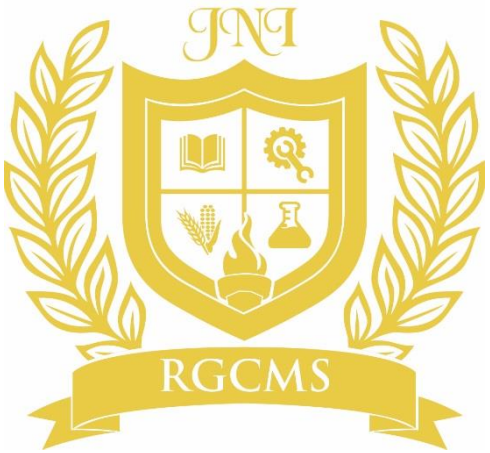


Scope and Career Opportunities

Emerging and Disruptive Technologies

Learning Outcomes

- Introduction to emerging technologies
  - Artificial Intelligence and Machine Learning
  - Cyber Security
  - Blockchain
  - Internet of Things
- Why these technologies are important in today's context
- Growth opportunities and career options
- Where these technologies are being used and will be used
- Help students make informed decision in their career option and future studies

Artificial Intelligence and Machine Learning

Photo Credit: Photo Credit: Pixabay

AI - Overview

- What is Intelligence?
  - the ability to calculate and reason,
  - perceive relationships and analogies,
  - learn from experience,
  - store and retrieve information from memory,
  - solve problems,
  - comprehend complex ideas,
  - use natural language fluently,
  - classify, generalize, and adapt new situations,
  - the capacity to learn and solve problems.

AI - Overview

- What is Artificial Intelligence?
  - The science and engineering of making intelligent machines
  - Simulation of human intelligence by machines
  - The ability to solve problems
  - The ability to act rationally
  - **The ability to act like humans**

  - https://www.youtube.com/watch?v=5iV_hB08Uns
  - https://www.youtube.com/watch?v=aFuA50H9uek
  - https://www.youtube.com/watch?v=f8jTu0FdhD0

Real World Applications of AI

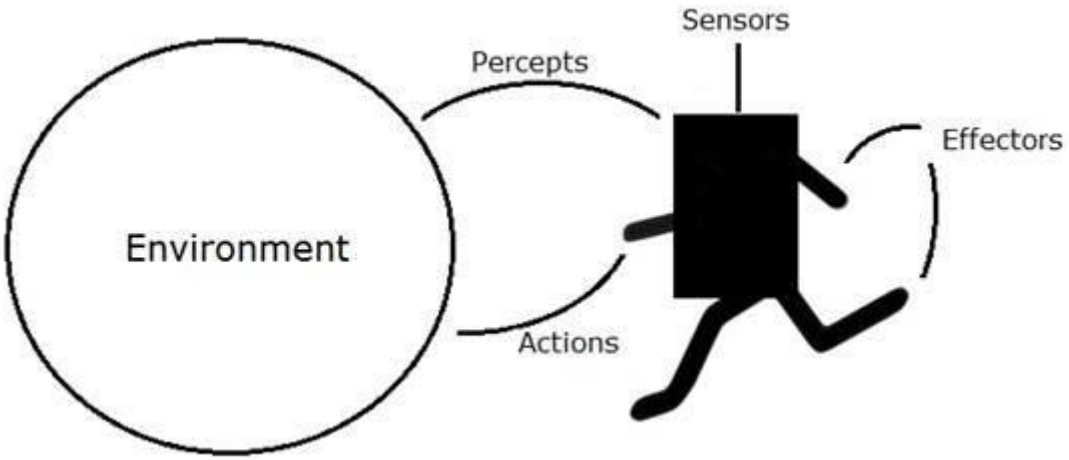
- Gaming
  - Machine can think of large number of possible positions based on heuristic knowledge
- Natural Language Processing
  - Interact with the computer that understands natural language spoken by humans
- Expert Systems
  - Impart reasoning, advise and explanation to humans
  - Gate allocation for the planes
  - Dynamic Ticket pricing

Real world Applications of AI

- Neural Networks
  - Vision system
    - Understand, interpret, and comprehend visual input on the computer. Ex: Pictures taken by spy planes, doctors to diagnose, face recognition
    - Analyze satellite images where areas have highest poverty
  - Speech Recognition
  - Handwriting Recognition
- Intelligent Robots
  - Industrial robots for moving, spraying, painting, precision checking, drilling, cleaning, coating, carving

What is AI System composed of

- Agents and Environments
  - Agents: anything that can perceive its environment through *sensors* and acts upon that environment through *effectors*
  - A *human agent* has sensory organs such as eyes, ears, nose, tongue and skin parallel to the sensors, and other organs such as hands, legs, mouth, for effectors.
  - A *robotic agent* replaces cameras and infrared range finders for the sensors, and various motors and actuators for effectors.
  - A *software agent* has encoded bit strings as its programs and actions.



Basic Concepts of AI

- Machine Learning
  - Traditional Software lack ability to learn independently
  - Machine learning is a branch of AI that aims to give machines ability to learn a task without pre-existing code
  - Machines are given a large amount of trial examples for a certain task
  - As they go through these trials, machines learn and adapt their strategy to achieve those goals
  - EX: image-recognition machine may be given millions of pictures to analyze. After going through endless permutations, the machine acquires the ability to recognize patterns, shapes, faces, and more.
- Deep Learning
  - Machines to learn more than just a specific task
  - Able to take what it has learned from analyzing photographs and use that knowledge to analyze different data sets
  - Formulate general-purpose learning algorithms that help machines learn more than just one task

AI trends to Watch in 2020 and beyond

- AI will become political talking point
  - Jobs will be created and jobs will be lost
- Logistics will become increasingly efficient
  - Amazon Robotics -- use a combination of artificial intelligence and advanced robotics
- Mainstream auto manufacturers will launch self-driving cars
- DARPA will develop advanced robo-warriors in plain sight
- Machine learning will aid knowledge workers
- Content will be created using AI
- Consumers will become accustomed to talking with technology
- AI will fight challenging diseases

Future of AI

- AI HAS ARRIVED WITH A BANG !!!
- It is a two-edged sword
  - Solve problems intelligently and / or Can pose problems themselves
  - We have to handle it properly
- Best way to handle it properly is to understand and learn how to put it to best use!

Why are we so worried about artificial intelligence? Surely humans are always able to pull the plug?

People asked a computer, “Is there a God?”
And computer said “There is now,” and fused the plug

- Stephen Hawking (Brief Answers to Big Questions)

Cyber Security

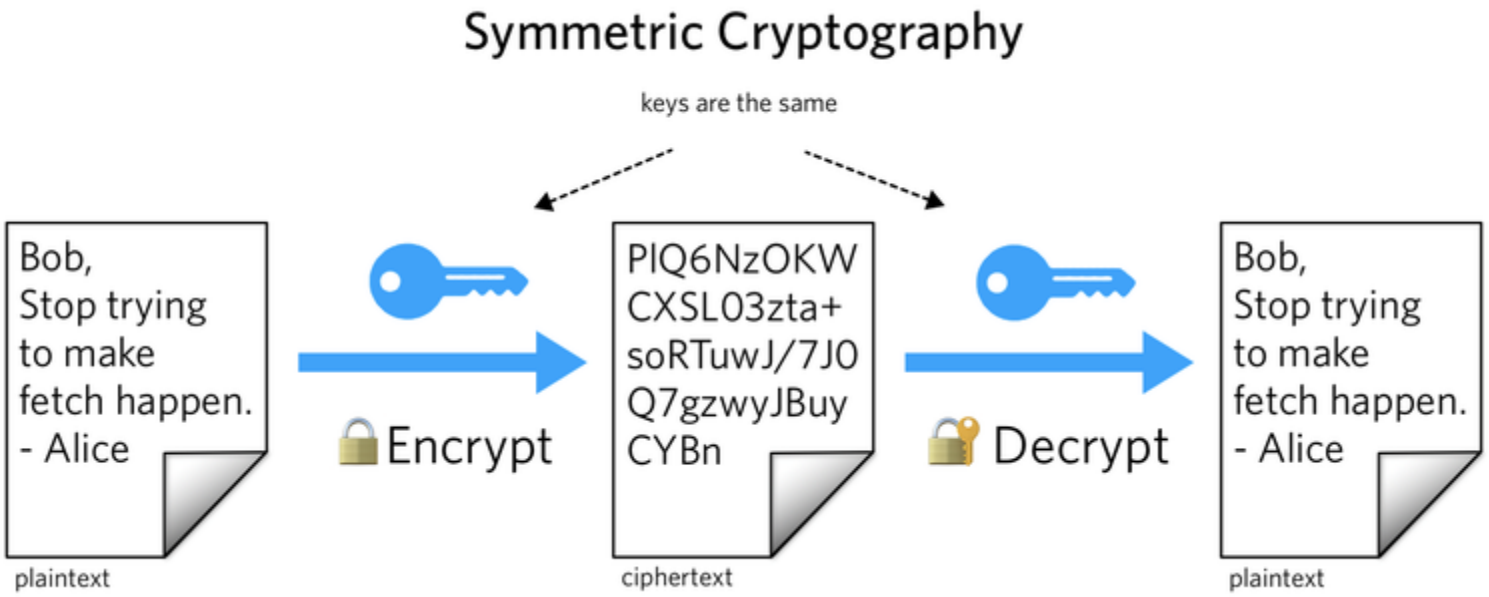
Pic Curtesy: https://www.geospatialworld.net/blogs/the-dire-need-of-prioritizing-cyber-security-in-the-age-of-ai/

Cyber Security

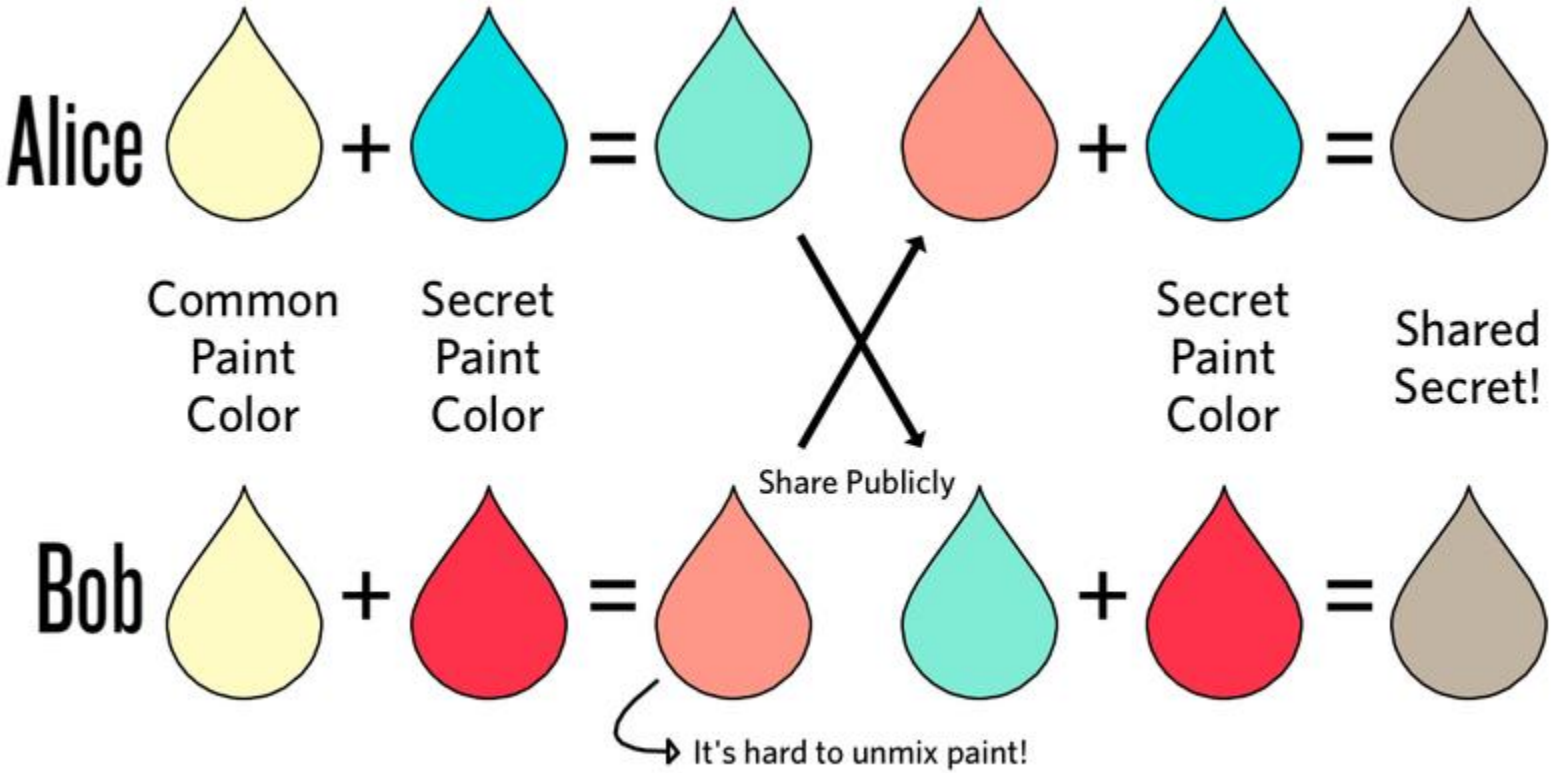
- What does Cybersecurity mean and what does it encompass?
  - Cryptography
  - Cyber Warfare
  - Digital Forensics
  - Ethical Hacking and Cyber Kill Chain
  - Malware Analysis and Vulnerability Assessment
  - Security Engineering

- Scope and Applications
- Career Opportunities

Cyber Security - Cryptography



Cryptography – Public Key / Private Key



CyberWarfare

- Cyberwarfare refers to the use of digital attacks
  - like computer viruses and hacking
  - by one country to disrupt the vital computer systems of another, with the aim of creating damage, death and destruction.
- Future wars will see hackers using computer code to attack an enemy's infrastructure, fighting alongside troops using conventional weapons like guns and missiles
- Threatmap: https://threatmap.checkpoint.com/

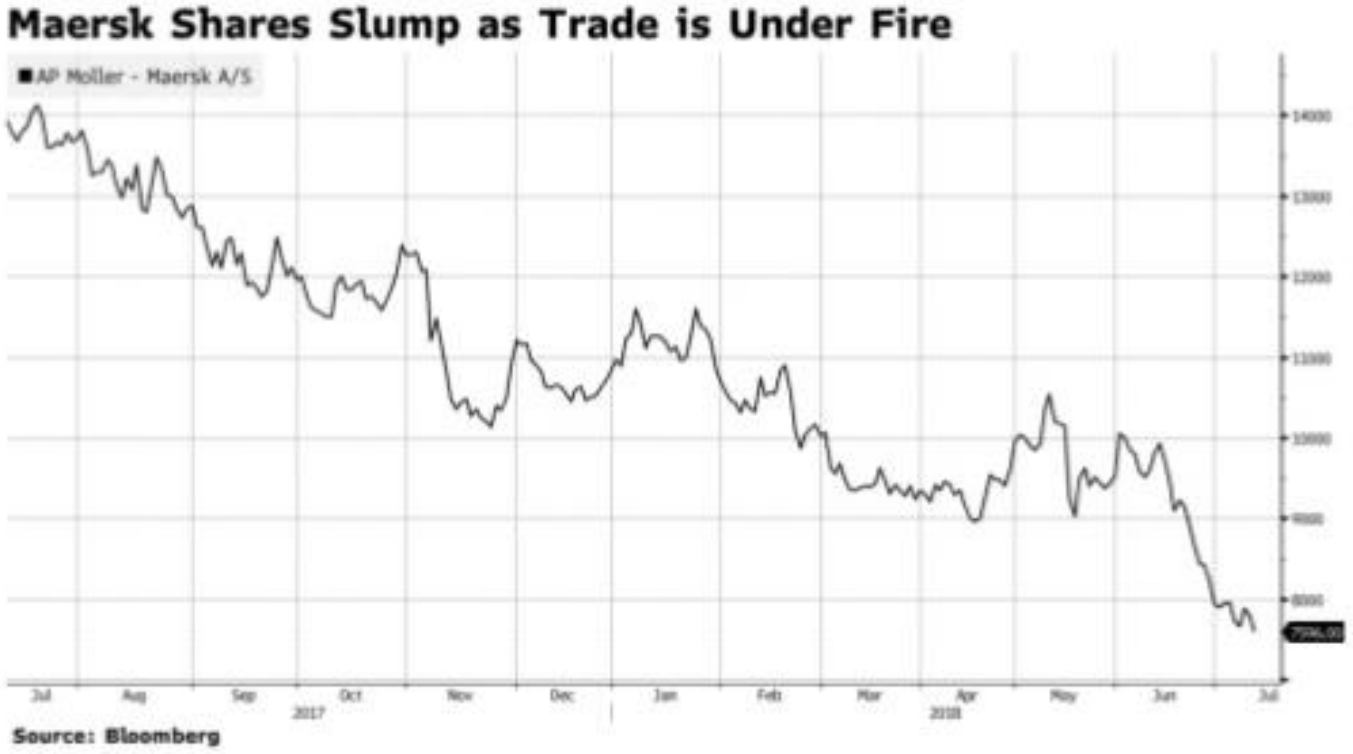
Cyber Attack - Maersk

Maersk cyber attack – overview

- Maersk infected via Ukrainian tax return vendor MeDoc
- Collateral damage from geo-political attack on Ukraine government, infrastructure and financial system
- Full propagation of virus across whole company IT network within 7 minutes
- Affected all core business units
- 49,000 laptops destroyed, 1,200 apps instantly inaccessible and 1,000 destroyed, incl. the company's central booking website Maerskline.com
- Required immediate (within 2 hours) disconnection of global network
- Reverted to manual systems, resulting in 20% reduction in trading volumes
- Online bookings mostly resumed after 8 days
- 10 days to rebuild 4,000 servers and 45,000 PCs, and restore 2,500 applications
- Full IT network restored after four weeks

Cyber Attack - Maersk

2018 share price collapse

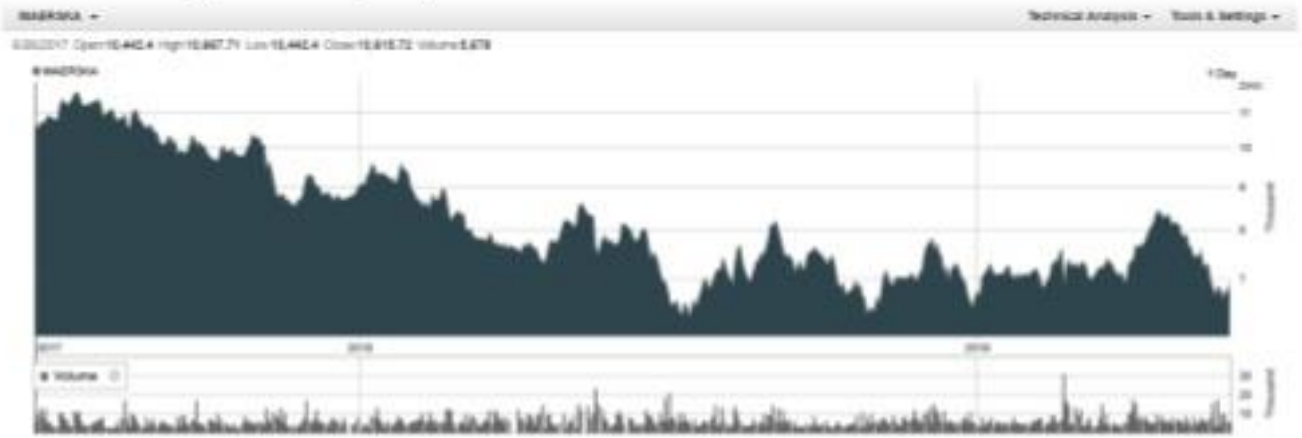


Cyber Attack - Maersk

Six-month business and reputational impact

- Revenue (FY 2017): **30.9 bn (35.5 bn)**
- Operating profit/loss: **-USD 1.2 bn (-1.9 bn)**
- Underlying profit: **USD 356 m (711 m)**
- Market cap (after 1 year): **-27%**

- Cyberattack costs: **USD 300-350m**
- Global damages (est): **USD 10bn+**
- Brand value: **+43%**



Sources: AP Moller Maersk Annual Report 2017; Reputation Institute, March 2019; Brand Finance, Feb 2019

Ethical Hacking and Cyber Kill Chain

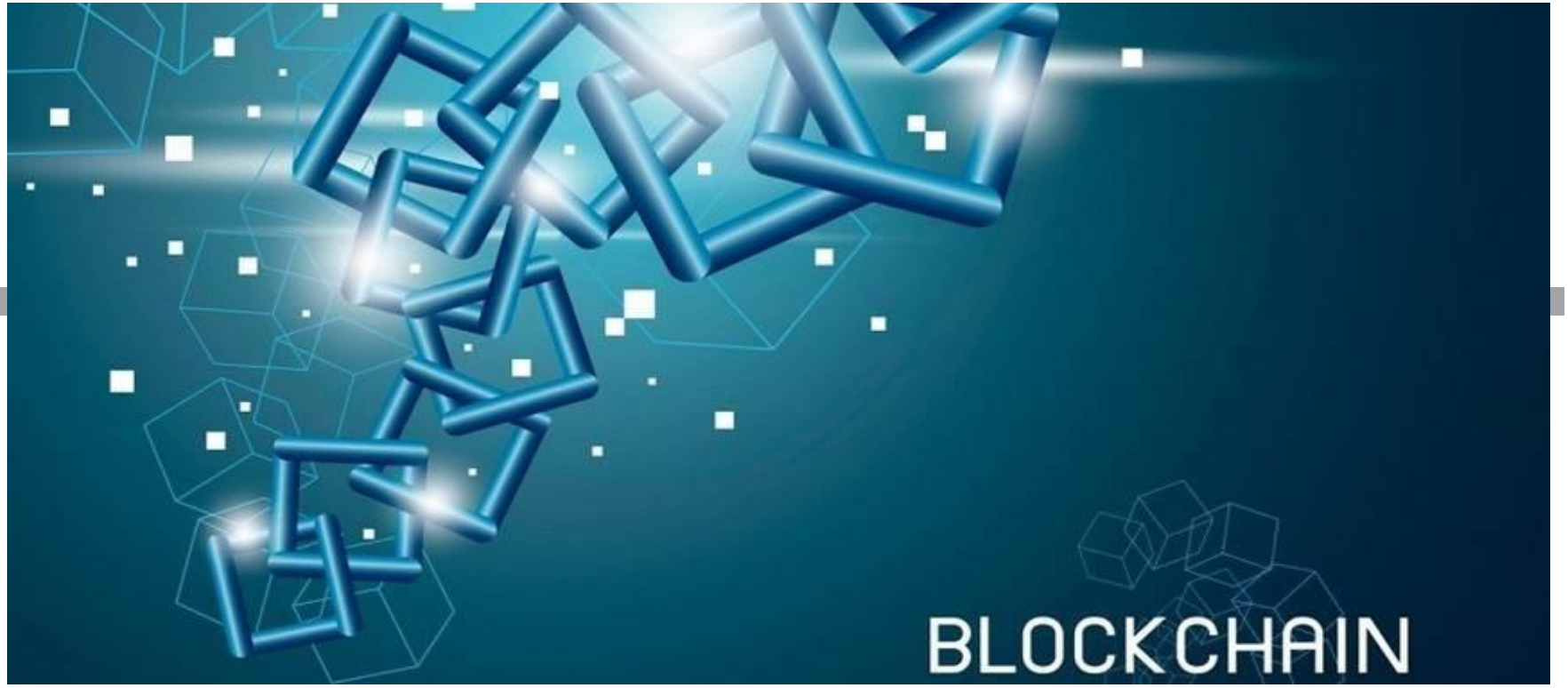
- Ethical Hacking
  - Ethical hacking is used by cyber practitioners to find vulnerabilities before an attacker is able to exploit them.
- Cyber Kill Chain Model
  - Describes Phases of Targeted Cyber Attacks
  - 7 Steps : Reconnaissance, Weaponization, Delivery, Exploit, Installation, Command and Control, and Actions on Objectives

Malware Analysis and Vulnerability Assessment

- Risk Evaluation to enterprise from array of vulnerabilities
- Prevent breaches once Malware is analyzed
- Ransomware
  - Type of malicious software (malware) used by cybercriminals to extort money.
- WannaCry (Locker Ransomware)
  - Takes your data hostage, promising to return it if you pay a ransom.
  - Attack took place in May 2017 for Microsoft OS systems
  - The WannaCry ransomware attack hit around 230,000 computers globally.

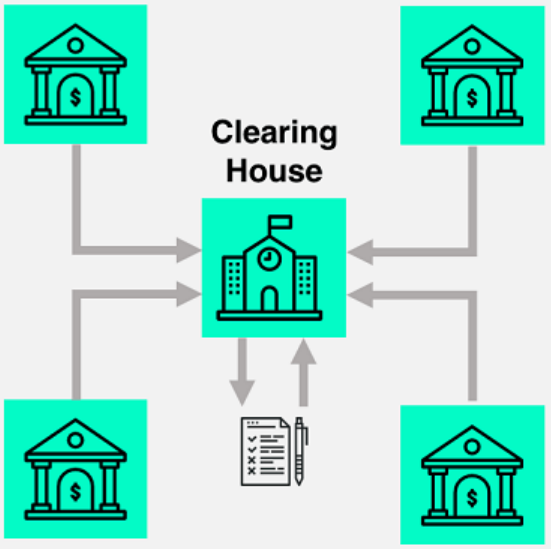
Cybersecurity- Wannacry Ransomware

Blockchain

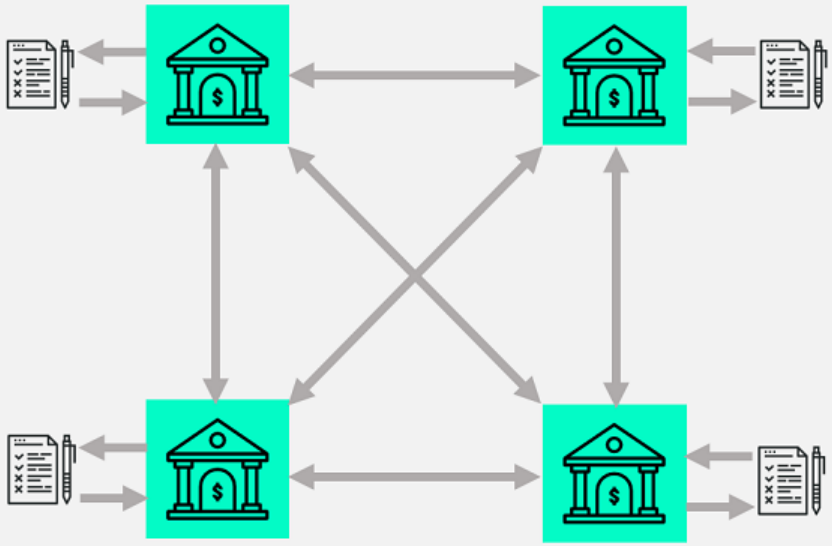


https://content.techgig.com/learn-blockchain-with-these-free-resources/articleshow/75427912.cms

Centralized Ledger V/S Distributed Ledger

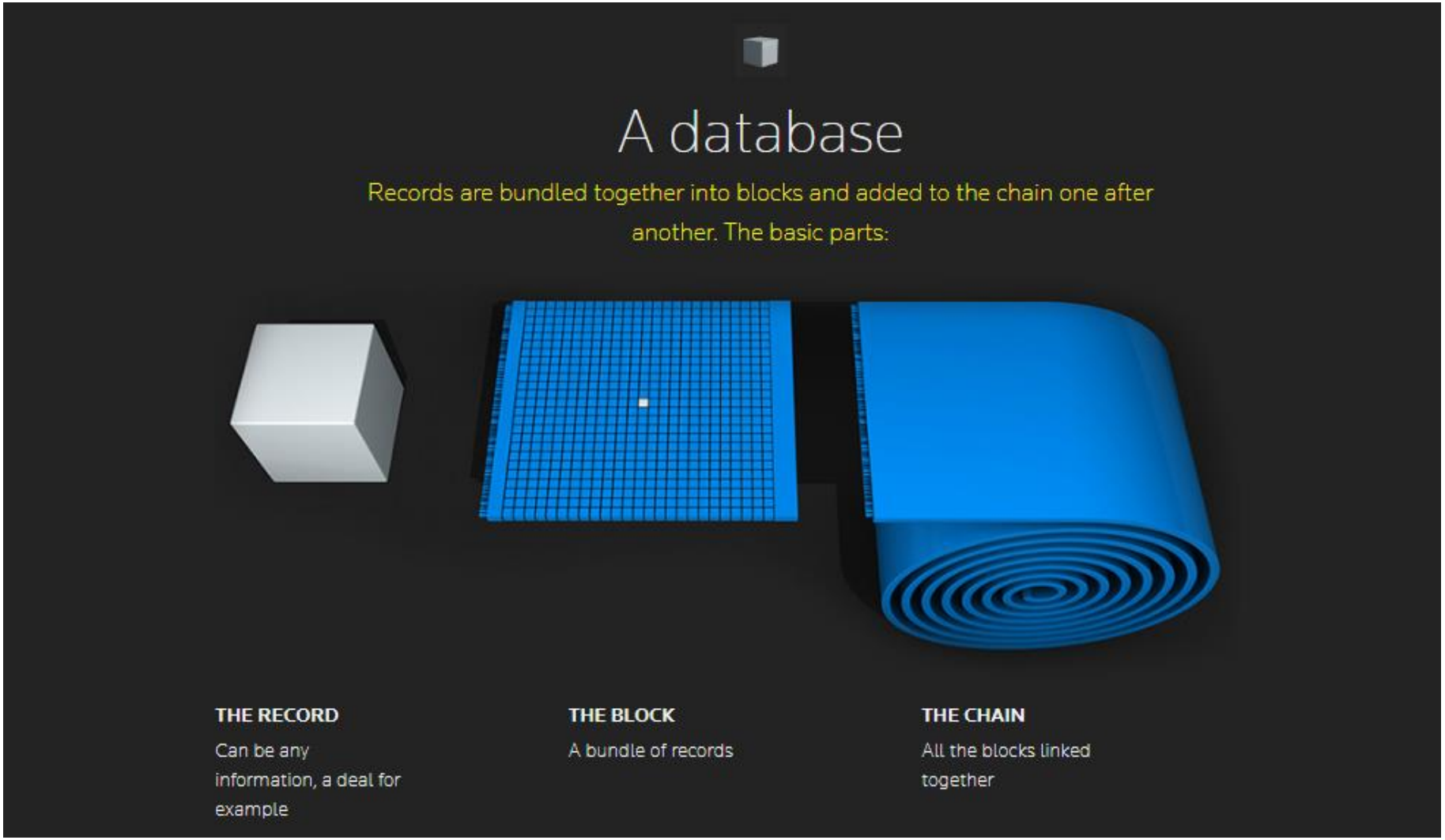


Centralized Ledger

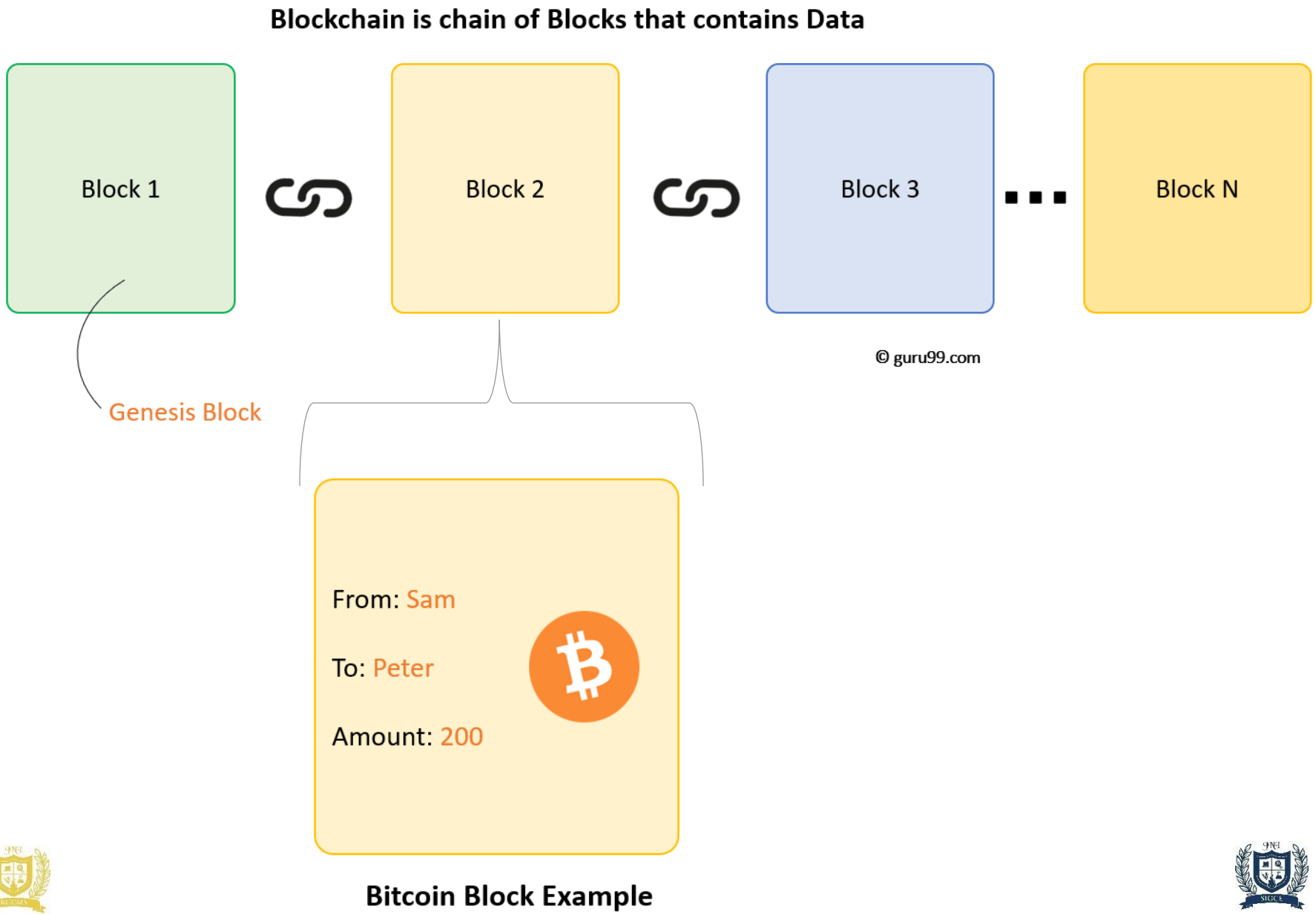


Distributed Ledger

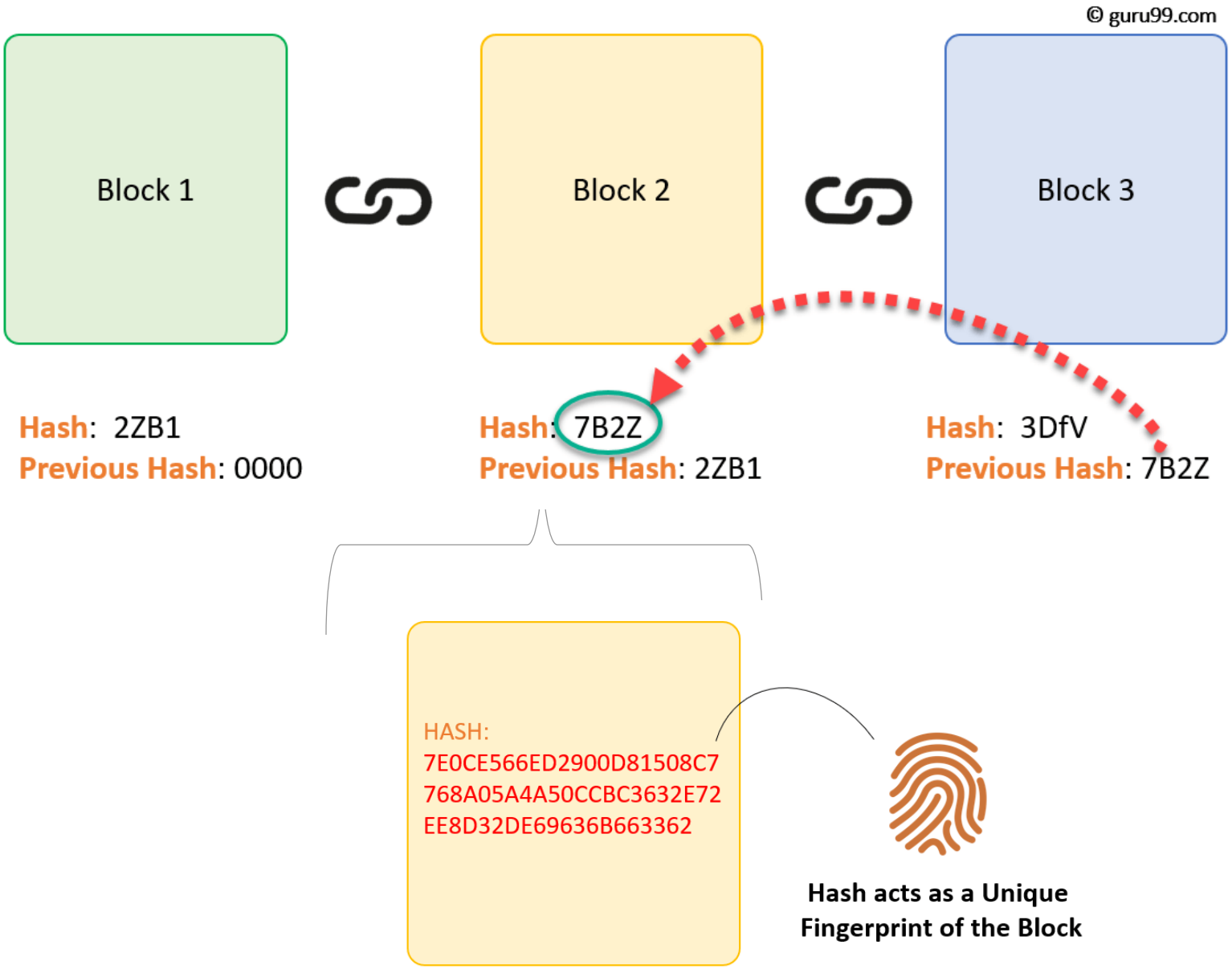
Blockchain


A database
Records are bundled together into blocks and added to the chain one after another. The basic parts:
THE RECORD
Can be any information, a deal for example
THE BLOCK
A bundle of records
THE CHAIN
All the blocks linked together

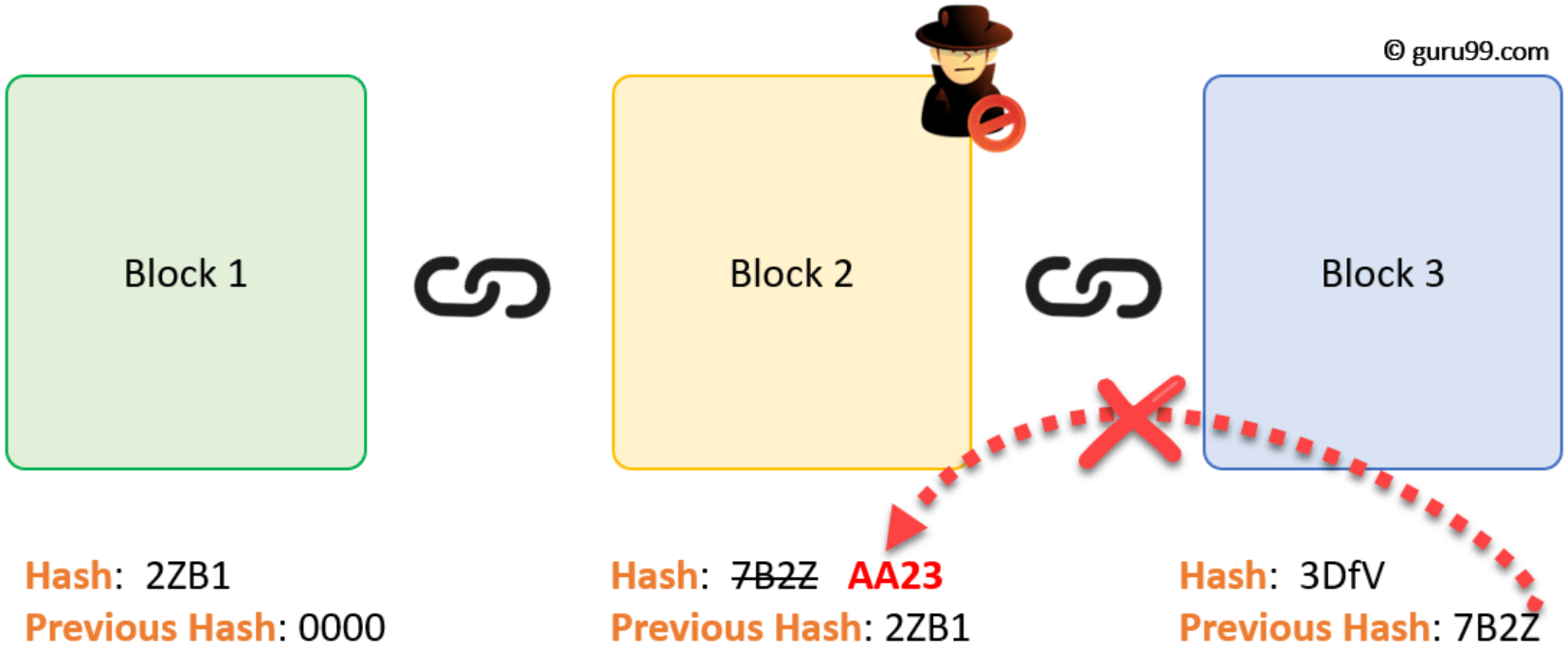
Blockchain


Blockchain is chain of Blocks that contains Data
Block 1
Block 2
Block 3
Block N
© guru99.com
Genesis Block
From: Sam
To: Peter
Amount: 200
Bitcoin Block Example

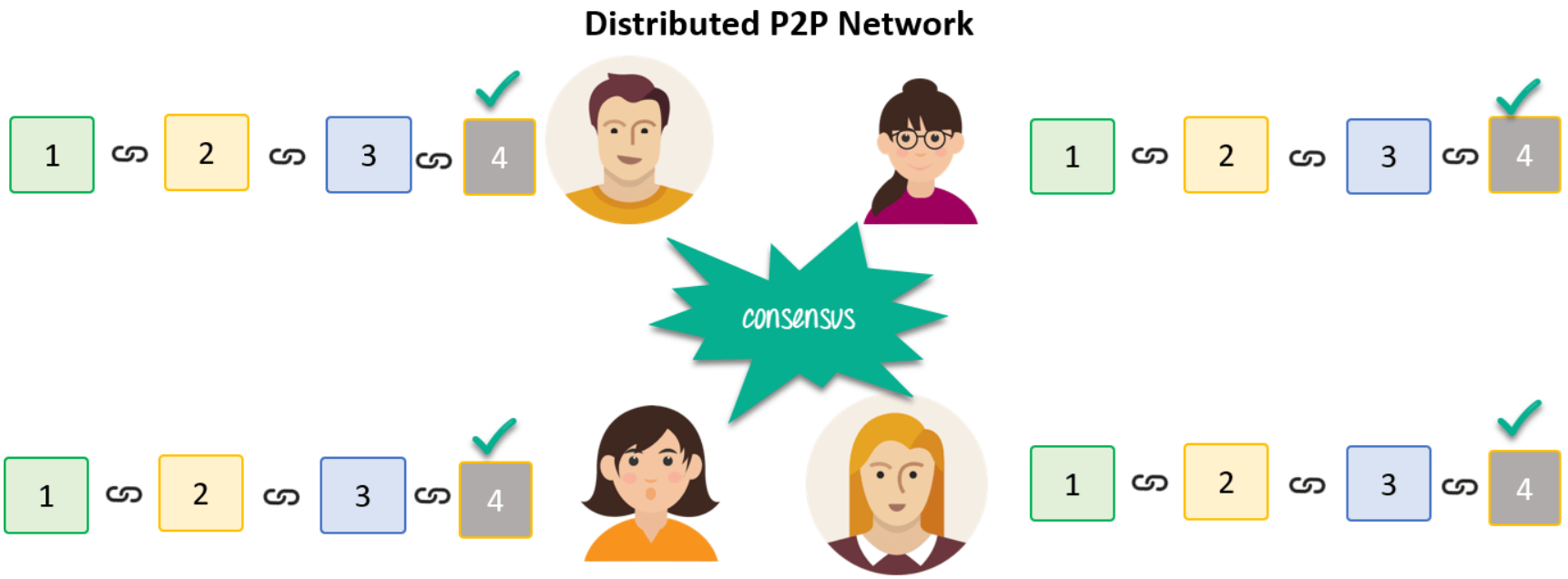
Blockchain


© guru99.com
Block 1
Block 2
Block 3
Hash: 2ZB1
Previous Hash: 0000
Hash: 7B2Z
Previous Hash: 2ZB1
Hash: 3DfV
Previous Hash: 7B2Z
HASH:
7E0CE566ED2900D81508C7
768A05A4A50CCBC3632E72
EE8D32DE69636B663362
Hash acts as a Unique
Fingerprint of the Block

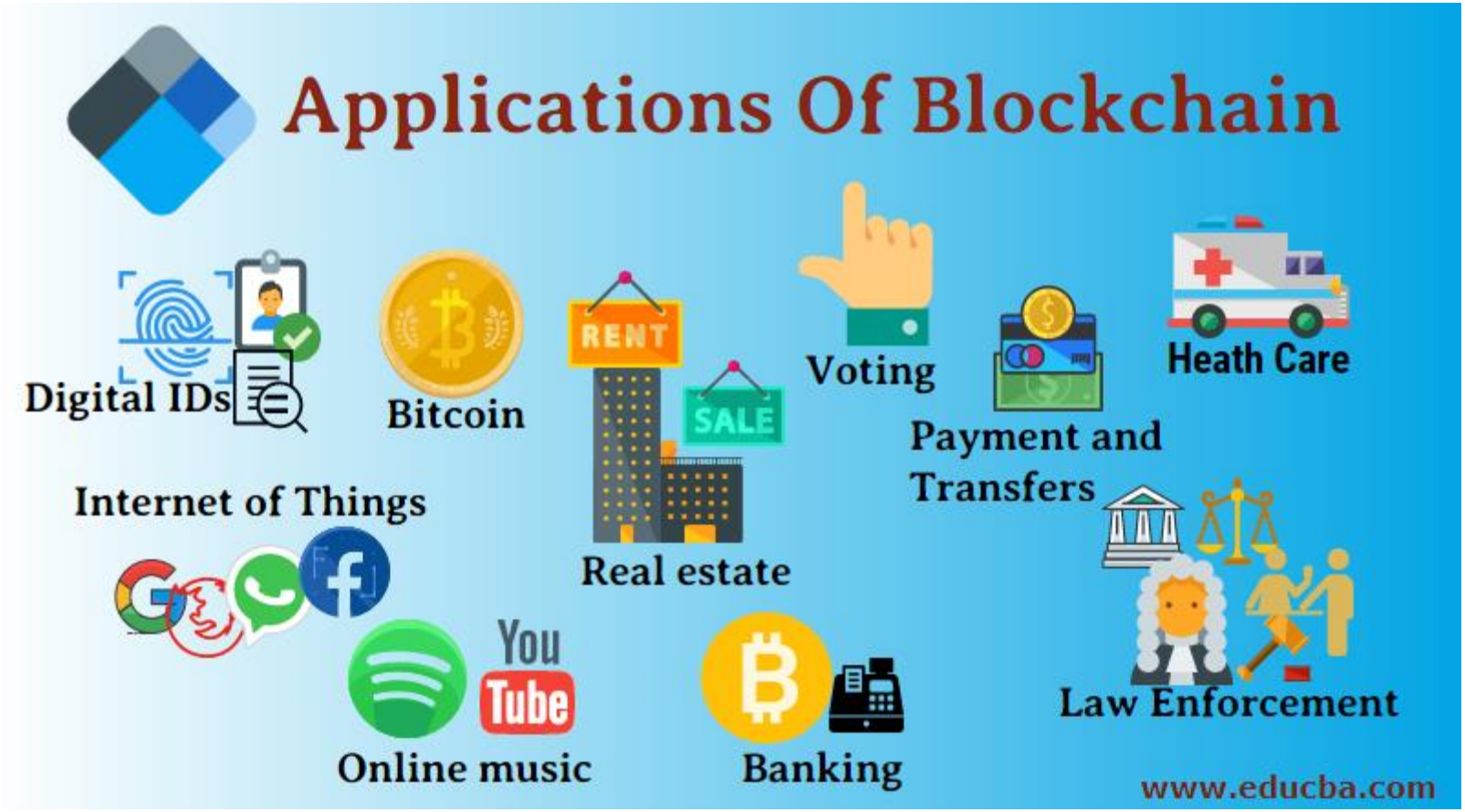
Blockchain


© guru99.com
Block 1
Block 2
Block 3
Hash: 2ZB1
Previous Hash: 0000
Hash: 7B2Z AA23
Previous Hash: 2ZB1
Hash: 3DfV
Previous Hash: 7B2Z

Blockchain



Blockchain – distributed, decentralized, public ledger

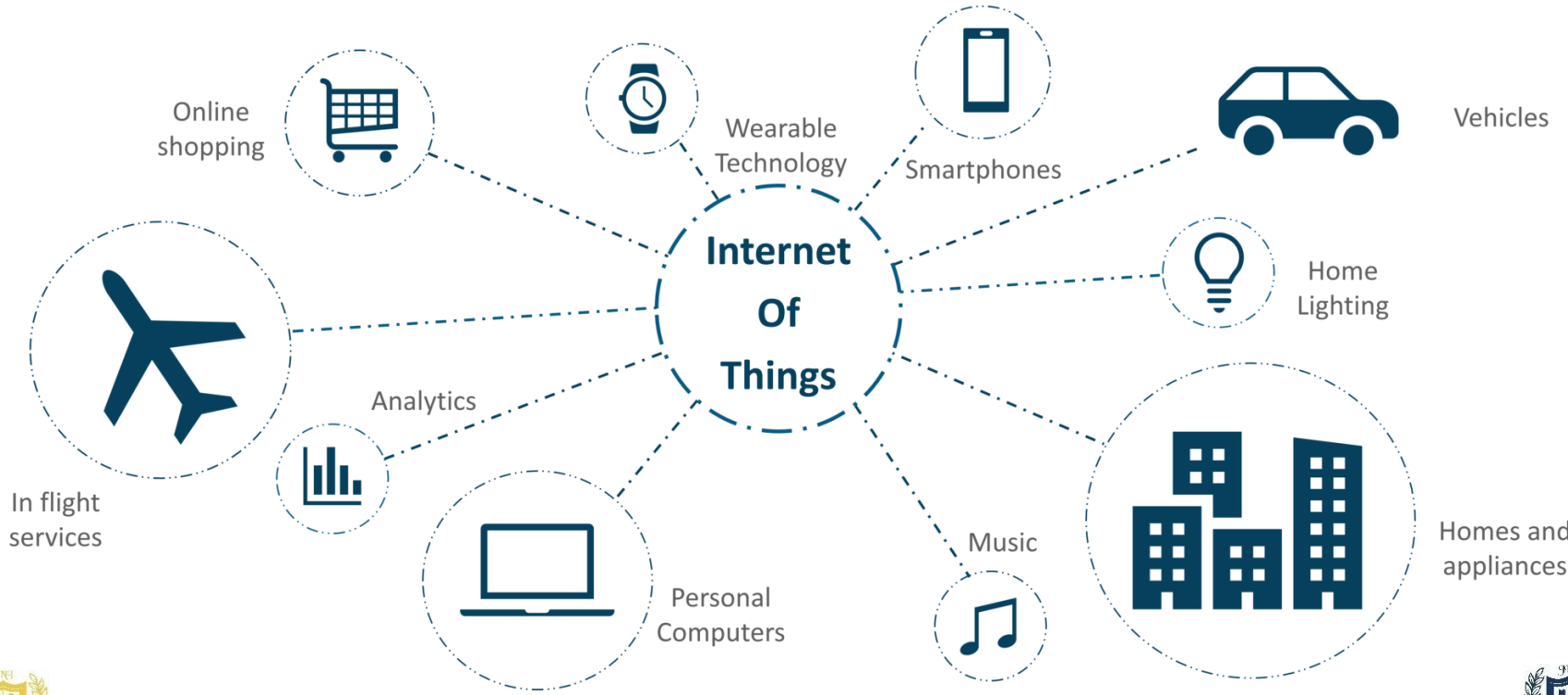


https://eraswap.life/
https://eraswapwallet.com/

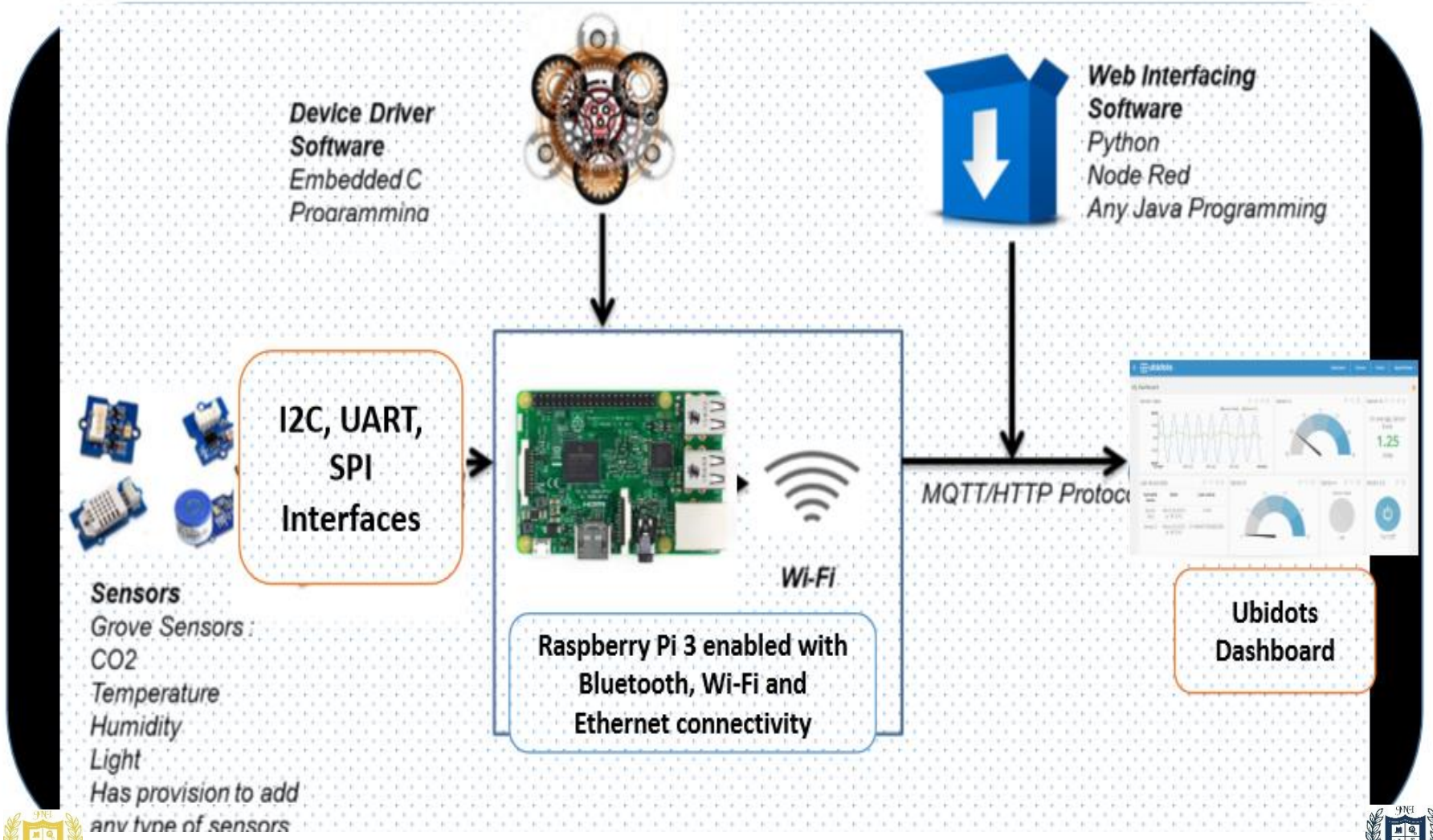
Internet of Things

Internet of Things

- The **Internet of things** (**IoT**) is a system of
  - ..interrelated computing devices, mechanical and digital machines
  - ..provided with unique identifiers(UIDs) and the ability to transfer data over a network
  - ..without requiring human-to-human or human-to-computer interaction



IoT Schematic Diagram



IOT Sensors

- Light proximity
- Microphones
- Camera (front & black)
- Gyroscope
- Accelerometer
- Barometer
- Humidity

Positioning
- GPS / GLONASS / GALILIEO
- Wi-Fi
- Cellular (A-GPS)

NFC

Pressure

Temperature

Gesture Fingerprint

Heartbeat monitor

Current Covid Scenario – Possible IoT projects

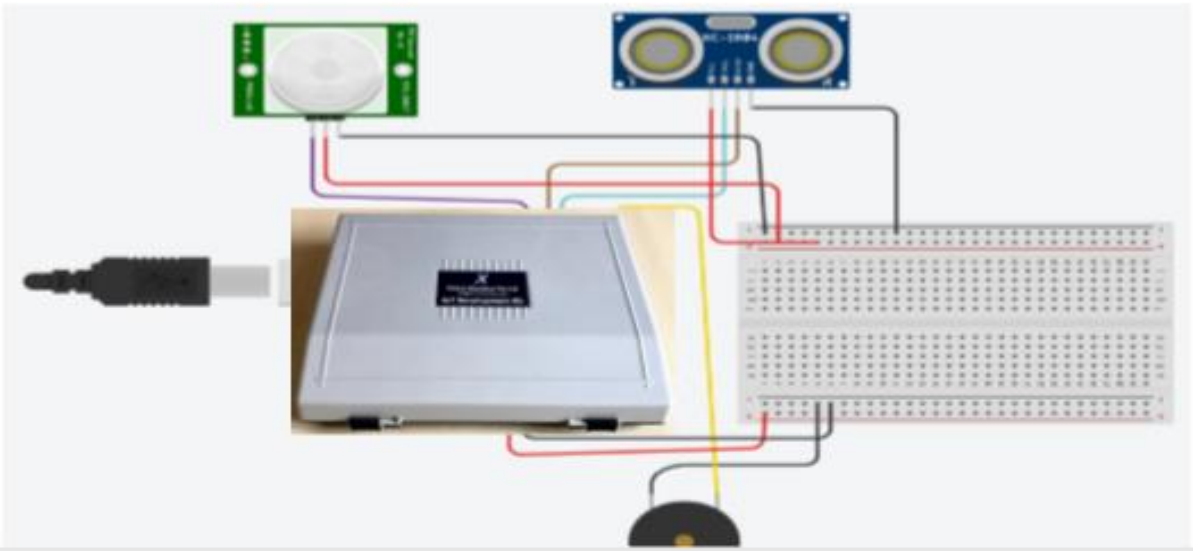
- Monitoring traffic flow at Railway station or Bus station
- IoT Enabled monitoring at isolation wards and quarantine facilities.

  Temperature and Gas sensors and Air Quality
- Wearable based (smart watch) monitoring systems

  Body temperature and GPS enables location learning
- Social Distance Monitoring (less then 6 feet) – Buzzer or an LED indication
- Touchless Sanitizing System

Current Covid Scenario – Possible IoT projects

Social Distancing Alert System



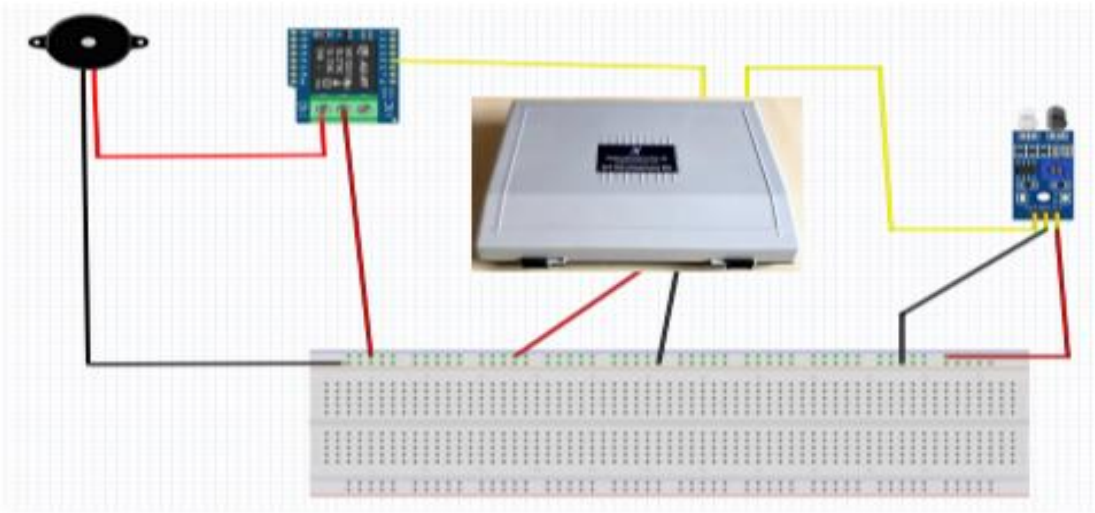
Xtranssolutions.com

Components

- Arduino UNO (Arduino Nano)
- Ultrasonic Sensor
- PIR Sensor
- Buzzer

Current Covid Scenario – Possible IoT projects

Touchless Door Bell



Components

- Arduino UNO (Arduino Nano)
- IR Sensor
- Relay
- Buzzer
- PIR Sensor (Optional)

Current Covid Scenario – Possible IoT projects

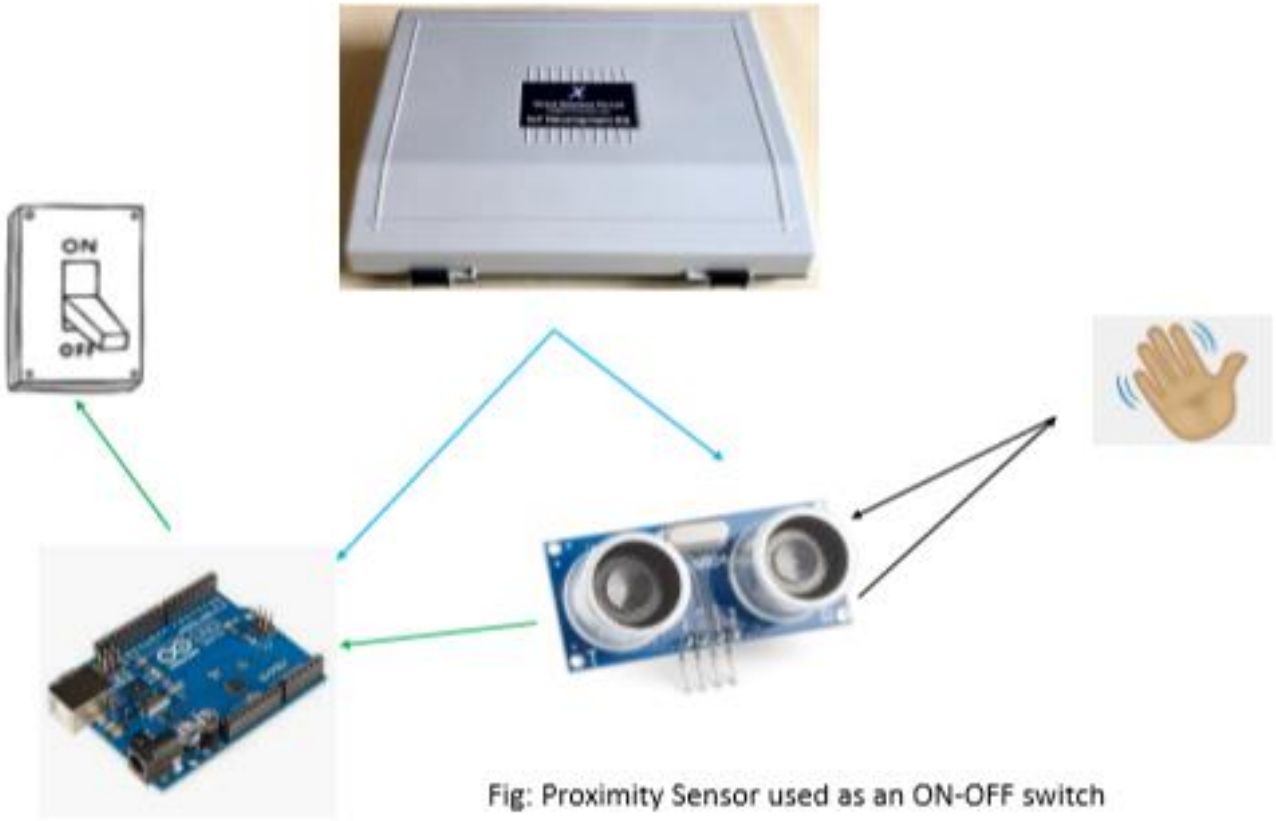
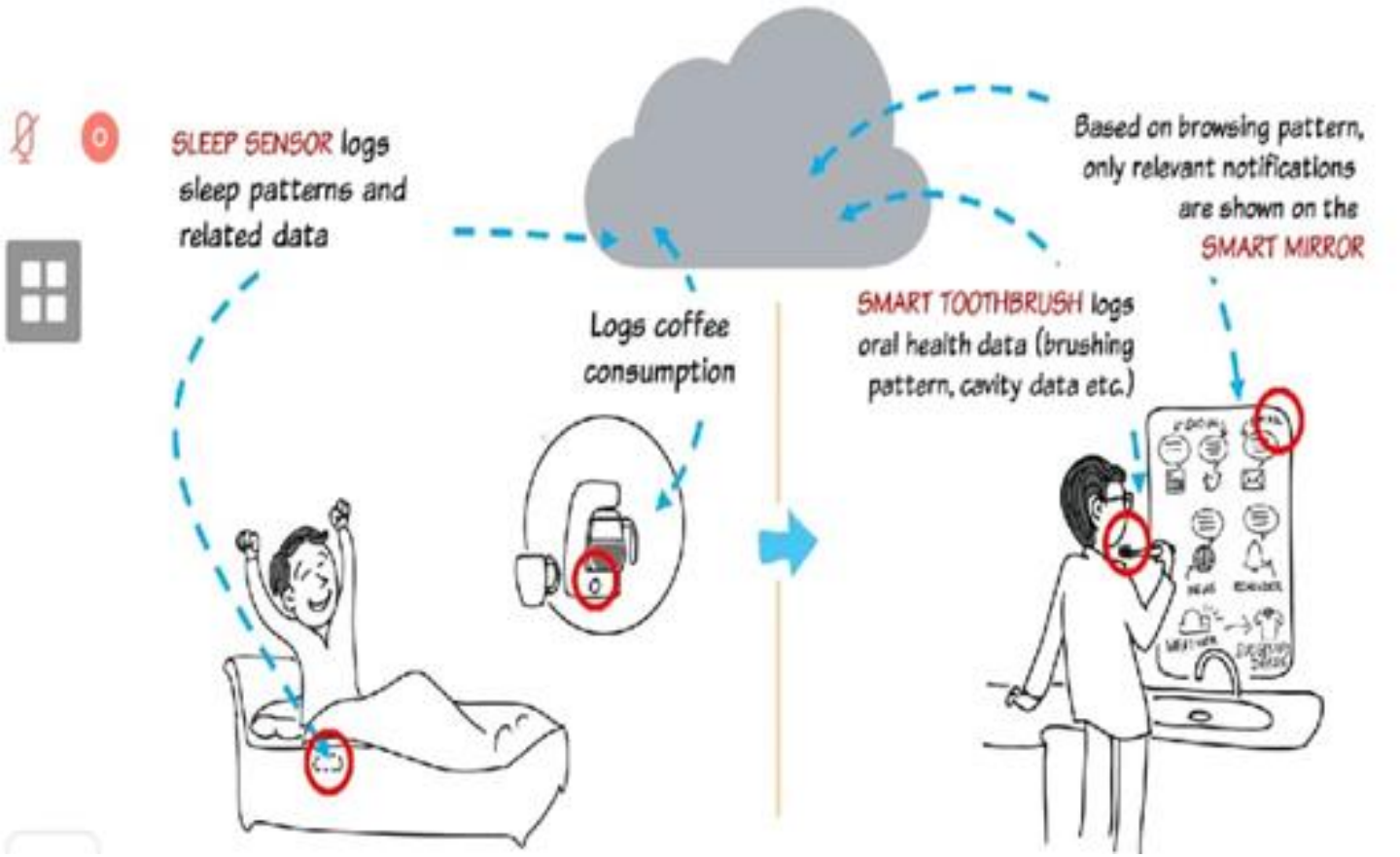


Fig: Proximity Sensor used as an ON-OFF switch

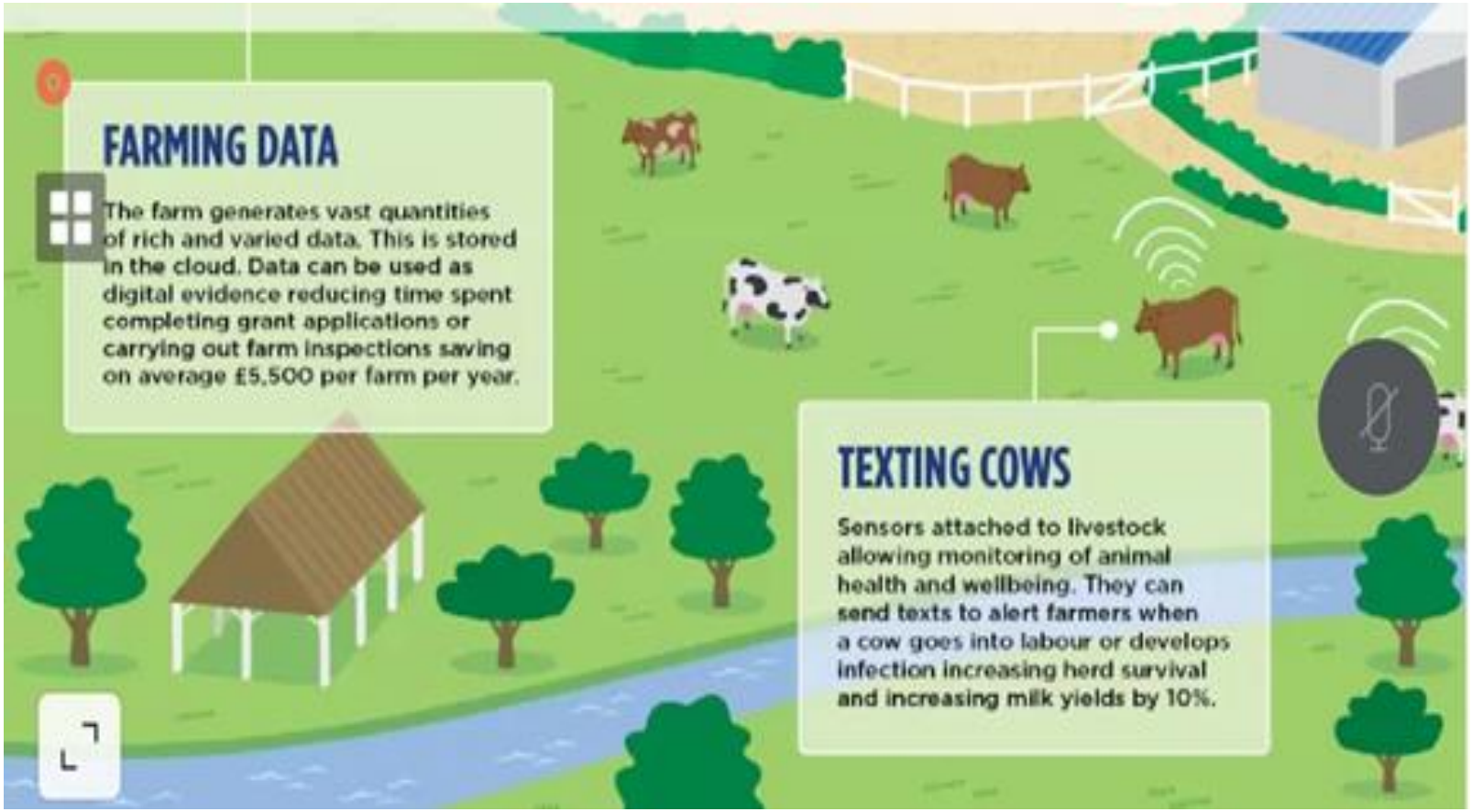
Possible IoT projects

Possible IoT projects

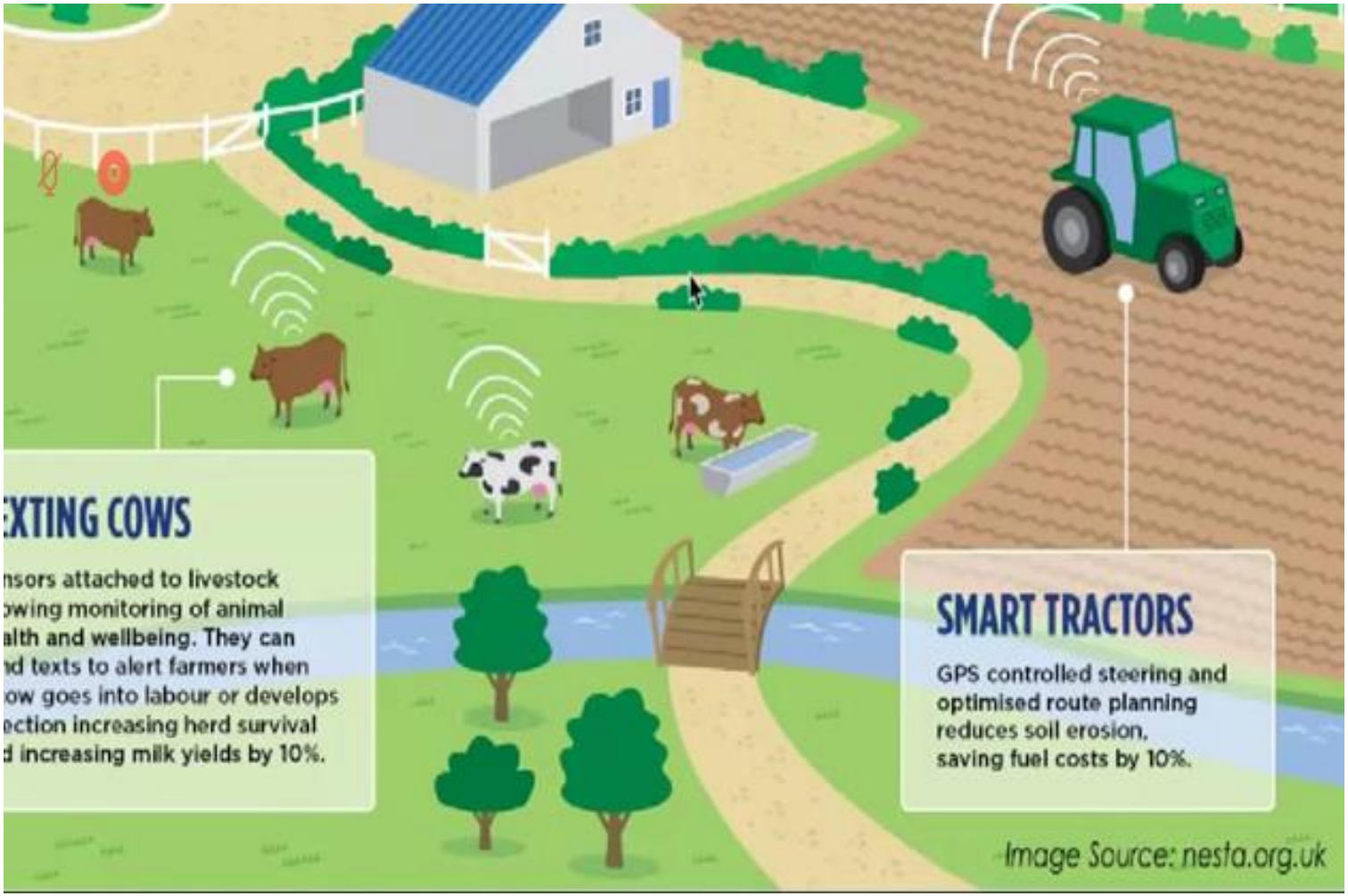
Possible IoT projects



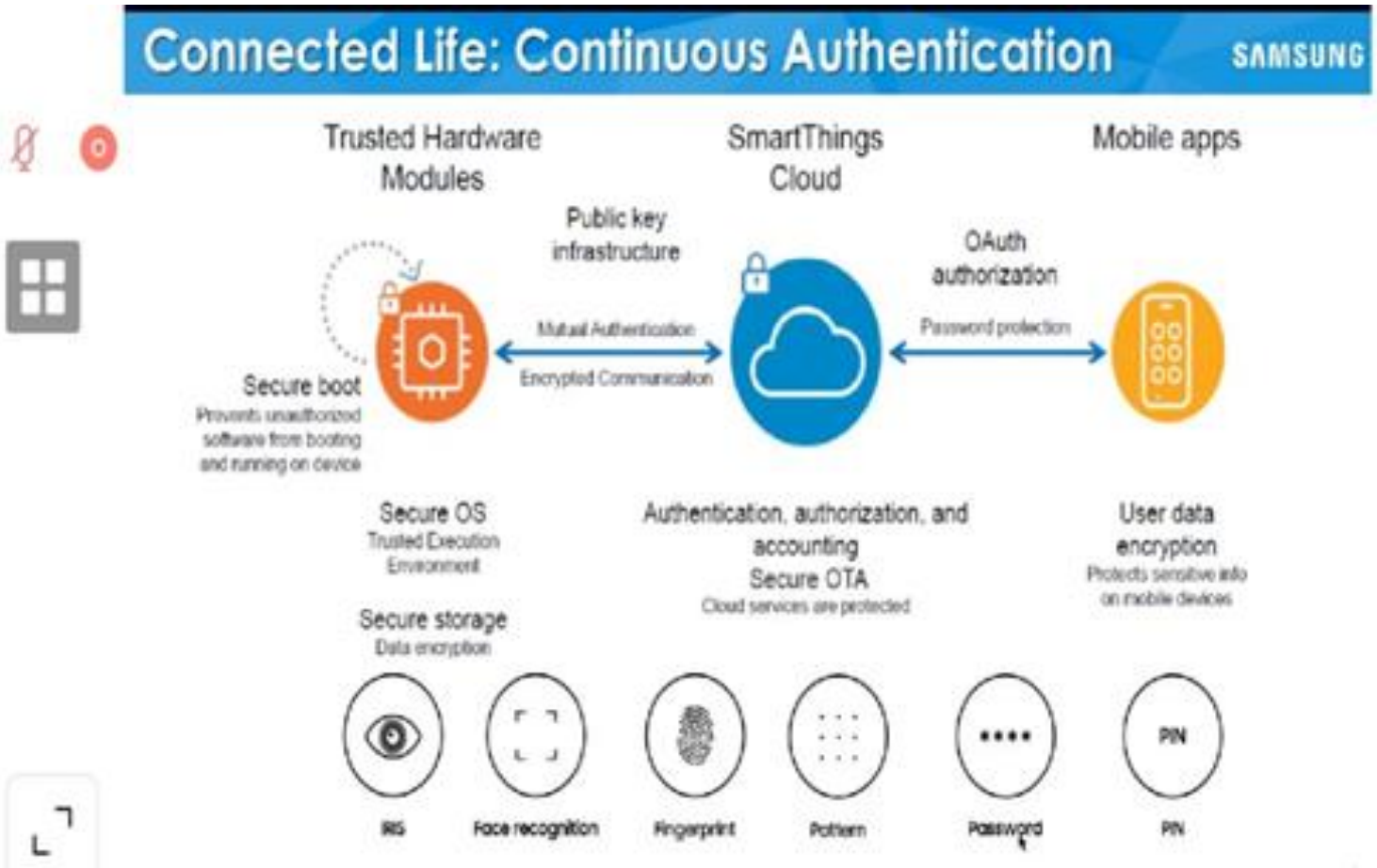
Possible IoT projects



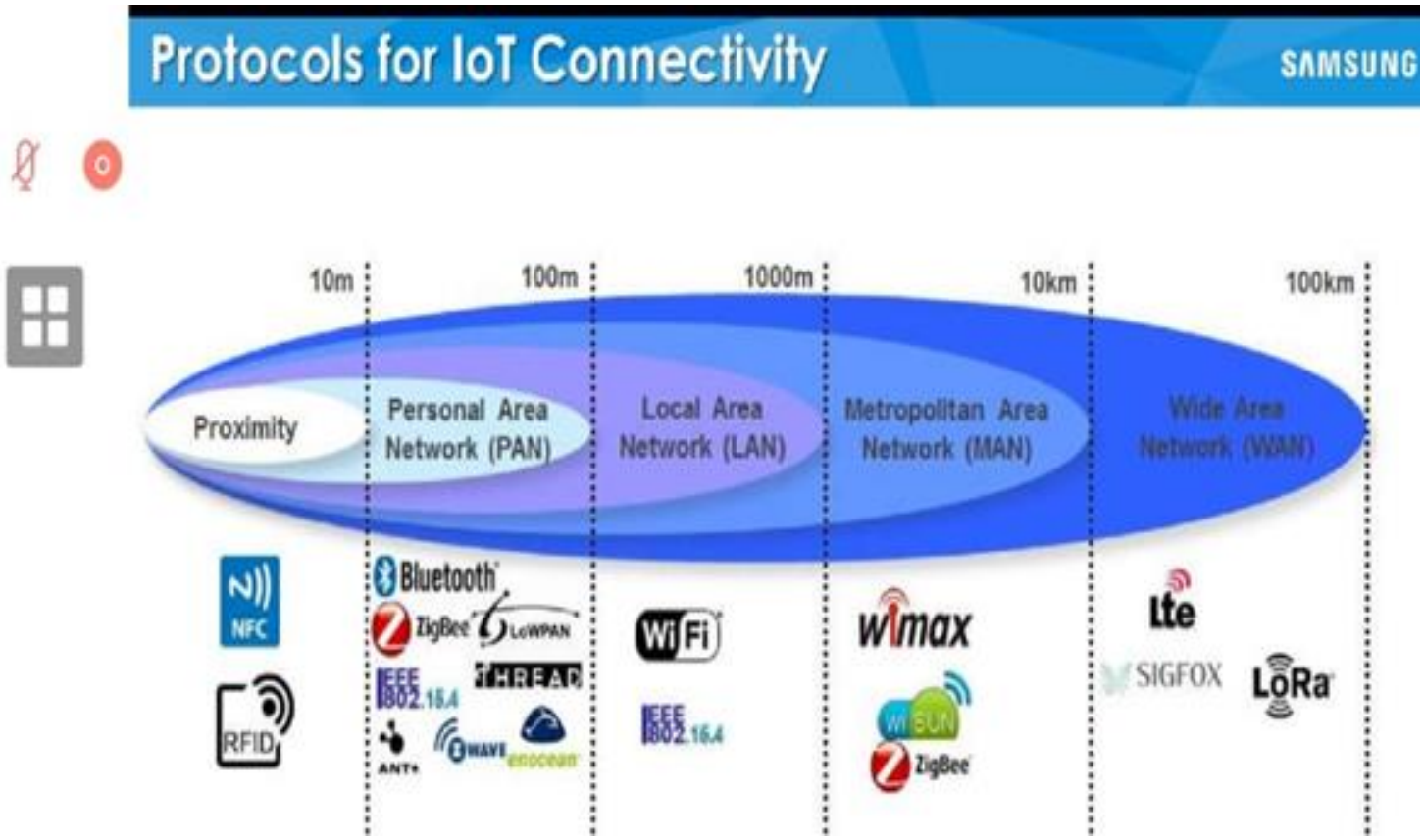
Possible IoT projects



Possible IoT projects



Possible IoT projects



Questions…

- Kindly fill the feedback form
  - https://bit.ly/2WvbLT7
- You can also send your questions to
  - webinar@rgcms.edu.in
- Material shared on following link
  - http://sigce.edu.in/announcements/career-opportunities.asp
- All above information / links are also provided in chat box