

Monitoring and troubleshooting a CDMA2000 1X / EVDO data network.

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About RADCOM

- Established 1993. NASDAQ: 1997
- One of the world leaders in the business of Monitoring and Analysis for next generation networks
- Headquarters / R&D in Israel, with offices in the U.S. and China, and sales support in Europe
- Customers in over 45 countries

1X / EVDO services

- The IP data portions of any wireless network is now “cleared” to bring ARPU up
- Name of the game: services!
- Mostly (if not all) are IP based
- Setting / tuning / “debugging” the IP overlay on top of a CDMA2000 network is one of the most complicated tasks

EVDO troubleshooting problems

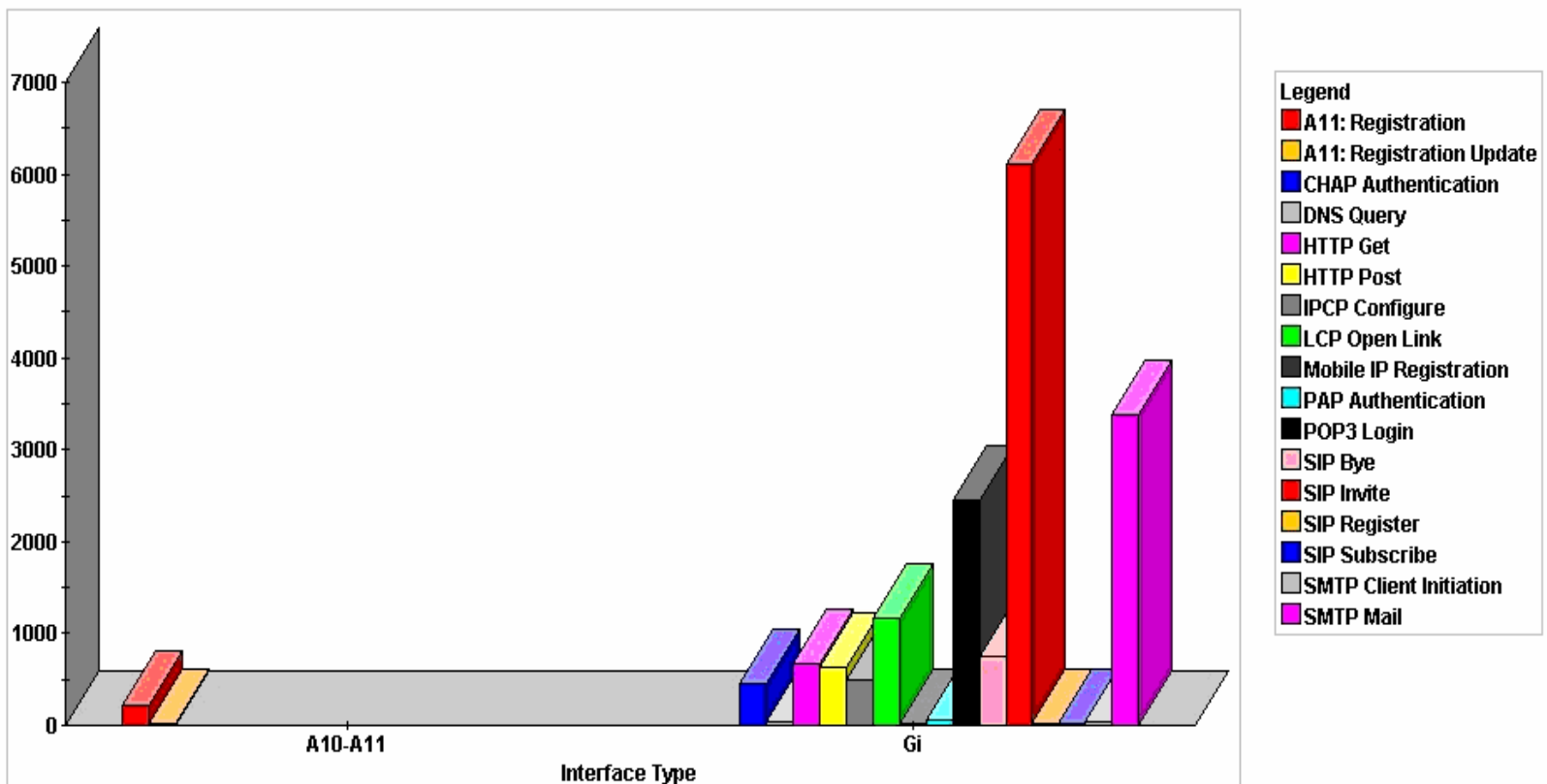
- No visibility
- “Legacy” OSS does not provide any insight (as it did with voice)
- IP network are more complex than CS networks.

Report Name: BMC 13 CDMA Latency (Statistics)

Report Range: 10/12/2005 13:00 - 10/12/2005 13:36 ((GMT - 05) Eastern Time (US & Canada))

Parameters: Avg(Procedure Duration)

'Procedure Duration' In: 'Interface Type' Compare by: 'Procedure Type'



Done

Internet



12:56 PM



Load balancing issues



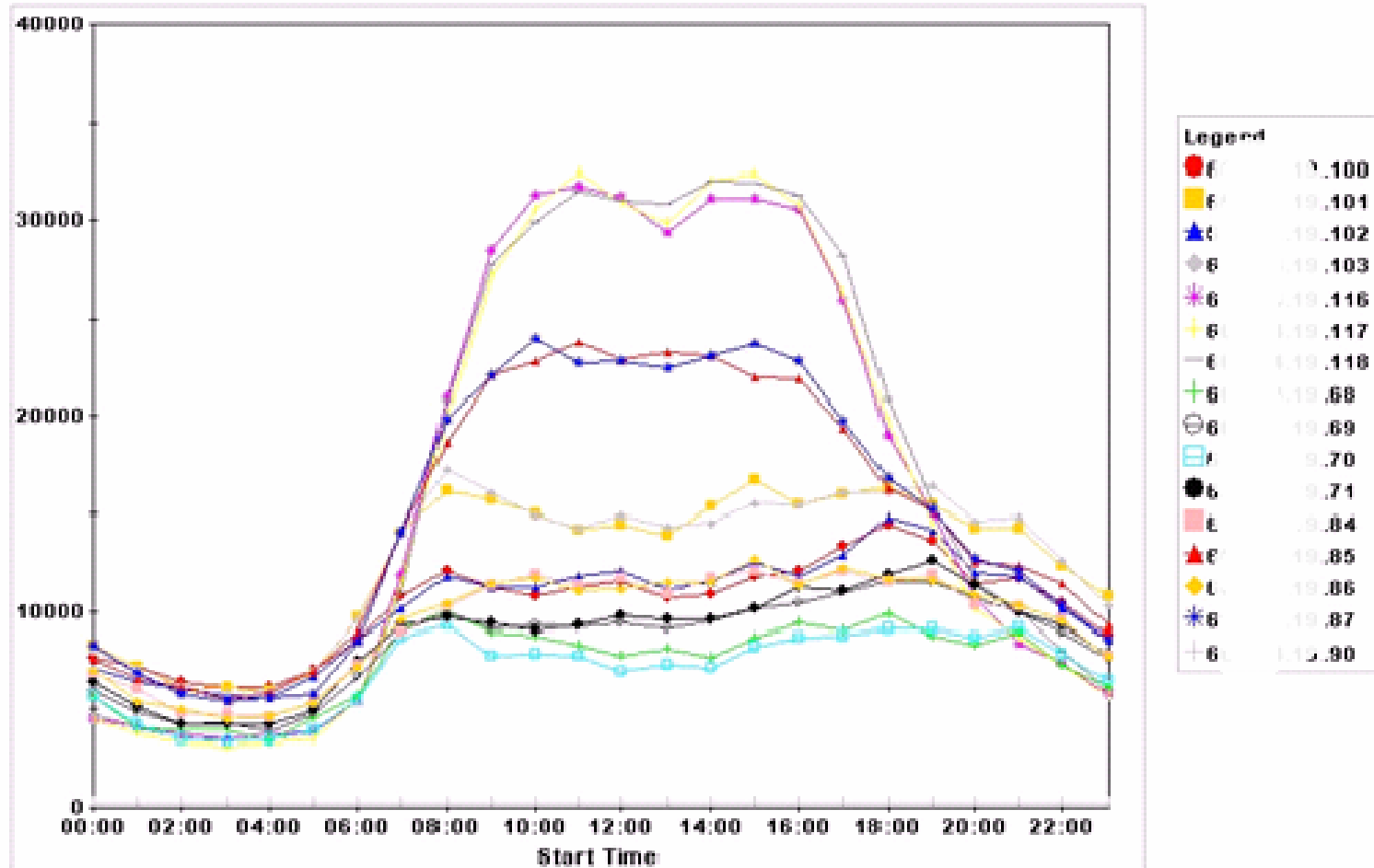
Report Name: Factory-1x PCF Load Sharing (Statistic)

Report Range: 07/13/2005 00:00 - 07/13/2005 23:59 ((GMT - 05) Eastern Time (US & Canada))

Charts List:

Procedures Count

'Procedures Count' In: 'Start Time' Compare by: 'PCF IP Address'



Troubleshooting solutions

- Characteristics and aspects of both a real-time and a long term monitoring solution.
- The problem experienced is usually:
 - intermittent
 - time varying
 - has a complex interrelationship with multiple network parameters
 - Involves several network elements.

Effective troubleshooting tools

- Must have the ability to monitor and analyze traffic over an extended period of time.
- As a corollary - sophisticated data mining tools to identify significant information
- Robust, flexible, real time triggering mechanism
- Ability to simultaneously view the user plane (media) and the signaling plane is mandatory.

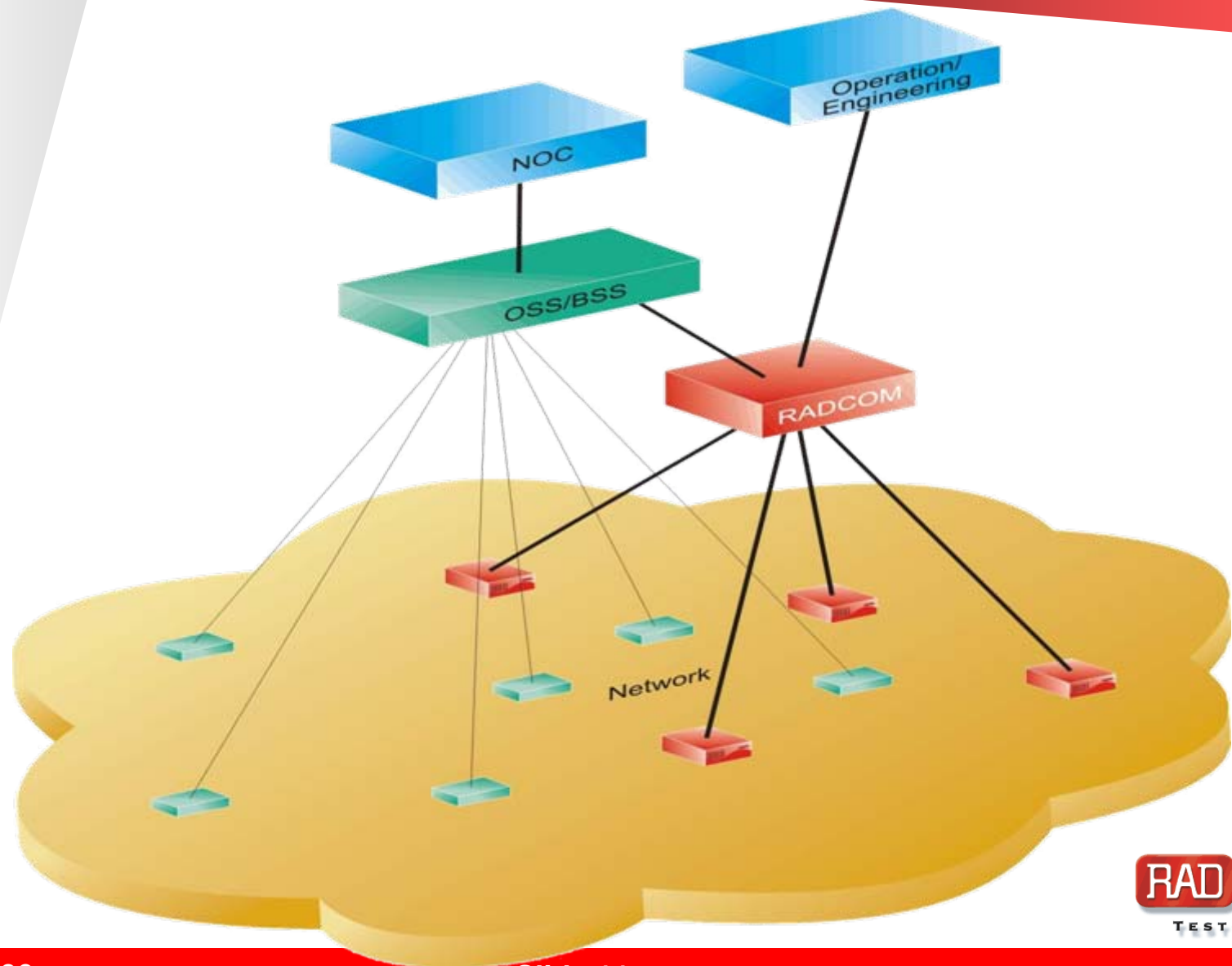
Effective troubleshooting tools

- Statistically monitor all transactions and identify / isolate the problematic sessions in real time
- Ability to correlate a specific session captured on different interfaces is critical when trying to analyze the end user experience.
- Keep these sessions, throw or aggregate the rest.

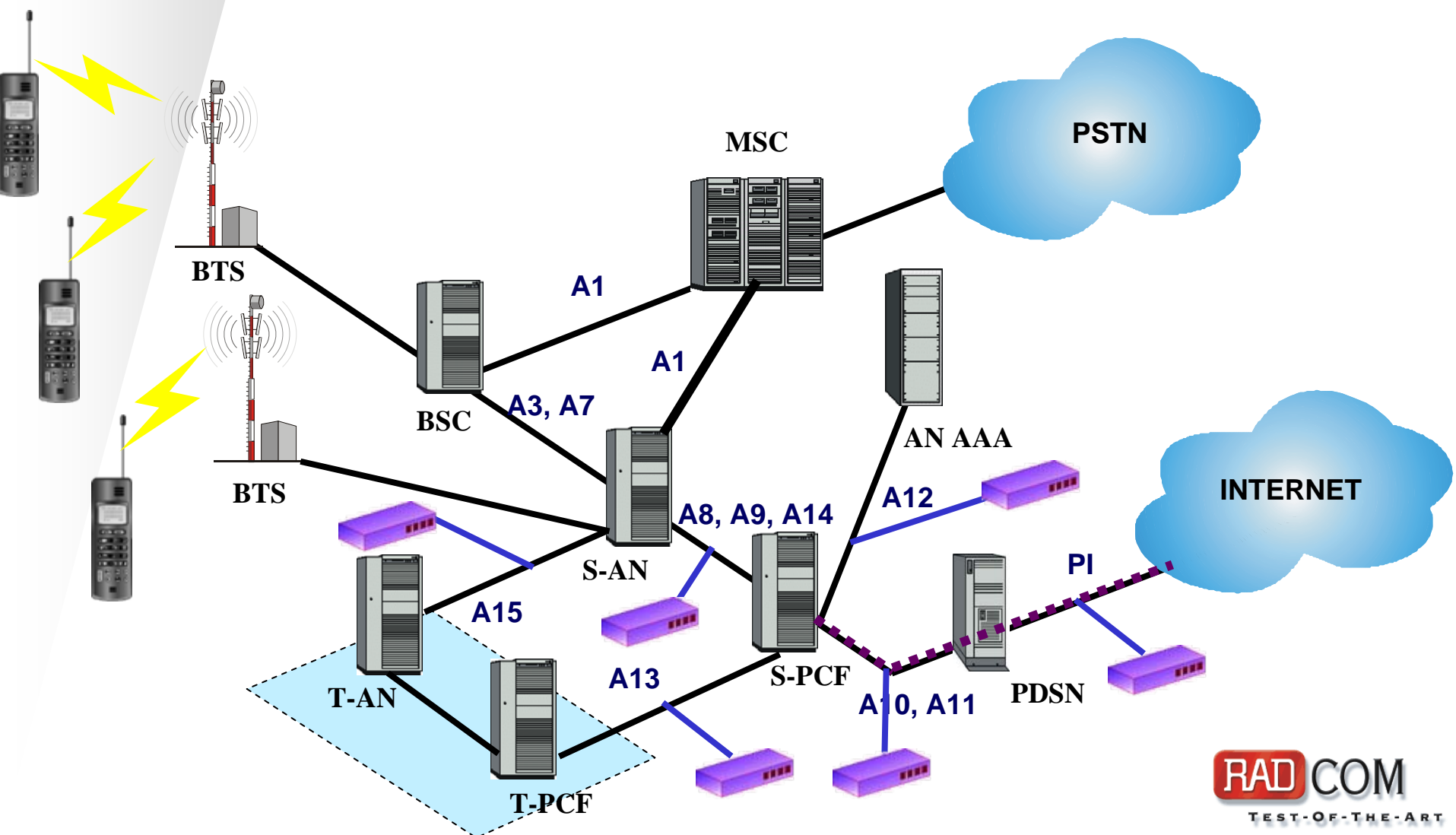
Monitoring systems: Primary Usages

- Troubleshooting;
 - Subscriber problems.
 - Network problems.
 - Reactive and Proactive.
- Creating Base-line;
 - For Network/Element Maintenance.
 - For future reference
- Trending;
 - For network design and capacity.
 - For network health.

Monitoring systems – general idea



CDMA2000 1x/1x-EV-DO Consultants



Sample Information elements - monitoring system

■ Measurements

- Procedures type
- Event Success / reject
- Procedure end cause
- Procedure success ratio
- Procedure Duration
- Mean Throughput DL/UL
- Peak Throughput DL/UL
- Total Data DL/UL

■ Services:

- Service Protocol
- Service Destination (IP)

■ Identifiers

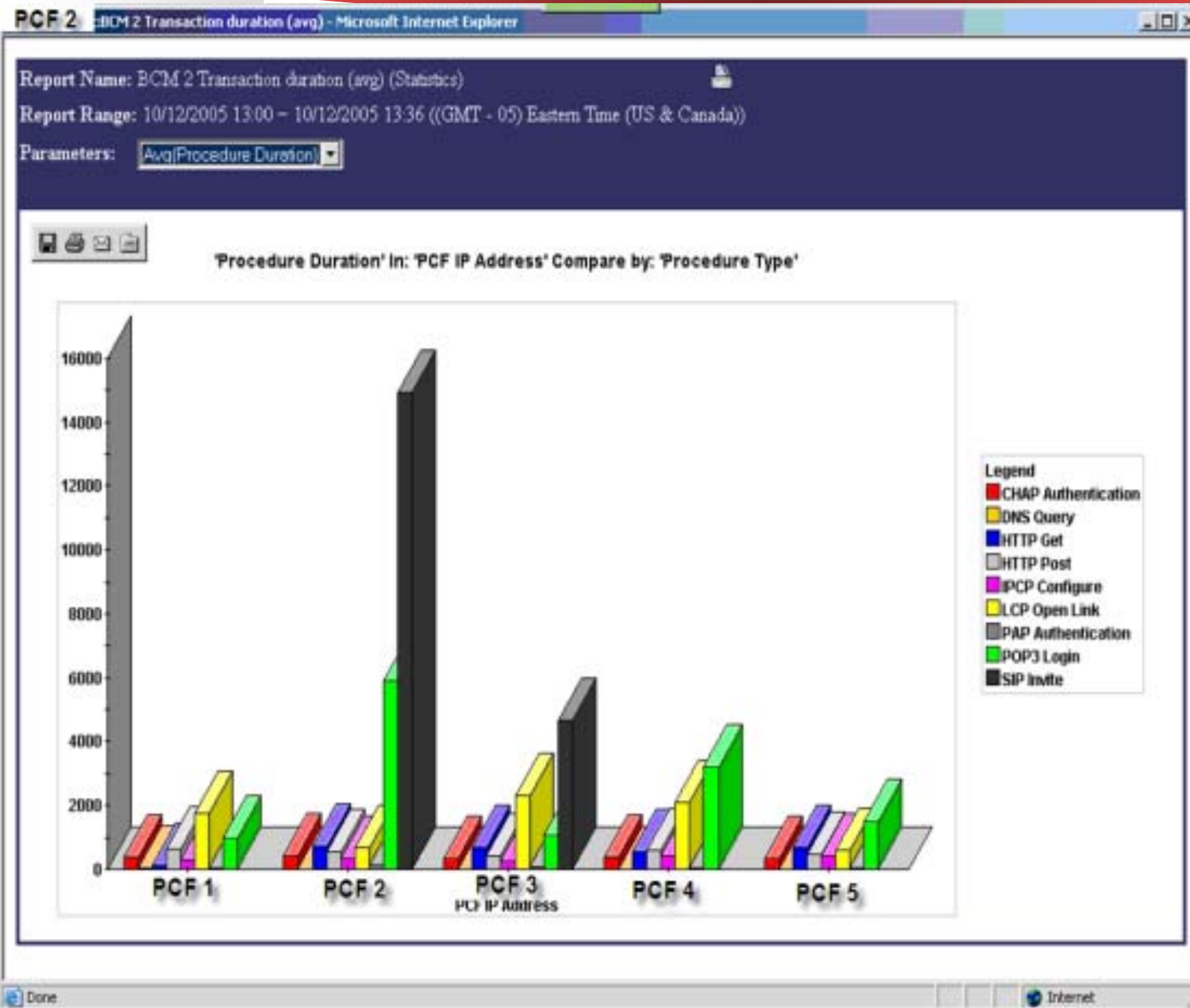
- User / group identifier
 - MS IP Address (IP) / IMSI
 - User Name
- PCF IP Address (IP)
- PDSN IP Address
- Start Time (Date and Time)
- URI

Aggregated information.

- Procedures Count
- Reference Group
- Procedure Avg/Max Duration
- Procedure success ratio

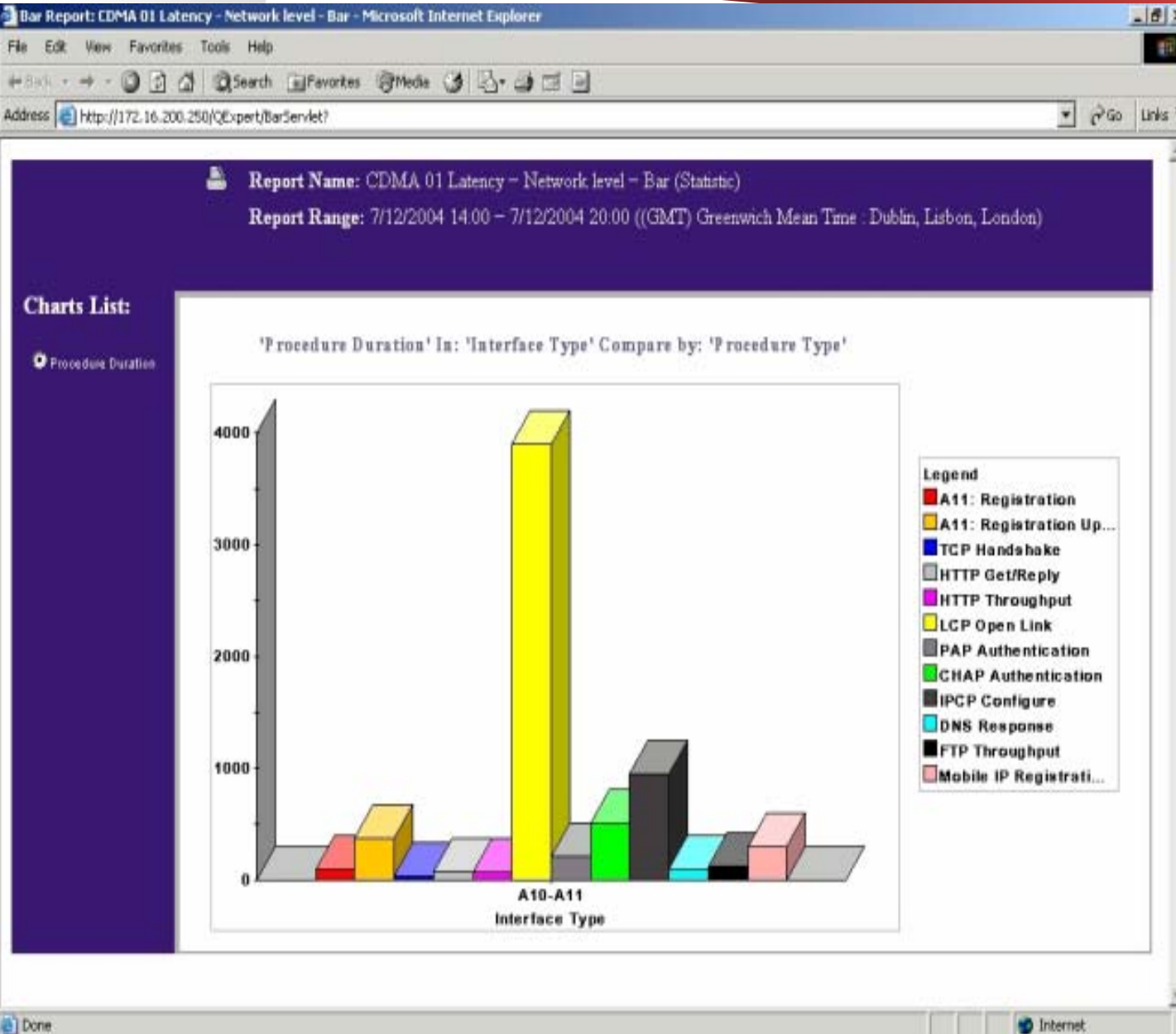
Few real networks examples

Procedure duration per PCF



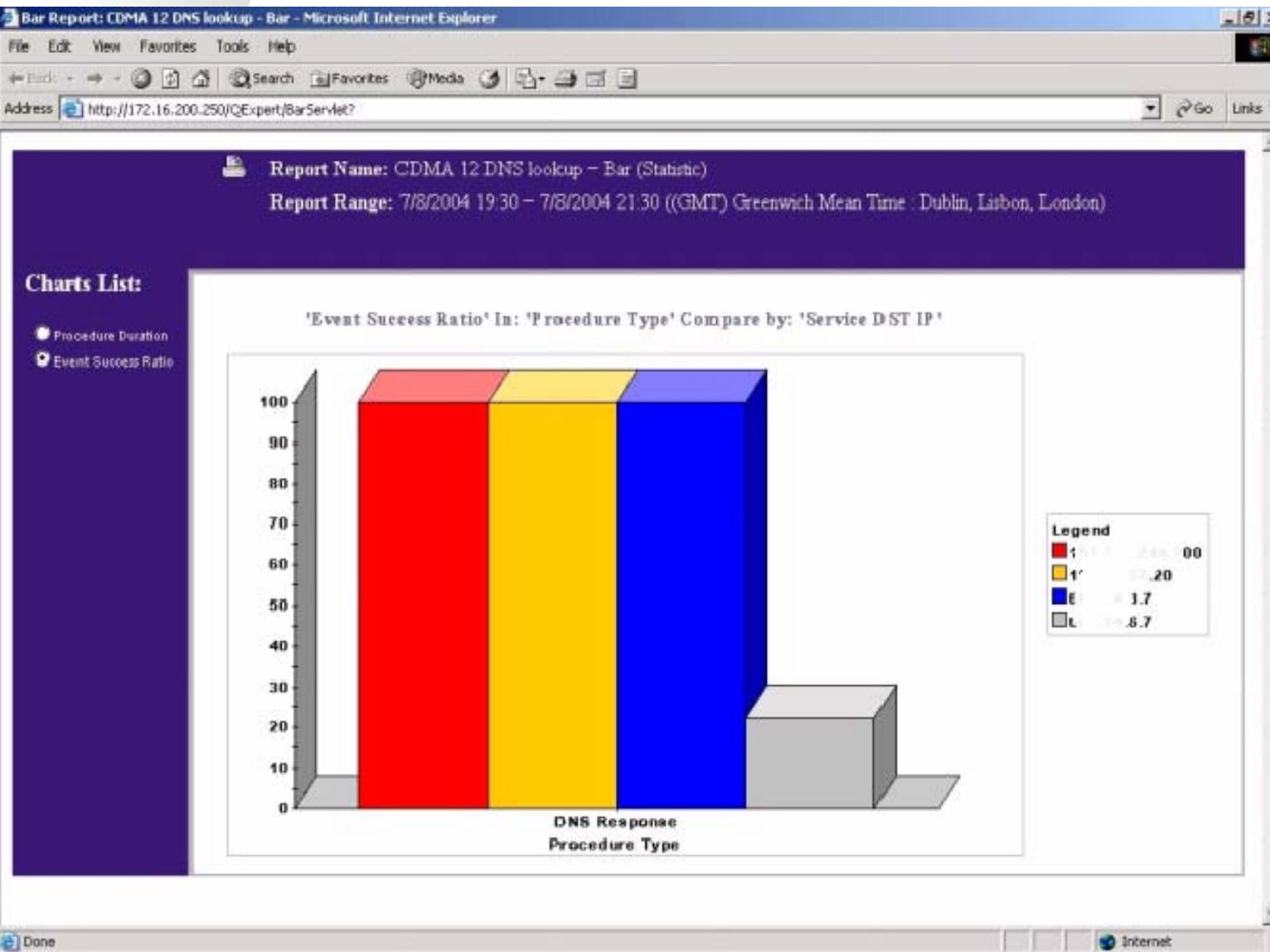
Too long
SIP invite
procedure

Latency analysis – per procedure



Too long LCP
open procedure

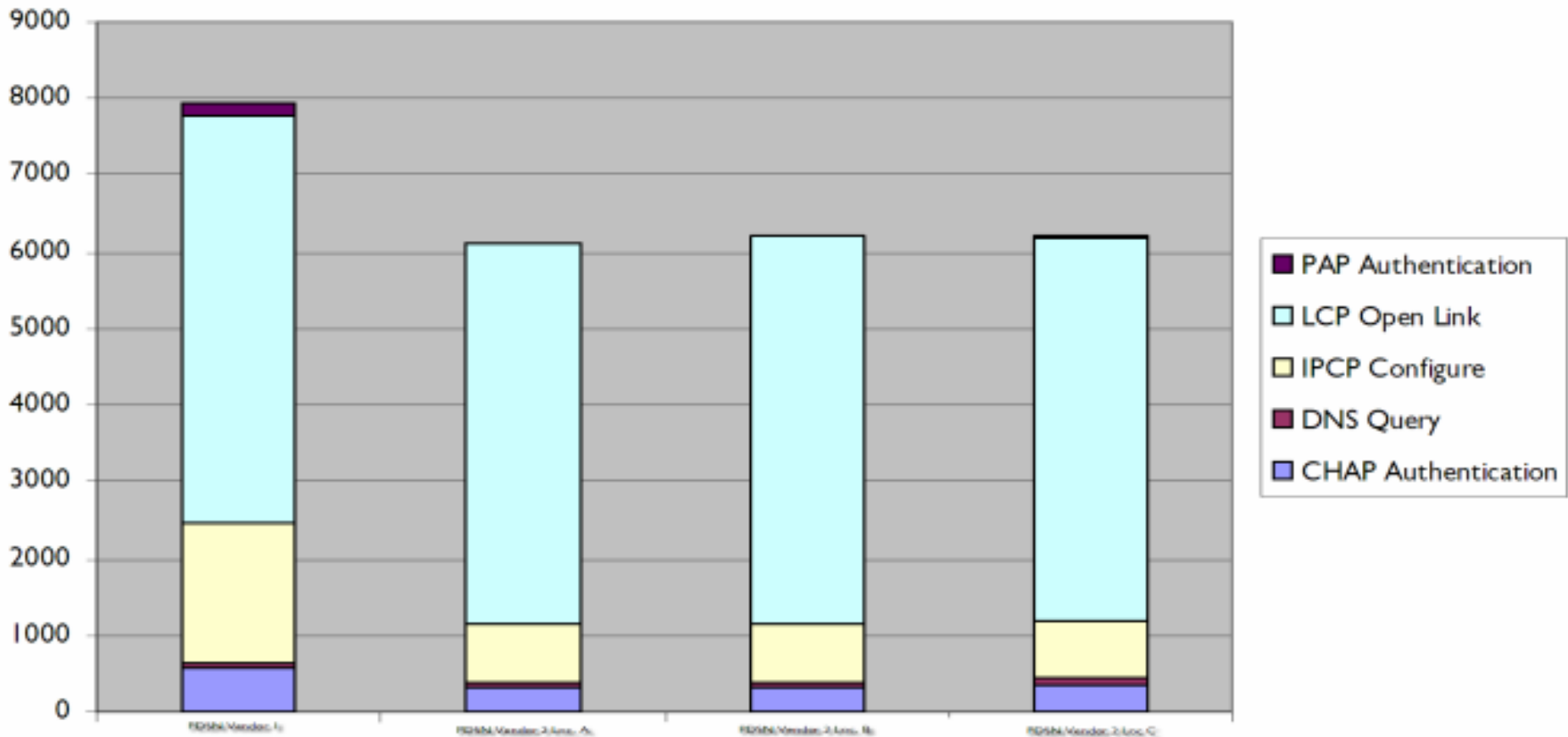
DNS failures - analysis



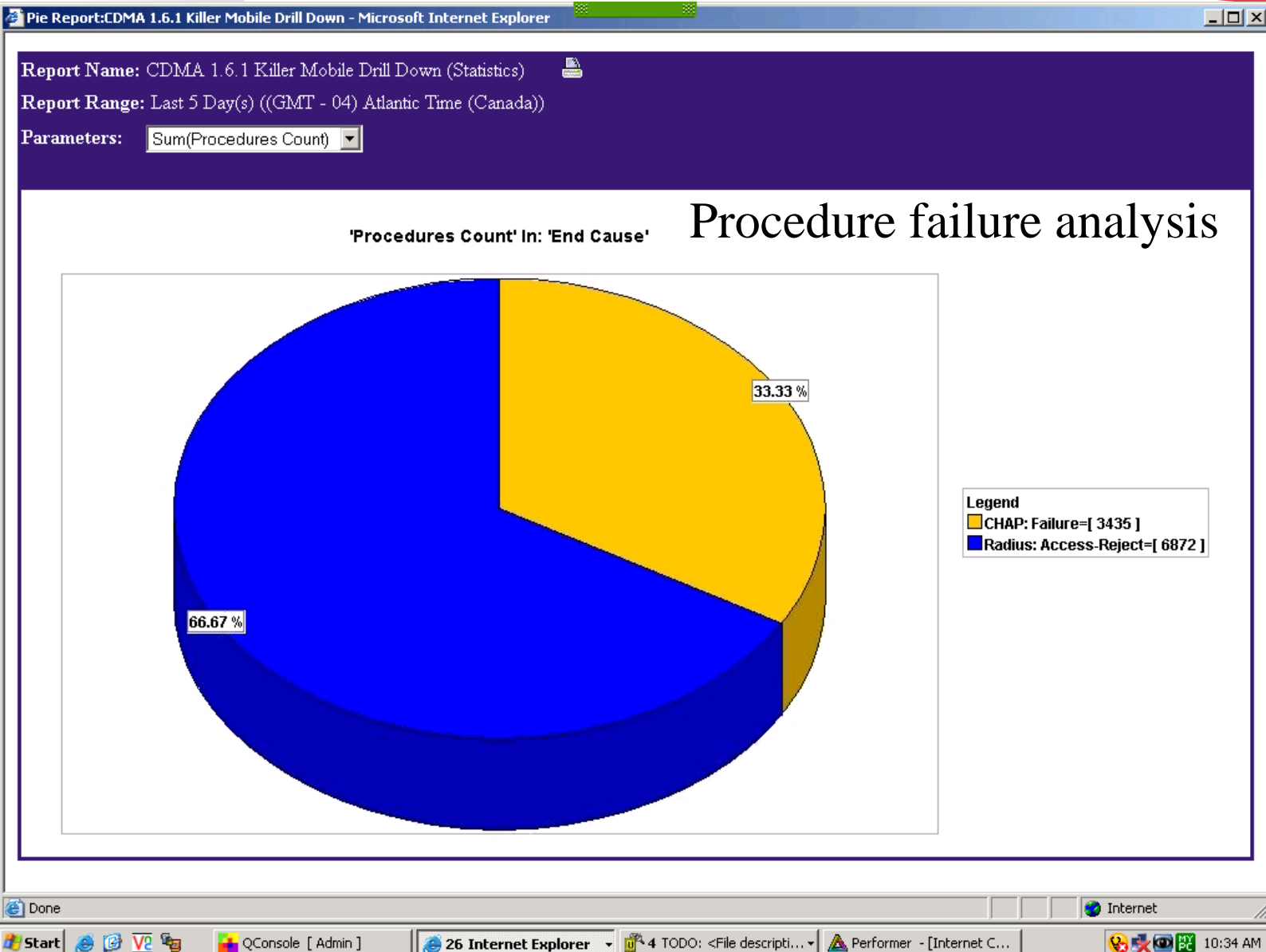
80% of DNS lookup failures. Per PCF

Session setup by PDSN – PPP tunnel setup

Too long IPCP Session setup



Faulty mobile analysis



Latency analysis - trending

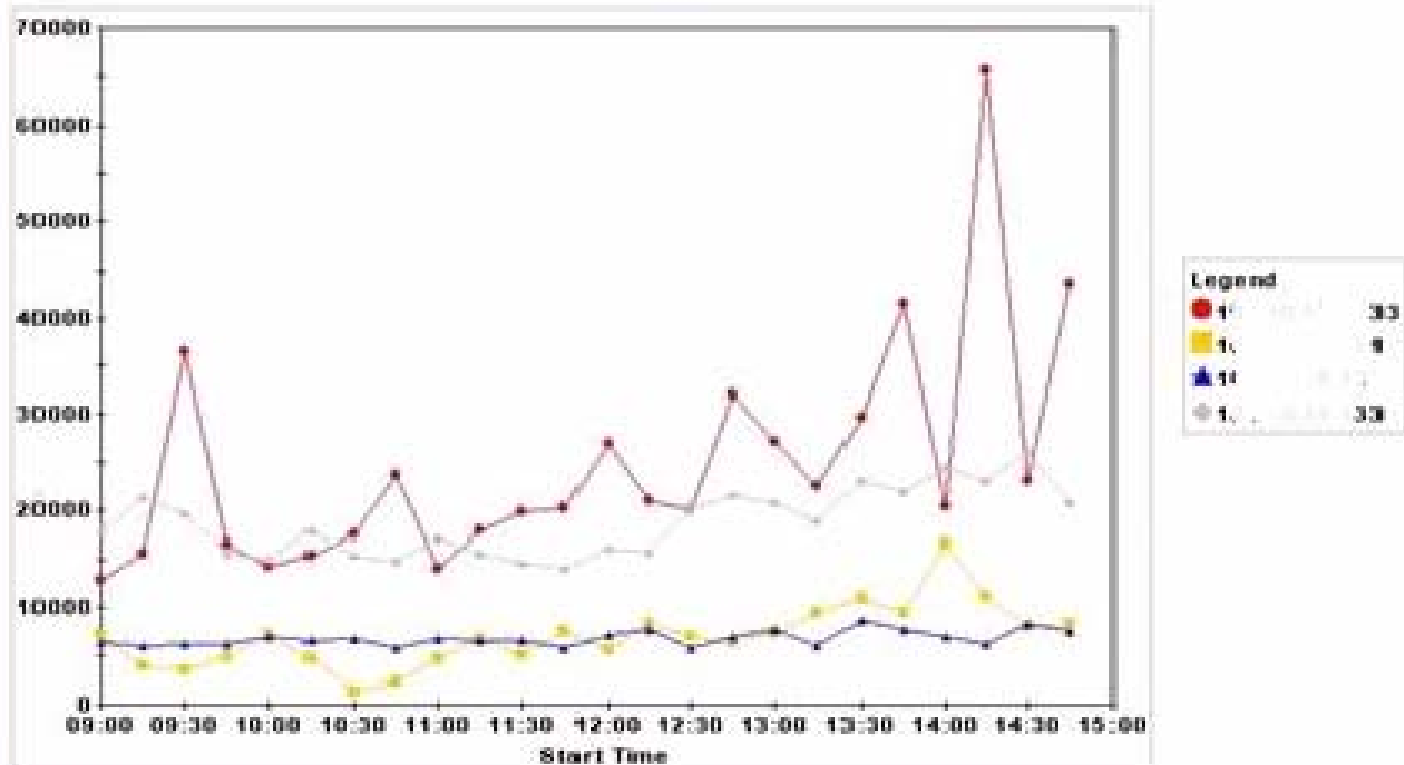
latency trending per relevant PDSNs

Report Name: CDMA 04 Latency - PDSN Timeline (Statistic)
Report Range: 02/08/2005 09:00 - 02/08/2005 14:59 ((GMT) Greenwich Mean Time : Dublin, Lisbon, London)

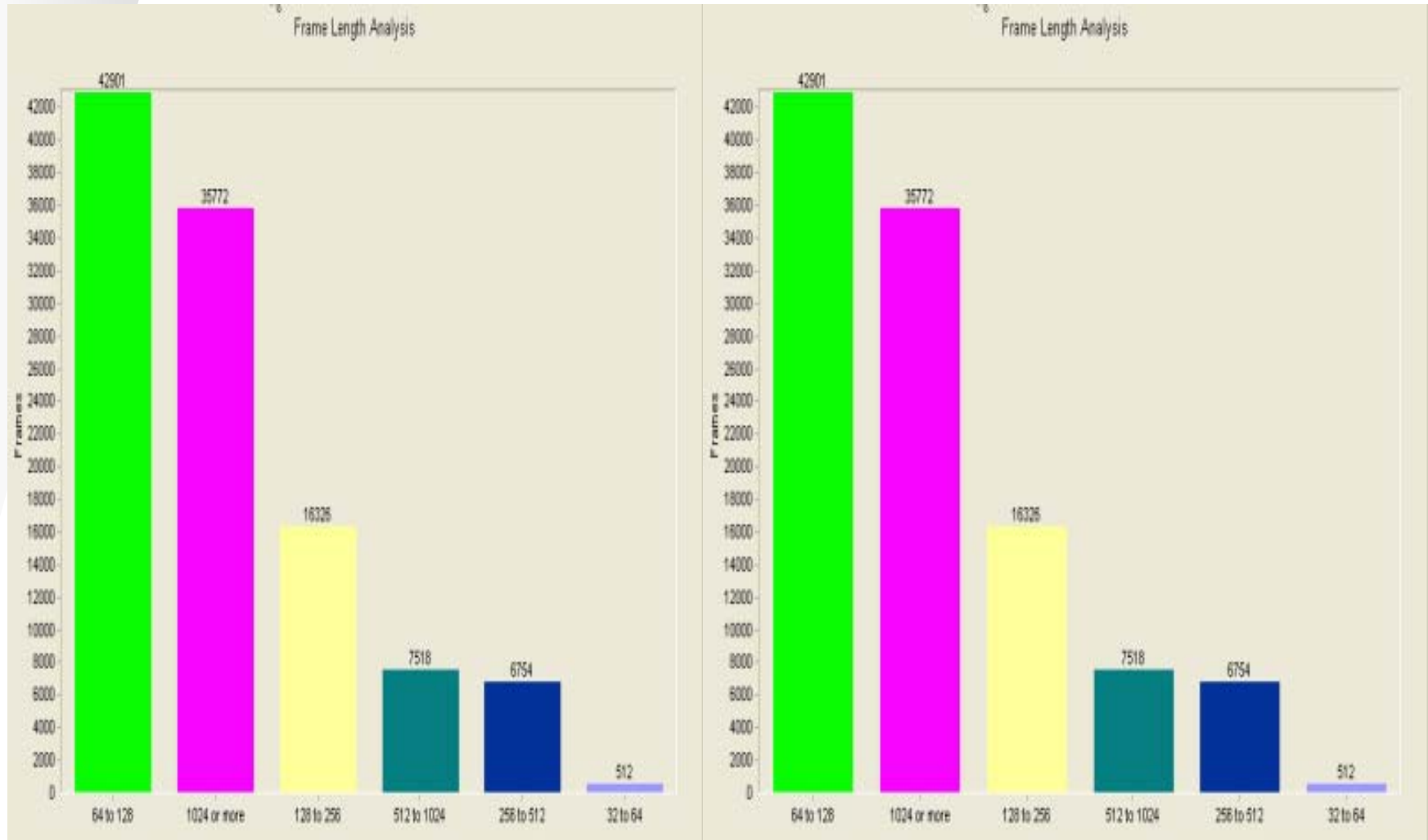
Charts List:

Procedure Duration

'Procedure Duration' vs: 'Start Time' Compare by: 'PDSN IP Address'



Too much IP fragmentation



TEST-OF-THE-ART

- Anomalies are too hard to find.
- Lack of visibility and shortcoming of OSS leaves providers with a huge gap:
- Session analysis in a 1x / EVDO is a must
- Monitoring systems provides significant advantages to their users.