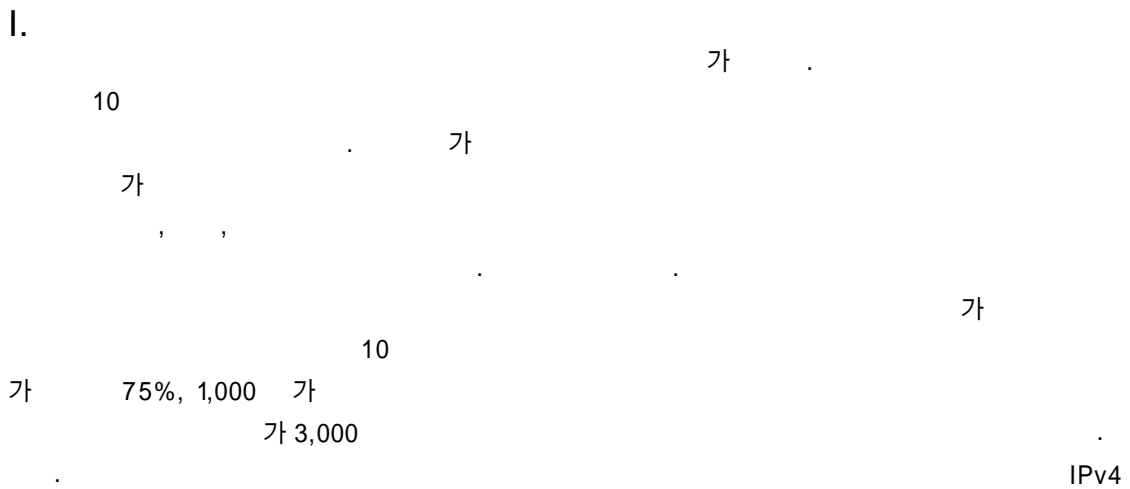
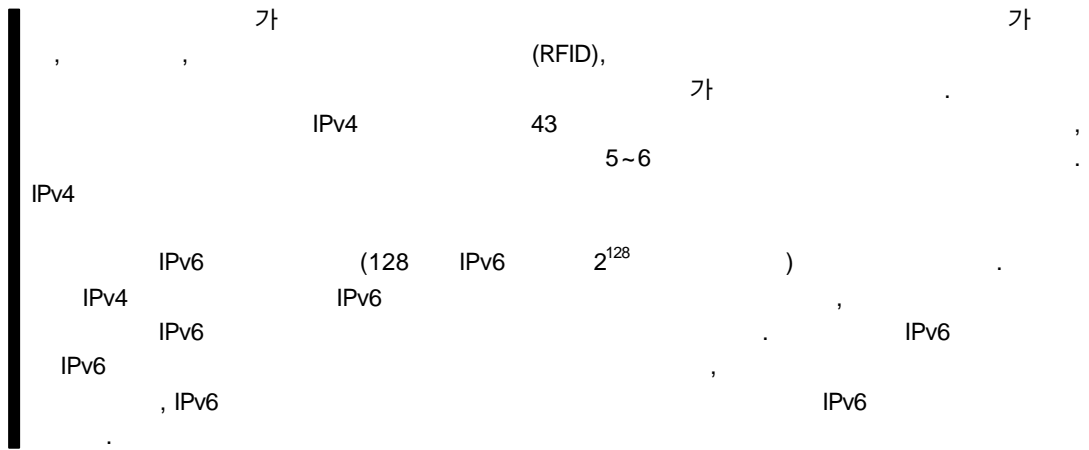




IPv6

The Trend of IPv6 Router System Technology for Next Generation Internet Service

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가
 가 , IPv4 32
 가 43
 5~6 가
 , 32 IPv4(Internet Pro-
 tocol version 4)
 IPv4 가
 [1]. IPv4
 , , ,
 , RFID
 IP
 가 ,
 IPv4
 IP 가
 , IETF IPv6(IPng)
 , IPv6
 IPv6 IPv4
 가
 - : 128
 - IP : IPSec
 -
 - Mobility
 - 가가
 II IPv6 III
 IPv6
 IV
 V
 IPv6
 VI

II. IPv6 [2]

1. IPv6

IP
 IP
 . IPv4 IPv6 IP
 , 128
 IPv4 20 IPv6 40
 . (1) IPv6
 Version
 IPv6 6 . Traffic Class IPv4
 "Type of Service"
 class
 Diffserv DSCP field
 Flow Label QoS
 . Flow label 가
 flow
 label flow
 . Payload length IPv6
 . Next header
 IPv4 Type ,
 IPv6
 . Hop limit
 IPv4 TTL field
 IPv4 20 60
 가 ,
 . IPv6

Ver.	Class	Flow Label	
Payload Length		Next Header	Hop Limit
Source Address			
Destination Address			

(1) IPv6

가
128 IPv4 32

가
RFC 2460
8
, IPv6
가

가

Hop-by-hop

Fragment

Encapsulating security payload

2. IPv6

IPv6
128
IPv6
IPv4

가

가

IPv4

가

RFC 2373 IPv6 prefix

< 1>
prefix

IPv6

IPv6

DHCP

IPv6

< 1> IPv6 Prefix

	Prefix
Reserved	::0/128
Reserved for NSAP	0000 001
Reserved for IPX	0000 010
Aggregatable global address	001
Link-local unicast address	FE80::/10
Site-local unicast address	FEC0::/10
Multicast address	FF00::/8

MAC

IPv4 가
global address

3. ICMPv6

IPv4 IGMP, ARP, RARP IPv4
, IPv6

ICMPv6 IPv4
ICMP , ARP Neighbor Discovery(ND) RFC 2461
ND Router Solicitation(RS), Router Advertisement(RA), Neighbor Solicitation(NS), Neighbor Advertisement(NA) redirect message

layer 2

link-layer 가 가

Router Advertisement
(RA) FF02::1
. RA prefix가

subnet mask 가
IP

4. IPv6 가 IPv6 .
 IPv4 NAT .
 IPv6 NAT .
 . IPv6 IPv6 IPv4 .
 . IPv6 .
 IPv6 .
 가 가 .
 가 .
 가 .
 . Translation , IPv4 IPv6 .
 IPv6 IPv4 .
 . RFC 3056 .
 6to4 tunnel , (2) .
 2002::/16 . 6to4 tunnel .
 6to4 , .
 gateway public IPv4 .
 gateway IPv4 .
 48 가 16 subnet .
 ID subnetting . 6to4 .
 gateway IPv4 가 .
 configured tunnel tunnel .
 source tunnel end , tunnel .
 source point-to-multipoint tunneling .
 tunneling .

16bit	32bit	16bit	64bit
0x2002	Local gateway IPv4 address	Subnet ID	Interface ID

(2) 6to4 address

translation NAT-PT(RFC 2766) DSTM(Dual Stack Transition Mechanism)(RFC 3142) . NAT-PT IPv4 NAT가 .
 가 .
 ALG(Application Layer Gateway) .
 DSTM IPv6 가 IPv4 IPv6 .
 IPv4 .
 IPv4 .
 IPv4 .
 IPv4 IPv6 .
 encapsulation DSTM tunneling .
 , DSTM IPv6 decap-sulation IPv4 .
 .
 III. IPv6
 1. IPv4/IPv6
 IPv6 IPv6 .
 IPv6 add-on .
 IPv6 가 .
 .
 IPv6 .
 .
 IPv4 IPv6 .
 .
 IPv4 IPv6 .
 가 .
 IPv4 IPv6 .
 .
 IPv4 IPv6 .
 가 .
 IPv4 IPv6 .
 .

IPv4/IPv6 , 128 . RFC3513[3]
 IP , global unicast
 IP IPv4 IPv6 64 64
 LPM
 single stack 1.5~2 128
 single stack FIB(Forwarding Information Base) 가 IPv4 FIB
 가 IPv6 , IPv6 wire-speed LPM
 wire-speed IPv6
 IPv6 FIB (hierarchical routing) route
 IPv6 summarization 가 FIB
 transition , IPv4 IPv6 classification
 . IPv4 over IPv6 configured tunnel, IPv4-IPv6
 6to4 tunnel , NAT-PT filtering 가 IPv6 IPv4 4
 ISATAP, 6PE, DSTM transition 가 classification fil-
 가 TCAM(Ternary Content Addressable Memory)
 search key 가
 2. 128 4 TCAM
 rule 가 1/4
 IPv6 IPv4 32 가
 128 ,
 가
 가 , IPv4
 IPv4 long-
 estprefix matching(LPM) , 10 20
 32 IPv6 IPv6 IPv4

IPv4 tunneling, IPv6 translation, transition point가
 NAT-PT NAT 가
 IP NAT ALG 가
 figured tunnel, 6to4, ISATAP IPv6 island 가 IPv4 ,
 . Con-tunneling

IPv6 L4 filtering classification 가
 , 가

4. L4

ACL(Access Control List) filtering classification rule source/destination IP , protocol , source/destination TCP/UDP port , TCP flag 가 . L4 TCP/UDP port

. Filtering classification

(parsing) search key ,

, search key

가
 . IPv4 IP IP
 , TCP/UDP
 , IP
 TCP/UDP 가 가
 . IPv6 IPv6
 hop-by-hop ,
 destination 가
 , IPv4
 TCP/UDP 가 IP
 가 . TCP/UDP

IV.

1. Cisco

Cisco[4] 가
 IPv6 . IPv6 phase
 1, phase 2, phase 3
 , phase 2
 phase 3 . IPv6
 Cisco IPv6 < 2>

Cisco IPv6
 ,
 7500 가 가 feature
 , CPU
 IPv6 가
 . 12000 en-gine 2

, engine 3 ISE
 IPv6 ACL .
 7600 catalyst 6500 supervisor engine 720
 IPv6
 ACL . 12000 ISE
 7600 supervisor engine 720 IPv6
 over MPLS(6PE) , config-
 ured tunnel, 6to4 tunnel

< 2> Cisco IPv6 Feature IOS

	Feature	7500 series	GSR 12000	7600 Catalyst 6500
Phase 1	IPv6 Basic specifications(RFC2460)	12.2(2)T	12.0(22)S	12.2(14)S
	ICMPv6(RFC2468)	12.2(2)T	12.0(22)S	12.2(14)S
	Neighbor Discovery(RFC2461)	12.2(2)T	12.0(22)S	12.2(14)S
	Stateless Auto -Configuration	12.2(2)T	12.0(22)S	12.2(14)S
	RIPng(RFC2080)	12.2(2)T	12.0(22)S	12.2(14)S
	MP -BPG4 (RFC2545 & 2858)	12.2(2)T	12.0(22)S	12.2(14)S
	Configured & Automatic Tunnels	12.2(2)T	12.0(22)S	12.2(14)S
	6to4 Tunnels(RFC3056)	12.2(2)T	12.0(22)S	12.2(14)S
	GRE Tunnels	12.2(2)T	N/A	12.2(14)S
	Data Links(Ethernet, FDDI, PPP, HDLC, ATM, FR)	12.2(2)T	12.0(22)S	12.2(14)S
	Applications(ping, traceroute, telnet, ftp, DNS AAAA over IPv4, HTTP)	12.2(2)T	12.0(22)S	12.2(14)S
	Standard Access Control List	12.2(2)T	12.0(22)S	12.2(14)S
Phase 2	IS -IS for IPv6	12.2(8)T	12.0(22)S	12.2(14)S
	CEFv6/dCEFv6	12.2(13)T	12.0(22)S	12.2(14)S
	Extended Access Control List	12.2(13)T	12.0(23)S	12.2(14)S
	IPv6 over MPLS? 6PE	12.2(15)T	12.0(22)S	12.2(14)S
	NAT -PT (RFC2766)	12.2(13)T	N/A	TBD
	IPv6 MIBs	12.2(15)T	12.0(22)S	12.2(14)S
	Static ND Cache entry	12.2(8)T	N/A	12.2(14)S
	Link -local address for BGP4+ peering	12.2(4)T	12.0(22)S	12.2(14)S
	Broadband Access(encapsulation, AAA, prefix pools)	12.2(13)T	N/A	TBD
	DNS AAA over IPv6	12.2(8)T	12.0(22)S	12.2(14)S
	SSH over IPv6	12.2(8)T	12.0(22)S	12.2(14)S
Phase 3	IS -IS multi -topology support for IPv6	12.3(2)T	12.0(26)S	12.2(18)S
	OSPFv3	12.3(2)T	12.0(24)S	12.2(18)S
	IPv6 policy -based routing	12.3(7)T	N/A	N/A
	Stateless DHCPv6	12.3(4)T	N/A	N/A
	DHCPv6 prefix delegation	12.3(4)T	N/A	N/A
	MLDv1,v2	12.3(2)T	12.0(26)S	12.2(18)S
	IPv6 PIM -SM	12.3(2)T	12.0(26)S	12.2(18)S
	IPv6 PIM -SSM	12.3(4)T	12.0(26)S	12.2(18)S
	ISATAP tunnel	12.3(2)T	N/A	12.2(14)S
	IPv6 QoS(shaping, policing, classification)	12.3(2)T	12.0(28)S	12.2(13)T

2. Juniper

Internet Processor II

IPv4

IPv6

Juniper [5] M , T , E
 3 가 ,
 IPv6 . M T 가 .

OSPFv3, RIPng, IS-ISv6,
BGP4+ , IPv6 over IPv4 tunnel
tunnel PIC 가 .
NAT-PT .

3. Hitachi

Hitachi[6] IPv6
GR 2000 GR4000
, tunnel
IPv6 over IPv4 IPv4 over IPv6
OSPFv3, RIPng, IS-
ISv6, BGP4+ PIM-SMv6,
PIM-SSMv6
QoS, ACL filtering
, tunneling NAT-PT
. Hitachi NAT-PT translator
AG8100 .

4. IPv6

80Gbps
IPv6 , KOREAv6
, IPv6 ready logo
IPv4/IPv6
IPv6 .

Gbps IPv6
TTA IPv6
IPv6
, 가가

V. IPv6 [7]

1.

DOD(Department of Defense)
2008 IPv6

가 가
. 1)
, MS IPv6
, 2001
IPv6 2003
IPv6 , MS 2002
XP IPv6 , 2003
OS 2003 PDA OS Win
CE IPv6 가 (< 3>
) .

< 3>

	Cisco, Juniper, Proket	
	MS, SUN, HP	IPv6
	Sprint, Verio, Qwest, C&W	

2.

1998 WIDE IPv6
, 2001 IPv6 (IPv6
Promotion Council) IPv6
(< 4>) .

< 4> IPv6

()	- NTT Communications, KDDI, , Powered-Com, IJ, JENS, Adove- Net Japan
()	- ADSL : e-Access, ACCA Net- works - CATV: 知多 - LAN :
IPv6	- : , NEC, , - : SONY, , ,

1) 2003 9 IPv6 Interim Transition Guideline

3.

1,100
6INIT, 6WINIT, Euro6IX, 6NET
40
가
IPv6

VI.

IPv6
IPv6
IPv4
IPv6
IPv4
IPv6
IPv6

4.

2003
IPv6
CERNET
2002 6TNET
(IPv6 Telecom Trial Network)
IPv6

가
IPv6
IPv6
KOREAv6 BcN
IPv6

5. IPv6

2003 9 "IPv6"
IPv6
6Bone-KR, Korea IPv6, 6KANet
2004 IPv6
IPv6
(KOREAv6)
IT839 3
(BcN), (USN)
IPv6 2005 BcN,
IPv6
2006
, 2007
IPv6

IPv6

[1] Geoff Huston, "IPv4 – How Long Have We Got?,"
<http://www.potaroo.net/ispcolumn/2003-07-v4-address-lifetime/ale.html>

[2] 4, " , IPv6
 2000-001, 2000.

[3] IETF RFC3513, "Internet Protocol Version 6(IPv6) Addressing Architecture," 2003. 4.

[4] <http://www.cisco.com/warp/public/732/Tech/ipv6/>

[5] <http://www.juniper.net/>

[6] <http://ipv6.lghitachi.co.kr/product/product1.asp>

[7] , " - IPv6
 , ETRI CEO Information 11 , 2004. 8. 25.