title: Assignment 1
subtitle: Computer performance, reliability, and scalability calculation

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1.2

a. Data Sizes

Calculation

a. Character Message

File Size: Number of characters x 1 byte

b. Image File

File Size: pixel count × bit depth
Bit Depth: 32 for PNG; 8, 10, 12 14 bits are available for RAW in which I have chosen 14 bits
Link: https://toolstud.io/photo/filesize.php?imagewidth=1024&imageheight=768 (https://toolstud.io/photo/filesize.php?imagewidth=1024&imageheight=768)

b. Video Files

File Size: Bitrate x duration x compression ratio
Bitrate: Frame size x Frames Rate
Pixel Count: W *H*
Uncompressed Pixel Count: W H * 24 bit
HD and 4K: I have chosen Youtube video as reference
Link: https://toolstud.io/video/filesize.php?width=3840&height=2160&framerate=30&timeduration=15&timeduration_unit=minutes&compression=27127&spec (https://toolstud.io/video/filesize.php?width=3840&height=2160&framerate=30&timeduration=15&timeduration_unit=minutes&compression=27127&spec

Data Item	Size per Item
128 character message.	128 Bytes
1024x768 PNG image	3.15 MB
1024x768 RAW image	1.38 MB
HD (1080p) HEVC Video (15 minutes)	1.08 GB
HD (1080p) Uncompressed Video (15 minutes)	150 GB
4K UHD HEVC Video (15 minutes)	2.25 GB
4k UHD Uncompressed Video (15 minutes)	672 GB
Human Genome (Uncompressed)	3.43 GB

b. Scaling

a. Tweets

Daily uncompressed tweets: 500M x 128 bytes
Daily snappy compressed tweets: (500M x 128 bytes)/1.6
Compression rate: 1.6%

b.Instagram Photos

Daily Photos: 100M x 3.15 MB (PNG)
Hard Disk: (315 TB x 3 Replica)/10 TB

c.Youtube Photos

Daily Video: 500 Hours x 1440 Mins (per day) * 1.08 GB
Hard Disk: (3.11 PB x 3 Replica)/10 TB

d. Yearly Calculation

Yearly Calculation: All the data * 365 days

	Size	# HD
Daily Twitter Tweets (Uncompressed)	64 GB	1
Daily Twitter Tweets (Snappy Compressed)	40 GB	1
Daily Instagram Photos	315 TB	95
Daily YouTube Videos	3.11 PB	~935
Yearly Twitter Tweets (Uncompressed)	23.36 TB	8
Yearly Twitter Tweets (Snappy Compressed)	14.60 TB	5
Yearly Instagram Photos	~115 PB	~34493
Yearly YouTube Videos	1135.3 PB	~340590

c. Reliability

Annualized Failure Rate for 2022: 1.46%
Reference: https://www.backblaze.com/b2/hard-drive-test-data.html (https://www.backblaze.com/b2/hard-drive-test-data.html)

	# HD	# Failures
Twitter Tweets (Uncompressed)	8	0
Twitter Tweets (Snappy Compressed)	5	0
Instagram Photos	34493	518
YouTube Videos	340590	5109

d. Latency

Los Angeles to Amsterdam

Link: https://www.consoleconnect.com/locations/amsterdam/ (https://www.consoleconnect.com/locations/amsterdam/)

Low Earth Orbit Satellite & Geostationary Satellite

Link: https://www.satsig.net/latency.htm (https://www.satsig.net/latency.htm)

Earth to the Moon & Earth to Mars

Link: https://www.spaceacademy.net.au/spacelink/commdly.htm (https://www.spaceacademy.net.au/spacelink/commdly.htm)

	One Way Latency
Los Angeles to Amsterdam	112 ms
Low Earth Orbit Satellite	75 ms
Geostationary Satellite	250 ms
Earth to the Moon	1300 ms
Earth to Mars	5 - 20 minutes

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