



هفتمین نشست تخصصی همگرایی اینترنت اشیاء ، داده های حجیم و رایانش ابری

گروه آموزشی و پژوهشی سیب

Internet Of Things

M. Ali Azimi
Z Koohnavard



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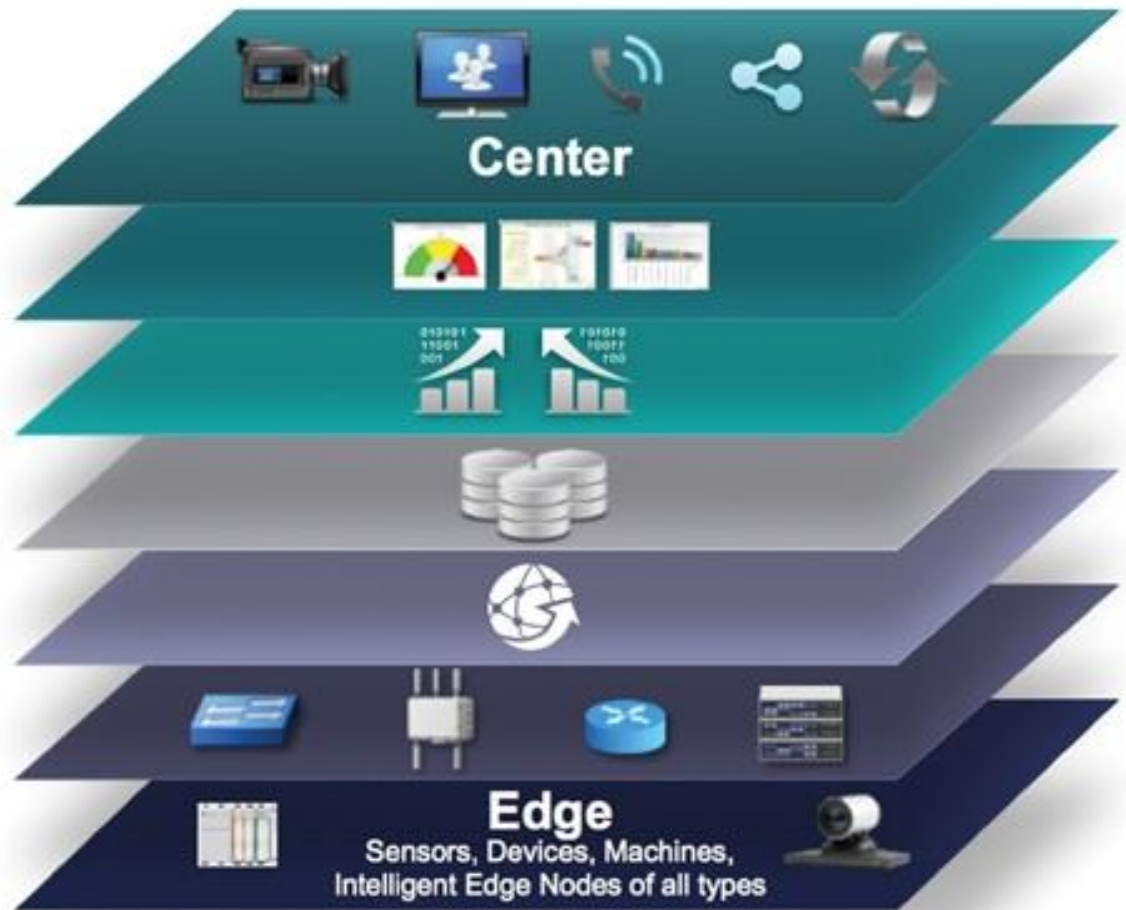


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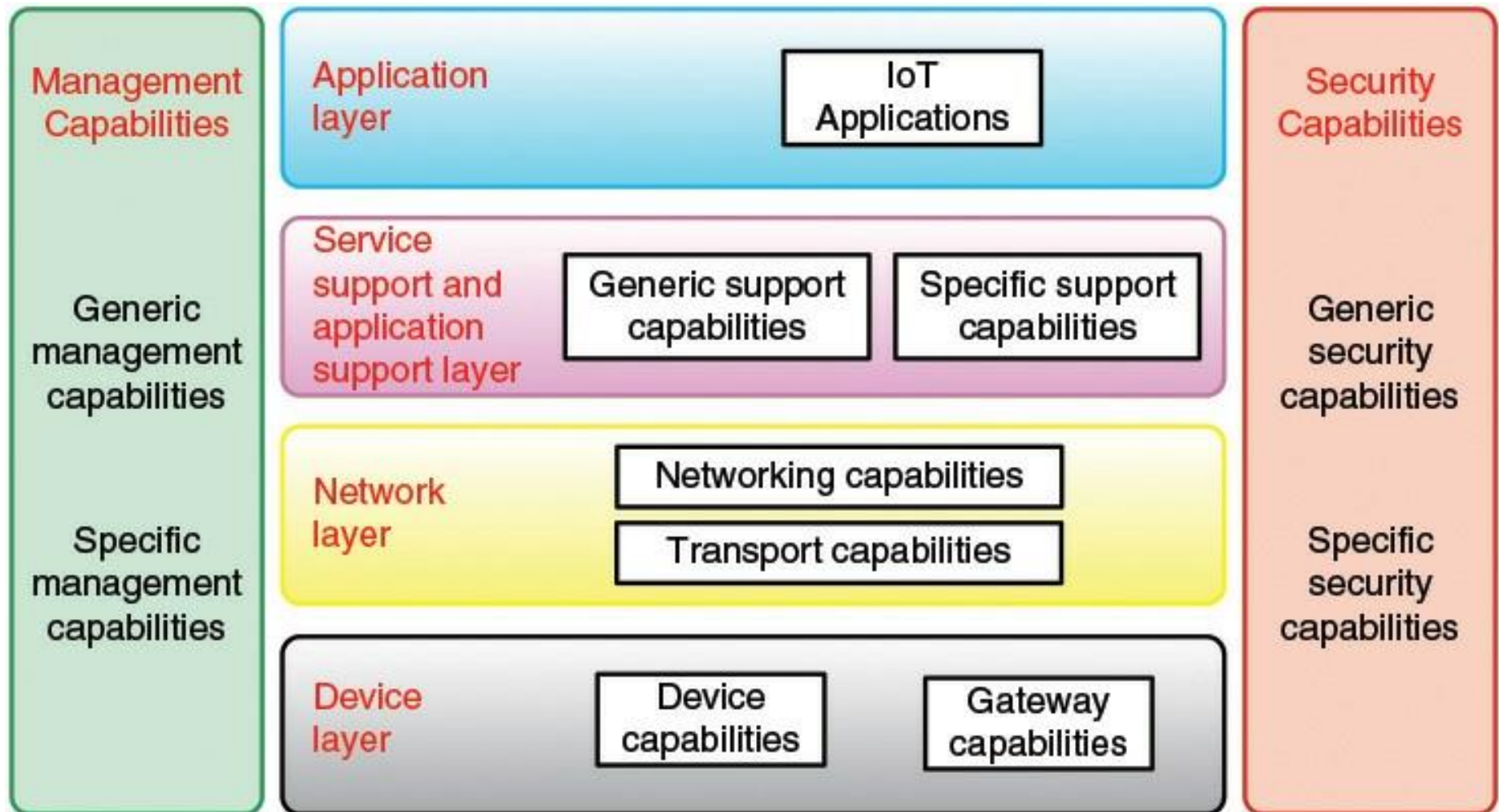
IOT World Forum مدل مرجع

Levels

- 7 Collaboration & Processes**
(Involving People & Business Processes)
- 6 Application**
(Reporting, Analytics, Control)
- 5 Data Abstraction**
(Aggregation & Access)
- 4 Data Accumulation**
(Storage)
- 3 Edge Computing**
(Data Element Analysis & Transformation)
- 2 Connectivity**
(Communication & Processing Units)
- 1 Physical Devices & Controllers**
(The "Things" in IoT)



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مدل مرجع ITU-T

لایه توانایی‌های مدیریتی

- توانایی‌های عمومی
 - مدیریت دستگاه
 - مدیریت توپولوژی شبکه محلی
 - مدیریت ترافیک و تراکم
- توانایی‌های اختصاصی

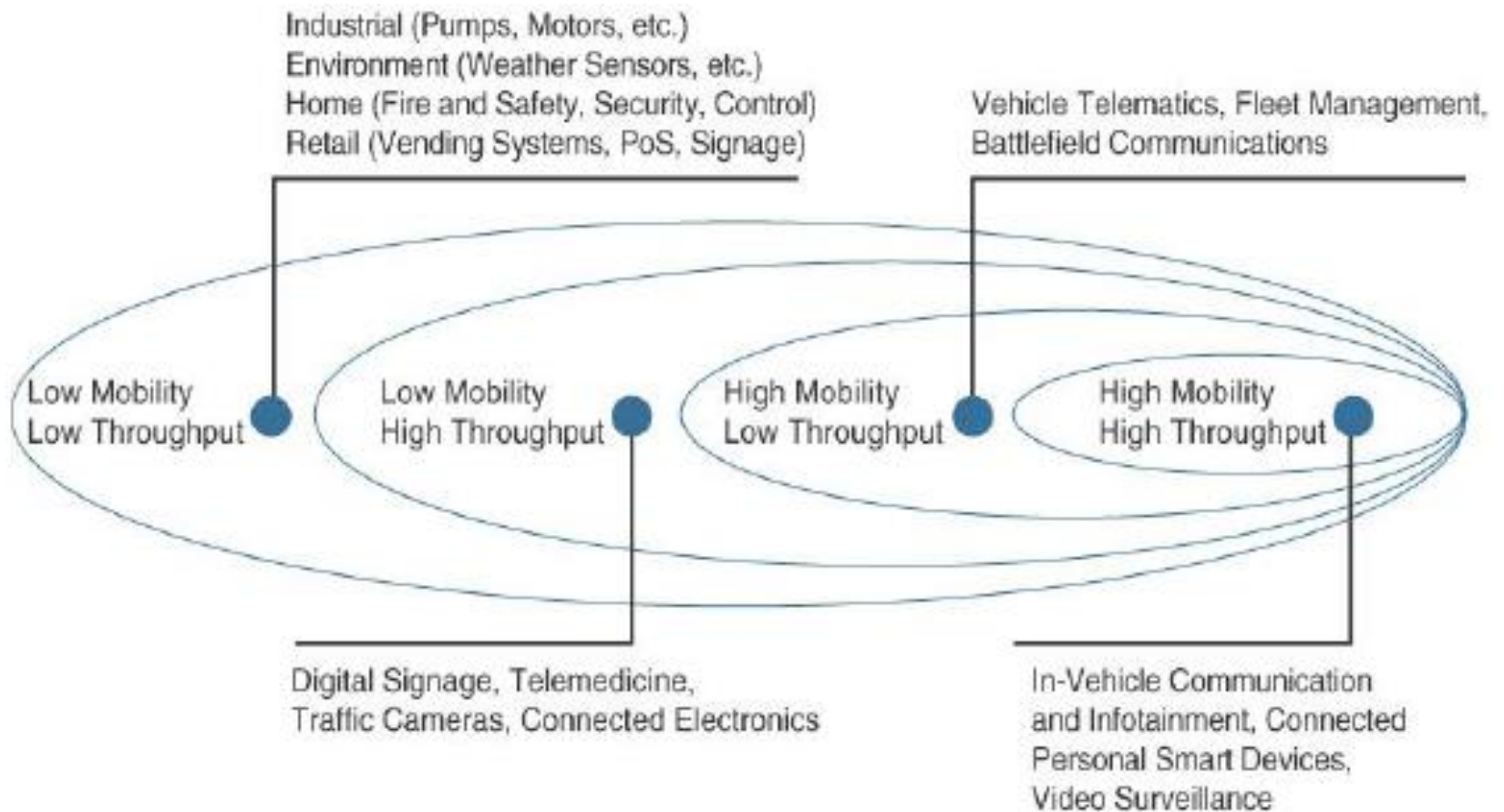
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لایه توانایی‌های امنیتی

- توانایی‌های عمومی
 - لایه برنامه‌های کاربردی
 - لایه شبکه
 - لایه دستگاه
- توانایی‌های اختصاصی

Thing Layer

- Battery-powered or power-connected
- Mobile or static
- Low or high reporting frequency
- Simple or rich data
- Report range
- Object density per cell



- Active or passive
- Invasive or non-invasive
- Contact or no-contact
- Absolute or relative
- Area of application
- How sensors measure
- What sensors measure

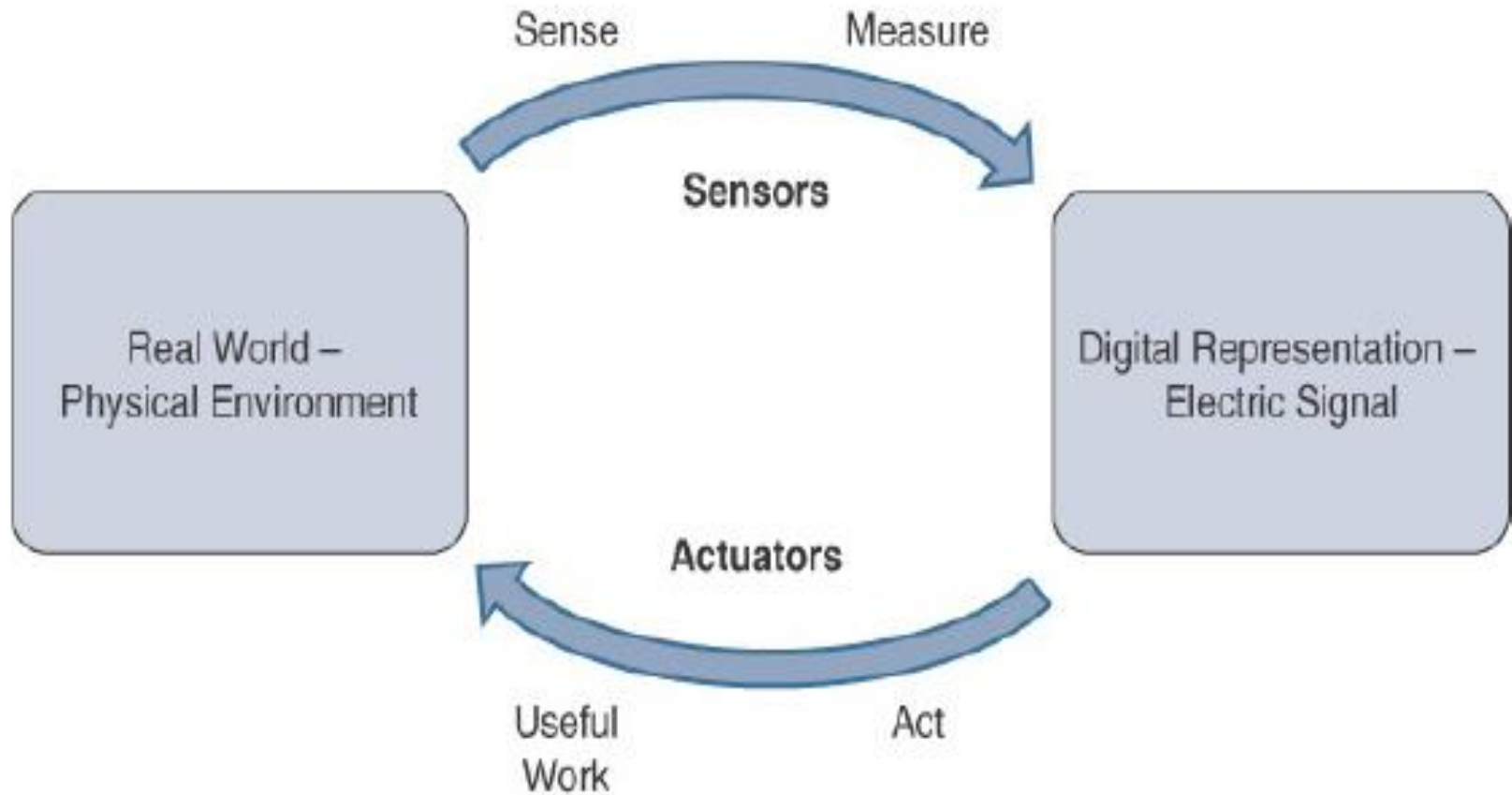
Sensor Types	Description	Examples
Position	A position sensor measures the position of an object; the position measurement can be either in absolute terms (absolute position sensor) or in relative terms (displacement sensor). Position sensors can be linear, angular, or multi-axis.	Potentiometer, inclinometer, proximity sensor
Occupancy and motion	Occupancy sensors detect the presence of people and animals in a surveillance area, while motion sensors detect movement of people and objects. The difference between the two is that occupancy sensors generate a signal even when a person is stationary, whereas motion sensors do not.	Electric eye, radar
Velocity and acceleration	Velocity (speed of motion) sensors may be linear or angular, indicating how fast an object moves along a straight line or how fast it rotates. Acceleration sensors measure changes in velocity.	Accelerometer, gyroscope

Force	Force sensors detect whether a physical force is applied and whether the magnitude of force is beyond a threshold.	Force gauge, viscometer, tactile sensor (touch sensor)
Pressure	Pressure sensors are related to force sensors, measuring force applied by liquids or gases. Pressure is measured in terms of force per unit area.	Barometer, Bourdon gauge, piezometer
Flow	Flow sensors detect the rate of fluid flow. They measure the volume (mass flow) or rate (flow velocity) of fluid that has passed through a system in a given period of time.	Anemometer, mass flow sensor, water meter

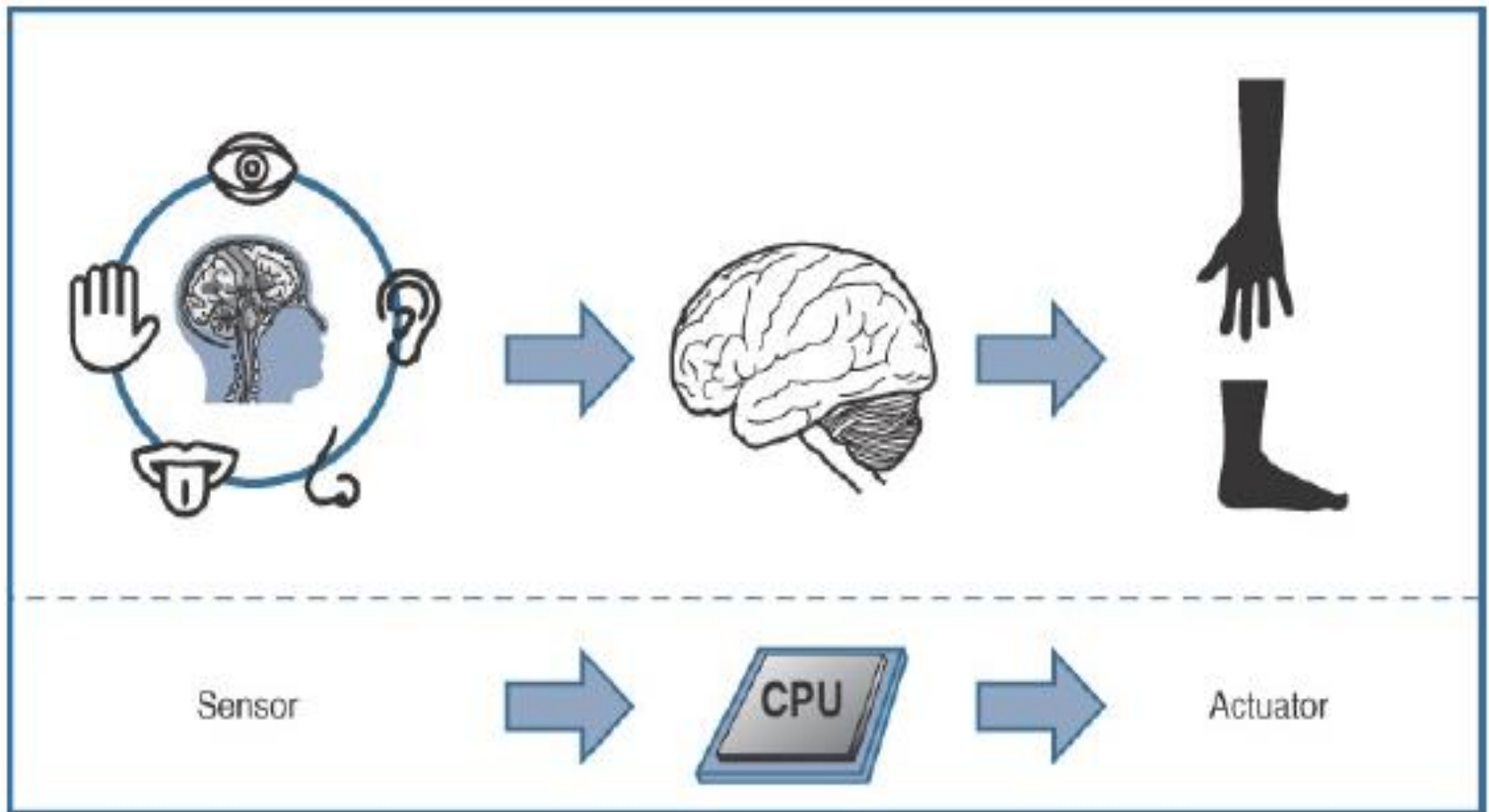
Acoustic	Acoustic sensors measure sound levels and convert that information into digital or analog data signals.	Microphone, geophone, hydrophone
Humidity	Humidity sensors detect humidity (amount of water vapor) in the air or a mass. Humidity levels can be measured in various ways: absolute humidity, relative humidity, mass ratio, and so on.	Hygrometer, humistor, soil moisture sensor
Light	Light sensors detect the presence of light (visible or invisible).	Infrared sensor, photodetector, flame detector
Radiation	Radiation sensors detect radiation in the environment. Radiation can be sensed by scintillating or ionization detection.	Geiger-Müller counter, scintillator, neutron detector

Temperature	Temperature sensors measure the amount of heat or cold that is present in a system. They can be broadly of two types: contact and non-contact. Contact temperature sensors need to be in physical contact with the object being sensed. Non-contact sensors do not need physical contact, as they measure temperature through convection and radiation.	Thermometer, calorimeter, temperature gauge
Chemical	Chemical sensors measure the concentration of chemicals in a system. When subjected to a mix of chemicals, chemical sensors are typically selective for a target type of chemical (for example, a CO ₂ sensor senses only carbon dioxide).	Breathalyzer, olfactometer, smoke detector
Biosensors	Biosensors detect various biological elements, such as organisms, tissues, cells, enzymes, antibodies, and nucleic acid.	Blood glucose biosensor, pulse oximetry, electrocardiograph

Sensor And Actuators



Sensor And Actuators



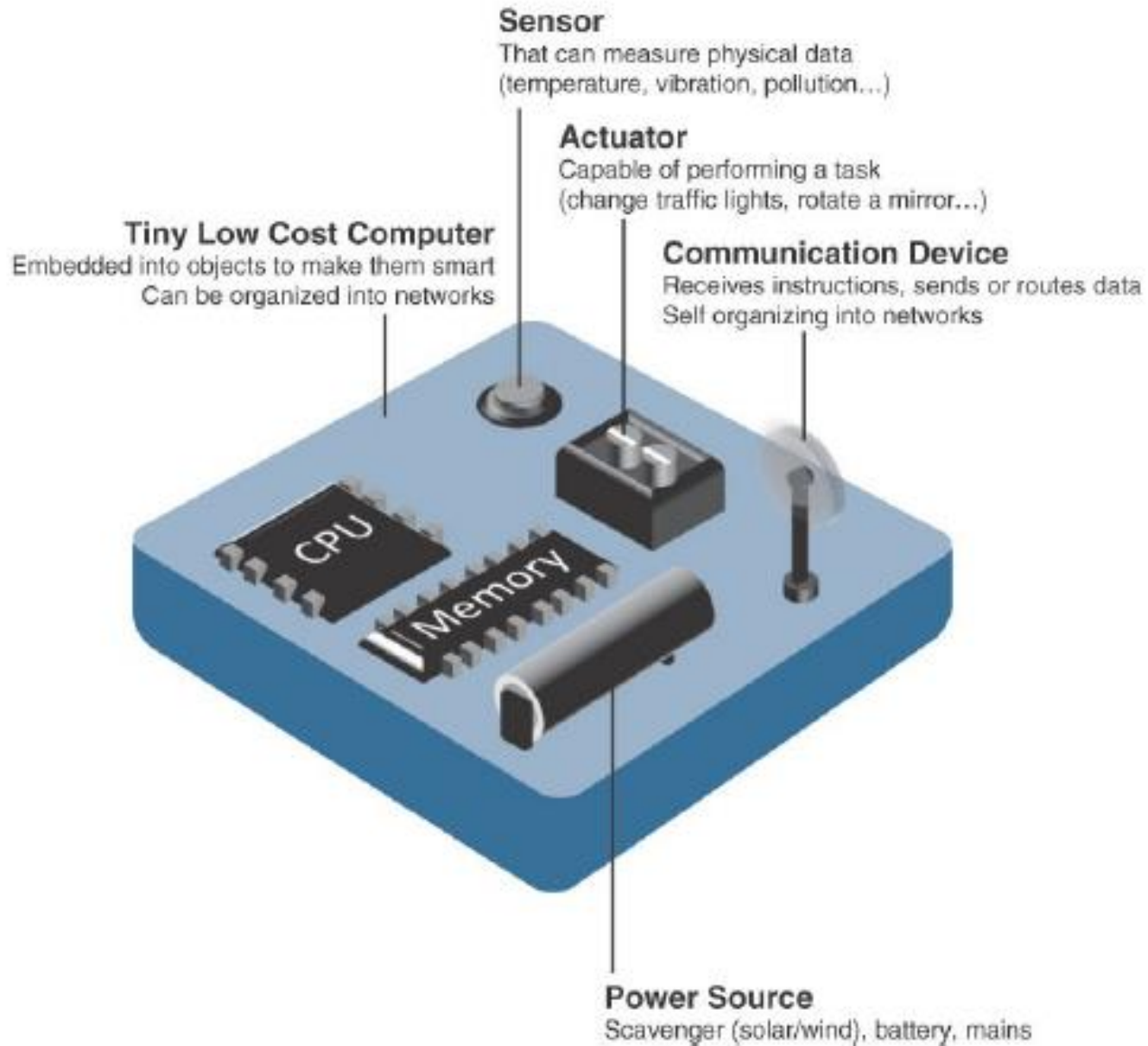
Actuators Type

- Type of motion
- Power
- Binary or continuous
- Area of application
- Type of energy

Type	Examples
Mechanical actuators	Lever, screw jack, hand crank
Electrical actuators	Thyristor, biopolar transistor, diode
Electromechanical actuators	AC motor, DC motor, step motor
Electromagnetic actuators	Electromagnet, linear solenoid
Hydraulic and pneumatic actuators	Hydraulic cylinder, pneumatic cylinder, piston, pressure control valves, air motors
Smart material actuators (includes thermal and magnetic actuators)	Shape memory alloy (SMA), ion exchange fluid, magnetostrictive material, bimetallic strip, piezoelectric bimorph
Micro- and nanoactuators	Electrostatic motor, microvalve, comb drive

Smart Object

- Processing unit
- Sensor(s) and/or actuator(s)
- Communication device
- Power source



Trends in Smart Objects

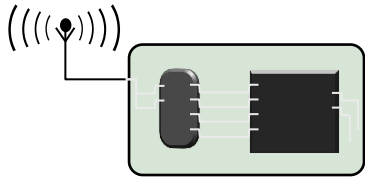
- Size is decreasing
- Power consumption is decreasing
- Processing power is increasing
- Communication capabilities are improving
- Communication is being increasingly standardized

Smart Object

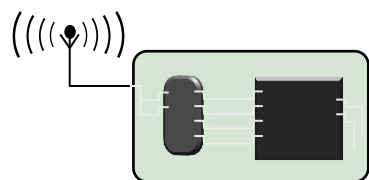
- Limited processing power
- Limited memory
- Lossy communication
- Limited transmission speeds
- Limited power

شبکه‌های حسگر بی‌سیم WSN

- عناصر شرکت کننده در شبکه های پیشین، دستگاه‌هایی بودند که به انسان نزدیک بوده و با انسان‌ها تعامل می‌کردند
- مفهوم جایگزین:



- به جای تمرکز بر روی تعامل با انسان، بر روی تعامل با محیط تمرکز شود
- شبکه در درون محیط نهفته شده است
- گره‌های شبکه با حسگر و محرک تجهیز شده‌اند تا محیط را اندازه‌گیری کرده یا بر روی آن تاثیر بگذارند
- گره‌ها اطلاعات را پردازش و به شکل بی‌سیم آن را منتقل می‌کنند



- شبکه‌های حسگر بی‌سیم (WSN)!
- یا شبکه‌های حسگر و محرک بی‌سیم (WSAN)

Thanks for listening!
Any questions?

