



La Sapienza

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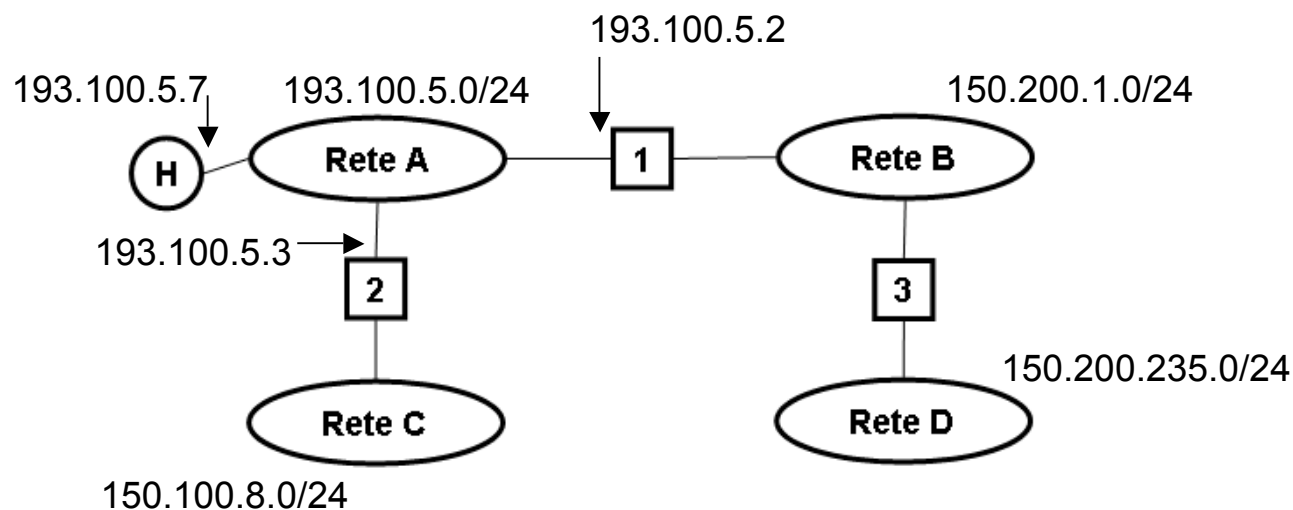
Computer Networks II

Exam of 11/02/2009

Solutions [sketch]



Question 1.a – address assignment to subnets and routers



Net	Address	Mask	Router	Address
Net A	193.100.5.0	255.255.255.0	Router 1	193.100.5.2
Net B	150.200.1.0	255.255.255.0	Router 2	193.100.5.3
Net C	150.100.8.0	255.255.255.0	Router 3	?
Net D	150.200.235.0	255.255.255.0		



Question 1.b – routing table compression at host H

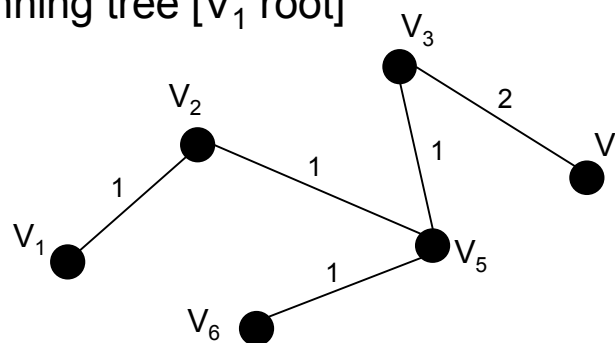
Destination	Mask	Next hop
193.100.5.0	255.255.255.0	-
150.100.8.0	255.255.255.0	193.100.5.3
150.200.0.0	255.255.0.0	193.100.5.2



Question 2.a – application of Dijkstra’s algorithm

Step	T	L(2)	Path	L(3)	Path	L(4)	Path	L(5)	Path	L(6)	Path
1	1	1	1-2	∞	---	∞	---	∞	---	4	1-6
2	1,2	1	1-2	4	1-2-3	∞	---	2	1-2-5	4	1-6
3	1,2,5	1	1-2	3	1-2-5-3	6	1-2-5-4	2	1-2-5	3	1-2-5-6
4	1,2,5,3	1	1-2	3	1-2-5-3	5	1-2-5-3-4	2	1-2-5	3	1-2-5-6
5	1,2,5,3,6	1	1-2	3	1-2-5-3	5	1-2-5-3-4	2	1-2-5	3	1-2-5-6
6	1,2,5,3,6,4	1	1-2	3	1-2-5-3	5	1-2-5-3-4	2	1-2-5	3	1-2-5-6

Question 2.b – Spanning tree [V_1 root]



Question 2.c – OSPF



Question 3.a

The anomaly occurs due to false routing information received at node B from C; this information concerns a non-existing route offered by C towards destination, which in fact traverses B itself and is due to a convergence delay of the algorithm.

In order for the anomaly to occur it is necessary that A's and C's routes towards destination use link BD and thus router B. it can be easily seen that this can only happen if $x \geq 3$.

Please check what happens for $x = 1$ and 2



Question 3.b

When link BD breaks, router B sends triggered updates to A and C. meanwhile, it may happen that routers A and C send periodic updates to B, which still do not take new network conditions into account and, therefore, announce a spurious route to destination network. Inviino a B un aggiornamento periodico che ancora ignora le nuove condizioni della rete e che si riferisce, pertanto, ad un percorso fittizio verso la rete di destinazione [a route that traverses B itself]. This circumstance causes the anomaly.

If instead B's triggered updates are processed by A and C **before** the timeout to send periodic updates expires, the 2 routers will recompute the route towards destination [A will route towards C and C towards D] and will send triggered updates to B. in these conditions, routers will use real available routes even with $x \geq 3$ and the anomaly will not occur.



Quesito 7

1. H sends a STUN [**binding request**] message to the remote STUN server using as source port the local UDP port that will be used by SERVICE; the STUN server's reply [**binding response**] contains mapping information containing the information on the mapping [SERVICE_PUBLIC_IP, SERVICE_PUBLIC_PORT]
 - STUN uses UDP, hence the request itself will cause the creation of an entry in the router's NAT mapping table [which was initially empty]
 - The STUN server's reply is important to verify the hypothesis on the implemented NAT type
2. H starts SERVICE on local UDP port
3. H broadcasts on the Internet the information SERVICE_PUBLIC_IP and SERVICE_PUBLIC_PORT, using the SERVICE_PUBLISHING_PROTOCOL to this purpose.
4. H periodically sends "keep alive" packets, so as to ensure the permanence of the NAT binding even in the absence of traffic to or from SERVICE
 - Keep alive Packet destination might be the STUN server but also any other host in the Internet [since the NAT type is full cone]
 - A less efficient alternative is to use periodic STUN requests as a keep alive mechanism