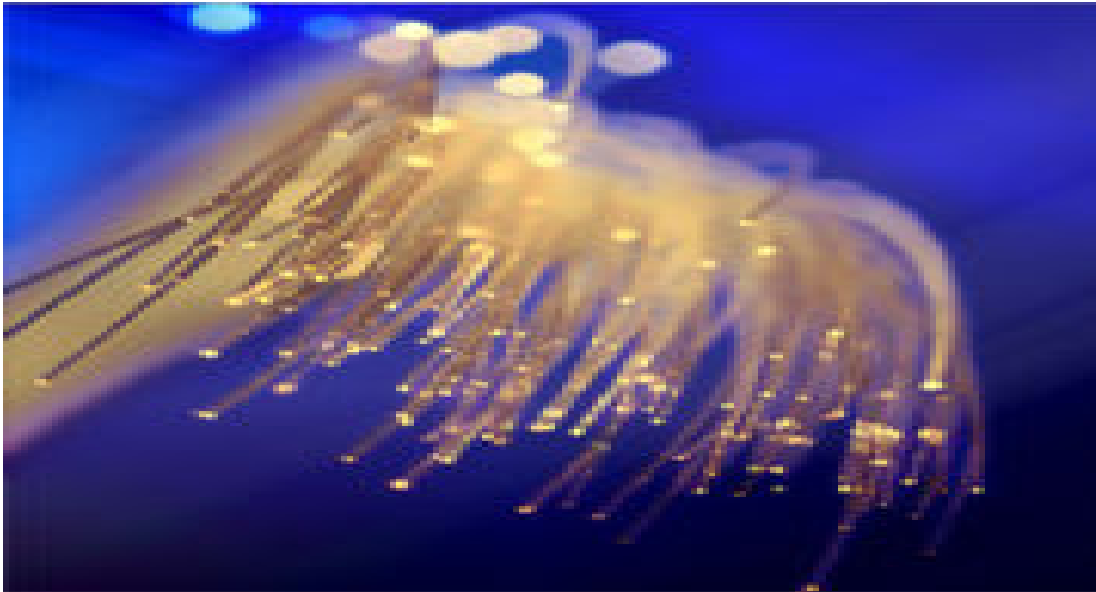


Analysis of Network Outage Reports for NRSC Meeting



*Communications Systems
Analysis Division – Public
Safety & Homeland
Security Bureau*

John Healy

April 2010

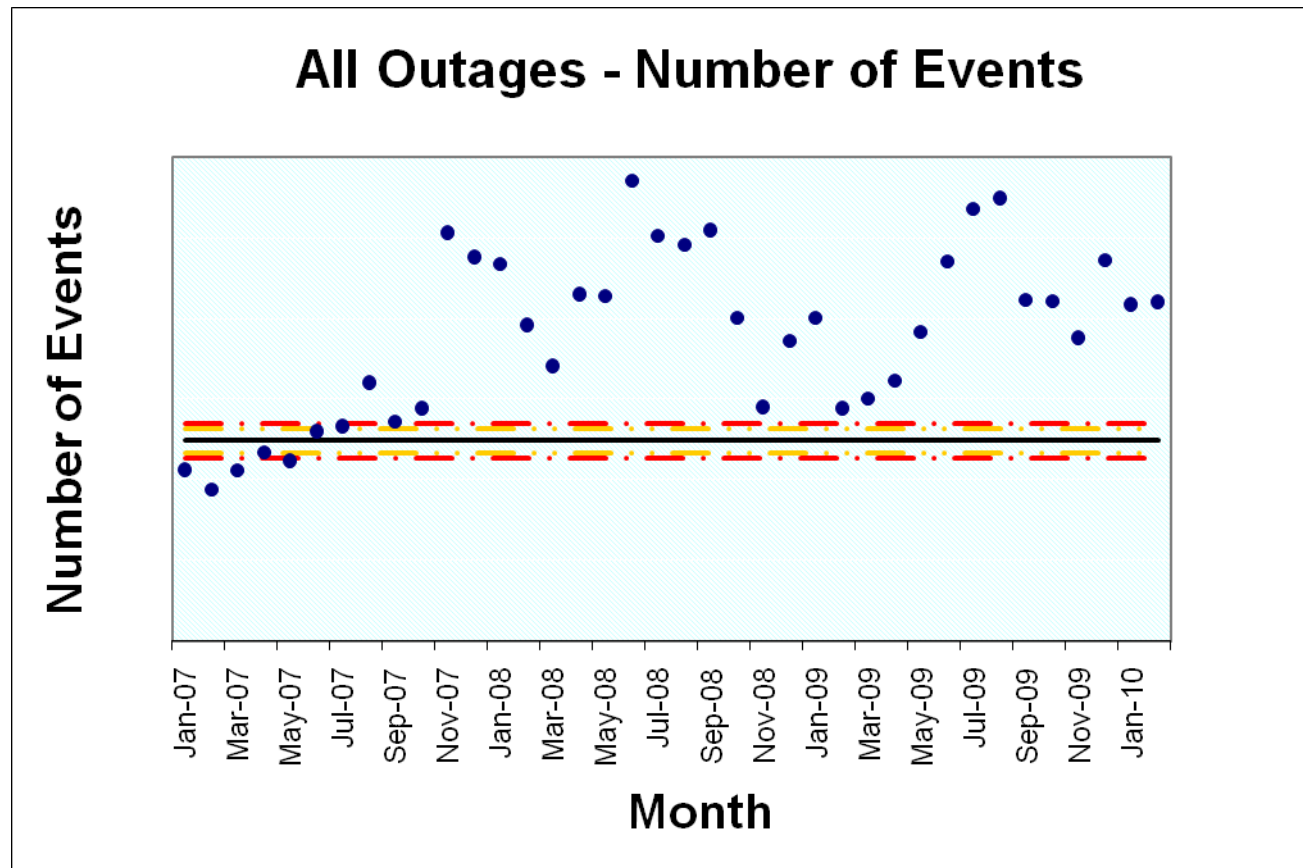




Overview of Presentation

- Network Reliability Status
- Improvements to NORS
- NRSC Activities

Frequency of Outages by Month

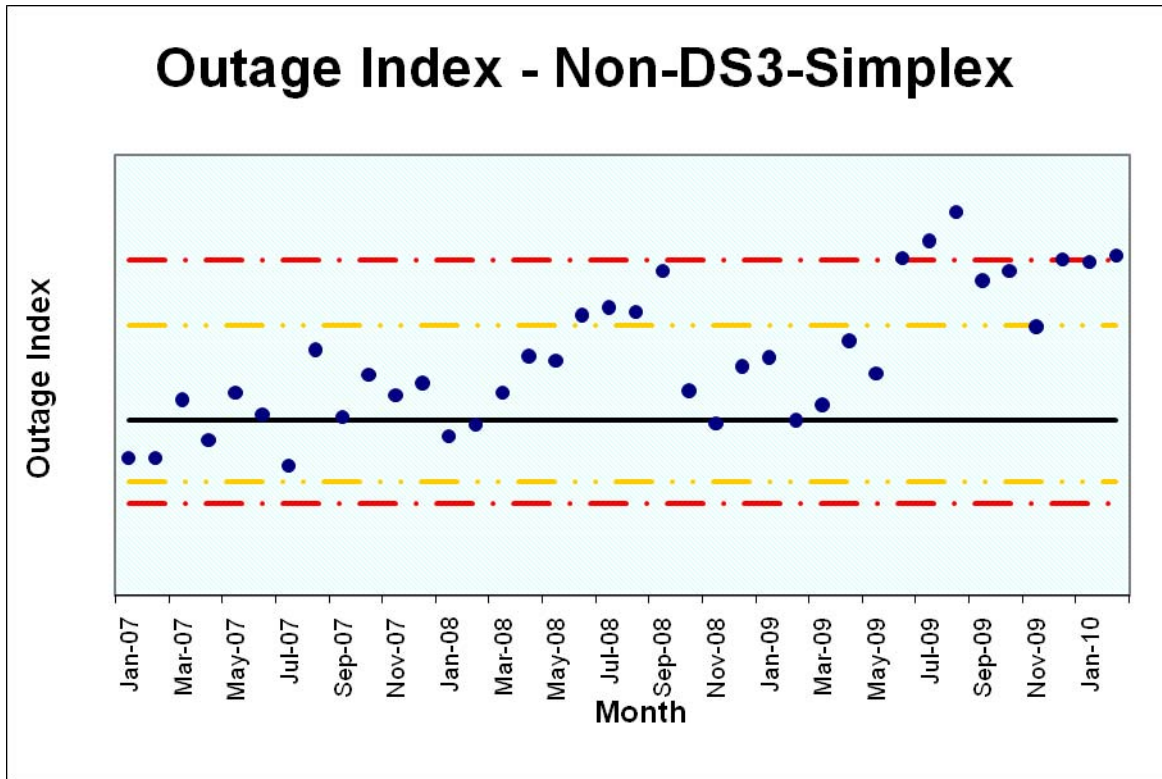


Standards for Outage Frequencies



- Took average of January 2007 through October 2007 as the standard

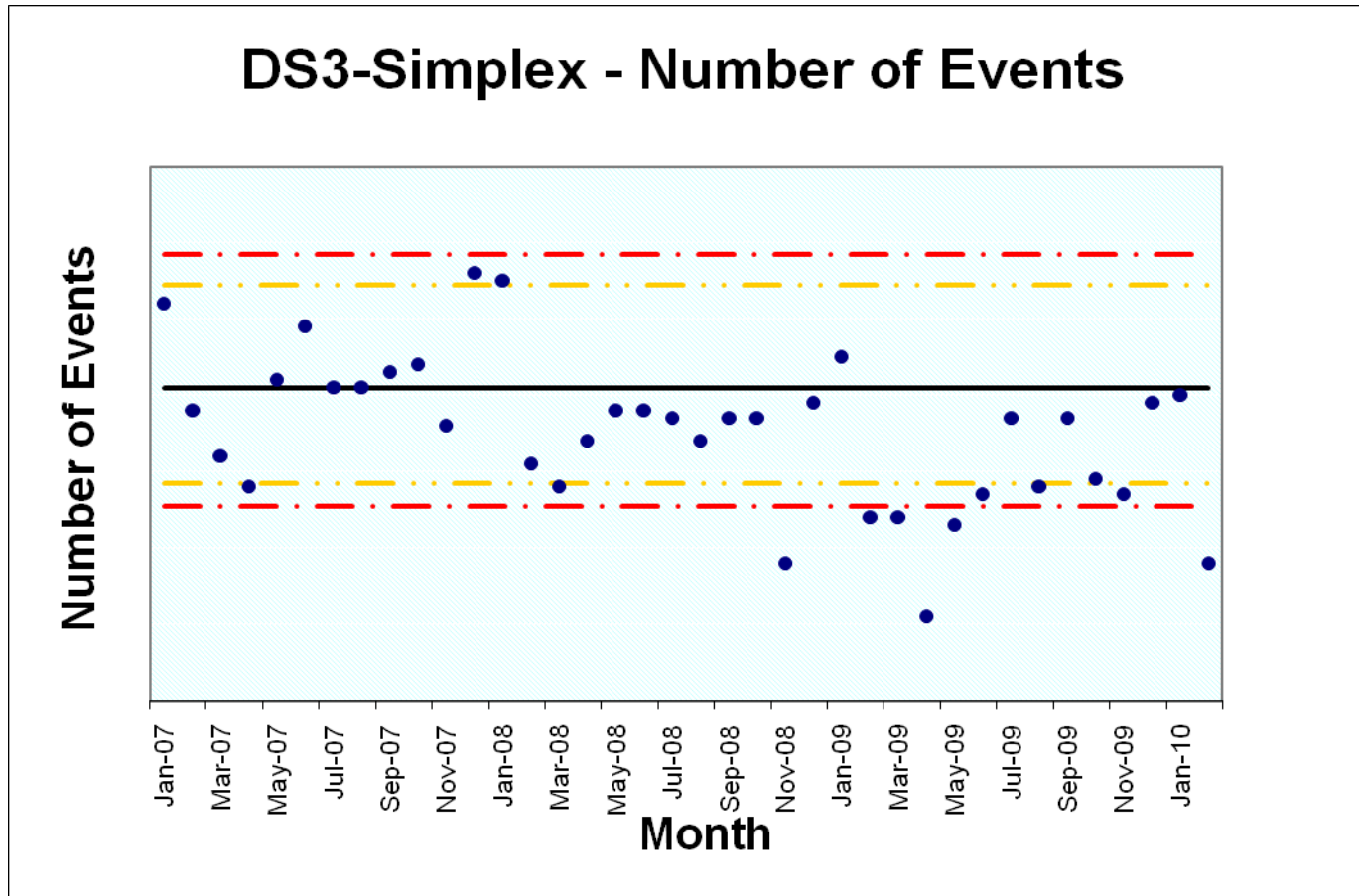
Outage Index – For All Outages Except DS3-Simplex



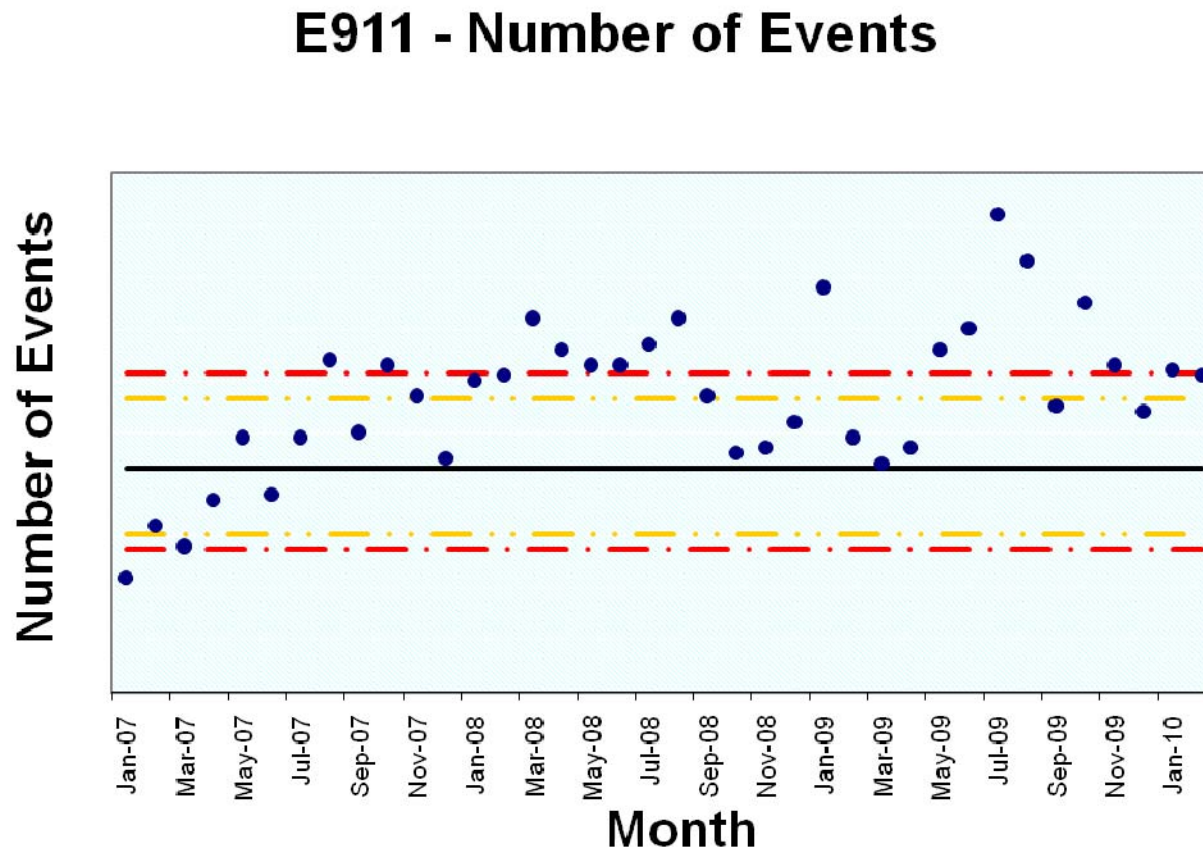
**Last 9 months
have been very
high**

See PRQC-2006-019 for a description of the method used to calculate the outage index.

DS3-Simplex



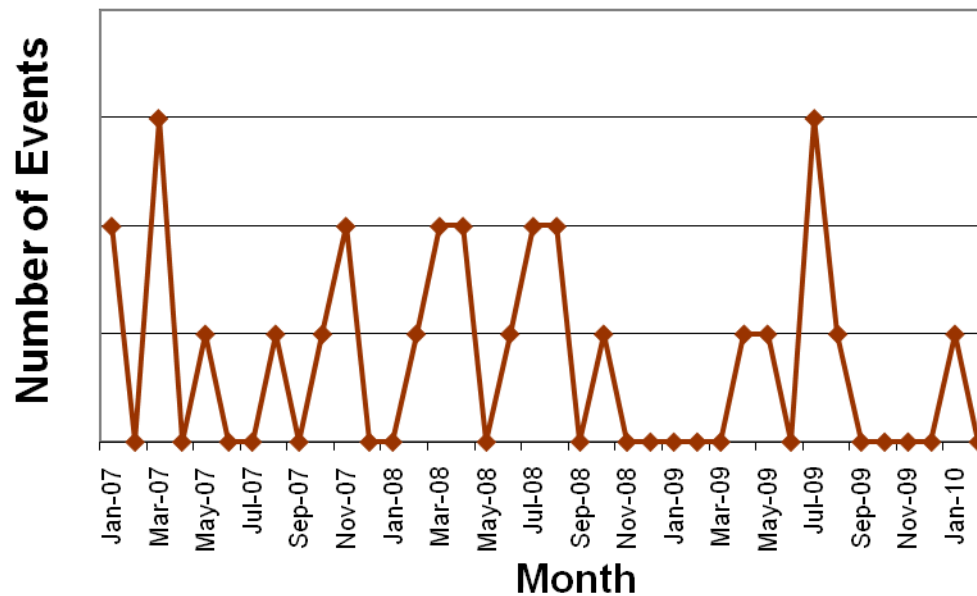
E911



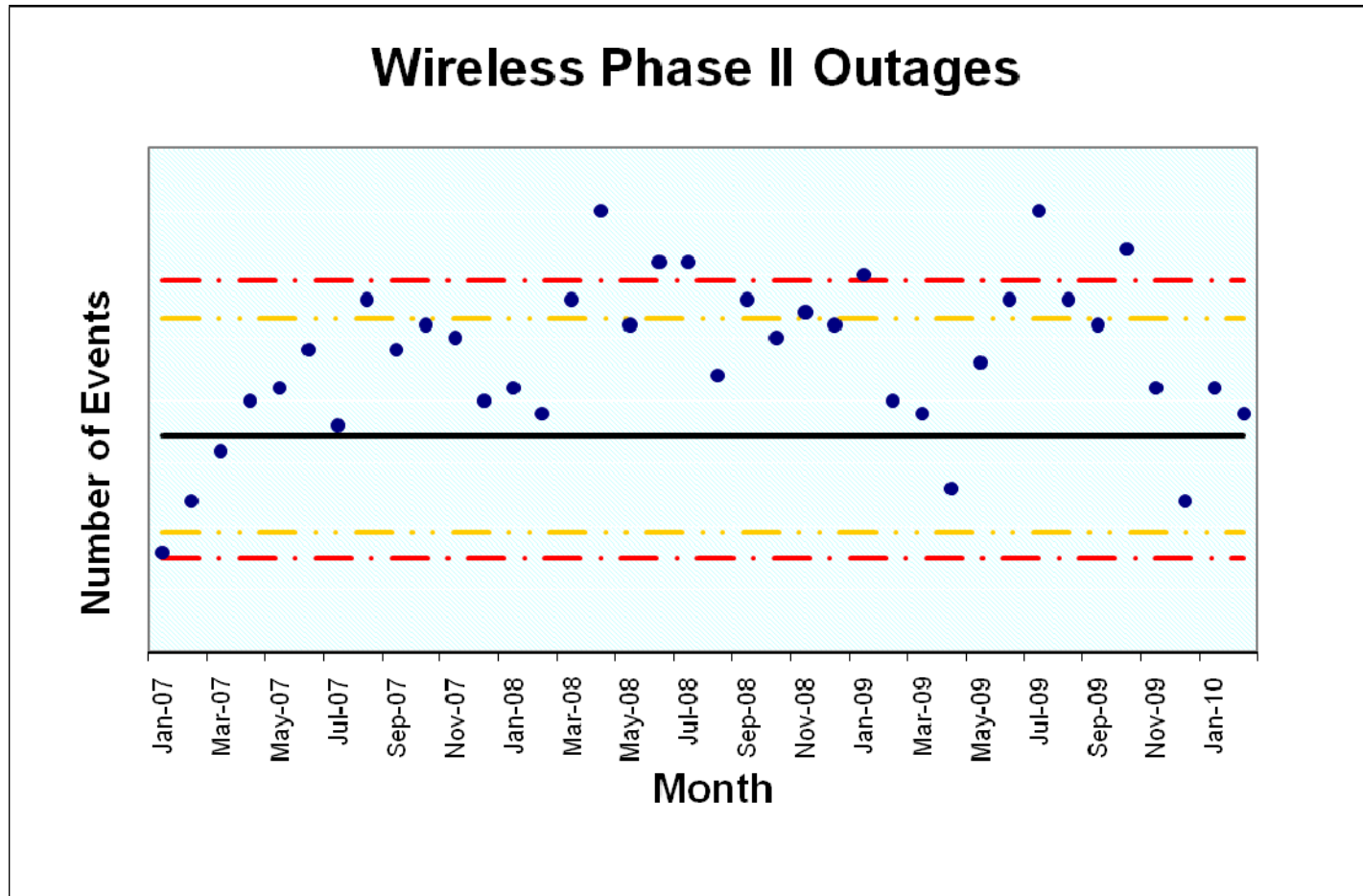
Very Large E911 Outages



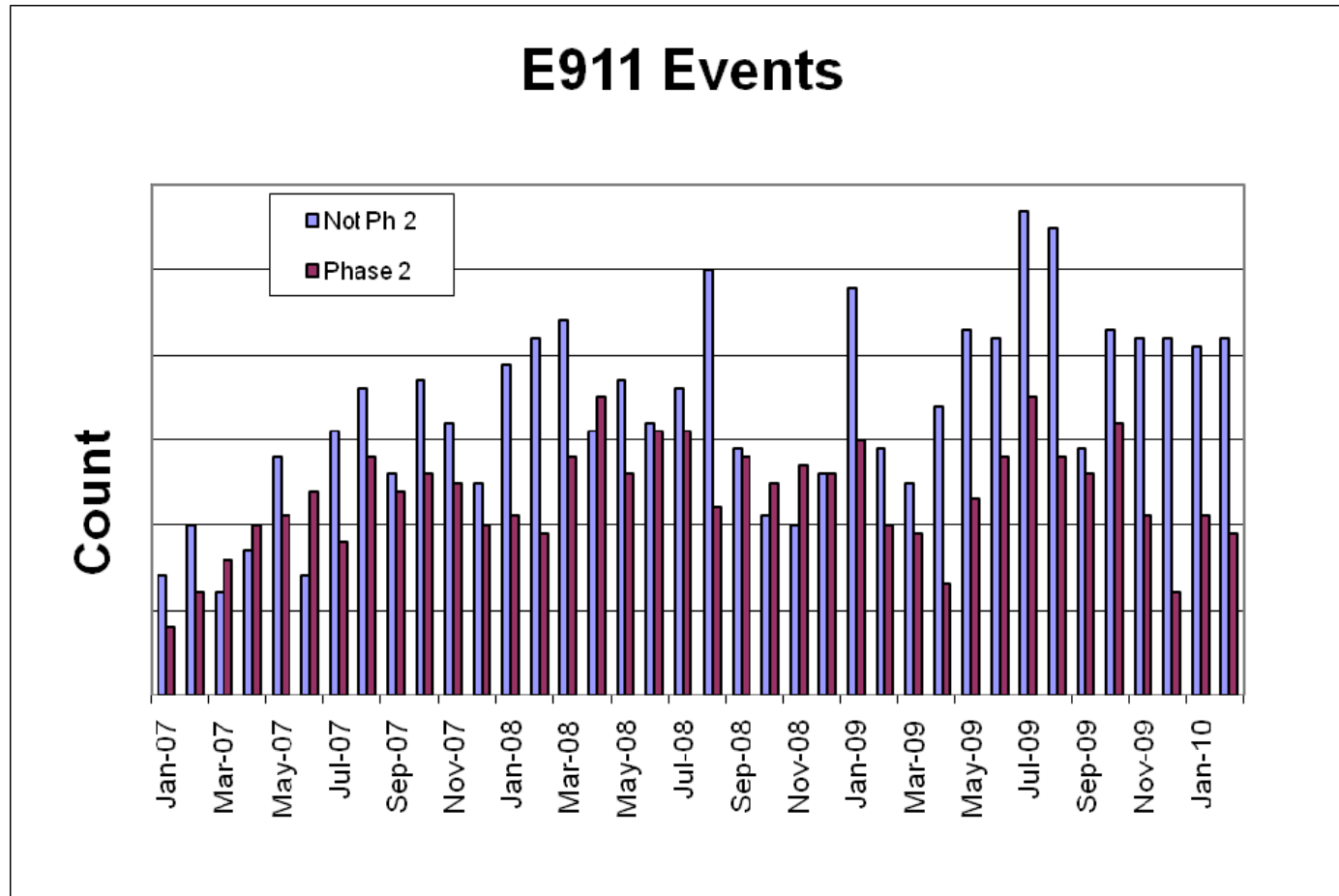
E911 Events Affecting > 1,000,000 Users



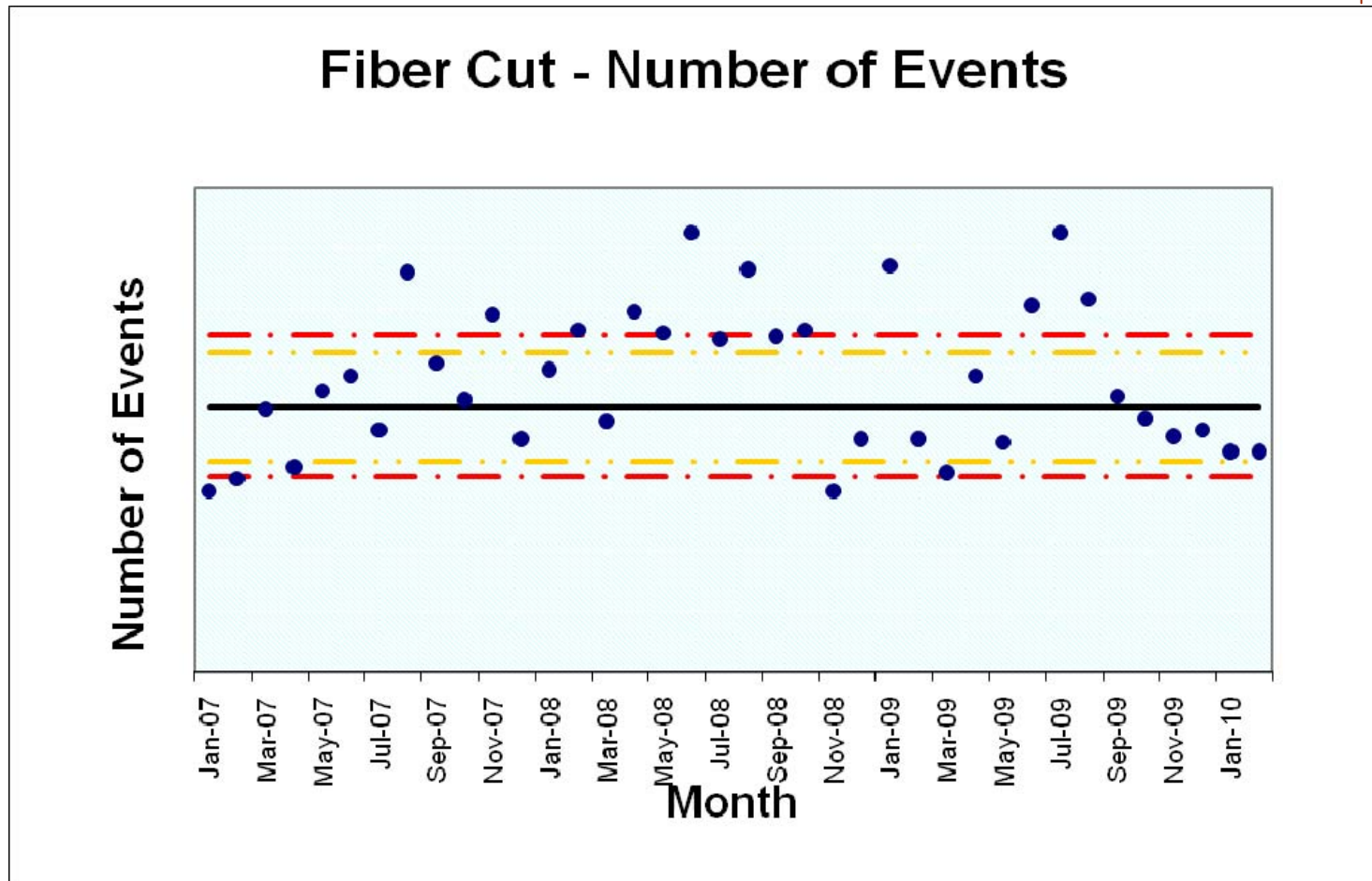
E911 – Phase 2 Events



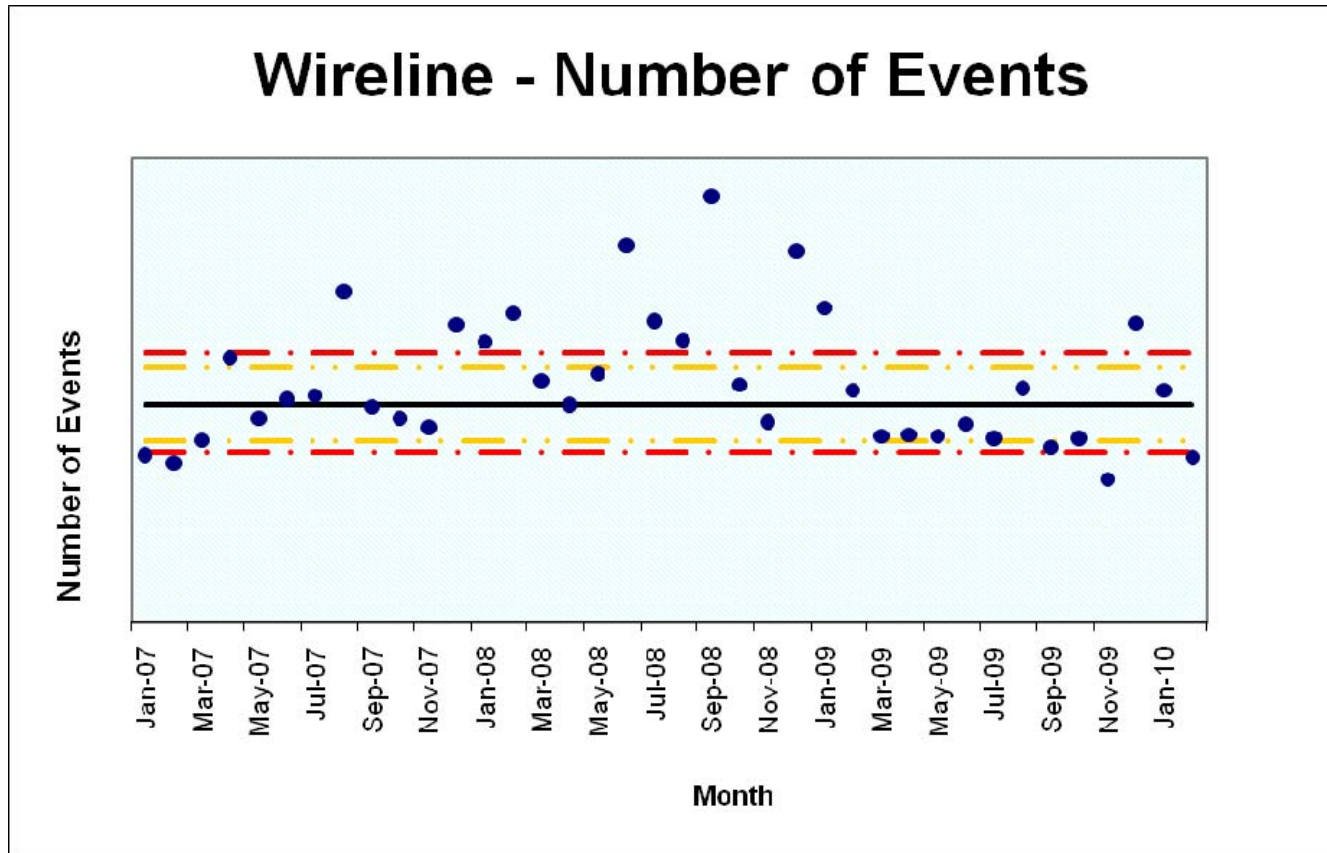
Phase 2 vs. All Other E911 Outages



Fiber Cut

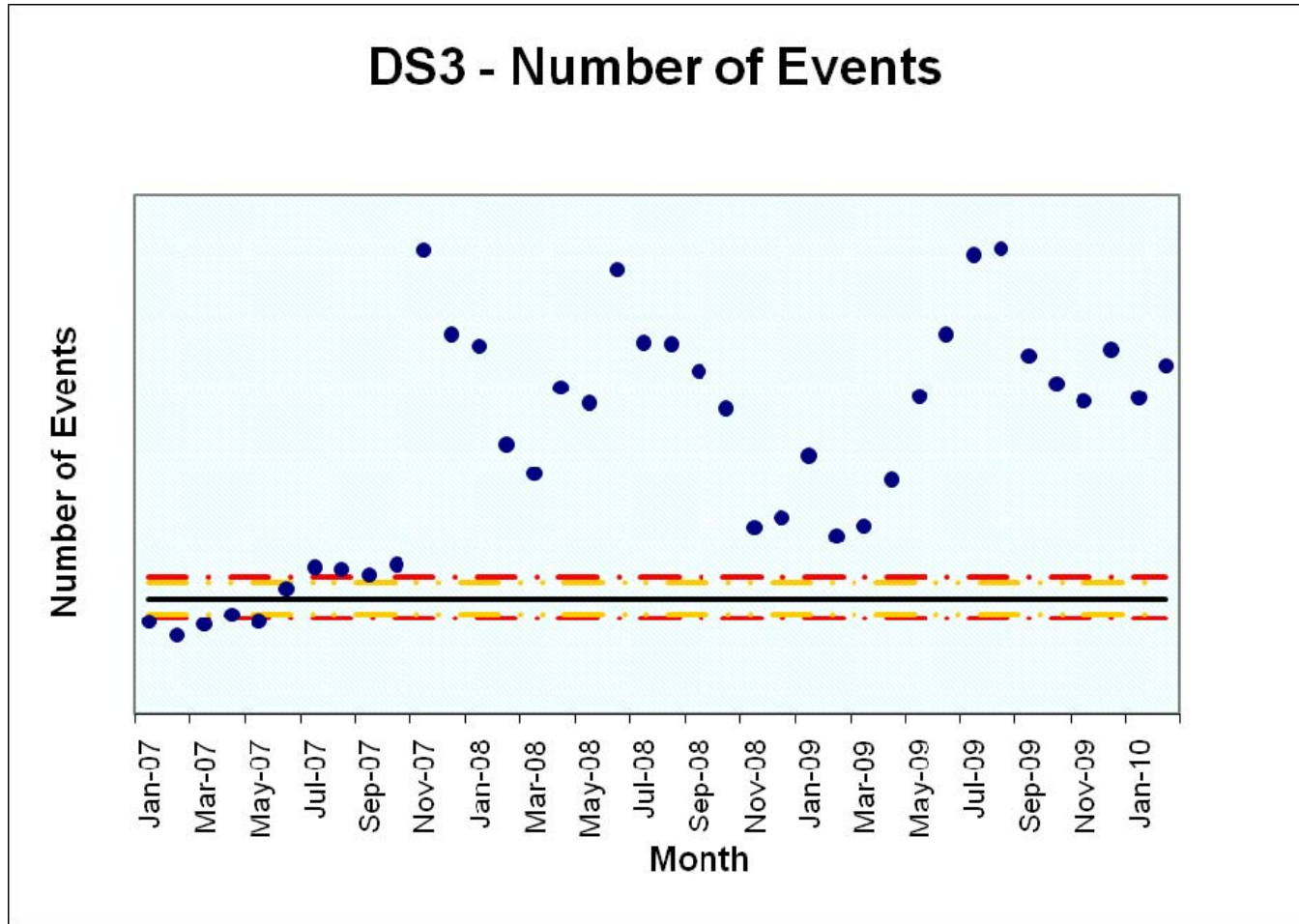


Wireline

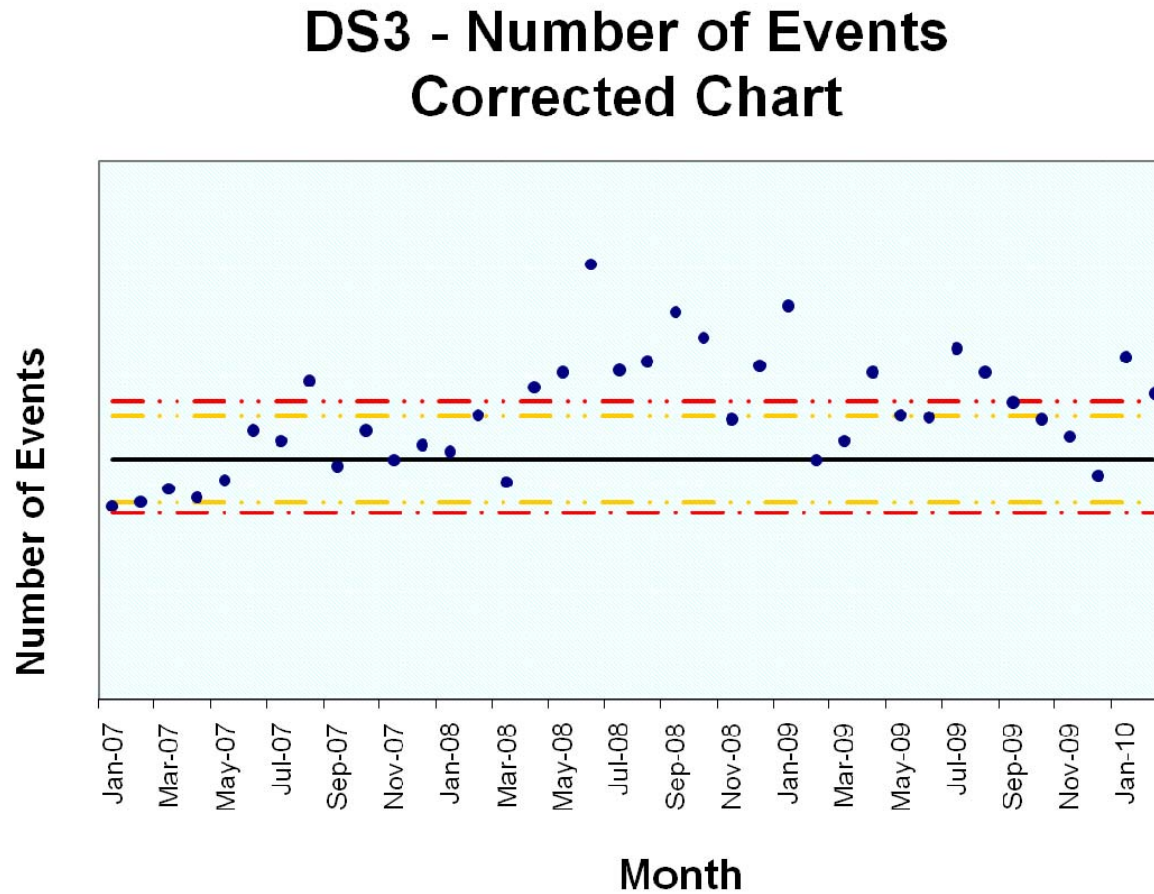


Wireline outages are all outages for which the Reason Reportable was at least 900,000 wireline user-minutes.

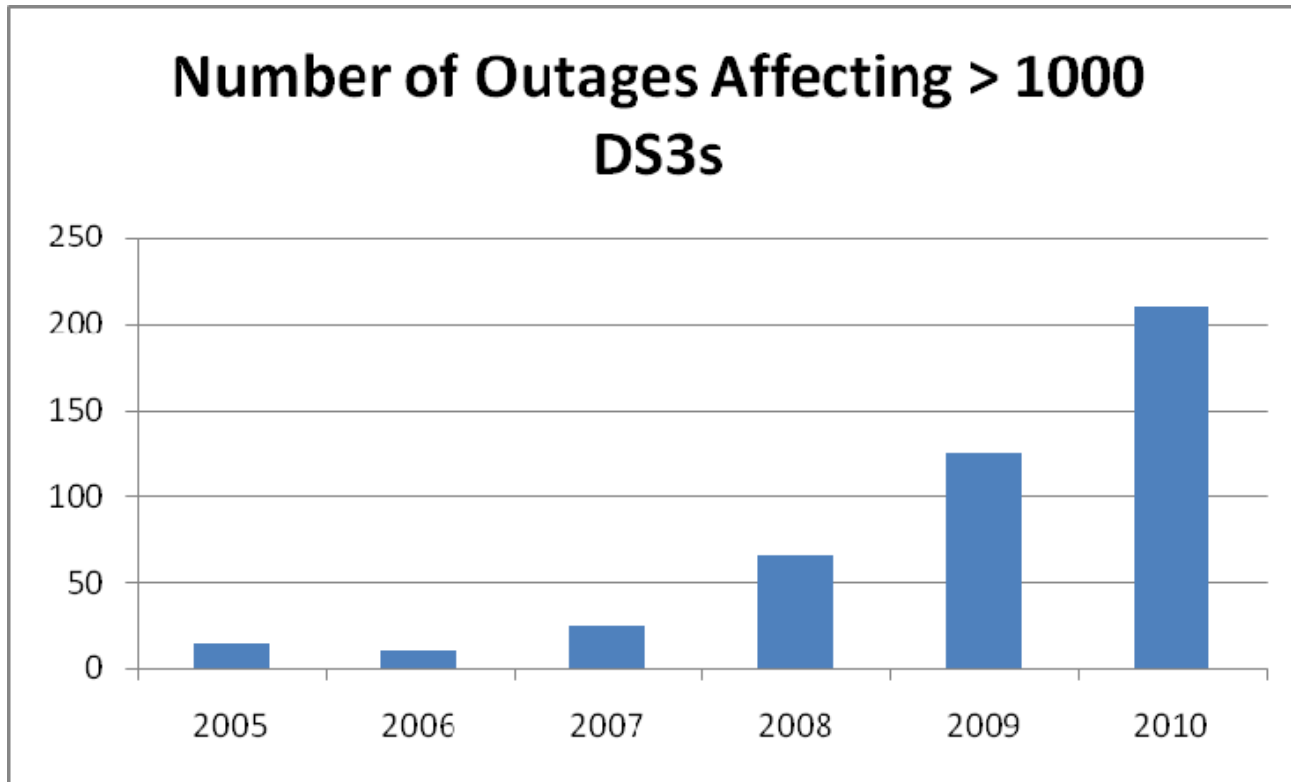
DS3 (Non-Simplex) Events



DS3 (Non-Simplex) Events

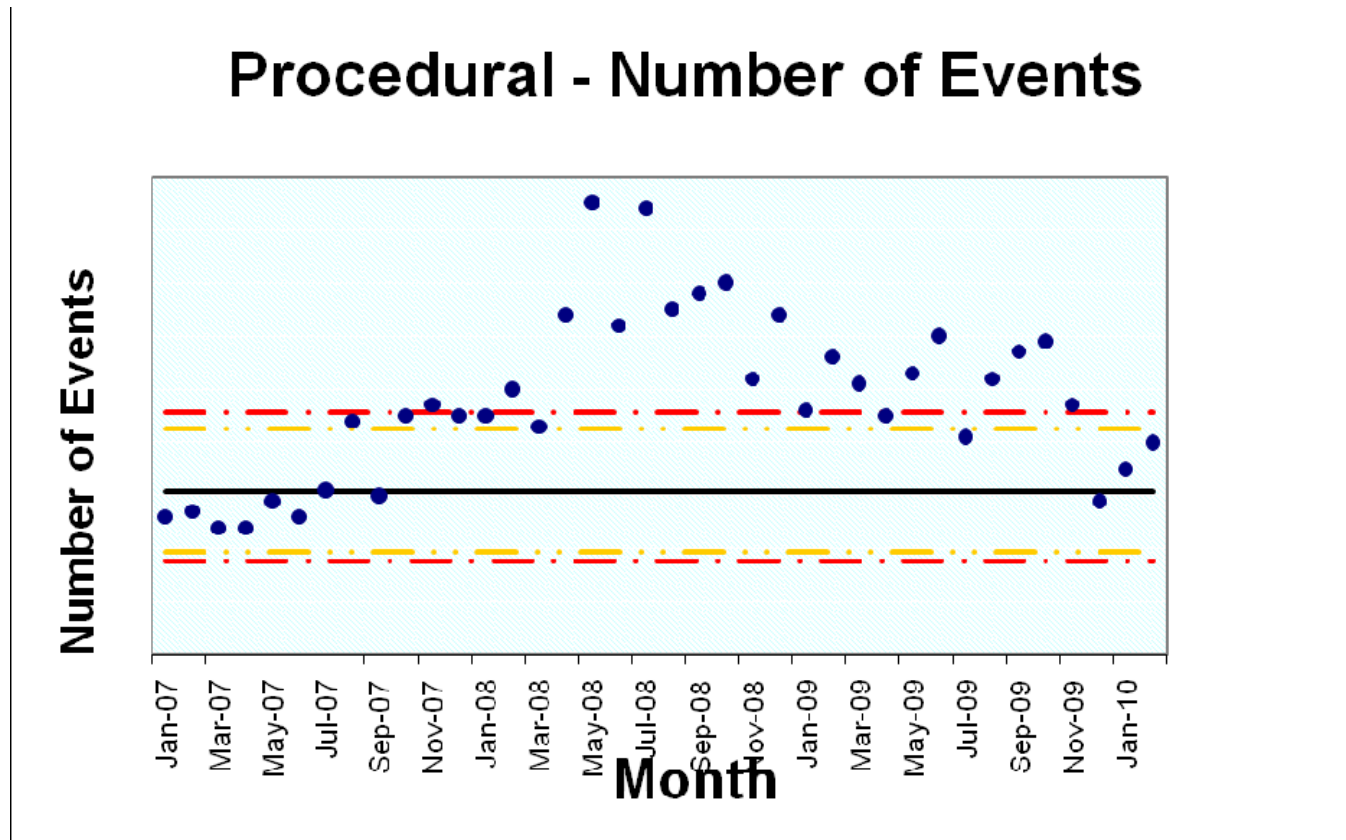


Big DS3 Outages



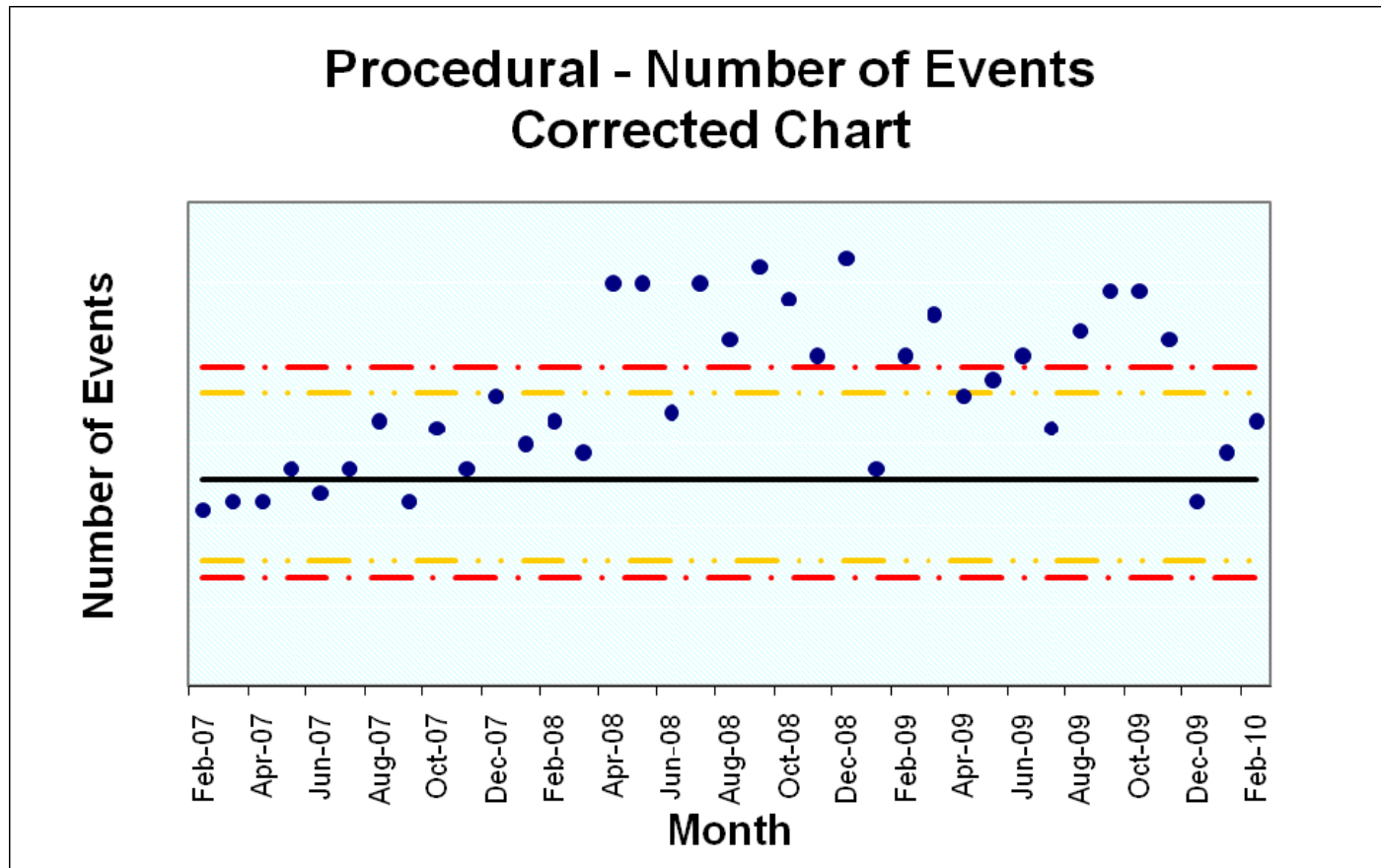
For 2010, the number of outages for January and February was multiplied by 6

Procedural Events

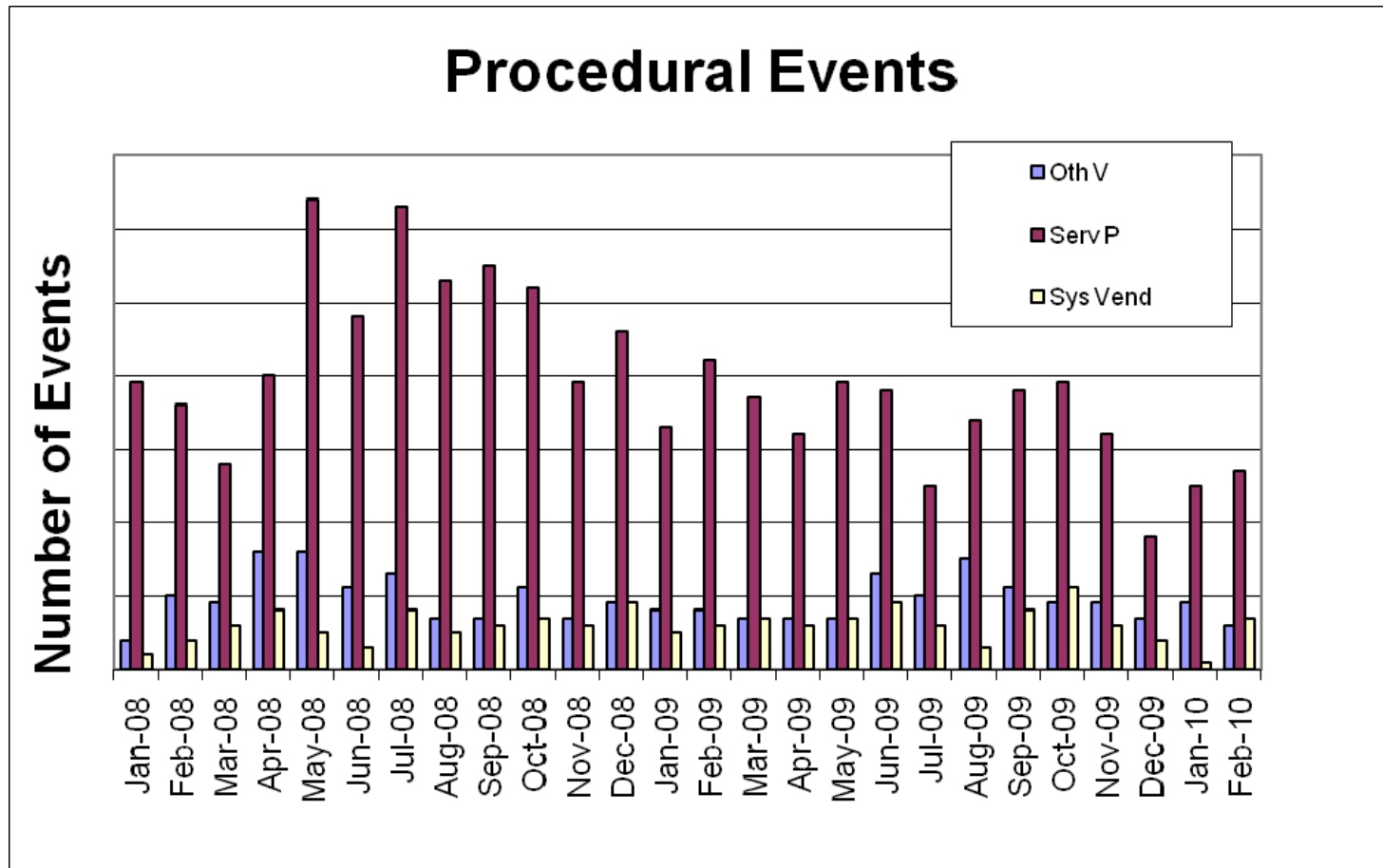


Procedural events are ones which have a procedural root cause.

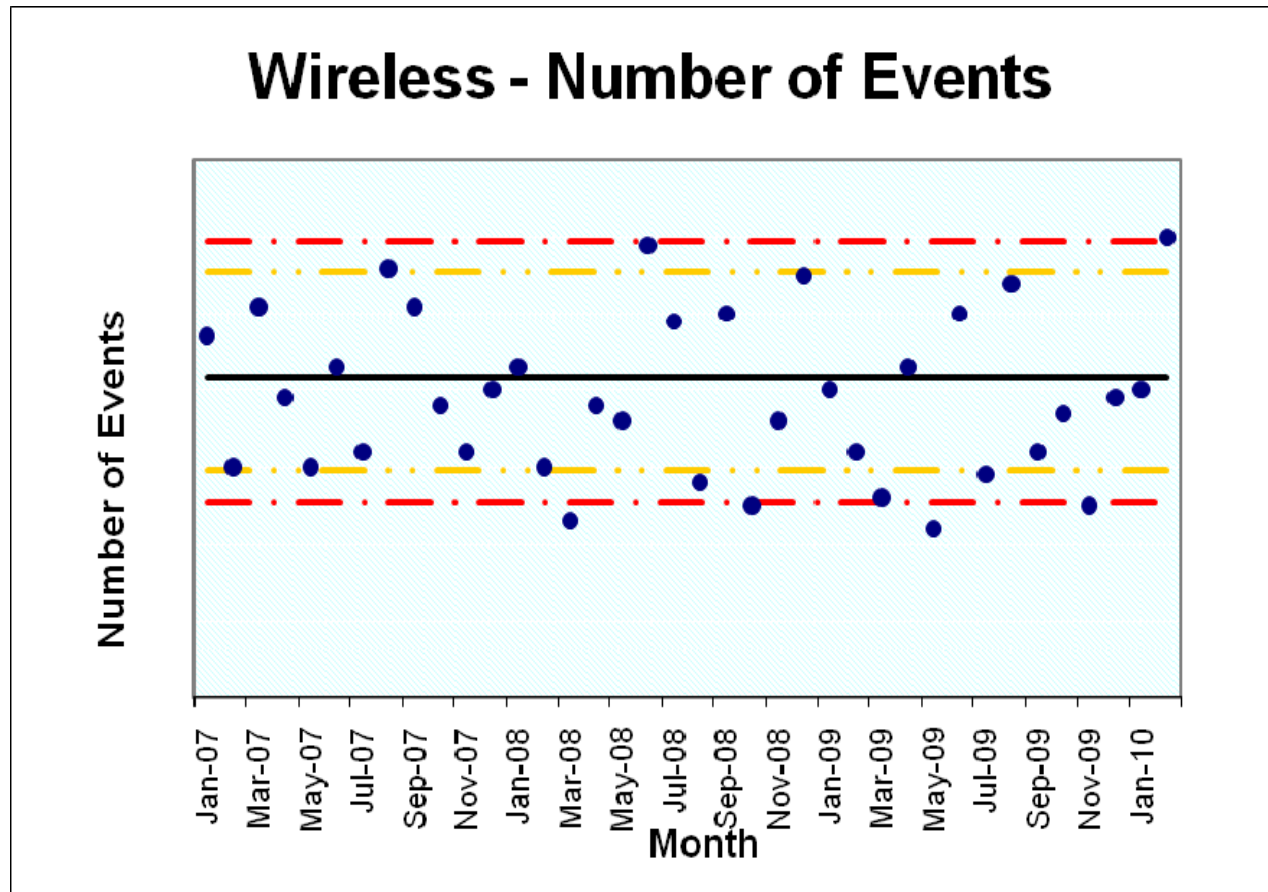
Procedural Events



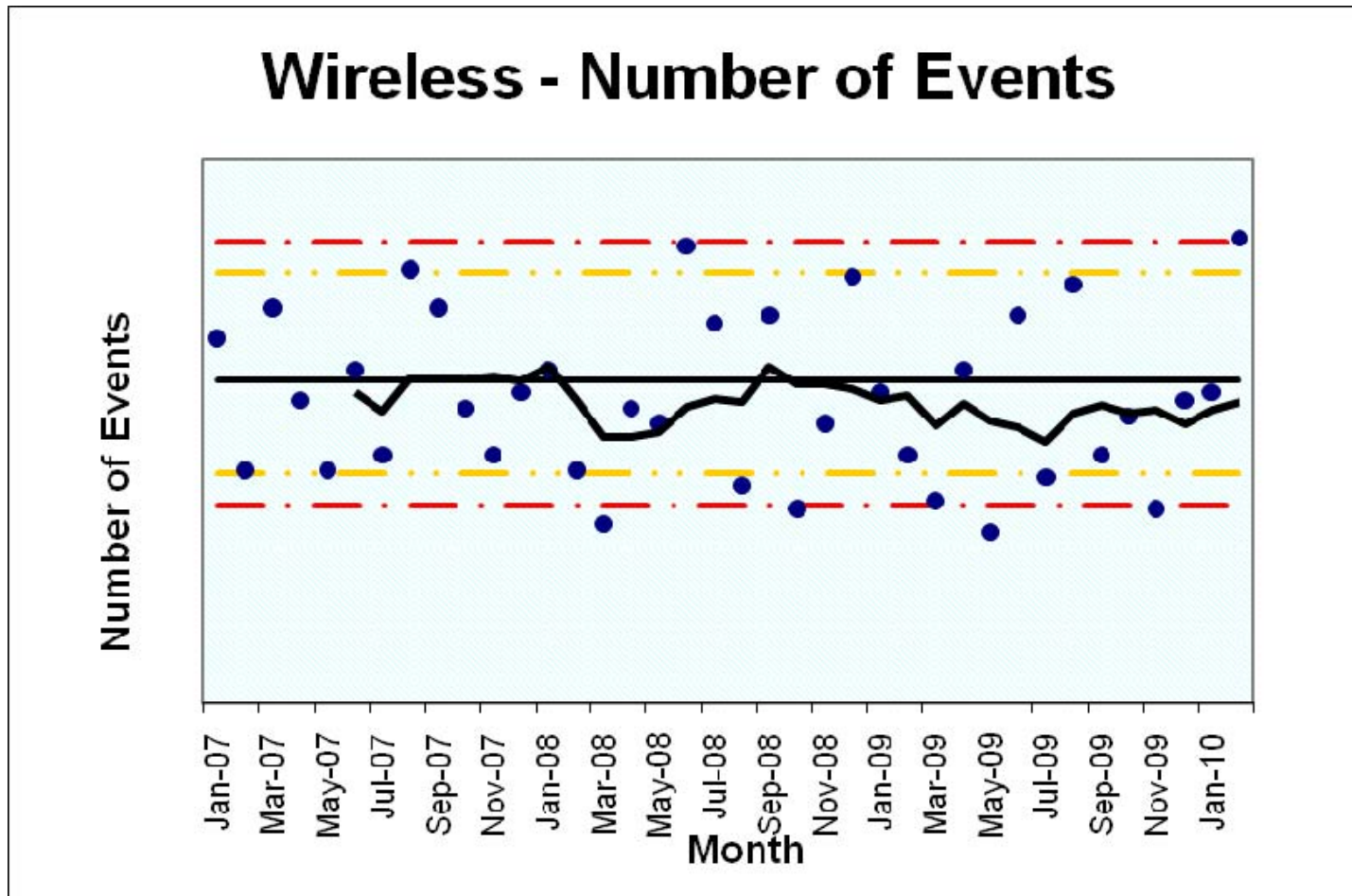
Procedural Events by Source



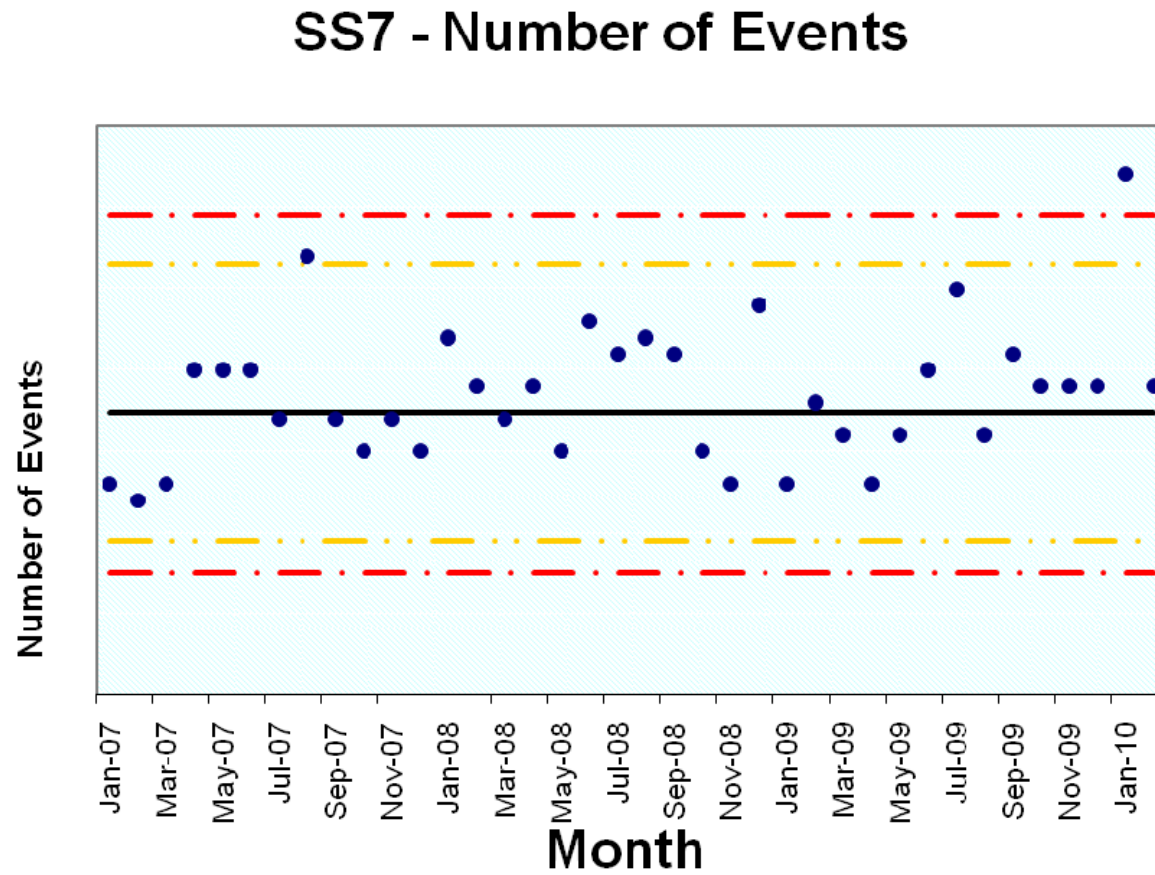
Wireless



Wireless with Trend Line



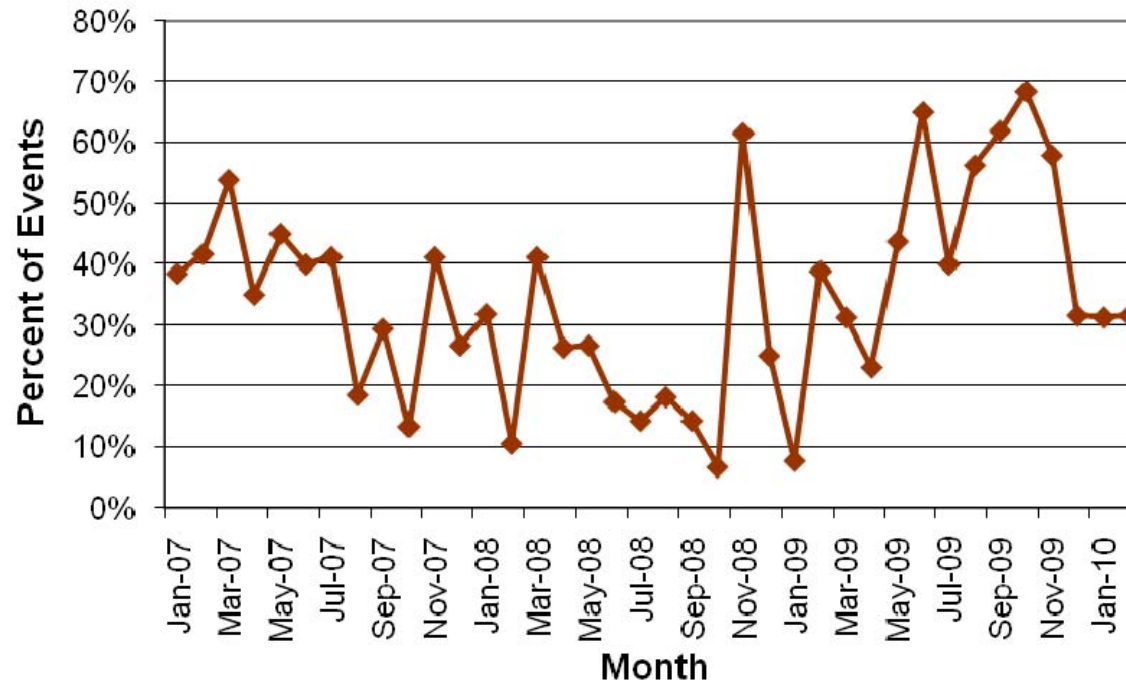
SS7



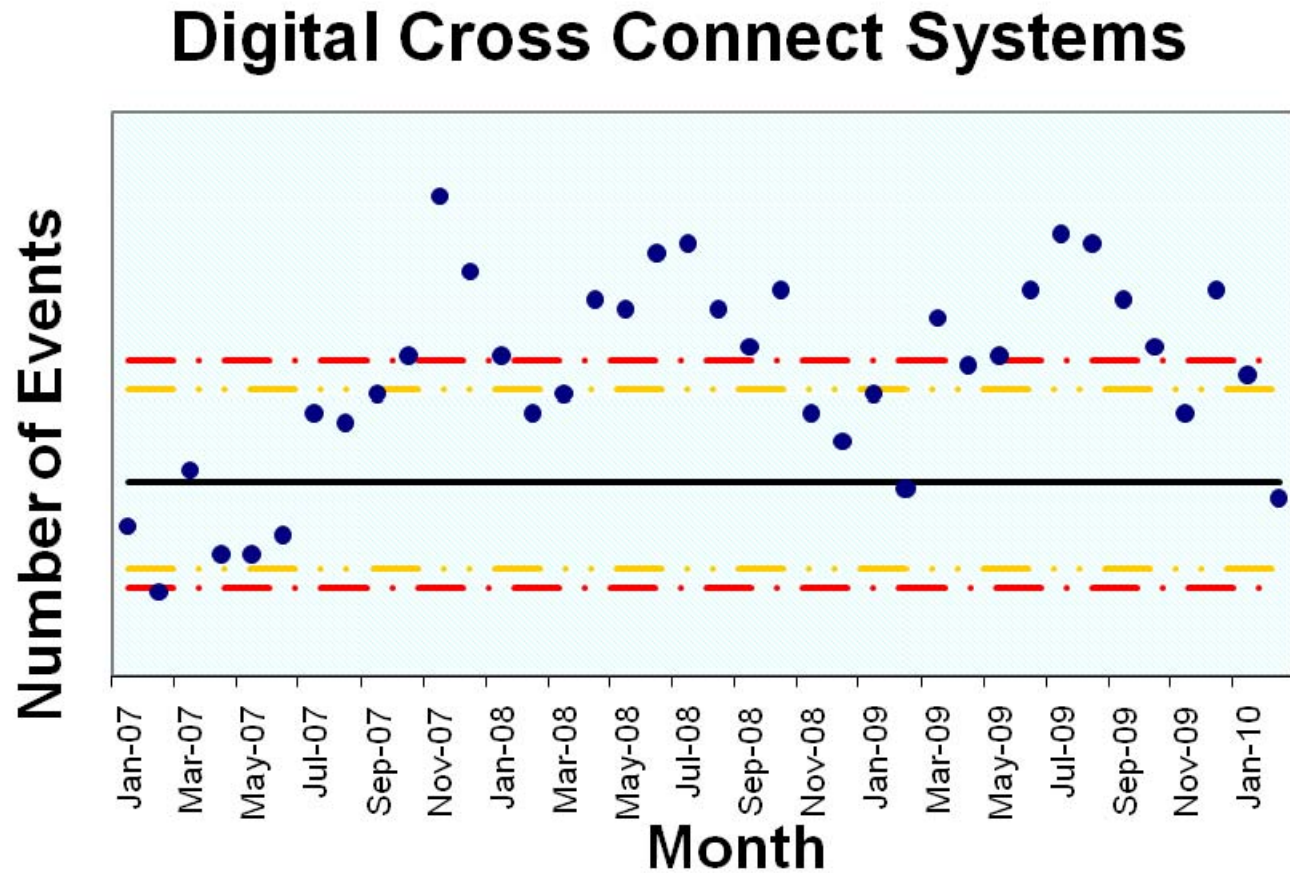
SS7 and Diversity



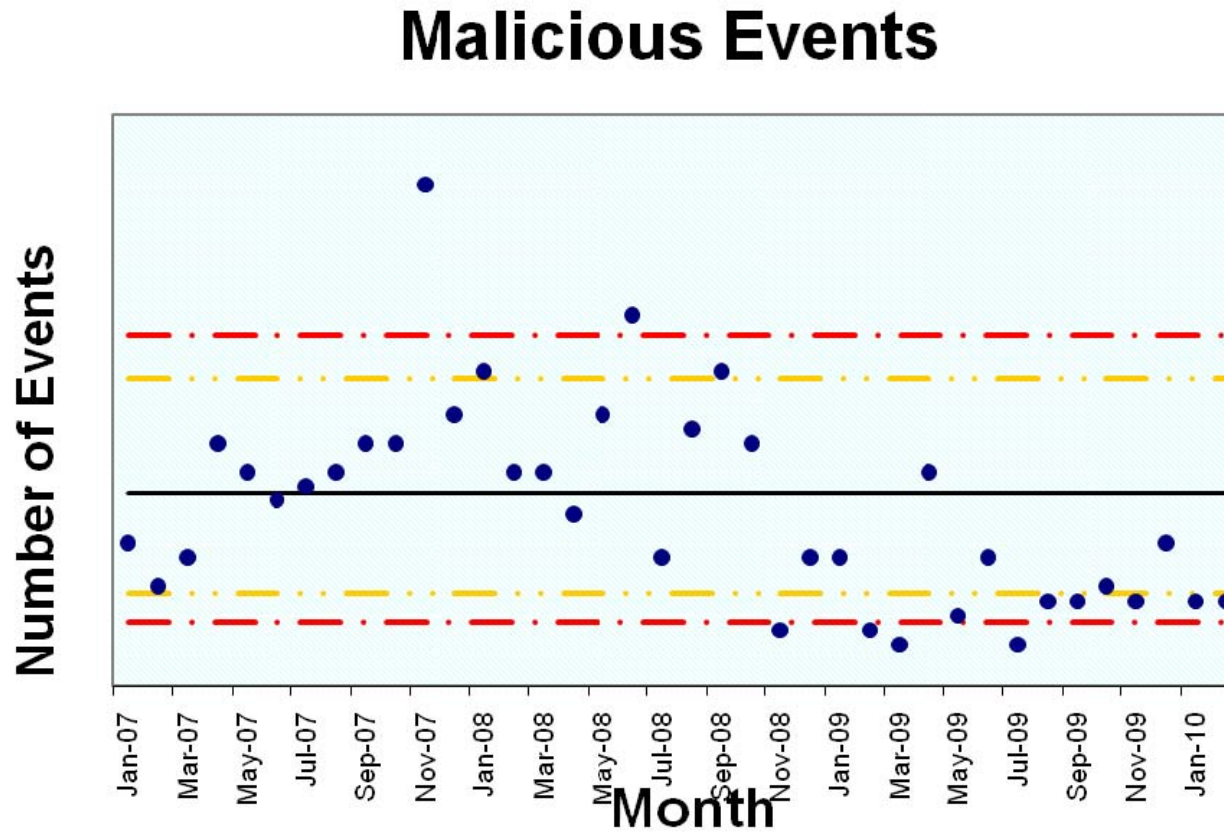
Percent of SS7 Events with Diversity Problems



Digital Cross Connect Systems



Malicious Events

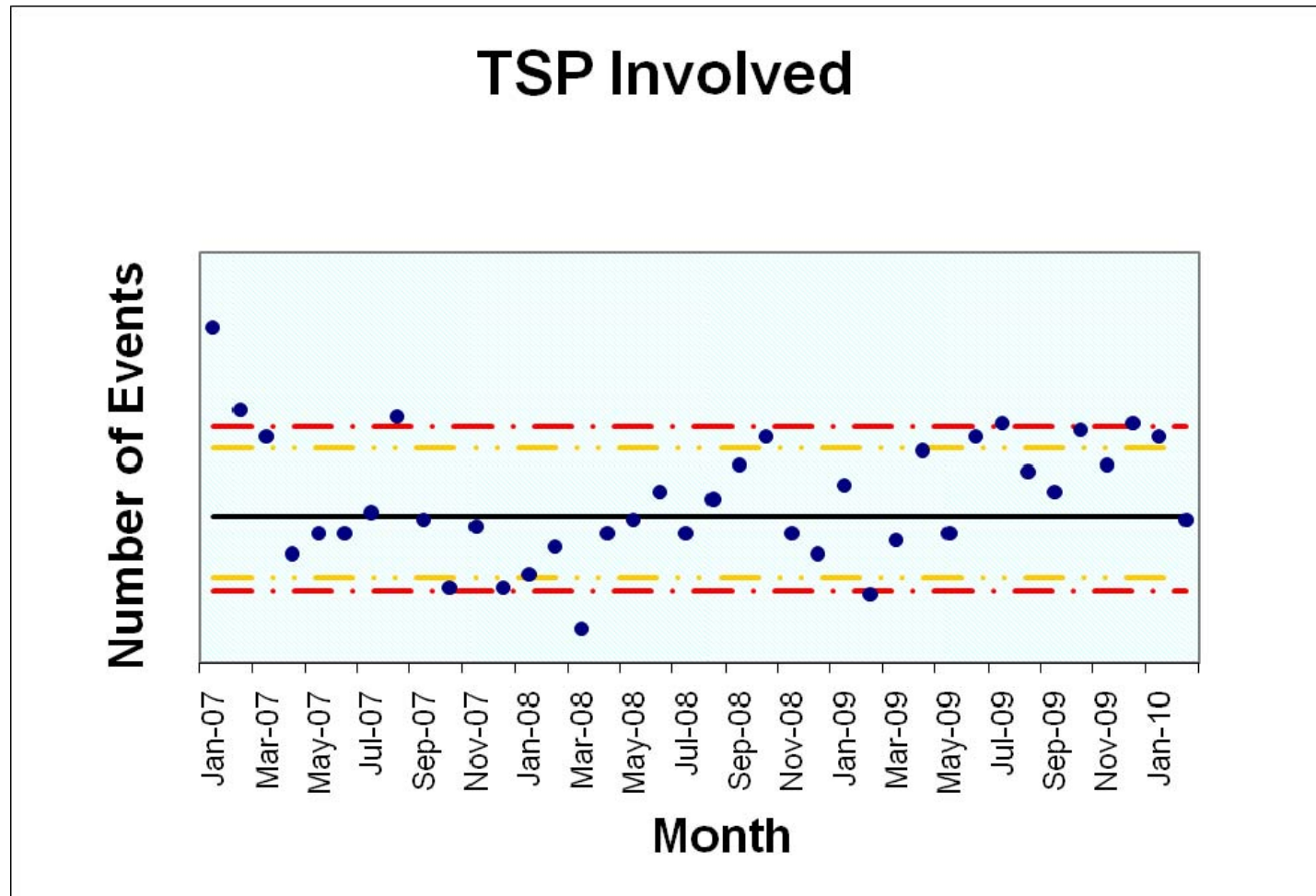


Malicious Activity



- 471 outage reports where malicious activity was indicated (188 in 2007, 188 in 2008, 83 in 2009 and 12 in 2010)
- No outages seemed to be related to terrorist activities.
- About 53% of the reports (44) mentioned vandalism in 2009 and 25% (3) mention vandalism in 2010.
- About 12% of the reports (10) mentioned gun or shots in 2009 and 33% (4) in 2010.

Telecommunications Service Priority



Telecommunications Service Priority



- About 25 outages per month in 2007 check TSP
- About 18.5 outages per month in 2008 check TSP
- About 27 outages per month in 2009 check TSP
- About 27 outages per month in 2010 check TSP



Outage Durations (Hours) – 2010

	5% Percentile	10% Percentile	25% Percentile	Median	75% Percentile	90% Percentile	95% Percentile
Airport	0.97	1.60	2.87	7.25	20.17	87.18	141.75
Blocking	0.58	0.98	2.20	4.75	14.00	108.00	108.00
Cable Telephony	1.17	1.57	1.82	6.75	18.00	51.90	.
DS3	1.22	2.17	5.20	19.10	30.56	52.11	78.09
DS3-Simplex	121.54	125.68	139.75	172.65	287.88	700.80	845.19
E911	0.98	1.18	2.00	4.28	9.71	19.21	25.18
MSC	1.22	1.31	2.49	3.13	4.03	9.81	.
SS7	0.75	1.00	1.88	4.60	17.00	79.17	.
Wireless	0.99	1.92	3.55	8.43	29.98	70.19	91.12
Wireline	5.29	8.53	38.56	82.22	159.03	284.58	466.67
All Except DS3- Simplex	1.18	2.00	4.57	17.25	36.48	92.69	150.02

Outage Durations (Hours) in 2009



	5% Percentile	10% Percentile	25% Percentile	Median	75% Percentile	90% Percentile	95% Percentile
Airport	1.05	1.55	2.69	5.52	18.45	58.14	84.07
Blocking	0.74	1.00	1.83	3.92	7.75	14.08	25.47
Cable Telephony	0.92	1.17	3.18	6.58	24.15	59.37	80.95
DS3	1.46	2.32	6.55	24.22	33.07	62.28	87.80
DS3-Simplex	72.74	120.91	131.38	170.69	286.40	666.01	1076.30
E911	0.80	1.10	2.12	4.20	8.22	19.98	30.80
MSC	0.63	0.94	1.60	2.25	4.85	9.32	20.12
SS7	0.50	0.50	0.70	1.92	4.00	11.43	.
Wireless	0.81	1.14	2.27	4.89	12.04	30.03	50.66
Wireline	3.05	5.34	20.00	61.92	117.78	192.49	258.83
All Except DS3-Simplex	1.17	1.90	4.65	18.25	36.45	78.24	122.27

Test for Trend in Event Duration



Non-DS3-Simplex Outages Data from 2009 and 2010

Rank Correlation of
duration with date is .01
and is not significant

**Conclusion: Non DS3-
Simplex Outages are not
changing in duration from
1/09 to 2/10**

DS3-Simplex Events Only Data from 2009 and 2010

Rank Correlation of
duration with date is -.03
and is not significant

**Conclusion: DS3-Simplex
Events are not changing
in duration from 1/09 to
2/10**

Customers Affected Vs. Duration (DS3-Simplex Excluded)



Inside and Outside a Building - 2010

Customers Affected	30 Min to 1 Hr	1 to 2 Hr	2 to 4 Hr	4 to 8 Hr	8 Hr to 1 Day	1 Day to 1 Week	> 1 Week
1 to 1000 Cust	0.4%	1.7%	2.0%	2.0%	6.5%	77.1%	10.4%
1,000 to 10,000	0.4%	1.2%	8.2%	16.5%	42.1%	29.8%	1.8%
10,000 to 30,000	4.6%	17.9%	20.0%	19.5%	21.0%	15.9%	1.0%
30,000 to 50,000	7.2%	18.2%	24.9%	19.3%	19.3%	10.5%	0.6%
50,000 to 100,000	10.0%	13.3%	25.0%	18.3%	22.5%	10.8%	0.0%
100K to 300K	5.6%	16.4%	21.1%	28.2%	15.5%	12.2%	0.9%
300K to 1 Million	11.9%	8.5%	22.0%	18.6%	30.5%	6.8%	1.7%
> 1 Million	5.7%	11.4%	22.9%	31.4%	22.9%	5.7%	0.0%

Inside and Outside a Building - 2009

Customers Affected	30 Min to 1 Hr	1 to 2 Hr	2 to 4 Hr	4 to 8 Hr	8 Hr to 1 Day	1 Day to 1 Week	> 1 Week
1 to 1000 Cust	0.6%	1.3%	2.5%	2.3%	6.7%	81.3%	5.4%
1,000 to 10,000	0.5%	1.6%	9.1%	18.7%	38.1%	30.7%	1.3%
10,000 to 30,000	4.3%	16.6%	24.5%	25.5%	19.5%	9.1%	0.6%
30,000 to 50,000	8.5%	22.7%	20.6%	21.2%	18.9%	7.4%	0.7%
50,000 to 100,000	7.6%	17.9%	21.0%	25.3%	22.9%	5.3%	0.0%
100K to 300K	8.3%	20.5%	22.9%	24.9%	17.5%	4.8%	1.1%
300K to 1 Million	10.7%	15.8%	21.8%	22.6%	20.1%	7.3%	1.7%
> 1 Million	5.7%	7.3%	22.0%	31.7%	28.5%	3.3%	1.6%

Customers Affected Vs. Duration (DS3-Simplex Excluded) - 2010



Inside a Building

Customers Affected	30 Min to 1 Hr	1 to 2 Hr	2 to 4 Hr	4 to 8 Hr	8 Hr to 1 Day	1 Day to 1 Week	> 1 Week
1 to 1000 Cust	0.2%	1.4%	1.4%	1.2%	4.8%	89.4%	1.6%
1,000 to 10,000	0.5%	1.3%	9.8%	13.5%	42.9%	31.2%	0.8%
10,000 to 30,000	5.0%	24.8%	24.8%	14.9%	18.2%	12.4%	0.0%
30,000 to 50,000	8.1%	22.8%	28.5%	16.3%	17.1%	7.3%	0.0%
50,000 to 100,000	12.8%	15.4%	34.6%	12.8%	16.7%	7.7%	0.0%
100K to 300K	7.3%	22.0%	22.7%	22.0%	14.0%	11.3%	0.7%
300K to 1 Million	21.4%	10.7%	28.6%	10.7%	21.4%	7.1%	0.0%
> 1 Million	10.5%	15.8%	31.6%	36.8%	5.3%	0.0%	0.0%

Outside a Building

Customers Affected	30 Min to 1 Hr	1 to 2 Hr	2 to 4 Hr	4 to 8 Hr	8 Hr to 1 Day	1 Day to 1 Week	> 1 Week
1 to 1000 Cust	0.7%	2.2%	2.9%	3.2%	9.0%	57.9%	24.1%
1,000 to 10,000	0.0%	1.1%	4.9%	22.7%	40.5%	27.0%	3.8%
10,000 to 30,000	4.1%	6.8%	12.2%	27.0%	25.7%	21.6%	2.7%
30,000 to 50,000	5.2%	8.6%	17.2%	25.9%	24.1%	17.2%	1.7%
50,000 to 100,000	4.8%	9.5%	7.1%	28.6%	33.3%	16.7%	0.0%
100K to 300K	1.6%	3.2%	17.5%	42.9%	19.0%	14.3%	1.6%
300K to 1 Million	3.2%	6.5%	16.1%	25.8%	38.7%	6.5%	3.2%
> 1 Million	0.0%	6.3%	12.5%	25.0%	43.8%	12.5%	0.0%

Changes to NORS



No major changes to NORS

Comments and suggestions are greatly appreciated

NRSC Activities



- Wireless Team
- DS3 (Non-Simplex) Team
- Wireline Team
- E911 Team
- Outage Reporting Advisory Team
 - Improvements to the NORS System
 - Improvements to the template
 - Recommended ways to communicate information
 - Recommendations on cause categories