

IPv6 014-1-1 011 Ai IP VPN a Ls A-1 5171011

©I-W01, E1 2

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A Study on Evaluation and Analysis for IP VPN Model in IPv6 Transition Environment

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For a smooth transition to IPv6 network from IPv4, study of transition mechanisms are processed according to various network situation. Therefore, we have present the factor, which raising overhead of processing cost using simulation of cost evaluation by VPN model applicable to NGtrans environment; conformance of endpoint of VPN, IP encapsulation tunneling, applying position of translation mechanism.

1. A1-g

IPv6 71 711011 7171151717A-N Aj-qt_
71Vt°) 414-91 IPv4 1-11E-913.91- VRt1-
711 V i°14. o1a1JfIt1 7°11 71IPv6 LIM
srls11A1IEIFNGTrans
-91 0l ag cil LI°Jt 13IM1-1 &+ °J.7 711
71-E- *1°3, 1°1 1-°iltl3 91 a
V- 01 . II.7O, v6ops7d. a°g°11A1 t°
1°1 --u, 1°11 IPv6 71711 IA14-17-
91r-1[1].
IPv6 71 . 1,1V. 1301- 11 511 IPv6 II
t1.711AP-1 el ul°ck
/ TIP1 1-v E°91 1443 IPv6 q°1
-e-7-A1°1°14.
(Secure) Li °1 a)IPsec
of q Ell °11-2-t
VEI°. .-1°Ee°11A1-t.- 2
IP VPN f IPv6 111y0-1
Vucitl-17-, 3 1° tit} ullY1-1-1, 1°,
°11 VPN 71-1-614
r1-.4 ..11A1-;__ aqua VPN -R 710761 A1el ti 1
'a1M°, 1s2-131, 571A-1 41318°211°11 WV:

Al-d°401-V_I- 4-1-4°14.

2..4

2.1 IP VPN 71
VPN z Ntiti°t.

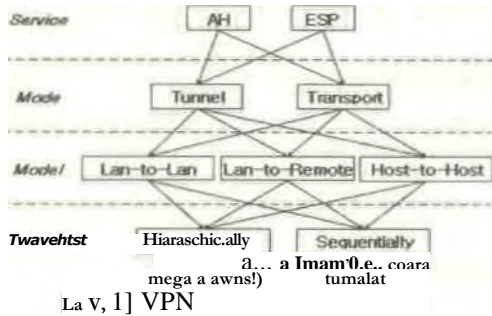
4711 Alt151=2. IPv4 °11A1 IPv6
°11Alt. 71134 71VI a
LaHT°z7: IP 711-1°91 VPN 71*.g.A1 IPsec z A1-§4
a914. [aPE1 11°11A1t° VPN °11 1 A1W°61 t°7°A 0 11
1°11 r-1-F_ 44* 1-141-11-a
u}. IPsec 91 AH 91 ESP all c°11°=- IP 7410o11 5-417)
oil tilt- co_t,-54 wt -S- IPv4
AR °1 ESP °11 ;719_ a 7144°
IPsec =a1-1- IPv6 2E- All 91-
ESP °1 V°4°1 714Y-1°1V:1, IPv4 9)
1°11°11°71A1 1°11°11 91 c°1 A1 19i 711*

01

(Transport)2.E9) tl2-8° E11e1E1°9-1 IF 411=1= YA1-

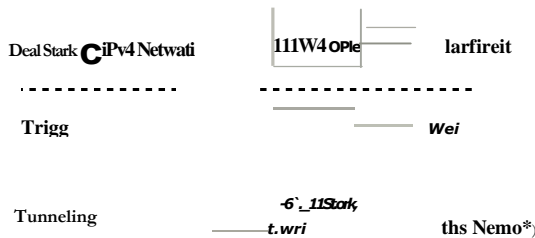
IP °11 71112a
-aV °Jr+. ffit° IPsec
a° E°PA1 tV_IV, °11 71111°-1°11 r-qE1° Host-
to°Host (H-t-H), Gateway-to- Gateway (G-t-G),
Host-to-Gateway (H-t-G) --11-1c°i

C)[2. 3].



IPSec J__(ZI: J.
 °11 44 °1- zt 91"--1-E1 ---1r1°11°-1t11
 711²651 (Hierarchical ly), (Sequentially)
 71 V 4- 9,1r-1-. VPN EI
 la QoS lj 7c14t1-71
 t L2TPv3°-1-
 • f:3-1°74711 ItT7
 VPN 711 °1_A-111-,-°11 AI AMT. El ta
 oho 4°1° °1 E1" ° ° 11°=2 tVR1° EliJ.?-61--3-- Whoa}
 71 -1-1t11 F1 z --&1al7 tl- , °1°- A 1-
 • A/ All :11 L-11-?-13. 7116: VPN 71 AI
 44°-E1 °11 1-M;°13.°1 LM-c-137t1°s1
 E1 -doz17 Adt1-1±.-E°11 AI--R-1G1 1-
 IPSec AH 9-1- ESP, a
 el a El L1°-1 -si sr11°11 44 ti-°J
 IPSec °1 21 oil °J;
 c91 71 , °1 Y, °1 , °11.t/ °11 V. -LI

2.2 IPv6 41171 U
 IETF oll AI AP C1 Y1 31 911.-± clCjig
 (Transition) nil -0°)s1 A-11 44 71)
 °1(91°131, a °4.11 AI Tr
 • 2-°-q (Dual stack), only-IPv6 only-IPv4
 1 -a° 91 °11 11 7.° 1-° 50,
 cl° °1 1311 [-a 2]1A-1 4E14
 3,131- V-01 3.711 r-1(dual stack),
 (Tr ans l at ion) , H z ci(Tunnel ing)
 914 [3, 41.



LL 2] IPv6

• r°d-?-1E-31 (Dual Stack)

.E_011 7°1 z °I=
 91-5)--131 , °1 IPv4 All All
 (Load) A°17-°EM
 9.14. V4_°- IPv6 °1°
 IPv6 71-°-°;:- AI -T,°%°1 E.1°4
 71°11 IPv4 c IPv6 °11
 01 V DNS g-4F1 °1 iz.1 EA°01 -2-7°51°1°1°1, IPv4-
 IPv4 IPv6-IPv6 4°)zi°11 9,1-°jr
 °1, °1-°11- [3] .
 • 1.°1 °11A-1
 (Transl ator)
 IPv4 IPv6 AI°1°11
 °-1 1t+. On 1 y- IPv4 O IPv6
 Vlt° IP °1°
 I CMP°k°-1 °1 .
 °1M 1-d. 2-1191711* t sr°N t- u111
 2411E1-. °11 °°11A1 NAT-PT
 [6], SHT[6] °1°-91-9-1 °1°°11A1 °W°1°4°71
 u11°71°11 ohs A-
 V -1-7A1S.°1°1 °1°-1 fflIV
 A1171- 1_17,110-1.4 471 oil Path MTU,
 10114 *°T-011 Etl-Et110t°V-, ICMPv6, TCP, UDP
 • °1°21°all°c°1 (Pseudo Header) hH 7112°-T°-el°51°1
 AFV--(:)1 °j L). °114°°11 AISOCKS [7] ,
 TRT[8] °1111°-1 ,11t1-°1-°1°41
 1°rill° El t11 °1.°; °111 -°11A0j
 BIA[9]9-1-
 IPv4
 °s g~~nzz IPv6 111 °11A°1 °7rt°-
 rtt °1311°)°1°1*°a°
 _aci(core)
 111 °-13.1 011N(edge)°11A1 14-°51c1x1t°-°-
 11111-1 01cf.

r1 V °c) 1°1°0		
6over 4	6-to-6 over4	over4 Y_- 1.2_-.._91-tIMR-la °.E?1°
I SATAP	6-to-6 over4	„
DSTM	4-to-4 over6	„
IP-in-IP	6-to-6 over4, 4-to-4 over6	Cont figured71_., t Vir 1. z. °... 1,11_-7-1 a °VI °.t2:-_91-IIM-itl a °.Y.F. °-
6-to-4	6-to-6 over4	III liq a °-

<ff. 1> el LA eg °1°1.1-10°1 °-11-

• E Ideal (Tunneling)

IPv6 1711-T-1⁷-1⁶11 5:°1-I X71°11 i
 IPv4 LIM 4¹1 a °11 } of °Li V 1*
 t1-71 Prl °Jr t^{of} Erl- el- A¹ IPv6 LH
 ■ 1711F-I-sr)-E¹(border router)t- IPv6 41⁷)*
 IPv4 °J.11- a⁴°1⁰(encapsulation)t1-°1
 IPv4 1-1M-°1 a el-M-711 E¹4P6¹-a-
 - 111°11t- T -1T-----V⁵21 IPv4 ulliTh
 cat1-711 EP-d* IPv4
 (manual)°0. A J 1 V 01 IPv6 11711 a IPv4
 _y_fsj-ttai IPv6 01-2-ti-cl
 ■ Wed* tl-t- °I V 4-
 • E1¹-4i1°. IPv6 y11 z IPv4 IP °1111*41
 o] AA 471¹-1- VI II ael oil
 • El¹.4 ed.* cs°VAJ / °11 6-to-6
 over 4, 4-to-4 over 6 VE11.-iTr 4 5,131,
 1₁g-11 11-FIA1 1-11.-?1 a
 a -?-11°11 er¹ 14⁵-1
 ol -1' 914 . <A 1> E1 til
 -11-4* 4E141 59, El- [11, 12, 13].

2.3 IPv6 Vg011A¹ IPsec
 °1 V°11A¹Z_-=-. x^H Al °11
 IPsec 01 * IPv4 V-76⁴011Ai --*51Q)
 VPNtS * t¹ l ol oil t11\$} -¹₁
 -a- 3l--111- IPv6 t7113-1-1 *9j:01
 °1-g-4"0 7L}°11 71³-g-t1-711
 VPN01 Y.°JY-1°1V
 41 ti 1-1 fit°11 Ai 7/°1 * 71-¹75- 471 4
 71-1 c34Al2.1V
 011A-1 V_s-11-⁹- V01 IPv6.1711³⁷-1-1 t[°]11Ai.Y. IPv4
 7^d°11A1-71⁵-1R1 VPN
 s1⁰1⁰1-4. 71¹-°1 3¹-gi-s1R1. VPN aq°11
 "111-¹-1-I.°1 t/
 j2- 71- C\l ii" r} 2>-E- JEW oil
 AlAlt1-91R1 oil 1-1 41 al- VPN
 E_Vid 14011 IPsec³1-g• 7P-JAJ

(1) --rcd

ir°V 1-0_°11 Ell °Ill 412
¹⁵1 471 oil , IPsec 14- fit} IPv4
 IPv6 Apszis>._q 1451p_
 IPsec 14°1 IPv6
 IPsec 44%¹⁴ IPv4 IPsec 1.1* 5¹--r 71-A⁰k
 71 l(11-1?_°11 J-91 °174I(Security Association)L1 71
 ril F-1 7f 71 tt^{OF}4¹ c!°11 ujtH4
 °1 el 3,¹⁰1 ut.<A2>011A191- V0)
 VPN VIA) 7AO 11°11 EP-A
 1 -¹-⁹-1Al
 °1 H-t-H VPN 7/A1 E¹1-1s1
 1¹-°-- 71'7?4 G-t-G VPN A⁶1A1 *cd2=-q
 E Pd o 1117}1-1*¹ 6¹ Al°M⁹-1 141

-1-r¹ 1=54 Al 0M*-11 01 -71 T 91-9--¹1 , 711°1
 _°1101011 VPN 1Fht-71011_77°11 141*
 °1
 4-1¹It° 9 --Al- rt. -a a¹1-1- *cj.
 71101Lt11°1 t
 Al⁹1- 1³17j°11 t11a> IPsec **Li]**
 _e-7-1A1- V711

(2) let- P1111-1,4- (Translator)

011 T²z
 BIA/BIS1-1Msria 1TLE 7i121-si
 17-11-111-Ri. TRT, NAT-PT 14401 IPsec
 -R- -7-e14 z²-1-` 914 .
 • 7]H] vV1-1-1f3- (BIA, BIS)
 BIA = 1-1M-V-13 7410°11A1
 -3}1o}°1-7-°1 RI °I-2 el 1 01)cl. oil
 A-11 IPsec
 V-LF. BIS -q1 7,14- IPv6 VPN z -71471 s'rl MI 1'
 *I°11 VIV-71(translator)71- Pr³t1-71 4 *011
 14011 i * All 71- V . az114 BIA L) BIS _a
 - IPv4 VPN A1 i IPsec .2-°01
 tra-
 *cd2"--q 4 trI-11-71-xlg 151
 _v11° Li Al .11 5,1 F-1 91- IPsec 1 4-
 J-44°1 °t .

<\$1 2> t°111-11-11°11A11 IPsec 7r0Ad

Vi*TiIM ¹ -14-	-	ftnH	i;-	i)-G	-	
				ESP		
	0	0	0	U	0	0
SIIT	X	X	A	A	X	X
SOCICS	X	X		AA	X	X
NA	X	X		44	X	X
	A	A	0	0	A	A
	0	0	0	0	0	0
	X	X		AA		XX
Can ied	0	0	0	0	0	0
funs e l 6t o4 6ovoer	0	0	0	0	0	0
I SkrAF	0	0	0	0	0	0
b _k DM.	A	A	0	0	A	A

0: 01 IPv4/IPv6 71- -k .11
 Al IPsec 01 ---I--71-3.10,1 V 01 ILA 71-t

A 14-1=- IPsec 14-°1
 71 l IPv4 01M°1 Aiul 31-1* 1 4714 , IPv6
 °HAI ffi Ai 5412 7111 4- oil IPsec 1
 °01 °0k* 4 -2- LI-F-P-11r-1- . L 5-
 -• El t^a Γ id⁷1V?1" 71²-0- V 4 -2²1 of Ckr-1-
 ex) -Err-VAj TIHH 2jstr- , IPsec

Eila?-e1 91711 IEFF1-AI DSTM
VPNHzoz 714-1¹⁻⁴ IPv4 2--"E-11011
IPsec 01 1.,15101 9,1N °71 g11-Y-°11

x:] 71 AM
7* t 7p01°1 v** sl ul
ex) 1J El Voi -8- 1, 1=r-' V 1 414
1,
111'0¹ *71--f-(IKE) 1-°-
- >,4*⁷¹ t-
1⁹¹
VPN 2-11

• LIE1¹- (L4:
SOCKS, TRT, L3: NAT-PT, SIIT)
IPsec 1-1- °J 711-t 7¹
e's1 -V- °I 1 * el -7- cl N sl TCP
UDP IPsec s²1t11
f11 At-gL51 711°14°1⁹⁻¹ 711-t-ell Al te.
*²r V 1, IP tffE¹91- F 11 TCP t11E-191 1°1 1⁷5-
171ul1E-°11 VPN E1 'd%¹
- -1¹V IPsec°11A¹
VI ?I- If-A t¹ * V-- V T %714P,-1, - VPN
-7-Al T1 s¹11 L1 t- AN -1- VPN t
al-?-1-A1 SOCKS LI- TRT 91- 711*
(Layer 4:L4)011A1 All -1'41=2 let III 1*
VPN E1 V91 Aorj5-1ciek
IPsec 1-2-°1 71-*V T ;att. 1-ziAl
?1°11 °&1-1-1-91 IPsec VPN A,3¹°11 711
:it°1
111-E-711 4.
a⁹1 1211 X11-1*1.1 SIIT 91- NAT-PT 1/ML1--14
141_4-13. 711-Z-(Layer 3:L3)1Ai °Pr-°iN
711 IPv4 91- IPv6 A11711,
811r-1's1 A,\$) tl-g-131 a ala-r-1---71
E-.011, ?1-q1 VPN -71A1 L4, L3 -IA] SIIT
- 11111¹-1-q°1 1*-5¹°1 IPallr1
ti '111o T IPsec 011A1⁹1 _VS.1¹11- .
11°&§-1-7} 41⁷°1 r191 1-11-2-, 371011
v⁷1 4-2°11 aft- ul-Al⁰1-7-°11⁰t t^r-1%
t1-1 Al le t41171 la
°1 ix-5¹°1A1711°M*11°11A1 VPN E1¹-1s1
· T0¹ VPN Hzoz Lo V 1 -7-
ulE-3⁴9-g-t VPN

(3)E1¹4%)4 11-14-(Tunnel)
El aol t 1 Al A,,10 4
'ZIA -A' °1 Ae El z tril't°11 Ai A - E1 V
✓ M s1
ti
X1101-1⁴_(decapsulation)912-3-. APJ.
1-E- 41310111--_- t.1§1-71- Vt1-. VPN
-7 1 t 1 sr' ql E1611 r1111- T⁷dAo , 71 V Ad *
;Pr A1 V-²r IPsec °VE}.
EPV0¹13111¹-17Tr°22 011A1dL117111-1¹1⁹1-V
01 c,9.Acl rho V F-11 °11 71-N Ell
c.1 V 4- cf. r-1-2- Elzo 411 1-1¹-1 Aal
31-1 EIE-711 DSTM IPv4 43¹,01 IPv6

IPsec 11114

IPsec

Web' uP1-1-1-,7011 VPN 01_2_5101 El
-4 -a- 111 OT, IP all E'1 ol
Ad °11 e-11¹1-R-°)
E1 V-6¹>t/11 }lan°11 VPN E¹-d%14-³1-*V¹ 14',
IP °,111*e-11°R4-3: VPN E.i<11V- 91_9_14
uPl-1-1 *91 *rill) oil V*1 at t.-IPSec 91*
all Liz 'lelaN ³E- z}sf-E¹1-1- 1.21.t011 -4--
71--q tel °i qtjr-1-.

Tl s}V°1 41171-¹-1-r°11 VPN 7AJA1 ³1*
71-²t--to u1171-1-1-1q-
°1 , r1-E- IP 1'11'17,1-91 °JAI J_91- 711
°~1 all E1 .11 tea, °J T7}7.1 01 1 J- 7dV* 41 all ,
sl all rd F- 1-14-3- 4- 1 71±:
171-LI *1.1 , IPsec 91 14- ⁷0¹§.1-
471 -⁷1A V⁹1 Eil°1E-191 le if
le A) ts}t}71 -*1 °PI *1¹ i 13P1-1-1
°11Al -t= tgAtal-71

3. IPv6 Oi Oil Ai VPN 4 g71.

3.1 IPv6 NGtrans VPN

NGtrans V- 1011A-1 -7-A,s¹5.17 - 0,1 Aj
A J-g- -11 tli Al Al ^aj °k , 'et , El
Vo/ 71-N 12117}1-1q-31- VPN71
AN- .f.A-1 A11A15101N1' _--. H-t-H, G-t-G, H-
t-G ar⁴⁴-ti P--g-A1 ..T-Mt- c¹¹61E1
A¹ °11 Els} 14-7-4

RFC2893 °1A11EELdo411 1^m-1177-e²17Aa

• host-to-host (HtH), router-to-router (RtR),
router -to-host (RtH) 51.14. VPN -
AJ91 at &01 H-t-H, G-t-G, H-t-G VIM'4451
³1³4 , E¹1-4 1-¹-1 Ad V-. 4-1⁻=
111 a* -T¹61-²E- 411 ce VA}doll
1⁹5¹1 slulg- VPN s²1 --
E1 zo 1/11 -¹-1q--⁹1 -710]1 ⁰1⁸11 11-1³1
-2- . -8-A1 ³,71- router-to-host,
host-to -router EIV-⁰1T-1171-11q- VPN
rS5-1)- 114-1- ul3t1-71 -1-'14Al router 011 r41'401 0l
E11³¹1-9 110]1 711⁰1_V-11°1-A¹
ftlrl-7-, host-to- router 1F-1.⁹1 1-°- host

1PM'cf.

cd 17' ti c.11 , 01E1 11z 1 4'r

t1-71 11E-1 VPN 91 El

o A14²⁻⁵.11 °JENA-
* VA ⁷111°11 711⁶1_41101g- ult1-711
rl- . cl-°Jt1-¹1⁴ 171-¹-1q-* 017Ol
cl 1¹4-¹1⁴-V-a 1111 4 VPN

°1 11** id¹ t1¹11 LIM-stlaoill
· 1F-111-R- ti¹1°11Ai ttul.

3.2 I*

70011A1 VPN 71* 71t '11
 °1E1 :1.26= AI * IP 4N121-91 VI t 41-12-61
 °-1°M °AIM4°1 Ei FdAC,11:1,
 oil -V-1° VPN H z o 7141*-9---- 1.-1-17-61
 - .IP 41.11-1:1- 41 VI.V-1111
 °1111-1-1tr°11 IF Mel 41** VaT 51-7- , °11 1*
 ° 1 44 E "A ?,-1, 7-A u1 a°
 r-1-°Jtt 71-Ai

71- r7
 AI el H1 *4- sl 131 VA- • fat- VPN E°Pd o 1- 7°
 V- ail011 L,IPSec °11-E Mels1- 1,1/
 °JT-
 °TIT oil Al 1-7- til1 111°11
 ti ki-1- M 41*
 °11SziCZAV *tilA1 [14-201
 LIF-1V1° 9.45S-1-4°1 NGtrans V1°11A11 VPN
 R-V1 7141-R-* A11
 tcl t1311- 11011 tufel 1°°1 t 4- 91
 - , '61=1131 11 J z 1 41-4- 1 R- 1 1°
 D11 °1E1 II VAL VPN z 71

- aE°1191clA11=2
 4%1-131 V. 2= Al°kt
 2.E.011 414 91*
 • 4314521 1-71-9-1- ella414°1- aela 4-
 431°1 ,11 4-tA1°11 Ell 131**
 • OA11 4
 NGtrans V1°11A1 VPN 7-kJ
 471*1 H°1374
 erg-Q-1 4°1°11 -71-°:
 04 1°1_ -°1
 aleitf Al 432, 71VA 'eV-411
 1-a ceVAJ°11V-91- VPN 71°11 5:16131s1
 41** 1°11 ffit E1ted 1:1 a°
 1 41 Al tq"°?1° V,s1\$: TIV; E1 VIA
 011 VPN H z o zPrAl° J-° ,1
 1°°1 Al- 1°11 °1-7°°1 1F-11-2° a)% t}.
 i°° H1* 2°1- 1° 714

4°1E1 4131°il
 1,1.1 4E-4 , 71.E-12-
 °L)(end-to-end) VPN z 7111°1 9,..NAisl
 111-2°4 111°147-4 4%4; 31* 2-cl' III-2-
 (host)311-
 H011A1 A1e011-g-(Crouter)* 2°7c1t1°%
 VPN 2)l H-t-H, G-t-G, H-t-G °11 VPN
 -1011A1 4°1E1
 • A1P-1 1-1F-1-1-114.

3.3 NGtrans VPN 1°6' 11.4 3-4 1:114-
 tll 71011 -1= 1 1°0° u1-x011 eg
 IPv4 checksum 711 L1 41*, 131
 1°1Sril A14-41311E-1- IPv6 TCP, UDP
 E1 ANI of 914 af el A°1 131 :1:=1

1-6 H1 * IPv6 011 °1E1 i°71°4S1-
 V_ H1*(v6.l rate (byte/pkt))33- IPv4
 t11 °1 Ei C51-1*Alc,9_ (Irate
 (bYte/pkt))- v6
 °12°-1 dt
 Al°LI°11 71i-1* slult1-1M, IPv6
 111°°11 ufel 71V T 91r-1° [14,
 15]. <1E 3> 011 Aft -1V171-1-171i-t-1 Al VPN
 71°011 A)S°1°1 114
 4E1°17-
 <1E 3> NGtrans V11A1 VPN

Vhth	host-to-host VPN -71)°31-g-
Vgtg	gateway-to-gateway VPN ?1 414
Vrtg	remote-to-gateway VPN -71 1-Q-
Chost	Hid tq1.Z-f.01A1 VPN 7141*
Crouter	Ella t* -1- 44-E1011A1 VPN 7111-8-
irate	IP ul.it g11°, 7- 11 / 1SI ,.1: °LI "IS-1 1-7,1*011 tr 1-1-1c,1_
v6	IPv6 .1-1=1°, :l. 1°t-1 1°; (v6 > 0)
Sh	y. °} 811E1 Me141-R-
Ci p	°11°, 1°01 AA tilc iA el u 1 1-
lc	MTU 011 af-E- gliVr-cl R4311E11°143
Fd	L° ell a 71E11 °1 AA Al el °1*
Pkt	& _):.. rii - 1 41 V °r (Pkt =
IA	t-fer'<1 49°11 dEl td V /14, Al x11711
Csiit	Vi t-IV-Lig-oilAi SIIT °1 1°-?-1-.,41 111°2°3-1- lookup A-1°-1°1-g-
N	Public Net. Y.131lc,1 1_1°9-1
n	--1. A1-°1 E-2°1 -& -1- (default = 1)
Nn	VPN°-1-81°1°1-t tq 12-°-°-1r

4P1-1g°-vi VPN * .1tl°°11 1.1°P.1E°
 e4L IP qlPRe110141 r211 Fb4L01-vPki 4A3°
 Epay,i:°?... -7-11-Y-161 2-1°- ;OA. 71-8-34-9-
 ti011 Al Al--R-4-1=- IP
 °11
 configured E1° Adl IP °.1111* °1°14 _
 , VPN E P%1-°- IKE 1-1°
 J-° 1-°0 g711(SA: security association)t11°14
 11°r°at 11°12-g. 711° 711119 _ _ E
 °44 91° VI 7°14°1 -71til
 • eol * O AH,
 ESP
 a..gs_oil
 144,
 -?14 Sul
 • CPU ARI HH H1*(°5 V°14711 11V°1° ,
 IPv6 V1°11A1slIPSec 011
 Al -I° J. a el eg IP Hi .1t 71 Al

°J 4 711 Al-⁵1 71 011 `01 a elt1- 1 %

VN

1-10¹¹71 E1 WeJX⁷⁰71 °J11*41
 0171 11 (P 71-³lal1Li91 1¹137-1- 01 °11
 4E-⁴ 4all11 1⁴4³²1- 41V :A14*⁹,14 ±¹¹1⁵1⁶1
 All=j- CPU A-I4 ffit- IP °,1111-A⁴011
 El 1-j o'-} VPN El o-7AO AI²-V-°1 IP al1L1 T7}
 LE 41⁴⁷¹¹ M el 1 -V- 1³1 El z %I
 -7 AI AI *V t1-711 z1⁷1 1-2--⁸1-%E1[17]
 ci'll1Mell°1•14 °J/-41.4 E 1V0¹
 a}71 4 uM1--1 el 11- %1 °II
 r-1²-1 1V_Z- 1-1V 1, Alel31-71 T1
 c'El AI tPI-S- Atetl-AI Al LIN1A1
 Ell 61 El⁹1 -4A1-1-1- 711-2-01
 °r1 Al al r0 Ell tj ti *(M)-a-El-
 SIIT ca-aelt-M
 McLotti-t All, Path MTU, 214-a1Ell
 -PrIT°11 111-E- ICMPv6, TCP, UDP
 4E1 (Pseudo Header) 4 4 *⁹-1 1³1*
 (Csi it)* -1-71--g- '014 tH16-201 •
 Ei Se 14 4711 51-1E- NGtrans 41-1°11⁹1
 VPN 71 Al 1³1011 r1101E1
 °1°11 --7-e1⁴⁷¹ 24⁶1
 o o >o}(N)°11⁹191 4²1--
 el a}4 Ul" • et-4-471--T.-71-V611 7-1-4- 1³1 :1.°11 t4
 t1-71 Tl V , VPN 011
 VPN
 71101E *1101 VPN M
 el 1 *el 1- V 71 1
 11°11⁷14-E-VPN Ao 1³1-2-(51
 , 41-1-
 VPN A-11Ad7H.E1-a-7 31-
 (1) -Tr cd 21
 -Tr ca -1.311^k1 V-a- IP 13] V-.01 3 71-
 71 VPN E.V 91 71 1³1*-g- El- VPN El
 9-1 rLi" 76' All 1¹1-R-(Chost)
 (Sh + M) * Pkt -2- ' ; , 1¹al-Vri-
 rd' 91/41-41 Ai el 9 1³1-4 °11 1E1--q
 15-el 41-¹J1t1-%-2-real
 LIMR-1391 T n 4.
 sl 4-?-q71- A⁶⁴ All H1 -2-
 (Crouter) I_ (Sh + M + Fd) * Pkt * Nn
 1 4°14 . 41-21 .t
 VPN z Tz z Al 4 V T 9171 1
 1:1461⁹1011
 1= r-1-. 1r ed 2'- VA all Al 4 VPN
 5-//V 111-&-a- 2⁷6¹41E¹ 4
 Vhth = 2*Chost + [N*v6*Irate
 2*v6*n*Irate] * Pkt (1)
 Vrtr = 2*Crouter + [N*v6*Irate
 2*v6*n*Irate] * Pkt * Nn (2)
 Vhtr = Chost + Crouter + [2*v6*n*Irate
 +N*v6*Irate] * Pkt * Nn (3)

Al 1¹1 *-&-- 44 qui- Vrtr Vhtr
 trc.¹⁻ 7.11°1-1°1 t-a⁻ 4
 1A1 1³1* 34-Ell °1 El⁹1 4-a⁻ 4°1
²r 5;1*- 1-1-E1-141-11 914. Vhtr 3-17- Vrtr
 0i1A-1 71-31.5.1..g_ 1
 1°11cd 1-7-t e-V-3-
 SP tr-f ;:- 4 °7111- VPN 7//°1*-//°1 14.1-¹7¹-1 r-Ft-
 1.2--E-⁷1- VPN 1-1-F-1-1&
 9)c4. 91 4 VPNLz F-4?)-91
 IPv6 cLLV 1-1-41-II-11 9.1a , IPv4 1 1-1¹
 71°1°1] al-#. Irate 4k0] 1⁵1 c-¹ 71 4
 1 Irate*(N + 2*n)*(v6* -1)1 11,1,-q-⁹1 194
 31°Al 1114.
 (2) Elzo
 El 6-to-6 over 4 91- 4-to-4
 over 6 9-1 cdV1611 144 11-1--,-4-71----"sta⁰¹⁰¹ Er}
 VPN 1 3 71-1 .-17-rz i H¹** 4914.
 _r-Ett El -4%¹ c⁻1°11-a- €1-€A011 44,
 RFC2893 [3]°11⁷1⁹-1- V°1 Router-to-Router (RtR),
 Router-to- Host (RtH), Host-to-Host (HtH)91 3
 7171 7-A.J.Y1c>IV T 9,14. 4 tilr-o' €*
 €Alt V-1°11AI -e--7AI-V°11 44 44-⁵1
⁶1²r-L 5,.q_Qurl, 6 over 4RtH⁹-1 Eli 4%¹s]
 t1- 14* 71-(=9_g_ F-1_17_E_
 VPN -7 1471 tll °I 4 4
 < 4>°11A1 El LA %Iu111-1-1--,-7,- 4
 VPN 471 *a}°1²14
 914. LV. 1 Al Al c'M 01A1-01 °JEN
 IPv4 Al4t1-711⁵1-11,
 71101€401 IPv6 L7₁-z L)
 e i 111-4'41 LI
 A1⁹P13*401.0.01 1-R-⁵1⁶17]-t.T.-
 ,v VPNE-Pj%,91
 °7-ciAltr..13-5-
 • El 4%¹ °M1-In
 VPN X⁷⁰ 1¹1*
 IPv6 island [22] _ .1311(Zil-a- IPv4 ocean [22]
 111 cj-z 911.11-J-0⁷4°1-T-t
 island 1-11V-⁵2I
 sg_ag101 1711 4
 Al a Al] 1-1--1 RtR
 1/111-1--1,-7,-9.-t- Configured Ella,
 6to4 E- Pa 111¹°1 914. RtR
 V.-ciW IP 11¹,44°N¹¹0¹1-a- 1-@-t1-111, 44-E
 1?_°11-1f-_- Altai island .1111°1,1°) IP
 cLi⁷ Ad -&- .71 RtR z 7-70 a All
 4-9-Eitt IP⁰¹¹ 11*41°IV_ V 7711 VPN
 Ella F-0¹.* VPN El
 °E11-41-⁹-1-⁹-1- 1³4 01⁹1011
 01'14 ill , E o 71°11 trl--E1³1 4-
 t1'1 t1-914

4>oll RtR4' J_EL¹, IPv4 91- IPv6
11.1?~13011Al t14-ZlcW 2*6*n*Irate +
N*Iratez¹+F-1¹-1131,E1V6⁹¹*V11¹⁵-1¹VPN
j sill ,*1 Chost Crouter 71¹11¹1⁵M
o 1 4⁷ri- E o 10
-4- ?-11a1?_1Eil oI - tit-g(Fd)1¹= 4⁷ 2¹1⁵14, Vhl
nao||~| 1-g'lc>1Vull^t 1Piz¹11tIVul¹.
0¹ t z--f²1⁰11A1 qtl'A⁴ 0¹AAT-Ir II/41-§-1¹
el o¹;11 Rellarl.4⁰1A,1⁰1¹1⁵171 allt7¹. 614.
EEC-, 1¹ *13 1471¹ Fd El
ad*IT o^hk1 5,171all⁷o11
tltNek4
VPN
11Vfd
Vrtr, Vrth - VPN
(Nn)^o11 if-14711⁰.*11⁰11A1⁹-1 le-1¹=1-g⁰14¹
9171 4E⁰11 VPN
a el

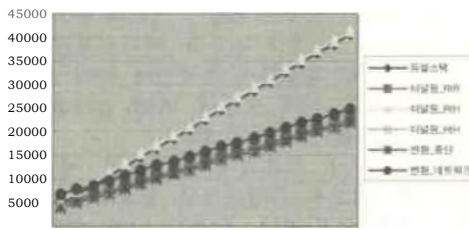
• E1¹4 %) HtR 2-r-S¹1⁷- VPN h_oul
HtR ocean .¹³11ri'l.P-qA1 IPv4 oI⁹r1*1
P-12.E.t IPv6 i s l and¹³11⁰.2:2--("A
1* 7-1 .5,1 all A^fs_i 11-1 oI L}. HtR oil
-12-51 6over4, DSTN,
ISATAP, 6t o4 El V0¹t^gl EP¹•e1⁰1 I*
51 i4 all rd⁴ 1¹-1g^rg⁴1³1,
4 4117}L-1¹ N¹.el uf-E- IP HI tl
oJ.⁵13}71 RI t¹.4 -7^{ho}'11¹ 4
1⁹.1³-zr' IP * 4=7} oJIM* 4⁰1 ;z¹.. %I* AI
IltR⁰11A1 -If- island o¹
o¹ o¹ IP ill 711¹ *11¹ a¹ T¹
III, /4⁵1⁶-1N 7¹
9-1⁴-El-7V⁰-1A¹it IP o¹,1111 1⁴_H z o^o1
u1171¹-1 4⁴41⁰11 DSTN
IPv6 Ei z eel (4 to 4 over 6)* 6over4 ISATAP
IPv4 V-0¹ (6 to 6 over 4)* Y^AJ
4>011A1 Ei 91-e: IPv4¹.11E-9¹ ag⁴31
AI⁰-M-ff
El 'd'o' uP1¹-1¹7i^o11 if1⁴ IPv4 IPv6 Lel T13
r^oV¹9,lr¹. IPv6¹-11:ff⁹13⁸V
oimAi v6*Irate*(n+N)+n*Irate
IPv4¹-11Esdaca ally 1 v6*N - n 1 *Irate "Li.
9¹ 4¹ s²1¹*-7¹11 VPN &zt-
V⁰1 -77⁷1¹V aH sil^fd⁴ 4^o1 E^o11 Ai⁹1 IP ul oil
al-E- tv^eN 'V¹-8.- v6 liq^fr9 4^o1* LI'EP& T 9.1.ut.
RtR 011A191- V-01 El de_ol *AI 4 Crouter,
Chost, Cip oll ull

• EN HtH VPN
11-E
HtHV6¹ AI^gV
oilAi9-11M-\$1 a.a.71-a¹;IMR-13.71 IPv4
V*. 1 IPv6 Eita^oa¹ t}
1¹ 0¹ NGtrans⁰11A1 ocean * -7⁹r
island -* .q* 41^o11 A¹

oJ. VI^a*1811 1¹91t¹11¹ 0¹ AI¹³,¹ , VPN
7¹O III T1all island .1111 tl:
Fd Lilt- Ai4Ai
E140 -01-4v01 •1.2= oil Al
44 4^o914.
(3)
44- El oII A¹17¹1¹-171¹(³1¹ tq
-m-WM^o43
7¹1 VPN ^o111g¹a¹
4= 2¹ Ell 9] 4 1 1 *¹S 7¹
a t¹1 %5;kul¹
5>⁶11 ti⁹-1 1 -R^N p^o11
4¹1¹-Prtl¹Vu^l. R^o1- 1A¹1 14¹: 1^o0.⁹-1
oII A¹ BIS⁹1- 1¹--1 Q^o1 4⁵1^o.
sl¹³1 . 2⁵²1 1¹1¹- 1T:5¹ 71-
Al⁶1⁹1 Gateway oll Ai NAT-PT 91- V¹11.-1¹
1-1¹-2-
71¹-1^o1 &2¹E9-1- 711⁰1 .-4¹11^o1 4¹4²E-
IPv4
1¹M1-1.3⁹1 IP¹³1 7¹1^o11 if1r4 xl (Irate)
011 Ella¹ 1v6- 11*N*Irate "al T
ulr. 2 ell , Vhth Vhtr 91 , trL1¹?¹: VPN
* 471 A¹t^o 01171¹-1^o11 4¹-
'1E¹ z eaf² 3¹al c't tau+. o¹11
ul~^o1 4³¹1⁵1 V

4. Araokili

VPN E.V31- uP1-1-1-t,-.1
oil AI¹³*i
VPN^{a1} 7¹1 oil ±_g-⁵1= APS
9-1 1¹-va 711-Z³1⁰:1^ho¹6⁶11¹01
e^gl^a Al '*?~11⁰1⁰_-&¹1¹1t1²⁴
Al 4⁰1¹A¹t¹ 1⁷.1²?..- 4.3^o11A. 7¹
4² 711¹S 'V. 4⁵r EP⁴%J T³1*
c01 Sh, Cip 711²J¹-Sh
191\$⁰1 Cip 91-7⁰1 .41±¹r-1^o1 Ap^c-r411 oil Ai
9¹ 1¹=1*⁰1⁹1^o11^o O¹, 4.t§1^o11 Melul-g¹
0¹ R7⁵1¹11-2^o11 Sh > Cip ti-711-E-
EEV¹ Ei¹deol oil Fd, M oil
tir J1¹.4 el Al c¹11-. 8¹
L¹11srli3 09101 VPN H Vol
El Al -^f trAtt¹t¹ 114⁰1 7¹ all Y⁰11 Sh 91-
CiP⁸1 * El¹ - oA⁹1 it



1 2 3 4 5 6 7 8 9

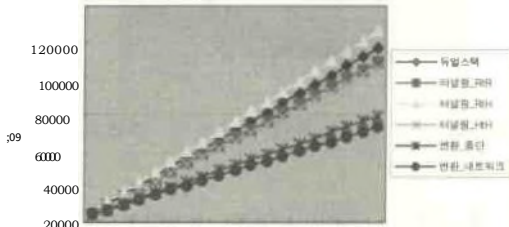
10111213141516171819
t814.0

[= %¹ 4] Ad² 6 = 4¹ (N) * 7¹ Al Thai R Lz 4⁻¹ 2-

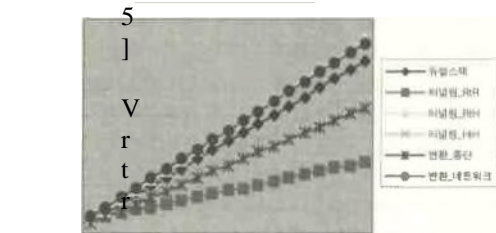
[a; 4] 9¹ - V⁰ 1

(Irate) P_ E-1161E1Me]111.a-61)°=01
 °1⁻¹ 14.MATO.7-1A11r1⁰1E1
 *⁰11 °,14A1, sit r-1 1¹ *⁰11
 LEFE °1
 • °1⁹ °11 °g4-A⁻ Ti °c,14⁷1⁻
 • *⁰11A1 *°d 37f11⁻
 EI⁻¹ 413 I-1(1)(3)⁹1 IA% L¹ °11 44
 IPv6 (Zi T, IPv4 011 ti1t11 111-\$-01
 1 Irate*(N + 2*n)*(v6*⁻¹)1°171 °Wei] IPv6
 °T t¹ 4⁻ 4⁻(N)⁹1⁻ Irate *7¹E. °1t1⁻
 A1⁰1⁰11 t.1-1= '4⁰1E11 0

7¹ 0¹¹
 9¹¹ EI ft



3 5 7 9 11 13 15 17 Pi
1¹* &AM .9(N)



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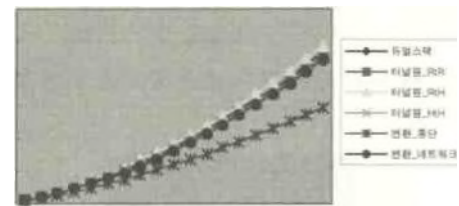
[_a 61

071⁻Al Vrth¹¹1-g-

J_°1T⁻g- 9,14. Iv6⁻11>o °J;
 ,Irate⁻671.°11 44.°126=Al i.1°11 r41
 al 471- 3711 VS*²1⁻ 91-g'S eq 9.14.
 dal Vhth 91⁶1Al 1.91¹7,1⁻
 all El id ed⁻a⁻7⁻Ad t⁻t⁻9¹-1⁻41E¹M 41⁷ii

-3-71 °Jt11 EP4e03t11 71- %-a- *714a-
 914.
 [5, 1171A1 VPN 11*
 4414117- 914. 7171 Alt-)J
)a.v 47} 711 Al 5P1--t- Vhth
 • °1 71 'CY'. °11, E1°11A1 1°J.
 °1 R}- al 51 'n1 xl 491_9_4, 1311°11 4E_
 0] 9-1011 ul4 *714°11 91°1A1
 *71-°11 IV * 1g1
 4 Vrtr, Vrth VPN 071-V 4,
 • ELA11 41E11A174IVN
 HLY011
 441417 914.
 [gyp 5, 6]°11A1_all *71- -1=-07:-
 -g- ,r`d-11°-11-°1 1-1- v6
 1T°11 Al ,EP4 Vrtr, Vrth -1•J°11)-1
 91* lt-P1?-1°11 91t1: t711011 -g1
 °3-17.1-R V" at 9/ A- -a- V__ al sig. timA
 011A1 31* ullA-1-1*(if. 2-2)91
 fai3 51

300000
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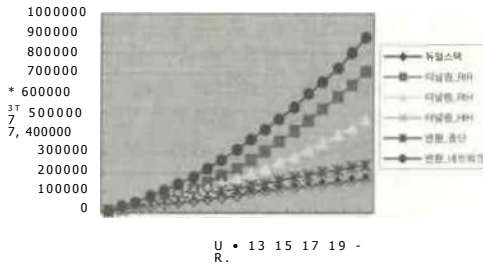


T9 11 13 15 17 19
 54215104fd

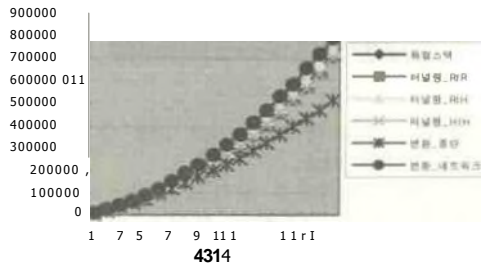
[-u-!E1 71 Re11-211.E11°1,4(Fd) 071-A1 Vrtr

011A1 M°1-g- 914. .x214
 • 61°11A17. e,t1.52_131, 011-1-
 Vrtr 7°4.A1 111141-1g- 111-A1
 AITIV EIV°1 -X0 5171 ITIP1°14. ffit, Vrtr 91
 1714°1 u1141-1-
 AcJcL VPN 1AJ 4%71 1E°14.
 • 131171-1*91 Vhth 71 *c1°1 VPN -a- -T" A_j
 V 1 1-11-1a°11A1 -I-11°11 44 4*
 VPN DIV VPN
 Ao1 471 Mt AIV4 HL °1.-7-011 91z11
 H1-R471 fr a 914.
 71r Fd 11* 071A1 2-*S1 01.44-47112
 .to=1--_17_93,4. Fd Csh, Cip 91-91
 7171-17- 914. Fd F-1 IP ill
 11~a11°1 14°11A1°1 PMTU discovery [231
 **on 141V *71 Al Fd = fc * Pkt 91 Al*
 fc MTU-91 A1°12°11 4E- a_o_g. IP °111iA°1
 011A] PMTU discovery 71- a11,
 41V°1 *71V4-4 41-12°1
 4E1-1-11Z- Vcl-. Kru 71- 7f-ie°11
 919.1 371 -a7_761910.1 59s-i-T_ Ill fc1=1`Vol'g
 4=71 V4. ffit i_1311a.,11.E1101),4_01 -1-71-V -1=4
 41V°11 Csh, Cip wl rft1

711 , VPN Vrtr, Vrth
E1 t-K-1_es] ell A1 Csh, Ci pE-1
ttt}71 Fd
Di17}1-1*9-1 L1 1 til-R-01 J.
°li 91-g-4 914 01 ALI °1
7f 1,1°11 14MR-13 7g_
•_E.011 M --
L 91
[8, 9, 10]011A11=-_*) *7111 urW-
1144- 14F-101-77- Vg. LiMliq a Ai 71
-10°1A , [au,±1 8, 9]°0
1=1]



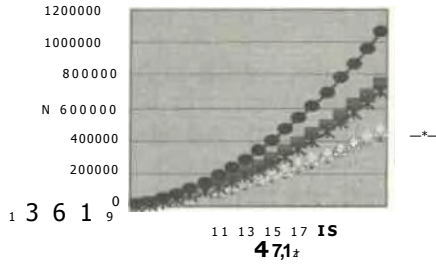
[.a 8] ffKI--(pkt) *71011 Vhth 111



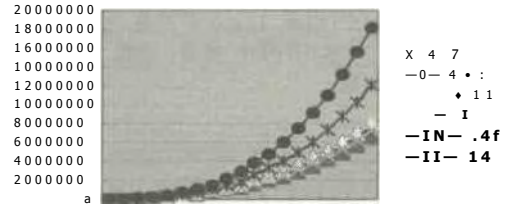
[.a 9] (pkt) -1'4°11 Vrtr 11-g-

7] 91--t- 417,1°1 *7f A1 %--° FA
111-8--°1 *7114 J-c1;--1/- 9114. Vhth
ri14°1 '117.! °1 Fd
71- 071-tl-cri 31 -R-51 c>i
' till, Cs i i t 91- Al Eild Al Al zl Al 44
I-2 M d V-1=7} -1-71-t1-71 allt1°1
[I-3 91011A1 L Vrtr 011 H z o_RtR
14°11 *71- Al :! 114°1 T El z tq-9-1
Tai AI c",111*4°1)A-7-1 VPN
-q-5171 4-7-.011 E P'ded
914. 10]1 Vrth NLqoil
EiWed_RtH, siAol
61-41.52._q 1-1-q1-111-7 V**
Lel olt-1H tde,-LRtR ara-A- 112711 oil WI}
El 1%1 1°11 r-11'a1-01 4_1 -91 71I
°) 011 VPN 4-1471 all
°) El.

[°I VPN *71-91. t1-#11
41 461 *71-V 14-91 M u11111-4
9,1P-1 417,14(0)1 *71-1.1°11 al-
VPN tilt]) alb zo-71-z-
4-E1-1-1131 914.
VPN
19A 4 4-E1-1-11:a 914. 9171-7,1- 38-1011 9101



[a] 10] 41V2-r(pkt) 071-°11 rri-E Vrth 1114-



[L 11] 4:P1- VPN 1°-71A1 Vrth 111

Csh > Csiit Vali Csiit
71- *714 a 1=1,t- laiML-1* R L oil
A1°1 ill 1jg1-71-
VPN `4- 7AA' all, Csiit 011 Ai Al-451
SI IT Vdle-i-t-si "Pg-si '1e1
silqV 47,1°1 ----7 1°15117: kiAd
Al 1_11 VPNeI 114-4 tj-
3 1111 all 71 91*
4- 1-1-F-1-1-1-1 914. Alf °191-91 ,;-cd 2=q
E11'd ed_Rth 91- V R- Al q
VPN 1°0471 5°.°1
AI E- 141
9,1-g-t- 4E1-1-112 9,14.
A1frA°19_ E' Pd o 171-1-1*°11 A'I
VPN -R-1°1 qtleel-91 9.1
, all 1-1-1 VPN LA AI AI
tug oil 91 811A1 VPN H1-2-1
4 -7= 7),1 EEt- xflal,lop,4
01 E1%) c'1101E1
VPN 71°1 tll M al
1318°1 *71-q4 4E14 914.
oil AI IP c',11.1*-dl 01 AAA- VPN H Ld

Fd 417,1-eli 071-4 LE 4=13.
E11°,2°11 n}4 .lt_ -`11 AIPI 19i 71--a 71-1
_9_711 14eji, E--
NV- 1 sr)- IPsec W4E-Ea *4 IP °PA* 1
01)A-g- r1P-1V- 1T, E-Pdaol q°11
44 Vhth o 4- 2*Ci p*Pkt, Vrtr Vrth
2*Ci p*Pkt*Nn 131-g- T.
41171-1-1-Z N4.11 4'3,1 111-g-(Csi i001
71-t1-0 tra- Al*V 111
sr'l a lr_ * c).i , Ll z VPN 511.4
1.1_1^1/P1^-1] °I1 t1:1 E:4 -T-°- 1- 1^-71^4a^- d
is -°1 APd a- 7-
Ad tl- 1 * &1 AI TIA VPN -a^- -Y-1 9171 III
&INF1°i 071^91- 11^1=11
tqz1 .V_°1+
VPN °I1 EII St-
44 1.115-1°1 .-c,151°1z1 T °Jul-
1 tj- IP 131
o°ka} 7° OI -17--F15161 , Vhth ca 1-Or
1 P-1 oil Al sl 1',11-1-N 4 Al
ojt)-a, Vrtr, Vrth V oTi Eft 111171^-1-1 -°;-
0 la 341 * V- -a- aT-- tl-
7;1°1 N 413112- 1--A-1°1u1-.

5. gS

13111-1--1,-.1 44 VPN AI
1* --,1, 4%4. 1-g-
H1*°: VPN 3,1 AI 4 'col- _€
g- °II 4-E 1AI 511-a- Cf: ql
AI V^21: 9,14. EEV- r-iE- IP t^1°11A1
VPN z -YAW] R-Itj IPsec
moo, 71:al 1111^-1-T°1 lit11511
ho -a- +144 11-4. of
0]] VPN 5^1-1°1 al 4-11
AI*F11°IM -a^- -g-t11 , VPN E1 zo 311- IP °PA
*4 °PA °111^-1-1
-90], 11171^-1-1*°11 VPN
Ala}
7- Al-V- c.11 4 4 , VPN 3a p Lz5 v1V.
a4-11^urZ 521 ia 711
t1 44:= ed -3- *4 1. VI -a
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[1] HyLn-Ku Ken, et. al., " A Study on PSec Possbity of Adaptation in Pv6 Transition Mechaniiir7 ", Proceecfngs of the 19th Korea hformation Processing Sodety(KPS) Sprng Conference, May 2003.
[2] Naganand Doraswany, "Psec", Prentice Hal, 1999.
[3] Fangzhe Chang and Dariel G. Waddington, "Realithg the Transition to Pv6", EEE Communications Magazne, Jule 2002.
[4] Gigan, R. and E. Nordmark, "Transition Mechanisms for Pv6 Hosts and Routers", RFC 2893, August 2000.
[5] Tsrtsis, G. and P. Srstresh, "Network Address Translation-Protocol Translation (NAT-PT)", RFC 2766, February 2000.
[6] Nordma21-, E., "Stateless P/ICMP Translator (SIT)", RFC 2765, February 2000.
[7] H. Kitamura, "A SOCKS-based Pv6/Pv4 Gateway Mechanism", RFC 3089, Apri 2001
[8] J. Hagino, K. Yamamoto, "An Pv6-to-Pv4 transport relay translator, RFC 3124", Jme 2001.
[9] Seungyun Lee et al, "Dual Stack Hosts usng "Bump-n-the-API"(BIA)" <draft-ietf-NGtrans-bia-01.txt>, November 2001.
[10] K. Tsuchiya, H. Figuchi, Y. Atarashi, "Dual Stack Hosts usng the "BUMP-h-the-Stack" Technique (BIS)", RFC 2767, February 2000.
[11] A. Durand, "Pv6 Tunnel Broker", RFC 3053, January 2001.
[12] Jrn Bound et al., Dual Stack Transition Mechanism (DSTM), <draft-ietf-NGtrans -dstrn-05.txt>, November 2001.
[13] Fred L. Tempin, "htra-Site Automatic Tanel Addressing Protocol(ISATAP)", <craft-ietf-NGtrans-isatap-02.txt>, November 2001.
[14] Marc E. Fiuczynski, et. al., "The Design and Implementation of an Pv4/Pv6 Network Address and Protocol Translator", USENX Annual Technical Conference, Are 1998.
[15] Sheral Zeadaly, et. al., "Impact of Pv6 on End-User Applications", EE/EEE International Conference on Telecommunications (ICT 2003), Tahiti, Papeete, French Polynesia, February 2003.
[16] Sherai Zeadaly, et. al., "Evaluating Pv4 to Pv6 Transitin Mechanisms", EE/EEE International Conference on Telecommunications OCT 2003), Tahiti, Papeete, French Polynesia, February 2003.

- [17] J. J. Pai, "P 711g Oi1A1²1 VPN Il=c1¹T,G11 ,E)Q1 Xi1 26a1 114, 2001.
- [18] Jul fV1URAI, et. al., 'Performance Evaluation of Data Transmission Ushg PSec over Pv6 Networks", 1NET 2000, July 2000.
- [19] Takefumi Yamazaki, et. al., "Appication Performance Analysis n Transition Mechanism from Pv4 to Pv6", M/S2000, Japan, February 2000.
- [20] V. Ganapathy, et. al., "Pv6 Performance Analysis on FreeBSD Workstation Ushg SFnple Appications", ASIAN 2000: 6th Asian Computing Science Conference, Penang, Malaysia, November 2000.
- [21] Perkhs, Charles E. "P Encapsulation within P", RFC 2003, ETF, October 1996.
- [22] R. Caton, D. Haskh, "Routh Aspects Of Pv6 Transition", RFC 2185, September 1997.
- [23] Mogul, Jeffery, and Stephen Deerhg, "Path MTU Discovery". RFC 1191, November 1990.

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