Indian Institute of Technology, Bhilai

CSL351: Computer Networks

Assignment - 4 (Application Layer Protocols)

Full Marks: 30 *Deadline: 09/02/2026*

Submission Instructions:

1) Answer all the questions.
2) Deliverables in a .zip:
    a) Submission Guidelines: Upload the **Assignment Report** .zip.
    b) Readable Report **[5 Points for report quality]** enumerating steps followed with screenshots for each of the important steps:
        i) Pcap trace collected and mention the command/tool used.
        ii) Put the screenshots (**mandatory**) to validate your answers in the report.
        iii) Clear and concise writing.
        iv) Upload the pcap file in your personal drive and include the drive link in the report.
3) Follow the instructions carefully given in the question.
4) You can use latex/word to make the pdf.
5) The naming of the file should strictly follow the given format: <Roll_No>_<Name>_<Assignment No>. If your name is Alex, your roll number is B23CS055, then the filename should be: B23CS055_Alex_04.zip
6) **Any plagiarism case will be considered unethical practice, and appropriate action will be taken against them.**

Objectives:

1. Analyze and understand HTTP and DNS protocols using packet analysis tools like Wireshark.
2. Reconstruct application layer content from captured HTTP traffic.
3. Explore and document DNS queries and responses to create domain-to-IP mappings.
4. Investigate web page loading behavior, including connections, objects, and response times.

Description:

This assignment focuses on studying HTTP and DNS application-layer protocols using tools such as Wireshark. It involves capturing and analyzing network traffic, reconstructing application-layer data, examining DNS query-response

behavior, and evaluating web page loading processes. The goal is to gain practical insights into how these protocols facilitate communication over the Internet.

PART 1: HTTP [15 Points]

Instruction: Start packet capture just before opening the https://www.iitbhilai.ac.in website, and stop it once the entire page has loaded (or wait for 2 minutes and then stop the capture). Save the pcap file and answer the following questions by analyzing the packet traces.

1. When you browse the IIT Bhilai main page (https://www.iitbhilai.ac.in) how many requests are sent (how many of the GET requests are for embedded content and how many get requests for the text)? Plot the IO graph for packets sent to iitbhilai.ac.in and packets received from iitbhilai.ac.in **[3 Points]**
2. For each HTTP GET request as you see above, find out the total amount of data being received in the corresponding HTTP response message. **[2 Points]**
3. How many HTTP packets were received with response codes other than 2XX? What are the different response codes received? Explain. **[2 Points]**
4. How many HTTP/HTTPS connections are of type persistent? **[1 Point]**
5. For the response to your HTTP GET request, get the image reconstructed by the hex editor. Hint* **[2 Points]**
6. Surf a website (other than google.com) of your choice and discuss the end-to-end process of web page loading using Wireshark. How much time did it take to load the page? Find out how many connections are used to download this page. Are these connections persistent or non-persistent? How many objects have been transferred on these connections? Which object took the longest time to download? **[5 Points]**

Hint*: For an HTTP GET request, you may get a response. Check the response for the application layer content. Choose the byte stream that contains data for that file. If the image is not shared across multiple chunks, then simply export using Wireshark (file → export selected bytes). Else, copy the image file across multiple files into a hex editor to get back the original image.

PART 2: DNS [10 points]

1. Along with the IIT Bhilai website, access one more website of your choice and answer the following questions. How many DNS packets have you observed in total? **[4 Points]**
    a. Create a <Domain Name, IP> table by exploring the queries and the answers in those DNS packets. The Domain Name will be the domain for which you see a query, and the IP address will be the address that is being returned against the corresponding query.
    b. Can you find the IP addresses of the DNS servers by analysing DNS packets?
2. The root servers on the Internet are in the domain root-servers.net. You can see the list of all root servers using dig [DNS lookup utility] or any tool/command. **[6 Points]**

    Use dig to ask the root server for the address of www.iitbhilai.ac.in, without recursion. Go through the hierarchy from the root without recursion, following the referrals manually until you reach the address www.iitbhilai.ac.in.

    List all the name servers involved to find the IP address of www.iitbhilai.ac.in.

Check Web sources for more information.