

## **DNS Application**

### **Abstract**

The Java application described in this report implements a Domain Name System (DNS) service using the client-server paradigm. The server utilizes a resource record cache in a tree structure, generated from a resource record file provided by the user named "master.txt". The client is able to make type A, CNAME, and NS DNS queries to the server, which resolves these queries using only its stored cache. Additionally, the server is able to multiplex requests made from multiple clients using concurrency.

### **Technical Specifications**

The application is programmed in Java and runs on OpenJDK (v17.0) development environment.

The application is organised as shown in the diagram below.

```
> assignment
  > src
    > Makefile
    > Server.java
    > Client.java
    > DNSZone.java
    > ResourceRecord.java
    > ZoneFactory.java
```

### **Application Design**

The application is designed using object-oriented programming and involves instantiating the DNSZone and ResourceRecord classes to represent occurrences of these. A DNSZone consists of a label, which when combined with the labels of its parent zones, provides the domain name of the zone. Resource records are contained within these zones.

DNSZones are related using a tree structure as shown in figure 1, where the root node corresponds to the DNSZone of the root server (i.e., ".").

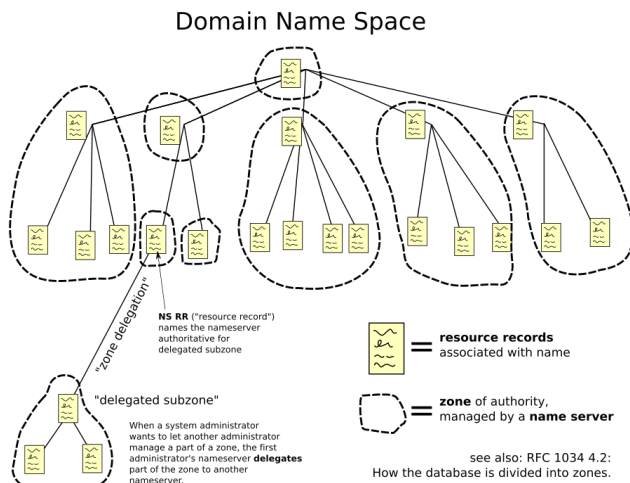


Figure 1

The query sent by the client has the format illustrated in figure 2, where each section of the message is terminated by a newline ('\n') character.

qid		} Header
qname	qtype	

Figure 2

Similarly, the response message provided by the server has the format shown in figure 3.

qid			}	Header
numAnswerRecords	numAuthorityRecords	numAdditionalRecords		
qname	qtype			
qname	qtype	data	}	Answer records
qname	qtype	data		Authority records
qname	qtype	data		Additional records

Figure 3

## Known Limitations

The primary limitation of this DNS implementation is that the server is limited to the resource records provided by the user and is unable to make queries to other DNS servers in the event where a query cannot be resolved. Other limitations relate to the structure of the required master file, including the fact that it must contain at least one NS record for the root server.

## References

- [https://en.wikipedia.org/wiki/Domain\\_Name\\_System](https://en.wikipedia.org/wiki/Domain_Name_System) (Figure 2)
- <https://stackoverflow.com/questions/6406470/java-simplydateformat> (used in Server.java)