UNIVERSITY COMPUTER SCIENCE • EXERCISE SHEET

9.5 Application protocols

Name: _____ Class: _____ Date: _____ **Total: 24 marks**

KEY WORDS DNS • HTTP

Objective

Trace a DNS walk and read an HTTP exchange byte by byte.

1 Key knowledge and worked examples

■ **The walk**

Resolver → root (referral to TLD) → TLD (referral to authoritative) → authoritative (the address) ✓; caches skip the walk for the TTL ✓.

■ **Worked example: the response**

`200 OK`, `Content-Type: text/html`, `Content-Length: 128`, blank line, exactly 128 body bytes ✓.

2 Practice

2.1 Which DNS level finally holds the host record? [3]

2.2 What physically ends an HTTP header block? [3]

2.3 Name the four status-code classes in one line. [3]

3 Exam-style questions

3.1 A resolver with a cold cache resolves `www.example.com`.

List each server it contacts and what each returns (referral or answer). State which contacts the cache eliminates for the next lookup of `example.com` and for how long. State what changes if the TLD's answer is already cached but the authoritative's is not. [8]

3.2 The server replies `HTTP/1.1 301 Moved Permanently` with `Location: https://example.com/new` and `Content-Length: 0`.

State what the client should do next and the header that tells it. State what a 200 for the same URL would have carried instead. Give the byte-level structure of a 200 response with a 60-byte body (list the parts in order). State why the blank line is load-bearing. [7]

Solutions

2.1

- The authoritative server for the zone ✓.

2.2

- A blank line – two consecutive newlines (CRLF CRLF) ✓.

2.3

- 2xx success, 3xx redirect, 4xx client error, 5xx server error ✓.

3.1

- Root: referral to the `.com` TLD servers ✓.
- TLD: referral to example.com's authoritative servers ✓.
- Authoritative: the answer – `www.example.com`'s address ✓.
- The cache eliminates the root contact on the next lookup, for the TTL of the cached referral ✓.
- With the TLD cached but not the authoritative: the walk starts at the TLD – one contact fewer, same final answer ✓.

3.2

- Follow the redirect: request the URL in `Location` ✓.
- A 200 would have carried the resource body with its Content-Type and Content-Length ✓.
- Structure: status line; headers (Content-Type, Content-Length: 60); blank line; 60 body bytes – in that order ✓.
- The blank line is load-bearing because headers are length-prefixed by nothing else: the parser cannot know where they end without it ✓.