

A Wireless Mesh Infrastructure Deployment with Application to Emergency Scenarios

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Abstract: Establishing and accessing a reliable communication infrastructure at a crisis site is a challenging research problem. When a large scale disaster strikes, first responders are sent to the site immediately. Failure of communication infrastructure and information exchange impedes the early response efforts, potentially resulting in loss of life and economic impact.

A communication infrastructure within the context of emergency applications must be reliable, robust, and interoperable in a heterogeneous environment with minimum interdependencies. At a disaster site, there may not be existing communication infrastructure available. A mesh network can be deployed quickly to provide an infrastructure for local communication. If there is any communication technology available, the mesh network deployed at the disaster site can communicate to the outside world through the available infrastructure. We are extending the network study to integrate the concept of human communication into the communication technology with the objective of bridging the gap between real-life scenario and technology. We study the way human communication affects the chain of command in an emergency response including the interactions among different organizations.

Emergency Communication Challenges

- Unpredictable, mobility, reliability, delay in decision making or resource allocation
- Rapidly changing load
- Different network QoS requirements (various traffic types)
- Interoperability among different communication devices
- Robustness
- Dynamic adaptive reconfiguration

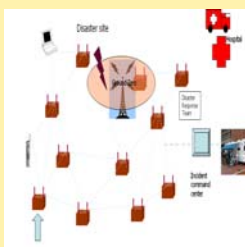


Management Objectives:

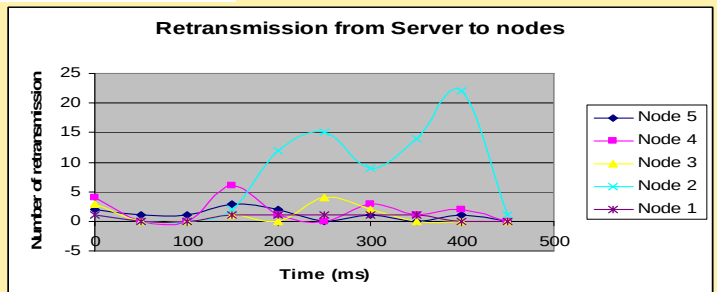
- Effective communication, information management, and proper information sharing
- Understand agencies' policies and directions
- Establish incident objectives
- Ensure every one has a supervisor
- The number of people who can be managed efficiently with one manager (span of control)
- Must have communication between resources and leaders, and from leaders to the next supervisor
- Explain how resource status is changed, how notification of changes is made and how status is maintained at an incident

Case Studies:

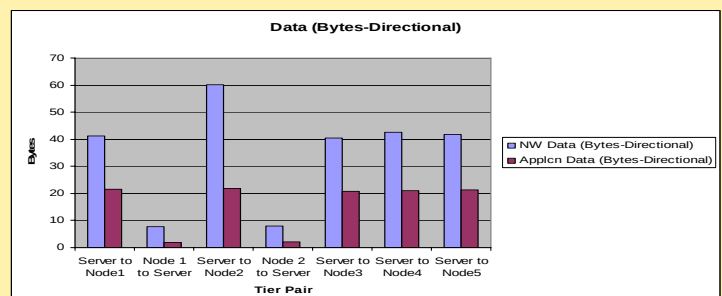
- Several drills, live deployments with area first responders at UCSD campus, city, county and regional level: Chula Vista (multi-incident drill), downtown San Diego at Mardi Gras, Del Mar, etc.
- Capture network traffic
- Investigate the flow of information
- Network performance evaluation based on the measurements taken over the test bed to enhance the response by deploying a wireless mesh network infrastructure in an emergency application



- Manage information by objective
- Identify responsibilities of local command center
- Specify how supervisory system can contribute to improve local control system performance
- Specify interactions between local controllers and supervisory



Total number of Retransmissions from server to the mesh nodes



Application and Network Data from server to the mesh nodes (Bytes-Directional)