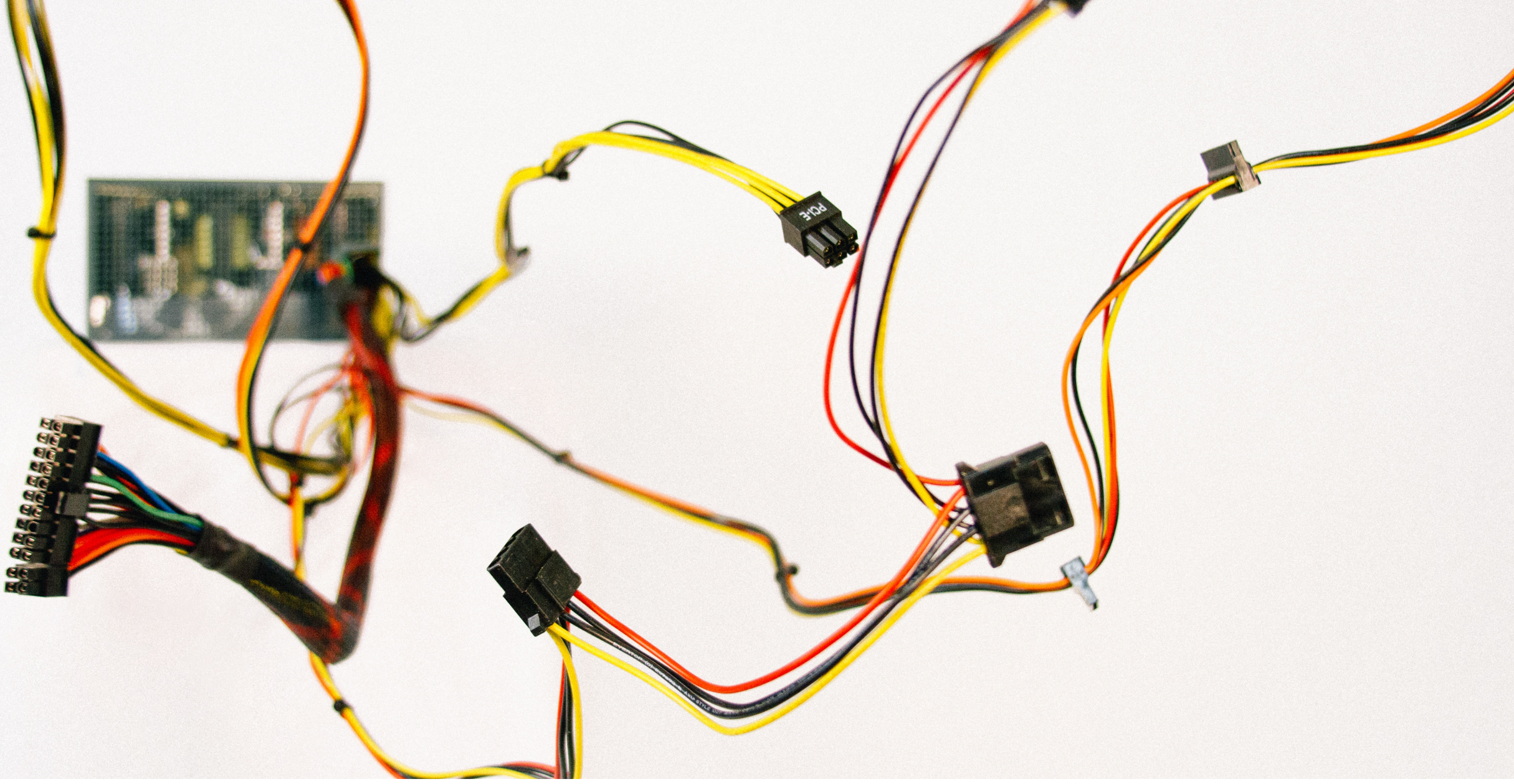

Internet of Things

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TESARK

A Brief Intro

TESARK

- Tesark technologies is a 4 year old Technology development boutique based in Chennai, India.

- Expertise in developing Cloud-based Applications (Web & Mobile)

What Is Expected?

- What exactly is **Internet of Things** (IoT)?
- What is **Machine Learning**?
- What could be the **future** with IoT?

What Exactly Is Internet of Things?

Wikipedia has a nice definition which explains IoT as:

the network of physical objects—devices, vehicles, buildings and other items—embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data.

Anything that can produce data can be considered IoT, practically EVERYTHING in our natural and unnatural world.

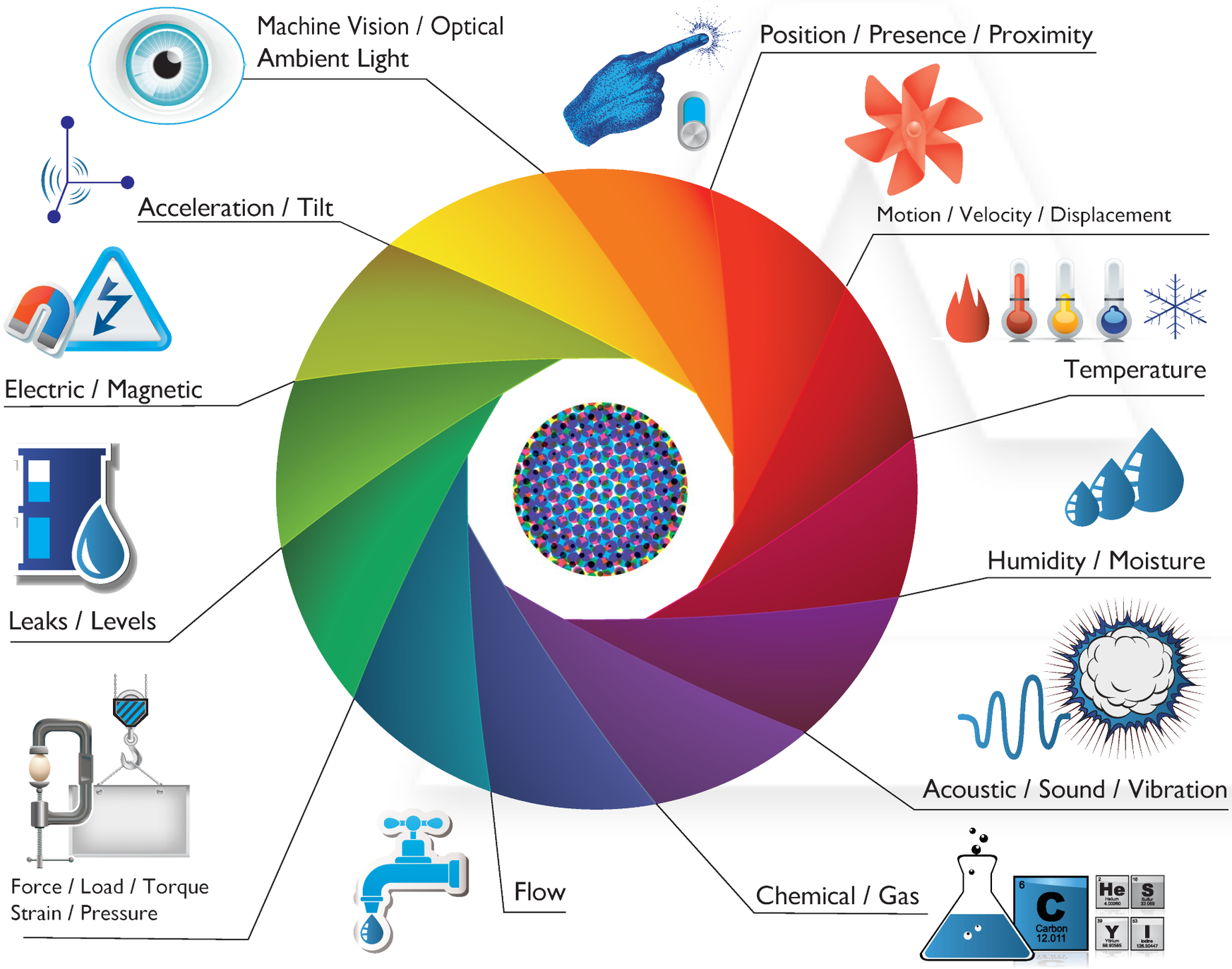
IoT Combination

Sensors & Actuators

Connectivity

People & Process

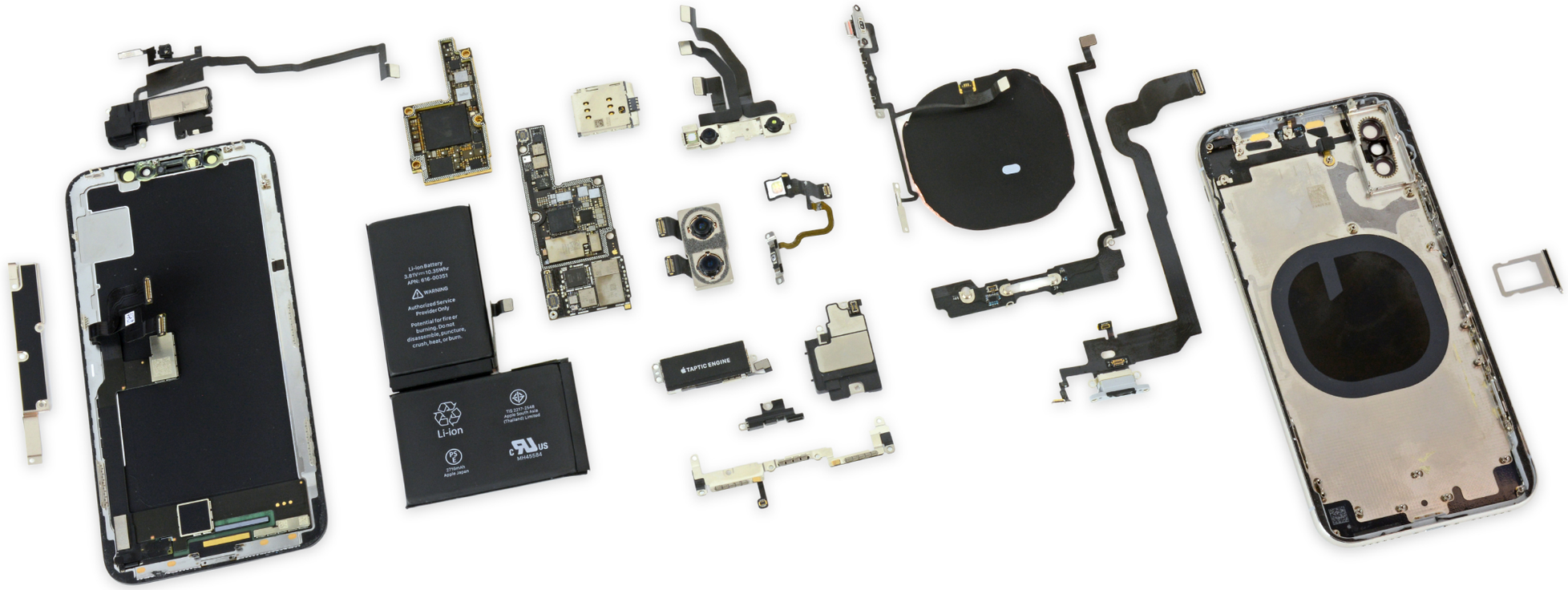
1.Sensors & Actuators



We are giving our world a digital nervous system.

Location data using GPS sensors. Eyes and ears using cameras and microphones, along with sensory organs that can measure everything from temperature to pressure changes.

Take the Case of iPhone X

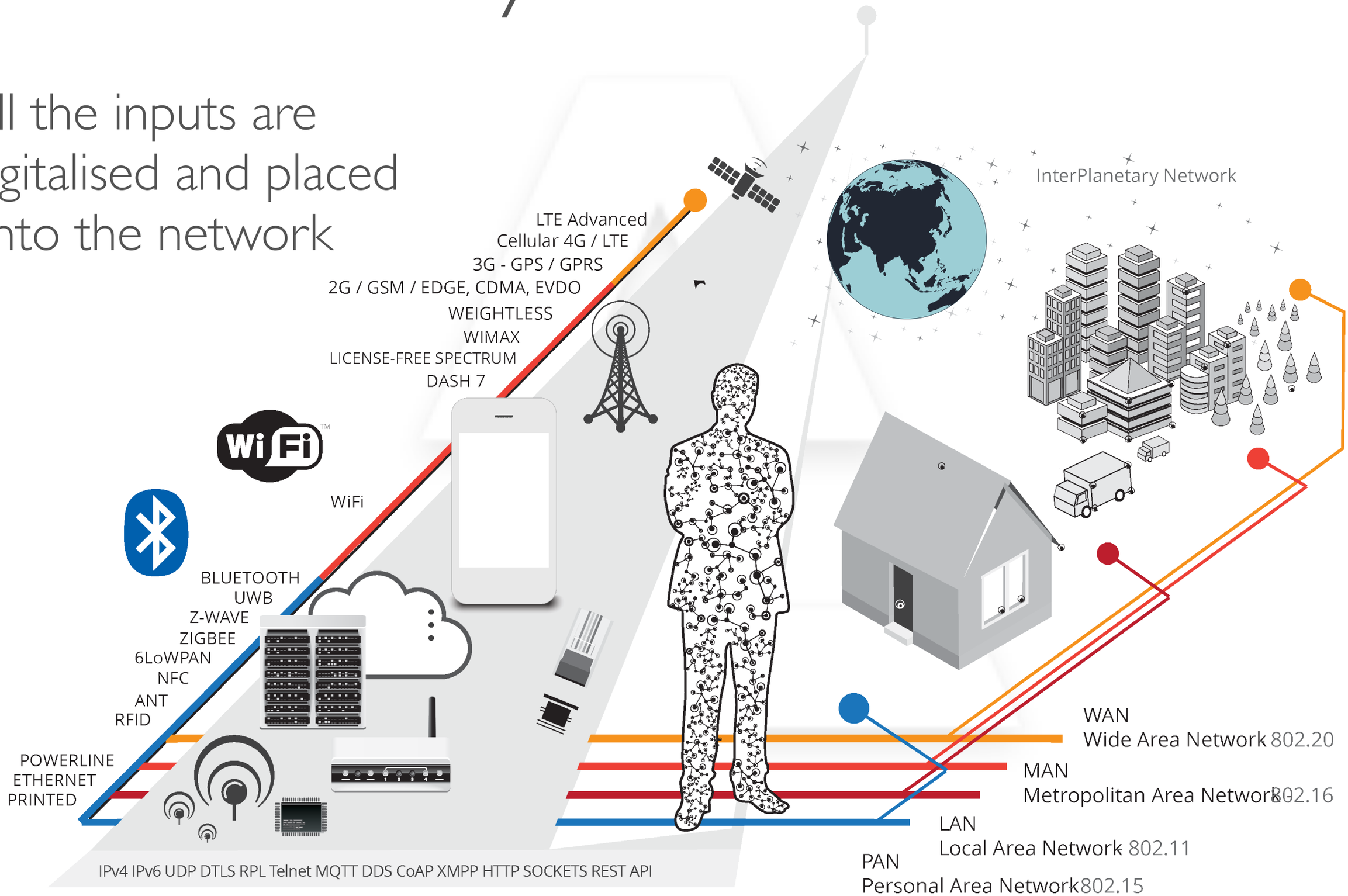


- **TrueDepth camera system**
  A dot projector, An infrared camera, Flood illuminator
- **Taptic Engine**
  technology that provides tactile sensations in the form of vibrations
- **Motion coprocessor**
  implement raise to wake functionality reducing idle power usage.
- **Proximity sensor**
- **Ambient light sensor**
- **Accelerometer**
- **Gyroscope**
- **Compass**
- **Barometer**
- **Temperature sensor**
- **GPS Location**
- **Magnetometer**
- **OLED Multi-Touch display**

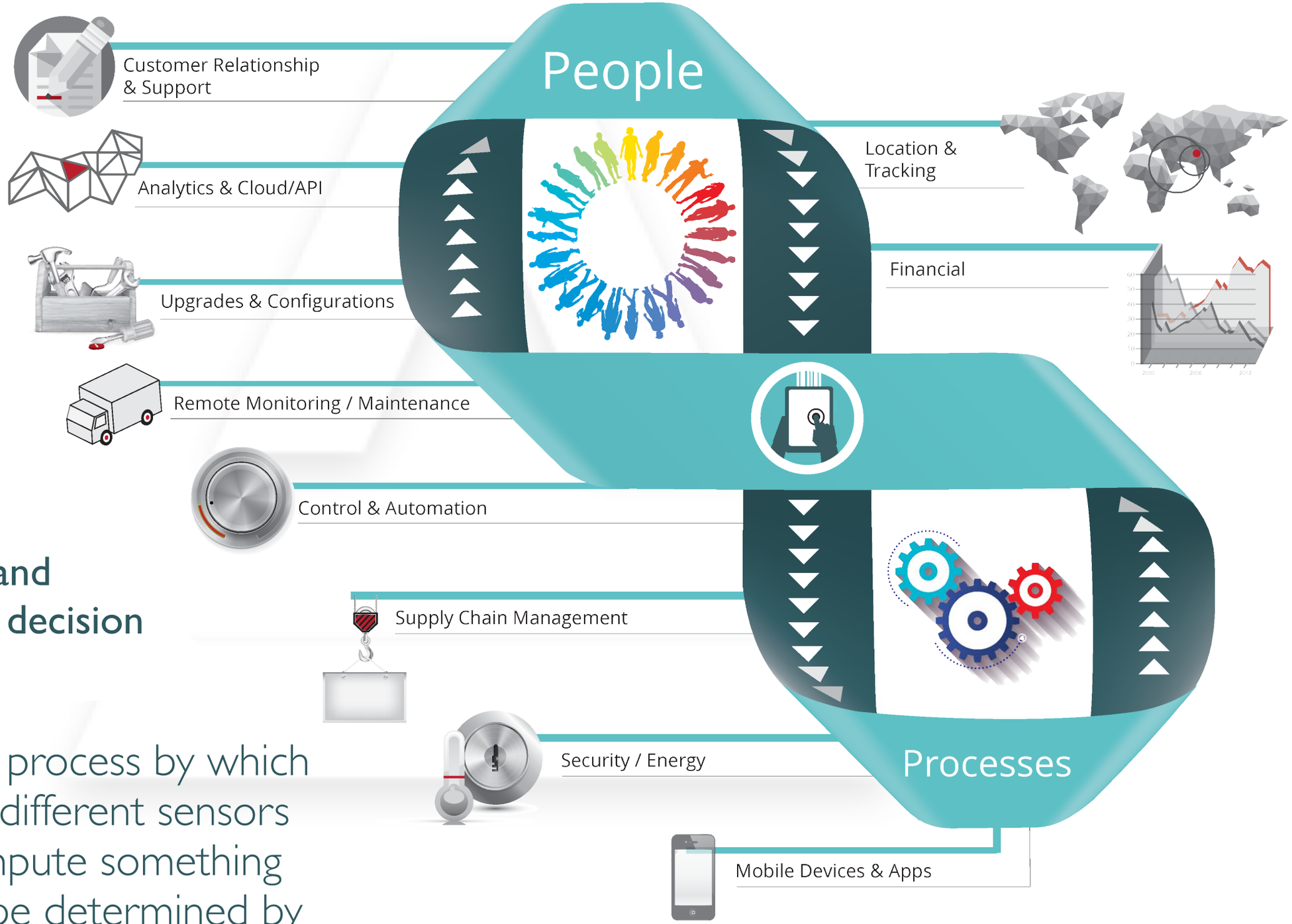
Apart from Wifi, Bluetooth, NFC, Fingerprint module, 4K Camera,Storage unit…

2.Connectivity

All the inputs are digitalised and placed onto the network



3.People & Processes



These networked inputs can then be combined into bi-directional systems that **integrate data, people, processes and systems for better decision making.**

Sensor fusion is a process by which data from several different sensors are "fused" to compute something more than could be determined by any one sensor alone.

Why Now?

- Low cost Chipset (Sensors and Processors)

  Mass Production, Opensource Community - Raspberry Pi, Arduino etc

- Long-range wireless technology

  Govt Policies adapting 3G/4G.

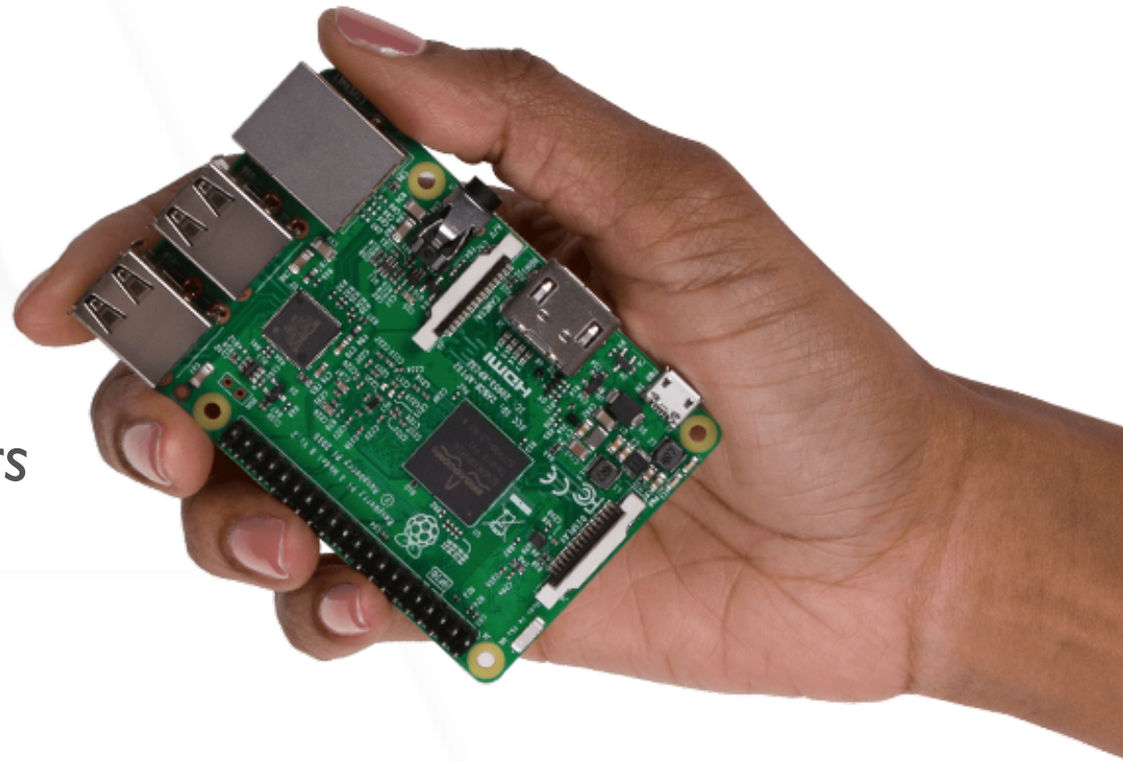
- Rise in Cloud technology

  Advent of Amazon Web Services and other players

- Increased Startup Ventures

  Creates Value in the Economy

- Of course, everybody becoming lazy day by day



Challenges

- **Currently, most IoT data are not used.**

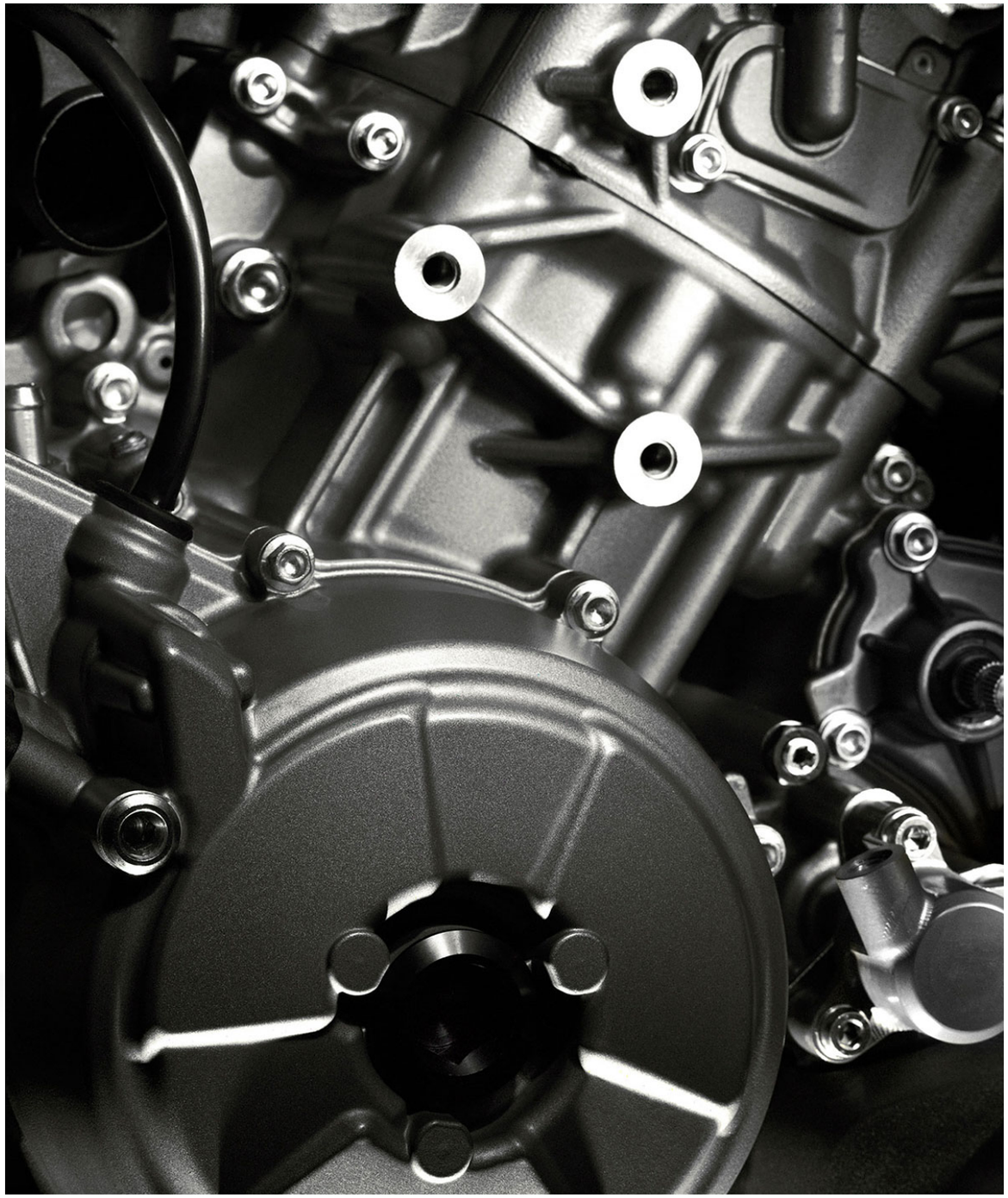
  For example, on an oil rig that has 30,000 sensors, only 1 percent of the data are examined. That's because this information is used mostly to detect and control anomalies —not for optimization and prediction, which provide the greatest value.

- **Since all things are connected, if anything goes wrong everything goes wrong.**

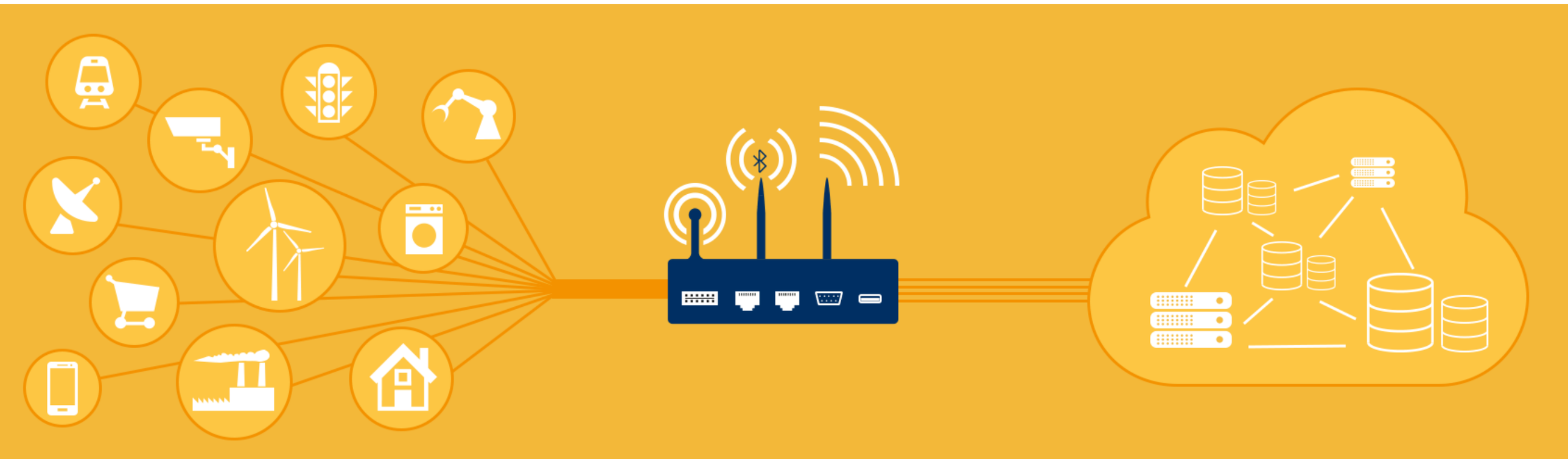
  Ever growing numbers of sensors and IT assets, combined with heightened data collection and aggregation, naturally attracts undesirable attention from cyber criminals.

- Technology Barriers

  Data transmission, processing, and storage requirements, limited battery life, Power Consumption, Range, and Bandwidth



- It is estimated by 2020, **26 billion "things"** will be connected to the internet.
- Data grows up to 60% per year. 90% of the world's data was created in the last two years.
- Only 0.5% of the data is used.
- Reliance Jio – **'Data Is the New Oil'** – Mukesh Ambani, MD



Machine Learning

Machine learning is a subset of artificial intelligence. The important word there is "learning"—as in, not being explicitly taught.

"A computer program is said to learn from ***experience E*** *with respect to some* ***task T*** *and some* ***performance measure P****, if its performance on T, as measured by P, improves with experience E."*

Prepare > Train > Test > Deploy

"predict whether this image has a bird in it"

"this user has a 53% chance of buying our product, so we should suggest it to them"

Google Maps

Google Maps continuously combines the data coming in from all the cars on the road and sends it back by way of those colored lines on the traffic layers.

Google Maps bases its traffic views and faster-route recommendations on two different kinds of information: historical data about the average time it takes to travel a particular section of road at specific times on specific days and real-time data sent by sensors and smartphones that report how fast cars are moving right then

Industrial Applications

AUGURY

A company called Augury does with vibration and ultrasonic sensors installed on Industrial equipments

"The collected data is sent to our servers, where it is compared with previous data collected from that machine, as well as data collected from similar machines. Our platform can detect the slightest changes and warn you of developing malfunctions."

Smart Surgeons Using Alexa

Echo Dot is a hands-free, voice-controlled device

Allowing physicians to dictate paperwork during surgical downtime

Voice input is converted into Text and send to Alexa Skill

Customised human recognisable information is send back to Echo which delivers it to physician

Smart Surgeon Skill

alexa

The Alexa Voice Service (AVS) enables you to integrate Alexa directly into your products.

Text from the Physician's dictation is recognised and intended task will be initiated by Alexa Skill Kit. Alexa Skill Kit is trained to perform multiple set of tasks

Desired Response will be send back

Intended task could be Storing a new information or Getting the stored information about the patient

Patient Profiling

Database is similar to an excel sheet which contains collection data about the patients. Updating this database will improve profiling of the patients better.

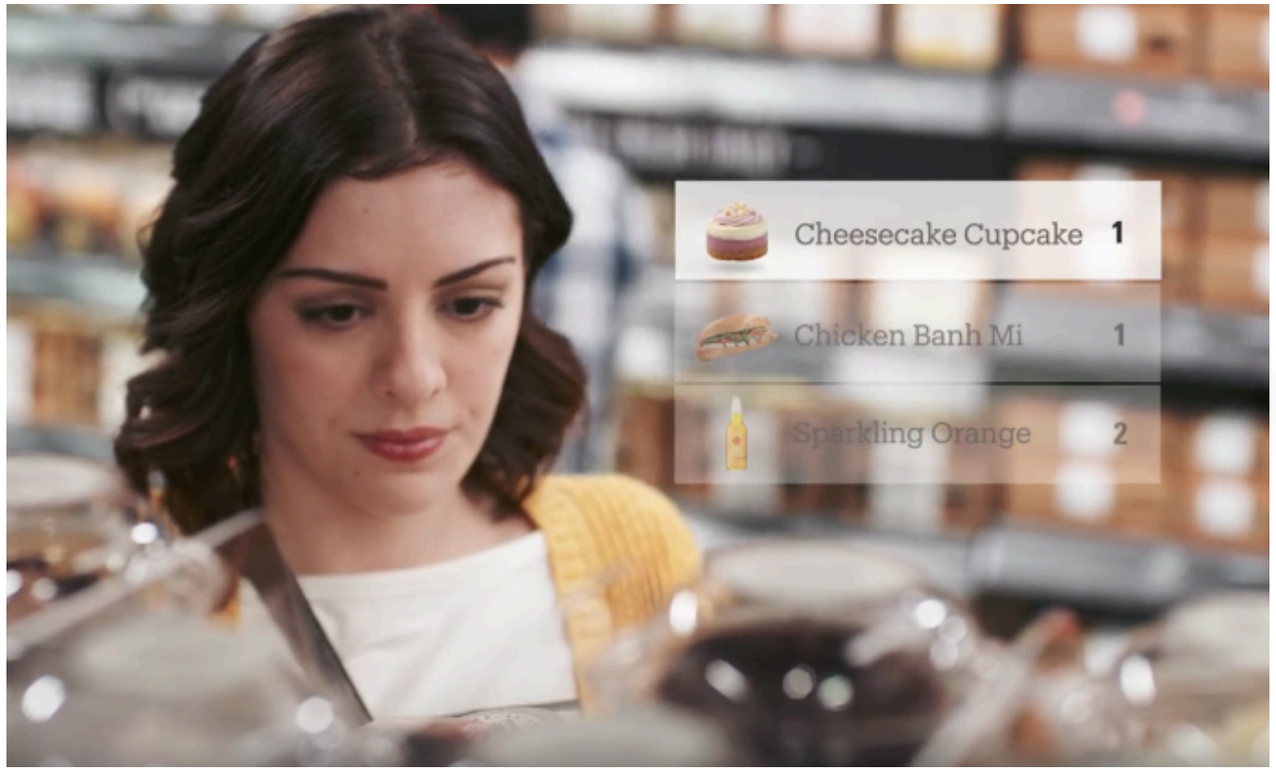
In future these data will help in diagnosing another patient with similar problem

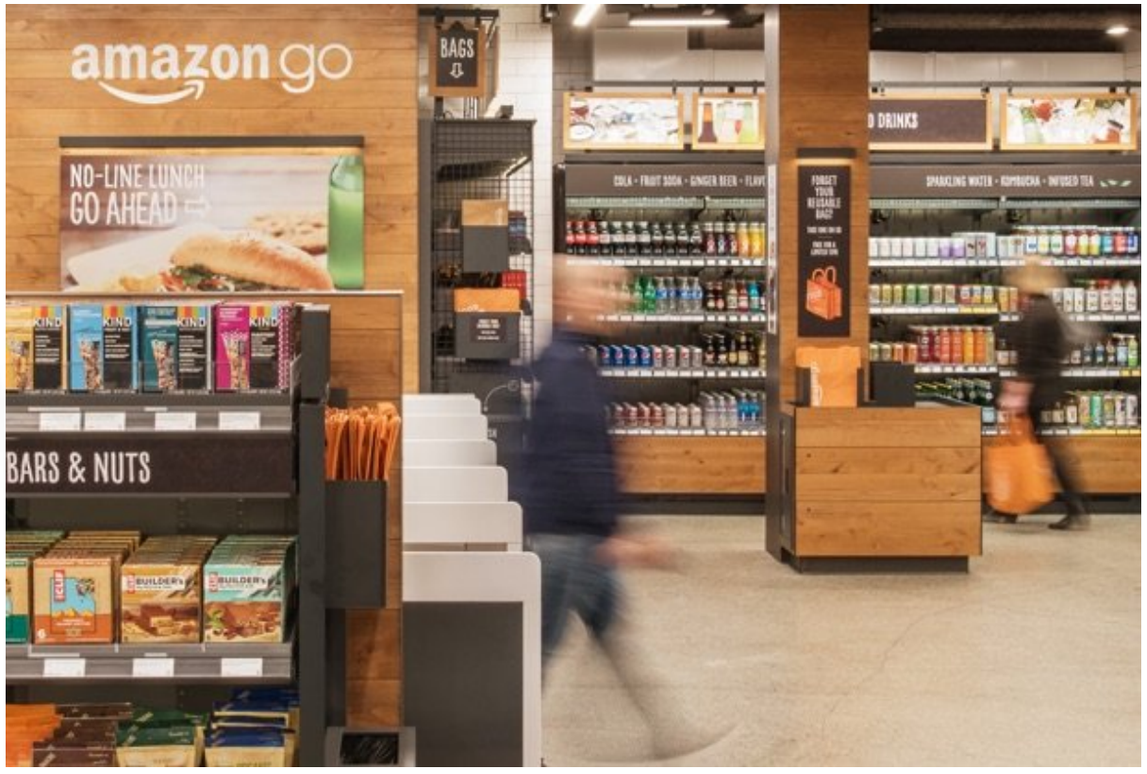
Amazon Dash Button

Amazon Dash Button is a Wi-Fi connected device that orders your favourite product with the press of a button.

Each Dash Button is paired with a product of your choice, which is selected through the Amazon App on your Android or iOS smartphone during the set-up process.

Amazon Go





It is a store with no credit card machines or cash registers, just AI.

When you enter the store, you start up the Amazon Go app on your smartphone. The store then uses a a lot of cameras and LIDAR sensors (lasers) to track everything you do once inside the store. The ***image recognition*** *combined with* ***sensor fusion and deep learning*** *technologies has already confirmed your order and totalled it up.*

Things - Consumer

Home Security
HOMEBOY
arlo
canary
dropcam
piper

Smart Locks
August
Lockitron
ring VIDEO DOORBELL
Kwikset
GOJI

Home Appliances
nest
tado°
Whirlpool
smart ThinQ
Aros
SAMSUNG
cinder

Smart Bed
LUNA
beddit
select comfort
SLEEPIQ KIDS

Smart Lights
LIFX
belkin
link CONNECTED LED BULBS
CREE
hue PERSONAL WIRELESS LIGHTING

Gardening / Water
EDYN
NIWA
Droplet
LONO
grove

Trackers
tile
TrackR
BeLuvv
bikn
hereO

Smart Pet
Whistle
CleverPet
FiSHBiT
Petnet
CATA
FitBark

Fitness/Health
Withings Inspire health
fitbit
ATHOS
GARMIN
MISFIT

Smart Watches
WATCH
moto 360
androidwear
OLIO pebble
LG Watch Urbane
ALCATEL onetouch
SMARTWATCH 3

Smart Fashion
TORY BURCH FOR FITBIT
RINGLY
CUFF
Ring
MOTA
SWAROVSKI

Home Automation
SmartThings
ALARM.COM
Control4
vera
vivint.
icontrol NETWORKS

Connected Car
AUTOMATIC
navdy
metromile
dash
Jasper
vinli
android auto
Apple CarPlay
TESLA
BMW
Ford
HondaLink

Things - Enterprise

Smart Logistics
WEFT
KEEP TRUCKIN
SCANIA
Maruti3PL Track. Monitor. Manage. Secure.
CISCO
DHL
MAERSK LINE
SAIA

Smart Factory
intel
GE
Rockwell Automation
SAP
SIEMENS
CISCO

Smart Agriculture
JOHN DEERE
PRECISIONHAWK
FARMOBILE
AgSmarts
Granular
ONFARM
OBSERVANT
Medria
semios

Smart Cities
enevo
GRID WASTE
ParkHelp
WM WASTE MANAGEMENT
IBM
Bigbelly
Kiunsys Move on!

Smart Grid
OPOWER
TENDRIL
Itron
SPACE-TIME INSIGHT
actility Making Things Smart
S&C ELECTRIC COMPANY
Schneider Electric
SILVERSPRING

Smart Retail
PERCOLATA
euclid
Scanalytics Inc.
Egburt
estimote
kontakt.io

IOT Security
Bastille
sansa SECURITY
offspark
ARM
CoroNet

Smart Healthcare
proteus DIGITAL HEALTH
ORTHOSENSOR
soundhawk
AdhereTech
CareTRx FOR INHALERS
MedMinder
vitalconnect
VITALITY
AliveCor

Internet - Infrastructure

Hardware/ Connectivity Platforms
Particle
TESSEL
electric imp
ARMmbed
pinoccio
HELIUM

Board / Chipsets
beaglebone
ODROID Hardkernel
ARM Raspberry Pi
AMTEL
QUALCOMM
intel Edison
MARVELL
BROADCOM

Software Platforms
resin.io
xively by LogMeIn
TempoIQ
TEMBOO
PubNub
ThingWorx
waygum
Jasper
MODE
Ayla Networks

Design Considerations

IoT devices can ascend through five levels of usefulness:

- Reporting
- Actuating
- State Changing
- Receiving Commands
- Coordinating

Design Considerations

Ask these questions when designing a product:

- How much data will I need to collect? Will collecting this data add a lot of value?
- What should I allow users to control? What's the expected interaction?
- What additional features can I add to the device that will exponentially increase what can be done with the product?
- What benefit will be derived by opening up my device to third parties to control?
- What coordination can other devices have with mine to create unique experiences?

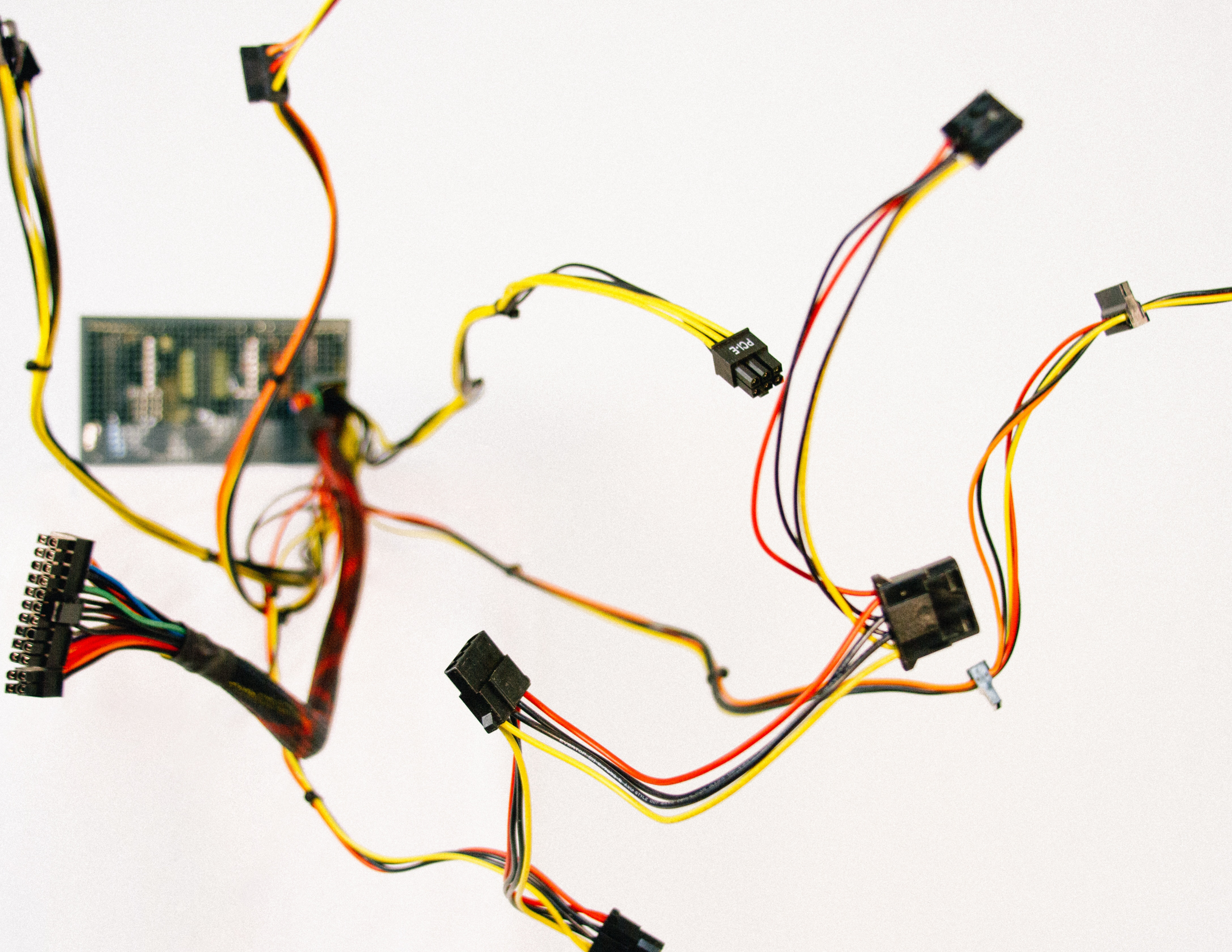
Future of IoT

- IoT will drive new value propositions and new business models.

- All spheres of life that can be digitized will be digitized.

- **Internet of Everything**

In tomorrow's world, a "thinking" dosai maker will make your dosai as you wake up and send a network request to your refrigerator to buy some more ID Chutney and Dosai batter.


PCI-E

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