Name Services

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HT15

what's a name service

A service that provides information about remote resources given *a name*.

terminology

name or identifier:

- name - often human readable
- identifier - not so

pure names:

- pure - no internal information
- non-pure - contains information

flat or hierarchical

- flat - all names directly comparable or,
- hierarchical - names interpreted in an environment

resolving:
A name is *resolved*, resulting in information about an object, often the *address* so that one can access the object.

address:
An address, at one level, could be a name on a lower level.

flat or what

130.237.215.140

- Is this a pure name?
- Is it a flat name space?

```
> route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
default         net215.it.kth.s 0.0.0.0         UG    1024   0        0 eth0
dhcpsrv-4a.lan. net215.it.kth.s 255.255.255.255 UGH   1      0        0 eth0
130.237.215.0   *               255.255.255.0   U     0      0        0 eth0
```

flat or what

```
eth0 Link encap:Ethernet HWaddr 00:1e:8c:93:c6:da
```

- Is this a pure name?
- Is it a flat name space?

URI example

A scheme, a node, a port and a resource

http://www.kth.se:80/people/~johanmon

mailto:johanmon@kth.se?subject=Test& body=Hej

spotify:track:6JEK0CvvjDjjMUBFoXShNZ

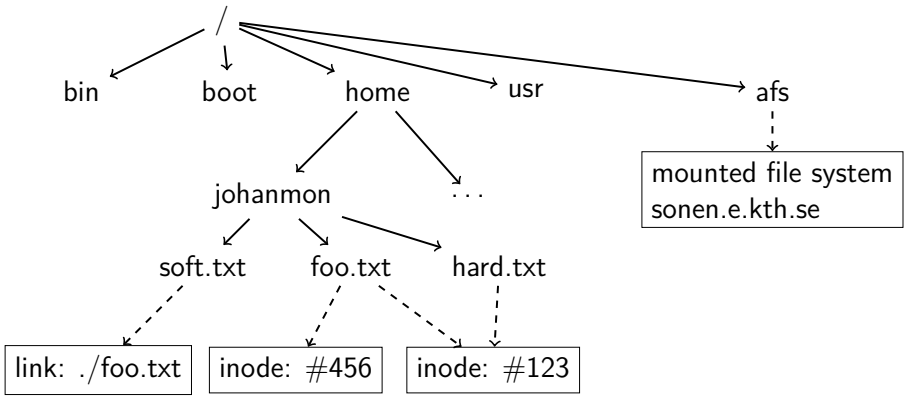
spotify:album:2mCuMNdJkoyiXFhsQCLLqw

urn://isbn/0451450523

A scheme, a name space and an identifier

Uniform Resource Identifier (URI) includes URL and URN

File systems



All nodes are represented by vnodes - virtual nodes.

DNS - Domain Name Service

- Originally the name space was flat and stored in the hosts file on each client.
- John Postel developed DNS in -82, finally defined in Mockapetris RFC 1035 -87
- Grew from a few thousand entries to over 100 million entries!

DNS - Names and attributes

www.kth.se

A DNS name consist of:

- a top-level domain: se
- a sequence of dub-domains: kth
- possibly a host name: www

Use `nslookup` to find the *attributes* of a name:

```
> nslookup www.kth.se
Server:         127.0.1.1
Address:        127.0.1.1#53

Non-authoritative answer:
Name:   www.kth.se
Address: 130.237.28.40
```


DNS attributes

- A: the address of a host
- MX: the mail server of the sub-domain
- CNAME: a symbolic link
- SOA: Start of Authority
- TXT: more stuff
- . . . and more

```
> nslookup -type=SOA kth.se a.ns.kth
Server: a.ns.kth.se
Address: 130.237.72.246#53

kth.se
   origin = a.ns.kth.se
   mail addr = hostmaster.kth.se
   serial = 2015081901
   refresh = 14400
   retry = 900
   expire = 604800
   minimum = 86400
```

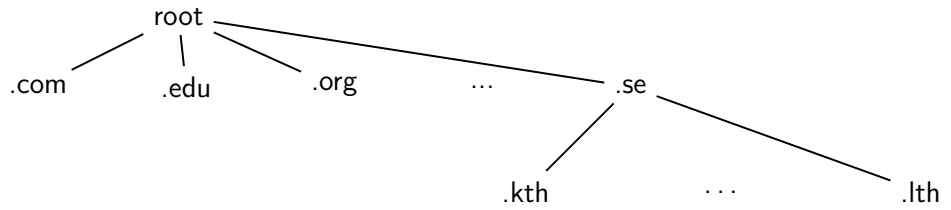

DNS attributes

```
> nslookup -type=TXT kth.se a.ns.kth.se
Server: a.ns.kth.se
Address: 130.237.72.246#53

kth.se text = "3 - SE-100 44  STOCKHOLM"
kth.se text = "2 - Kungliga Tekniska H|gskolan"
kth.se text = "5 - Tel. +46 8 790 60 00"
kth.se text = "1 - Royal Inst of Technology"
kth.se text = "v=spf1 a:mx5.kth.se a:mx6.kth.se a:mx7.kth.se a:smtp-3
kth.se text = "MS=ms86914267"
kth.se text = "4 - SWEDEN"
```


DNS architecture

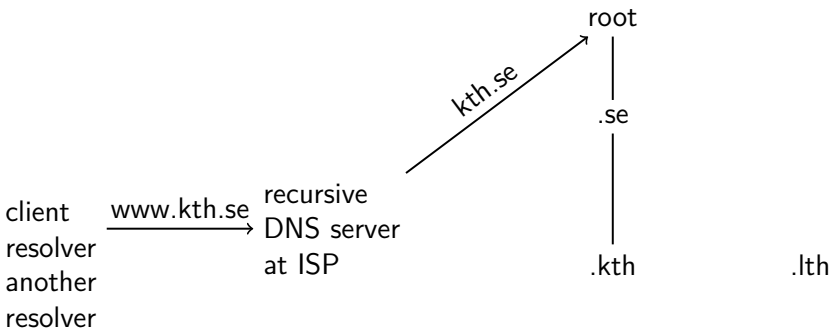
A hieracy of servers that divide the responsibility.



Each server is an *authoritative server* for a zone, it holds the master record for the nodes below it.

Authoritative servers also work as slave servers for other zones to provide redundancy.

DNS resolution



The recursive, or caching-only DNS server, is essential for performance.

DNS infrastructure

There are 13 DNS *logical root servers* in operations.

Each *logical root server* is replicated at up to 20 locations world wide, but share the same IP-address.

An ISP have several recursive DNS servers that are used by their subscribers (i.e. you).

Due to caching, there could be delays in updates to up to 24 hours.

DNS servers can be used a load balancers and hand out different or multiple replies based on time and location.

DNS Round Robin load balancing

```
> nslookup -type=A www.google.com ns1.google.com
Server:         ns1.google.com
Address:        216.239.32.10#53

Name:   www.google.com
Address: 64.233.161.106
Name:   www.google.com
Address: 64.233.161.104
Name:   www.google.com
Address: 64.233.161.147
Name:   www.google.com
Address: 64.233.161.103
Name:   www.google.com
Address: 64.233.161.105
Name:   www.google.com
```


Directory service

A directory service will look up an object given a description of its *attributes*.

More general than name services that typically requires a *name* to be given.

X.500/LDAP

X.500

- the vision of a global telephony directory
- standardized by ITU in 1997
- used Directory Access Protocol (DAP)

LDAP

- Lightweight DAP, RFC 2251 in 1997
- initially used as a proxy for DAP servers
- used by email clients for address books
- simple interface to databases

X.509 is the standard for digital certificates

LDAP example

```
> ldapsearch -x -h  ldap.kth.se
     -b ou=Addressbook,dc=kth,dc=se -LLL "ugUsername=johanmon"

dn: cn=Johan Montelius (johanmon),ou=Addressbook,dc=kth,dc=se
objectClass: top
objectClass: person
ugUsername: johanmon
ugKthid: u1bx6gxe
givenName: Johan
sn: Montelius
displayName: Johan Montelius
mail: johanmon@kth.se
cn: Johan Montelius (johanmon)
```


LDAP example

```
> ldapsearch ... "(&(sn=Montelius)(objectClass=eduPerson))" givenName

dn: cn=Erika Montelius (erikamo),ou=Addressbook,dc=kth,dc=se
givenName: Erika

dn: cn=Hans Montelius (hansmo),ou=Addressbook,dc=kth,dc=se
givenName: Hans

dn: cn=Johan Montelius (johanmon),ou=Addressbook,dc=kth,dc=se
givenName: Johan
  :
  :
```


Summary

- name services - maps unique names to resources
  - DNS - distributed hierarchical architecture
- directory services - query directory given attributes
  - X.500
  - LDAP