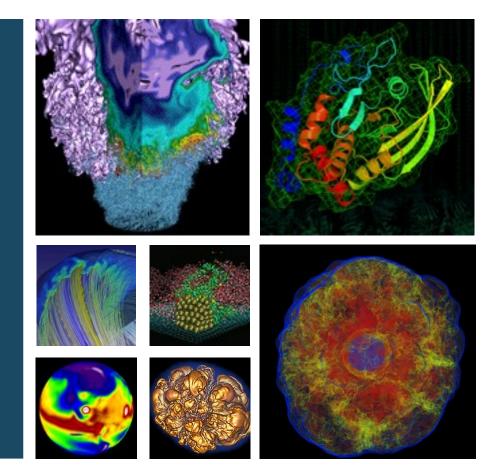
A slice of the NERSC data collect system





Thomas Davis & Cary Whitney ^{Title} ^{4/21/16}







- NERSC is moving between data centers.
 - Old data center is a mis-mash of systems.
 - 3 separate building control systems
 - One is Windows 98 based
 - Two are embedded Windows
 - This one is browser based, except..
 - You load an active-x object to check java version
 - And if you do not have the correct version, downloads it from a 3rd party website..
 - Then you load java to run a java-ws program..
 - Which then downloads and runs a Windows DLL to provide window decoration.
 - New data center has no chillers.







- Introduce several new ideas..
 - Clean slate no legacy to clean up or rebuild.
 - Security is paramount.
 - Most BAS/metering protocols are insecure.
 - Ability to Fail fast
 - Modularity
 - We demand the ability to replace anything, at any time, for any reason.
 - Use services that are designed for HA
 - We want failover, maintainability, and scalability
 - Zero downtime.
 - We are the first up, and the last down







- A new way of doing things.
 - System must be first one up, and the last one down.
 - System has many sensors, collectors and networking.
 - 1600+ temperature sensors
 - 800+ power meters
 - Substations master breakers, Substation breakers, panel breakers
 - 600+ power strips (Raritan, 50/60 amp is the preferred vendor/model)
 - With breaker level monitoring 6 breakers per strip.
 - 200+ bacnet devices
 - Many with logical sub-devices.
 - 2k+ ethernet ports
 - 24+ network switches
 - 4 Seismometers
 - The data roach hotel.
 - Data checks in, but never checks out..
 - HPSS is your friend.





Footer Information

- 4 -



- No plugins.
 - No java, no active-x, no flash
- HTML5 support.
- Desired to work on Cell phones, tablets, Linux, OSX, Windows.
- Stream processing
 - Ability to calculate a PUE in realtime
 - Fault detection
 - Security incidents
 - Building Control
 - Filtering
- Instrument the data collectors themselves.





Footer Information

- 5 -



Metrics 2.0 implementation

- What the heck is metrics 2.0?
- A different way of representing data
- Attaching meta information to the metric.
- See http://metrics20.org

Traditional systems	Metrics 2.0
<pre>collectd.dfs1.df.srv-node-dfs10.df-complex.used diskspacesrv_node_dfs10.byte_used { server: dfs1 }</pre>	<pre>{ server: dfs1 what: diskspace mountpoint: srv/node/dfs10 unit: B type: used metric_type: gauge } meta: { agent: diamond, processed_by: statsd2 }</pre>





- Ovirt (RHEL) VM management
 - VLAN tagging/trunks
 - PXEboot needs untagged packets..
 - Dense servers 8 nodes in 4U slot.
 - Supermicro Fat-twin based
- Rancher with Docker containers
- Split networks
 - Have to connect to 10 different networks.
 - 3 public networks
 - 7 private networks

Office of

Science

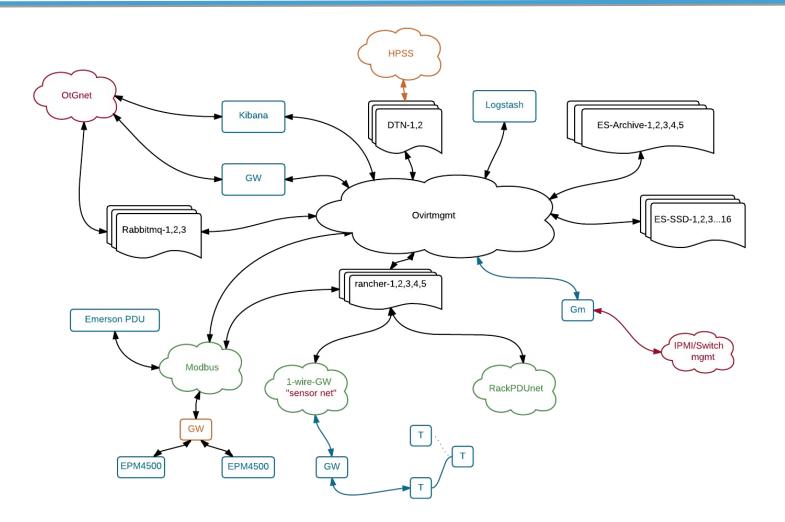






CRT Data Collect Network

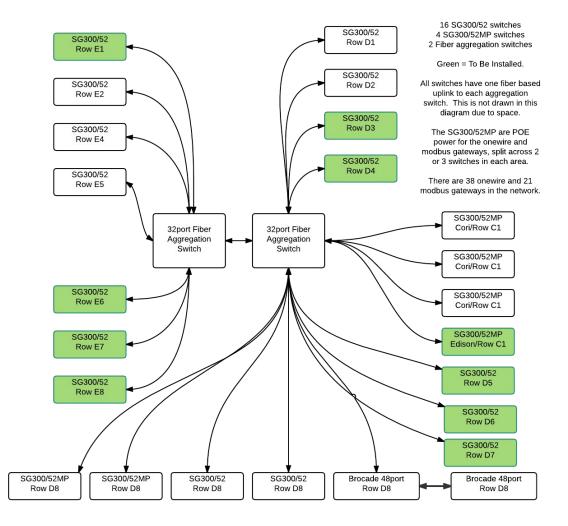










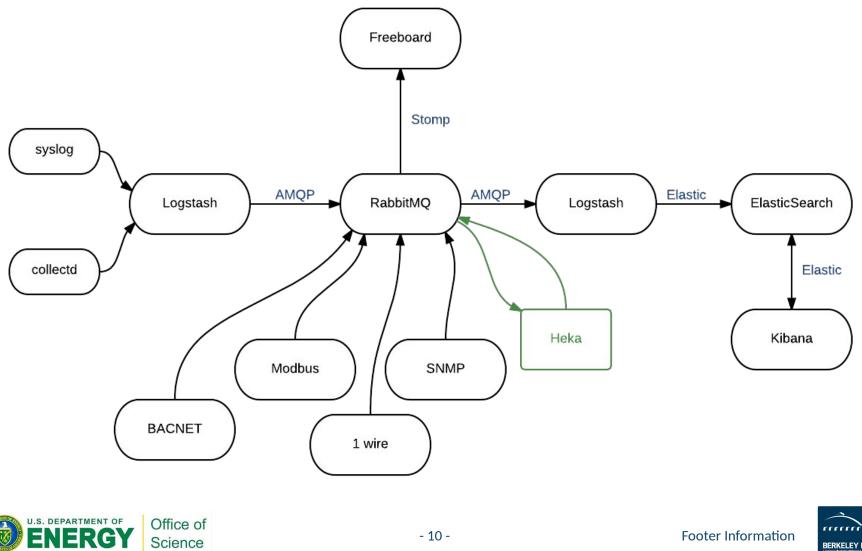


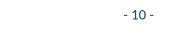




Science









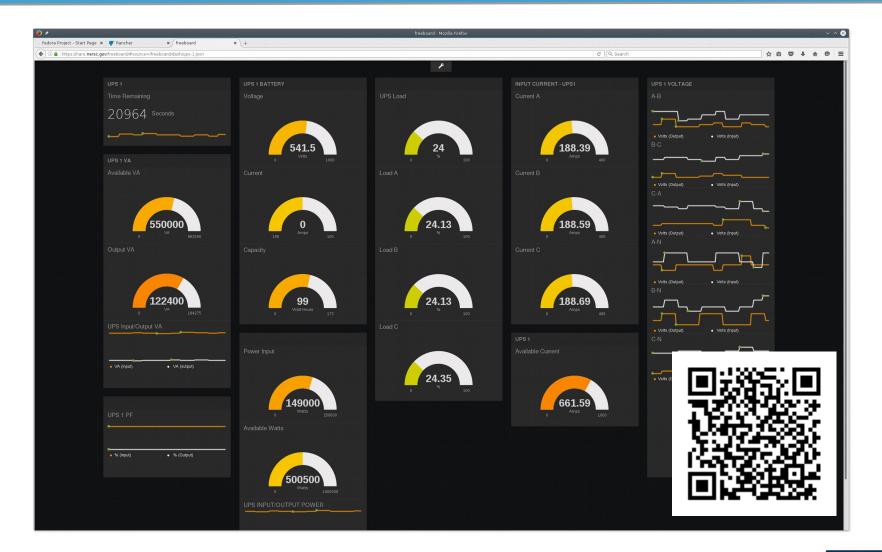


- 15 Elasticsearch (ingest) nodes w/SSD and 64GB ram
- 5 Elasticsearch (archive) nodes w/8TB disk and 64GB ram
- 3 dedicated Master nodes (both Consul & Elasticsearch) (vm)
- 2 internal logstash2amqp nodes (ha) (vm)
- 1 Kibana/Elasticsearch worker node (no data/not a master) (vm)
- 4 internal amqp2logstash nodes (vm)
- 3 rabbitmq-servers in ha/mirror cluster mode (vm)
- 6 node redis cluster (vm)
- 8 Rancher/docker nodes
 - 1 VM for Substation network
 - 2 VM for UPS network
 - 2 real nodes (dual socket, 32 cores, 64GB of ram)
 - 3 floating VM's











.....

BERKELEY LAB

oVirt



- http://ovirt.org
- Redhat's RHEV product, opensource version.
 - We are currently on the 3.6.x version.

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BERKELEY

oVirt



- KVM/qemu based
- GlusterFS, nfs, iscsi volume management
- Web interface
- Understands VLANs, bridges
- Can talk to Openstack components
- Manages images, templates for you.



RancherOS



• http://rancher.com

- Recently released 1.0.1
 - Oh no.. a x.0 release!
 - Does have some irritating bugs.
 - But it does solve several major problems!

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Rancher



- Supports docker, kubernetes, and Docker Swarm.
- Internal, encrypted network between containers.
- HTML and CLI interfaces.
 - Docker compose file support
- Catalog for applications.
- Running on both VM's and bare metal systems.
- They even have a Docker based OS RancherOS
 - Like CoreOS/AtomicOS, but geared towards virtual machines.
- Convoy for docker volume management using GlusterFS/NFS.





Rancher



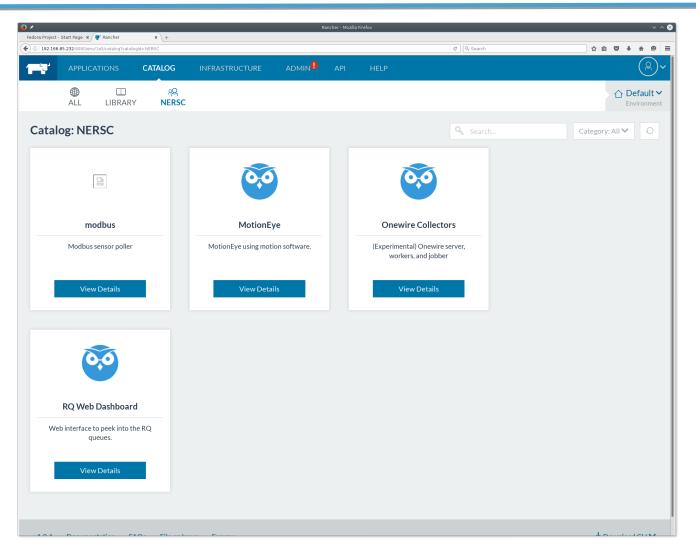
- One click deployment of application stack.
 - Scales containers, creates internal network, manages volumes
 - Rollback, upgrades are simplified.
 - Schedules containers on the proper nodes.
 - Based on tags.
 - We use this for network routing for example.





Catalog..









Setup.



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Production..



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- Service discovery/registration with Consul
 - Uses Nagios checks for health and integration in nagios.
 - DNS routing and load balancing
- Used by onewire stack to route onewire api requests to the proper gateway.
- Nagios also checks for service health.
- Also used to provide round-robin DNS name service for internal services.
- Future uses include configuration templating and key value pairs.



