SCTE ISBE CABLE-TEC EXPO '16

SEPTEMBER 26-29 PHILADELPHIA

Using Open-Source Tools To Solve Customer Problems Before They Notice

Andrew Gray

IP Engineer IV

Cox Communications

SCTE Society of Cable Telecommunications Engineers

ISBE International Society of Broadband Experts

#CableTecExpo

Essential Knowledge for Cable Professionals™

Defining the Problem

- Cox has many tools to diagnose individual node problems in the field.
- Cox has complex node analysis tools that record statistics on every node.
- Talking to the people in the field doing the work revealed the first was too fine grained or only useful when they already knew where to look, and the second set were either too complex or too slow to use.

How this was a problem

- Frequently, people in the field were in places where a full-sized laptop either wouldn't work or would be troublesome.
- For DOCSIS issues, this usually meant they would call up DOCSIS support engineers to look at levels, verify problems, and the like.
- Since a lot of the proactive monitoring was cumbersome to use, or throwing a lot of (seemingly) false positives, human nature dictated that they wouldn't be used like they should.

First pass at a solution

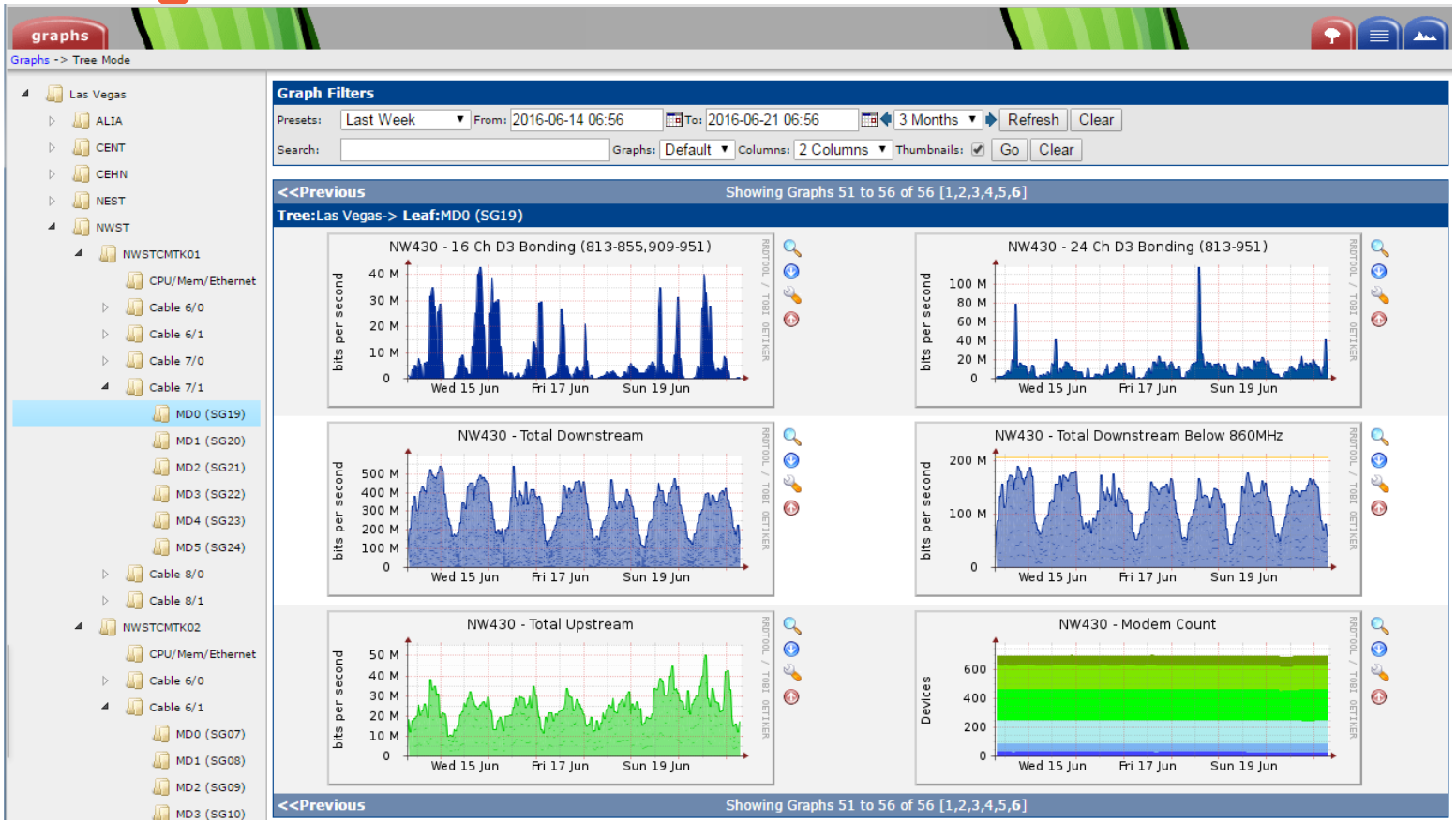
Give the people what they want

- A few years ago, the first conversations brought to light that the (then new) smart phones could be used for a lot of this sort of thing.
- The current websites that worked from desktops were a very poor experience on mobile devices (browser requirements, Java requirements, ActiveX controls, etc.).

First pass at a solution

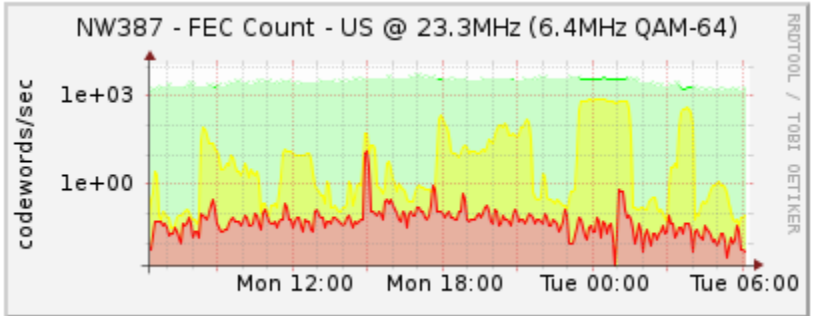
- We decided to take on a side-of-desk effort to do Something Better.
- Open-source tools had the benefit of being easy to deploy quickly (just needed server space).
- We settled on using Cacti to handle monitoring, the integrated Spine multi-threaded SNMP poller, and various shell scripts to tie together various functions and do reporting.

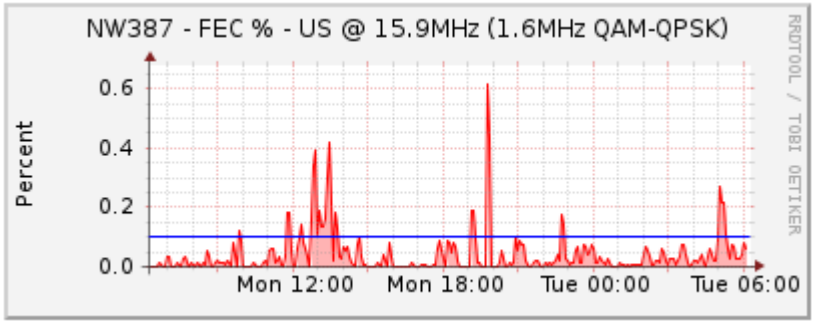
Presenting the Raw Data

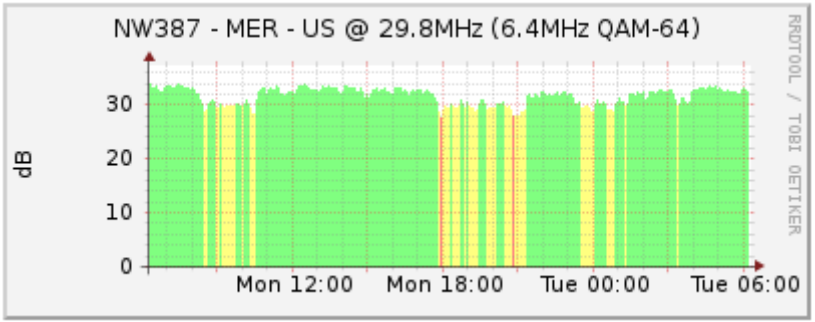


Using the data

- Various FEC and MER charts update every 5 minutes.
- Long term statistics up to a year useful for trending.

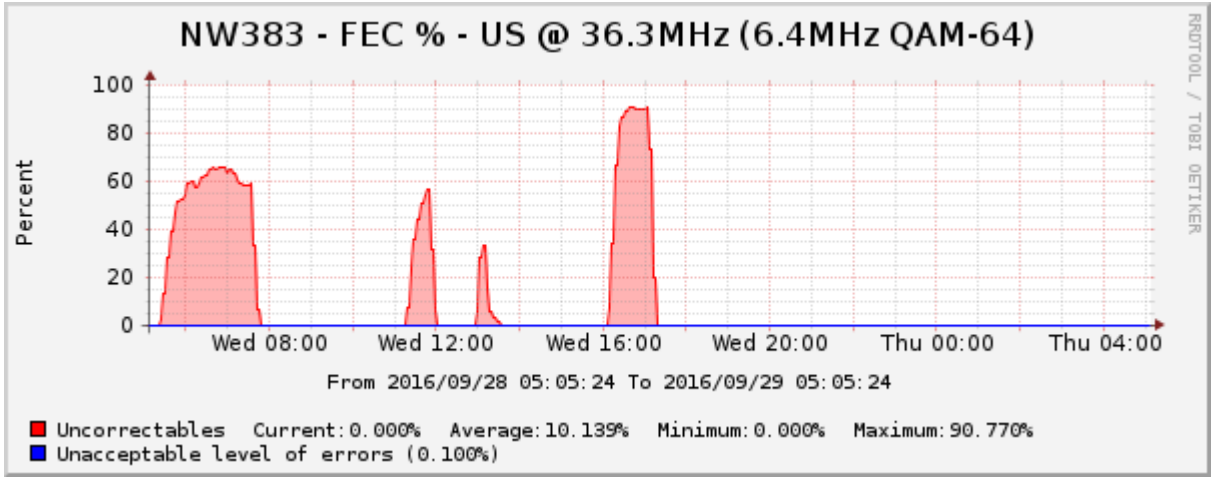


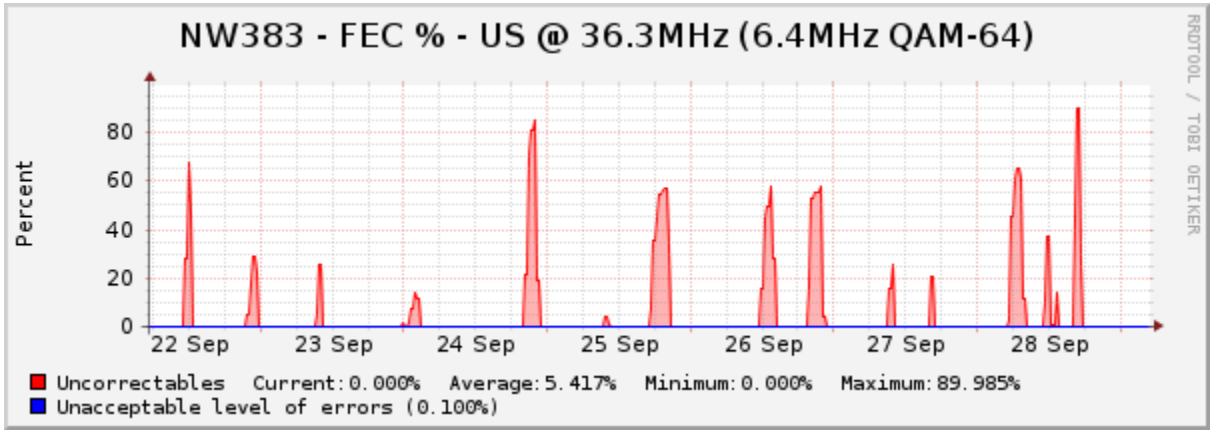




Trending data

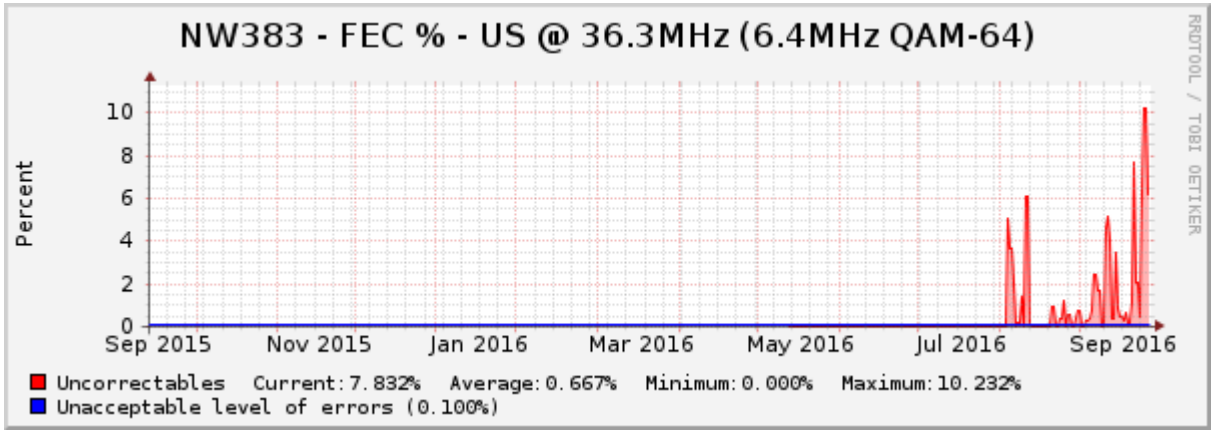
- Helps find highly intermittent issues.
- We can also see this is not just a one time event.
- It seems to be at nearly the same time every day.





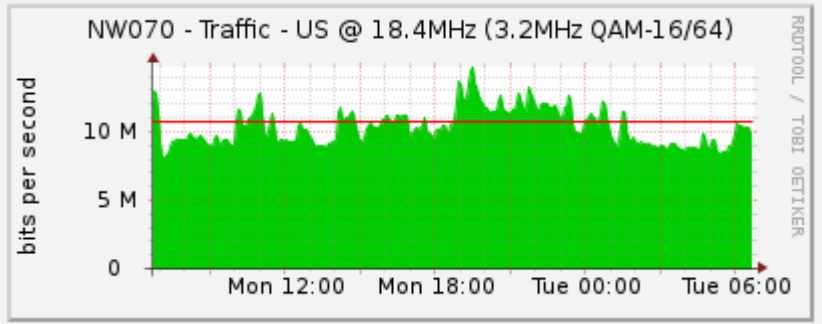
Trending data

… and has been for quite a while.



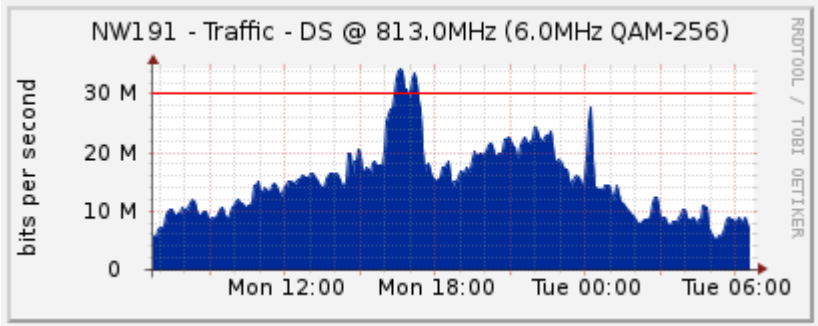
Using the data

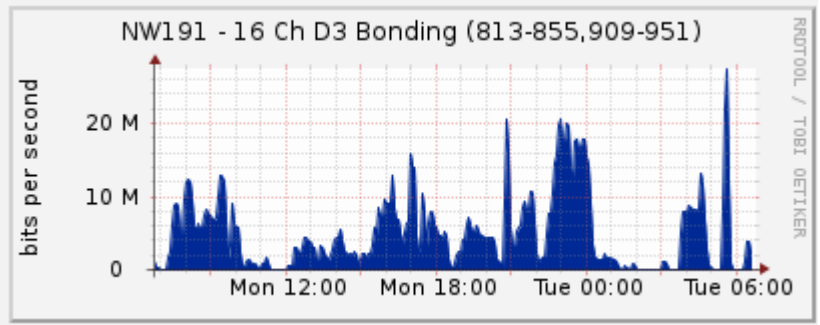
Bandwidth graphs provide a hint as to why this node was having reported throughput problems…



Using the data

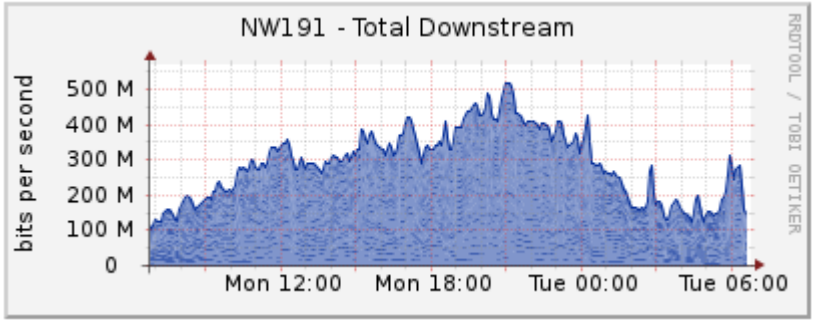
- Downstreams are graphed both individually, and from their combined bonding groups.
- This is useful when rolling out new bonding groups and watching the uptake.

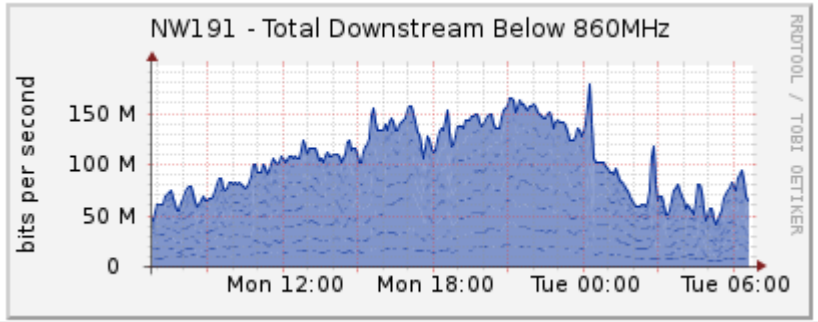


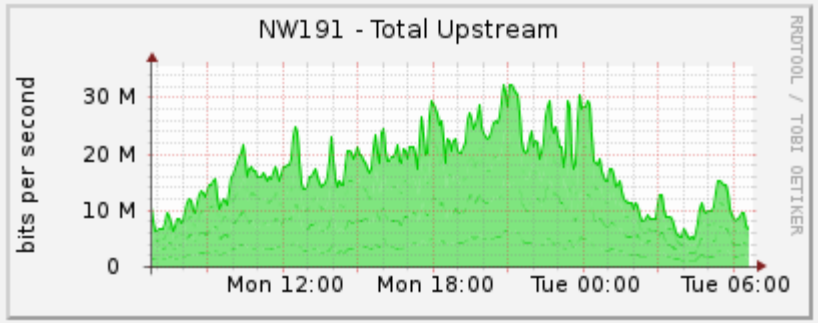


Using the data

- Various totals are graphed which can help identify some other issues.



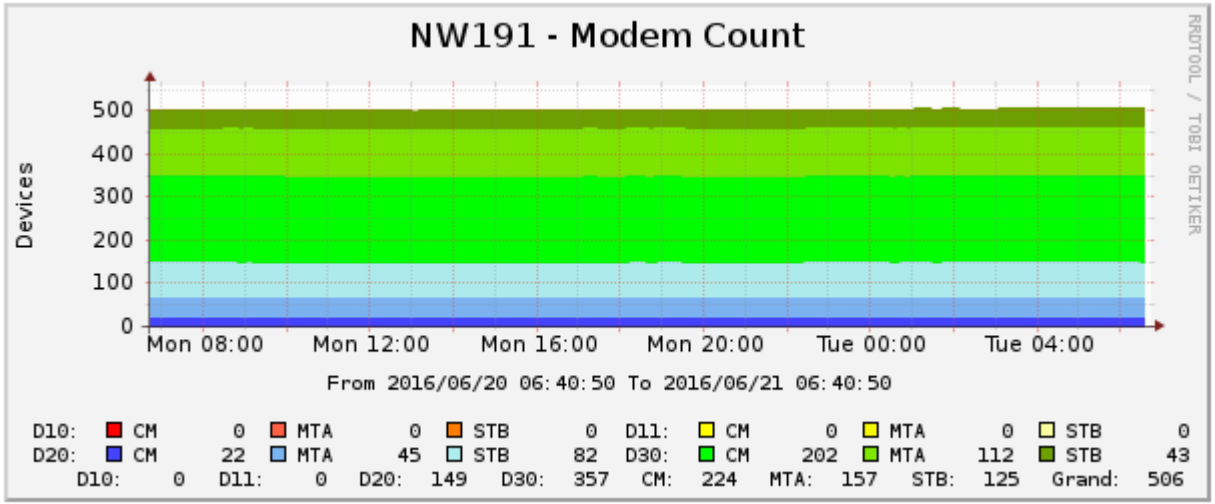




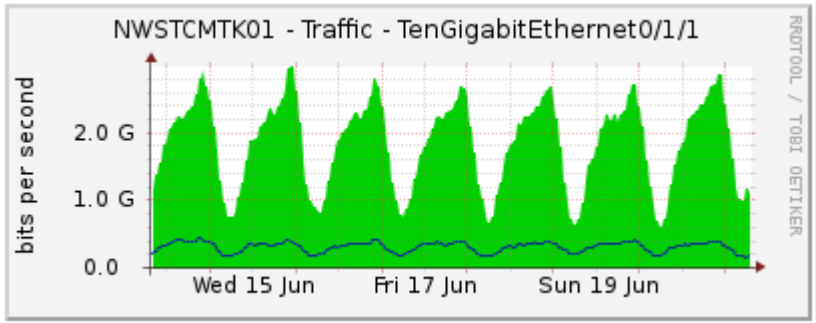
Gathering Data

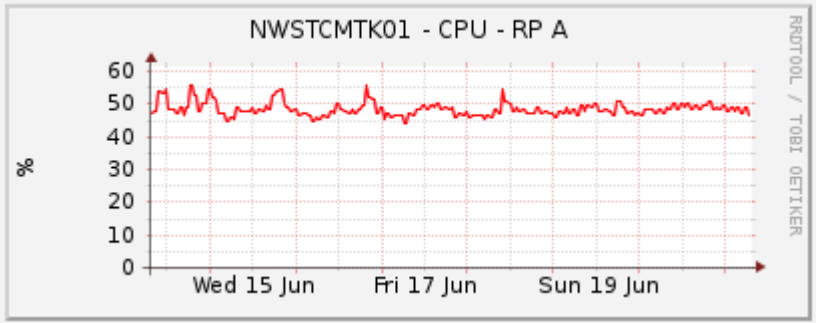
The modem count chart has a surprising number of uses

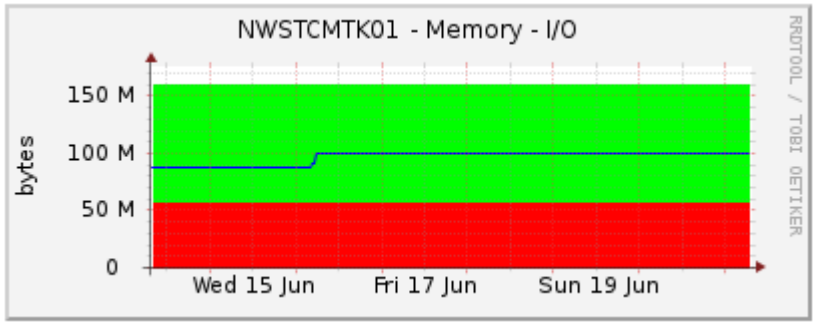
- D3.0 penetration - D1.0/1.1 elimination - New D3.0 STB rollouts
- Monitoring modem counts pre and post work.

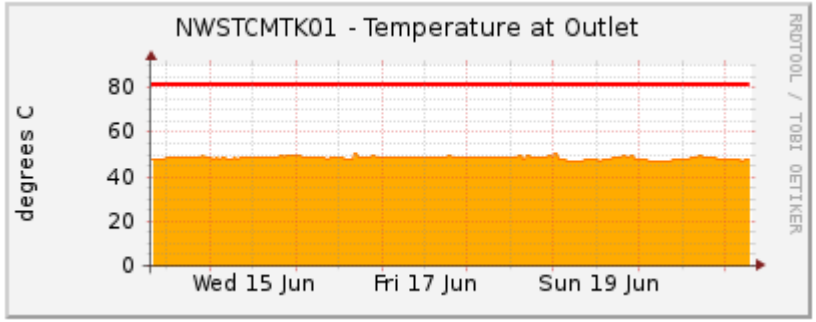


Gathering Data – Chassis-Wide Information









How much data is collected?

- The poller was setup to monitor all of these parameters across every CMTS in two cities.
- This results in over 830,000 individual data points being gathered every 5 minutes.
- Only one (relatively low-powered) polling server is needed!
  - A polling cycle takes 92-95 seconds to complete, using 150 threads in parallel.
  - Cacti uses RRD flat files, so storage requirements are around 75GB for everything.
  - We use a RAM disk to speed up the polling.

That’s a good first step

- Now we have a lot of data in a easy-to-use format
- But that doesn’t solve a lot of the original problem – we’ve in some cases made it worse by having Yet Another Tool.
- This led to more conversations with the field, and we agreed - it’s time for Phase 2.

Actually USING the Data - Daily

Node NW852	**NWSTCMTK02 port Cable6/0/5**	**Node is 3.8% degraded. Cacti Graphs**
18.4 MHz	**Upstream channel 0**	FEC problems - errored average of 0.6% (threshold 0.4%). Was in error 340 minutes (threshold 60 minutes).

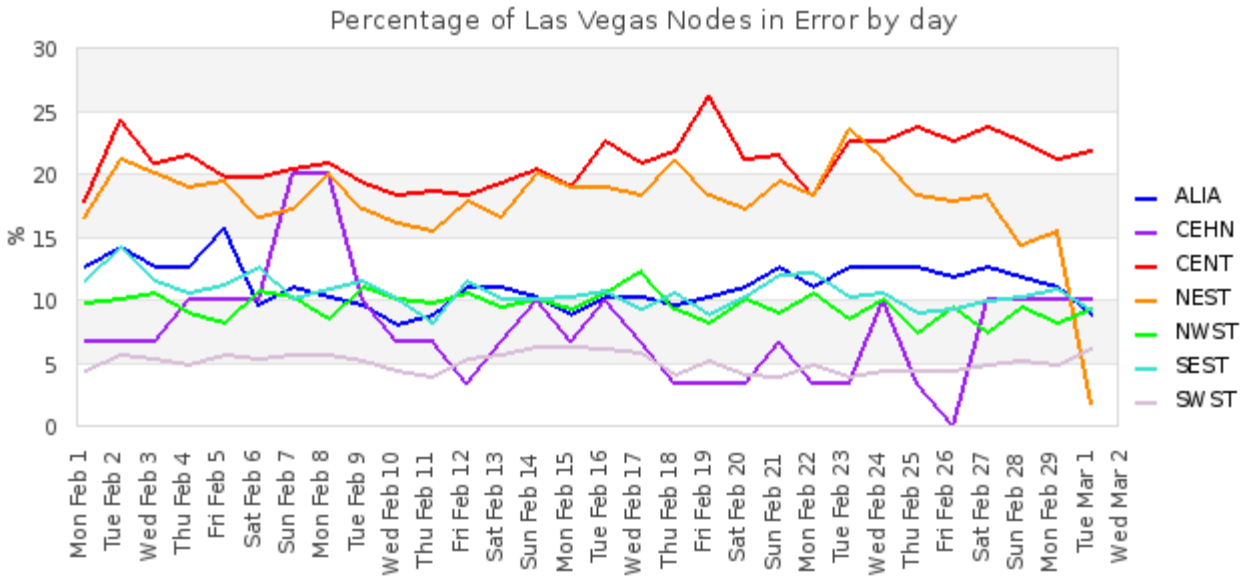
Node NW060	**NWSTCMTK02 port Cable8/1/0**	**Node is 99.2% degraded. Cacti Graphs**
36.3 MHz	**Upstream channel 3**	FEC problems - errored average of 2.9% (threshold 0.4%). Was in error 1435 minutes (threshold 60 minutes).
15.9 MHz	**Upstream channel 4**	FEC problems - errored average of 9.3% (threshold 0.4%). Was in error 1410 minutes (threshold 60 minutes).
29.8 MHz	**Upstream channel 2**	FEC problems - errored average of 2.4% (threshold 0.4%). Was in error 1435 minutes (threshold 60 minutes).
23.3 MHz	**Upstream channel 1**	FEC problems - errored average of 2.7% (threshold 0.4%). Was in error 1435 minutes (threshold 60 minutes).

Node NW456	**NWSTCMTK02 port Cable6/1/2**	**Node is 17.4% degraded. Cacti Graphs**

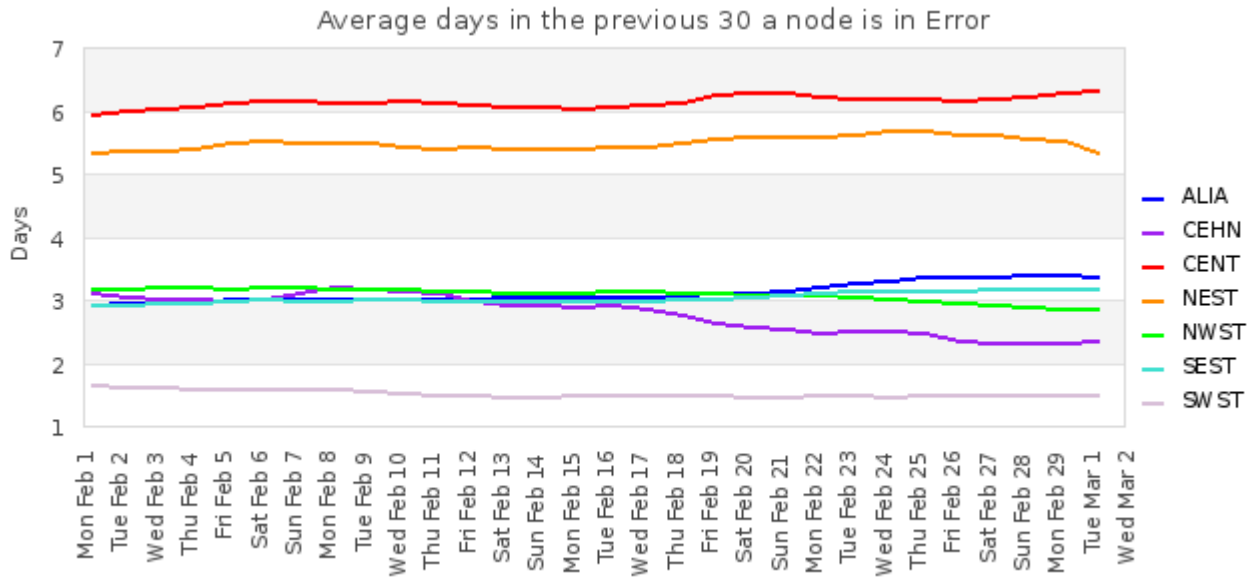
Using the Data - Weekly

STC	Nodes in STC	Number of nodes ever in error	Average number of days in error	Nodes in error 7+ days	Nodes continuously in error over the last 7 days	Nodes continuously in error over the last 14 days
ALIA	127	65 (51.2%)	3.3	23 (18.1%)	5: NQU81 NLV96 NNV58 NQW07 NQV84	2: NQU81 NNV58
CEHN	30	11 (36.7%)	2.3	3 (10.0%)	0:	0:
CENT	275	190 (69.1%)	6.3	91 (33.1%)	23: RON54 RQQ34 RQN59 RPQ53 ROT89 ROP02 RNN70 RSQ33 RSP09 RPQ19 RPQ18 RRQ47 RRN43 RSO83 RQN92 RPQ98 RRN30 RSN13 RPN26 RON19 ROL32 RSQ84 RQQ70	10: RON54 RQQ34 RQN59 RPQ53 ROT89 RSQ33 RPQ19 RRN43 RPQ98 RON19

Using the Data - Weekly



Using the Data - Weekly



What’s next?

- This data was made fairly open and easy to get to inside Cox.
- A lot of surprising uses come from just having a clean, reliable, easily-accessible sets of data.
- A lot of functions got prototyped and trialed here, and then rolled into centralized tools.

Closing thoughts

- Don’t horde data (either deliberately, or by making it extremely lengthy or difficult to get to).
- Help facilitate communications to the people who have access to data.
- Don’t frown upon people doing a little side work to produce functions like these.
- Rapid prototyping / DevOps / Agile – whatever you want to call it, every end product doesn’t need to be perfectly polished.

SCTE ISBE CABLE-TEC EXPO '16

SEPTEMBER 26-29 PHILADELPHIA

Andrew Gray

Andrew.Gray@cox.com

SCTE Society of Cable Telecommunications Engineers

ISBE International Society of Broadband Experts

#CableTecExpo

Essential Knowledge for Cable Professionals™