

Lifeline Support of the Internet

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SAINT2003 Workshop January 28, 2003

Outline

- Lifeline Support of the Internet
- Problems and Requirements
- Framework of our Model
- Summary

Lifeline support of the Internet

Lifeline support of the Internet means:

- Communication when serious disaster events such as earthquakes, hurricanes, terrorist attacks...
- Communication for social lifeline services such as police, ambulance, gas, electricity, water...

We focus on the latter “lifeline communication”

To support it on the Internet:

- same function as various traditional media
- advanced multimedia environment
 - for more convenient service when emergency
 - for handicapped person etc.

Classification of lifeline communication

- Lifeline communication can be roughly classified into three types
 - from citizen to lifeline service agency (ex. emergency call)
 - from lifeline service agency to citizen (ex. emergency announce)
 - among the members of lifeline service agency (emergency and/or important communication)
- We mainly target the first type here.

Internet topology and lifeline service

How does a user contact to each lifeline service?

- Jurisdiction range and contact: (in Japan)
 - police -- each prefecture
 - fire -- each city or county
 - water -- each city, town or village
- Contact addresses differ:
 - for each lifeline service
 - corresponding to user's geographic location
- Jurisdiction ranges differ from Internet topology
 - Internet topology and routing solve nothing
- Mobile users want to use lifeline service without being conscious of the geo location

Identification in lifeline communication

- Why is identification needed?
 - prevent spoofing
 - deter nuisance call
 - immediate service for emergency
 - call back
 - communication among agency members
- What is needed as identification information?
 - geographic location
(ex. to go there for emergency help)
 - Internet location
(ex. to call back to fixed device)
 - user address
(ex. to call back to mobile user)

QoS for lifeline communication

To guarantee QoS for lifeline traffic, the network must have the following functions:

- Requirement to minimize packet loss, jitter and delay by traffic control (ex. Diffserv PHB)
- Establishing a communication path to guarantee QoS with policy server, CR-LDP, RSVP
- Monitoring communication paths using SNMP server, policy server, etc.
- Filtering packets to protect lifeline communication against DoS attacks

Requirements for geographic location

- User may move with terminal device
(at home, during commutation, in company etc.)



Structure to get user's own geographic location

- Contact address of each lifeline service depends on user's geographic location



Structure to get appropriate contact address

- Service agency need to get user's geo location
(to rush to there, to deter naughtiness etc.)



Structure to notify user's geographic location

Requirements for identification

- Type of identification
 - user
 - Internet location
 - geographic location
- The needed type is variable according to the situation
- The domain used to identify user depends on the target
(People belong to some domains)
- In emergency communication
 - identification info must be sent automatically
 - incomplete identification should be accepted
→ dilemma -- nuisance call vs. emergency call

Requirements for QoS

- new IX model for exchanging lifeline traffic
- Routing control based on path usage between ISPs
 - ISPs must have some SLA with each other when exchanging packets
 - Lifeline enabled networks have some unified model for exchanging IP packets
- new QoS model (ex. Diffserv PHB) for lifeline traffic

Framework of our model

- Our focus for lifeline support of the Internet:
 - middleware technology used as the base for various lifeline communication
 - network technology for securing the quality of lifeline communication
- We propose the following two:
 - communication session management framework
 - network path management framework

Model of lifeline communication session

- Get the geographic location from local server
- Get target address using geographic location
(when target depends on geographic location)
- Select home domain depending on target
- Register the Internet location to home server
(Be recognized as a member of the domain)
- Lifeline traffic class is applied when
 - lifeline service agency
 - authorized member of lifeline service agency
- Establish lifeline communication path
- Send identification information to target
(geographic location, user id, etc.)

Model of network management framework

- Carrying and exchanging packets using MPLS LSP for lifeline traffic
- Advantage of MPLS model in QoS control
 - policy routing
 - Changing routing paths according to traffic class
 - easier bandwidth management than Diffserv
 - Mapping each traffic class into different path
- Lifeline IP network can control the QoS based on the traffic class

Future works

The following will be subjects of future research.

- Adaptability of multicast and xcast to support announce-type applications.
- Group membership management technology.
- Lifeline support function on intranet and home network.
- Bandwidth control technology applied to the access network of ISPs.

Summary

- We defined the lifeline support of the Internet, which functions are required and why those functions are required.
- We discussed the technology required to realize each function.
- We proposed the following lifeline framework,
 - the middleware technology used as the base for lifeline communication
 - the network technology for securing the quality of lifeline communication.