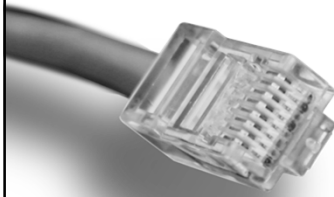


Network Light



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Modul II

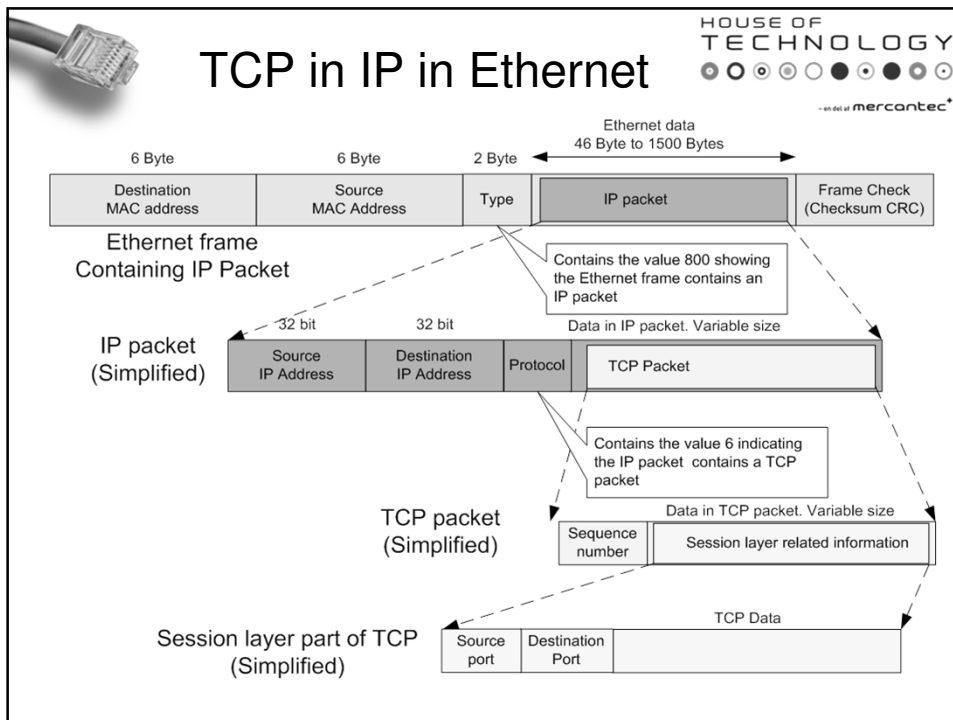
Subjects

- Review from Pre-Break
- Network performance measurement

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Name Resolution Example

- On a windows 7 computer today:
 - HOSTS file
 - DNS+DNS Suffix
 - LLNMR(Sends 2 requests on IPv4 and IPv6)
 - NetBIOS(Sends up to 3 queries)


```

C:\Users\rasmus>ping media


Pinger media [10.1.0.20] med 32 byte data:
Svar fra 10.1.0.20: byte=32 tid<1ms TTL=128
Svar fra 10.1.0.20: byte=32 tid<1ms TTL=128
Svar fra 10.1.0.20: byte=32 tid<1ms TTL=128
Svar fra 10.1.0.20: byte=32 tid<1ms TTL=128

Ping-statistikker for 10.1.0.20:
    Pakker: Sendt = 4, modtaget = 4, tabt = 0 (0% tab),
    Beregnet tid for rundtur i millisekunder:
        Minimum = 0ms, Maksimum = 0ms, Gennemsnitlig = 0ms
  
```

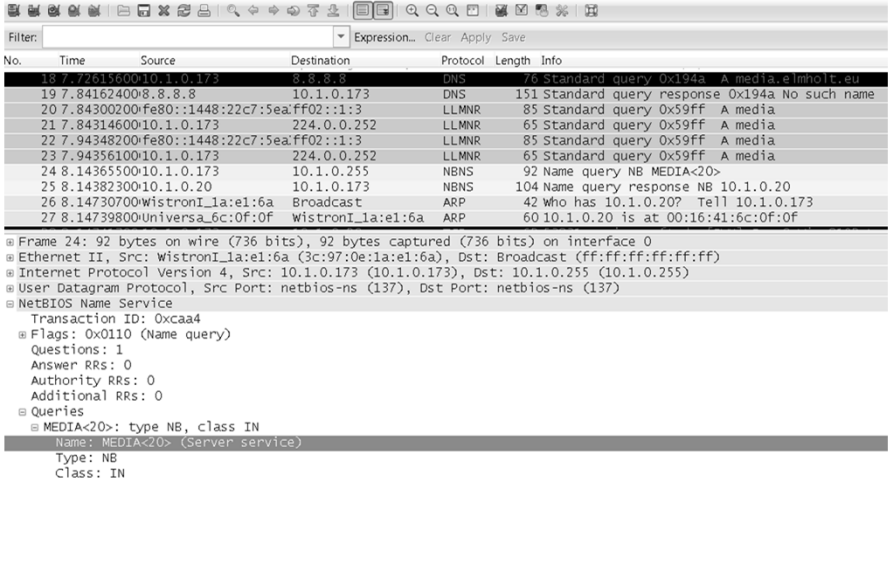
<http://technet.microsoft.com/en-us/library/bb878128.aspx>




Name Resolution Example




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The screenshot shows a Wireshark capture of network traffic. The packet list pane displays several packets, including a DNS standard query (No. 19) and LLMNR standard queries (Nos. 21, 22, 23). The packet details pane is expanded to show the 'MEDIA<20>' section of a NetBIOS Name Service query, indicating a type NB and class IN.



Link-Local Multicast Name Resolution



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- Microsoft designed protocol that can be used on private networks where there is no DNS server
- It is one of many protocols that do similar things for zero-configuration networks
- Defined in RFC 4795.
- LLMNR multicasts UDP messages on port 5355
 - IPv4 - 224.0.0.252
 - IPv6 - FF02::1:3
- On Windows 7, LLMNR can be disabled by a registry entry:
 - HKLM/Software/Policies/Microsoft/WindowsNT/DNSClient/
 - Create a DWORD called "EnableMulticast" with a value of 0.



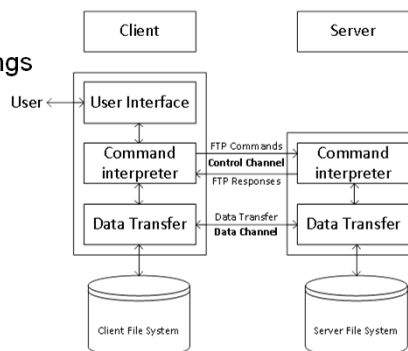
File transfer Protocol(FTP)

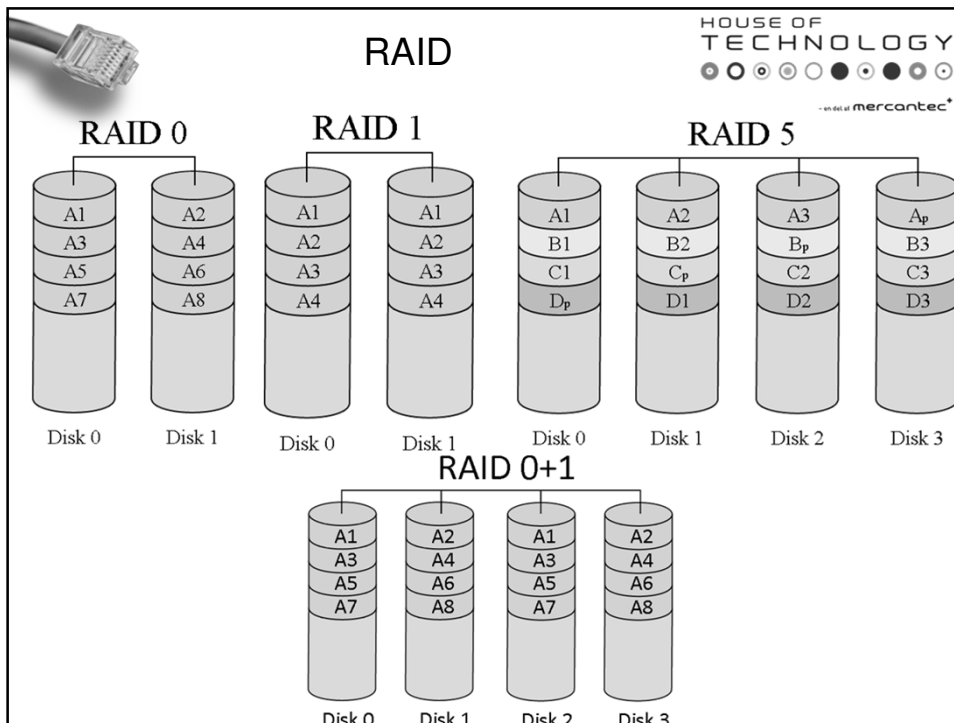
- Client/Server protocol used to transfer files between systems on the internet
- Defined in RFC 959
- Uses TCP connections to transfer files in plain text.
- Supports username/password but is sent in plain text.
- Uses a data and control channel to transfer commands and data
 - **Control**: Used to create the session and validate the user and ask for information(files)
 - **Data**: Used to transfer files and directory listings.
- Supports 2 operation modes:
 - **Active**: The server connects to the client for data connections
 - **Passive**:The client connect to the server for data connections



FTP Channels

- Control channel
 - Authenticates with the server
 - Negotiates FTP parameters(Supported extensions)
 - FTP commands(dir, get, put, bye)
- Data Channel
 - Tranfers files and directory listings






Subjects


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- Review from Pre-Break
- Network performance measurement
 - Application layer file transfer
 - Network layer latency
 - Transport layer bandwidth(TCP/UDP)
 - Transport layer latency




Network performance

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- Network performance is used to indicate how well a network/network device performs under specific conditions.
- Often network administrators perform and document a network baseline to compare against
- If we measure on a single device we call it a DUT - Device Under Test
- Devices often perform differently on the different layers in the OSI model.
 - Application layer file transfer
 - Network layer latency
 - Transport layer bandwidth(TCP/UDP)
 - Transport layer latency




File transfer

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- Transfer a file of a certain size from a storage device and count the seconds




The screenshot shows a web browser window with the URL 'speedtest.tele2.net'. The page features the 'TELE2' logo and text explaining the service: 'Tele2 Speedtest', 'This service is running on a Sun Fire X2100 with a 10GbE NIC connected to the Tele2 Swedish core network. The node is located in Stockholm, Sweden. TCP windows have been slightly tweaked to support higher throughput.', and 'We provide a variety of testfiles with different sizes, for your convenience. 100MB 1GB 10GB 50GB 100GB 1000GB. These are sparsities and so although they appear to be on disk, they are not limited by disk speed but rather by CPU. Warp9, the server that is currently hosting this service, is able to sustain some 500MB/s (~5Gbps) of throughput.' It also includes an FTP link and contact information.



Network Layer Latency

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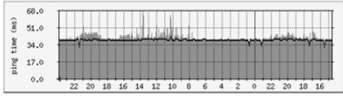
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- Ping a device repeatedly and log the times
- Ping is a Layer 3 protocol and will show the RTT on layer 3 and below.

Round Trip Time Analysis for www.google.dk

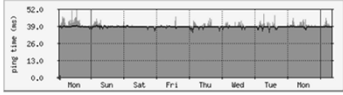
The statistics were last updated Monday, 12 November 2012 at 23:56, at which time 'unknown' had been up for unknown.

'Daily' Graph (5 Minute Average)




Max	Average	Current
Max: 47.0 ms (87.0%)	41.0 ms (81.0%)	40.0 ms (80.0%)
Min: 42.0 ms (82.0%)	35.0 ms (70.0%)	35.0 ms (70.0%)

'Weekly' Graph (30 Minute Average)




Max	Average	Current
Max: 51.0 ms (91.0%)	40.0 ms (80.0%)	39.0 ms (78.0%)
Min: 39.0 ms (78.0%)	35.0 ms (70.0%)	35.0 ms (70.0%)



Transport Layer Bandwidth


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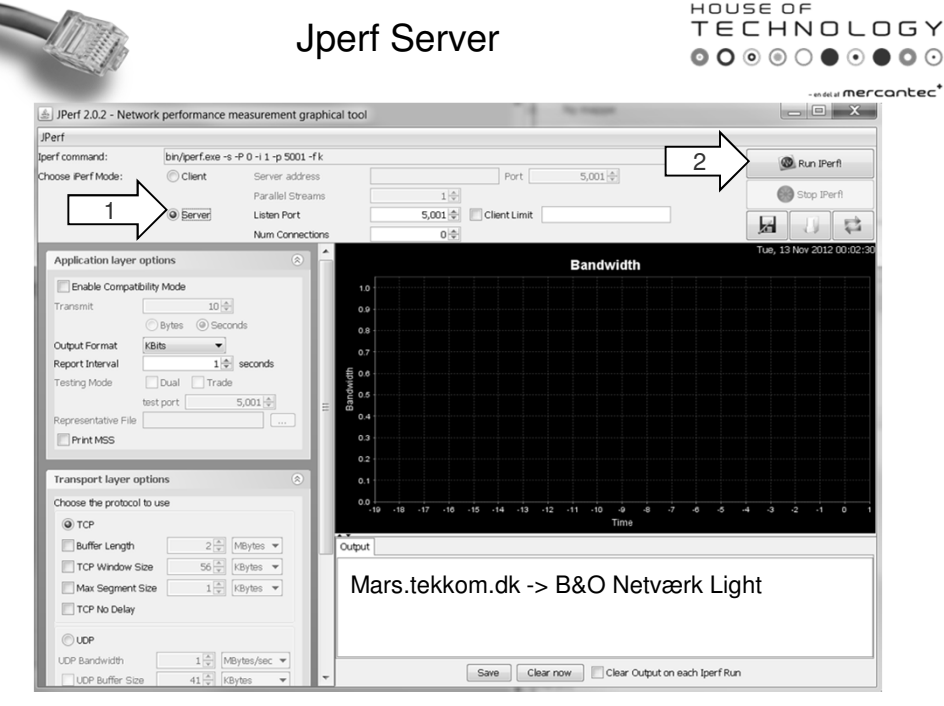


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- Use a server and a client on two devices to transfer data.
- Iperf is a great tool to test network performance across a DUT
- Iperf creates a socket and transfers random data from the memory. Eliminates the bottleneck with Disk I/O
- Jperf is a Java GUI to Iperf that runs on windows
- Iperf and Jperf is free and OpenSource☺
- Configure one computer as the server
- Configure one computer as a client


Jperf Server

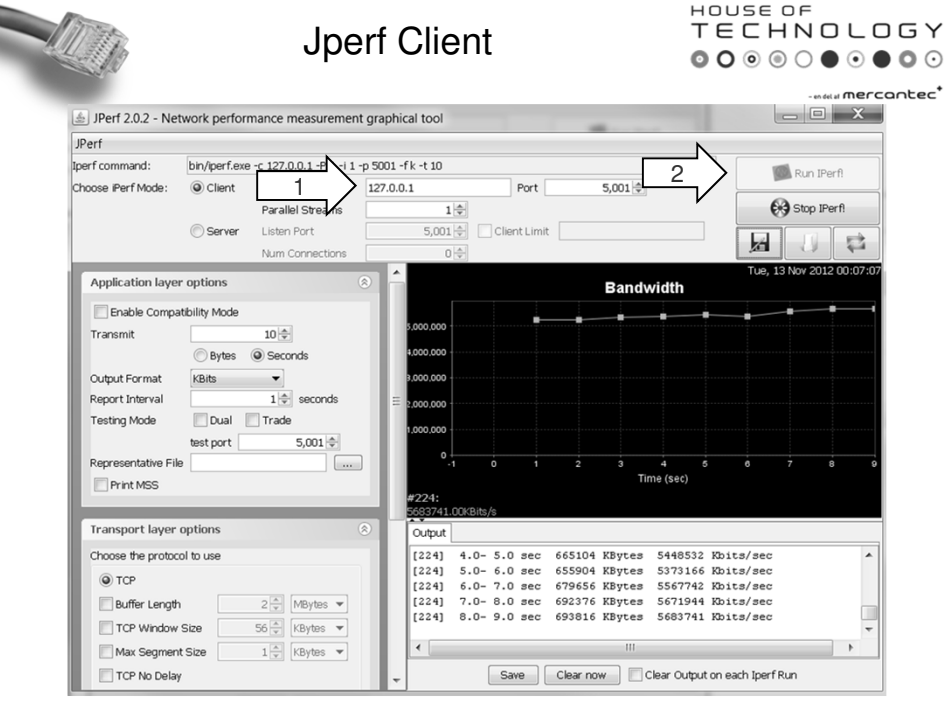




The screenshot shows the JPerf 2.0.2 Server interface. The 'JPerf command' is set to `bin/perf.exe -s -P 0 -l -p 5001 -fk`. The 'Choose Perf Mode' is set to 'Server'. The 'Server address' is empty, and the 'Port' is 5,001. The 'Application layer options' include 'Transmit' set to 10, 'Output Format' set to KBits, and 'Report Interval' set to 1 second. The 'Transport layer options' include 'TCP' selected, 'Buffer Length' set to 2 MBytes, 'TCP Window Size' set to 56 KBytes, and 'Max Segment Size' set to 1 KBytes. The 'Bandwidth' graph shows a flat line at 0.0. The 'Output' window displays the command: `Mars.tekkom.dk -> B&O Netværk Light`.

Jperf Client





The screenshot shows the JPerf 2.0.2 Client interface. The 'JPerf command' is set to `bin/perf.exe -c 127.0.0.1 -s -P 0 -l -p 5001 -fk -t 10`. The 'Choose Perf Mode' is set to 'Client'. The 'Server address' is 127.0.0.1, and the 'Port' is 5,001. The 'Application layer options' are identical to the server interface. The 'Transport layer options' are also identical. The 'Bandwidth' graph shows a line fluctuating around 5,000,000 Kbits/s. The 'Output' window displays the following data:

Time (sec)	Bytes	KBytes	Kbits/sec
4.0- 5.0 sec	665104	665.104	5448532
5.0- 6.0 sec	655904	655.904	5373166
6.0- 7.0 sec	679656	679.656	5567742
7.0- 8.0 sec	692376	692.376	5671944
8.0- 9.0 sec	693816	693.816	5683741



Transport Layer Latency

- Windows Ressource Monitor can be used for Transport Layer latency. Every TCP packet is acknowledged and windows monitors the time it takes to receive that ACK.
- Windows Ressource monitor also shows the percentage of lost packages in a TCP session.
- This information is very usefull when we need to take a look into an existing TCP connection



Transport Layer Latency

