

# ITS323 – Performance Notes

1920 x 800 pixels

24 fps

24 bits per pixel

2hr 15min

895 GB Uncompressed video

Compression:

video 8851 kb/s 9GB

audio 1509 kb/s 1.5GB

10.5GB

Figure 1: Calculation of raw and compressed video size; Lecture 02

$$\begin{aligned} 12 \text{ MB} &= 96 \text{ Mb} \\ &= 96,000,000 \text{ bits} \end{aligned}$$

26 sec

$$\begin{aligned} \text{Throughput} &= \frac{96,000,000 \text{ b}}{26 \text{ sec}} \\ &= 3.6 \text{ Mb/s} \end{aligned}$$

Figure 2: File download throughput calculation; Lecture 03



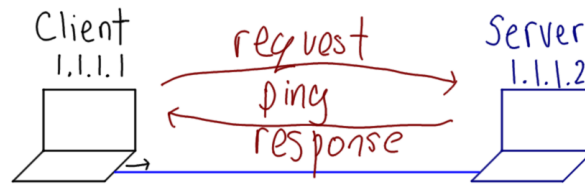
Figure 3: Experimental setup of client and server with HTTP; Lecture 04

$$\begin{aligned}
 \text{Data rate} &: 100 \text{ mb/s} \\
 1 \text{ bit} &: \frac{1}{100 \text{ m}} = 10 \text{ ns} \\
 &= 0.01 \mu\text{s} \\
 \text{File 1MB} &: 8 \text{ mb} = 8,000,000 \text{ b} \\
 \text{Time to transmit} &= \frac{8,000,000}{100,000,000} \\
 &= 0.08 \text{ s} \\
 &= 80 \text{ ms} \\
 \text{File 50 MB} &: \text{Time} = 4000 \text{ ms} \\
 &= 4 \text{ s} \\
 &\quad (\text{transmit}) \\
 \text{Throughput} &: 50 \text{ MB in } 4.3 \text{ s} \\
 &= \frac{50 \times 10^6 \times 8}{4.3} \\
 &= 93 \text{ mb/s} = \\
 \text{Data rate} &= 100 \text{ mb/s} \\
 \text{Efficiency} &= \frac{93}{100} = 93\%
 \end{aligned}$$

Figure 4: Data rate, throughput and efficiency calculations; Lecture 04

Response  
Total size : 616 B  
Data : 291 B  
Overhead : 325 B  
Efficiency :  $\frac{291\text{B}}{616\text{B}} = 0.472$

Figure 5: HTTP response overhead; Lecture 04



100 B	:	0.602 ms	$\approx$	600 $\mu$ s
500 B	:	0.898 ms	$\approx$	900 $\mu$ s
1000 B	:	0.982 ms	$\approx$	1000 $\mu$ s

Transmission delay:  

$$\frac{\text{data size}}{\text{data rate}}$$

$$100\text{B} @ 100\text{mb/s} : \text{trans} = \frac{100 \times 8}{100 \times 10^6} = 8 \mu\text{s}$$

Propagation delay  

$$\frac{\text{distance}}{\text{speed}}$$

$$1\text{m} @ 300,000,000 \text{ m/s}$$

$$\text{prop} = \frac{1}{3 \times 10^8} = 0.003 \mu\text{s}$$

Processing delay

Figure 6: Ping delay for different packet sizes; Lecture 04

$$\text{A} \xrightarrow{100 \text{ mb/s}} \text{B}$$

Packet :  $800 \text{ B} + 200 \text{ B}$   
           data       header  
     
                                   1000B

How long for 1 packet :  
 1000B @ 100 mb/s  

$$\frac{1000 \times 8}{100 \times 10^6} = 80 \text{ } \mu\text{s}$$

Receive 1 packet every 80  $\mu\text{s}$   
 Receive 800B data every 80  $\mu\text{s}$

Throughput =  $\frac{800 \text{ B}}{80 \text{ } \mu\text{s}} = 80 \text{ mb/s}$

Efficiency =  $\frac{80 \text{ mb/s}}{100 \text{ mb/s}} = 0.8 = 80\%$

Figure 7: Data rate, throughput and efficiency calculation (2); Lecture 04

$$\begin{array}{l}
 \text{A} \xrightarrow[\text{speed} = 2.8 \times 10^8 \text{ m/s}]{10 \text{ km}} \text{B} \\
 \text{1 Mb/s} \\
 100 \text{ B data} \\
 \text{tran} = \frac{\text{data size}}{\text{data rate}} \\
 = \frac{100 \text{ B}}{1 \text{ Mb/s}} \\
 = \frac{800}{1 \times 10^6} \frac{\text{b}}{\text{b/s}} \\
 = 800 \text{ us} \\
 \text{prop} = \frac{\text{distance}}{\text{speed}} \\
 = \frac{10 \text{ km}}{2.8 \times 10^8 \text{ m/s}} \\
 = 35.7 \text{ us} \\
 \text{total} = 800 + 35.7 = 835.7 \text{ us}
 \end{array}$$

Figure 8: Example of link delay; Lecture 05

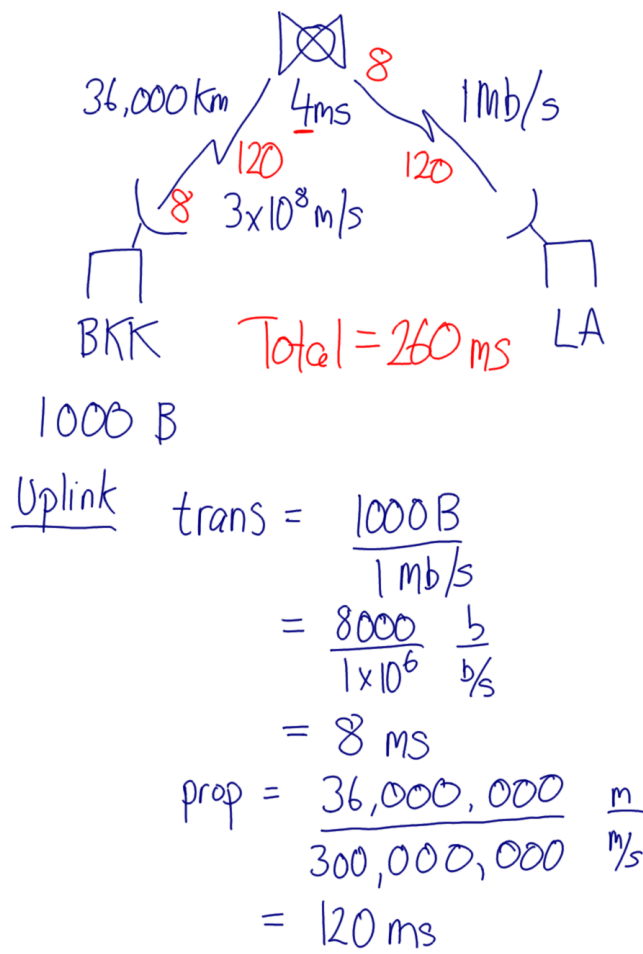


Figure 9: Example of satellite network delay; Lecture 05