



# Why is 2023 a Digital Pivot Point?

December 2020



## iterateOn

events that inspire continuous  
thought-provoking learning about  
technologies and digital-oriented trends

By 2025 ~

The average person will interact  
with connected devices 4,800x per day –  
**every 18 seconds**

By 2025 ~

30% will be **real-time**

Global Datasphere

IDC ...

<https://datacenterfrontier.com/smart-things-everywhere-the-connected-future-of-2025/>

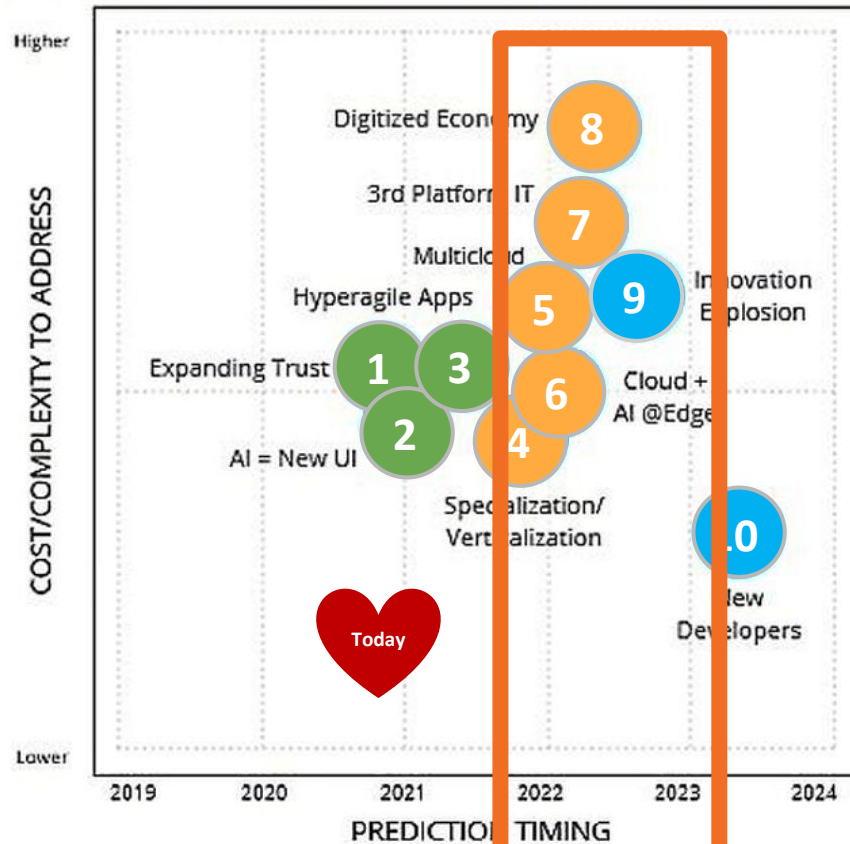
By 2025 ~

***Smart*** will be the new normal



**But the real pivot year is**

**2023**



## 10 Tech Trends - Concentrated in 2023

Source: IDC, 2018

SOURCE: IDC FUTUREScape: WORLDWIDE IT INDUSTRY 2019 PREDICTIONS,

**Tinier**

**Faster**

**Cheaper**

# Tinier

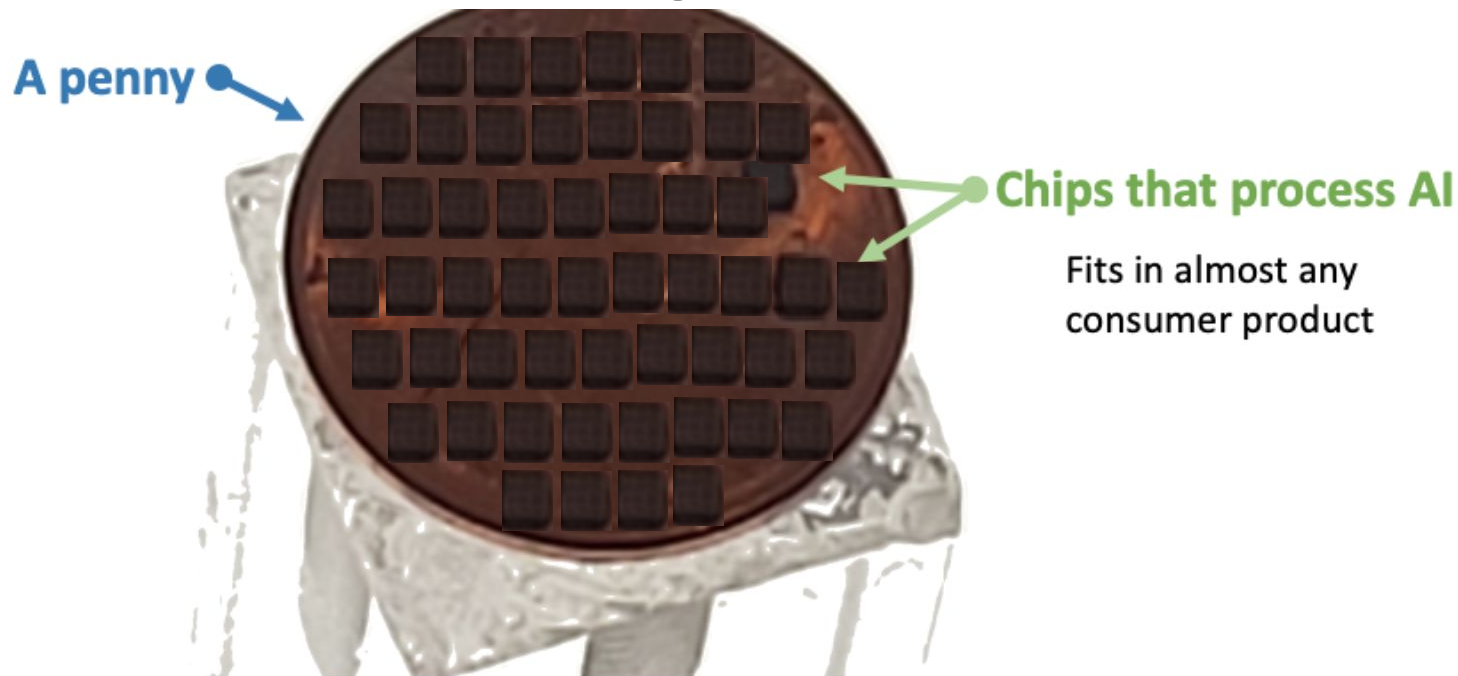
# Faster

# Cheaper



The data-driven world will be **always on**,  
**always tracking**, **always monitoring**, **always listening** and  
**always watching** – **because it will be always learning.**

# 54 Chips

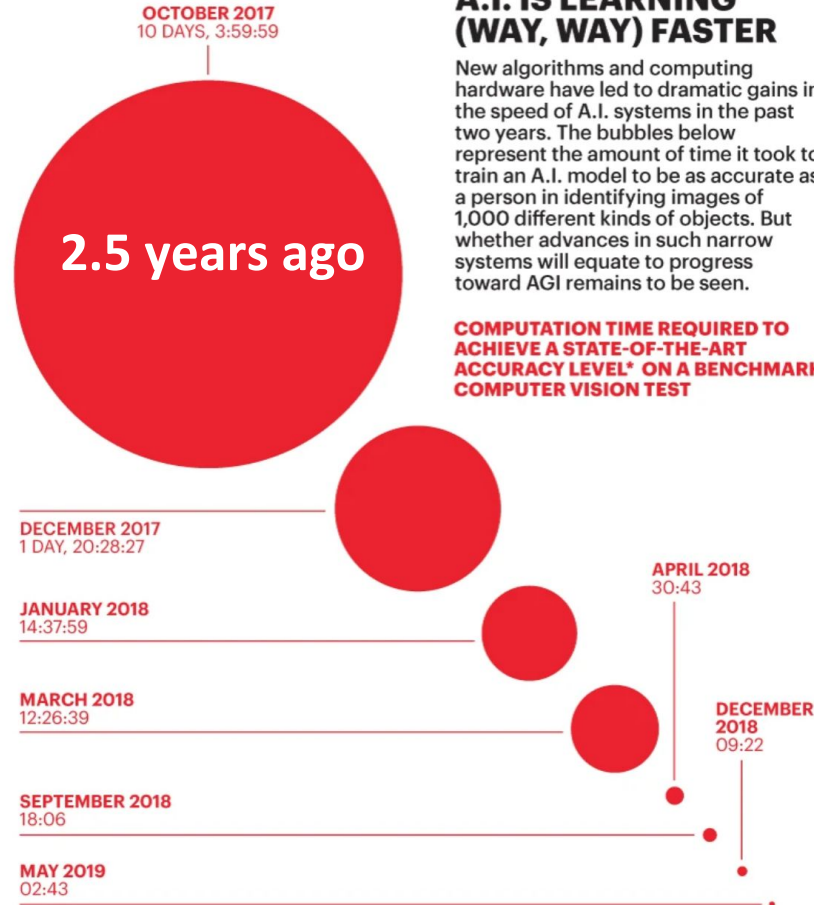


**CONSUMER PRODUCTS are getting BRAINS + MEMORIES**

## A.I. IS LEARNING (WAY, WAY) FASTER

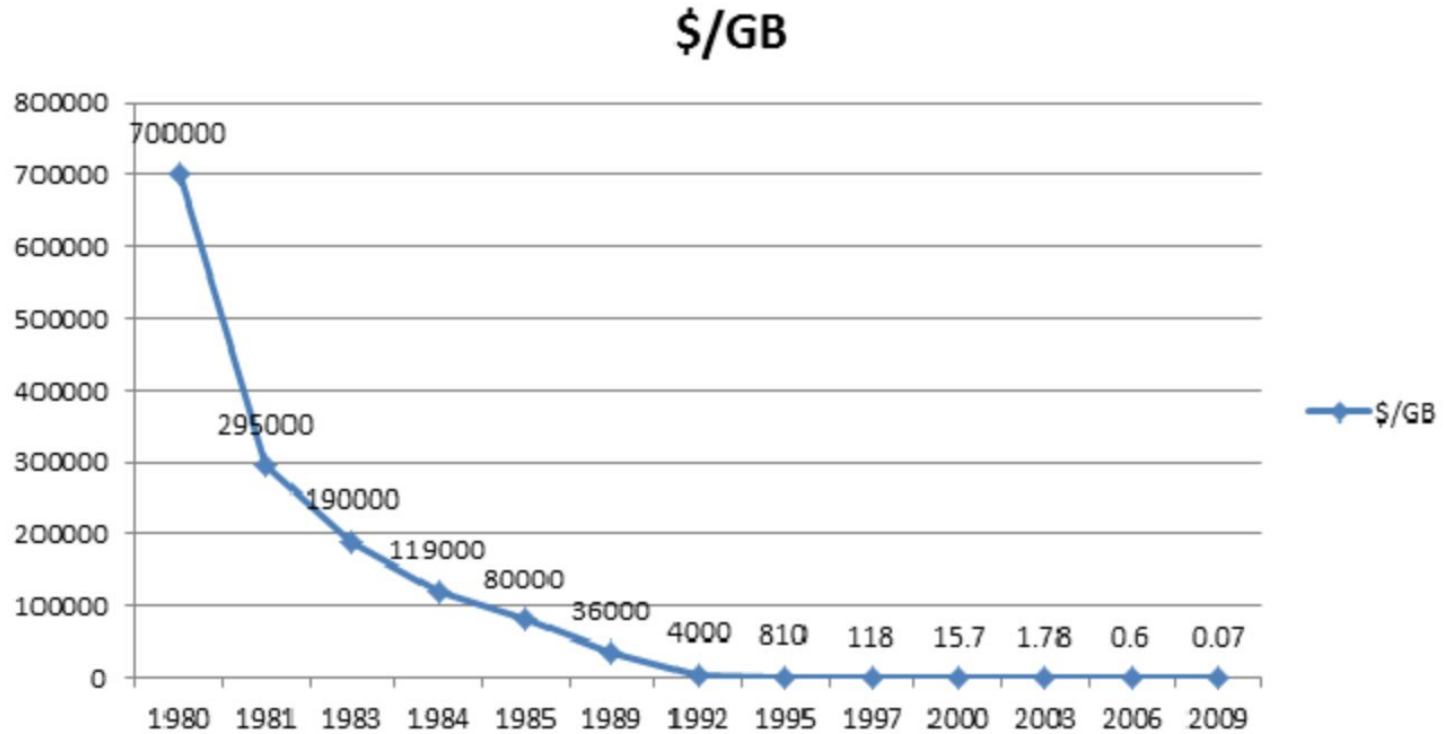
New algorithms and computing hardware have led to dramatic gains in the speed of A.I. systems in the past two years. The bubbles below represent the amount of time it took to train an A.I. model to be as accurate as a person in identifying images of 1,000 different kinds of objects. But whether advances in such narrow systems will equate to progress toward AGI remains to be seen.

**COMPUTATION TIME REQUIRED TO  
ACHIEVE A STATE-OF-THE-ART  
ACCURACY LEVEL\* ON A BENCHMARK  
COMPUTER VISION TEST**



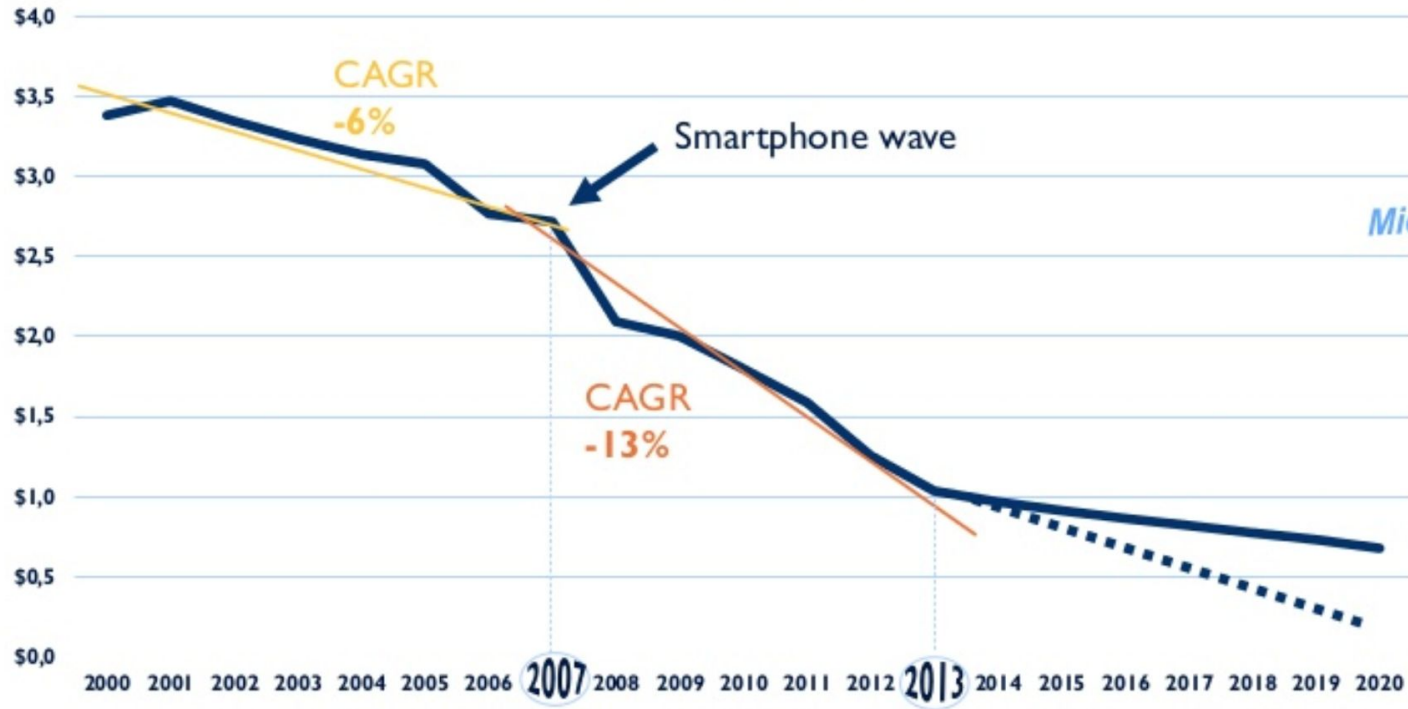
\* ACCURATE 93% OF THE TIME SOURCE: STANFORD UNIVERSITY

## Plummeting costs for storage



## 2000 – 2020 MEMS ASP decrease

Source Yole Développement



*Accelerometer only \$0.14 !*



*Microphone only \$0.19 !*



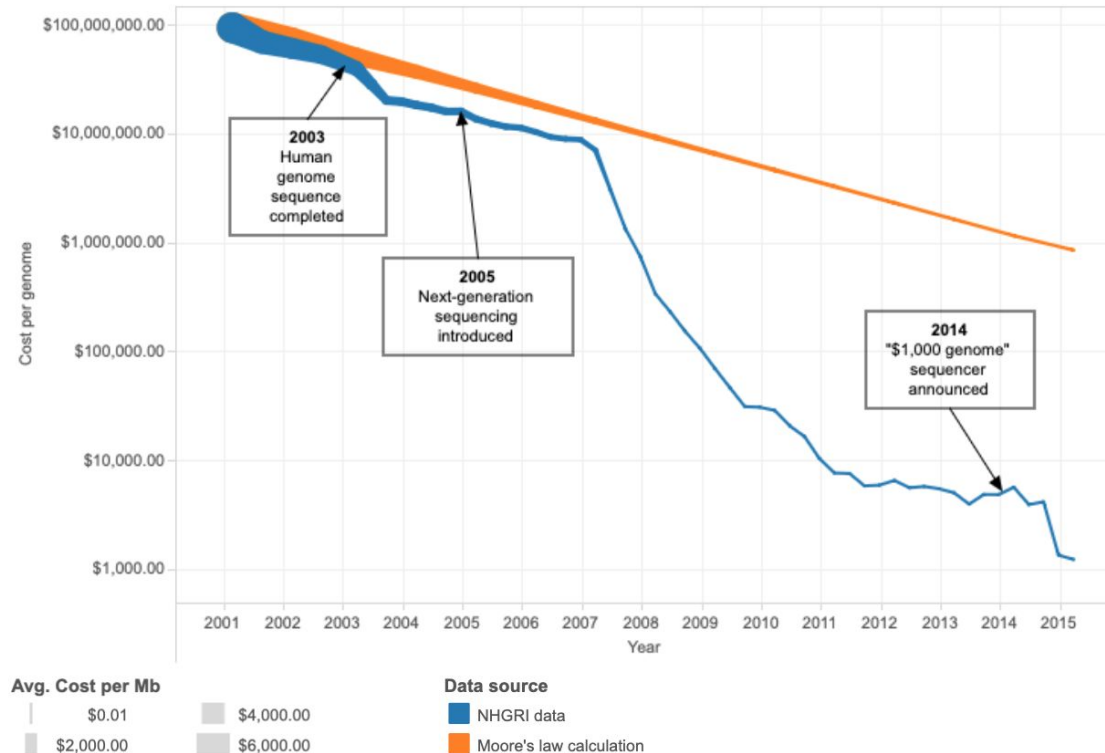
**under \$1**  
since 2013...

Microelectromechanical Systems, or **MEMS**, is a technology that in its most general form can be defined as miniaturized mechanical and electro-mechanical elements (i.e., devices and structures) that are made using the techniques of microfabrication.



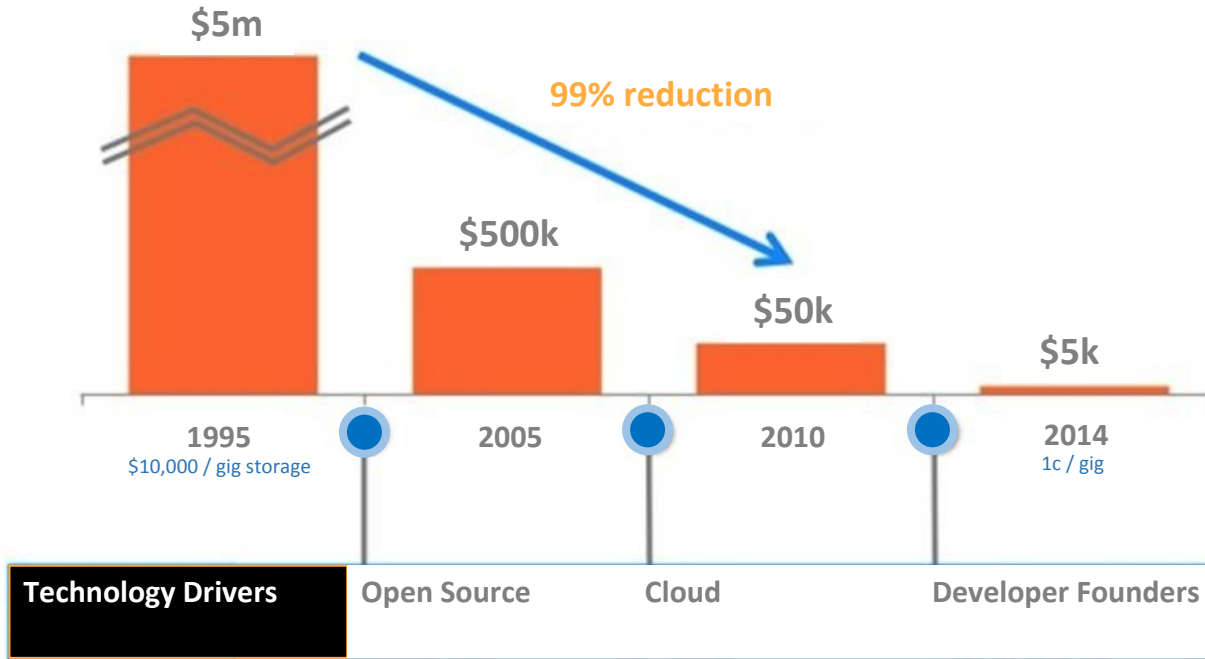
# Plummeting costs in bio and genetics (human genome)

DNA sequencing costs over time



Decline in real costs compared to expected declines based on Moore's Law.  
Trend line: Cost per human genome. Line width: Cost per megabase (Mb)  
(Data: NHGRI <https://www.genome.gov/27541954/dna-sequencing-costs-data/>)

## Startups = Cheaper + Faster



# Lower barriers has fueled a **proliferation of startups**

**2011**  
~150



**2012**  
~350



**2014**  
~1,000



**2015**  
~2,000



**2016**  
~3,500

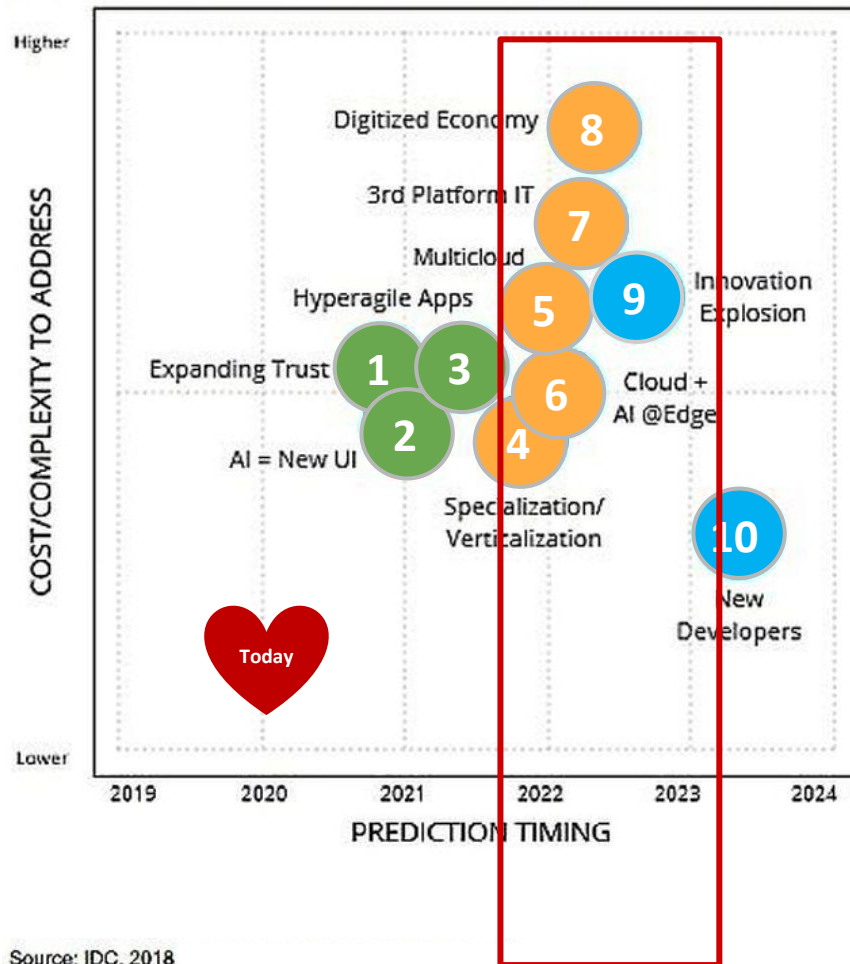


**Number of digital marketing  
solutions created by startups**



**2018**  
~7,000

Source: Scott Brinker  
Marketing technologies



Source: IDC, 2018

SOURCE: IDC FUTUREScape: WORLDWIDE IT INDUSTRY 2019 PREDICTIONS,

# Today

operating ~independently

**4G**

**AI**

**AR/VR**

**BC**

**Voice**

**IoT**

**Open  
Source**

# 2023

big + intertwined

**5G**

**AI**

**AR/VR**

**BC**

**Voice**

**IoT**

**Open  
Source**

**1.1B**

**\$98B**

**\$100B**

**\$23B**

**\$18B**

**\$1T**

**100M**

**phones**

← Single year spend (NOT including R&D) →

**43B devices**

**libraries**

# IDC: The "Digital-First Enterprise" Will Be Half of the Economy by 2023. Are You Ready?

At its annual Directions conference, IDC said the "Digital Economy" has become an operational state, rather than just an aspiration. It predicts "digitally transformed" firms will account for more than half of global GDP by 2023.



By Michael J. Miller March 13, 2020



## What's Changed in the Digital Economy?



Competition is increasingly powered by platforms



Ecosystems are feeding off themselves



Innovation has accelerated



Transforming data into insights is a strategic imperative



Customers expect engagement, personalization & simplicity

The Digital Economy is moving from conceptual, to aspirational, to operational



ANALYZED  
THE FUTURE

© IDC





# ***IDC: The "Digital-First Enterprise" Will Be Half of the Economy by 2023. Are You Ready?***

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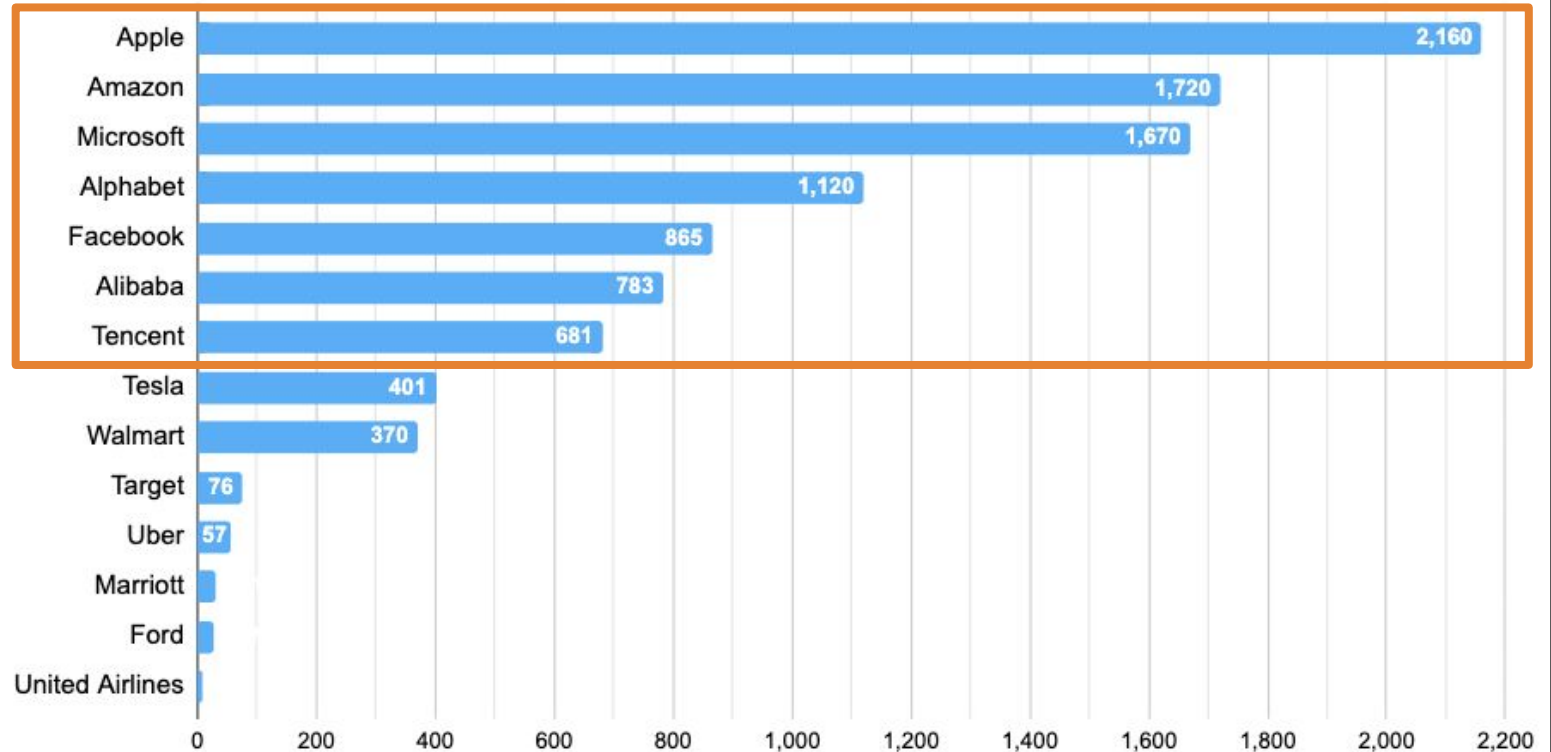


Customers expect  
engagement,  
personalization &  
simplicity

The Digital Economy is moving from conceptual, to aspirational, to operational



# World's 8 highest value firms are "platforms"



Market Cap (i.e. Amazon is \$1.7 trillion in this graph) as of Aug 26, 2020

# Amazon is a complex ecosystem; not a company

**Snapshot 2019**

- \$280.5B reported revenue (GMV is higher)
- \$456.8B revenue when reported as GMV
- \$11.6B net income
- \$40B R&D annual investment run rate
- 200M Echo's sold (distributed IoT devices)
- 798,000 employees

graphic by  
**iterate.ai**  
open innovation platform

Estimates as of  
May 25, 2020

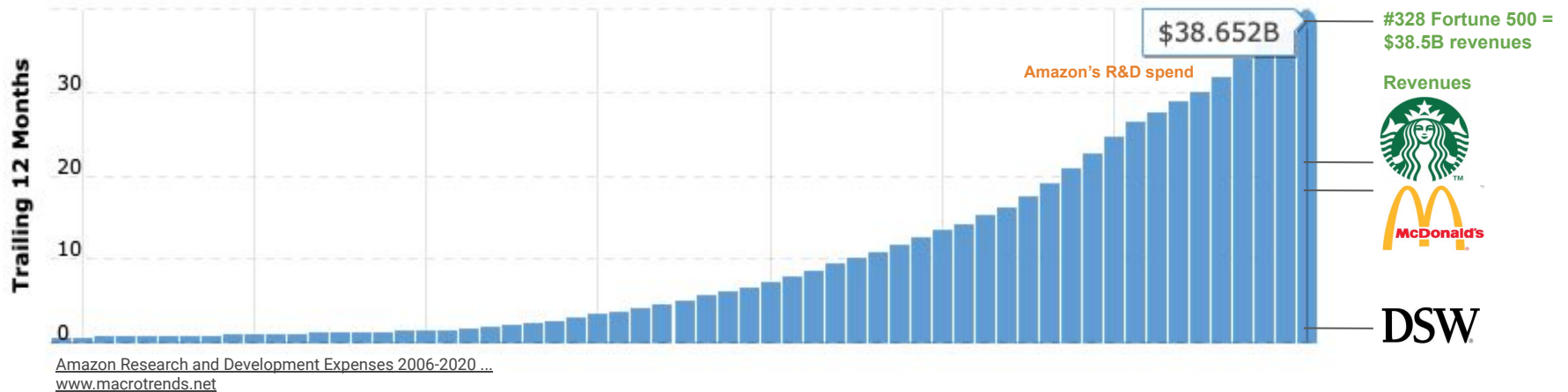
... it's largely about data-sharing



43	43
INNOVATION & STARTUP ENABLEMENT	
1	A9 (search and ad software lab)
2	Amazon Consulting (partner-path.com)
3	Amazon Alexa Fund (for voice)
4	Alexa Accelerator (for voice)
5	CreateSpace (indie publishing)
HEALTHCARE + RETAIL	
6	PillPack
7	Health Navigator
RETAIL	
8	Whole Foods
9	Zappos.com
10	Fabric.com
11	Woot
12	Quidsi
13	Souq
14	BOP (ShopBop)
15	comXology
16	AbeBooks
BOOKS	
17	Audible
18	MobiPocket (software for digital reading)
19	The Book Depository
VIRTUAL COMMUNITY & CONTENT	
20	Goodreads
21	Digital Photography Review
22	Internet Movie Database
ENTERTAINMENT	
23	LoveFilm International
24	Box Office Mojo
25	Sye Streaming Service
ESPORTS	
26	Twitch Interactive
27	CryEngine
28	GameSparks
IOT & AI DEVICES	
29	Ring (Cameras)
30	eero (Smart Home)
31	Blink (Security Doorbell and Cameras)
VOICE	
32	Ivona Software
IOT and AI SOFTWARE + INFRASTRUCTURE	
33	2lemetry (IoT platform)
34	Annapurna Labs (Edge Chips)
35	Amazon Web Services
36	DataRow
37	CloudEndure
38	Amiato
39	Clusterk
GROCERY LOGISTICS	
40	Webvan Group
DIGITAL PAYMENTS & FINANCE	
41	GoPago
DIGITAL ADVERTISING	
42	Sizmek
DIGITAL EDUCATION	
43	TenMarks



R&D → digitizing consumer behavior



2023  
intertwined



**5G**

**AI**

**AR/VR**

**BC**

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43B devices

libraries

5G

## “Digital Highway”

4G



5G



# 5G

## **“Digital Highway”**

Everything health, fitness, commercial.  
Your behaviors and habits.

Where you work. When you drive, eat, sleep.  
Who your family and friends is.

Your age, prescriptions, preferences.  
Pictures and text you post socially, click on, read.  
Your political views, travel habits, purchases.

## Political Battle.

The Chinese government  
wants this to work.  
It aims to own the networks.  
Globally.

The same is true for AI and Blockchain.

## Business Battle.



## IDEAS

## 5G Is Where China and the West Finally Diverge

The rollout of speedy new cellular networks is a geopolitical turning point, but neither Trump nor the public yet recognizes this.

JANUARY 5, 2020

**Lindsay Gorman**

Fellow at the Alliance for Securing Democracy



GEORGE FREY / AFP / GETTY

The rollout of fifth-generation cellular networks around the world will likely be a defining geopolitical dilemma of 2020. But American and European consumers could easily mistake 5G for just another marketing ploy for early adopters—to the detriment of democracies worldwide.

Some of the world's leading telecom-equipment manufacturers, including Huawei and ZTE, are Chinese companies with murky ownership structures and close ties to China's ... government.

Many in the U.S. NSA **fear** that equipment made by these companies could allow Beijing to **siphon off sensitive personal or corporate data**. Or **well-concealed kill switches** could cripple Western telecom systems during a ... war.

The mere threat of this activity would endow China ... with geopolitical leverage at all times.



## Analysts think global 5G smartphone shipments will overtake 4G in 2023

Brian Heater @bheater / 7:49 am MDT • July 1, 2019

Comment



Image Credits: Miquel Benitez / Getty Images

After years of buildup, 5G is finally here — albeit more as a trickle than a deluge. These things take time, of course. Carriers are adding coverage, city by city, promising dozens by year's end. And as for hardware, early adopters have somewhere between one and three handsets to choose from, carrier-dependent.

Indeed, 5G is pretty universally regarded as the next key mobile trend, but it's not going to happen overnight. A new report from Canalys has 2023 as the true pivot point, when 5G handset shipments finally overtake 4G. That's roughly five years, with 2019 included. Of course, that's the global number, and these things will almost certainly vary from market to market.



c|net

COVID-19 BEST PRODUCTS ▾ REVIEWS ▾ NEWS ▾ HOW TO ▾ FINANCE ▾ SMART HOME ▾ CARS ▾

## 5G customers predicted to hit 1 billion by 2023

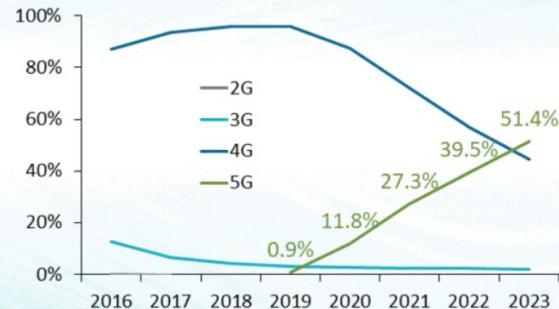
And that's just in Asia and North America, IHS says.

Corinne Reichert July 24, 2019 3:06 p.m. PT



1.9 billion 5G smartphones will ship in the next five years, overtaking 4G shipments in 2023

Percentage of global shipments



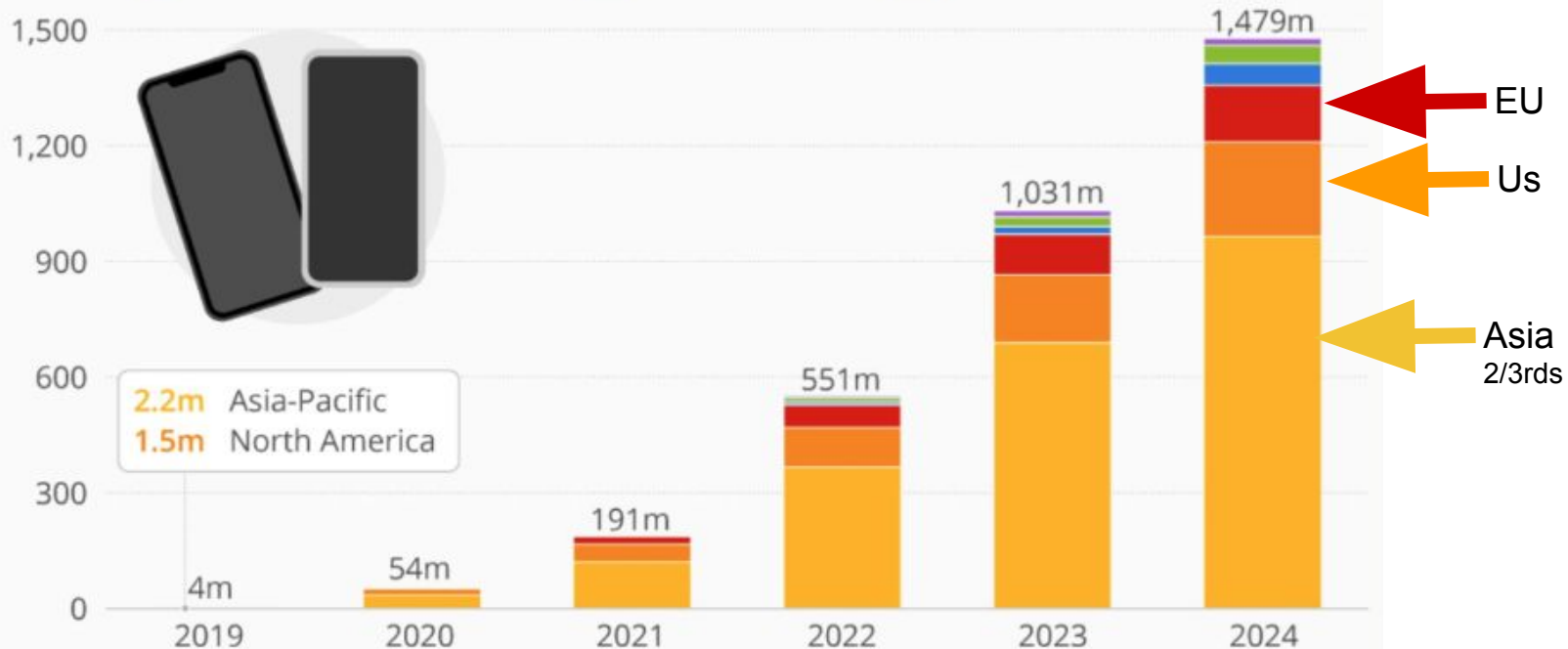
2019-2023  
Accumulated 5G smartphone shipments: 1.9 billion  
CAGR: 179.9%

Source: Canalys forecasts, Smartphone Analysis, June 2019



# Global 5G Adoption to Take Off in 2021

**Subscriptions** forecast



1G

Voice



2G

Voice  
Texting



3G

Social  
Music Streaming starts



4G LTE

Mobile Economy  
• Uber + Lyft  
• AirBnB  
Movie Streaming  
Shopping



5G

WiFi provides **wireless Internet** access via radio waves which transmit a signal to a wireless enabled device. Typically slower than 3G or **4G**.

WiFi:  
There are access points  
in every building. **250  
connected devices per  
access point.**

**4G LTE** means fourth generation long term evolution. **LTE** is a kind of **4G** that provides fastest connection to mobile Internet.

10X faster than 3G.

**4G** and **4G LTE** are not the **same**.

**1,000 connected  
devices per access  
area (1 sq km)**

1G

Voice



2G

Voice  
Texting



WIFI:  
There are access points  
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3G

Social  
Music Streaming starts



4G LTE

**1,000 connected  
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Mobile Economy  
• Uber + Lyft  
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Movie Streaming  
Shopping



5G

5G:  
**1,000,000 connected devices per access area;**  
1000x more bandwidth, 10-100x faster; virtually  
everything can join the connected world

Unprecedented Connectivity

- Connectivity of all things
- Network is as fast as brain processing
- Real-time translations via your device
- 10 year battery life
- 90% reduction in network energy use

Events

- **100s of cameras in a venue**
  - Choose your camera angles
- Massive capacity
- No latency – instantaneous
- Video and data processed on premise

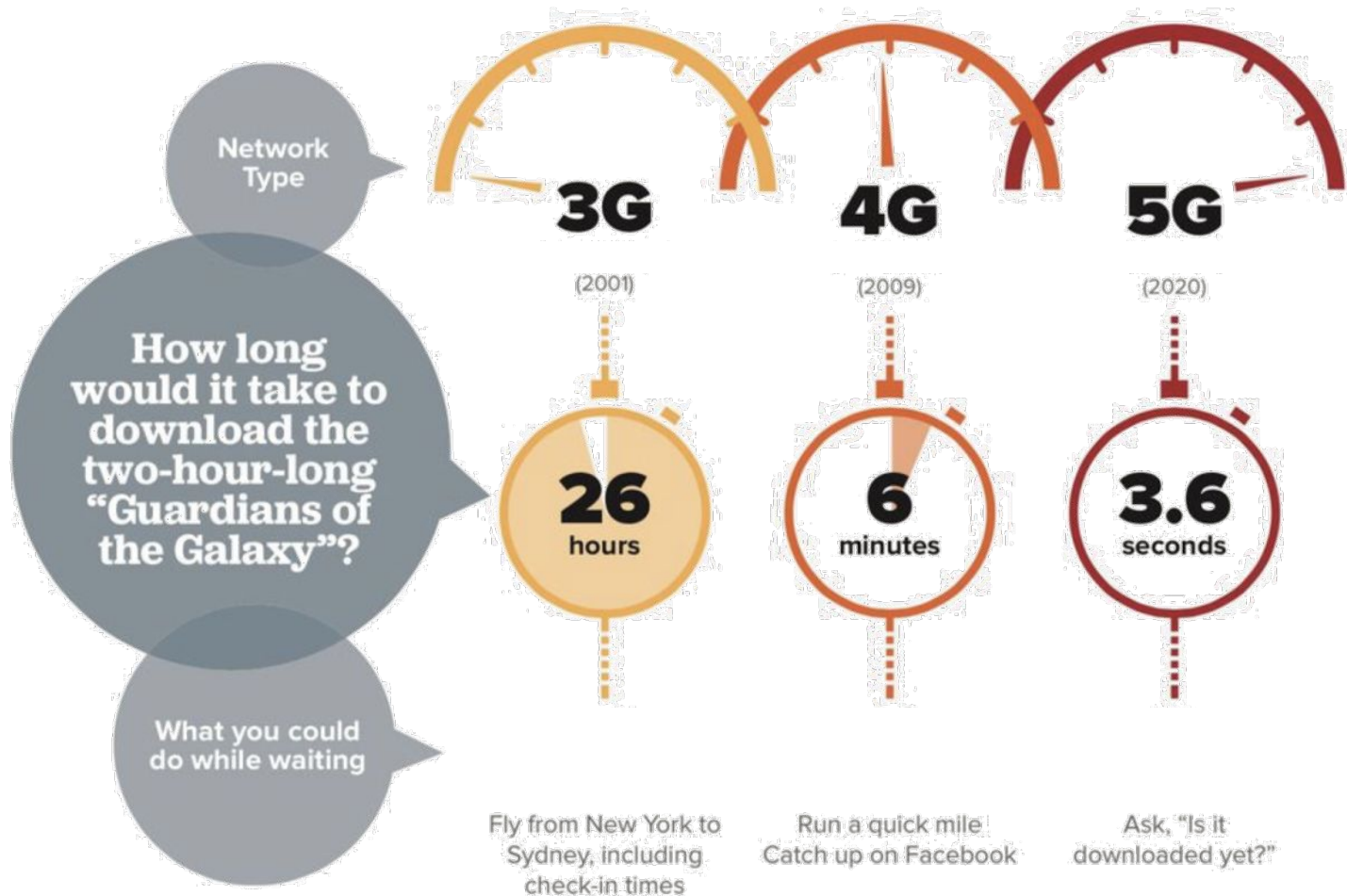
Medicine

- Robotic surgery

Personal Tools


- Toothbrush will tell you that you have a cold

**Extreme  
improvement  
in data  
movement**



## The 5G wireless revolution, explained



Roger Cheng  Oct. 27, 2019 5:00 a.m. PT

ES



99+




- 4G network lag = 20 milliseconds.
- **5G latency = 1 ms** (flash on a camera).


That responsiveness is critical for ...

- playing intense **video games in VR**
- NYC **surgeon** controlling **robotic arms** in Portland.
- **self-driving cars** that co-communicate in real time.






The average reaction time for humans to a visual stimulus is 250 ms or 1/4 of a second. People are capped at around 190-200 ms with proper training.



Imagine now that your car could **react 250 times faster than you**. Imagine it could also respond to hundreds of incoming information and can also communicate its reactions back to other vehicles and road signals all within milliseconds.



At 60 mph (100km/h), the reaction distance is about 33 yards (30 meters) before you pull on the brakes. With a 1ms reaction time, the car would only have rolled a bit more than one inch (less than 3 centimeters).



Sensors to actuators real-time communication for industrial applications



Driverless cars navigation



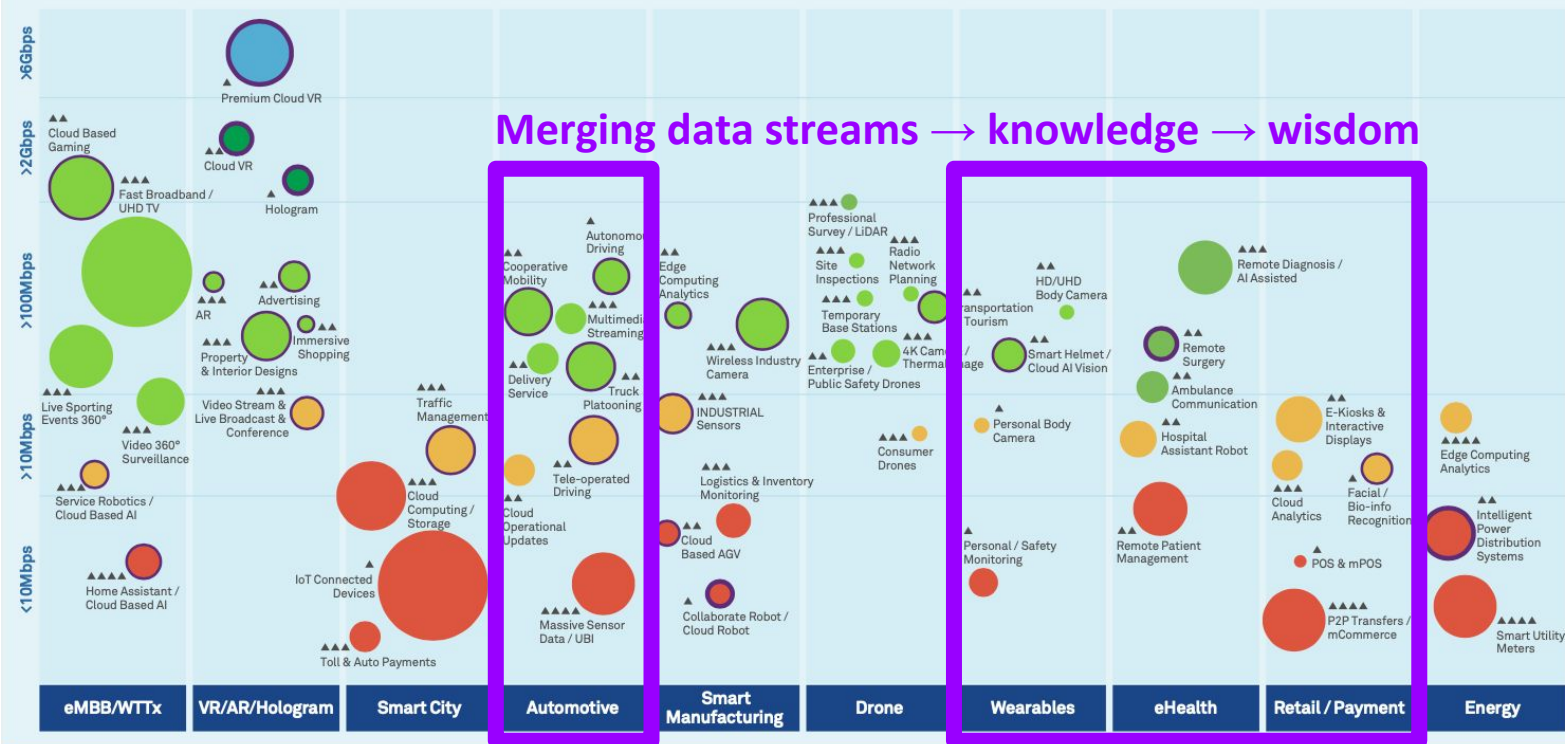
Healthcare monitoring systems



Drones/robotics applications

# 5G Applications Market Potential & Readiness Matrix

## Connectivity & Value Added Services Opportunity



### 2020 Readiness for 5G Index

1. Prototype-----▲
2. Early Adopter-----▲▲
3. Price Reduction-----▲▲▲
4. Feature Enhanced-----▲▲▲▲
5. Mature Application-----▲▲▲▲▲

### 2025 Market Potential Index



### Latency Requirement Index

- Low latency required (<50 ms)
- Very low latency (<10 ms)

### Bandwidth Requirement Index

- Low: <10 Mbps-----●
- 11 to 99 Mbps-----●
- Med: 100M to 1Gbps-----●
- 2 to 5 Gbps-----●
- High: 6 to 10 Gbps-----●

### Index Definitions



~ Jim Kuiken



ABIresearch®



5G works differently  
on connected products that **don't need a constant connection**,  
like a **sensor** for fertilizer.

Low-power scanners  
can use the **same battery for 10 years**  
periodically sending data.

# Massively distributed small cells

4G



5G

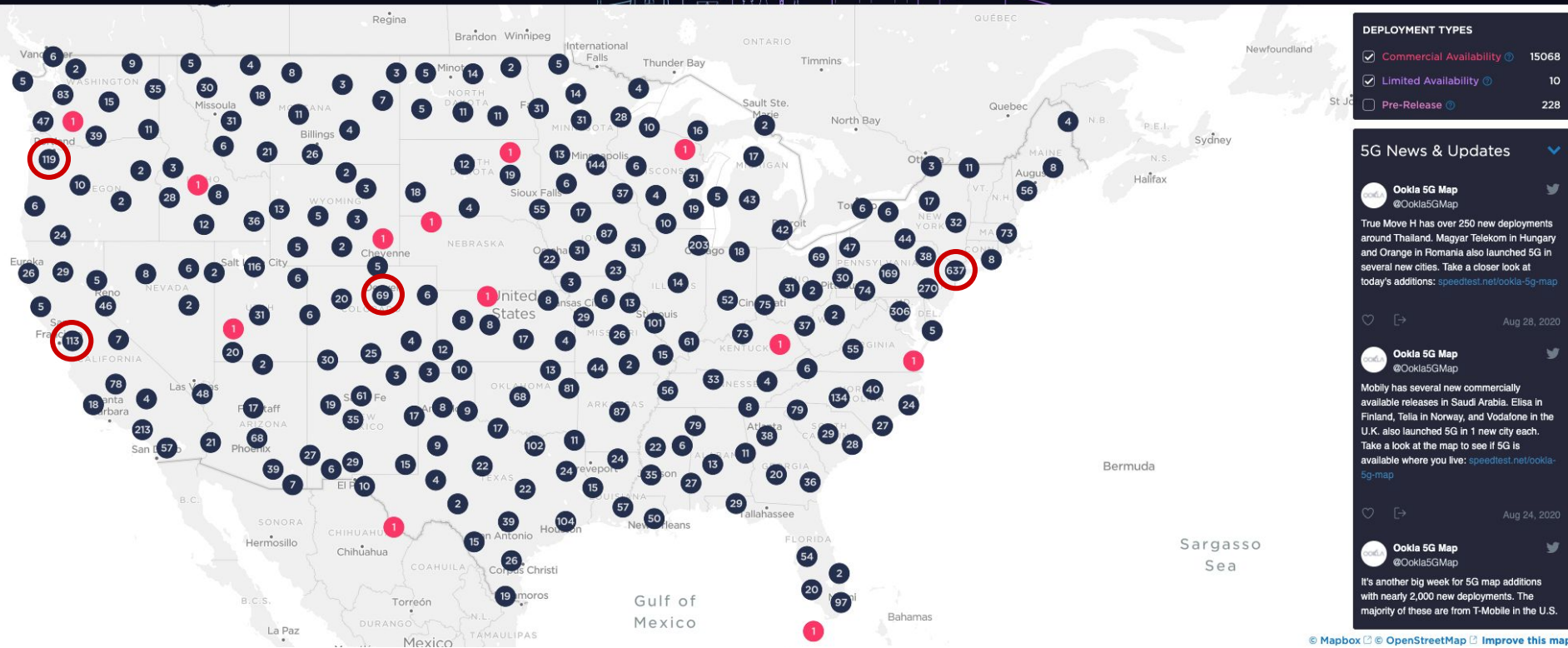


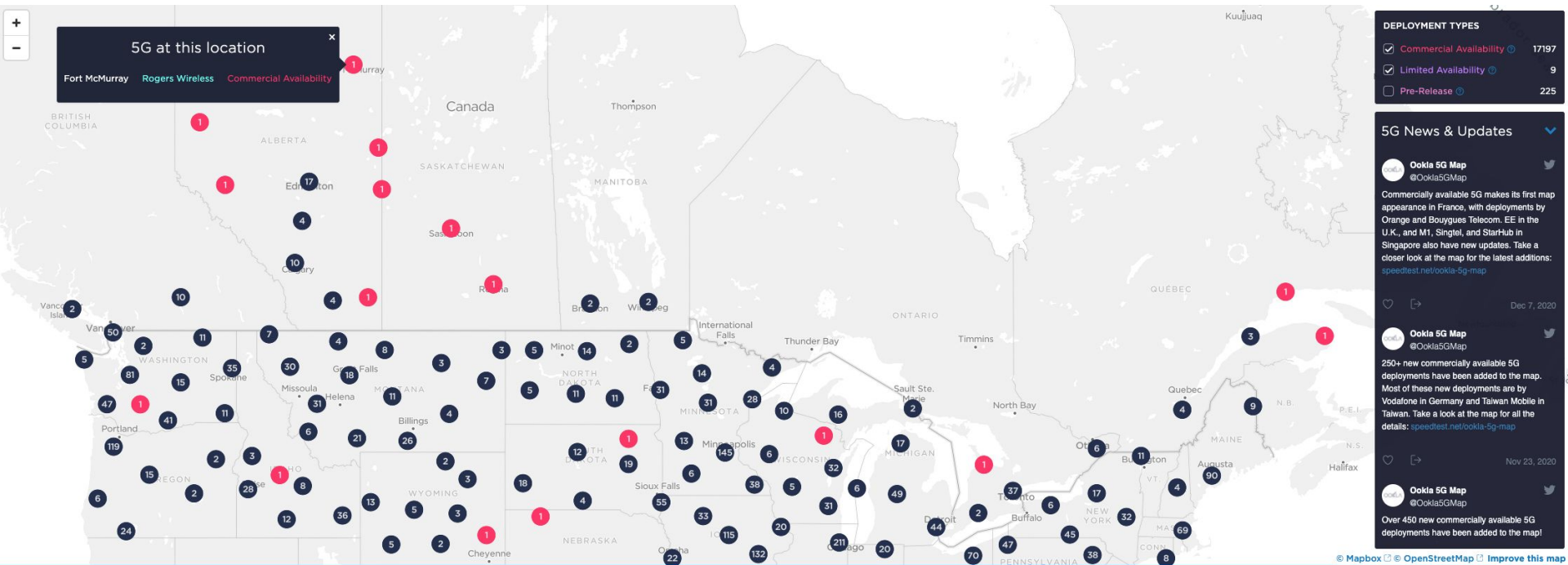
With the addition of seven new small cell nodes, Anytown's network is able to handle many more simultaneous connections.

5G Towers - 5G cell towers are so small, they can be positioned in ordinary places like on light poles, the tops of buildings, and even street lights.

# OOKLA 5G MAP™

The interactive Ookla 5G Map tracks 5G rollouts in cities across the globe. Updated weekly from verified public sources and Ookla data, you can follow operators' newest 5G networks on [@Ookla5GMap](#).





## Overwhelmed with cell permit requests in 2018

## Aesthetic complaints

Similarly, Zayo's Parra said that some local regulators are quickly getting overwhelmed by small cell permitting requests.

Another local hiccup that Zayo, CenturyLink and other small cell providers face is a question of aesthetics. "Every municipality has their own idea of what looks good and what doesn't," Bozich said.

That means some cities don't really care what a small cell installation physically looks like, while others want to make sure the deployments fit into a city's overall architecture and design. The issue has sparked a number of complaints at the federal level.

**A Messy Small Cell**



Some have complained about the aesthetics of small cell installations.

Source: Michael J. Marcus



## 5G cells in Seattle



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### A Messy Small Cell



Some have complained about the aesthetics of small cell installations.

Source: Michael J. Marcus

## 5G in Denver



WiFi 6 is emerging, too





5G

## “Digital Highway”

4G



5G



2023  
intertwined



**5G**

**1.1B**

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**\$98B**

**AR/VR**

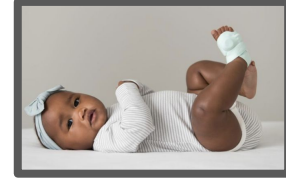
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**Open  
Source**

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← Single year spend (NOT including R&D) →

**43B devices**

**Inc.**

5G REVOLUTION

# How 5G Will Fundamentally Change Everything You Know About Mobile Computing--From Farms to Phones

The next generation of broadband will reshape industries--and your business.

in f 

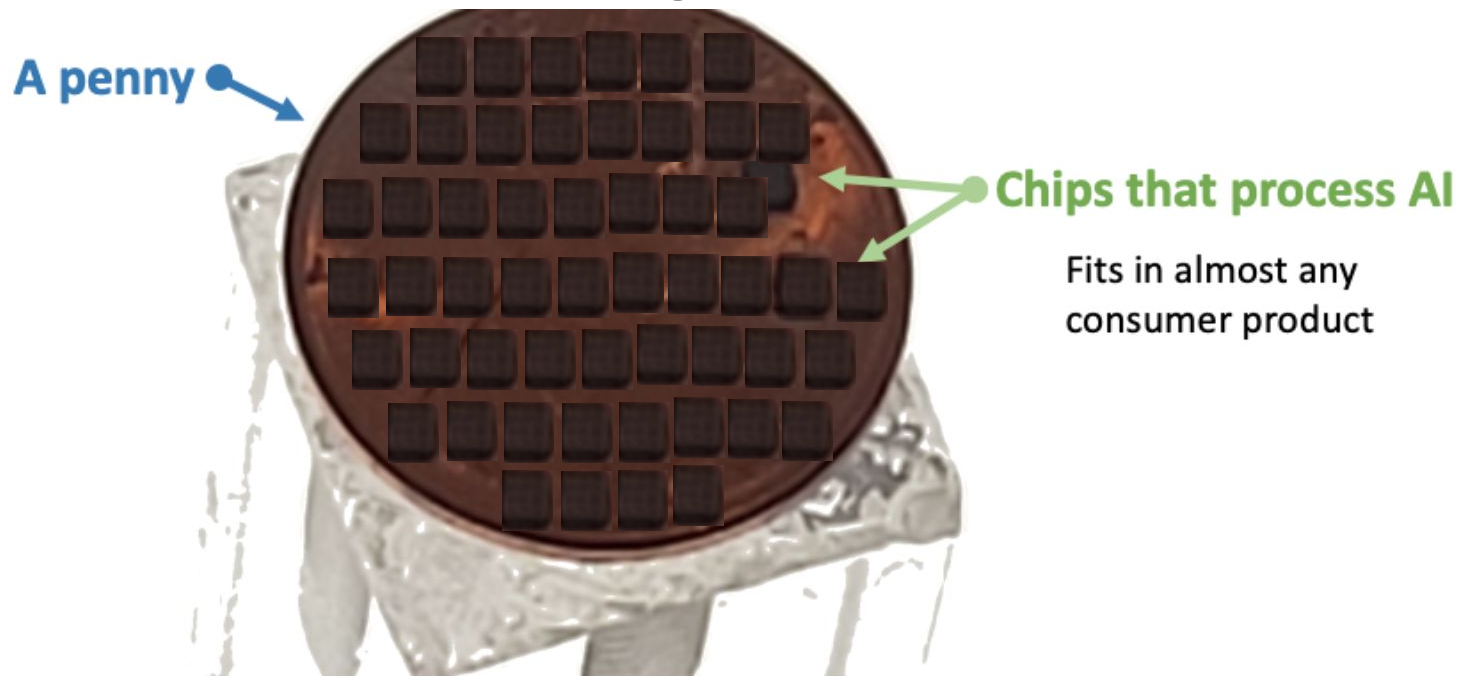


By Jennifer Alsever  [@JenAlsever](https://twitter.com/JenAlsever)

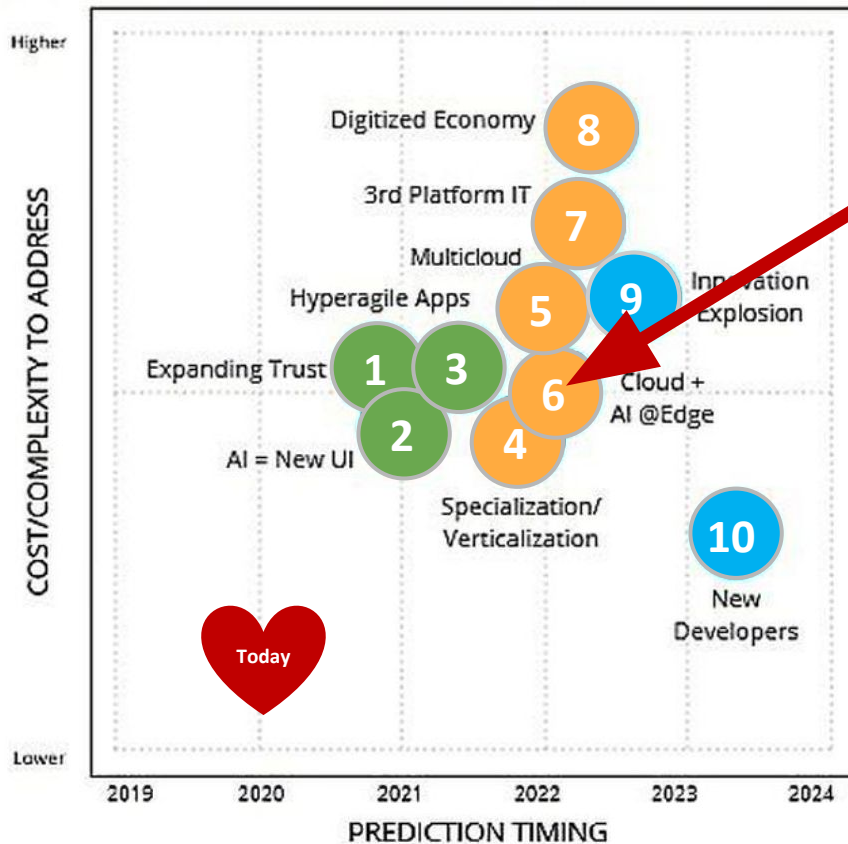
<https://www.inc.com/magazine/202002/jennifer-alsever/5g-wireless-network-broadband-high-speed-gigabit-technology.html>

ATMs  
Sensor for fertilizer  
Refrigerator  
Dog collar  
Farm tractor

# 54 Chips



**CONSUMER PRODUCTS are getting BRAINS + MEMORIES**



**Expand to the edge by 2022.**

- 40% of company cloud deployments include **edge computing**

- 25% of endpoint devices and systems execute **AI algorithms**

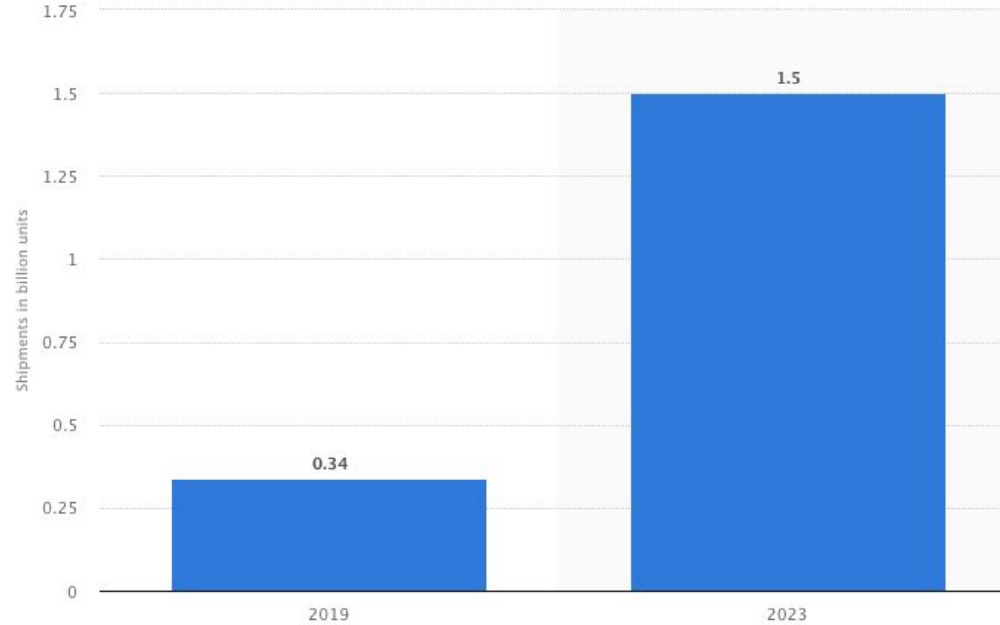
Code is smaller. It, too, can operate on the edge today. Software like Iterate.ai's Interplay facilitate edge processing.

Source: IDC, 2018

SOURCE: IDC FUTUREScape: WORLDWIDE IT INDUSTRY 2019 PREDICTIONS,

## Forecast shipments of artificial intelligence (AI) edge processors worldwide in 2019 and 2023

(in billion units)



**cumulative  
effect**

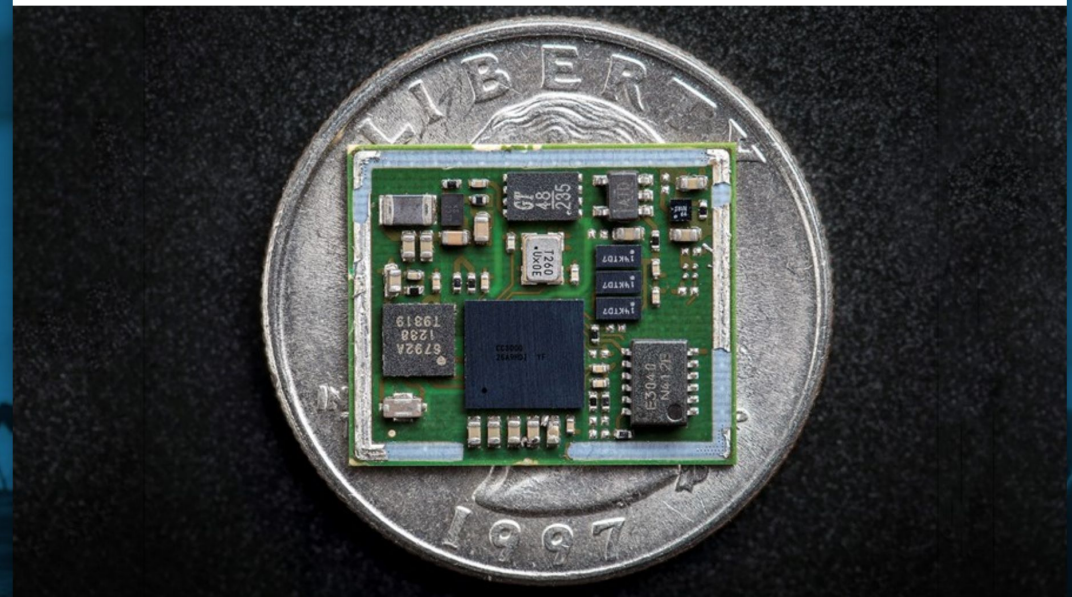
INTERNET OF THINGS

## Global IoT spend will top US\$ 1 Trillion by 2023



By Martyn Warwick

Jul 23, 2019





# Growing opportunities in the Internet of Things

July 2019 | Article

McKinsey  
& Company

By [Fredrik Dahlqvist](#), [Mark Patel](#), Alexander Rajko, and Jonathan Shulman



Maturing underlying technologies will make Internet of Things technologies easier to implement and help companies and investors seize new opportunities.

**A**fter years of hype, anticipation, and steady uptake, the Internet of Things (IoT) seems poised to cross over into mainstream business use. The number of businesses that use the IoT technologies has increased from 13 percent in 2014 to about 25 percent today. And the worldwide number of IoT-connected devices is projected to increase to 43 billion by 2023, an almost threefold increase from 2018.<sup>[1]</sup>

## DOWNLOADABLE RESOURCES

[Article \(PDF-938KB\)](#)



# 5G changes everything

Edge computing  
inflection point



# Scaling and Extending "Digital Reach"

39,000 core data centers

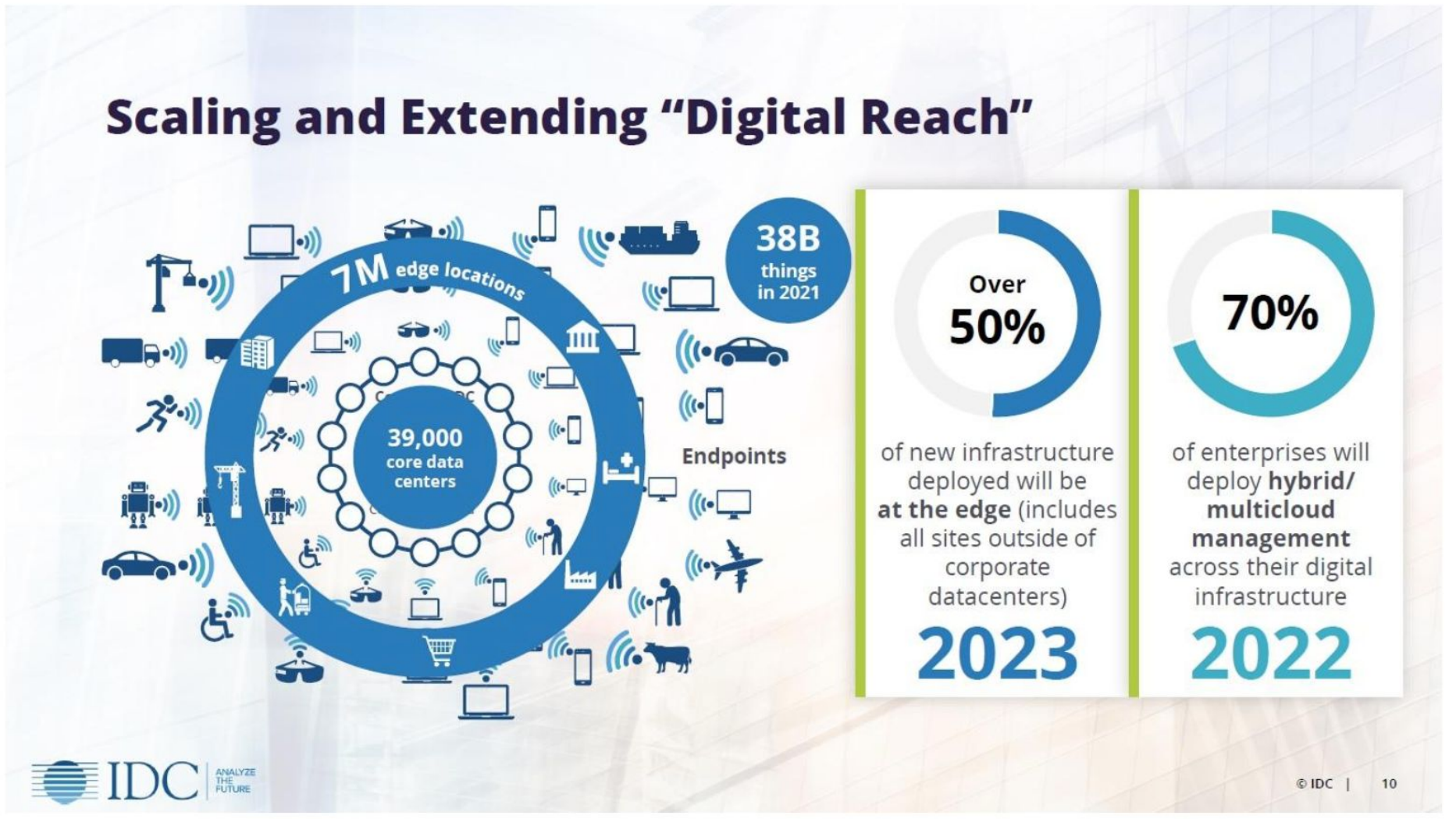
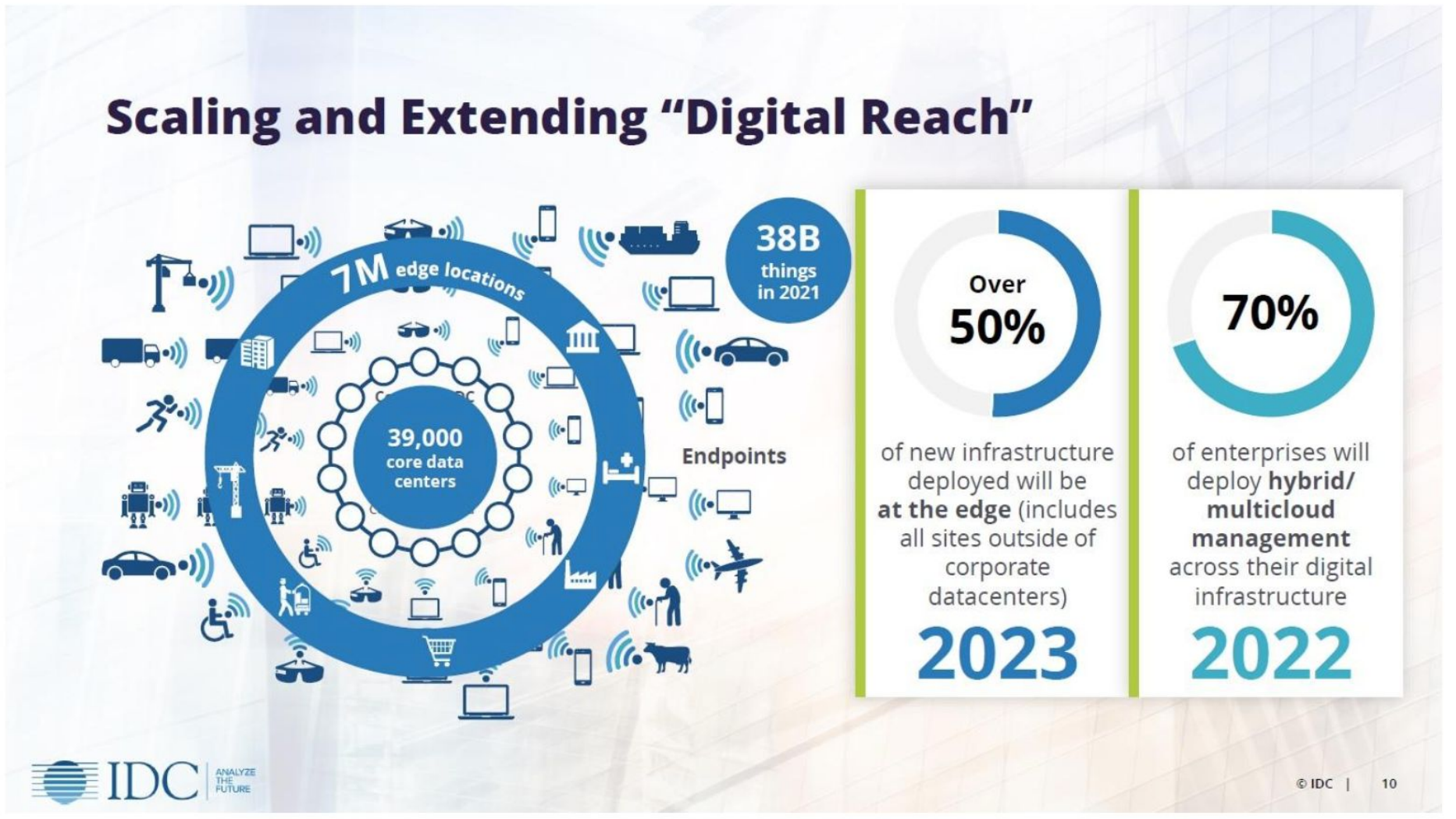
7M edge locations

38B things in 2021

Endpoints

Year	Percentage	Detail
2023	Over 50%	of new infrastructure deployed will be at the edge (includes all sites outside of corporate datacenters)
2022	70%	of enterprises will deploy hybrid/multicloud management across their digital infrastructure

© IDC | 10



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© IDC | 10

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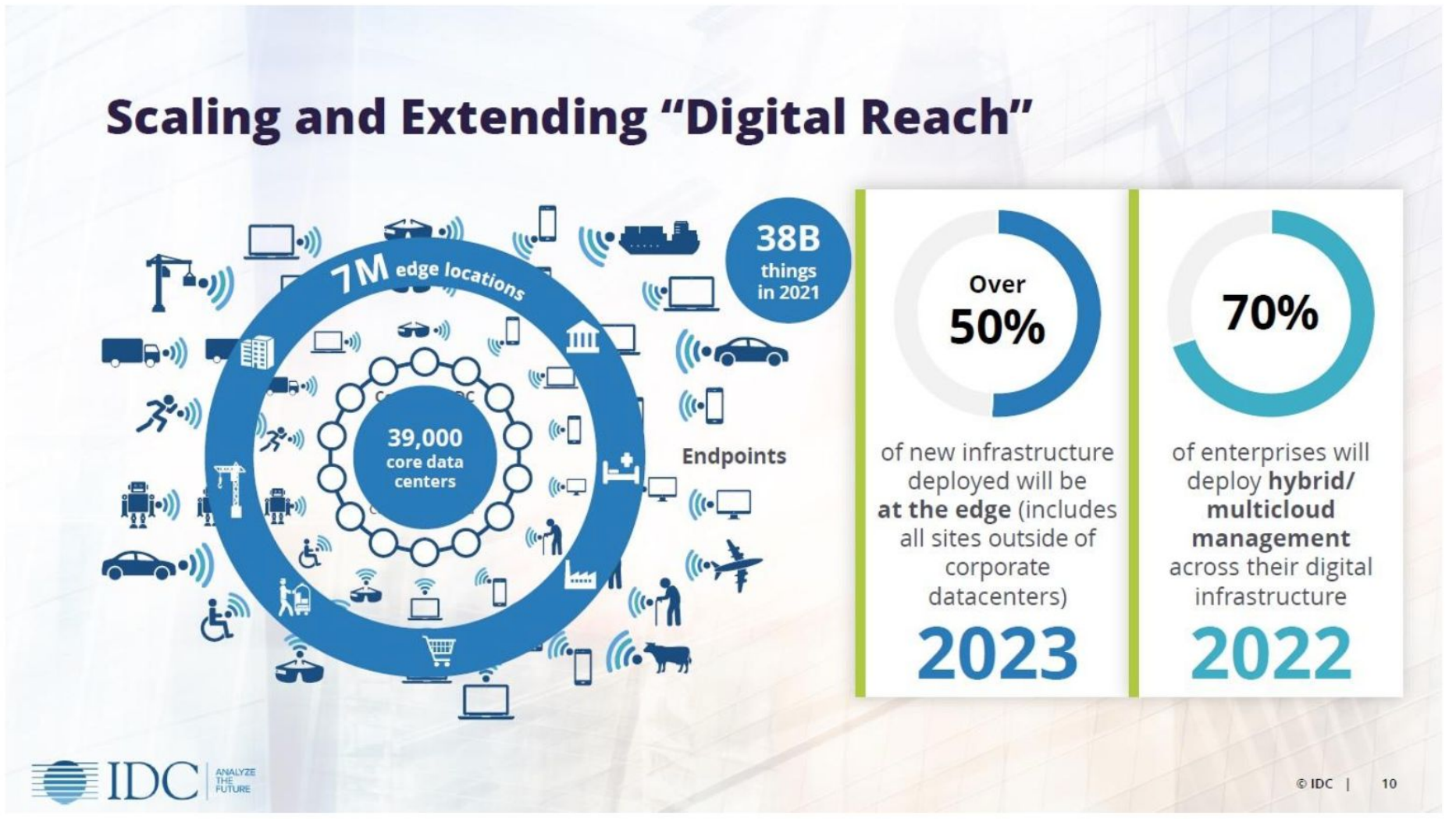
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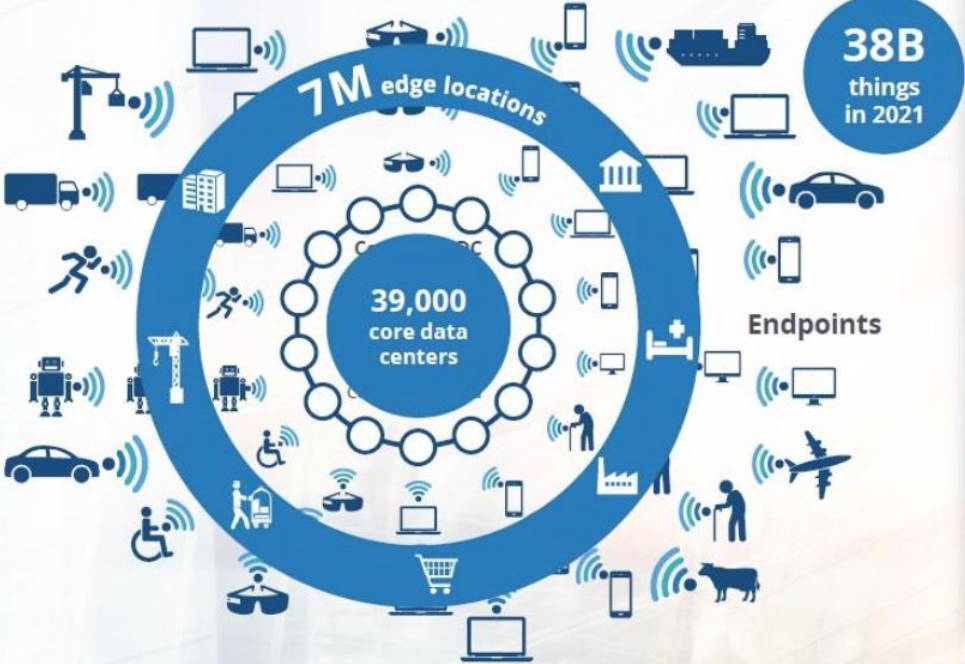
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# Scaling and Extending "Digital Reach"



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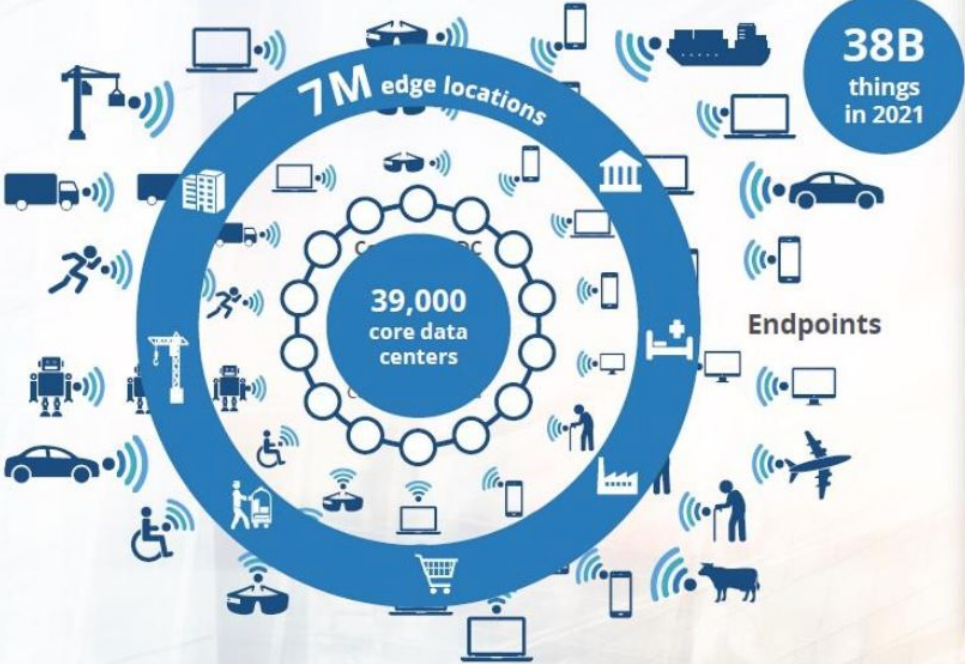
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**2022**

 **IDC** | ANALYZE THE FUTURE

© IDC | 10

# Scaling and Extending "Digital Reach"



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**2022**

 **IDC** | ANALYZE THE FUTURE

© IDC | 10

# 5G speeds up camera and sensor connections

The store is about 10,400 square feet and stocks roughly 5,000 items, including fresh produce, meats and alcohol.

Feb 25, 2020



Amazon just opened its first full-size, cashierless grocery store



Pay with your plates



2023  
intertwined



**5G**

**1.1B**

phones

**AI**

**\$98B**



**AR/VR**

**\$100B**

**BC**

**\$23B**

**Voice**

**\$18B**

**IoT**

**\$1T**

**Open  
Source**

**100M**

← Single year spend (NOT including R&D) →

**43B devices**

**libraries**

"You can now wear Alexa on your face."



- Amazon's catalog
- Amazon's reviews

5G  
WiFi 6



# Facebook eyes 2023 launch for smart glasses project

BY BUSTER HEIN • 1:52 PM, SEPTEMBER 17, 2019



Zuckerberg has reportedly asked that the project be made a priority.  
*Photo: Facebook*



## Apple Eyes 2022 Release for AR Headset, 2023 for Glasses

At an internal October meeting, Apple executives shared the company's product roadmap for two augmented reality devices. The stakes for the closely-watched products are sky-high as Apple hunts for the next big tech platform after phones.

By Wayne Ma, Alex Heath and  
Nick Wingfield  
Nov. 11, 2019 5:01 AM PST

<https://www.theinformation.com/articles/apple-eyes-2022-release-for-ar-headset-2023-for-glasses>



# Is Apple Working on Bone Conduction

Better sound-and better accessibility-may be on the horizon.



// BY COURTNEY LINDER AUG 4, 2020

granted Apple a patent for an "apparatus for delivering audio signal" that uses both your typical air-based sound conduction, plus something known as a "bone conduction transducer."

## POPULAR MECHANICS

Plus, there's a chance the hearing device could be combined with "a pair of viewing glasses capable of displaying a video to the user or augmenting the visual perceptions of the user." Apple Glass, anyone?

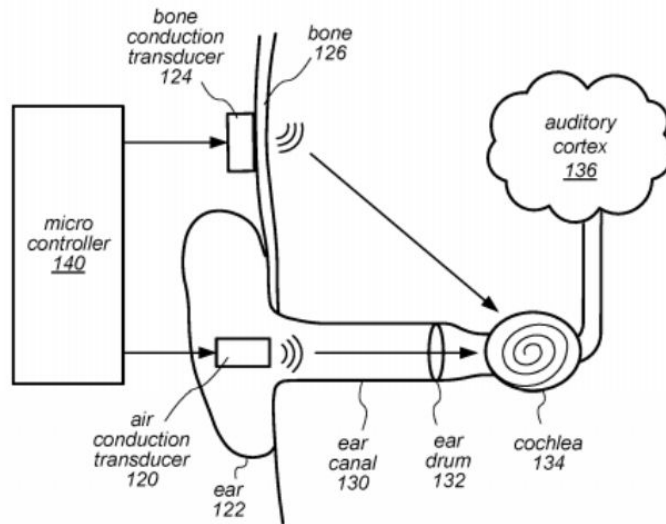


Fig. 1B

APPLE/USPTO

- The U.S. Patent and Trademark Office granted Apple a patent for a "Multipath audio stimulation using audio compressors."



## Bone conduction may make smart glasses smarter and more interactive

A non-invasive, wearable, peripheral neural interface that allows humans to converse in natural language with machines, AI assistants, services, and other people without any voice—without opening their mouth, and without externally observable movements—simply by articulating words internally.



Arnav Kapur, a graduate student at MIT's Media Lab, wears a device called AlterEgo. The device intercepts electrical signals, which the brain normally sends to vocal cords, and sends that information to a computer. / **CBS NEWS**



Correspondent Scott Pelley tests Arnav Kapur's system that allows users to surf the internet with their mind / **CBS NEWS**

The feedback to the user is given through audio, via bone conduction, without disrupting the user's usual auditory perception, and making the interface closed-loop. This enables a human-computer interaction that is subjectively experienced as completely internal to the human user—like speaking to one's self.

# AR Matures with 5G and WiFi 6

**AR** (mobile AR, smart glasses) could top 2.5b installed base and \$70b+ revenue by 2023

Digi-Capital



Facebook CEO, Mark Zuckerberg showing a variation of AR glasses.

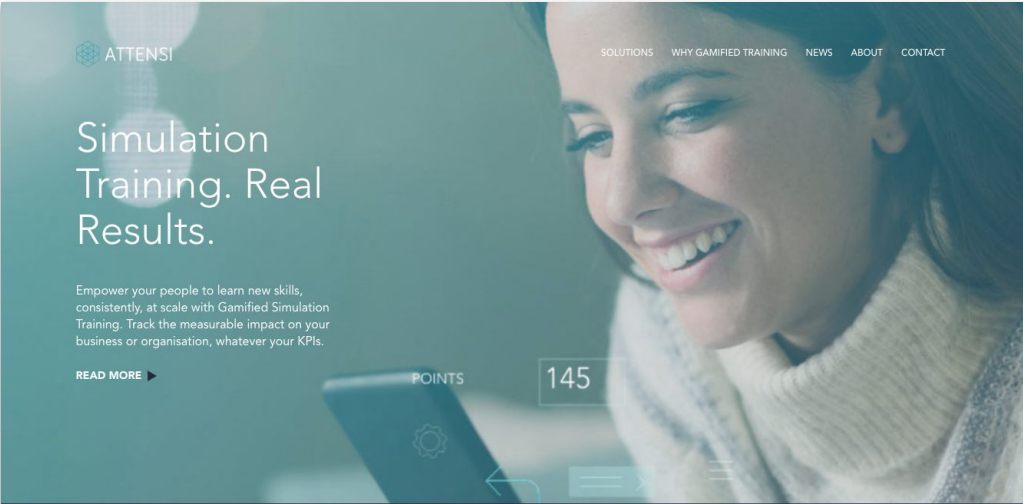
**VR** = \$30b+ by 2023

Global spending on **AR/VR** between 2019-2023, should achieve a 5-yr CAGR of 77.0%

IDC

# Use Cases

## AR VR for Training



# AR/VR Leaders\*

\* selected AR/VR companies that have raised funding or generated significant revenue, plus selected corporates (January 2020)

<b>Advertising/marketing</b> 			<b>Art/design</b> 	<b>Books</b> 	<b>Business</b> 	<b>Distribution</b> 	<b>eCommerce</b> 
<b>Education</b> 			<b>Enterprise</b> 			<b>Entertainment</b> 	<b>Games</b> 
<b>Food/drink</b> 	<b>Health/fitness</b> 	<b>Kids</b> 	<b>Lifestyle</b> 	<b>Location based</b> 			<b>Navigation</b> 
<b>Medical</b> 			<b>Peripherals</b> 			<b>Photo/video</b> 	
<b>Music</b> 	<b>News</b> 	<b>Productivity</b> 	<b>Solutions/services</b> 			<b>Tech</b> 	
<b>Smartglasses</b> 			<b>VR headset</b> 			<b>Travel/transport</b> 	
<b>Sports</b> 			<b>Utilities</b> 			<b>VR headset</b> 	

Digi-Capital

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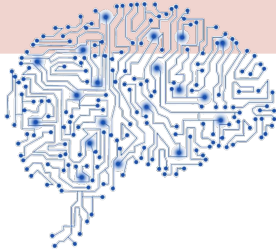
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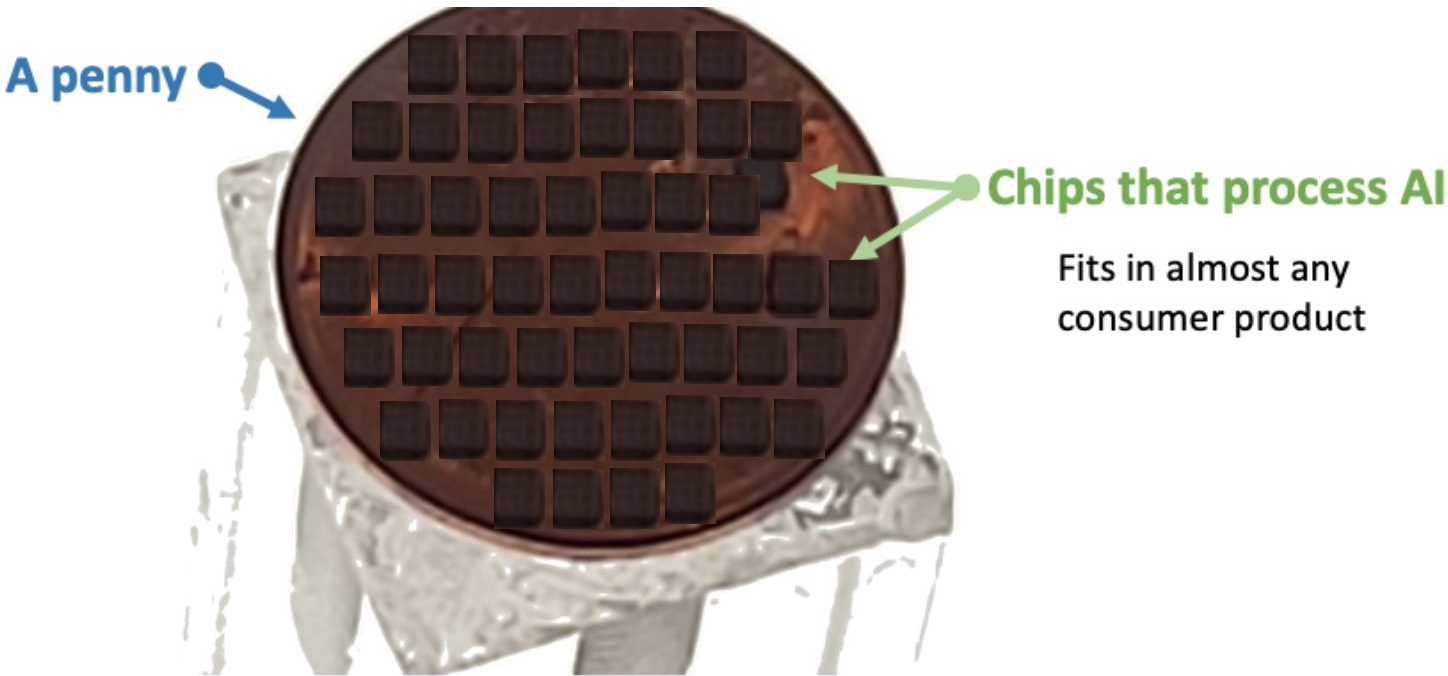
**libraries**





5G helps AI chips do their jobs

# 54 Chips

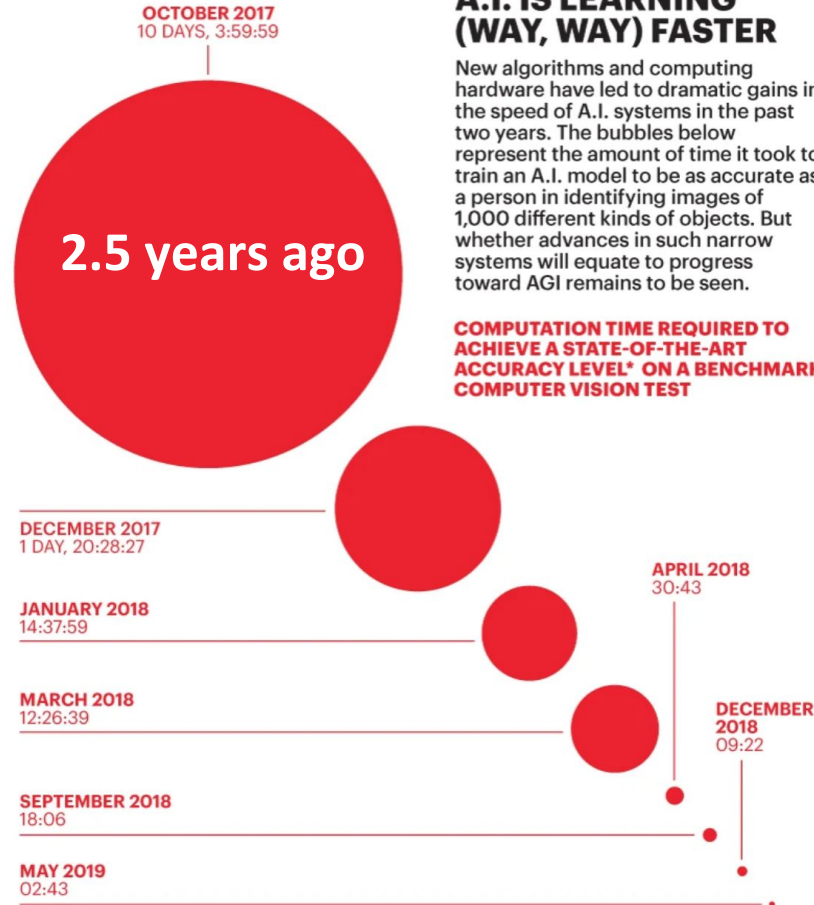


**CONSUMER PRODUCTS** are getting **BRAINS + MEMORIES**

## A.I. IS LEARNING (WAY, WAY) FASTER

New algorithms and computing hardware have led to dramatic gains in the speed of A.I. systems in the past two years. The bubbles below represent the amount of time it took to train an A.I. model to be as accurate as a person in identifying images of 1,000 different kinds of objects. But whether advances in such narrow systems will equate to progress toward AGI remains to be seen.

**COMPUTATION TIME REQUIRED TO  
ACHIEVE A STATE-OF-THE-ART  
ACCURACY LEVEL\* ON A BENCHMARK  
COMPUTER VISION TEST**



\* ACCURATE 93% OF THE TIME SOURCE: STANFORD UNIVERSITY



◀ PREVIOUS PAGE

# Worldwide Spending on AI Systems Will Be Nearly \$98 Billion in 2023

September 4, 2019 | IDC

🕒 Reading time 3 min (890 words)

Global spending on artificial intelligence (AI) systems is expected to maintain its strong growth trajectory as businesses continue to invest in projects that utilize the capabilities of AI software and platforms. According to the recently updated International Data Corporation (IDC) Worldwide Artificial Intelligence Systems Spending Guide, spending on AI systems will reach \$97.9 billion in 2023, more than two and one half times the \$37.5 billion that will be spent in 2019. The compound annual growth rate (CAGR) for the 2018-2023 forecast period will be 28.4%.

"The AI market continues to grow at a steady rate in 2019 and we expect this momentum to carry forward," said David Schubmehl, research director, Cognitive/Artificial Intelligence Systems at IDC. "The use of artificial intelligence and machine learning (ML) is occurring in a wide range of solutions and applications from ERP and manufacturing software to content management, collaboration, and user productivity. Artificial intelligence and machine learning are top of mind for most organizations today, and IDC expects that AI will be the disrupting influence changing entire industries over the next decade."

<http://pcb.icconnect007.com/index.php/article/119309/worldwide-spending-on-ai-systems-will-be-nearly-98-billion-in-2023/119312/?skin=ein>



## AI at Scale:

By 2024, with **proactive, hyperspeed operational changes and market reactions**, **AI-powered enterprises will respond to customers, competitors, regulators, and partners 50% faster than their peers.** ~IDC

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libraries



TECH | [CONSUMER TECHNOLOGY](#)

## Amazon Says It Has Over 10,000 Employees Working on Alexa, Echo

Number of employees doubles the staff in that division a little more than a year ago

By *Douglas MacMillan*

Updated Nov. 13, 2018 3:49 pm ET



PRINT



TEXT



LAGUNA BEACH, Calif.— Amazon.com Inc. has more than 10,000 employees working on its Alexa virtual assistant and the Echo devices it powers, the executive in charge of the business said, double the staff in that division a little more than a year ago.



# Speech and Voice Recognition Market Worth 18.30 Billion USD by 2023

PRESS RELEASE PR Newswire

Aug. 2, 2017, 10:30 AM



SHARE

PUNE, India, August 2, 2017 /PRNewswire/ --

The report **"Speech and Voice Recognition Market by Technology (Speech Recognition, Voice Recognition), Vertical (Automotive, Consumer, Banking, Financial Services and Insurance (BFSI), Retail, Education, Healthcare & Government) and Geography - Global Forecast to 2023"**, published by MarketsandMarkets™, the Speech and Voice Recognition Market is expected to be valued at USD 6.19 Billion in 2017 and is likely to reach USD 18.30 Billion by 2023, at a CAGR of 19.80% between 2017 and 2023.

2023  
intertwined



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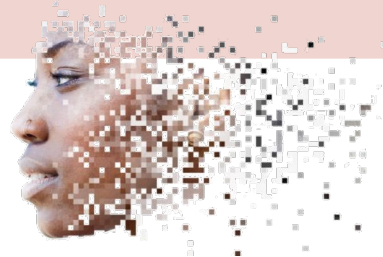
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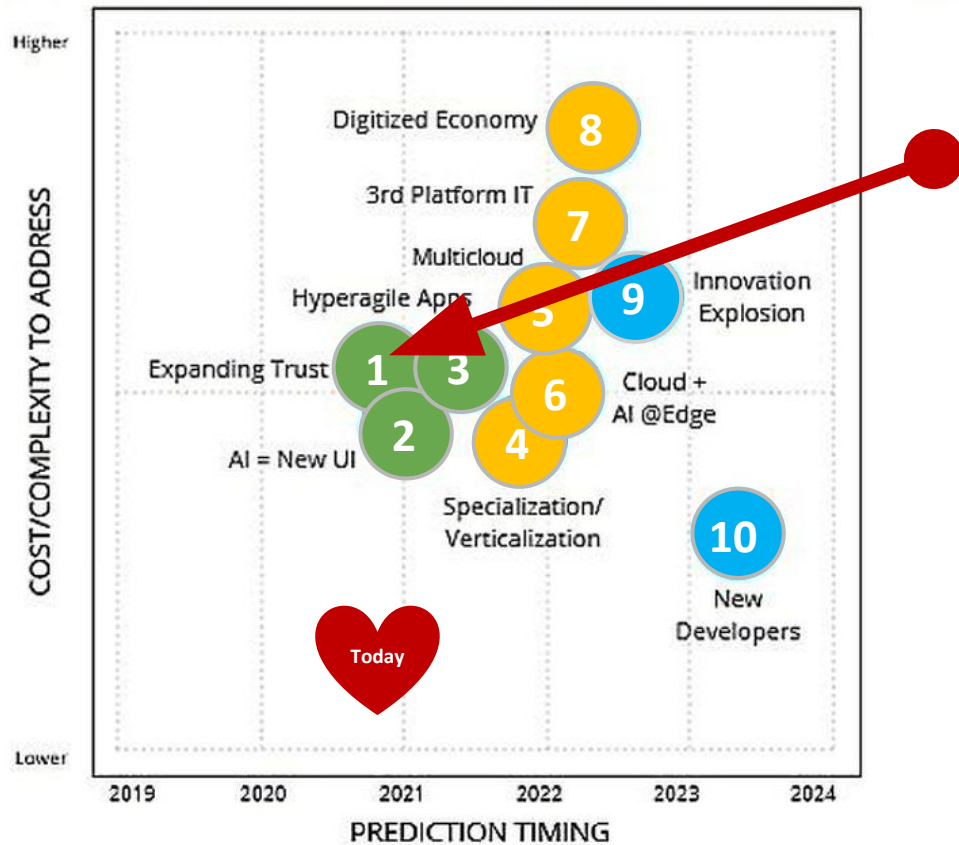
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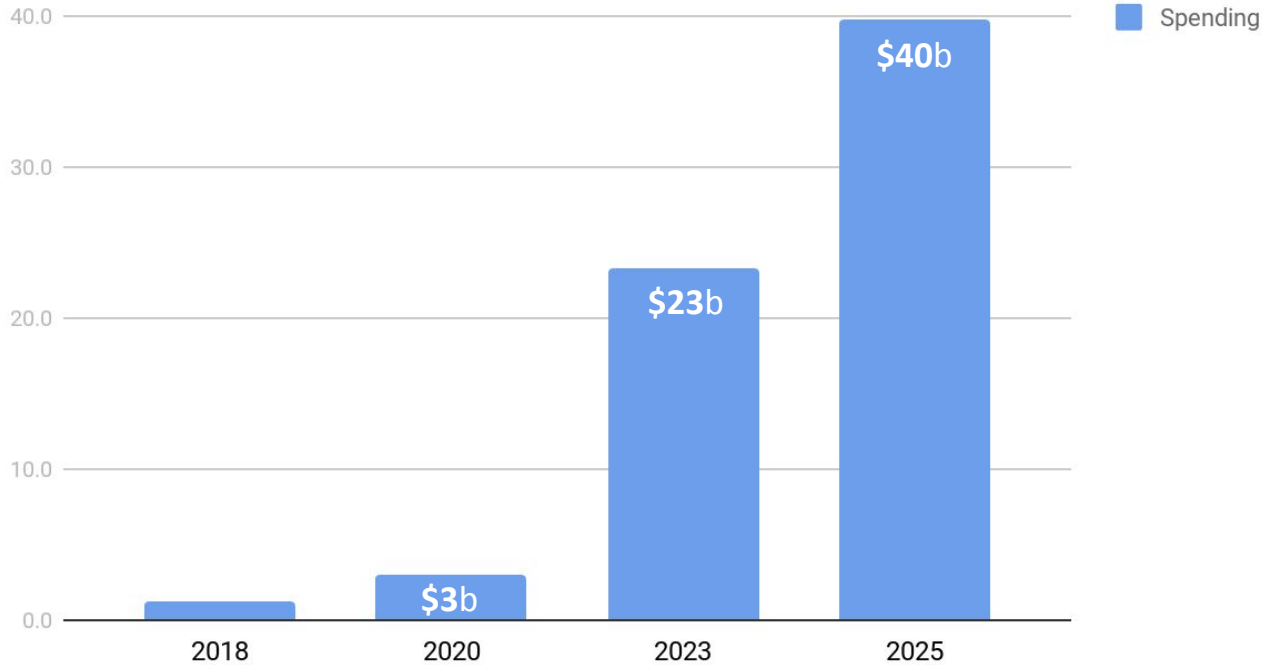


By 2022, 150 million people will have **blockchain-based digital identities**.

Source: IDC, 2018

SOURCE: IDC FUTUREScape: WORLDWIDE IT INDUSTRY 2019 PREDICTIONS,

## Blockchain Market



### Research provided by MarketsandMarkets<sup>TM</sup>

MarketsandMarkets<sup>TM</sup> provides quantified B2B research on 30,000 high growth niche opportunities/threats which will impact 70% to 80% of worldwide companies' revenues. Currently servicing 7500 customers worldwide including 80% of global Fortune 1000 companies as clients. Almost 75,000 top officers across eight industries worldwide approach MarketsandMarkets<sup>TM</sup> for their pain points around revenues decisions.

Our 850 full time analyst and SMEs at MarketsandMarkets<sup>TM</sup> are tracking global high growth markets following the "Growth Engagement Model - GEM". The GEM aims at proactive collaboration with the clients to identify new opportunities, identify most important customers, write "Attack, avoid and defend" strategies, identify sources of incremental revenues for both the company and its competitors.

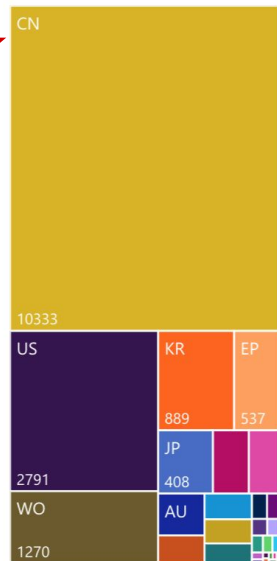


# Blockchain IP filed globally ... China is aggressive

## Macro Movements

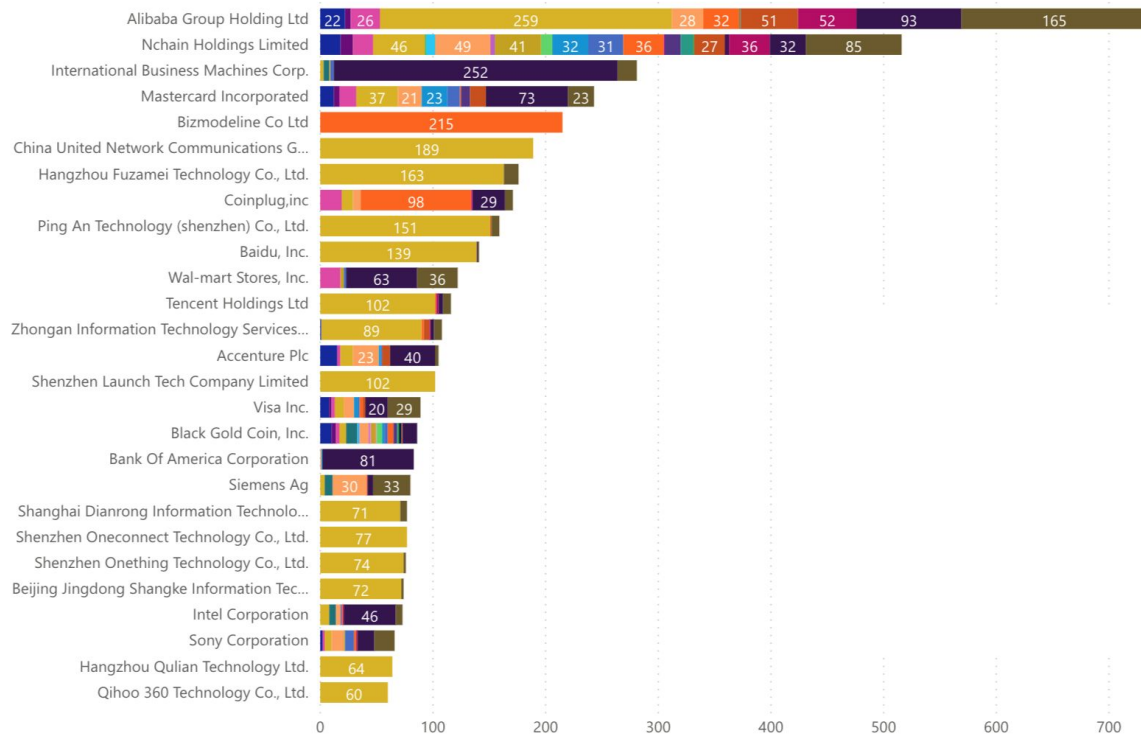


Harrity Patent Analytics publishes interactive dashboards for clients that provide insights into technology areas, competitors, and their own portfolio. To learn more about Harrity Patent Analytics, visit <https://harritylp.com/>



## TOP PLAYERS IN THE BLOCKCHAIN SPACE

(active patents & pending applications as of 10/1/2019)



# Lots of intellectual property being created in China and the USA

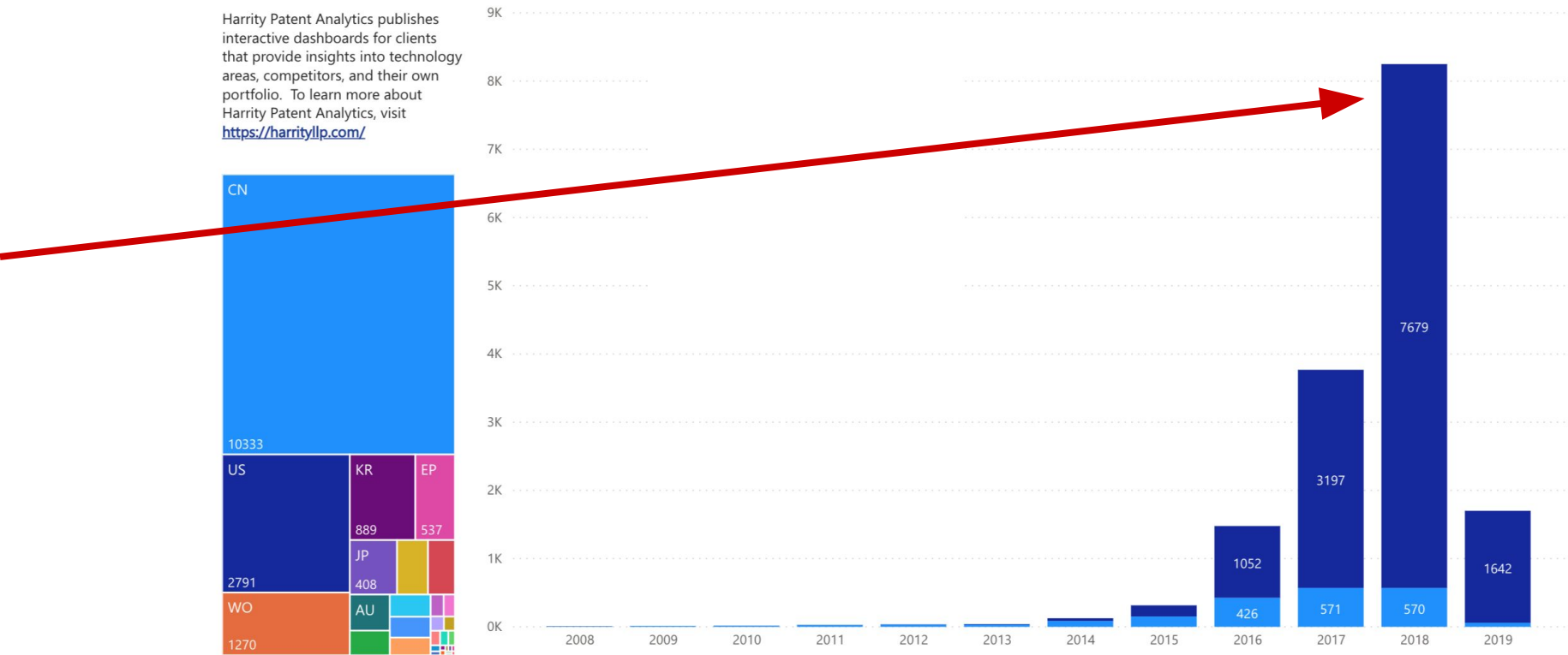
Macro Movements



Harrity Patent Analytics publishes interactive dashboards for clients that provide insights into technology areas, competitors, and their own portfolio. To learn more about Harrity Patent Analytics, visit <https://harritylp.com/>

## WORLDWIDE BLOCKCHAIN PATENT APPLICATION FILINGS

(active patents & pending applications as of 10/1/2019)



# Governments and Blockchain

## MIT Technology Review

Blockchain Jan 09

### Baidu's "Xuperchain" launch is just the beginning of China's blockchain rush



Baidu, the search engine often called the Google of China, has launched a public beta version of its blockchain service for businesses, called Xuperchain, according to a [local report](#).

**What is it?** The service is supposed to let small and medium-size businesses and developers cheaply launch so-called decentralized applications, or dapps. It's also just one of the hundreds of blockchain projects in the works in China, where President Xi Jinping recently [called for the nation](#) to lead the world in blockchain technology development.

Xi says, "Win the  
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**User-friendly:** Baidu first [revealed its plans for Xuperchain](#) in September 2018. A white paper touted an innovative design and ultra-fast transaction processing speed compared with decentralized blockchains like Bitcoin. Baidu made the technology open source last May, but developers faced a number of technical challenges when they tried to deploy it, according to the news report. The new service will apparently be easier and cheaper to use, since companies won't need as much technical expertise to deploy it.

**Government-approved (read: centralized):** The news report emphasizes that Xuperchain will be compliant with Chinese blockchain standards. Last January, China's internet censorship agency unveiled regulations that require any "entities or nodes" that provide "blockchain information services" to collect users' real names and national ID or telephone numbers. [More than 500 projects](#) had registered as of October. Blockchain purists would argue that this kind of centralized control [defeats the purpose of the technology](#): shifting power to users and away from governments and banks.

**A coming wave:** But China's leaders apparently see an opportunity to develop world-leading database technology in the form of centralized blockchains. In October, Xi called on the country to "seize the opportunity" to become the world's leader in the technology's development. Among those touting future blockchain-based products are Baidu's fellow big tech companies Tencent, [Alibaba](#), and the e-commerce firm JD.

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2 yrs ago

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China setting  
standards

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## Blockchain on AWS

Enterprise blockchain made real

### Purpose-built for your needs

AWS provides purpose-built tools to support your distinct needs, whether you need a centralized ledger database that maintains an immutable and cryptographically verifiable record of transactions, or a multi-party, fully managed blockchain network that helps eliminate intermediaries.

### Most productive to build on

Developing blockchain and ledger applications is simpler, faster, and more efficient with AWS. Amazon Managed Blockchain eliminates the heavy lifting involved in the setup of blockchain networks by reducing 60% of time taken in hosting Hyperledger Fabric frameworks. Managed Blockchain also makes it easy to operate networks as it support AWS CLI, AWS CloudFormation, and Amazon Cloudwatch logs. Amazon QLDB is 2 – 3X faster than traditional frameworks and also provides SQL-like operators and a document data model for handling transactions.

### Most widely used

More customers trust AWS for their blockchain and ledger technology workloads than any other cloud vendor. 25% of all Ethereum workloads in the world run on AWS. Enterprise customers for Hyperledger Fabric include Nestle, Sony Music, BMW, Sage, Guardian, DTCC, Workday, Klarna Bank, SGX, Legal & General, Splunk, Zilliant, Contura Energy, DVLA UK, and many more.

### Broadest ecosystem

AWS has over 70+ validated blockchain solutions from partners who provide support to all major blockchain protocols including Hyperledger Sawtooth, Corda, DAML, Ethereum, Quorum, Blockstack, Blockapps Strato, RSK, Kadena ScalableBFT, and many more.



*"Transparency in supply chains is increasingly important to consumers. While Nestlé has begun to release information on its supply chains, using blockchain technology enables a more precise tracking. With Amazon Managed Blockchain, we are able to set up our Hyperledger Fabric network and easily invite our partners to collaborate in our supply chain transparency efforts."*

**- Armin Nehzat**  
Digital Technology Manager, Nestlé Oceania

**60%**

Reduction in setup time on AMB vs. hosting own Hyperledger Fabric

**2 - 3X**

Faster transactions with Amazon QLDB vs. traditional frameworks

**25%**

Percentage of Ethereum nodes in the world that run on AWS

**70+**

Validated blockchain partner solutions on AWS Marketplace



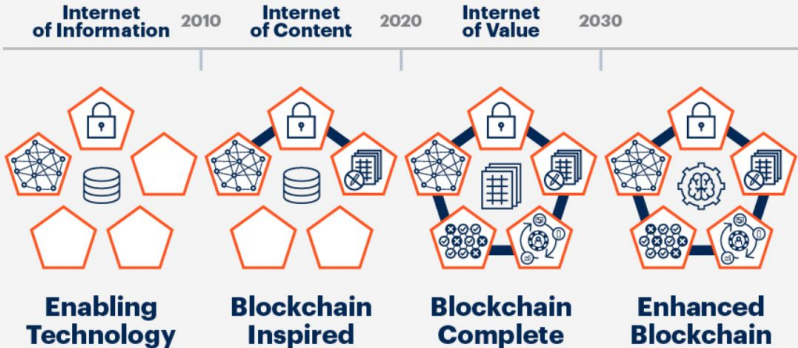
By 2023, blockchain will support the global movement and tracking of **\$2 trillion of goods and services** annually.

Source: Gartner  
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<https://www.google.com/imgres?imgurl=https://emtemp.gcom.cloud/ngw/globalassets/en/information-technology/images/infographics/insight-illustration-blockchain-global-movement.png&imgrefurl=https://www.gartner.com/en/information-technology/insights/blockchain&docid=uNgJhyiwcB7osM&thnid=kO-vinMro1XuGM:&vet=1&w=1020&h=830&hl=en-US&source=sh/x/im#h=830&imgdii=kHhseAwFcxCCFM:&vet=1&w=1020>

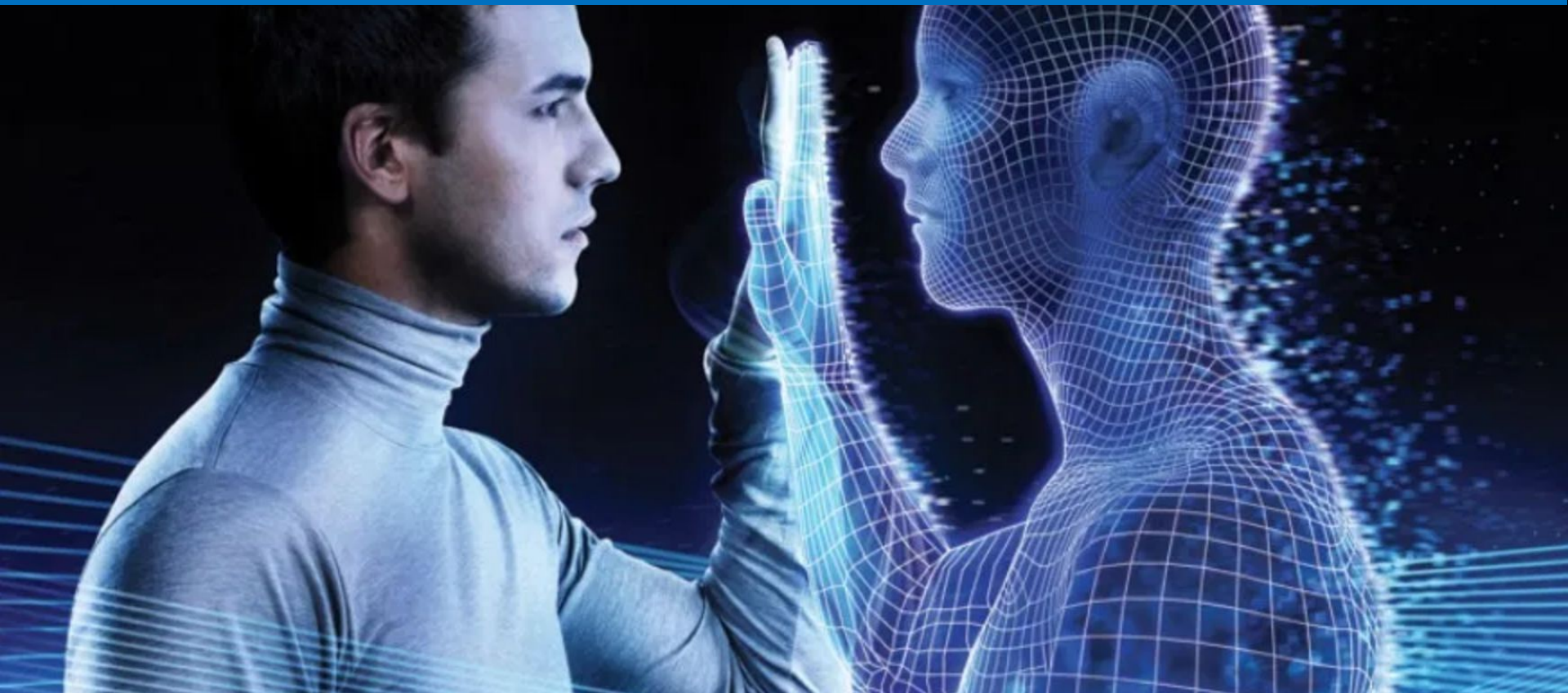
The Gartner Blockchain Spectrum, which began with emergence in 2008, predicts **maturity around 2025:**



Source: Gartner  
© 2019 Gartner, Inc. and/or its affiliates. All rights reserved.

Gartner®

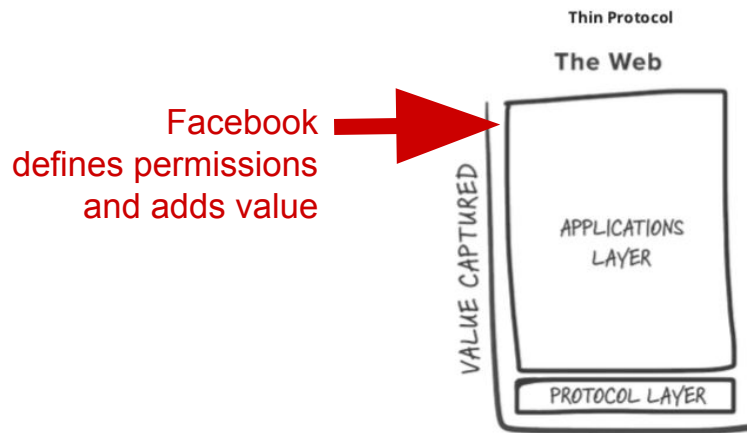
# Digital Me



Forgetful, emotional,  
selective memory,  
may know algebra and geometry

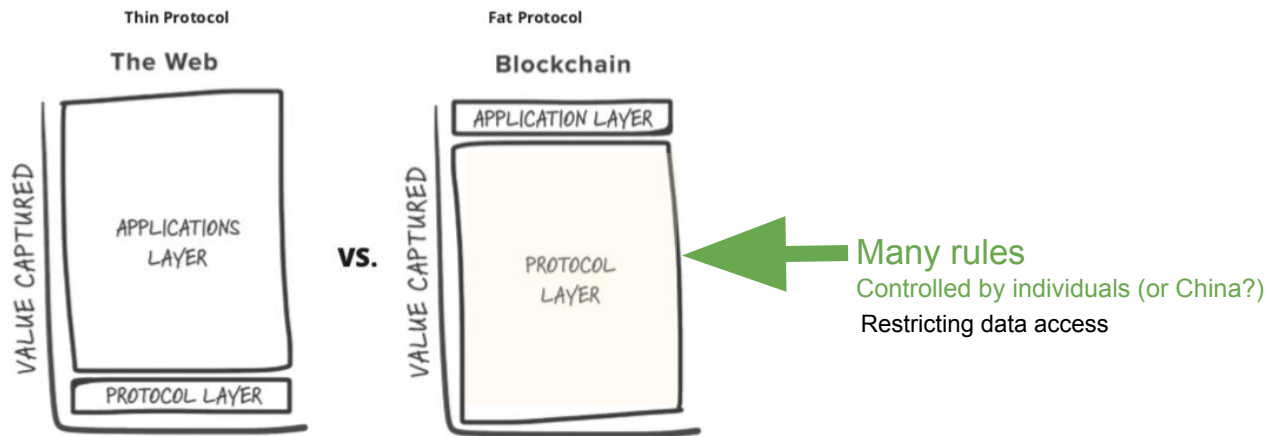
Lifelong memory, all knowledgeable,  
deep learning, complex calculus  
automatically, spatial learner

# Digital Me and individual provisioning of data



Images by Joel Monegro of Union Square Ventures: <http://www.usv.com/blog/fat-protocols>

# Digital Me and individual provisioning of data



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## Network Protocol

A protocol is a digital set of rules defining how information behaves in a given scenario.

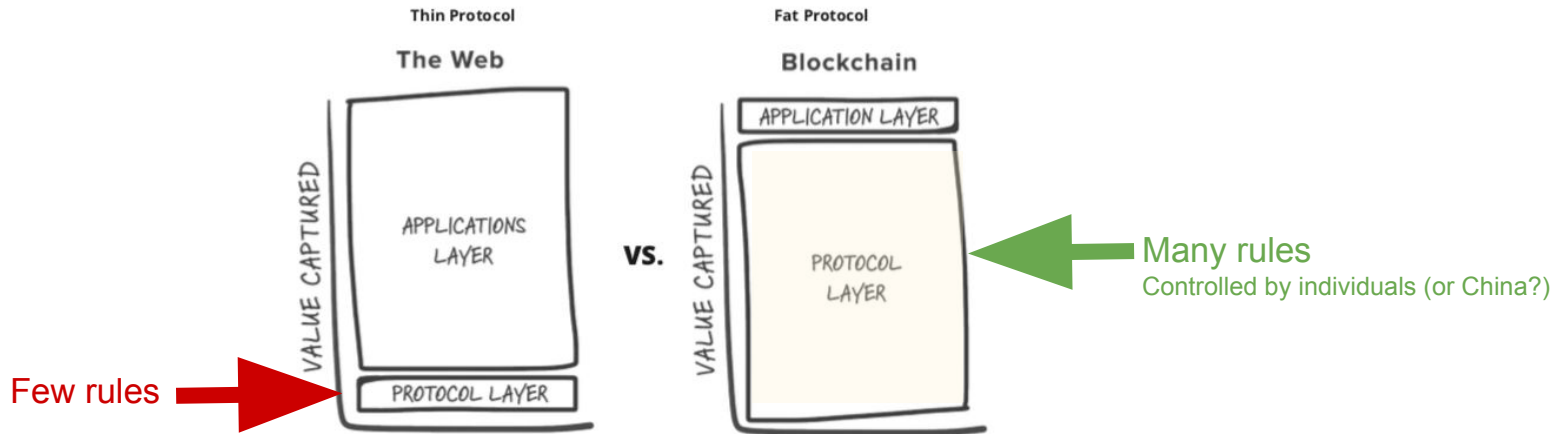
You use protocols every day such as TCP/IP, SMTP, and HTTP which define how information moves across the Internet, how you can email someone from Outlook to Gmail, and how you can access a website regardless of whether you use Safari or Chrome.

### "Fat Protocol" vs. "Thin Protocol"

In the Web model, the protocols or rules are intentionally simple. Web related protocols are *thin*. This gives application developers a chance to add a lot of value (e.g., Facebook, Airbnb, Spotify) on top of it.

In the blockchain (a.k.a. "decentralized") model, the rules can be much more robust or *fat*. For example, a protocol developer can write the same matching algorithms that Facebook, Airbnb, or Spotify uses and make it native to the protocol. You get the same benefits, you just don't need the centralized party to do the matching, the software does it for you.

Joel Monegro explains it as well as anyone in his post *Fat Protocols*, and it comes to life in these two images (which he created):



Images by Joel Monegro of Union Square Ventures: <http://www.usv.com/blog/fat-protocols>



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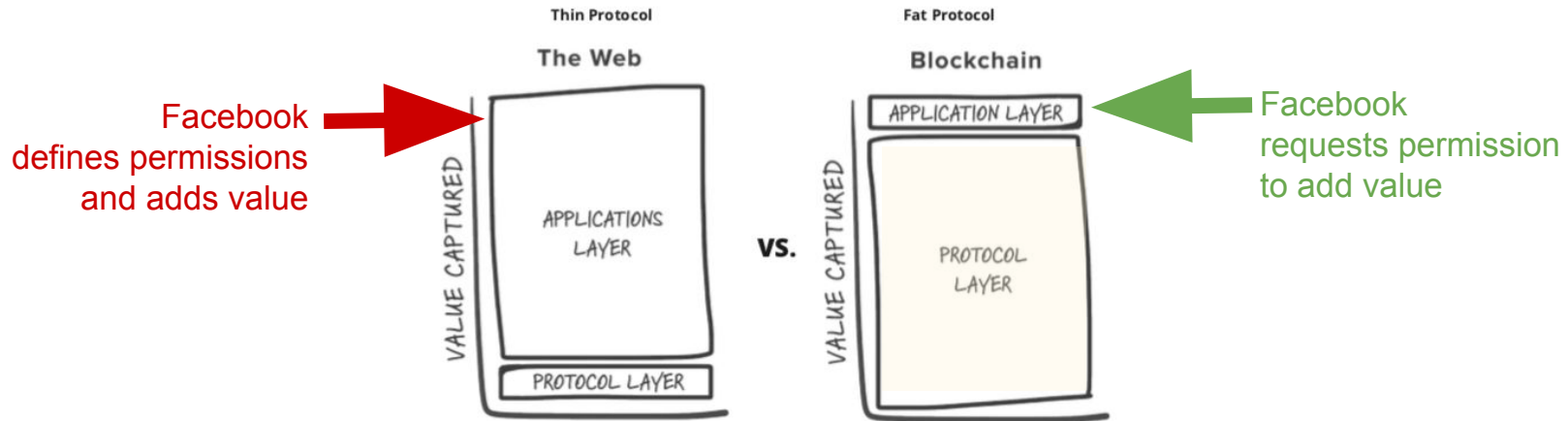
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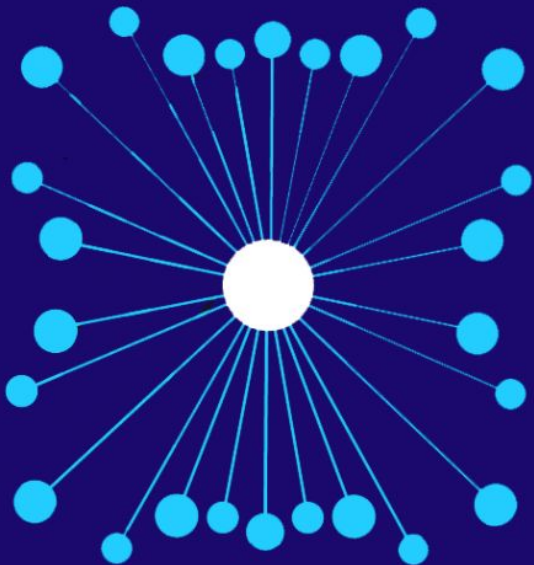
Joel Monegro explains it as well as anyone in his post *Fat Protocols*, and it comes to life in these two images (which he created):



Images by Joel Monegro of Union Square Ventures: <http://www.usv.com/blog/fat-protocols>

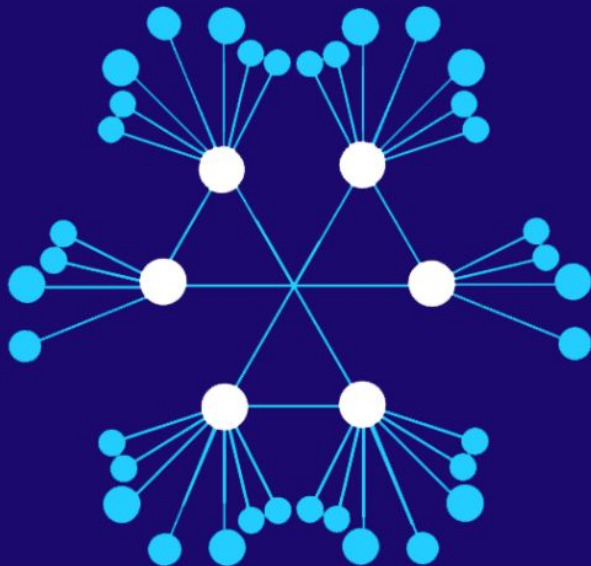


# Centralized vs Decentralized vs Distributed Network: An Overview



**Centralized Network**

All the nodes are connected under a single authority



**Decentralized Network**

No single authority server controls the nodes, they all have individual entity

Edge computing  
AI chips  
Blockchain



**Distributed Network**

Every node is independent and interconnected with each other

News · Technology

# Gartner: by 2023 blockchain can improve data quality by 50%

2 months ago · by Ledger Insights



Yesterday, research firm Gartner said it expects **blockchain smart contracts** to increase overall data quality by about 50% by 2023. Better data availability will, in turn, improve the decision-making process for organizations. Hence it recommends blockchain for data and analytics (D&A).

“When an organization adopts blockchain smart contracts — whether externally imposed or voluntarily adopted — they benefit from the associated increase in data quality, which will increase by 50% by 2023,” said Lydia Clougherty Jones, senior research director at Gartner.

But there is a caveat here, as consortium governance for blockchains or smart contract rules may reduce the availability of data to companies. Gartner predicts overall data asset availability will decrease by 30% by 2023.

“This variable (availability of data) could leave participants in a worse position than if they did not participate in the blockchain smart contract process,” said Jones. Presumably, that is worse compared to APIs to connect to data from multiple sources.

**You need to make yourself important to consumers and partners -- so they will choose to share data with you. Loyalty and membership programs will change. Digital selves and synthetic selves will emerge.**

# Take back control of your data

Now you can pay and verify your identity – without sharing your personal data. Not even Nuggets can see it.

Welcome to the new privacy. Nuggets is decentralized, self-sovereign identity and payment. In other words, your data is your own again.

 **HOW NUGGETS WORKS**

TAKE CONTROL NOW. DOWNLOAD NUGGETS FOR IOS OR ANDROID.



# Open source infrastructure for the global Personal Data Economy

Allowing for the safe, consensual and compliant storage, sharing and trading of Personal Data between organizations that hold it, their consumers who produce it and other organizations and platforms seeking it.



## **Businesses**

Manage privacy compliance risks.  
Minimise data breach risks.  
Become trustworthy.  
Realize value of their data.



## **Consumers**

Control their personal data.  
Share monetization.



## **Marketers**

Permissioned, highly  
targeted, motivated  
audiences.

2023  
intertwined



**5G**

**AI**

**AR/VR**

**BC**

**Voice**

**IoT**

**Open  
Source**

**1.1B**

**\$98B**

**\$100B**

**\$23B**

**\$18B**

**\$1T**

**100M**

phones

← Single year spend (NOT including R&D) →

43B devices

libraries

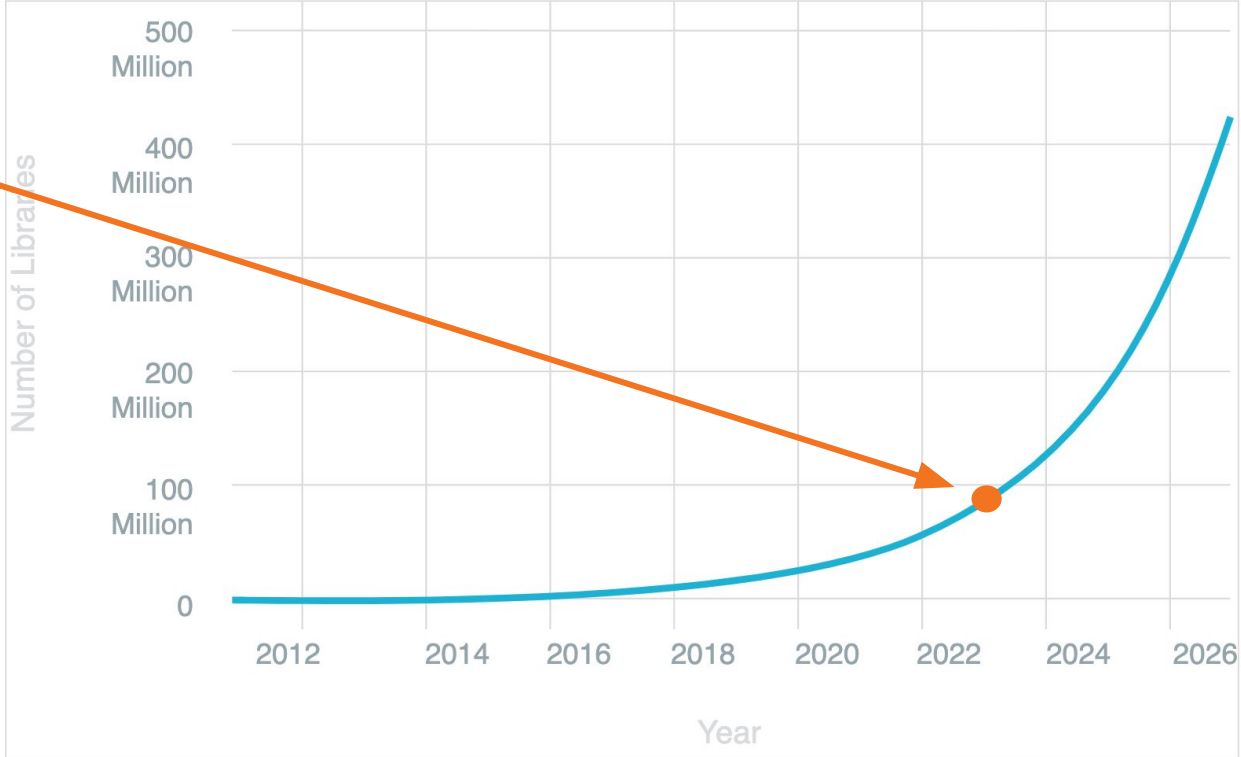


# Open-Source 100M libraries

- contribute to “partnerships”
- allow startups to move faster and cheaper ...

inflection point ...

As open-source has become mainstream, the amount of code available in the form of libraries has exploded. The frequency with which that code is being released is also increasing and open-source code is constantly being broken up into smaller and smaller chunks of reusable code in the form of libraries. We have done the math and estimate that if things continue at the same rate, there will be almost half a billion open-source libraries available to developers within a decade.



## MARKETPLACE

# How it works

**Source** from a network of 2,500+ qualified providers. **Order** immediately from any provider with established contracts. **Manage** projects, exchange data, securely communicate. **Pay** providers easily and compliantly.

### CATEGORIES

[Virology Services](#)
[Virus Production](#)
[AAV Production](#)
[Adenovirus Production](#)


Virus Production available from  
**ALSTEM**  
Richmond, California, United States of America

 113 Virus Production Orders

 100 Total Orders  88% Positive

[Select](#)





Pricing Upon  
Request

Select

Select  
provider  
your



Virus Production available from  
**Vigene Biosciences**  
Rockville, Maryland, United States of America





 79 Virus Production Orders  
 85 Total Orders  93% Positive  
 0 Endorsements

[Select](#)

Pricing Upon  
Request



Virus Production available from  
**Vector BioLabs**  
Philadelphia, Pennsylvania, United States of America





 40 Virus Production Orders  
 41 Total Orders  100% Positive  
 0 Endorsements

[Select](#)

Pricing Upon  
Request



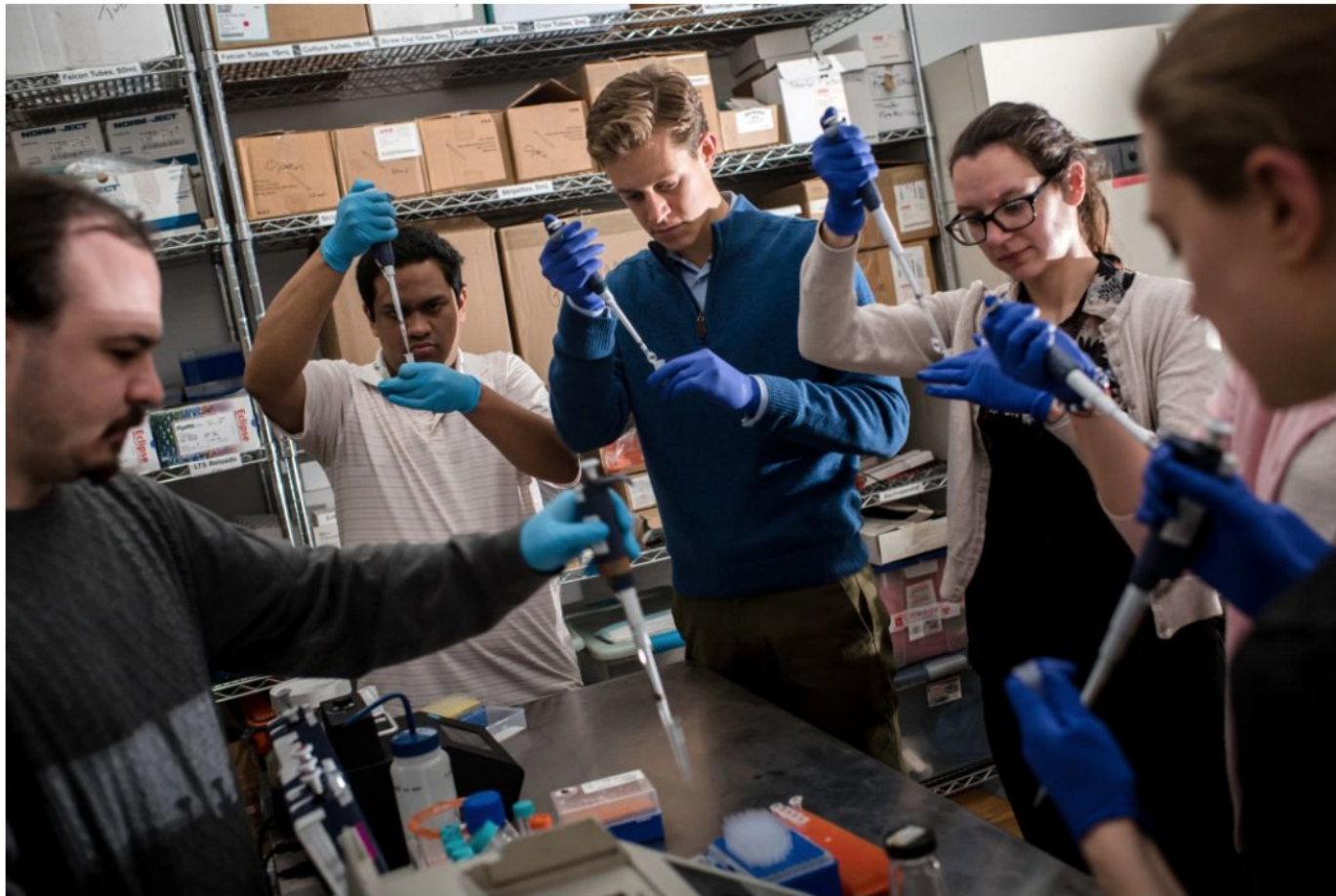
Virus Production available from  
**SignaGen Laboratories**  
Rockville, Maryland, United States of America

 32 Virus Production Orders  
 32 Total Orders  91% Positive  
 0 Endorsements

[Select](#)

Pricing Upon  
Request





## Biohacker Boot Camp

Homegrown genetics projects

Open source biology + software

Students at the Genspace lab in Brooklyn attending a “Biohacker Boot Camp” where participants can learn basic technical skills for homegrown genetics projects. Ryan Christopher Jones for The New York Times

# Wrapping Up

**What should we do?**

## The Real Power Will Be in Synergy

Firms like Qualcomm often advance by having separate groups work on distinct market segments. Then, once critical mass is achieved, they begin to think about the synergy between the segments, and then the real magic occurs. Smartphones talking to cars, Smartwatches tied to advanced distributed AI systems, and PC seamlessly connected cloud resources and all this stuff able to inter-react with each other. Imagine your Smartwatch as the key to your car, your car seamlessly connected to your in-home entertainment systems so you can move between venues and continue the same movie or show, and AIs that are smart and keep you from accidents either caused by you or caused by others.

<https://www.itbusinessedge.com/blogs/unfiltered-opinion/qualcomm-at-ces-the-big-pivot-to-5g-for-homes-cars-and-iot.html>

2023  
intertwined



5G

1.1B

phones

AI

\$98B



AR/VR

\$100B

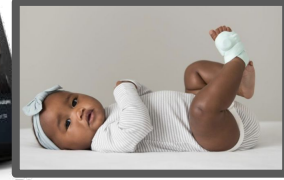
BC

\$23B



Voice

\$18B



IoT

\$1T



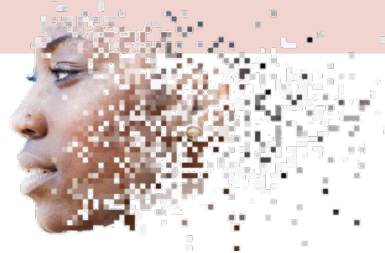
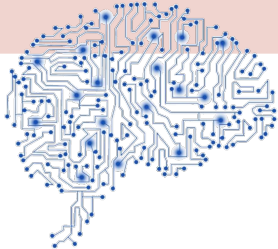
Open  
Source

100M

libraries

← Single year spend (NOT including R&D) →

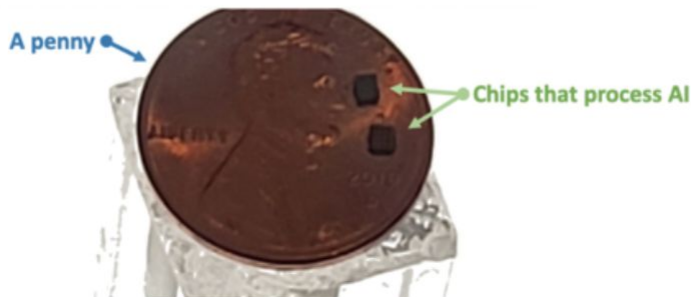
43B devices



**Product companies** with a few **services**  
**need to become**  
**Service companies** that offer **products**

~ this is **the new reality** ~

Products will have \$1 brains that can collect data, “think” and interact with your Digital Self





# ***IDC: The "Digital-First Enterprise" Will Be Half of the Economy by 2023. Are You Ready?***

## What's Changed in the Digital Economy?



Competition  
is increasingly  
powered by  
platforms



Ecosystems  
are feeding off  
themselves



Innovation has  
accelerated



Transforming  
data into insights  
is a strategic  
imperative



Customers expect  
engagement,  
personalization &  
simplicity

The Digital Economy is moving from conceptual, to aspirational, to operational

By 2024

leaders in 50% of G2000 orgs

will have mastered “future of culture” traits  
such as

empathy, empowerment, innovation,

and

customer- and data-centricity

to achieve leadership at scale.

~ IDC

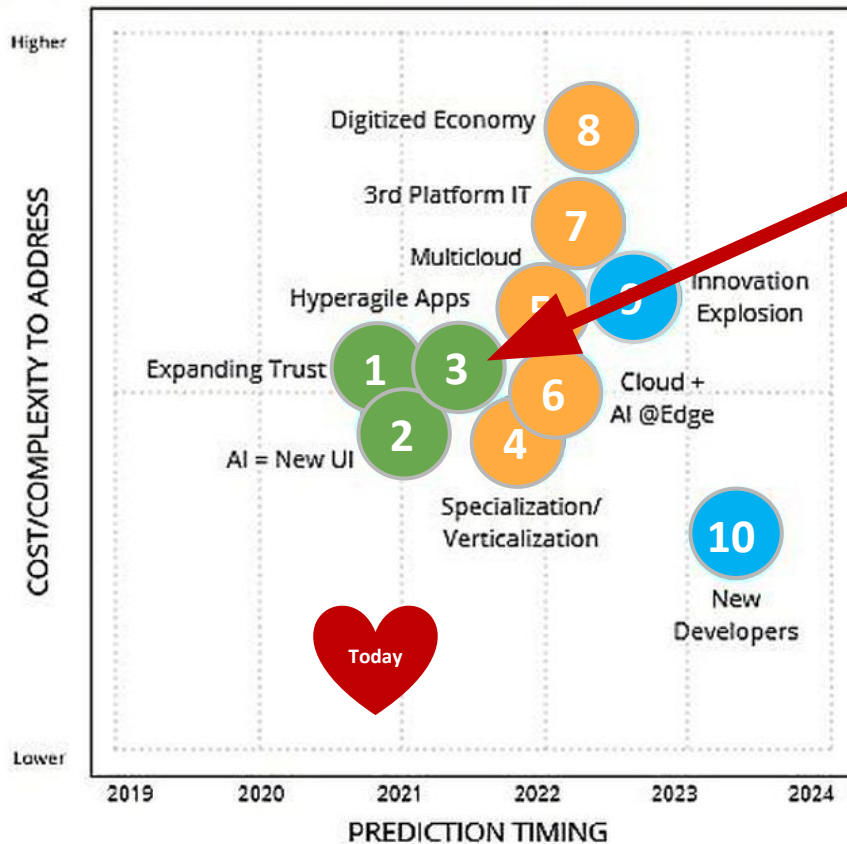


**Tinier**

**Faster**

**Cheaper**

**Modular**  
**+**  
**Agile**



### Agility revolution by 2022.

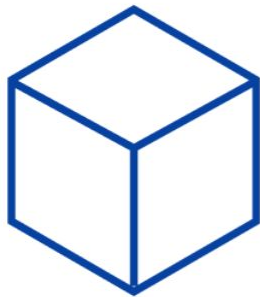
- 90% of all new apps have **microservices** architectures
- improved ability to design, debug, update, and **leverage third-party code**

Keywords: microservices, APIs, low-code, cloud

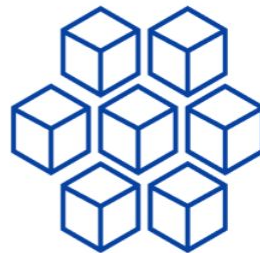
Apps that are highly modular distributed, continuously updated, and leveraging cloud-native technologies such as containers and serverless computing.

Source: IDC, 2018

SOURCE: IDC FUTUREScape: WORLDWIDE IT INDUSTRY 2019 PREDICTIONS,



**MONOLITHIC**  
Single unit



**MICROSERVICES**  
Fine-grained

## Old Way

8 months

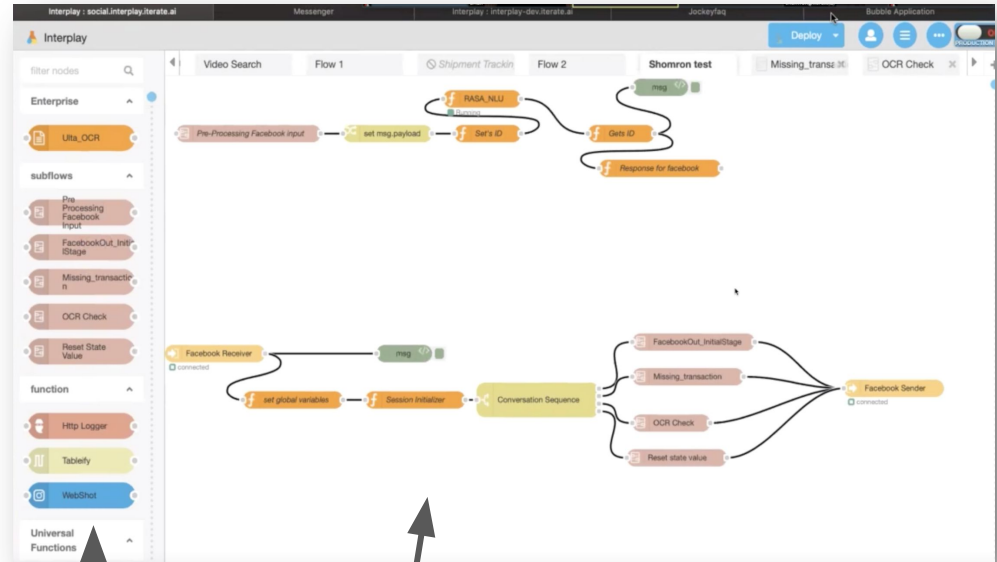
Tedious

```
code!— todo: put this in a different file!!! —>
542 <script>
543 function authenticateUser(username, password) {
544   var accounts = apiService.sql(
545     "SELECT * FROM users"
546   );
547
548   for (var i = 0; i < accounts.length; i++) {
549     var account = accounts[i];
550     if (account.username === username &&
551         account.password === password)
552     {
553       return true;
554     }
555   }
556   if ("true" === "true") {
557     return false;
558   }
559 }
560
561 $('#login').click(function() {
562   var username = $('#username').val();
563   var password = $('#password').val();
564
565   var authenticated = authenticateUser(username, password);
566
567   if (authenticated === true) {
568     $.cookie('loggedin', 'yes', { expires: 1 });
569   } else if (authenticated === false) {
570     $('#error_message').show();
571   }
572 });
573 </script>
574
```

## New Way

3 weeks

Low code



Code inside  
pre-wrapped  
in modules

Drag-n-drop  
dev workbench

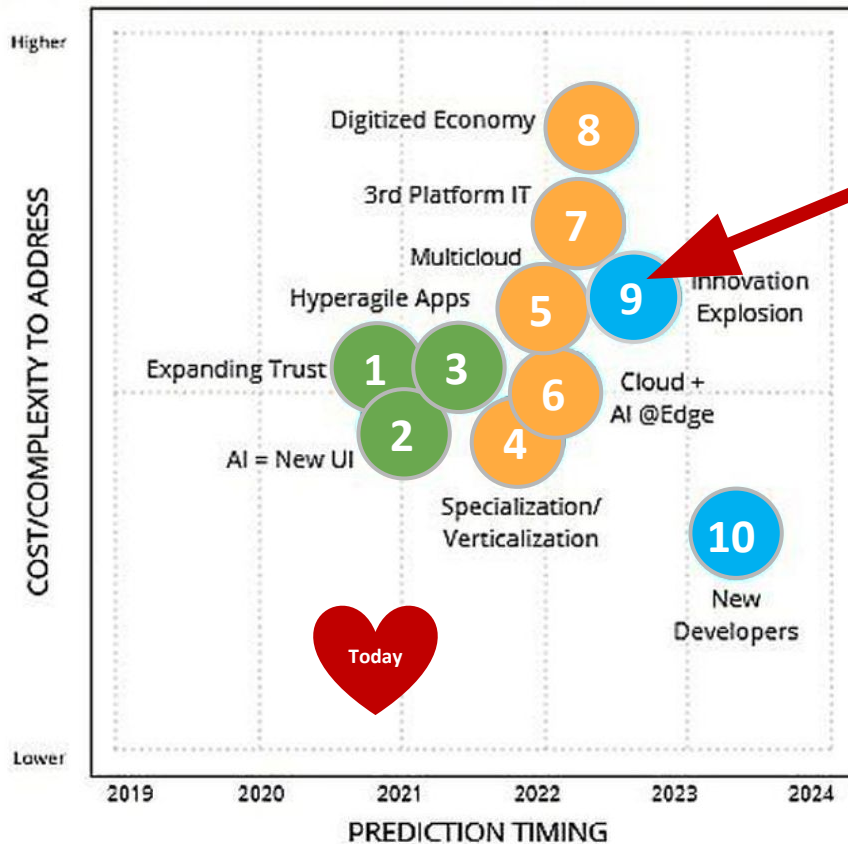
Powered  
by  **Interplay**

# Create Chatbots using Interplay



iterate.ai





**Prepare for the digital innovation explosion.**

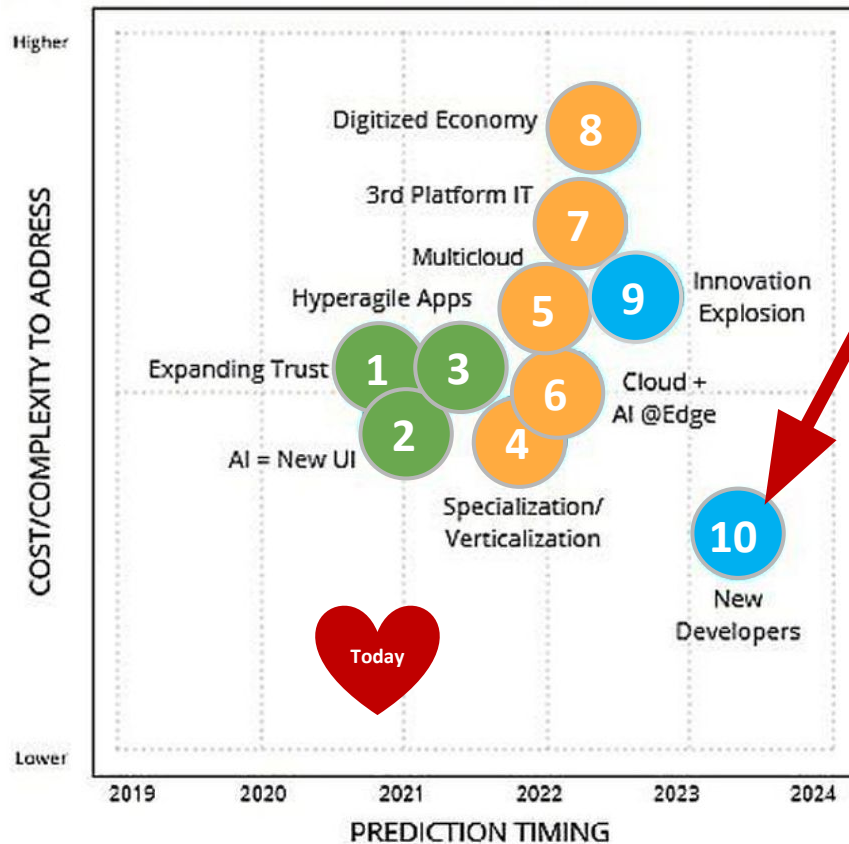
- new tools + platforms, more developers, agile methods, lots of **code reuse**
- 500 million new logical apps created from 2021 to 2025 -- equal to the number built over the past 40 years.

IDC predicts by 2023, entirely new applications will be created by **collecting and integrating components from code repositories**. By 2022 IDC predicts 75% of new applications being developed will be made up of greater than 50% code that was **procured rather than written**. AI- and machine learning components will achieve adoption scale quickly, as they'll be repurposed from public and private code repositories.

Source: IDC, 2018

SOURCE: IDC FUTUREScape: WORLDWIDE IT INDUSTRY 2019 PREDICTIONS,





**Prepare to embrace the new developer class**

- new class of developers **produce code without custom scripting**
- expands developer base +30%
- speeds up digital transformation

Source: IDC, 2018

SOURCE: IDC FUTUREScape: WORLDWIDE IT INDUSTRY 2019 PREDICTIONS,

**By the end of 2023, 80% of digitally advanced organizations will replace the walled garden, IT-as-an-enabler model with a self-service model.**

Providing libraries of cloud solutions, functions-as-a-service (FaaS), and **low-code/no-code tools** that are easily accessible and usable by non-IT users or by **citizen developers** allow the business to rapidly respond to changing market needs without the need to involve IT, but with the assurance that these solutions will be secure and compliant.

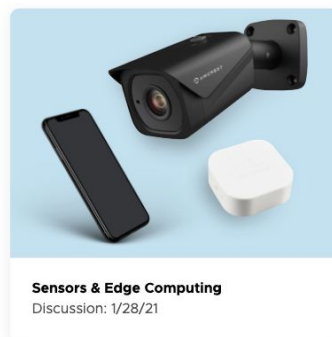
Source: [IDC FutureScape: Worldwide CIO Agenda 2020 Predictions](#)

# The Great Acceleration

What we're seeing (and preparing for) →

1. More Hacks
2. Openness
3. Resilience and Modularity
4. Convenience
5. Health Everywhere
- 6. Digital Connectivity** (community, friendship)
7. Digital Services
8. Digital Inclusion
9. Digital Identities

## Upcoming events



### Contacts:

[jon@iterate.ai](mailto:jon@iterate.ai)

[andrea@iterate.ai](mailto:andrea@iterate.ai)

[dave@iterate.ai](mailto:dave@iterate.ai)

[brooke@iterate.ai](mailto:brooke@iterate.ai)



Thank you for attending ...

**“Why is 2023 a  
Digital Pivot Point?”**



**iterateOn**

December 2020

# Welcome! We want to hear from you ~

Goal: provide **continuous thought-provoking learning** from partners, members, advisors, authors.

- This is a 55 minute event
- This webinar will be recorded and sent out
- Please submit questions and comments as you have them
- At the end of the 55 minutes we will release a poll
- Unanswered questions will be answered via email