

# Internet Engineering

241-461

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<http://fivedots.coe.psu.ac.th/~kre>

## DNS Examples

Query to find address of fivedots.coe.psu.ac.th

```
// got answer:
// ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 4
// flags: qr aa rd ra;
// QUERY: 1, ANSWER: 1, AUTHORITY: 2, ADDITIONAL: 2
// QUERY SECTION:
//   fivedots.coe.psu.ac.th, type = A, class = IN
// ANSWER SECTION:
fivedots.coe.psu.ac.th. 1W IN A 172.30.0.5
// AUTHORITY SECTION:
coe.psu.ac.th.          1W IN NS   ninedots.coe.psu.ac.th.
coe.psu.ac.th.          1W IN NS   fivedots.coe.psu.ac.th.
// ADDITIONAL SECTION:
ninedots.coe.psu.ac.th. 1W IN A 172.30.0.9
fivedots.coe.psu.ac.th. 1W IN A 172.30.0.5
```

◊ We now know the address

◦ This is a normal positive answer

## DNS Examples (2)

Query to find address of www.psu.ac.th

```
// got answer:
// ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 4
// flags: qr aa rd ra;
// QUERY: 1, ANSWER: 2, AUTHORITY: 2, ADDITIONAL: 2
// QUERY SECTION:
//   www.psu.ac.th, type = A, class = IN
// ANSWER SECTION:
www.psu.ac.th.        12H IN CNAME  s1.psu.ac.th.
s1.psu.ac.th.         12H IN A     192.100.77.61
// AUTHORITY SECTION:
psu.ac.th.            12H IN NS     ns.psu.ac.th.
psu.ac.th.            12H IN NS     ns2.psu.ac.th.
// ADDITIONAL SECTION:
ns.psu.ac.th.         12H IN A     192.100.77.5
ns2.psu.ac.th.        12H IN A     192.100.77.2
```

◊ We know the address here too

## DNS Examples (3)

Query to find address of oddball.psu.ac.th

```
;; Got answer:
;; ->HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 4
;; flags: qr aa rd ra;
;; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 0
;; QUERY SECTION:
;;      oddball.psu.ac.th, type = A, class = IN
;; AUTHORITY SECTION:
psu.ac.th. 12H IN SOA (
    ns.psu.ac.th. netadmin.ratree.psu.ac.th.
    2001080801      ; serial
    10800          ; refresh - 3 hours
    1200           ; retry - 20 minutes
    1209600        ; expiry - 2 weeks
    43200 )        ; minimum - 12 hours
◇ This name does not exist.
◦ NXDOMAIN error code "No existing DOMAIN"
◦ The SOA Resource Record
```

## DNS Examples (4)

Query to find location of really.stupid.psu.ac.th

```
;; Got answer:
;; ->HEADER<<- opcode: QUERY, status: NXDOMAIN, id: 5371
;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 0
;; QUESTION SECTION:
;really.stupid.psu.ac.th. IN LOC
;; AUTHORITY SECTION:
psu.ac.th. 10792 IN SOA ns.psu.ac.th. (
    netadmin.psu.ac.th.
    2010120701 10800 1200 1209600 43200 )
◇ Again, the name does not exist
◦ Again psu.ac.th. zone says that
```

## DNS Examples (5)

Query server for AC.TH to find address of jade.coe.psu.ac.th

```
;; Got answer:
;; ->HEADER<<- opcode: QUERY, status: NOERROR, id: 10129
;; flags: qr; QUERY: 1, ANSWER: 0, AUTHORITY: 2, ADDITIONAL: 2
;; QUESTION SECTION:
;jade.coe.psu.ac.th. IN A
;; AUTHORITY SECTION:
psu.ac.th. 7200 IN NS ns.psu.ac.th.
psu.ac.th. 7200 IN NS ns2.psu.ac.th.
;; ADDITIONAL SECTION:
ns.psu.ac.th. 7200 IN A 192.100.77.5
ns2.psu.ac.th. 7200 IN A 192.100.77.2
◇ This is a referral.
◦ The server queried does not know the answer.
◦ It can say what are the servers for psu.ac.th.
```

## DNS Examples (6)

Query for Mail eXchange for jade.coe.psu.ac.th

```
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 57015
;; flags: qr rd ra; QUERY: 1, ANSWER: 0, AUTHORITY: 1, ADDITIONAL: 0
;; QUESTION SECTION:
;jade.coe.psu.ac.th.      IN  MX
;; AUTHORITY SECTION:
coe.psu.ac.th.  9160  IN  SOA  ninedots.coe.psu.ac.th. (
sysadmin.coe.psu.ac.th.
2010120101
14400
3600
2419200
14400  )
;

◇ There is no MX RR for jade.coe.psu.ac.th
◦ There is NOERROR - the domain name exists
◦ The SOA RR says what_zone_says_MX does not exist
```

## DNS Query Types

### ◇ Can Query for Specific RR Type

- A - IPv4 Address
- MX - Mail Exchange
- NS - Name Servers
- CNAME - Canonical Name
  - Lots more

### ◇ Can Query for Meta-Type

- ANY - Any RR's owned by the name
- AXFR - All RR's in Zone Named

## DNS Responses

### ◇ No Error

- Answer Provided
  - ...
  - No data of requested type exists
- Referral
  - Try again at one of these servers

### ◇ Error

- Name Invalid
- Server Error
- Format Error
- Not Implemented
- Refused

# Contents

- ◇ The Domain Name System
- ◇ The DNS Database
- ◇ DNS Protocols
- ◇ DNS Message Formats
- ◇ DNS Limits
- ◇ Zone Transfer
- ◇ Mapping Addresses to Names

## DNS Limits

- ◇ Max Label - 63 bytes
  - Fixed in Protocol
- ◇ Max Domain Name - 255 bytes
  - Protocol convention (could be altered)
- ◇ Max UDP Packet size - 512 bytes
  - Protocol Convention
    - ▷ Avoid Fragmentation
    - ▷ Guarantee Buffer Space
- ◇ Only one RR in Question Section
  - Convention - enforced by protocol limitations

## Exceeding DNS Limits

- ◇ Label length
  - Cannot be done - protocol error to try
- ◇ Domain Name Length
  - Implementation defined - typically reject name
- ◇ UDP Packet Size
  - Can only be exceeded in Reply
  - DNS Query max size:
    - ▷ One Question
      - Max Length  $255 + 2 + 2$
    - ▷ Plus Header (12)
      - Total 271
  - TC bit in reply indicates Truncation
    - ▷ Repeat query using TCP