Lecture 7: The Domain Name System and UDP

Homework 2 is due Monday Sept 13

Reading 2.5 (DNS), 2.1.4 (Transport Types)
Domain Name System
- distributed application

forward lookup:
translates domain names into IP addresses
www.google.com -> 134.87.9.98

mail exchange resolution:
uic.edu (MX) -> mailin-grp1.uic.edu

reverse lookup:
134.87.9.98 -> frontend102948484.google.com
experiment1.labs.google.com
DNS response types (resource records)

A - name = IPv4 address

AAAA - name = IPv6 address

NS - name : next nameserver (name) to ask

MX - domain/name : responsible smtp server

SOA - start of authority

TXT - text

PTR - reverse DNS pointer : in-addr.arpa address -> name

CNAME - alias:  www.google.com -> google.com
### The DNS Message Format

<table>
<thead>
<tr>
<th>ID</th>
<th>FLAGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUESTION_CNT</td>
<td>ANSWER_CNT</td>
</tr>
<tr>
<td>AUTH_CNT</td>
<td>OTHER_CNT</td>
</tr>
<tr>
<td>QUESTIONS</td>
<td></td>
</tr>
<tr>
<td>ANSWERS</td>
<td></td>
</tr>
<tr>
<td>AUTHORITIES</td>
<td></td>
</tr>
<tr>
<td>OTHERS</td>
<td></td>
</tr>
</tbody>
</table>

**12 bytes**

- **DNS Resource Records (RR):**
- **Varying sizes:**
### DNS Question section format

<table>
<thead>
<tr>
<th>NAME</th>
<th>TYPE</th>
<th>CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>variable</td>
<td>2 bytes</td>
<td>2 bytes</td>
</tr>
</tbody>
</table>

### DNS Resource Record format

<table>
<thead>
<tr>
<th>NAME</th>
<th>TYPE</th>
<th>CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME TO LIVE</td>
<td>DATALEN</td>
<td></td>
</tr>
<tr>
<td>4 bytes</td>
<td>2 bytes</td>
<td></td>
</tr>
</tbody>
</table>

DATA ...

DNS Name Compression

Because host names are frequently repeated or very similar in DNS responses, a compression mechanism is used. First names are transcribed:

```
www.cs.uic.edu
```

If one of the 'length numbers' is on the (binary) form (11******) (0xc0) the 6 LSB and the next byte are used as an (offset) pointer into the packet.

Let the name 3www2cs3uic3edu start at offset 0x20. The name 4mail(0xc024) is then read out as mail.cs.uic.edu:

```
4mail + 2cs3uic3edu
```

dns.h - has the supporting code for this