

Edge Computing Standardisation and Initiatives

IACS Workshop paper

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Abstract: Since Edge Computing (EC) became more important in industry and research several standardisation groups and initiatives are considering related technologies in their strategies and future roadmaps. The work includes the definition of reference architecture models, access interfaces but also addresses edge node autonomy and security aspects. This contribution introduces some basic concepts and common understanding of EC within selected standardisation groups and industrial initiatives. Additionally, technical viewpoints and topics are discussed that are relevant for various communities.

Keywords: Edge Computing, Industry 4.0, Internet of Things, Industrial IoT.


1 Introduction


Due to the Edge Computing (EC) paradigm several national and international organizations and interested communities had started to create e.g. initial terminologies, architecture models, reference technology stacks, recommendations and best practices. Currently the list of active groups is growing and it is essential to provide an actual overview in short periods. Therefore this contribution provides a snapshot for discussion at the IACS workshop in September 2020 for discussions on technical topics possible harmonisation strategies.

In the following sections dedicated groups and initiatives have been selected due to their actual work for EC. Section 2 address relevant standards developing organisations (SDOs) and section 3 provides a list of further interest groups. Of course, this list is not complete and should only reflect the scope and goals of different stakeholders.

2 Standardisation

The following list is an initial selection for discussion only.

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2.1 ISO/IEC JTC1

Edge Computing is part of the work within the joint technical committee (JTC) of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) (ISO/IEC JTC1). Since several subcommittees (SC) do address EC here just two important SCs will to be mentioned.

First, the projects of the Cloud Computing Standardization Committee JTC1/SC38 have to be mentioned, in particular the technical report TR 23188 [Iso20a] about the EC landscape gives an overview on Cloud Edge Computing including e.g. architectural foundation, relationships to IoT, Cloud, Smart Infrastructures, Access and Service Networks, HW Capabilities, SW Platforms, Virtual Machines, Data Edge Processing, Management and Orchestration. Another SC38 project is JTC1/JETI presented by a JTC1/SWG7 white paper about a survey of Fog, Edge, Mist Computing and their relationships among themselves.

Secondly, JTC1/SC41 is working on Internet of Things and related technologies. Technical aspects of edge computing are also under discussion within this technical subcommittee.

The new technical report TR 30164 [Iso20b] describes the common concepts, terminologies, characteristics, use cases and technologies (including data management, coordination, processing, network functionality, heterogeneous computing, security, hardware/software optimization) of edge computing for IoT systems applications. This document is also meant to assist in the identification of potential areas for standardization in edge computing for IoT.

Further interesting work from IEC can be retrieved from documents IEC 61499, 62541 and 62541.

2.2 ETSI

At ETSI the Industry Specification Group (ISG) on Multi-access Edge Computing (MEC) is creating a standardized, open environment allowing the efficient and seamless integration of applications from vendors, service providers, and third-parties across multi-vendor Multi-access Edge Computing platforms. Recently the ISG MEC published a white paper [Mec20] about harmonizing standards for edge computing.

Additionally, the ETSI Management and Orchestration (MANO) group is aligning their activities with ETSI Network Function Virtualization (NFV) information models and the ETSI MEC interfaces.

2.3 GSMA

The GSM Association (GSMA) Foundation is not a formal standards body but global member-led organisation representing the mobile industry with impact on international standardisation work. Since operators want to make their assets and capabilities consistently available across networks and across national boundaries they also discuss a unified “operator platform” that will federate multiple Operators’ edge computing infrastructure to give application providers access to a global edge cloud.

An Operator Platform Concept whitepaper published by the GSMA [Gsm20] addresses an edge cloud computing concept. Such platform comprises management functionalities and data model for e.g. service availability/roaming, onboarding and instantiation, session & mobility and federation.

2.4 Others

Further standardization groups include the 3rd Generation Partnership Project (3GPP): 5G Specifications, Deutsche Institut für Normung (DIN): 92222 / NA043-01-38AA, Distributed Management Task Force (DMTF): Open Virtualization Format (OVF), Institute of Electrical and Electronics Engineers (IEEE): 1934 / TSN, International Telecommunication Union (ITU): Q.5001 / SG11, Internet Engineering Task Force (IETF): IIoT-SFC-Edge-Computing, National Institute of Standards and Technology (NIST), oneM2M, Object Management Group (OMG).

3 Industrial Initiatives

The following list is an initial selection for discussion only.

3.1 EECC

In Europe the Edge Computing Consortium (EECC) has been announced and is in preparation [Eec18]. It aims at saving research and development efforts by providing technology stacks for Edge Nodes based on existing, matched components to small, medium and large enterprises for the rising Edge Computing market in smart manufacturing and other Industrial IoT domains.

goals of this initiative include the specification of a Reference Architecture Model for Edge Computing (ECCE RAMEC), the development of reference technology stacks (ECCE Edge Nodes), the identification of gaps and recommendation of best practices by evaluating approaches within multiple scenarios (ECCE Pathfinders), and the synchronization with related initiatives/standardization organizations and the promotion of the results.

3.2 AIOTI

The aim of the Alliance for Internet of Things Innovation (AIOTI) is to contribute to the creation of a dynamic European IoT ecosystem. Within the AIOTI Strategic Research and Innovation Agenda (SRIA) the research and innovation priorities for the next decade will be stated. Its roadmap [Aio20] is aligned with the goals of the Next Generation Internet initiative proposed under the new Horizon Europe programme to achieve dependable IoT intelligent connectivity by jointly building on edge computing. Thus, SRIA proposes research that extend the industrial edge.

3.3 Others

Further EC working groups have also been initiated or planned within other organizations like e.g. Bitkom e.V. (the EC has been identified some years ago as an important technical trend [He18].), Standardization Council Industrie 4.0 (SCI), Verein Deutscher Ingenieure / Verband der Elektrotechnik Elektronik Informationstechnik (VDI/VDE), Verein deutscher Maschinenbau-Anstalten (VDMA), Zentralverband Elektrotechnik- und Elektronikindustrie (ZVEI), 5G Alliance for Connected Industries and Automation (5G ACIA) in Germany. Further, other activities Europe and its Member States that started discussing the EC topic include the European Processor Initiative (EPI) and GAIA-X in Europe, French Alliance Industrie du Futur, Industria 4.0 (Italy), Przemysł 4.0 (Poland) Industria Conectada 4.0 (Spain), or the Association of Industrial Automation of Ukraine.

Additionally, a number of software around the Linux Foundation have been established, such as Akraino, Baetyl, EdgeXFoundry, Edge Virtualization Engine (EVE), Fledge, Core Infrastructure Initiative (CII), or HomeEdge. Other activities include Kubernetes KubeEdge and the international Eclipse Foundation. The Eclipse IoT Edge working group already contributed a whitepaper on edge security challenges and concerns [Ho19].

4 Conclusion

Currently multiple different aspects of EC are under discussion in various working groups of standardization bodies and industrial associations. The technical viewpoints differ due to the various stakeholders in the organisations and interest groups. Landscape documents already support the interested experts and public community. However, there is still a need for harmonization and common strategies.

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