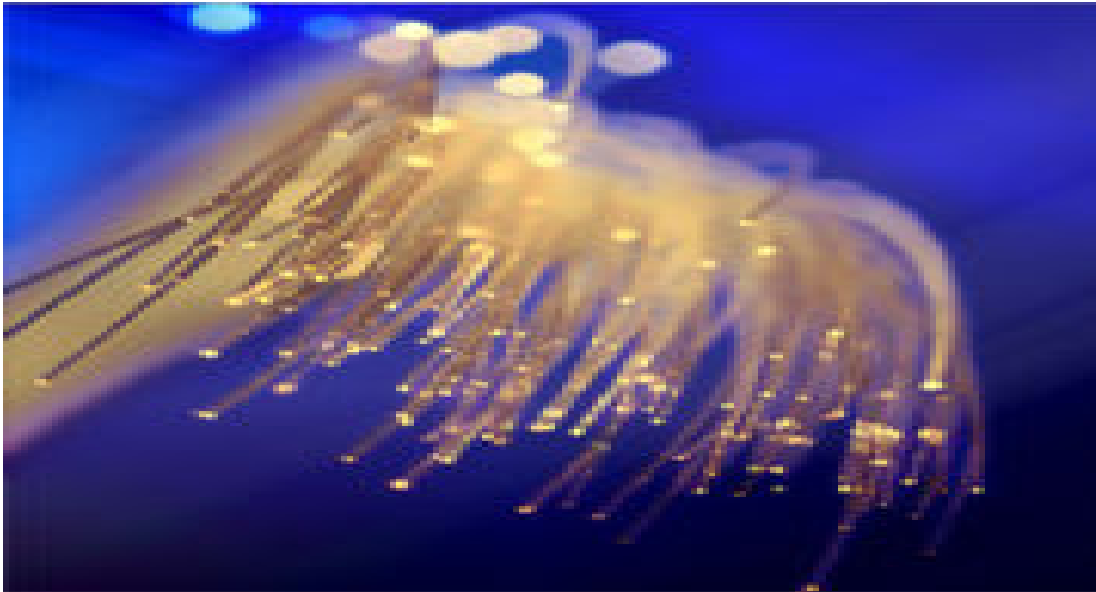


Analysis of Network Outage Reports for NRSC Meeting



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

John Healy

August 2009

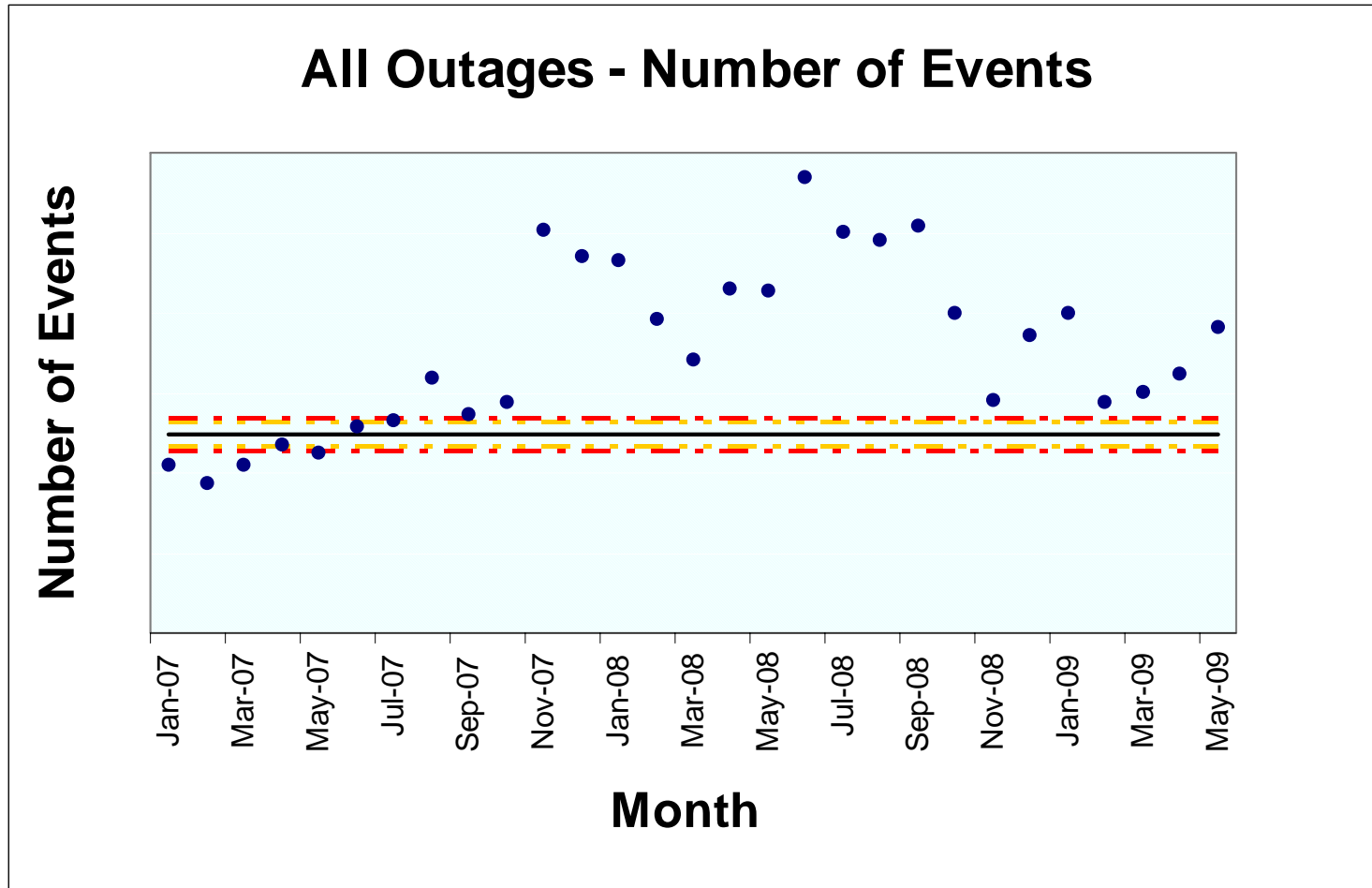




Overview of Presentation

- Network Reliability Status
- Improvements to NORS
- NRSC Activities

Frequency of Outages by Month

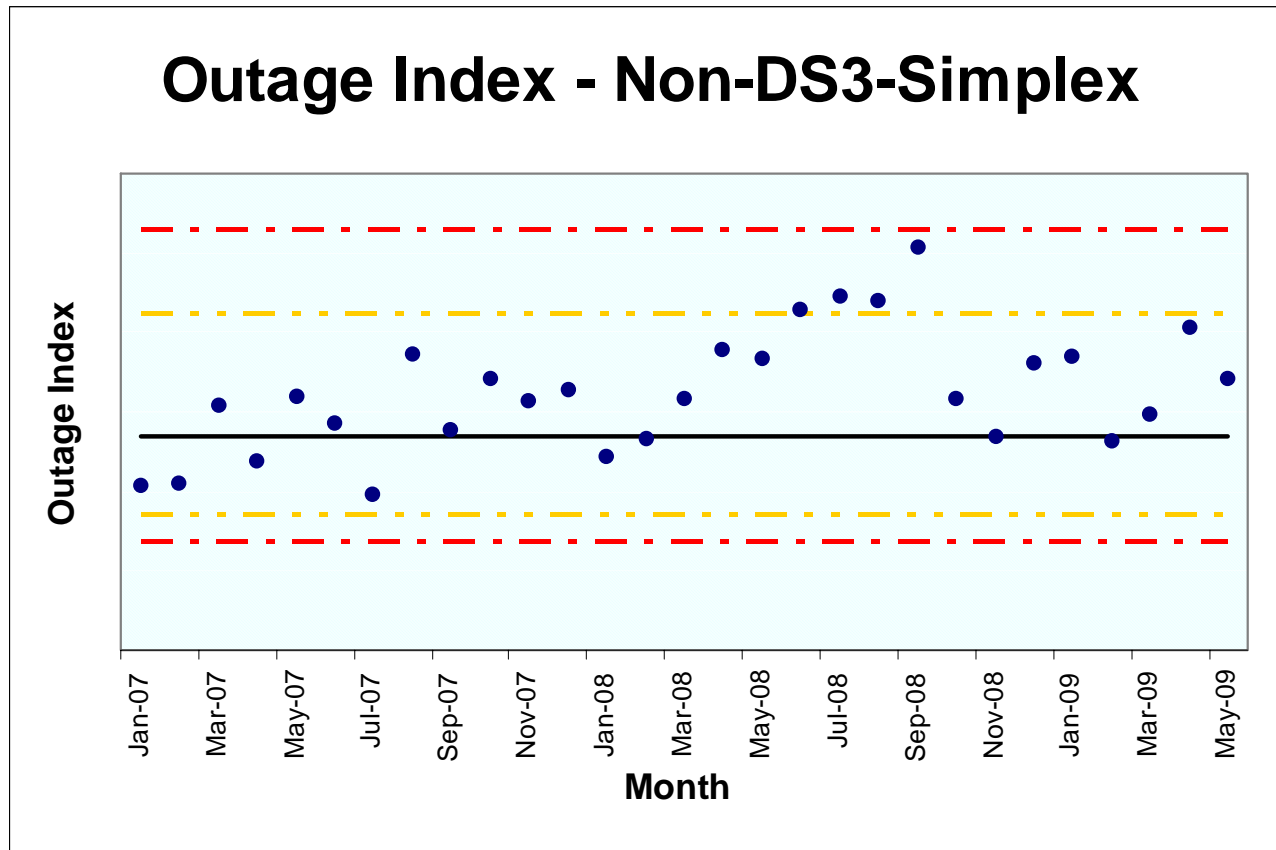


Standards for Outage Frequencies



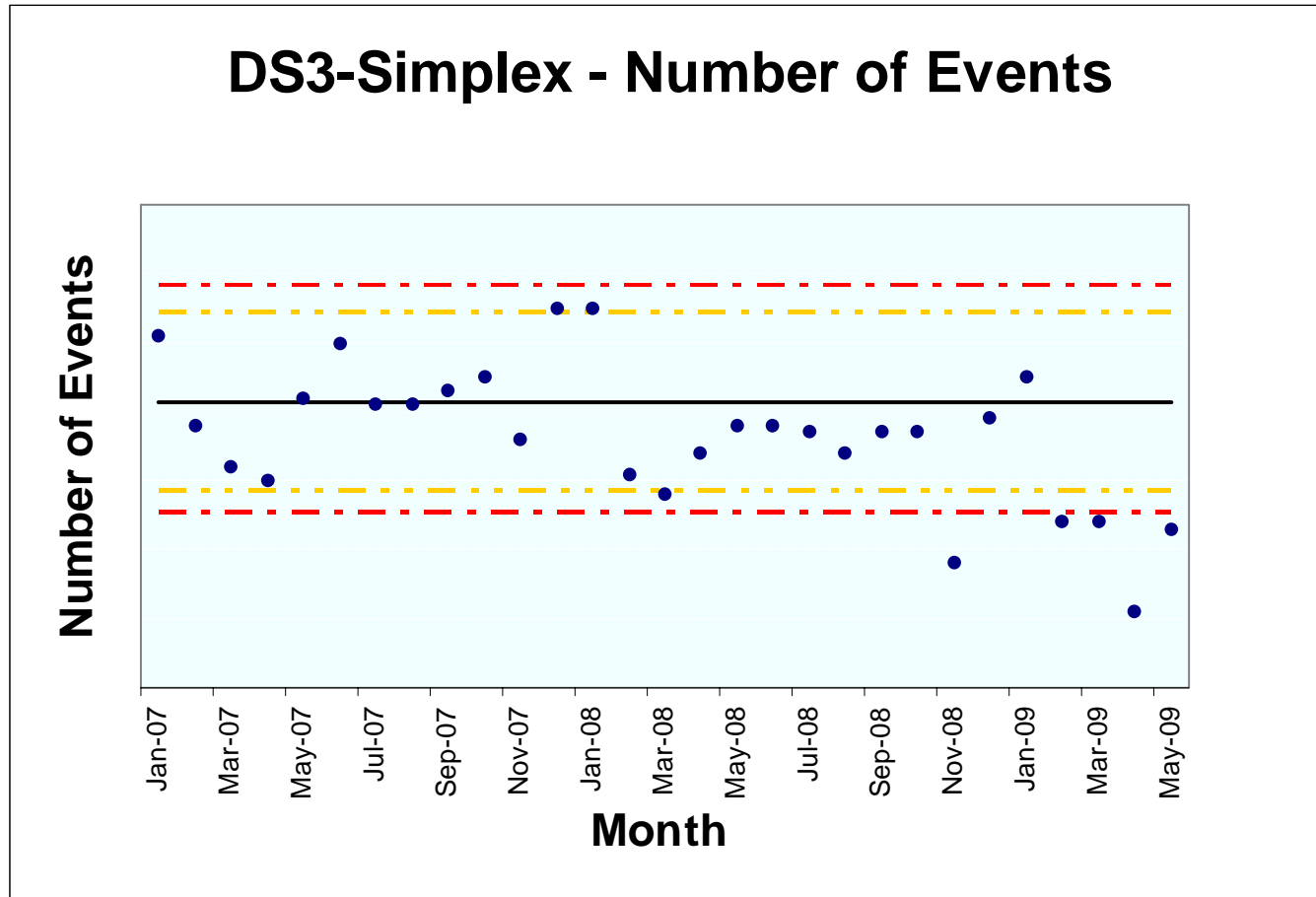
- Took average of January 2007 through October 2007 as the standard

Outage Index – For All Outages Except DS3-Simplex

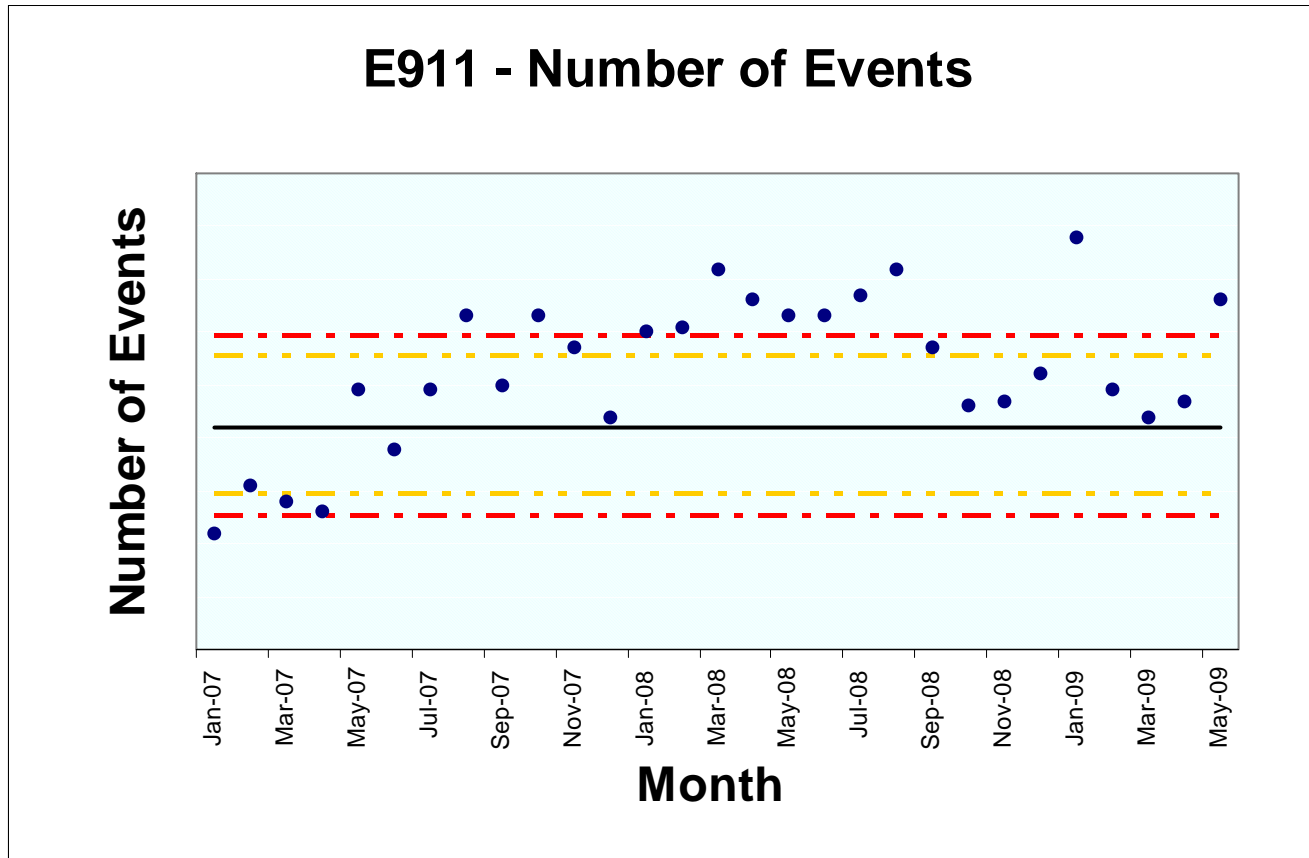


See PRQC-2006-019 for a description of the method used to calculate the outage index.

DS3-Simplex



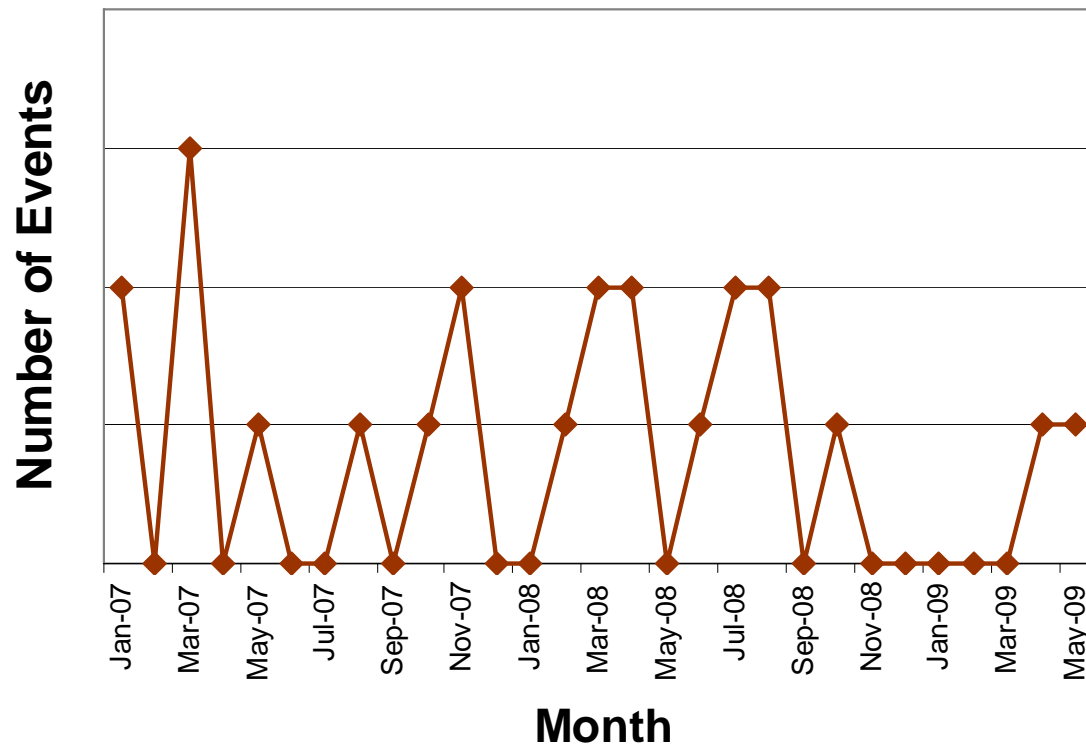
E911



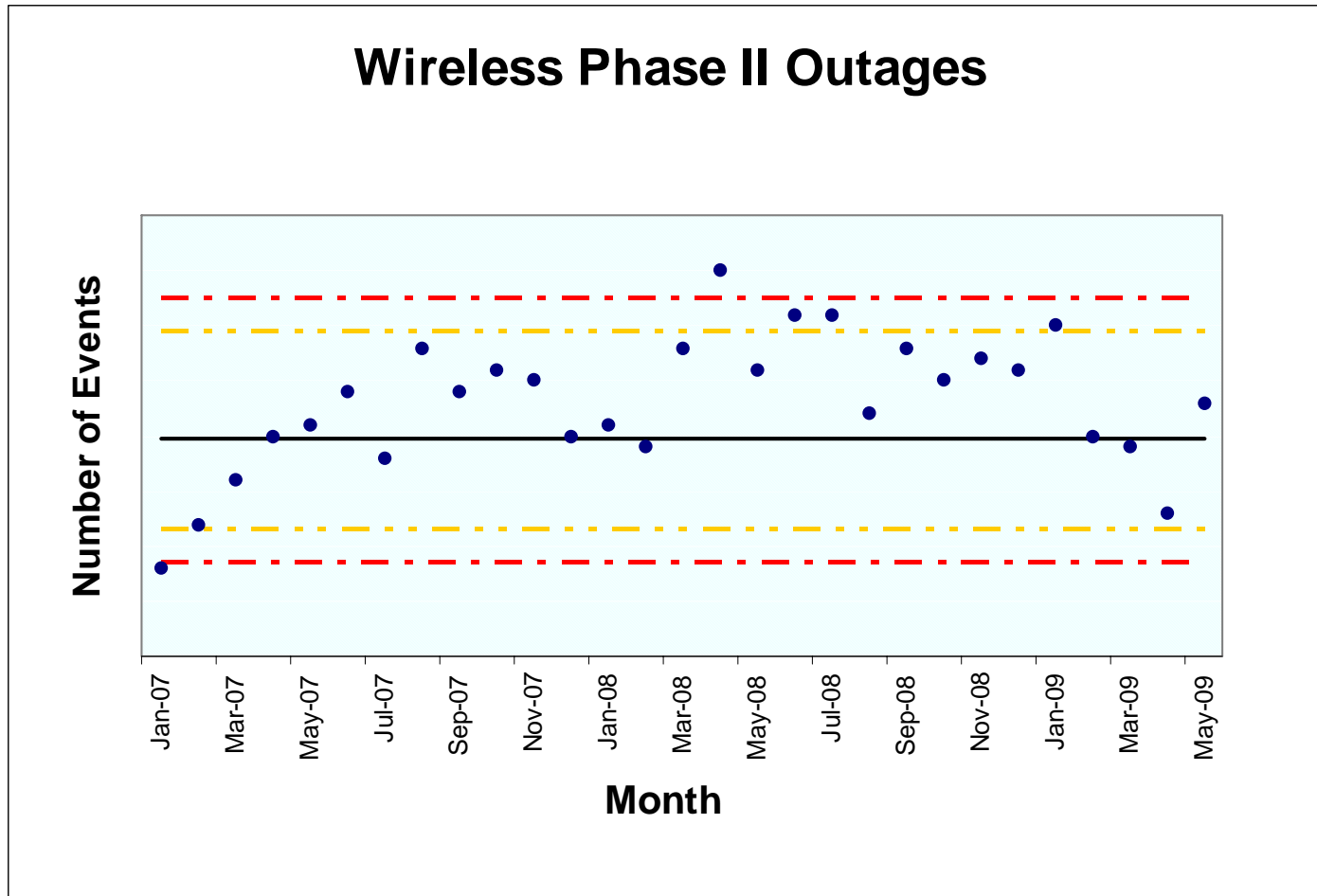
Very Large E911 Outages



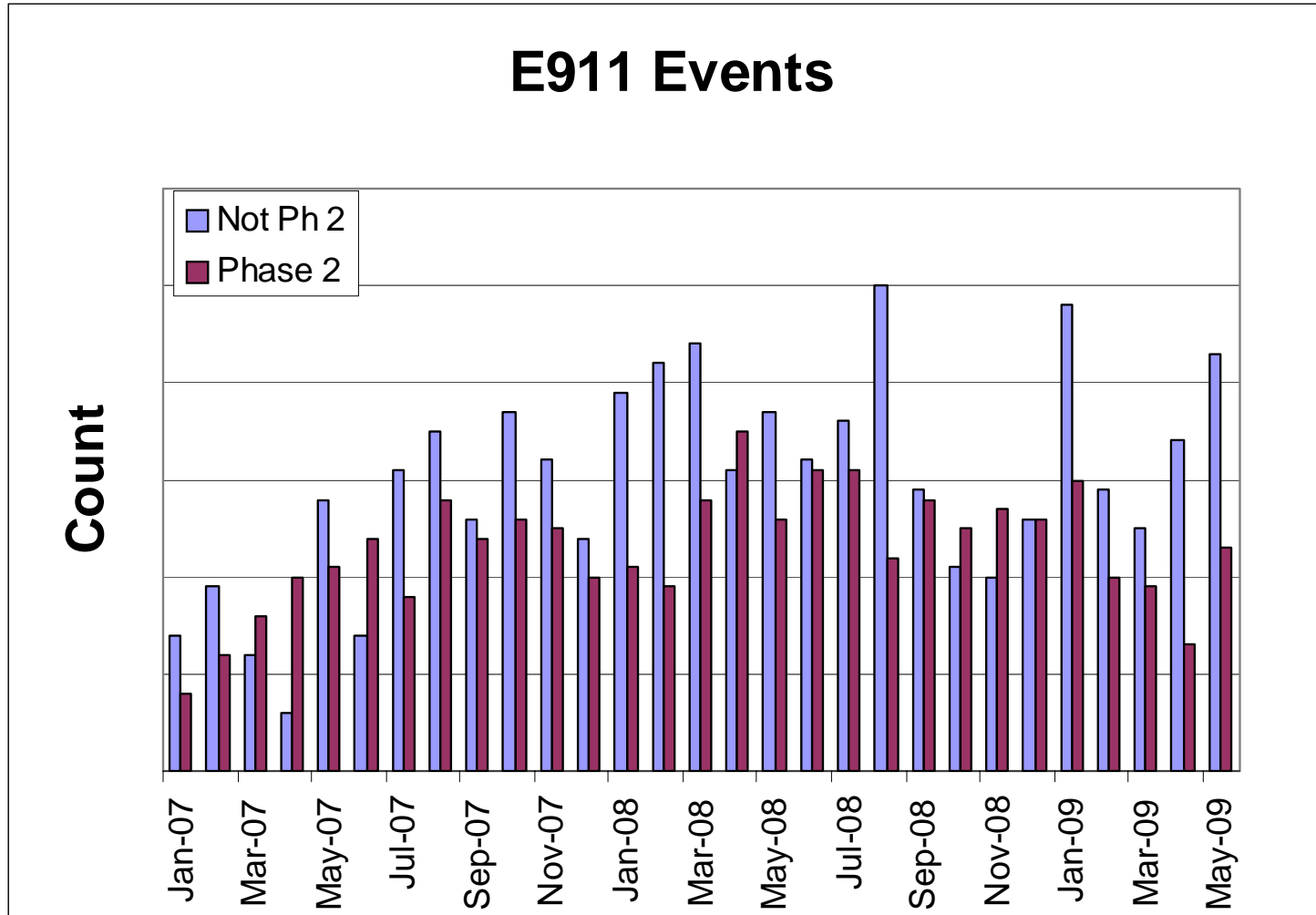
E911 Events Affecting > 1,000,000 Users



E911 – Phase 2 Events



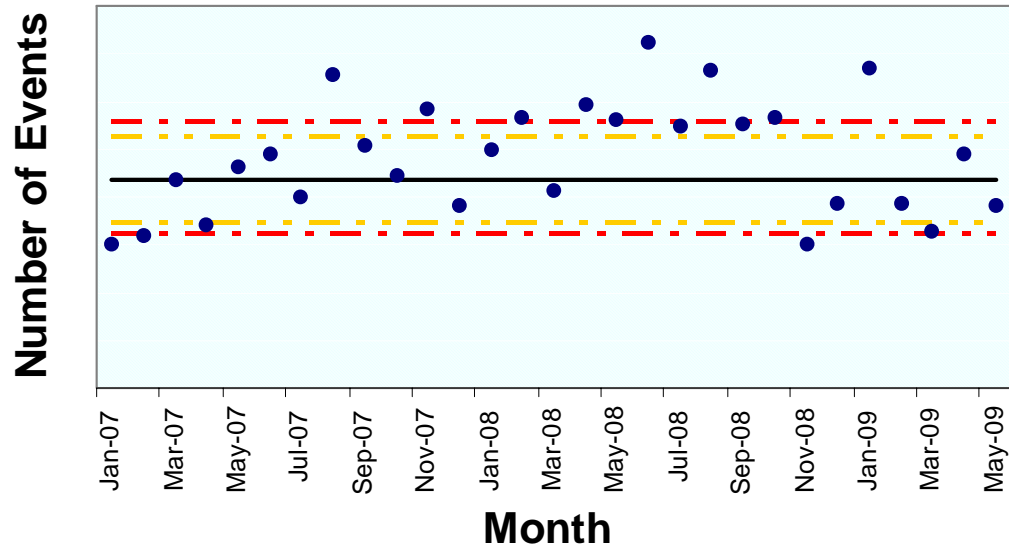
Phase 2 vs. All Other E911 Outages



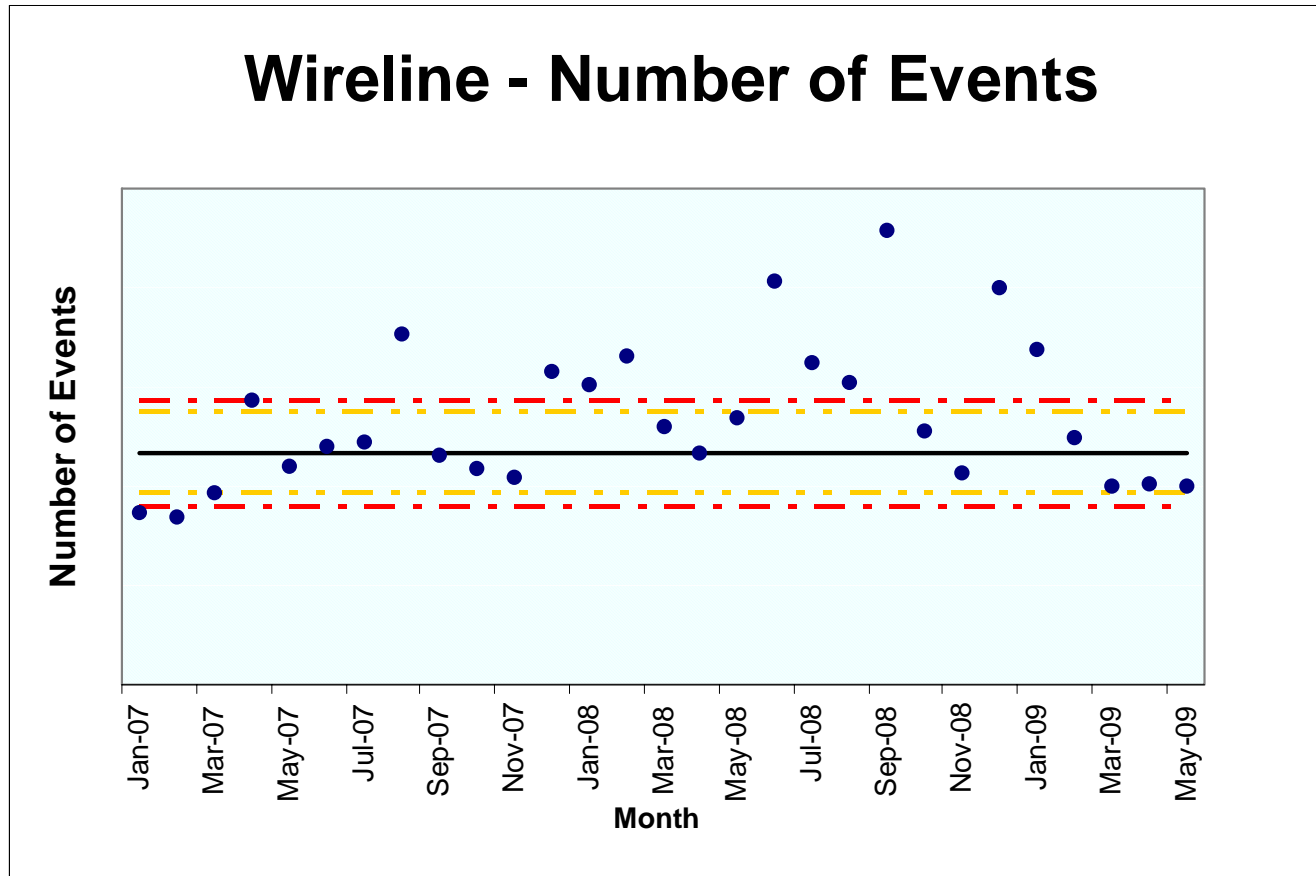
Fiber Cut



Fiber Cut - Number of Events

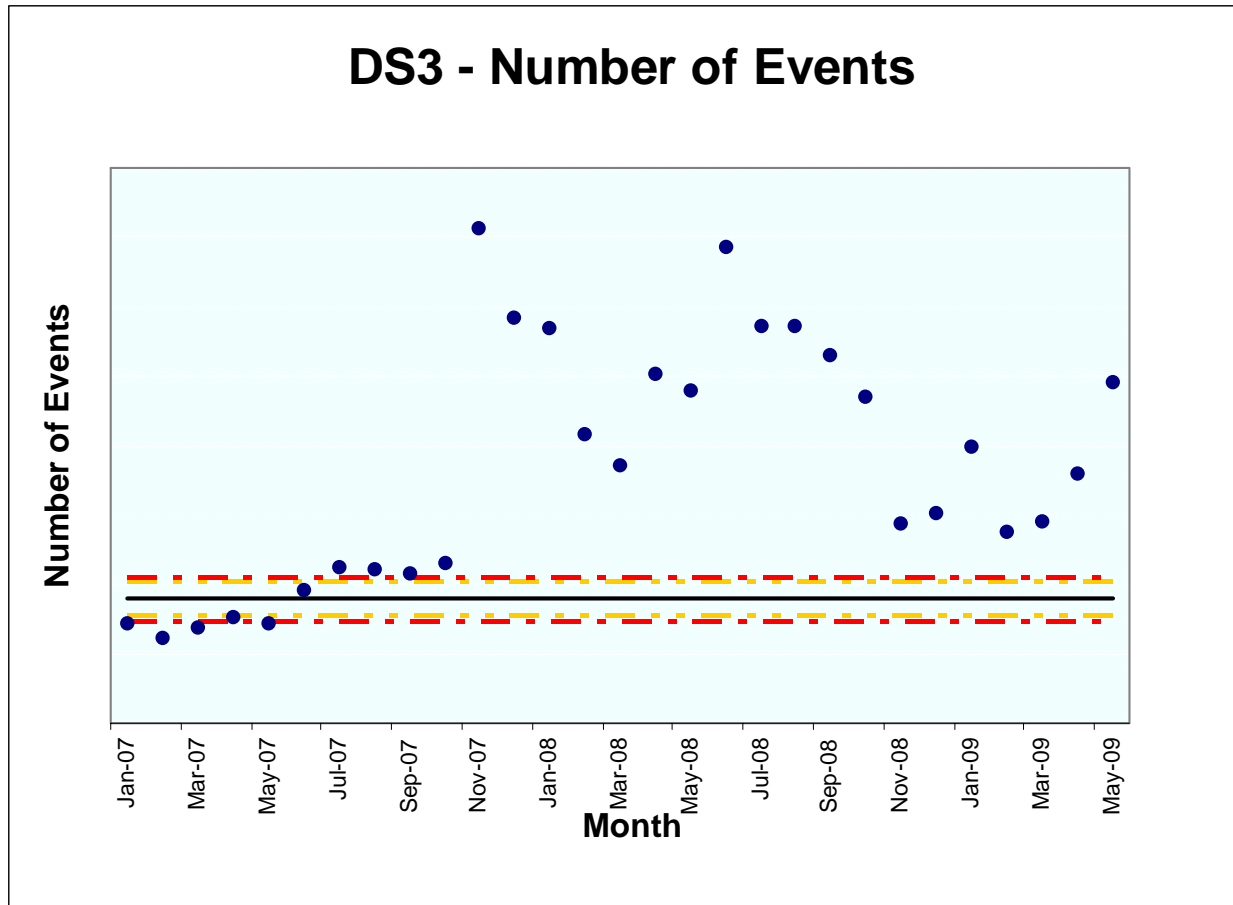


Wireline

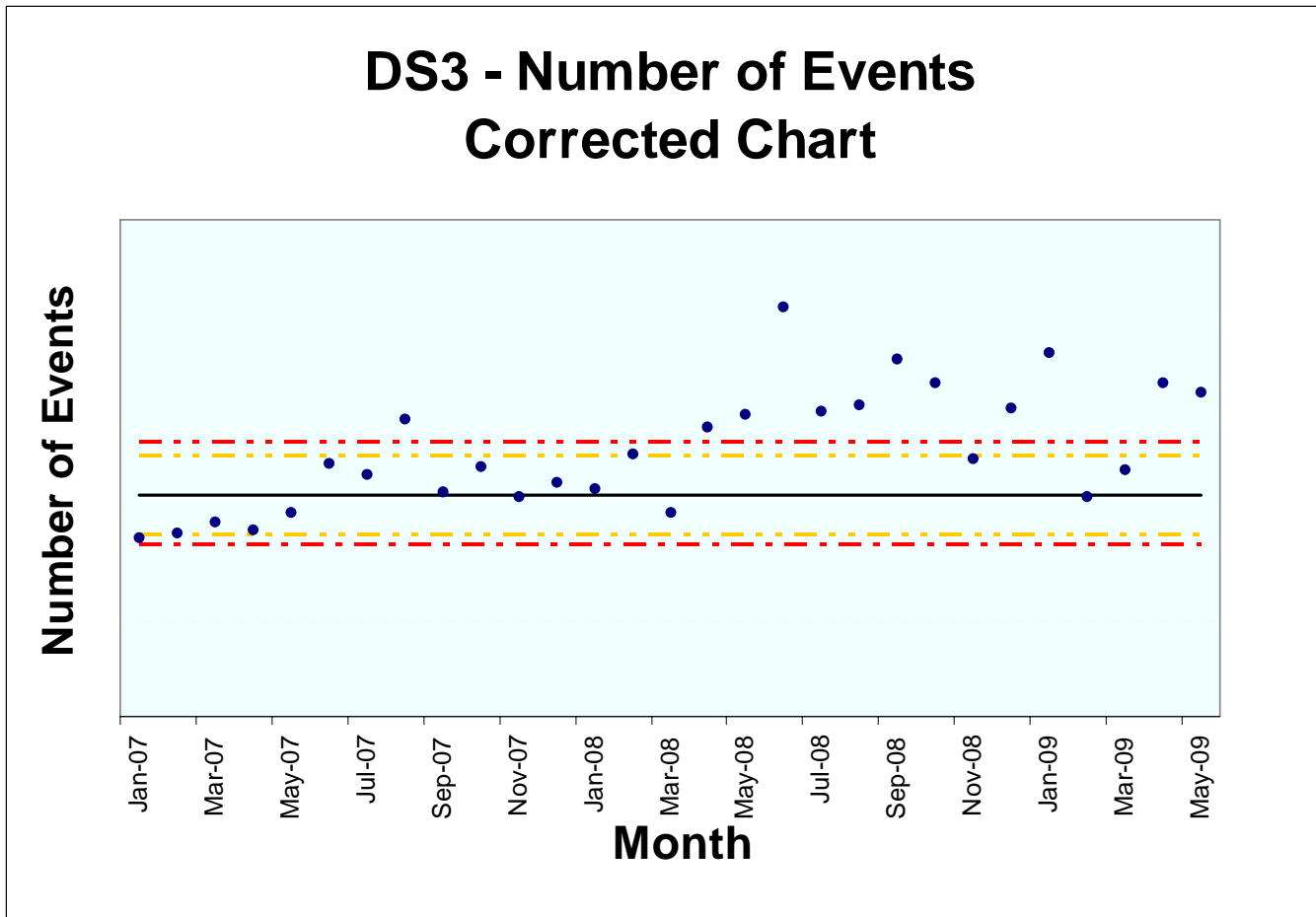


Wireline outages are all outages for which the Reason Reportable was at least 900,000 wireline user-minutes.

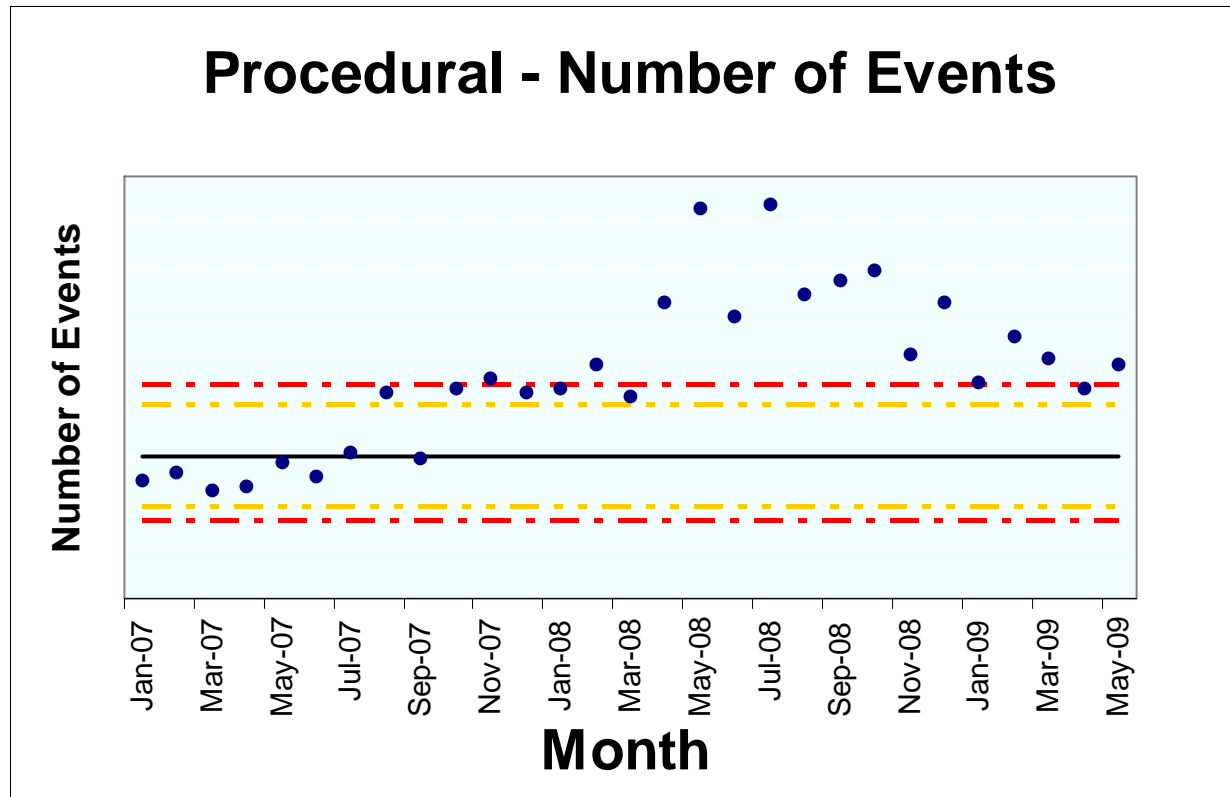
DS3 (Non-Simplex) Events



DS3 (Non-Simplex) Events

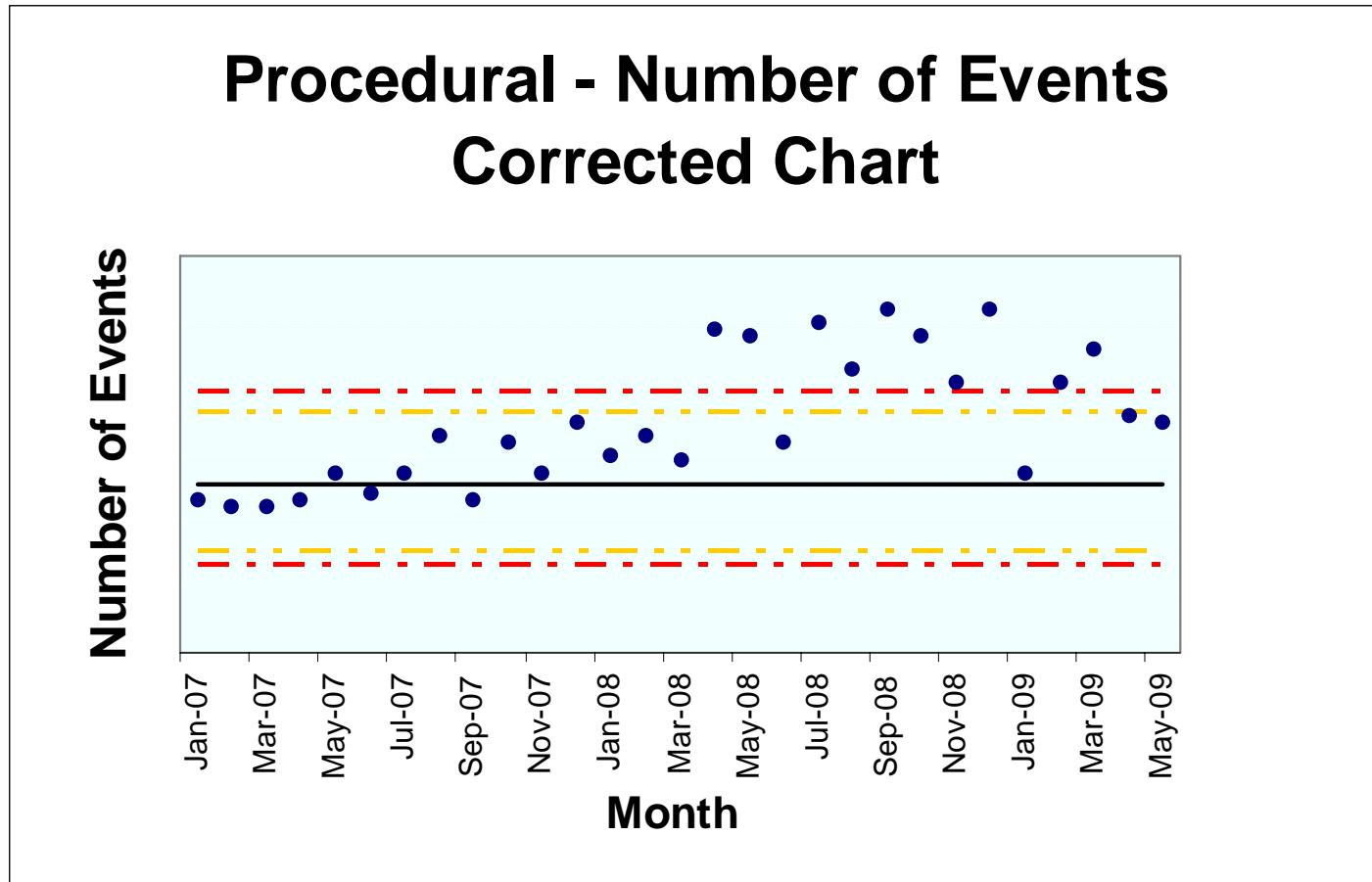


Procedural Events

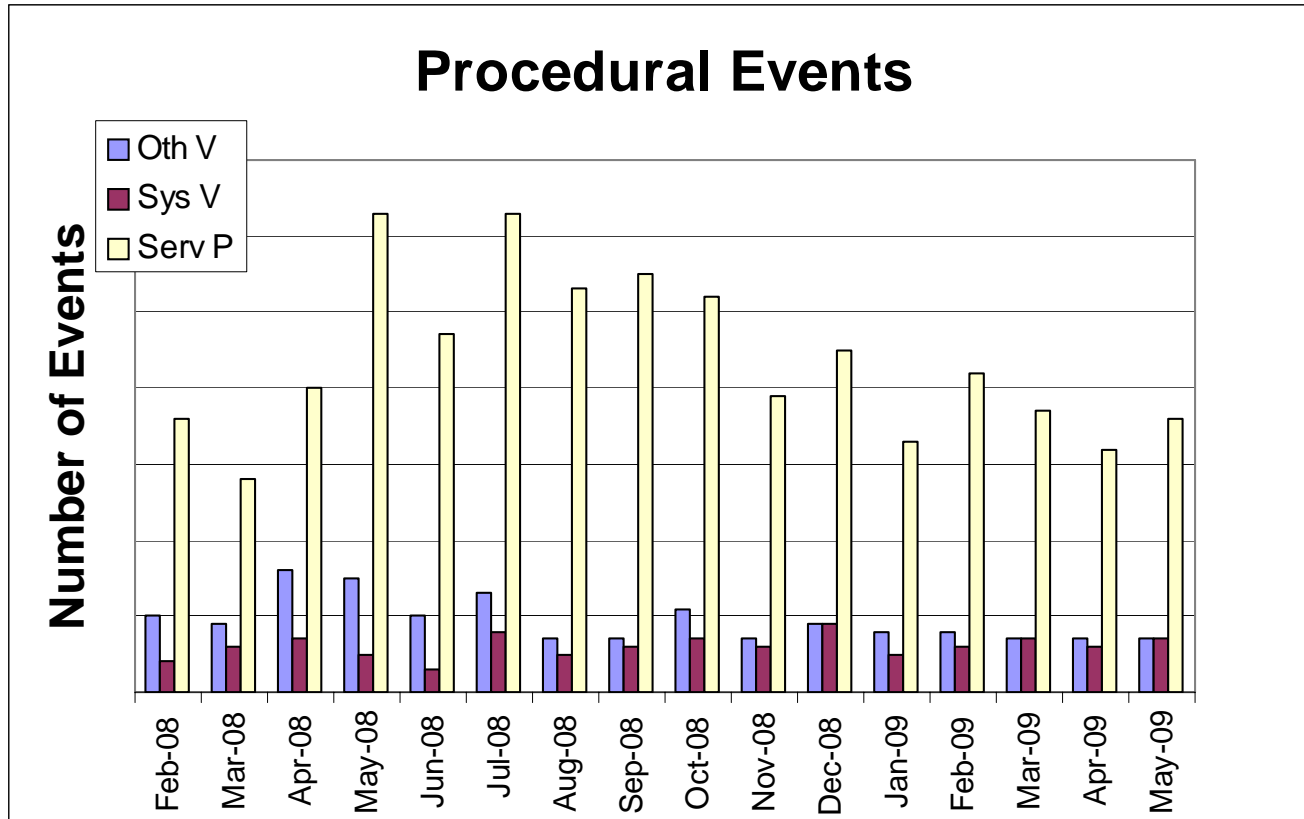


Procedural events are ones which have a procedural root cause.

Procedural Events



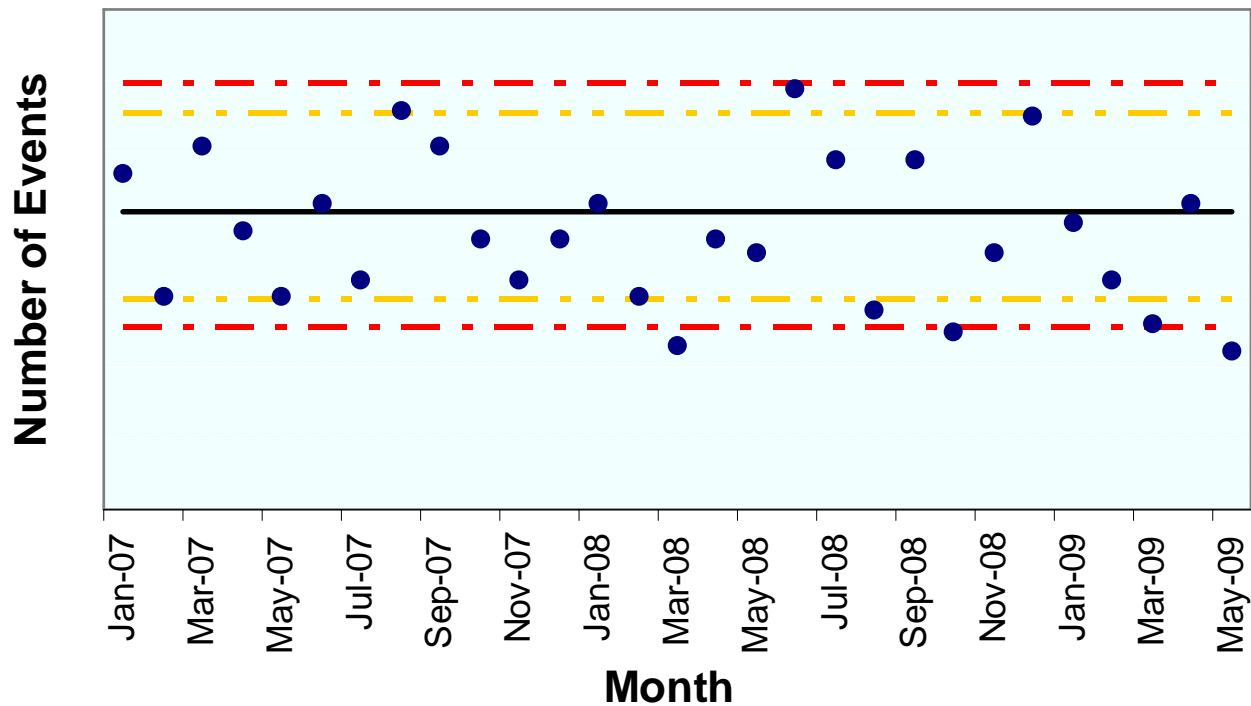
Procedural Events by Source



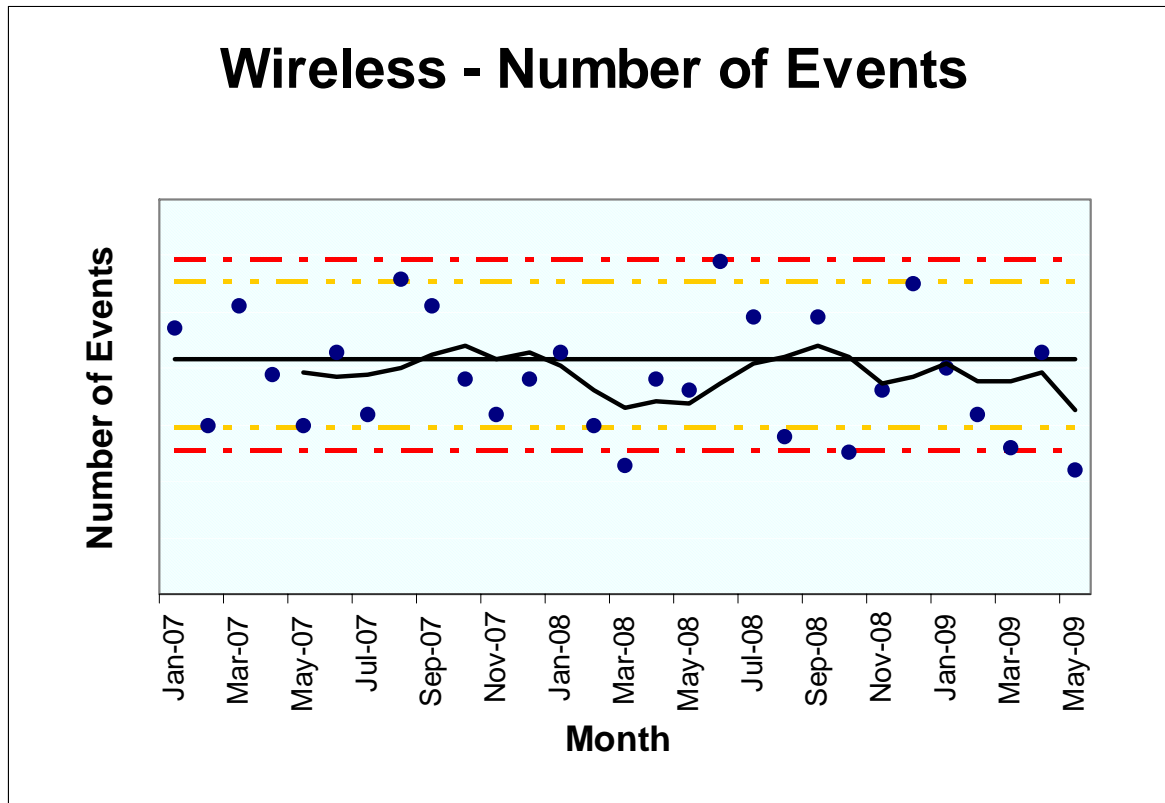
Wireless



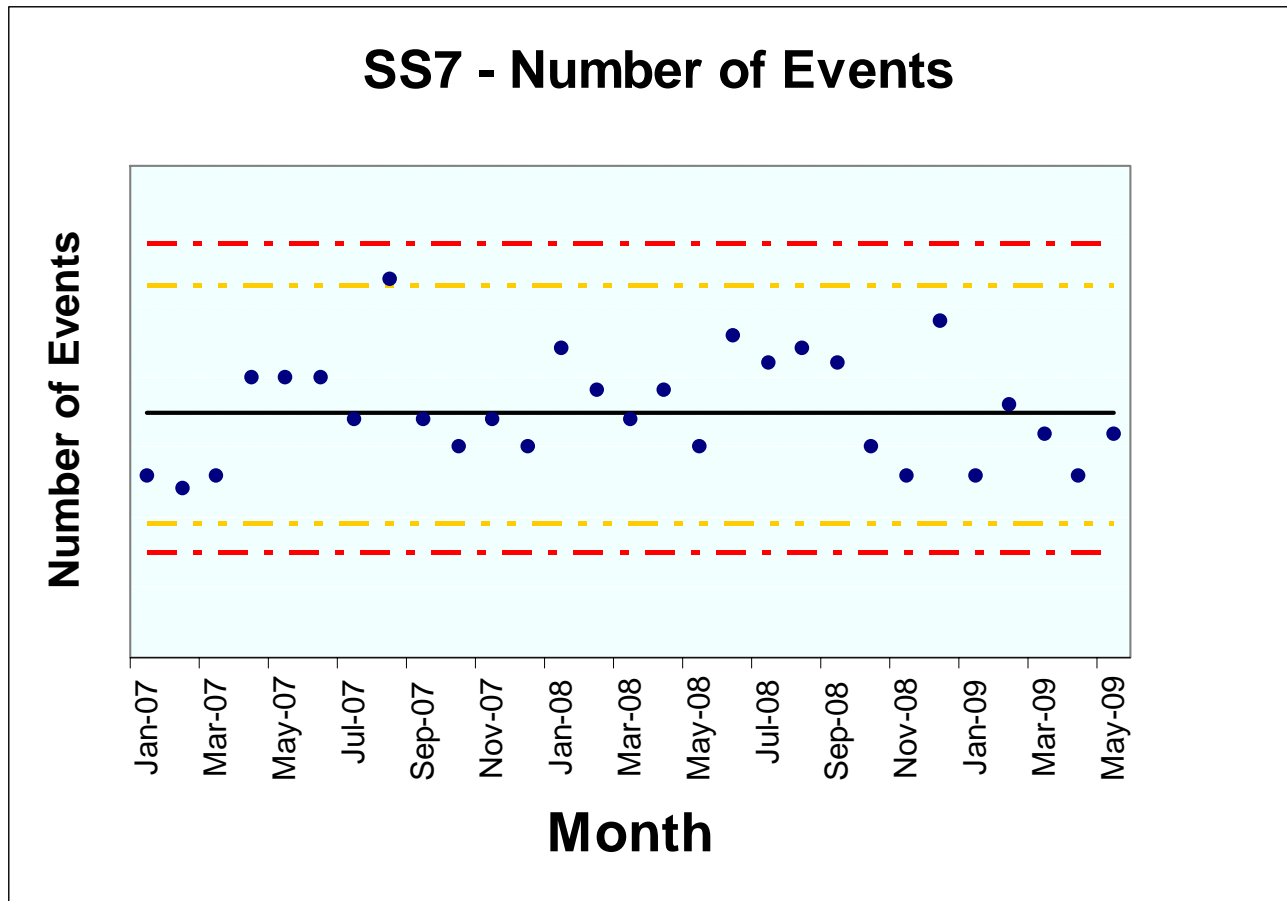
Wireless - Number of Events



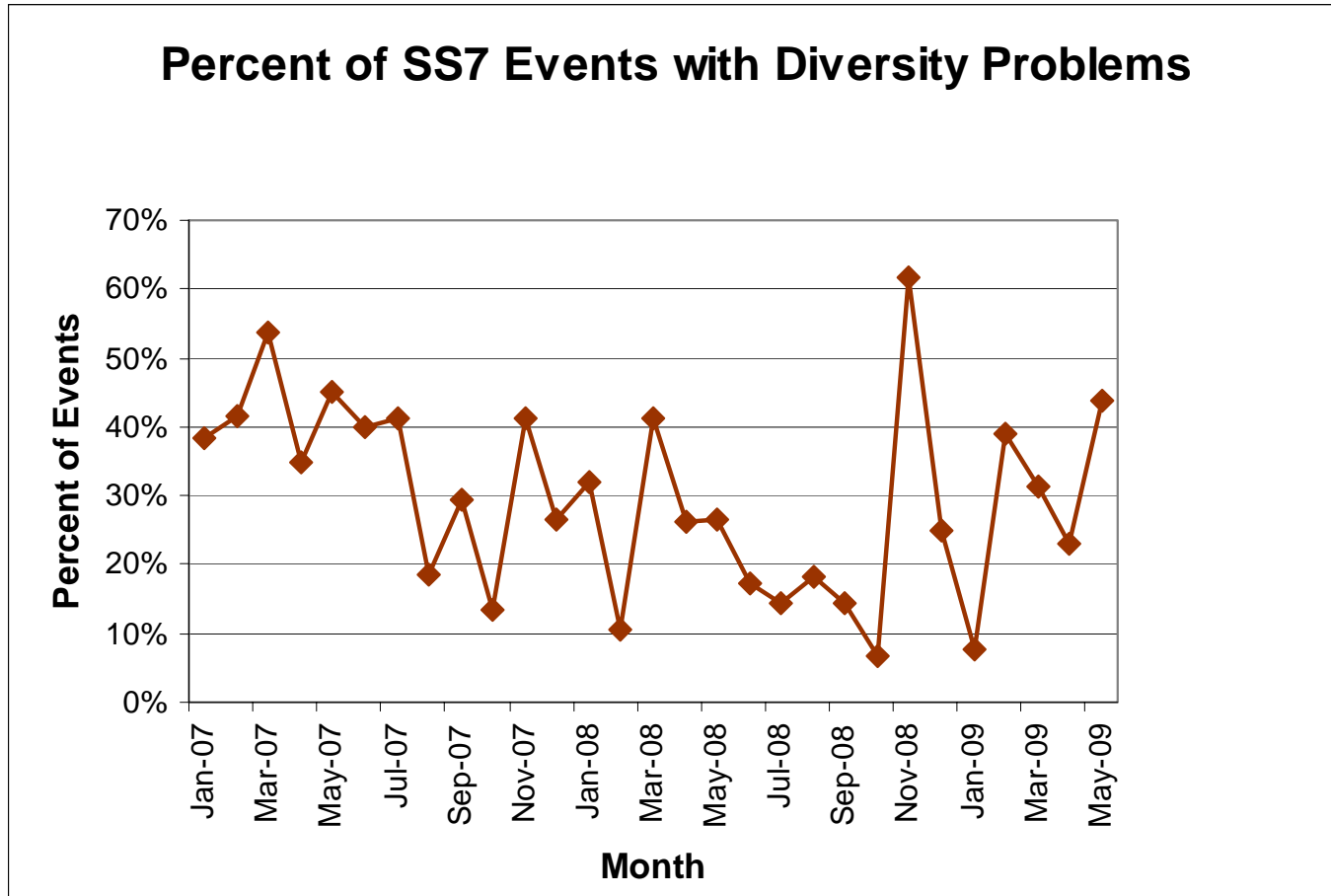
Wireless with Trend Line



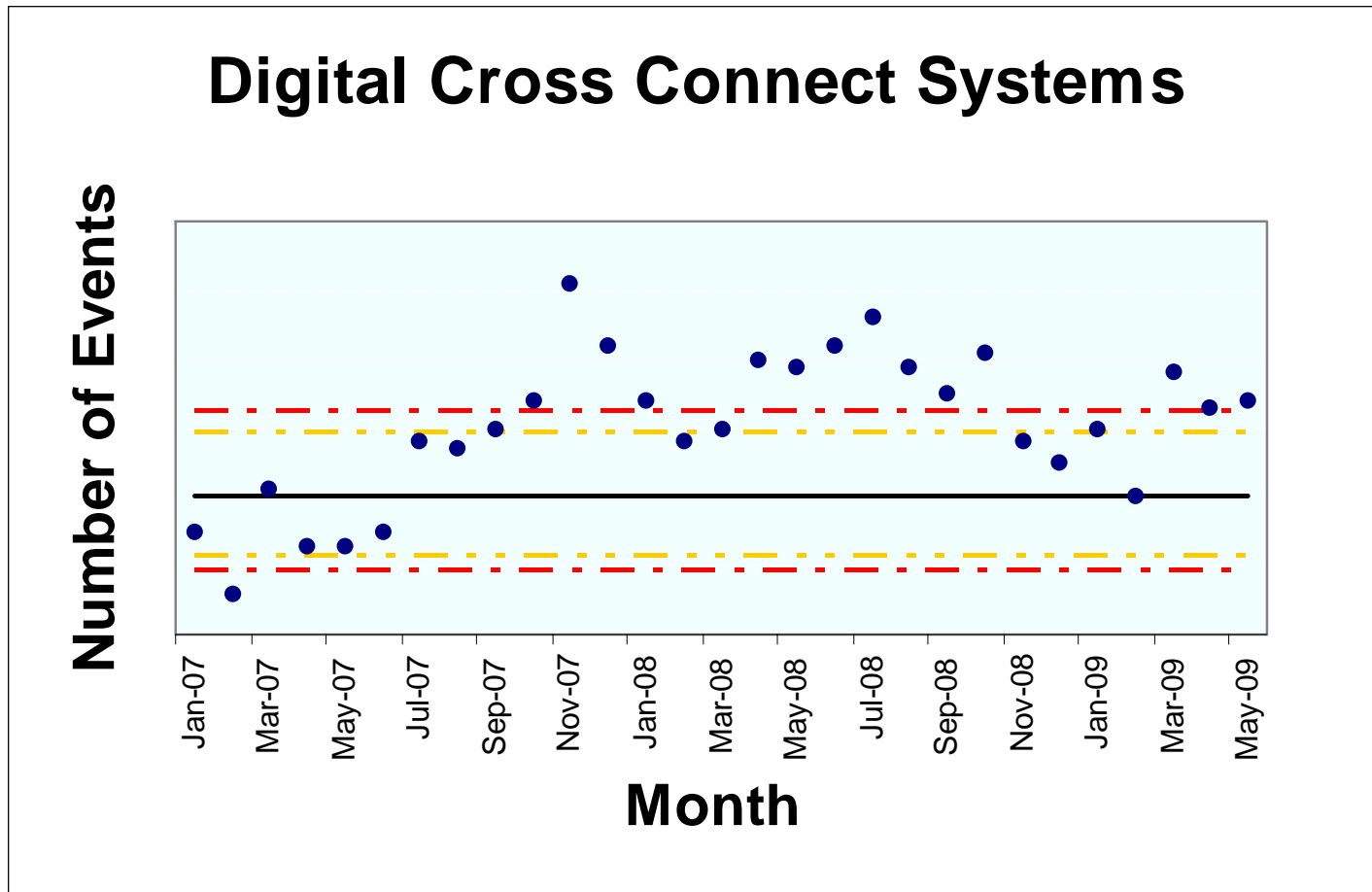
SS7



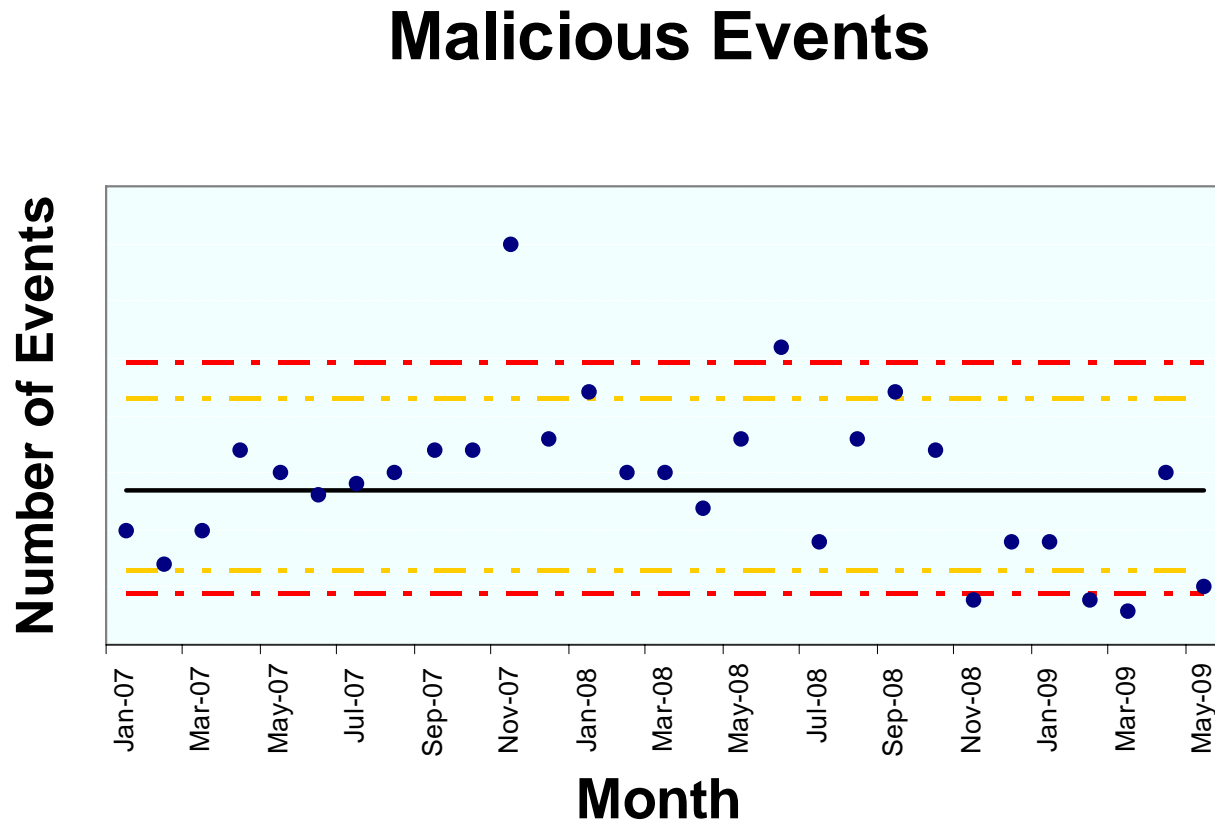
SS7 and Diversity



Digital Cross Connect Systems



Malicious Events

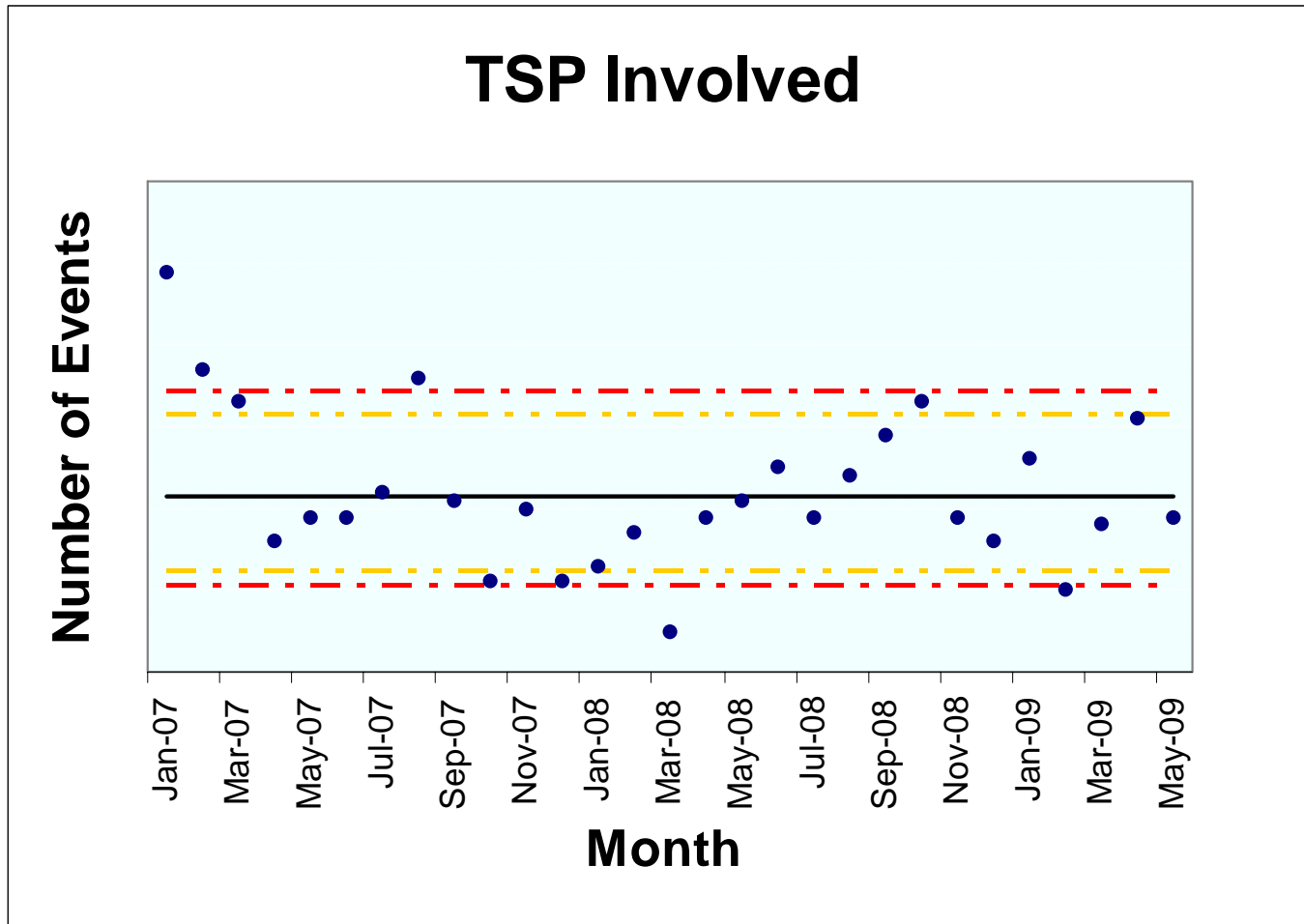


Malicious Activity



- 566 outage reports where malicious activity was indicated (58 in 2005, 99 in 2006, 187 in 2007, 186 in 2008 and 36 in 2009)
- No outages seemed to be related to terrorist activities.
- About 59% of the reports (109) mentioned vandalism in 2008 and 53% (19) mention vandalism in 2009.
- About 8% of the reports (14) mentioned gun or shots in 2008 and 11% (4) in 2009.

Telecommunications Service Priority



Telecommunications Service Priority



- About 13 outages per month in 2006 check TSP
- About 25 outages per month in 2007 check TSP
- About 18.5 outages per month in 2008 check TSP
- About 21 outages per month in 2009 check TSP

Outage Durations (Hours) – 2008



	5% Percentile	10% Percentile	25% Percentile	Median	75% Percentile	90% Percentile	95% Percentile
Airport	1.00	1.77	2.81	5.58	14.76	38.88	73.08
Blocking	0.75	1.11	2.11	4.80	8.71	14.20	23.98
Cable Telephony	1.12	1.72	3.25	6.52	20.50	73.71	164.40
DS3	1.68	2.80	7.08	23.08	44.98	84.75	117.66
DS3-Simplex	110.96	122.06	137.07	184.40	395.68	1542.05	4252.83
E911	0.78	1.08	2.00	3.98	8.55	19.29	43.62
MSC	0.79	0.92	1.38	2.65	5.14	12.95	26.38
SS7	0.78	1.38	1.97	3.82	9.65	14.52	53.17
Wireless	0.82	1.10	2.07	4.45	10.78	28.71	57.54
Wireline	2.10	4.52	13.28	49.73	101.00	174.95	264.00
All Except DS3- Simplex	1.27	2.00	4.94	16.43	47.12	97.21	140.85



Outage Durations (Hours) in 2009

	5% Percentile	10% Percentile	25% Percentile	Median	75% Percentile	90% Percentile	95% Percentile
Airport	0.96	1.32	2.50	5.05	17.45	59.64	94.15
Blocking	0.67	1.00	1.93	4.17	7.75	16.93	39.25
Cable Telephony	1.00	1.17	3.00	6.15	26.75	68.78	84.67
DS3	1.70	2.53	6.58	24.02	43.34	72.83	96.56
DS3- Simplex	44.38	115.33	131.36	182.05	348.28	705.83	2103.67
E911	0.85	1.13	2.12	4.63	9.15	22.44	37.03
MSC	1.02	1.23	1.60	2.27	5.32	18.45	103.87
SS7	0.70	0.70	2.18	3.12	10.19	.	.
Wireless	0.75	0.99	2.10	4.97	11.47	26.22	47.39
Wireline	2.65	5.13	17.53	54.62	113.12	166.94	216.80
All Except DS3- Simplex	1.22	1.92	4.67	16.25	44.75	90.47	129.89

Test for Trend in Event Duration



Non-DS3-Simplex Outages Data from 2008 and 2009

Rank Correlation of
duration with date is $-.009$
and not significant

Conclusion: Non DS3-Simplex Outages have not changed in duration from 1/08 to 2/09

DS3-Simplex Events Only Data from 2008 and 2009

Rank Correlation of
duration with date is $-.097$
and significant

Conclusion: DS3-Simplex Events are getting shorter in duration from 2008 to 2009

Customers Affected Vs. Duration (DS3-Simplex Excluded)



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	0.8%	1.3%	3.3%	2.6%	7.2%	79.6%	5.3%
1,000 to 10,000	0.2%	1.9%	8.6%	19.6%	39.1%	29.5%	1.2%
10,000 to 30,000	4.8%	17.2%	23.0%	24.6%	17.6%	12.0%	0.8%
30,000 to 50,000	10.4%	17.0%	22.6%	22.0%	20.5%	6.8%	0.6%
50,000 to 100,000	4.5%	21.4%	18.9%	26.4%	24.4%	4.5%	0.0%
100K to 300K	9.0%	20.3%	22.0%	26.5%	18.0%	3.4%	0.8%
300K to 1 Million	4.5%	15.7%	24.7%	22.5%	21.3%	9.0%	2.2%
> 1 Million	9.8%	4.9%	12.2%	31.7%	31.7%	4.9%	4.9%

Inside and Outside a Building - 2008

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%	1.2%	2.7%	2.7%	8.0%	77.6%	7.0%
1,000 to 10,000	0.4%	1.0%	9.4%	18.1%	43.7%	25.5%	1.9%
10,000 to 30,000	4.2%	16.7%	23.5%	25.6%	19.9%	9.6%	0.5%
30,000 to 50,000	14.2%	17.7%	23.0%	23.3%	17.3%	4.0%	0.5%
50,000 to 100,000	8.0%	15.6%	21.8%	26.1%	20.0%	7.2%	1.4%
100K to 300K	11.5%	18.0%	18.2%	24.4%	22.3%	4.8%	0.8%
300K to 1 Million	7.4%	13.7%	16.2%	23.5%	28.4%	6.9%	3.9%
> 1 Million	5.1%	11.5%	20.5%	33.3%	19.2%	7.7%	2.6%

Customers Affected Vs. Duration (DS3-Simplex Excluded) - 2009



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	0.5%	0.3%	0.8%	1.4%	6.3%	88.9%	1.8%
1,000 to 10,000	0.2%	2.9%	10.3%	21.5%	35.0%	29.5%	0.8%
10,000 to 30,000	7.5%	22.1%	32.1%	20.4%	9.3%	7.9%	0.7%
30,000 to 50,000	12.1%	21.6%	27.4%	18.9%	13.7%	5.8%	0.5%
50,000 to 100,000	6.5%	32.4%	24.1%	15.7%	17.6%	3.7%	0.0%
100K to 300K	10.8%	24.7%	26.5%	25.1%	11.2%	1.3%	0.4%
300K to 1 Million	3.9%	25.5%	29.4%	21.6%	11.8%	7.8%	0.0%
> 1 Million	16.7%	4.2%	12.5%	41.7%	20.8%	4.2%	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	1.2%	3.0%	7.8%	4.8%	8.9%	62.6%	11.6%
1,000 to 10,000	0.2%	0.7%	6.5%	17.3%	44.2%	29.4%	1.6%
10,000 to 30,000	1.0%	10.3%	10.3%	30.5%	29.1%	17.7%	1.0%
30,000 to 50,000	8.2%	11.0%	16.4%	26.0%	29.5%	8.2%	0.7%
50,000 to 100,000	2.2%	8.6%	12.9%	38.7%	32.3%	5.4%	0.0%
100K to 300K	6.1%	12.9%	14.4%	28.8%	29.5%	6.8%	1.5%
300K to 1 Million	5.3%	2.6%	18.4%	23.7%	34.2%	10.5%	5.3%
> 1 Million	0.0%	5.9%	11.8%	17.6%	47.1%	5.9%	11.8%

Customers Affected Vs. Duration (Only Wireline Outages) – 2009



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	0.0%	0.0%	0.0%	4.3%	13.0%	78.3%	4.3%
1,000 to 10,000	0.0%	3.3%	6.7%	50.0%	20.0%	20.0%	0.0%
10,000 to 30,000	5.3%	31.6%	36.8%	15.8%	5.3%	5.3%	0.0%
30,000 to 50,000	16.7%	25.0%	16.7%	25.0%	16.7%	0.0%	0.0%
50,000 to 100,000	0.0%	37.5%	37.5%	25.0%	0.0%	0.0%	0.0%
100K to 300K	0.0%	0.0%	20.0%	40.0%	20.0%	0.0%	20.0%
300K to 1 Million	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
> 1 Million	100.0%	0.0%	0.0%	0.0%	0.0%	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	0.0%	0.0%	0.0%	0.0%	3.5%	79.8%	16.7%
1,000 to 10,000	0.0%	0.7%	5.6%	5.6%	36.4%	50.3%	1.4%
10,000 to 30,000	0.0%	6.5%	6.5%	28.3%	17.4%	41.3%	0.0%
30,000 to 50,000	0.0%	0.0%	13.3%	26.7%	46.7%	13.3%	0.0%
50,000 to 100,000	0.0%	0.0%	22.2%	33.3%	44.4%	0.0%	0.0%
100K to 300K	0.0%	0.0%	0.0%	75.0%	25.0%	0.0%	0.0%
300K to 1 Million	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%
> 1 Million	0.0%	0.0%	0.0%	0.0%	50.0%	0.0%	50.0%

Changes to NORS



Report List command revamped.

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