Domain Name System

Handed in April 25, 2013, by Team 2

Rasmus Bækgaard	10893@iha.dk
Anders Kielsholm	10749@iha.dk
Lasse Hansen	10063@iha.dk
Mia Leth Sørensen	0959@iha.dk

Electrical and Computer Engineering
Aarhus University
Finlandsgade 22, 8200 Aarhus N, Denmark

Abstract

About your reports and this template

- Use this template for your project work reports
- Substitute the template's place-holder dates and titles with appropriate ones
- Place-holders are marked with square brackets, i.e. [place-holder]
- For each report, you hand in both a tex and a pdf file
- The report should be 10-15 pages in total and it must be written in English

About the abstract, i.e. the current section

- An abstract is a brief summary of the report that helps the reader quickly ascertain the report's purpose. The abstract should be approximately half a page.

Contents

Chapter 1

Introduction

Approximately 1 page introduction that addresses the following

1. What the report is about
2. Why the report is relevant
3. How the rest of the report is structured

These are test citations to example bibliography entries number one [**?**] and two [**?**]. You should have at least 3 references to books and/or papers, i.e. web pages excluded.

Chapter 2

Domain Name System

Domain Name System, DNS, is used to find IP-addresses from a logical name using the concept of the Host Lookup Table. The Host Lookup Table, HLT, was a file placed on every computer connected to the network which contained the IP-address and the logical name for each computer connected [1, History section].

When the HLT was updated, all computers needed to add the address which, due to the expansion of connecting computers to the network, became an obstacle and hindrance for the flow. To solve this the DNS system was invented in 1982 [2, History section].

DNS is like a big telephone book which everyone uses to lookup IP-addresses from logical names, through an address record (A record) [3, p. 210], rather than everyone keeping track of all connected addresses.

2.1 DNS fundamentals

To find the computer's host name the command `hostname` will show the logical human readable name for the computer. The hostname will be shown on the list of connected computers on a network.

In Linux the command `nm-tool` will access the NetworkManager Tool and among others, show the IP-address, MAC-address, connection state and DNS-server for the computer. This is shown in Figure 2.1[1].
You can run a similar command in Windows; `ipconfig /all` to access IP-address, DNS-server, MAC-Address ect. shown in Figure 2.2.

[1] Note that this is on a virtual machine which do not show as much as a native Linux machine will

```
limro@ubuntu:~$ nm-tool

NetworkManager Tool

State: connected (global)

- Device: eth0  [Wired connection 1] ----
------------
  Type:              Wired
  Driver:            vmxnet
  State:             connected
  Default:           yes
  HW Address:        00:0C:29:D5:8E:55

  Capabilities:
    Carrier Detect:  yes
    Speed:           1000 Mb/s

  Wired Properties
    Carrier:         on

  IPv4 Settings:
    Address:         192.168.92.128
    Prefix:          24 (255.255.255.0)
    Gateway:         192.168.92.2

    DNS:             192.168.92.2
```

Figure 2.1: Use of the command `nm-tool`

```
C:\Users\Becks>ipconfig /all

Windows IP Configuration

   Host Name . . . . . . . . . . . . : Becks-PC
   Primary Dns Suffix  . . . . . . . :
   Node Type . . . . . . . . . . . . : Hybrid
   IP Routing Enabled. . . . . . . . : No
   WINS Proxy Enabled. . . . . . . . : No
   DNS Suffix Search List. . . . . . : iha.dk
   System Quarantine State . . . . . : Not Restricted


Wireless LAN adapter Wireless Network Connection:

   Connection-specific DNS Suffix  . : iha.dk
   Description . . . . . . . . . . . : Broadcom 4313 802.11b/g/n
   Physical Address. . . . . . . . . : E0-2A-82-A7-2E-43
   DHCP Enabled. . . . . . . . . . . : Yes
   Autoconfiguration Enabled . . . . : Yes
   Link-local IPv6 Address . . . . . : fe80::29e7:43ec:7fc0:49c4%14(Preferred)
   IPv4 Address. . . . . . . . . . . : 10.193.2.193(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : 16. april 2013 12:05:07
   Lease Expires . . . . . . . . . . : 17. april 2013 00:55:45
   Default Gateway . . . . . . . . . : 10.193.2.1
   DHCP Server . . . . . . . . . . . : 10.88.1.95
   DHCPv6 IAID . . . . . . . . . . . : 383789698
   DHCPv6 Client DUID. . . . . . . . : 00-01-00-01-18-F8-51-A0-64-31-50-0E-14-76

   DNS Servers . . . . . . . . . . . : 10.20.255.36
                                       10.20.255.33
   NetBIOS over Tcpip. . . . . . . . : Enabled
```

Figure 2.2: Use of the command `ipconfig /all`

To detect an IP-address and determine the latency to the server use the `ping` command. `ping` will target either a webserver name to get the IP-address or target the IP-address directly without asking the DNS-server. This is shown on figure 2.3

```
limro@ubuntu:~$ ping -c 3 www.google.com
PING www.google.com (173.194.65.105) 56(84) bytes of data.
64 bytes from ee-in-f105.1e100.net (173.194.65.105): icmp_req=1 ttl=128 time=24.7 ms
64 bytes from ee-in-f105.1e100.net (173.194.65.105): icmp_req=2 ttl=128 time=30.1 ms
64 bytes from ee-in-f105.1e100.net (173.194.65.105): icmp_req=3 ttl=128 time=36.3 ms

--- www.google.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 24.746/30.437/36.375/4.754 ms
limro@ubuntu:~$ ping -c 3 173.194.65.105
PING 173.194.65.105 (173.194.65.105) 56(84) bytes of data.
64 bytes from 173.194.65.105: icmp_req=1 ttl=128 time=25.4 ms
64 bytes from 173.194.65.105: icmp_req=2 ttl=128 time=24.7 ms
64 bytes from 173.194.65.105: icmp_req=3 ttl=128 time=24.0 ms

--- 173.194.65.105 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2005ms
rtt min/avg/max/mdev = 24.080/24.764/25.468/0.566 ms
```

Figure 2.3: Use of the command `ping -c 3 www.google.com`

Before makeing a lookup at the DNS server the system will check local HLT file, located in */etc/hosts*, to see if any redirects or A records are listed. Redirections are created by typing the static IP-address followed by the new logical name as shown in Code snippet 2.1

Code snippet

```
# Redirections
212.130.55.139 vejr #Resolve vejr to "www.dmi.dk"
159.20.6.38 nyhed #Resolve nyhed to "www.dr.dk"
157.55.46.241 mail #Resolve mail to "www.hotmail.com"
```

When requesting a webserver through a DNS, the root servers first redirect to the top-level domain server, TLD, which contains the '.com', '.net', '.dk' etc [3, p. 192]. From here the domain server can return the IP-address for the name server to which the client can connect. This will then (most likely) recursively or (less likely) iterative[2] return the specified IP-address to the client.

Each DNS server is responsible for looking up domains in nonoverlapping parts called 'zones'. A zone is implemented by a separate name server [3, p. 202-205].[3]

When looking for a host name there can be multiple units with the same logical name. However it is possible to specify a name for a unit to unambiguously unique with a '.' (dot) at the end of the logical address which is called a fully qualified domain name (FQDN) [4].
Multiple computers could have the name *myComputer* but if looking for a computer on a network called *work.net.* there can only be one computer with the name *myComputer.work.net.*

[2] See section 2.2, Name resolution
[3] FiXme Note: Find eksempel

2.2 Name resolution

When looking

Chapter 3

Prototype: Title of your prototype

Approximately 2-5 pages in-depth description of prototyping with the technology under consideration. That is, you analyze, design, implement, and test

- a very limited, but functional prototype that utilizes the technology under consideration.

You define your own prototype and the context in which it should function; the list below is for your inspiration.

- Domain Name System: A public school or a medium sized company would like to host their own DNS and/or forward requests to OpenDNS.
- Data Distribution Service: A hospital or a production factory would like to employ Connext DDS to distribute mission critical data.
- Java Remote Method Invocation: A company is setting up facilities, e.g. parcel or luggage sorters, abroad and would like to be able to access back-end methods and data at home.

In your analysis you should at least address and/or include:

- Overall diagram and description of the prototype
- Relevance of the technology under consideration to your prototype
- How the technology is included in your prototype
- Definition of a small set of realistic use-cases and related functional requirements

The design, implementation, and test should at least address and/or include:

- Diagrams, e.g. UML, supplemented with code snippets of most important parts
- Test and evaluation of your system: Does it work as intended?
- Evaluation of the prototype and the technology employment as a whole

Chapter 4

Conclusion

Approximately 1-2 pages covering conclusion, discussion, and perspectives.

4.1 Conclusion

Conlude on your investigations.

4.2 Discussion

Discuss your project work.

4.3 Perspectives

What are the perspectives on the technology and your prototype?

Bibliography

[1] Wikipedia, "Hosts (file)," April 2013. Accessed 19-04-13, URL: http://en.wikipedia.org/wiki/Hosts_(file).

[2] Wikipedia, "Domain name system," April 2013. Accessed 19-04-13, URL: http://en.wikipedia.org/wiki/Domain_Name_System.

[3] A. S. Tanenbaum and M. Van Steen, "Distributed systems principles and paradigms," *Network*, vol. 4, p. 20, 2004.

[4] Wikipedia, "Fully qualified domain name," April 2013. Accessed 19-04-13, URL: http://en.wikipedia.org/wiki/Fully_qualified_domain_name.