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Intro to the IOT & Embedded system

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week 1

Internet of Things

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Any device beside computer

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* Add computational intelligence

+

* Add a network connection

Using RFID a device can be provided with the IOT advantages.

week 2

Embedded system:

* The device, where complexity is hidden from the user.
* Interact with user with a simple interface

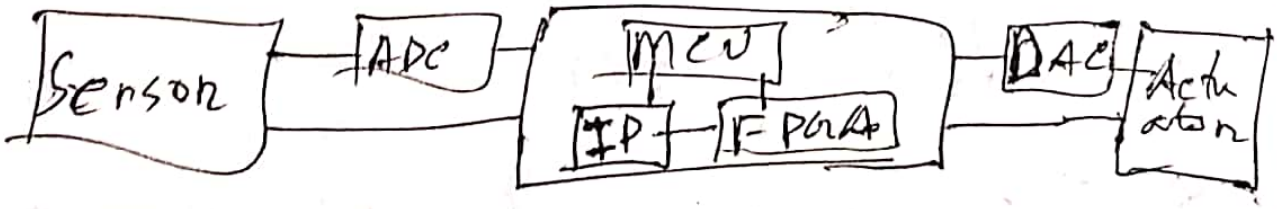
(2)

Tight constraints

- Cost
- Performance
- power
- Time to market

Embedded system is focused on one application

- Hardware and software are often designed together.
  - Because when you make software you need to know what hardware can do.
  - So designer must understant software and hardware together.



IP → Intelectual property

- An integrated circuit that perform or function

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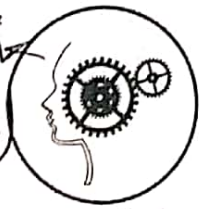
Example: 1. Ethernet (network controller)



2. Audio/Video (audio codec)

* Must interface with mcu.

FPGA — Field Programmable Gate Array

* Hardware that can be reconfigured to do different task.
* No fabrication needed.

Week 3

MCU Features to be considered

1. Bitwidth (8/16/32/64)
2. I/O pins
3. Performance (clock rates)
4. Timers
5. ADC
6. Low power mode (for power saving)
7. Communication Protocol (I2C, UART, SPI)

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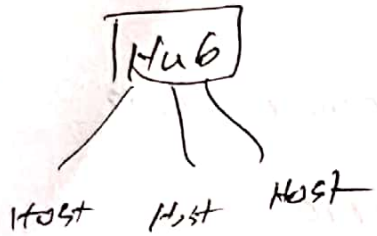
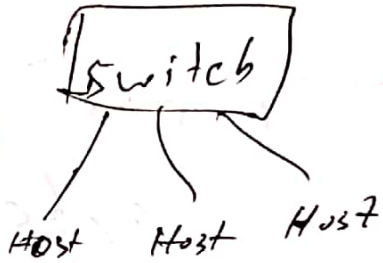
Von Neumann Bottleneck:

Memory is slower than CPU

Thats why we use cache memory and ram.

Week 3





Hub can not

switch controls where to send which data

mobile Ad hoc network → MANET

Mobile IOT Device where it reconfigure network constantly. Because it may move out of network.

~~Protocol~~

protocol – Rules of communication.

IP → Internet protocol

TCP → Transmission control protocol

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TCP/IP is protocol for global IP internet.

IP → defines a uniform format for host address.
→ is assigned to every host & router.

→ Rules → Routing, Flow control, ~~arbitration~~ arbitration

performed in stack → protocol stack

requires → network topology

requires → message priority

OSI Layer

Encapsulation → Transmission
→ Reception

Every layer adds a header

Routing layer → Top layer
Flow control layer
Arbitration layer
Transmission layer → Bottom layer

In reception layer it is reversed to get the original data.

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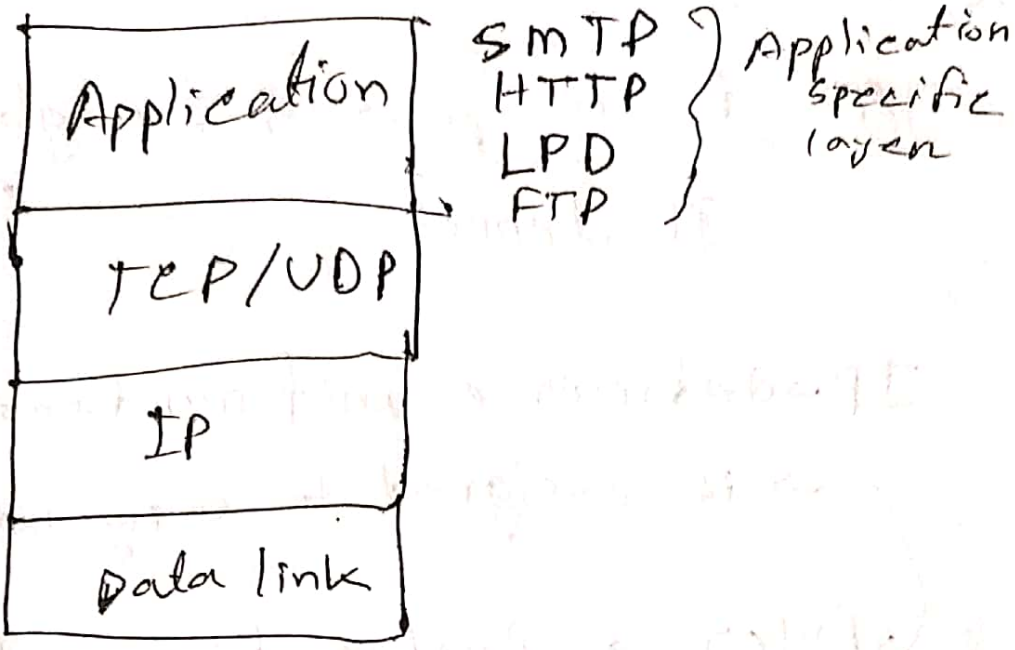
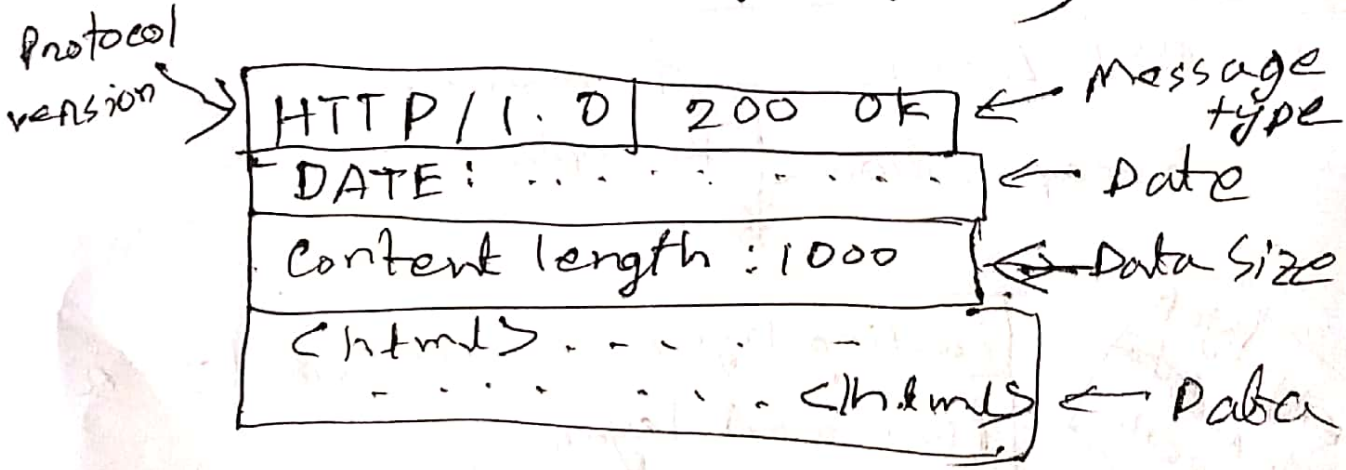


HTTP response message transmitted in response to a request for a web page. (GET)



MANET (self configuring mobile net)

* Power budget
* Data Rate
* Security

(7)

Network Programming in Practice

We only touch the application layer code.

* Library Functions handles the lower level tasks.

Example:

* sendMessage()
  it creates TCP/IP message and transmit it.

* ReceiveMessage()
  Receives TCP/IP message and returns contents.

* Using "Wireshark" we can capture all packet data Received or sent in detail.

Mark
April 21, 2020