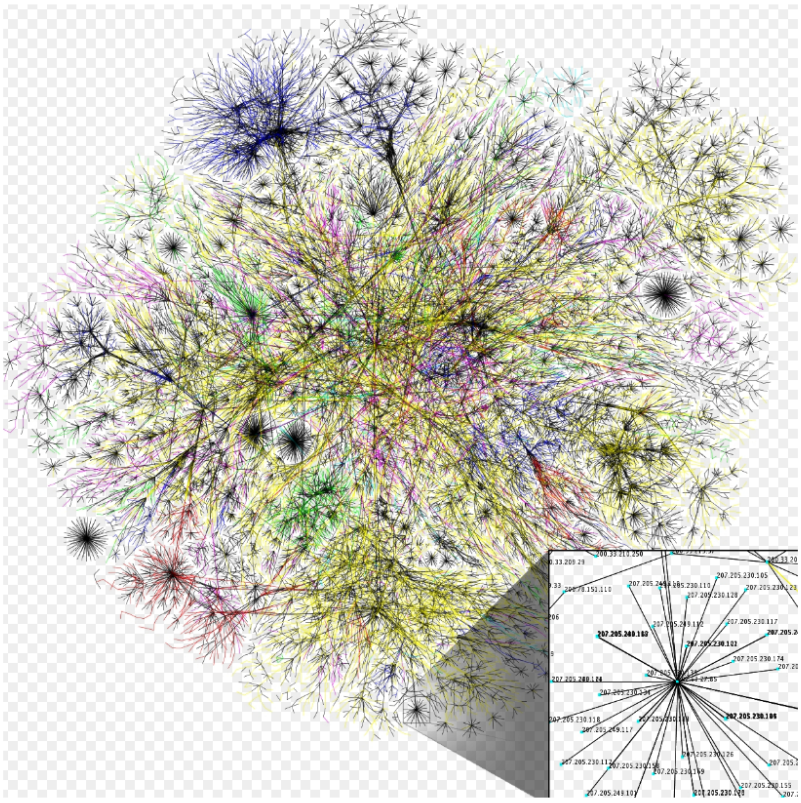
Abstract: Global Internet Value and Work

Definition of work; Measuring work in a “brick and mortar” industry; Measuring work in the global network; Two types of messages on the Internet: Human Initiated Actions; Definition of static historical labor; Software Initiated Actions; Artificial Intelligence and work.

Visualization of the global network



Circa 2005, Reference: https://en.wikipedia.org/wiki/Opte_Project

Work, a definition revisited

Work, or an action in the real world, whether driving a car, moving a computer mouse, swiping the screen of a smart phone, typing a letter or sawing a board, is work.

Measuring work in a “brick and mortar” industry

In a “brick and mortar” industry, the amount work performed by humans, the amount work performed by automated machinery, the resultant capital and derived value, that is, profit can be measured to more or less a definite amount for any given period. The limit or the boundaries of the analysis converge to a definite quantity. That is, the work produced by humans and automated machinery is repeatable and predictable for a given time period.
References: See **Appendix B**

Measuring work in the global network

To measure this work, one must consider a global active workforce active 24 hours a day, 365 days a year. This work force is you, me and everybody with a mobile smart-phone, notepad, tablet, smart appliance, lap-top work-station connected to the global network. The global network is the core of the 21st century service economy.

The quantity of messages, which are work, produced by humans and software on the network rise, fall and fluctuate for a given time period. The resultant capital and derived value also fluctuate. The work produced by humans and software is variable. Given a time frame, the boundaries of analysis diverge from a definite quantity. To measure the amount of work, the rate of change must be measured at each change in direction, the derivative of the change from the beginning of the time period to the end. The amount of work is the integral of this change from the beginning of the time period to the end.

The amount of messaging work through the global network is staggering.

Approximately 1516000 gigabytes of information are transferred in one minute on the Internet, that is 1,156,000,000,000,000 bytes in one minute or 1,156 petabytes per minute.

Assuming a typical message of 75,000 bytes renders15413333333 messages per minute, assuming e-mail average message size. This size does not take into account compression, which could reduce the size to the average e-mail message size to 1279 bytes. Then the rendering is 903831118061 messages per minute.

References: https://www.webpagefx.com/internet-real-time, Mobile and Wireless Internet: Protocols, Algorithms and Systems ; Kia Makki, Niki Pissinou, S Kami Makki, E.K. Park, https://www.textrequest.com/blog/texting-statistics-answer-questions

Also See **Appendix C**

Two types of messages on the Internet

There are basically two types of messaging on the Internet. A user selecting, clicking, pressing, swiping, typing, querying by voice, is the first. The human user is doing an action, i.e., the physical act of some type of labor, to actuate a message in some form.

The second type is a software end-point sending and receiving messages to one or more software end-points. The software is generating the message is as a result of the combined actions of the group of humans that developed and implemented the software.

Human Initiated Actions

In a global base of users, who as a result of their actions receive what they request, unless they are actually purchasing an item, usually at no cost. From the users viewpoint, there is no payment, other than the original purchase of the provider, just actions.

Where is the value? Where is the profit?

One way surplus value, or profit, is extracted by a scheme where the users work, i.e., requests on the Internet are accompanied with advertising, and then the option of the removal of advertising for a fee. Another method of extracting profit is to initially provide a base or community service but then requiring a fee for more advanced features.

The Internet Protocol was developed in the late 1960s as part of the Apollo Project. After the end of the project, the decision was made that no one enterprise could own the source code or the algorithms, so it was given to a neutral party, UC Berkeley, where the IP protocols were enhanced and became what we use today. The concept of equal access of the global net, or net neutrality has existed since its inception. Ruling groups want to discard net neutrality, in favor of access and data control by their corporations. Thus with a broad legal sweep, controlling corporations could increase the surplus value from the global network.
Reference: https://en.wikipedia.org/wiki/Net_neutrality#Internet_neutrality

The capitalist principal that surplus value must be increased over time, still holds true.

Static historical labor, a definition revisited

Static labor, also know as “dead labor”, is the work used to create the machinery, the physical infrastructure of a business. It would also include any hardware, computers or otherwise and those software programs that are constant and unchanging what they do. An example are the Internet Protocols, developed in the late 1960s. They have been modified and have error scenarios removed since then, but the combined work of the developers remains effectively unchanged. Karl Marx designated “dead” or “past” labor as constant capital as opposed to variable capital, human work.
Reference: https://en.wikipedia.org/wiki/Transformation_problem

Software Initiated Actions

Creating software that uses standard message protocols, like SOAP and REST is the current message work of software developers. The quantity of this software initiated work might be: 1516000 gigabytes in one minute on the Internet -or- 1156000000000000 bytes in one minute -or- 1156 petabytes per minute that is $1156*1000^5$ bytes per minute.
The assumption is a message of 2048 bytes renders 1007996950224 messages per minute.
References: See **Appendix A**

Are these messages a product of static labor, that is, they don’t change? The quick answer is “it depends”. The control areas of the messages are static, they must be, since they are the lowest machinery level of global network messaging. How dynamic and how “intelligent“ are the produced

contents of the messages? Some messages constructed by the developers never change. These messages are defacto a static product of the developers labor and will not change.

When the message content of a end-point to end-point message is dynamic, that is, is not constant, leads to an analysis of the contents of the messages. In most cases, they are always changing. Imagine a factory machine the changes shape and the function that it performs contingent on dependencies and requests.

The number of total global net messages are end-point to end-point messages, where one software module is communicating with another software module is variable and application specific. As a general rule, the more distributed the application, the more end-point to end-point messages.

Artificial Intelligence and work

A definition of AI from the viewpoint of economics:
Core to the modern conception of AI is the idea of designing agents: entities that perceive the world and act in it.
Reference: http://science.sciencemag.org/ 17-July-2015

The range and type of AI systems vary. The most simple, a rule based expert system can parse a vast system of rules and emit answers, that will vary in quality depending on the rule constructs, to the most advanced AI systems using persisted neural networks, think of these as “memories”, the successful combination of computer vision, think of these as “eyes”, with the deep learning of an “unsupervised” neural system powered by artificial evolution.

The initial work by scientists, engineers and developers is rendered static when it is captured first in source code and then machine readable binary. As development patterns were enhanced by newer developers and the AI engines became more sophisticated, the work performed becomes greater than the sum of the developers previous work. What once was an aggregate of static or “dead” labor now operates and and produces surplus value as if the work was performed by a human being.

There are a number examples of AI entities producing value. Self driving cars, Watson, Siri and Echo are some well known examples of AI functioning as if a human was working..

The ruling groups that have power over the global economy are well aware of the value produced by AI.

“Big leaps in artificial intelligence are raising tensions among businesses and policy makers over what impact fast-changing technology will have on millions of middle-income jobs.”
Reference: Wall Street Journal 18-Jan-2017

“There are also important questions about how rapid progress in AI will affect the workplace and the broader economy, both in the U.S. and globally, and this is an area that economists and policy makers should be looking at and are looking at.”
Reference: https://phys.org/news/2015-07-artificial-intelligence-economic-theory.html

"The digital revolution in manufacturing began with an explosion in monitoring, analytics, and new computing capabilities. Combined with such advances as artificial intelligence, automation, and robotics, they are changing our concepts of manufacturing in general – from product development and facatory operations to materials supply. This evolution also connects product and process designers and leaders in manufacuring engineering. Digital manufacturing isn't a dream or a concept on some advanced developers design table; it's occuring now and will change industry forever."

"One one hand for example, computers can direct recombinant and synthetic biology to build living structures component by component; on the other hand, nucleic acids themselves are promoted as a potential means of high-density data storeage."
Reference: BioProcess International March, 2017

Topics related the contents of this paper but not covered

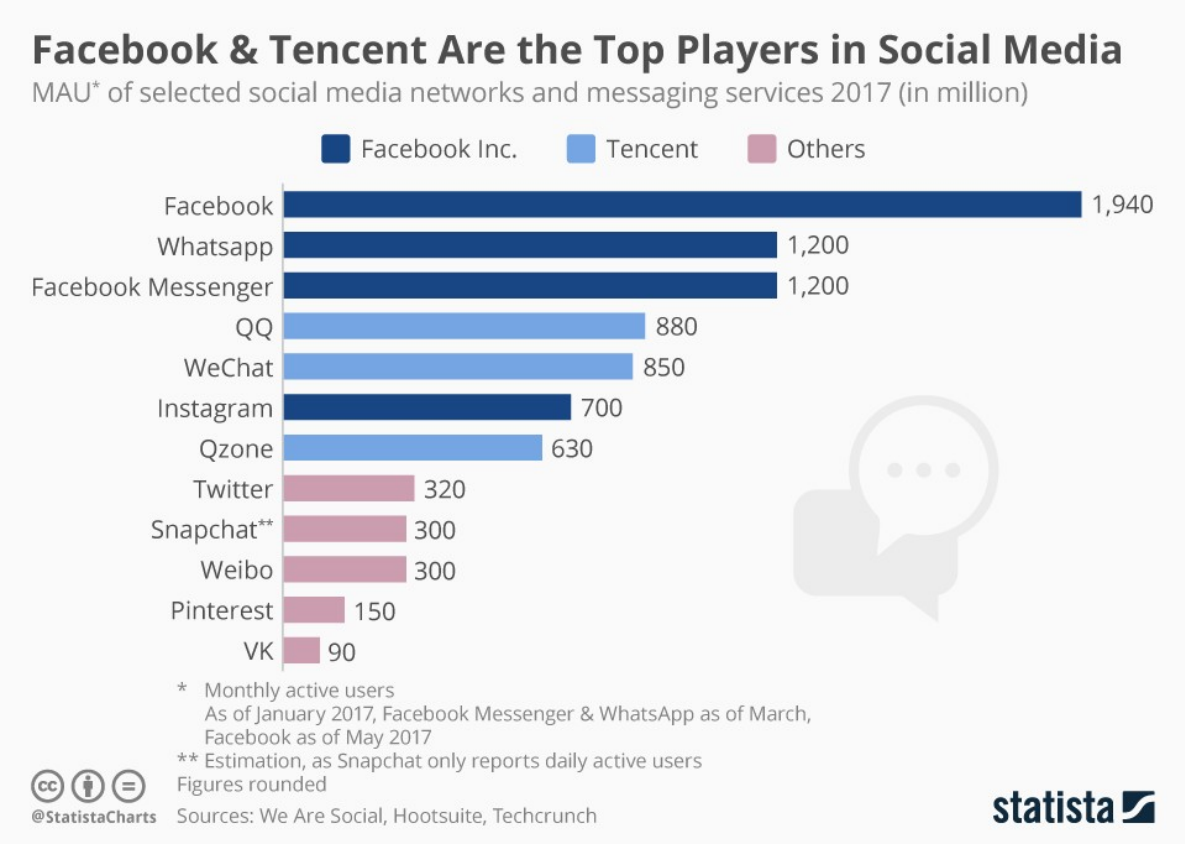
- Social capital
- Status and reputation as a commodity
- Search engine optimization and surplus value

Conclusion

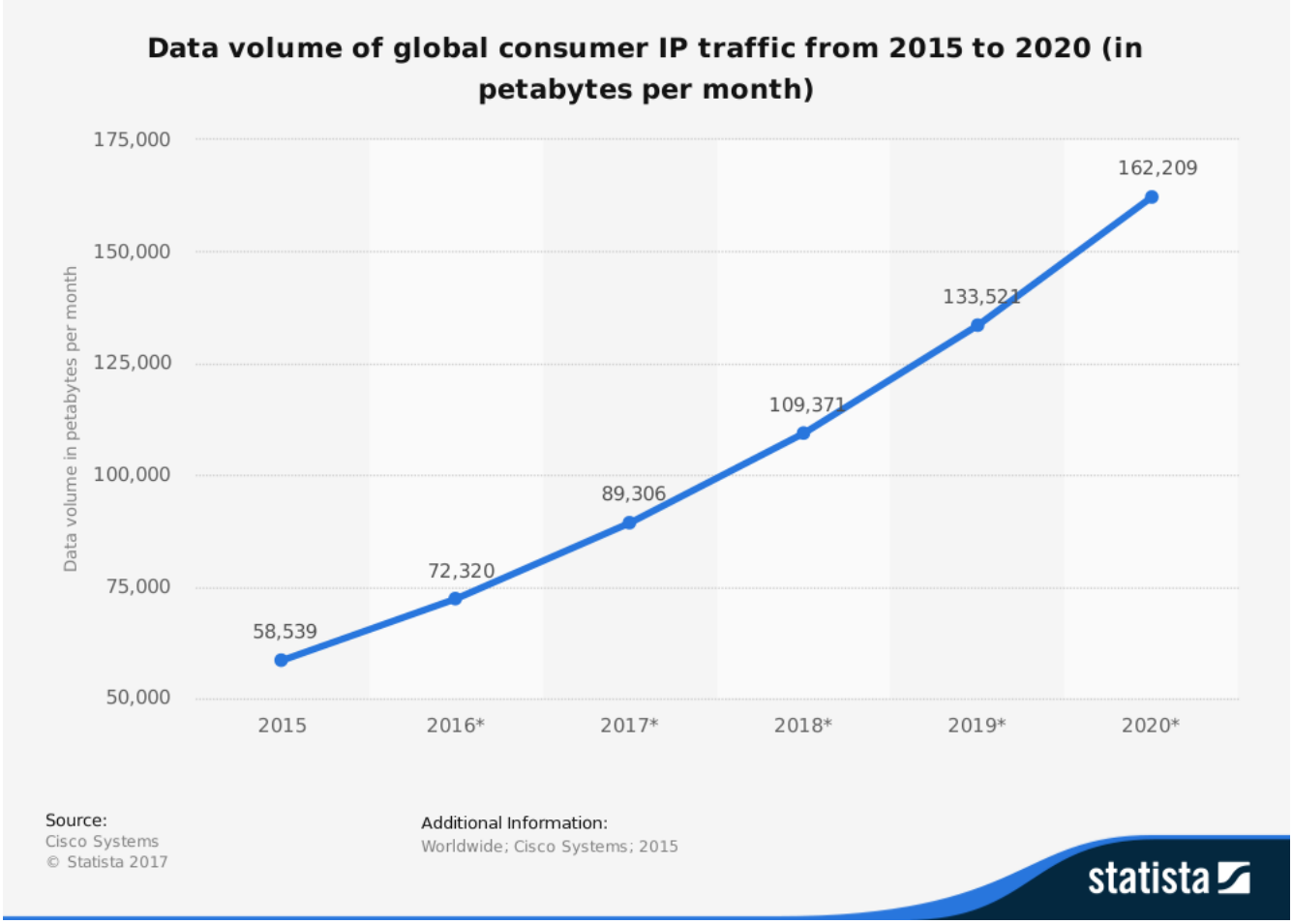
There has been a dramatic shift in the basis of global economics. Enterprises now have a planet-wide source of new labor that provides the work that drives messages through the global network. But this shift still is bound by the real world and the requied increase of surplus value. The enterprises that control their operations in the global network must still increase the value (profit) produced by the global network.

Appendix A. Sample measurements

The increasing spread of mobile devices such as smart-phones and tablets as well as the increasing mobile media consumption are expected to cause the global mobile data traffic to increase 10-fold by 2017 and exceed 11.2 exabytes per month. According to industry statistics, the most popular mobile apps based on global user base penetration are Google Maps, Facebook Mobile app and YouTube. This computes to be 1.6 petabytes per second.
Reference: https://www.statista.com/statistics/267202/global-data-volume-of-consumer-ip-traffic



Consumer IP traffic via mobile data amounted to 5,127 PB per month in 2016. In 2017, mobile data is expected to reach 8,326 petabytes of global traffic per month, up from 3,027 petabytes in 2015.



The following values were obtained from https://www.webpagefx.com/internet-real-time/ . I measured the real-time message rate here marked “timer measured” using a notepad timing program. Each of these should be considered an approximate amount of work for the integral of one minute.

Facebook:

3,400,000 posts per minute (timer measured)
3,100,000 likes per minute (timer measured)
4,500,000,000 posts in 24 hours (source: Facebook, TechCrunch, SocialBarrel)
4,700,000,000 status updates in 24 hours (source: Facebook, TechCrunch, SocialBarrel)

Twitter:
3,400,000 tweets per minute (timer measured)
96 accounts per minute (timer measured)
tweets per second, around 5,700 (source: Twitter)

LinkedIn:
10,080 searches per minute (source: LinkedIn)

Instagram:

45,000 uploads per minute (timer measured)
1,660,000 likes per minute (timer measured)
70,000,000 photo uploads per twenty four hours. (source: Instagram)

Foursquare

4010 checkins per minute (timer measured)
71 check-ins per second (source TheNextWeb)

Printerest

3,472 images pinned per minute (source: Simply Measured)

Tinder

600,000,000 swipes per day (timer measured)
6,944 swipes each and every second (source: Tech Crunch)

Whatsapp

27,000,000,000 individual messages per day (source: Mashable, The NextWeb)

Snapchat

In 2014 5,787 messages per second (source: Business Insider, The Verge)
490,000 snapchats per second (timer measured)
350,000 stories viewed per minute (timer measured)

Skype

23,148 minutes worth of data each second, which includes video, audio and chat

Amazon.com

426 items per second (2013) (source: Amazon)
$2,361 sales per second (2013)

Google

4,080,000 searches per minute(timer measured)
95,700 add revenue per minute(timer measured)

Kickstarter

$902 pledged per minute (timer measured)

Yelp

new review every two seconds in 2013 (source: Yelp)

(Generic) Emails Sent

127,000,000 email transactions per minute (timer measured)
182,000,000,000 sent and received in a twenty four hour period (source: Source Digit)

Dropbox

665,000 files saved per minute ((timer measured))
300,000,000 users save approximately 1,000,000,000 files in a 24 hour period (source: drop box)

Wordpress

979 posts per minute (timer measured)
18,000,000,000 read pages on blogs each month, 63,000,000 comments per month , 2014 (source WordPress)

Tumblr

54,000 posts per minute (timer measured)
900 posts per second in 2014 (source: Marissa Meyer)

Flickr (Yahoo)

653 image uploads per minute (timer measured)
1,000,000 photos in a twenty four hour period (source: Tech Crunch)

Reddit

76 posts per minute (timer measured)
771 comments (timer measured)
157,000 votes (timer measured)

votes per second, 252 (source: reddit, reddit.blog)

Android App Downloads

52,000 app downloads per minute (timer measured)
2,500,000,000 apps per month
964 apps per second (source: TheNextWeb)

iOS (Apple)

49,600 app downloads per minute (timer measured)
800 app downloads per second (source: TechCrunch)

YouTube

137,600 hours watched (timer measured)
100 hours uploaded (timer measured)
2,314 hours of video consumed every second (source: YouTube)
100 hours of new video uploaded to YouTube each minute

Netflix

39,800 hours watched (timer measured)
655 hours streamed every second (source: The Diffusion Group 2014)

Spotify

8,600 hours streamed (timer measured)

Pandora

32,500 hours streamed (timer measured)
532 hours of music streamed each second (source: Statista)

WhatsApp and **Facebook Messenger** combine more that 60,000,000,000 messages each 24 hour period in a populace of 4,200,000,000 world wide.

Appendix B Some Math for a "brick and mortar" industry

For a labor force that consists of people with a fixed schedule and a fixed infrastructure, the produced goods for a fixed period of time converges to a known value. Questions about shared resources between enterprises and what has been defined at a "macro" level are not taken into account.

P_t is defined as the produced goods for the time interval ***t***.
C_t is defined as the constant capital for the time interval ***t***.
V_t is defined as the variable capital for the time interval ***t***.
S_t is defined as the surplus value (profit) for the time interval ***t***.

$P_t = C_t + V_t + S_t$ Renders the produced goods for the time period ***t*** where t is a measured period.

$$P(x) = \left(C + V + S \right)$$

In the diagram above the vertical axis represents the produced goods and the horizontal axis a definite time period.

Reference: https://en.wikipedia.org/wiki/Transformation_problem, Karl Marx Das Capital Volumes I and III.

Appendix C Some Math for global network value

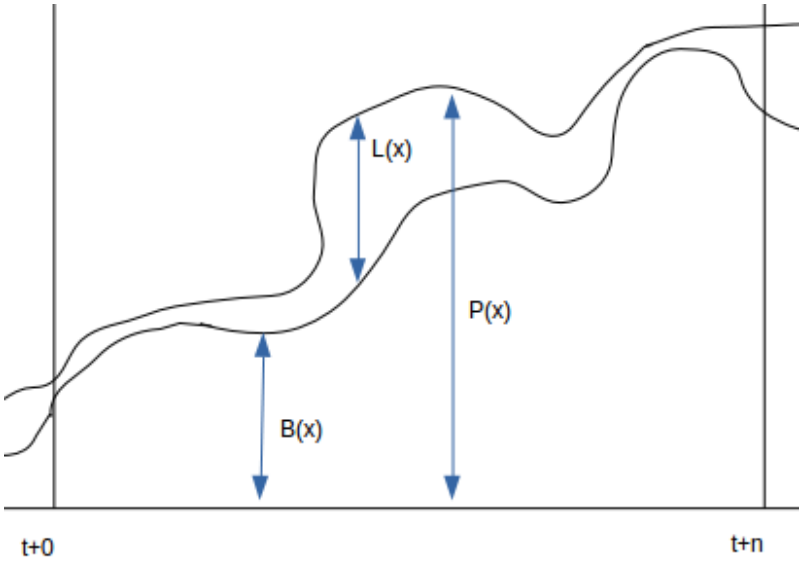
The next set of equations are derived from the traditional factory model, but are measured from work, constant capital and variable capital as applied to enterprises extracting value from operations on the global network.

C is defined as the constant capital for the time interval ***t***.
H is defined as all human derived work, variable capital, which includes global network users and current technical work for time interval ***t***.
A is defined as work produced by intelligent systems, as variable capital for time interval ***t***.
S is defined as surplus value consisting of advertising, subscriptions, donations, application purchases and purchased good for time interval ***t***.

$$B(x) = \int_{t+0}^{t+n} (C+H+A)\,dt$$

$$P(x) = \int_{t+0}^{t+n} (B(x)+S)\,dt$$

$$L(x) = (P(x) - B(x))$$



In the diagram above the vertical axis represents the produced goods and the horizontal axis a definite time period.

Appendix X Large Numbers

1 gigabyte = 1,000,000,000 (1 billion)
1 terabyte = 1,000,000,000,000 (1 trillion)
1 petabyte = 1,000,000,000,000,000 (1 quadrillion)
1 exabyte = 1,000,000,000,000,000,000 (1quintillion)
1 zettabyte = 1,000,000,000,000,000,000,000 (1 sextillion)

1 yottabyte = 1,000,000,000,000,000,000,000,000 (1 septillion)