NTMobile: a new end-to-end communication architecture in IPv4 and IPv6 networks

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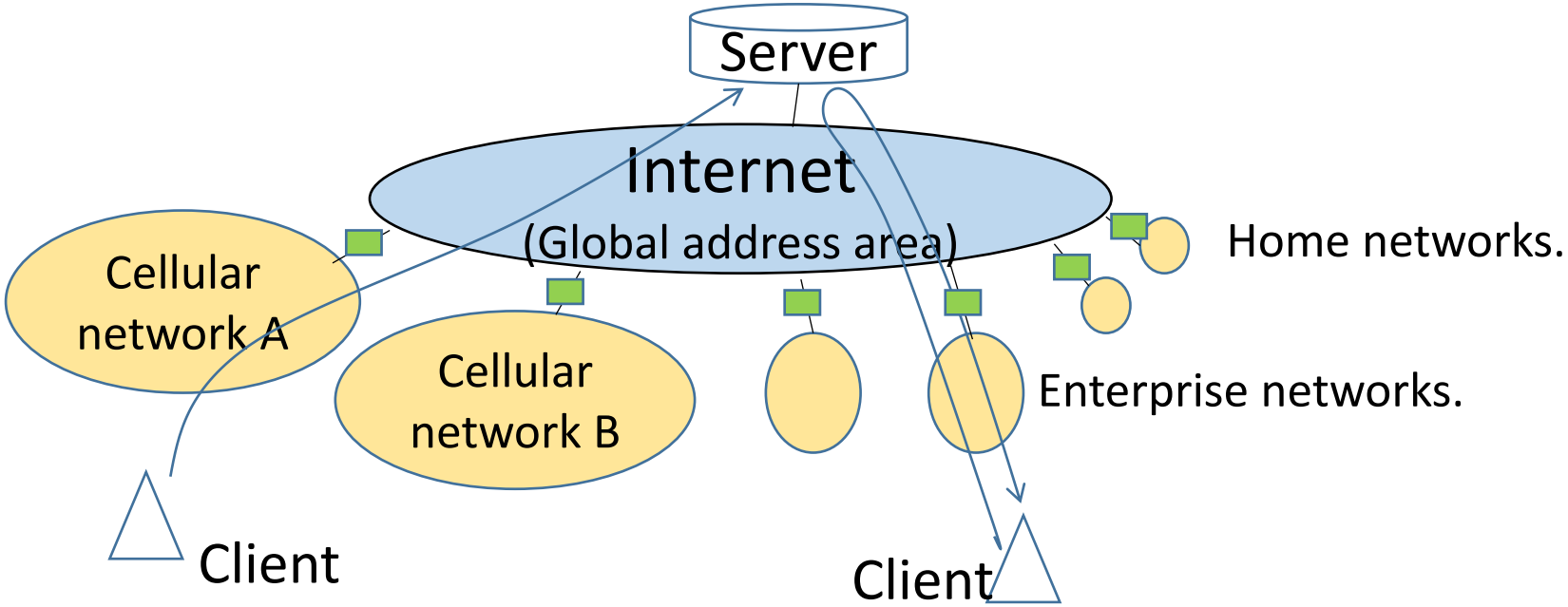
Background

Complex networks and restrictions
Big issues are:
- NAT traversal problem
- IPv4/IPv6 incompatibility
- Mobility

Purpose of the research
- Full connectivity
- Full mobility
- Optimal route communication
- Making a flat network
  → Finally, end-to-end communication

Most systems are made of client/server type.



Private addresses are in everywhere.

NAT is needed for connecting to the Internet.

Reason: NAT traversal problem

You can not start the communication from a global address area to private address area.

Other big Issues

IPv4/IPv6 incompatibility

IPv4 addresses are now exhausting.
Using IPv6 addresses are inevitable.
IPv4 and IPv6 have different formats.

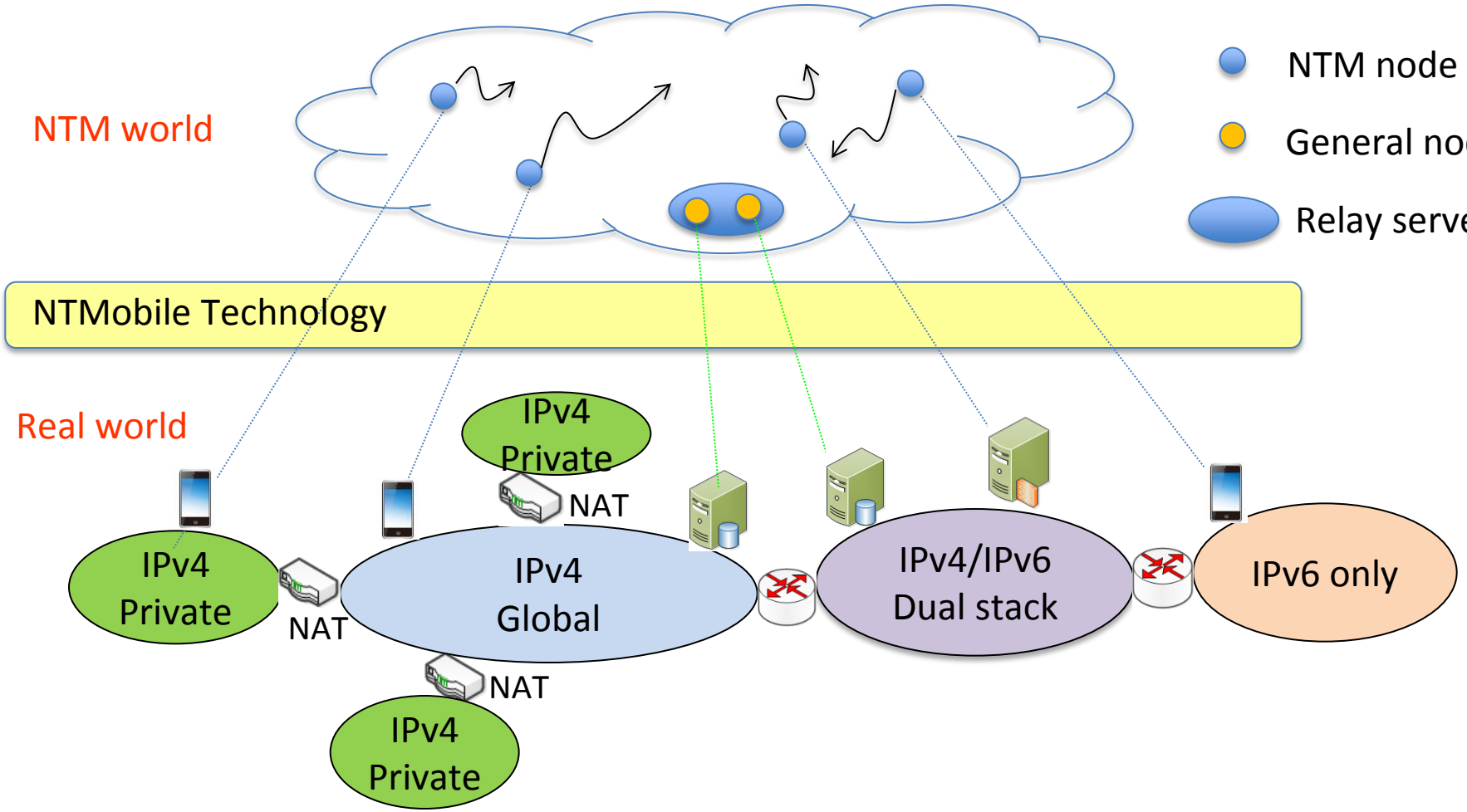
Mobility

Mobile telephone networks are tend to overflowing.
You may want to use wi-fi instead of mobile telephone networks.
IP addresses change if the accessing network changes.
IP addresses are used for the connection ID.
It is quit difficult to realize mobility in IPv4 because of NAT.

Concept of NTMobile

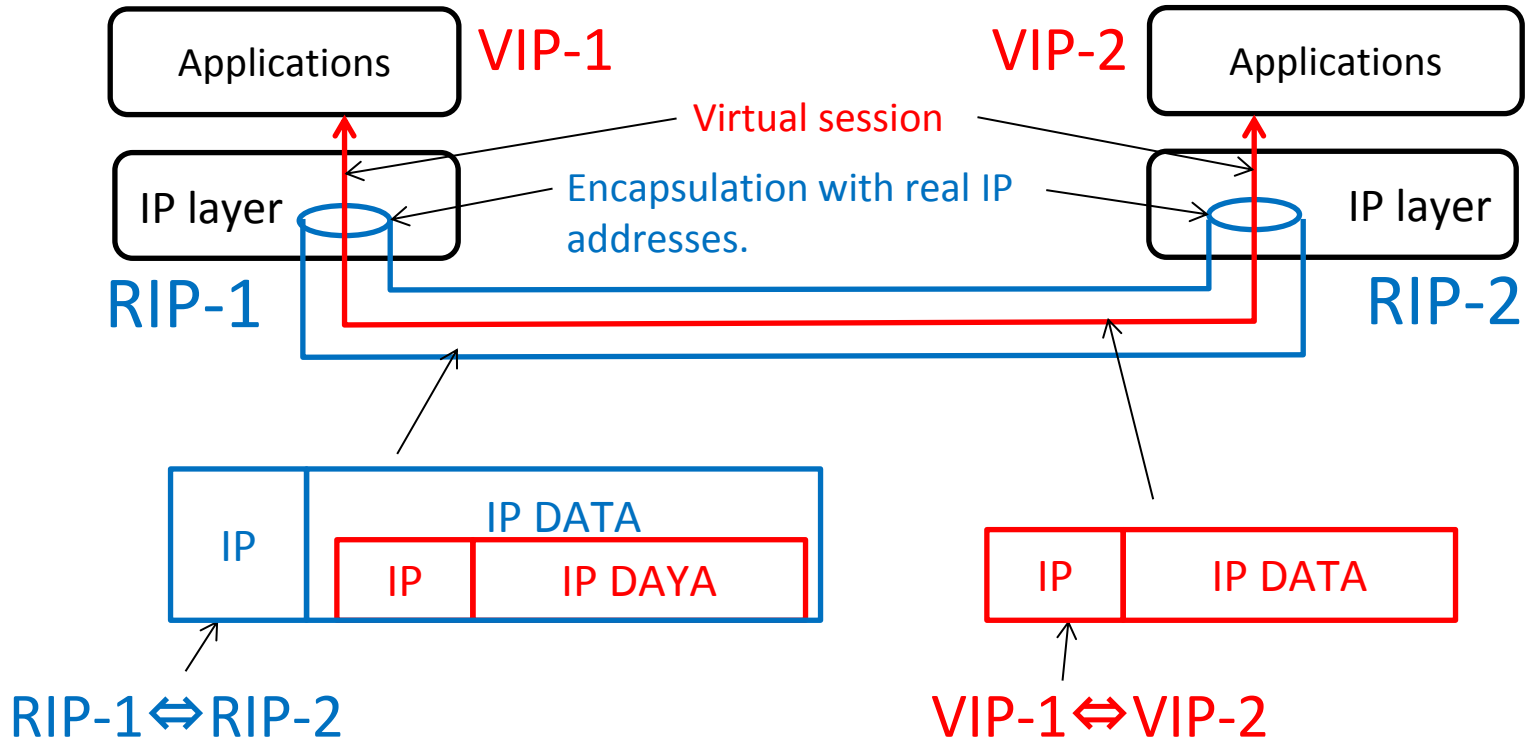
NTMobile technology makes a flat network.

Free communication, and mobility in IPv4 and IPv6 networks.



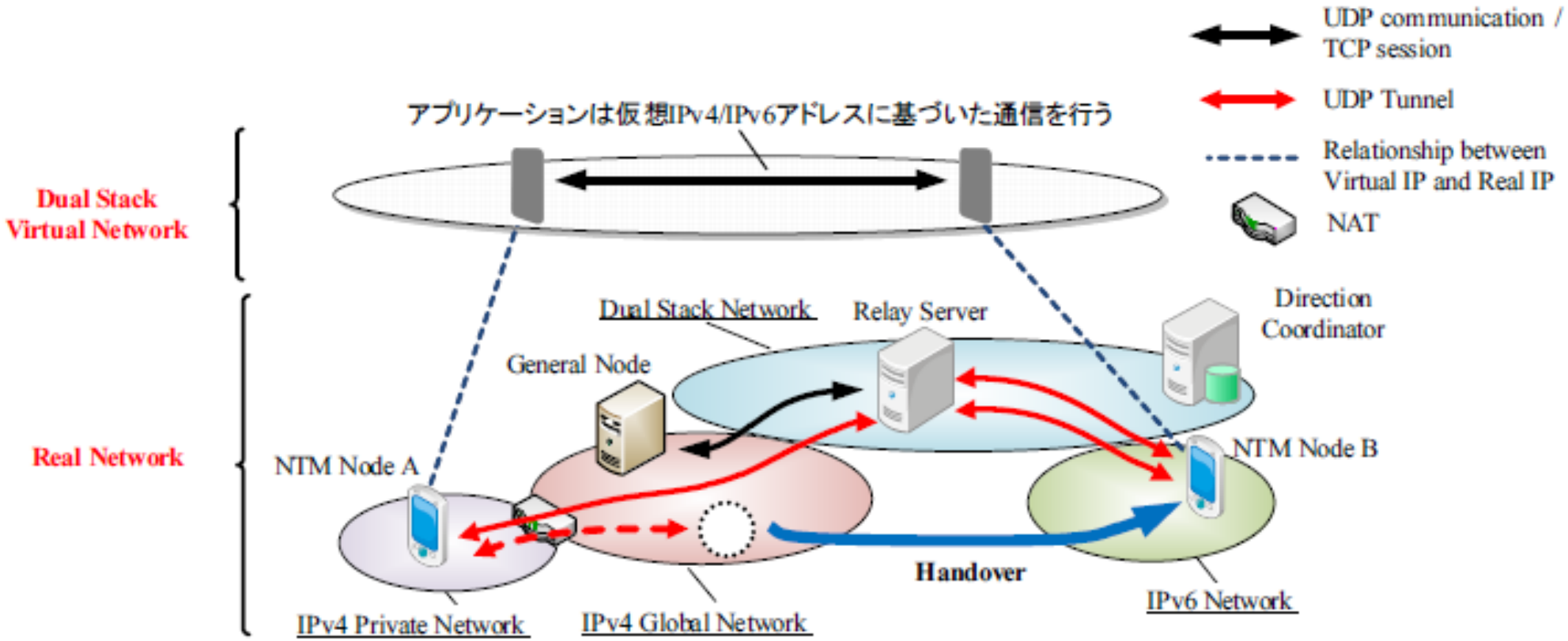
Principle of NTMobile

Virtual IP addresses are distributed from the Direction Coordinator.
Applications make a session with virtual IP addresses.
All communication packets are encapsulated with real IP addresses.

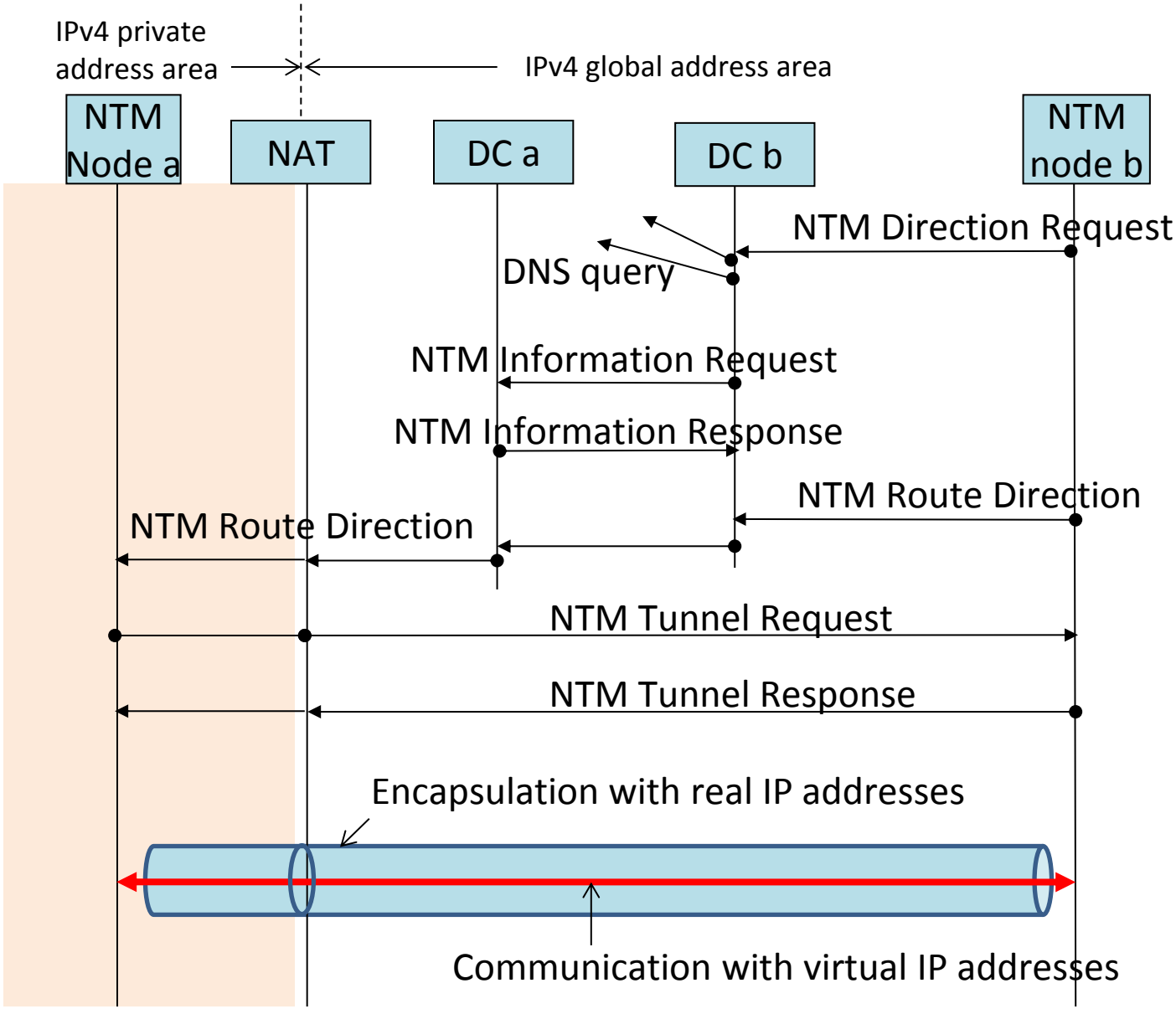


Real IP addresses change if NAT exists on the communication route.
Real IP addresses change if the access network changes.
Virtual IP addresses never change.

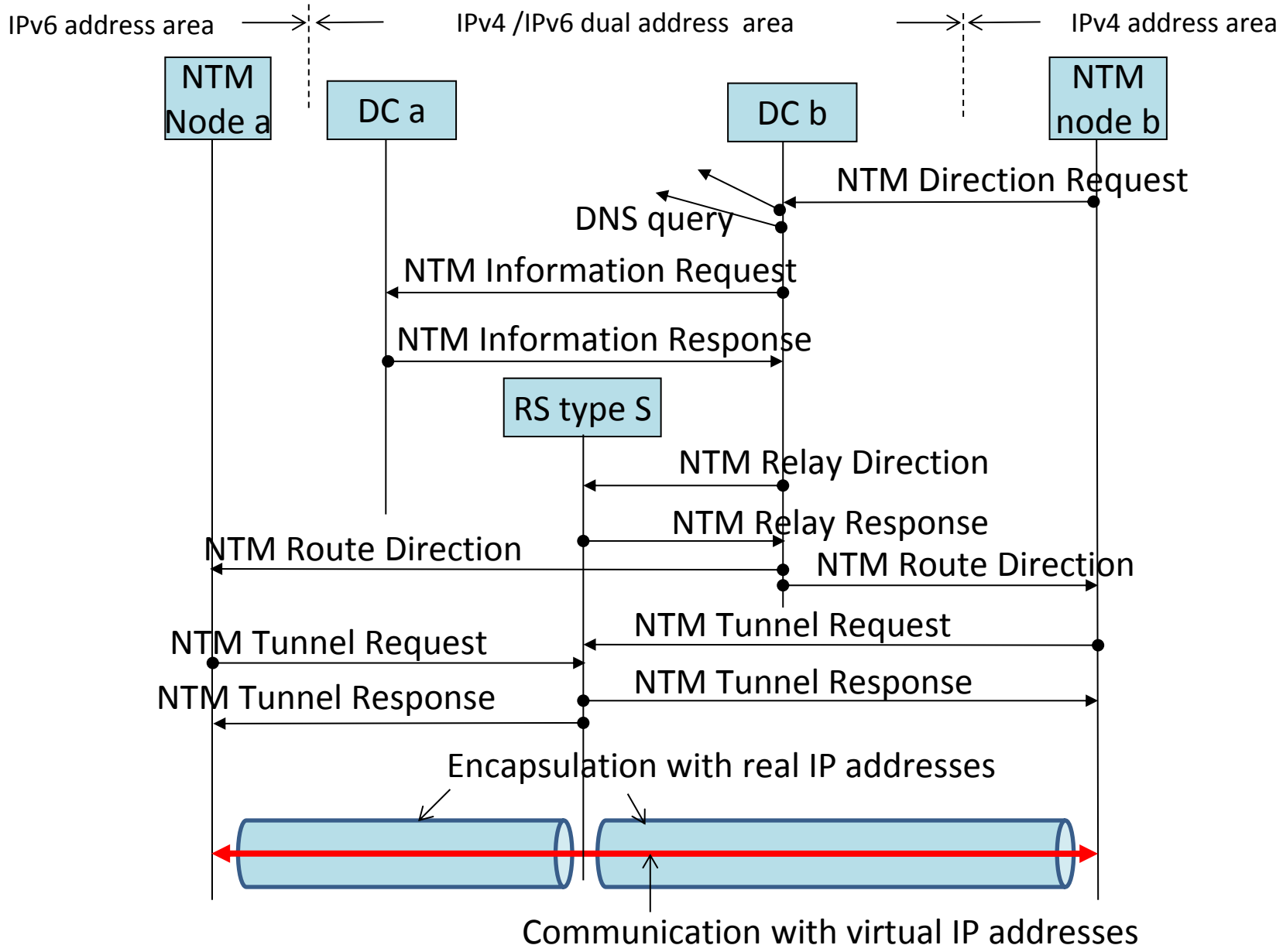
System configuration of NTMobile



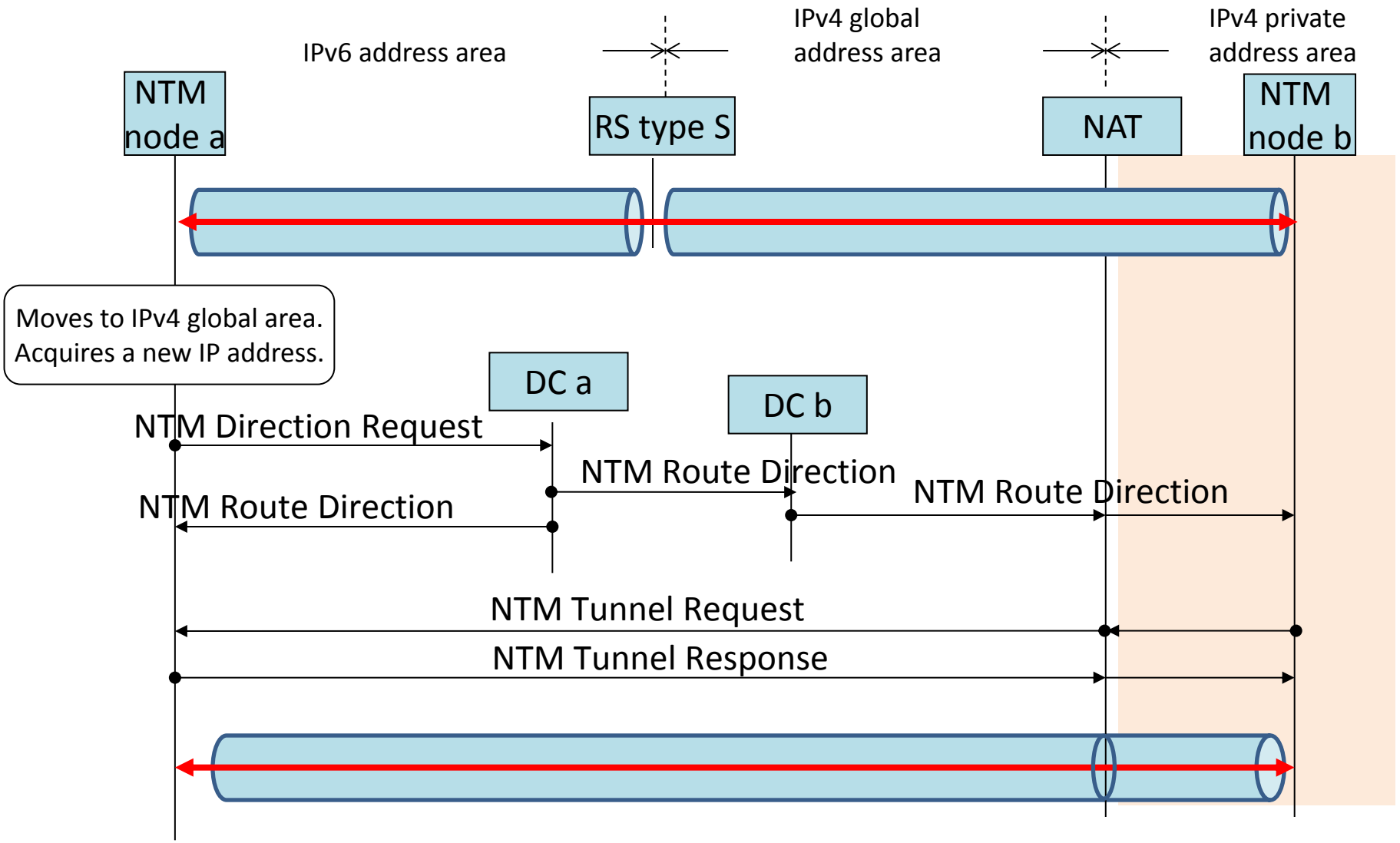
Example 1:
How to solve the NAT traversal problem?



Example 2:
How to make a connection with IPv4 and IPv6 networks?

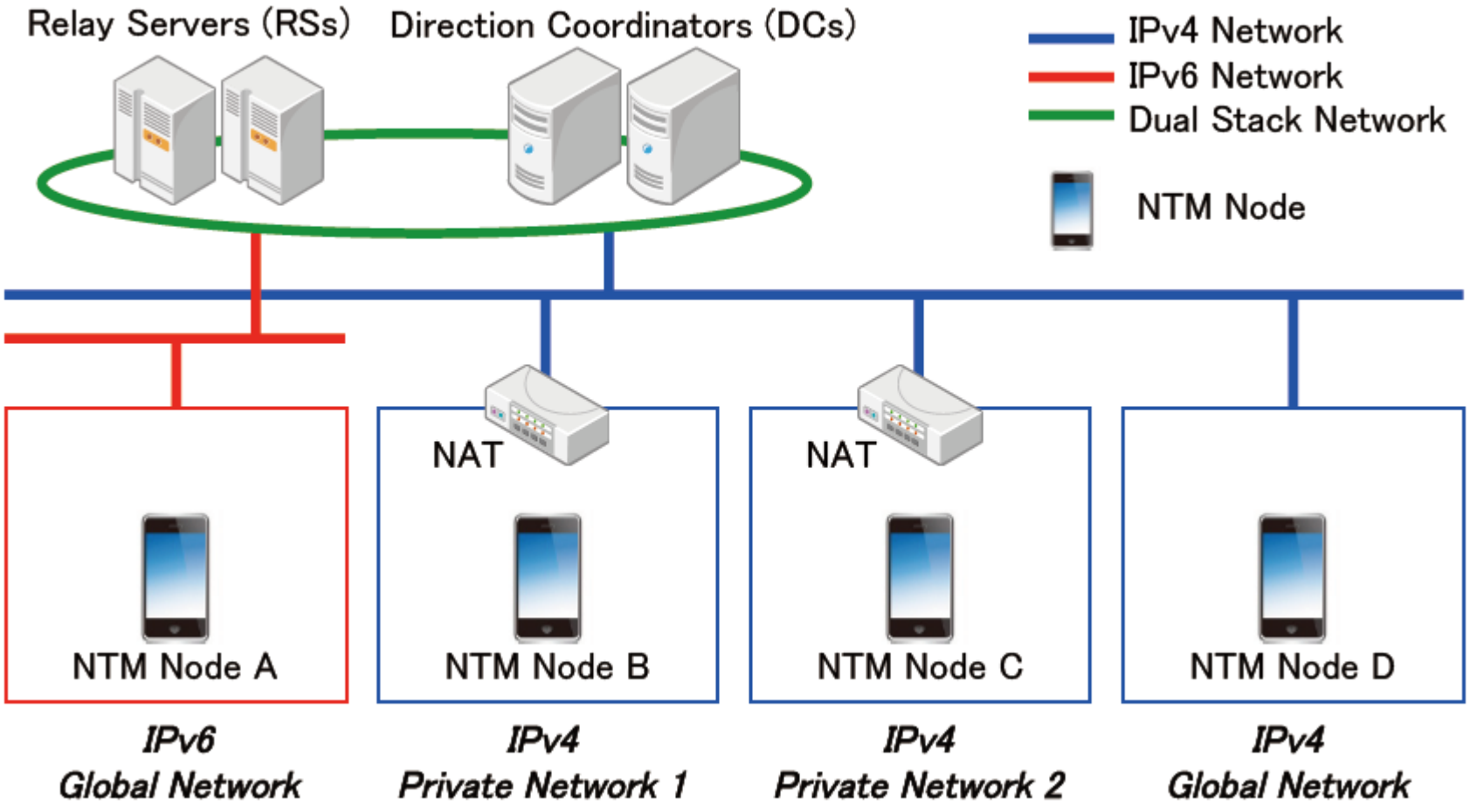


Example 3:
How to realize mobility?



DEMO system

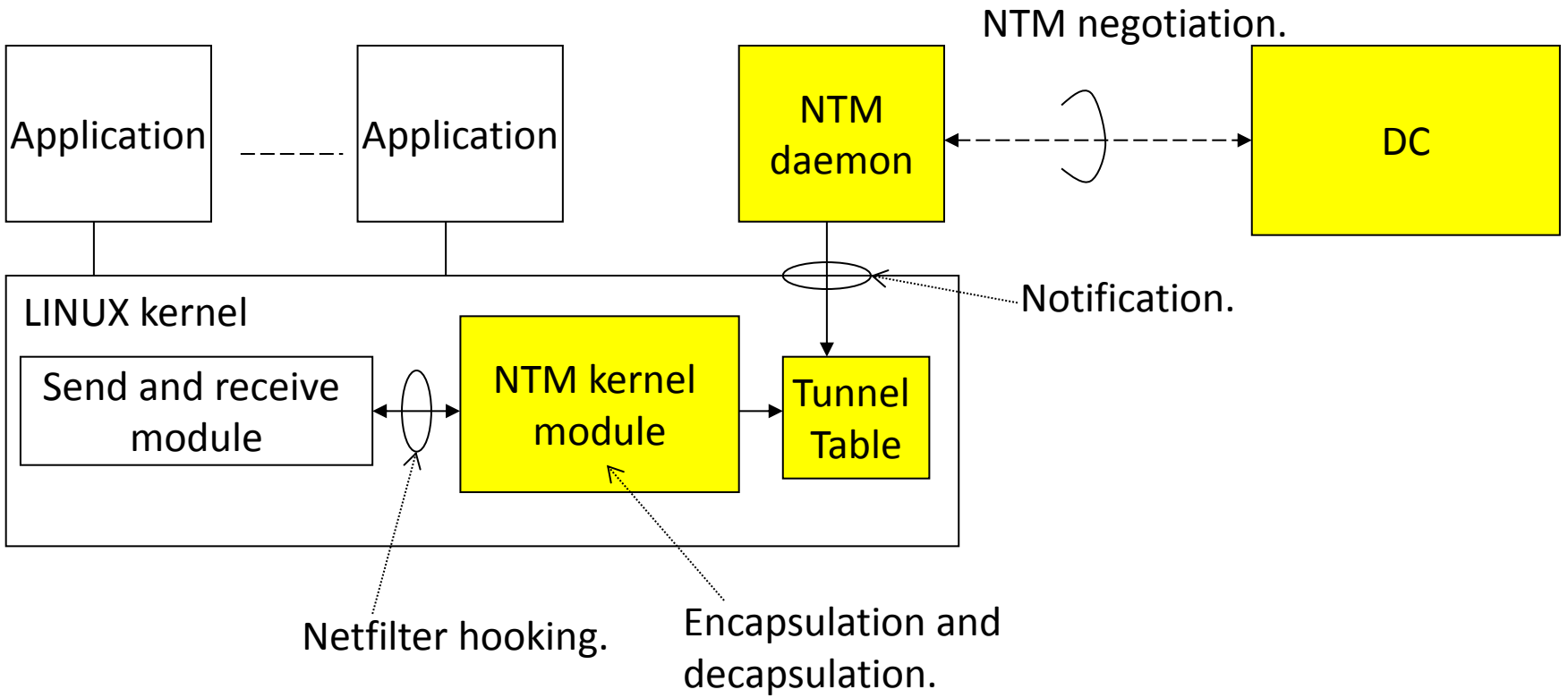
http://www.youtube.com/watch?v=__f4x7PJc3Y



Implementation 1

Kernel type

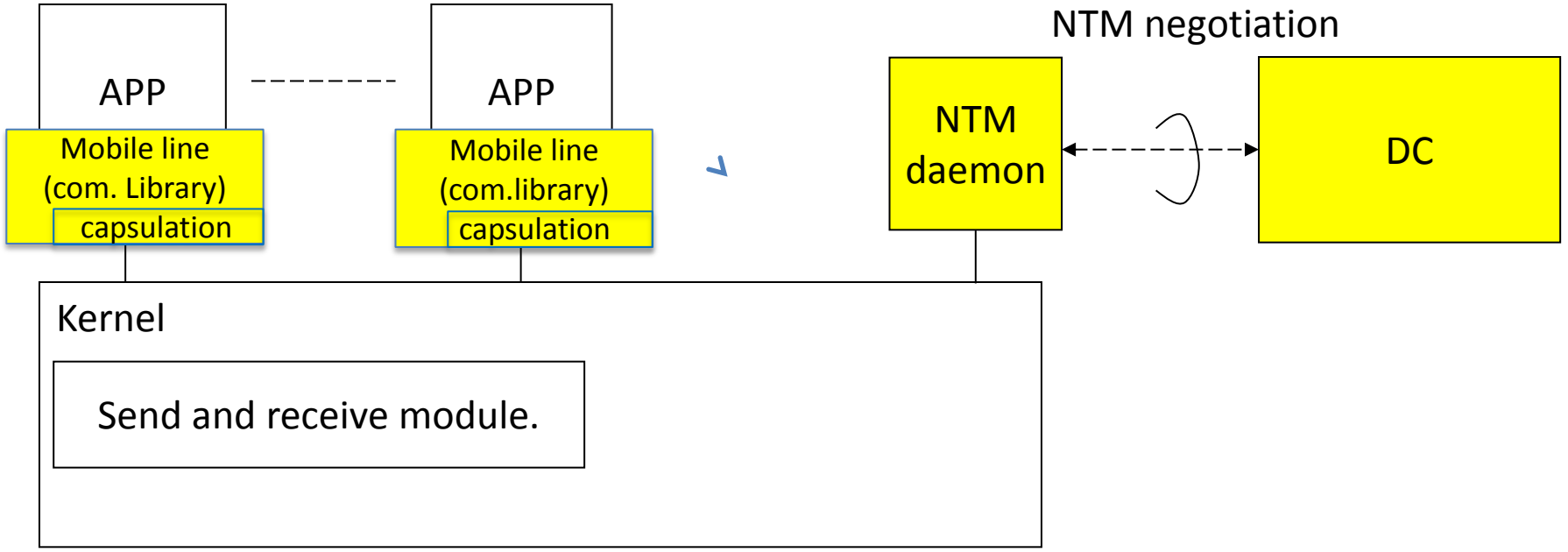
- Encapsulation /decapsulation are implemented in kernel module.
- All applications can enjoy NTMobile functions.
- High throughput.
- Available in LINUX and Android.
- Root authority is needed.



Implementation 2

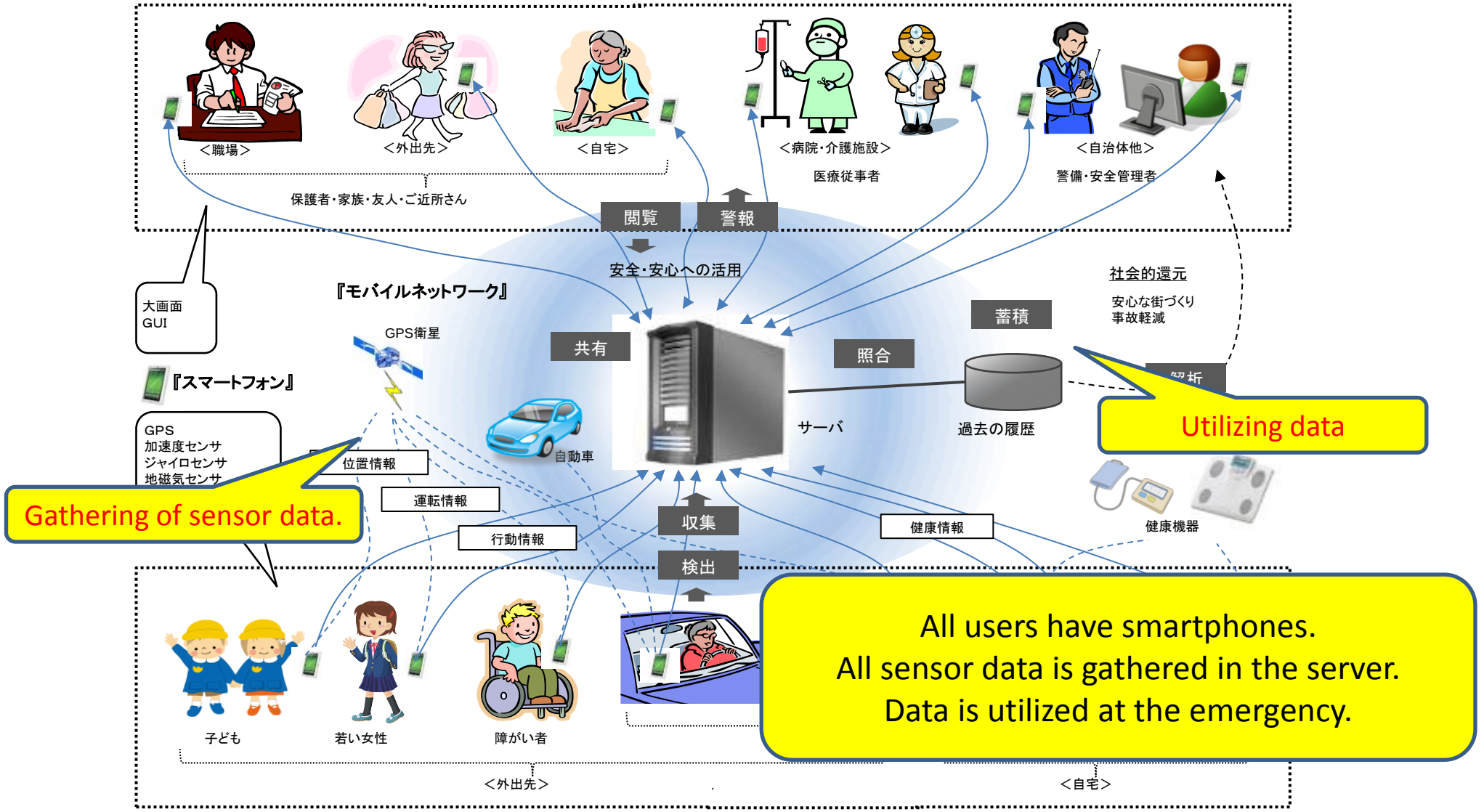
Library type => We call this “Mobile line”

- All NTMobile functions are ported as an application.
- Available in LINUX, Android, and iOS.
- Only new applications can enjoy NTMobile functions.



The example of end-to-end communication

The current system configuration of TLIFES



Problems of Client/Server systems such as TLIFES.

- Management loads of the server.
- Concerns of the leakage of privacy data.
- High network traffic.

Distributed Total Life Support system (DTLS)

The functions of TLIFES are realized without the server.