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Keynote Study of Wireless Text Messaging -Results Summary-

What:

Between December 1, 2002 and December 14, 2002 Keynote conducted a study of the performance and availability of inter-carrier Short Message Service (SMS or wireless text messaging). The study included the largest providers of wireless service in the United States including AT&T Wireless, Cingular Wireless, Nextel, Verizon Wireless and T-Mobile. **The study was not able to include Sprint PCS due to Sprint's support for web based messaging service, Sprint Short Mail, rather than SMS.** The goal of the study was to scientifically determine, on average, the 'success rate' for sending wireless text messages between carrier networks.

How:

The Keynote Wireless Perspective Service was used to send text messages from wireless devices in Dallas, New York, and Seattle. Each test measurement consists of a single short message originated from a mobile handset and received by a mobile handset connected to a Keynote Wireless Perspective™ Agent. Messages are originated from the Agent location that is receiving the short message. For example, for handsets located in New York, the short message is originated via the Agent in New York.

Messages are sent from each network to the remaining four networks to measure the inter-carrier performance and from each network to itself to determine the intra-carrier performance. Over 25,000 messages were sent during the two-week study. The text messages were sent *between* carrier networks to assess the number and percent of messages actually received on the other end. If a message was *not* received within 120 seconds it was counted as 'lost.' The average time for sending and receiving inter-carrier text messages is approximately 13 seconds.

Measured performance depends on factors such as geographic location, wireless network coverage, network performance at each measurement location. The performance experienced by an individual user in one of the cities above may be better or worse than our measured average depending on how the user is connected to the wireless network, RF signal strength, and other factors.

Study Results:

Total number of messages sent: 25,966
PERCENT OF MESSAGES LOST: 7.5%
TOTAL NUMBER OF MESSAGES LOST: 2,120
Average availability for all carriers: 92.5 %
Average performance for all carriers: 13.39 seconds

Average Availability Sending Inter-Carrier SMS Messages

(Example: AT&T Wireless sending to all carriers)

- | | |
|----------------------|--------|
| 1. AT&T Wireless | 95.5 % |
| 2. Cingular Wireless | 95.0 % |
| 3. Nextel | 94.3 % |
| 4. Verizon Wireless | 93.0 % |
| 5. T-Mobile | 86.0 % |

Average Availability Receiving Inter-Carrier SMS Messages

(Example: All carriers sending to Verizon Wireless)

- | | |
|----------------------|--------|
| 1. Verizon | 95.0 % |
| 2. AT&T Wireless | 94.8 % |
| 3. Cingular Wireless | 93.8 % |
| 4. T-Mobile | 92.0 % |
| 5. Nextel | 87.4 % |

Average Availability Sending and Receiving Intra-Carrier SMS Messages

(Example: AT&T Wireless to AT&T Wireless)

- | | |
|----------------------|--------|
| 1. AT&T Wireless | 97.8 % |
| 2. Cingular Wireless | 97.3 % |
| 3. Verizon Wireless | 96.6 % |
| 4. Nextel | 89.1 % |
| 5. T-Mobile | 87.0 % |

Implications of Keynote Study of Wireless Text Messages

1. With 7.5% of all SMS messages not transmitted successfully, wireless carriers are losing revenue due to a high percentage of messages not reaching the destination network. Wireless carriers currently generate \$.05 - \$.10 per message transmitted. It is also likely that wireless customers are currently being charged for sending text messages that are never received.
2. As the usage of SMS continues to grow in the US market, the current percentage of lost messages will ultimately lead to poor customer satisfaction and higher churn between wireless networks.
3. The current level of service points to a significant need for end-to-end performance management services to monitor and diagnose problems with wireless text messaging.

Glossary of terms:

Availability:

Availability is calculated as the percentage of measurements that complete without an error and within 120 seconds. Measurements which result in an error or which are not received within 120 seconds reduce the availability percentage.

Performance:

Performance is calculated as the arithmetic mean in seconds of the total time to originate and receive an SMS message. Messages that take longer than 120 seconds to reach the mobile handset are considered an error and not counted towards the average response time.

Inter-carrier Messaging:

Also referred to as inter-operator or inter-network messaging, text messages transmitted between multiple mobile communications networks regardless of technologies involved.

Intra-carrier Messaging:

Text messages transmitted within the same network.