

## Chapter 5

# Participation in the Standards Organizations Developing the Internet of Things: Recent Trends and Implications

**Justus Alexander Baron**  
*Northwestern University, USA*

### **ABSTRACT**

*This chapter explores patterns and recent trends in meeting attendance at four standard development organizations (SDO): 3GPP, IETF, IEEE 802.11, and One M2M. Average meeting attendance has slightly increased over the last two decades. It is rare for individuals to attend meetings in different SDOs. IETF has the least attendee overlap with other SDOs and the lowest attendee affiliation concentration. Nevertheless, 3GPP attendance has become more diverse and IETF attendance more concentrated. The affiliations of attendees of 3GPP and IETF have become more similar over time while OneM2M attendance has become more distinct from other SDOs. IEEE 802.11 attendance has become significantly less diverse since 2007. Until 2014, there was a significant convergence with 3GPP. Since 2014, this trend has reversed, and attendance at IEEE 802.11 has become more similar to IETF. The author explores implications of the described evidence for differences between telecommunications and internet standardization, companies' standardization strategies, and consequences of the patent policy change at IEEE.*

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## **INTRODUCTION**

A number of Standard Development Organizations (SDOs) currently develop the standards that will support a large range of technologies for the communication from machine to machine (M2M), collectively labeled the Internet of Things (IoT). While several detailed studies have investigated specific aspects of standardization processes in individual organizations, SDOs such as the 3<sup>rd</sup> Generation Partnership Project (3GPP), the Institute of Electrical and Electronics Engineers Standards Association (IEEE-SA), the Internet Engineering Task Force (IETF), and OneM2M increasingly interact in the development of standards (indeed, 3GPP and OneM2M are themselves the result of extensive collaboration between SDOs). For a better understanding of the standardization processes in these SDOs and the behavior and strategies of the participating individuals and organizations, it is important to analyze individuals' and firms' participation in and across various SDOs.

Participation in standardization processes has many facets, including actively developing technical contributions to standardization problems, and implementing standardized technologies in new products and services. In this chapter, I focus on one dimension of participation in standardization – attendance of SDO meetings. Meeting attendance is more systematically observable than other, more complex forms of participation. Furthermore, meeting attendance data covers large parts of the diverse group of individuals and organizations participating in standardization, such as companies competing for leadership over standardization projects, research organizations presenting new technical ideas, downstream firms eager to learn about new standards in order to develop new products and services, and individual technology or standardization enthusiasts. I collected, compiled and cleaned the publicly available attendance lists of meetings at 3GPP, IEEE 802.11, IETF, and OneM2M and created a database with 325,371 attendance records in 3,369 SDO meetings. Over the past 20 years, more than 40,000 individuals representing 6,466 different organizations participated in at least one meeting of one of these four SDOs. In this chapter, I present patterns and recent trends in the attendance data. In particular, I document changes in attendance frequencies, co-attendance patterns across SDOs, and concentration of individual attendees' affiliations.

These SDOs have very different processes, so that the nature of meetings as well as the role of meeting attendees differ substantially from one SDO to the other. Nevertheless, there are some common patterns across organizations. The overall population size, i.e. the number of individuals attending at least one SDO meeting per year, has not markedly increased at any SDO over time, and has significantly decreased at IETF from a peak in 2000. Nevertheless, individuals that are active in SDOs attended a significantly larger number of meetings in 2017 than at the beginning of the respective observation periods. Therefore, total meeting attendance

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