

# Apdex Performance Symposium

## Session 55A – Open Meeting of the Apdex Alliance

CMG International Conference  
Reno, Nevada  
December 7, 2006

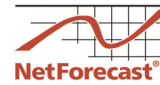


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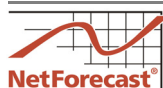
## Apdex Alliance Contributing Members



|  |  |  |  |  |
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## Session 55A – Open Meeting of the Apdex Alliance

### Symposium Schedule

|             | Session |  |
|-------------|---------|--|
| 8:00-9:00   | 50A     | <b>Defining Performance and the Apdex Standard</b> |
| 9:00-9:15   |         | <i>Break</i>                                       |
| 9:15-10:15  | 51A     | <b>Applying Apdex to Your Enterprise</b>           |
| 10:15-10:30 |         | <i>Break</i>                                       |
| 10:30-12:00 | 52A     | <b>Tools to Measure and Improve Performance</b>    |
| 12:00-1:30  |         | <i>Lunch</i>                                       |
| 1:30-2:30   | 53A     | <b>The Apdex Management Process</b>                |
| 2:30-3:00   |         | <i>Break</i>                                       |
| 3:00-4:00   | 54A     | <b>Case Studies Using Apdex</b>                    |
| 4:00-4:15   |         | <i>Break</i>                                       |
| 4:15-5:15   | 55A     | <b>Open Meeting of the Apdex Alliance</b>          |

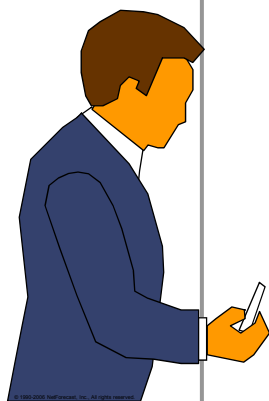
 *Technical Sessions*

 *Speaker Panels*

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### Open Meeting of the Apdex Alliance



**Dwight Barker**  
VP Product Management  
Network Physics

**Scott Haugdahl**  
CTO  
WildPackets

**Chris Loosley**  
Sr. Technology Advisor  
Keynote Systems

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## Agenda

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- **Introductions**
  - Peter Sevcik
- **Governance Transition**
  - Scott Haugdahl
- **The Apdex Exchange**
  - Peter Sevcik
- **New Task Chain Standard**
  - Peter Sevcik
- **Potential Apdex Turns-Based Standard**
  - Dwight Barker
- **New Apdex Voice Working Group**
  - Peter Sevcik & Chris Loosley
- **Suggestions for Next Year from the Attendees**
  - Peter Sevcik

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## Voice Already Has MOS !

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- **Apdex provides a formal methodology for measuring data application performance where none previously existed**
- **Voice already has a number of well established measurement methodologies, including MOS, R-value, and PSQM**
- **Why do we need to create a new measurement approach for voice?**

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## Aggregation of Values

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- Today there is no ‘standard’ way of aggregating measurements for reporting
- Averaging loses outliers, which may be important
  - Example, 500 calls, 450 at MOS 4.2, 50 at MOS 3.0
  - Average MOS for 500 calls = 4.08
  - SLA Threshold of 4.0 indicates all calls were OK
- Max and Min values tell little about infrastructure problems that need to be addressed
- Standard Deviation is not well understood, and is relative to the measurement (i.e. is not a normalized index)

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## Normalization

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- An Index can provide a Normalized answer
- Index provides a single scale (e.g. 0 to 1) for any measurement type
  - Normalize between types (MOS, PSQM, R)
  - Normalize between expectations (cell vs toll vs broadband)
  - Normalize to the specific requirements of each business
- Comparable to data application measure, thus:
- Able to manage combined voice / data applications

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## Apdex Vision

- Create an index that can aggregate data, voice, video, presence and other measurements into a single number to measure the performance of the application
- Make this number comparable to the existing Apdex for data applications
- Allow vendors to provide a dashboard with easy to understand results from a range of measurement techniques for voice applications, data applications and combined applications

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## Existing Metrics Dashboard

| Application | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 |                  |
|-------------|--------|--------|--------|--------|--------|--------|--------|------------------|
| Telephony   | 4.2    | 4.1    | 4.25   | 4.3    | 4.1    | 4.2    | 4.2    | MOS              |
| CRM-Data    | 4      | 3.5    | 4.2    | 4.1    | 3.8    | 3.4    | 3.4    | Task Time (sec)  |
| CRM-Voice   | 3.8    | 3.9    | 4.1    | 4.2    | 4.1    | 4.2    | 4.2    | MOS              |
| Citrix      | 1      | 1.2    | 2.5    | 2.4    | 2.6    | 1.2    | 1.1    | Task Time (sec)  |
| Presence    | 200    | 280    | 270    | 180    | 210    | 180    | 170    | Update Time (ms) |
| Video       | 1.50%  | 1.40%  | 1.30%  | 1.40%  | 2.10%  | 0.40%  | 0.30%  | Packet Loss (%)  |

- Mixed metrics make finding the problems difficult
- Is a bigger number better, or a smaller number?
- Is 1.5% loss bad? Is 4 seconds for CRM good?
- How do I determine next steps?

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### Apdex Vision

| Application | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 |
|-------------|--------|--------|--------|--------|--------|--------|--------|
| Telephony   | 0.92   | 0.93   | 0.95   | 0.96   | 0.96   | 0.95   | 0.97   |
| CRM-Data    | 0.97   | 0.97   | 0.96   | 0.95   | 0.96   | 0.97   | 0.96   |
| CRM-Voice   | 0.89   | 0.88   | 0.97   | 0.97   | 0.97   | 0.96   | 0.97   |
| Citrix      | 0.95   | 0.96   | 0.89   | 0.88   | 0.87   | 0.95   | 0.95   |
| Presence    | 0.95   | 0.96   | 0.97   | 0.96   | 0.94   | 0.95   | 0.95   |
| Video       | 0.89   | 0.85   | 0.89   | 0.84   | 0.83   | 0.92   | 0.92   |

0 = bad  
1 = good

Tune QoS

Deploy ADS  
Technology

- Enterprise IT reports Apdex for business critical applications
- Management determines spending priorities based on value of application performance to the business
- Results demonstrated in Apdex index

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### Voice Service Providers Profiled



#### VoIP Hard Phone Services



#### VoIP Soft Phone Services



#### PacketCable Services



[San Francisco location only]



[New York location only]

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## Ranking Methodology – Audio Quality



The Audio Quality index ranking is based on Keynote extensions of the Apdex standard to represent user satisfaction with audio quality:

- Mean Opinion Score (MOS) [T, F] = [4.0, 3.1]\*\*
- Audio Delay (ms) [T, F] = [150, 400]\*\*\*

$$1000 \times \frac{\text{Satisfied count} + \frac{\text{Tolerating count}}{2}}{\text{Total samples}}$$

Each call is determined to be in the Satisfied, Tolerating, or Frustrated performance ranges for MOS and audio delay, based upon industry standard thresholds.

\* See www.apdex.org

\*\* Thresholds based on Telecommunications Industry Association Technical Services Bulletin 116 "Voice Quality Recommendations for IP Telephony".

\*\*\* Thresholds based on International Telecommunications Unions standard ITU-T G.114 "One-way transmission time".

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## Responsiveness Apdex by VoIP Service Provider



| VoIP Service Provider | Apdex              | Samples   |            |            |       |
|-----------------------|--------------------|-----------|------------|------------|-------|
|                       | Audio Delay (msec) | Satisfied | Tolerating | Frustrated | Total |
| Provider A            | 0.85 [150,400]     | 19510     | 7935       | 26         | 27471 |
| Provider B            | 1.00 [150,400]     | 2923      | 26         | 0          | 2949  |
| Provider C            | 0.84 [150,400]     | 2011      | 950        | 1          | 2962  |
| Provider D            | 0.92 [150,400]     | 4264      | 858        | 2          | 5124  |
| Provider E            | 1.00 [150,400]     | 13187     | 44         | 6          | 13237 |
| Provider F            | 0.68 [150,400]     | 8619      | 14192      | 320        | 23131 |
| Provider G            | 1.00 [150,400]     | 2790      | 5          | 1          | 2796  |
| Provider H            | 0.71 [150,400]     | 11901     | 16451      | 48         | 28400 |
| Provider I            | 0.81 [150,400]     | 17840     | 10393      | 374        | 28607 |

Apdex

Green ≥ 0.85

Yellow > 0.70 - < 0.85

Red ≤ 0.70

$$\text{Apdex [T, F]} = \frac{\text{Satisfied Samples} + \frac{\text{Tolerating Samples}}{2}}{\text{Total Samples}}$$

- The actual Apdex value cells are color-coded based on conditional formatting rules specified below the column.
- The two threshold values are indicated with each Apdex value.
- Sample totals are reported because not all providers have similar number of data points.

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### Provider H Responsiveness Apdex by Call Path



| Provider H<br>Call Path | Apdex<br>Audio Delay (msec) | Samples   |            |            |       |
|-------------------------|-----------------------------|-----------|------------|------------|-------|
|                         |                             | Satisfied | Tolerating | Frustrated | Total |
| CHI - NY                | 0.74 [150,400]              | 1360      | 1369       | 17         | 2746  |
| CHI - SF                | 0.50 [150,400]              | 27        | 2719       | 1          | 2747  |
| DAL - NY                | 0.92 [150,400]              | 2474      | 463        | 0          | 2937  |
| DAL - SF                | 0.56 [150,400]              | 327       | 2606       | 1          | 2934  |
| NYC - NY                | 0.90 [150,400]              | 2214      | 516        | 2          | 2732  |
| NYC - SF                | 0.58 [150,400]              | 457       | 2287       | 0          | 2744  |
| TPA - NY                | 0.88 [150,400]              | 2199      | 662        | 24         | 2885  |
| TPA - SF                | 0.50 [150,400]              | 15        | 2849       | 1          | 2865  |
| SFO - NY                | 0.92 [150,400]              | 2433      | 477        | 2          | 2912  |
| SFO - SF                | 0.57 [150,400]              | 395       | 2503       | 0          | 2898  |

Apdex  
Green  $\geq 0.85$   
Yellow  $> 0.70 - < 0.85$   
Red  $\leq 0.70$

$$\text{Apdex [T, F]} = \frac{\text{Satisfied Samples} + \frac{\text{Tolerating Samples}}{2}}{\text{Total Samples}}$$

- This breaks down the numbers for a single provider by calling route to highlight asymmetries based on (in this case) the destination being called.

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### Clarity Apdex by VoIP Service Provider



| VoIP Service Provider | Apdex<br>MOS    | Samples   |            |            |       |
|-----------------------|-----------------|-----------|------------|------------|-------|
|                       |                 | Satisfied | Tolerating | Frustrated | Total |
| Provider A            | 0.40 [4.0, 3.1] | 359       | 18355      | 5176       | 23890 |
| Provider B            | 0.50 [4.0, 3.1] | 23        | 2898       | 28         | 2949  |
| Provider C            | 0.97 [4.0, 3.1] | 2789      | 173        | 0          | 2962  |
| Provider D            | 0.80 [4.0, 3.1] | 3123      | 1994       | 5          | 5122  |
| Provider E            | 0.55 [4.0, 3.1] | 2030      | 10075      | 778        | 12883 |
| Provider F            | 0.63 [4.0, 3.1] | 6117      | 16484      | 353        | 22954 |
| Provider G            | 0.52 [4.0, 3.1] | 115       | 2669       | 4          | 2788  |
| Provider H            | 0.92 [4.0, 3.1] | 24075     | 4233       | 44         | 28352 |
| Provider I            | 0.90 [4.0, 3.1] | 22908     | 5203       | 95         | 28206 |

Apdex  
Green  $\geq 0.85$   
Yellow  $> 0.70 - < 0.85$   
Red  $\leq 0.70$

$$\text{Apdex [T, F]} = \frac{\text{Satisfied Samples} + \frac{\text{Tolerating Samples}}{2}}{\text{Total Samples}}$$

- For MOS values, higher values are better, so the T will be higher than the F value.

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## Provider H Clarity Apdex by Network Connection



| Provider H         | Apdex                    | Samples   |            |            |       |
|--------------------|--------------------------|-----------|------------|------------|-------|
| Network Connection | MOS                      | Satisfied | Tolerating | Frustrated | Total |
| CHI - Cable        | 0.97 [ 4.0, 3.1 ]        | 2557      | 151        | 4          | 2712  |
| CHI - DSL          | 0.99 [ 4.0, 3.1 ]        | 2700      | 56         | 2          | 2758  |
| DAL - Cable        | 0.95 [ 4.0, 3.1 ]        | 2690      | 263        | 4          | 2957  |
| DAL - DSL          | 0.92 [ 4.0, 3.1 ]        | 2452      | 464        | 1          | 2917  |
| NYC - Cable        | 0.94 [ 4.0, 3.1 ]        | 2465      | 311        | 3          | 2779  |
| NYC - DSL          | 0.93 [ 4.0, 3.1 ]        | 2345      | 355        | 0          | 2700  |
| TPA - Cable        | 0.98 [ 4.0, 3.1 ]        | 2801      | 64         | 23         | 2888  |
| TPA - DSL          | 0.99 [ 4.0, 3.1 ]        | 2753      | 73         | 3          | 2829  |
| SFO - Cable        | <b>0.61 [ 4.0, 3.1 ]</b> | 631       | 2229       | 0          | 2860  |
| SFO - DSL          | 0.95 [ 4.0, 3.1 ]        | 2681      | 267        | 4          | 2952  |

**Apdex**  
Green  $\geq 0.85$   
Yellow  $> 0.70$  -  $< 0.85$   
Red  $\leq 0.70$

Apdex [T, F] =  $\frac{\text{Satisfied Samples} + \frac{\text{Tolerating Samples}}{2}}{\text{Total Samples}}$

- This breaks down the numbers for a single provider by last mile network connection (either cable modem or DSL modem) to identify any problem areas.

# Thank You



Articles and reports on performance measurement, analysis, and management are available for free at [www.netforecast.com](http://www.netforecast.com)

Information about Apdex and joining the Apdex Alliance is at [www.apdex.org](http://www.apdex.org)

