

Influence of Root & TLD Servers on DNS System Performance

tilde



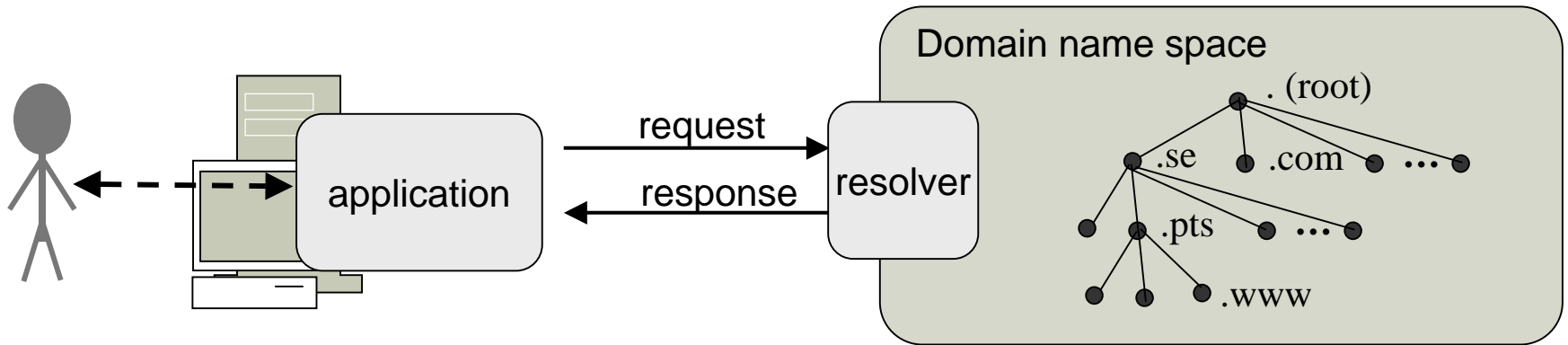
RIPE 2003-05-12
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.se

Goal of these tests

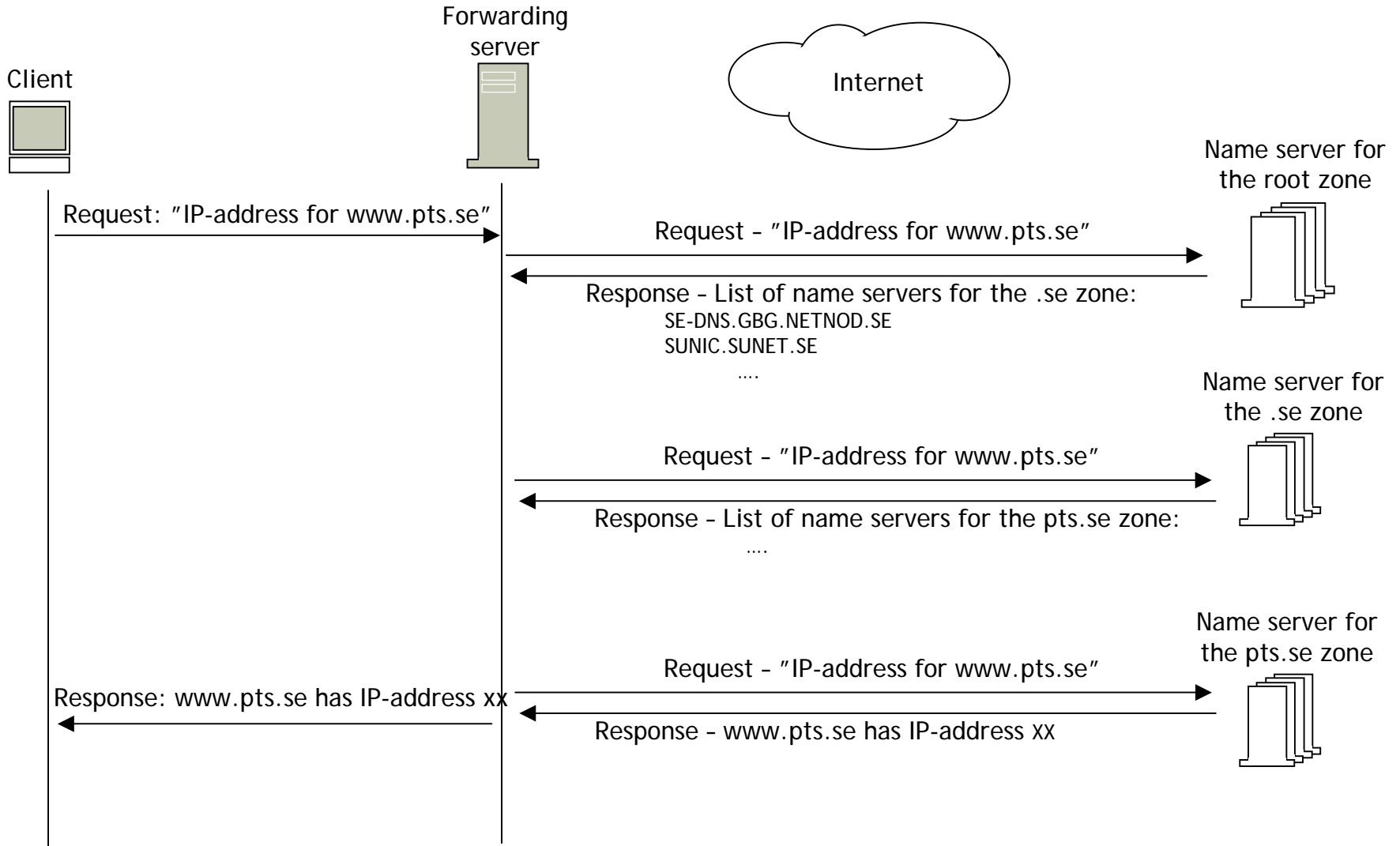
To investigate how the DNS service behaves and what the consequences are for the end-users when servers at .se or root level is subjected to stress and inconsistencies.

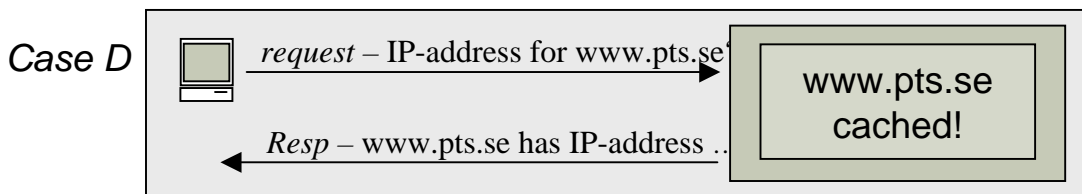
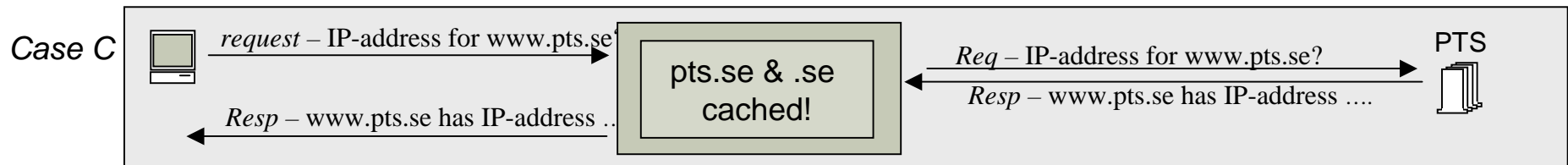
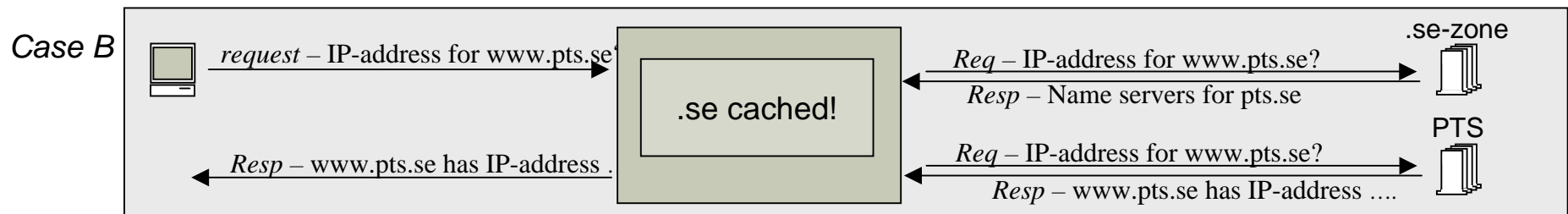
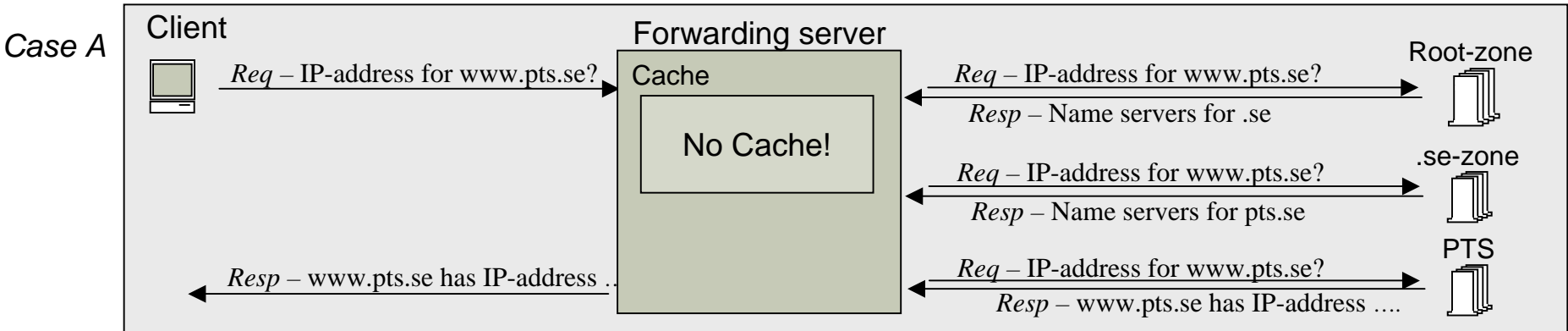
DNS from a users point of view (RFC 1034)



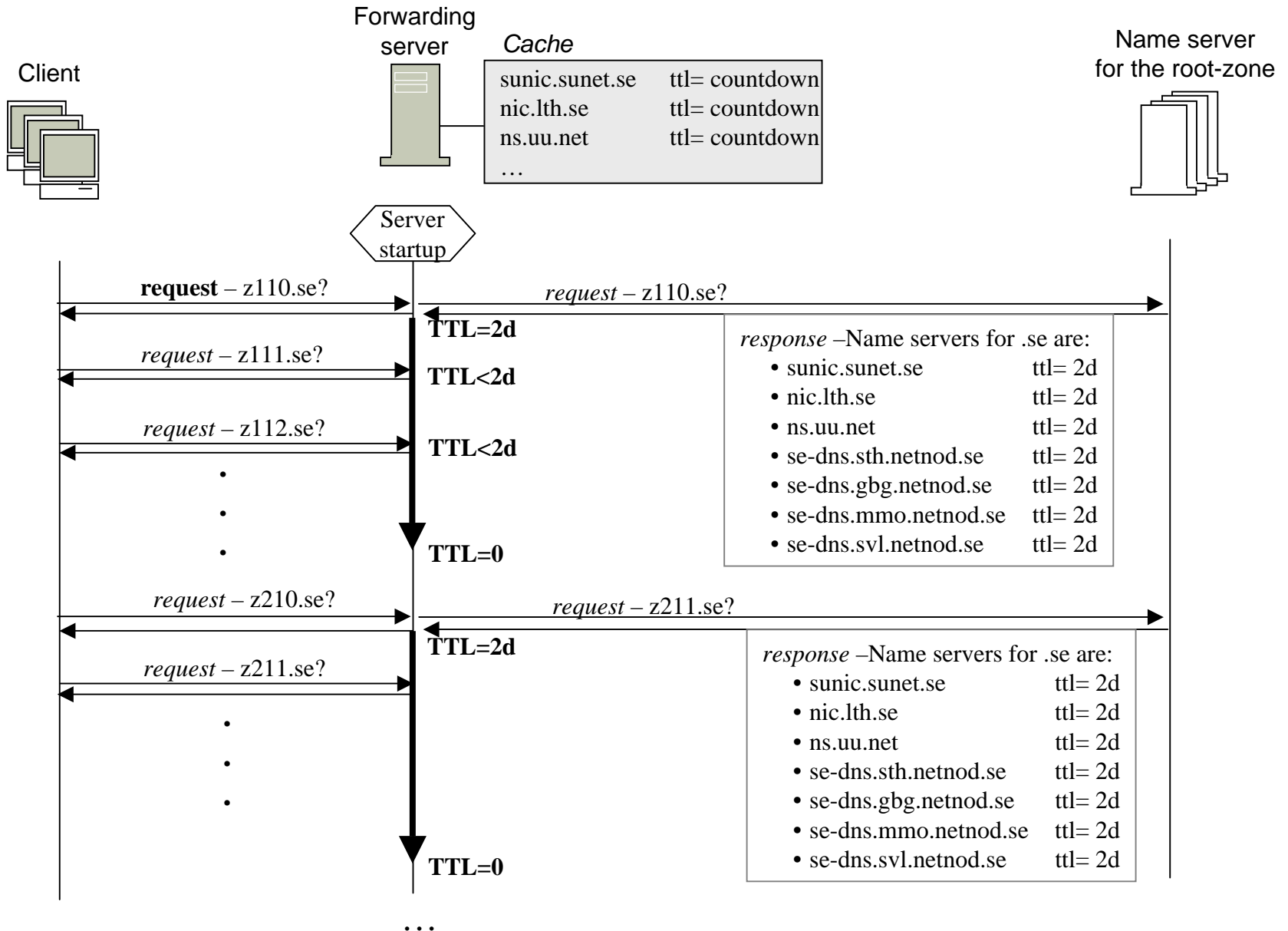
- "From the user's point of view, the domain system is accessed through a simple procedure or OS call to a local resolver. The domain space consists of a single tree and the user can request information from any section of the tree." - (RFC 1034)

DNS query





Cache Timeouts



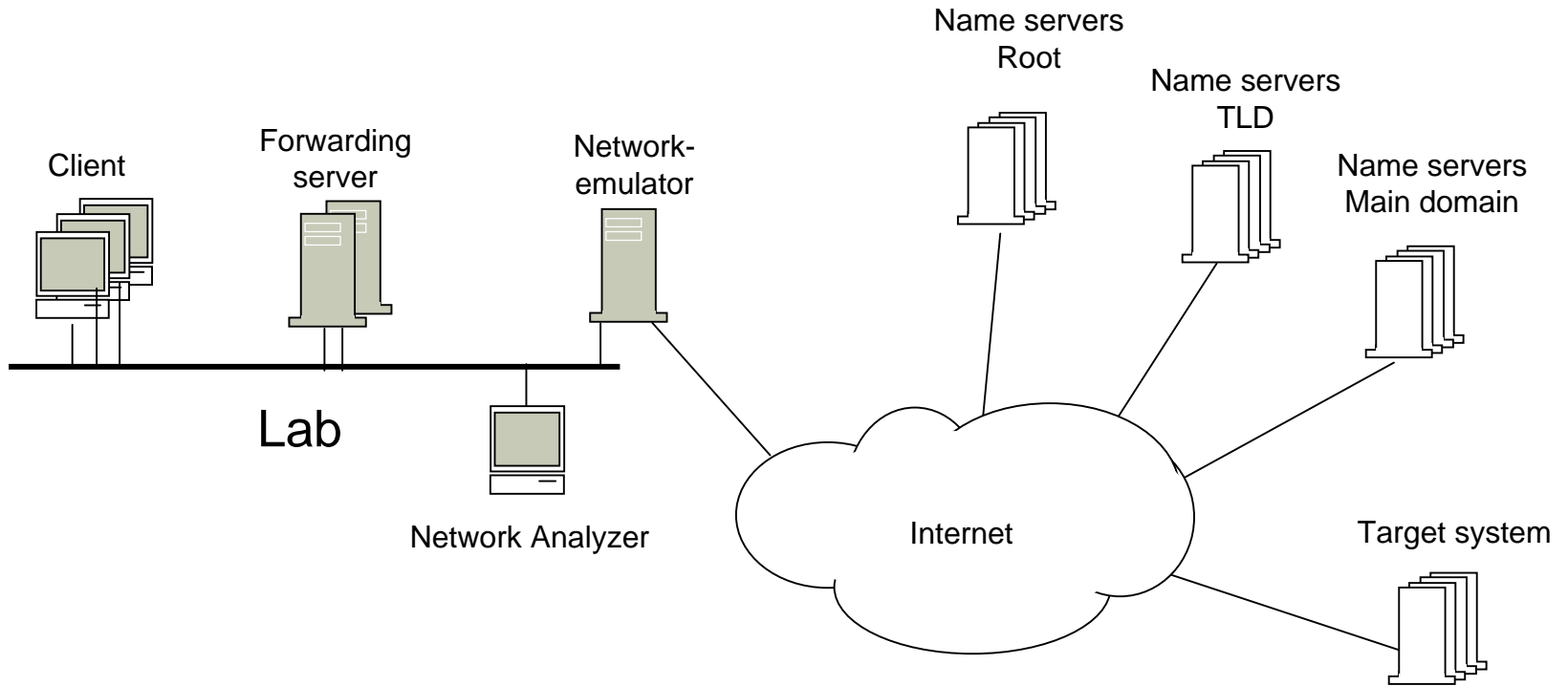
Some TTL values (November 2002)

Zon	TTL for NS	TTL for A
Root	6 days	41 days, 16 hours
Root about TLD	2 days	2 days
.se about domains below .se	1 day	
Verisign about domains below .com, .net och .org	2 days	
.NU Domain about domains below .nu	1 day	
www.sverigedirekt.riksdagen.se		1 day
www.regeringen.se		1 day
www.pts.se		1 day
www.tt.se		1 day

Resolver Software

- Bind 9
 - Bind 9.2.0
- Bind 8
 - Bind 8.3.3
- Microsoft
 - DNS service running on Windows 2000 5.00.2195
- Cisco
 - Cisco Registrar DNS 5.5.1

The test environment



The traffic generator

DNS Trafikgenerator v0.3 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media

Address <http://localhost> Go Links >>

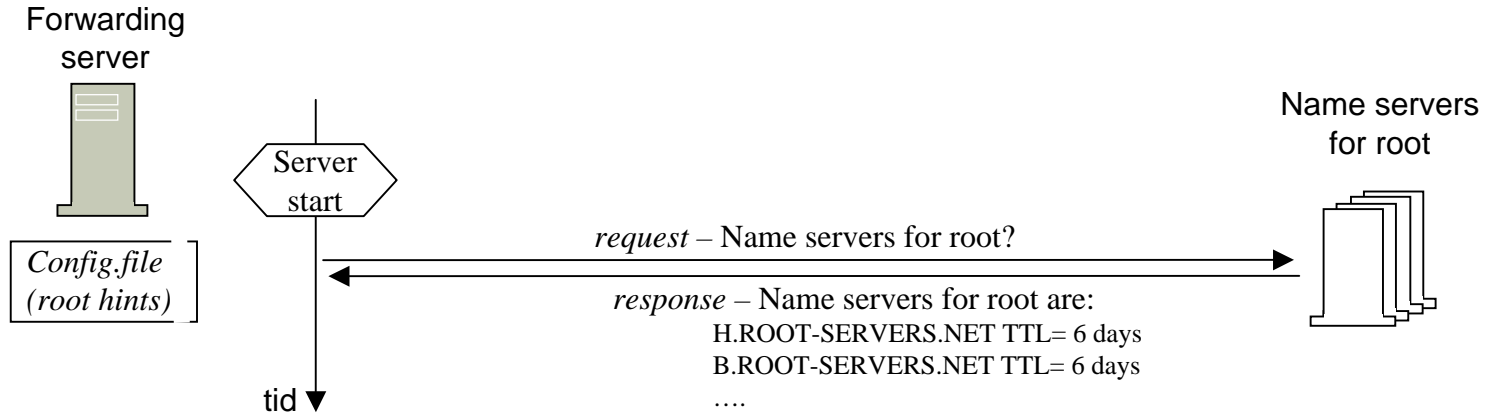
iistester.a1.se sent... Unable to Resolve HostName
iistester.a2.se sent... Unable to Resolve HostName
iistester.a3.se sent... Unable to Resolve HostName
iistester.a4.se sent... Unable to Resolve HostName
iistester.a5.se sent... Unable to Resolve HostName
iistester.a6.se sent... Unable to Resolve HostName
iistester.a7.se sent... Unable to Resolve HostName
iistester.a8.se sent... Unable to Resolve HostName
iistester.a9.se sent... Unable to Resolve HostName
iistester.a10.se sent... Unable to Resolve HostName

DNSServer: 192.71.80.162
Timeout: 0 ms
Interval: 0 s
Normal: 0,00% (0)
Unable to Resolve HostName: 100,00% (10)
DNS Request Timed Out: 0,00% (0)

DNS: 192.71.80.162 ToStart: 500 ToStop: 500 Step: 100 Int: 0 Pre: iistester.a Start: 1 No: 10 TLD: se kör

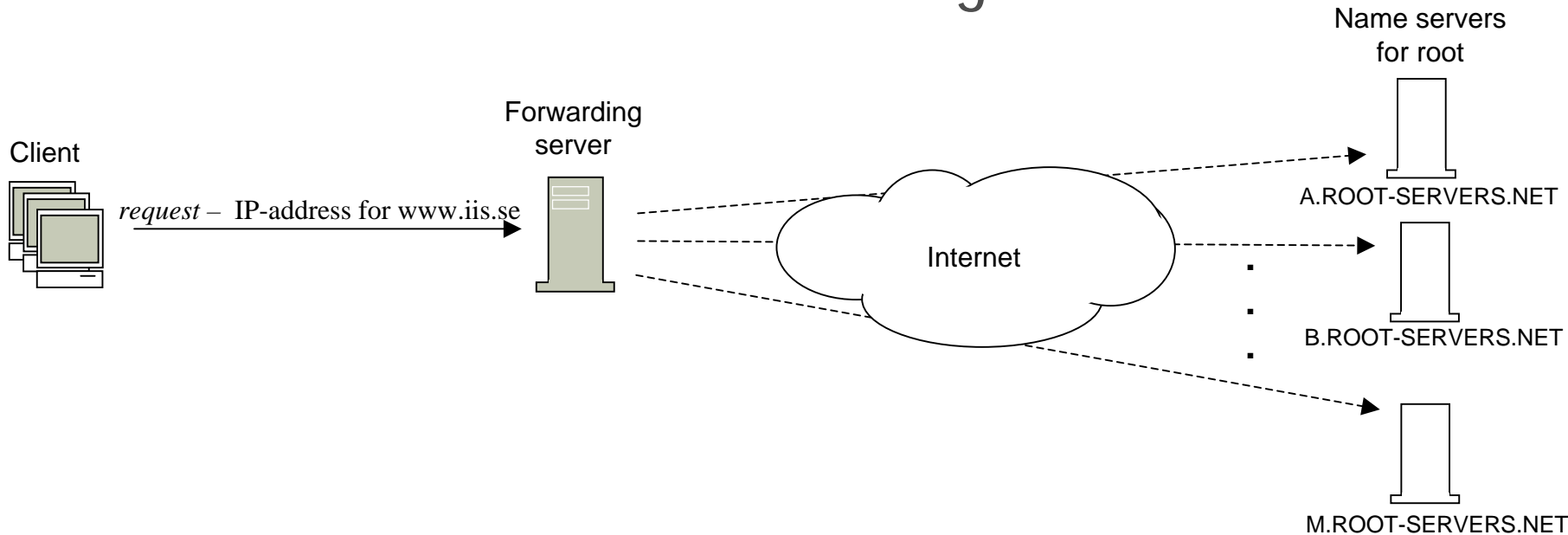
Done Local intranet

Test 1 - Behavior of resolver at start-up



	Bind 8	Bind 9	MS DNS	CNR
Local file with "root hints" where used?	YES	YES	YES	YES
When did the update of root servers occur?	At start-up	After the first request from the client	After the first request from the client	At start-up
How did the resolver choose which server to use from the "root hints"	Random	Random	Random	Always the first server (A-root)

Test 2 - Method for choosing root server

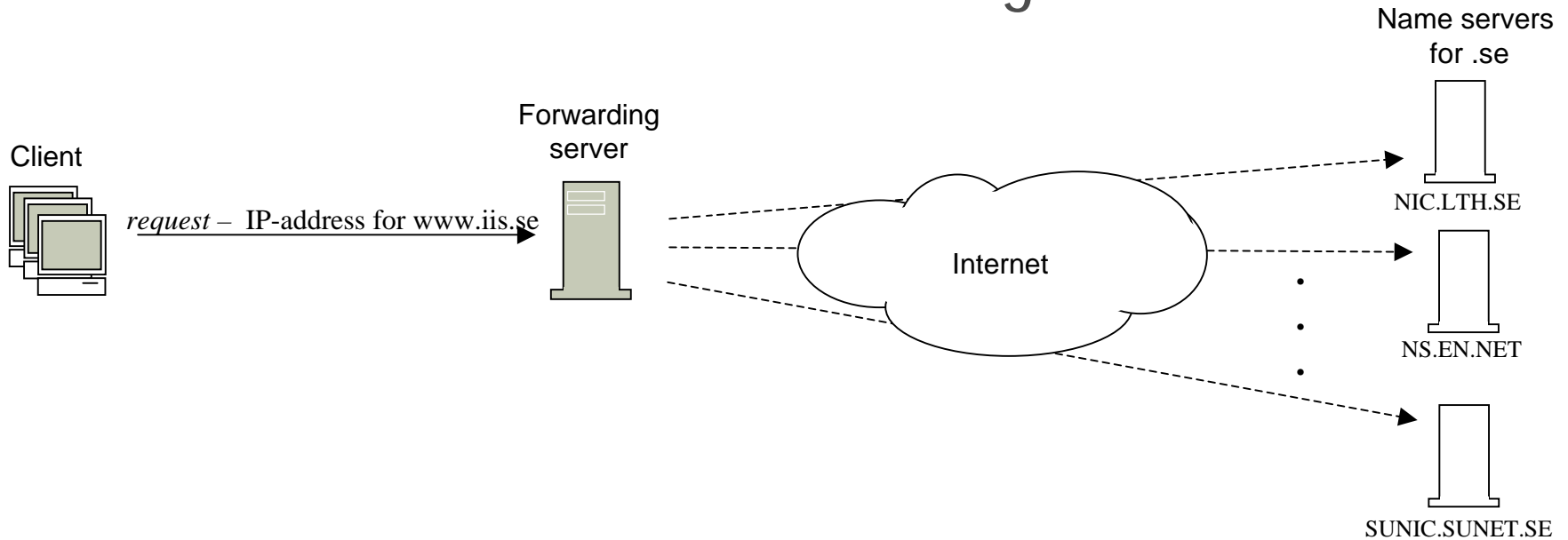


	A-ROOT	B-ROOT	C-ROOT	D-ROOT	E-ROOT	F-ROOT	G-ROOT	H-ROOT	I-ROOT	J-ROOT	K-ROOT	L-ROOT	M-ROOT
BIND 8	2,7%	2,2%	1,6%	2,7%	1,1%	1,1%	1,6%	2,2%	70,7%	2,7%	8,7%	1,6%	1,1%
BIND 9									100%				
MS DNS				100%									
Cisco CNR	13%	4%	4%	10%	3%	3%	9%	7%	16%	8%	16%	4%	3%

Method: Approx 200 requests to different servers. The first 20 request where discarded.

Note: I-root had the best response time from the test network.

Test 3 - Method for choosing tld server

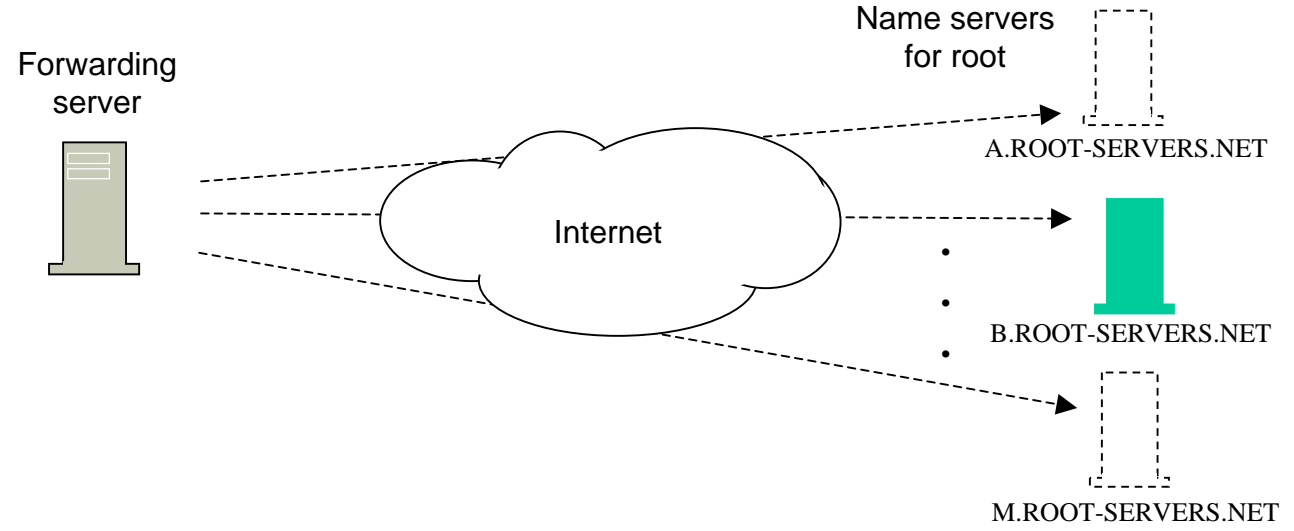


	nic.lth.se	ns.eu.net	ns.uu.net	se-dns.gbg.netnod.se	se-dns.sth.netnod.se	sunic.sunet.se
BIND 8	2%	7%	2%	0%	1%	88%
BIND 9				1%	10%	89%
MS DNS			100%			
Cisco CNR	20%	12%	10%	12%	12%	34%

Method: Approx 100 requests to different servers. The first 20 request where discarded.

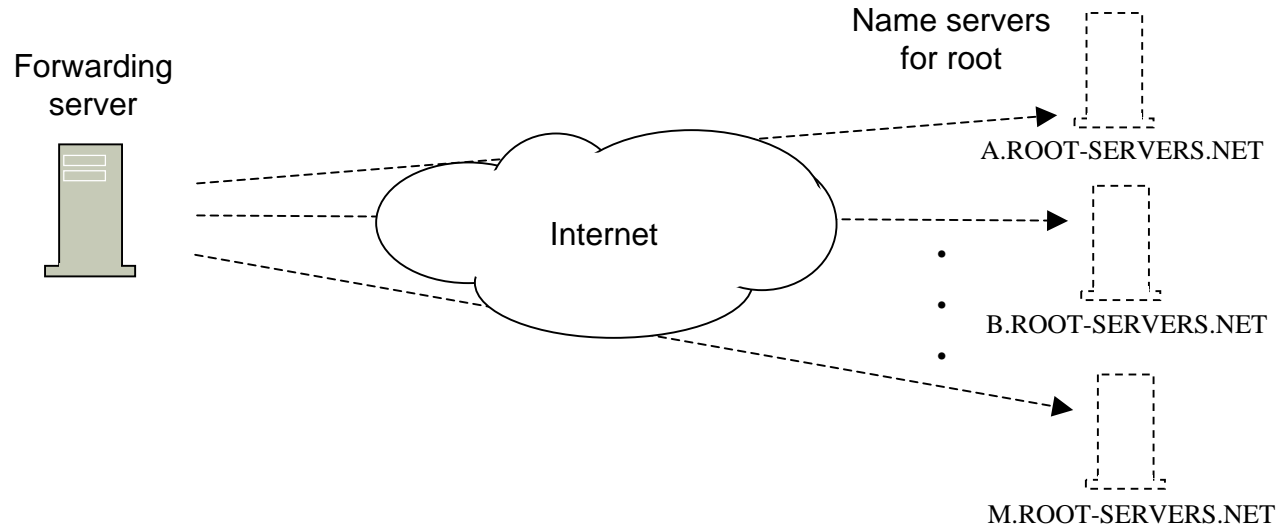
Note: sunic.sunet.se had the best response time from the test network.

Test 4 - Absence of all root-servers but one



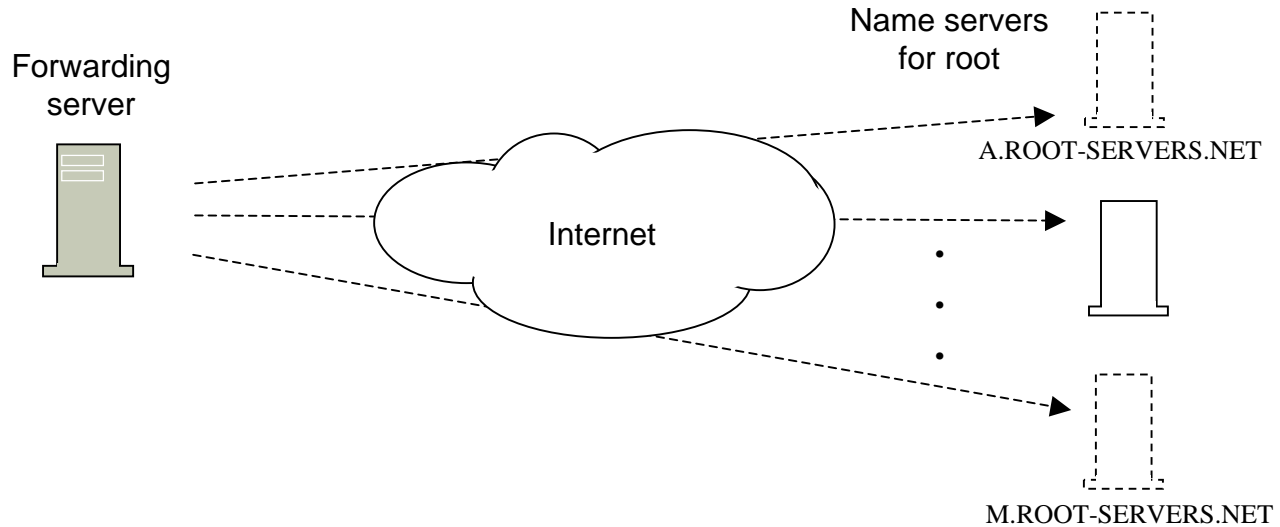
	Bind 8	Bind 9	MS DNS	CNR
Got response?	YES	YES	YES	YES
Did if search thru the root list until a server was found?	YES	YES	YES	YES
Time out between requests?	4 sec	2 sec	3 sec	4 sec

Test 5- Absence of all root-servers at start-up



	Bind 8	Bind 9	MS DNS	CNR
Method of selecting which root-server to try next	Random	Random	Random	In order (a-m)
Time-out between request	4-8 sec ...	2 sec, 8 sec after 52 sec...	3 sec, ..	4 sec, ...

Test 6 - Absence of all root-servers but one while running

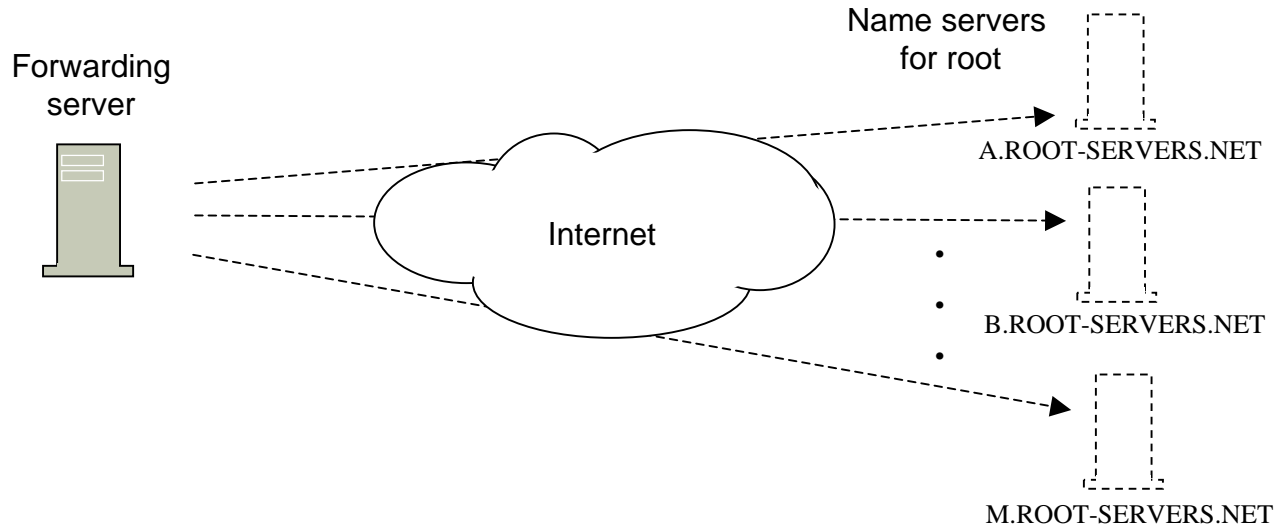


If the following are true does the resolver answer queries:

- One root server is reachable
- All TTL have expired for cached information about the TLD name server

Bind 8	Bind 9	MS DNS	CNR
YES	YES	YES	YES

Test 7 - Absence of all root-servers while running

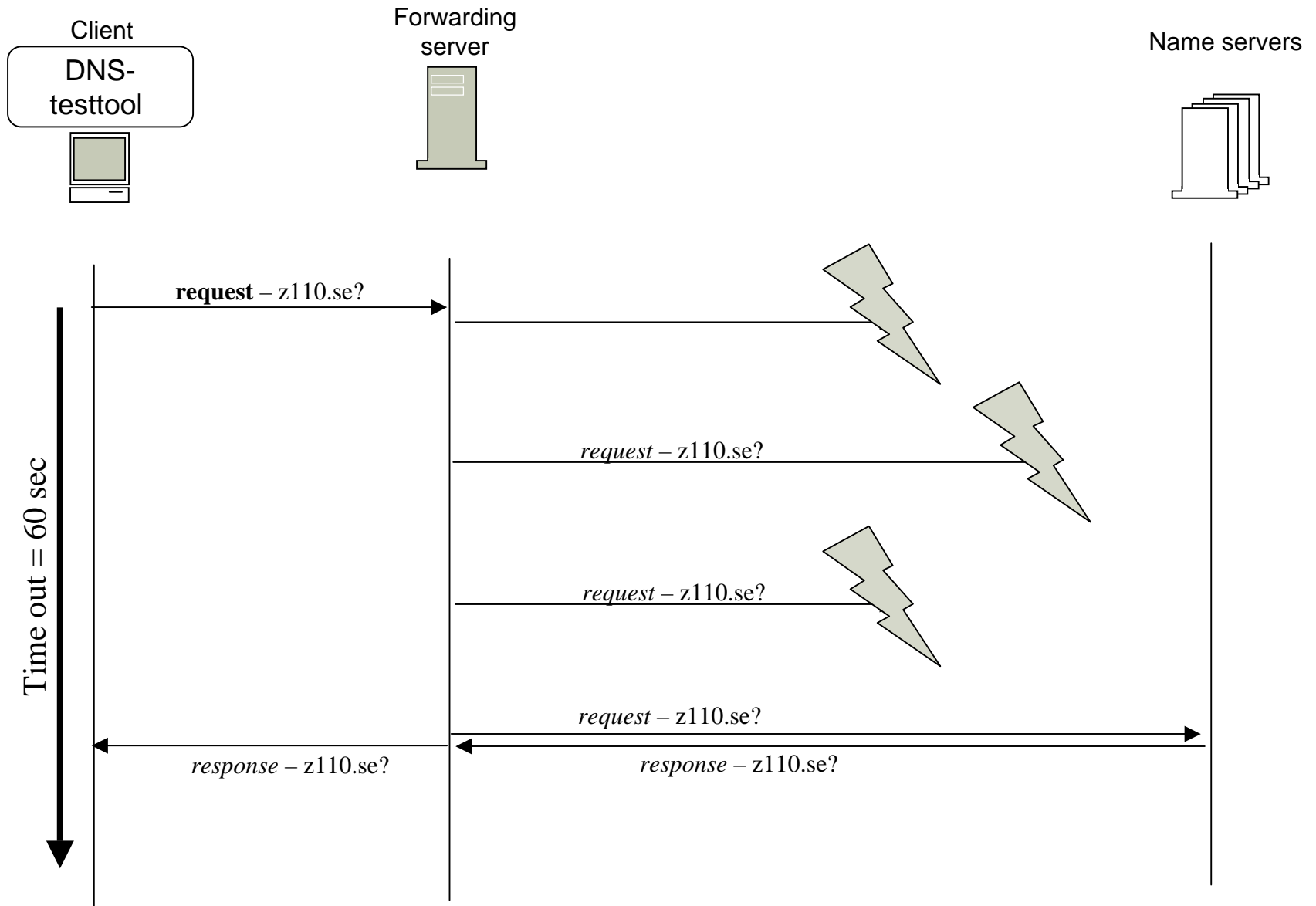


If the following are thru does the resolver answer queries:

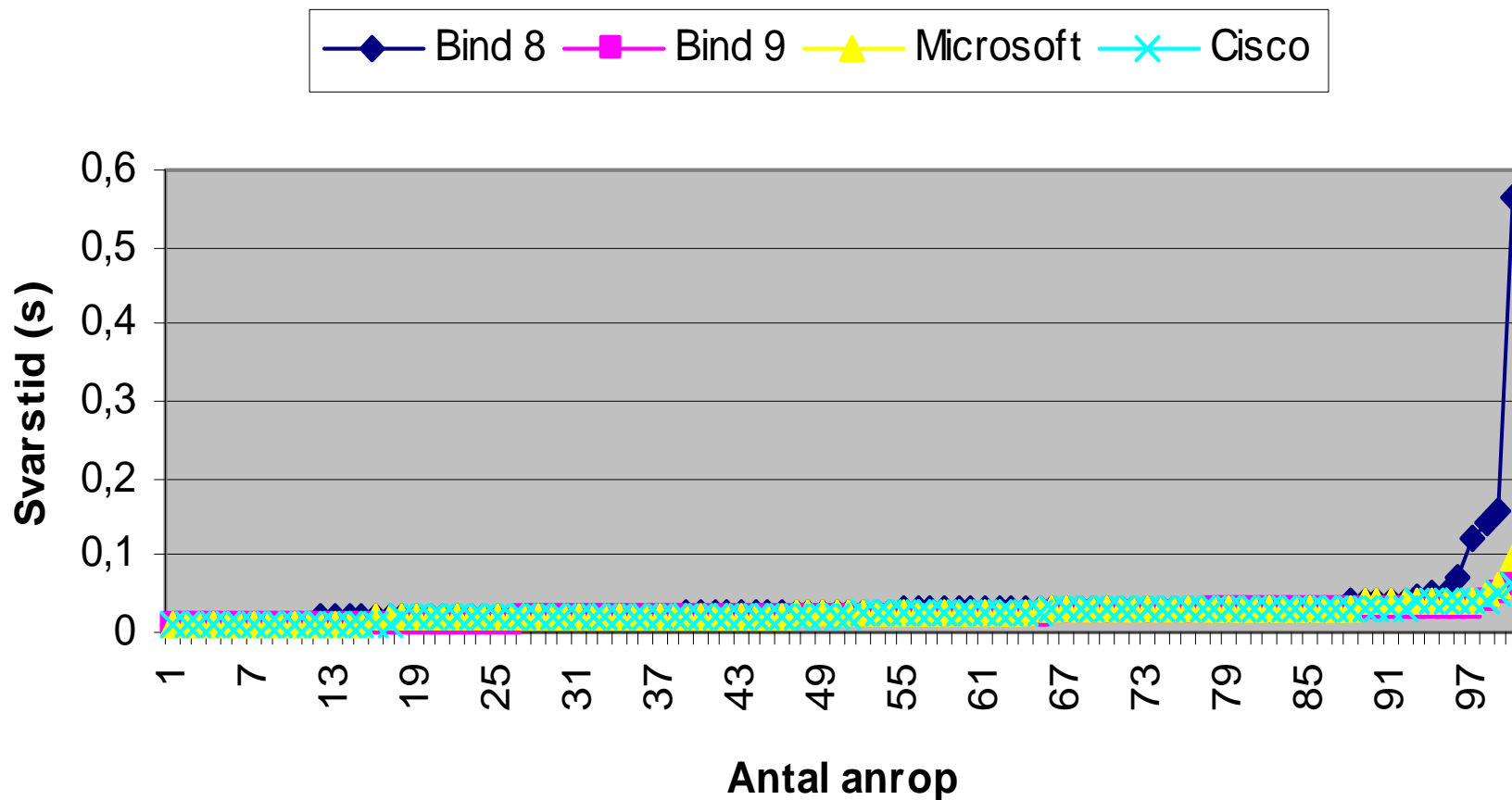
- Root servers are not reachable
- All TTL have expired for cached information about the TLD name server

Bind 8	Bind 9	MS DNS	CNR
NO	NO	NO	NO

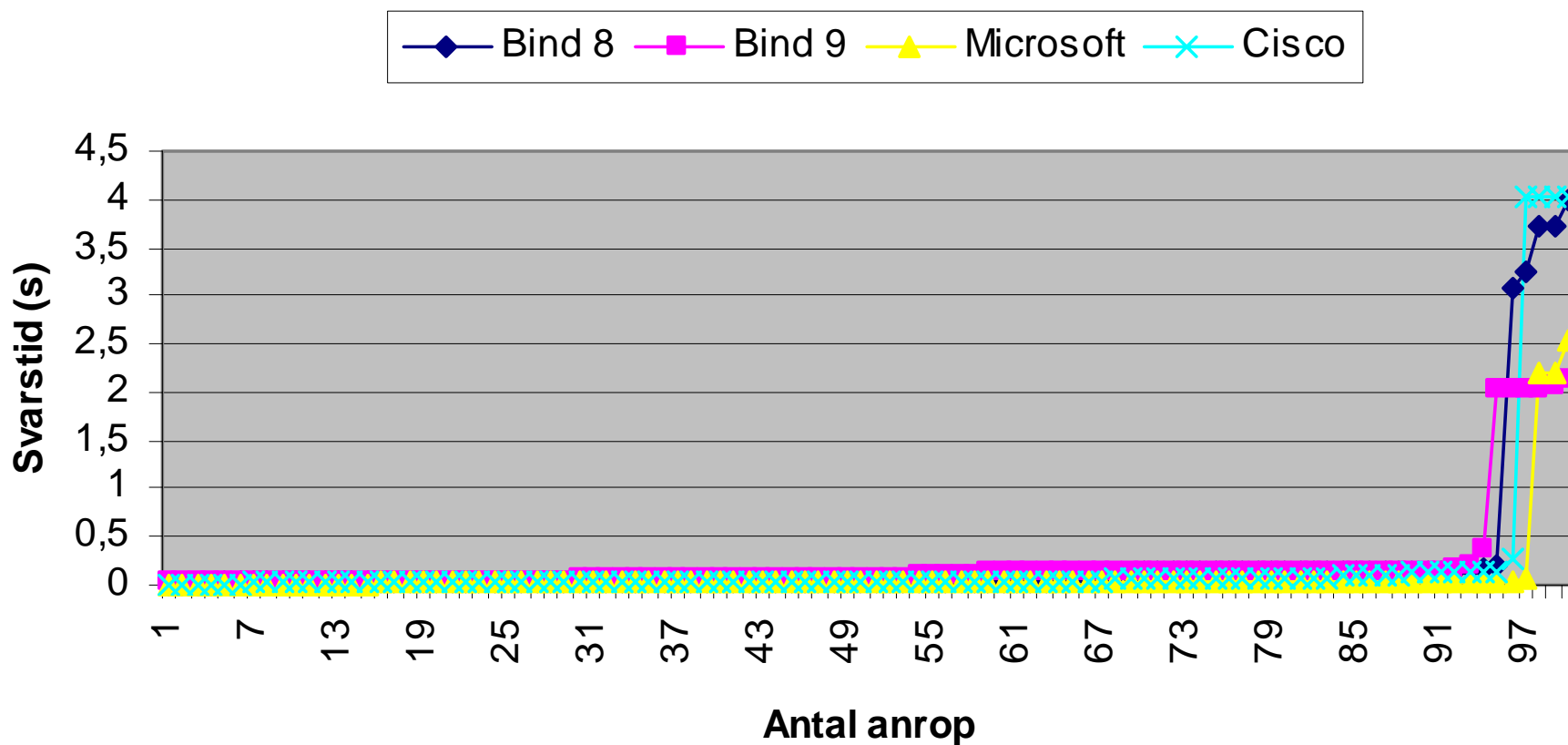
Test 8 - Packet-loss



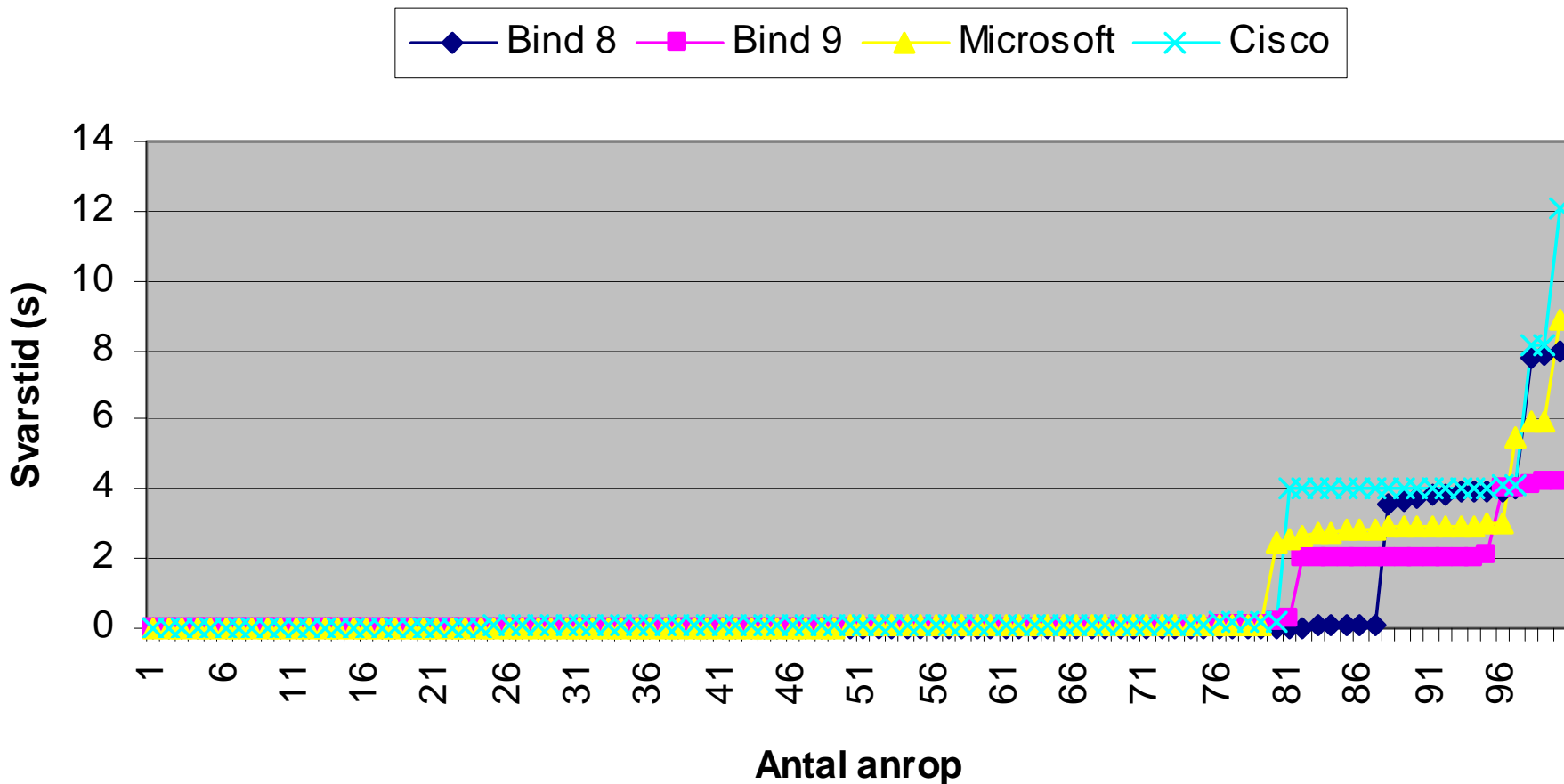
Distribution of response times at 0% packet-loss



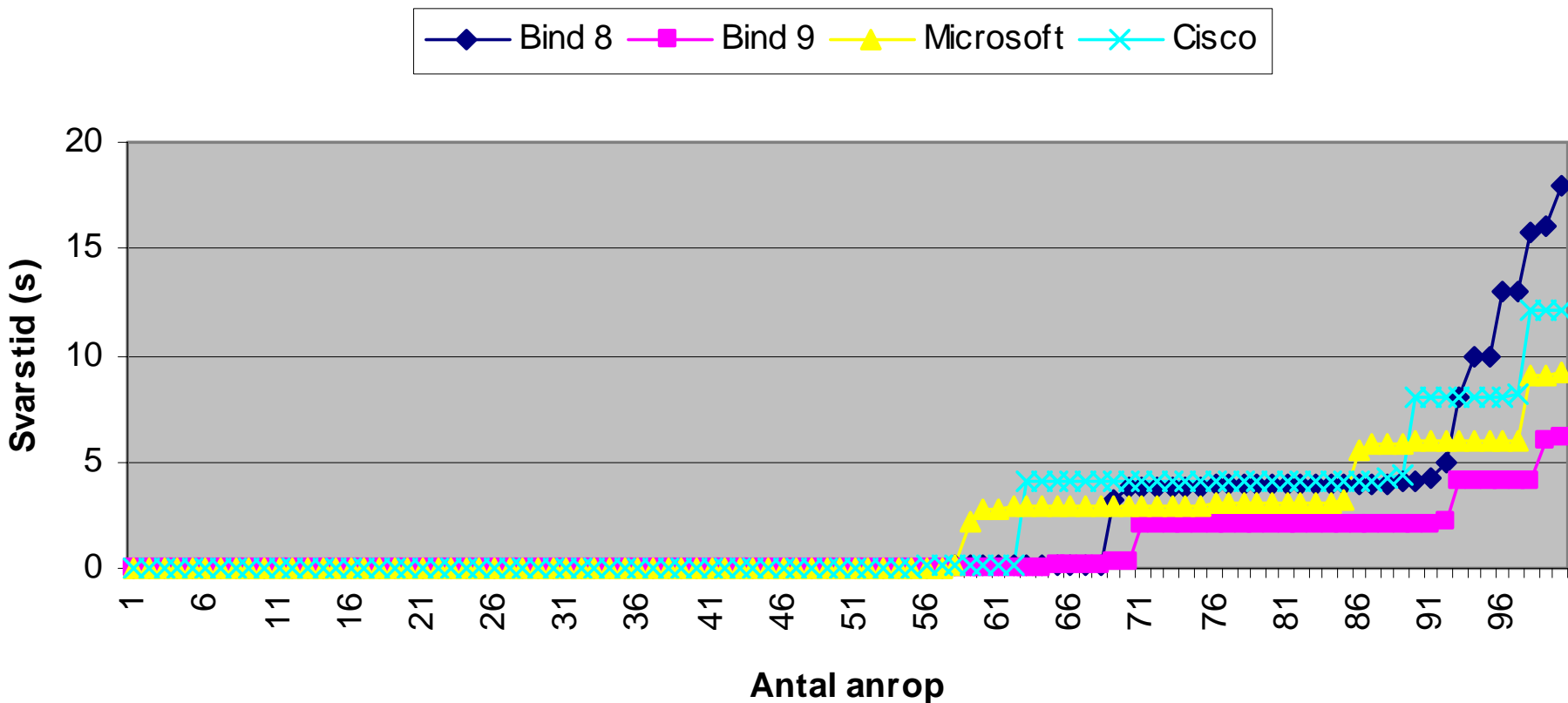
Distribution of response times at 2% packet-loss



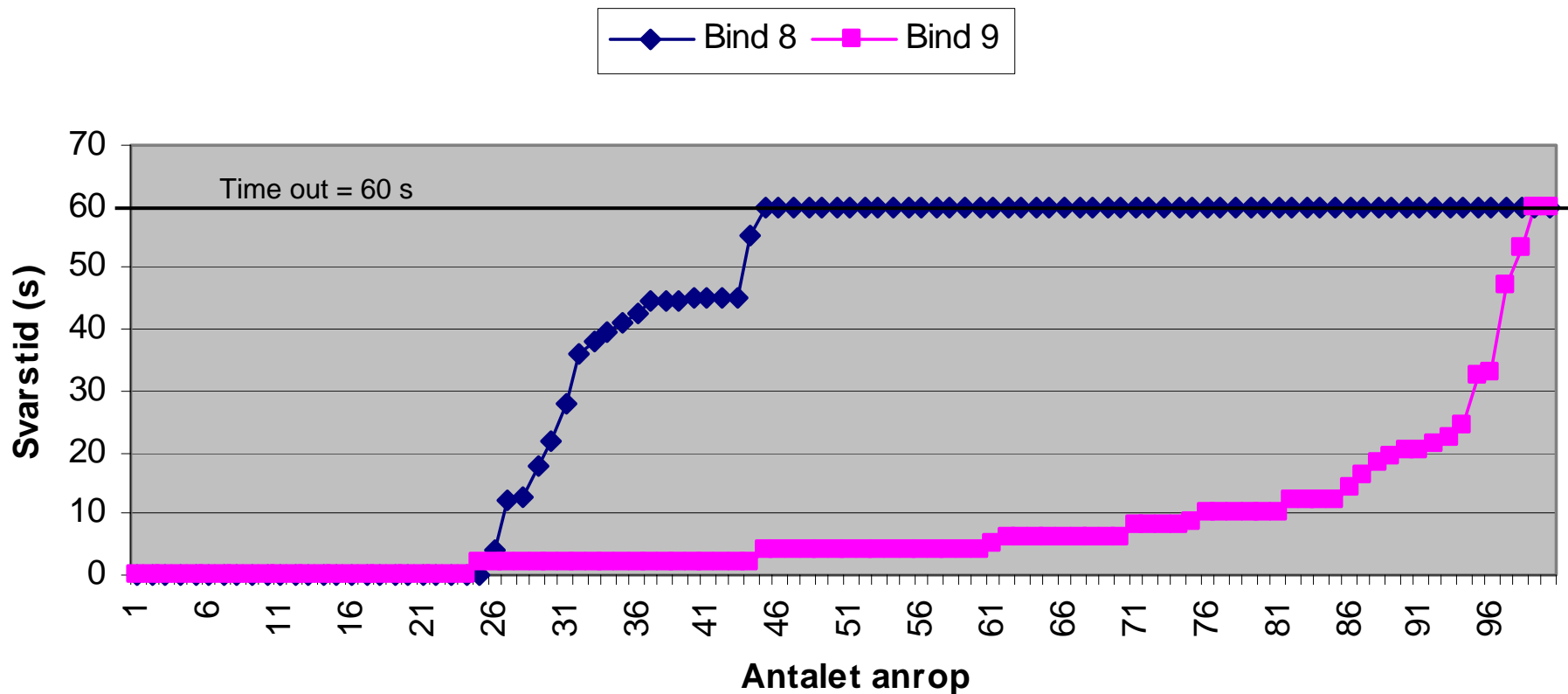
Distribution of response times at 10% packet-loss



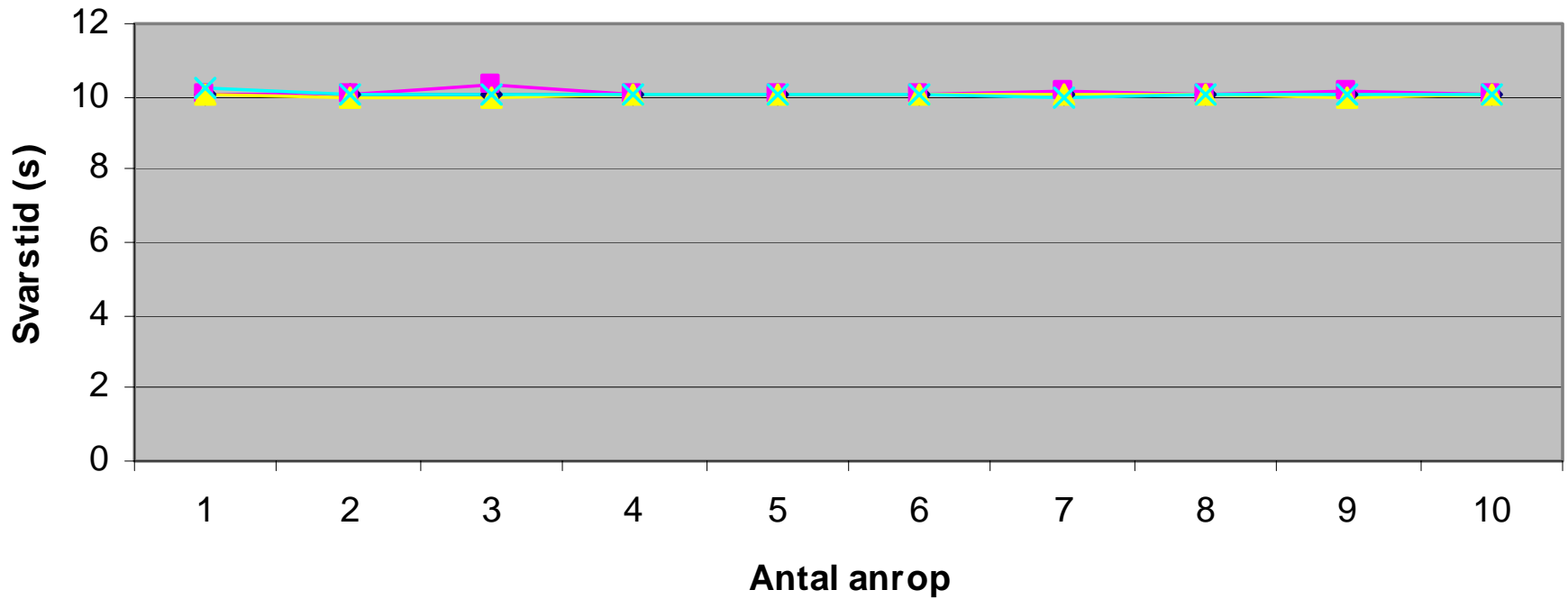
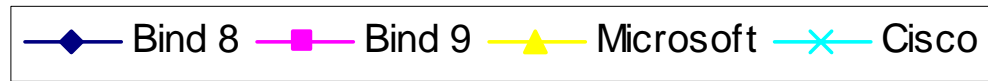
Distribution of response times at 20% packet-loss



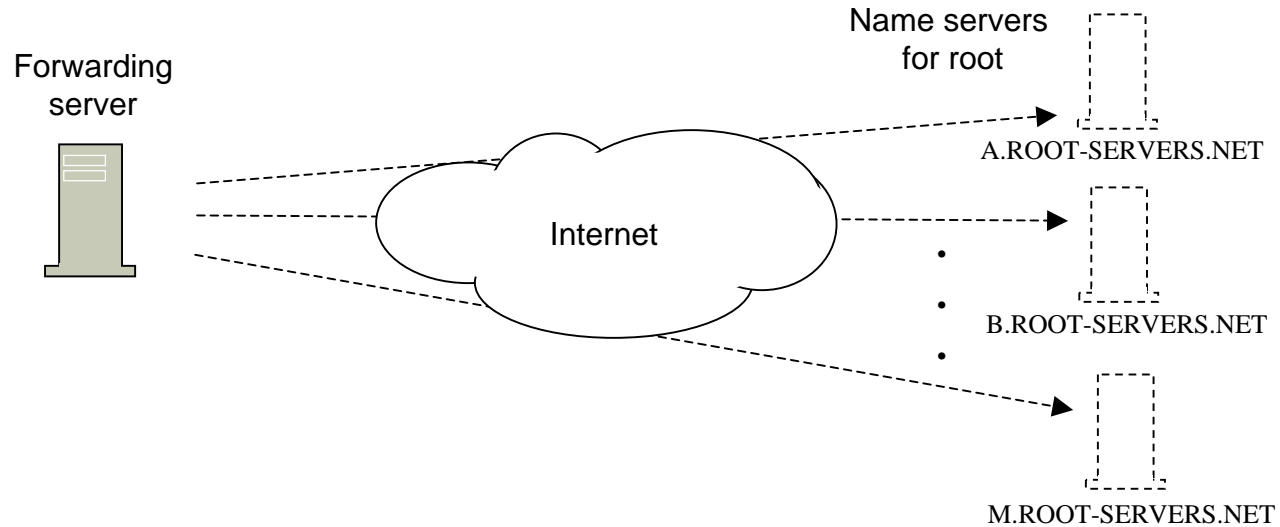
Distribution of response times at 50% packet-loss



Test 9 - 5 seconds packet delays



Test 10 - Absence of all root-servers while running when a the TLD name server is cached.



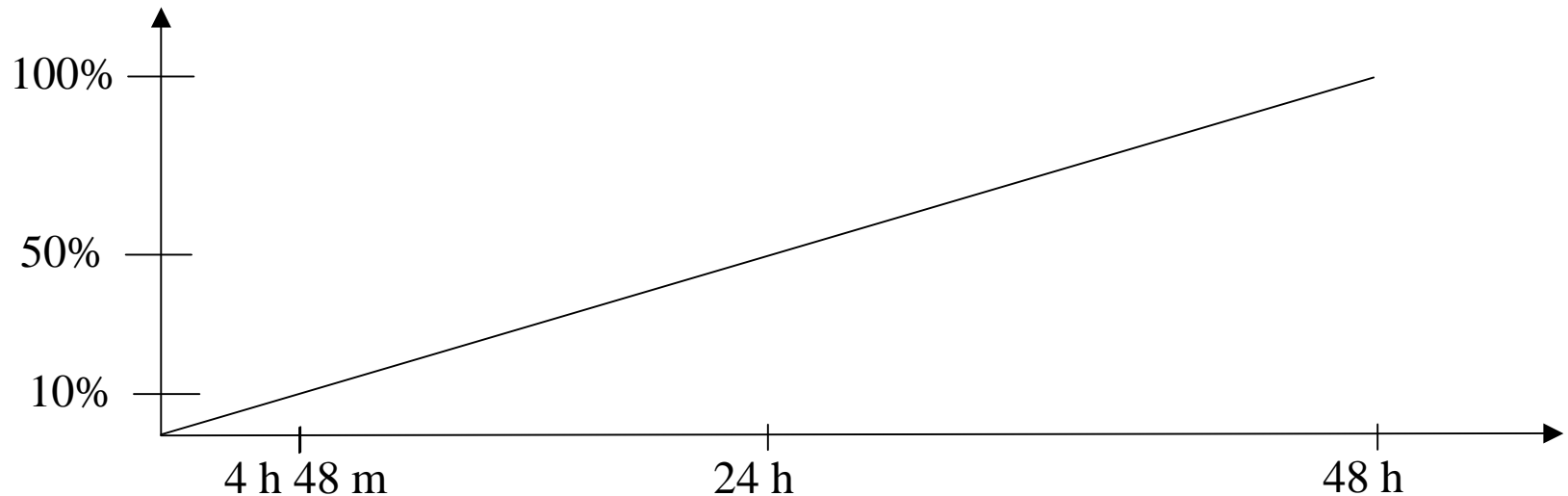
If the following are thru does the resolver answer queries:

- Root servers are not reachable
- All TTL have expired for cached information about the root name server
- All TTL have expired for cached information about the target
- TTL has not expired for cached information about the TLD name server

Bind 8	Bind 9	MS DNS	CNR
NO	NO	NO	NO

What if all tld servers are unavailable?

Percentage of resolvers
that are down.



- prerequisites
 - No re-starts of the resolvers.
 - This implies that the TLD is up to date and cached. TLD that are not in the cache are not available at all.
 - The TTL for the TLD name server are 48 hours
 - etc...

The "expire"-value

Zon	Expire
rot	7 days
.se	28 days
.com	7 days
.nu	30 days

Client applications - Email



Client applications - Web

The screenshot shows a Microsoft Internet Explorer browser window displaying the Aftonbladet website. The address bar shows the URL <http://212.112.162.203/>. The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The address bar also contains a search icon, a home icon, and a go button. The website's header features navigation links for "köp & sälj bil", "köp & sälj båt", and "köp & sälj prylar".

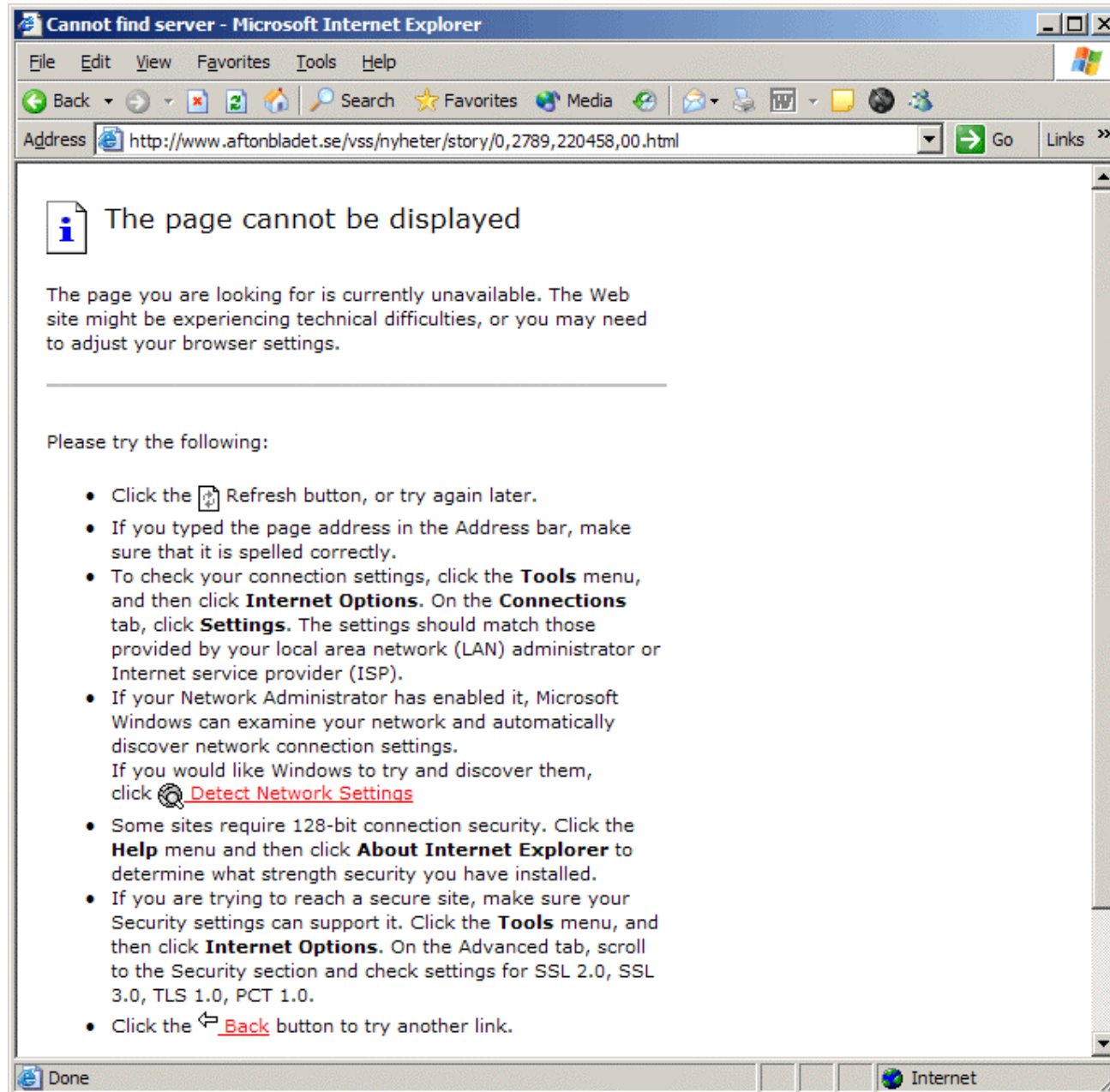
The main content area displays the date "MÅNDAG 28 OKTOBER 2002" and the page title "STARTSIDAN". The primary news article is titled "Förbjud barn att ha mobiltelefoner" (Ban children from having mobile phones). The article text includes a poll question: "Tror du att det är farligt för barn att prata i mobiltelefon?" (Do you think it is dangerous for children to talk on mobile phones?). The poll options are "Ja" (Yes), "Nej" (No), and "Vet ej" (Don't know). A link "Se resultat" (See results) is provided. Below the poll, the article continues with "17-åringen skyldig till minst ett av morderna" (17-year-old guilty of at least one of the murders) and "Akzo Nobel säljer ut - 180 får gå" (Akzo Nobel sells out - 180 get to go).

The sidebar on the left contains a "nyheter" (news) section with links for "senaste nytt" (latest news), "kolumnister" (columnists), and "tipsa oss" (tip us). Below this is a search box with the text "Sök". The "INNEHÅLL:" (Contents) section lists various news categories: "nyheter", "sport", "nöje & puls", "ekonomi & börs", "kvinna", "bil med köp & sälj", "bostad", and "föräldrar".

The sidebar on the right features a "sex & kärlek" (sex & love) section with a link "Fyra av tio otrogna mot sin partner" (Four out of ten unfaithful to their partner) and a "film" (film) section with a link "berätta Hur har du drabbats av otrohet?" (tell me how you have been affected by infidelity?).

The status bar at the bottom of the browser window displays "Error on page." and "Internet".

Client applications - Web



Client applications - Web

A screenshot of the Aftonbladet website in Microsoft Internet Explorer. The browser window title is "Aftonbladet - Sveriges Hylfetsportal - Microsoft Internet Explorer". The address bar shows "http://www.aftonbladet.se/". The page features a navigation bar with "köp & sälj" and "Aftonbladets stora nyheter och nyheter". Below this is a search bar and a "Tanka mobilen" advertisement. The main headline is "Nu kan du få dina brev dit." followed by the Aftonbladet logo and the date "TORS DAG 20 NOVEMBER 2002". The main article is titled "Vittne: Roboten var en meter från vingen" with a sub-headline "Fyra flygare, 53, alla reser med utomlands flyg". To the right is a "Länsförsäkringar" advertisement. At the bottom, there is a "Personalman" advertisement for Stockholm.

A screenshot of the Aftonbladet website in Microsoft Internet Explorer, identical to the first one. The browser window title is "Aftonbladet - Sveriges Hylfetsportal - Microsoft Internet Explorer". The address bar shows "http://www.aftonbladet.se/". The page features a navigation bar with "köp & sälj" and "Aftonbladets stora nyheter och nyheter". Below this is a search bar and a "Tanka mobilen" advertisement. The main headline is "Nu kan du få dina brev dit." followed by the Aftonbladet logo and the date "TORS DAG 20 NOVEMBER 2002". The main article is titled "Vittne: Roboten var en meter från vingen" with a sub-headline "Fyra flygare, 53, alla reser med utomlands flyg". To the right is a "Länsförsäkringar" advertisement. At the bottom, there is a "Personalman" advertisement for Stockholm.

Conclusions

The DNS system is well designed and works very well in practice.

DNS handles network disturbances very well.

All tested resolvers did what they were expected to do and did it well.

Most applications are dependent on DNS and does not work very well without it.

There is no easy way to replace DNS if it fails.

More information about the tests

This presentation and the full test specification (in Swedish) are provided at:

<http://www.iis.se/meta/english.shtml>

<http://www.learnswedish.nu>

For questions contact me:

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