REPORT ON THE 1ST WIRELESS RURAL AND EMERGENCY COMMUNICATIONS CONFERENCE

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I've just returned from Rome, where I attended WRECOM 2007. I was at the event to present a paper titled "Community-based Hazard Warnings in Rural Sri Lanka: Performance of Alerting and Notification in a Last-Mile Message Relay," authored by Nuwan Waidyanatha (first author), myself, and Peter Anderson from Simon Fraser University.

The paper presents research findings from the HazInfo Project, where we compare a subset of indicators for evaluating system design and performance of the LM-HWS. In particular, it introduces and defines measures for "reliability" and "effectiveness" for assessing the utility of technologies deployed in the last-mile of the HazInfo Project. The measures were applied to data gathered from exercises conducted with the HazInfo System to determine how various combinations of ICTs perform in terms of alerting the ICT Guardians as well as conveying the contents of warning messages.

An important contribution of the paper, and one that I strived to highlight during the presentation, is the concept of "complementary redundancy." Test results using the reliability and effectiveness measures in the study, showed that overall scores for end-user devices varied considerably and highlighted some important concerns for user training and unforeseen implementation issues. For example, addressable satellite radios rated high in terms of reliability but relatively low in terms of effectiveness, as their messaging capability is limited (english only) and because they are nomadic but not mobile, meaning that the units cannot accompany the ICT-G from place to place (thereby reducing the score on the "Active Alerting" index). On the other hand, mobile phones scored high on effectiveness, with capability to display warning messages in three languages and because they are a form of personal media that will usually accompany the ICT-G at all times. However, mobile phones scored less reliably because of signal coverage and battery maintenance issues.

When combined, however, addressable satellite radio and mobile phone technology compensate for eachothers deficiencies and produce a synergy we refer to in the paper as "complementary redundancy." As such, results from the initial field tests and technology assessment suggest that appropriate combinations of wireless technologies will provide the best performance if they exhibit complementary redundancy. These results have a number of implications for emergency planners. First, planners should consider deployment of multiple devices with the aim of achieving complementary redundancy in reliability and effectiveness at the last-mile. Second, planners should adopt the Common Alerting Protocol because of its ability to support the goal of complementary redundancy by providing consistent and complete messaging across multiple devices. Third, that research is needed to further refine the reliability and effectiveness measures into a more robust index for assessing public warning technologies.

The paper presentation was well received and I responded to questions about security provisions in the HazInfo system. I told the audience that security does remain a concern but that significant progress has already been made with provisions included in the HazInfo CAP profile as well as lower layer security measures built into the various ICT gateways, such as the WorldSpace satellite radio access gateway.

WRECOM 2007 was sponsored by the IEEE Communications Society and Italian communications vendor and defense contractor Selex Communications. The aim of the conference (Wireless and Rural Emergency Communications --WRECOM) was to bring together research on various facets of wireless

broadband communications for emergencies and disasters, particularly in rural settings where infrastructure may be limited or non-existent. To that end, various sessions covered wireless mesh networks, WIMAX and TETRA technologies, satellite services, as well as operational experiences with emergencies and public safety networks. Being an IEEE conference, most sessions were technical at an engineering level and addressed specialized topics such as routing protocols, transmission control, and technical performance analysis. Unfortunately many of the detailed issues were lost on me (not being an engineer) but I did notice that several important research papers (e.g., mesh networking in rural areas) presented findings with no mention of the potential application to emergency management!

Despite these drawbacks, I did manage to come away with a few general observations for HazInfo Project. Namely, that mesh networking is not as easy as one might be led to believe in the popular literature. A study led by Nicholas Race from Lancaster University, for instance, has followed the deployment of a mesh network in a small UK village for the past three years, with findings that suggest governance issues are significant. However, the project also noted that user interest and participation in the upkeep and active development of the network was enhanced in a mesh architecture setting. For the HazInfo project, these findings may shed some light on the challenge of long-term sustainability of the system and for building local technical know-how and local capabilities to further integrate the network into everyday activities beyond hazard warning.

Roberto Saracco from Telecom Italia spoke about several paradigms that might be applied to emergency communications services, such as load sharing, broadcasting, peer to peer, and bit/video torrents. He then went on to explain that the "layered" or "mashed" paradigm is growing in importance, with the likes of Google Maps and so forth. Linking all these paradigms is a tension that emergency planners and policymakers must content with; namely, the choice between piggybacking on commercial networks and the deployment of dedicated infrastructure and services. Of course, the problem with the former is concerns about guaranteed quality of service during critical situations. The concern about the latter is cost and under-utilization. Somewhere in between--and perhaps this is where layered/mashed systems come into play--is a balance between dedicated, specialized services and cost effectiveness.

The US and other countries are now dealing with these economics of emergency communications in terms of the next generation of first responder radio systems. In terms of public warning, HazInfo Project has been innovative in terms of rethinking the model. By choosing to implement an open source like Common Alerting Protocol and by working closely with industry stakeholders to connect communities using everyday technologies, the project has in effect created a layered system that can in future expand in functionality and scope through mash-up applications with, for example, Google Earth for map sharing, as well as other applications as the need becomes evident. The ongoing challenge is to take this to the next level through a sustained research project that builds on the current achievement.

More detail about the conference is available at http://www.wrecom.org