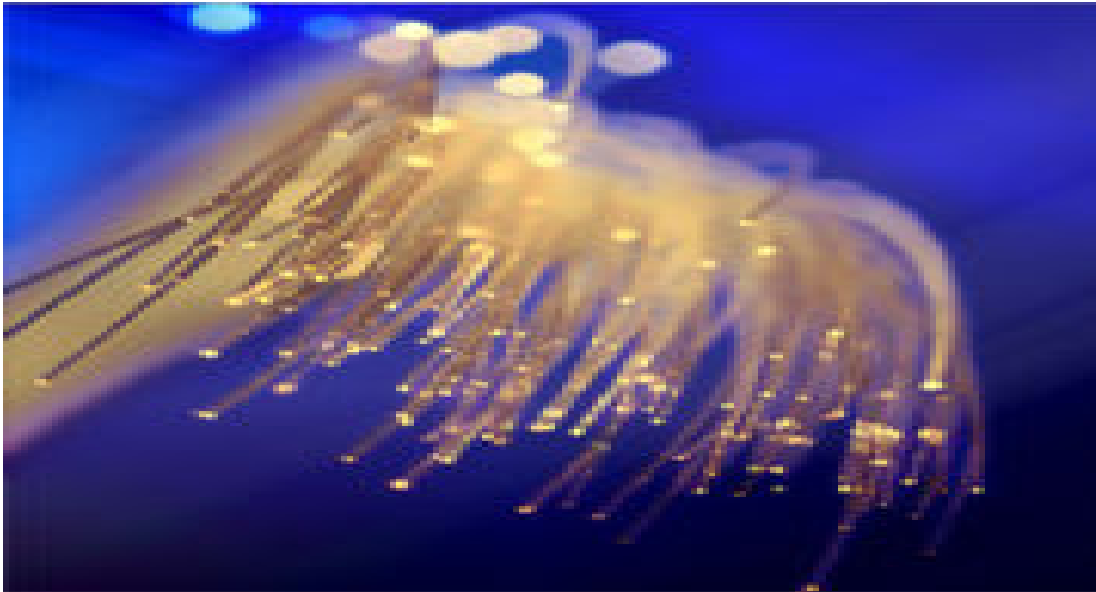


# Analysis of Network Outage Reports for NRSC Meeting



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

*John Healy*

November 2009

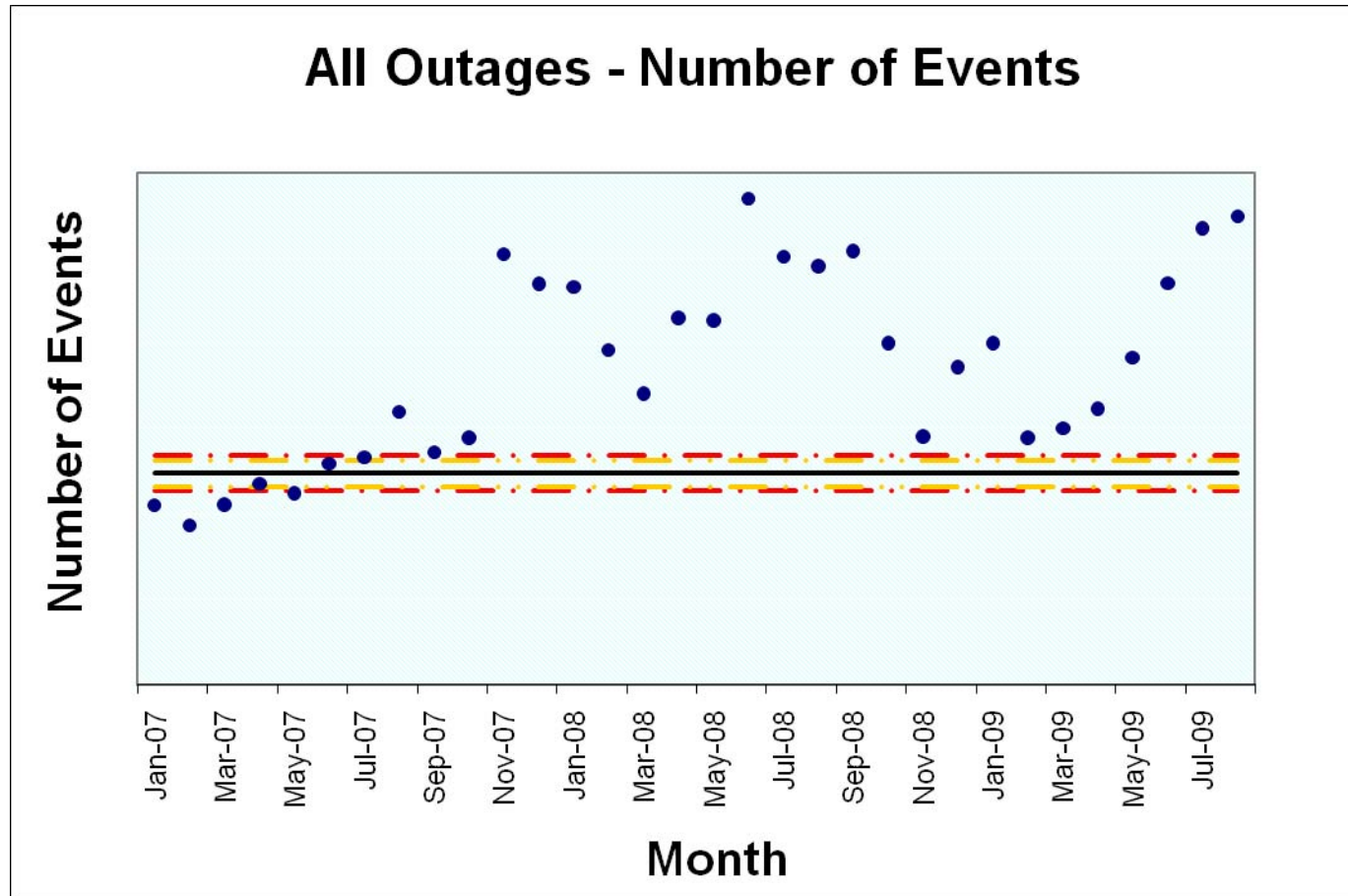




# Overview of Presentation

- Network Reliability Status
- Improvements to NORS
- NRSC Activities

# Frequency of Outages by Month

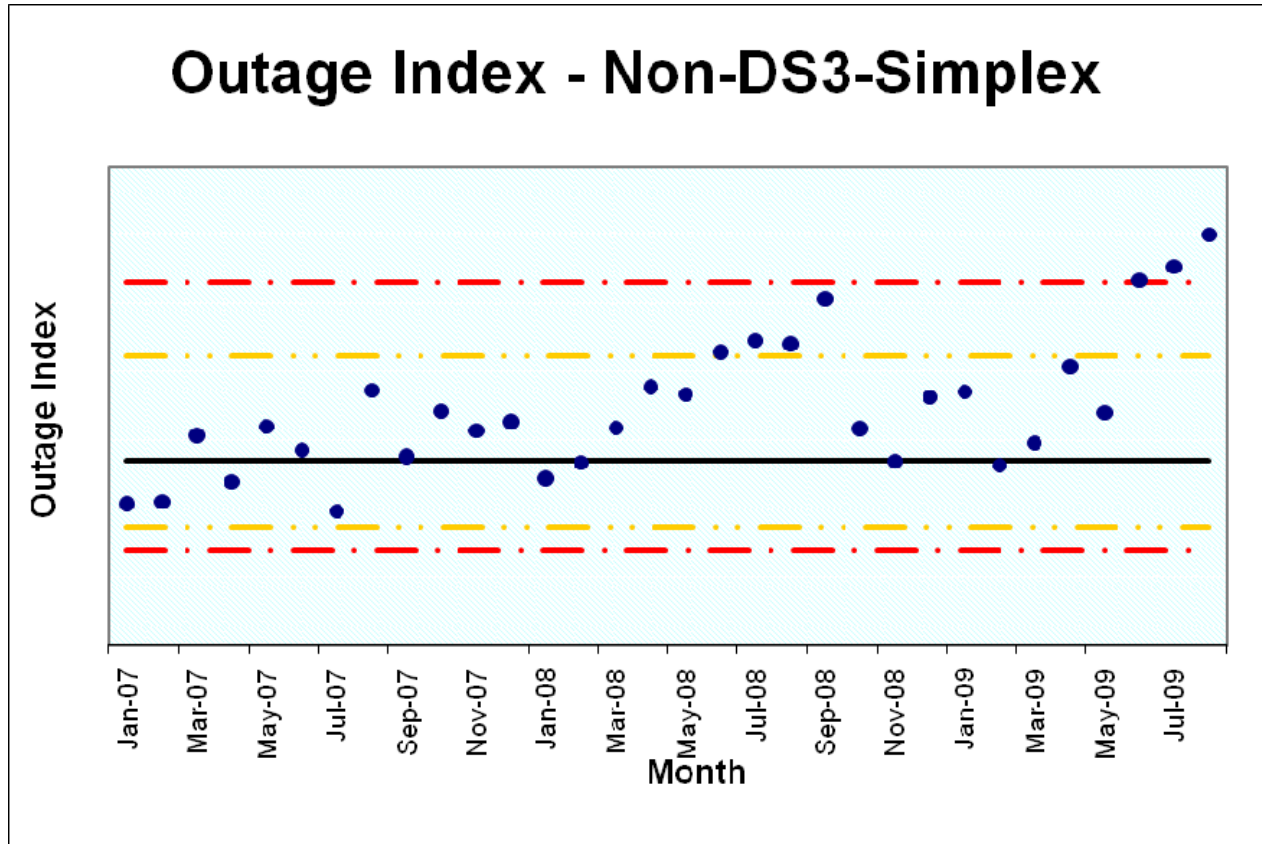


# Standards for Outage Frequencies



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

# Outage Index – For All Outages Except DS3-Simplex



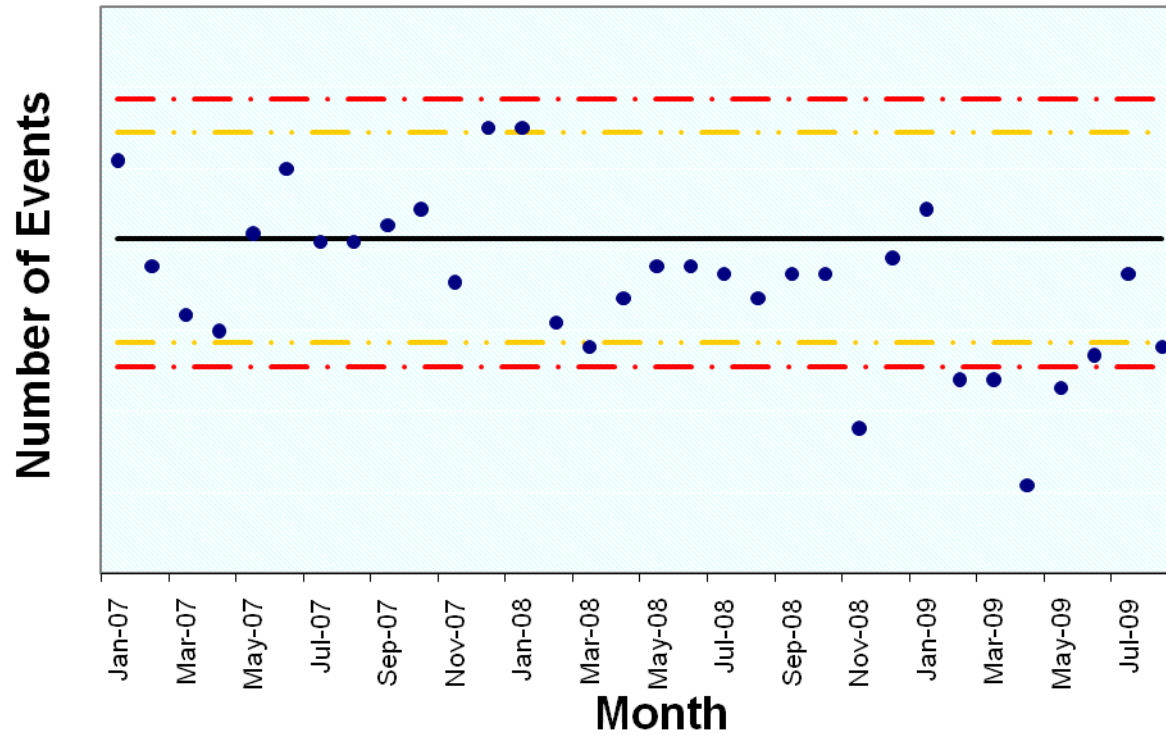
**Highest it has ever been for DS3-Non-Simplex, E911 and Wireless**

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

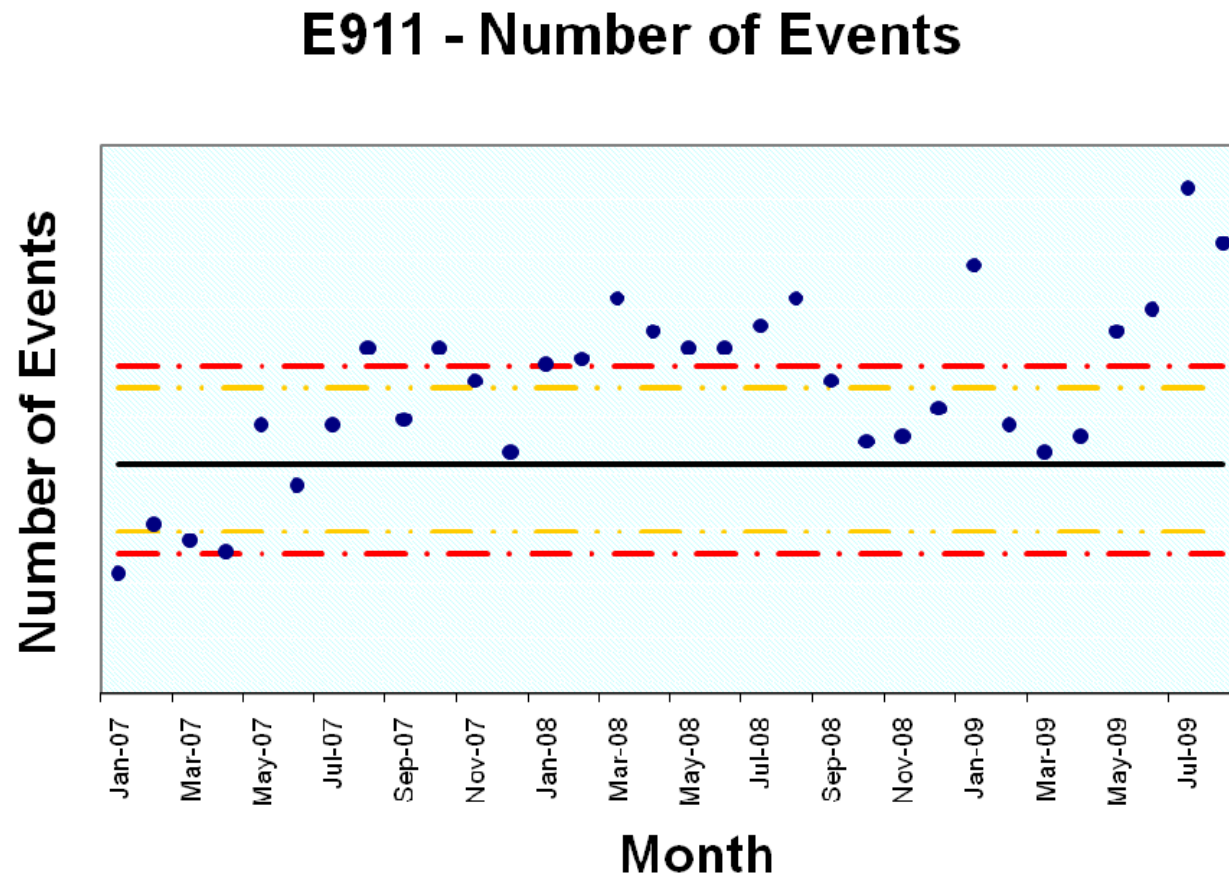
# DS3-Simplex



DS3-Simplex - Number of Events



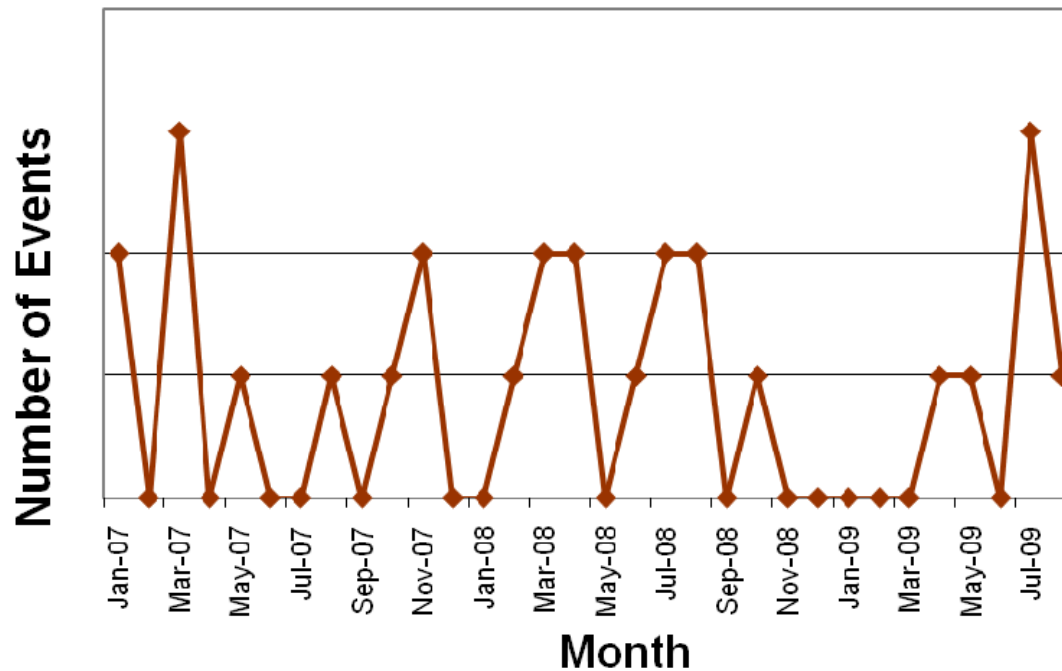
# E911



# Very Large E911 Outages

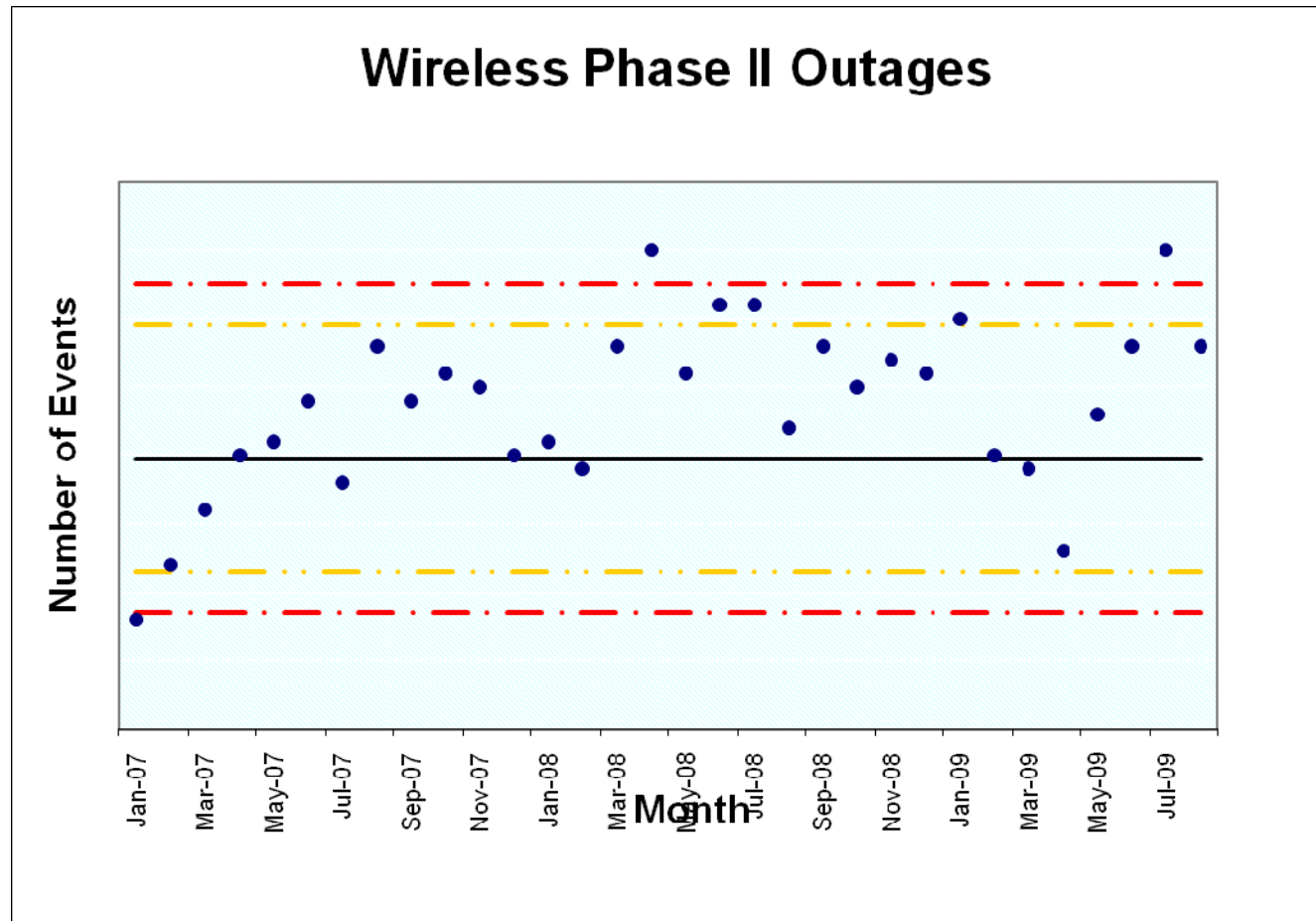


E911 Events Affecting > 1,000,000 Users

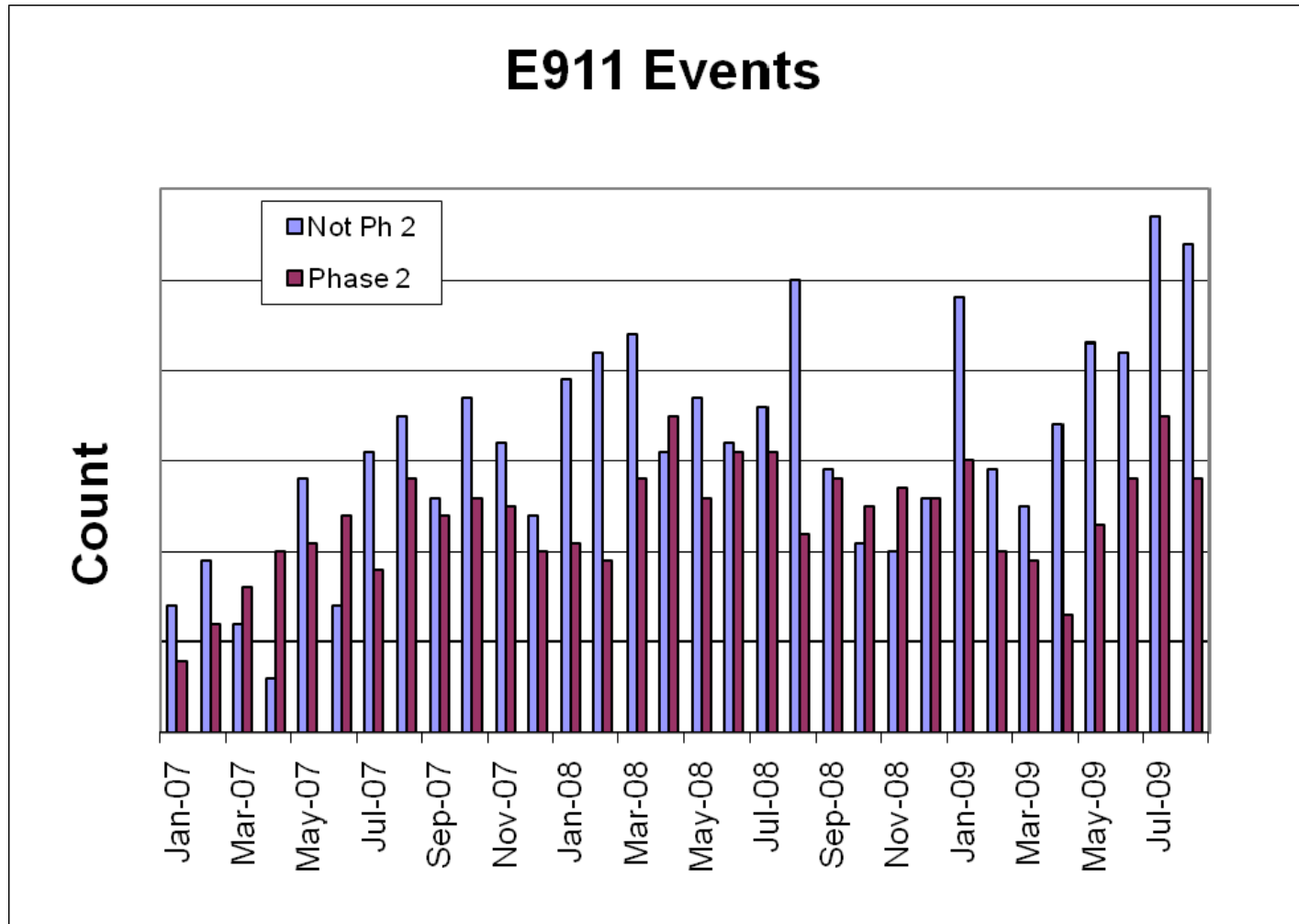




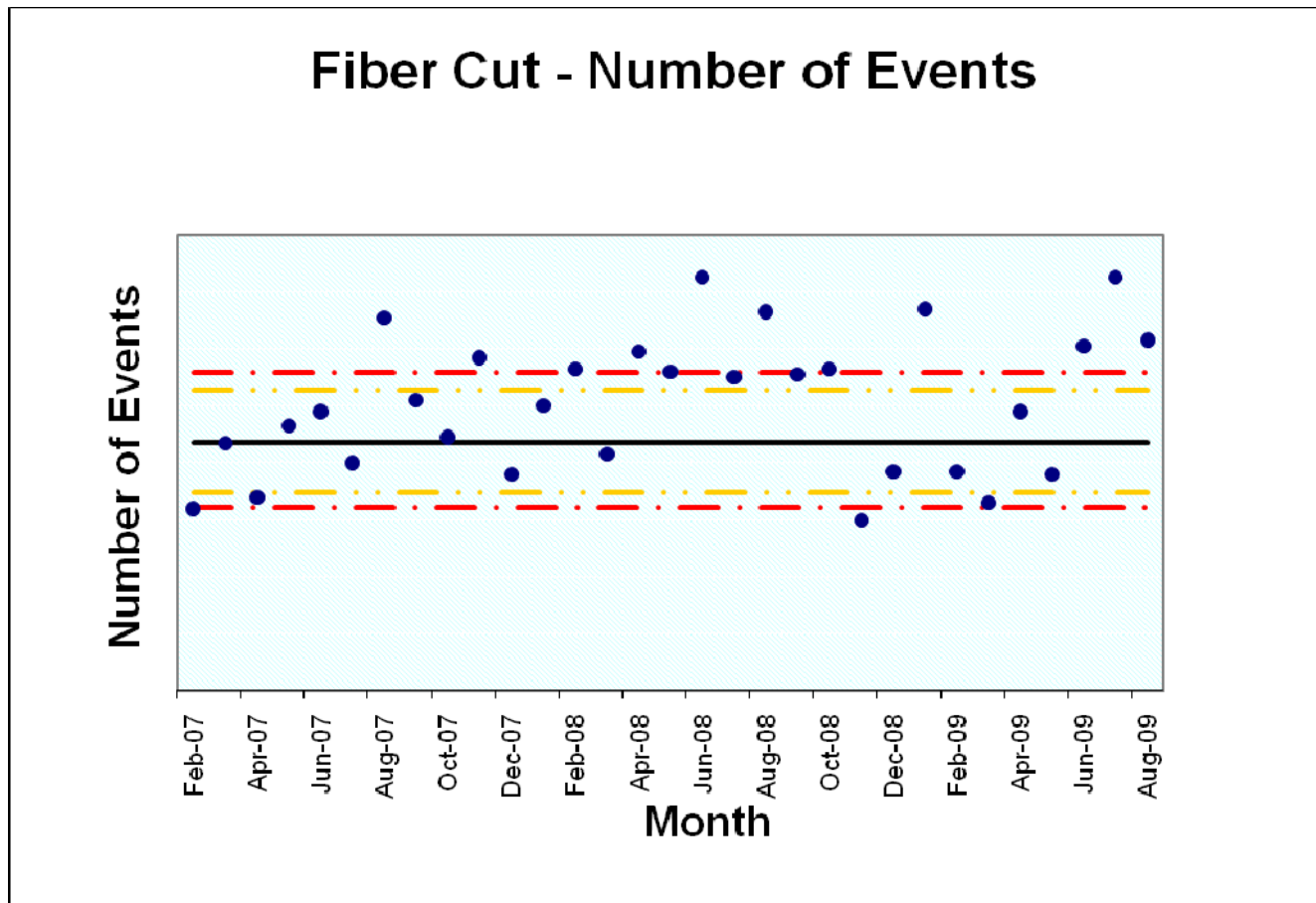
# E911 – Phase 2 Events



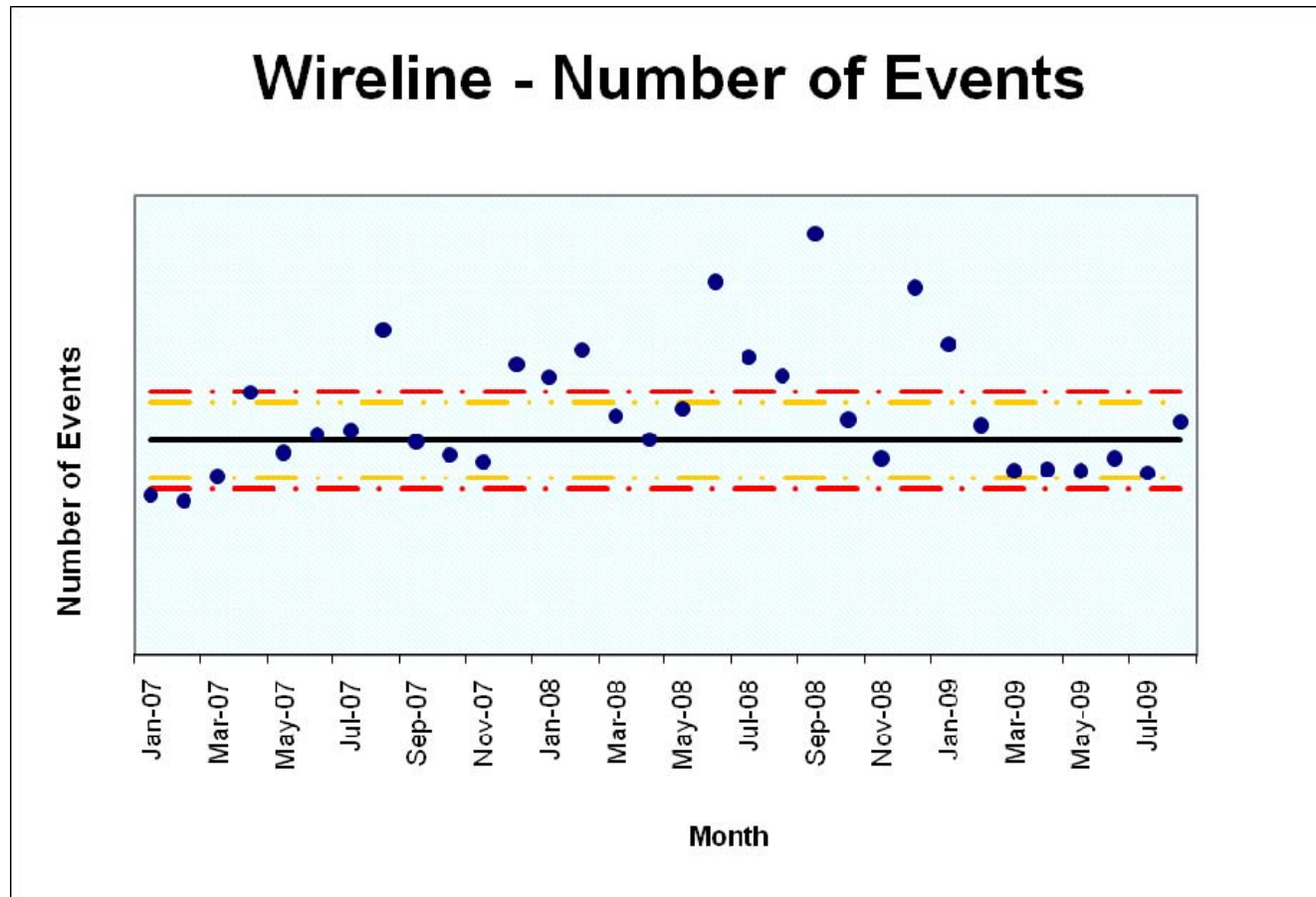
# Phase 2 vs. All Other E911 Outages



# Fiber Cut

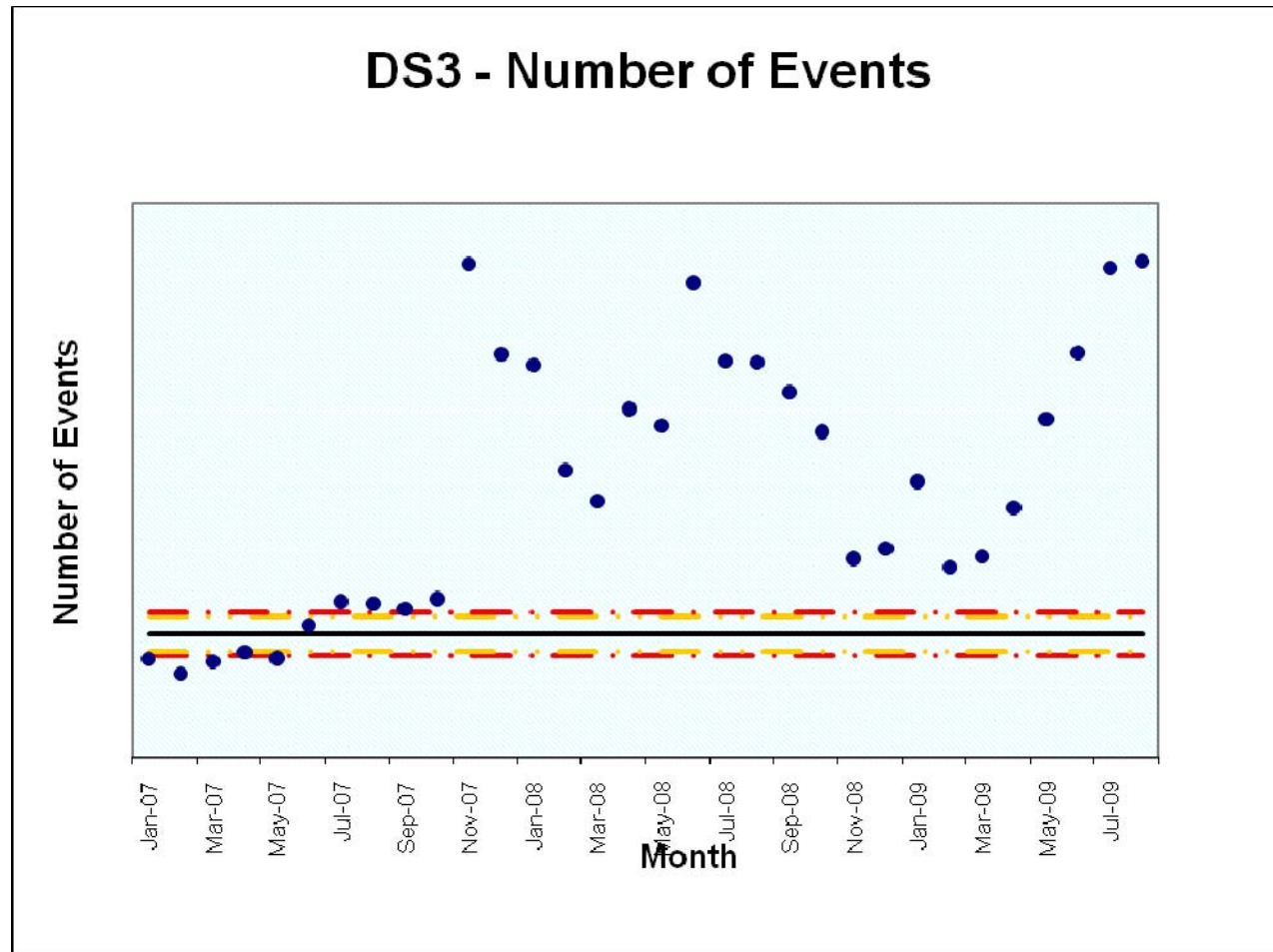


# Wireline

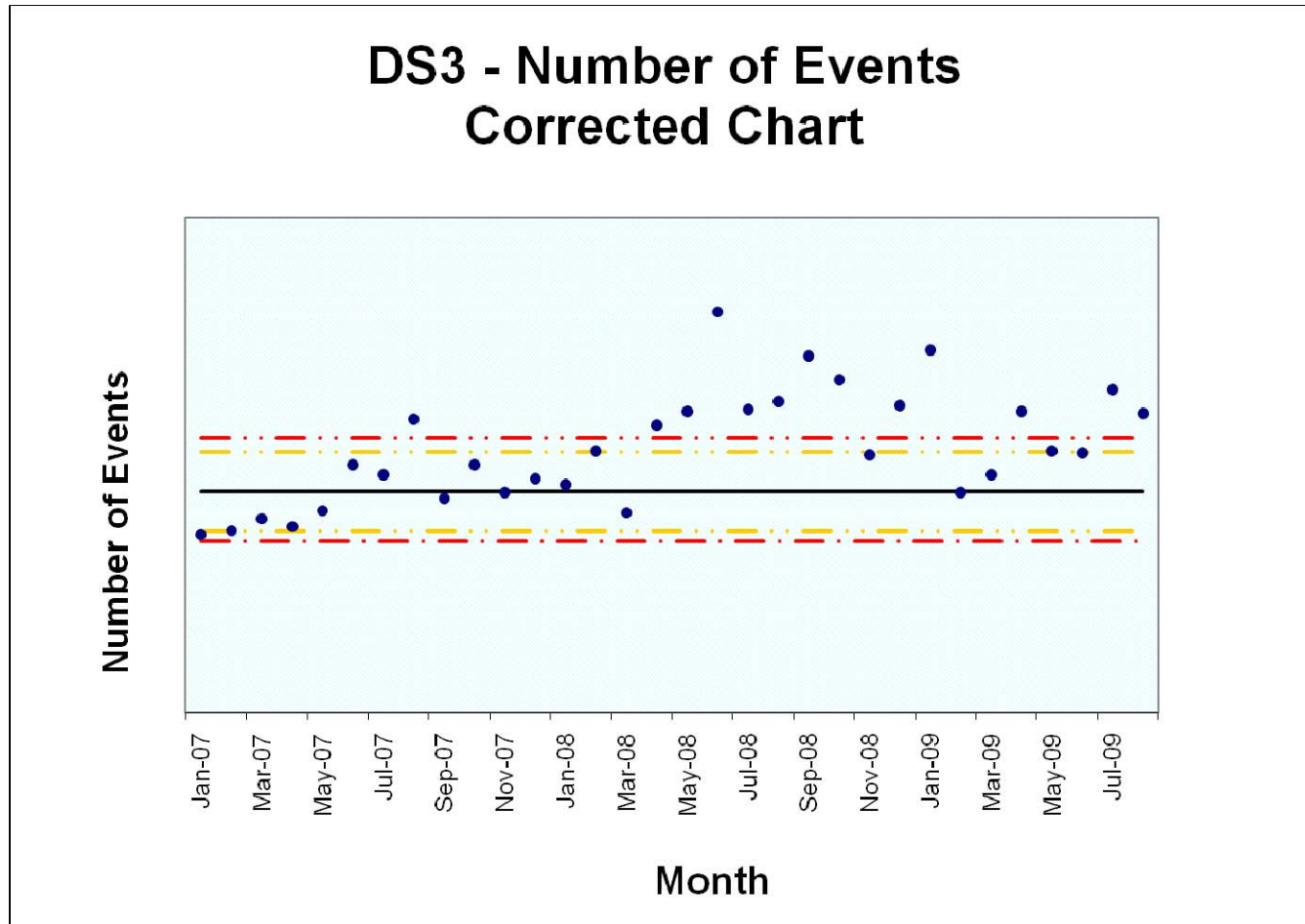


**Wireline outages are all outages for which the Reason Reportable was at least 900,000 wireline user-minutes.**

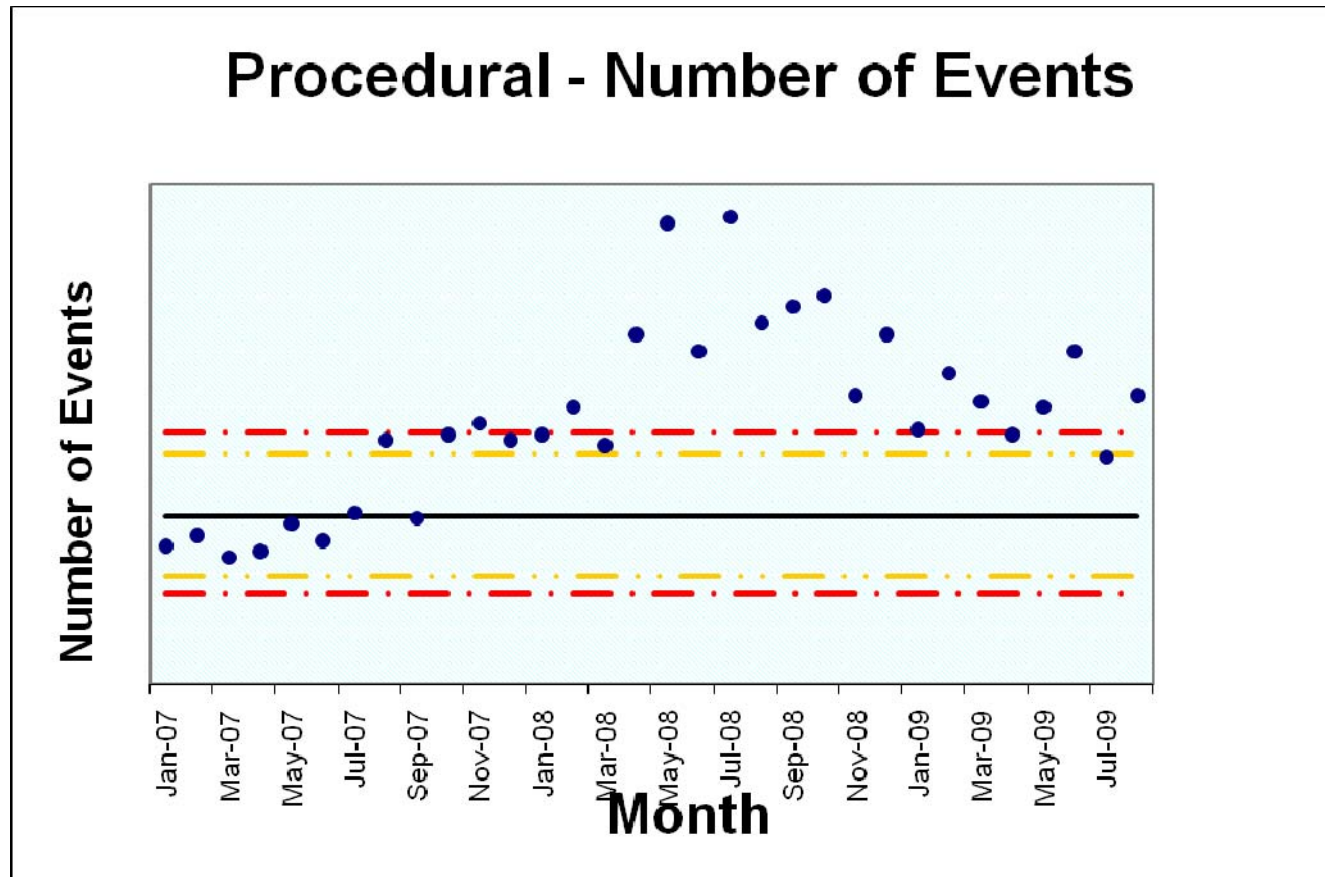
# DS3 (Non-Simplex) Events



# DS3 (Non-Simplex) Events



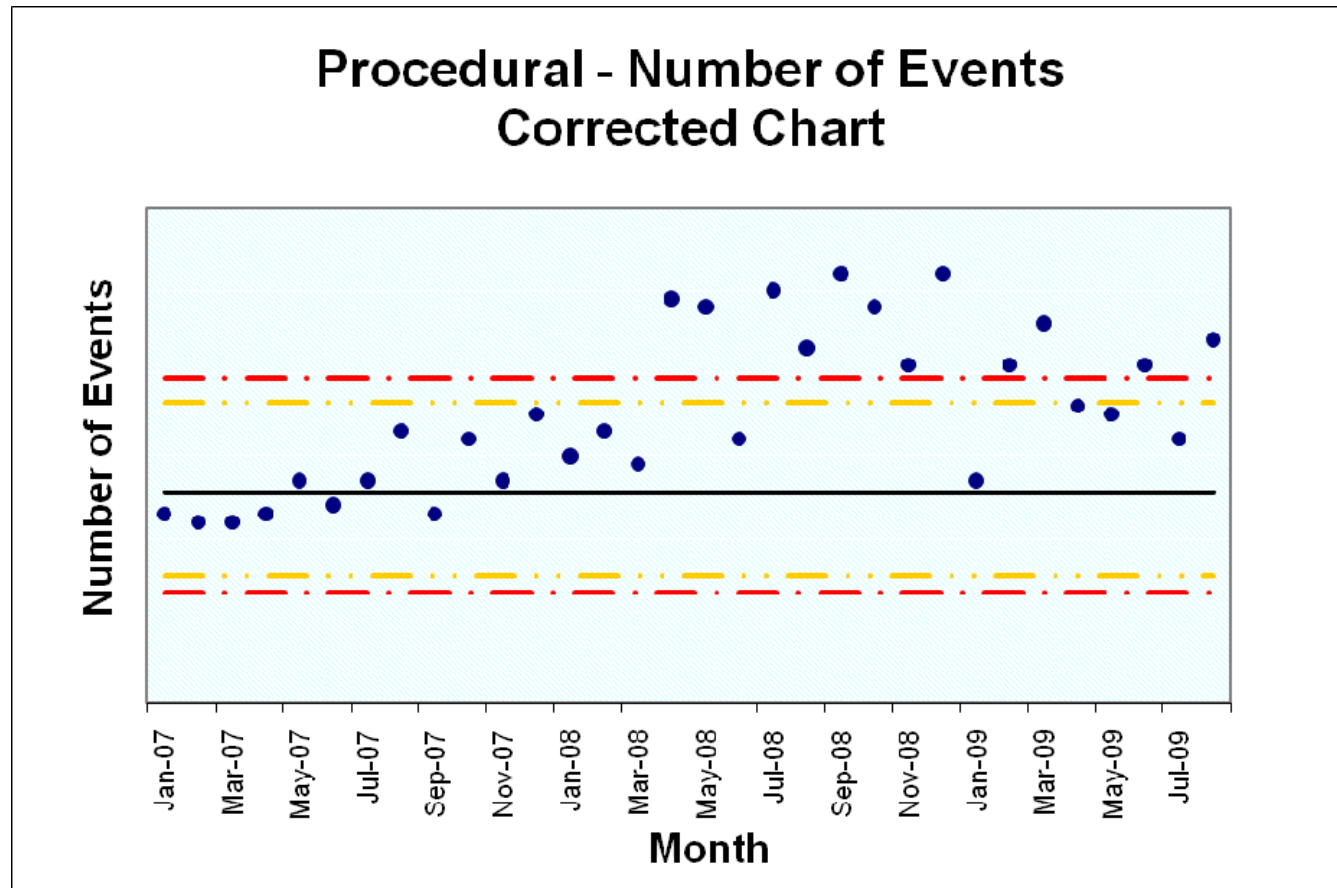
# Procedural Events



**Procedural events are ones which have a procedural root cause.**

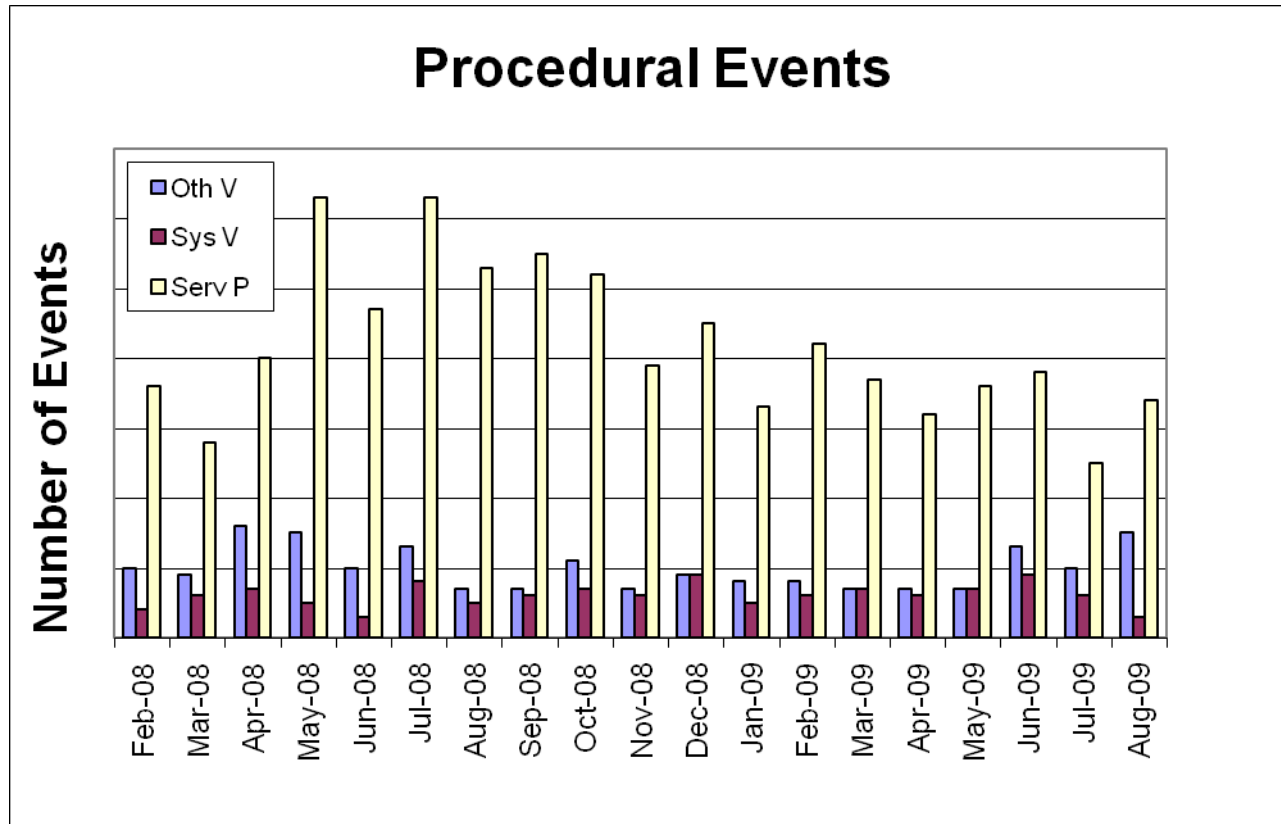


# Procedural Events





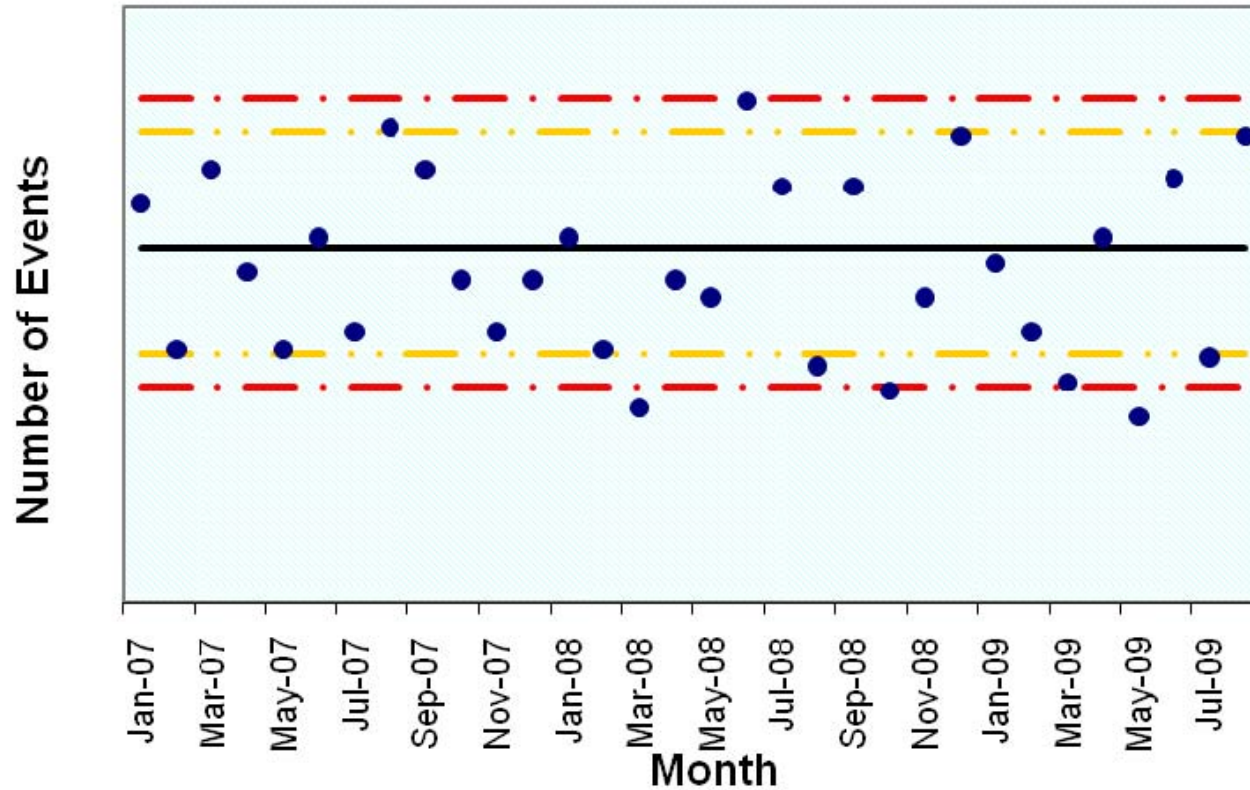
# Procedural Events by Source



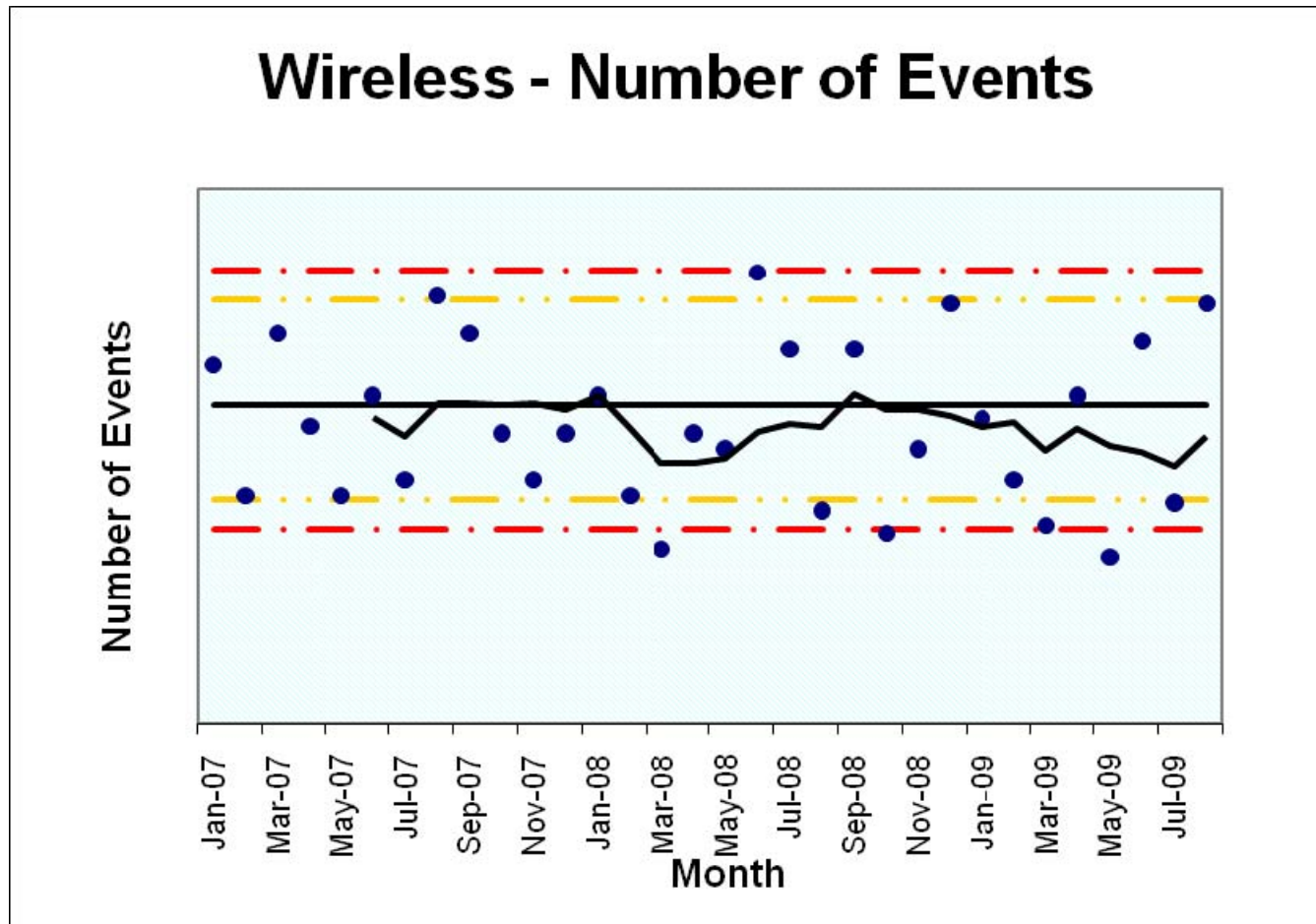
# Wireless



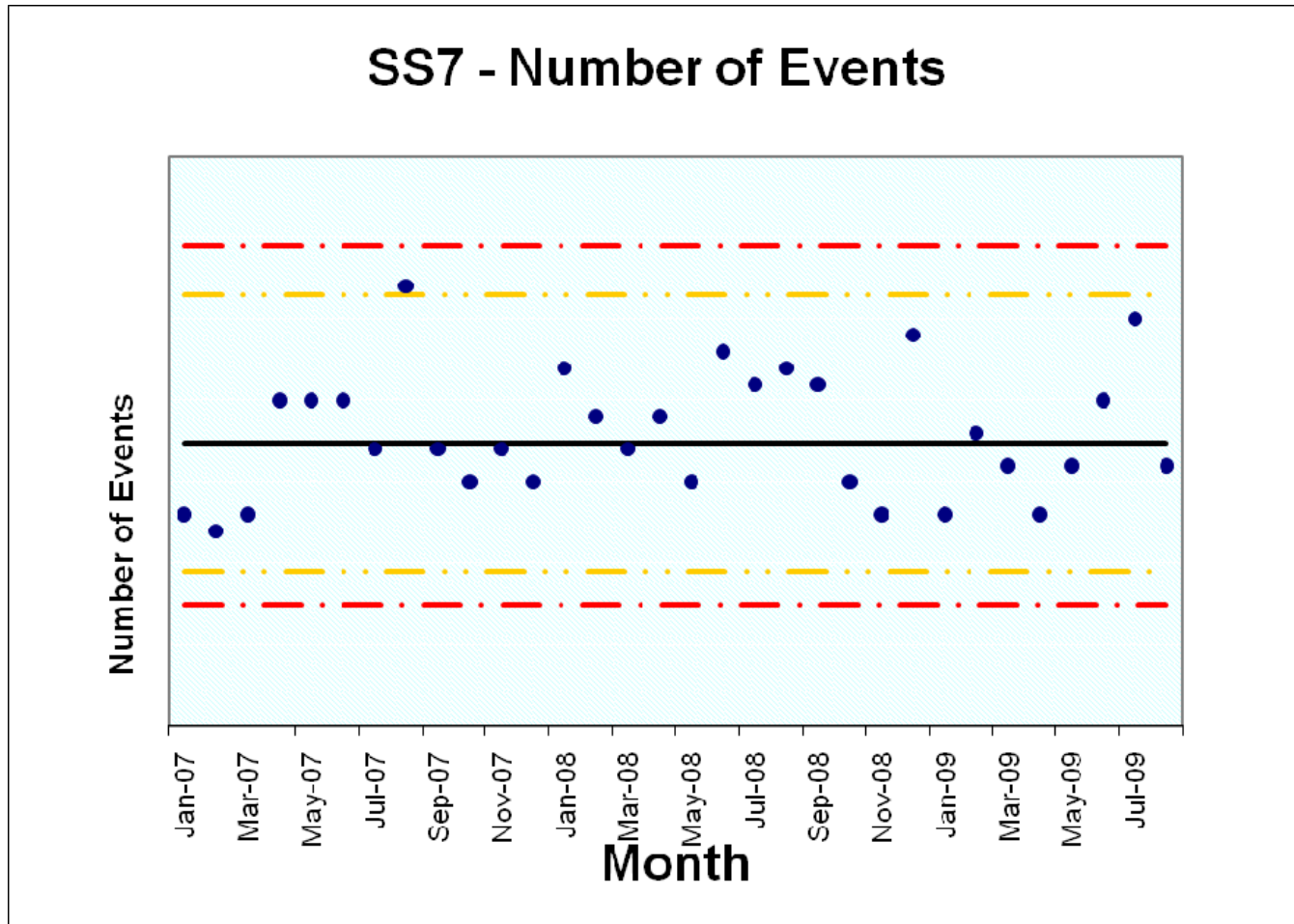
## Wireless - Number of Events



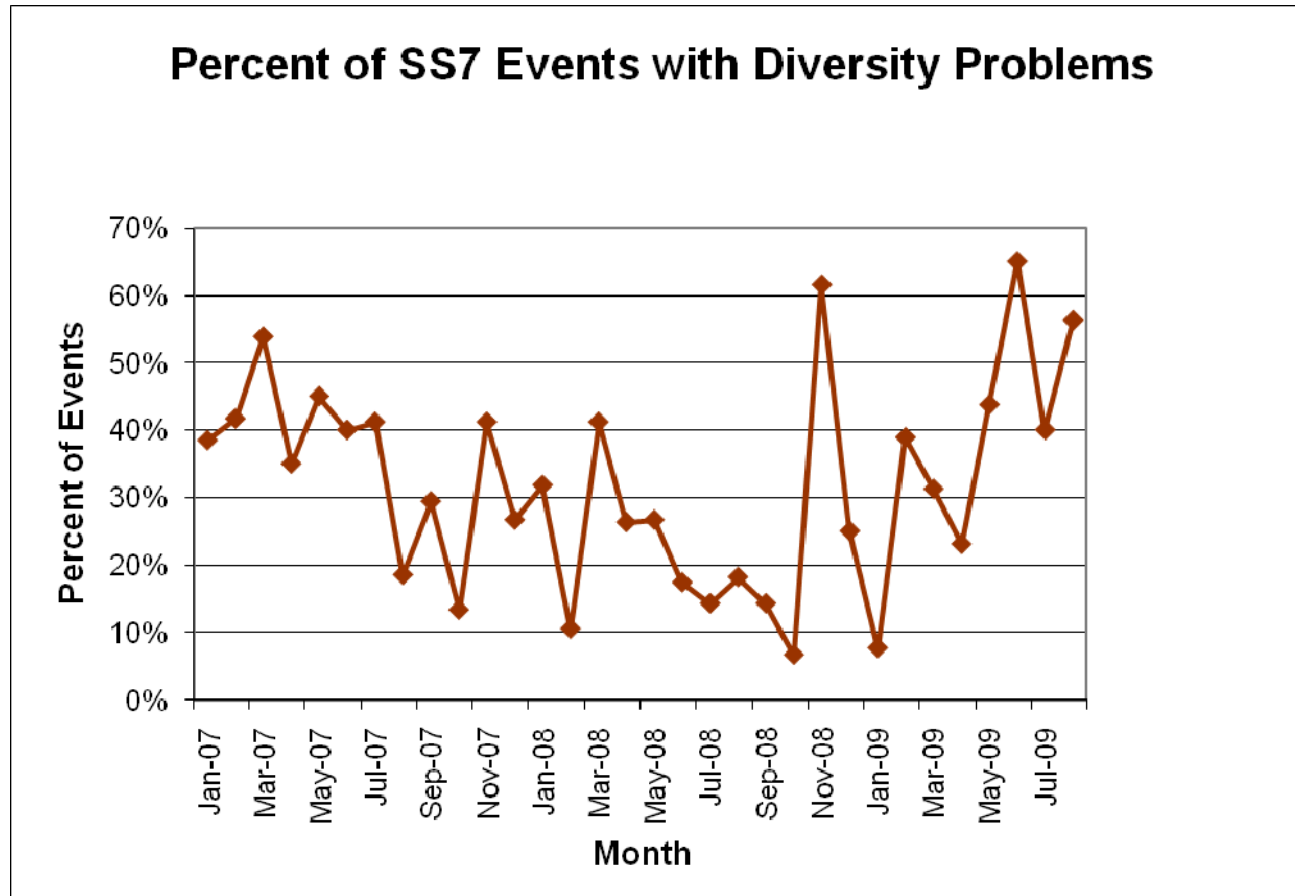
# Wireless with Trend Line



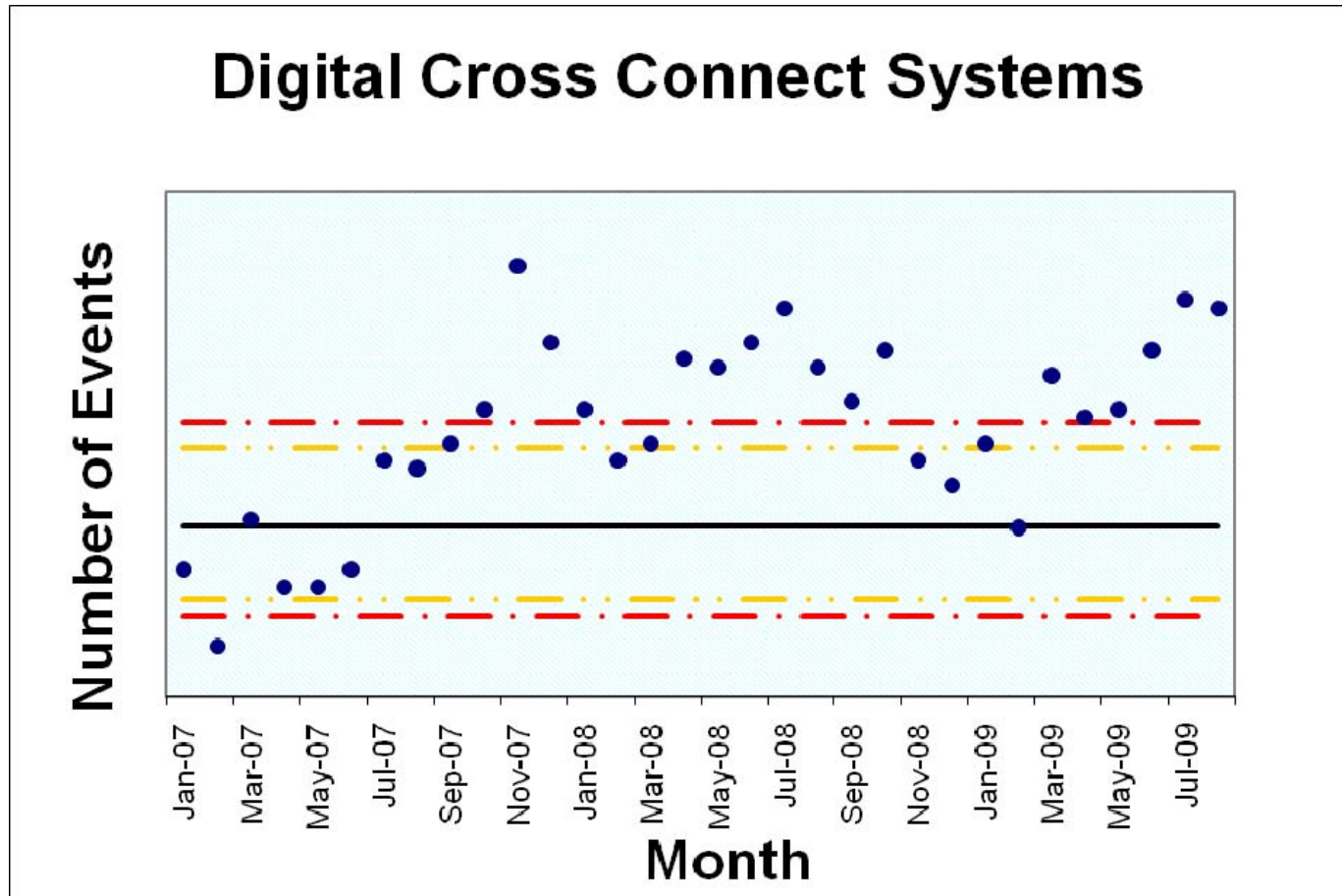
# SS7



# SS7 and Diversity

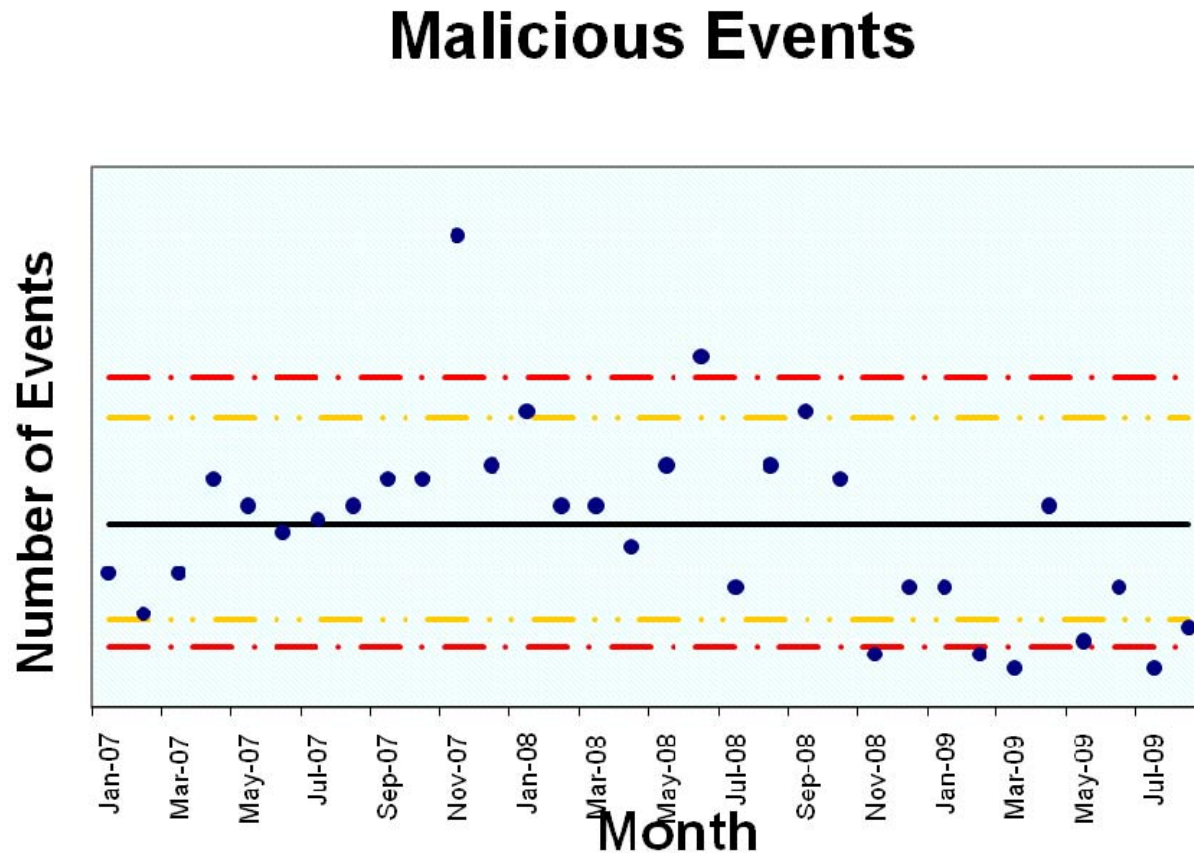


# Digital Cross Connect Systems





# Malicious Events



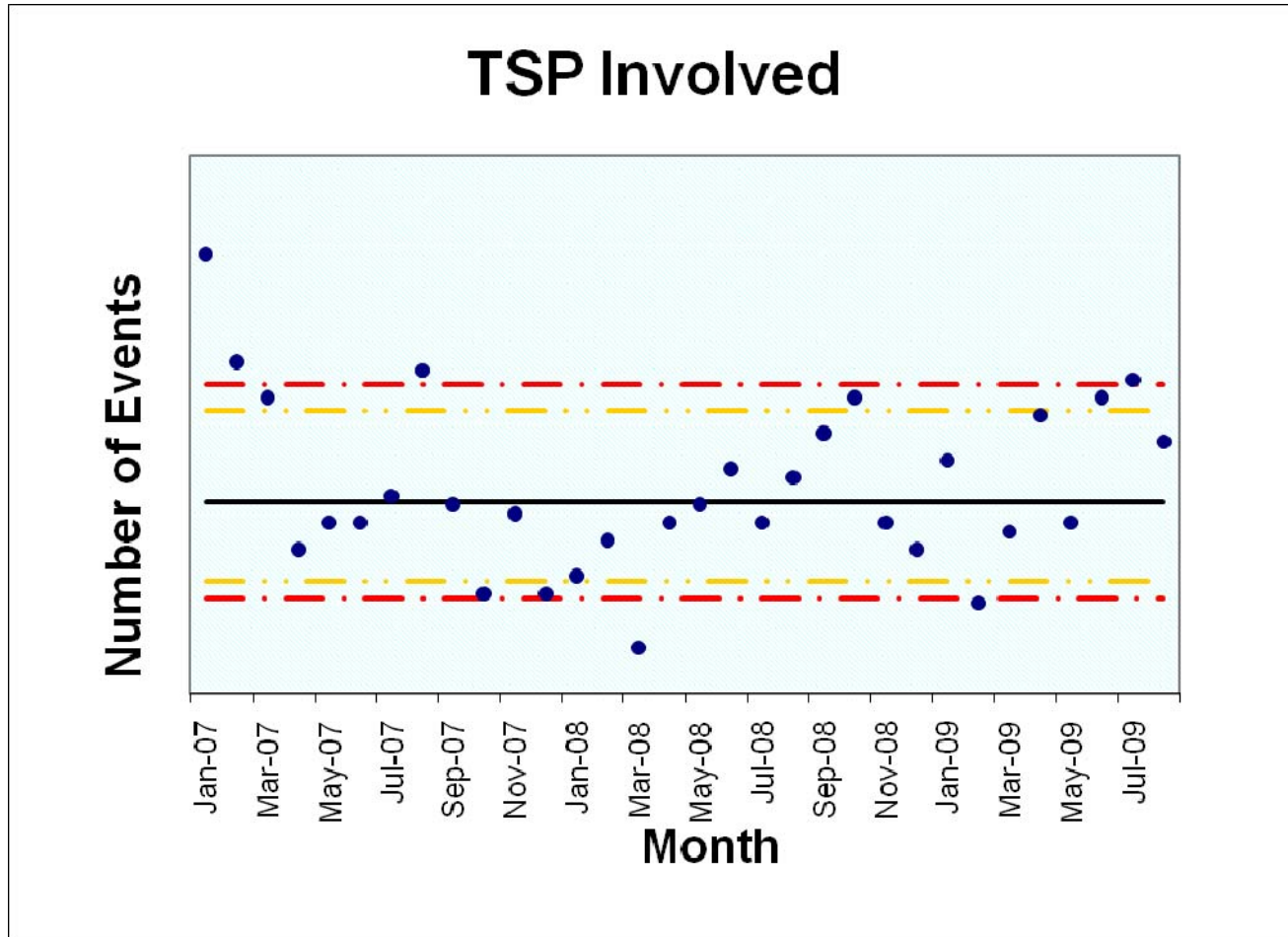
# Malicious Activity



- 590 outage reports where malicious activity was indicated (58 in 2005, 99 in 2006, 188 in 2007, 188 in 2008 and 57 in 2009)
- No outages seemed to be related to terrorist activities.
- About 59% of the reports (110) mentioned vandalism in 2008 and 53% (30) mention vandalism in 2009.
- About 8% of the reports (15) mentioned gun or shots in 2008 and 12% (7) 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 25 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
<b>All Except DS3- Simplex</b>	<b>1.27</b>	<b>2.00</b>	<b>4.94</b>	<b>16.43</b>	<b>47.12</b>	<b>97.21</b>	<b>140.85</b>

# Outage Durations (Hours) in 2009



	5% Percentile	10% Percentile	25% Percentile	Median	75% Percentile	90% Percentile	95% Percentile
Airport	1.01	1.43	2.67	5.07	17.45	63.49	89.87
Blocking	0.67	0.97	1.83	4.17	7.75	14.41	30.49
Cable Telephony	0.85	1.08	2.79	6.08	19.04	52.50	75.85
DS3	1.52	2.32	6.30	24.12	35.90	67.34	92.38
DS3-Simplex	57.23	120.75	132.08	178.43	318.05	697.58	1169.92
E911	0.83	1.12	2.09	4.38	8.33	22.19	34.28
MSC	0.56	0.88	1.50	2.03	3.79	13.82	33.71
SS7	0.50	0.58	1.00	2.18	4.83	11.44	.
Wireless	0.76	1.06	2.20	4.47	10.95	23.77	41.74
Wireline	2.73	4.91	17.55	55.11	108.13	166.63	228.77
<b>All Except DS3-Simplex</b>	<b>1.15</b>	<b>1.88</b>	<b>4.48</b>	<b>16.60</b>	<b>38.14</b>	<b>78.72</b>	<b>120.94</b>

# Test for Trend in Event Duration



## Non-DS3-Simplex Outages Data from 2008 and 2009

Rank Correlation of  
duration with date is  $-.029$   
and is significant

**Conclusion: Non DS3-Simplex Outages are getting shorter in duration from 1/08 to 8/09**

## DS3-Simplex Events Only Data from 2008 and 2009

Rank Correlation of  
duration with date is  $-.104$   
and is significant

**Conclusion: DS3-Simplex Events are getting shorter in duration from 1/08 to 8/09**

# 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	0.7%	1.2%	3.0%	2.6%	6.8%	81.3%	4.4%
1,000 to 10,000	0.6%	1.9%	9.8%	19.2%	37.7%	29.7%	1.1%
10,000 to 30,000	4.1%	16.8%	23.7%	25.3%	18.9%	10.5%	0.7%
30,000 to 50,000	8.6%	22.3%	20.9%	21.6%	18.6%	7.6%	0.4%
50,000 to 100,000	6.5%	18.6%	19.9%	25.8%	24.1%	5.2%	0.0%
100K to 300K	7.8%	21.8%	21.6%	25.6%	19.0%	3.5%	0.8%
300K to 1 Million	9.3%	15.0%	25.0%	21.4%	20.7%	6.4%	2.1%
> 1 Million	8.2%	6.8%	20.5%	27.4%	30.1%	4.1%	2.7%

## 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%	0.9%	1.1%	5.4%	90.4%	1.4%
1,000 to 10,000	0.5%	3.0%	11.8%	18.2%	34.4%	31.3%	0.9%
10,000 to 30,000	6.3%	20.8%	30.3%	21.5%	13.1%	7.5%	0.5%
30,000 to 50,000	9.3%	25.2%	25.9%	21.3%	11.6%	6.3%	0.3%
50,000 to 100,000	9.6%	27.6%	26.3%	14.1%	17.9%	4.5%	0.0%
100K to 300K	9.1%	25.7%	25.1%	24.6%	13.3%	1.9%	0.3%
300K to 1 Million	11.6%	20.9%	30.2%	17.4%	14.0%	5.8%	0.0%
> 1 Million	12.2%	9.8%	26.8%	29.3%	17.1%	4.9%	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	1.0%	3.2%	7.4%	5.6%	9.6%	62.3%	10.9%
1,000 to 10,000	0.6%	0.6%	7.3%	20.4%	41.9%	27.8%	1.4%
10,000 to 30,000	0.8%	10.5%	13.5%	31.2%	27.8%	15.0%	1.1%
30,000 to 50,000	7.9%	18.9%	15.0%	22.0%	26.8%	9.1%	0.4%
50,000 to 100,000	3.0%	8.1%	12.6%	39.3%	31.1%	5.9%	0.0%
100K to 300K	5.7%	16.0%	16.4%	27.0%	27.5%	5.7%	1.6%
300K to 1 Million	5.6%	5.6%	16.7%	27.8%	31.5%	7.4%	5.6%
> 1 Million	3.1%	3.1%	12.5%	25.0%	46.9%	3.1%	6.3%

# 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%	2.9%	11.4%	82.9%	2.9%
1,000 to 10,000	0.0%	2.9%	14.3%	42.9%	22.9%	17.1%	0.0%
10,000 to 30,000	3.8%	34.6%	38.5%	11.5%	7.7%	3.8%	0.0%
30,000 to 50,000	14.3%	21.4%	21.4%	28.6%	14.3%	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	11.1%	11.1%	11.1%	44.4%	11.1%	0.0%	11.1%
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%	3.1%	80.6%	16.3%
1,000 to 10,000	0.0%	0.5%	5.3%	7.9%	36.0%	48.7%	1.6%
10,000 to 30,000	0.0%	5.8%	9.6%	30.8%	17.3%	36.5%	0.0%
30,000 to 50,000	5.0%	5.0%	20.0%	20.0%	40.0%	10.0%	0.0%
50,000 to 100,000	0.0%	0.0%	16.7%	33.3%	50.0%	0.0%	0.0%
100K to 300K	0.0%	0.0%	0.0%	71.4%	14.3%	14.3%	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



**Email sent to filer as well as Outage Coordinators when report is filed.**

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