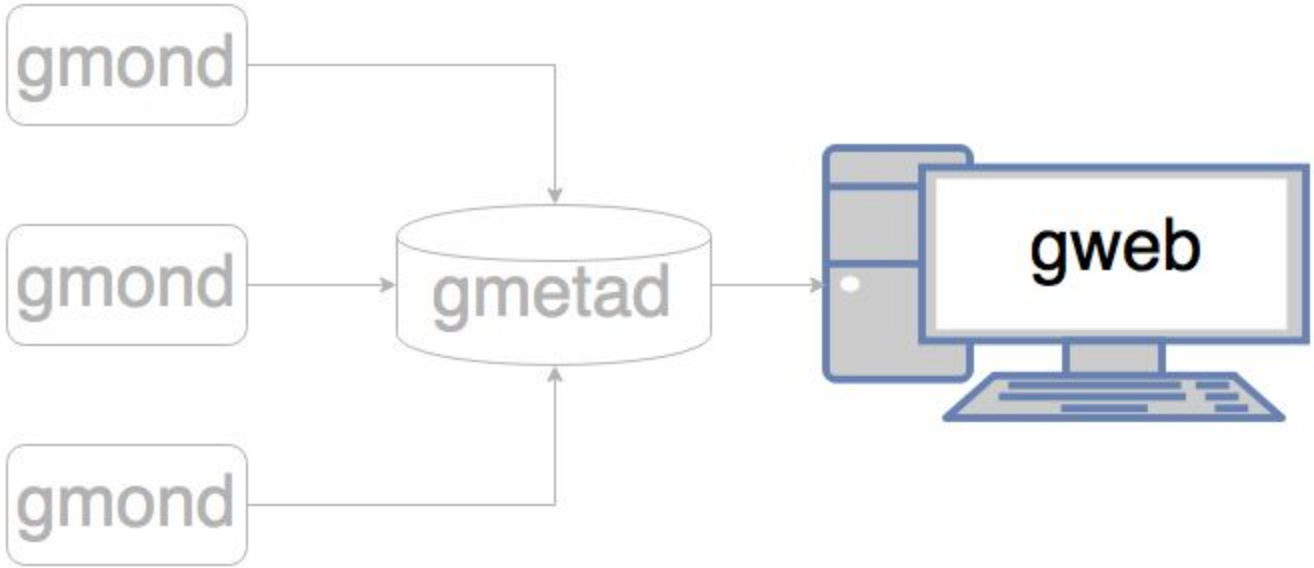
How Ganglia works - gmetad



(aside) How RRDs work



How Ganglia works - gweb



How Ganglia works - Upsides

Built-in hierarchy, summarization, and metadata

Web UI is easy to browse and grok

How Ganglia works - Downsides

Downsampling loses data :’(

Custom visualizations are hard

- What is Ganglia?
- How Ganglia works
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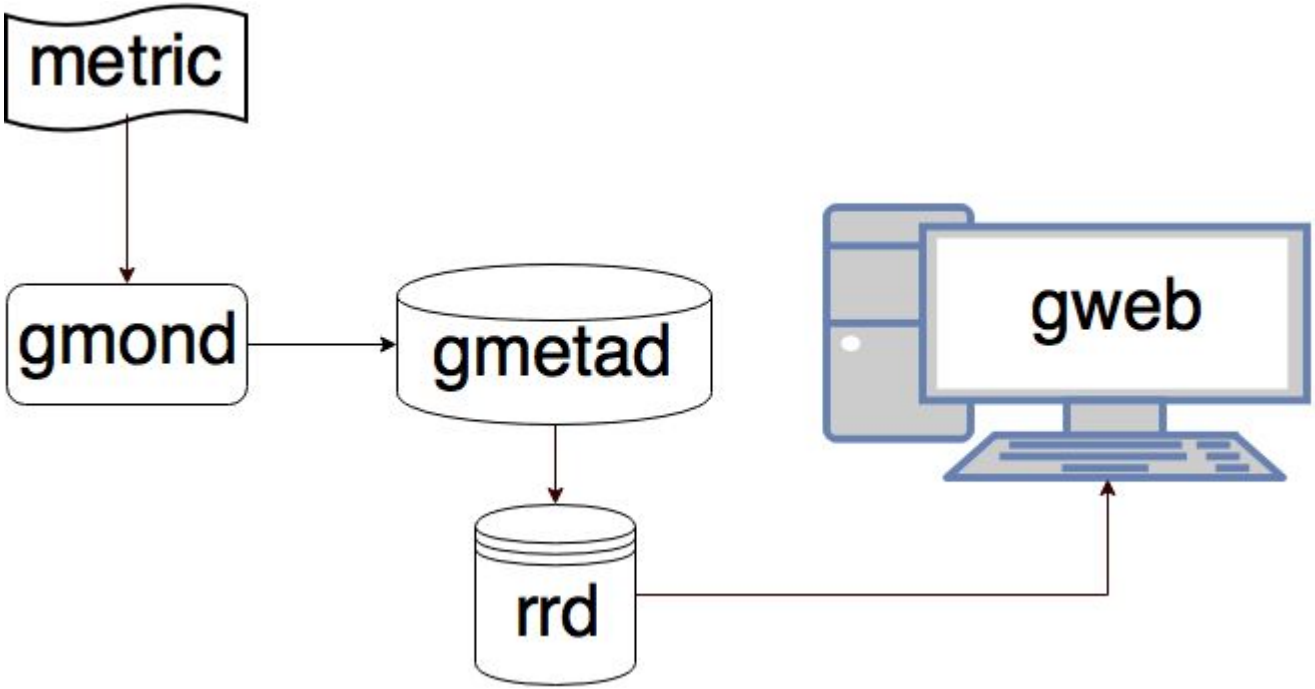
Life of a Metric



Inputs - How do we feed it?

- gmond
- gmetrics
- snmp2ganglia
- json2gmetrics

Inputs - json2gmetrics

Translates a structured JSON block into metrics

```
'[{"name": "mood", "value": "happy", "type": "string"},
  {"name": "sad_people", "value": 0, "type": "uint8" }
]' | json2gmetrics
```

Why so many inputs?

Less work to report = more metrics

More metrics = more useful

Classes of metrics

- High-level operating system health
- In-depth system performance
- Infrastructure metrics
- Application performance
- String “metrics”
- Anything!

Classes of metrics - Monitoring checks

Privileged checks run locally and report to Ganglia

Monitoring interprets metrics as check results

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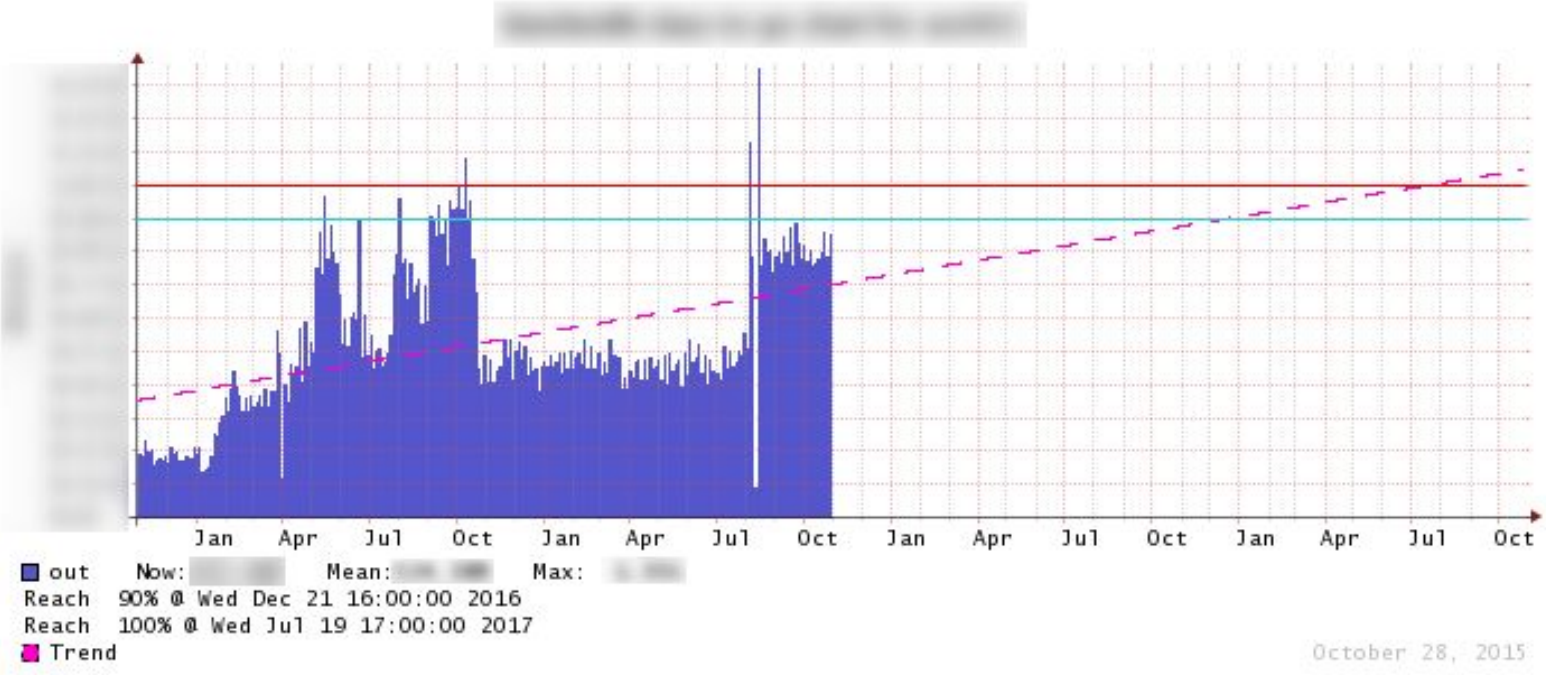
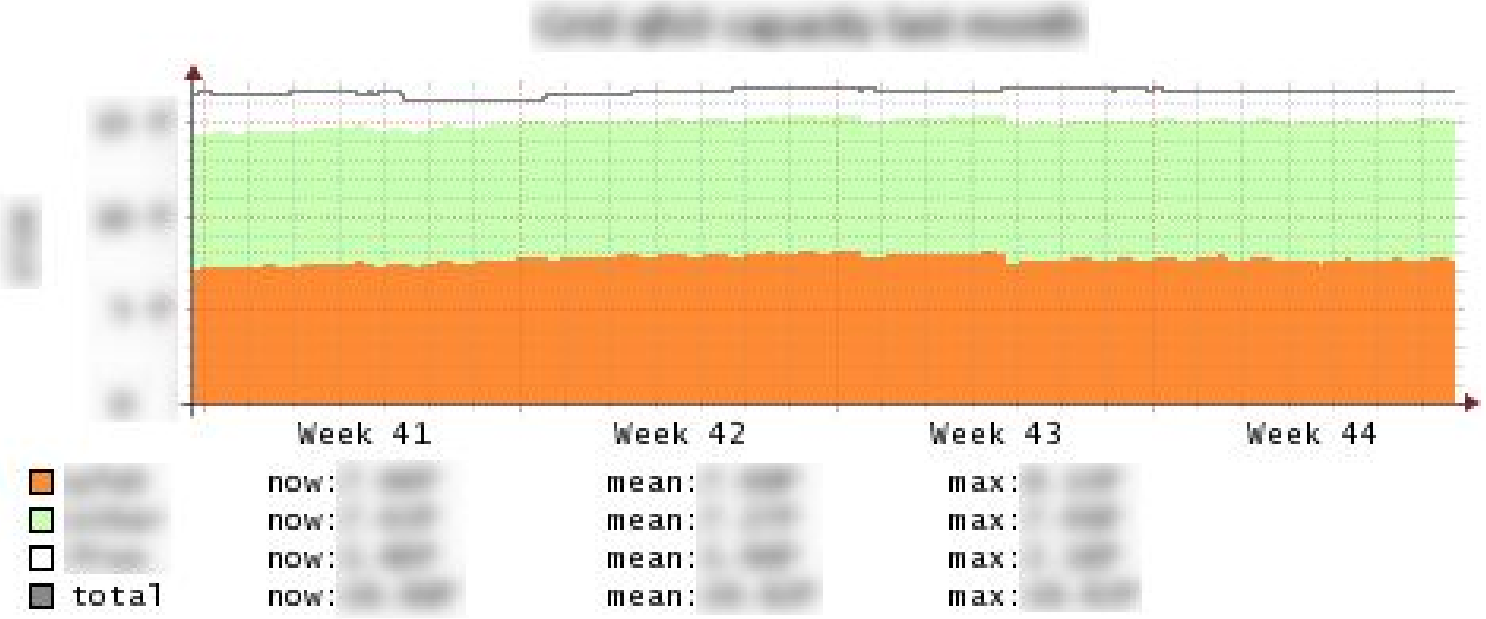
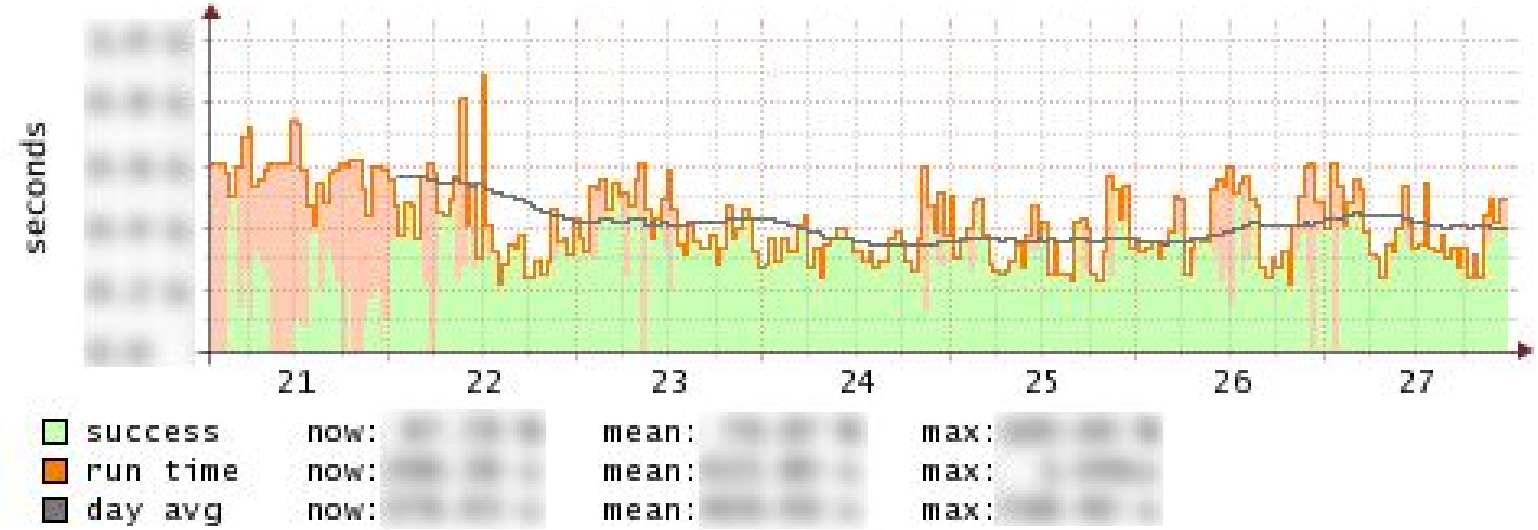
Visualizations - trendlines



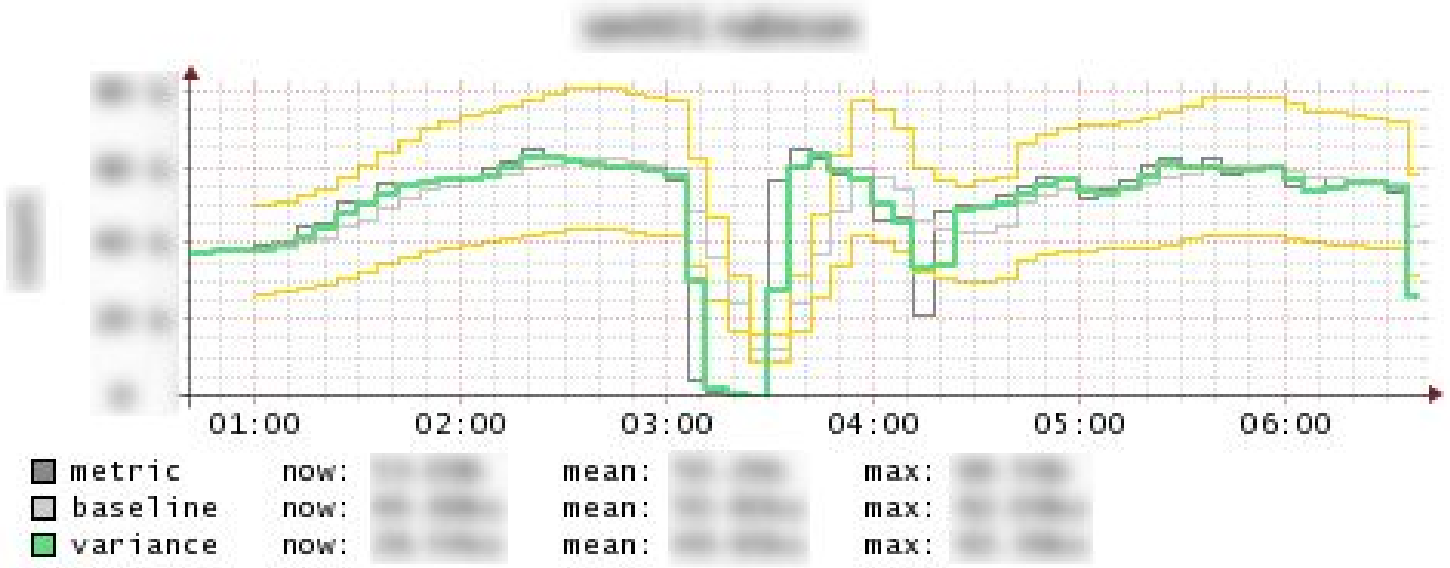
Visualizations - CPU/Memory per-user



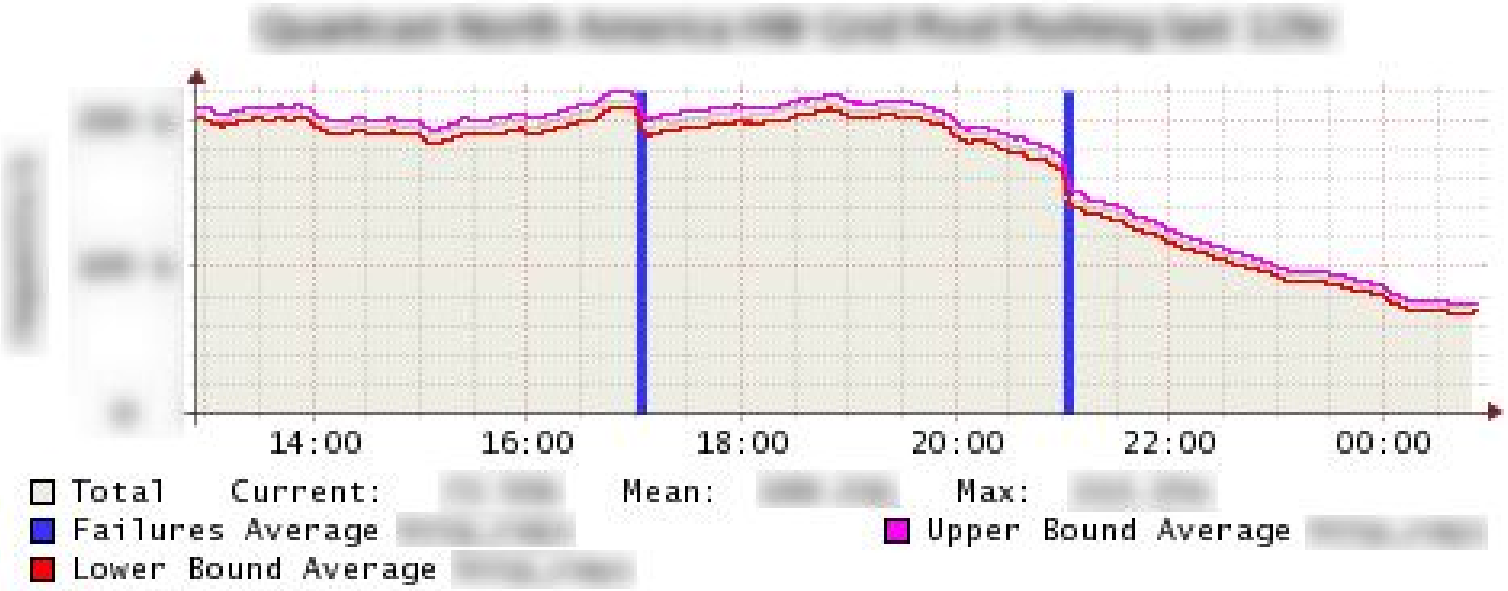
Visualizations - Red background for failures



Visualizations - running variance + bounds



Visualizations - Holt Winters

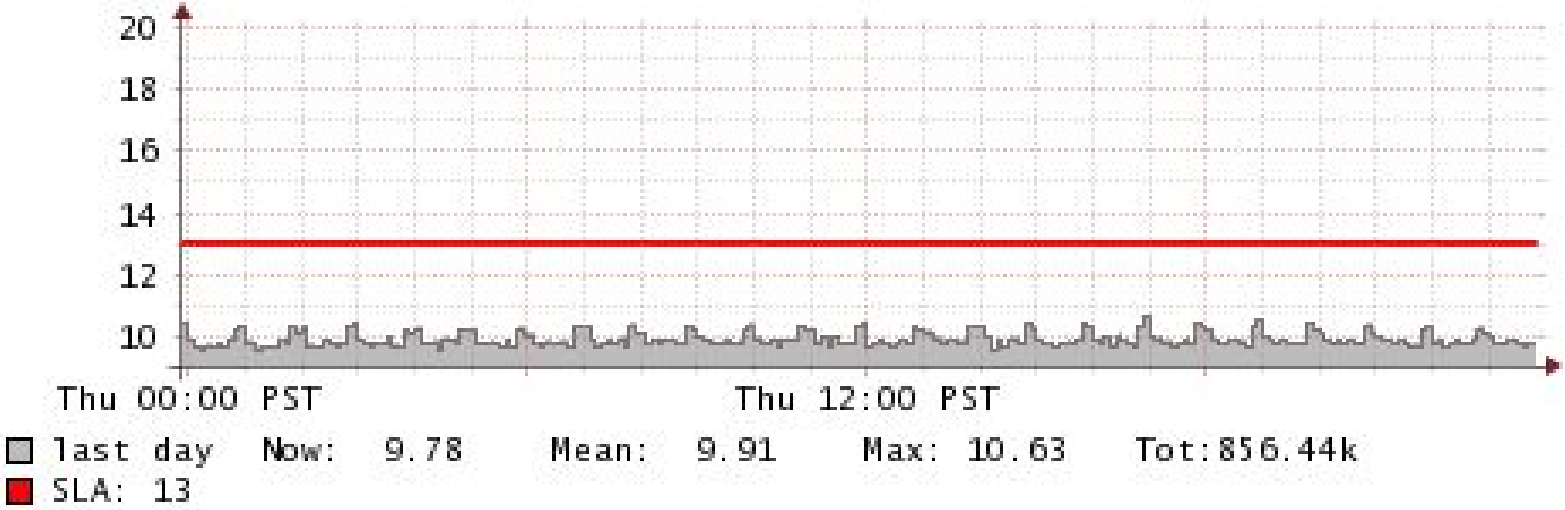


Monitoring

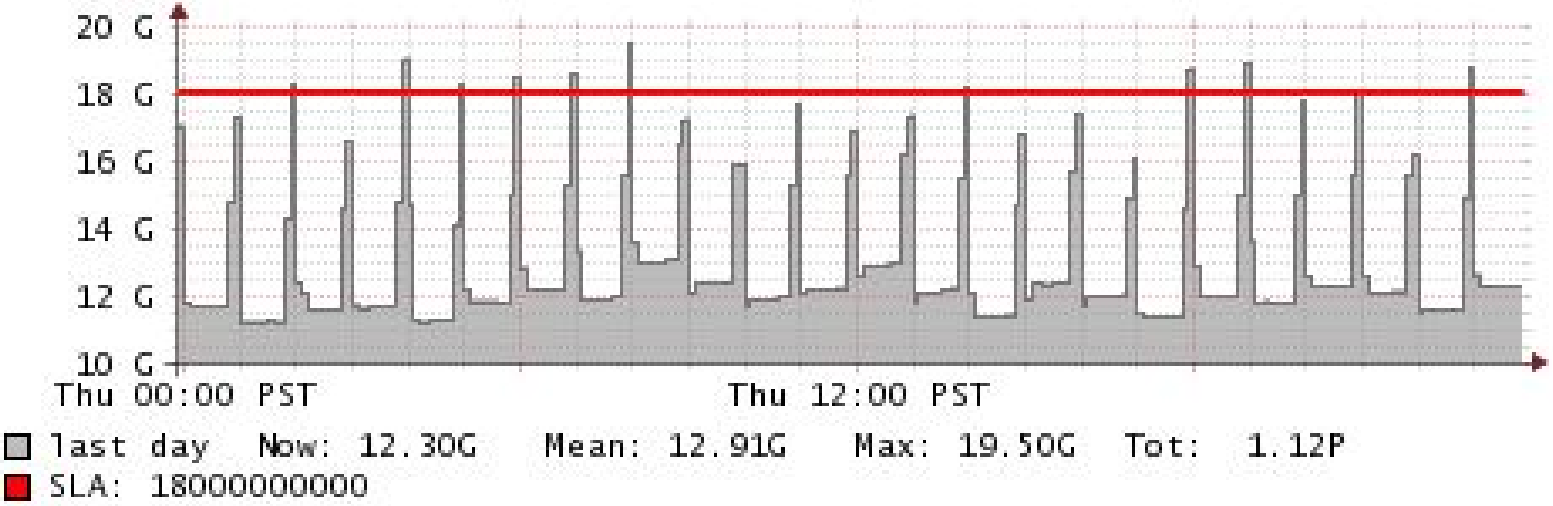
Ganglia metrics are a huge component (> 50%) of our monitoring world

- Simple, static thresholds
- Historical averages
- Smart “raw data” graphs

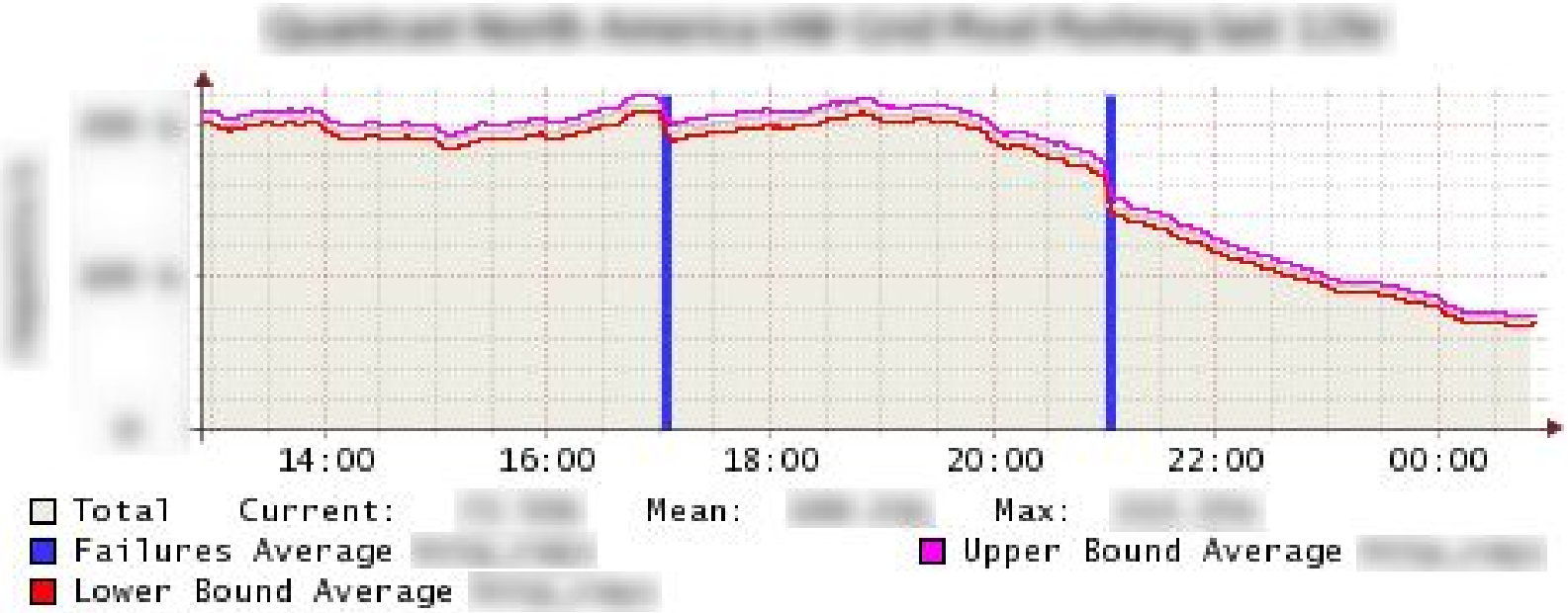
Monitoring - Static Thresholds



Monitoring - Historical Averages



Monitoring - Smart Graphs



Tracking Deployments

Before deployment, identify key metrics and expected change

After deployment, verify the changes are as expected

Troubleshooting

- All metrics for a host at once
- Same metric across all hosts
- Easy to make aggregate graphs

Capacity Planning

- Ganglia can store long term data (years)
- Simple to see trends over long spans of time

- What is Ganglia?
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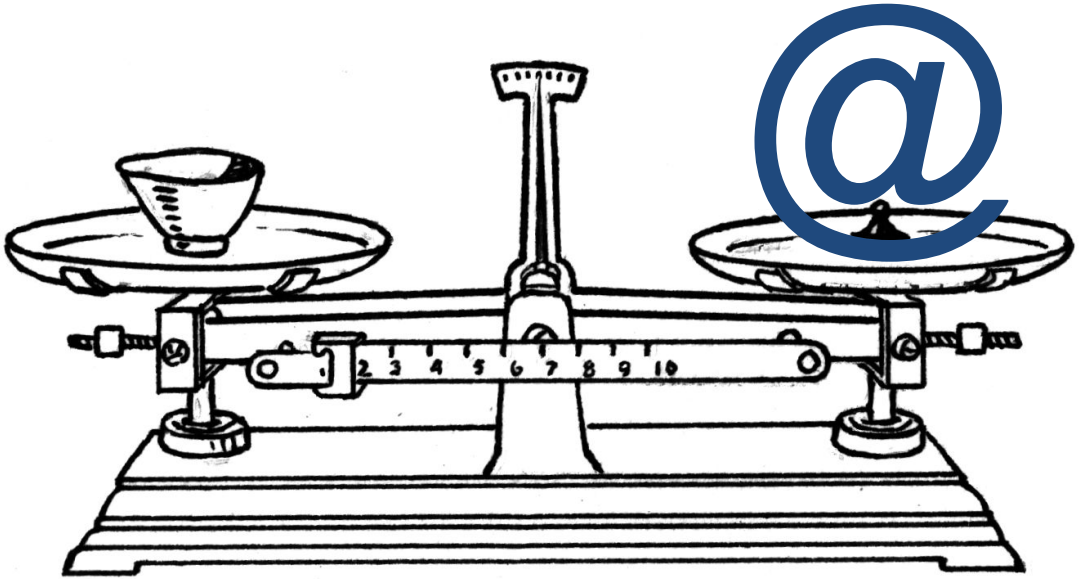
- What’s next

Scaling

Performance metrics must be:

- Realtime
- Highly-available
- Actionable
- Comprehensive
- “At scale”

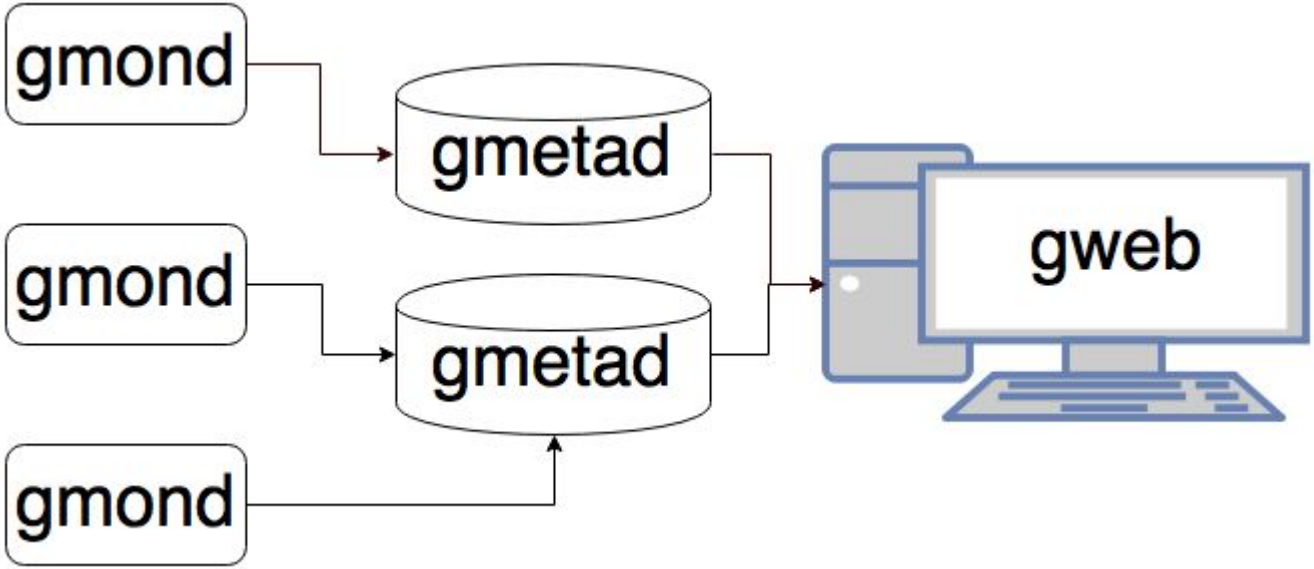

1 2 3 4 5 6 7 8 9 10

Scaling

"at scale":

functionality dictated by business requirements, not the other way around

Scaling Ganglia - sharding



Scaling Ganglia - gmond

- gmetad -> every gmond? Too slow
- gmetad -> master gmond? SPoF
- gmetad -> multicast gmond? Just right

Scaling Ganglia - tmpfs and mmap

- Metrics -> tmpfs
- tmpfs -> disk
- disk -> tmpfs (on reboot)

Note: Turn off mmap in RRDtool!

Scaling Ganglia - patches

Several other bottlenecks in the Ganglia code

Some fixes have been published, others not yet

- What is Ganglia?
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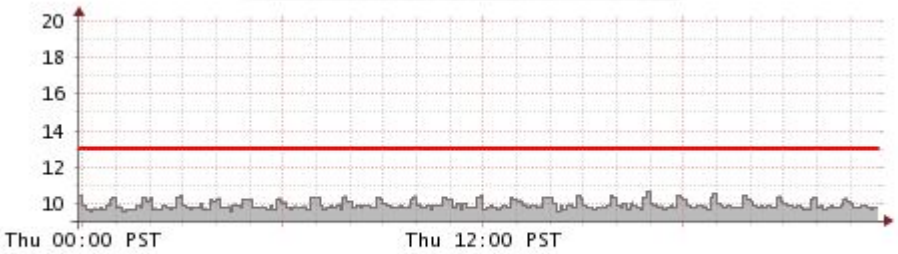
What’s next - Full resolution

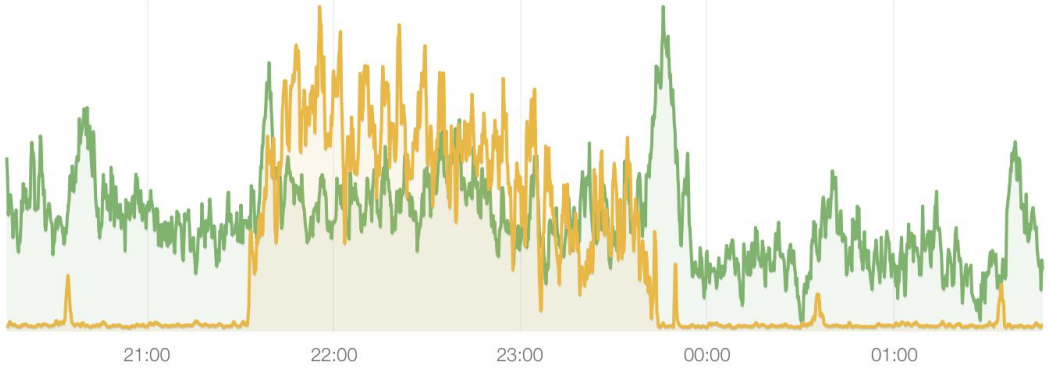
High-resolution metrics downsample too quickly

Why not store all data forever?

What’s next - Visualizations



vs.



What’s next - still Ganglia

Why not move away from Ganglia entirely?


END
OF
ROAD

Takeaways

- Ganglia is powerful, reliable, and scales incredibly well
- Don’t let your metrics system decide what data you can collect
- You are probably ignoring useful metrics right now

Thank you!

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Image Sources

Slide 7: http://shop.oreilly.com/product/0636920025573.do

Slide 16: https://www.flickr.com/photos/internetarchivebookimages/14782490515/

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