
TWENTIETH ANNUAL
TestConX™
March 3 - 6, 2019
Hilton Phoenix / Mesa Hotel
Mesa, Arizona
Archive

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Marketplace Report Cloud Driven Future

Ira Feldman
Feldman Engineering Corp.

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Mesa, Arizona • March 3 - 6, 2019

2000 - 2019 20 YEARS ANNIVERSARY

FELDMAN ENGINEERING

Overview

- Computing History
- Hyperscale
- Proprietary Computing
- Future Computing
- Socket Market

UNIVAC ca. 1950

Wikipedia - U. S. Navy Electronics Supply Office

IBM System/360 ca. 1960

IBM System/360 - computerhistory.org

IBM PC 1981

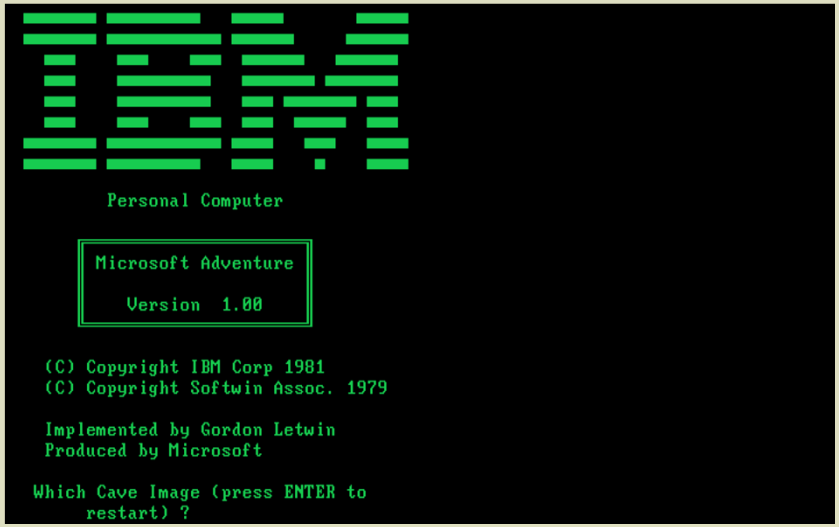
Wikipedia / Ruben de Rijcke

Personal Computing

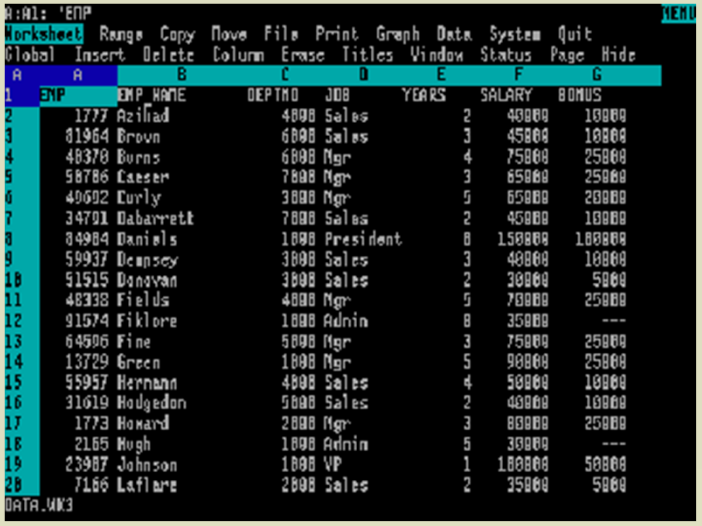
Classic Stock / Alamy


Electrolight.com

Adventure, Lotus 1-2-3…

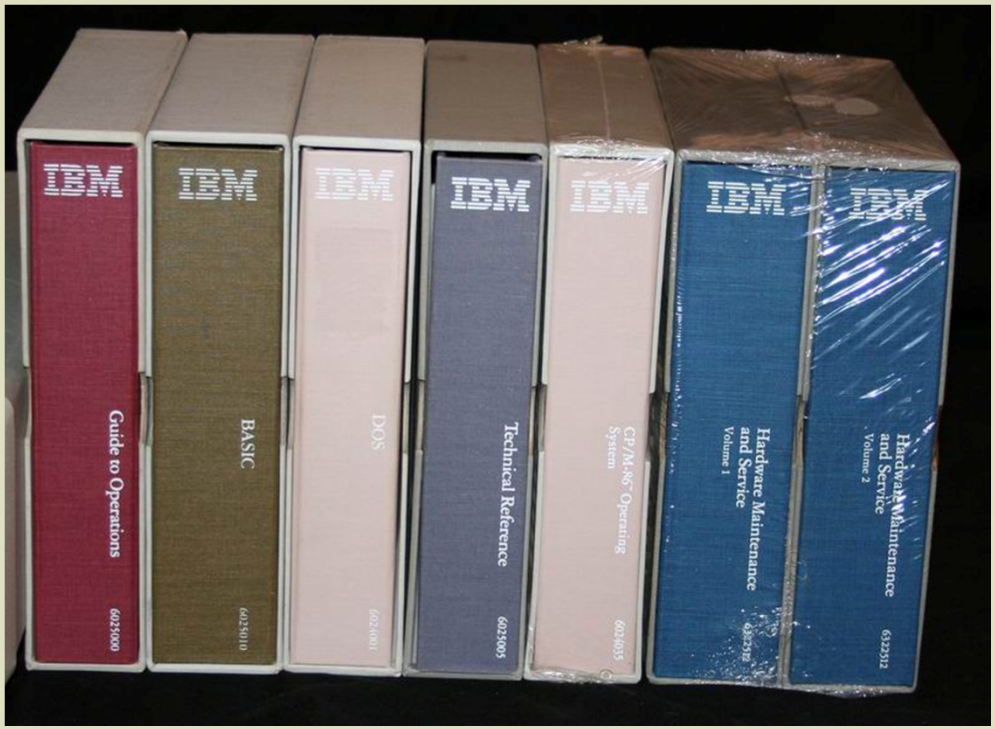


Pcjs.org



Wikimedia / Ozzmosis

Don’t Forget the Manuals!

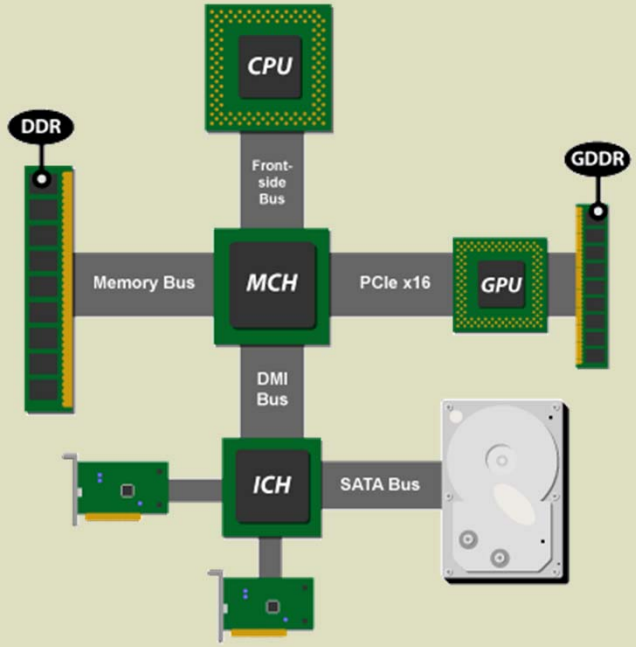


vintage-computer.com/ibm_pc.shtml

Intel Architecture & Motherboards

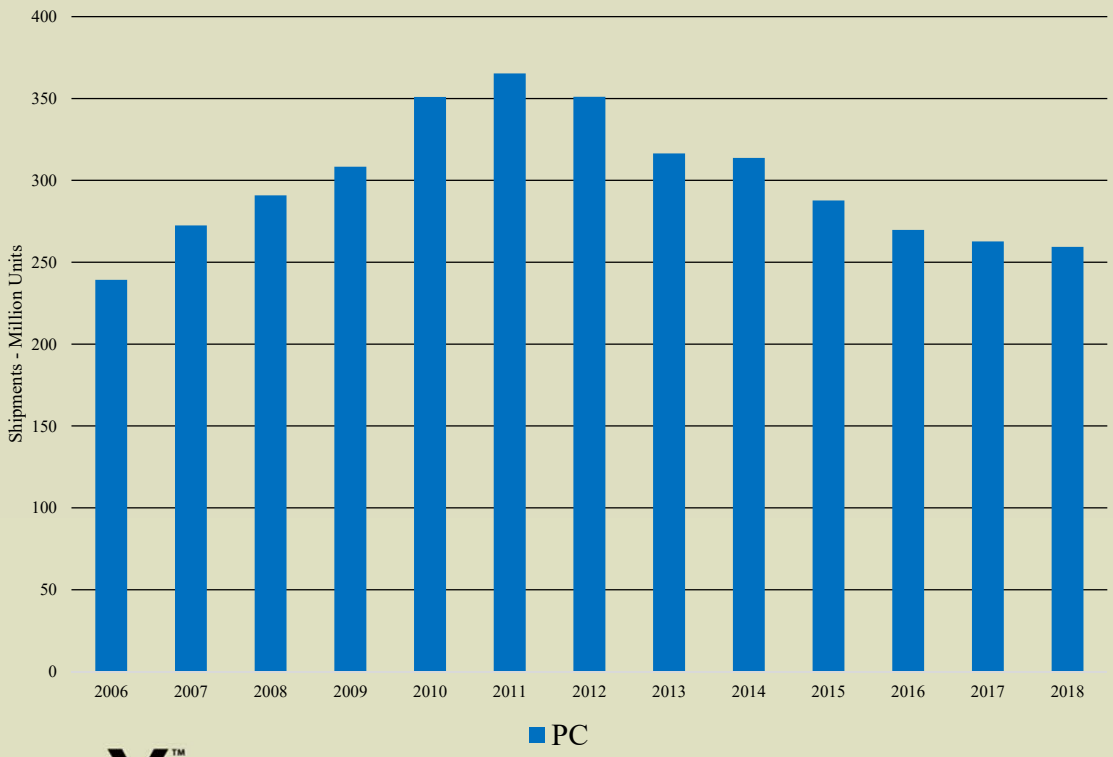
>1B
shipped by Intel
(2009)

Ark.intel.com



arstechnica.com

Personal Computer Shipments



Gartner & IDC / Statisca
January 2019

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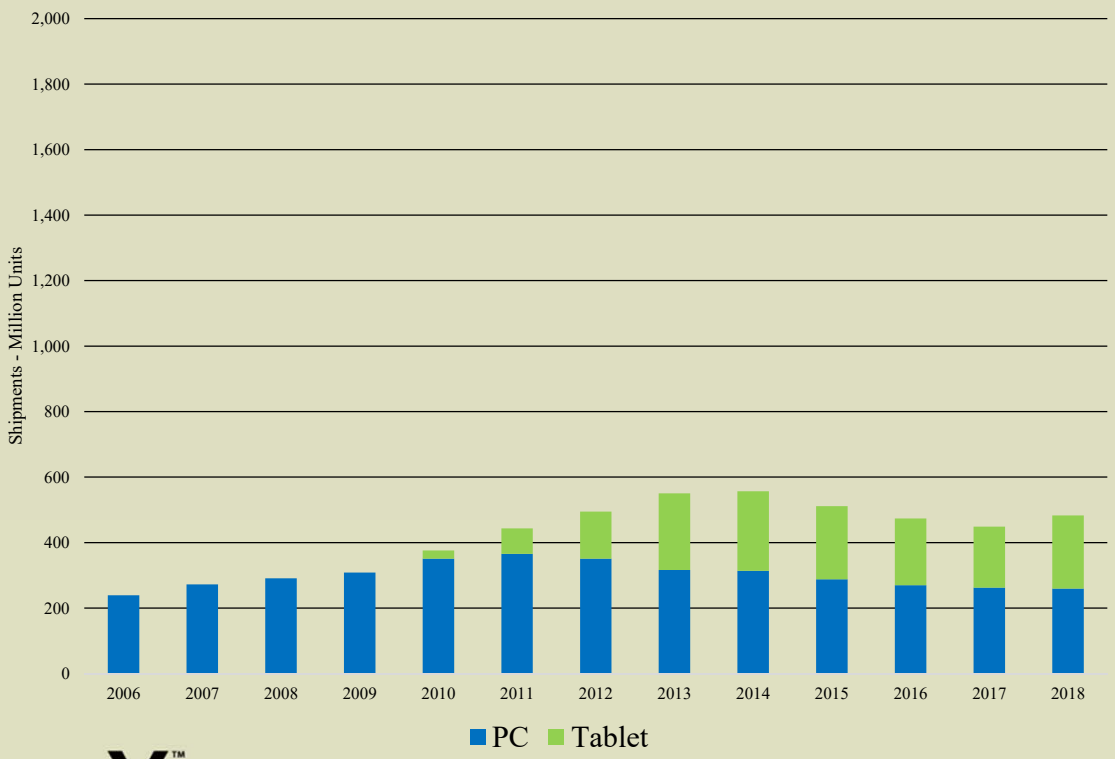
Tablets?



Gartner & IDC / Statisca
January 2019

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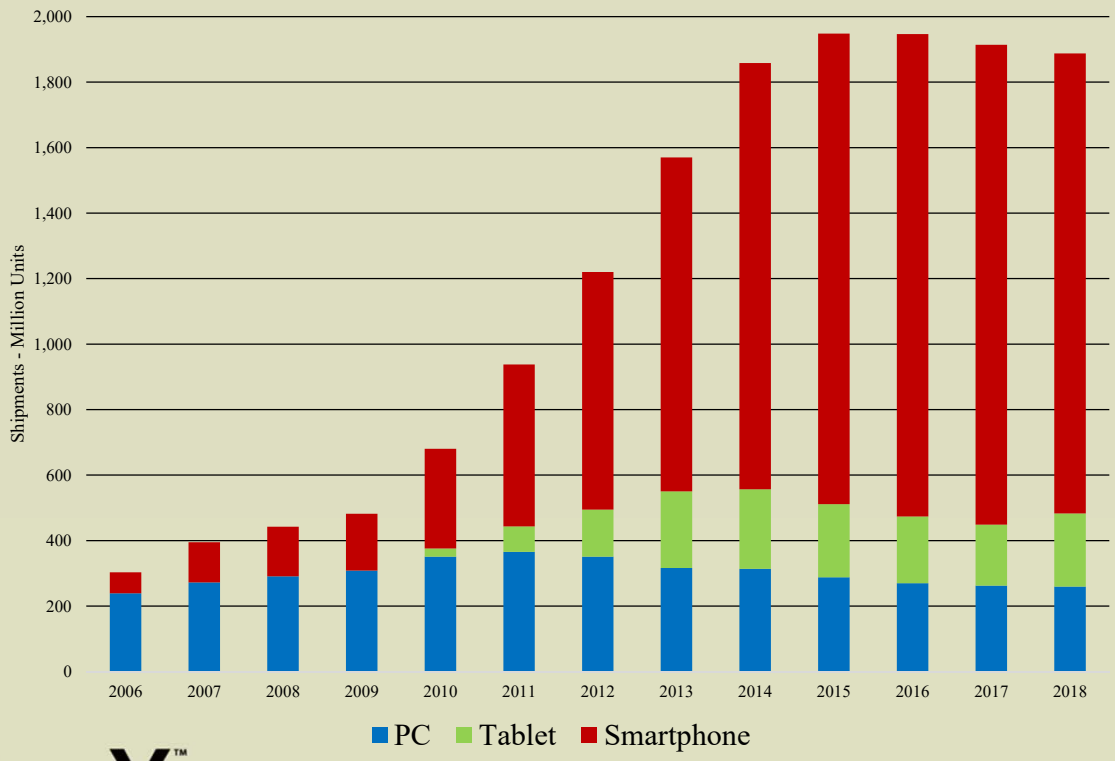
Smartphones!



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January 2019

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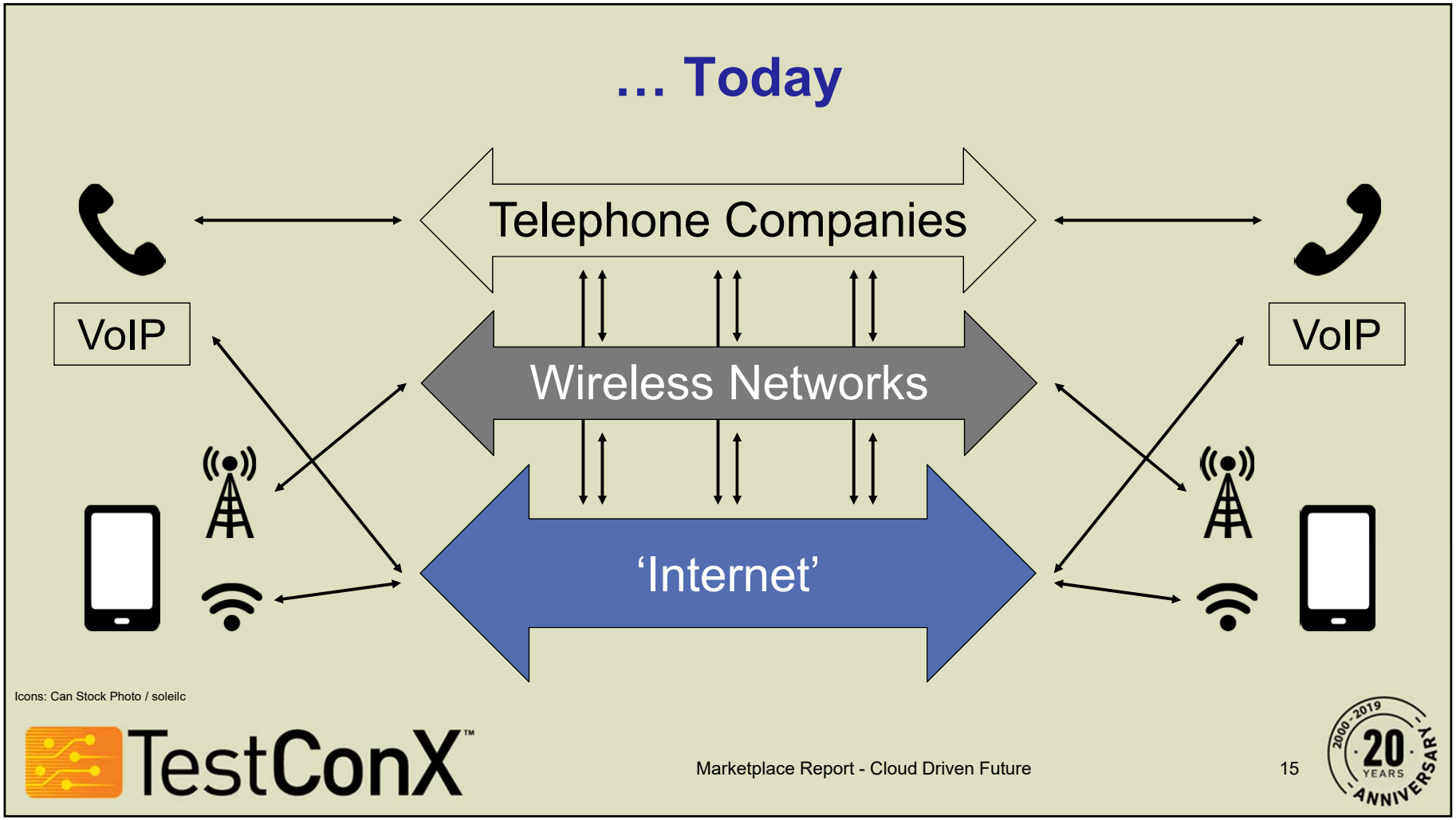
Old School…

Can Stock Photo / lucadp


… Today
Telephone Companies
VoIP
VoIP
Wireless Networks
'Internet'
Icons: Can Stock Photo / soleilc
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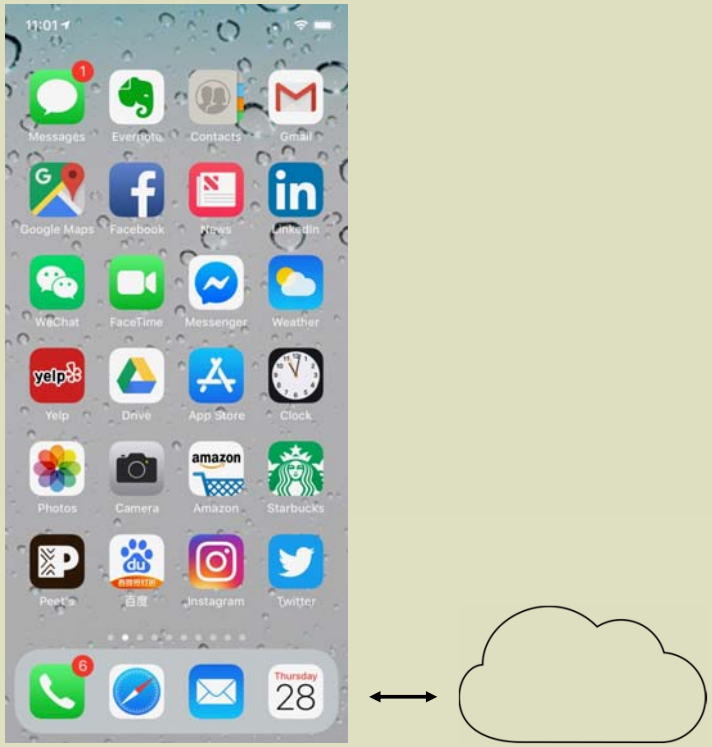
User Perspective



Hyperscale 8

Top: Google - St. Ghislain, Belgium / Bottom: Facebook proposed Singapore

Alibaba Group 阿里巴巴集团

amazon

Baidu 百度

Google

Microsoft

Tencent 腾讯

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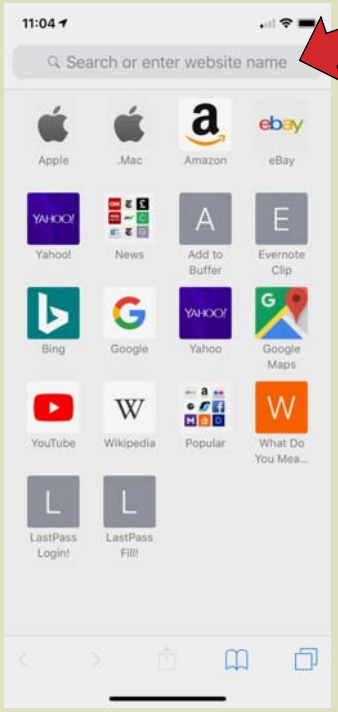
Value Engineered Computing

Facebook / Open Compute Project

World's Most Valuable Real Estate



The Motley Fool

Why Google Is Willing to Pay Apple $12 Billion Per Year

Apple's fee for making Google the default search engine in Safari reportedly could top $12 billion next year.

Adam Levy (TMFnCaffeine)
Oct 24, 2018 at 11:00AM

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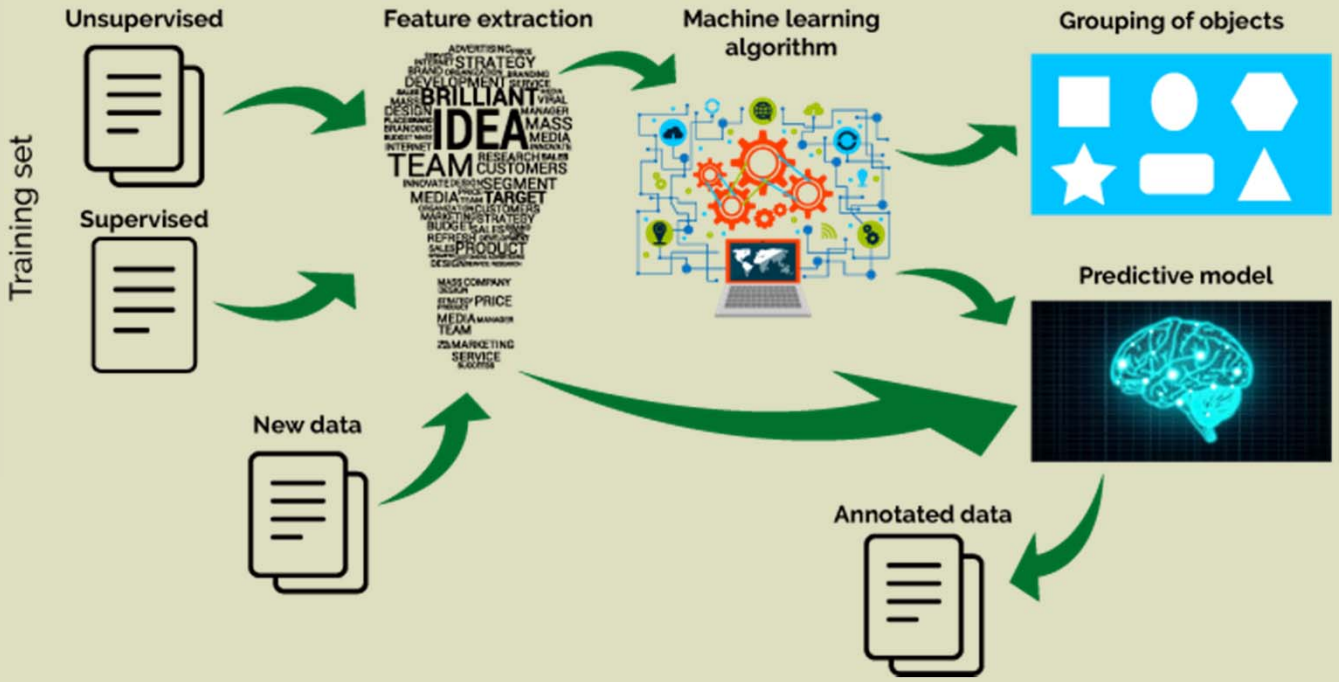
Machine Learning



TowardsDataScience.com

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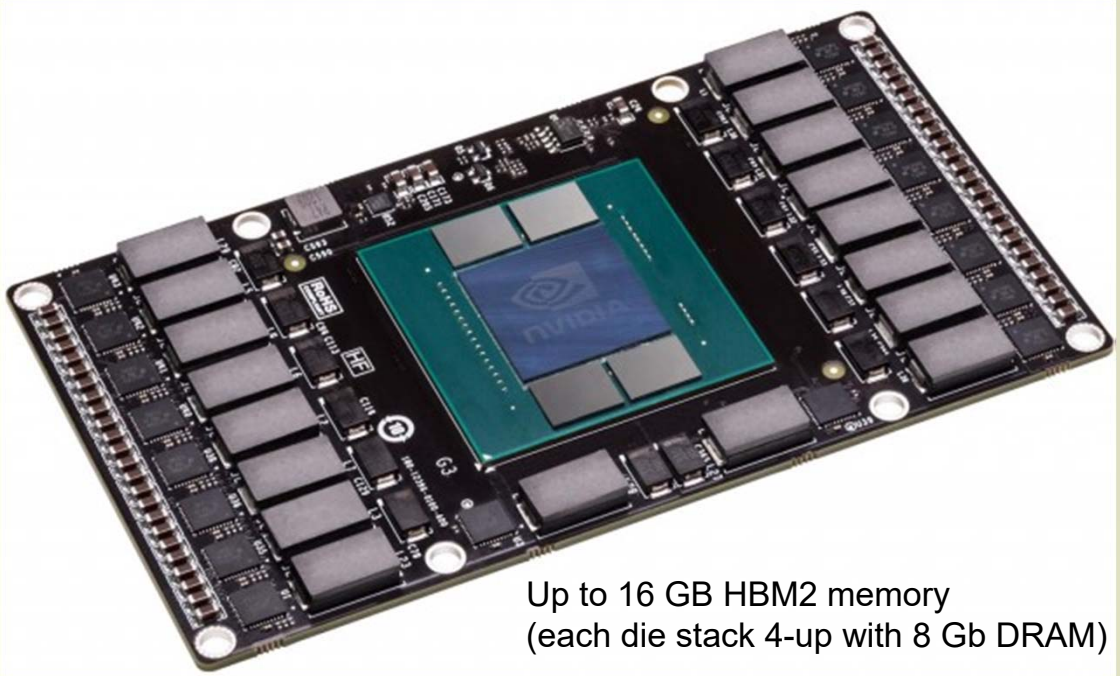
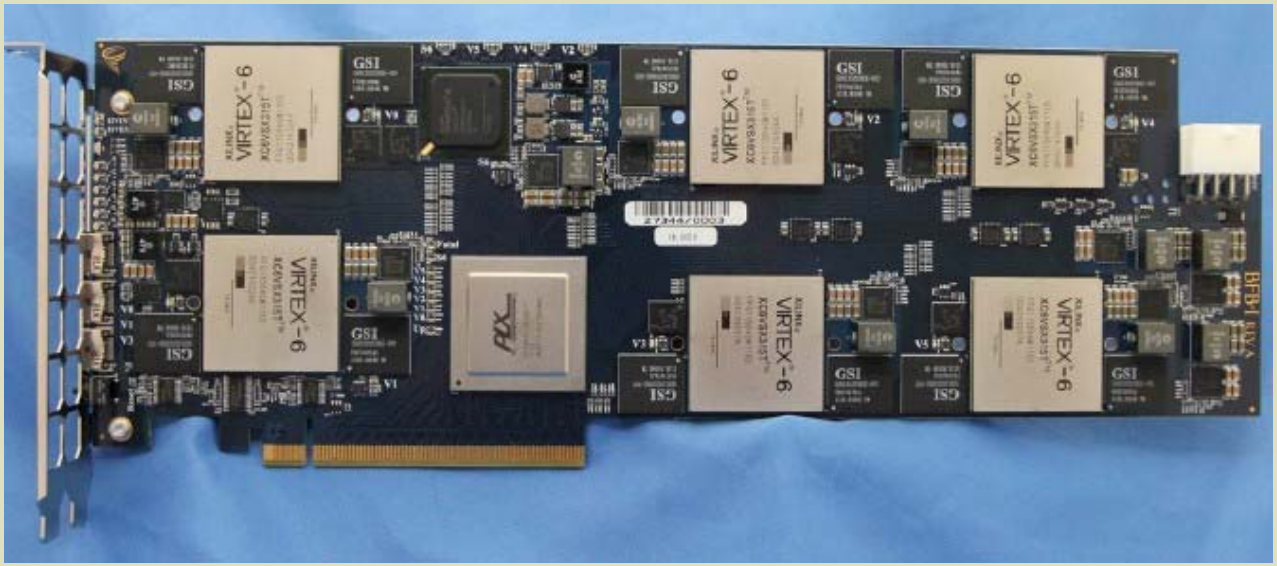
Graphical Processor Unit (GPU)



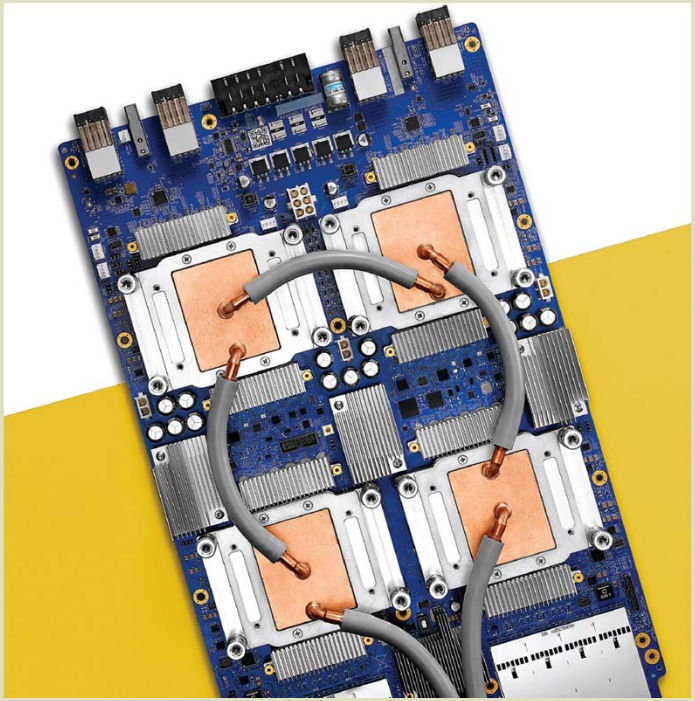
Nvidia Pascal GPU (2015)

Field Programmable Gate Arrays (FPGAs)



Microsoft Project Catapult / EnterpriseTech.com

Application Specific Processor (ASP)



Google Tensor Processing Unit (TPU 3.0)

Why ASPs?

Haswell has 18 cores and the K80 13 processors. The GPU and TPU use the Haswell server as host. The semiconductor technology is in nm. TDP stands for thermal design power; TOPS/s is 10^{12} operations/second; memory bandwidth is gigabytes/second, and the TPU die is less than half the size of the Haswell die.

Model	mm²	nm	MHz	TDP Chip	TOPS/s 8b	TOPS/s FP	GB/s	Chips/ Server	TDP Server
Haswell CPU	662	22	2,300	145W	2.6	1.3	51	2	504W
Nvidia K80 GPU	561	28	560	150W	—	2.8	160	8	1,838W
TPU	<331	28	700	75W	92	—	34	4	861W

< ½ the die size

~20x performance / Watt

A Domain-Specific Architecture for Deep Neural Networks
Jouppi, et. al. *Communications of the ACM*, Sept. 2018; 61/9

Setting the Future of Computing?

Yann LeCun
Chief AI Scientist, Facebook

2019 IEEE INTERNATIONAL SOLID-STATE CIRCUITS CONFERENCE

1.1 Deep Learning Hardware: Past, Present, and Future **8:45 AM**

Yann LeCun, *Facebook AI Research & New York University, New York, NY*

Deep learning has caused revolutions in computer understanding of images, audio, and text, enabling new applications such as information search and filtering, autonomous driving, radiology screening, real-time language translation, and virtual assistants. But almost all these successes largely use supervised learning, which requires human-annotated data, or reinforcement learning, which requires too many trials to be practical in most real-world situations. In contrast, animals and humans seem to learn vast amounts of background knowledge about the world through mere observation and occasional actions in a self-supervised manner. Making progress in self-supervised learning is the main challenge of AI for the next decade. Success may result in machines with some level of common sense. But they will be built around deep learning architectures that are considerably larger than current ones, requiring vastly more powerful hardware than what we have today.

Facebook's AI Chief Researching New Breed of Semiconductor

Yann LeCun says the company is leaving "no stone unturned" in chip effort, and that existing chips are largely inadequate for deep learning.

Bloomberg | Feb 19, 2019

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Quantum Computing via IBM Cloud

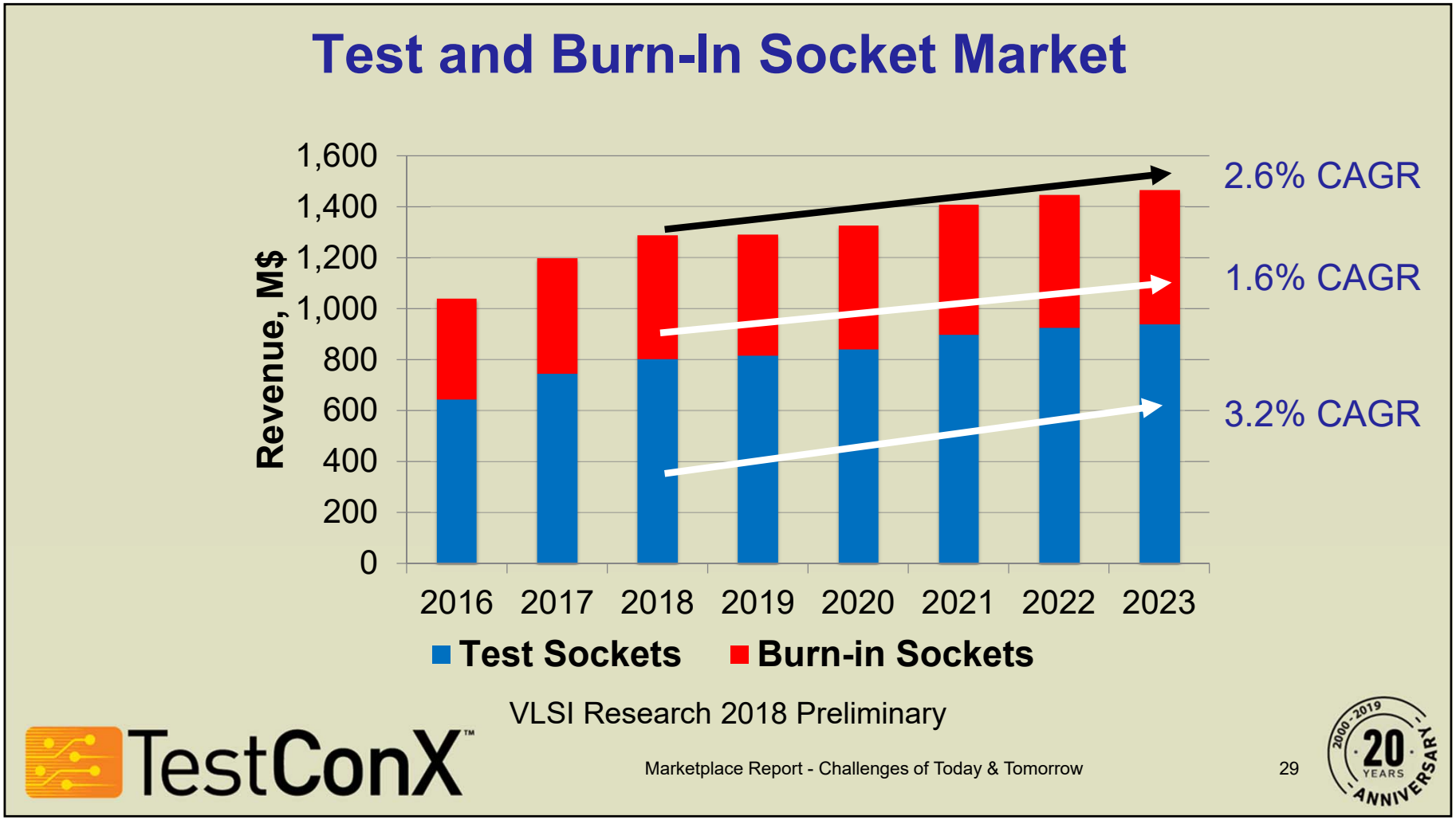
IBM Unveils World's First Integrated Quantum Computing System for Commercial Use

IBM to Open Quantum Computation Center for Commercial Clients in Poughkeepsie, NY

YORKTOWN HEIGHTS, N.Y., Jan. 8, 2019 /PRNewswire/ -- At the 2019 Consumer Electronics Show (CES), IBM (NYSE: IBM) today unveiled IBM Q System One™, the world's first integrated universal approximate quantum computing system designed for scientific and commercial use. IBM also announced plans to open its first IBM Q Quantum Computation Center for commercial clients in Poughkeepsie, New York in 2019.

Look beyond the small screen to get the big picture!

SOCKET MARKET


Test and Burn-In Socket Market
Revenue, M$
1,600
1,400
1,200
1,000
800
600
400
200
0
2016
2017
2018
2019
2020
2021
2022
2023
2.6% CAGR
1.6% CAGR
3.2% CAGR
Test Sockets
Burn-in Sockets
VLSI Research 2018 Preliminary
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Top Test & Burn-in Vendors 2018

Rank	Overall
1	Yamaichi Electronics
2	Enplas
3	ISC
4	Smiths Interconnect
5	LEENO Industrial

VLSI Research 2018 Preliminary

Top Test & Burn-in Vendors 2018

Rank	Overall	Test Socket	Burn-in Socket
1	Yamaichi Electronics	ISC	Yamaichi Electronics
2	Enplas	LEENO Industrial	Enplas
3	ISC	Smiths Interconnect	Sensata Technologies
4	Smiths Interconnect	Xcerra	Plastronics
5	LEENO Industrial	Yokowo	Loranger

VLSI Research 2018 Preliminary