Lifeline Communication System in the Internet

Takahiro KIKUCHI*1, Masaaki NORO*1,
Katsuyuki YAMAZAKI*1*2, Hideki SUNAHARA*1*3,
Shinji SHIMOJO*1*4

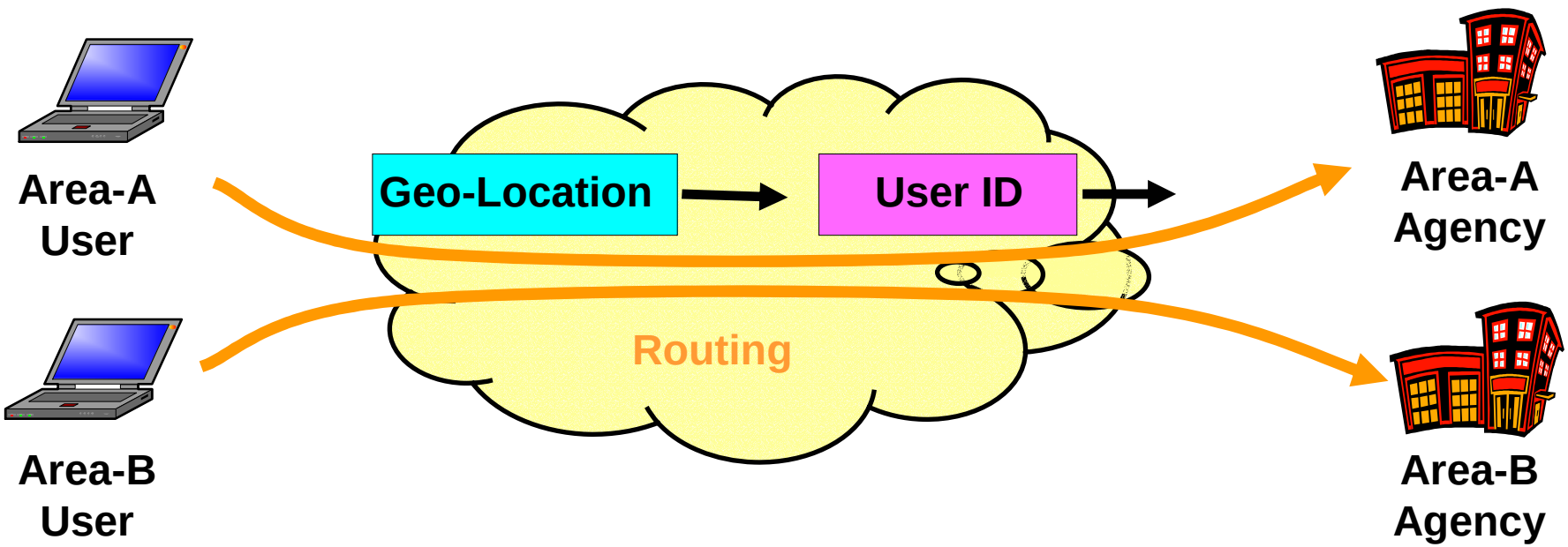
*1 TAO Nara IP Lifeline Research Center
*2 KDDI R&D Laboratories
*3 Nara Institute of Science and Technology
*4 Osaka University

Introduction

- What is the lifeline support of the Internet?
  - Lifeline communication for social lifeline services such as police, ambulance, gas, electricity, water...
- Why is the lifeline support of the Internet needed?
  - same function as various traditional media
  - advanced multimedia environment
    - for more convenient service when emergency
    - for handicapped person etc.

Requirements for Lifeline Communication

- Routing to a nearby suitable lifeline service agency
- Notification of user identification
- Notification of geographic location information



Classification of access method of Lifeline Communication

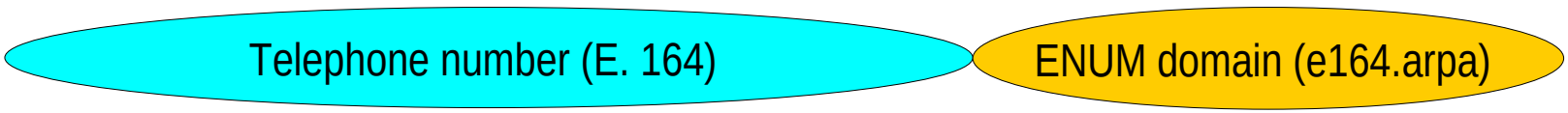
- Special telephone number
  - ex. Police (No.110), fire fighting (No.119), etc. [In Japan]
  - It connects to the different target depending on the location
    - ENUM does not support special numbers
- Ordinary telephone number
  - Lifeline service such as gas, electricity, and water service etc.
  - User must memorize the telephone number for each service
- New Internet service for lifeline communication
  - Mail, Web, and Video communication service etc.
  - User must memorize the various Internet addresses

Routing Requirements for Lifeline Communication

- The feature of lifeline communication
  - Real target varies depending on the user's geo-location.
    - Need to get the user’s geo-location
  - Each lifeline service has a different area of jurisdiction
    - A local conversion table is required for each lifeline service
  - Various Internet addresses and telephone numbers except for a special number
    - The simple access method is desirable
  - Need to support various communication services on the Internet
- Mapping model
  - If a geo-location and a lifeline service are provided, then a list of Internet address available is gotten.

ENUM based on Geographic Location

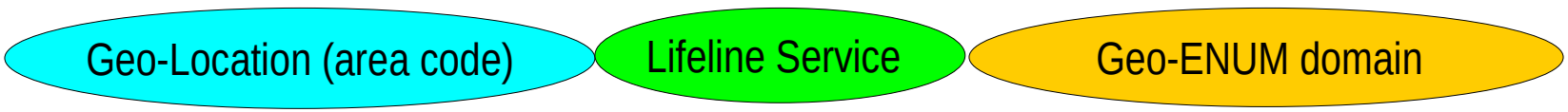
ENUM



Example: +81-743-79-5026 (E.164 telephone number)

6.2.0.5.9.7.3.4.7.1.8.e164.arpa

ENUM based on Geographic Location (proposal)



Example: 631-0101 (ex. postal code) and Police service

1.0.1.0.0.3.6.police.emergency.demo

As a result of the query of the NAPTR RR of this domain name to the DNS
The following list of URL is obtained:

sip:request@nara-police.demo
mailto:request@nara-police.demo
http://www.nara-police.demo/

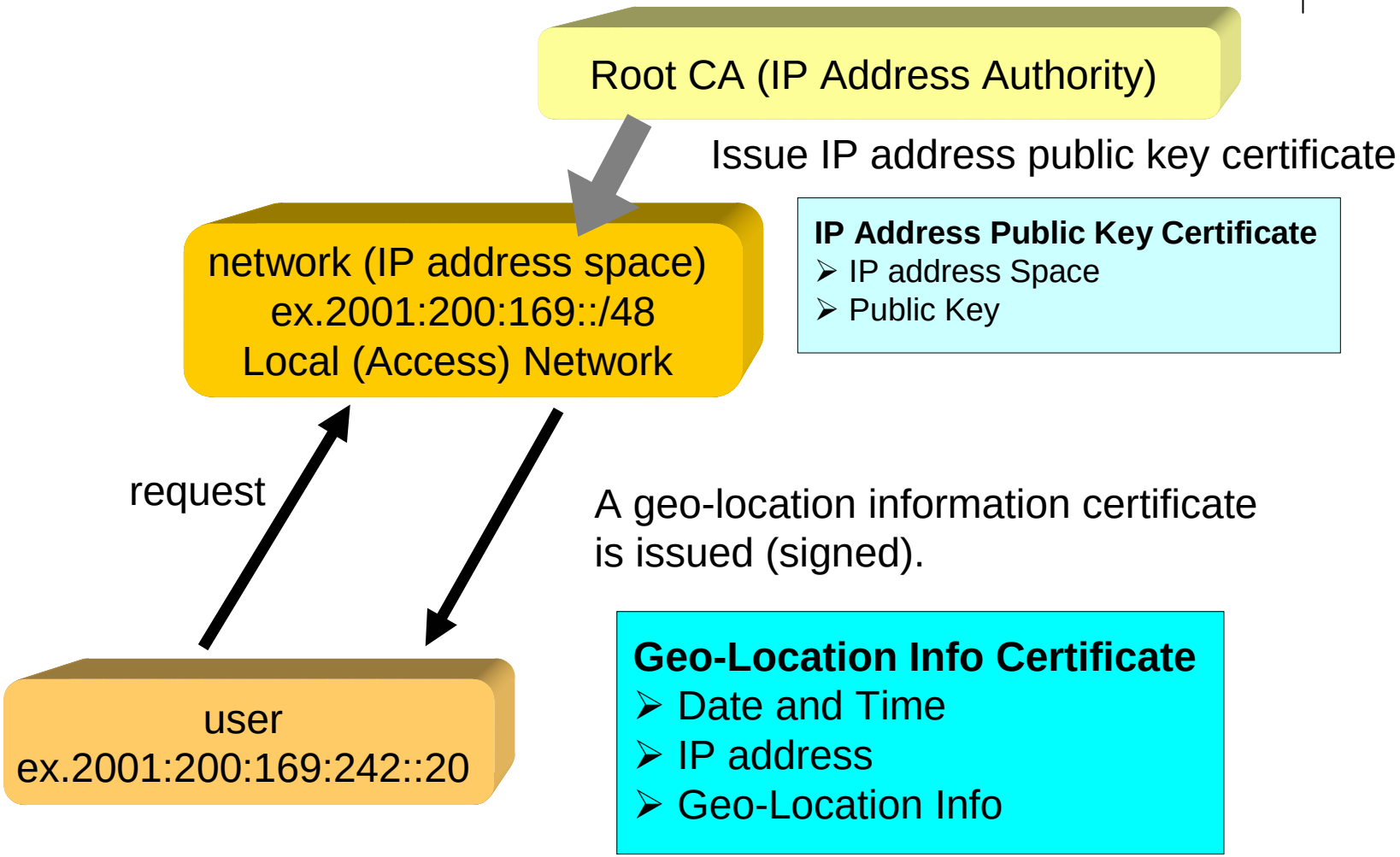
Geographic Location Information

- Problem
  - GPS provides an accurate geographic location information
    - However, there are many situations that GPS cannot be used
    - When the user notifies the GPS information to the service agency, the agency cannot judge whether the information is valid or not.
  - There is no framework to notify a geo-location information.
- Requirements
  - The framework to get a geo-location information on the Internet, with be independent of GPS.
  - The framework to notify a geo-location information with preventing spoofing.

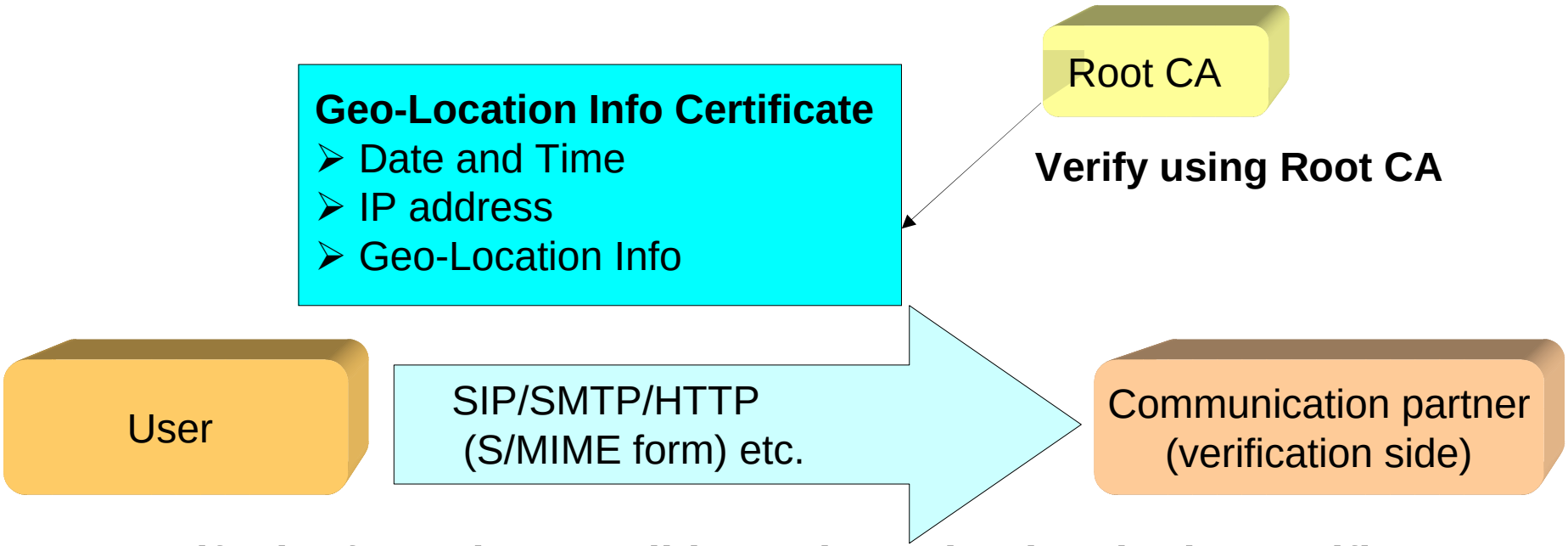
The model which guarantees Geographic Location Information

- The local access network for the user can guarantee the following, without being dependent on the user.
  - In a certain time,
  - the host with a certain IP address exists
  - whthin a certain physical area.
- Geographic Location Information Certificate is the following combination information signed by the network
  - Date and Time
  - IP address
  - Geographic Location Information

Issue of Geographic Location Information Certificate



Verification of Geo-Location Information Certificate



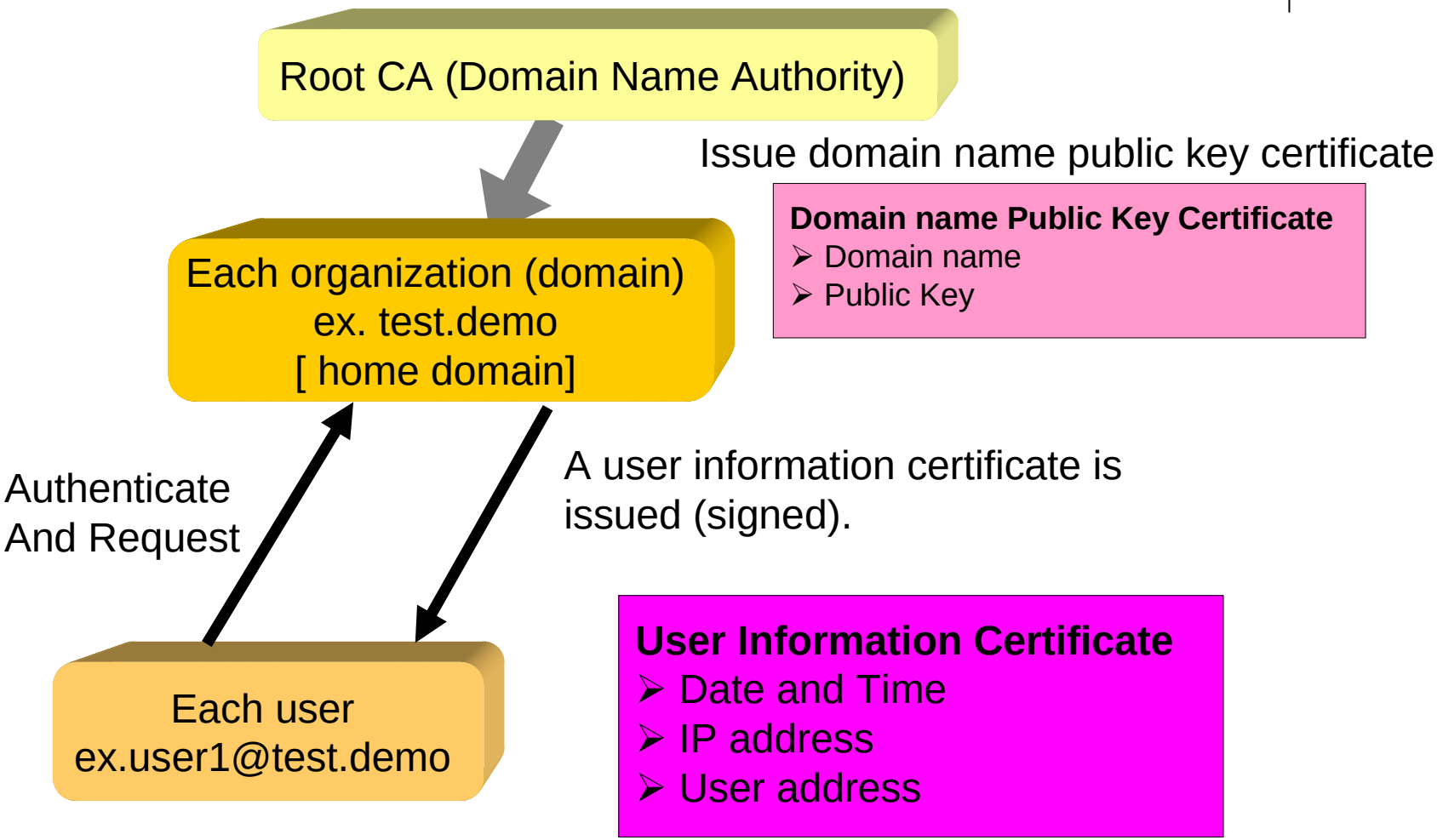
Verify the following conditions about the data in the certificate.

- ✓ Date and Time ≧ Start Time of communication between both
- ✓ IP address = User's IP address
- ✓ IP address ⊂ Signer's IP address space

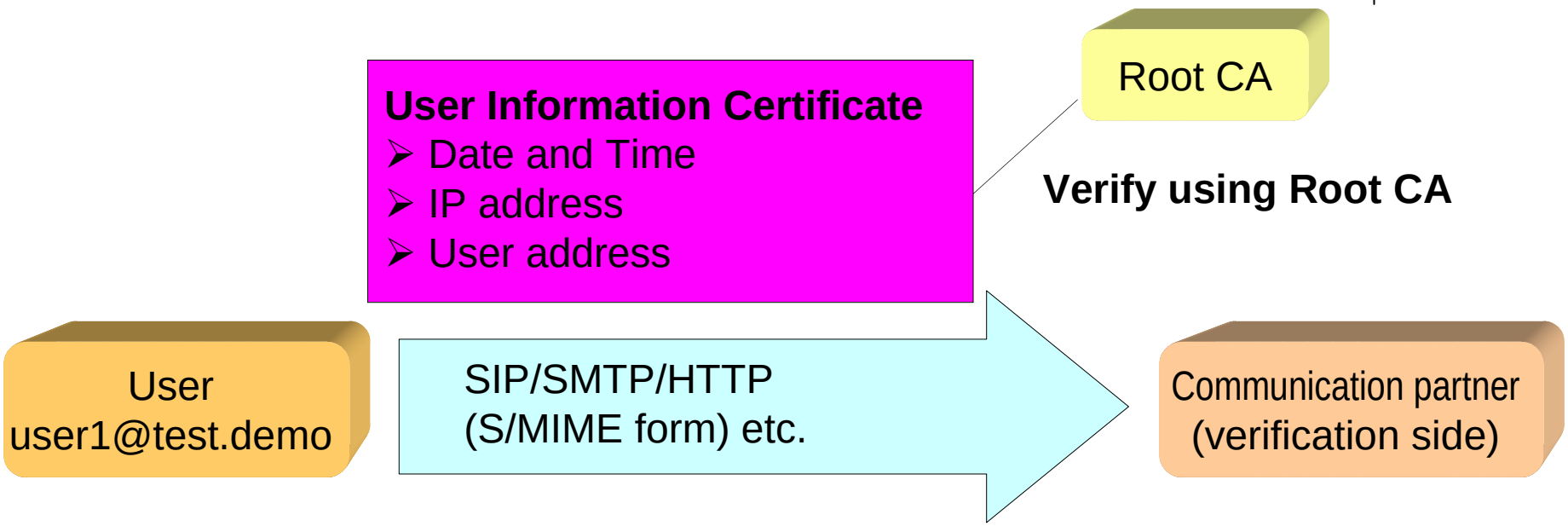
The model which guarantees User Information

- The home domain for the user can guarantee the following, after authenticating the user
  - In a certain time.
  - the host with a certain IP address is
  - used by a certain user
- User Information Certificate is the following combination information signed by the domain
  - Date and Time
  - IP address
  - User address

Issue of a User Information Certificate



Verification of User Information Certificate



Verify the following conditions about the data in the certificate.

- ✓ Date and Time ≧ Start Time of communication between both
- ✓ IP address = User's IP address
- ✓ User address = User's User address
- ✓ User address ⊂ Signer's Domain name (Domain part)

Evaluation

- Requirements
  - Proposed system satisfy the requirements about routing and user/geo-location information
- Scalability
  - It is possible to verify a certificate locally
  - The hierarchical structure of domain name and IP address space are available
- Privacy and Security
  - Geographic location information and user information can be treated independently
  - There is no problem of an access control because of using certificates

Summary

- We propose Lifeline Communication system including the following architecture models
  - ENUM based on Geographic Location
  - Geographic Location Information Certificate
  - User Information Certificate
- Future Work
  - Apply these models to mobile IP environment