

# What role will wearables play in future healthcare?

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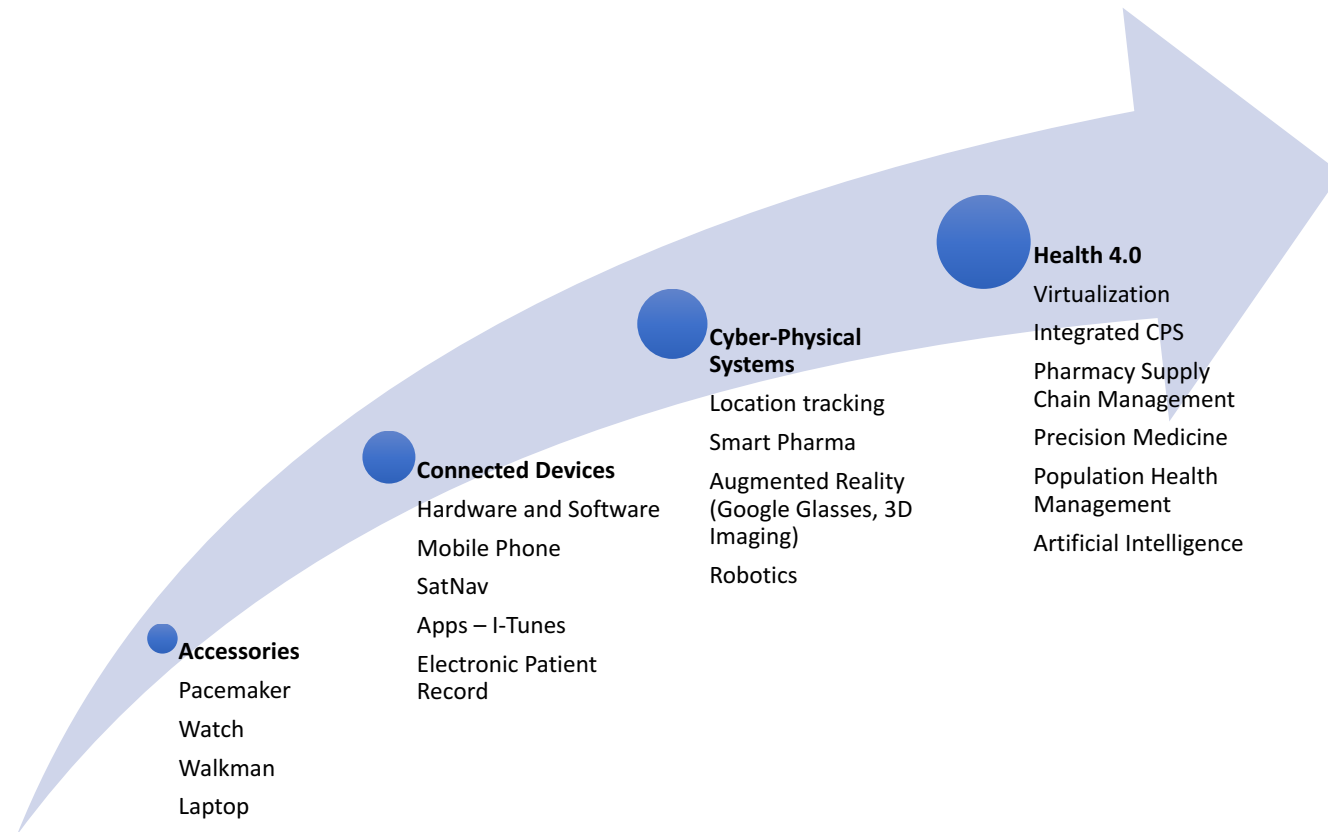
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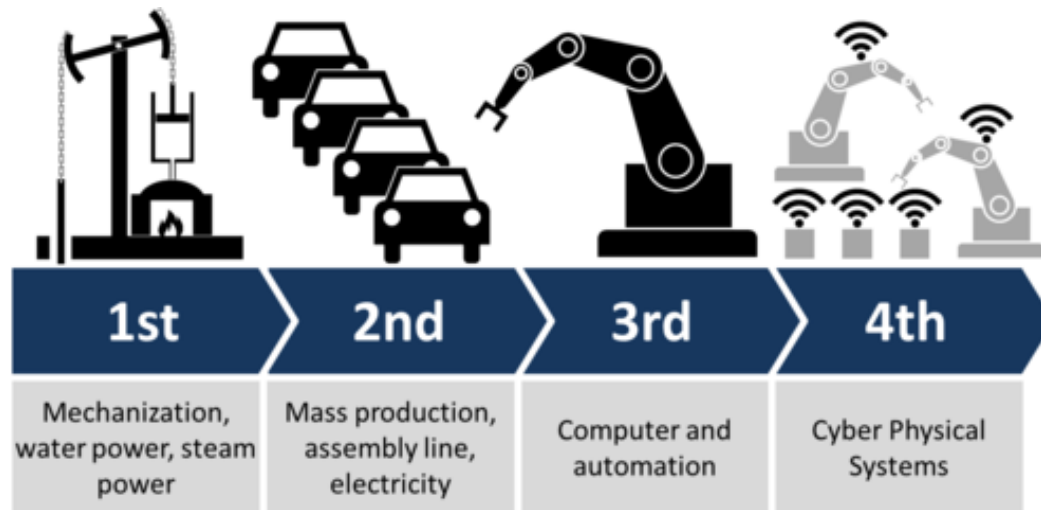
# What is a “Wearable”?

- It is mobile
- It is of no particular size
- It is of no particular weight (from RFID chip to Exoskeletons)
- It typically contains some kind of sensor
- It contains some storage
- It contains a processor
- It has a modem
- It has a communication interface / radio access technology module

# The Evolution of the Wearable Dream



# Health 4.0 is the application of Industry 4.0 principles in the health domain



**Industry 4.0** is the current trend of [automation](#) and data exchange in manufacturing technologies. It includes [cyber-physical systems](#), the [Internet of things](#) and [cloud computing](#).

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## Health 4.0: How Virtualization and Big Data are Revolutionizing Healthcare Hardcover – 11 Jan 2017

by [Christoph Thuemmler](#) (Editor), [Chunxue Bai](#) (Editor)

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This book describes how the creation of new digital services—through vertical and horizontal integration of data coming from sensors on top of existing legacy systems—that has already had a major impact on industry is now extending to healthcare. The book describes the fourth industrial revolution (i.e. Health 4.0), which is based on virtualization and service aggregation. It shows how sensors, embedded systems, and cyber-physical systems are fundamentally changing the way industrial processes work, their business models, and how we

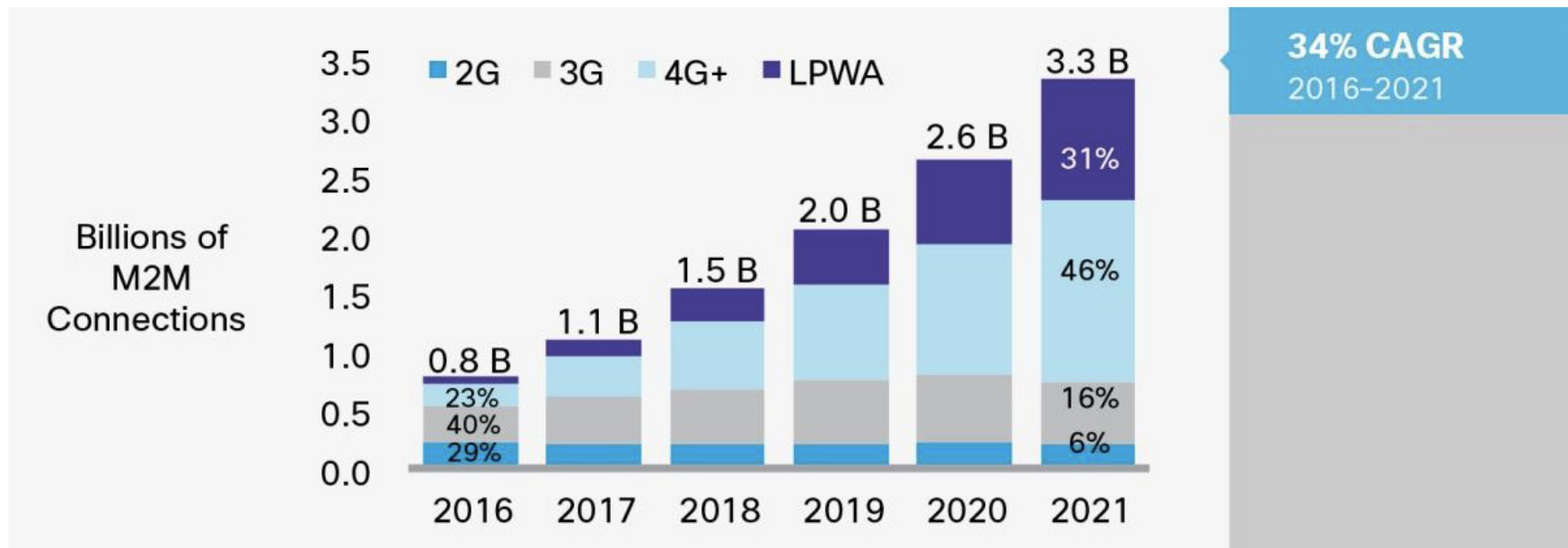
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# Machine to Machine (M2M) connections



Source: Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2016–2021

# EU-CN White Paper on Internet of Things





# Wearables in the Health Domain



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# Wearable / Devices / Things



- Tagging and tracking devices
  - Wheelchairs
  - Valuable goods
  - Hospital equipment
  - Pharmacy Supply Chains
  - Geo-fencing
- Sensor devices
  - Temperature sensors
  - Heart monitoring
  - Smart inhalers
  - Smart Insulin pens
- Artificial organs
  - Pacemaker
  - Brain Pacemaker
  - Endo-prothetics
  - Insulin pumps
  - Home dialysis machine
- Enhancement and virtualization
  - 3D Glasses
  - Augmented reality
  - Process automation (surgical robots, autonomous cars)
  - Algorithms
- Assessment
  - Gait-analysis
  - Geriatric Assessment

# Bluetooth and the Phone as Gateway no longer Gold Standard



# Smart Pharmaceuticals will not require Smart Phones as gateways in the future



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12. September 2016

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TECH

## Google Parent and Sanofi Name Diabetes Joint Venture Onduo

Joint venture will develop tools for managing the disease expected to affect 592 million people world-wide by 2035



Joshua Riff, who was a senior executive at UnitedHealth Group's Optum, will be chief executive of the new unit. PHOTO: EUROPEAN

Saxon One



  
**Tutima**  
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The 5G Infrastructure Public Private Partnership



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increasing wireless capacity  
1,000 times



connecting  
7 billion people



connecting  
7 trillion "things"



saving 90% energy



perceiving zero downtime



# Billions of People will benefit from Health 4.0

- Asthma around 334 million people (Global asthma report 2014)
- COPD: 384 million people in 2010  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4693508/>
- Diabetes: around 420 million people (WHO 2014)
- Gastro-Esophageal Reflux Disease GERD prevalence estimates was 18.1%-27.8% in North America, 8.8%-25.9% in Europe, 2.5%-7.8% in East Asia, 8.7%-33.1% in the Middle East, 11.6% in Australia and 23.0% in South America (El-Serag HB, Sweet S, Winchester CC, Dent J (2013), [Gut](#). 2014 Jun;63(6):871-80. doi: 10.1136/gutjnl-2012-304269. Epub 2013 Jul 13
- Plus Cancer, Mental Health, Dementia, MS, etc

# Trust

- Google and Facebook score low on consumer trust  
<http://www.quicktapsurvey.com/blog/2016/01/21/why-people-dont-trust-google-and-facebook-according-to-new-survey/>
- European General Data Protection Regulation (GDPR) to come into play in 2018
- US court ruled that US government agencies may enforce transfer of data from European to US servers (Google 2/2017)  
[https://www.washingtonpost.com/news/voxx-conspiracy/wp/2017/02/03/google-must-turn-over-foreign-stored-e-mails-pursuant-to-a-warrant-court-rules/?utm\\_term=.f2d9e3fd239d](https://www.washingtonpost.com/news/voxx-conspiracy/wp/2017/02/03/google-must-turn-over-foreign-stored-e-mails-pursuant-to-a-warrant-court-rules/?utm_term=.f2d9e3fd239d)
- Safe Harboring – Privacy Shield

Google  
IS WATCHING  
YOU





## EU-U.S. Privacy Shield

The EU-U.S. Privacy Shield imposes **stronger obligations on U.S. companies** to protect Europeans' personal data. It reflects the requirements of the European Court of Justice, which ruled the previous Safe Harbour framework invalid. The Privacy Shield requires the U.S. to **monitor and enforce more robustly**, and cooperate more with European Data Protection Authorities. It includes, for the first time, written commitments and assurance regarding **access to data by public authorities**.

### The new arrangement will include the following elements:

#### Commercial sector

##### Strong obligations on companies and robust enforcement:

- > Greater transparency.
- > Oversight mechanisms to ensure companies abide by the rules.
- > Sanctions or exclusion of companies if they do not comply.
- > Tightened conditions for onward transfers.

#### Redress

##### Several redress possibilities:

- > **Directly with the company:** Companies must reply to complaints from individuals within 45 days.
- > **Alternative Dispute Resolution:** free of charge.
- > **With the Data Protection Authority:** they will work with U.S. Department of Commerce and Federal Trade Commission to ensure unresolved complaints by EU citizens are investigated and swiftly resolved.
- > **Privacy Shield Panel:** As a last resort, there will be an arbitration mechanism to ensure an enforceable decision.

#### U.S. Government access

##### Clear safeguards and transparency obligations:

- > For the first time, written assurance from the U.S. that any access of public authorities to personal data will be subject to clear limitations, safeguards, and oversight mechanisms.
- > U.S. authorities affirm absence of indiscriminate or mass surveillance.
- > Companies will be able to report approximate number of access requests.
- > New redress possibility through EU-U.S. Privacy Shield Ombudsperson mechanism, independent from the intelligence community, handling and solving complaints from individuals.

#### Monitoring

##### Annual joint review mechanism:

- > Monitoring the functioning of the Privacy Shield and U.S. commitments, including as regards access to data for law enforcement and national security purposes.
- > Conducted by the European Commission and the U.S. Department of Commerce, associating national intelligence experts from the U.S. and European Data Protection Authorities.
- > Annual privacy summit with NGOs and stakeholders on developments in the area of U.S. privacy law and its impact on Europeans.
- > Public report by the European Commission to the European Parliament and the Council, based on the annual joint review and other relevant sources of information (e.g. transparency reports by companies).

### What will it mean in practice?

#### For American companies

- > Self-certify annually that they meet the requirements.
- > Display privacy policy on their website.
- > Reply promptly to any complaints.
- > (If handling human resources data) Cooperate and comply with European Data Protection Authorities.

#### For European individuals

- > More transparency about transfers of personal data to the U.S. and stronger protection of personal data.
- > Easier and cheaper redress possibilities in case of complaints—directly or with the help of their local Data Protection Authority.

# Ouuch!!!!

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## Google told to hand over foreign emails in FBI search warrant ruling

Posted Feb 4, 2017 by **Natasha Lomas** (@riptari)



A U.S. judge has ordered Google to hand over emails stored outside the country in order to comply with an FBI search warrant. The warrant in question pertains to a domestic fraud probe.

The ruling is notable because it goes against an appeals court judgement last

### Crunchbase

#### Federal Bureau of Investigation

FOUNDED	1908
OVERVIEW	
Federal Bureau of Investigation is a threat intelligence-driven national security and law enforcement agency. FBI provides investigative expertise, intelligence, resources, and training to domestic and international agencies and departments. The mission of the FBI is to protect and defend the United States against terrorist and foreign intelligence threats, to uphold and enforce the criminal law, and to provide leadership and coordinate the response to national emergencies.	
LOCATION	
Washington, DC	
CATEGORIES	
Search Engine, Intelligent Systems, Business Intelligence, Law Enforcement	
WEBSITE	
<a href="http://www.fbi.gov">http://www.fbi.gov</a>	

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# EU-US Privacy Shield

- Press release 17. October 2017 [http://europa.eu/rapid/press-release\\_IP-17-3966\\_en.htm](http://europa.eu/rapid/press-release_IP-17-3966_en.htm)
- EU-US Privacy Shield probably as good as it gets, but...
  - Space for improvement with regards to enforcement through US agencies
  - More proactive and regular monitoring of companies' compliance with their Privacy Shield obligations by the U.S. Department of Commerce
  - US entities may not refuse handing over data sitting on European servers to federal courts and US agencies
  - Enshrining the protection for non-Americans offered by Presidential Policy Directive 28 (PPD-28), as part of the ongoing debate in the U.S. on the reauthorisation and reform of Section 702 of the Foreign Intelligence Surveillance Act (FISA).
  - Google, Amazon, Microsoft, Apple

# General Data Protection Regulation – **GDPR**, Medical Device Regulation

- <http://www.eugdpr.org>
- (GDPR) replaces the Data Protection Directive 95/46/EC
- Enforcement date 25.May 2018
- **Local interpretations will have a significant impact on the instantiation of the Directive in the different member states!**
- **UK ?**
- **Medical Device Regulation**, REGULATION (EU) 2017/745 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 April 2017 on medical devices, amending Directive 2001/83/EC, Regulation (EC) No 178/2002 and Regulation (EC) No 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC

# Challenges

- How can we guarantee privacy to the data owner?
- How can we prevent the commercial use of patient's data without explicit consent?
- How can we prevent health care providers having to pay for patient data they need for treatment?
- how can we guarantee end-to-end governance?
- How can we protect end-users from unsolicited offers?
- How can we prevent patient data to show up on the Internet or the "Dark Web"?
- Patient data to fetch 60 times the value of credit card information on the black market!!! <http://www.cnbc.com/2016/03/10/dark-web-is-fertile-ground-for-stolen-medical-records.html>