DAILY ASSESSMENT FORMAT

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Course:	industrial iot on google cloud platform	USN:	4AL17EC068
Topic:	industrial iot on google cloud platform	Semester & Section:	6TH B
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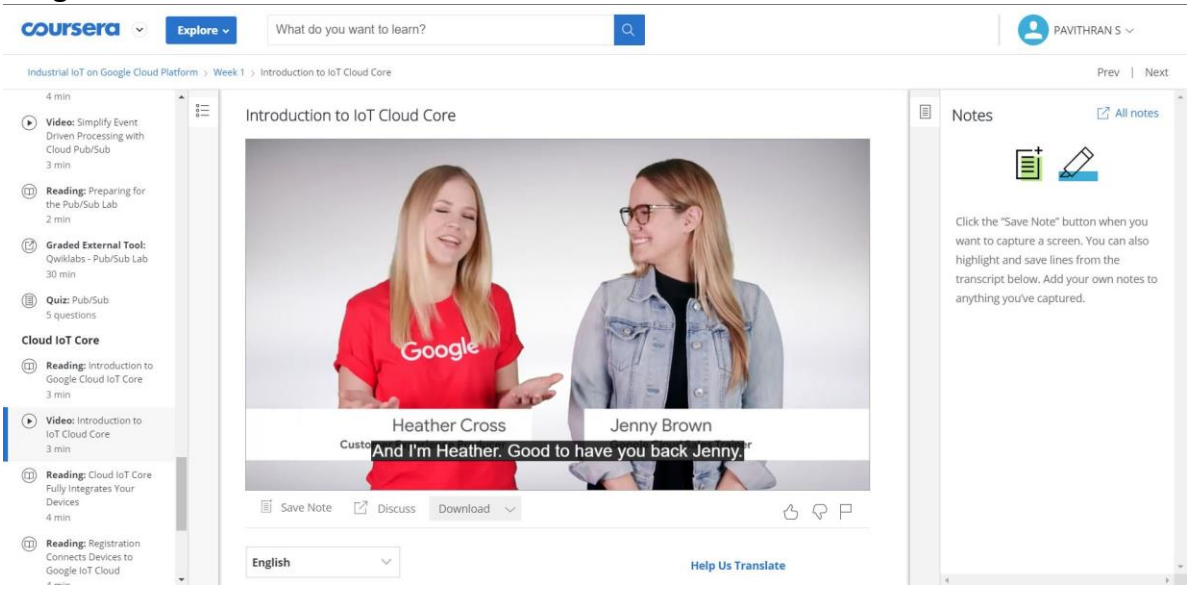
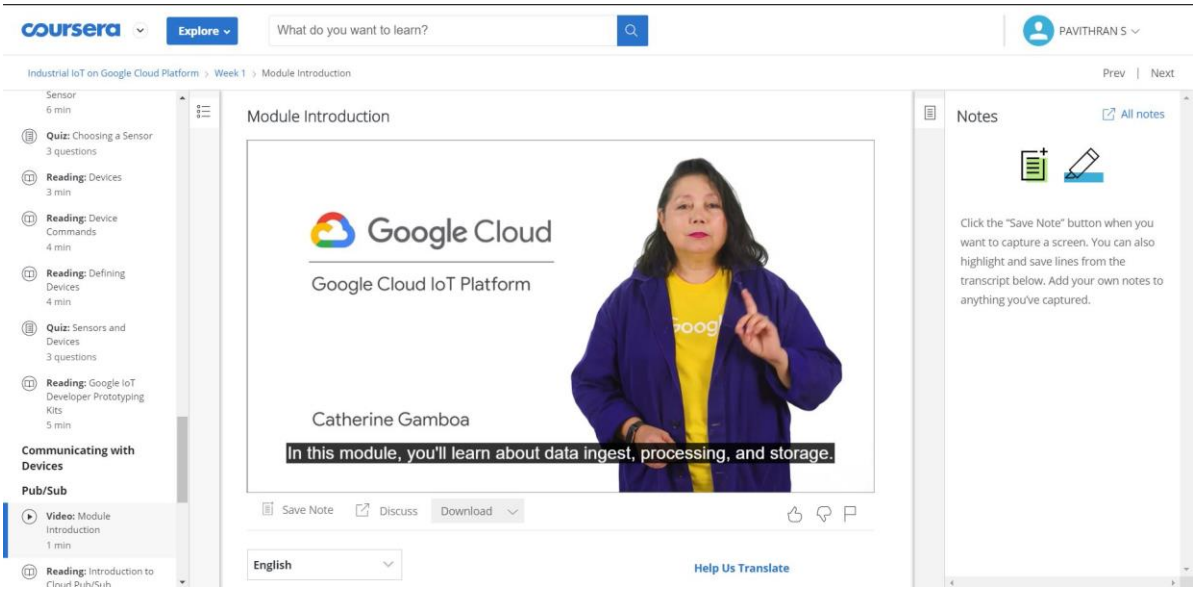
FORENOON SESSION DETAILS

Image of session



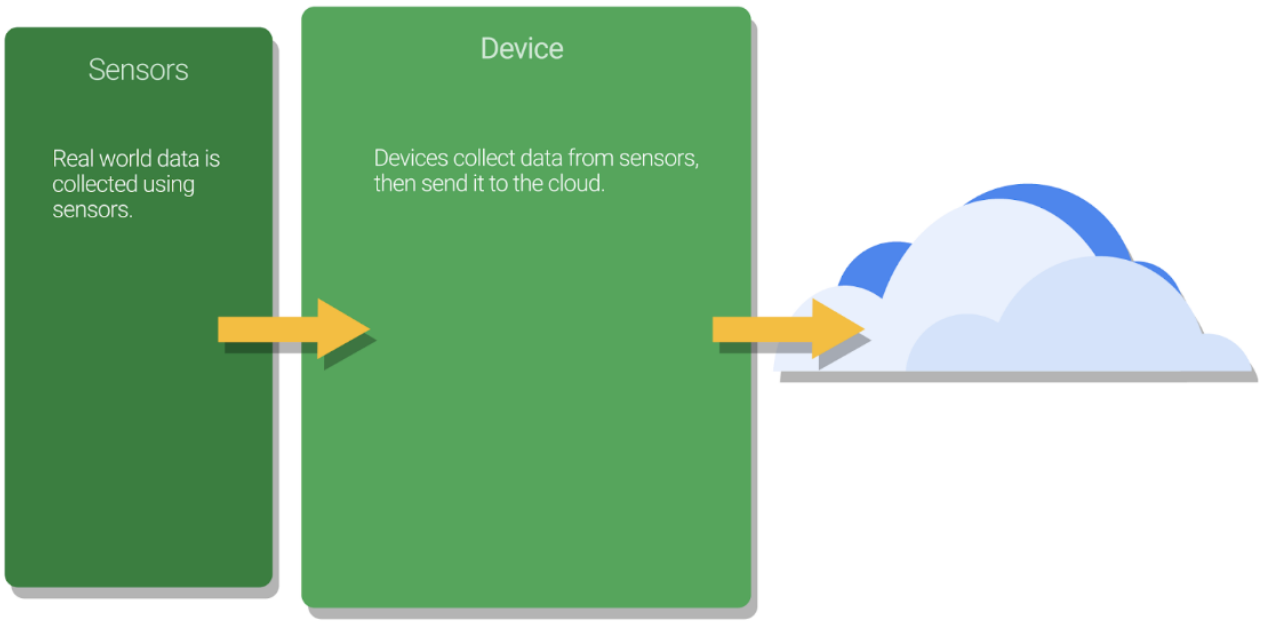


Report – Report can be typed or hand written for up to two pages.

Sensors and Devices Introduction

In this lesson you learn about sensors and devices. Often, sensors and devices are referred to as simply 'devices,' with the presence of sensors implied. The two will be discussed separately in this module, but throughout the rest of the course, 'devices' may refer to both the sensor and device combined.

A sensor is a module that observes changes in its environment and sends information about these changes to a device.



Devices collect data from sensors and send it to the cloud. Devices can be very small and have very few resources in terms of compute, storage, and so on. They might be able to communicate only through networks that cannot reach a cloud platform directly, such as over Bluetooth Low Energy (BLE). Standard devices are more likely to resemble small computers and may have the ability to store, process, and analyze data before sending it to the cloud.

Types of Sensors

There are many sensors available for IoT and a number of ways of categorizing them. The categories discussed below are just a small sample of the ways sensors can be grouped.

Sensors can be divided by their external power requirements:

Type	Definition	Example
passive	Does not require external power to operate. They respond to input from their environment.	A temperature sensor that changes resistan response to temperature changes
active	Requires external power to operate.	A camera

Type of signal the sensor produces:

Type	Definition	Example
analog	Outputs an analog continuous signal	Accelerometers,
digital	The output is converted to discrete values (digital 1s and 0s) before transmitting to a device	Digital pressure sensor

Type of measuring device:

Type	Definition
chemical	Responds to chemical changes in its environment
mechanical	Responds to physical changes in its environment
electrical	Responds to electrical changes in its environment

Choosing sensors for your project requires a clear understanding of what you want to measure and what accuracy is required.

Choosing a Sensor

When selecting an IoT sensor, there are several things to consider. Typically, the goal for an IoT sensor and device is long life with little human interaction. You expect to place IoT sensors and devices into the desired environment and have them work for an extended period of time. They might be in a remote location or embedded deep within a system, inaccessible to humans. Replacing a sensor and device in this situation may be extremely costly, dangerous, or even impossible; all reasons to carefully consider your sensor and device decisions.

Your decision is based on many factors. As you design your system, you need to carefully consider the importance of each factor and its priority to the overall design.

The following list of considerations can be thought of as a starting point for any IoT sensor discussion.

Durability

Durability must be considered with regard to the environment of the sensor. You want to make sure your device is as durable as necessary to operate for a reasonable period of time, without incurring unnecessary costs.

For example, a water-resistant temperature sensor may be acceptable for a remote weather station, but it would be completely unsuitable for monitoring water temperature in a pool because it is not waterproof.

Accuracy

You want to have enough accuracy to correctly monitor an environment, but you don't want to pay for more than you need.

For example, if you are designing a system to regulate the temperature in a remote household storage unit, you are probably willing to accept a sensor that might be accurate with +/- 2 degrees. This accuracy would be completely unacceptable if you were designing a medical device system. A medical device temperature sensor would need to be accurate to +/- 0.2 degrees!

Versatility

Sensors must be able to operate within reasonable variations of environment. Because most IoT network designs have many sensors, in a variety of environments, it is important to have sensors that can function accurately in all variations of the environment.

For example, if you are building remote weather stations for wilderness areas, you will need to use sensors capable of handling extremes of summer and winter temperatures. It would not be practical to have sensors that only operate accurately at room temperature.

Power Consumption

Depending upon the situation, your requirements might be for a low-power, or even very low–power device. You will need to decide whether power-saving features (like sleep mode or fast wake up) are necessary.

For example, a sensor or device powered by solar-charged batteries may need to spend a great portion of

its life in sleep mode to prolong battery life during low-light times. It may also need fast wake times to accurately capture data.

Special Environmental Considerations

Sensor choice can even affect the final system design.

For example, when designing a system for monitoring water quality, a sensor that can be placed within the main water supply piping is far more cost-effective and accurate than a sensor that requires diverting water samples.

Cost

IoT networks usually involve hundreds or even thousands of sensors and devices. Every aspect of sensor design must be scrutinized from a cost perspective. These costs involve more than just the price of the sensor. Consideration must be given to the cost of placement, maintenance, reliability, etc.