DAILY ASSESSMENT FORMAT

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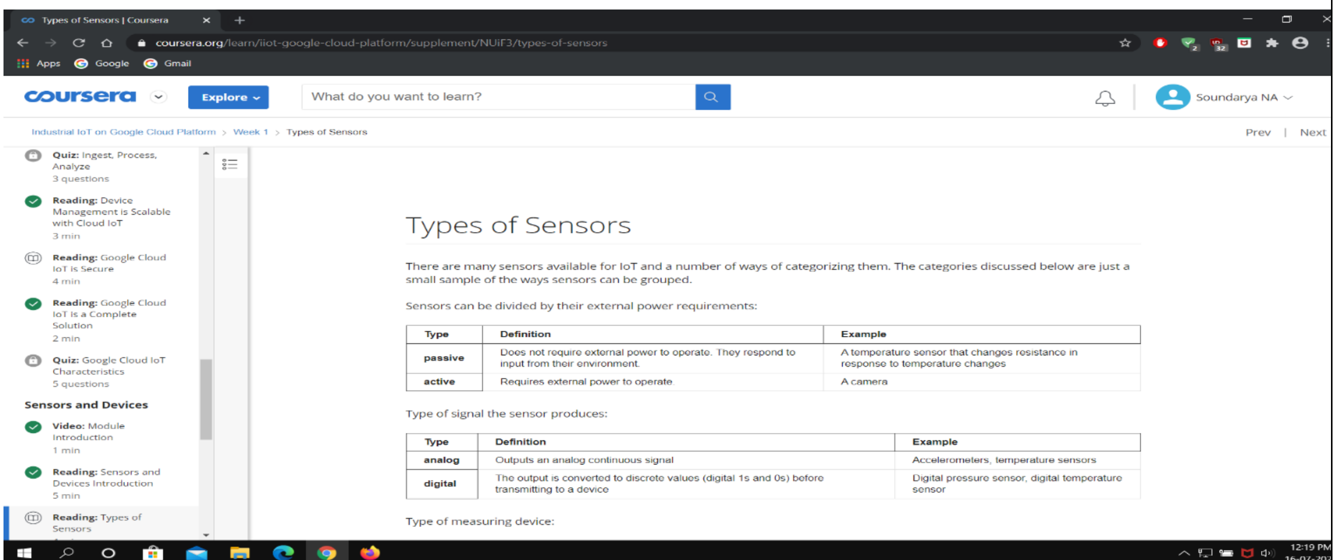
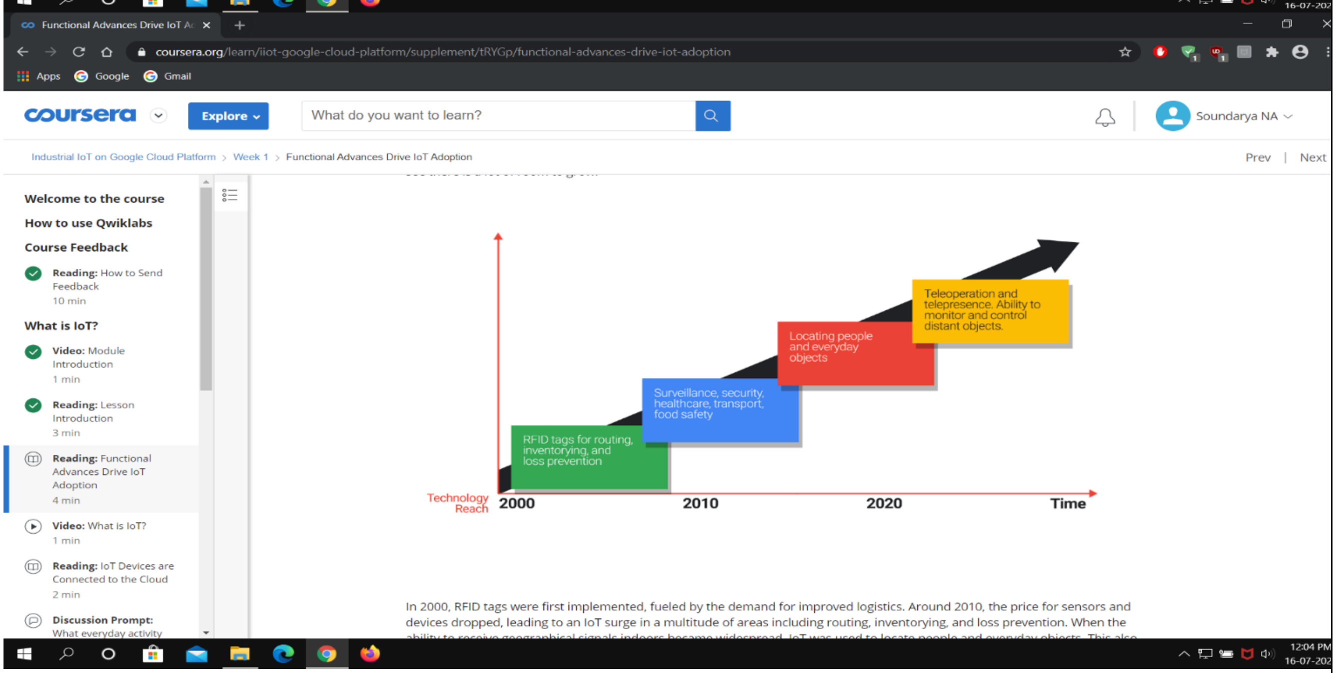
Topic:	Industrial IOT on Google Cloud Platform	**Semester & Section:**	8th - B
Github Repository:	Soundaryana-courses		

FORENOON SESSION DETAILS
Image of session





Report:

The Internet of Things (IoT) is gradually becoming a reality, supported by an assortment of heterogeneous devices, varying from resource- starved wireless sensors to embedded devices and resource-rich backend systems, which are supplemented by a range of networking technologies and protocols. Nevertheless, this diverse ecosystem of platforms and protocols, along with the inherent limitations in processing power, energy, memory and communications bandwidth for some of the involved devices, render secure and interoperable interactions a primary concern, and an important obstacle to the introduction of novel applications, and the adoption of IoT in general. Motivated by the above, this work presents SeMIBIoT, a Secure Multi-protocol Integration Bridge for the IoT. Acting as a gateway, SeMIBIoT is able to provide hop-by-hop or end-to-end secure communications between an array of heterogeneous nodes and standardized IoT protocols, guaranteeing seamless interactions and thus alleviating security and interoperability concerns. Using a realistic testbed featuring a number of diverse platforms, the bridge is evaluated in a variety of scenarios, validating the feasibility of the proposed approach.

Protocols:

Cloud IoT Core supports two protocols for device connection and communication: MQTT and HTTP. Devices communicate with Cloud IoT Core across a "bridge" — either the MQTT bridge or the HTTP bridge. The MQTT/HTTP bridge is a central component of Cloud IoT Core, as shown in the components overview.

When you create a device registry, you select protocols to enable: MQTT, HTTP, or both.

- MQTT is a standard publish/subscribe protocol that is frequently used and supported by embedded devices, and is also common in machine-to-machine interactions.
- HTTP is a "connectionless" protocol: with the HTTP bridge, devices do not maintain a connection to Cloud IoT Core. Instead, they send requests and receive responses. Cloud IoT Core supports HTTP 1.1 only (not 2.0).

Terminology:

- "server": an endpoint exposing information (e.g., a smart object such as a light bulb or TV). Also known as a producer or provider in some protocols.

- “client”: an endpoint consuming such information (e.g., an app). Also known as a consumer in some protocols.
- “data model”: a concrete schema, i.e., a schema expressed in a particular language/format (e.g., in RAML, JSON Schema, D-Bus introspection XML, etc.).
- “resource”: a specific instance of something implementing one or more data models for different types of functionality, exposed by a server.
- “bridge”: a device designed to translate from one protocol and/or data model to another, to allow a client of one to communicate with a server of another. The bridge may be physically collocated with the server, or the client, or (more typically) in a separate device such as a hub.
- “schema bridge”: a bridge component that can translate data expressed in a given data model to another one that expresses the same information in a different way. The conversion might involve conversion of data types (e.g., integers vs string literals), property names, resource granularity (e.g. one data model vs two more specific data models), or other more complex conversions.
- “protocol bridge”: a bridge component that can translate from a given protocol to another given protocol, but does not translate the data model. Thus, often a protocol bridge requires one or more schema bridges due to the two protocols using different data models.

Taxonomy:

This scenario typically requires translation code on a per-data model basis, since each standard can express things completely differently. However, since both are standards, such code can be authored by a third party (i.e., someone other than the client and server code owners).

This similarly requires bridging code on a per-data model basis. Since the server’s data model is not a standard, it often must be authored by the same vendor/coder as the server or by someone who obtains permission from them. Thus the bridge must either be server-vendor-specific itself, or else it must allow vendor-specific extensions to be included or added

In this case, the bridge does not try to translate to a particular schema/data model, but attempts to keep the same data model (whether standard or proprietary) as much as possible and only translate the actual syntax into the language/format used on the other side (e.g., XML to JSON or vice versa), without any domain-specific knowledge of the data model being translated or its semantics. Thus, there is only one dynamic schema bridge needed (at least for a given pair of protocols), and it can be authored by a third party.

In general, we believe that bridges should use specific schema bridges for known data models (which we call “static schema bridges”), and fall back to using a dynamic schema bridge when no specific schema bridge is found for a discovered resource. Furthermore, we believe that static schema bridges are important to convergence (e.g., one client communicating with multiple server implementations), and it is thus important for bridges (that aren’t embedded into the server itself) to separate the notion of “protocol bridge” from “(static) schema bridge” and allow extensibility by others. The bridge, or the owner of a bridge, should be able to easily install schema bridges for new and/or proprietary data models.

To ease the job of developing schema bridges and increase semantic interoperability, it is desirable that different data models for the same type of thing (e.g., light bulbs) are as similar as possible for basic functionality. In an ideal world, data models used by different protocols and organizations would express exactly the same information in ways that are algorithmically translatable by a dynamic schema bridge with no domain-specific knowledge. Sharing data models more widely, and having agreements in principle of at least using the same abstract information model, would be very beneficial.

It is also important to keep in mind that the IoT ecosystem is still undergoing significant innovation, especially in terms of new types of resources, and even new variations of existing types of resources. For example, while classic light bulbs historically had on/off, then dimming capability, many now have color settings, and perhaps other bells and whistles. It is important to not preclude innovation and vendor differentiation, in order to grow the IoT ecosystem and allow it to evolve. Thus it is also critically important to not limit use to only standard schemas. Hence the recommendation to support dynamic schema bridges, as well as allowing bridges to acquire new static schema bridges.