DNS Configuration Report

COS370 / COS372 — Computer Networks

1. Network Topology

The DNS lab consists of three virtual machines connected through a VMware virtual network. The Win7 client queries the DNS Server (port 53) to resolve www.nawaf.com, then sends an HTTP request to the resulting Web Server address (port 80).

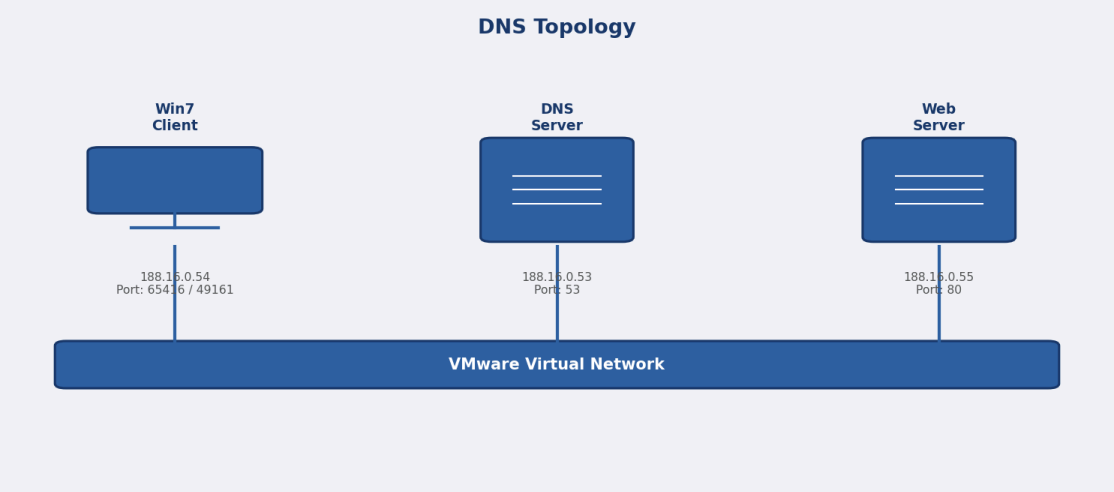

Figure 1 — DNS Lab Topology (Win7 Client, DNS Server, Web Server on VMware)

2. Captured Messages Summary

The table below lists every captured packet in the session. ARP is used to resolve MAC addresses before each new IP communication; DNS resolves the domain name; HTTP carries the actual web content.

DNS Capture — Message Summary Table

#	Source IP	Destination IP	Src Port	Dst Port	Message
1 (ARP)	188.16.0.54	188.16.0.55	-	-	ARP Request
2 (ARP)	188.16.0.55	188.16.0.54	-	-	ARP Reply
3 (DNS)	188.16.0.54	188.16.0.55	65416	53	Standard Query 0x3252 A www.nawaf.com
4 (DNS)	188.16.0.55	188.16.0.54	53	65416	Standard Query Response 0x3252 A 188.16.0
5 (ARP)	188.16.0.53	188.16.0.55	-	-	ARP Request
6 (ARP)	188.16.0.55	188.16.0.53	-	-	ARP Reply
7 (HTTP)	188.16.0.55	188.16.0.54	49161	80	GET / HTTP/1.1
8 (HTTP)	188.16.0.54	188.16.0.55	80	49161	HTTP/1.1 200 OK (text/html)

Figure 2 — DNS Session Packet Summary

3. Message Flow Graph

The flow diagram below illustrates the complete sequence: ARP resolution for the DNS server, DNS query/response, ARP resolution for the web server, then the final HTTP exchange.

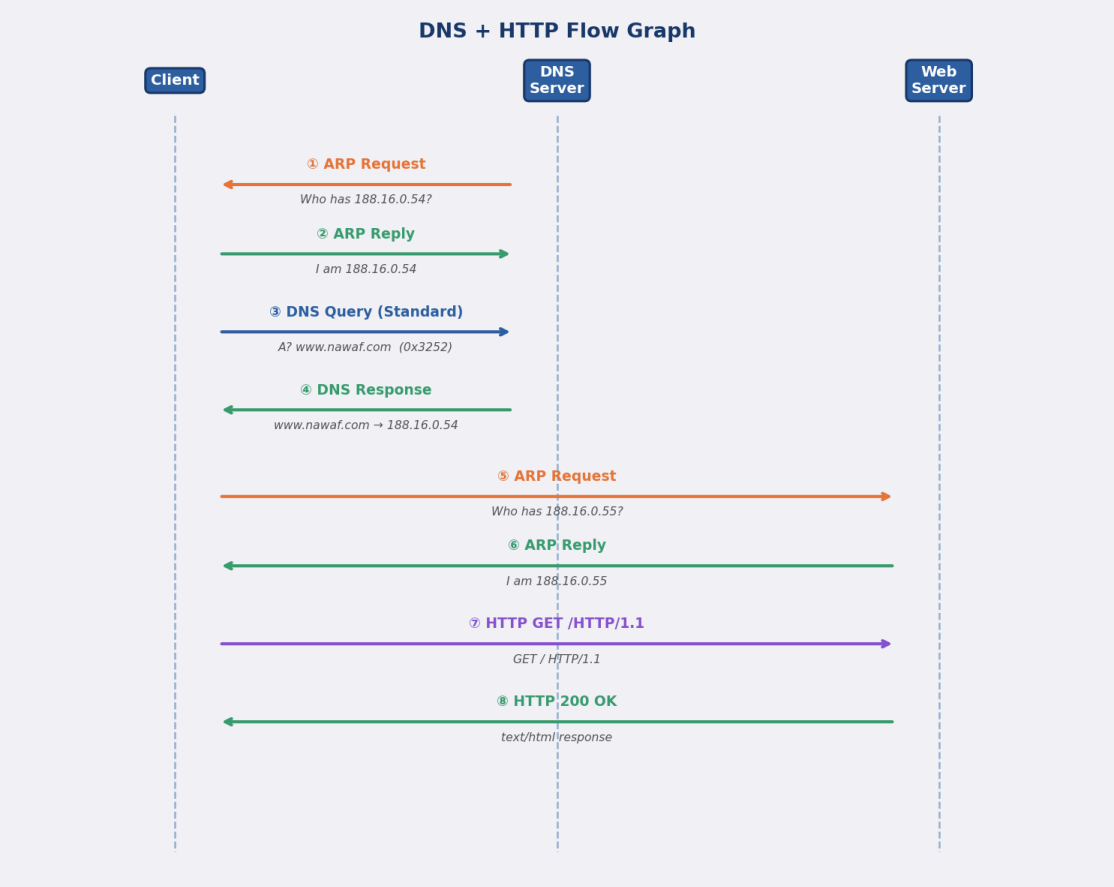

Figure 3 — Full DNS + HTTP Flow Sequence

4. ARP Frame Analysis

ARP (Address Resolution Protocol) is used to map IP addresses to MAC addresses within the local network. Below are the key fields for both ARP request and reply frames.

ARP Request — Win7 to DNS Server

Field	Value
Hardware Type	0x0001 (Ethernet)
Protocol Type	0x0800 (IPv4)
HW Address Length	0x06 (6 bytes)
Protocol Length	0x04 (4 bytes)
Operation	0x0001 (Request)
Sender MAC	0x000c2908c83c
Sender IP	188.16.0.54
Target MAC	0x000000000000 (unknown)
Target IP	188.16.0.55

ARP Reply — DNS Server to Win7

Field	Value
Hardware Type	0x0001 (Ethernet)
Protocol Type	0x0800 (IPv4)
HW Address Length	0x06
Protocol Length	0x04
Operation	0x0002 (Reply)
Sender MAC	0x000c29f3384d
Sender IP	188.16.0.55
Target MAC	0x000c2908c83c
Target IP	188.16.0.54

5. DNS Query Packet — www.nawaf.com

The client sends a standard DNS query (Type A) for www.nawaf.com with Transaction ID 0x3252. Each field is numbered the structure diagram shows the layout and the reference table below it explains every field.

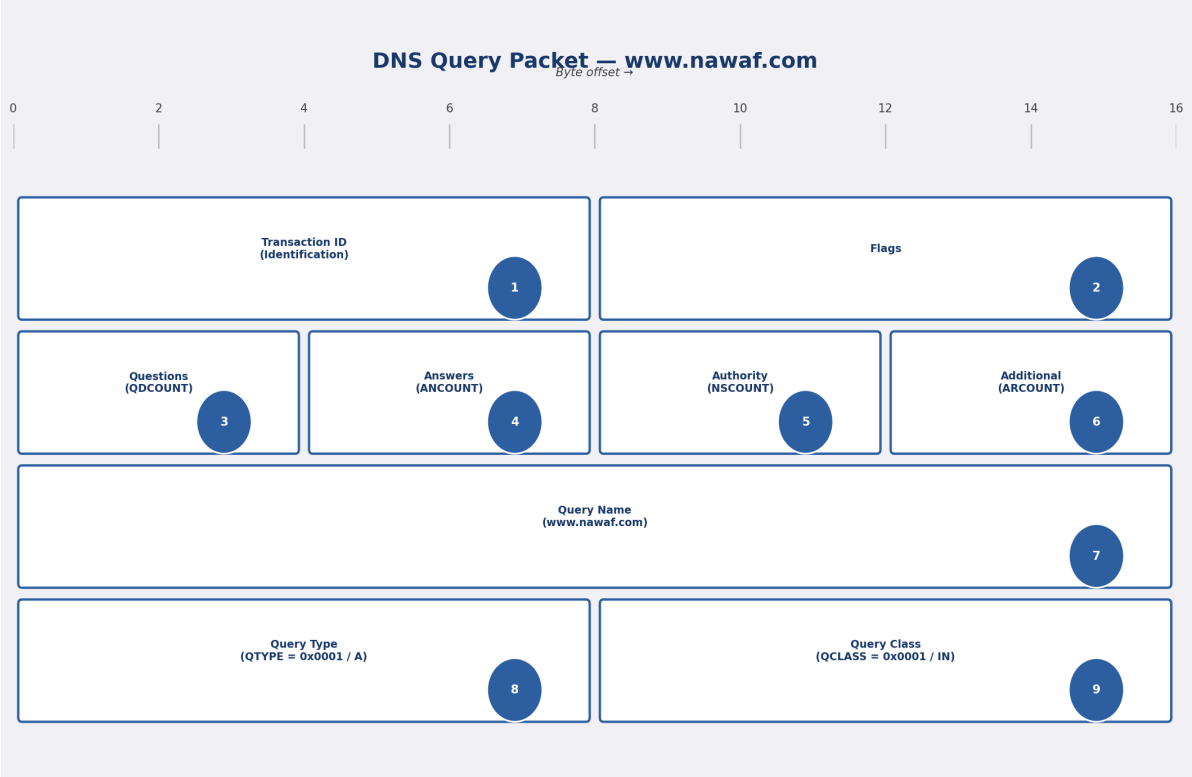

Figure 4a — DNS Query Packet Layout (numbered)

DNS Query Field Reference

#	Field Name	Role / Notes
1	**Transaction ID**	0x3252 — matches query to reply
2	**Flags**	0x0100 — QR=0 (query), RD=1 (recursion desired)
3	**Questions**	0x0001 — one question entry
4	**Answers**	0x0000 — no answers (this is a query)
5	**Authority**	0x0000 — no authority records
6	**Additional**	0x0000 — no additional records
7	**Query Name**	0x037777...6d00 — encoded "www.nawaf.com"
8	**Query Type**	0x0001 — Type A (IPv4 address lookup)
9	**Query Class**	0x0001 — Class IN (Internet)

Figure 4b — DNS Query Field Reference Table

6. DNS Response Packet — www.nawaf.com → 188.16.0.54

The DNS server responds with Transaction ID 0x3252, confirming that www.nawaf.com resolves to 188.16.0.54. The response echoes the question section and adds an Answer record.

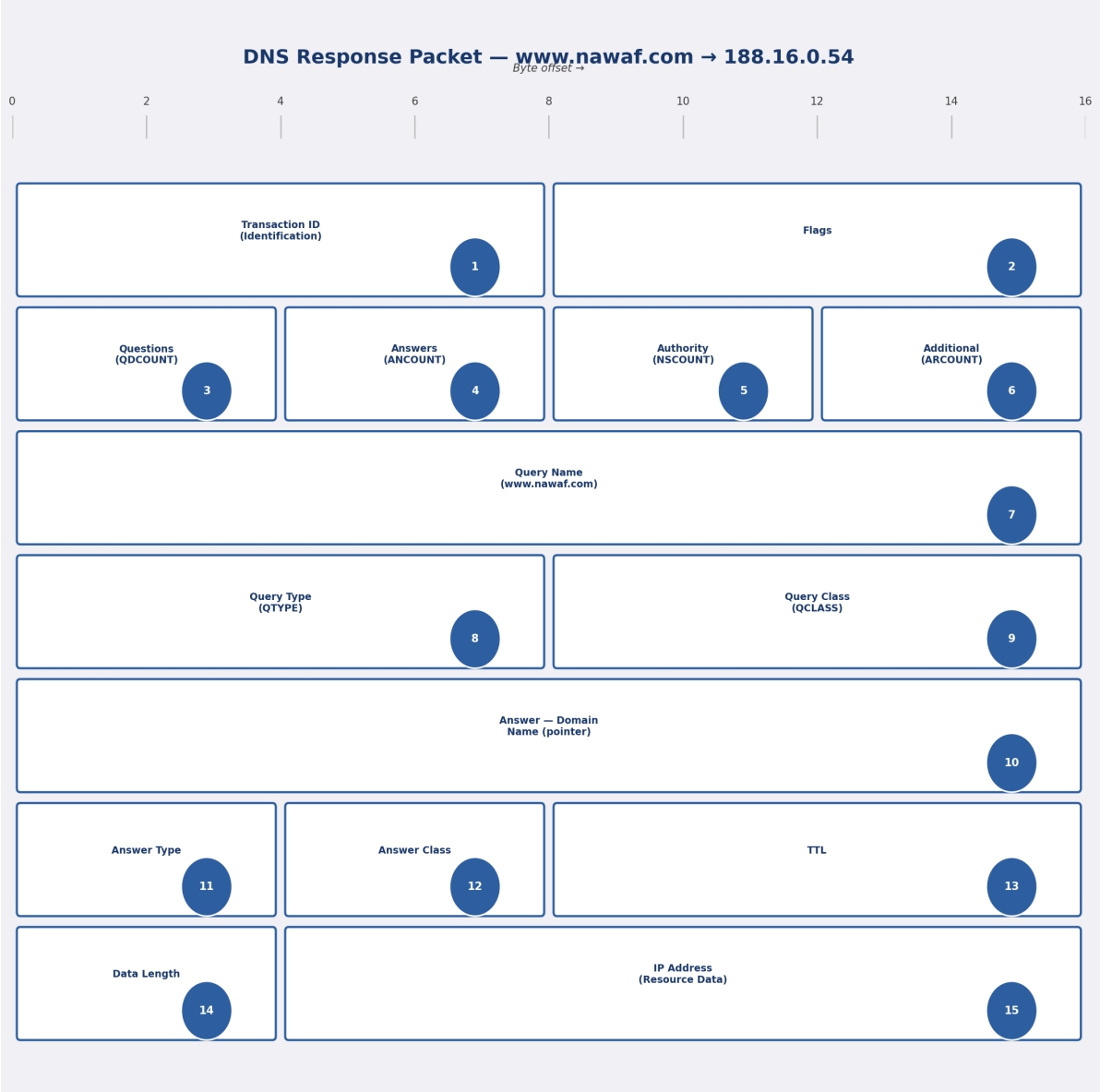

Figure 5a — DNS Response Packet Layout (numbered)

DNS Response Field Reference

#	Field Name	Role / Notes
1	**Transaction ID**	0x3252 — matches the original query
2	**Flags**	0x8580 — QR=1 (response), AA=1, RD=1, RA=1
3	**Questions**	0x0001 — one question echoed back
4	**Answers**	0x0001 — one answer record
5	**Authority**	0x0000 — no authority records
6	**Additional**	0x0000 — no additional records
7	**Query Name (echo)**	"www.nawaf.com" — echoed from query
8	**Query Type (echo)**	0x0001 — Type A
9	**Query Class (echo)**	0x0001 — Class IN
10	**Answer Domain Name**	0xc00c — pointer back to query name
11	**Answer Type**	0x0001 — Type A (IPv4)
12	**Answer Class**	0x0001 — Class IN
13	**TTL**	0x0000012a — 298 seconds
14	**Data Length**	0x0004 — 4 bytes (IPv4 address)
15	**IP Address**	0xd83ac64e → 188.16.0.54

Figure 5b — DNS Response Field Reference Table

7. HTTP Request & Response

After resolving the domain, the client sends an HTTP GET request to the Web Server. The server responds with HTTP/1.1 200 OK and HTML content.

HTTP Request

Field	Value
Request Line	GET / HTTP/1.1\r\n
Host	www.nawaf.com
User-Agent	Mozilla/5.0 (Windows NT 6.1)...
Accept	text/html,application/xhtml+xml...
Accept-Language	en-US,en;q=0.5
Accept-Encoding	gzip, deflate
Connection	keep-alive

HTTP Response

Field	Value
Status Line	HTTP/1.1 200 OK\r\n
Content-Type	text/html
Last-Modified	Thu, 31 Aug 2017...
Server	Apache/2.4.18 (Ubuntu)
Date	Sat, 31 Aug 2019...
Content-Length	(varies)
Data	<html>...<body>...</body></html>