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INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

Next Generation Networks – Frameworks and functional
architecture models

Framework of node identifier and locator separation in IPv6-based next generation networks

Recommendation ITU-T Y.2057



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Recommendation ITU-T Y.2057

Framework of node identifier and routing locator separation in IPv6-based next generation networks

Summary

Recommendation ITU-T Y.2057 describes a framework of node identifier and routing locator separation (also known as ID/LOC separation) in IPv6-based next generation networks (NGNs). It describes IPv6 address separation, mapping functions and procedures, and considerations for the deployment of identifier and locator separation in IPv6-based NGNs.

History

Edition	Recommendation	Approval	Study Group
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ID/LOC separation, IPv6 address.

FOREWORD

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Recommendation ITU-T Y.2057

Framework of node identifier and routing locator separation in IPv6-based next generation networks

1 Scope

Recommendation ITU-T Y.2051 defines a new term, "IPv6-based NGN", to support advanced architectural objectives of the next generation network (NGN) by using IPv6 protocols and mechanisms. Recommendation ITU-T Y.2015 describes general requirements for identifier and locator separation (also known as ID/LOC separation) to efficiently support mobility, multihoming and host renumbering in the NGN.

In order to enrich the IPv6-based NGN with the benefits of ID/locator separation, this Recommendation describes a framework of ID/LOC separation in the IPv6-based NGN.

The scope of this Recommendation includes:

- IPv6 addressing schemes for ID/LOC separation
- mapping functions and procedures for ID/LOC separation in IPv6-based NGNs
- considerations of deployment for ID/LOC separation in IPv6-based NGNs.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is published regularly. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T Y.2001] Recommendation ITU-T Y.2001 (2004), *General overview of NGN*.
- [ITU-T Y.2015] Recommendation ITU-T Y.2015 (2009), *General requirements for ID/locator separation in NGN*.
- [ITU-T Y.2022] Recommendation ITU-T Y.2022 (2011), *Functional architecture for the support of host-based separation of node identifiers and routing locators in next generation networks*.
- [ITU-T Y.2051] Recommendation ITU-T Y.2051 (2008), *General overview of IPv6-based NGN*.
- [ITU-T Y.2701] Recommendation ITU-T Y.2701 (2006), *Security requirements for NGN release 1*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 address [b-ITU-T Y.2091]: An address is the identifier for a specific termination point and is used for routing to this termination point.

NOTE – This Recommendation only uses the term "address" in the case where it does not specifically refer to a locator or an identifier.

3.1.2 identifier [b-ITU-T Y.2091]: An identifier is a series of digits, characters and symbols or any other form of data used to identify subscriber(s), user(s), network element(s), function(s), network entity(ies) providing services/applications, or other entities (e.g., physical or logical objects). Identifiers can be used for registration or authorization. They can be either public to all networks, shared between a limited number of networks or private to a specific network (private IDs are normally not disclosed to third parties).

NOTE – In this Recommendation, the identifier is referred to as an "NGN identifier."

3.1.3 ID/LOC separation [ITU-T Y.2015]: ID/LOC separation is decoupling the semantic of IP address into the semantics of node IDs and LOCs. Distinct namespaces are used for node IDs and LOCs so that they can evolve independently. LOCs are associated with the IP layer whereas node IDs are associated with upper layers in such a way that ongoing communication sessions or services shall not be broken by changing LOCs due to mobility and multihoming.

NOTE – In this Recommendation, a completely new namespace for node IDs can optionally be created that would leave the IP address space more or less intact for LOCs, allowing routing technologies to be developed independently with no implications on end-host mobility or end-host multihoming.

3.1.4 IPv6-based NGN [ITU-T Y.2051]: This refers to NGN that supports addressing, routing protocols, and services associated with IPv6. An IPv6-based NGN shall recognize and process the IPv6 headers and options, operating over various underlying transport technologies in the transport stratum.

NOTE – In this Recommendation, this term is abbreviated as "NGNv6."

3.1.5 locator (LOC) [ITU-T Y.2015]: A locator is the network layer topological name for an interface or a set of interfaces. LOCs are carried in the IP address fields as packets traverse the network.

NOTE – In this Recommendation, there are two types of locator: local-scoped locator and global-scoped locator. Generally, a locator means the global IPv6 address.

3.1.6 multihoming [b-ITU-T G.8081]: Multiple links between an end-point and one or more transport networks. Multihoming may be used, for example, for load balancing or protection via diverse routes.

3.1.7 node [ITU-T Y.2015]: A node is defined as a connection point that may be a network device, a user terminal or a process where data can be transmitted, received or forwarded. In general, a node is identified by its NGN identifier by the user, and by its node ID by the protocol stack.

3.1.8 node ID [ITU-T Y.2015]: A node ID is an identifier used at the transport and higher layers to identify the node as well as the endpoint of a communication session. A node ID is independent of the node location as well as the network to which the node is attached so that the node ID is not required to change even when the node changes its network connectivity by physically moving or simply activating another interface. The node IDs should be used at the transport and higher layers for replacing the conventional use of IP addresses at these layers. A node may have more than one node ID in use.

NOTE – Unless otherwise specified, the term "ID" used in this Recommendation represents a node ID, not an NGN identifier specified in this or any other Recommendations.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 ID/locator mapping record: An ID/locator mapping record contains the relationship between a node IDv6 and a locator. An ID/locator mapping record pertaining to an end-user function contains the node IDv6 and locator that the end-user function possesses.

NOTE – The end-user function should possess at least one node IDv6 and one locator at any time. When the end-user function possesses many locators (e.g., when it is multihomed), its node IDv6 may relate to many locators at the same time.

3.2.2 IPv6 address separation: IPv6 address separation is the approach of using the IPv6 address space for deriving both node IDs and locators to be used in the NGNv6.

NOTE – The node ID and locator namespaces may overlap or be isolated. If the node ID and locator namespaces are overlapped, an IPv6 address derived from the overlapped space can be a node ID, a locator, or both, depending on approaches of implementing ID/locator separation.

3.2.3 namespace: A collection of IPv6 addresses from which the node IDs and locators can be derived in the IPv6-based NGN.

3.2.4 node IDv4: A node ID used in the ID/LOC separation architecture of IPv4-based NGNs.

NOTE – Similar to an IPv4 address, the node IDv4 is allowed to have a hierarchical representation consisting of prefix, scope, version and other fields.

3.2.5 node IDv6: A node ID used in the ID/LOC separation architecture of IPv6-based NGN.

NOTE – Similar to an IPv6 address, the node IDv6 is recommended to have a hierarchical representation consisting of prefix, scope, version and other fields.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

DHCPv6	Dynamic Host Configuration Protocol for IPv6
DNS	Domain Name System
EUF	End-User Function
FE	Functional Entity
ILCF	ID/LOC mapping Control Functions
ILM-FE	ID/Locator Mapping – Functional Entity
ILMF	ID/LOC Mapping Functions
ILMS-FE	ID/Locator Mapping Storage – Functional Entity
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
NACF	Network Attachment Control Functions
NGN	Next Generation Network
NGNv4	IPv4-based NGN
NGNv6	IPv6-based NGN
ORCHID	Overlay Routable Cryptographic Hash Identifiers
SCF	Service Control Functions
SUP-FE	Service User Profile Functional Entity
TCF	Transport Control Function
TLM-FE	Transport Location Management Functional Entity
TUP-FE	Transport User Profile Functional Entity