IoT and Big Data: Challenges ahead

Alessandro Bassi
IoT-A Technical Coordinator
April 4th, 2013, Paris

April 4th, 2013
Outline

1. Who am I and why am I here?
3. IoT Architectures for Big Data
Who am I?
IoT and Big Data: Challenges ahead

Who am I and why am I here?

Back a couple of geological eras ago . . .

Managing Data Storage in the Network

The Internet backbone protocol, or IBP, supports logistical networking to allow applications to control the movement and storage of data between nodes.

To ensure a robust and scalable network, early designers of the Internet chose a stateless model: Routers transfer data statelessly, and routing algorithms, which require only that the routers behave correctly, determine the path of data from server to receiver. Although the data is stored transiently in the routers' buffers, this storage is not generally utilized by the routing algorithms. This statelessness has allowed the Internet to scale far beyond its original design while maintaining stable levels of performance and reliability.

Major uses of the Internet, however, have shifted from communication to the access and management of distributed data. Caching and replicating content on the World Wide Web, for example, is a rapidly growing global industry, and massive scientific data sets are being distributed via networked systems of large storage resources. Managing shared state in such systems is in no way a part of the underlying network model, and consequently must be implemented using application-specific mechanisms that are rarely interoperable. The result is a balkanization of state management capabilities that prevents many applications from benefiting from the kind of standardization, interoperability, and scalability that have made the Internet into such a powerful communication tool.

The Internet backbone protocol provides a uniform interface to state management that is integrated with Internet networking protocols. IBP supports logistical networking in large-scale, distributed applications. (See the sidebar, "IBP and Logistical Networking," for a discussion of work in this area.) The protocol's name reflects its purpose: to enable applications to treat the Internet as if it were a processor backplane. IBP provides access to remote storage and standard Internet resources and directs communication between them with the IBP API. In short, the motivation behind IBP is to design,
Outline

1. Who am I and why am I here?
3. IoT Architectures for Big Data
Internet of Things in 2020 - published in 2008

Wider technological trends

It is possible to identify, for the years to come, four distinct macro-trends that will shape the future of IT, together with the explosion of Ubiquitous devices that constitute the future Internet of Things:

1. The first one, sometimes referred as exaflood or data deluge, is the explosion of the amount of data collected and exchanged. [...] As current networks are ill-suited for this exponential traffic growth, there is a need by all the actors to re-think current networking and storage architectures. It will be imperative to find novel ways and mechanisms to find, fetch, and transmit data. One relevant reason for this data deluge is the explosion in the number of devices collecting and exchanging information as envisioned as the Internet of Things becomes a reality.
IoT and Big Data: Challenges ahead

Back in 2008...

Just an example of the exaflood

- Temperature measurement by a "dummy" sensor every 15 seconds: 128 bits ID (if using IPv6 addressing), 128 bits timestamp, 16 bits value = 34 bytes
- 34 bytes every 15 seconds make 136 bytes every minute
- or 8,160 bytes per hour, or 195,840 bytes per day (191.25 KB)
- or 68 MB per year.
Outline

1. Who am I and why am I here?


3. IoT Architectures for Big Data
Introducing the IoT-A tree:
- a generic Reference Model, derived from Business considerations, application-based requirements and current technologies,
- able to generate different Reference architectures depending on domain-specific requirements,
- to be used as a blueprint for concrete architecture design.
Architectural Reference Model

- Understand IoT domain
- Unified Requirements
- IoT Reference Architecture
- Business Scenarios, Existing Architectures & Stakeholders
- Application-Specific Requirements
- Compliant Domain-Specific Architectures

- Guides
- Steer
- Guides with Best Practices

- Define
- Extrapolate

IoT and Big Data: Challenges ahead
IoT Architectures for Big Data
Heterogeneous Architectures
Different IoT architectures

"Dummy" periphery
- Huge amount of data traffic
- Weaker security and resilience
- Not-so-scalable

"Smart" periphery
- Expensive devices
- Very complex Management and Orchestration algorithms.
- Local optimum might not converge
- Hard to upgrade
Thank you for your attention