Auditing Next Generation Technologies

Disruptive Technology and the Auditor

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BerryDunn LLC.

Objectives

- Provoke thought and discussion
- Look at technologies that we can relate to everyday
- How will these technologies impact me and my family?
- How will these technologies impact my work today and the future?
- What opportunities exist?
- What are our responsibilities?

Overview

- Strategic technology trends have significant potential to create and respond to disruption and to power both transformation and optimization initiatives.
- Artificial intelligence (AI) is a foundational catalyst for advanced process automation and human augmentation and engagement.
- Physical environments including factories, offices and cities will become “smart spaces” within which people will interact through multiple touchpoints and sensory channels for an increasingly ambient experience.
- Dealing with privacy, digital ethics and security challenges generated by AI, the Internet of Things (IoT)/edge, and other evolving technologies will become critical to maintain trust and avoid legal entanglements.

ATTENDANCE CHECK

Technology Drivers

Solutions looking for a problem!

- Cloud Technology
  - IoT
  - Augmented Reality
  - Virtual Reality
  - Blockchain
  - Artificial Intelligence
  - 3D Printing
  - Drones
  - Robots

Annual Digital Growth (2018-2019)

TOTAL POPULATION	UNIQUE MOBILE USERS	INTERNET USERS	ACTIVE SOCIAL MEDIA USERS	MOBILE SOCIAL MEDIA USERS
				
+1.1%	**+2.0 %**	**+9.1%**	**+9.0%**	**+10%**
+84 MILLION	**+100 MILLION**	**+367 MILLION**	**+288 MILLION**	**+297 MILLION**

The Digital World Around You (2019)

TOTAL POPULATION	UNIQUE MOBILE USERS	INTERNET USERS	ACTIVE SOCIAL MEDIA USERS	MOBILE SOCIAL MEDIA USERS
				
7.676 BILLION	**5.112 BILLION**	**4.388 BILLION**	**3.484 BILLION**	**3.256 BILLION**
URBANIZATION:	PENETRATION:	PENETRATION:	PENETRATION:	PENETRATION:
56%	**67%**	**57%**	**45%**	**42%**


Shanghai, China
1987

Shanghai, China

2013

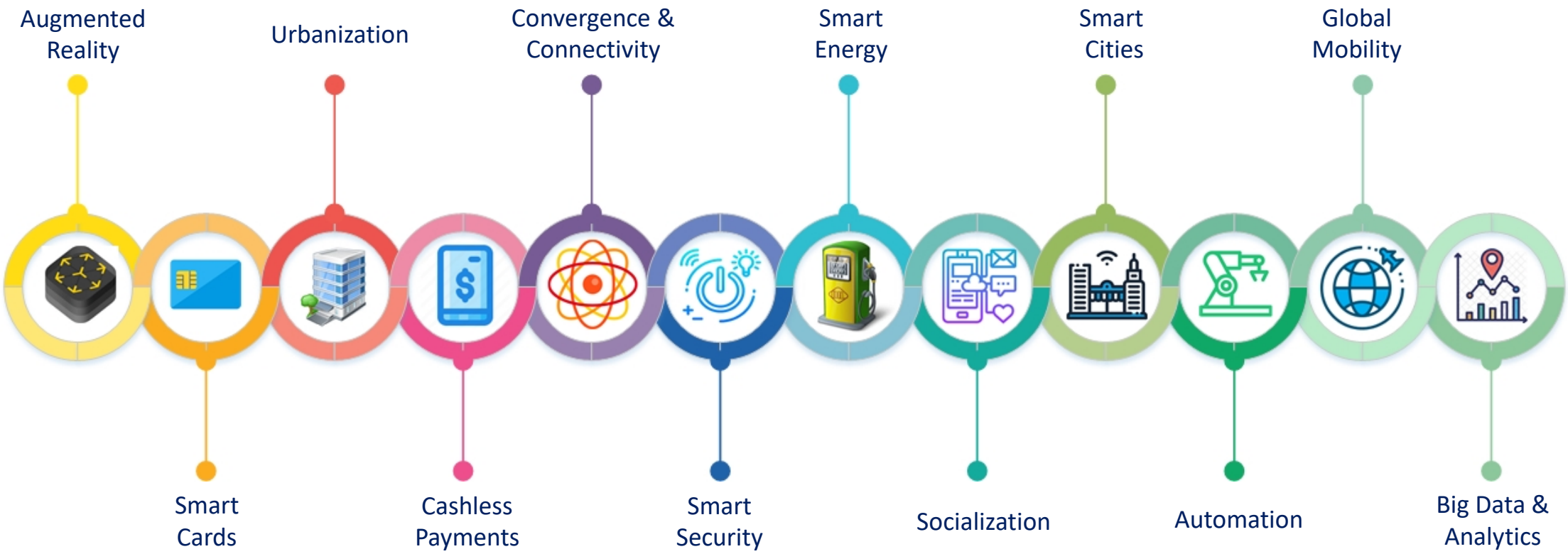

Dubai, UAE
1990

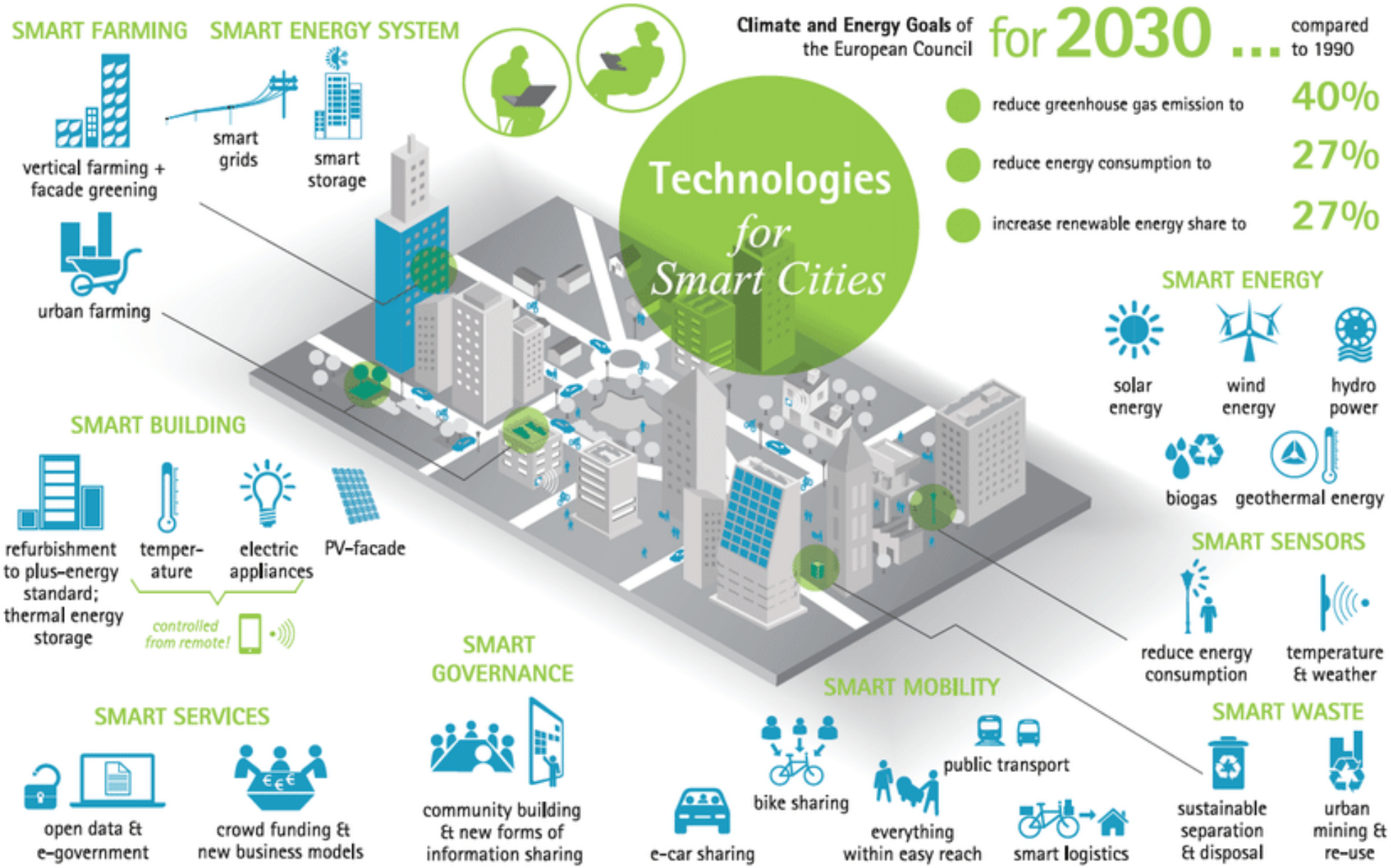

Dubai, UAE
2015


Nashville, USA
1975


Nashville, USA
2020

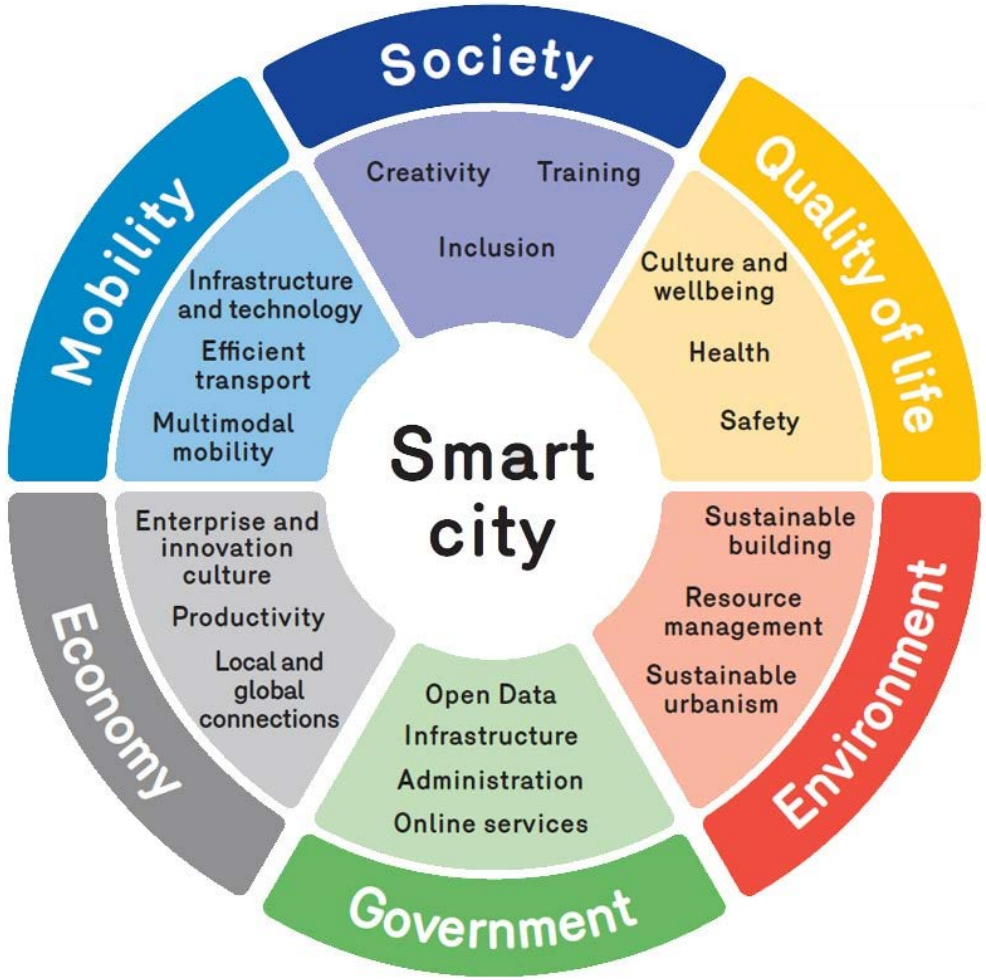
Mega Trends


Augmented Reality
Urbanization
Convergence & Connectivity
Smart Energy
Smart Cities
Global Mobility
Smart Cards
Cashless Payments
Smart Security
Socialization
Automation
Big Data & Analytics


SMART FARMING
SMART ENERGY SYSTEM
vertical farming + facade greening
smart grids
smart storage
urban farming
Technologies for Smart Cities
Climate and Energy Goals of the European Council for 2030 ... compared to 1990
reduce greenhouse gas emission to 40%
reduce energy consumption to 27%
increase renewable energy share to 27%
SMART ENERGY
solar energy
wind energy
hydro power
biogas
geothermal energy
SMART BUILDING
refurbishment to plus-energy standard; thermal energy storage
temper-ature
electric appliances
PV-facade
controlled from remote!
SMART SENSORS
reduce energy consumption
temperature & weather
SMART SERVICES
open data & e-government
crowd funding & new business models
SMART GOVERNANCE
community building & new forms of information sharing
SMART MOBILITY
bike sharing
public transport
e-car sharing
everything within easy reach
smart logistics
SMART WASTE
sustainable separation & disposal
urban mining & re-use

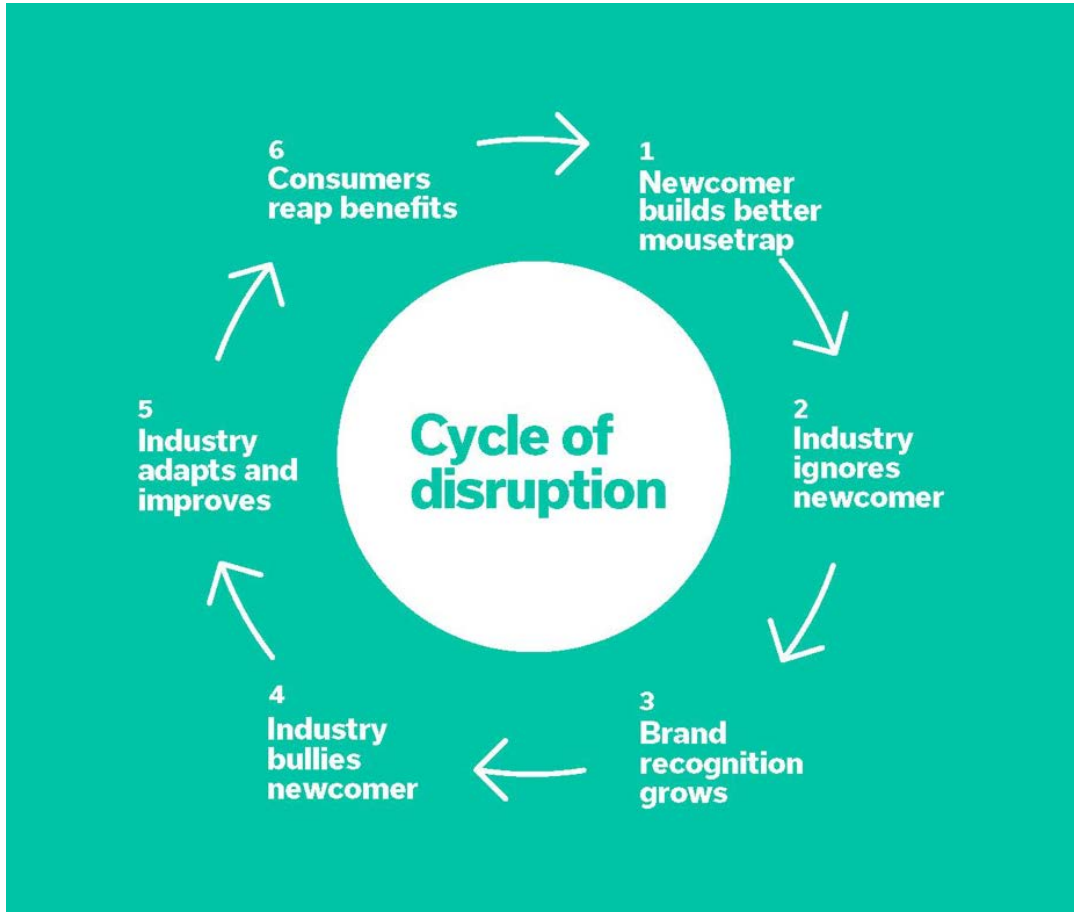
The Promise of Technology

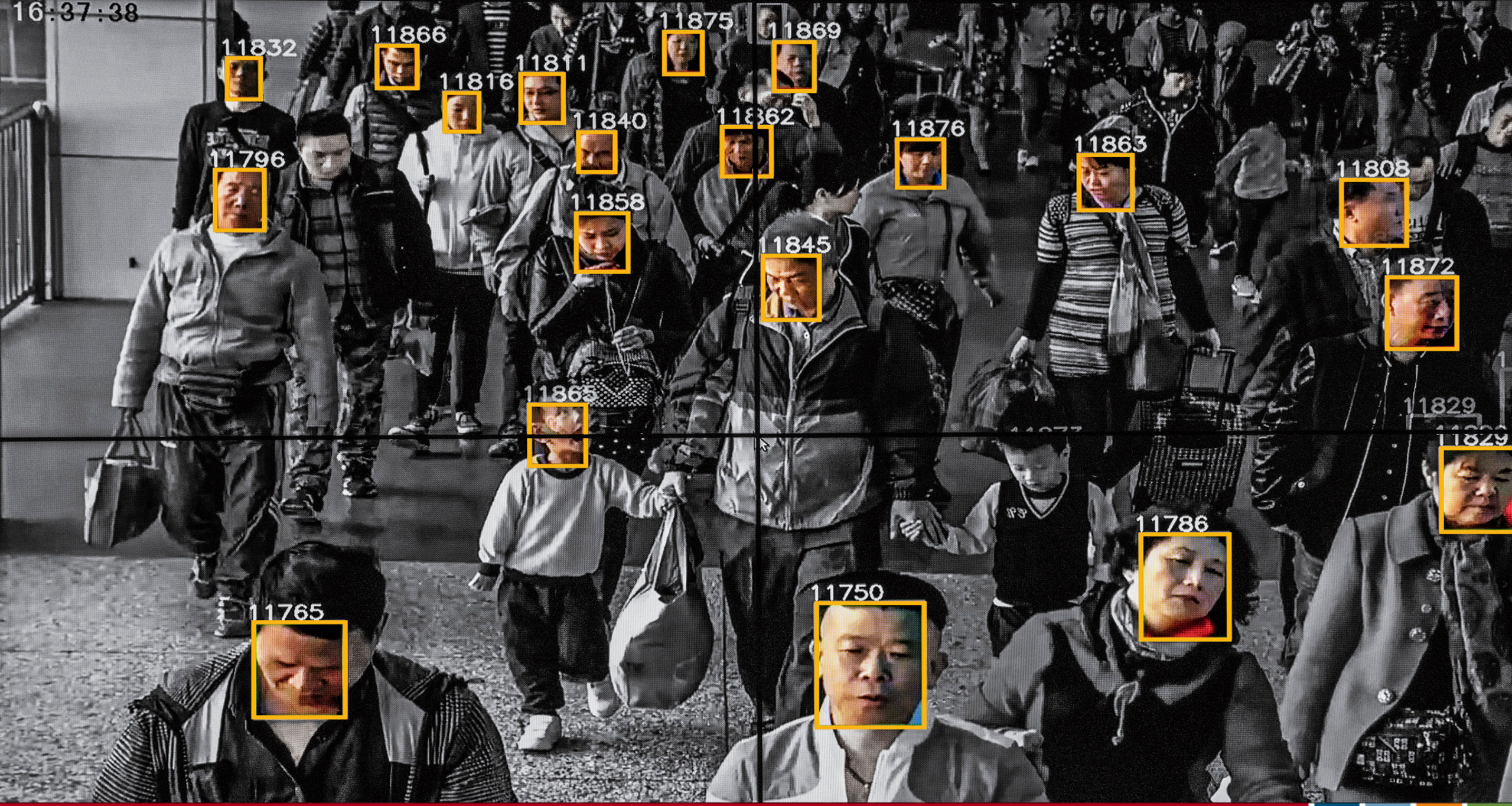
- Make government efficient
- Save money
- Transparency
- Encourage inclusivity and diversity
- Improve mobility



Cycle of Disruption

- Epidemic and Pandemic
- Civil Unrest
- Nation State espionage
- Cybercrime
- Insider Threats

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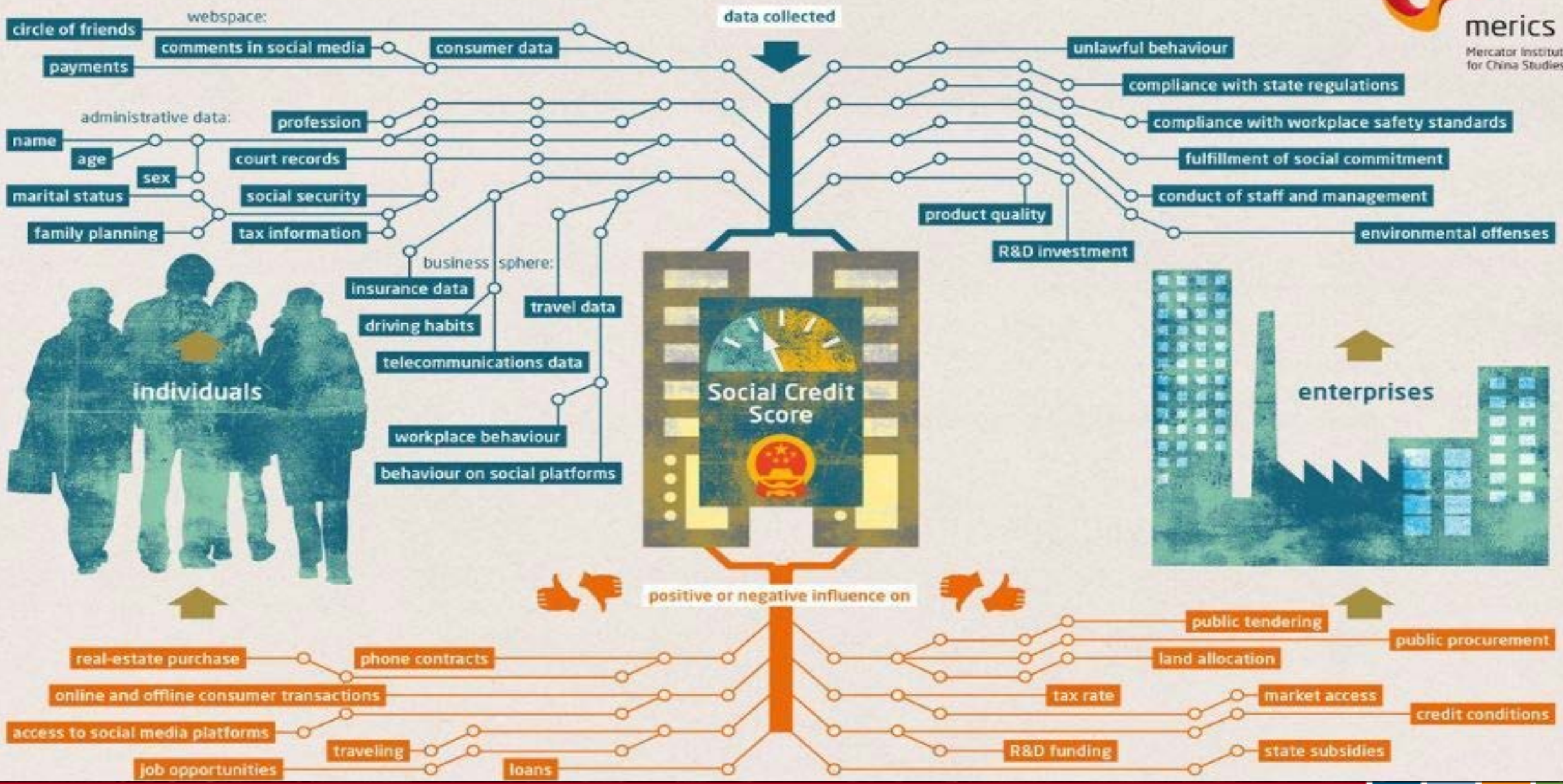
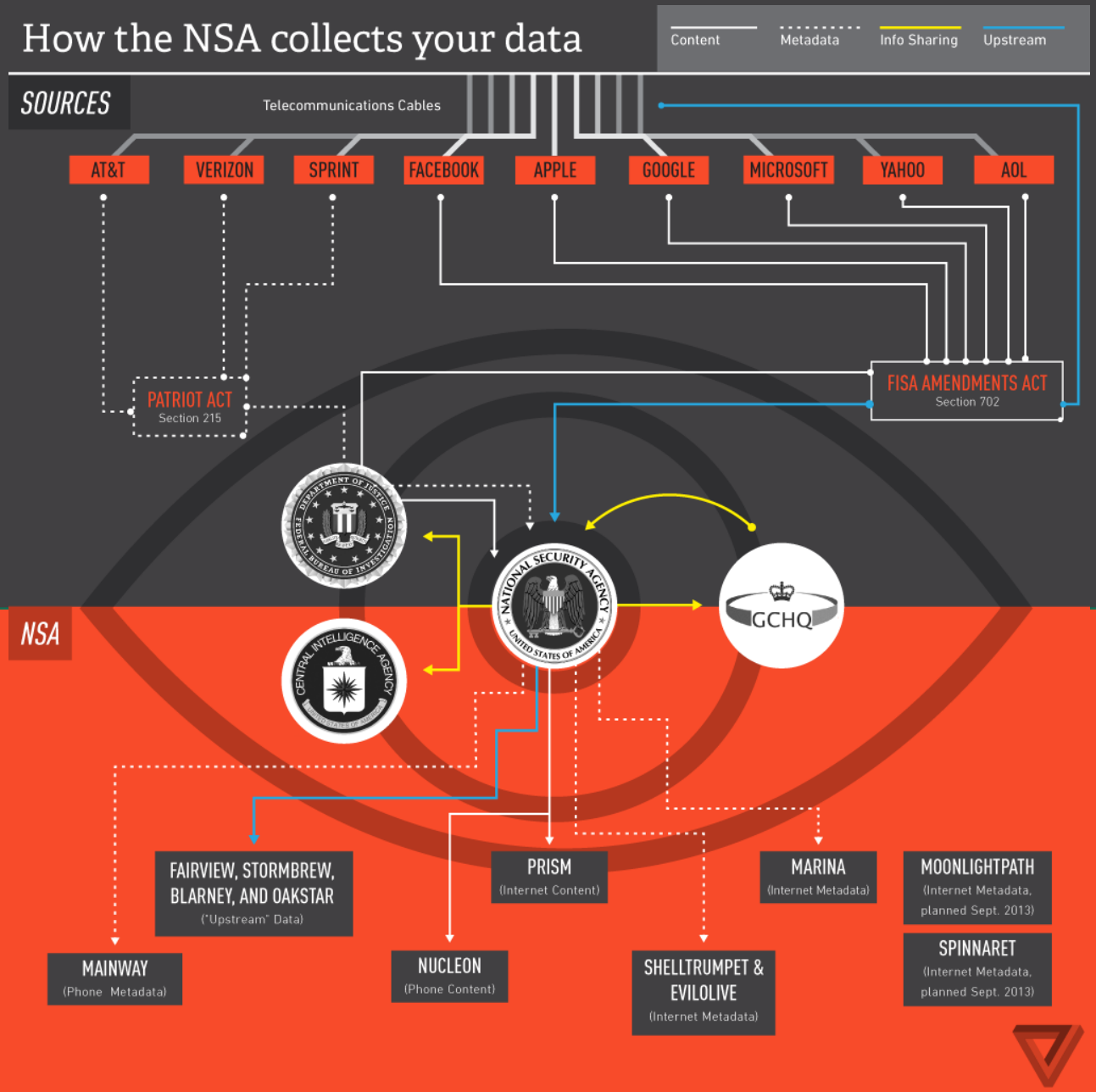
The all-seeing state: China's plans for total data control

merics
Mercator Institute for China Studies

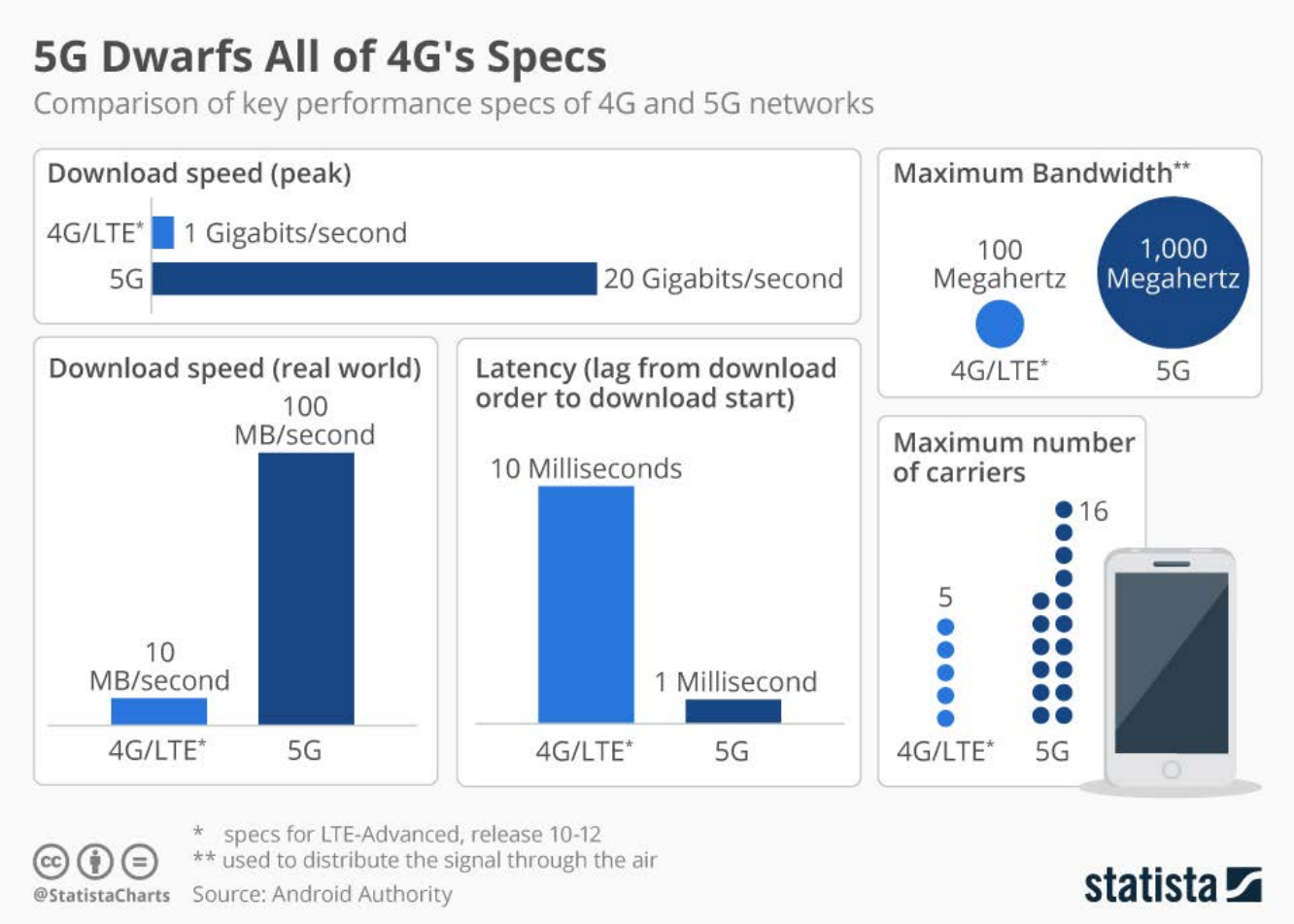


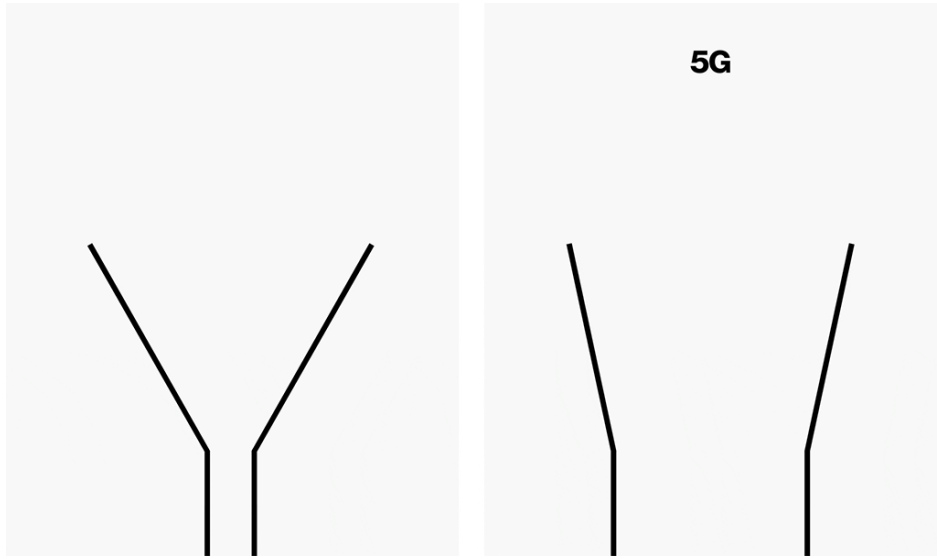
How the NSA collects your data



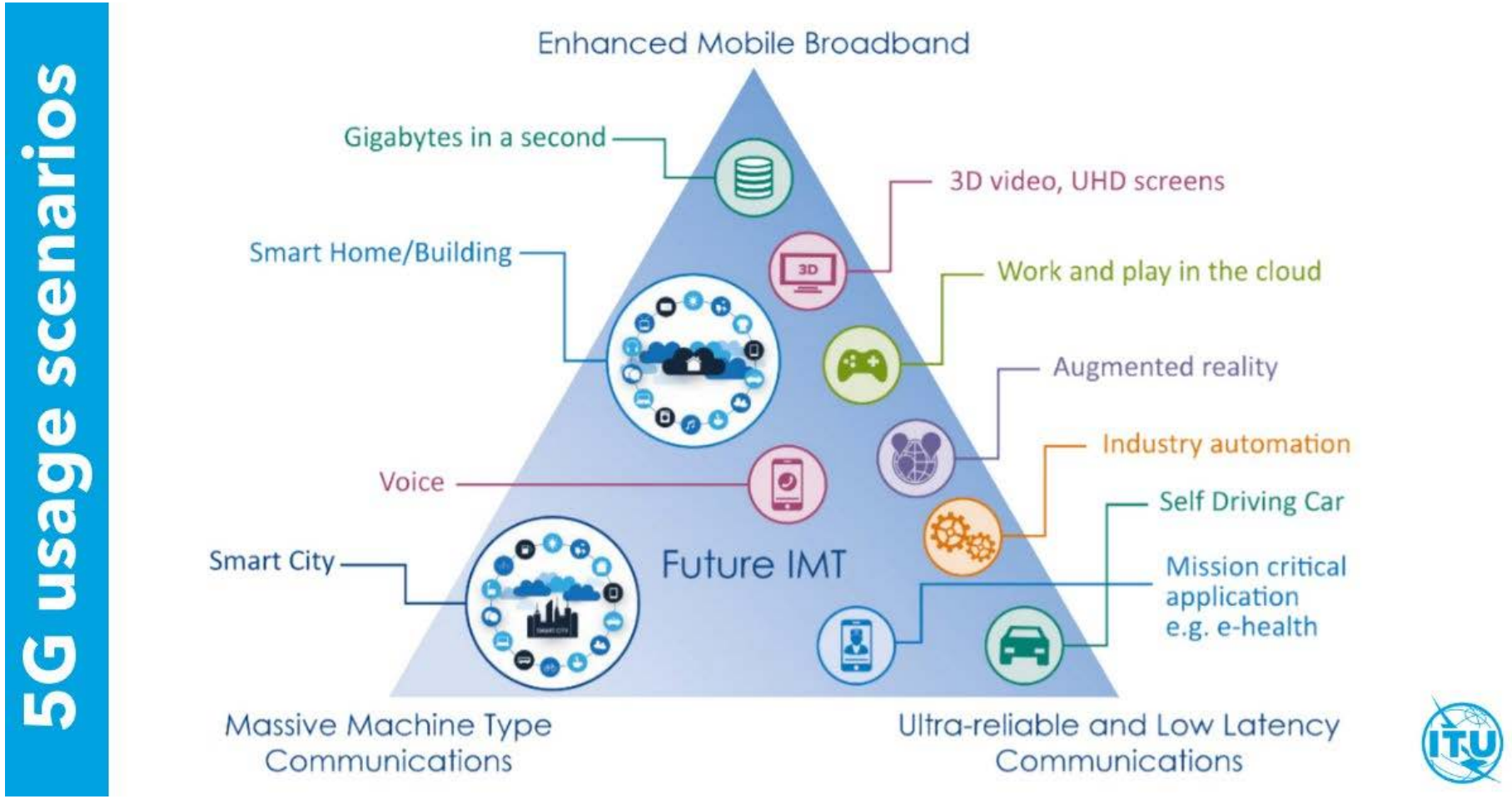
The Six Big Disruptors

#1: 5G

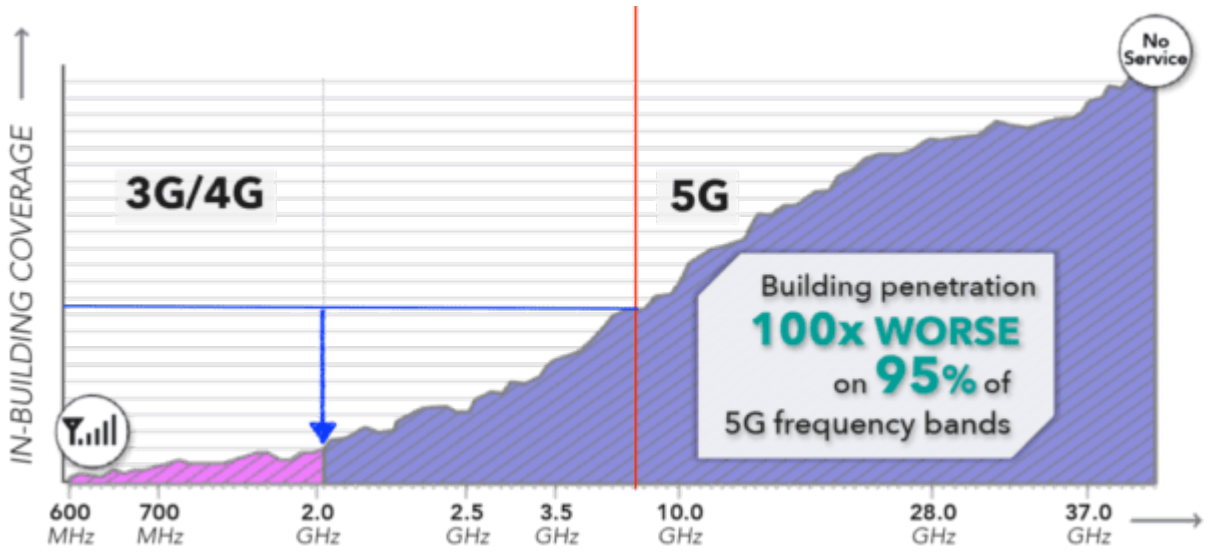

5G Dwarfs All of 4G's Specs
Comparison of key performance specs of 4G and 5G networks
Download speed (peak)
4G/LTE* 1 Gigabits/second
5G 20 Gigabits/second
Maximum Bandwidth**
100 Megahertz
1,000 Megahertz
4G/LTE*
5G
Download speed (real world)
100 MB/second
10 MB/second
4G/LTE*
5G
Latency (lag from download order to download start)
10 Milliseconds
1 Millisecond
4G/LTE*
5G
Maximum number of carriers
16
5
4G/LTE*
5G
* specs for LTE-Advanced, release 10-12
** used to distribute the signal through the air
@StatistaCharts
Source: Android Authority
statista

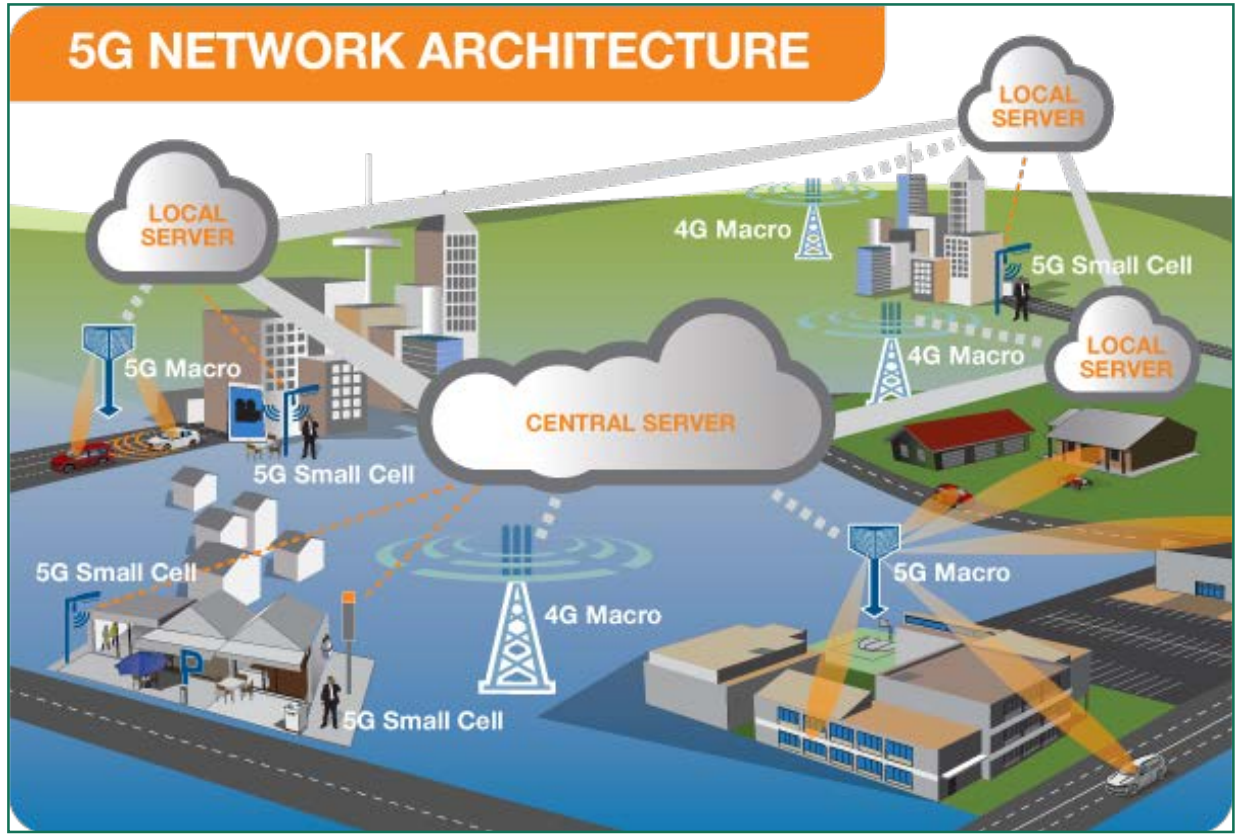

5G

Why is 5G Important?

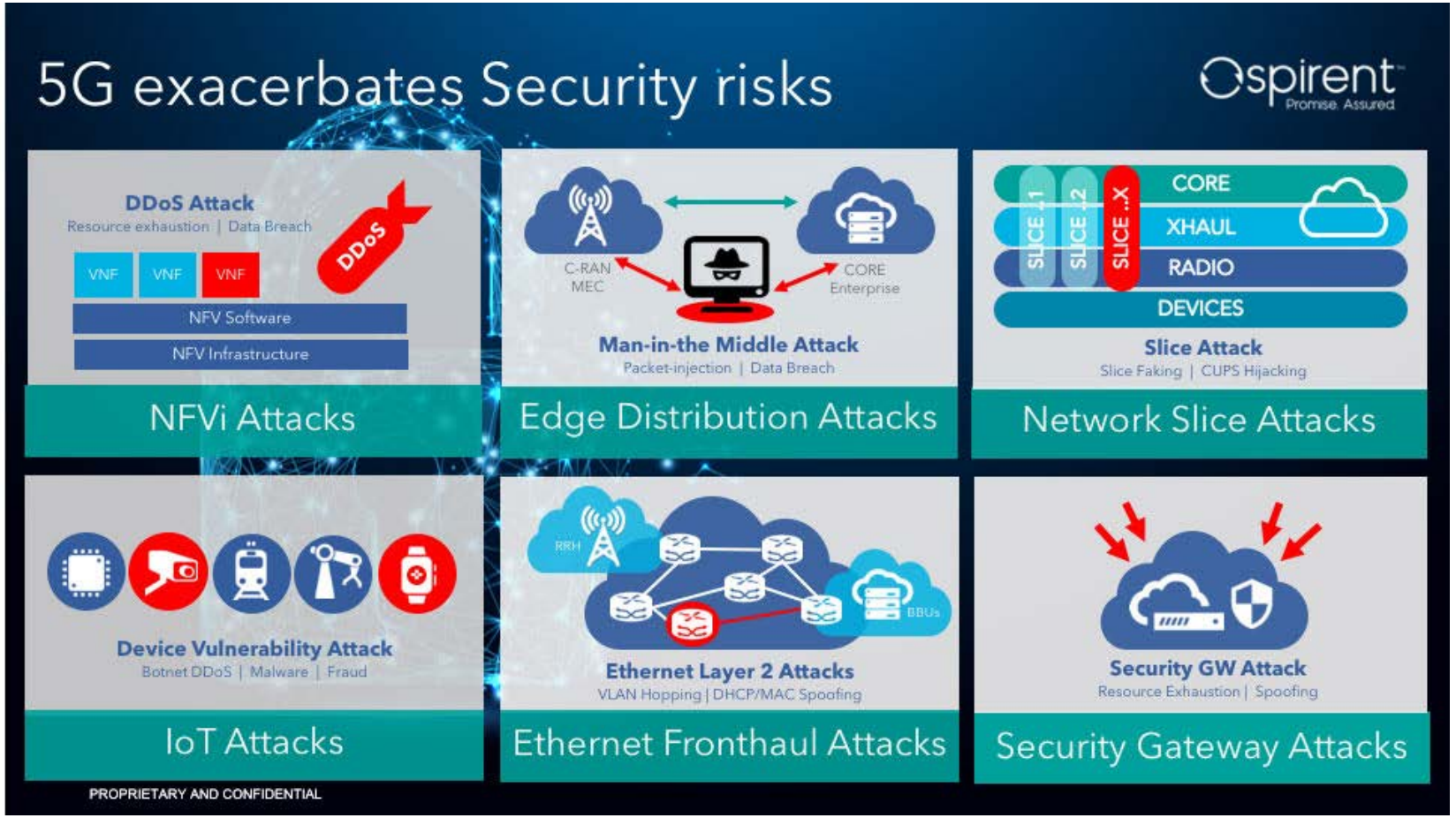


5G Network Architecture





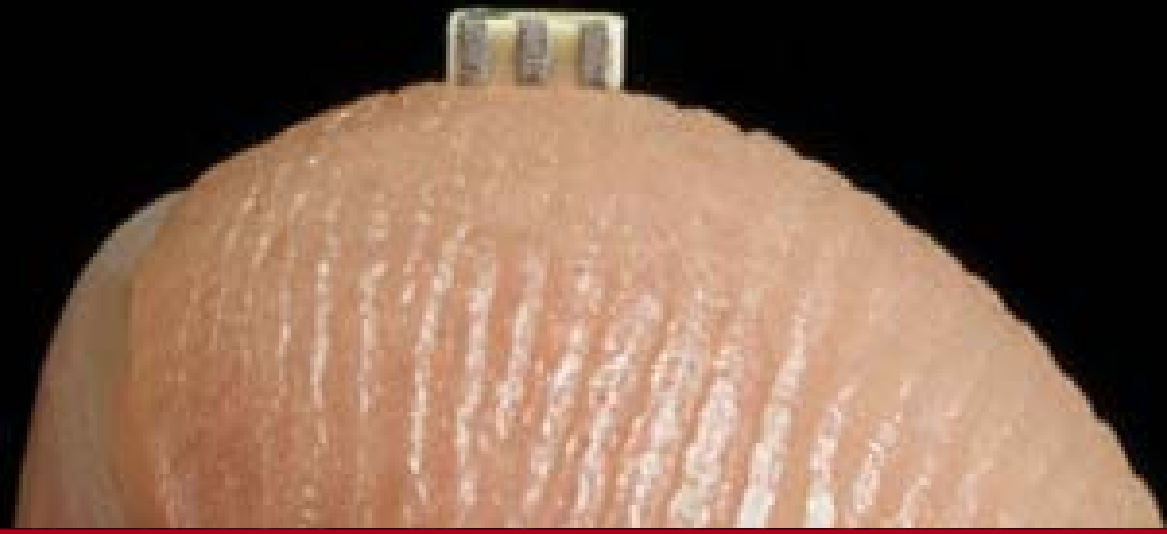
Risks of 5G


5G exacerbates Security risks
Spirent
Promise. Assured
DDoS Attack
Resource exhaustion | Data Breach
DDoS
VNF
VNF
VNF
NFV Software
NFV Infrastructure
NFVi Attacks
C-RAN
MEC
CORE
Enterprise
Man-in-the Middle Attack
Packet-injection | Data Breach
Edge Distribution Attacks
SLICE ..1
SLICE ..2
SLICE ..X
CORE
XHAUL
RADIO
DEVICES
Slice Attack
Slice Faking | CUPS Hijacking
Network Slice Attacks
Device Vulnerability Attack
Botnet DDoS | Malware | Fraud
IoT Attacks
RRH
BBUs
Ethernet Layer 2 Attacks
VLAN Hopping | DHCP/MAC Spoofing
Ethernet Fronthaul Attacks
Security GW Attack
Resource Exhaustion | Spoofing
Security Gateway Attacks
PROPRIETARY AND CONFIDENTIAL

Bloomberg Businessweek

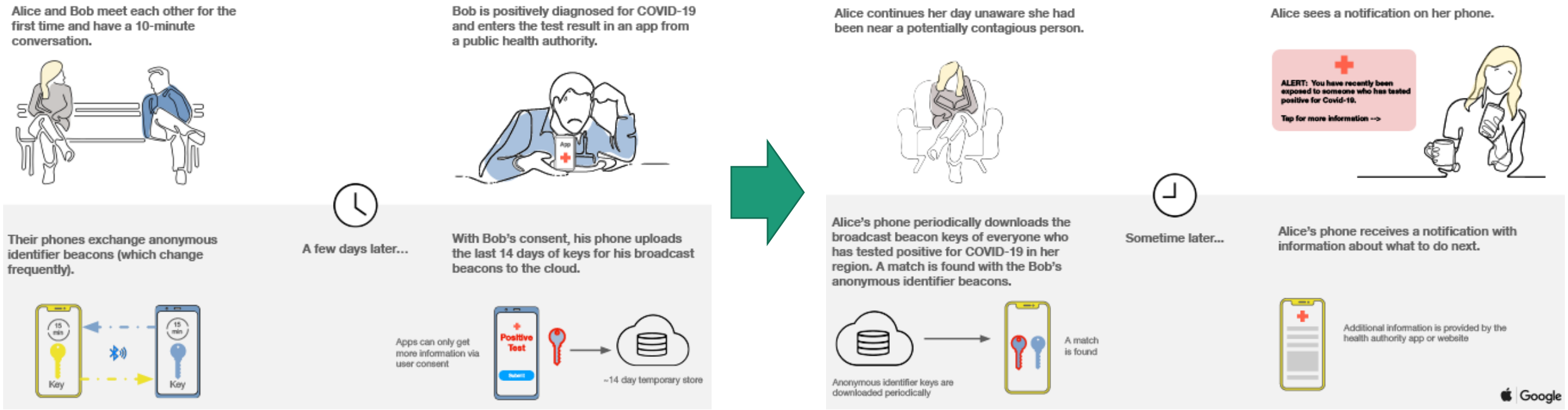
October 8, 2018

The Big Hack



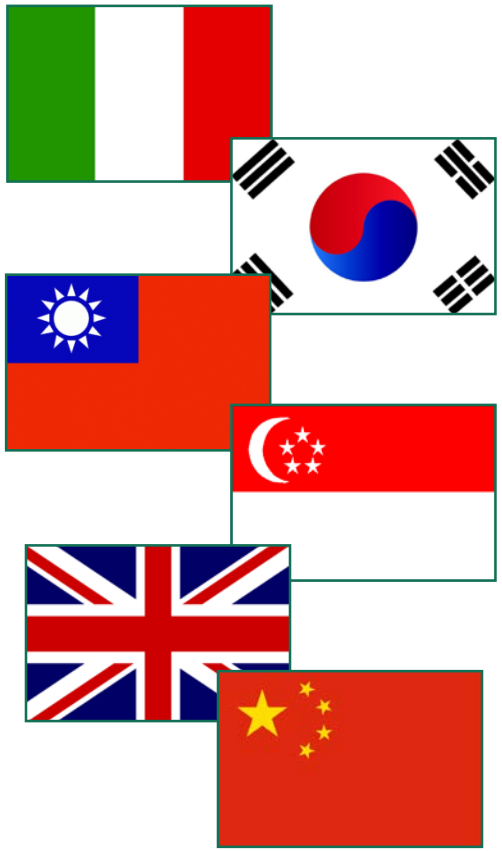
HUAWEI

#2 Digital Contact Tracing

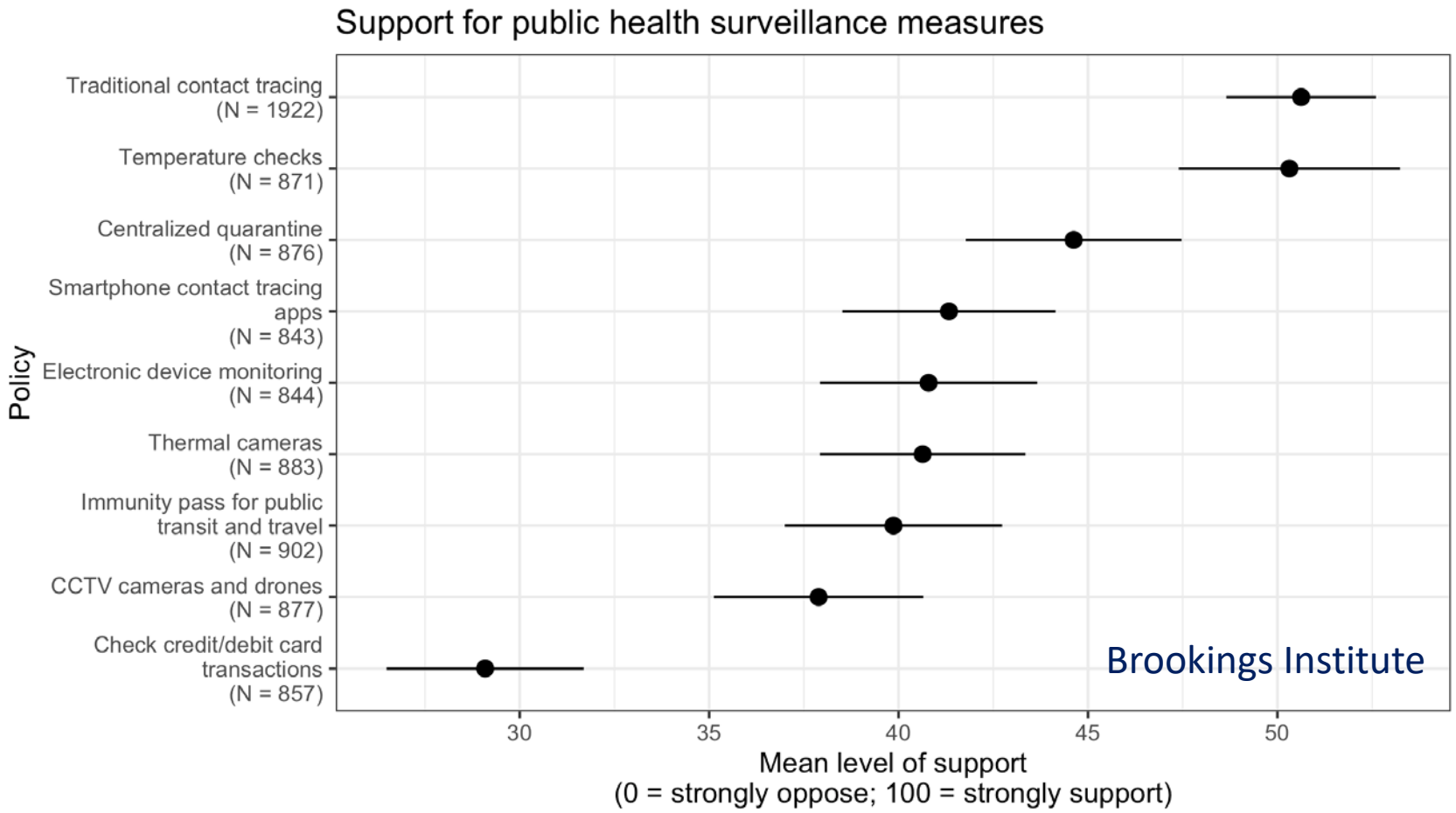


Why is it Important?

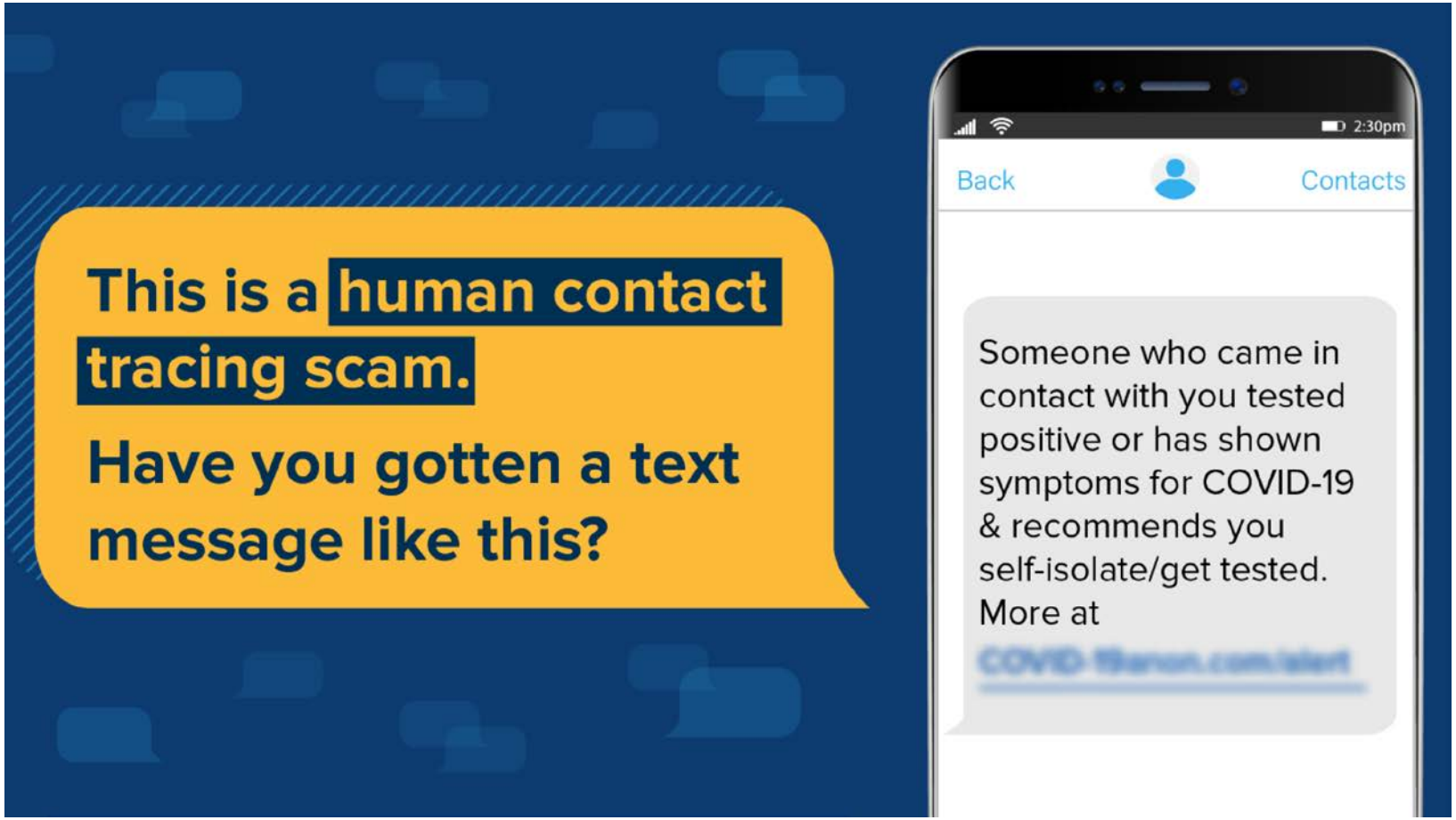
- **Information gathering**. Health authorities in Italy have used aggregate mobile location data provided by major cellphone carriers to gauge compliance with lockdown policies.
- **Information sharing**. Health authorities in South Korea have pushed alerts to residents with COVID-19 updates ranging from reminders about public health guidance to revealing the recently visited locations of newly infected persons.
- **Quarantine enforcement**. Health authorities in Taiwan have used location-tracking mobile apps to monitor and enforce quarantine.
- **Digital contact tracing**. Health authorities in Singapore have used digital proximity tracing techniques as a complement to manual contact tracing to identify close contacts of COVID-19-positive residents and quickly isolate them.
- **Digital health passports.** Discussions have begun around the concept of digital health passports that might serve as individual credentials for proof of immunity in conjunction with future antibody testing. For example, authorities in the U.K. are exploring "immunity passports," and authorities in China deployed a mobile app health classification system.



Public Support



Risks to Digital Contact Tracing



Risks to Digital Contact Tracing

- False sense of security – Apple's and Google's decentralized approach
- It is only as good as a broad public health solution not an individual one
- Inconsistent coverage among the elderly and under-resourced
- False negatives
- Malicious false positives
- Malicious use of data
- **Privacy**

#3: Telepresence

- AKA “Socio-assistive” technology
- Healthcare
- Law enforcement
- Fire fighting
- Assisted living

Why is it Important?

Making Your Presence Robotic

A new generation of robots is making it possible to be, in effect, in two places at once. From anywhere with a computer and a Wi-Fi connection, the operator can use the robot to hear, talk, see and be seen and move around a workplace far away. Early adopters include doctors, technology workers and supervisors. The robots range in size, features and price. Here is a sampling.

	Vgo (made by Vgo Communications)	**Tilr** (RoboDynamics)	**Texai** (Willow Garage)	**RP-7i** (InTouch Health)	**QB** (Anybots)
HEIGHT	4'0"	3'8" or 4'2"	5'2"	5'5"	2'6" to 6'0"
TOP SPEED	3.75 m.p.h.	2.4 m.p.h.	1.5 m.p.h.	2 m.p.h.	3.5 m.p.h.
DISPLAY SIZE	7"	8" (touchscreen)	15"	15"	3.5"
FIELD OF VIEW	60 degrees	55 degrees	140 degrees	360 degrees	130 degrees
CONNECTION	400 kbps	500 kbps	500 kbps	600 kbps	500 kbps
PRICE	$4,995	$10,000	Not available	Not available	$15,000
UNIQUE FEATURES	Text-to-speech; camera auto-tilts based on drive speed; remote monitoring headlights and auto-docking to the charger.	Web-based controls; can use own video like Skype, Google Vid Chat, MSN, etc.	Technology agnostic (can pilot on Windows, Mac or Linux), secure connection between pilot and Texai (SSL and VPN tunnel).	FDA-cleared, connects directly to Class II medical devices including electronic stethoscopes, otoscopes and ultrasound.	Untippable, two-wheel drive design; stabilized video; Web-based controls.

Sources: the companies

THE NEW YORK TIMES

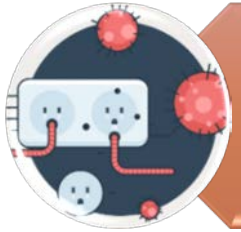
Telepresence Use Cases

Risks of Telepresence

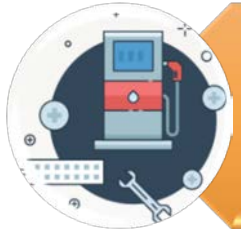
Risks of Telepresence

Vulnerability Exploits

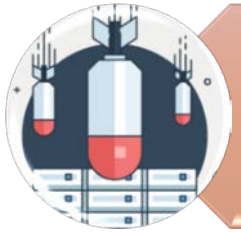
Man in the Middle Attacks



Malware



Physical Tampering



DoS and DDoS

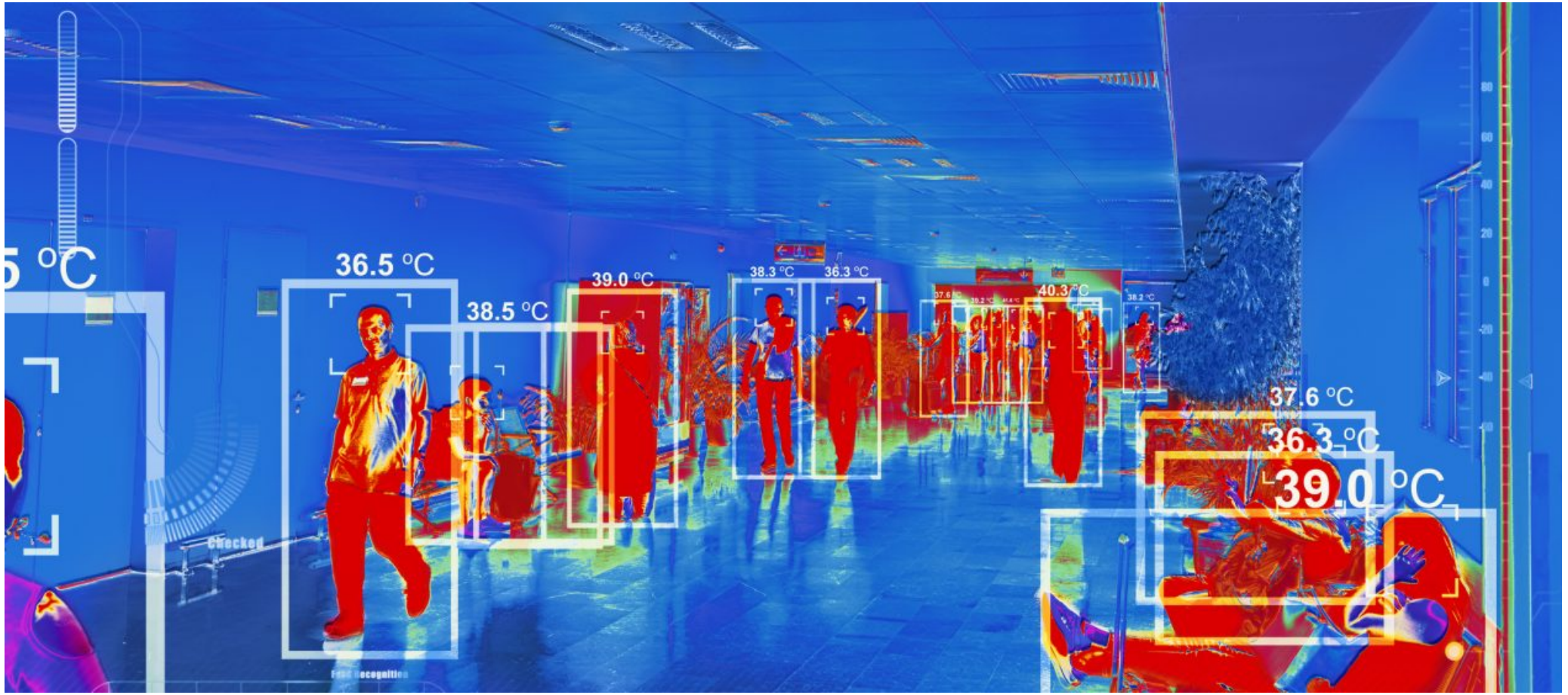
Eavesdropping and PII and PHI Theft

#4: Thermal Technologies

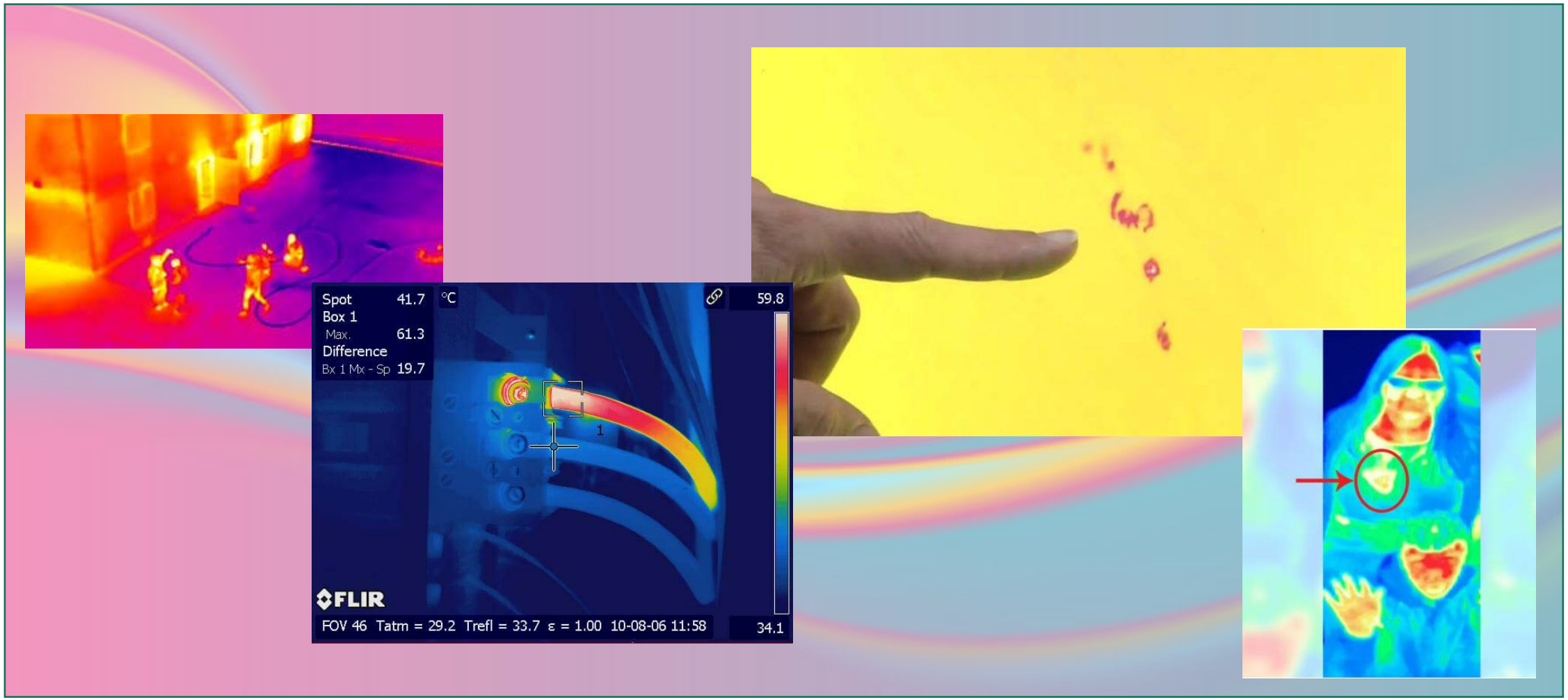
- Forward-looking Infrared (FLIR)
- Uses infrared radiation to create a picture

5x3x1 inches
$499.00

Why is it Important?



Thermal Technologies Use Cases



Risks of Thermal Technologies

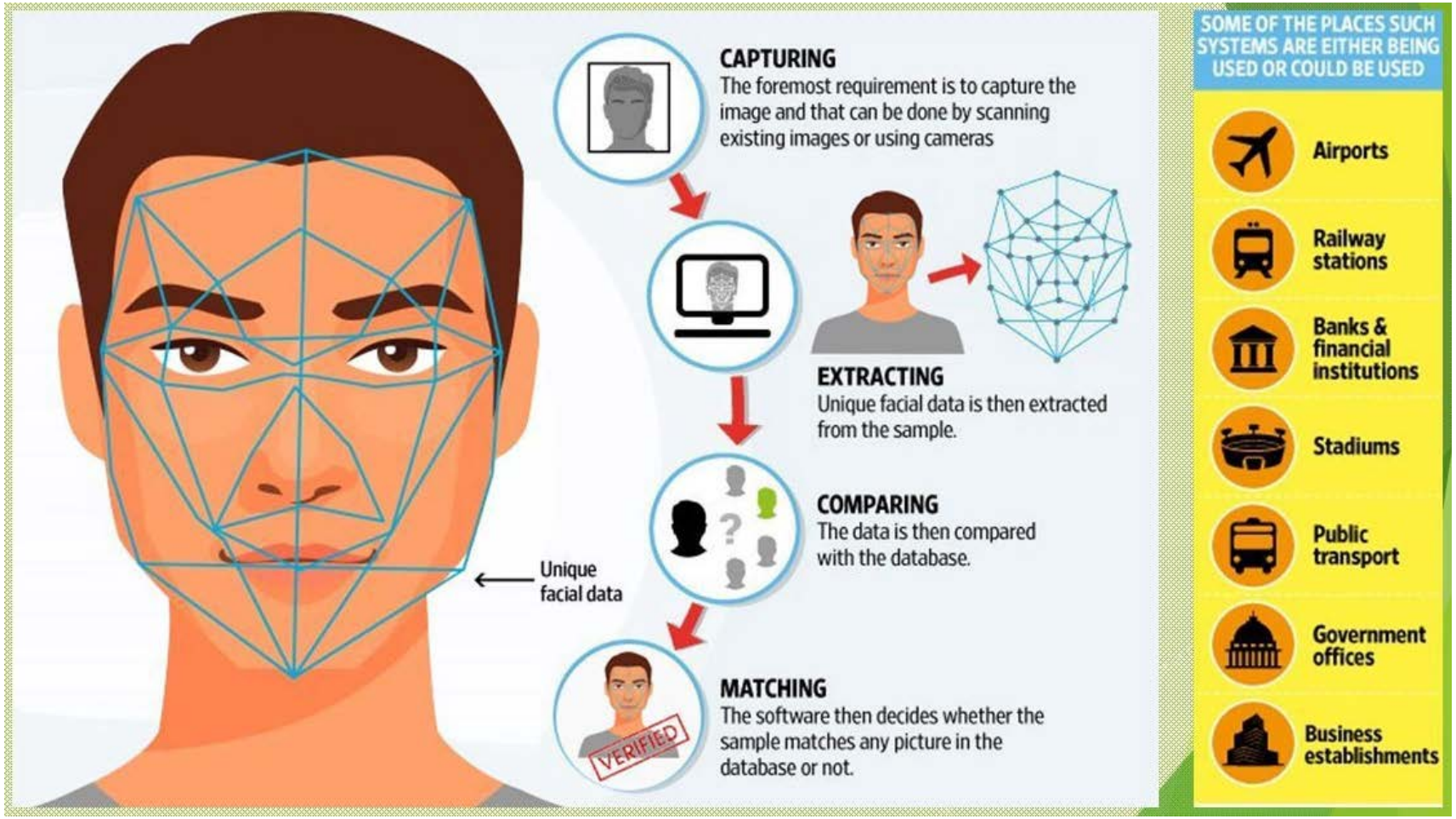
- Very large infrastructure requires offshoring of results for processing
- Very low public support
  - In 2001, deemed a violation of Fourth Amendment protections
  - In 2015, using in the Baltimore protests by the FBI
- Limits public movement
- False negatives - May not be effective at a distance
- Data leakage and improper use
- Can reveal the face of political protesters

Thermal Technologies and Regulatory Compliance

- International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) Guidance – Requires deployment standards.
- Food and Drug Administration (FDA) – Requires 510(k) approval. “The technology should be used to measure only one subject’s temperature at a time.”
- The Americans with Disabilities Act (ADA) and Other Privacy Laws - The EEOC has noted that “the fact that an employee had a fever or other symptoms would be subject to ADA confidentiality requirements.” You will need to make sure you’re complying with appropriate regulations like GDPR, HIPAA and other local and regional data privacy regulations regarding personally identifiable information.
- National Defense Authorization Act (NDAA)

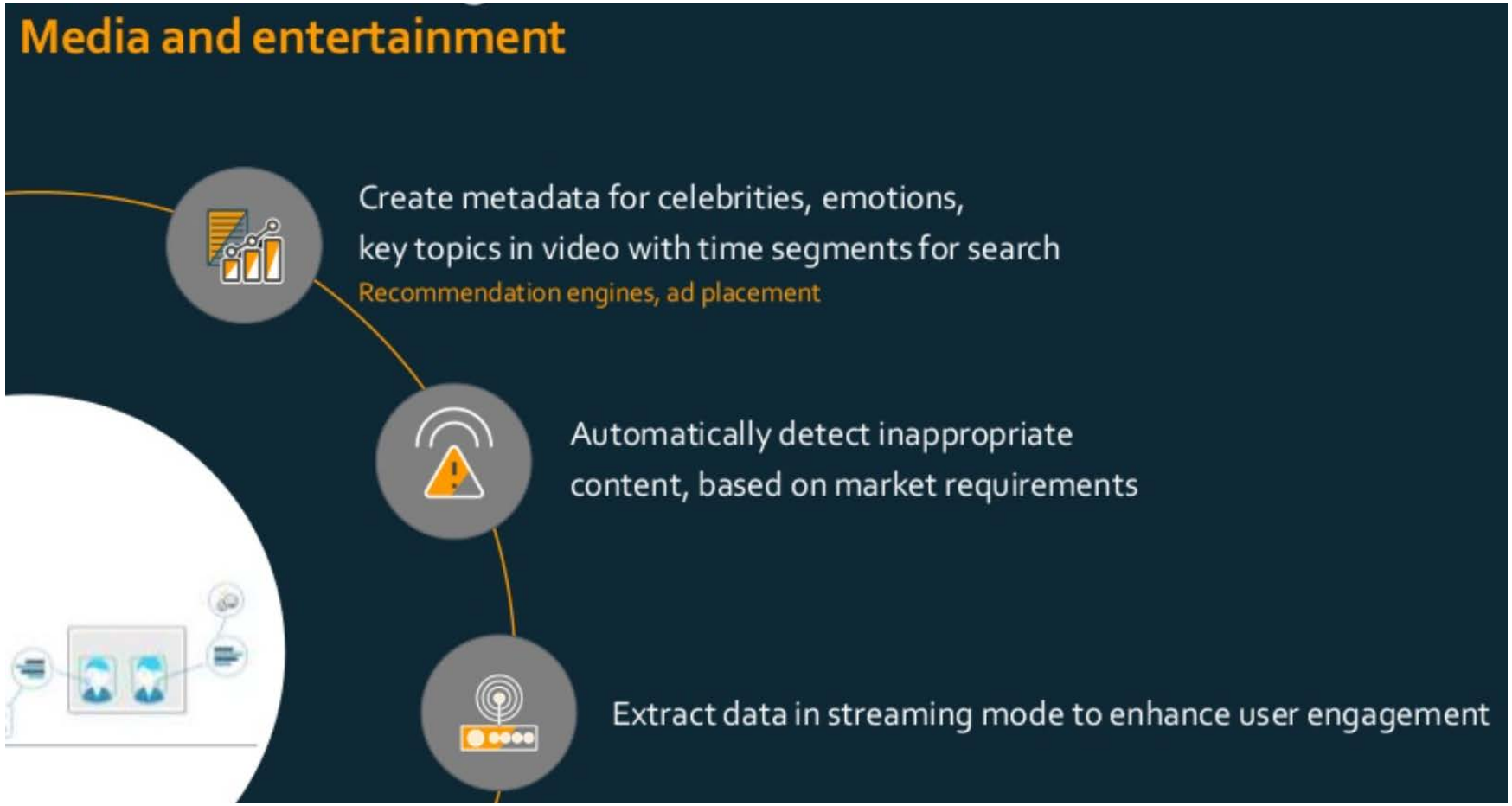
#5: Facial Recognition Technologies

Why is it Important?



Facial Recognition Technology Use Cases

Risk of Facial Recognition Technologies



Risk of Facial Recognition Technologies

- Inaccuracy – 2016 London's police conducted 10 trials. University of Essex to independently assess the scheme, and they concluded that the system is 81% inaccurate. They found that of 42 matches, only eight were confirmed to be correct.
- Gender and racial bias – Rekognition mistook women for men 19% of the time and mistook women of color for men 31% of the time
- Large quantities of PII is attractive to hackers – *"Suprema's Biostar 2 system is used to secure buildings around the world"*

Risk of Facial Recognition Technologies

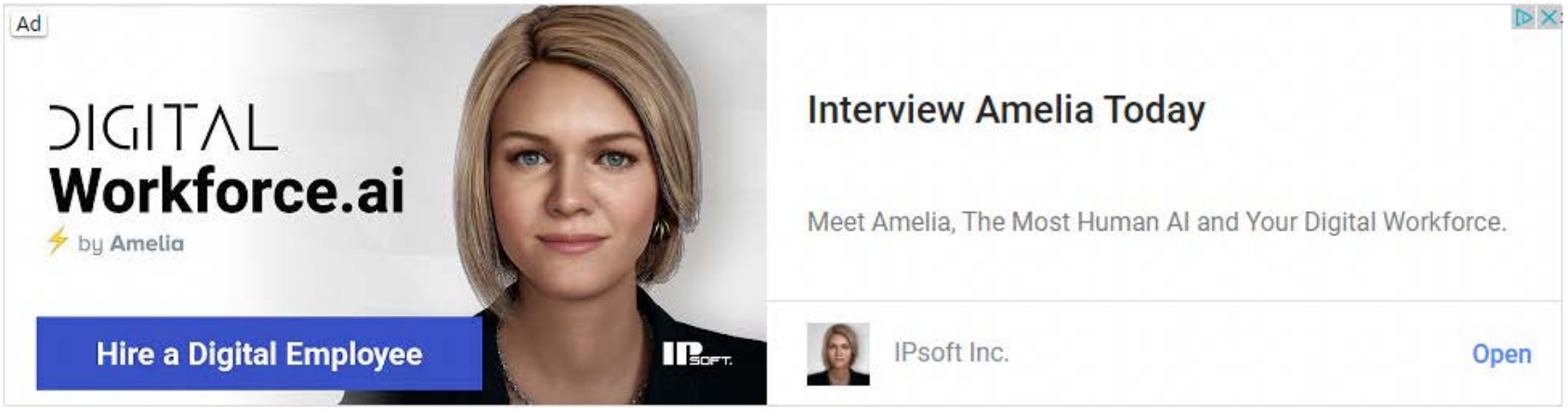
- The lack of permission and user consent
  - Facial recognition data can easily be collected in public places – all the software would need is a clear image of the subject's face.
- Predatory Marketing
  - Software which analyses facial expressions could potentially be put to use by some companies to prey on vulnerable customers.
- Disadvantage when applying for employment
  - facial recognition could potentially allow recruiters to find out more about you than you'd realize.
- Stalking and targeted misuse
  - Tools like reverse image searches can provide stalkers with more data about their victims.
- Identity fraud
  - Criminals who have collected enough personal information on you could commit identity fraud.

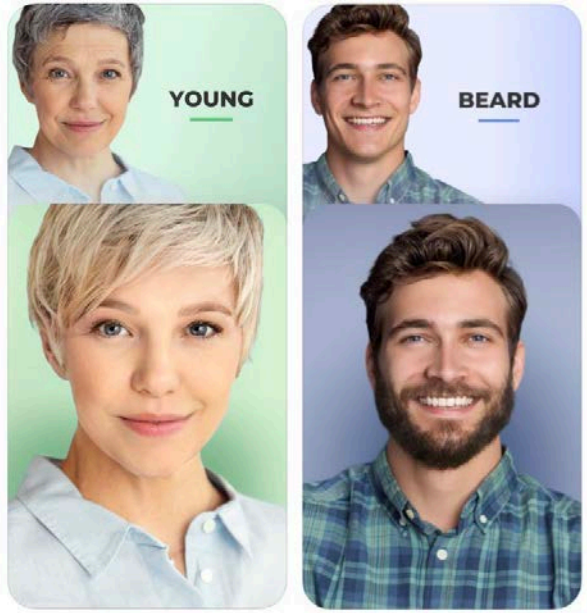
#6: Deepfake Technologies

- Uses AI based deep neural networks to:
  - Transfer facial movements of one person to a target video
  - Map the face of a target person onto other videos
- Been in use for decades
- Requires the gathering of many photos

Why is it Important?

- Entering New Markets
- Tailored marketing to fit each customer demographic
- Building audience trust
- Responding to crisis
- Instant Marketing Segmentation





Risks of Deepfake Technologies

- The blurring of privacy
- Erosion of authenticity
- Unsafe mass data collection
- Enables fraudulent activities
- Political foul play
- Distortion of democratic discourse

Gabon President Ali Bongo Ondimba

https://www.facebook.com/watch/?v=324528215059254

What can we do now?

The auditor needs to change, but how fast?

- Inventory where technologies are being used or trialed and who is accountable for its proper use
- Understand your data assets, who owns the data, and where they're stored
- Identify the regulations and frameworks needed for compliance
- Understand workflows and the components that make them work
- Prepare your teams through education and advanced training

What can we do later?

- Discuss these systems before plans are put in place and laws are passed that may violate laws and regulations
- Ensure future technology implementations include a sunset clause to define when surveillance ends
- A chain of custody agreement for data passed between government, industry and researchers, which includes a process to delete data.
- A plan to protect data sovereignty, which ensures that data are subject to laws and governance structures.
- Evaluate commitments to accountability if data are misused, stolen or sold.

Make Privacy a Priority

- What kinds of personal data is being collected and for what purpose?
- What kinds of personal data is being processed and for what purpose?
- What kinds of personal data is being stored and for what purpose?
- How is the personal data collected, processed and stored?
- What kind of consent is required by the individual?
- What steps are taken to ensure the accuracy and integrity of the stored data?
- How is the data disposed of when it is no longer required?

Questions?

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