title: Assignment 1.2

subtitle: Computer performance, reliability, and scalability calculation

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1.2

a. Data Sizes

Data Item	Size per Item
128 character message.	512 Bytes
1024x768 PNG image	2.25 MB
1024x768 RAW image	1.5 MB
HD (1080p) HEVC Video (15 minutes)	900 MB
HD (1080p) Uncompressed Video (15 minutes)	201 MB
4K UHD HEVC Video (15 minutes)	5.12 GB
4k UHD Uncompressed Video (15 minutes)	7.6 GB
Human Genome (Uncompressed)	1.5 GB

b. Scaling

	Size	# HD
Daily Twitter Tweets (Uncompressed)	768 GB	2TB
Daily Twitter Tweets (Snappy Compressed)	256 GB	750GB
Daily Instagram Photos	25 TB	75TB
Daily YouTube Videos	0.25 PB	0.75 PB
Yearly Twitter Tweets (Uncompressed)	1 TB	3 TB
Yearly Twitter Tweets (Snappy Compressed)	1.5TB	4.5 TB
Yearly Instagram Photos	52 PB	150 PB
Yearly YouTube Videos	93 PB	300 PB

c. Reliability

	# HD	# Failures
Twitter Tweets (Uncompressed)	512	20
Twitter Tweets (Snappy Compressed)	7.8MP	
Instagram Photos	7.8MP	

	# HD	# Failures
YouTube Videos	4kUHD	

d. Latency

	One Way Latency
Los Angeles to Amsterdam	149 ms
Low Earth Orbit Satellite	100 ms
Geostationary Satellite	240 ms
Earth to the Moon	1.3 s
Earth to Mars	21 minutes

Working Notes

Data Item

1. 128 character message. 1 character needs 4 bytes. Hence 128*4=512 Bytes
2. 1024x768 RAW image

   Step 1: Total Number of pixels = Multiply the horizotal and vertical pixel (1024*768 = 786,432 pixel (0.786 Megapixel Detector))

   Step 2: Total number of bits of data = Multiply total number of pixels by the bit depth of the detector (16 bit) to get the total number of bits of data. (12,582,912)

   Step 3: Dividing the total number of bits by 8 equals the file size in bytes. (12,582,912 / 8)

   Step 4: Divide the number of bytes by 1024 to get the file size in kilobytes. Divide by 1024 again and get the file size in megabytes.

   1024x768 PNG image - 0.786 Megapixel Detector

   ```
   2 bytes per pixel. Hence 1.5 MB
   ```

3. 1024x768 PNG image

1024x768 PNG image - 0.786 Megapixel Detector

```
3 bytes per pixel. Hence 2.25 MB
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4. HD (1080p) HEVC Video (15 minutes)

File Size = Bitrate x duration x compression ratio

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= 20* 90 * 5
= 900 MB
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5. 4K UHD HEVC Video (15 minutes) = 80905 around 5 GB
6. Human Genome (Uncompressed) 6 diploid gename * 1 byte / 4 base pairs = 1.5 GB (Ref 1)

6×10^9 base pairs/diploid genome x 1 byte/4 base pairs = 1.5×10^9 bytes or 1.5 Gigabytes

Scalling

1. Daily Twitter Tweets (Uncompressed) - 500 million tweets - 500 m * 512 = 256 GB
2. Daily Instagram Photos - 9 million photos - 9 million * 2.5 MB = 20 TB
3. Daily YouTube Videos - 5 Billion * 5 GB = petabytes

the same calculation followed for Yearly too

Latency Referred Ref -2

References

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