# assignment_01_BasitAbdul

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## 0.1 Title: Assignment 1

## 0.2 Subtitle: Computer performance, reliability, and scalability calculation

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## 0.4 Date: 2nd September, 2022

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### 0.4.1 1.2 Assignment

| Data Item | Size per Item | Ref |
|---|---|---|
| 128 character message. | 128 Bytes | 1 |
| 1024x768 PNG image | 1.5 MB | 2 |
| 1024x768 RAW image | 2.25 MB | 3 |
| HD (1080p) HEVC Video (15 minutes) | 2500 MB | 4 |
| HD (1080p) Uncompressed Video (15 minutes) | 15600 MB | 5 |
| 4K UHD HEVC Video (15 minutes) | 2550 MB | 6 |
| 4k UHD Uncompressed Video (15 minutes) | 255000 MB | 7 |
| Human Genome (Uncompressed) | 1.5 GB | 8 |

**a. Data Sizes**

## 0.5 Solution Reference:

1. http://extraconversion.com/data-storage/characters/characters-to-bits.html
2. ((1024 * 768 * 16 bit)/(8 * 1024))/1024=1.5 MB
3. ((1024 * 768 * 24 bit))/(8 * 1024))/1024=2.25 MB
4. http://extraconversion.com/data-storage/characters/characters-to-bits.html
5. https://www.digitalrebellion.com/webapps/videocalc?format=uncompressed_8_1080&frame_rate=f30&le
6. 170MB per 60 seconds (1 minute) so 170MB*15minutes = 2550 MB
7. Same as 6 https://www.imore.com/how-shoot-trim-edit-and-share-4k-video-iphone
8. https://bitesizebio.com/8378/how-much-information-is-stored-in-the-human-genome/

| | Size | # HD |
|---|---|---|
| Daily Twitter Tweets (Uncompressed) | 64GB | 1 |
| Daily Twitter Tweets (Snappy Compressed) | 37.65GB | 1 |

| | Size | # HD |
|---|---|---|
| Daily Instagram Photos | 112.5TB | 12 |
| Daily YouTube Videos | 500TB | 50 |
| Yearly Twitter Tweets (Uncompressed) | 23.36TB | 3 |
| Yearly Twitter Tweets (Snappy Compressed) | 13.75TB | 2 |
| Yearly Instagram Photos | 41062.5TB | 4107 |
| Yearly YouTube Videos | 182500TB | 18250 |

**b. Scaling**

### 0.6 Solution:

1. 500 million * 128 bytes = 64GB
2. 64GB / 1.7 = 37.65 GB
3. 75 Million Instagram Pictures * 1.5 MB PNG Image = 112500000MB = 112.5 TB. 112.5 TB / 10 TB per HD = 11.25 HD. (round up = 12 HD)
4. 500 hours * 60 mins = 30000 mins. 15 min = 2500MB, 30000/15 = 2000, 2000 * 2500 = 5000000MB = 500 TB
5. 64 GB (daily) * 365 = 23360 GB = 23.36 TB, 23.36 / 10 TB per HD = 2.336 (round up = 3 HD)
6. 37.65 GB (daily) * 365 = 13742.25 GB = 13.75 TB, 13.75 / 10 TB per HD = 1.375 (round up = 2 HD)
7. 112.5 TB (daily) * 365 = 41062.5 TB, 41062.5 / 10 TB per HD = 4106.25 (round up = 4107 HD)
8. 500 TB (daily) * 365 = 182500 TB, 182500 / 10 TB per HD = 18250 HD

| | # HD | # Failures |
|---|---|---|
| Twitter Tweets (Uncompressed) | 3 | 0.0255 |
| Twitter Tweets (Snappy Compressed) | 2 | 0.017 |
| Instagram Photos | 4107 | 34.9095 |
| YouTube Videos | 18250 | 3155.125 |

**c. Reliability**

### 0.7 Solution:

Failure rate = 0.85% (https://www.backblaze.com/b2/hard-drive-test-data.html) 0.0085 * 3 = 0.0255 0.0085 * 2 = 0.017 0.0085 * 4107 = 34.9095 0.0085 * 18250 = 155.125

| | One Way Latency |
|---|---|
| Los Angeles to Amsterdam | 139.611 ms |
| Low Earth Orbit Satellite | 600 ms |
| Geostationary Satellite | 240 ms |
| Earth to the Moon | 2560 ms |

| | One Way Latency |
|---|---|
| Earth to Mars | 13 minutes |

**d. Latency**

## 0.8 Solution:

1. https://wondernetwork.com/pings
2. https://www.omniaccess.com/leo/#:~:text=The%20GEO%20latency%20is%20of,and%20an%20essential%2
3. https://www.satsig.net/latency.htm
4. https://en.wikipedia.org/wiki/Earth%E2%80%93Moon%E2%80%93Earth_communication#:~:text=Propag
5. https://blogs.esa.int/mex/2012/08/05/time-delay-between-mars-and-earth

## 0.9 END