50th Anniversary ERA Conference

Celebrate the Past, Embrace Tomorrow

The Roaring 20's

The 20 Areas of Technology Innovation Driving the Evolution of Culture & Commerce in the Next Decade



Michael Knight – TTI Inc – Fort Worth, TX

Senior Vice President Business Development

President TTI Semiconductor Group (TSG)

"We live in a society exquisitely dependent on science and technology in which hardly anyone knows anything about science and technology."

- Carl Sagan

Parallels Between the 1920's and 2020's

- Euphoria following the end of the Spanish Flu & WWI
- Marked by a feeling of novelty associated with modernity and a break with tradition
- Large scale development and use of automobiles, telephones, movies, radio and electrical appliances
  - Cars replace horses
  - Movies compete with plays and books
  - Radios compete with newspapers
  - Aviation becomes a business
- Nations experience rapid industrial and economic growth, rise in consumerism
- Significant changes in lifestyle and culture
  - Woman get voting rights
  - Middle class gets leisure time
- Three small recessions: tremors before an earthquake
- Era ended with the Wallstreet crash of 1929 ushering in the Great Depression

- Euphoria following the end of the Great Recession
- Marked by a feeling of wonderment as science fiction becomes reality: flying cars, robots, bionic limbs, etc.
- Large scale implementation of BEV's, augmented reality, super-sized high res displays and smart tech
  - Electricity replaces gas, ADAS replaces driver
  - A/R digitizes human interaction and experiences
  - Everything collects and displays information
  - Micromobility and flying cars become mainstream
- Technology (green energy, satellite internet, etc) upgrades the 3rd world to 1st world standards
- Significant changes in lifestyle and culture
  - The blockchain transforms transactions like voting
  - Middle class recovers their leisure time
- Some small recessions marking transition periods
- Era predicted to end with the start of a depression

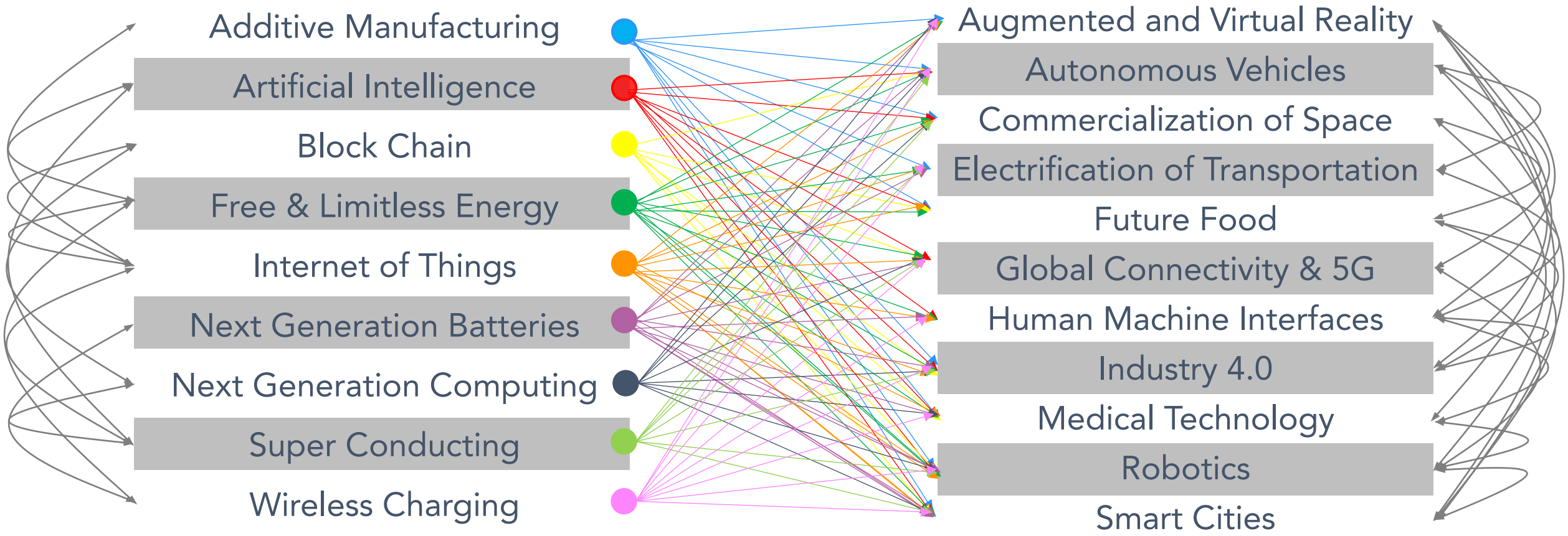
Here Right Now; Tipping in the 2020's

General Purpose Technologies

- Additive Manufacturing
- Artificial Intelligence
- Block Chain
- Free & Limitless Energy
- Internet of Things
- Next Generation Batteries
- Next Generation Computing
- Super Conducting
- Wireless Charging

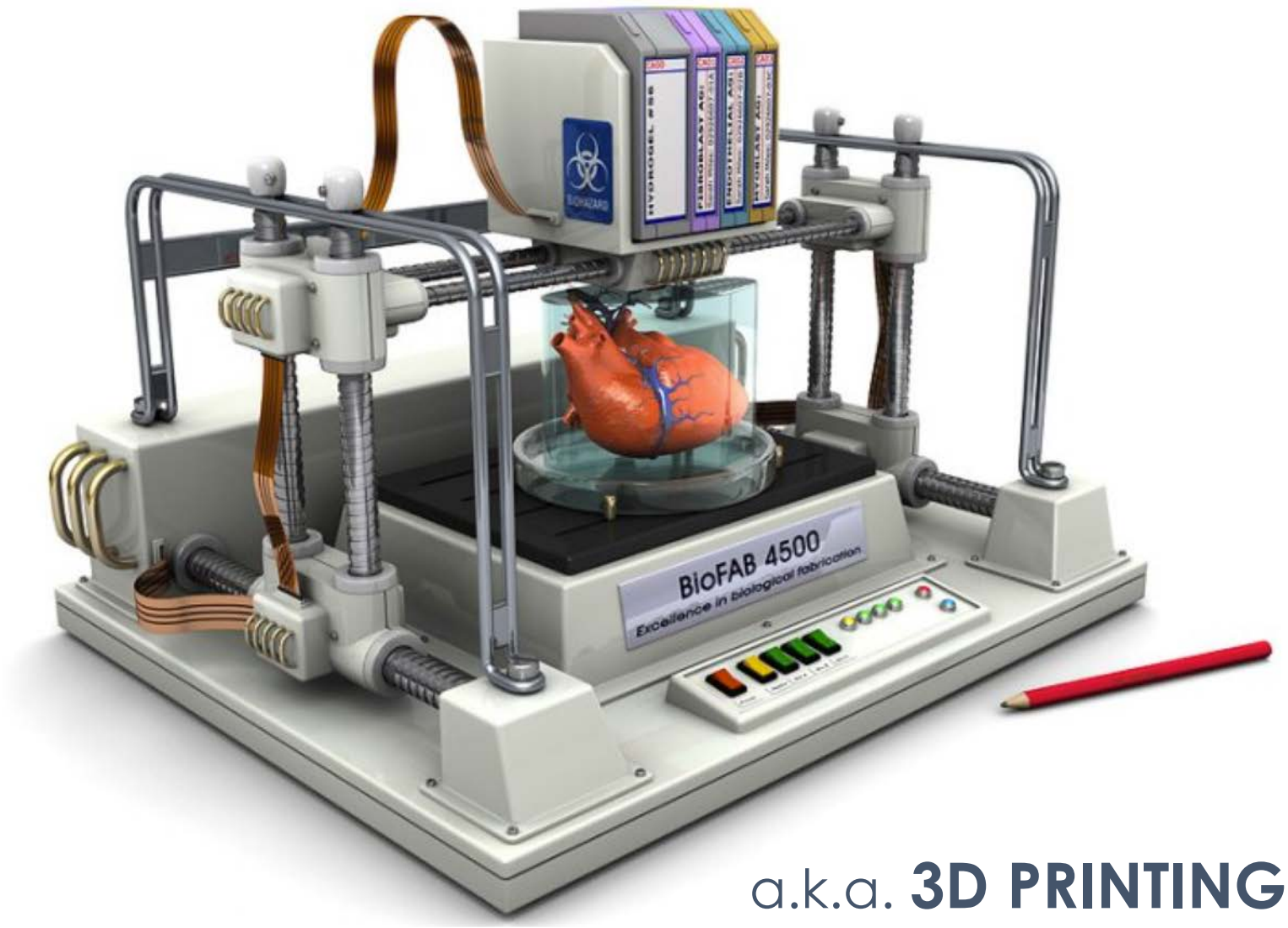
Application Specific Technology

- Augmented and Virtual Reality
- Autonomous Vehicles
- Commercialization of Space
- Electrification of Transportation
- Future Food
- Global Connectivity & 5G
- Human Machine Interfaces
- Industry 4.0
- Medical Technology
- Robotics
- Smart Cities



Deep cross-connects among all 20 technologies, enabling and accelerating each other

Additive Manufacturing



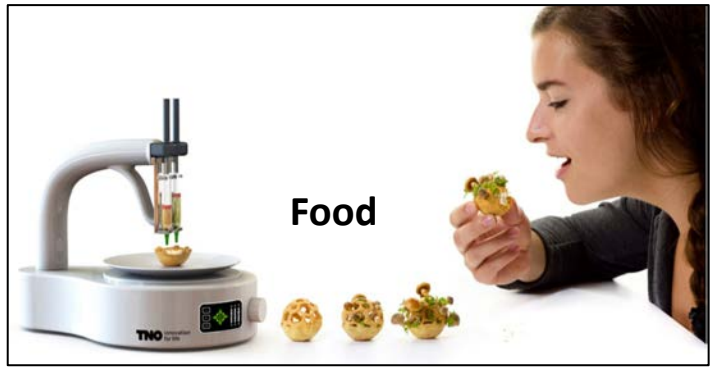
a.k.a. **3D PRINTING**

Manufacturing via 3D Printing

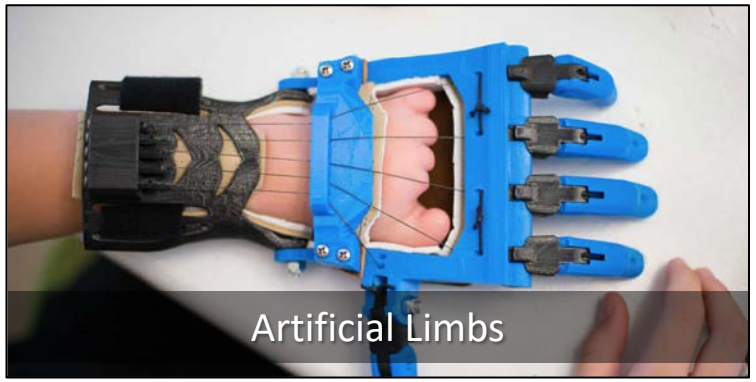




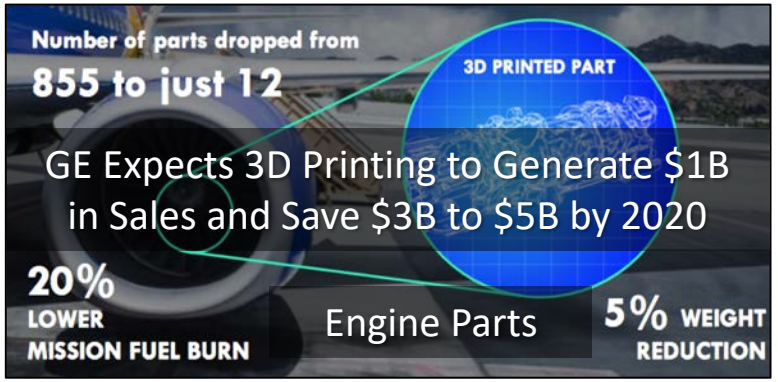
















3D printing moving out of prototyping into production

Enables mass customization

2019 directly attributable market value is $14.5B

AI

Artificial Intelligence



Definitions of Intelligence

Intelligence: mental quality that consists of the abilities to learn from experience, adapt to new situations, understand and handle abstract concepts, and use knowledge to manipulate one's environment; measured as Intelligence Quotient

Cognition: the mental processes involved in gaining knowledge and comprehension which include thinking, knowing, remembering, judging and problem-solving; higher-level functions of the brain that encompass language, imagination, perception, and planning

Consciousness: self awareness of mental processes such as thoughts, feelings, sensations and introspection

Sentience: the capacity to feel, perceive and experience subjectively; the ability to reason

Wilhelm Wundt – Father of Psychology

Artificial Intelligence: area of computer science that emphasizes the creation of intelligent machines that work and react like humans

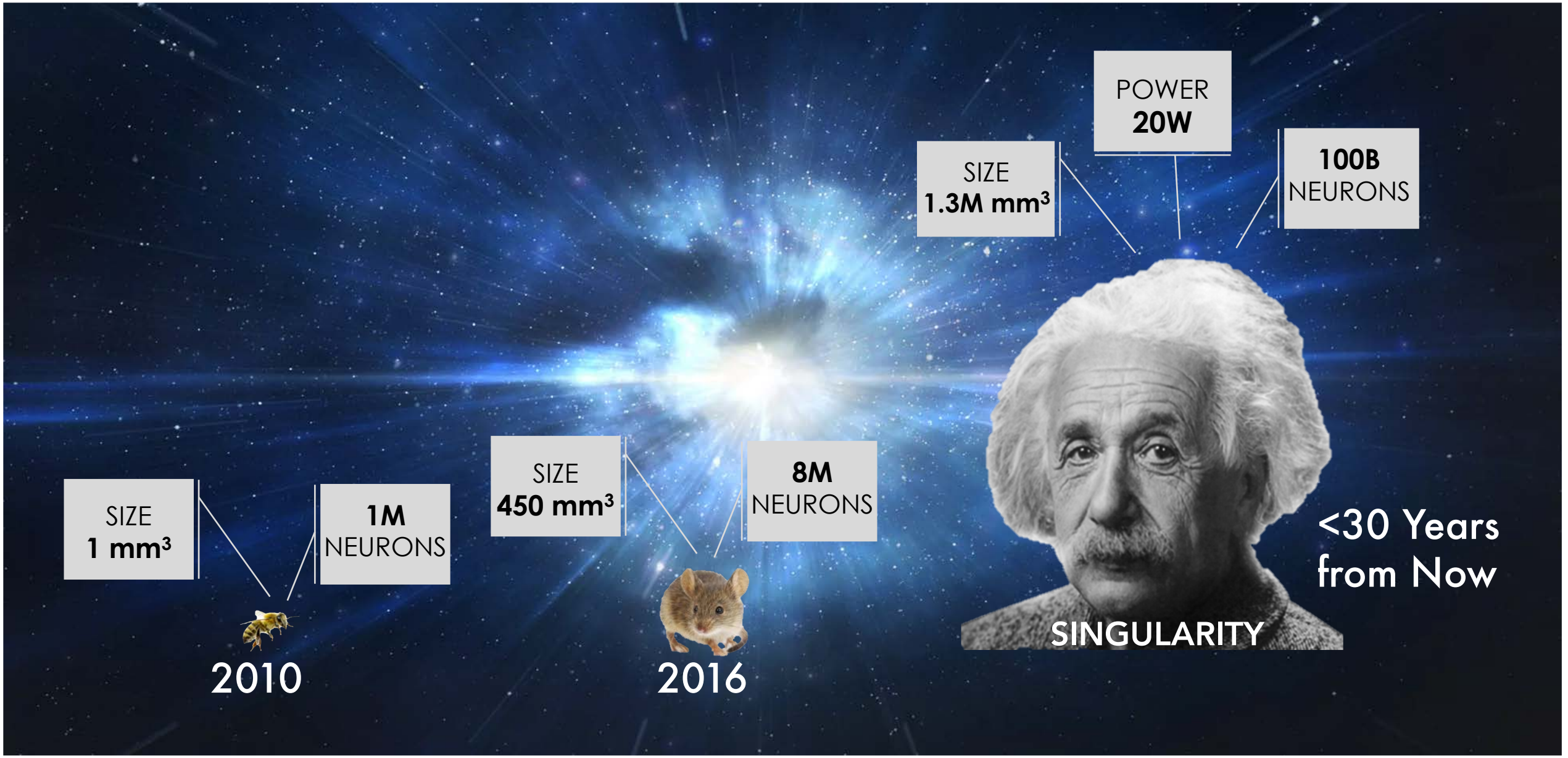
Machine Learning: method of data analysis that automates data model building; uses algorithms that learn iteratively from data and can find insights without explicit programming

Deep Learning: a subset of machine learning and refers to layers of artificial neural networks

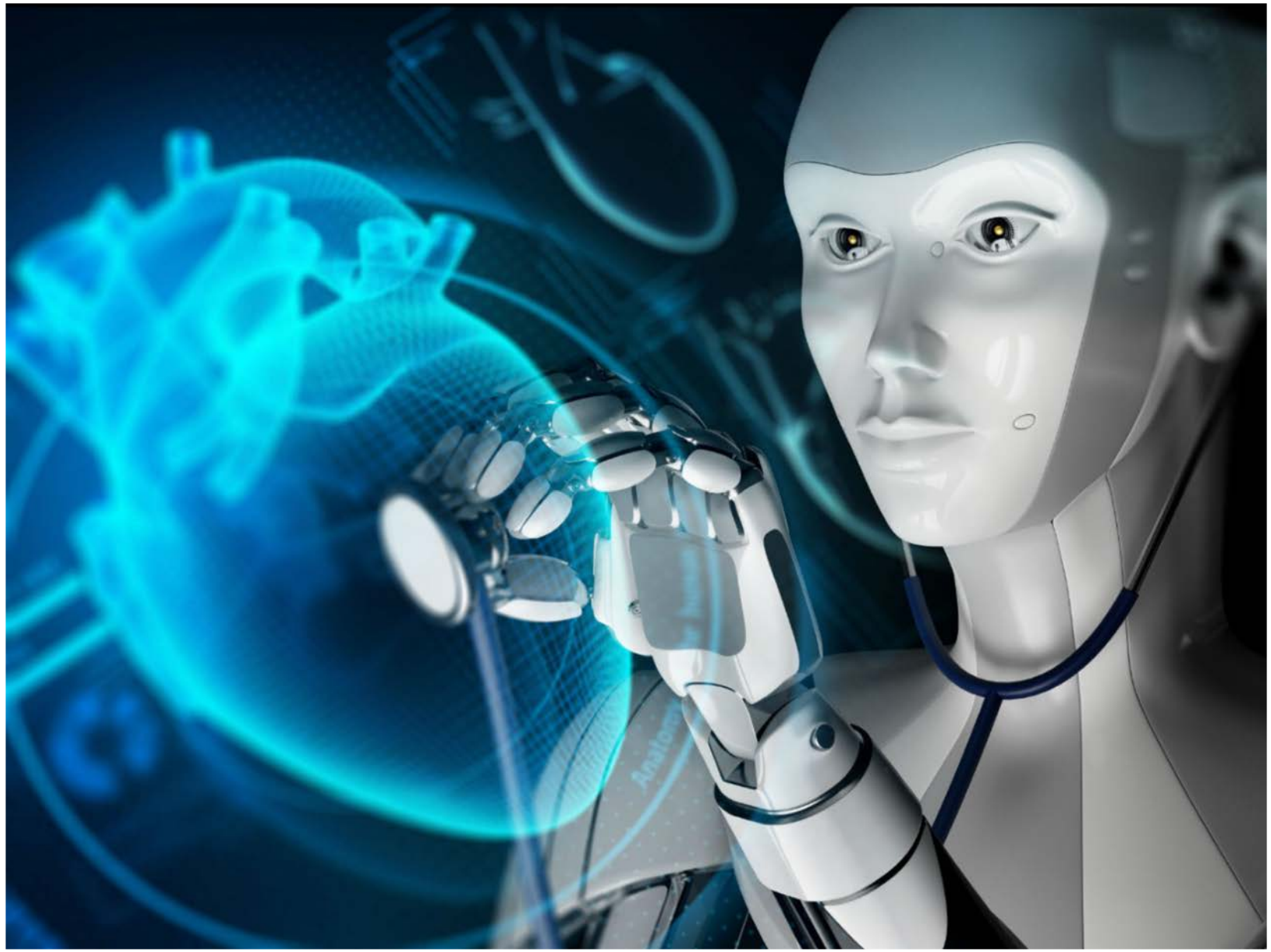
The Singularity: the point at which Artificial Intelligence catches up with human intelligence and becomes cognitive, conscious and sentient; the point at which all change in the last million years will be superseded by the change in the next five minutes

John McCarthy – Father of Artificial Intelligence

Artificial Intelligence is Evolving Exponentially



AI and Medicine



Google investing heavily in AI for healthcare

- Reading CT scans to detect cancer
- Tumors as small at 100 x 100 pixels
- 92.4% accuracy vs human pathologist 73.2%

Detect diabetic blindness and high blood pressure from eye scans

iPhone-based portable devices for skin cancer detection and ultrasound devices

- 95% accuracy vs dermatologist 86.6%
- In the U.S. +5.4M cases of non melanoma
- 4.3M basal cell with 3,000 deaths per year
- 1.1M squamous cell with 15,000 deaths
- 1 person dies every hour from melanoma
- Melanoma risk doubles at +5 sunburns
- Early detection is key to beating skin cancer

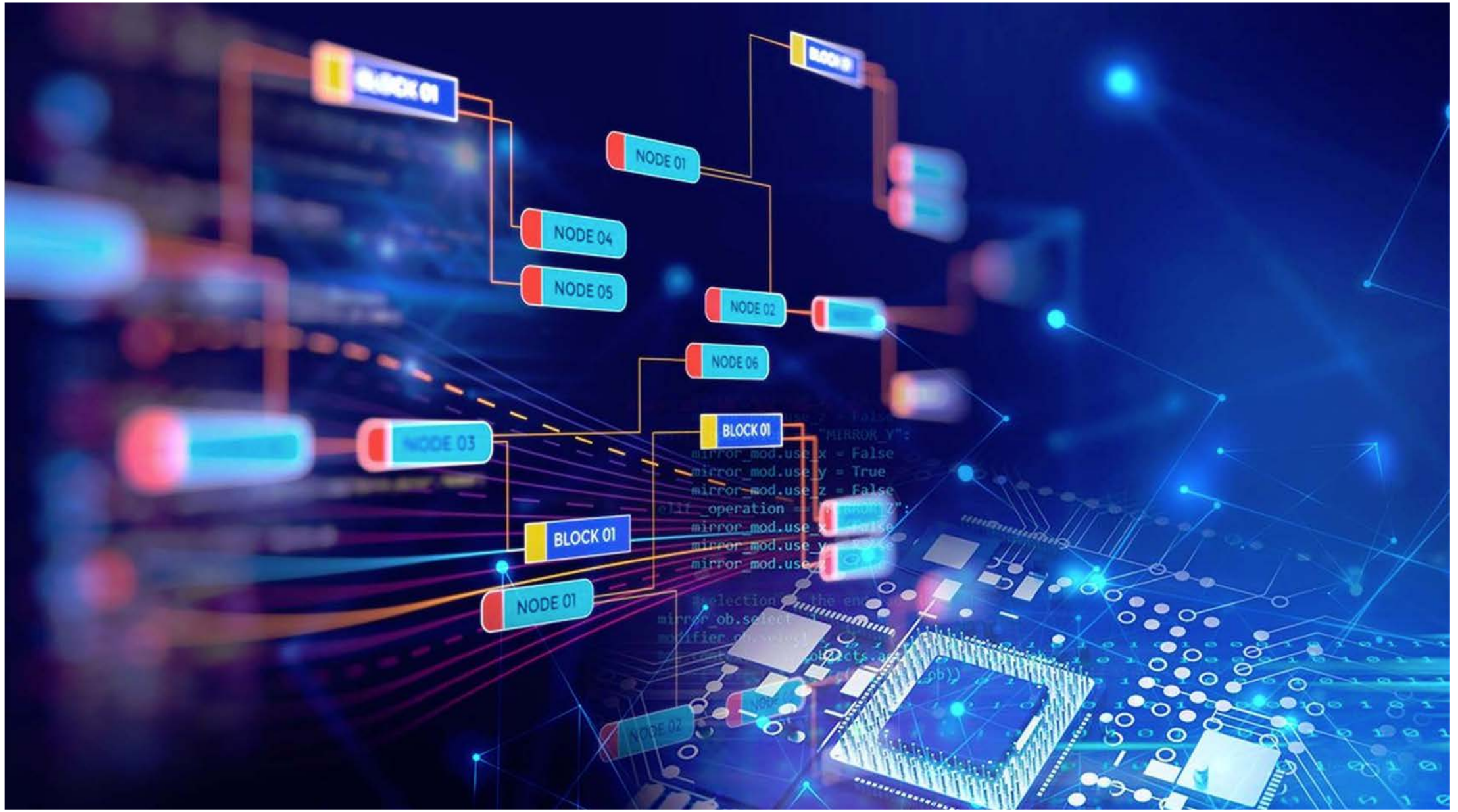




Scenes from the Future



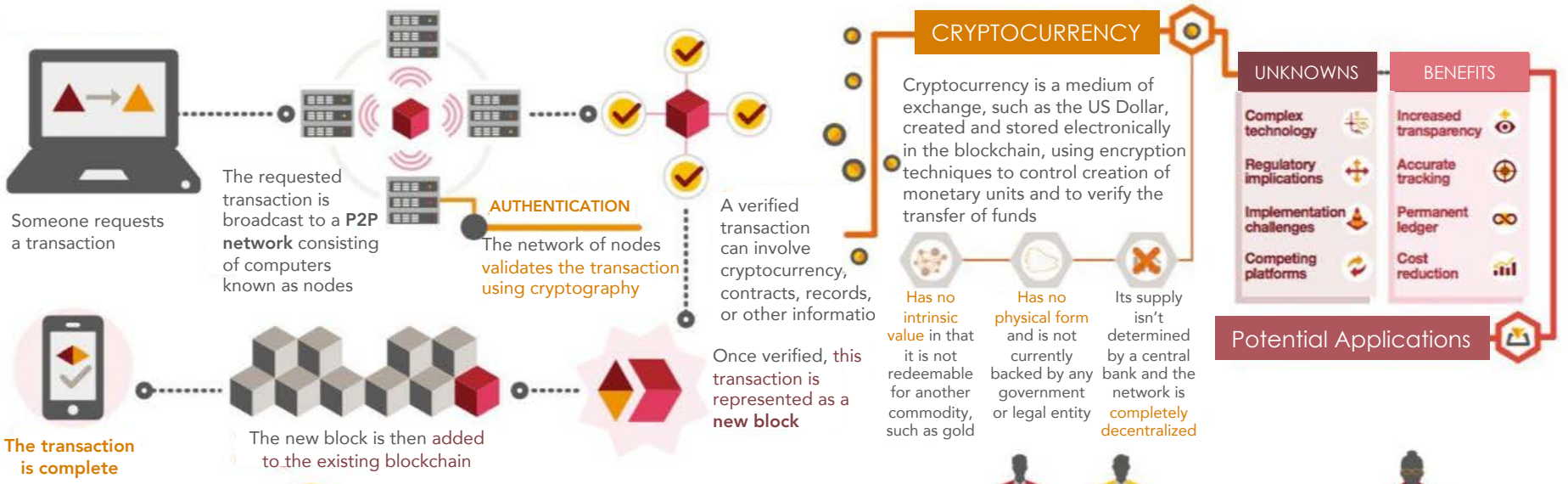
Block Chain


NODE 01
NODE 04
NODE 05
NODE 02
NODE 06
NODE 03
BLOCK 01
BLOCK 01
NODE 01

What is Blockchain Technology?

A decentralized ledger, or list, of all transactions across a peer-to-peer (P2P) network, a simple example of which is two, directly connected, equally privileged PC's. Using this technology, participants can transfer value across the internet without the need for a central third party

HOW IT WORKS:



CRYPTOCURRENCY

Cryptocurrency is a medium of exchange, such as the US Dollar, created and stored electronically in the blockchain, using encryption techniques to control creation of monetary units and to verify the transfer of funds

- Has no intrinsic value in that it is not redeemable for another commodity, such as gold
- Has no physical form and is not currently backed by any government or legal entity
- Its supply isn't determined by a central bank and the network is completely decentralized

UNKNOWNS	BENEFITS
Complex technology	Increased transparency
Regulatory implications	Accurate tracking
Implementation challenges	Permanent ledger
Competing platforms	Cost reduction

Potential Applications



AUTOMOTIVE



Consumers can use blockchain to manage ownership in autonomous cars and pay toll and parking charges

FINANCIAL SERVICES



Faster, less expensive settlements could shave billions of dollars from transaction costs while improving transparency and security

VOTING



Using a blockchain code, constituents could cast votes via smartphone, tablet or computer, resulting in immediately verifiable results, and a faster and less expensive voting process

HEALTHCARE

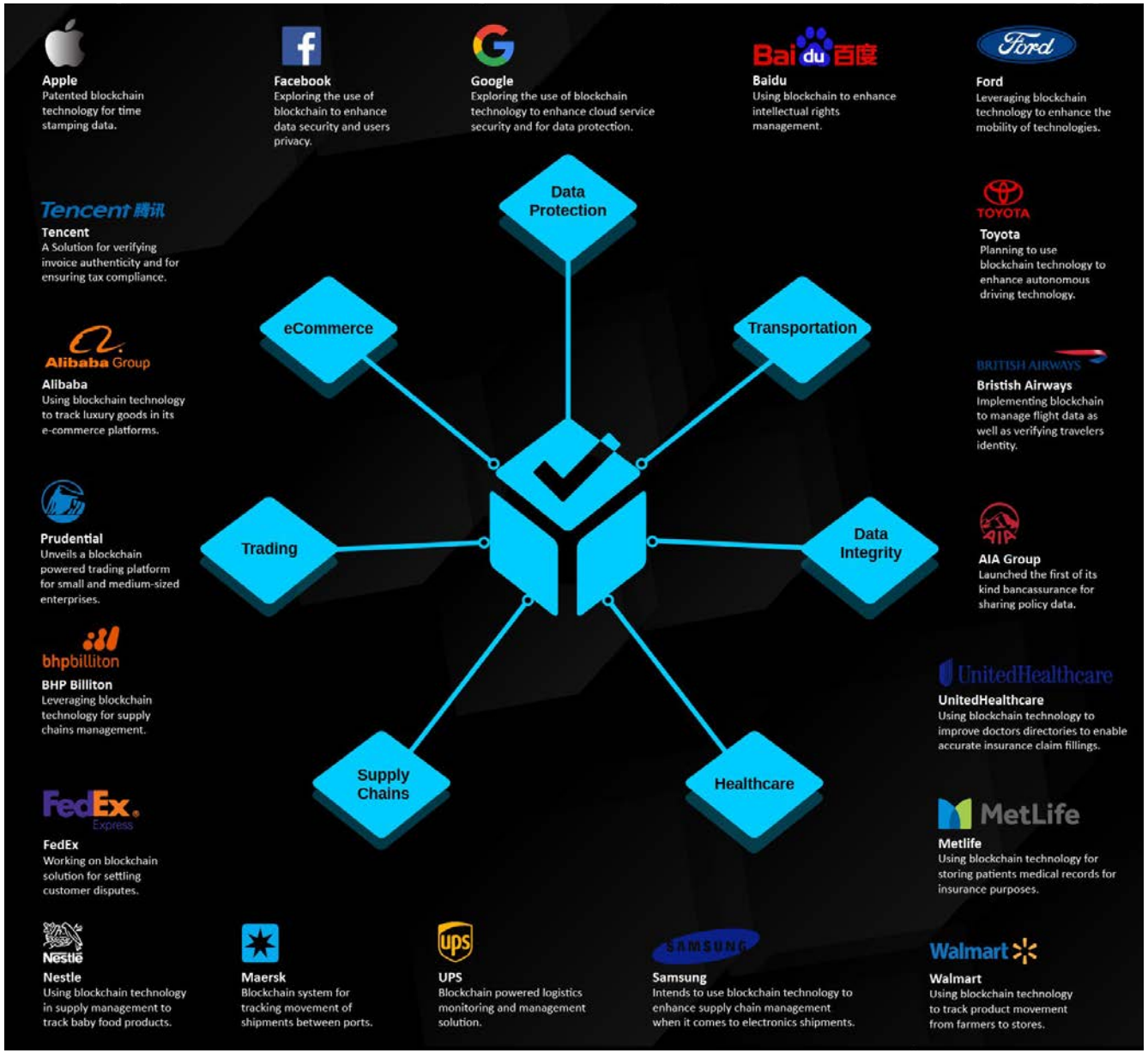


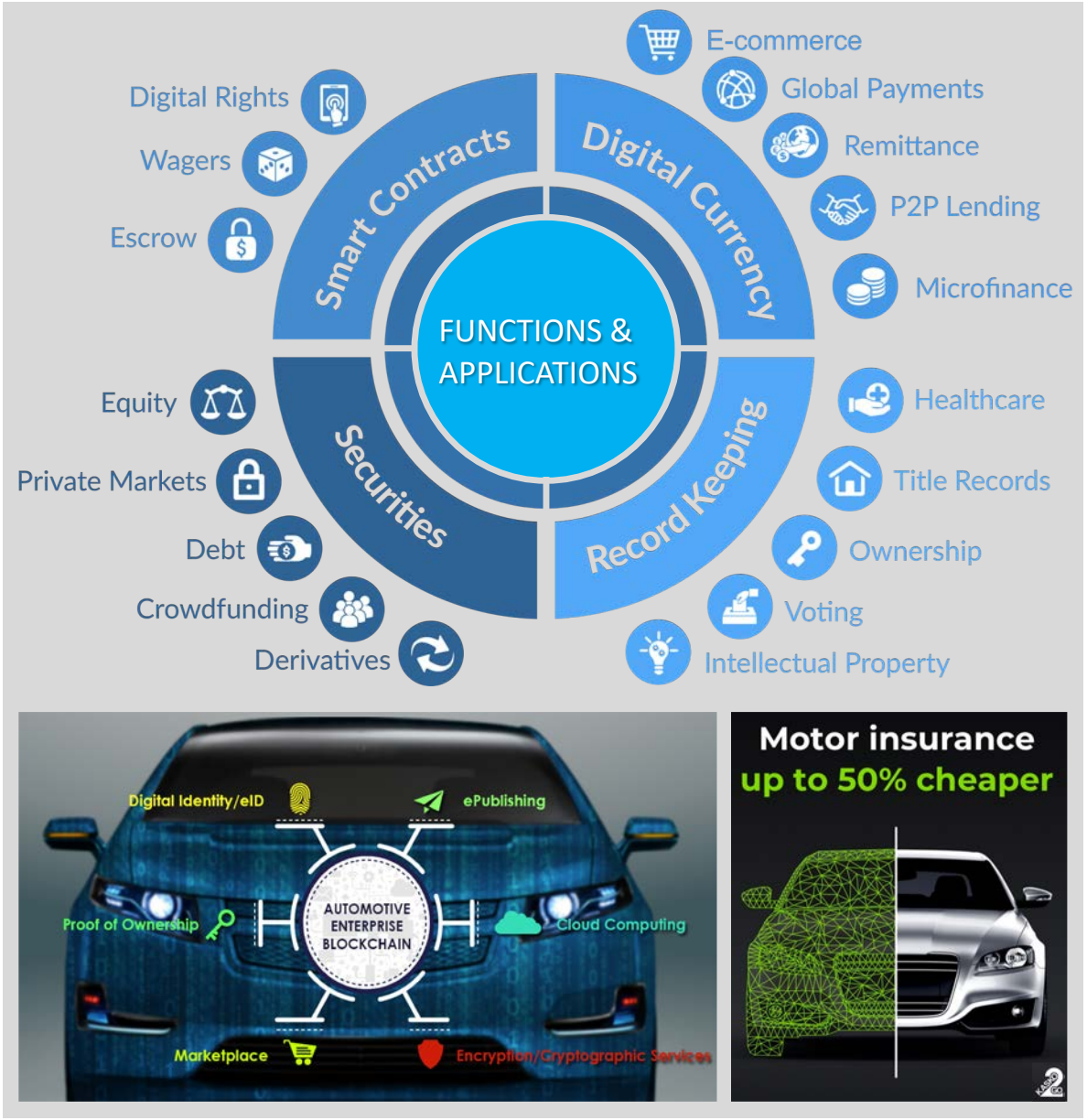
Patient's encrypted health information can be shared with multiple providers by the patient without the risk of privacy breaches

"The value of blockchain is projected to exceed **$176 billion by 2025**, and **$3.1 trillion by 2030**."

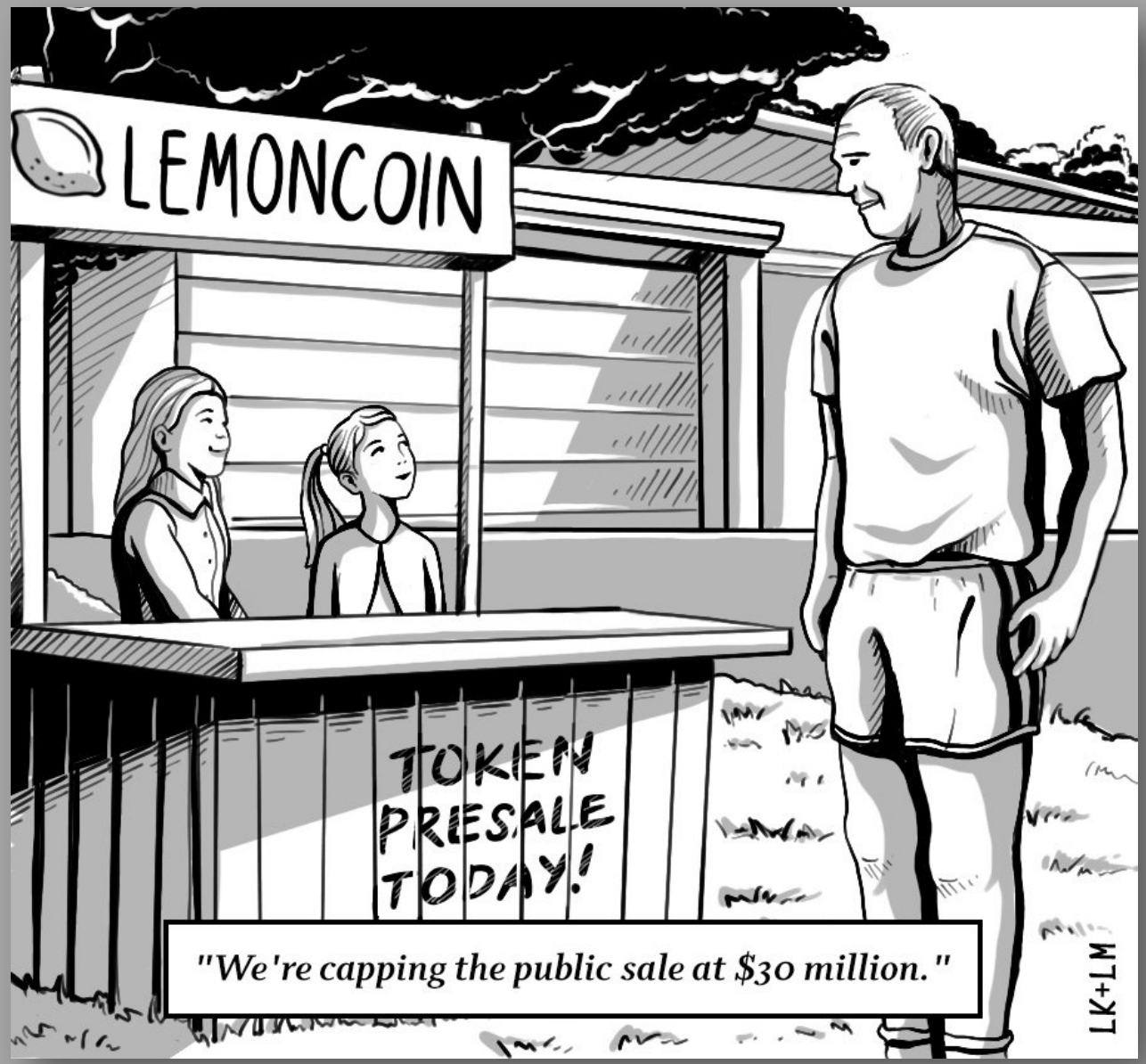
- PwC -

Blockchain Adopters and Use Cases





Scenes from the Future



Free and Limitless Energy



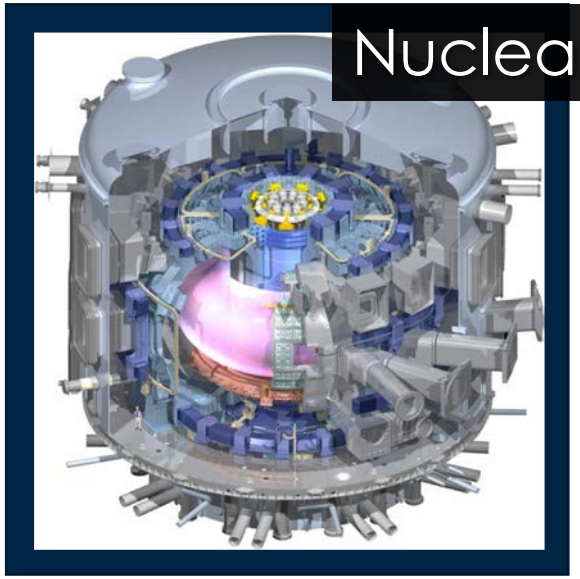
Renewables should be like the Manhattan Project and the Apollo Project — the government should put tens of billions of dollars into R&D

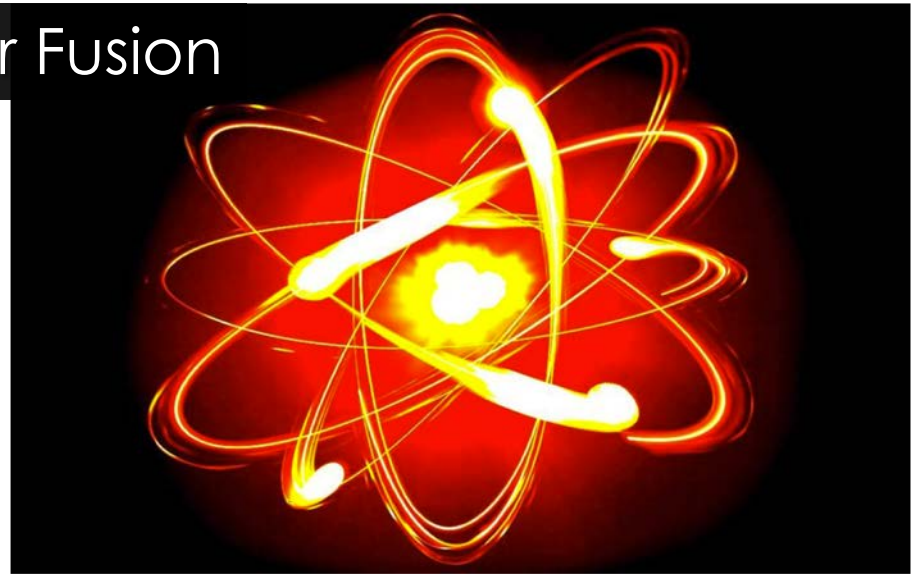
The Electrification of the Future Depends On It



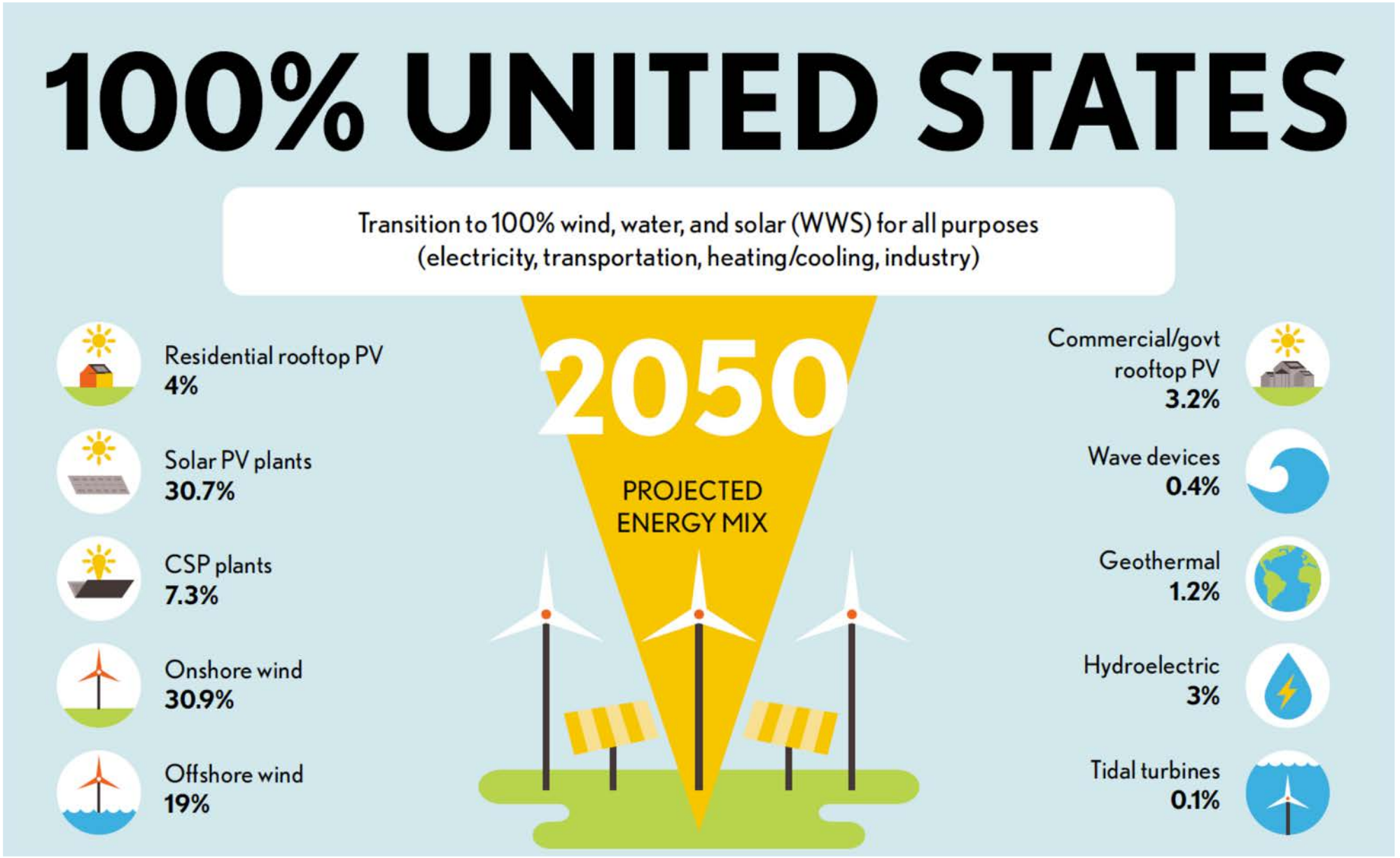








A Renewable Future



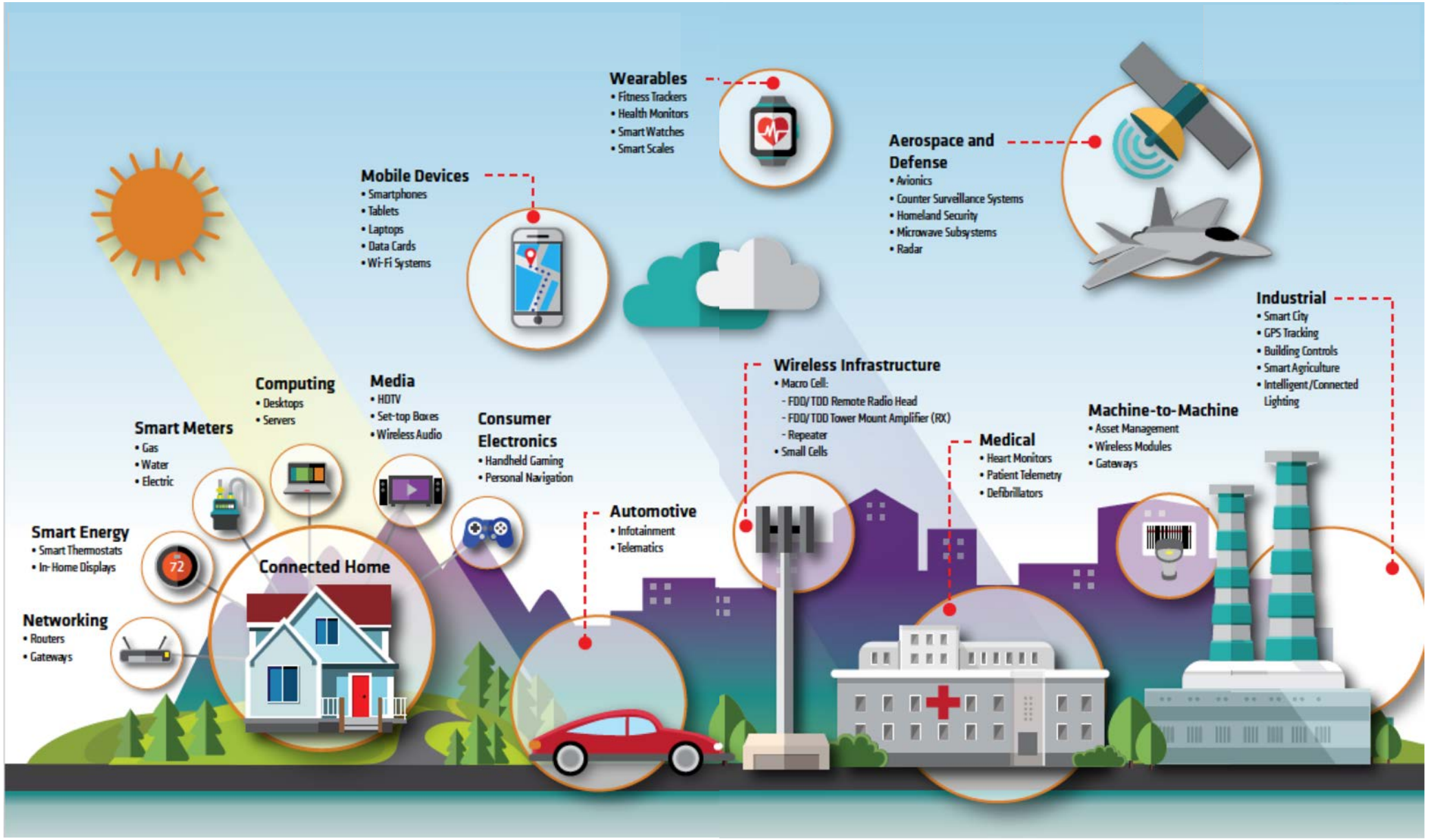
BY 2050…

- 139 countries will be 100% powered by wind, water and solar… they emit 99% of the world's industrial CO_2
- The switch to green energy will create 52M jobs and destroy 28M jobs
- 5.9M jobs created will be "35-Year" jobs in operations and construction

Source: Solutions Project and Stanford University

IoT

Internet of Things



1Trillion Sensors in 2020, 100 Trillion by 2030

The Internet of Things

The Internet of Things (IoT) connects machines and devices to one another. IoT can help all industries become more efficient, productive, and safer

To become connected an object must be able to:

Capture Data

Transmit Data

2003–2010:

10–20 BILLION

things connected to the internet

By 2020 this is estimated to grow to **40–50 BILLION**

That's roughly 5 connected devices per person on earth!

The Rise of the Sensors

Sensors enable IoT, every object, and the human body

THE INTERNET OF THINGS

Anything that is hard to monitor can be easy

Today's devices have between 6 and 9 sensors on average:

- Ambient Light
- Accelerometer
- Magnetometer
- M7 Motion Coprocessor
- Ambient Sound
- Gyroscopic
- Proximity
- Temperature and Humidity
- Barometer

The Opportunities Generated By IoT Far Outweigh the Risks

For businesses to fully realize the great potential of IoT, they need to be prepared for the risks that lie ahead

The insurance industry is well positioned to help businesses navigate an IoT world

IoT Risks: Privacy, Cybersecurity, Liability

A New Economic Age

The 2020 annual global economic potential across all sectors is estimated to be

$14.4 TRILLION

That is the current GDP of the European Union

Cost of an Accelerometer

2007 1 Axis: **$7.00**

Today 6 Axis: **$0.50**

Cheap sensors are accelerating the growth of IoT

The decrease in cost of sensors has fueled the number of connected devices

Industries Currently Benefiting from IoT: Automotive, Banking, Marine, Property, Energy, Aerospace, Healthcare, MFG, Food

Safety Driverless Cars, Worker Accident Prevention

Efficiency Biometric Banking, Smart TVs, and Thermostats

Decision Making Data Driven Insights

Infrastructure Risk Triggers, Electrical Networks, and Predictive Maintenance

MARKET SIZES

$4T - $10T by 2050

HOME
Chore Automation & Security
$200B - $300B

OFFICE
Security & Energy
$200B - $700B

FACTORIES
Operations & Equip Optimization
$1.2T - $3.7T

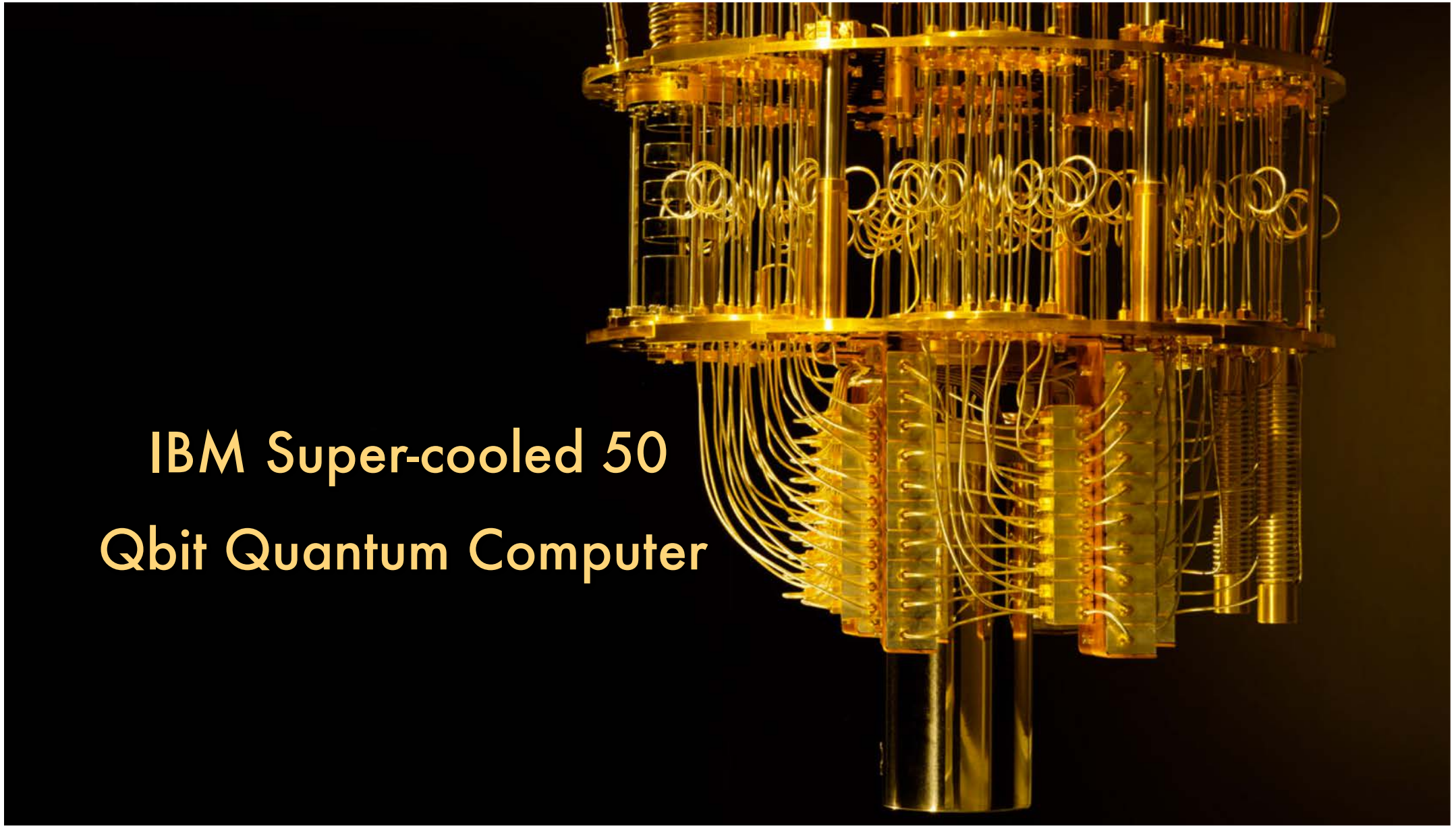
RETAIL
Automated Checkout
$400B - $1.2T

HUMAN
Health & Fitness
$200B - $1.6T

CITIES
Public Health & Transportation
$900B - $1.7T

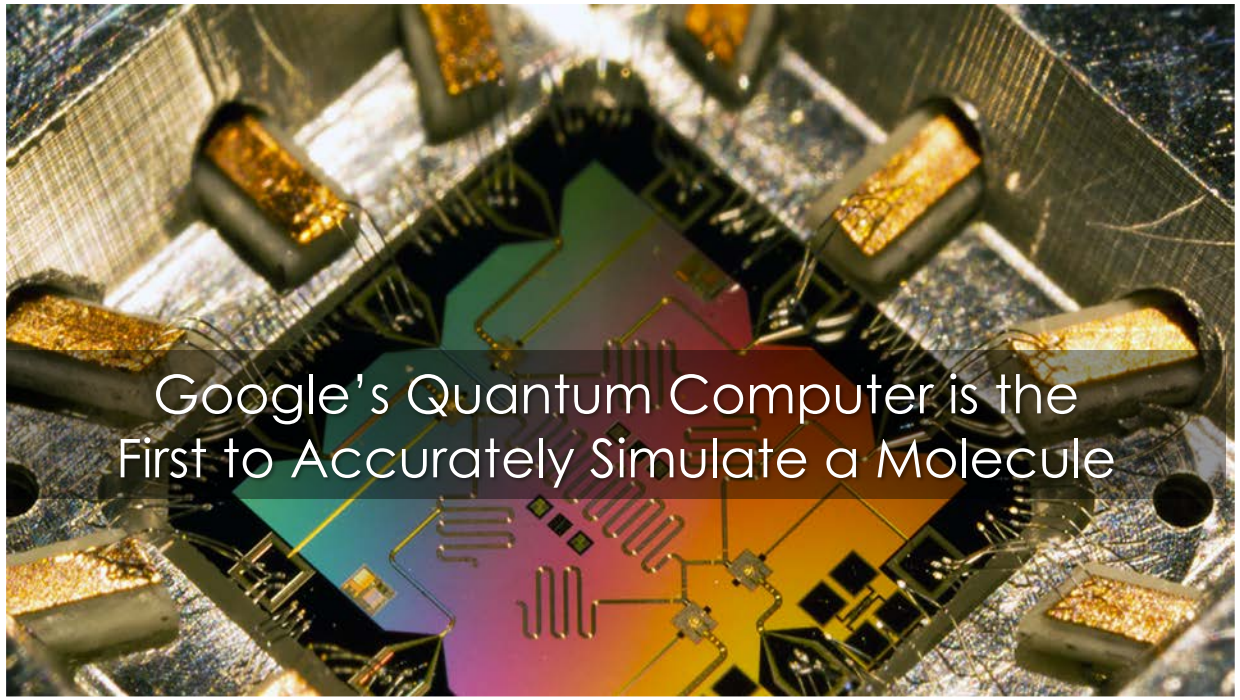
VEHICLES
Autonomous & Maintenance/Mgmt
$200B - $700B

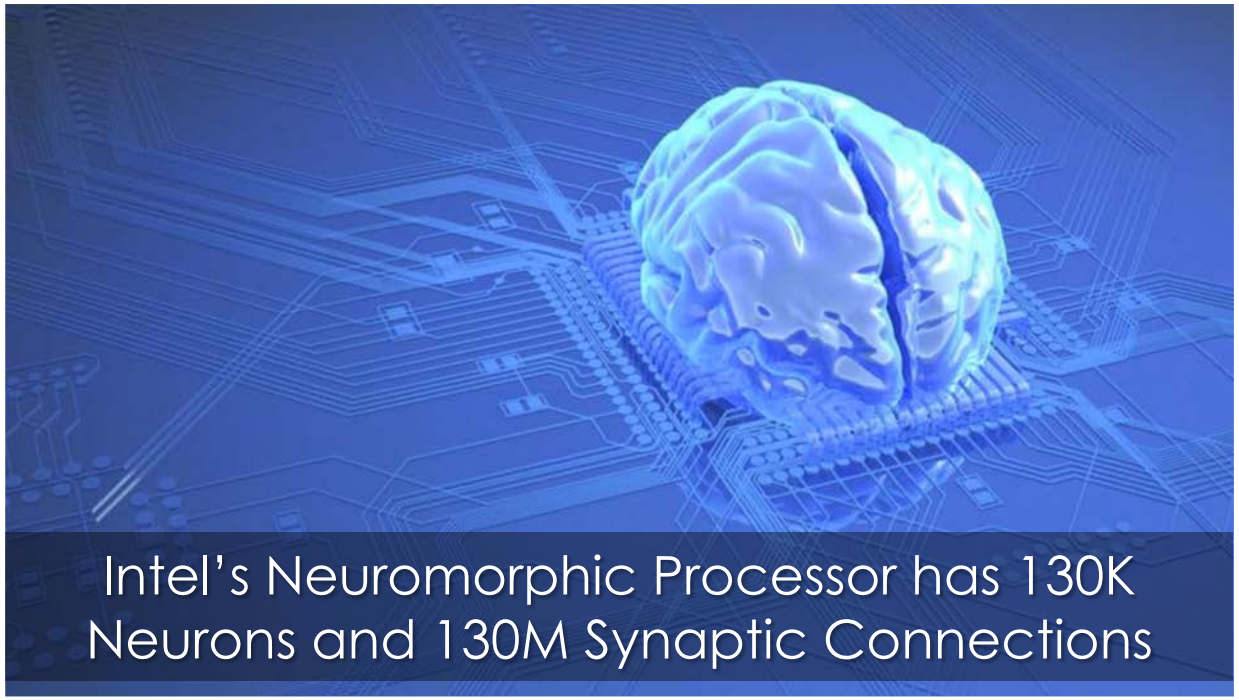
Next Generation Computing

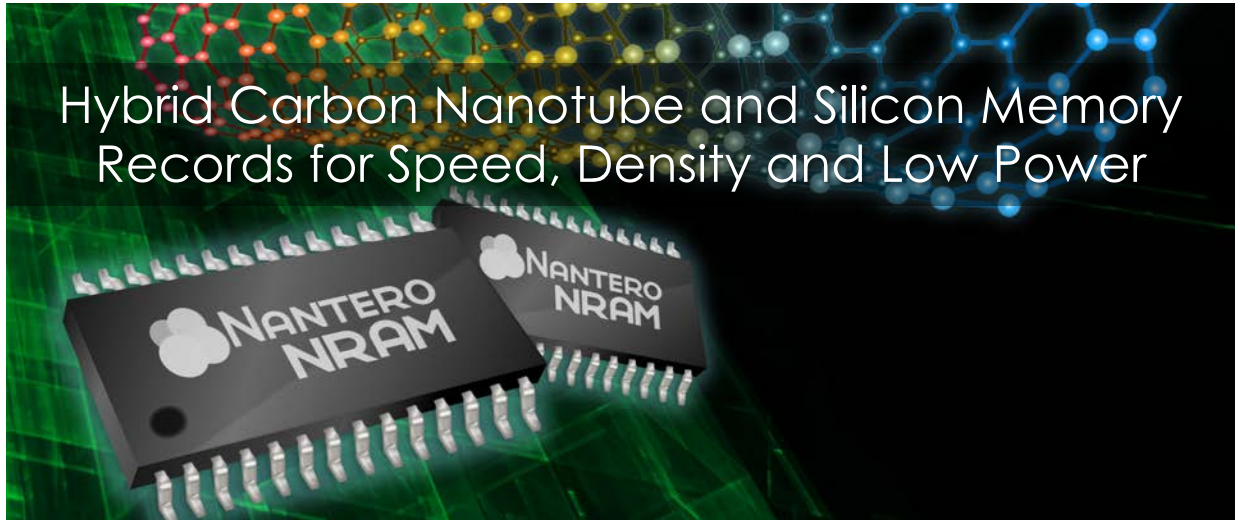


IBM Super-cooled 50 Qbit Quantum Computer

The ~~Evolution~~ Revolution in Processing & Storage



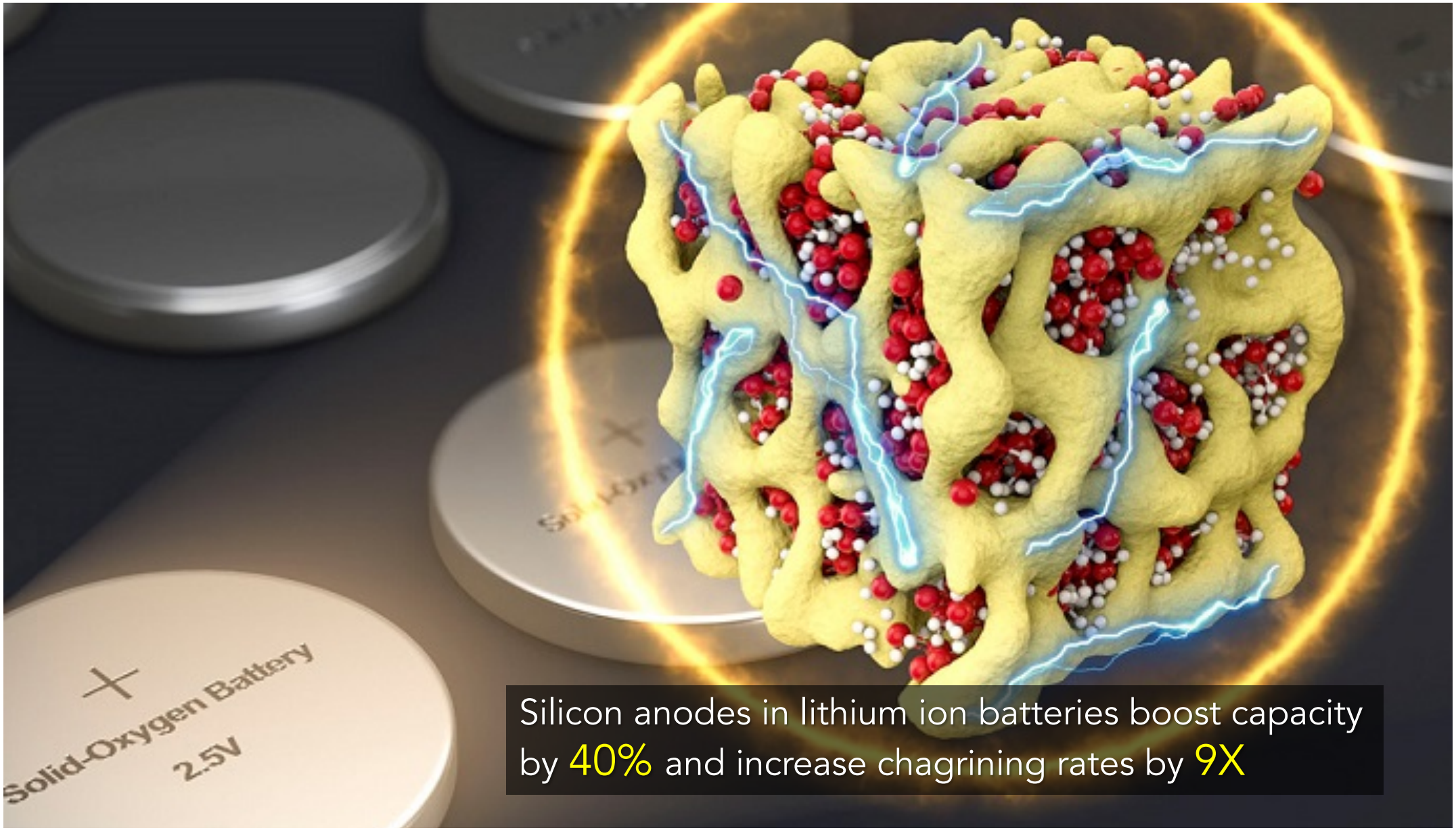






Better Energy Storage is the Missing Ingredient

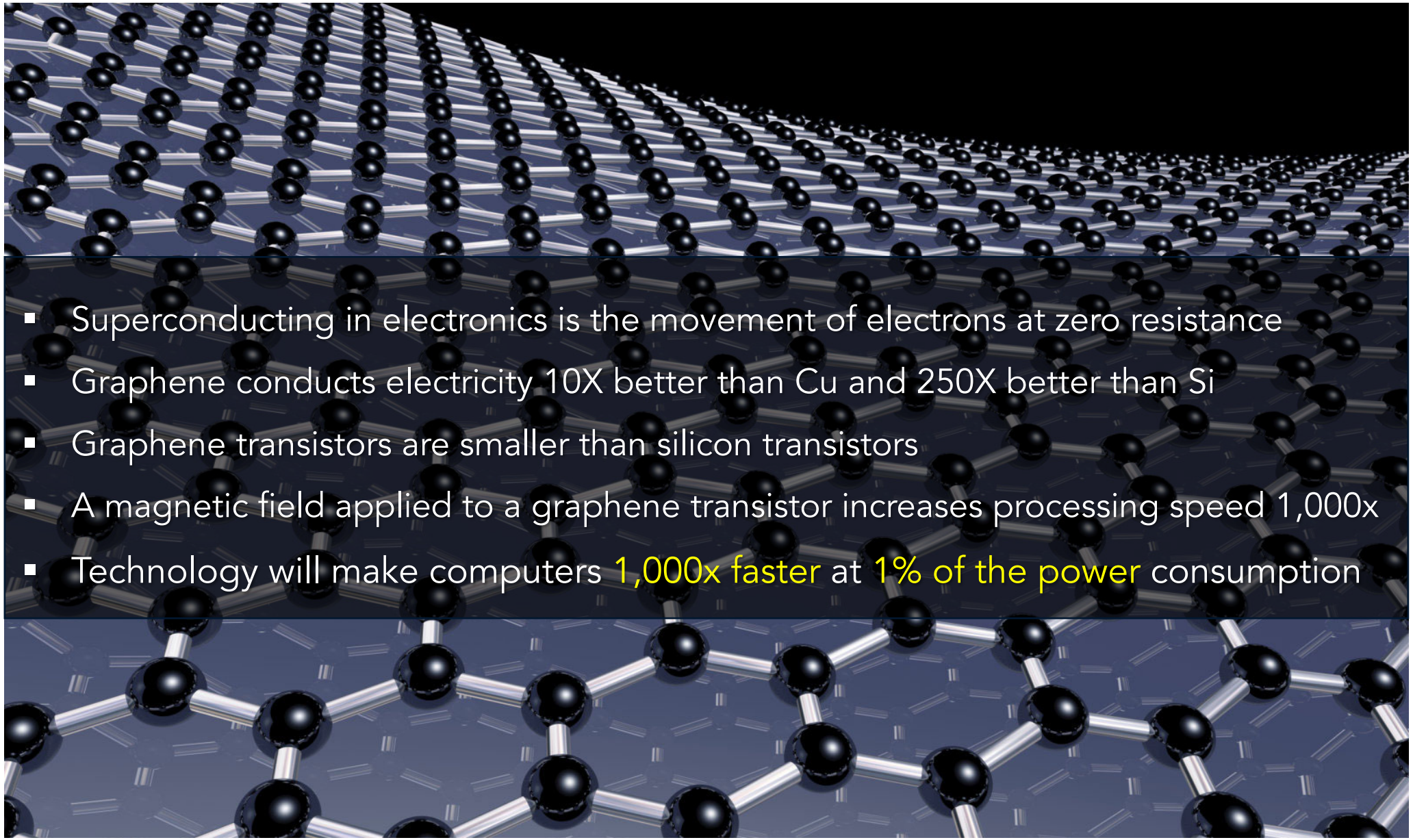
Next Generation Battery Technology



Silicon anodes in lithium ion batteries boost capacity by 40% and increase chagrining rates by 9X

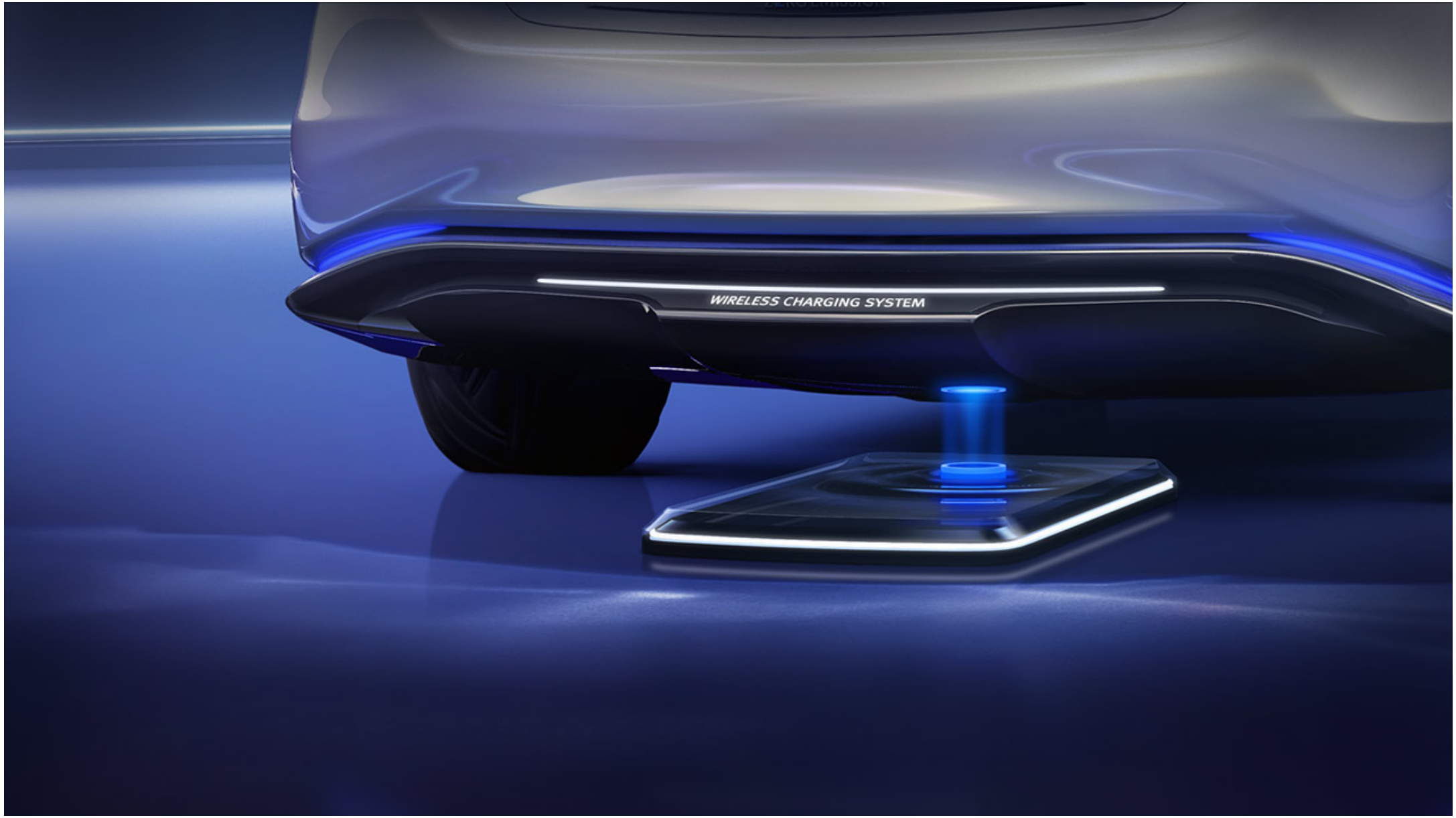
Smaller, Faster, Greener

Superconducting



- Superconducting in electronics is the movement of electrons at zero resistance
- Graphene conducts electricity 10X better than Cu and 250X better than Si
- Graphene transistors are smaller than silicon transistors
- A magnetic field applied to a graphene transistor increases processing speed 1,000x
- Technology will make computers 1,000x faster at 1% of the power consumption

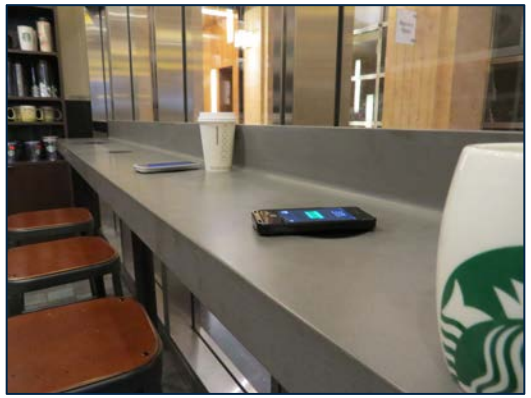
Inductive Charging

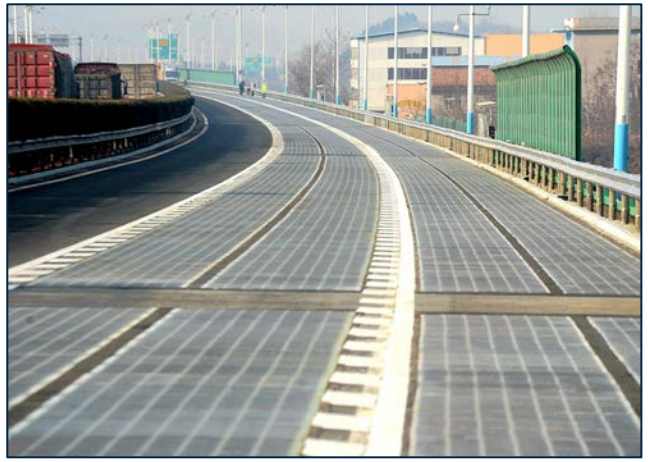


Cutting the Electric Cord



















Built-in wireless charging will become ubiquitous in everything from public spaces to furniture

Global market is $3B now growing to $71B in 2025

1.7M cars will ship with built-in wireless charging

Wireless EV Charging market to grow from $8M in 2020 to $407M in 2025 - 117% CAGR

Augmented & Virtual Reality

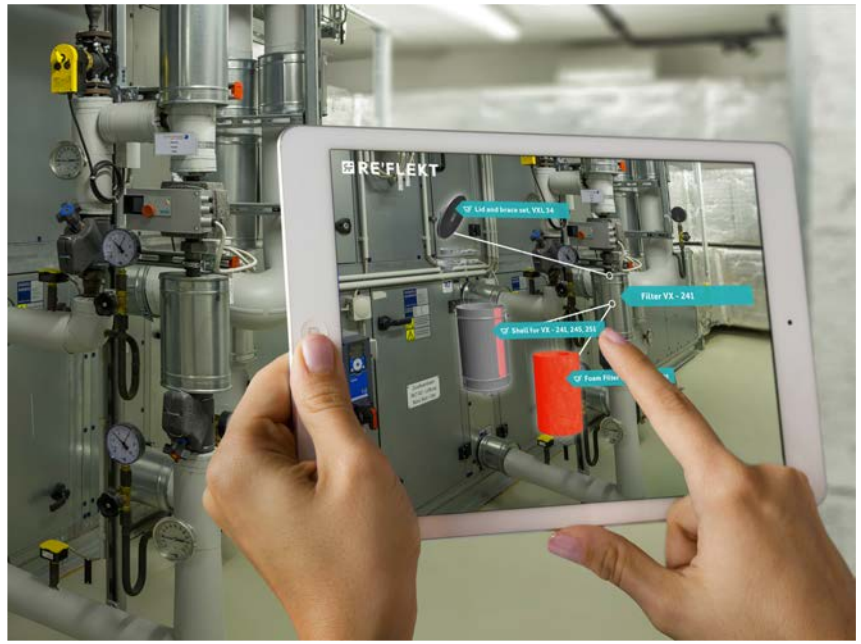


VR Healthcare Market $976M in 2017…



Augmented Reality and Industry 4.0





"The value of AR will grow exponentially as IoT proliferates. As IoT data continues to grow, so too does the power of AR, as it allows us to leverage and interpret information. AR serves as the bridge between the physical and digital worlds, opening up our ability to take advantage of the torrent of information and insights produced by billions of smart, connected products worldwide. In our factories, AI will supplement traditional manuals, brochures and training documents. By implementing AR technology, companies will see a dramatic positive impact on the productivity and quality of procedures, especially in manufacturing.

Scenes from the Future



Autonomous Vehicles

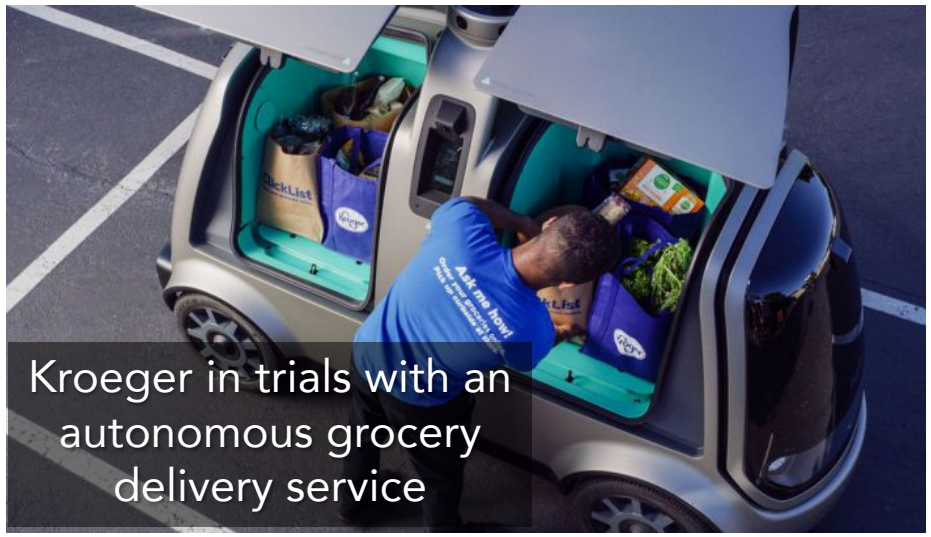


Auto in 2021…
Semiconductors = $68B
Sensors = $33B
Source: Lucintel

Autonomous Vehicles Picking Up Speed



Continental and ANYbotics team up to create an autonomous delivery system utilizing highly mobile robots for final (last mile) delivery



Kroeger in trials with an autonomous grocery delivery service



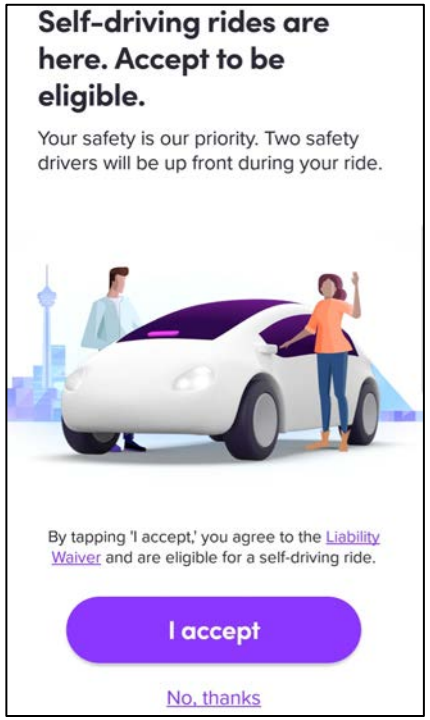
Chevy introducing an electric autonomous Volt with no steering wheel or pedals



Geo-fenced driverless shuttle in Frisco, Texas

Autonomous vehicles are…

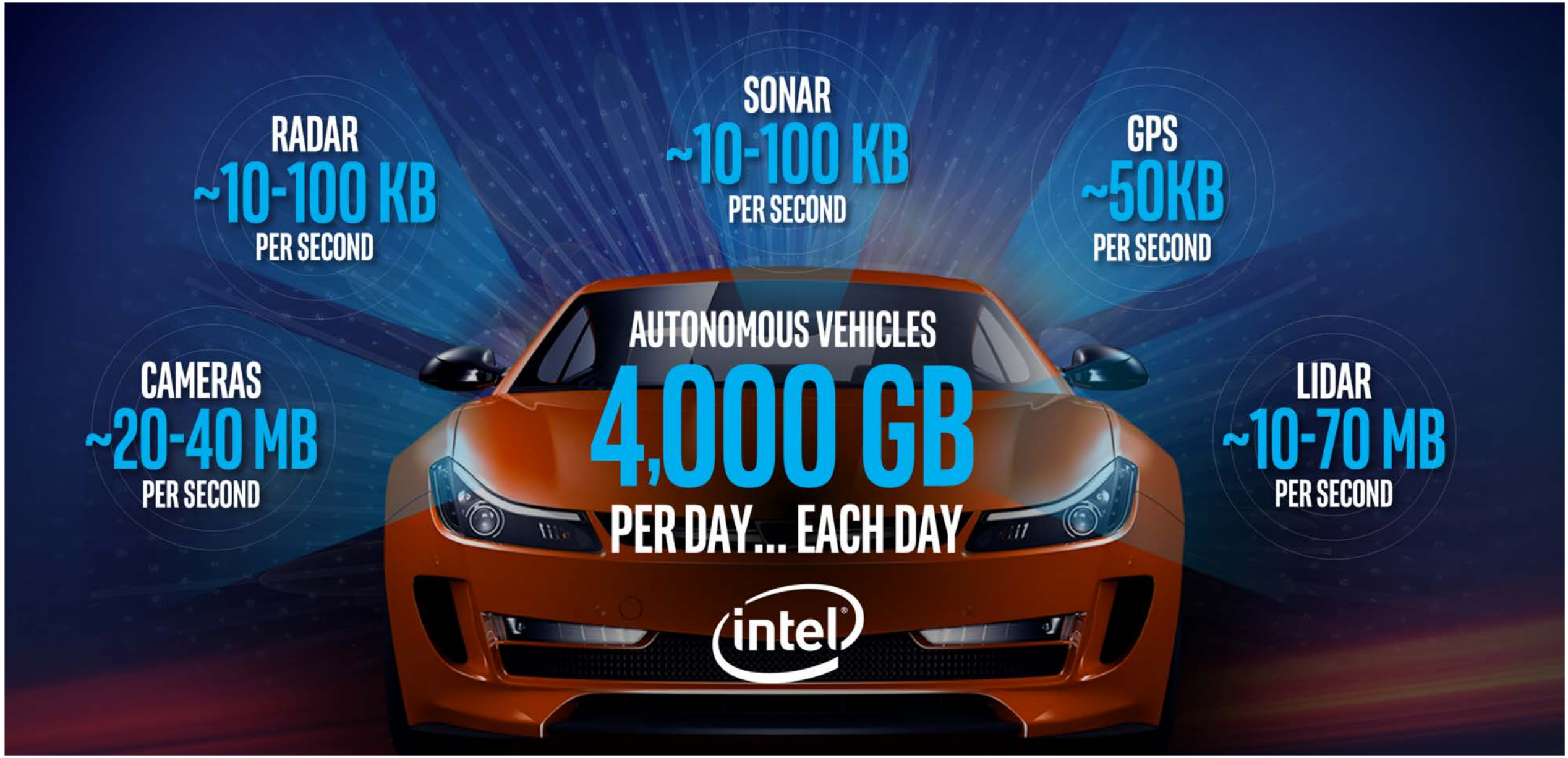
Economical
Environmental
Job-destroying
Life Saving
Inevitable



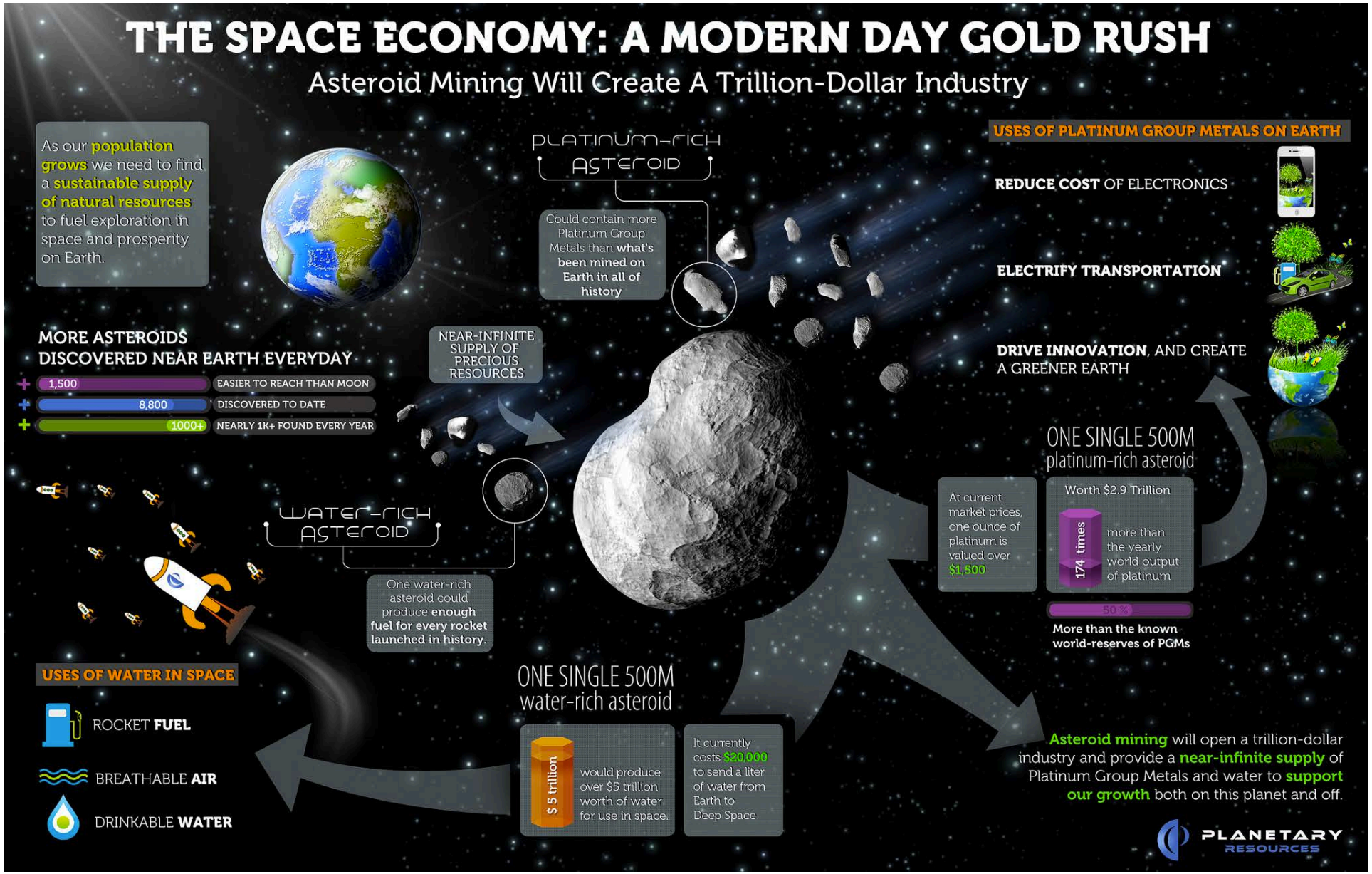
Self-driving Trucks May Be First to Arrive



The Coming Flood of Data from Autonomous Vehicles



Commercializing Outer Space



Space, the New Frontier

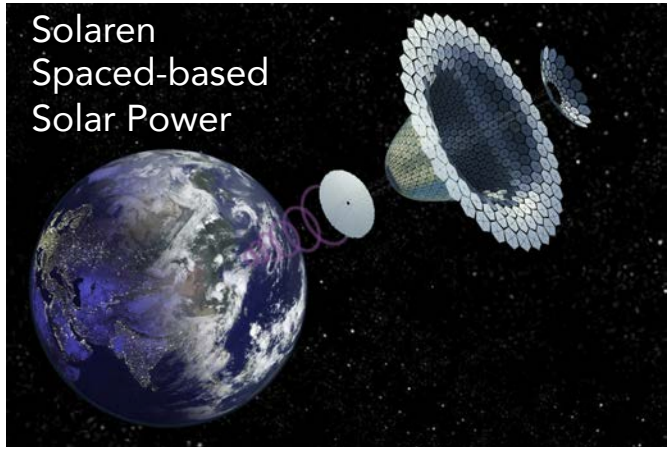


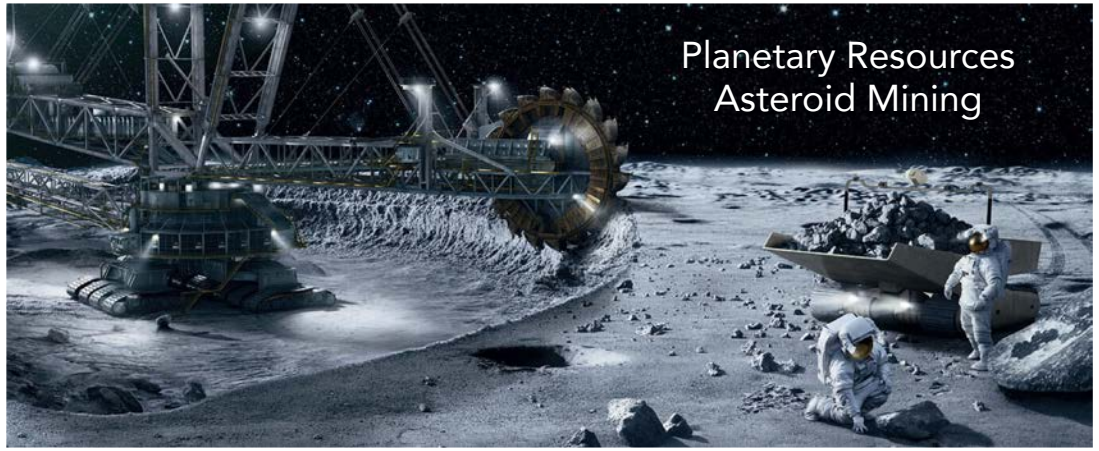












Sending 1 kg into space cost $9K to $43K today (private vs. government)

By 2030 the cost will be <$10/kg

This year (2019)…

- India becomes the 4th country to reach the moon, Israel the 5th
- First space tourists

Uber rich spacemen and space co's

- Richard Branson - Virgin Galactic
- Jeff Bezos - Blue Origin
- Paul Allen - Stratolaunch
- Elon Musk - SpaceX
- Peter Diamandis - PRI

Motivators….

- Multi-planetary species
- Back-up earth's biosphere
- Platinum group metals value of a typical asteroid is $2.9 trillion

EoT

Electrification of Transportation



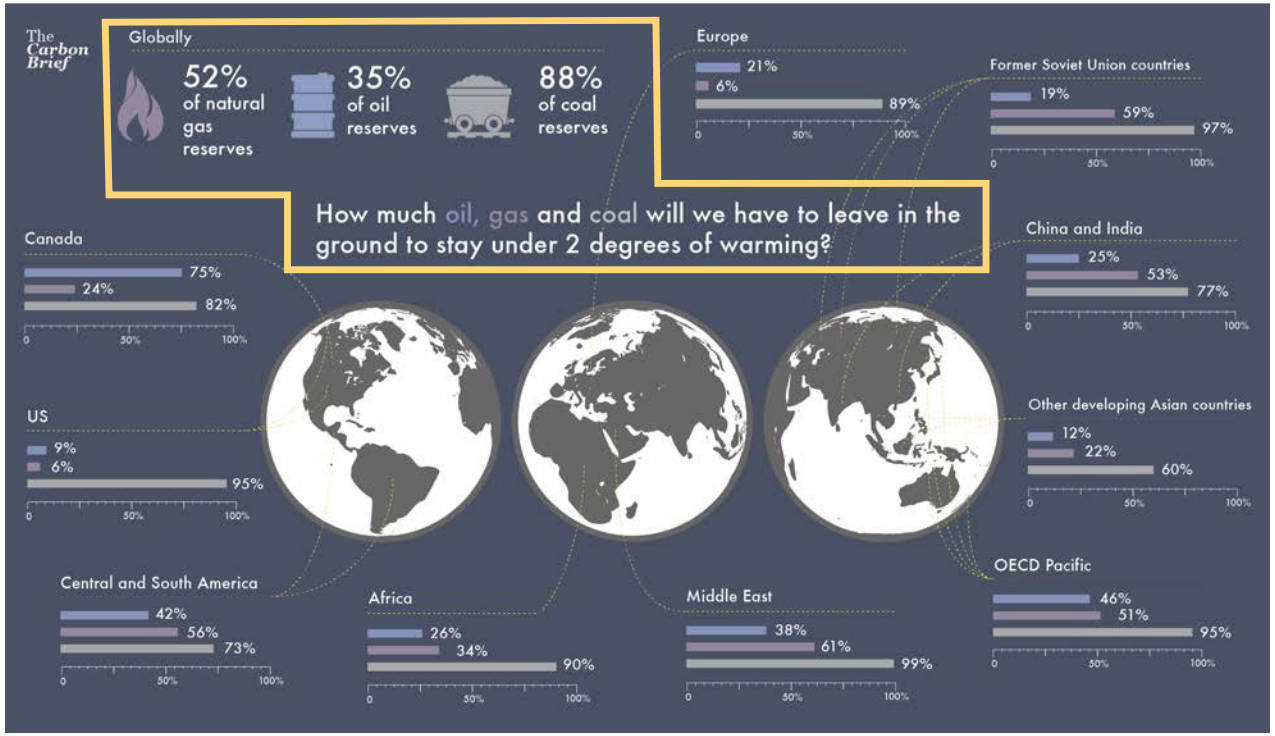
U.S. BEV Sales Grew 81% to 361,307 Vehicles in 2018

Source: InsideEVs

The Case for the Electric Vehicle







- Internal Combustion Engines (ICE) produce **16% of the world's man-made CO_2**
- Air pollution is linked to **5.5M deaths** globally per year
- Vehicle emissions kill more people in the U.K. than car accidents do
- CO_2 dissolves in ocean water causing acidification which is killing the coral reefs
- ICE's **convert 17 to 21% of stored energy** in gas into propulsion power
- Electric vehicles convert **59 to 62%** of grid electricity into propulsion power
- At current consumption rates, estimated 115 years of coal left and 50 years of oil and gas

EoT: An Idea 190 Years in the Making

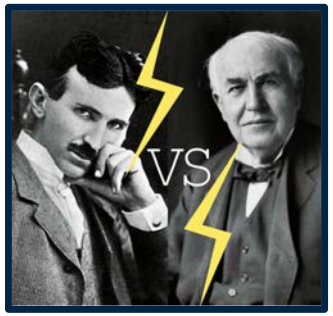
First Battery 1800



1st Electric Motor 1837



Battery Advancements



Electric Trolleys 1880's



Chicago's El 1890's



1st Electric Car 1891



Electric Cars Common in 1915



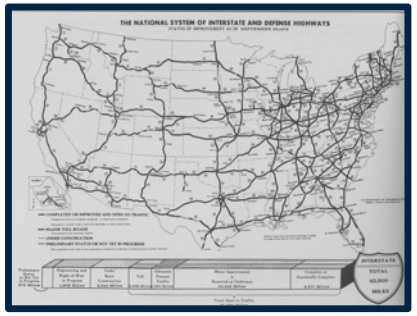
Mass-produced Ford Model T 1908



GM Rips Up Tracks 1940's



Interstate Highway 1956



Global Automakers are Investing +$300B in Electric Vehicles



95% of school buses in US run on diesel… ***there is no safe level of exposure to diesel exhaust for children***

'06 500K EV's WW
'18 1M EV's in US



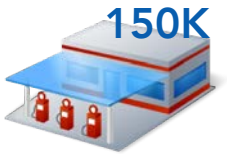




225 cars per pump
avg refueling <5 min

Today, electric cars and buses are displacing 280K barrels of oil per day – equivalent of what Greece consumes in one day







Oil use for cars peaks mid 2020's at the latest



Displaced per day by EV cars in **2040**

TESLA
MODEL 3

Tesla Model 3 is now more popular than the entry-level offerings of Audi, BMW and Mercedes combined

Charging , the Fuel that Drives EV Acceleration





bp "BP buys Charge Master – 6,500 charging stations in the U.K."

"Shell partners with Ionity to install 30,000 chargers in Shell stations across Europe"

"VW subsidiary, ElectricfyAmerica, to spend $2B installing fast EV charging stations in the U.S."

"PG&E to install 7,500 EV charging stations at apartment and office buildings in California"

"BMW, Porsche Reveal Prototype EV Fast Charger That Gives 62 Miles of Range in 3 Minutes"

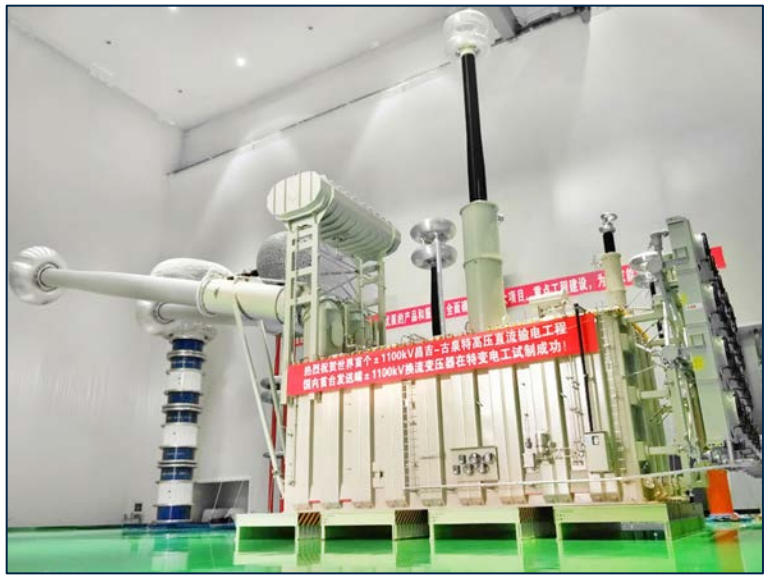
The power grid isn't ready...
60,000 EV's in Texas (0.25% of annual vehicle registrations) simultaneously doing a fast recharge (100Kw in 5 min) would consume 72 gigawatts which is equal to today's peak consumption

1M plug-in ev's in the U.S. in 2018 (of 156M) and 16K charging stations

GTM Research sees **40 Million EV charging stations and a $18.64B infrastructure market size worldwide by 2030**

IEA (International Energy Agency) predicts that there could be **220M EV cars on the road worldwide by 2030**... about 10% of the total car population

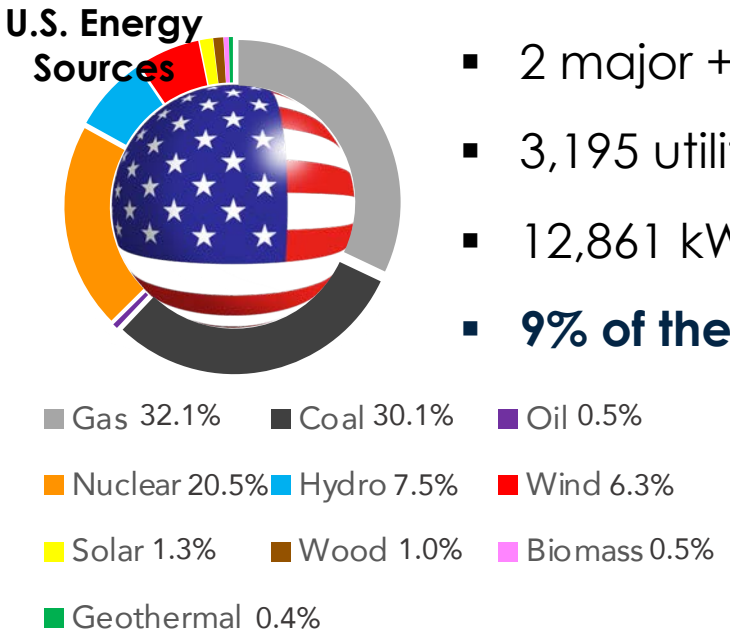
EV's and the Power Grid: A Chicken and Egg Story





- The **State Grid Corporation of China** has energized it's most powerful line using solar and wind power
- 1.1M volt **direct current** that sets world record for voltage, distance and power can transmit **12 gigawatts** at **97% efficiency**
- Equivalent of 25,000 train loads of coal





- 2 major + 2 minor grids that are **90% efficient**
- 3,195 utilities: <1,000 generate power
- 12,861 kWh annual energy usage per person
- **9% of the US GDP spent on energy**

- **63% of energy on the grid comes from fossil fuels**
- 37% comes from renewables

Whether it Floats, Flies or Rolls it will be Electric















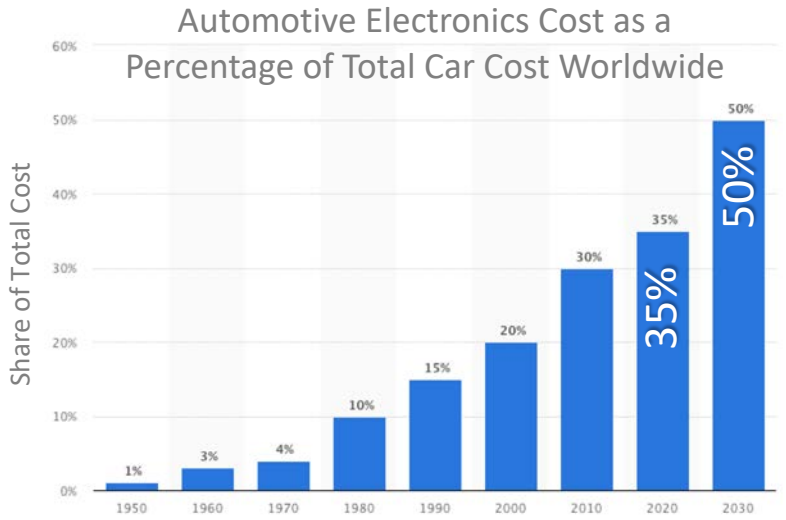












+30% Autonomous Vehicles:
Lidar, V2V Comm, Infotainment

+20% Electric Vehicles:
HP Connectors & Relays, Filters, Caps

+10% Advanced Driver Assist:
Cameras, Sensors, GPUs, Motors

Baseline Electronics:
Navigation, Radio, Back-up Camera

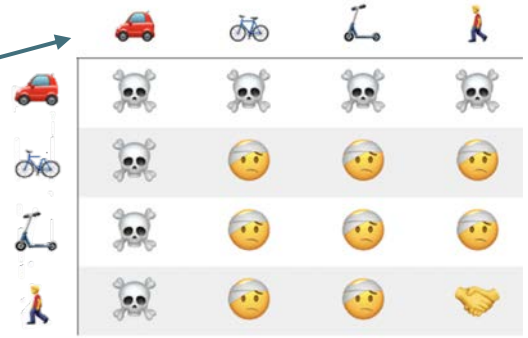
eMicromobility is Transforming City Life



OSLO NORWAY CITY CENTRE

- 6.9B hours wasted in U.S. traffic each year, burning an extra 3.1B gallons of gas at a congestion cost of $160B
- This is equal to 9K lives, 0.8% of GDP and 2.1% of gas consumption in the U.S.
- Sub 2 mile trips make up 50% of urban rides
- Space dedicated to parking in LA is 4X the size of Manhattan
- Gas engine are 35% efficient – only 5% of energy produced moves passengers
- For every gallon of gas only 2 oz used for people propulsion
- e Scooters convert 85% of energy into movement and weigh only 30 lbs creating a 70% energy efficiency
- 15 e Scooters can park in the space of 1 car

WHEN THIS
RUNS INTO THAT



The Flying Electric Car is Just (Over) Ahead



2020 "MILESTONES"

Uber trials in Dallas and L.A.
Toyota flying taxis at Olympics
Primary taxi service in Dubai







Scenes from the Future



The Future of Food



Urban Vertical Farms to Feed the Megacities







MEGATRENDS

7.3B CURRENT POPULATION

9.0B 2050 POPULATION
1st BILLION was 1804



CLIMATE CHANGE

842M PEOPLE LIVING WITH HUNGER

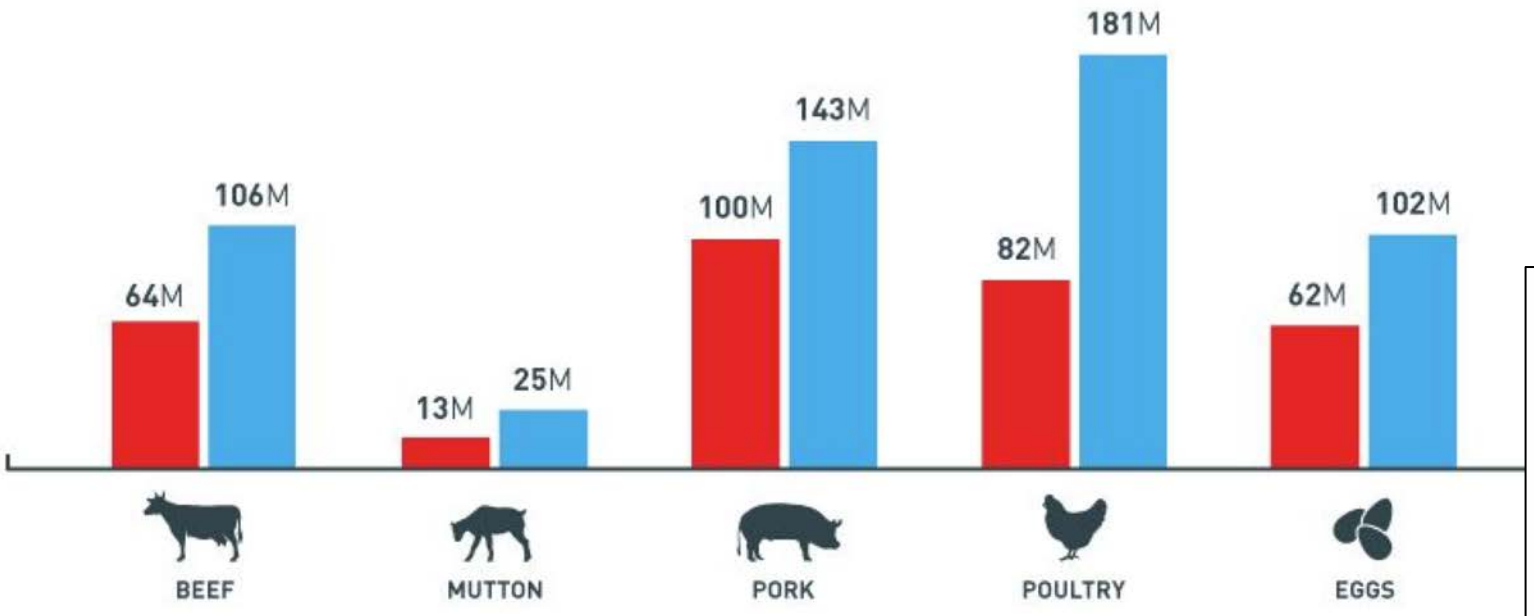
68% GLOBAL POP IN MEGACITIES



WATER SCARCITY

Protein: Animal vs. Synthetic

GLOBAL DEMAND FOR MEAT : 2005 vs. 2050 in TONS



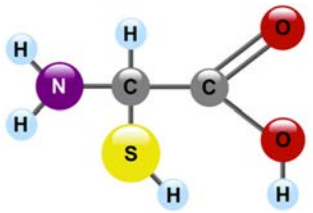
Source: Food and Agriculture Organization of the United Nations, ESA Working Paper No. 12-03, p. 131







- Today, land for food animals is *2X that of crops*
- Food animals account for *more greenhouse gases globally than cars* – **22.7B chickens**, **1.5B cows**, **770M** pigs on the planet right now



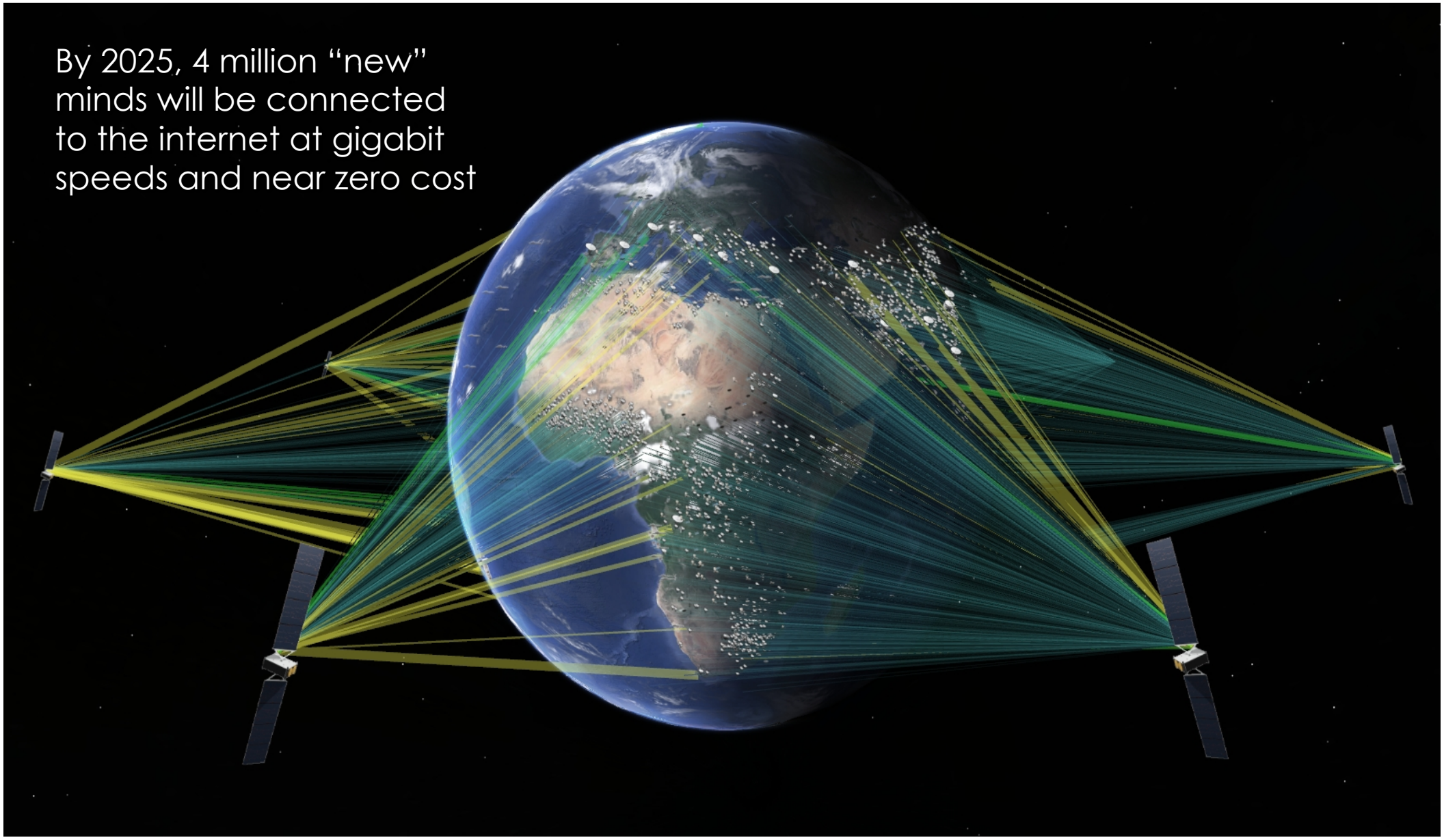
Protein Molecule

Scenes from the Future

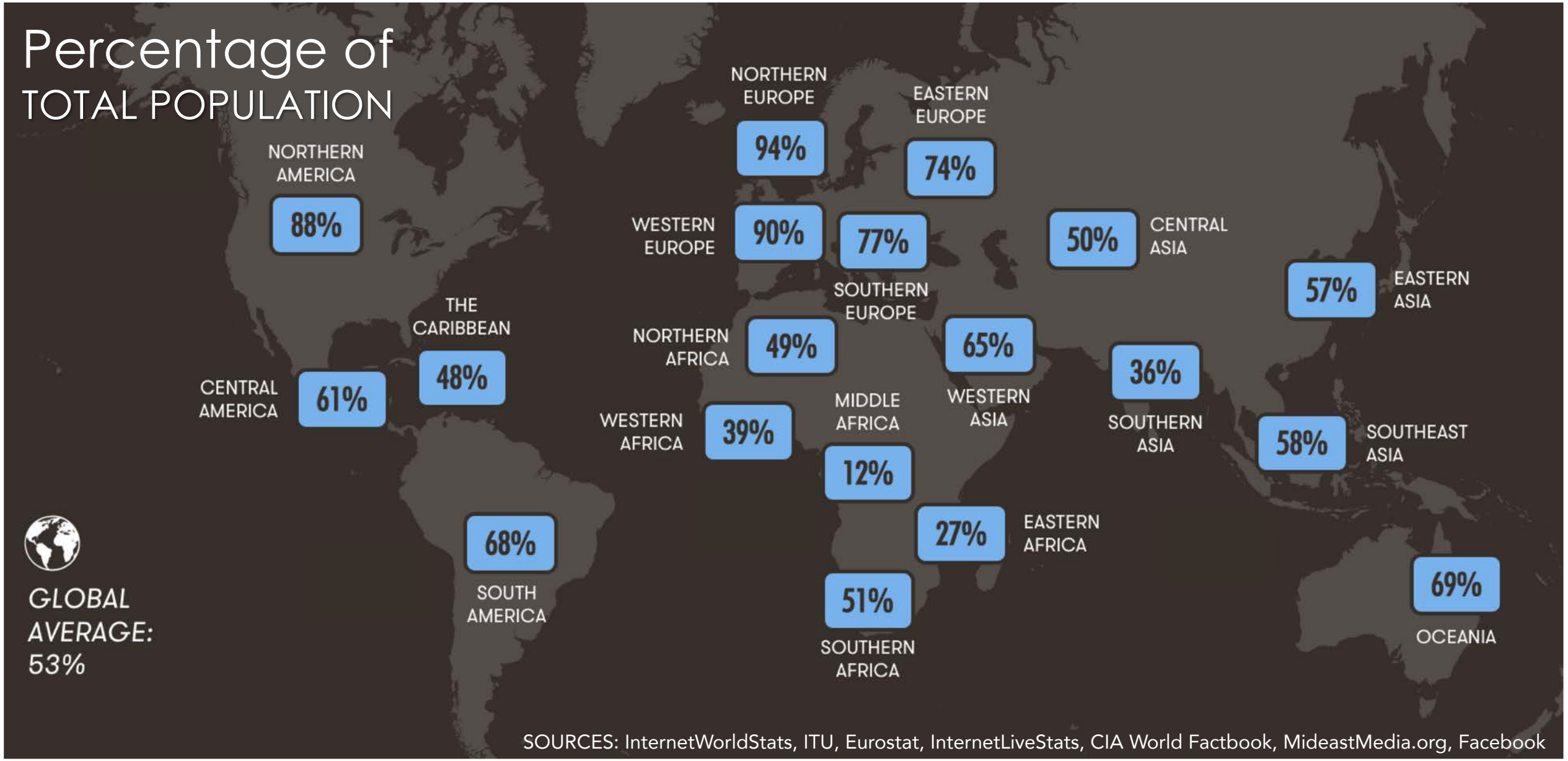


Global Connectivity

By 2025, 4 million “new” minds will be connected to the internet at gigabit speeds and near zero cost



Internet Penetration by Region : 2018

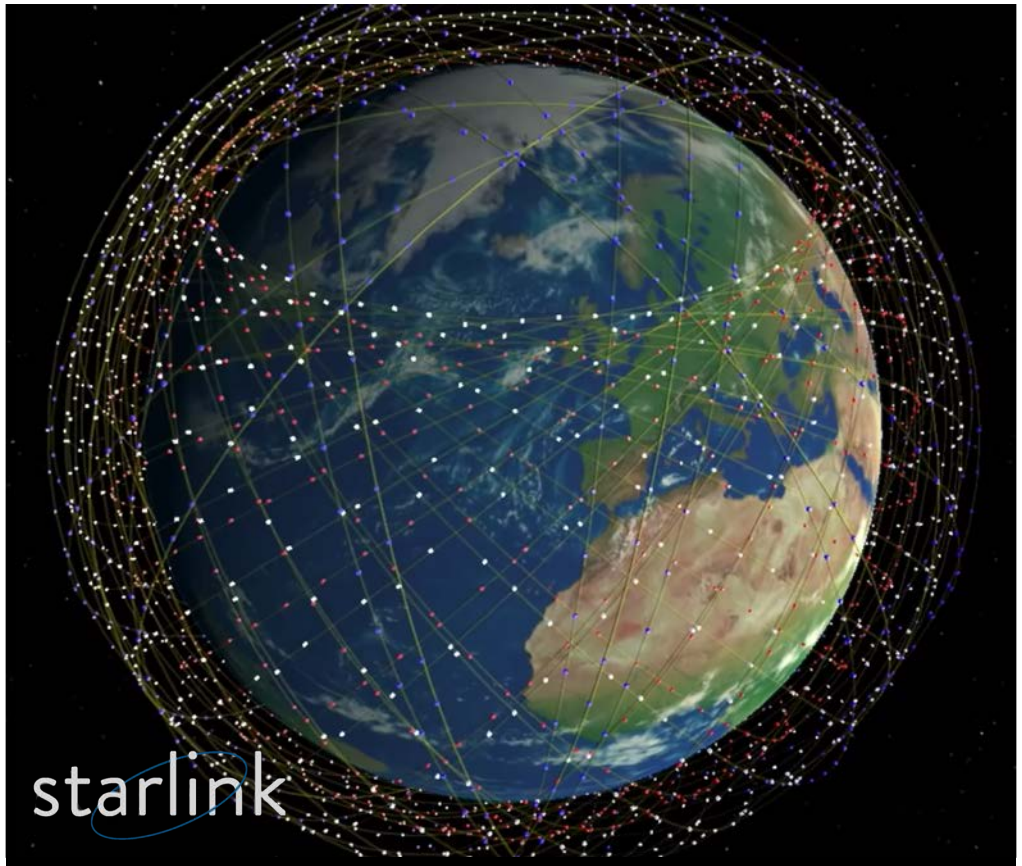


SOURCES: InternetWorldStats, ITU, Eurostat, InternetLiveStats, CIA World Factbook, MideastMedia.org, Facebook

The Tech Behind the Coming Global Network

Project Loon balloons float in the stratosphere, twice as high as airplanes and the weather. In the stratosphere, there are many layers of wind, and each layer of wind varies in direction and speed. Loon balloons go where they're needed by rising or descending into a layer of wind blowing in the desired direction of travel. By partnering with telecom companies to share cellular spectrum users are able to connect to the balloon network directly from their phones and other LTE-enabled devices. The signal is then passed across the balloon network and back down to the global Internet on Earth.





Starlink is a SpaceX satellite constellation intended to provide low-cost, high-performance, global space based internet connectivity. SpaceX has received FCC approval to deploy 11,943 broadband satellites. They will reside in low earth orbit and cost around $10 billion in total.

The Terrestrial 5G Ecosystem

Experts say that there will be over 75 billion connected devices by 2025, and most will use wireless networks. 4G simply won't be able to keep up. TE is enabling the next level of connectivity with solutions that support speeds up to 100 times those of 4G networks. With broader bandwidth and super-low latency, 5G will be integrated into infrastructure, connecting your devices to the world around you with greater speed and reliability.

Because of 5G's greatly expanded bandwidth, users will be able to download, upload, and access huge amounts of data. Virtual and augmented reality, connected cars, and smarter cities will all be possible—and reliable—with 5G.

Ruggedized (FullAXS connectors & RF)



Antennas & RF



5G EDGE COMPUTING will provide greater capacity, lower latency, more mobility and accuracy, and increased reliability and availability.

CLOUD COMPUTING will bring the efficiency and power of enormous data centers to even the most compact of 5G devices, enabling artificial intelligence and machine learning.

EDGE DEVICES will enable a complete ecosystem of interactive edge devices from smart home controls to vertical horticulture and from cellphones to connected streetlights.



Infrastructure market value to grow at a 50% CAGR from $1.3B in 2018 to $22.5B by 2025



Antennas, Sensors and USB Type-C Connectors

5G SMALL CELLS small cell technology is optimized for short-range, data-rich applications. Small cells are essentially miniaturized cell towers (think the size of a wifi router) for use in urban areas dense with edge devices using high amounts of data. Small cells will play a critical role in the infrastructure and roll-out of 5G networks.

5G ANTENNAS will distribute data with innovative techniques like beamforming and MIMO, allowing 5G networks to be reliable and scalable.Small cell and edge computing processes will further enhance network performance.



High-Speed

Source: TE Connectivity

Launching for homes & businesses in 2020

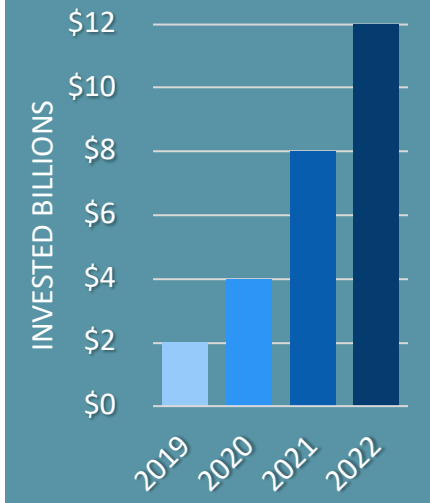
20M to 200M connections by 2021

Lead by U.S., China, Japan & South Korea

4G LTE vs 5G

Latency (ms): 85 vs 10
Peak (Gb/sec): 1 vs 20
Avg (Mb/sec): 10 vs 100

WW CapEx Spending



Scenes from the Future

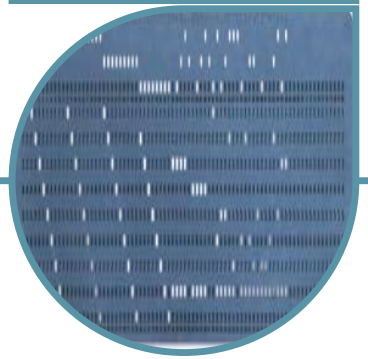


Evolution of Human Machine Interfaces

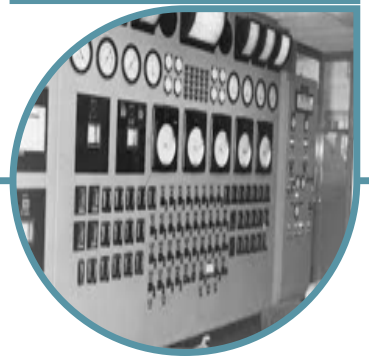


Machine Interface Becomes More Natural

PUNCH CARD



CONTROL PANEL



KEYBOARD



MOUSE



TOUCH PAD



STYLUS



TOUCH SCREEN



VOICE CONTROL



GESTURE



MIND CONTROL

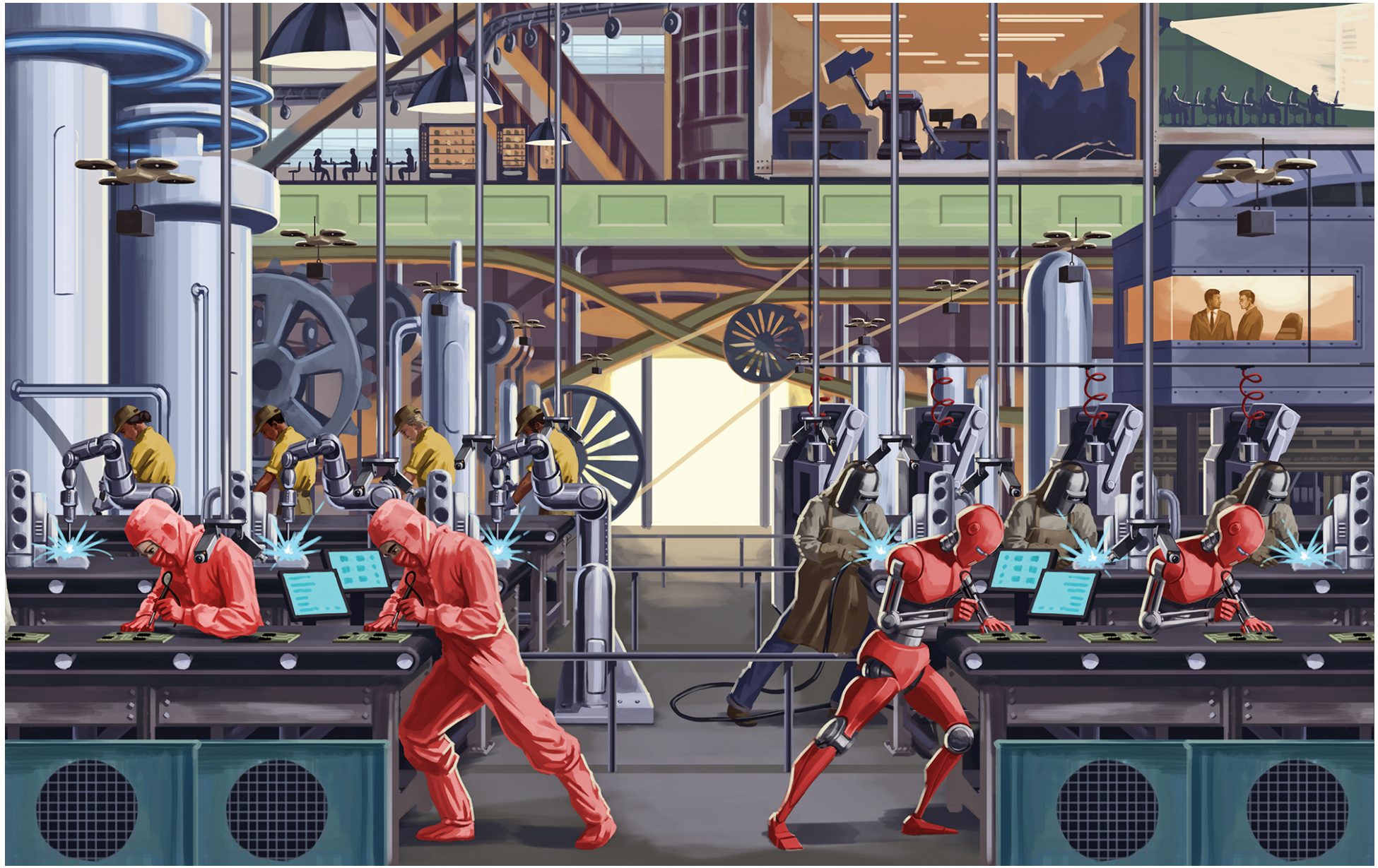


Voice Control Capability Will Drive a Massive Wave of Electronic Systems Replacement

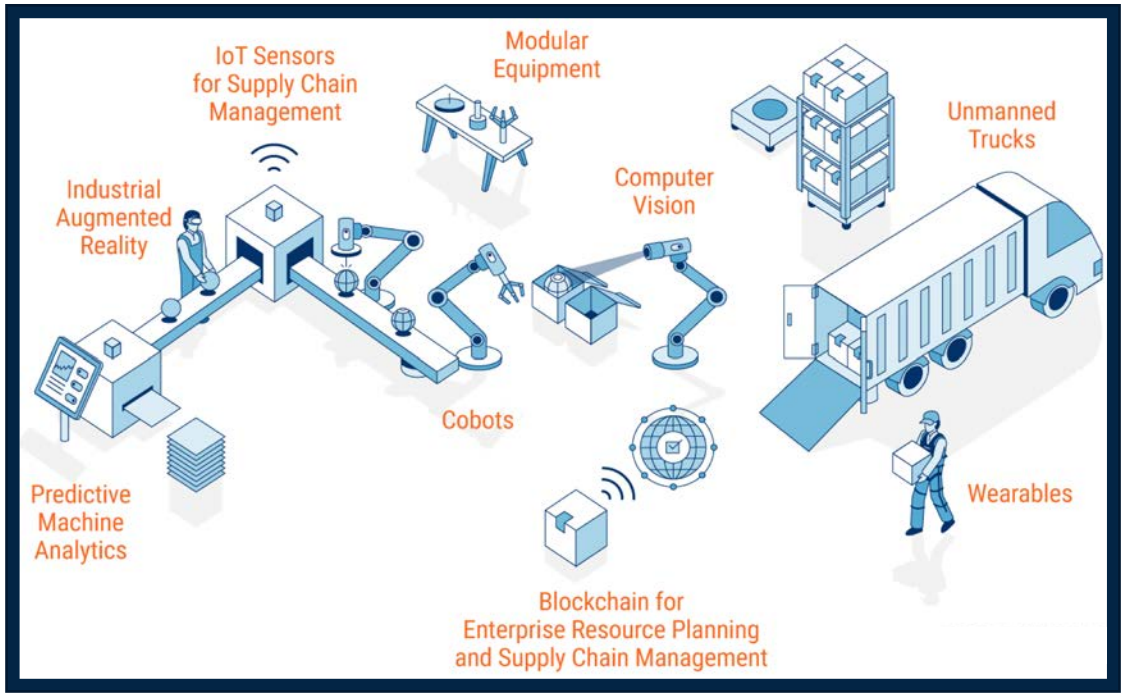
Scenes from the Future

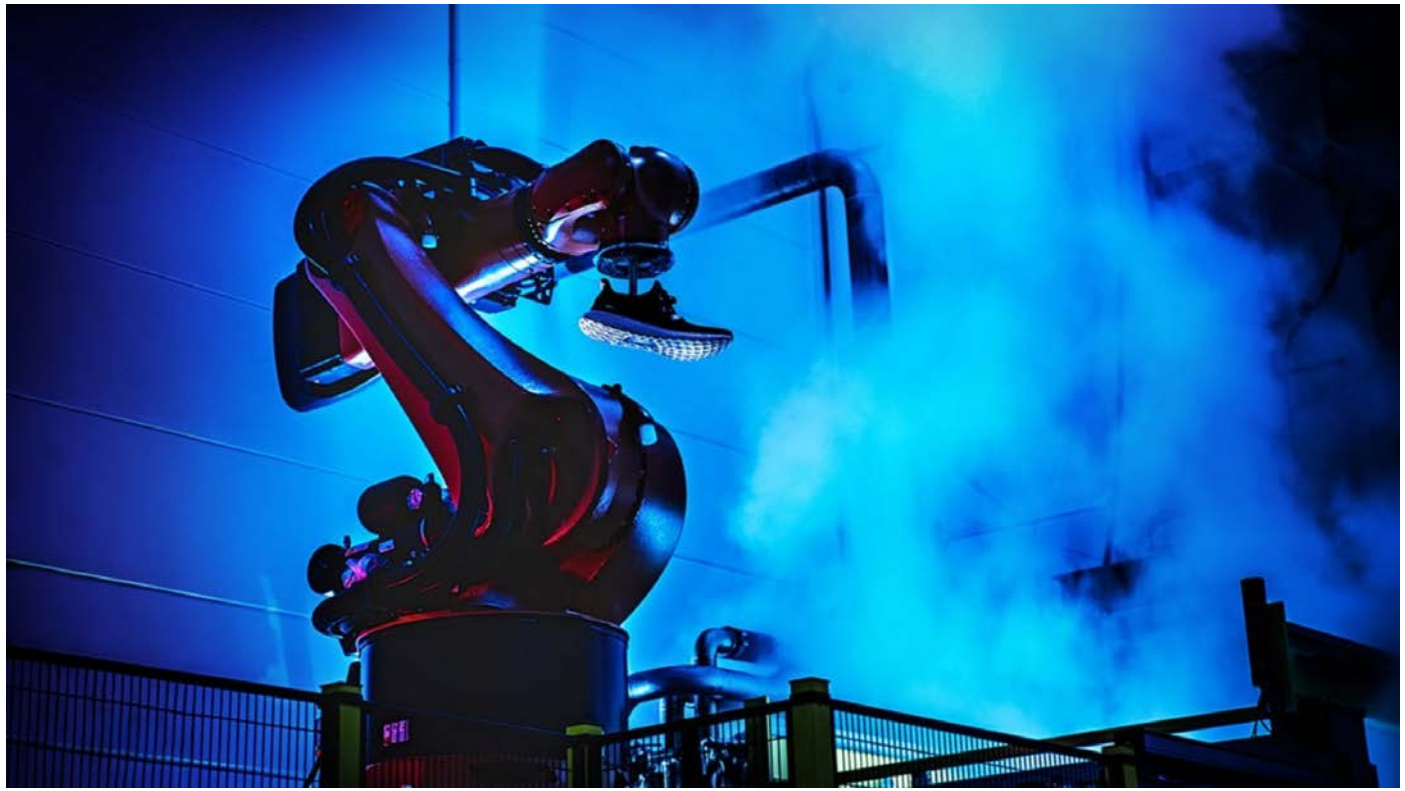


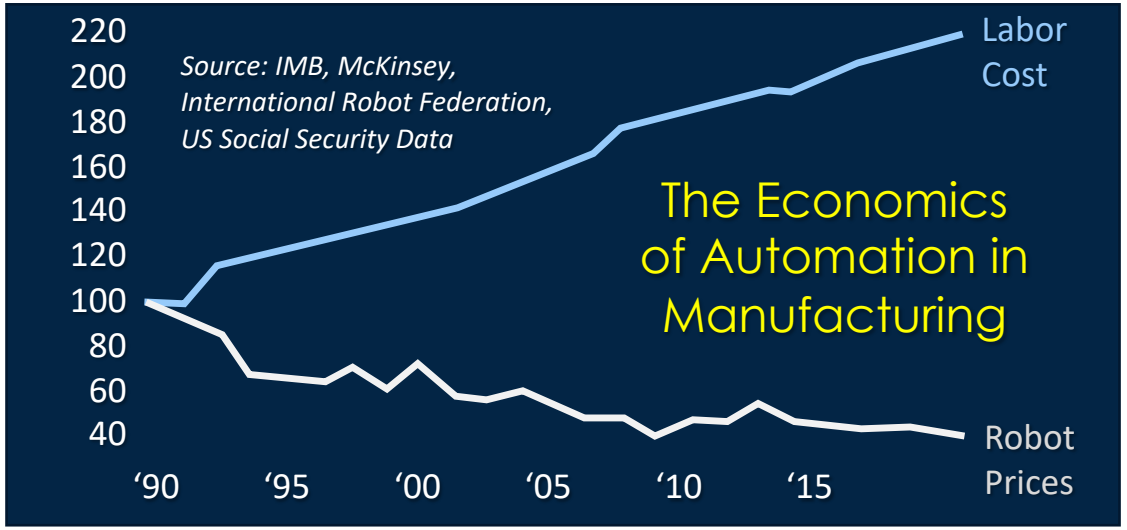
Industry 4.0



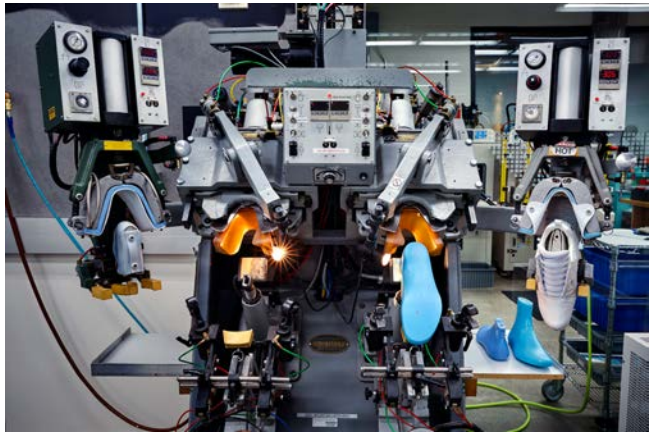
The Factory of the Future is Here











Scenes from the Future



MedTech



MedTech in the Operating Room & Patient



Medtronic superDimension™ System
lung cancer diagnosis, staging and treatment

SMART SURGERY

User Interface

Presenting data to surgeons and surgical staff. Includes overlay on existing displays, customised specialised displays and augmented reality displays in the field of view. Clarity of actionable data is key in the Smart Surgical setting. The User Interface needs to be able to present context specific information that changes based on the surgical workflow. To ensure consistent interpretation and provide clinician in-loop information for example through image overlay on surgical consoles, visualisation tools and haptics. AR tools are increasingly providing richer, context specific information.

Data Management

Aggregating and managing data efficiently. This can be either 'top down' (central, local or cloud-based EMR) or 'bottom up', (personal health record, maintained by the individual). Data Management is predominately local to the surgical setting, and will increasingly take advantage of cloud computing infrastructure as a service.

Smart Surgery

Sensing

Sensing technologies capturing data from the surgeon and the patient to inform decision making in theatre and the OR. Surgical tool-based sensors, imaging systems, patient condition monitoring, position sensing and voice as a user interface combine with manual inputs to provide an information rich surgical environment. Imaging systems provide additional data from the surgical field allowing identification of critical structures, discrimination of tumour tissue and assessment of physiological parameters.

Analytics

Making complex datasets actionable. Analytics can abstract complex aggregated data to help surgical staff to rapidly absorb relevant information and act upon it. Real-time data from the Sensing can be combined with pre-determined intelligence, such as rules-based algorithms and safety limit parameters. Analytics could also be undertaken remotely via cloud computing using Machine Learning to provide assistive guidance to the surgical staff. Analytics is key to presenting actionable data to the User Interface simply and dynamically.

Connectivity

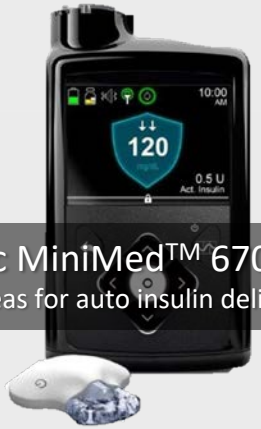
A range of wireless connectivity choices combine with both physical wires and interfaces to enable the elements of the end-to-end system to talk to each other. The surgical staff need always on, pairing free, high integrity connectivity, often in a dense radio environment which is heavily regulated.



Boston Scientific Vercise™ DBS
deep brain stimulation for parkinson's control



Oticon Medical Neuro One
wireless cochlear implant for deafness



Medtronic MiniMed™ 670G
artificial pancreas for auto insulin delivery

Life Sustaining Medical Robots









Medical Robots Perform **+300K Surgeries Per Year** and More Than **4M to Date**

2020 Surgical Robot Sales Forecasted at **$17B** – Joints, Brains, Eyes, Hearts

Exponential Medical Advancement



Illumina NovaSeq 600

Genome sequencing cost will soon be fast and cheap

Today sub $1K

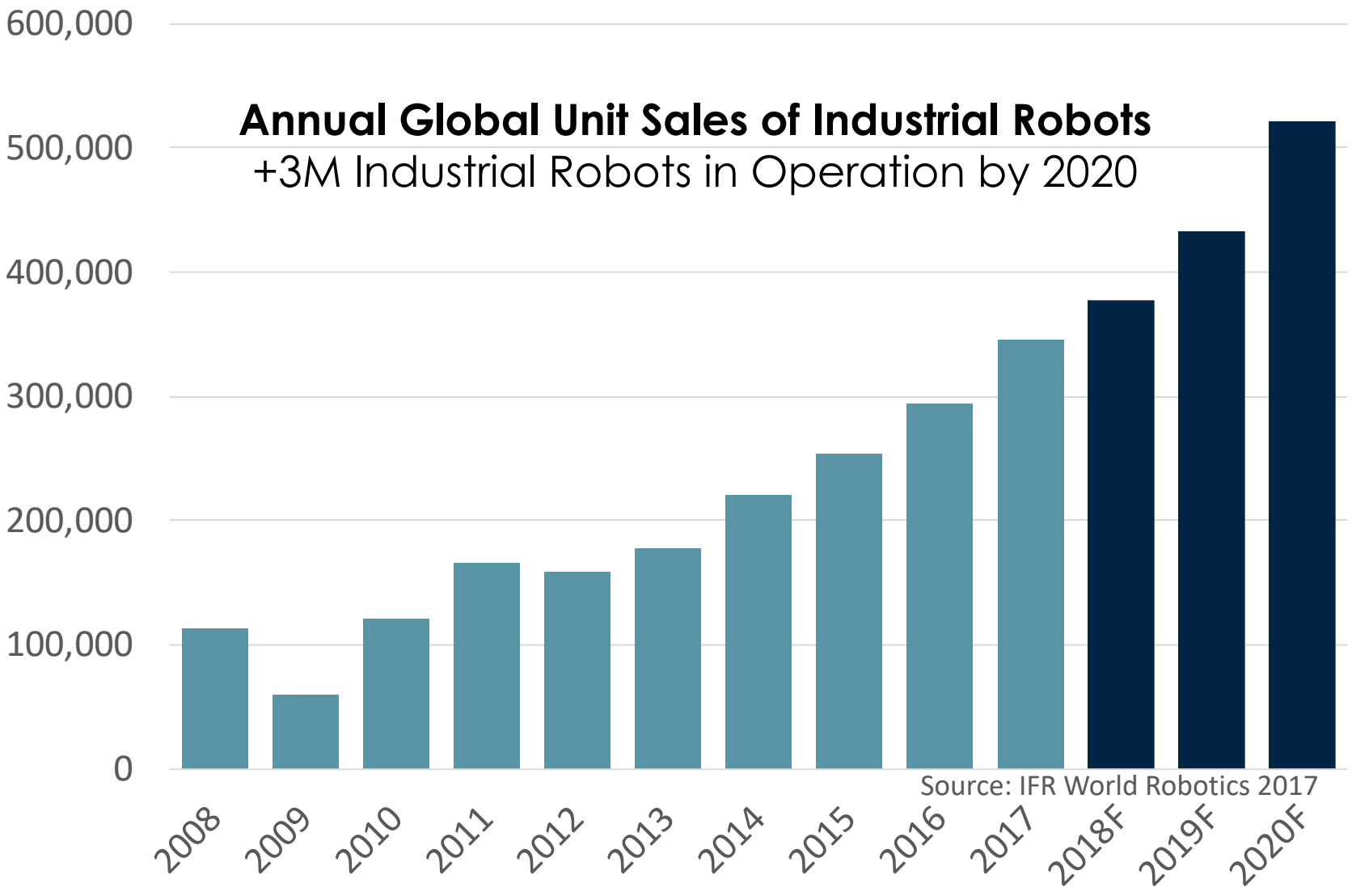
Soon to be sub $100

This transforms sick care into health care

Robotics



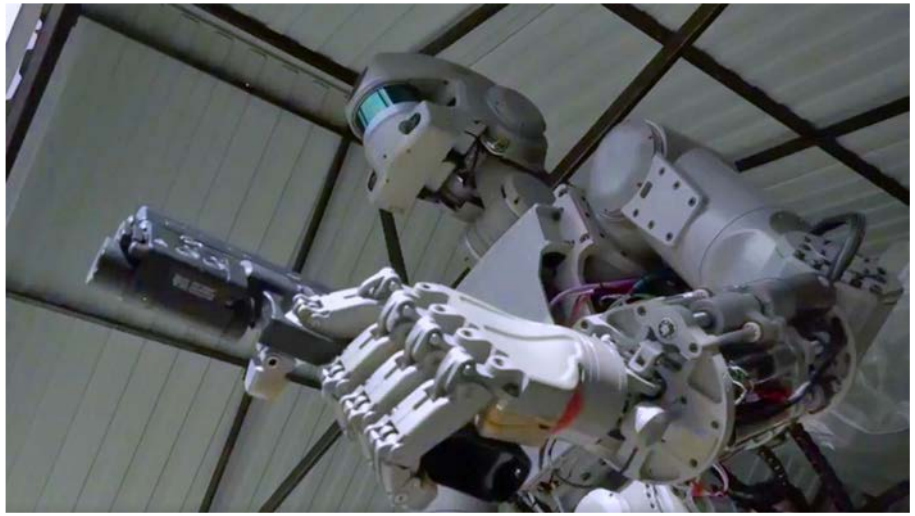
Job-killing Industrial Robotics

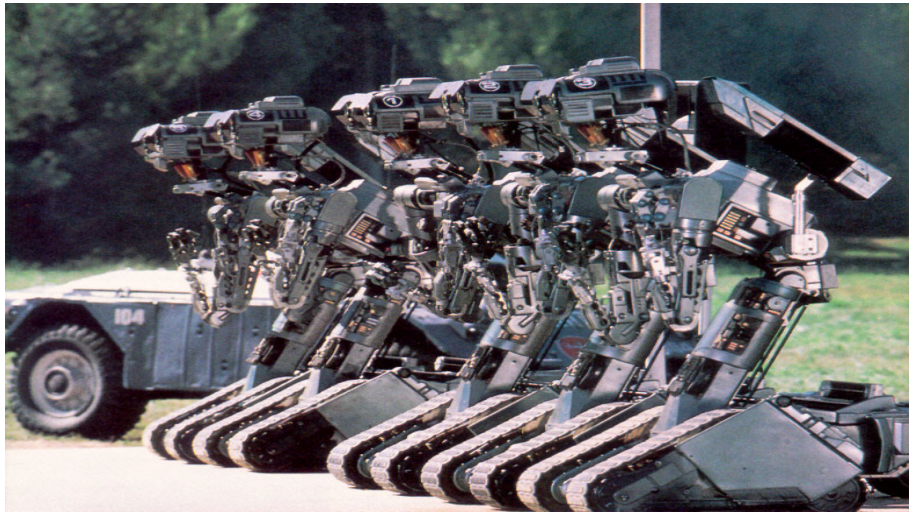


- China is the world leader in robot implementation with 1/3rd of all industrial robots at work in their factories
- Robots per 10,000 workers to increase 400% by 2020
- By 2020, 45% of newly installed industrial robots will be equipped with at least one of the intelligent features: predictive analytics, health condition awareness, self-diagnosis, peer learning, or autonomous cognition
- 87% of manufacturing job loss in U.S. due to automation
- Over next 15 years, 38% of all current jobs in the U.S. could be replaced by automation

Q: *If people don't have jobs, how do they purchase the things made by robots?*

Life Taking Military Robots











Life Enhancing Humanoid Robots



Assistants and companions in…













public spaces,

homes, hospitals and hotels



Global Personal Robot Market

2017: $10.4B

2020: $18.9B

2023: $28B - $35B

Taking the Robot out of the Human

Robotic Process Automation (RPA)

RPA IS:



Configurations that automate manual, repeatable tasks



Algorithms that solve specific problems

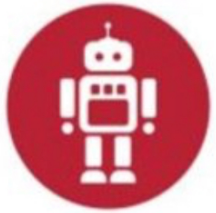


Software 'robots' that plug into and access existing business software



Workflow enabled interaction

RPA ISN'T:



A humanoid robot



Something that can entirely replace humans



Something that replicates human cognitive functions … *yet*



Purely just another 'cost play'

The Future of Commerce is Increasingly

Autonomous Systems Doing Business With Each Other

- Marketplace models allow everyone to manage their own preferences and requirements
- Incentives and goals shape the behavior of the participants and help drive them toward the same overall productivity targets
- Marketplace models also allow enterprises to smoothly blend internal and external resources
- Some participants are machines, some are people, some are based on rules, some are based on artificial intelligence

Source: PwC and E&Y

Scenes from the Future

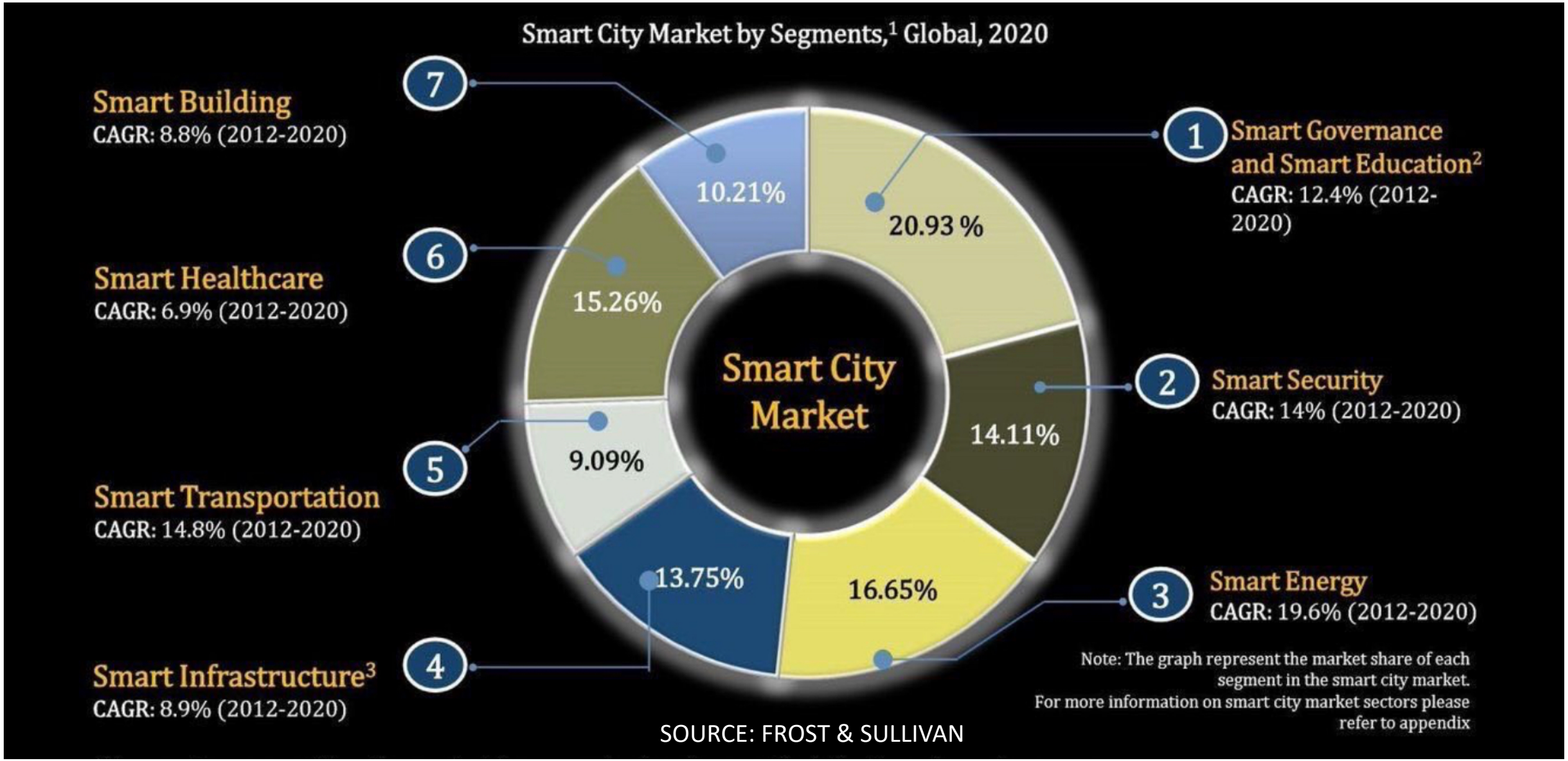




Smart Cities



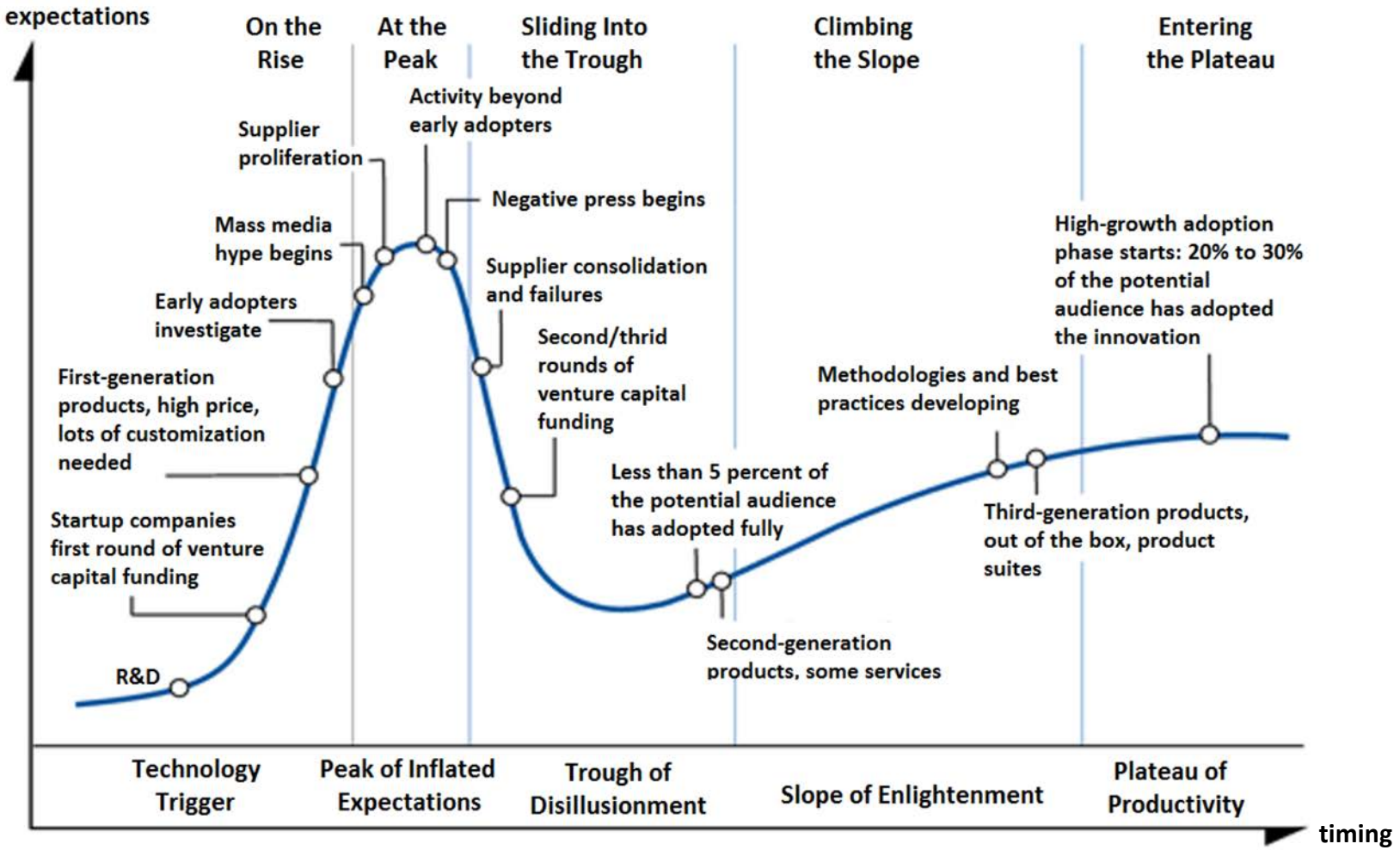
Smart City Market Value $1.5T in 2020



SOURCE: FROST & SULLIVAN

Technology Adoption Cycle

Never as Fast as Expected



"We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run." - *Roy Amara*

Scenes from the Future



knight@tti_marketeye

translating tech trends on twitter