

# The Internet of Things and Beyond: Rise of the Non-Human Actors

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## ABSTRACT

*In the past, it was rare for non-humans to interact with each other without any involvement by humans, but this is changing. The Internet of Things (IoT) involves connections of physical things to the Internet. It is largely about the relationships between things, or non-humans actors. In other cases the 'Things' seem to have inordinate power. The authors will ask: where does this leave humans? Are the things taking over? As a consideration of interactions like this must be a socio-technical one, in this article the authors will make use of Actor-Network Theory to frame the discussion. While the original applications for IoT technology were in areas such as supply chain management and logistics, now many more examples can be found ranging from control of home appliances to healthcare. It is expected that the 'Things' will become active participants in business, information and social processes and that they will communicate among themselves by exchanging data sensed from the environment, while reacting autonomously. The Things will continue to develop identities and virtual personalities. In the past non-human actors have needed humans to interact with each other; but this is not the case anymore. In this perhaps provocative and rather speculative article we will look not just at the Internet of Things, but other related concepts such as artificial intelligence and robotics and make use of scenarios from science fiction to investigate the Rise of the Non-Human Actors and where this may lead in the future.*

*Keywords:* Actor-Network Theory, Artificial Intelligence, Big Brother, Internet, Internet of Things, Privacy, Radio-Frequency Identification, Rings of Power, Science Fiction, Sensors

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## PEOPLE AND THINGS

Put very simply, the Internet of Things (IoT) could be described as technology which connects any physical thing to the Internet (Colitti, Long, DeCaro and Steenhaut 2014) and could be seen as "... all about physical items talking to each other." (Mukhopadhyay and Suryadevara 2014: 2). It is largely about the relationships between things, or non-humans actors, so where does this leave humans? Song (2014:75) suggests that soon "... computers would be able to access data about objects and the environment without human interaction." Clearly any consideration

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of implications of the IoT must be a socio-technical one and in this article we will make use of Actor-Network Theory (ANT) to frame the discussion. We will ask: are the things taking over?

The European Union organisation for Coordination and Support Action for Global RFID-related Standardisation Activities (CASAGRAS) sees the Internet of Things in terms of a “metaphor for the universality of communication processes, for the integration of any kind of digital data and content, for the unique identification of real or virtual objects and for architectures that provide the ‘communicative glue’ among these components”. (CASAGRAS 2014:5).

In this rather speculative article we will make use of this metaphor to look at how humans relate to the Internet of Things along with other non-human technologies and where the relationship between these technologies and humans may lead in the future. In some cases specific uses of IoT technologies are deliberately activated by humans while other cases are not directly human initiated and need no human input to operate. Advances in artificial intelligence that reduce, or even remove the need for human interaction are also a factor to consider here. In examining these ideas we will make use of some concepts and scenarios from science fiction where humans are marginalised by technology as well as the use of regular research references and factual material.

## THE INTERNET OF THINGS

Radio Frequency Identification (RFID) and Wireless Sensor Networks (WSN) have been in existence now for over two decades, but advances towards full use of the Internet of Things (IoT) offer much more and also pose more social challenges. There are many definitions of the Internet of Things and the CASAGRAS project sees it like this: “A global network infrastructure, linking physical and virtual objects through the exploitation of data capture and communication capabilities. This infrastructure includes existing and evolving Internet and network developments. It will offer specific object-identification, sensor and connection capability as the basis for the development of independent cooperative services and applications. These will be characterised by a high degree of autonomous data capture, event transfer, network connectivity and interoperability.” (CASAGRAS 2014:10). It can thus be seen as a network of physically connected objects in which embedded processing nodes with communication capability offer a means of networked functionality and communications. The goal is to make use of computer sensor information without any need for human intervention.

SAP Research defines the IoT like this: “A world where physical objects are seamlessly integrated into the information network, and where the physical objects can become active participants in business processes. Services are available to interact with these ‘smart objects’ over the Internet, query and change their state and any information associated with them, taking into account security and privacy issues.” (Haller 2009:12)

Pererez et al. (2014) note that the Internet of Things initially focused primarily on managing information through the use of RFID tags, to which Lazarescu (2014) adds Wireless Sensor Networks (WSN) as another key enabler, but that it now spans a wide variety of devices with different computing and communication capabilities. These are generically termed networked embedded devices (NED) in which sensors and actuators blend with the environment to share information across platforms and offers the possibility of measuring, inferring and understanding various environmental indicators (Gubbia, Buyyab, Marusic and Palaniswami 2013).

Wikipedia defines the Internet of Things as “the network of physical objects or ‘things’ embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct

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