
# IoT Edge Computing Challenges and Functions

**https://tools.ietf.org/html/draft-irtf-t2trg-iot-edge-02**

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# History of the Draft

- draft-hong-iot-edge-computing-01 (IETF 103)
  - Draft was presented along with two demo videos of use cases for IoT Edge computing (smart construction and real-time control system)

- draft-hong-iot-edge-computing-02 (IETF 104)
  - In a discussion on Edge and IoT in the T2TRG meeting, this draft was considered a possible starting point for a group document. New co-authors joined.

- draft-hong-t2trg-iot-edge-computing-00 (IETF 105)
  - Draft was integrated with *Survey and gap analysis, a* presentation made in T2TRG at IETF 100

- draft-hong-t2trg-iot-edge-computing-01 (IETF 106)
  - Focus changed from use case examples to Edge function analysis.
  - Draft changed from showing one Edge architecture to a range of models. Did not promote/preclude a particular model.

- draft-hong-t2trg-iot-edge-computing-02/3 (IETF 107)
  - Reorganized the draft, extended the background section and the list of functions

- draft-hong-t2trg-iot-edge-computing-04/05 (IETF 108)
  - Addressed comments from Thomas, including improvements to IoT challenges and to the draft structure; completed section 4 with additional text on distributed model, and developing research challenges associated with functions; started the RG adoption process

- draft-irtf-t2trg-iot-edge-computing-00/01 (IETF 110)
  - Addressed comments from Marie-Jose and Carlos, including new use cases

- draft-irtf-t2trg-iot-edge-computing-02 (T2TRG interim meeting, June 2021)
  - Addressed comments from Milan

# Quick Overview

**1. Introduction**

**2. Background**

- IoT, cloud computing, edge computing, use cases

**3. IoT Challenges Leading Towards Edge Computing**

- Time sensitivity, connectivity cost, resilience to intermittent connectivity, privacy and security
  - (Reasons that motivate the use of edge computing for IoT)

**4. IoT Edge Computing Functions**

- Overview of IoT edge computing today, general model, distributed model
- Functions/components, listing research challenges
  - OAM components: resource discovery and authentication, edge organization and federation, multi-tenancy and isolation
  - Functional components: in-network computation, edge caching and caching, northbound/southbound communication, communication brokering, other services
  - Application components: IoT end devices management, data management and analytics
- Simulation and emulation environments

**5. Security Considerations**

# Updates 1/2

1. Comment: “Some [use cases], like smart construction and smart water system, feel a bit generic and as described do not seem to exemplify the need for edge processing.”
   - Re-wrote the smart construction use case and deleted the smart water system one. Reordered some use cases.

2. Comment: “While most of the IoT traffic flow tends to be “upstream”, I think that the availability and cost of connectivity can be challenging in various IoT settings and suggest retitling and recasting this section as Connectivity Cost. It also states that many IoT deployments are not challenged by constrained network bandwidth, citing Wi-Fi 6 and 5G links. Since those are not yet widely deployed or suitable for a variety of IoT installations, I suggest changing “many” to “some”.”
   - Changed the title to Connectivity Cost and made other updates to take into account the constrained network bandwidth case.

3. Comment: “Resilience in IoT often entails the ability to operate autonomously in periods of disconnectedness in order to preserve the integrity and safety of the controlled system, possibly in a degraded mode. It might be useful to add that IoT devices and gateways are often expected to operate in the always-on and unattended mode, thus adding design challenges of fault detection and unassisted recovery to operational states.”
   - Added text based on this comment in section 4.1 (which describes IoT EC today)



*Comment thread: https://mailarchive.ietf.org/arch/msg/t2trg/UKTksEMeqT9yAXg8PCwxUeiYhWY/*

# Updates 2/2

4. Comment: “Section 4 - Should be revised to separate description of edge functions from the implementation mechanisms […] I suggest dividing the description into key IoT functions of the edge - […]”

   We have updated and re-organized sections 4, especially:

   - Virtualization Management is now Multi-Tenancy and Isolation
   - External APIs is now Northbound/Southbound Communication
   - Data Management section was expanded to include Analytics

5. Comment: “[The section on ‘Edge Caching’] should clarify that the edge node may offer local data storage (persistence subject to retention policies), caching (anticipatory best effort), or both.”
   - We updated and retitled this section (now ‘Edge Storage and Caching’) to include both local storage and caching

6. Also added new research challenges, corresponding to new papers added in reference.
7. Editorial comments were addressed



*Comment thread: https://mailarchive.ietf.org/arch/msg/t2trg/UKTksEMeqT9yAXg8PCwxUeiYhWY/*

# Plans for the Draft

- To our knowledge, all outstanding comments are addressed, the draft is in a stable state.
  - Additional comments are welcome.

- Last call?