

Demo from Huawei Network Technology Laboratory, Santa Clara, United States on “ICN based IoT Services in a network slice at the edge”

Abstract:

In this PoC work we explore the benefits of ICN deployment at the edge of the network utilizing the proposed 5G network slicing architecture and its utility for IoT services specifically. Here, ICN is used as the unifying protocol layer capable of adapting to heterogeneous computing environments with varying processing power, ranging from Intel powered edge servers to constrained IoT devices with very limited compute and memory resources. Through this PoC we demonstrate the key benefit of IoT services delivered over ICN which include: 1) self-configuration based on names, obviating the need for configuration protocols as in the case for IP address assignment; 2) name based security and trust management useful during bootstrapping and data distribution phases; 3) absence of any overhead for managing connection oriented stack on the constrained devices; 4) simplicity of unified name based routing applied both in the constrained and in infrastructure network where the IoT services are hosted.

We demonstrate these features through a home/industrial monitoring scenario where heterogeneous sensors and actuators such as motion, camera and lighting devices are coordinated using user defined policies managed by ICN based services. For this prototype, we use the popular ccn-lite/RIOT stack on the IoT devices and use some of the recent work in the research community to develop a secure onboarding framework and protocol for the IoT devices. The ICN-IoT service is orchestrated using the Docker framework over commodity servers, hence realized as containerized service components that include ICN service functions for authentication and data aggregation and service gateway function for interworking with IP based mobile client devices using HTTP. We also demonstrate the usefulness of in-network compute using Named Function Networking that allows the processing of IoT data to take place on any available node in the edge network, as opposed to a fixed or externally managed set of service points. Our framework can coexist with other services like the previously demonstrated video conferencing service in different network slices, enabling the network administrator to manage resources and heterogeneous services efficiently.