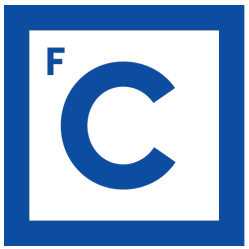
Monitoring

CGS - Hugo Miranda

2021



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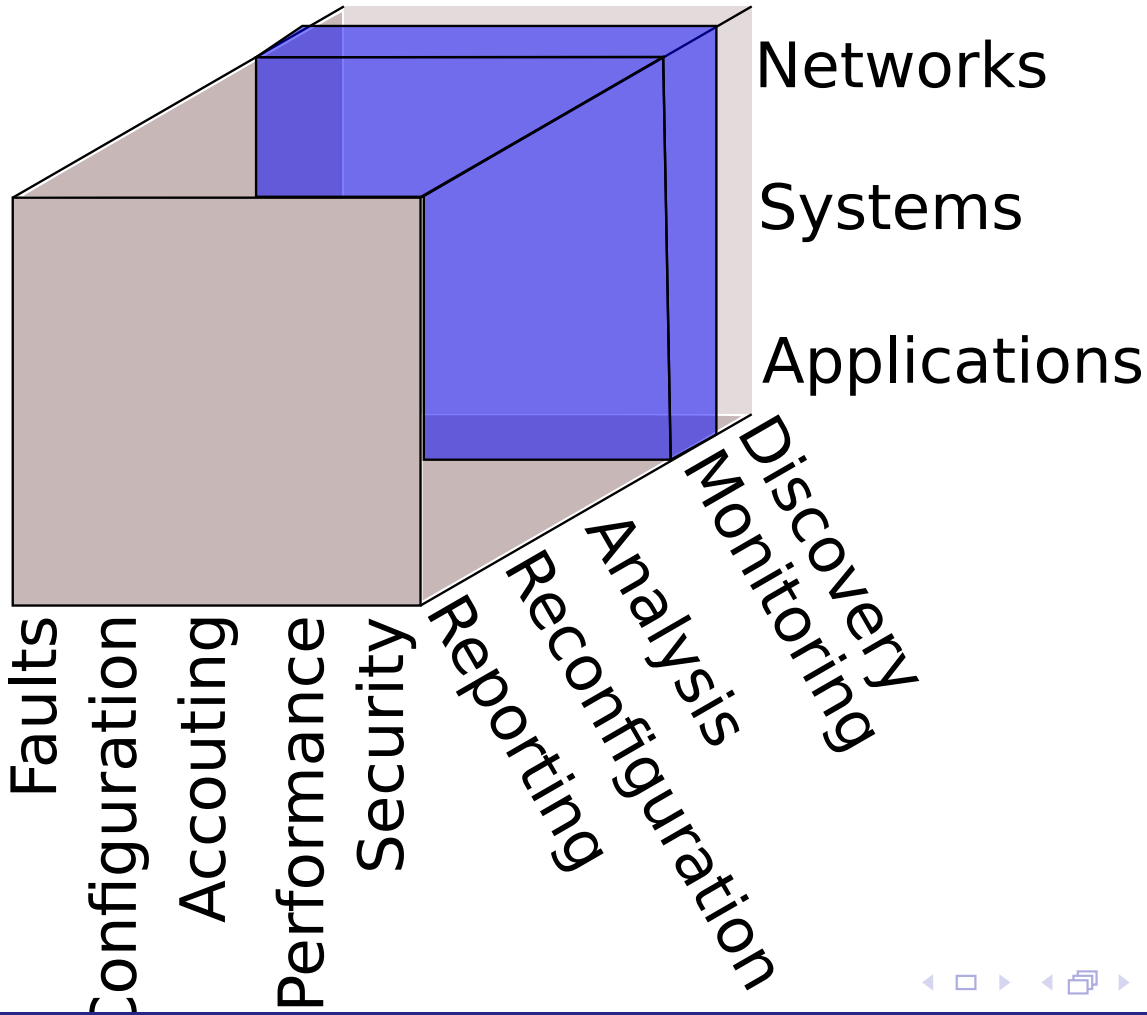
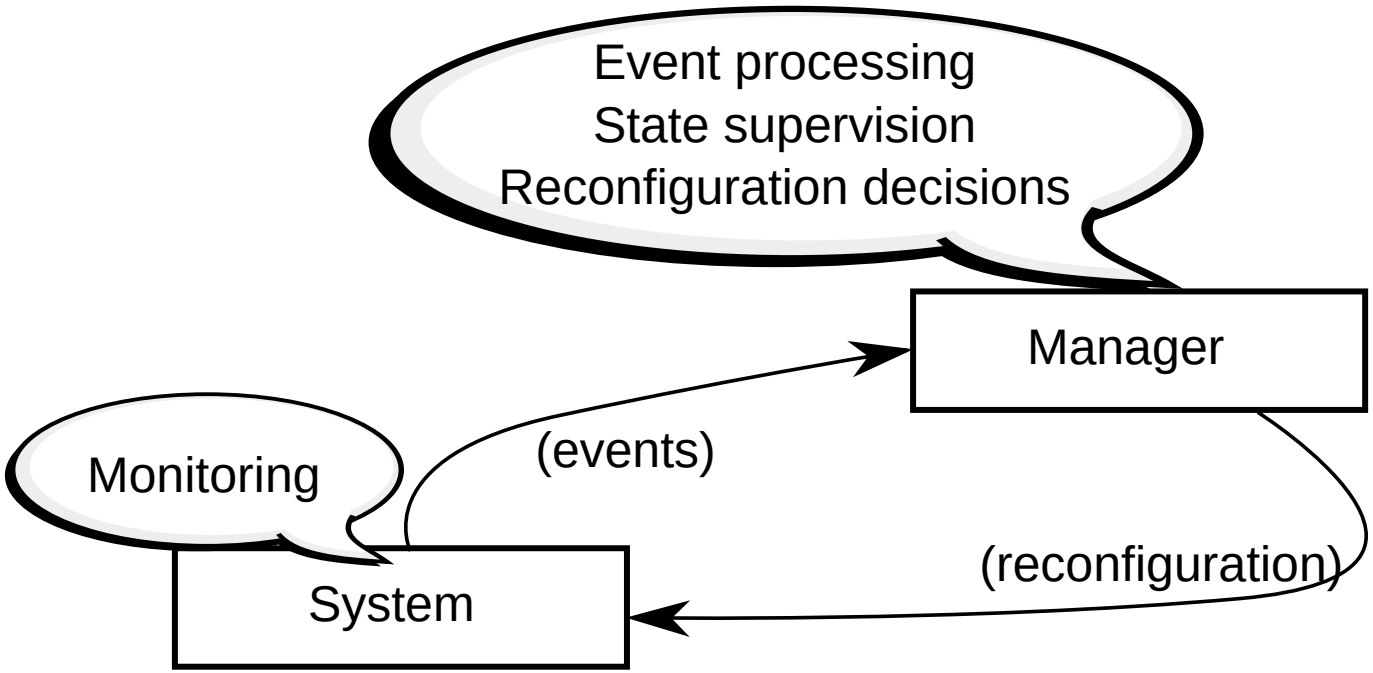
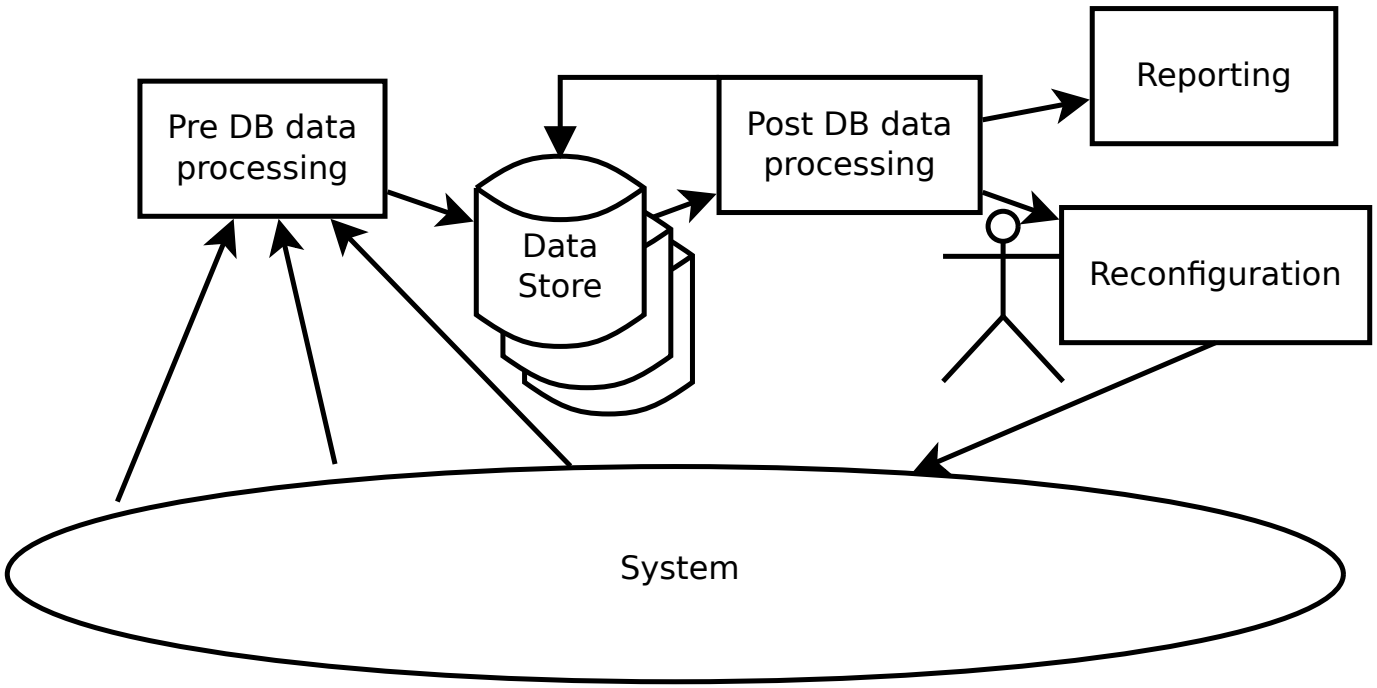
What to Monitor



The Big Picture



Data Flow


Pre DB data processing
Data Store
Post DB data processing
Reporting
Reconfiguration
System

Data Sources

Applications

- Logs
  - Count errors, accesses, etc.
- Proxies
  - Between the client and the server
- Fake requests
  - Withdraw/deposit money from a bank account
  - Request a web page
  - E.g. Site24x7 benchmark

Data Sources

Systems

- OS services
  - ps, who, uptime, free
- Logs
- Ping, IPMI, SNMP

Data Sources

Example (free)

```
$ free -h
              total        used        free      shared  buff/cache   available
Mem:           15Gi       1.6Gi       8.1Gi       162Mi       5.7Gi        13Gi
Swap:          19Gi          0B        19Gi

$ free | awk 'NR==2 {print $4;}'
```

Data Sources

Networks

- SNMP
  - traps/queries
- Fake nodes
  - Routing protocols
- Traffic observation
  - IPFIX
  - Port mirroring
- Diagnostic tools
  - Ping
  - Traceroute

Data Received

Status

- on/off/on with problems
- Ping
- Website responded

Configuration settings

- Certificate expire date
- DHCP lease range
- Number of threads for HTTP requests

Data Received

Statistics

- Free memory
- Number of 404 errors
- Response time
- Watermarks

Errors

Problems the agent is aware of

- Unexpected website response
- Route in cycle

How to cope with the large amount of data?

- Ask what you need to know
  - But not less than that

Passive Agents

Monitoring framework queries the agent

- Data flow regulated by monitoring framework
- Late discovery of problems
- Required to discover failed hardware/agent
- Requires 2 messages
- The authentication problem
  - Overhead for authenticating requester
  - Alternative is DoS vulnerability

Active Agent

Agent spontaneously notify the monitoring framework

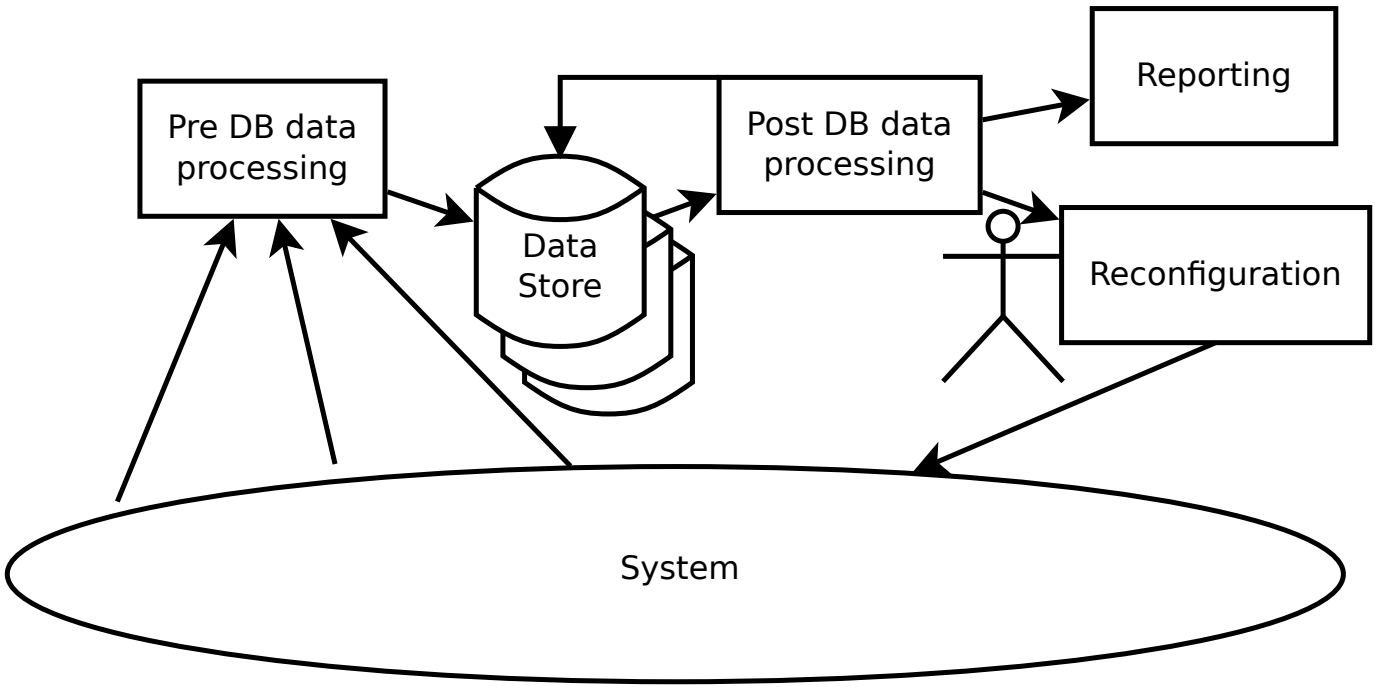
- E.g. SNMP traps
- Timely discovery of errors
- Can overload the monitoring framework
- Useless information/managed device resource consumption
- Risk of spontaneous synchronization
  - Random timers
  - Dynamic timers

Where to Calculate Metrics?

Performance problems may emerge when determining the metrics is computationally intensive

- On the managed entity
  - Impact on the managed entity performance
- Outside the managed entity
  - Requires the transfer of the file
- Write the file outside the managed entity
  - e.g. Elastic cloud/Kibana

Data Flow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Why pre-processing?

- Data must make sense
- Errors can happen
- Facilitate storage and analysis

Partition data in tokens

- Depends of the agent and data
  - SNMP
  - Apache log files
- Tokens
  - Timestamp
  - Device ID
  - Metric
  - Value

Validate tokens and logic

- CPU utilization > 100%?
- Timestamp is in the past?
- Device ID exists?
- End date > start date?

Correct tokens and logic

What if data is wrong?

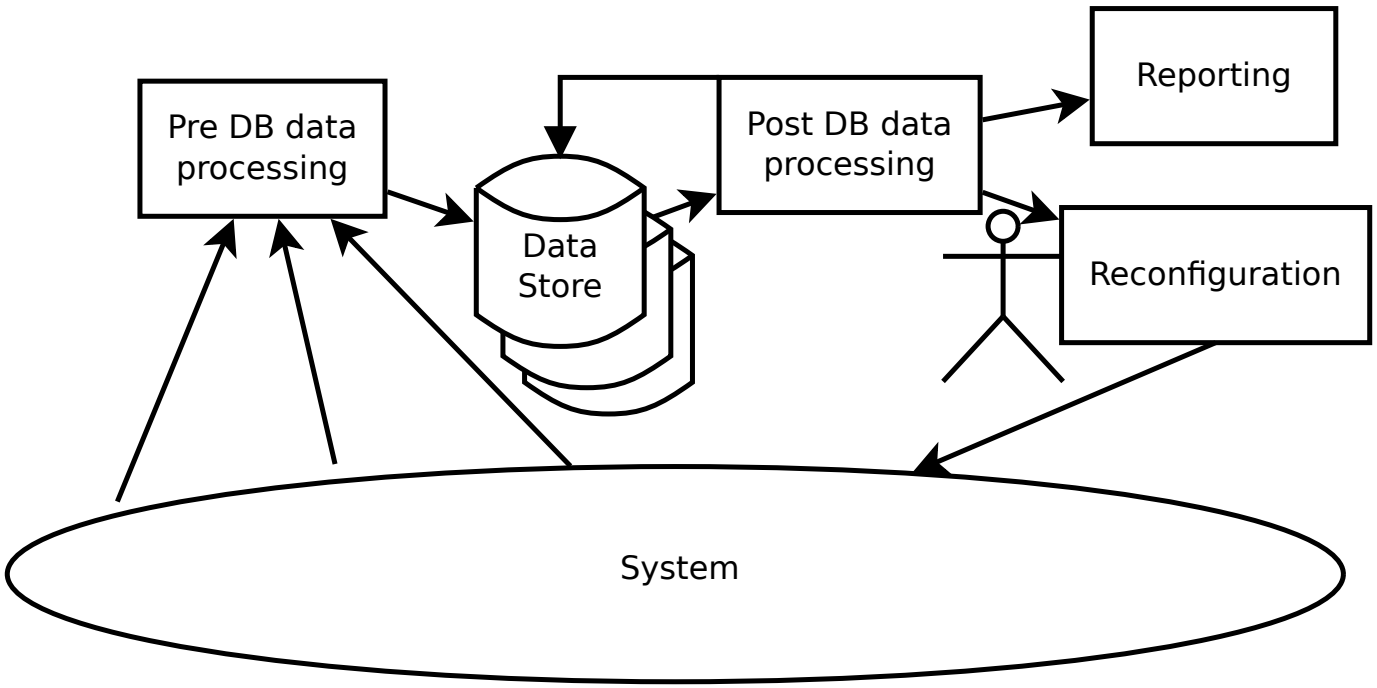
- Discard
  - Mark as unknown
- Recover
  - Repeat the last known value
    - Or weight the average of the n previous readings
  - Repeat the query
- Consider as a problem

Harmonize data

Make sure that comparable metrics are comparable

- Temperature in ºC
- Date format
- Power in W
- Time in ms

Data Flow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Coping with Large Amounts of Data

- As the volume of data increases
  - so does time to query it
  - so does space required to store it
- More may not be better

Compress data

- Compress repetitions
  - *Up since Jan 5th 2016*
  - *Route unchanged since Feb 27th 2012*
- Thresholding
  - *Temperate lower than 60ºC except*
    - *Mar 3rd, 22h37m (65º),*
    - *Mar 4th, 15h18m (67º)*
- Discard replications
  - *Website served by 4 replicas. Average response time 750ms*

Degrade data

- Historical data is important but precision becomes irrelevant

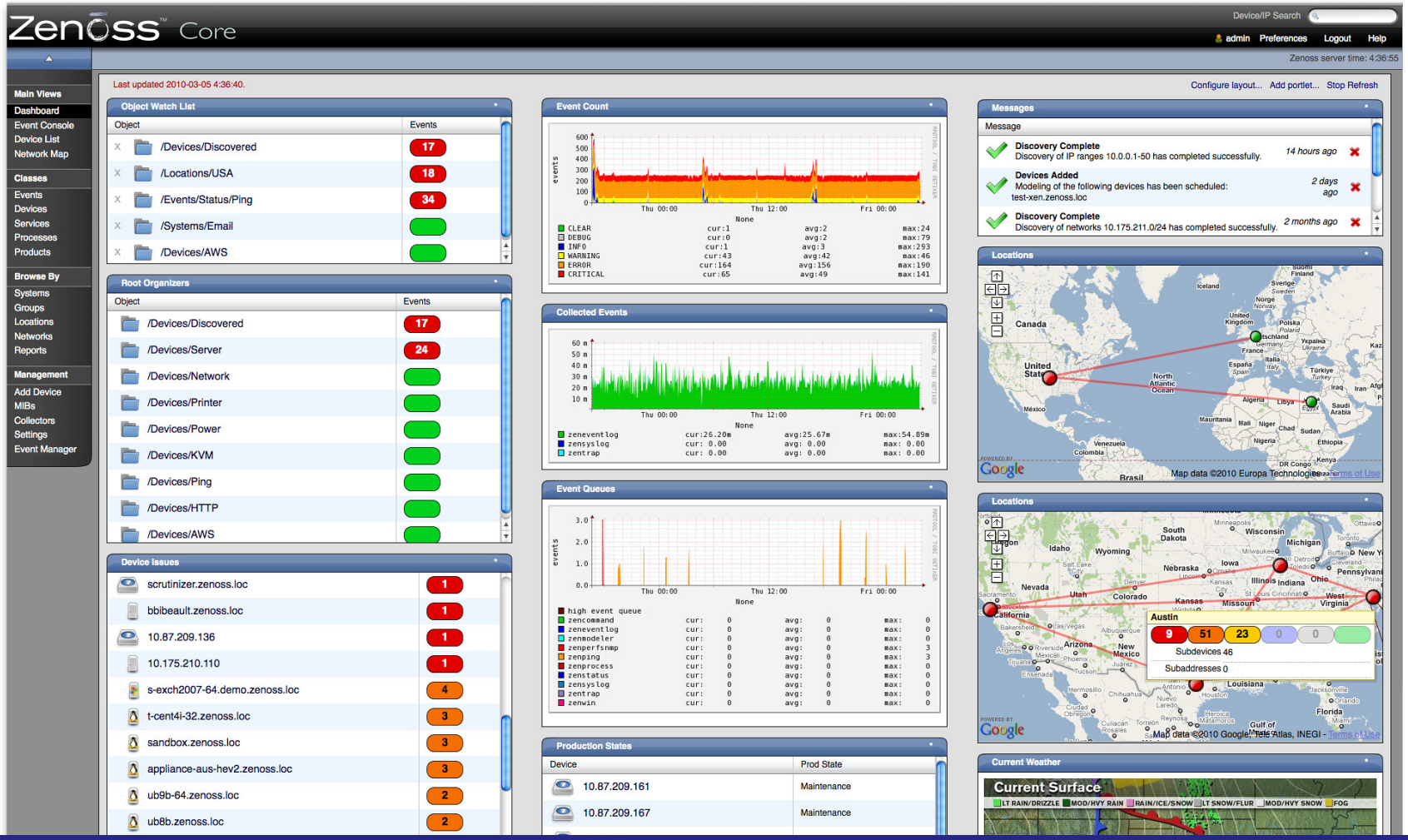
Interval	Data kept
Last 30 days	Every reading
30<t<60 days	Hourly max, min, average
60≤ t<180 days	Daily max, min, average
t≥180 days	Weekly max, min, average
	...

Data Store

Typical load balancing approaches for databases

- Distribute the data by several database instances
- Read-Only replication
- Round Robin Databases (RRD)
  - Circular buffers applied to databases
  - Works well with data degradation
- Hierarchical databases
  - Raw data is subsumed at multiple levels to facilitate analysis
- Rolling databases
  - Round robin at the database level

A Zenoss screenshot



Wrap Up

- Large amounts of data come in your way
  - Make sure that you get what you need
    - FCAPS (Not just Faults)
  - Make sure that you don't overwhelm the infrastructure to get what you don't need
- Keep cleaning
  - so that you can retrieve it when needed

What's Next

- Analysis, report and reconfiguration for FCAPS