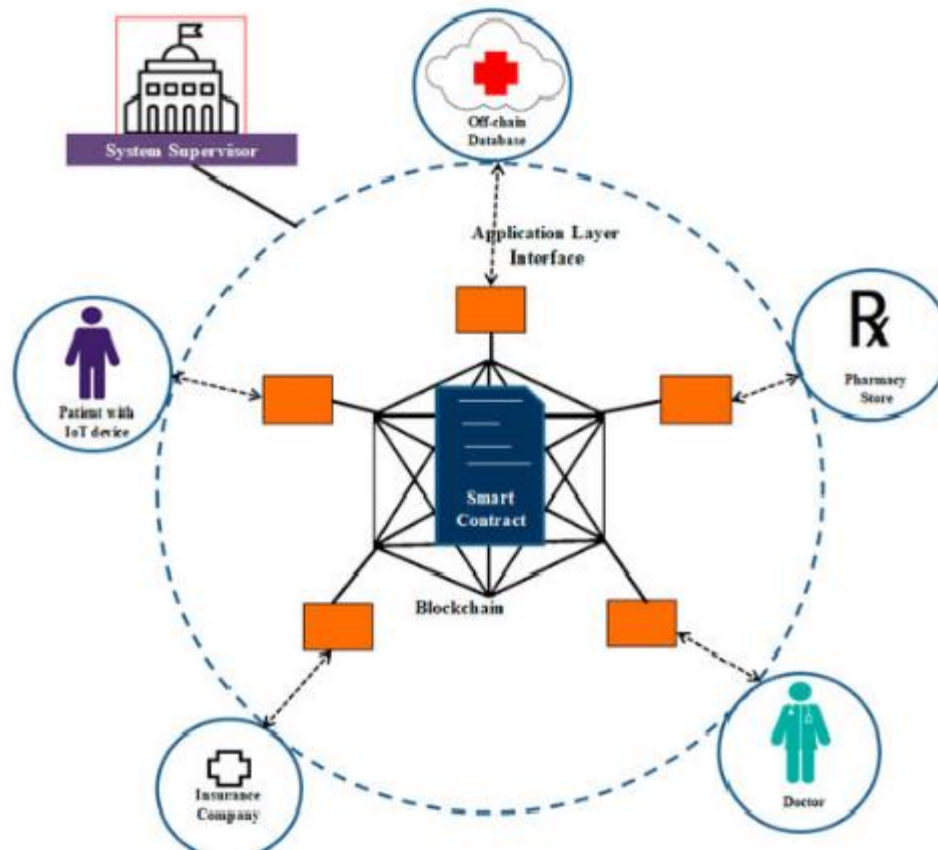# *Smart Sensor*

➢A smart sensor is **a device that takes input from the physical environment and uses built-in compute resources to perform predefined functions upon detection of specific input and then process data before passing it on**.

➢The system must also be re-configurable and perform the necessary data interpretation, fusion of data from multiple sensors and the validation of local and remotely collected data.

➢These sensors therefore contain embedded processing functionality that provides the computational resources to perform complex sensing and actuating tasks along with high level applications.

Smart Sensor

➤The functions of an smart sensor system can be described in terms of compensation, information processing, communications and integration. The combination of these respective elements allow for the development of these sensors that can operate in a multi-modal fashion as well conducting active autonomous sensing.

A smart sensor must be able to evaluate the validity of collected data, compare it with that obtained by other sensors and **confirm the accuracy Information processing encompasses the data related processing that aims to enhance and interpret the collected data and maximize the efficiency of the system, through signal conditioning, data reduction, event detection and decision making.**

What is smart sensor system

1. **Network Capable Application Processor** (NCAP) where control and data correction takes place

2. **Transducer Interface Module** (TIM) (one or more) containing the transducer and data

➤ Acquisition

➤ NCAP (Network Capable Application Processor)

➤ Communications

➤ Interface Control

➤ Message Routing

➤ TIM Discovery and Control

➤ Data Correction Interpretation of TEDS Data

➢Message Encoding and Decoding

➢TIM (Transducer Interface Module)

➢Analog Signal Conditioning

➢Triggering

➢Analog to Digital Conversion

➢Command Processing

➢TEDS Storage

➢Data Transfer

➢Communications

Advantages of smart sensors

➢ **Minimum Interconnecting Cables:**

The Smart Sensor System interconnects all of the transducers through a common digital bus cable. The centralized, bulky electronic boxes typical of traditional measurement systems are replaced with miniature modules strategically distributed throughout the setup.

➢ **High Reliability**

Reliability is improved by reducing the total number of interconnecting cables and including Build-in-Test (BIT) features. Self test adds a higher level of confidence that a given measurement channel is alive and working properly

Advantages of smart sensors

➤High Performance

Higher measurement accuracy is obtained by digital correction over the operating temperature range of both the transducers' sensitivity and the analog signal conditioning instrumentation.

➤Easy to Design, Use and Maintain

Transducer Electronic Data Sheet 1 (TEDS) stored in each smart sensor and interface module helps to reduce the complexity of the system design, integration, maintenance and operation.

➤Scalable -Flexible System

It allows for easy expansion or reduction in the number of measurement channels. This is possible with the use of Intellibus Interface Modules (IBIM).

Advantages of smart sensors

➢**Small Rugged Packaging:**

   A standard software interface (standard data interchange) would greatly reduce ongoing operating and maintenance costs.

➢**Multi sensing:**

➢A single smart sensor can measure pressure, temperature, humidity, gas flow and infrared, chemical reaction surface acoustic vapour etc.

Disadvantages of smart sensors

➢Required use of predefined embedded function during the design of the smart sensor

➢The smart sensor consist of both actuators and sensors

➢ Sensor calibration has to be managed by an external processor

➢In wired smart sensor, complexity is much higher as a consequence has to be managed by an external processor.

➢The cost is high