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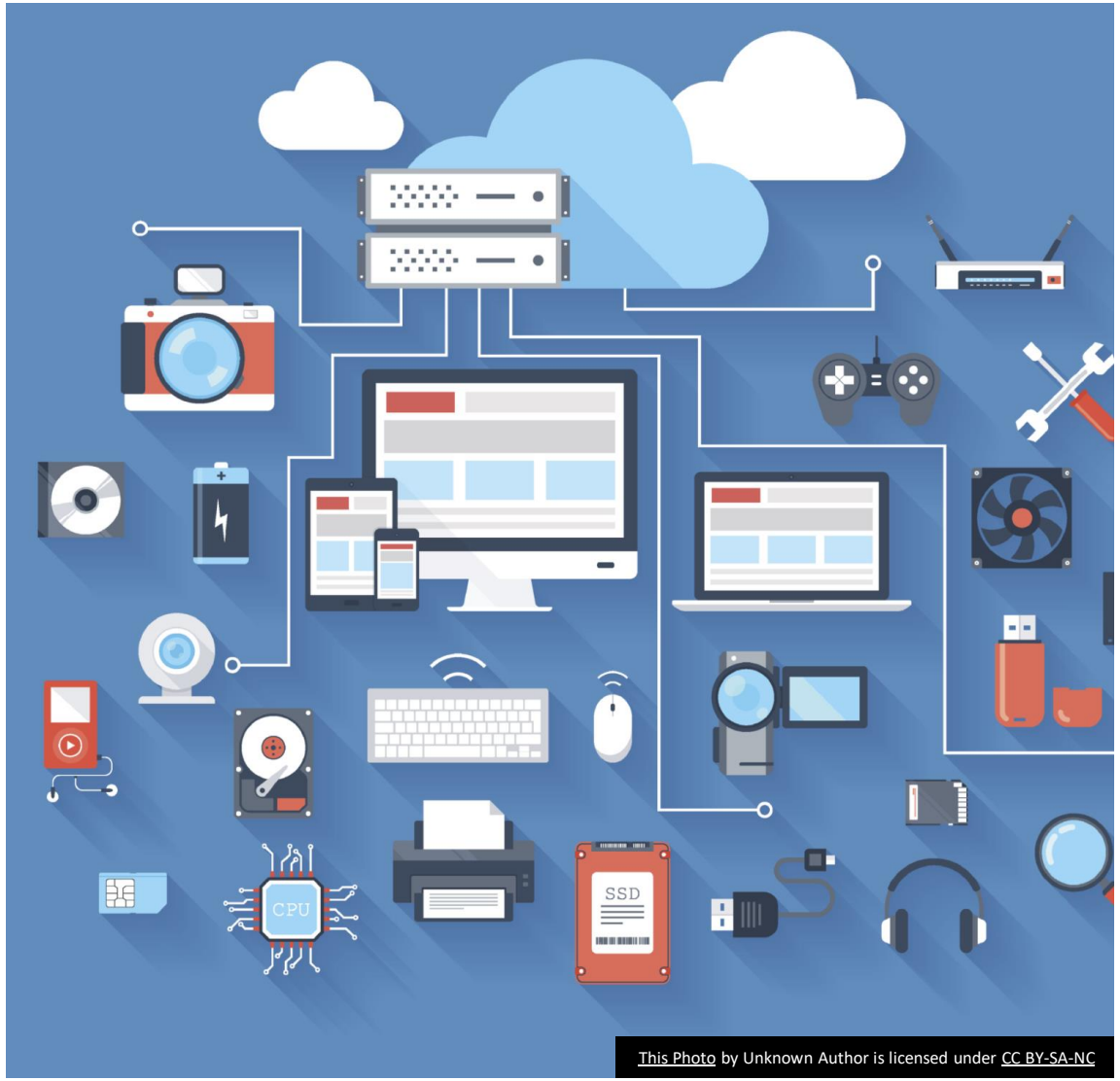
IoT Standards &Protocols

Agenda

1. Module Overview
2. Topics
3. Equipment & Tools
4. Delivery
5. Assessment

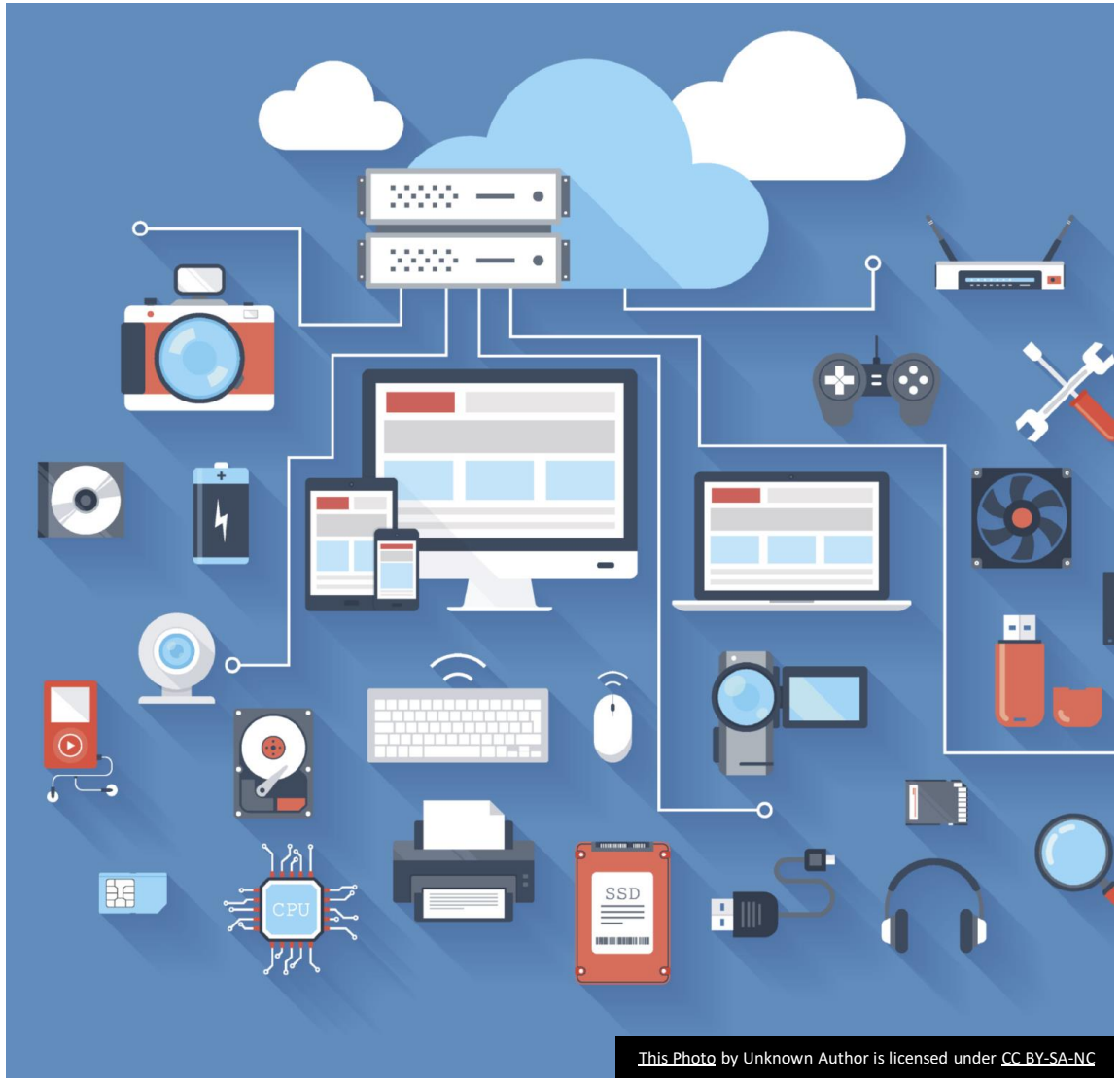
Module Overview: What's IoT

- Internet of Things:
  - Everyday objects with embedded technology to sense, connect, and communicate.
- Empowered by:
  - Sensors, cheap and accessible compute power (microcontrollers), ubiquitous connectivity, networking and internet protocols.
- Transforms isolated, passive things to connected things with compute power.
- Collaborate to enable ground breaking applications.



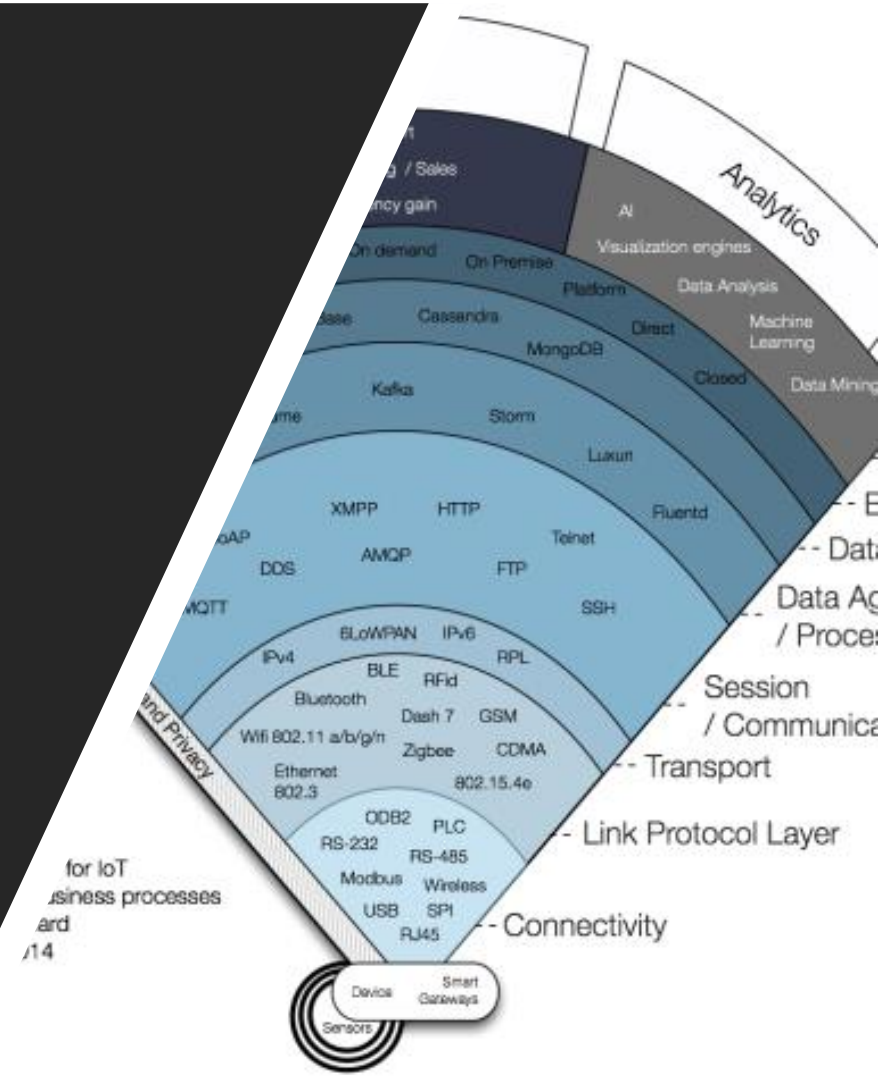
Module Overview 2: What will we cover

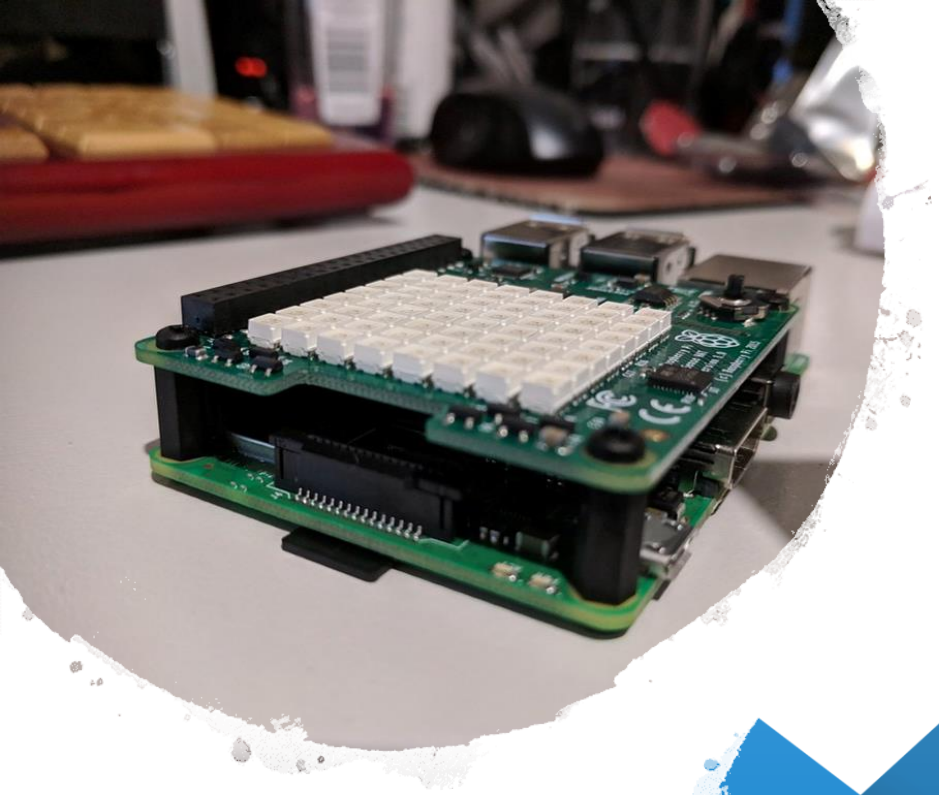
- IoT Protocol Stack
  - protocols and standards that allow for scalable, interoperable communications
- Sensors, Data Conversion, Serial Comms
  - I2C, SPI
- Messaging and Web APIs for IoT
- IoT Platforms
- Wireless Comms
  - Wifi/BLE/Sigfox(maybe)



IoT Stack Protocols

- **Connectivity layer:** The Actual physical connectors. RJ45 (usually for Ethernet), RS-232, ModBus, USB (as a connector type, not the communication protocol), SPI, ODB2 (in Cars), and Wireless (no connector!). Gateways can convert physical connectors into wireless.
- **Link Protocol:** How do device actually send the data. Ethernet **802.3**, Wifi 802.11a/b/g/n, BlueTooth, BLE, ZigBee, Rfid, 6LoWPAN, 802.14.5e, **CAN, SigFox, LoRa**
- **Transport:** IPv4 and **IPv6**
- **Session / Communication: MQTT**, a subscribe and publish protocol that is used by Facebook for its mobile app, XMPP and AMQP , FTP, Telnet and SSH,
- **Data Aggregation / Processing:** When device send data, lots of data, you need an end point to do something with it.
- **Data Storage / Retrieval:** The realm of Big Data backend and NoSQL solutions.





Equipment and Tools

- Equipment
  - Computer/Laptop (MAC/PC)
  - Minimum: Raspberry Pi 3 / 4, SenseHAT & Smartphone
  - Optional: Anything else (sensors/actuators…)
- Software Tools
  - VS Code Interactive Development Environment:
    - https://code.visualstudio.com/
  - Git and Github account
    - https://github.com/
    - **You will need Github ID to access Module Website**
  - Packet Tracer (you will receive an email about this)

Delivery

- Moodle
  - Links to Module Website, Online Lectures/Labs
  - Announcements, Assessment Submission.
- Module Website
  - Materials
- Lectures
  - In-Class(WIT Students)/Zoom(StudyAtHome Students)
- Currently timetabled at:
  - Monday: 9:15-12:15 GMT (3 hours)
  - Wednesday: 11:15 GMT (1 hour)

Assessment…

- Idea is to realise a prototypical full stack IoT solution which uses open standards and protocols to integrates IT and OT.
- Project style approach
  - Have a working artefact that demonstrates skills from other modules on the course.
- Use things
  - Raspberry Pi + SenseHAT, SmartPhone, Sensors
- Use languages
  - Python, Javascript, Shell Scripting
- Use protocols
  - Bluetooth, MQTT, WiFi, Sigfox…