HIP extensions for object to object communications
<draft-lee-hip-object-01.txt>

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Scope

- **This document**
  - explains the concept of object to object communications and specifies naming and addressing issues for object identification.
  - provides the extended architecture of HIP according to mapping relationships between host and object(s) in order to use Host Identity Protocol (HIP) for object to object communications
  - packet formats and considerations for HIP extensions concerning object are specified.
Updates since -00 version

- **Author**
  - Seng Kyoun Jo from ETRI

- **ITU-T Draft Recommendations**
  - Newly start to develop recommendations for object-to-object communications (September 2008)

- **Minor updates from last meeting results**
  - Mapping/binding for communications between objects
    - Connecting to Anything
  - Common identifier
  - Specific user cases
ITU-T Standardization Activities

- Y.NGN-UbiNet (Ubiquitous Networking)

Diagram illustrating the connections between different types of communication and devices:
- Human-to-Human Communication
  - PC
  - TV
  - PDA
  - Wearable PC
  - Mobile Phone
  - Human-to-Object Communication
    - Home Electronics
    - Sensors
    - Vehicle
    - RFID tag
    - Camera
    - Human with Attached Devices
    - Object-to-Object Communication
      - Database, Web, and application server
      - Smart Card
      - Telematics, Navigation Device
      - Medical Device
      - Home server, gateway
      - Objects (Remote Monitoring and Information Devices)

Ubiquitous Networking is depicted as a bridge between humans and objects, emphasizing the integration of various technologies and communication methods.
ITU-T Standardization Activities

Y.ipv6-ID (object mapping)

Layered Architecture

- Applications (Human, Objects)
- Services (Service stratum)
- Networks (Transport stratum)

Identity Processing

- User/Object Identities
- Service IDs
- Communication IDs
- Identification/Authorization
- Mapping/Binding

Name (Attributes)

- RFID, Content ID, Telephone number, URL/URI, etc
- Session/Protocol ID, IPv6 Address, MAC Address, etc

Scope

- Next Generation Internet
- Identity Management
- Object Mapping
- ID/LOC Separation
Collaboration with other SDOs

- **ITU-T**
  - Modeling and Operation
  - (Requirements, Architectures, OAM&P)

- **IETF**
  - Protocol Solution
  - (Protocol development based on Internet technology)

- **ISO/IEC**
  - Industrial Standard
  - (Devices and Systems)

**Collaboration**
A bridge between markets and technologies

**Development of Standards for Object to Object Communications in Internet**
Issues

☐ **Common identifier for object**
  - Most of identifiers for object specified with different format according to applications.
  - However, in order to contain information of all objects in HIP message and interoperate globally, it is required to specify common identifier and rules to accommodate all objects with unified format.

☐ **Some support from the existing infrastructure, including DNS, and HIP rendezvous server**
  - Define DNS resource records
    - Object identifiers, and object identity tags (OITs)
Proposals

☐ **Adopt as Research Group Item?**
  - Authors would like to propose this to become a research group item
    - The current idea already proposed to be used in ITU-T SG13

☐ **Next steps**
  - Feedbacks and comments are welcome
  - Request for contributors
    - Need your help
    - Need reviewers and great suggestions
Backup Slides (72\textsuperscript{nd} meeting)
Object to object communications

- **New capabilities of future network**
  - Extension of networking functionalities to all objects
    - Ubiquitous networking

- **Object to object communications**
  - Many different kinds of devices connecting to the network
  - New concept of end points
    - not always humans but may be objects such as devices/machines, and then expanding to small objects and parts of objects

- **Problem statement**
  - There is no consideration for new type of objects (contents, RFID tags, sensors, etc) as end points
    - The concept of host should be extended to support all of objects
Requirement and objectives

- **Requirement**
  - Mapping/binding for naming and addressing
    - Service IDs: RFID, Content ID, Telephone number, URL/URI, etc
    - Communication IDs: Session/Protocol ID, IP Address, MAC Address, etc

- **Objectives for protocol development**
  - Protection of object (including right management)
  - Connecting to anything using object identification
  - Service and location discovery
Mapping relationships between host and object(s)

- **Host = object (one to one mapping)**
  - Most of information devices such as PC, etc (telephone number)
- **Host ≠ object(s) (one to many mapping)**
  - Content server, RFID tags/Reader, etc (content ID, RFID code, etc)
HIP architecture for object to object comm. – 2

- Extension of stack architecture for one-to-many mapping

Case 1: Objects in a host

- Service(s)
- End point(s)
- Host location

Objects (Service IDs) → Socket → Host identity → IP address

Case 2: Remote objects

- Service(s)
- End point(s)
- Host location

Objects (Service IDs) → Sockets → Object identities → IP address
HIP extensions – 1

- Case #1 (objects in a host)
  - Mapping information between Host identity (HI) and Object identities (OIs)
  - HI + OI(s)
    - TLV

- Case #2 (remote objects)
  - Mapping information between IP address and Object identities
  - OI
    - OI typically identifies a services and can also identify end points
    - Object Identity Tag (OIT)
HIP extensions – 2

- Packet format
  - HIP header (include OIT(object identity tag))

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
|     Next Header     |  Header Length | 0 |     Packet Type     |  VER. |  RES. | 1 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
|          Checksum            |        Controls             |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
|          Sender's Host/Object Identity Tag (HIT/OIT)           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
|          Receiver's Host/Object Identity Tag (HIT/OIT)          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
|   HIP Parameters   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
```
HIP extensions – 3

Packet format

- New TLV: object_ID
  - Newly defined from HOST_ID of existing HIP
  - The Object Identity is generated from Service IDs defined for specific applications/services

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|             Type              |             Length            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          OI Length            |DI-type|      DI Length        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        Object Identity /                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                          Domain Identifier /                       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                               |Padding                          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
Conclusion and future work

- **Proposal**
  - Include as the topic of HIP RG

- **I-D update**
  - Feedback and update of discussion results
  - Detailed considerations for HIP extensions
  - Collaboration with other HIP related experts