The Open-Source Monitoring Landscape

Michael Merideth
Sr. Director of IT, VictorOps
mike@victorops.com, @vo_mike

My History and Background

- Working in IT since the mid 90's
- Mostly at startups in the Colorado Front Range area
- Along for the ride during the "dot com boom"
- Build my career using open-source tools

Since the 90's now, there's been a sharp division in tools and methodology between the enterprise space and the startup and small business communities. Obviously, smaller businesses, especially in the tech sector, were early and eager adopters of open-source technology, and much quicker to learn to rely on open-source tool chains in business-critical applications.

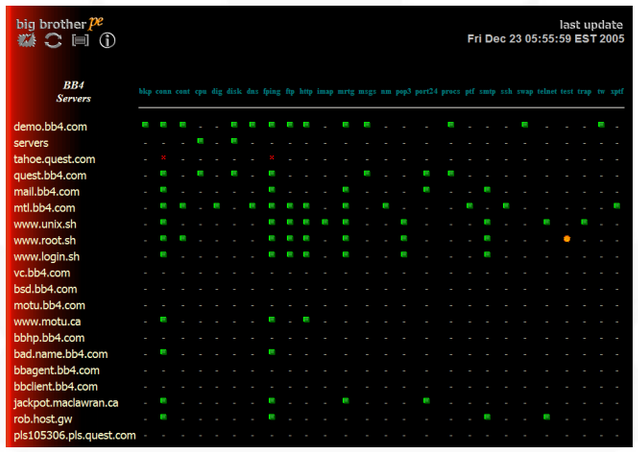
Up at the enterprise level, at the public companies, they're only now fully-embracing Linux as a business-critical tool, and I think that's largely because "the enterprise" is starting to be defined by companies that either came up in the dot com era, like Google, or built the dot com era, like Sun, or Dell, or let's say RedHat.

So, the "enterprise" had their toolchain, built on commercial solutions like HPUX and OpenView and so on, and the startup community, the "dot com" community had a completely different toolchain, based on Linux, based on open standards and protocols, built with open-source components like GNU, and Apache, and ISC Bind and so on. I'm lucky enough that I've been able to spend my career in the startup sphere, working with that open-source toolchain. I started working in IT in the mid 90's in the Colorado front range, and I've spent my time since then working for and consulting at early-stage startups and other "non enterprise" shops. I've been able to see first-hand as the OSS toolchain has gone from seat-of-the-pants flying to mature, stable, mission-critical solutions (with seat-of-the-pants mode still available for the adventurous of course).

I've always been interested in monitoring and telemetry, and the ways it can help make life easier for people like me, so I really have my dream job now, working for VictorOps in Boulder, Colorado. We spend a lot of time integrating our product with monitoring tools, which gives me an opportunity to see a lot of what's out there, and hear from our customers about what they're using and how it's working for them.

Open-Source Monitoring

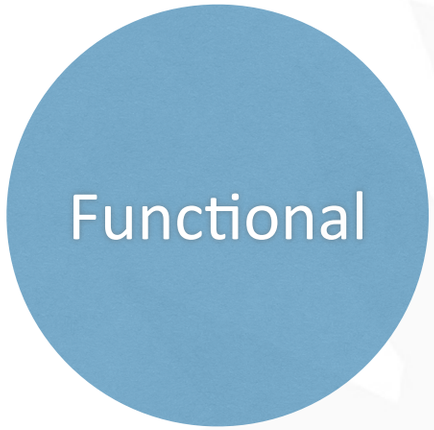
- Started out as shell scripts and "Big Brother"
- Better tools emerged in the late 90's
- For much of the 2000's, not much changed in the space
- Now things are shaking up!



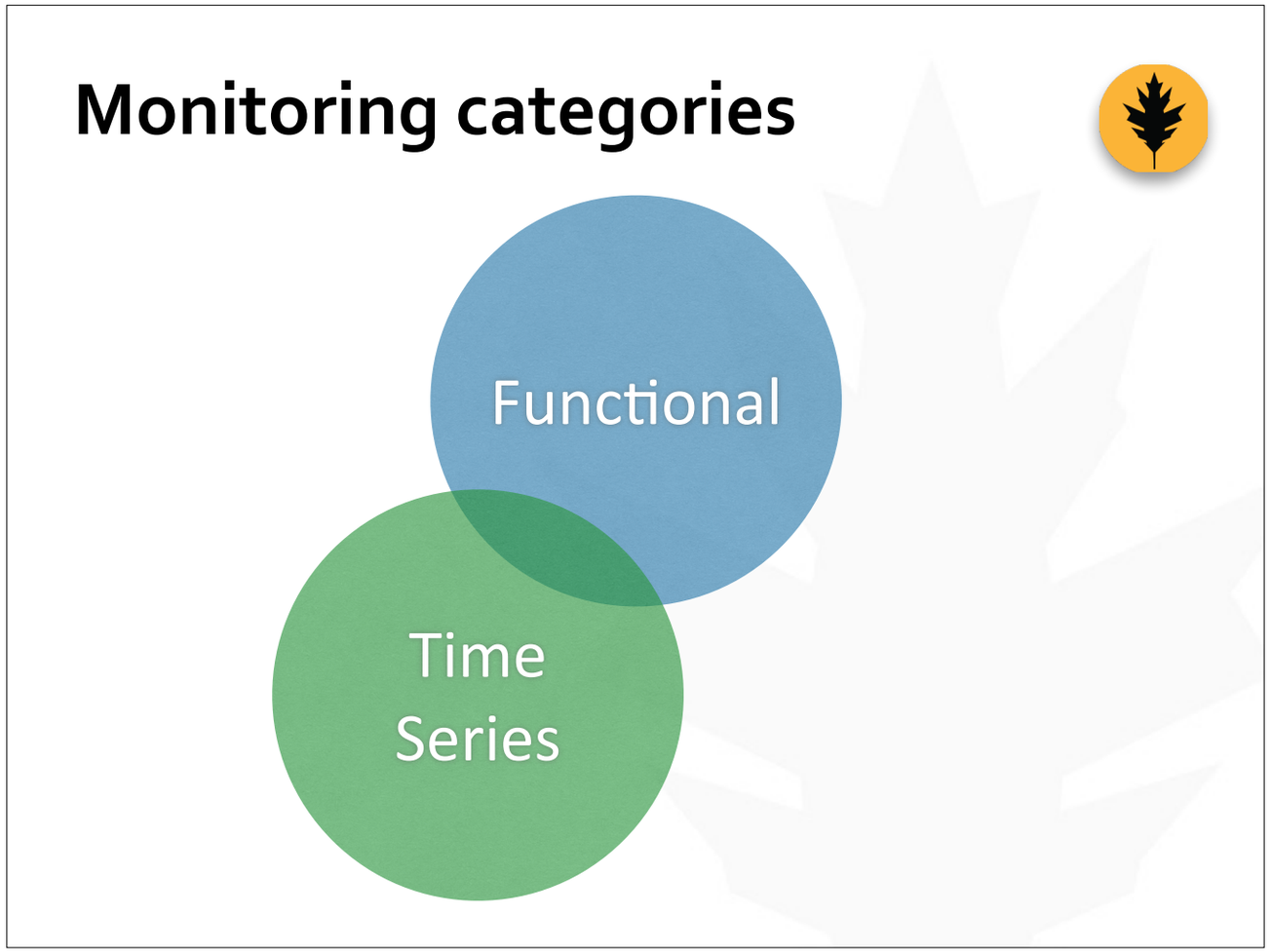
So that's why I'm here to talk to you about open-source monitoring today. When I started in IT, the free monitoring options were a little thin on the ground, and most of us were running scripts out of cron and using other homegrown solutions to get the job done. Here you can see a screenshot of "Big Brother", which was a common OSS tool at the time. Isn't that nice? I love the grid view, which assumes that every service runs on every host. That's just good design.

In the late 90's, better open-source monitoring tools started to emerge and get adopted. And for several years after that, not much changed. A great deal has been happening in the monitoring space lately though. I think it's in response to the rise of virtualization and cloud hosting, and in response to the rise of DevOps business methodologies. Some older, more established solutions are making changes, or getting challenged by new approaches, and I think a line is being drawn between a more enterprise-like all-in-one approach to monitoring solutions and a more modular approach.

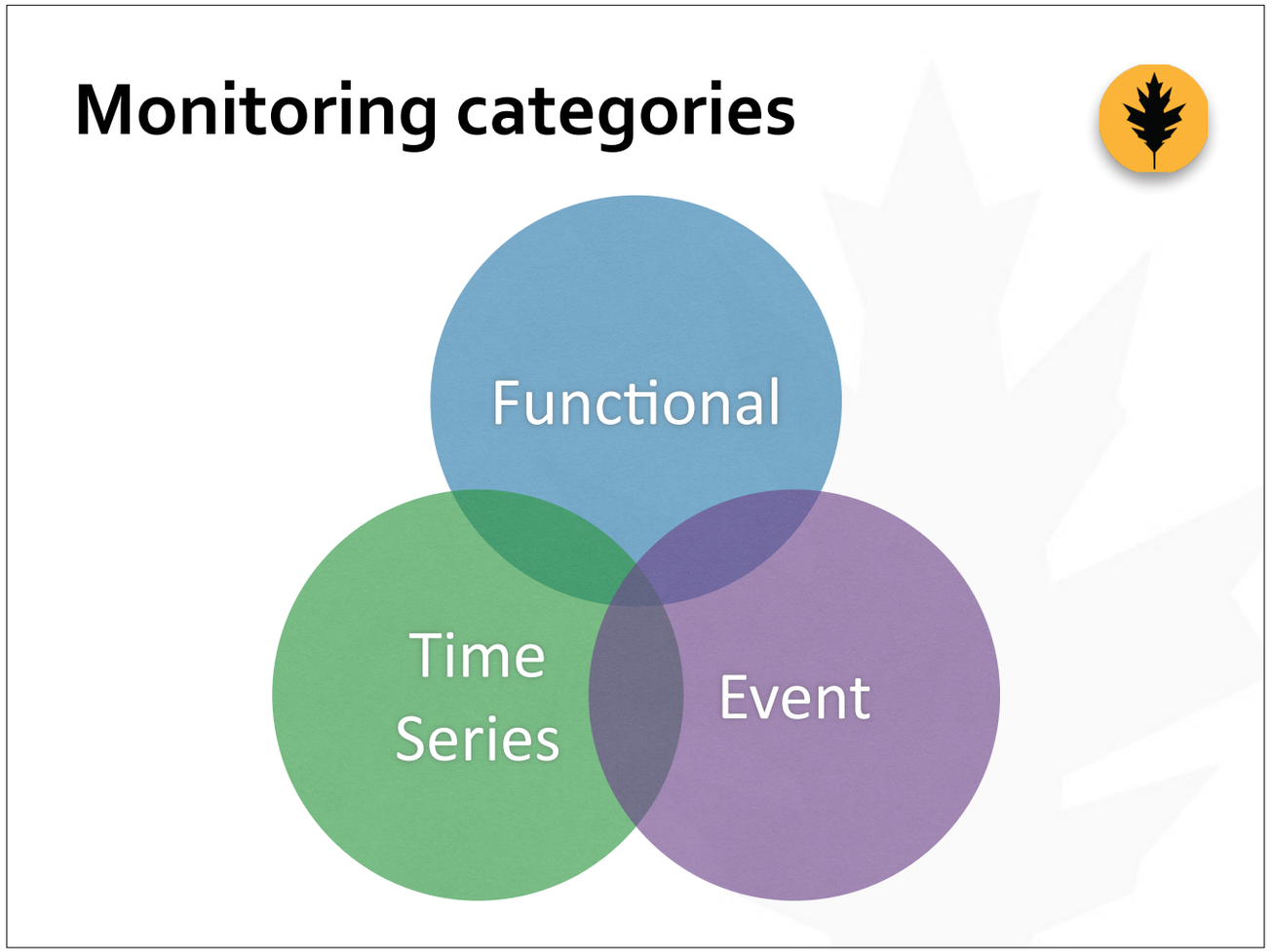
Monitoring categories



There's three main categories in monitoring where I'm going to be concentrating my focus here. First is traditional functional monitoring, the type of product that pages you when your website goes down. Nagios is an obvious example of a functional monitoring product.



Then we have time-series data collection, where we're more frequently generating graphs than generating alerts, though there certainly can be overlap. Cacti and Graphite are examples here.



Finally we have event processing, where we're looking at log content and other near log-type events, and this might get visualized like time series data, or it might generate an alert like a functional monitoring system. Logstash is a good example in this category.

So you can see there's a lot of overlap to these categories, and most organizations are using a combination of all three. I'll be examining some projects that take on a single category here, and a few that attempt a broader scope.

Why OSS Monitoring?

The practice of Systems Administration is changing quickly

- DevOps
- Infrastructure as Code
- Virtualization
- Cloud Hosting and Elastic Environments

Commercial solutions can't keep up!

First, though, I want to talk about why open-source monitoring is so important.

Business methodologies are changing, from the ground up. I don't know about you, but the day-to-day practice of my job looks radically different than it looked five years ago. DevOps, systems management frameworks and "infrastructure as code" change the picture of how I want my management tools to work together. Virtualization and cloud hosting mean that network architectures have been changing as well, and even the definition of "on-premise" is evolving. But what hasn't changed is the absolute requirement of availability. That means failure detection, that means capacity planning, that means predictive analysis, all while working at "elastic" scale.

Proprietary tools have a tough time in this environment. Maybe the licensing model doesn't work with a constantly changing network size, or maybe it isn't realistic about multi-site setups. Availability features of the software itself become a "premium" feature. Maybe something about the product makes network architecture demands that you simply cannot meet. And of course commercial solutions are frequently not excited about integrating with competitors' products. So, the commercial tool becomes a constraining force in the DevOps workflow, and you either lose velocity because of it, or you limit your use of the tool, and pay a price in quality. Open-source tools tend to integrate more easily with systems management frameworks like Puppet and Chef, as well as with other monitoring tools. They can be deployed experimentally without making a big financial commitment. You don't have to worry about "return on investment" if you only want to use a subset of features. So, open-source tools can become a process accelerator rather than getting in the way.

What about SaaS?

- There are some great options out there
- It can be a great way to get started
- It can be a great second-line of defense
- Cost can scale very quickly
- Even in a cloud-hosted environment, you will still need "on premise" monitoring

Now there's a ton of new SaaS offerings in the monitoring space. At VictorOps we're happy to work with them all of course, and they can provide great point solutions, especially in the early product development stages. I'm also a big fan of using external monitoring services to provide a second line of defense in case your primary monitoring solution fails, and they can also be a great way to see how you're performing from different parts of the world. However they tend to be priced by the data point, so as you scale up you tend to wind up going from watching everything to watching a statistically significant sample, to watching a statistically insignificant sample, and it's the same problem as enterprise software. You under-monitor, and you sacrifice quality. So, if you're scaling up at all, you can use managed services, but you're still going to want "on-premise" solutions that you can scale at will.

Functional Monitoring Tools

All right, so let’s start looking at the opens-source tools that are out there, starting with functional monitoring. This isn’t a comprehensive list of every project out there, so your personal favorite might not be represented. But these are some of the projects that I thought were interesting or important for one reason or another.

Nagios

Everybody Loves Nagios:

- Much better than its predecessors
- Simple architecture
- Thriving ecosystem of plugins and add-ons
- Well-understood and popular

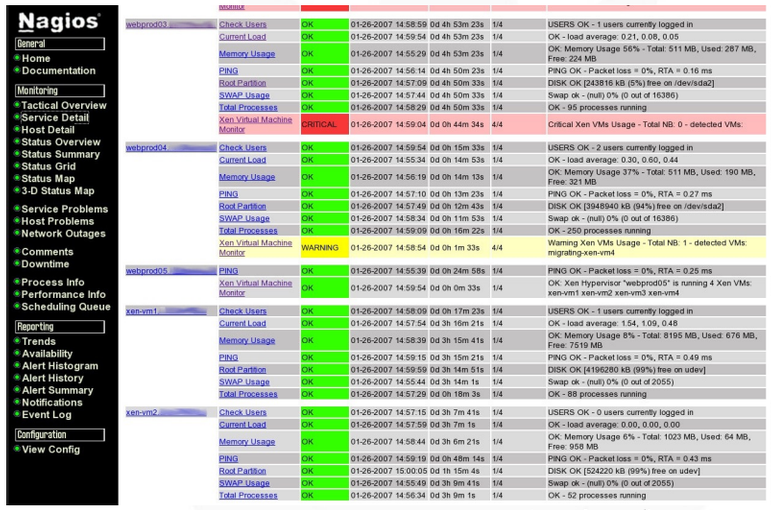


Image Source: linuxscrew.com

For about 15 years now, the 500 pound gorilla of open-source monitoring has been Nagios. It is the most commonly used integration we see at VictorOps by a wide margin. When it came along, most of us were using “Big Brother” for monitoring, or homegrown scripts running out of cron. In that world, Nagios was a revelation. It’s strength is that it’s really just a scheduler and event handler, and all the complicated check work is done by a highly modular and portable system of plugins. It’s easy to write a check plugin for nagios, and given that the checks are standalone programs that are called with a fork and exec, the plugins can be easily re-used by other monitoring daemons like NRPE or by completely different solutions. Plugins have been written to do complex, deep monitoring of most devices and applications out there, it’s a thriving ecosystem.

The configuration language for Nagios is well understood, even though it can lend itself to some ambiguity and it’s possible for nagios configurations to get impossibly complex. It mainly has the advantage of having been ubiquitous for so long that virtually everyone in the industry has some experience with Nagios configs. Systems management tools, like Puppet, have built-in capabilities for generating nagios configurations, so it’s relatively easy to build a configuration that automatically picks up changes in your network architecture. And again, it’s extremely flexible and can be adapted for a lot of different use cases.

Nagios

Everybody Hates Nagios:

- Many features require add-on software
- WebUI is clunky and inefficient
- Not scalable
- Not highly-available
- Config language is ambiguous and confusing

Nagios is not without its critics. Again, Nagios core is relatively simple software. It schedules checks, parses the output, maybe takes action, and has a basic web interface. It doesn't generate graphs or track metrics without add-on software. It doesn't parse log files or deal with event streams. It doesn't do automatic discovery. This is all true, but these are all intentional choices that are built in to the architecture, and part of the reason why it's so modular and flexible, and relatively good at what it does.

There are some more general and legitimate complaints. The web interface is clunky and dated, and hasn't changed substantially in years. Version 3, the version that's in widest use right now, and is in the repos of the major Linux distributions, is a bit of a resource hog and has trouble scaling past a few thousand data points. It's not cluster-aware or designed for high availability. It doesn't lend itself well to multi-datacenter use or horizontal scaling. Nagios's configuration language is well-known, but widely criticized for for being ambiguous and confusing.

Nagios

Fork's A-Comin'

- Community dissatisfaction with pace of development
- Differing views on product scope and architecture
- 2009: Icinga fork is announced
- Shinken follows quickly
- Naemon is a newer fork
- In 2015, things are getting interesting…

The add-on ecosystem has addressed a lot of those complaints, but there was growing dissatisfaction in the community about the pace of development of the core Nagios project and the fact that Ethan Galstad, the original developer and the CEO of Nagios Enterprises, was acting as a sole gatekeeper for changes to the core codebase. Some people in the community had different ideas about product scope and what features should be included, and others had different ideas about the overall product architecture. In 2009, over ten years after Nagios's original release as NetSaint, a group of developers announced a fork of the Nagios project called "Icinga", and it has been gaining in popularity ever since. More recently, the Shinken and Naemon projects have appeared as well. All four of these projects have taken radically different views on design, architecture, scope, and monetization strategy.

Now, as with all software projects where human developers and egos are involved, there has been no shortage of digital ink spilled about the political controversy surrounding these forks, and there have been critical statements made by all the parties about one another. That's well-covered online, so I won't wade in to it here. Read all the accounts before you form an opinion, that's my advice. The only opinion I have is about whether the controversy affects me personally, and for me that's a "no".

As a user of open-source software, I think the forking of Nagios has been a big positive. Icinga version 1 brought a lot of long-needed improvements to the web UI, and added support for additional database backends, among other things. At the same time it's motivated Nagios to add more developers to the core project, and to quicken the pace of development. So the users of both projects have benefitted. I think we'll need to wait and see what the ultimate impact will be of the Shinken and Naemon projects.

There are big changes happening right now though. Both Nagios and Icinga introduced new versions in 2014 that put them on a wildly divergent path. Nagios 4 and Icinga 2 are both major rewrites, with Icinga 2 going so far as to adopt a new configuration language. If Icinga was perceived as "Nagios with nicer UI" before, it is now a substantially different product with different design and architecture goals.

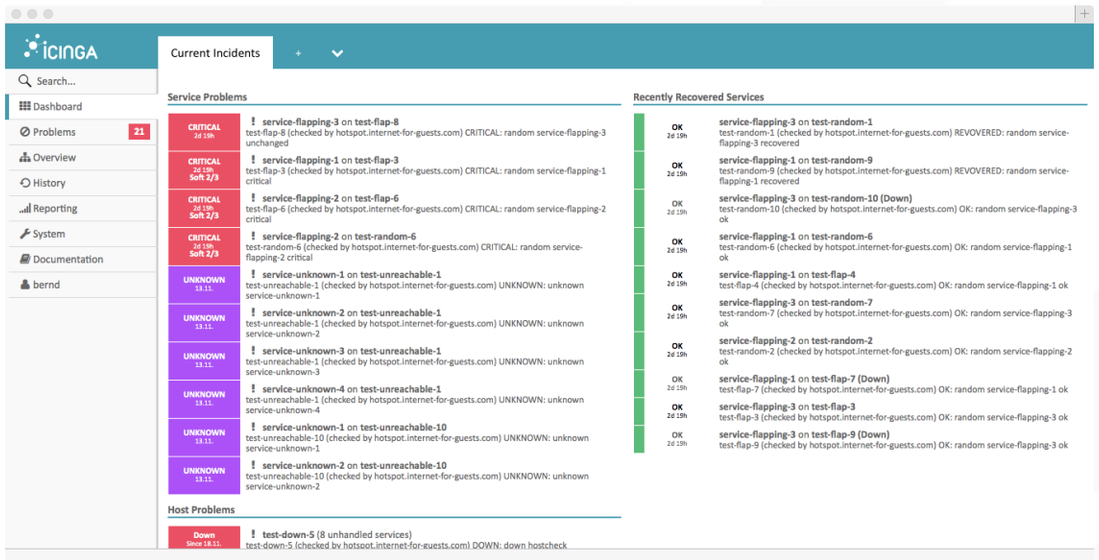
Icinga 2

- Totally rewritten from the ground up
- New command-line interface
- Several built-in modules
- Reload config without interrupting checks
- Totally new configuration language
- Includes a tool for converting Nagios configs

Icinga 2 is a complete ground-up rewrite. It provides a new cli management interface with access to program and monitoring configuration objects. Several common add-on features (database integration, performance data collection) are now built-in modules that can be enabled or disabled as desired from the CLI. It includes several performance features, including the ability to reload configuration data without interrupting running checks, and if you work in a shop that updates Nagios config a lot, you know that's a big deal.

The configuration language is completely changed from the Nagios standard. They do include a tool for converting Nagios-format configs to the new Icinga 2 format. The config language is said to adopt a "one best way" design philosophy, with the idea of eliminating the ambiguity that can arise in a Nagios configuration. It's object-based and rule driven, which means after initial templates are defined, managing changes in configuration should be simple. I love the look of Icinga 2. We're piloting it at VictorOps right now, and we may be adopting it for production use.

Icinga2



Here's a screenshot of Icinga running the new Icinga-web 2 webUI. You can see it's a much more modern-looking interface than Nagios, but design is just part of it. They've made some relatively minor changes to the way you interact with multiple services or multiple hosts at a time, that have produced big productivity gains over the Nagios UI.

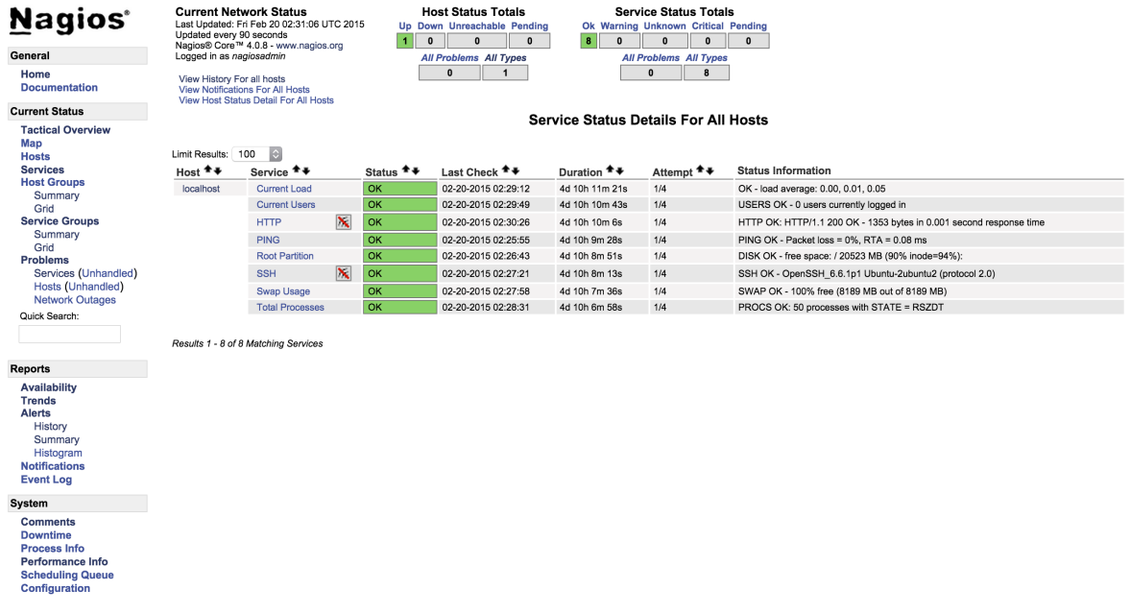
Nagios 4

- Lightweight worker processes to spawn checks
- API improvements
- Some features have been obsoleted
- Faster development and more core developers

Nagios 4 is also a major rewrite, but obviously sticking much more closely to the original Nagios paradigm. Nagios core now spawns lightweight worker processes that handle check execution, and that has greatly increased efficiency. Nagios has also made improvements in APIs and event handling, and obsoleted some features that were never fully implemented in previous versions of Nagios like failure prediction, or that had become difficult to maintain, like the embedded Perl interpreter.

Nagios has also added new developers to the Nagios Core team, and a succession strategy is being worked out. They've signaled that they intend to increase the pace of development on the core product.

Nagios 4



The nice thing about Nagios 4 is that it accomplishes all this while maintaining configuration fidelity, and in fact the day-to-day operation of Nagios 4 is essentially unchanged from earlier versions. This means that if you're using Puppet to manage your Nagios configuration, you can upgrade to Nagios 4 quite easily and enjoy the performance benefits without a ton of work. On the downside, the webUI still hasn't evolved significantly from Nagios 3, and is starting to feel really dated. Lots of common tasks are tedious and difficult from the UI. They have changed the default look-and-feel from "black" to "white", so it's a more readable interface, but it's still frames and tables.

Shinken

- Complete reimplilention in Python
- Modular architecture with multiple processes
- Config-compatible with Nagios

Shinken aims to have it both ways, being a complete reimplementation of Nagios core as a series of modular Python-based processes, but that maintains legacy Nagios configuration compatibility. They boast very impressive performance numbers, and an architecture that provides for high-availability and high-scale. That comes at the cost of having a lot of moving parts and a lot of external dependencies. It's also distributed using the PIP packaging system, and then it has it's own internal package repository-like functionality for adding modules to the software. So if you like the idea of layers upon layers of package managers and dependencies, then Shinken may be for you.

There's also a commercial Shinken Enterprise product, which includes some additional features not included in the community edition. So if you like the idea of PAYING for external dependencies and extra package managers, be sure to check that out.

Naemon

- Forked from Nagios 4
- Aims to add frequently requested features
- Non-commercial entity in control
- Explicit goal of a more open development process

Finally I'll mention Naemon, which is a more recent fork, this one based on the Nagios 4 codebase. The goal of the project is to introduce a lot of the same community-driven feature requests that Icinga and Shinken do, but also with an explicit goal to have a non-commercial entity managing the project and ensuring an inclusive development process. So if you find that the politics around using Nagios or Icinga or Shinken really bother you, then Naemon might be a good choice. They just hit their 1.0 release a bit over a week ago so that project is really just getting going.

Commercial Nagios Derivatives

- Groundwork
- Opsview
- Others, I'm sure
- If you want to pay for Nagios, pay Nagios

Image source: Cafepress

There are some explicitly commercial products out there that are based on Nagios as well; Groundwork and Opsview are two examples. I don't see a lot of value in them, they don't really offer anything over Nagios core except visual cruft and a licensing fee. If you want to pay to run Nagios, then you can always pay Nagios.

Sensu

- Similar scope to Nagios
- Architected as a composable framework
- Several external dependencies

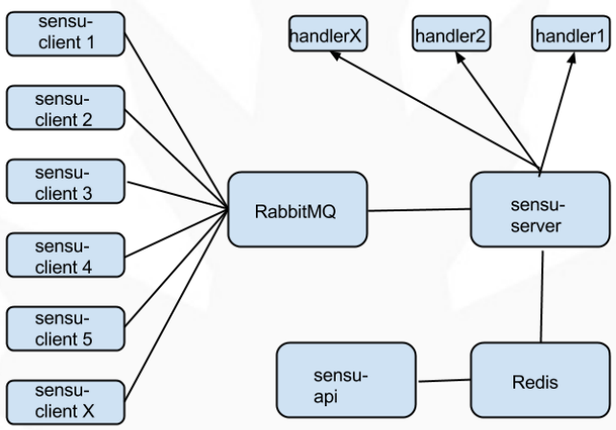


Image Source: florin.myip.org

There are a couple other projects I'll mention that are focused on functional monitoring:

Sensu has a fairly similar scope and feature set to Nagios, but takes the form of a composable framework of components, including a web interface that can serve as a front-end for several Sensu servers. Like Shinken, it has a lot of external dependencies, and getting it up and running is no joke, but if you need extreme flexibility or have very specific architectural requirements, it might be for you. At VictorOps we're seeing a growing number of our customers using Sensu

Monit

- Runs locally on each server
- Thresholds can trigger scripted actions or alerts
- Lightweight web interface shows status and stats
- M/Monit is a commercial product that offers a central dashboard

Monit runs as an agent on each monitored host. It can be configured to watch processes, files, or other metrics, and take scripted actions when thresholds get crossed. Monit provides a lightweight web interface for looking at status and statistics. A commercial product m/monit, can provide a central management point for several hosts running monit, but it's not a required component. In a managed environment you might have it send events to a Nagios host and in that way decrease poller load, or avoid some of the security concerns with running NRPE.

Managed vs. Discovery

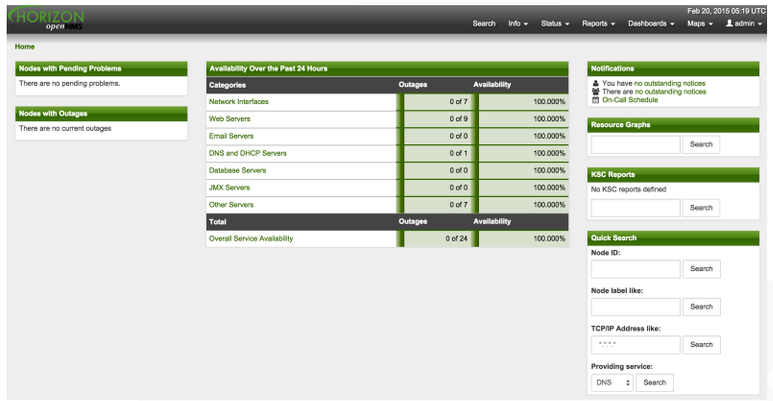
- Managed configs work great in an infrastructure-as-code environment
- Also fine for small environments that don't change
- Auto-discovery solves problems for some larger shops with heterogenous networks
- Network tripwire

All of those solutions are great if you are in a DevOps workflow, and you have a managed infrastructure, using something like Puppet or Chef. The hosts and resources that get monitored are either defined in well-known standard text configuration files, or can be managed programmatically. So it's possible to wire them into your systems management framework and get your configuration auto-generated.

Of course, not everybody lives in that world. Auto Discovery is an important feature for a lot of shops. If you work for a larger company that's making acquisitions, you might find yourself managing an inherited infrastructure with little prior knowledge and poor documentation. In this case, a tool that can discover the current state of a network and alert you to changes from that state can be an invaluable learning and troubleshooting tool while you're building documentation.

Auto-discovery can also act as a network tripwire, detecting devices that may have been placed on your network without your knowledge. Most monitoring systems with auto-discovery can send a notification when a new device is detected.

OpenNMS



- Released in 1999
- JVM-based
- Efficient ping-based auto-discovery
- Native support for SNMP

OpenNMS is an example of a discovery-based monitoring solution that's been around almost as long as Nagios. They're here at the conference so I'm sure many of you have spoken to them. It's JVM-based so it's pretty easy to get it deployed and running. In my experience it runs fine with OpenJDK. Once you've tuned the discovery settings it can pick up the state of a network quickly and provide a picture of where everything is running. One thing to note with OpenNMS, and a lot of discovery-based tools, is that the hosts being discovered have to respond to ICMP to be discovered. So it's less effective for finding "rogue" equipment on the network, and switch or router ACLs may limit the effectiveness of discovery in distributed networks.

OpenNMS uses SNMP to gather metrics and do local checks on monitored systems. This makes it especially handy if you're managing a lot of network gear or appliance-type devices, like video conferencing systems and so on.

The Assimilation Project

- "Nanoprobe" agents do discovery and monitoring
- Zero network footprint discovery listens to ARP traffic, so nodes don't need to respond to ping (or anything) to be discovered
- Agents form a self-organizing mesh of redundant monitors
- http://assimilationsystems.com

There's a brand-new project in the early stages of development called "The Assimilation Project". It was started by Alan Robertson, who you may know as the founder of the Linux HA project and long time maintainer of Heartbeat. It uses "nanoprobes", or basically little agents, that communicate state to a central data store, and these nanoprobes do distributed "zero network footprint" discovery by listening to arp traffic. This means that it can quickly discover your network topology even if your hosts don't respond to pings, and since the process is distributed and agent-based, it can discover complex and heterogenous networks (as long as the agents can connect back to the master). Monitoring is also highly distributed and redundant, so the loss of any one node will not result in the loss of monitoring for any other node.

In a lot of ways it represents a new paradigm in systems monitoring, and I'm probably not doing it justice here. I really encourage you to check out the project website, there are some good illustrations of the core concepts at play, that give you an inkling of the potential power of this software. If total information awareness is your goal, or you just like messing around with bleeding-edge technology, Assimilation should be on your list.

Zenoss

- Similar scope to OpenNMS
- Zenoss sells an enterprise product, but the free product is community supported
- "Zen Pack" plugins provide specialized monitoring and alerting capabilities

Zenoss is another tool that does discovery. Like OpenNMS, it also does time-series monitoring, and also has event handling capabilities. Hopefully you had a chance to stop and talk to them at their booth during the show; I get the impression that their community outreach team takes their jobs very seriously. So even though their main focus is a commercial enterprise product, the community version is OSS, and it's viable.

Zabbix

- Similar scope to OpenNMS
- Includes an agent to perform local checks and report system metrics
- Zabbix is a commercial company, but their software is all OSS

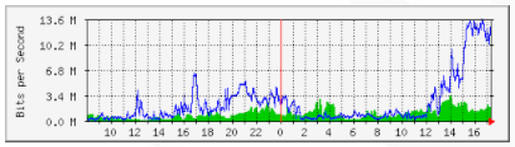
Zabbix is another product that does network discovery, similar to OpenNMS. Zabbix also includes an agent that can be installed on monitored hosts and provides system-level metrics (again, OpenNMS achieves this through SNMP). Zabbix is distributed by a commercial entity who offer support and consulting, but the software is all distributed under a GPL license.

Time-Series Monitoring

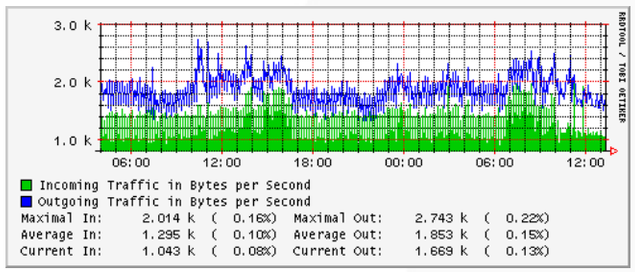
All right, now I want to highlight some projects that are focused on time-series data.

The early Players

- MRTG



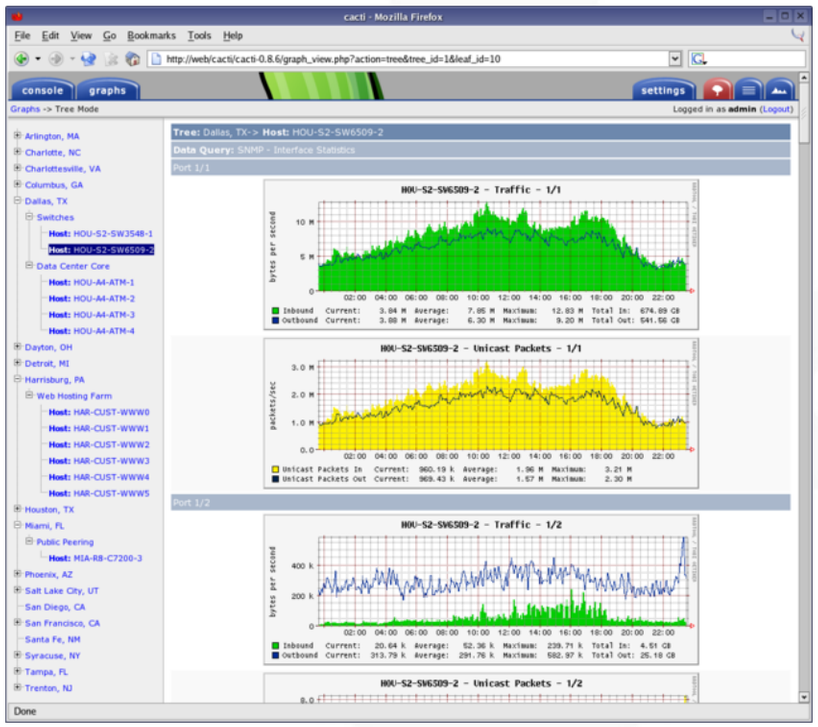
- RRDtool



This category really started with MRTG, and later rrdtool. They produced useful graphs, but were difficult to manage, and didn't scale well.

Cacti

- RRDtool with a nice web-based management wrapper and dashboard builder



Cacti came along in the early 2000's as a web configuration wrapper around RRDtool. It solved a lot of the ease of use problems, but didn't address the scalability of the RRDtool backend, or the inherent scalability challenges of an SNMP poller-based graphing tool.

Munin

- Local agents with a central poller
- Goes beyond SNMP monitoring
- Can produce alerts based on thresholds

Munin breaks through some of the poller-based scale challenges of an RRDtool-based solution, by using an agent that gathers data locally and transmits it in batches. The master can also pass alerts to Nagios if the agents report threshold violations. Munin also breaks out of SNMP-based checks by making process and filesystem checks simple in the agent. Out of the box, the agent collects a ton of metrics, so it's a good way to get a comprehensive look at a system. On the downsite, it's not known for great performance, and the agent may be a bit heavy for some people's tastes.

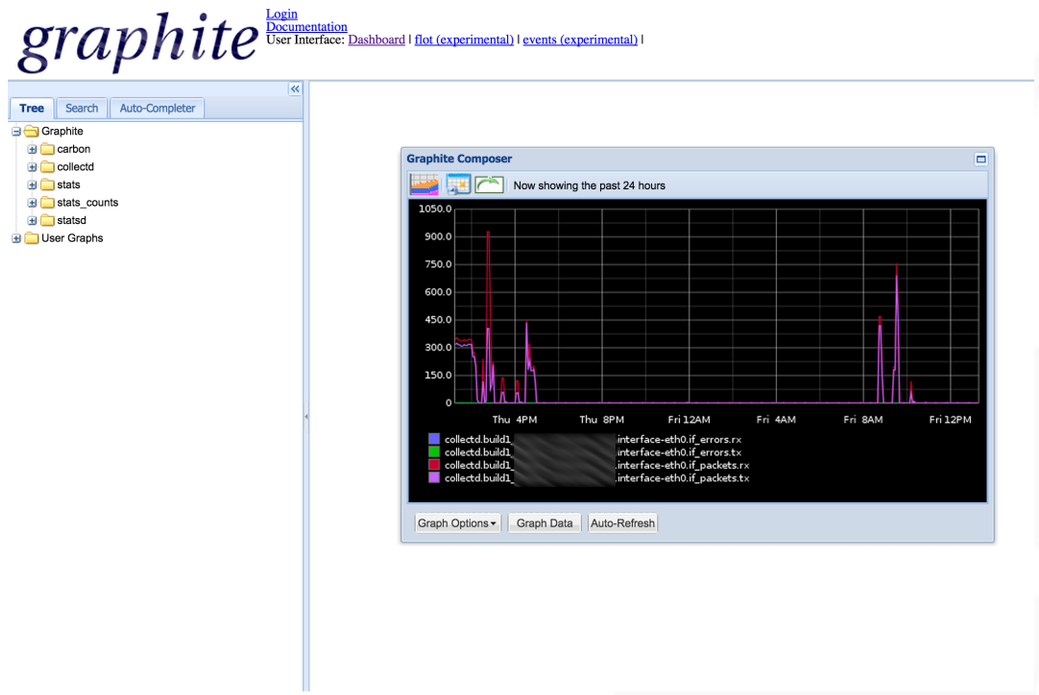
Graphite

- Whisper storage engine is similar to RRDtool, but can be clustered
- Modular framework includes listeners, pollers, and a visualization layer
- New data points automatically created in the database

More recently, new projects have taken a more modularized approach, which has allowed for more mixing between visualization layers, storage layers, and data sources. The storage back-ends have become very free form, allowing for the creation of arbitrary objects and key-value pairs.

Graphite is a popular example. It's a framework that includes a storage engine similar in many ways to RRDtool, a daemon that listens for time series data, and a web-based visualization layer. It's notably different than Cacti and Munin because it doesn't include a poller, it listens for connections and passively accepts data, automatically creating new tables when new data sources connect. So provisioning new hosts is effortless. Lots of compatible tools have been created to feed it data, including SNMP pollers, so more traditional setups and data sources can also be accommodated.

Graphite - Tree View



Here's a look at the graph composer, which allows you to browse through all of your data points, combine them in a single graph, and apply filtering, aggregation, transformations and so forth to the data. Very powerful.

Graphite - Dashboard

And here's an example of a graphite dashboard. It's super easy to compose dashboards of several graphs though the web interface.

InfluxDB

- Similar scope to Graphite
- Designed for horizontal scale
- Easy web API for the listener
- SQL-like query language for building graphs
- No external dependencies

InfluxDB is a brand-new project with similar scope to Graphite. It's designed to be easily horizontally scalable and its listener presents a standard http API, making it easier to write data. It also has a SQL-like query language with functions you can use to build complex graphs or new data sources. It's simple to install with no external dependencies. The project isn't calling itself production-ready yet, but it should be soon, and it's worth keeping an eye on.

Prometheus

- Just open-sourced by SoundCloud
- Similar to Graphite, but adds alerting functionality
- Includes a data poller, but can passively receive data too

Image Source: SoundCloud

Prometheus is an internal project at SoundCloud that they open-sourced in January.
It is another time-series database similar to InfluxDB, but that adds alerting functionality. It includes its own poller, but can also passively receive data like Graphite and InfluxDB.

Notice, this new generation of tools is all highly modular and composable. To some extent you can mix the front-ends and back-ends, and some collection tools can be used with just about all of them:

Collectd

- Gathers metrics and emits them to a configurable destination
- Runs as an agent on a variety of architectures
- Easy to manage configuration

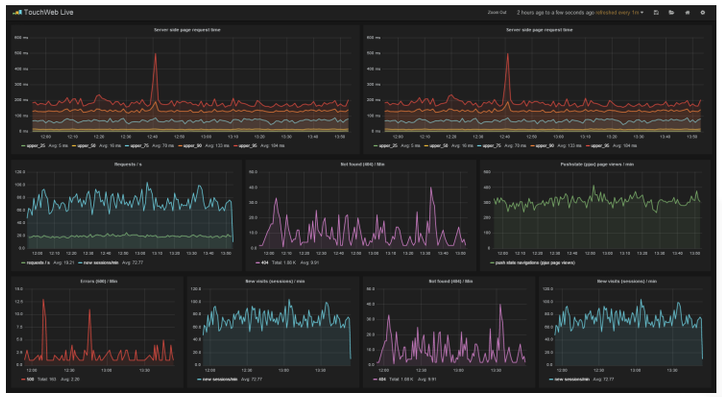
for example, collectd runs as a lightweight daemon on monitored hosts, gathering metrics based on a built-in plugin library and emitting them at regular intervals to a destination. It’s a great way to feed system statistics like CPU utilization and disk IO to a time-series database, and can be managed easily by Puppet or Chef.

Statsd

- Middleware to make it easy to get data into Graphite
- TCP and UDP listener receives metrics, forwards them to the Graphite listener
- Open-source project from Etsy, inspired by a similar project from Flickr

statsd is another example. It provides a TCP and UPD listener that can receive metrics in a simple format and forward them on to a backend like Graphite or InfluxDB. It's an easy way to add instrumentation to in-house software. Etsy released it, inspired by a similar project from Flickr.

Grafana



- Visualization interface
- Dashboard composer
- Can use multiple backends simultaneously
- Mix and match graphs from different tools on a single dashboard

Grafana provides a visualization interface and dashboard composer that can be used with multiple backends, including graphite and InfluxDB. In can embed annotations into time-series graphs, and can build dashboards that include data from different back-end data stores.

As you can see, there's a lot of activity happening in this category, and these tools work great in elastic environments and DevOps workflows because the storage engines are so free-form. I expect a lot of changes and a bit of consolidation in this space over the next few years, but it's so easy to get value out of these projects quickly that it's worth doing some experimenting and trying some new things out.

Sidebar: Poller vs. Listener

- Polling over a network is inefficient
- TCP is more expensive to the originator
- Poller connections are longer-lived
- Listeners can be used for functional monitoring
- Scale demands it, we're going to see more of it

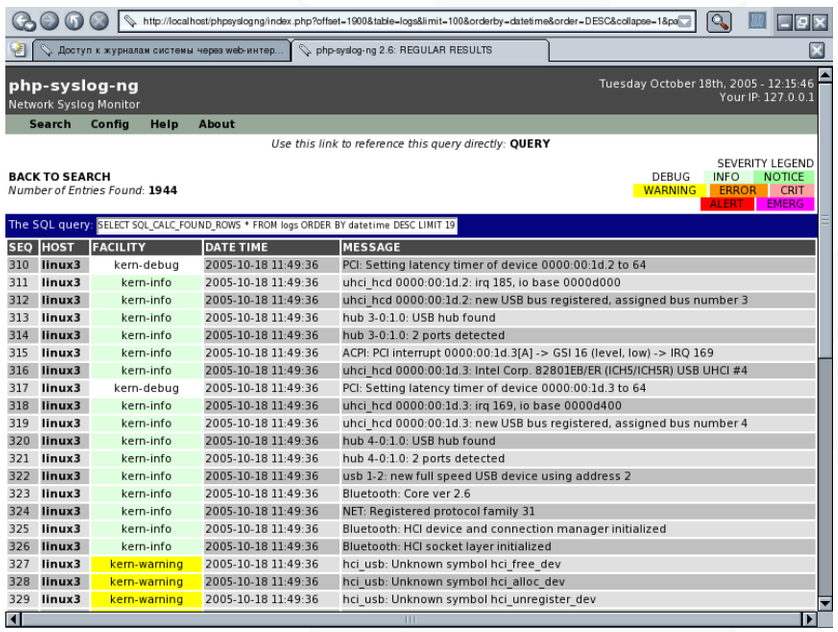
You may have noticed that a lot of the more recent tools have switched from a poller model to a listener model. This makes so much sense with time-series data, but I also think the model has application in functional monitoring. Poller-based monitoring is just inherently inefficient, since so much of the TCP heavy lifting is concentrated in one place, and frequently the connection has to be held open while the check is run or the metric sampled. Emitting events to a passive listener means more of the TCP work is distributed, and the check or sample can run before the connection is opened, so you only need to communicate long enough to send the data. In a managed environment, a lot of health checks can be run locally and problems emitted to Nagios or another event handler. This scales better than poller-based solutions in so many environment, I have to expect we'll start seeing more of it on the functional side. The Assimilation project has a fascinating approach to this as well; again, I urge you to check it out on their website.

Event Monitoring

Okay, on to our third category, Event monitoring

The Bad Old Days

- Logwatch
- Logmon
- Php-syslog-ng



SEQ	HOST	FACILITY	DATE TIME	MESSAGE
310	linux3	kern-debug	2005-10-18 11:49:36	PCI: Setting latency timer of device 0000:00:1d.2 to 64
311	linux3	kern-info	2005-10-18 11:49:36	uhci_hcd 0000:00:1d.2: irq 185, io base 0000d000
312	linux3	kern-info	2005-10-18 11:49:36	uhci_hcd 0000:00:1d.2: new USB bus registered, assigned bus number 3
313	linux3	kern-info	2005-10-18 11:49:36	hub 3-0:1.0: USB hub found
314	linux3	kern-info	2005-10-18 11:49:36	hub 3-0:1.0: 2 ports detected
315	linux3	kern-info	2005-10-18 11:49:36	ACPI: PCI interrupt 0000:00:1d.3[A] -> GSI 16 (level, low) -> IRQ 169
316	linux3	kern-info	2005-10-18 11:49:36	uhci_hcd 0000:00:1d.3: Intel Corp. 82801EB/ER (ICH5/ICH5R) USB UHCI #4
317	linux3	kern-debug	2005-10-18 11:49:36	PCI: Setting latency timer of device 0000:00:1d.3 to 64
318	linux3	kern-info	2005-10-18 11:49:36	uhci_hcd 0000:00:1d.3: irq 169, io base 0000d400
319	linux3	kern-info	2005-10-18 11:49:36	uhci_hcd 0000:00:1d.3: new USB bus registered, assigned bus number 4
320	linux3	kern-info	2005-10-18 11:49:36	hub 4-0:1.0: USB hub found
321	linux3	kern-info	2005-10-18 11:49:36	hub 4-0:1.0: 2 ports detected
322	linux3	kern-info	2005-10-18 11:49:36	usb 1-2: new full speed USB device using address 2
323	linux3	kern-info	2005-10-18 11:49:36	Bluetooth: Core ver 2.6
324	linux3	kern-info	2005-10-18 11:49:36	NET: Registered protocol family 31
325	linux3	kern-info	2005-10-18 11:49:36	Bluetooth: HCI device and connection manager initialized
326	linux3	kern-info	2005-10-18 11:49:36	Bluetooth: HCI socket layer initialized
327	linux3	kern-warning	2005-10-18 11:49:36	hci_usb: Unknown symbol hci_free_dev
328	linux3	kern-warning	2005-10-18 11:49:36	hci_usb: Unknown symbol hci_alloc_dev
329	linux3	kern-warning	2005-10-18 11:49:36	hci_usb: Unknown symbol hci_unregister_dev

Event monitoring and visualization is a fairly undeveloped area by contrast, but one that's starting to heat up. For a long time, if you had limited resources and limited money, you had to rely on hourly or daily runs of logwatch to look for errors in system logs, or run programs like "logmon" locally, basically watching a file with a tail -f and emailing alerts. Resource intensive and clunky. Splunk came along in the early 2000's offering an attractive centralized log analysis tool, but with a steep price that put it out of reach for a lot of small shops that produce a lot of log data.

Other open source log management tools have been produced, like php-syslog-ng, but relational data stores like MySQL struggle with log data and the results offered poor search performance and poor scalability. Php-syslog-ng has been rewritten as "Logzilla", by the way, and is now an exclusively commercial product.

ELK - Logstash

- The "ELK" stack is comprised of Elasticsearch, Logstash, and Kibana
- Clusterable, horizontally scalable data store
- Lots of listeners, filters, event handlers
- Beautiful easy to use visualization layer

Recent advances in open-source data stores like Elasticsearch has given rise to Logstash, which provides very similar functionality to Splunk with a completely open-source stack. This is commonly referred to as the "ELK" stack, comprised of Elasticsearch as the back-end data store, Logstash to receive and process log events, and then pass them to the storage backend, and Kibana, the web-based visualization layer that makes it easy to create dashboards of your log data including histograms and pie charts. As of 2013, Elasticsearch is the commercial keeper and distributer of the ELK stack components.

Logstash - Kibana

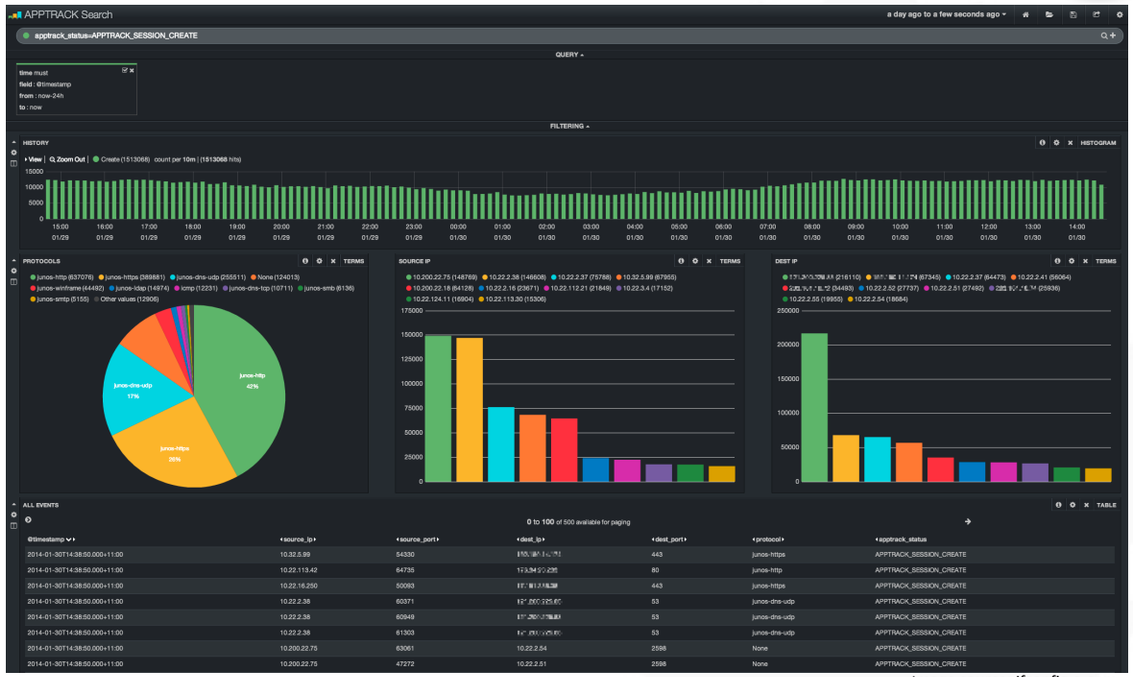


Image source: ifconfig-a.com

Here's a screenshot of the Kibana part of the ELK stack. As you can see, it provides not only ways to examine, search and filter your logs, but also to visualize them in interesting ways.

Nagios Log Server

- Nagios-branded ELK stack
- Includes user management and security features
- Promises easy clustering
- No free version

Last fall, Nagios annouced the Nagios Log Server, which is a commercialized version of the ELK stack with multi-user security features and integration with Nagios built-in, and promises easy-to-deploy clustering, something that can be challenging with a standard Elasticsearch deployment. There's no free version, but it might be a way to get ELK in the door if you have a manager that frets about software without support, or you simply don't have time to invest in getting an elasticsearch cluster running.

Graylog 2

- Similar scope to ELK stack
- Commercial company releases software as OSS, and sells support and consulting
- External dependencies on MongoDB and Elasticsearch

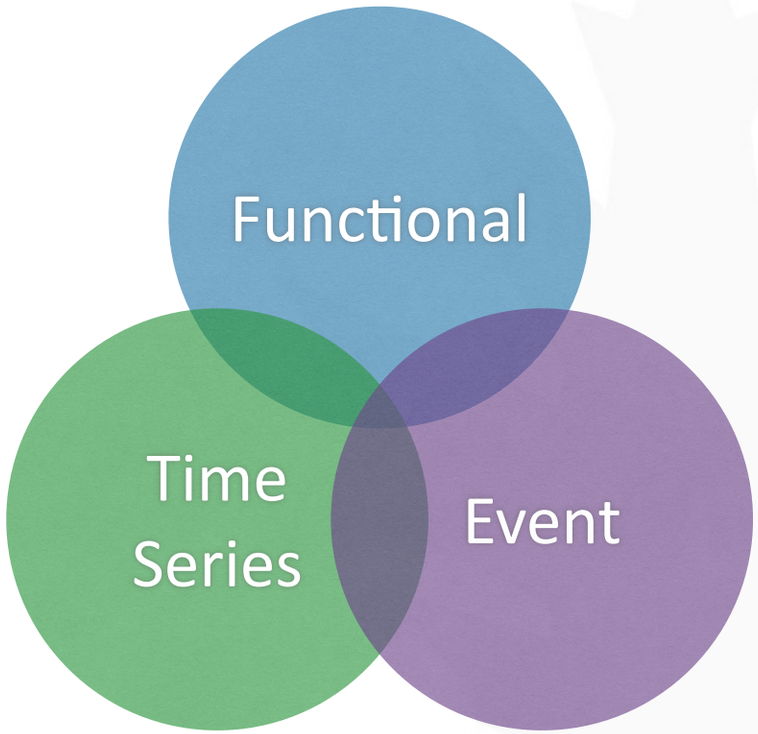
graylog2 is a product very similar to the ELK stack, and it's getting close to a 1.0 release. Similar to Elasticsearch, Graylog Inc. releases all of their code as open-source, and offers production and development support contracts for enterprise users. It has external dependencies on MongoDB and Elasticsearch.

Event Monitoring

- A lot of room for growth
- A lot of room for consolidation with time-series projects
- It's still a great time to be alive and generating log data

I expect to see the event management tools space heat up like the time-series space has, even as the two categories start to see more overlap. Again, I think it will be a while before a clear overall winner emerges in terms of storage backends, visualization layers, and event handlers, but what's out there today has plenty of value to offer. If you're not running Logstash or graylog2 today you owe it to yourself to get it going. Chances are you won't have to wait long to see a benefit.

Our Categories Again



Okay, that's a very quick survey of our three major categories. If I left your favorite project out, let me know, I'll probably want to hear about it! Now, as I said at the start, there's a lot of overlap between the functionality of the tools in these three categories, and some of the tools I mentioned could fit in multiple categories. It can be tempting to look for a single solution that captures all of this functionality, and several projects and companies are aiming at a unified solution.

Do-It-All Products

- OpenNMS
- Zenoss
- Zabbix
- Nedi
- Nagios Enterprises

OpenNMS, Zabbix, and Zenoss don't just do discovery and monitoring, they also graph time-series data, and have asset management and network management functionality built-in.

“Nedi” is a similar project that’s still defining it’s commercial and release model, but for now is mainly defined by a long list of external dependencies.

Nagios Enterprises is in the process of building a suite of commercial products around Nagios that’s comprised of a lot of different components (like Nagios Log server), but at least gives you a single neck to choke for support I guess

Monolithic vs. Modular

Monolithic:

- If all-in-one gets the job done, then great
- Good for smaller scale, non-tech-focused companies

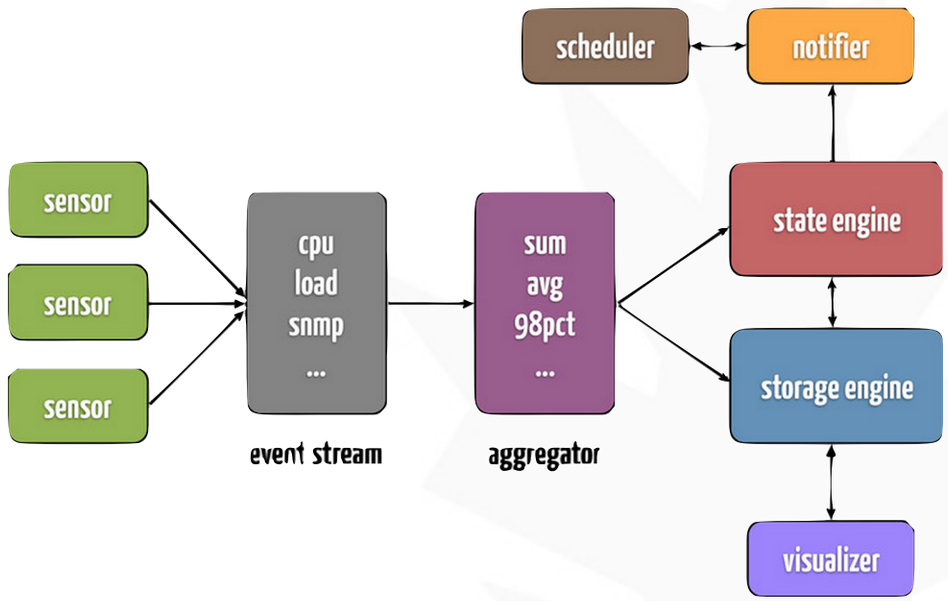
Modular:

- Agile and DevOps shops require flexibility and innovation
- Good for tech driven and ops-focused companies

Some of these all-in-one products and suites of products can be very attractive, and if you find one that meets all of your needs, then it can save you a lot of time you might otherwise spend composing a monitoring infrastructure out of individual parts. For a lot of shops that operate at a smaller scale but otherwise have more enterprise-like requirements (i.e. the primary business isn't technology), it may be a wise approach to look for a single product to do everything, and adapt your workflow to the tool if you need to.

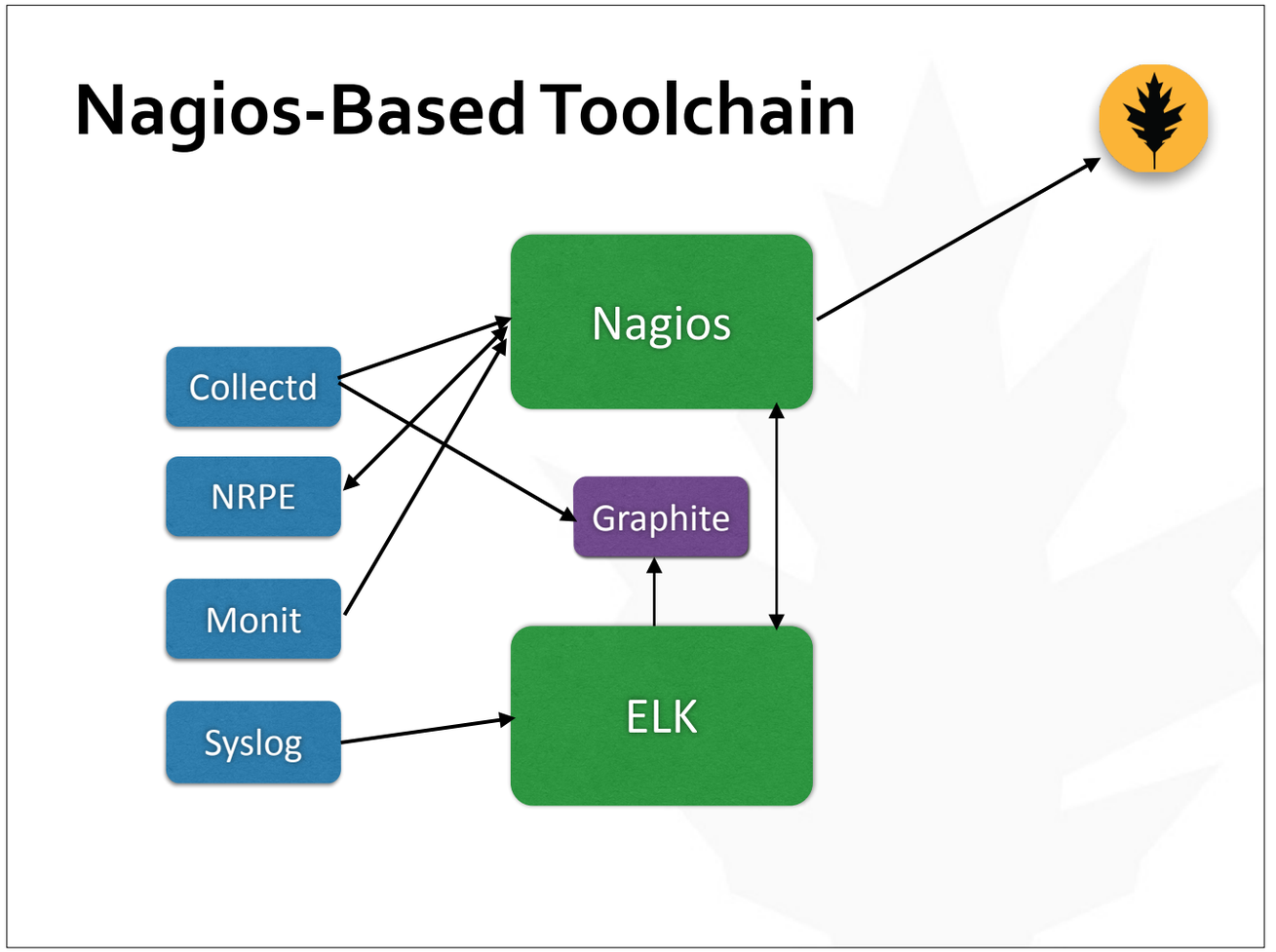
For shops adopting DevOps methodologies, and managing infrastructure as code, especially those working in elastic environments where architectures and requirements can change over time, there's tremendous opportunity to combine the latest generation tools in ways that were difficult or impossible just a few years ago, and produce business value quickly. If you find that one of the monolithic product works for you in that sort of environment, then great, but it's probable that a mixture of smaller components will address your specific needs more easily.

The "Event Stream" Concept



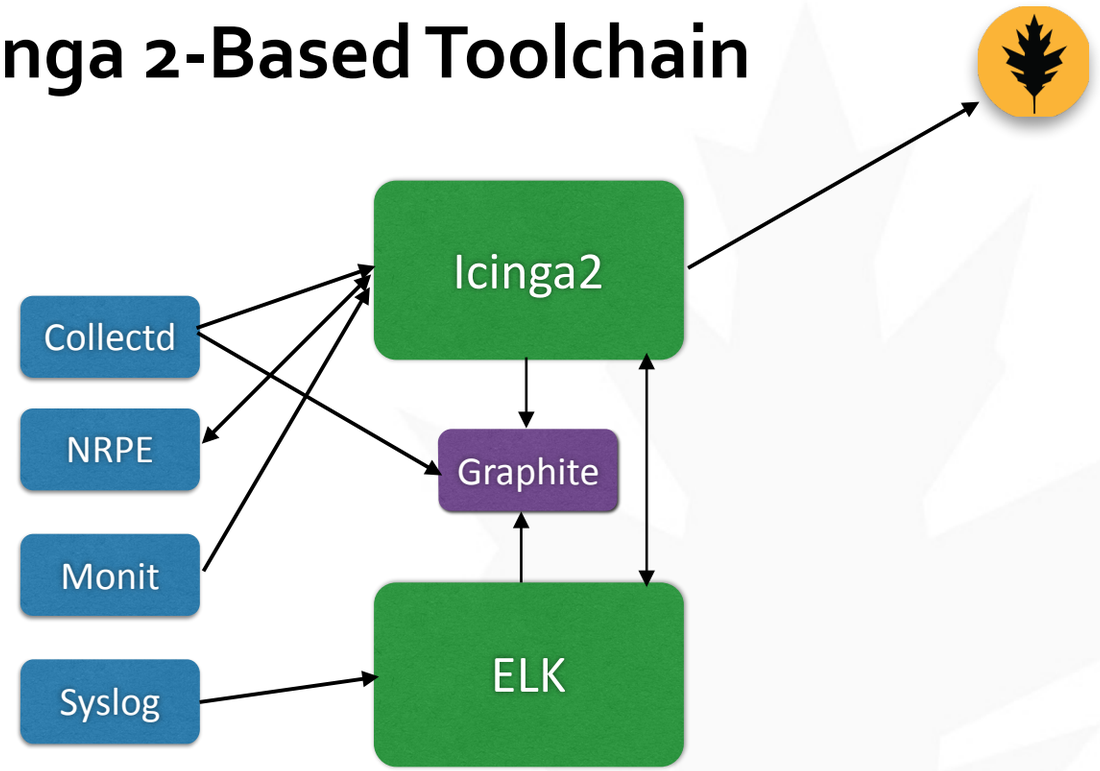
Source: @obfuscurity

For a few years now, Jason Dixon, who organizes the "Monitorama" conference which is going to be in Portland this year, has described the "event stream" paradigm in monitoring. Rather than try to reproduce his diagram I've just swiped it from one of his slide decks. It goes like this: events enter the toolchain. Depending on event type and content, it might get sent to a storage backend for visualization, or aggregated with other events before getting stored. Depending on content, it might change state in a state engine, trigger an event handler or alerting process, fire off an email or a VictorOps alert. By using small, composable tools in combination, you create the event stream that suits your technology stack and environment.



This doesn’t mean necessarily turning your back on institutional knowledge and established tools. Nagios can sit comfortably right in the middle of the event stream.

Icinga 2-Based Toolchain



Icinga 2 was designed with modularity in mind, and has a built-in support for sending metric data to Graphite. You can do this with Nagios as well, it's just not quite as easy. Sensu, Shinken, Monit, Collectd, they're all potential components in a modular monitoring toolchain. You can pick the pieces that best meet your particular needs, and combine them in a way that they lend value to each other rather than creating islands of data.

The current generation of open-source monitoring tools is giving us easier access to deep insight, better visibility into faults, and amazing interoperability. These solutions are quickly becoming critical sources of not just operational and developmental intelligence, but of business intelligence that has value outside of technical departments. This helps Dev, DevOps and IT teams more effectively communicate their overall value, and makes life a lot easer managing high-demand 24/7 platforms. The technology is moving way too fast for “Enterprise” solutions to keep pace, meaning that as a user of open-source monitoring solutions, you don’t have to wonder what you’re missing out on from commercial products. Open-source is now at the vanguard of monitoring and telemetry software development, and it’s a great time to be involved.

If you have any questions, I'd love to answer them now.