IoT System Design

Image Source: oblu.io

Internet

Internet

Internet

/ˈɪntənɛt/

noun

a global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols.

"the guide is also available **on the Internet**"

Internet of Things

Internet of Things

Internet of things

noun

the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.

"if one thing can prevent the Internet of things from transforming the way we live and work, it will be a breakdown in security"

Cloud Computing

Cloud Computing

cloud computing

noun

the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer.

Components of a typical computer

Computer

Image Sources: Wikipedia, Wikimedia

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Components of a typical software application

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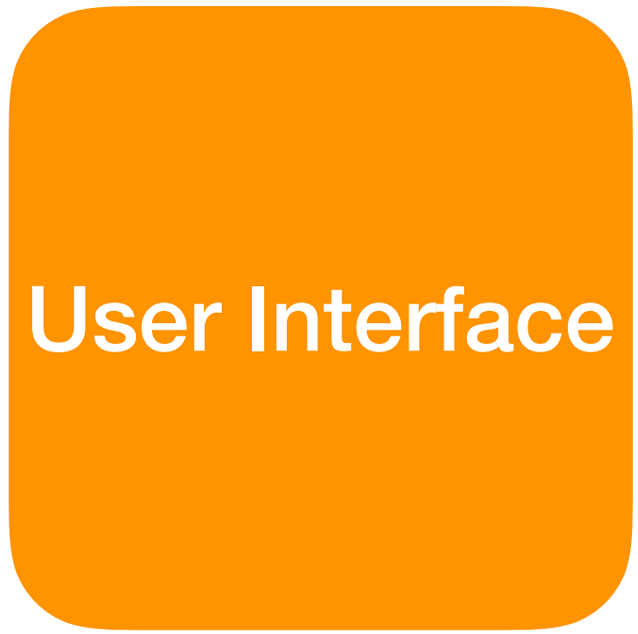

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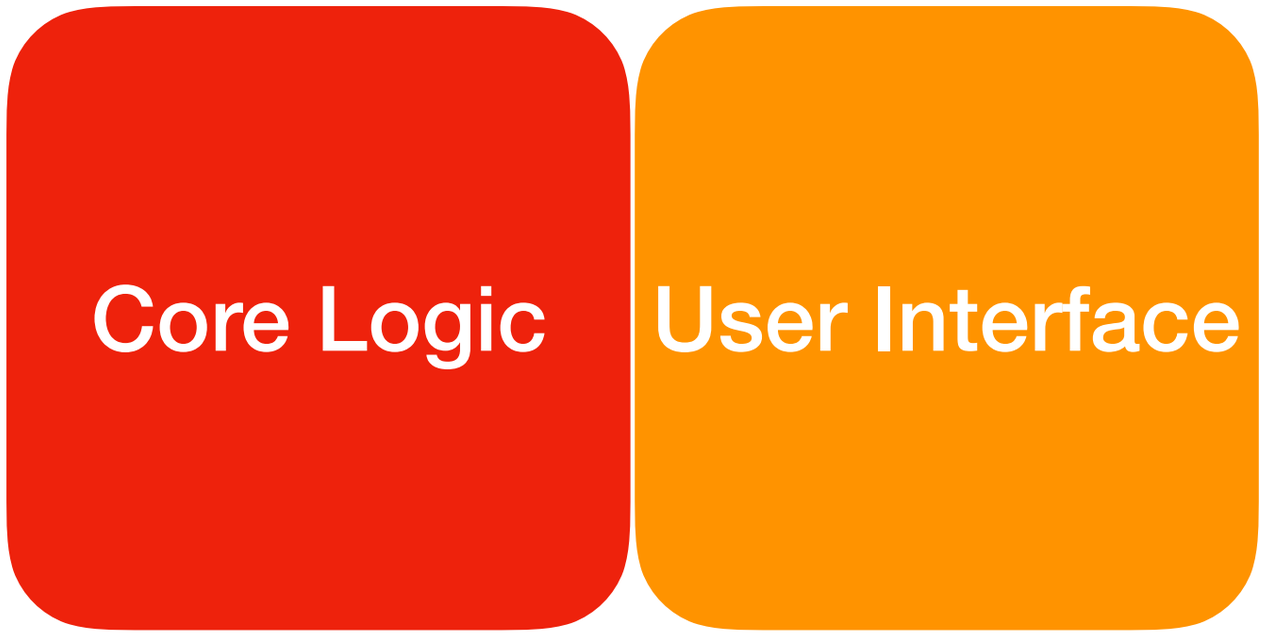

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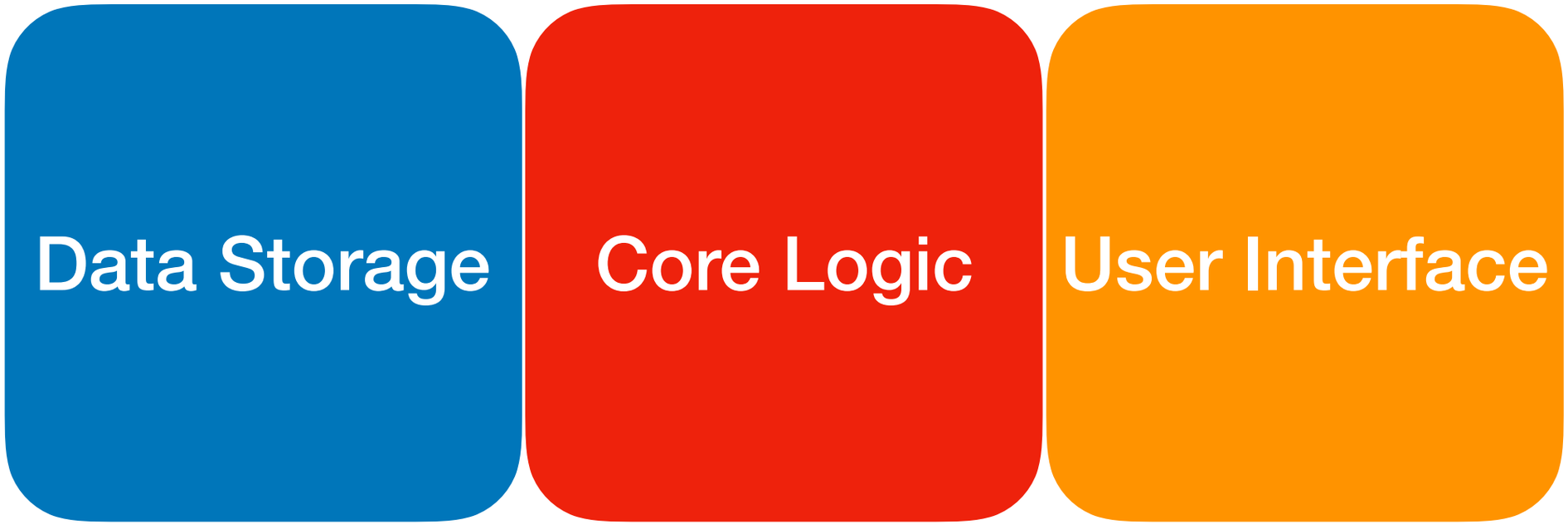

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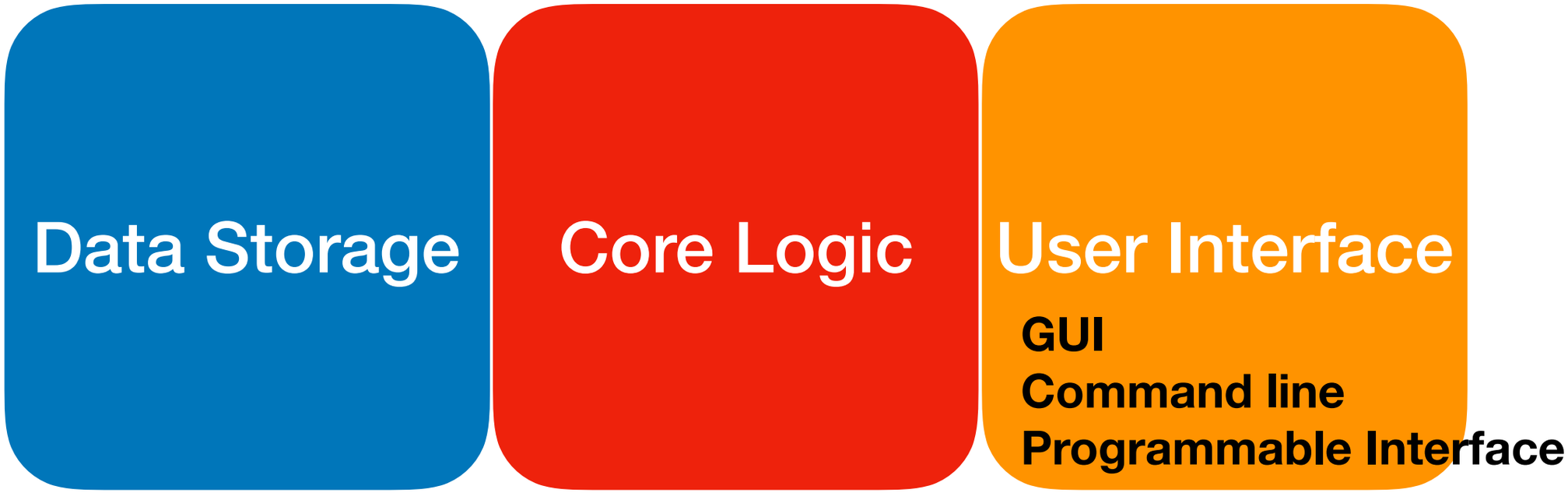

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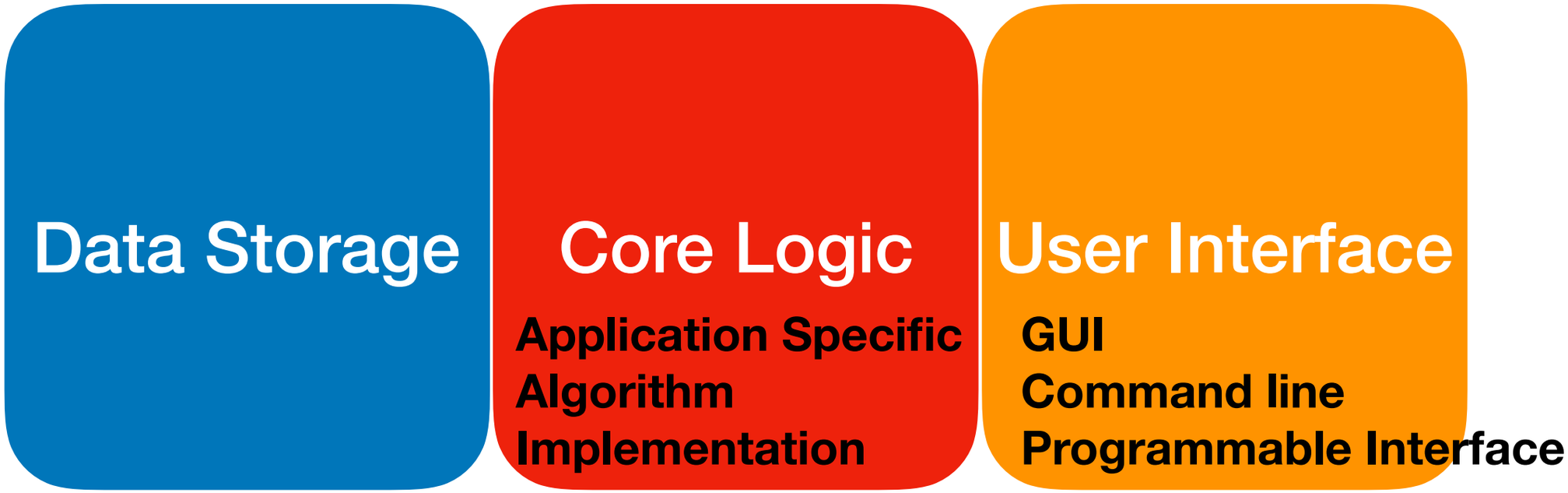

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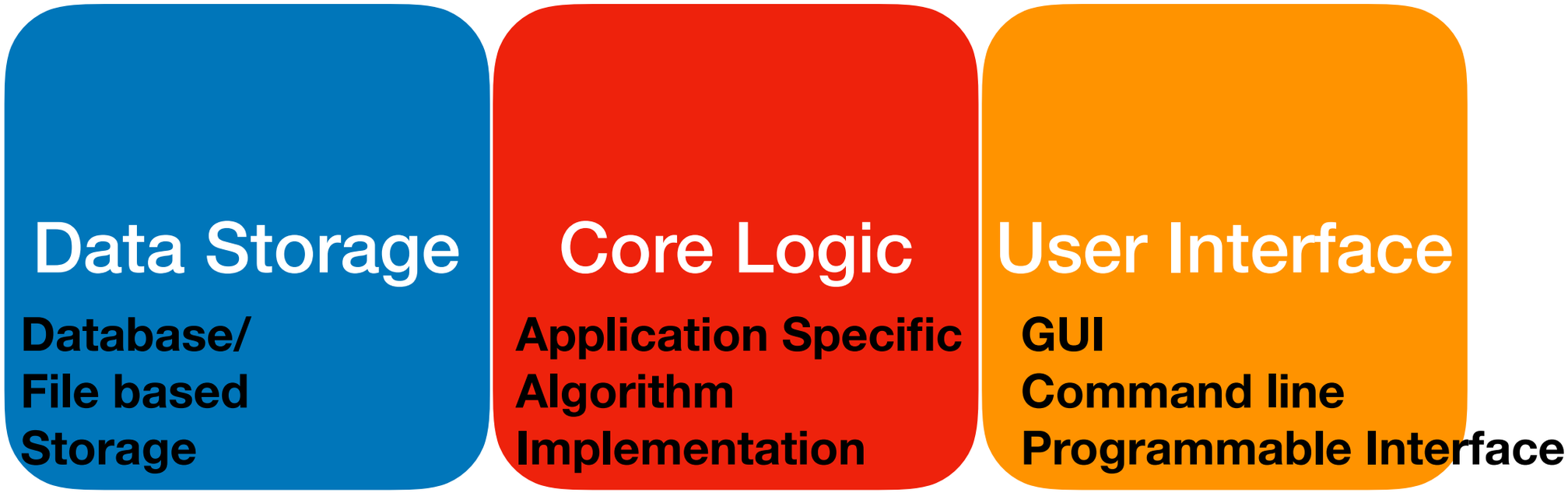

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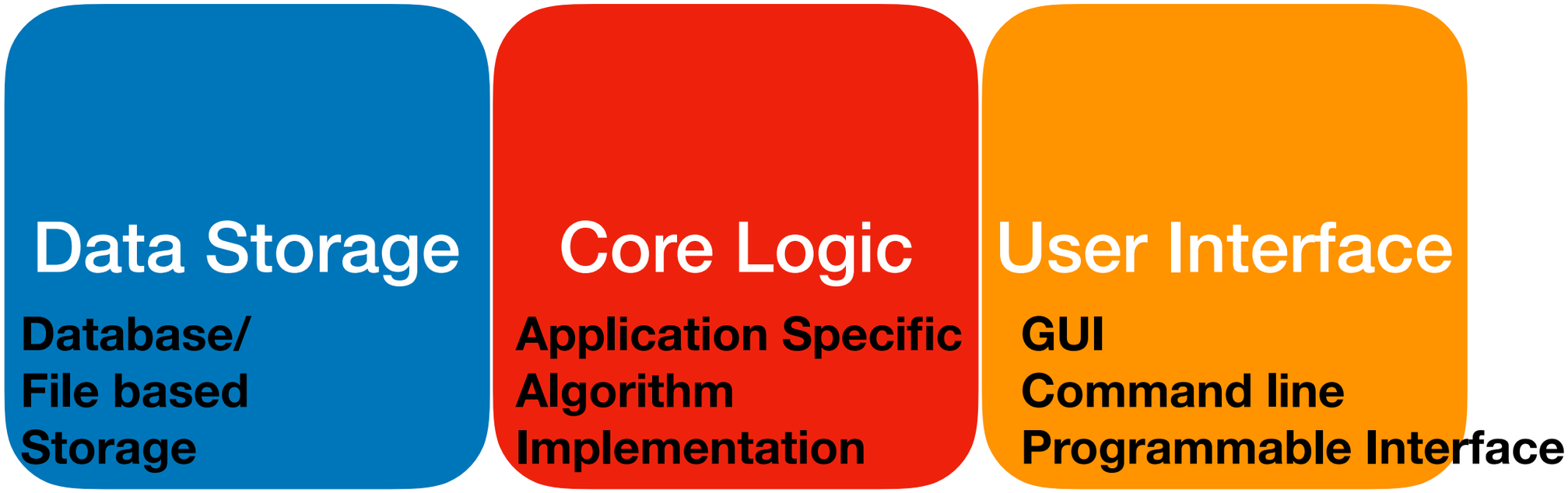
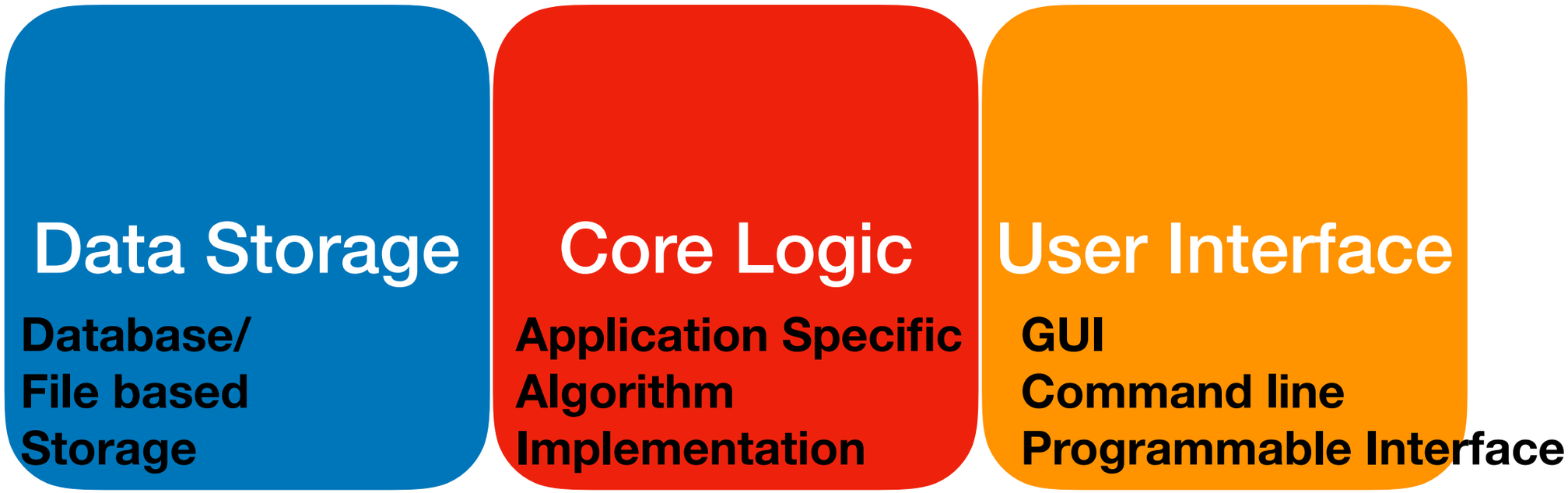


Traditionally the three components used to sit on the same computer


Data Storage
Database/
File based
Storage
Core Logic
Application Specific
Algorithm
Implementation
User Interface
GUI
Command line
Programmable Interface

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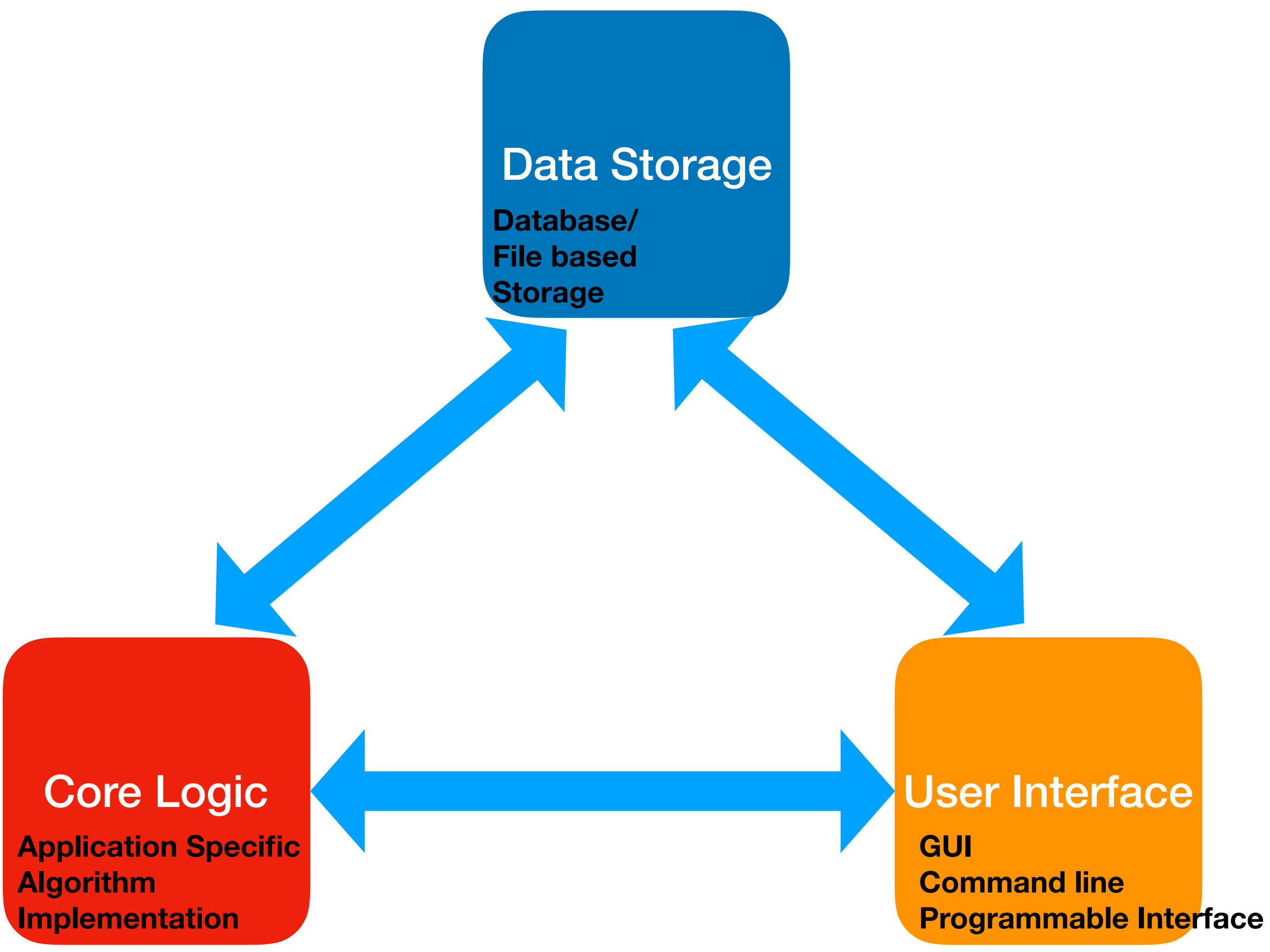
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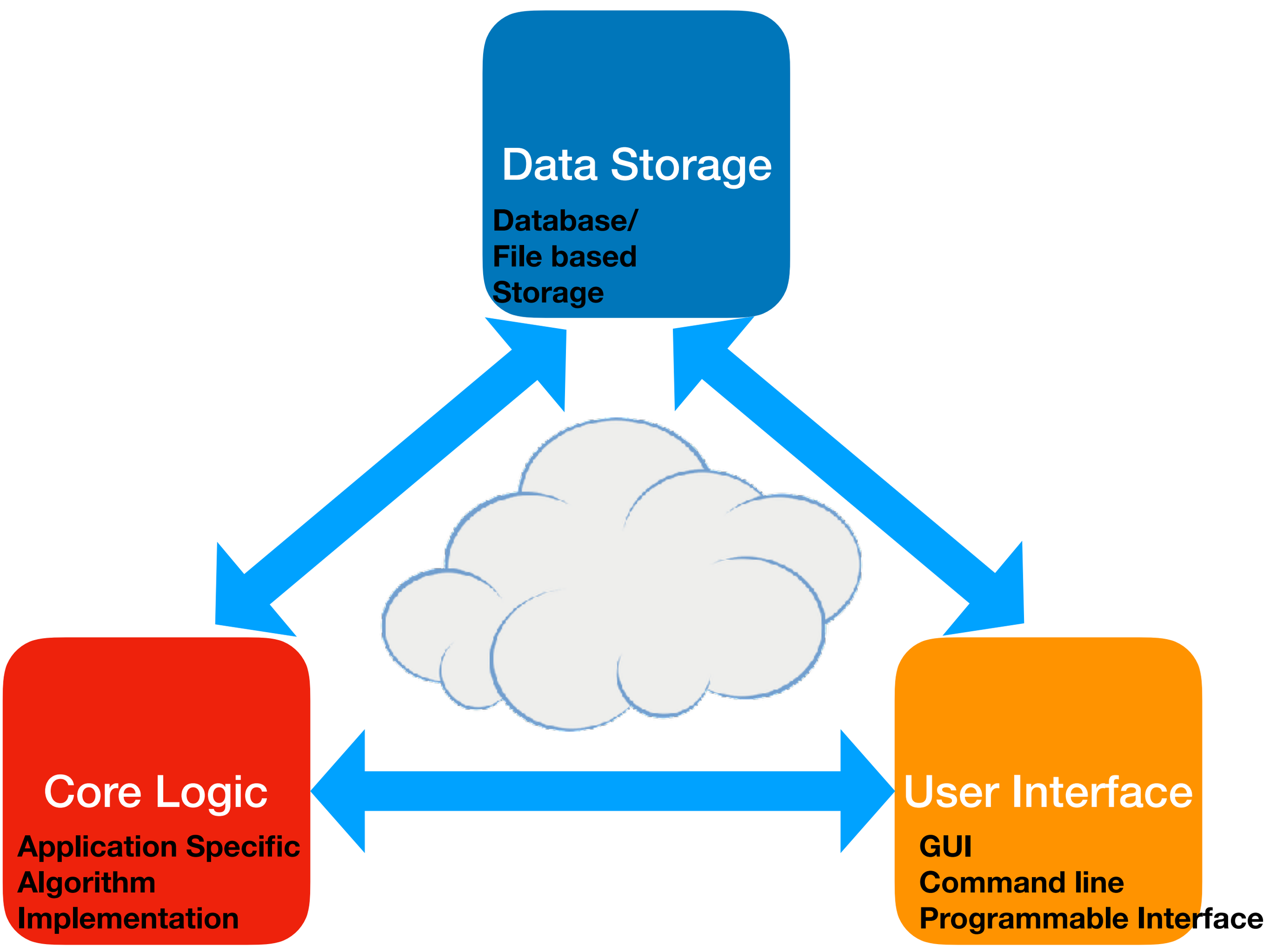
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- Similar to utilities like electricity, mobile network
  - Pay-per-use, without large infrastructural cost

Cloud as a Service

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- Software as a Service (SaaS)

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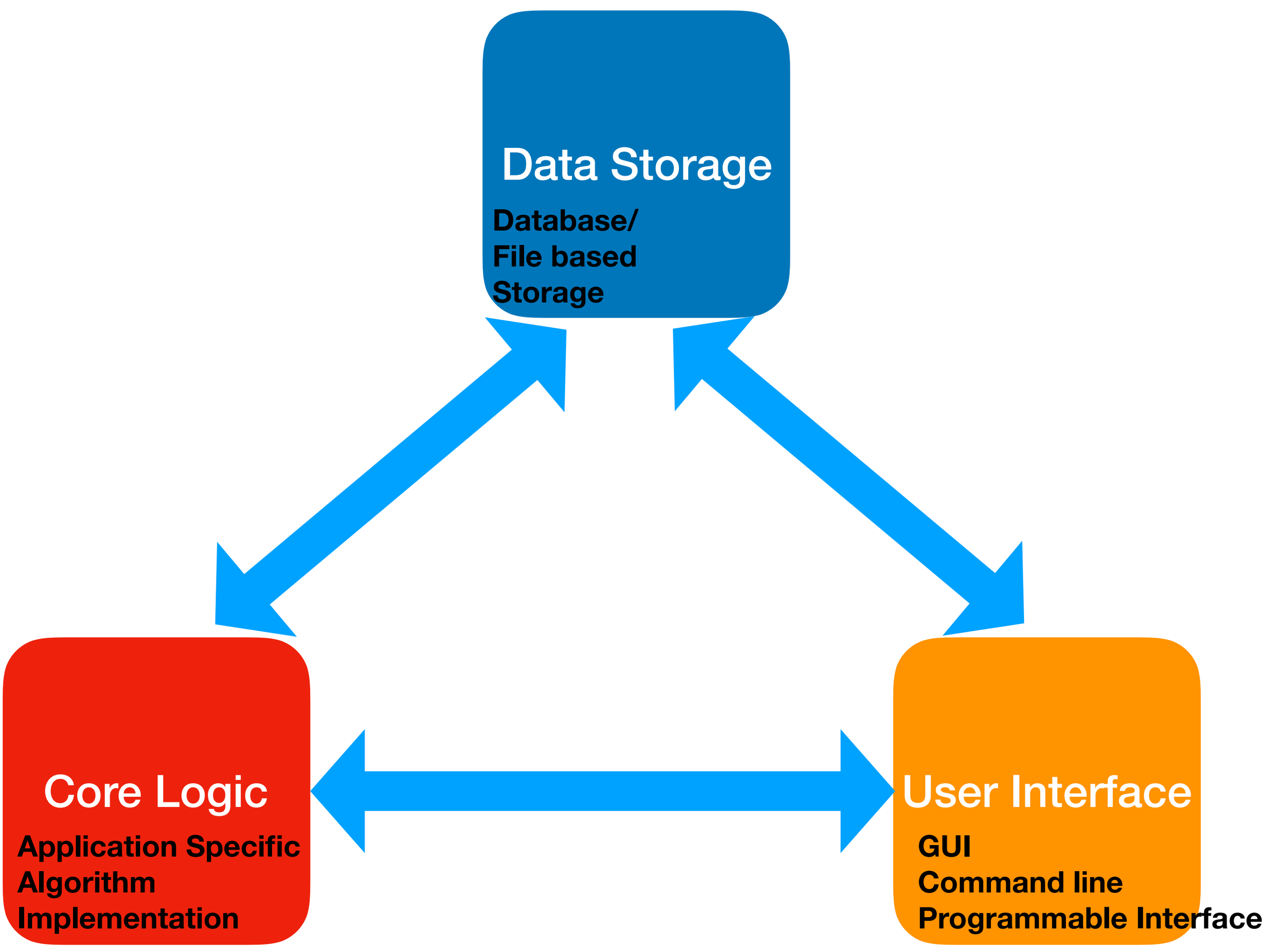
- Infrastructure as a Service (IaaS)

Cloud as a Service

- Software as a Service (SaaS)
- Infrastructure as a Service (IaaS)
- Platform as a Service (Paas)

Where does IoT come into Picture?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Sensors

Motion,
Temperature,
Proximity …

Data Storage

Database/
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End User Interface, not shown here.

Core Logic

Application Specific
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    - “Big Data” issues - This is where scalability of clouds come in handy.

An IoT System

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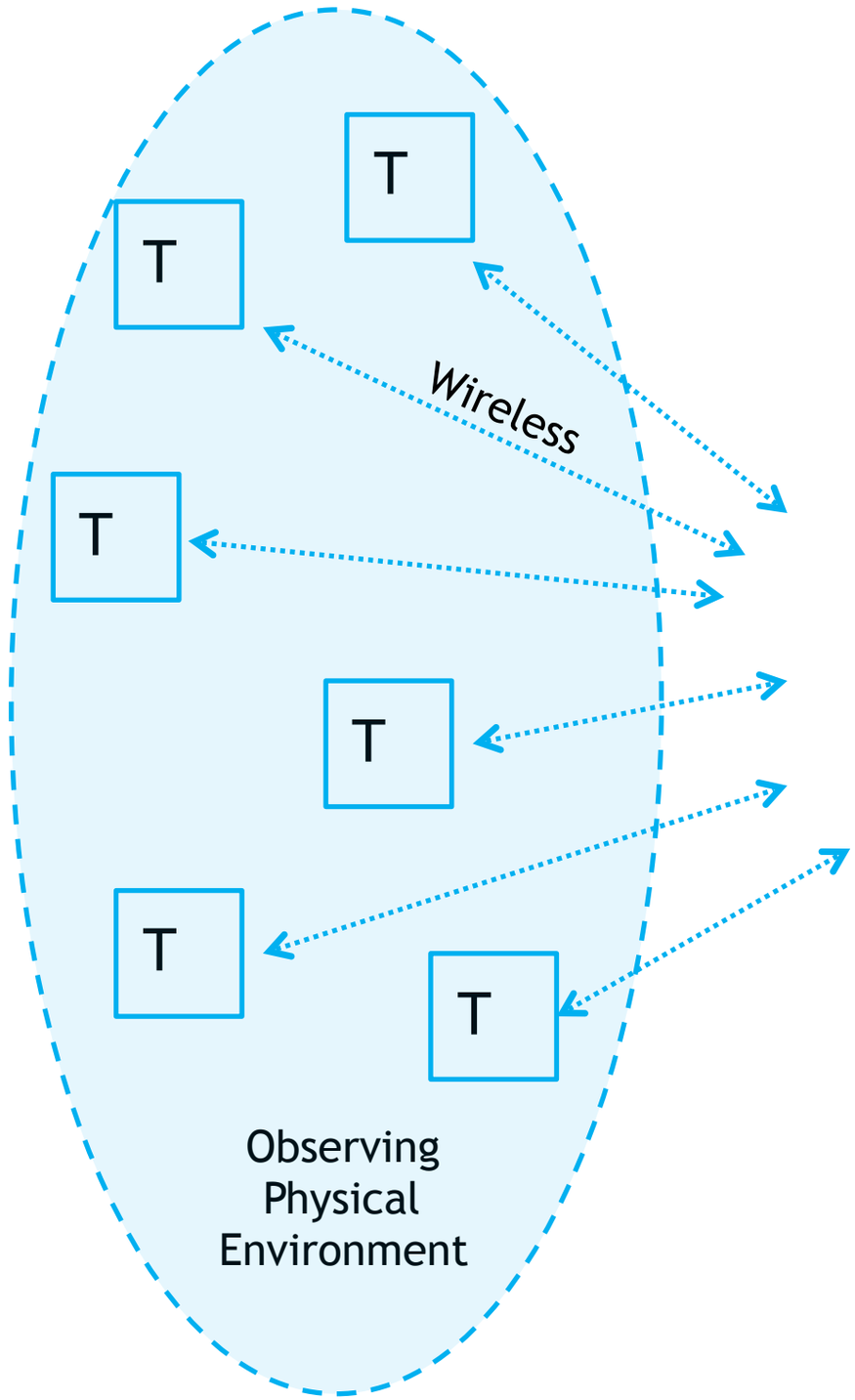

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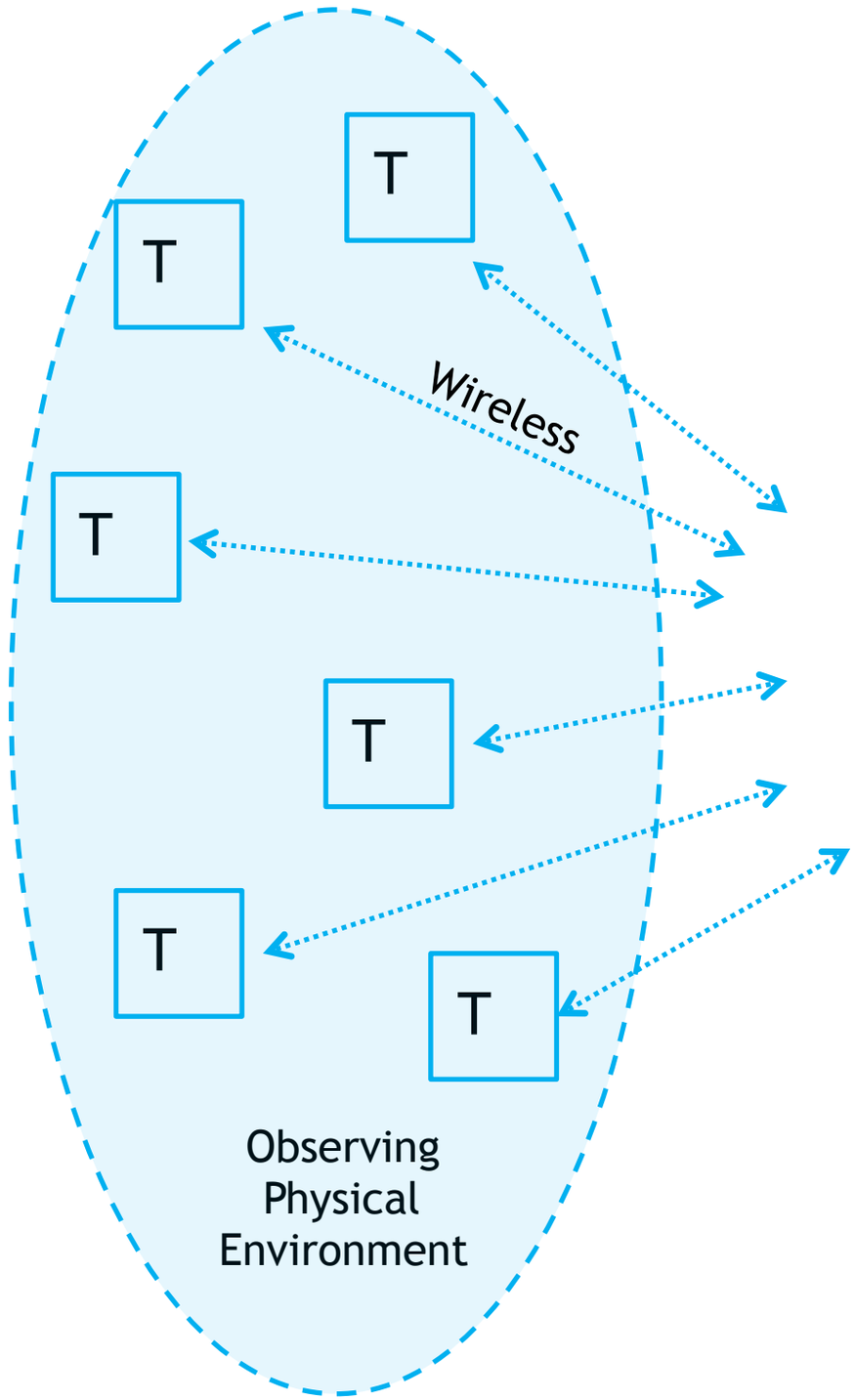

Machines ≡ Devices ≡ Sensors ≡ Things!

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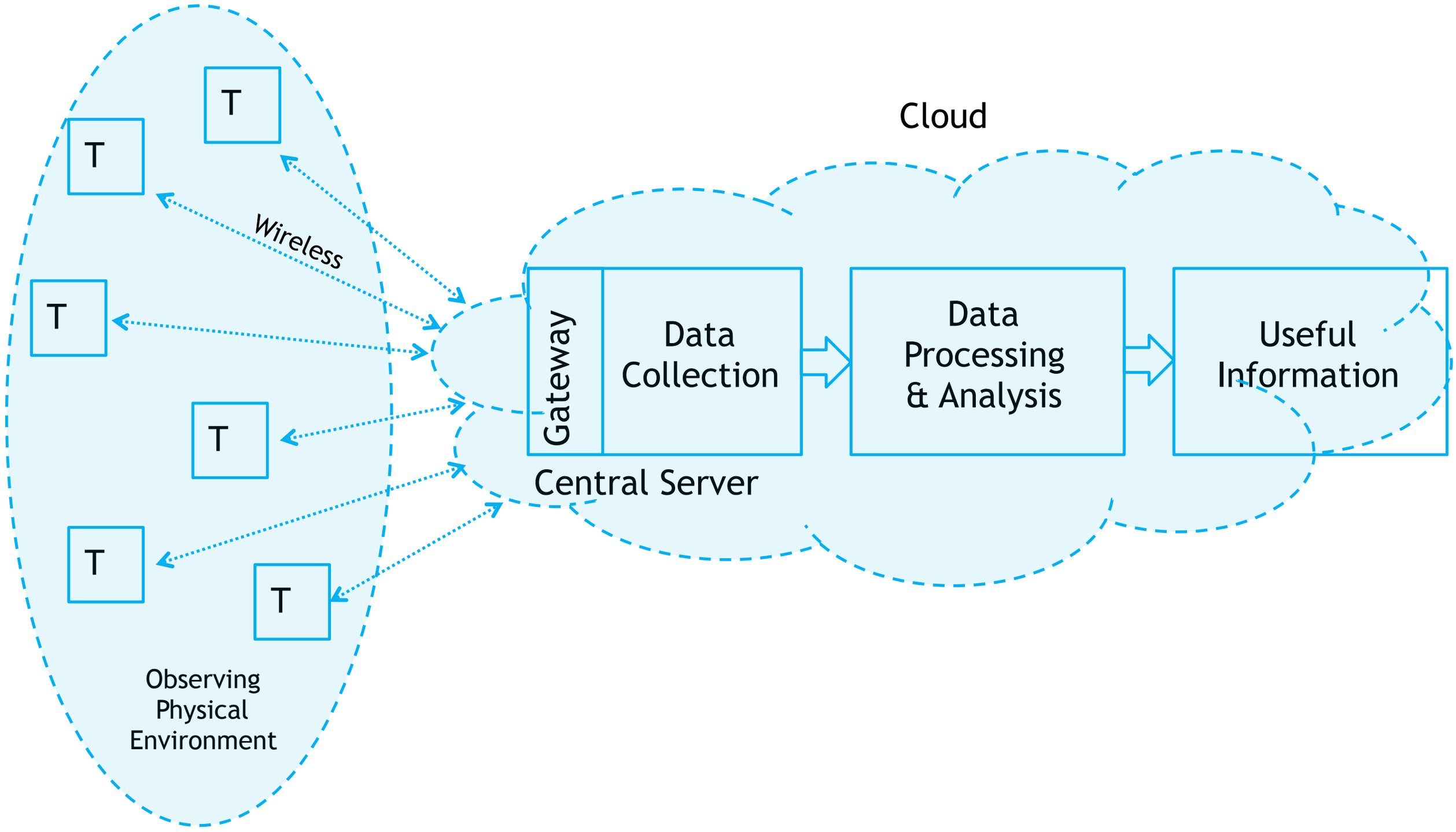

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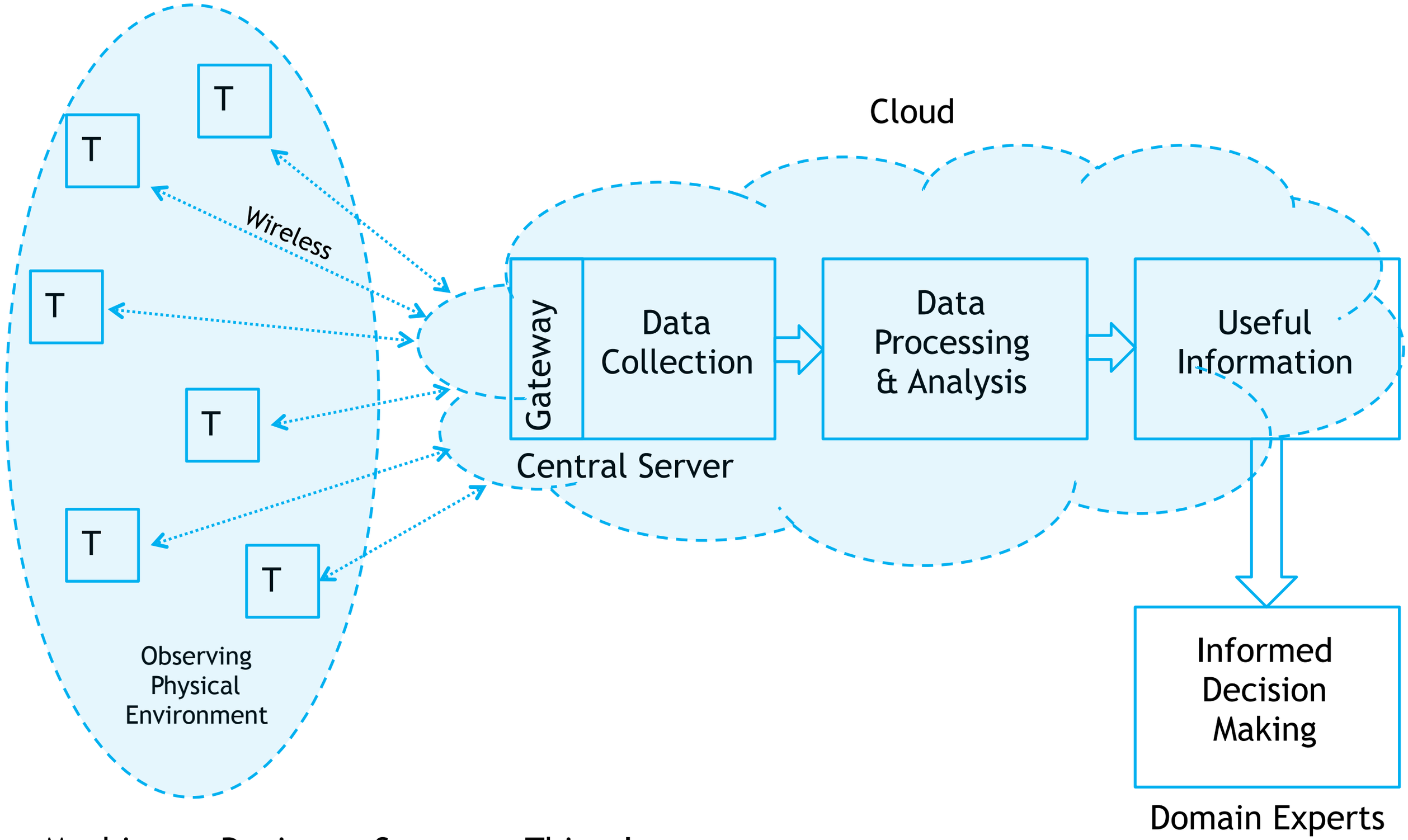

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- Cloud is an IoT enabler
- Huge amount of Incoming Data
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- Fast analytics for improving business, medical support, critical decisions

IoT Around Us

Image Source: oblu.io

Flex Your Neurons

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National Train Enquiry System

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- How is the train position obtained?

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- How is it different than the model shown in the earlier slide?

IoT for Agriculture

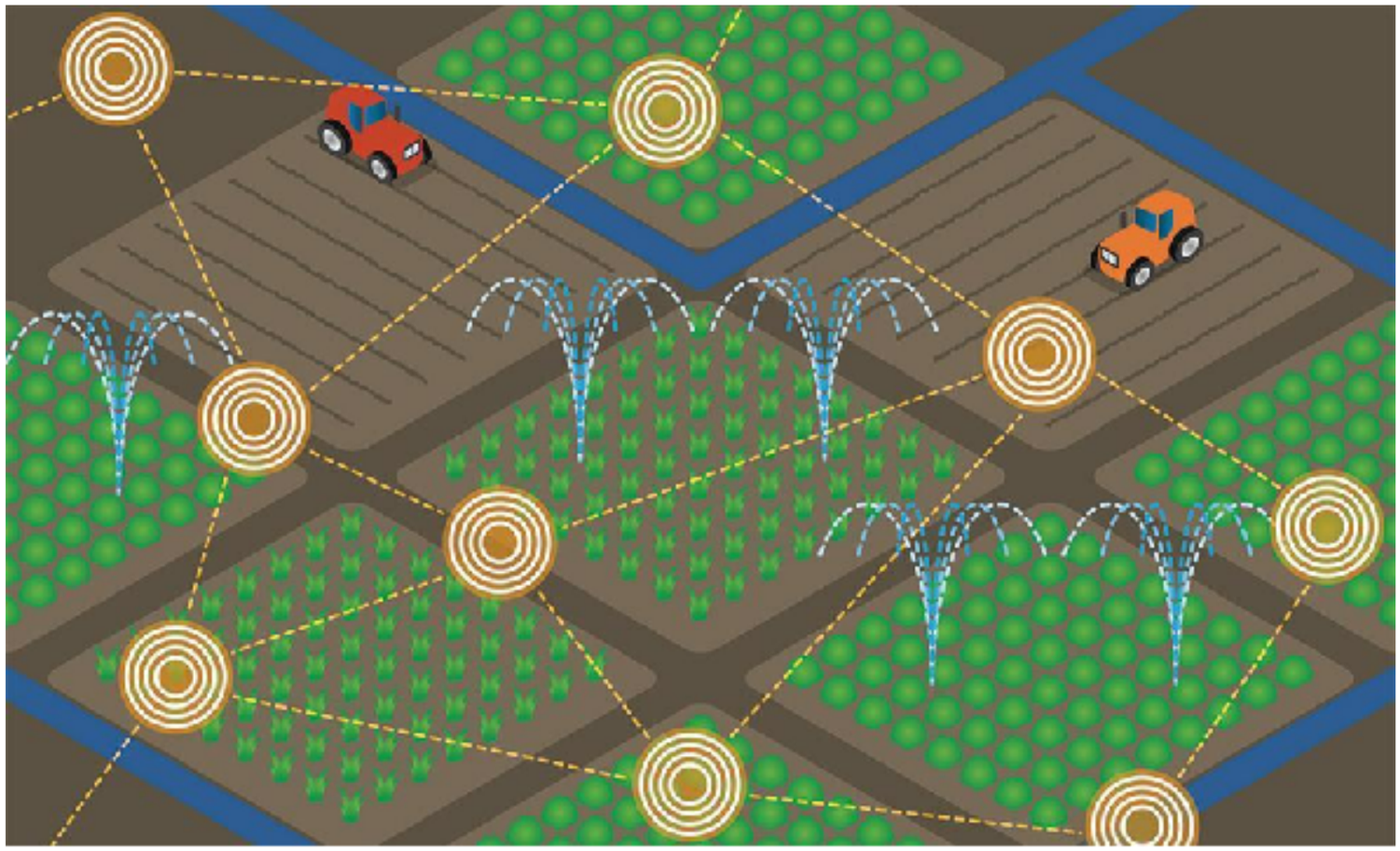
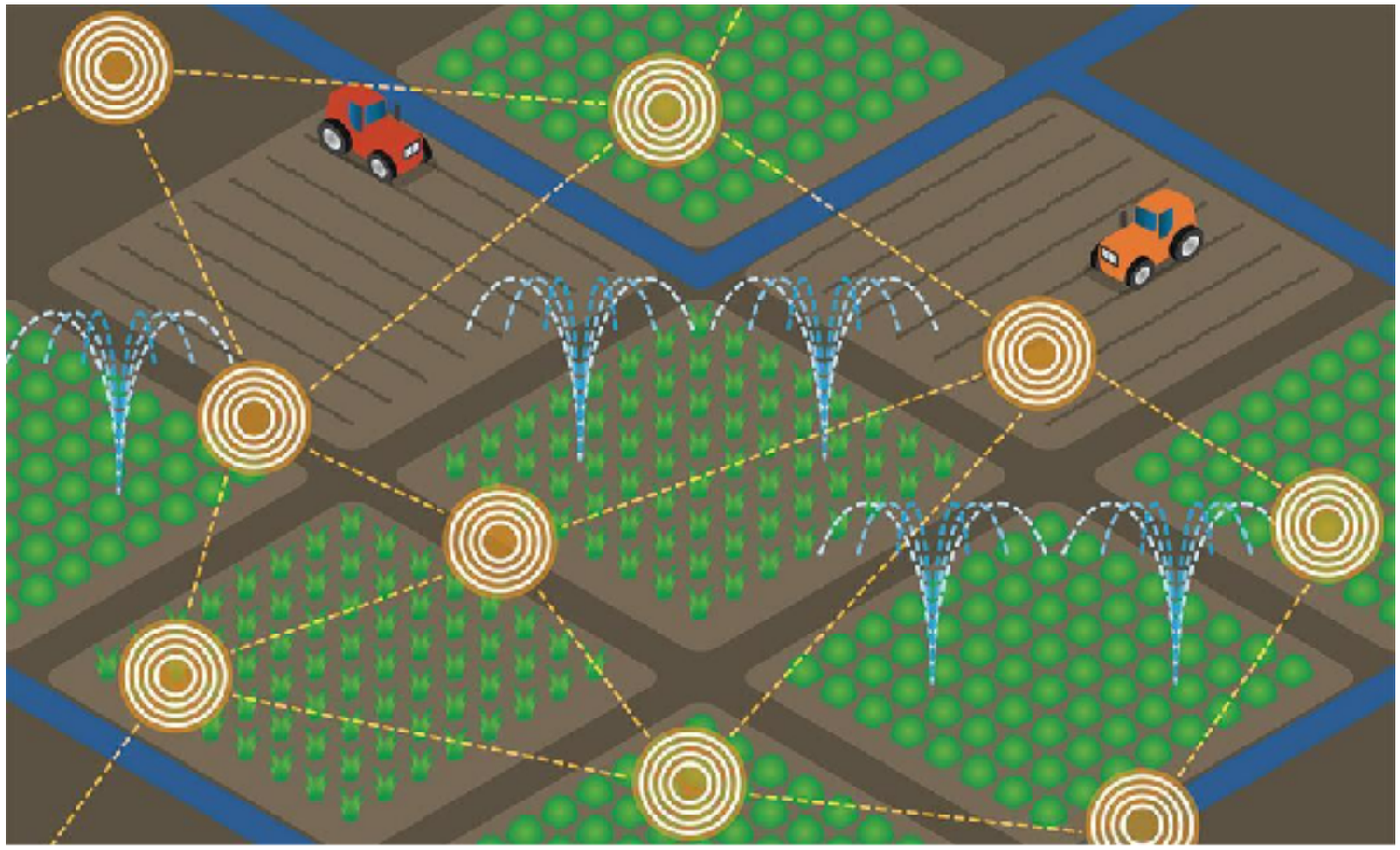


Image source: datafloq.com

IoT for Agriculture

What could be observed: Soil moisture, Temperature, Humidity, Gas concentration, Location



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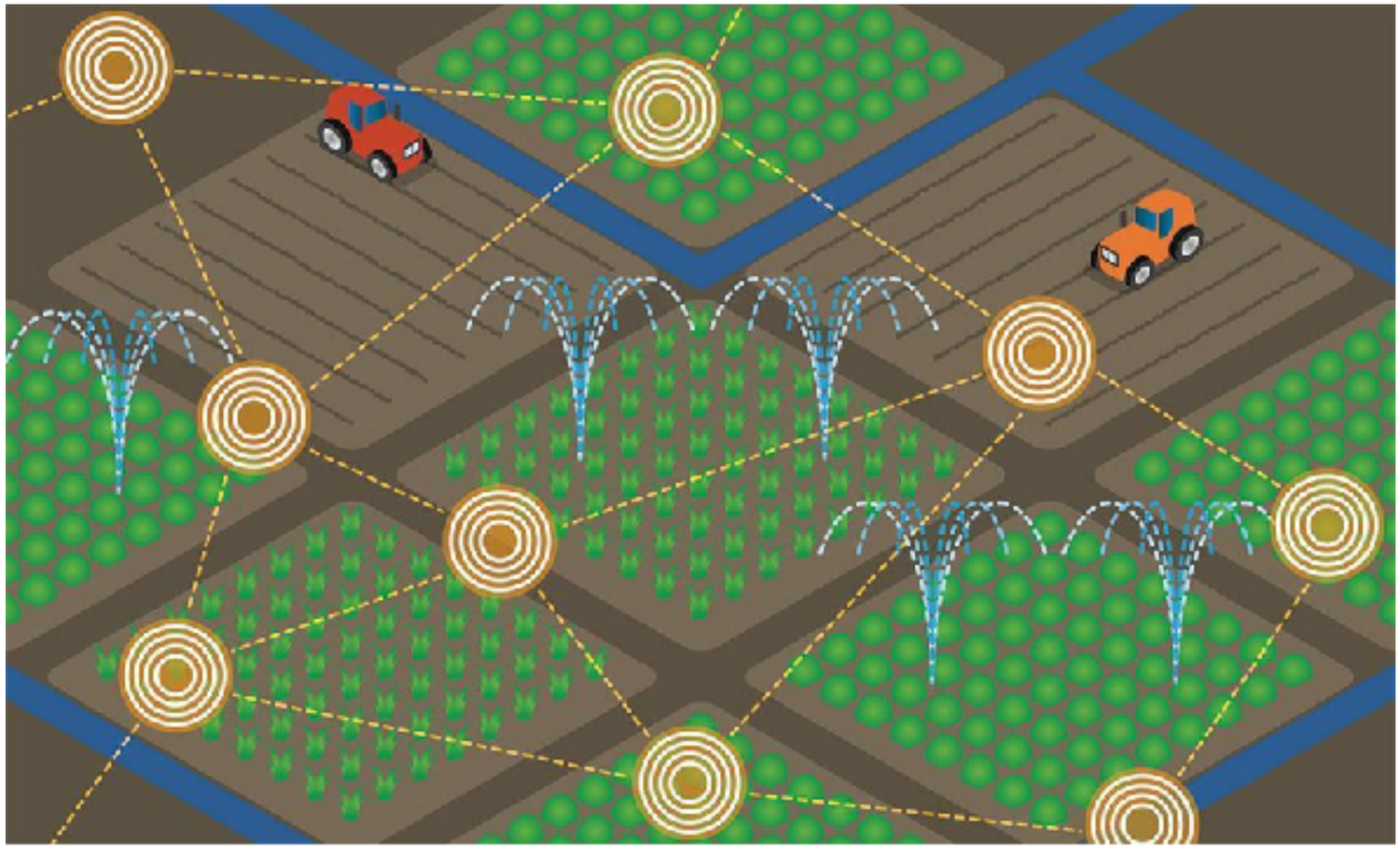

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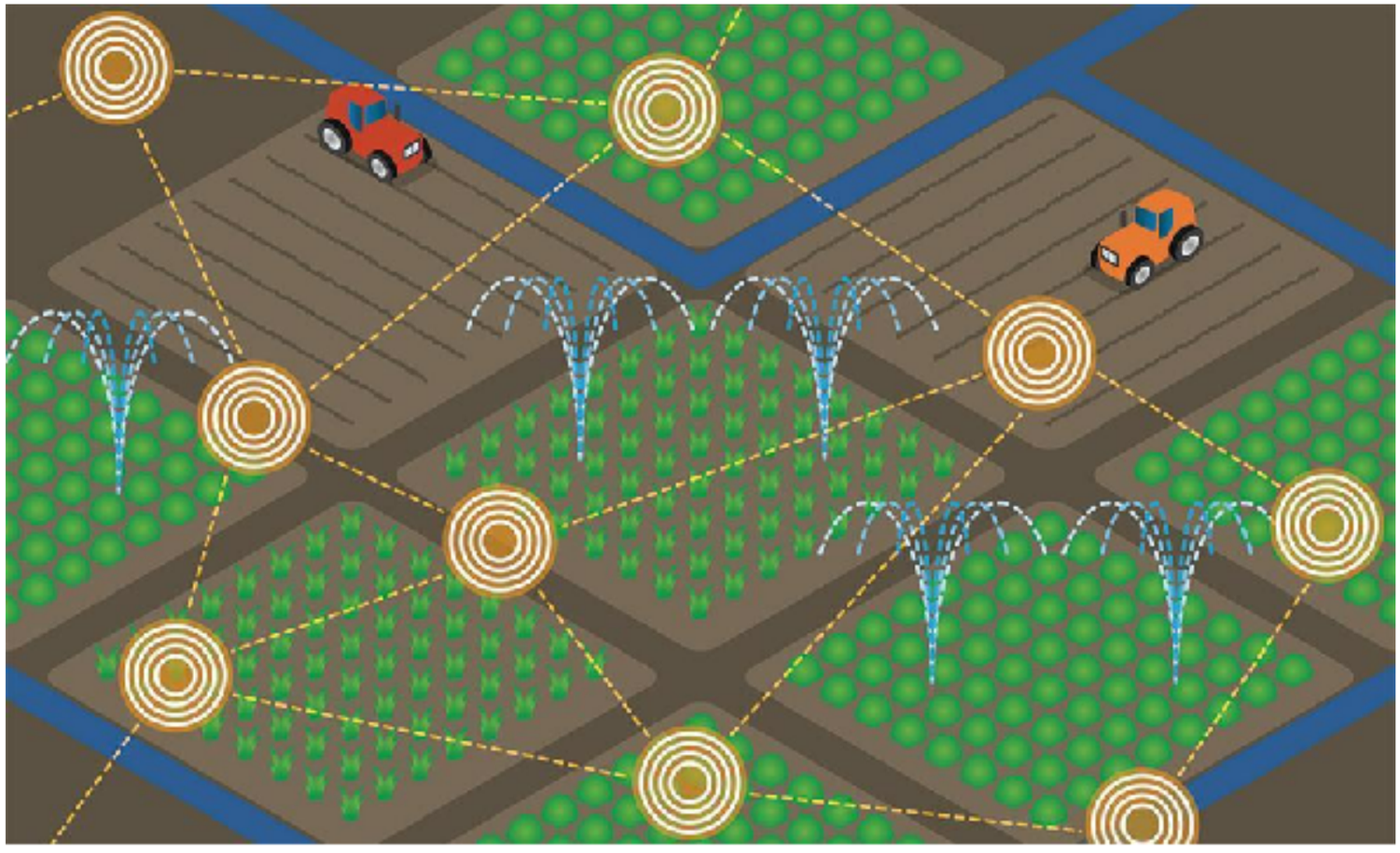

Home assignment 1: Make a list of Indian companies which offer IoT solutions for agriculture and farming. Highlight those which have links to IIT Kanpur (Founded/ governed by faculty/alumni/incubation centre of IIT Kanpur).

Image source: datafloq.com

IoT for Healthcare & Fitness

Image source: iverve.com

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What could be observed : Heart rate, Temperature, General fitness, Brain pressure, Heart functioning, Blood glucose etc

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Home assignment 2: Make a list of Indian companies which offer IoT solutions for healthcare. Highlight those which have links to IIT Kanpur.

Image source: iverve.com

Vehicle – A Sensor Hub

Image source: enterpriseiotinsights.com

Vehicle – A Sensor Hub

What could be observed : Motion, Ambience light, Location, Obstacle, Fuel level, Driving behavior, Erratic functioning, Tyre pressure, Noise level , Temp &Humidity, Pollutant concn etc

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Q: Should your car be intelligent enough to automatically induce upper limit on speed, based on tyre pressure, ambience light, weather conditions, external noise etc?

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Home assignment 3: (i) Make an exhaustive list of everything inside, immediate surroundings and on the auto body which must be “observed” for S&C driving. (ii) What is Insurance Telematics? (iii) Name only one company, other than automakers, which makes IoT solutions for automobile. How does their solution differ from the inbuilt solution in automobile? Who is their customer – Automakers or End users?

Image source: enterpriseiotinsights.com

IoT in Transportation

Image Source: iot.do

IoT in Transportation

What could be observed: Information on location, speed and direction of all the vehicles in a given area or fleet.

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IoT in Transportation

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Can the traffic be better managed this way?

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Home assignment 4: What more is required to make a car autonomous? Read Wikipedia entry on Autonomous Car.

Image Source: iot.do

Home Assignment 5

- Pick one IoT startup incubated in SIDBI Innovation & Incubation Centre of IIT Kanpur. Describe (i) the problem they are addressing and (ii) their solution.

For Classroom Discussion

Sometime back OLA initiated bicycle sharing concept on IITK campus.

- Are the bicycles smart enough to observe certain required environmental characteristics on their own?
- Propose a scheme to make Ola Pedal smarter.
- What would be the enabling technologies?

For Classroom Discussion

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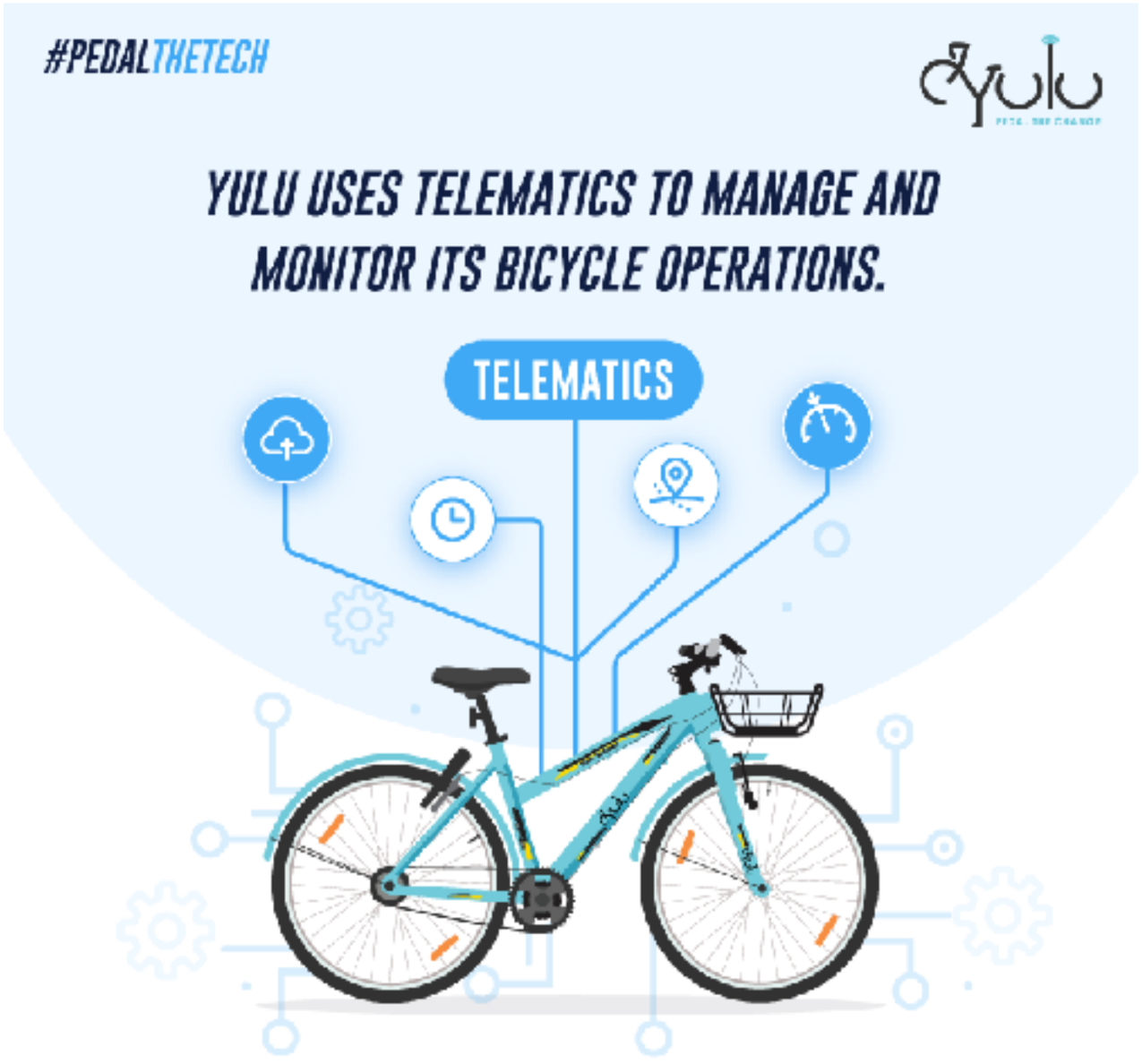
- How the data obtained from a network of such weather stations could help in forecasting weather?

Home Assignment 6



How is Yulu making use of IoT technologies for delivering great experience to their users?

Image Source: www.yulu.bike