

CS540 - Paper Review Report # 15

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Title: Internet of Things: A Survey on Enabling Technologies, Protocols, & Applications

Author: Ala Al-Fuqaha, Mohsen Guizani, Mehdi Mohammadi, Mohammed Aledhari, Moussa Ayyash

In the paper it is stated that Internet of Things (IoT) plays a great role in connecting number of physical objects to the Internet by enabling them to see, hear, think and perform jobs by having them “talk” together, to share information and to coordinate decisions. In doing so, IoT transforms these objects from being traditional to smart by exploiting its underlying technologies such as ubiquitous and pervasive computing, embedded devices, communication technologies, sensor networks, Internet protocols and applications. This will let IoT to have a significant impact on home and business applications and contributed the quality of life and to grow the world economy.

The paper also points out the basic IoT requirements such as Devices need to fit customer requirements, need of new protocols (to let heterogeneous devices to communicate), Architectural standardization, revision of current Internet architecture, security and privacy, and management and monitoring of IoTs. In the survey paper an overview of the Internet of Things (IoT) with emphasis on enabling IoT technologies, protocols (IETF, IEEE ad EDC global protocols), and applications together with IoT architecture is presented.

The authors have also discussed about IoT challenges, such as availability, reliability, mobility, performance, scalability, management, interoperability, security and privacy, and summary on the research efforts and projects associated with the IoT challenges under discussion. Using real-time use case that illustrates the use of traffic analytics in the context of IoT, the paper presents the relation between the IoT and other emerging technologies including big data analytics, cloud and fog computing. As IoT employs a large number of embedded devices, like sensors and actuators that generate big data which in turn requires complex computations to extract knowledge, the storage and computing resources of the cloud present the best choice for the IoT to store and process big data. It is indicated also that fog computing can serve as an optimal choice for the IoT designers for location, distribution, scalability, density of devices, mobility support, real-time interactive services, standardization and on the fly analysis features of IoT.

Finally, by choosing three application use-cases namely: Nursing Home Patient Monitoring System, Monitoring and Mitigation of Eating Disorders and Indoor Navigation System for the Blind and Visually Impaired People, the authors point out to the readers how the main IoT protocols fit together to deliver desired IoT application functionality.

Discussion Points:

- Standardization of IoT protocols and devices? Is it possible to have a single universal application layer protocol for IoT devices and applications to talk to each other, regardless of how they are physically connected?

Title: From the IoTs to the Web of Things: Resource Oriented Architecture and Best Practices

Author: Dominique Guinard, Vlad Trifa, Friedemann Mattern, Erik Wilde

The Internet of Things (IoT) is a system of physical objects that can be discovered, monitored, controlled or interacted with by electronic devices which communicate over various networking interfaces, and eventually can be connected to the wider Internet. As more and more devices are getting connected to the Internet communication among the devices is a problem. It is due to the unavailability of common universal application layer protocol that lets these devices and applications to talk to each other, regardless of how they are physically connected.

In order to address this issue the paper proposes Web of Things, approaches, software architectural styles and programming patterns that allow real-world objects to be part of the World Wide Web. In this concept, smart things and their services are fully integrated in the Web by reusing and adapting technologies and patterns commonly used for traditional Web content. By embedding tiny Web servers into smart things and applying REST architectural style to resources in the physical world it reuses and leverages readily available and widely popular Web protocols, standards and blueprints to make data and services offered by objects more accessible to a larger pool of (Web) developers .

The authors proposed an architecture for the Web of Things based on the concepts of REST, syndication for smart things, Web Hooks, and Smart Gateways, after summarizing the core design principles of Web architecture, the authors proposed. They also have demonstrated their idea with several prototypes. REST is an architectural style for developing distributed applications and is the basis upon which the modern Web is built. The essence of REST is to focus on creating loosely coupled services that can be easily reused, which is implemented using URIs, HTTP, and standardized media types. Abstracting the services from their application-specific semantics thanks to a uniform interface (HTTP verbs and response codes) makes it easy to build loosely coupled services as it provides a simple mechanism for clients to select the best possible representations for interactions. This makes the Web the ideal substrate for building a “universal” architecture and Application Programming Interface (API) to interact with Things. i.e. you can start interacting with Things via Web browsers and explore the Web of Things just as you would surf the Web (via links to other related things).

Finally the authors concluded that applying Web design principles, in particular openness, connectedness, and simplicity, can significantly leverage the ubiquity and versatility of the Web as a common ground for supporting interactions between devices and applications.

Discussion points:

- HTTP introduces communication overhead and increases average latency. How to handle this issue?
- Can we use Web of things in Local Networks(Intranet of a company)?
- Is it implemented? Do we have Web of Things nowadays? If not why?