Talk on "IED and IoT"

by Dr Siow Chun Lim, Grad. IEM

Dr Siow Chun Lim, Grad. IEM is currently the Associate Editor of Journal of Engineering Science and Technology and is also an active reviewer for several conferences and journals.

A talk on "IED and IoT" was successfully organized by Electrical Engineering Technical Division at Wisma IEM on 1st October 2016. The speaker was Mr. Fong See Ni, the co-founder and Director/ Chief Technology Officer of Mikro MSc Berhad. Mr. Fong started the talk by defining IED, IoT and Big Data. An Intelligent Electronic Device (IED) is essentially microprocessor-based controller of power system equipment such as circuit breakers, transformers and capacitor banks. Its main function is to receive data from sensors and power equipment and send control commands such as tripping circuit breakers if anomalies in voltage, current or frequency are sensed. On the other hand, the Internet of things (IoT) is the network of networks of uniquely identifiable endpoints that communicate without human interaction using IP connectivity whether locally or globally. It is the inter-linking via networking of physical devices embedded with electronics, software, sensors and network connectivity which enable collection and exchange data amongst the said objects. Simply said, it is the combination of sensors, connectivity and people and processes. The functionality of IED and IoT highly depends on the third element called the Big Data. Big data is a term for data sets deemed to be too huge for traditional data processing applications to deal with. Such data if processed effectively could lead to enhancement of insight, decision making and process automation.

Figure 1 shows the architecture of the overall IoT system where device/sensors can easily be substituted with IED:

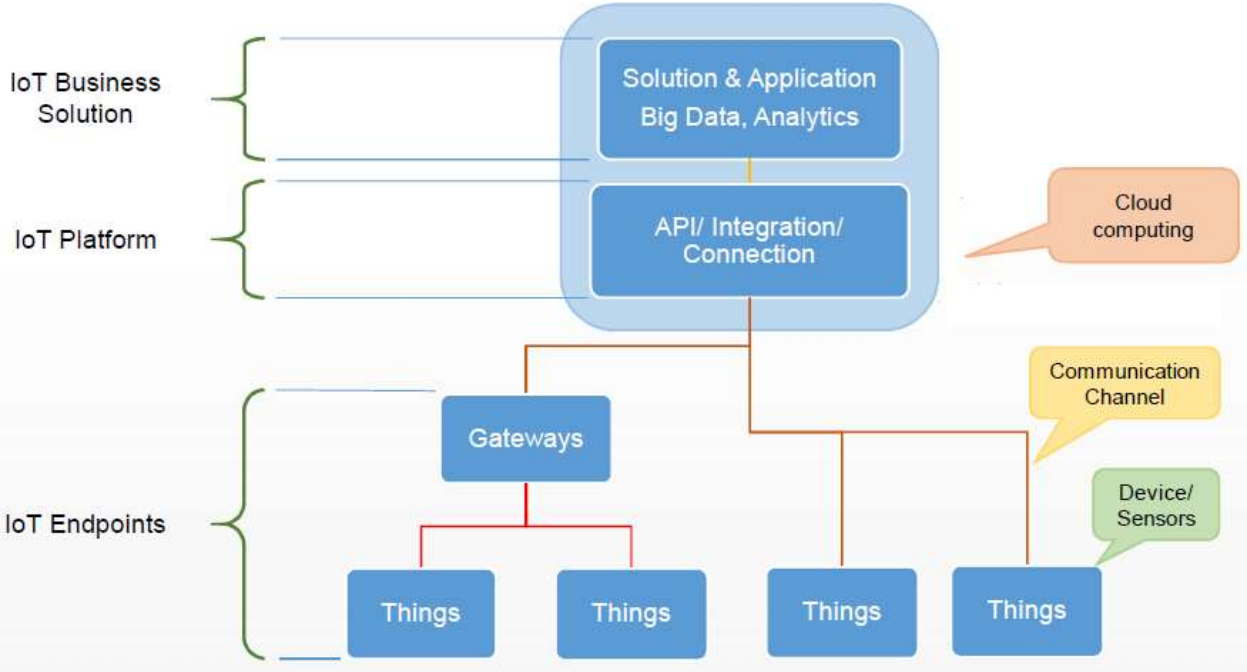

Figure 1: Linkage of IED, IoT and Big Data

Moving on, an embedded system is a computer system purposely built with a dedicated function within a larger system. It exists in different form factors and usually operate real-time as opposed to general computer which is usually for non-time critical applications. Embedded systems use specialized software and hardware and a simple embedded system may consist of an input, output, CPU, memory and display.

There are various examples of IED serving different purposes in the context of power system. IED for protection could be overcurrent and earth fault relay, earth leakage relay, motor protection relay, reverse power relay and under and overvoltage relay. IED for control application could be power factor regulator, load tap changer, re-closer controller, maximum demand controller and breaker control IED just to name a few. Furthermore, IED for measurement could be digital power meter, revenue meter, digital fault recorder and merging unit (IEC 61850).

The marriage of IED, IoT and Big Data can transpire into an extensive list of applications as outlined in Table 1.

Table 1: IoT and its applications

Industrial	**Consumer**
Heavy machinery	Wearables
Transportation	Phones
Smart cities	Televisions
Automation	Home appliances
Factories	Home monitoring
Healthcare	Home automation

Another outcome of the said marriage is the birth of Industrie 4.0 which is also dubbed the next industrial revolution. Rather than the current machine-to-machine serial automation of power system using SCADA, a radially functional smart grid which incorporates renewable energy systems, information control, smart homes and next generation watt-hour meters is made possible. Unlike SCADA, IoT is interactive and harmoniously connects human and devices. Figure 2 shows the evolution of IoT analytics capabilities:

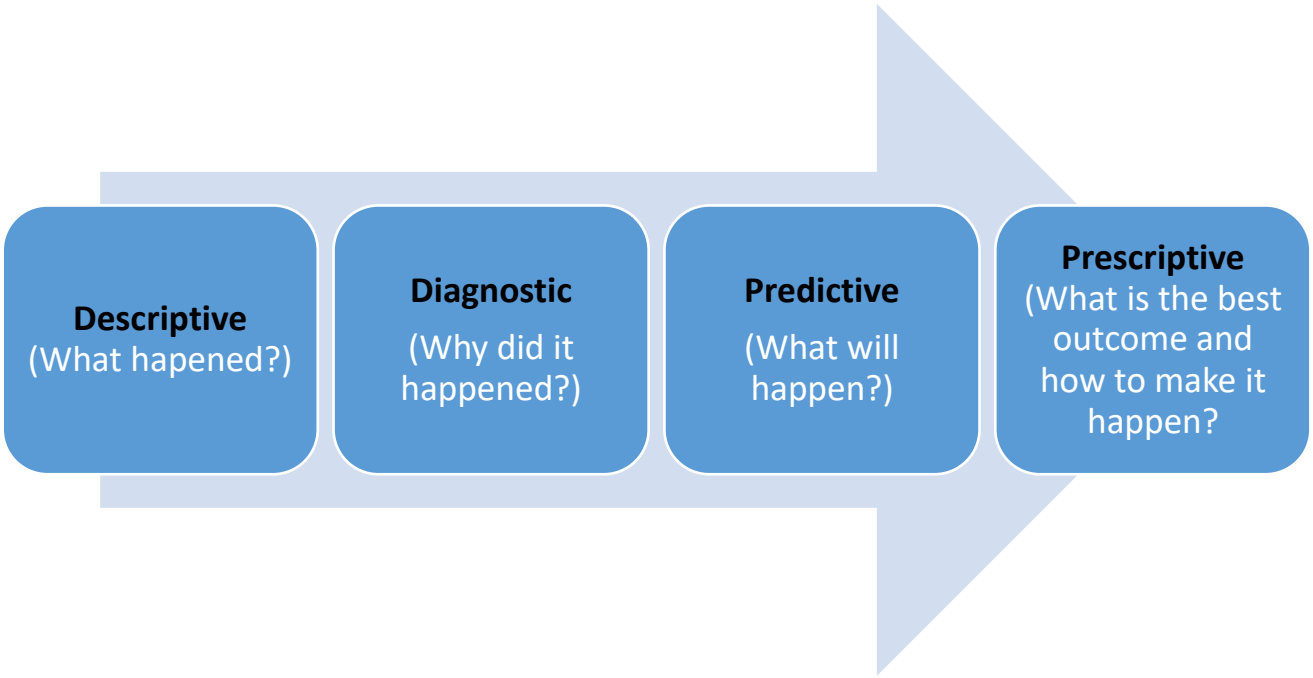

Figure 2: Future of IoT Analytics Capabilities

This evolution of IoT results in multi-pronged foreseeable benefits which include product differentiation, improvement of customer experience via enhanced engagement, reduction of costs and birth of new business models with additional services which ultimately results in additional revenue. Mr. Fong concluded his talk by re-emphasizing that IoT is a new and emerging technology with seemingly endless possibilities. He also foresees that more data scientists are needed in order for IoT to be sustainable. The session ended with the presentation of a token of appreciation from EETD subcommittee, Dr. Siow to Mr. Fong as shown in Figure 3. Figure 4 illustrates the strong crowd which attended the talk.

Figure 3: Token of appreciation from EETD to Mr. Fong

Figure 4: The participants