



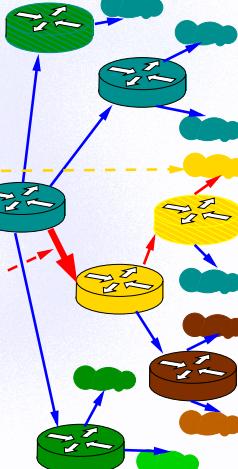
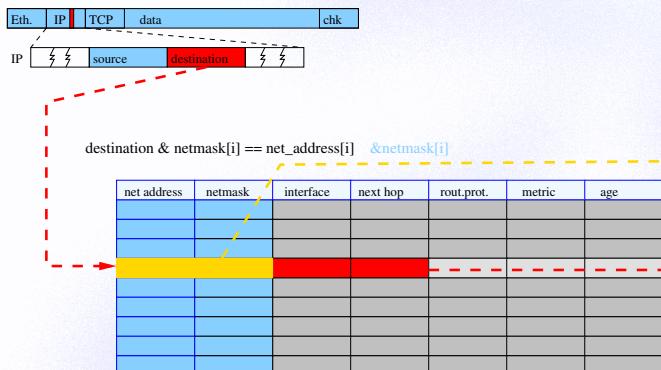
Plan wykładu

Sieci Komputerowe

Rutowanie statyczne i dynamiczne

mgr inż. Jerzy Sobczyk

Routing



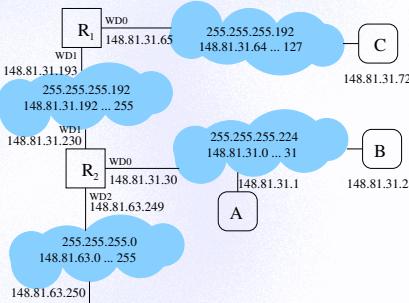
Tablica routingu

Kernel IP routing table						
Destination	Gateway	Genmask	Flags	Metric	Ref	Use Iface
194.29.132.64	0.0.0.0	255.255.255.252	U	0	0	0 eth0.51
194.29.164.160	0.0.0.0	255.255.255.224	U	0	0	0 eth0.330
194.29.168.224	0.0.0.0	255.255.255.224	U	0	0	0 eth0.203
194.29.164.128	0.0.0.0	255.255.255.224	U	0	0	0 eth0.300
192.168.22.0	0.0.0.0	255.255.255.224	U	0	0	0 eth0.419
194.29.170.0	0.0.0.0	255.255.255.192	U	0	0	0 eth0.610
194.29.160.64	0.0.0.0	255.255.255.192	U	0	0	0 eth0.727
194.29.164.192	0.0.0.0	255.255.255.192	U	0	0	0 eth0.310
192.168.48.0	0.0.0.0	255.255.255.0	U	0	0	0 eth0.301
192.168.49.0	0.0.0.0	255.255.255.0	U	0	0	0 eth0.741
192.168.5.0	192.168.1.15	255.255.255.0	UGD	0	0	0 eth0.120
192.168.4.0	192.168.1.14	255.255.255.0	UGD	0	0	0 eth0.120
192.168.3.0	192.168.1.14	255.255.255.0	UGD	0	0	0 eth0.120
192.168.2.0	192.168.1.15	255.255.255.0	UGD	0	0	0 eth0.120
192.168.1.0	0.0.0.0	255.255.255.0	U	0	0	0 eth0.120
192.168.15.0	0.0.0.0	255.255.255.0	U	0	0	0 eth0.715
192.168.14.0	0.0.0.0	255.255.255.0	U	0	0	0 eth0.717
192.168.17.0	0.0.0.0	255.255.255.0	U	0	0	0 eth1
192.168.31.0	0.0.0.0	255.255.255.0	U	0	0	0 eth0.120
192.168.60.0	0.0.0.0	255.255.252.0	U	0	0	0 eth0.722
192.168.176.0	0.0.0.0	255.255.248.0	U	0	0	0 eth0.790
0.0.0.0	194.29.132.65	0.0.0.0	UGD	0	0	0 eth0.51

Przykład sieci z dwoma routerami

Router 1					
Destination	Subnet Mask	Next Hop	Metric	Interface	
148.81.31.64	255.255.255.192	148.81.31.65	0	WD0	
148.81.31.192	255.255.255.192	148.81.31.193	0	WD1	
148.81.31.0	255.255.255.224	148.81.31.230	1	WD1	
0.0.0.0	0.0.0.0	148.81.31.230	2	WD1	

Router 2					
Destination	Subnet Mask	Next Hop	Metric	Interface	
148.81.31.0	255.255.255.224	148.81.31.30	0	WD0	
148.81.31.192	255.255.255.192	148.81.31.230	0	WD1	
148.81.63.0	255.255.255.0	148.81.31.249	0	WD2	
148.81.31.64	255.255.255.192	148.81.31.193	1	WD1	
0.0.0.0	0.0.0.0	148.81.63.250	2	WD2	



Tablica routingu

Destination	Subnet Mask	Metric	Next Hop	Type	Protocol	Age	Index
0.0.0.0	0.0.0.0	1	148.81.98.50	Indirect	Local	1242850	2
148.81.29.0	255.255.255.0	1	148.81.63.245	Indirect	Local	1242850	1
148.81.31.0	255.255.255.0	1	148.81.63.249	Indirect	Local	1242855	1
148.81.63.0	255.255.255.192	0	148.81.63.62	Direct	Local	1242865	3
148.81.63.64	255.255.255.192	0	148.81.63.65	Direct	Local	1242865	4
148.81.63.224	255.255.255.224	0	148.81.63.250	Direct	Local	1242865	1
148.81.64.0	255.255.255.0	1	148.81.63.248	Indirect	Local	1242855	1
148.81.64.248	255.255.255.248	1	148.81.63.126	Indirect	Local	1242855	4
148.81.65.0	255.255.255.0	1	148.81.63.243	Indirect	Local	1242855	1
148.81.68.0	255.255.255.0	1	148.81.63.244	Indirect	Local	1242855	1
148.81.70.0	255.255.255.0	2	148.81.98.53	Indirect	Rip	25	2
148.81.71.0	255.255.255.0	3	148.81.98.52	Indirect	Rip	50	2
148.81.72.0	255.255.255.0	1	148.81.63.246	Indirect	Local	1242855	1
148.81.88.0	255.255.255.0	2	148.81.98.53	Indirect	Rip	25	2
148.81.98.0	255.255.255.0	0	148.81.98.51	Direct	Local	1242865	2

Tablice routingu

dss<jurek>(133)\$ netstat -rn

Routing Table:					
Destination	Gateway	Flags	Ref	Use	Interface
127.0.0.1	127.0.0.1	UH	0	1039362	lo0
148.81.31.0	148.81.31.27	U	3	14205	le0
224.0.0.0	148.81.31.27	U	3	0	le0
default	148.81.31.30	UG	0	13078	

Routing Table:					
Destination	Gateway	Flags	Ref	Use	Interface
127.0.0.1	127.0.0.1	UH	0	9790	lo0
148.81.64.64	148.81.63.248	UGH	0	0	
148.81.65.64	148.81.63.243	UGH	0	0	
148.81.31.0	148.81.63.249	UGH	0	0	
148.81.63.32	148.81.63.250	UGH	0	0	
148.81.64.96	148.81.63.248	UGH	0	0	
148.81.31.224	148.81.63.249	UGH	0	0	
148.81.63.224	148.81.63.254	U	3	21336	le0
224.0.0.0	148.81.63.254	U	3	0	le0
default	148.81.63.250	UG	0	39701	

Polecenie – route

route [-fn] add | delete [host | net] destination [gateway[metric]]]

-f – opróżnij tablice routingu

-n – wyświetl adresy a nie nazwy

destination – numer maszyny/sieci

gateway – adres najbliższego routera

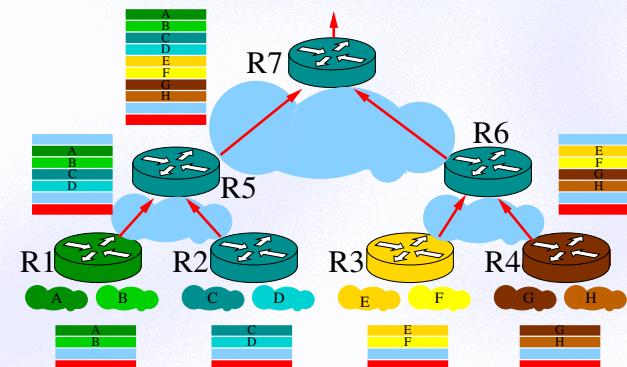
metric – koszt (odległość)

Polecenie – netstat

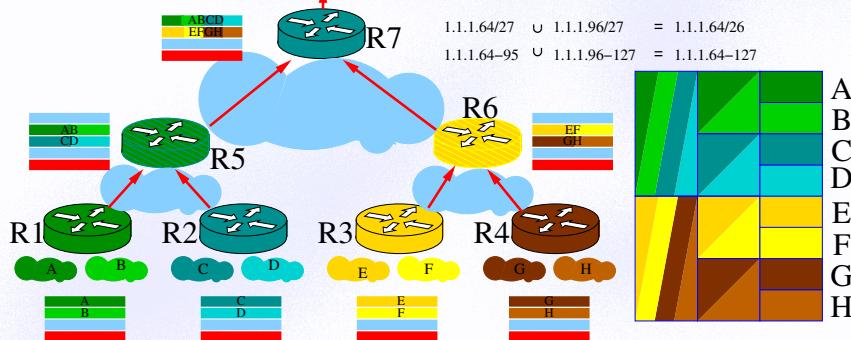
netstat [-rnpsv]

- r – wyświetl tablicę routingu
- n – wyświetlaj adresy a nie nazwy
- s – wyświetl statystyki
- v – wyświetl obszerniejsze informacje

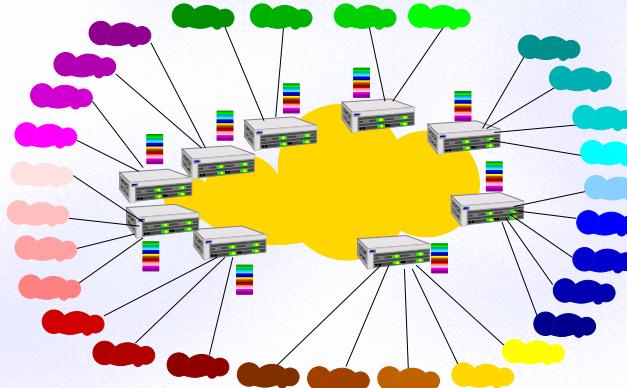
Trasa domyślna



Supernetting



Sieć dostawcy internetu



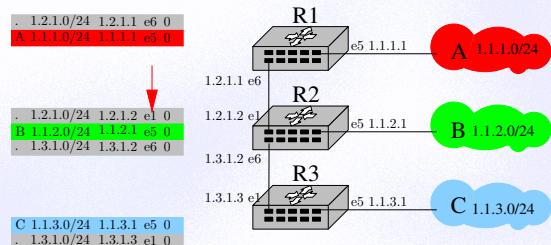
Nowy klient



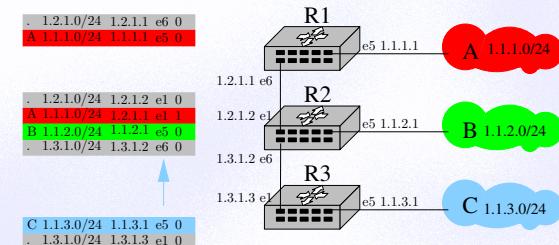
Protokół RIP

- Routing Information Protocol
- Distance vector algorithm.
- Pierwsza publikacja: Ford, L. R. Jr., and Fulkerson, D. R., "Flows in Networks", Princeton University Press, Princeton, N.J., 1962.
- Stąd określenie algorytm Forda-Fulkersona.
- Oparty o równanie Bellmana.
- Stąd określenie: algorytm Bellmana-Forda.

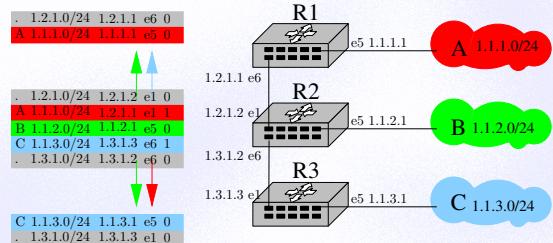
Protokół RIP - rozgłoszanie 1/4



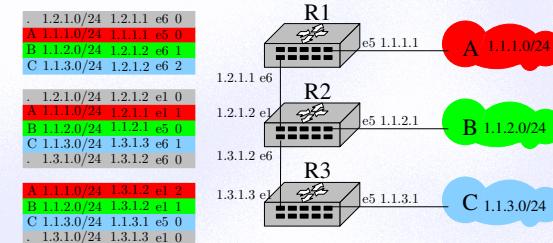
Protokół RIP - rozgłoszanie 2/4



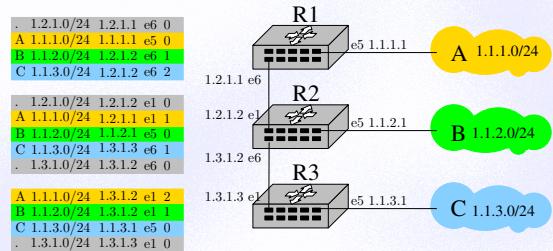
Protokół RIP - rozgłaszań 3/4



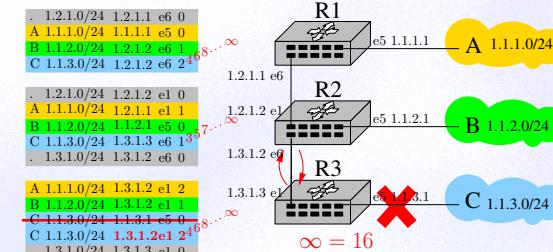
Protokół RIP - rozgłaszań 4/4



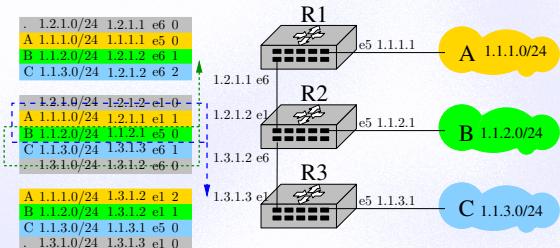
Protokół RIP - tablice routingu



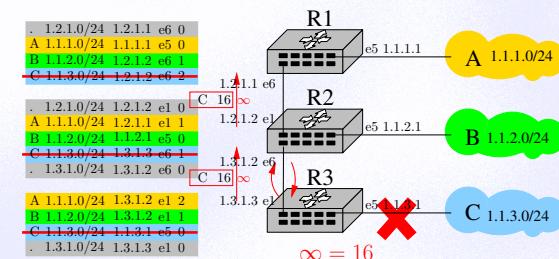
RIP - zliczanie do nieskończoności



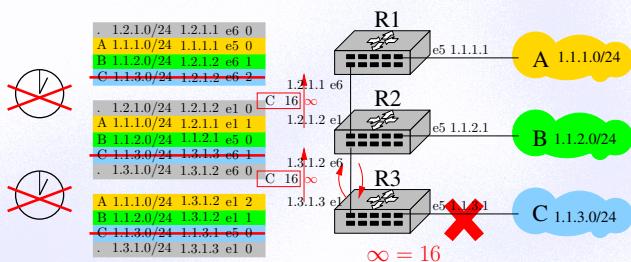
RIP - split horizon



RIP - poisoned reverse



RIP - triggered updates



Protokół RIP v1 i RIP v2

0	1	2	3
command	version	zero	
address family	zero		
IP address			
zero			
zero			
metric			

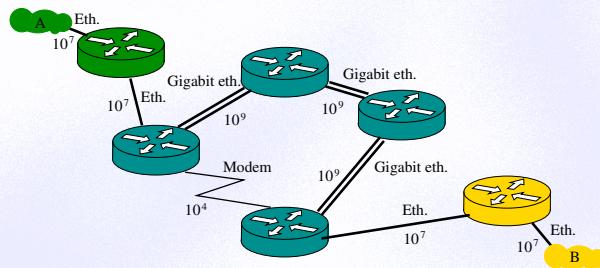
RIP v1

0	1	2	3
command	version	zero	
address family	route tag		
IP address			
subnet mask			
next hop			
metric			

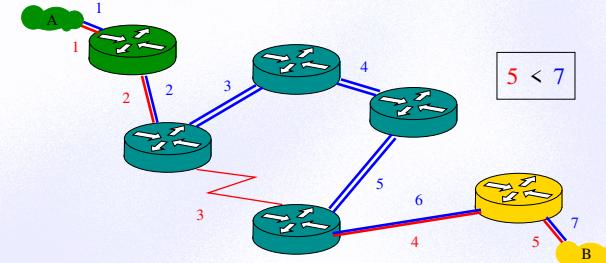
RIP v2

0	1	2	3
command	version	zero	
0xFFFF	authentication type		
Authentication			

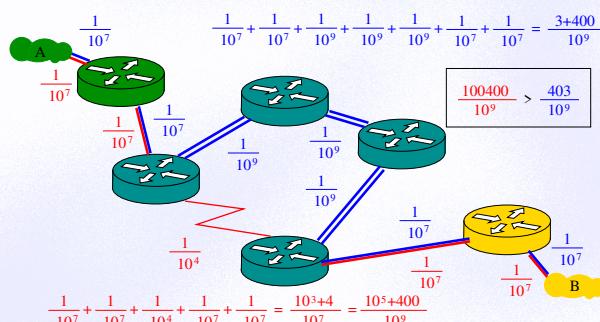
Porównanie metryka - koszt



Metryka

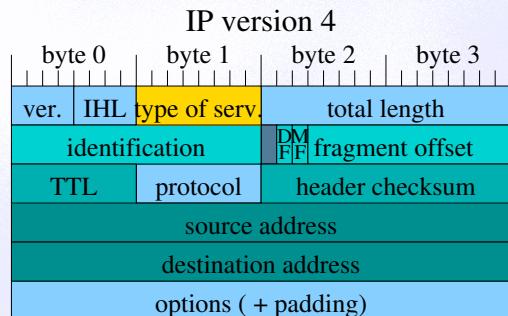


Koszt



Równoważenie obciążeń

Nagłówek protokołu IP



Type of Service / Diff. Serv.

RFC 791 1981.09 std.
prec. D T R 00

D = 1 – low delay
T = 1 – high throughput
R = 1 – high reliability

prec. = 0 – best effort
prec. = 1 – priority
prec. = 2 – immediate
prec. = 3 – flash
prec. = 4 – flash override
prec. = 5 – critical
prec. = 6 – internetwork ct.l.
prec. = 7 – network control

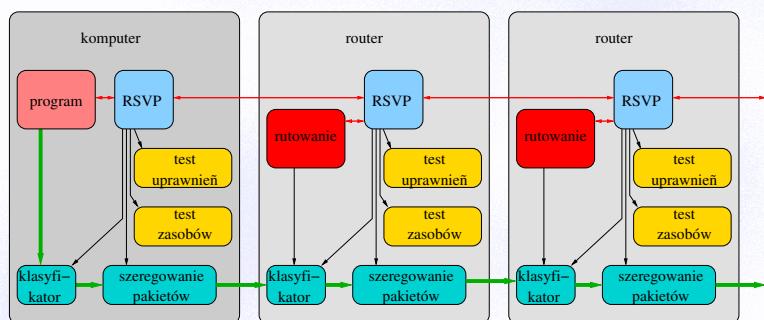
RFC 1349 1992.07 prop.std
prec. TOS 0

TOS = 1000 – minimize delay
TOS = 0100 – maximize throughput
TOS = 0010 – maximize reliability
TOS = 0001 – minimize monetary cost
TOS = 0000 – normal service

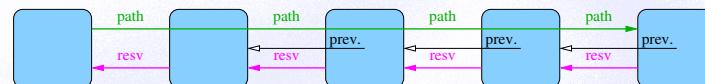
RFC 2474 1998.12 prop.std
RFC 3168 2001.09 prop.std
DSCP ECN

DSCP – diff.serv.code point
ECN – explicit congestion notification

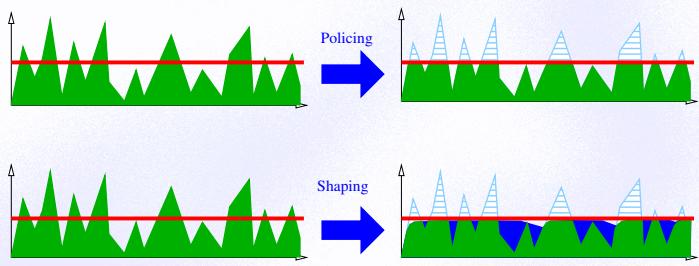
Resource ReSerVation Protocol - RSVP



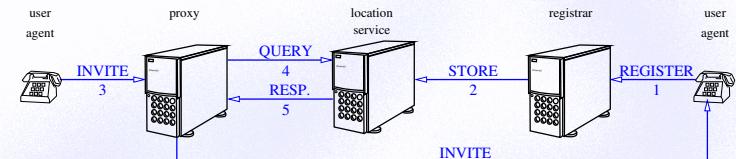
Działanie RSVP



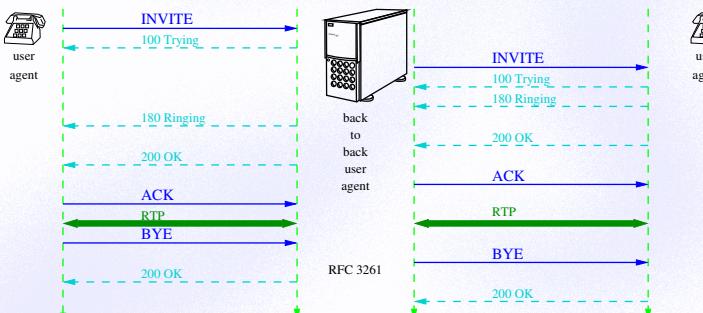
Policing vs. Shaping



Session Initiation Protocol



Session Initiation Protocol



Metody kolejkowania





Dziękuję za uwagę

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