Thirty Billion Metrics a Day:
Large-Scale Performance Metrics with Ganglia
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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?
● 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?
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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
• What is Ganglia?
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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

- Last day: 12.30G
- Mean: 12.91G
- Max: 19.50G
- Tot: 1.12P
- SLA: 180000000000
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?
How Ganglia works
Inputs
Outputs
Scaling
What’s next
Scaling

Performance metrics must be:

- Realtime
- Highly-available
- Actionable
- Comprehensive
- "At scale"
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?
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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