

How Individuals Receive Synchronous and Asynchronous Messages Delivered to Their Mobile Phone: Implications for Delivering Severe Weather Messages

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Statement of Problem

Prevalence of SMS

Cellular networks have approximately 90% penetration rate across the U.S.

Pew Study: 72% of adults now text

SMS is Appropriate For Only Certain Types of Messages

Alerting - gets people's attention

Informing - tells people about a pending event

Warning - tells people what to do

Implication: Any alert system has to STOP people from what they are currently doing, and then GET THEIR ATTENTION before they process the message

Limitations of SMS

Message length (limited text formatted)

- Standard weather feeds are longer than the current 93-120 characters supported by point-to-point SMS networks

"Store and forward": wireless provider doesn't send SMS in real time

Security issues: can't authenticate SMS sender

Not clear from the SMS "From" header (56149) that INWS delivered the SMS

- Could affect perceived credibility of sender

Longer messages may be reassembled, not necessarily in correct order; not all mobile phones can reassemble messages

Current point-to-point network is prone to network congestion

Method

In April 2010, 67 undergraduates (Ps) provided self-reported mobile phone use info such as make/model of their mobile phone, where they typically search for weather warning information, frequency (daily and weekly) of SMS messages that they send/receive, and their current SMS send and receive behaviors

We sent SMS messages at times selected to maximize the likelihood that they would 'build up' in Ps message queue:

- Known times students were in class
- M-F lunch hour
- Cellular network busy times (4-5 p.m. weekdays)
- Weekends

SMS message types:

SMS 1: Trivia ("A mouse can fit through a hole the size of a ballpoint pen. They can also jump 46cm high and travel vertically or upside down.")—no response required

SMS 2: "Do u have immediate access 2 a tv? radio? Internet thru a PC? About how many ppl r with u? Use the TRIP system to answer ex Y. Y. Y. 4"—Ps responded by SMS

SMS 3: Trivia ("Some ribbon worms eat themselves if they cannot find food. This worm can still survive after eating up to 95 percent of its body weight.")—no response required

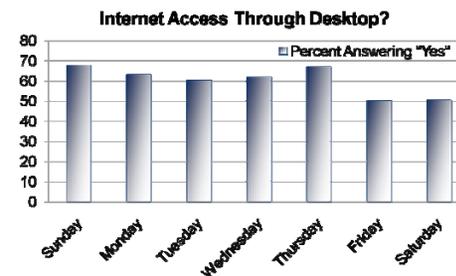
Between April 21, 2010 and Sunday, May 2, 2010, We sent Ps 30 SMS message pairs or single messages

- SMS 1 → then → SMS 2 (9 message pairs)
- SMS 2 → then → SMS 1 (12 message pairs)
- SMS 3 (9 messages)

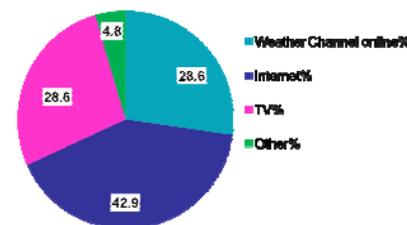
When multiple messages were sent, elapsed time between messages was around 3 minutes

Overview of Results

- 96% of Ps receive alert notification of SMS
 - More Ps use vibration than audible tone alerts
- 93% of Ps can receive MMS messages (though only 59% report they have Internet access on their phone)
- In another study conducted by researchers, median time in message queue is less than 40 seconds
- Therefore, most college students will have immediate notification
- However, they do not always have immediate access to the Internet, especially on weekends



First Source for Severe Thunderstorm/tornado Info?



Looking Forward

Two-Way Emergency Communication

Synchronous communication by video from citizens to emergency management personnel like Next Generation 9-11 (NG911)

- Is this realistic, given network load constraints?

NWS storm report spotter on Twitter: #wxreport: NWS monitors Twitter for these storm reports

4G Standards and the Cell Broadcast System

- 93 character SMS messages, up to 15 screens
- Messages automatically in correct sequence

Mobile Handsets

- 4G enabled
- Common Alerting Protocol (CAP) enabled?
- Better battery life?

Geographically-Targeted Messages

In cars, alerts may be sent through Radio Broadcast Data System (RBDS)

Create messages based on contexts of what people are doing at the time they receive alert

Challenges

Integrated Public Alert and Warning System (IPAWS)

Individuals can opt-out of receiving "Imminent Threat" messages

- Implications for the NWS?

Commercial Mobile Alert System (CMAS) standards do not allow hyperlink in CAP messages

- If NWS message doesn't link user to authoritative source of information (e.g., weather.gov), will unintended consequence be that users overload network by seeking additional info (e.g., browsing websites)?

CMAS unique alerting tone

- As mobile devices get smaller, their ability to vibrate becomes weaker