COMPUTER NETWORKS ASSIGNMENT 7

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The Custom Lightweight Discovery Protocol (CLDP) is a lightweight network protocol for service discovery and system information exchange on local networks. It allows clients to discover available servers and query them for system information. The CLDP runs over raw IP sockets.

Protocol Details

1. **Protocol Number**
    a. Uses a custom IP Protocol Number 253 (reconfigurable)
2. **Message Types**
    a. HELLO (0x01): Broadcast by the servers to announce their presence
    b. QUERY (0x02): Sent by clients to request system information
    c. RESPONSE (0x03): Sent by the servers in response to QUERY messages
3. **Header Format**
    a. Type (8 bits): Message Type (1=HELLO, 2=QUERY, 3=RESPONSE)
    b. Payload Length (8 bits): Length of payload in bytes
    c. Transaction ID (16 bits): Unique identifier for matching queries and responses
    d. EvenBit (32 bits): Redundant part (just to make number of header fields 4)
4. **Message Formats**
    a. HELLO Message
        i. No Payload
        ii. Transaction ID is set to 0
        iii. Broadcast to address 255.255.255.255
    b. QUERY Message
        i. The payload contains system information (hostname, time, CPU load)
        ii. Transaction ID matched the corresponding QUERY
        iii. Sent directly to the client's IP address

Protocol Operation

1. **Client**
    a. Server Discovery: A listener thread on the client captures incoming HELLO messages. When a HELLO message is received, the client updates an

internal list of active servers (identified by their IP addresses) along with a timestamp.

b. Information Collection: The client periodically sends QUERY messages to all known servers. Each QUERY uses a unique transaction ID. The client then polls for RESPONSE messages over a short time window. On receipt of a valid RESPONSE (with a matching transaction ID), the client extracts and displays the system information.

c. The client periodically checks the list of servers and removes entries that have not been refreshed (via HELLO messages) within a defined timeout period (20 seconds).

2. **Server**

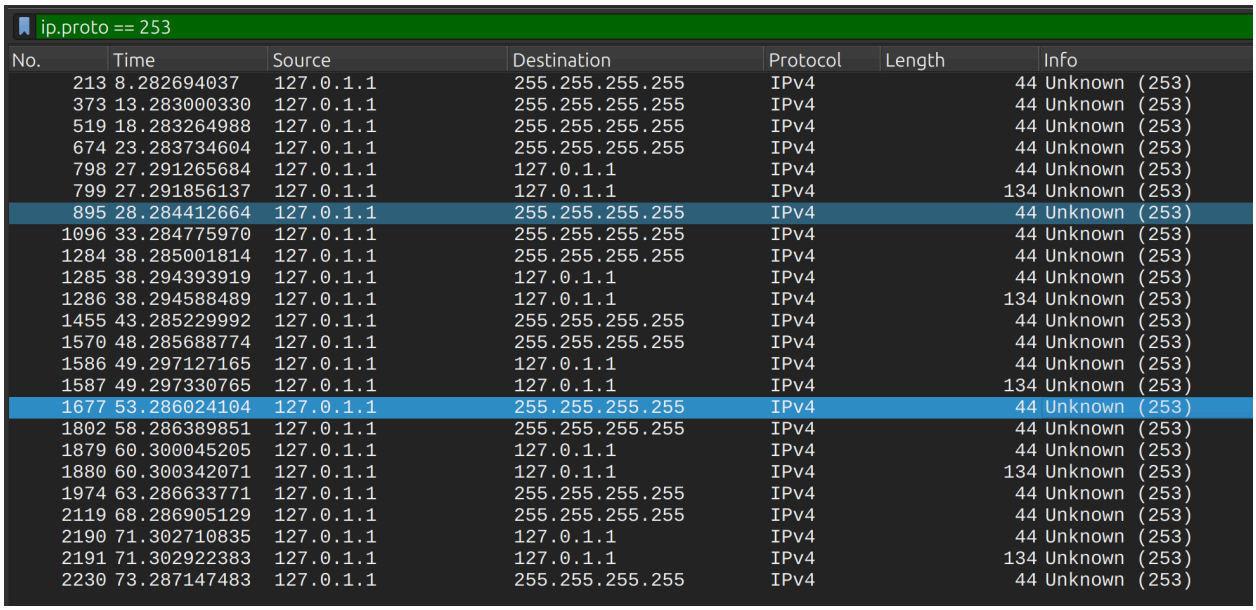
a. HELLO Announcements: A hello_thread on the server periodically sends HELLO messages to the broadcast address. This allows clients to discover available servers.

b. Query Response: The server listens for incoming packets. When it receives a QUERY, it gathers system information (hostname, current time via gettimeofday, CPU load via sysinfo) and constructs a RESPONSE message.

Checksum Calculation

A simple checksum algorithm computes the IP header checksum to detect discrepancies in packets developed during transmission.

WireShark Capture



No.	Time	Source	Destination	Protocol	Length	Info
213	8.282694037	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
373	13.283000330	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
519	18.283264988	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
674	23.283734604	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
798	27.291265684	127.0.1.1	127.0.1.1	IPv4	44	Unknown (253)
799	27.291856137	127.0.1.1	127.0.1.1	IPv4	134	Unknown (253)
895	28.284412664	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
1096	33.284775970	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
1284	38.285001814	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
1285	38.294393919	127.0.1.1	127.0.1.1	IPv4	44	Unknown (253)
1286	38.294588489	127.0.1.1	127.0.1.1	IPv4	134	Unknown (253)
1455	43.285229992	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
1570	48.285688774	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
1586	49.297127165	127.0.1.1	127.0.1.1	IPv4	44	Unknown (253)
1587	49.297330765	127.0.1.1	127.0.1.1	IPv4	134	Unknown (253)
1677	53.286024104	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
1802	58.286389851	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
1879	60.300045205	127.0.1.1	127.0.1.1	IPv4	44	Unknown (253)
1880	60.300342071	127.0.1.1	127.0.1.1	IPv4	134	Unknown (253)
1974	63.286633771	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
2119	68.286905129	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)
2190	71.302710835	127.0.1.1	127.0.1.1	IPv4	44	Unknown (253)
2191	71.302922383	127.0.1.1	127.0.1.1	IPv4	134	Unknown (253)
2230	73.287147483	127.0.1.1	255.255.255.255	IPv4	44	Unknown (253)