

# Securing IoT Networks: MUD Conformance Certification Framework

*An Essential Security Certification for IoT Devices*

## Introduction

Security remains the foremost challenge in Internet of Things (IoT) ecosystems. Reducing attack surfaces is essential to ensure secure deployment of IoT solutions.

Manufacturer Usage Description ([MUD](#)) Specification has emerged as a pivotal standard for fortifying the security of IoT networks. MUD provides for individual connected devices to explicitly specify their communication requirements. MUD makes it easy to reduce attack surfaces and to implement scalable security policies on resource constrained IoT devices in a practical and cost-effective manner.

This whitepaper outlines the development of the MUD Conformance Certification Framework (**MUD-CCF**). The framework aims to create a comprehensive test and certification solution to ensure IoT devices can comply with the MUD Specification specified by the IETF in RFC 8520.

MUD-CCF is a collaborative effort between the University of New South Wales (UNSW Sydney) and CNLABS.

## Background and Motivation

From smart homes to industrial automation, IoT technologies have permeated various sectors, offering unprecedented levels of

efficiency and automation. However, alongside these advancements, the rapid expansion of IoT ecosystems have also unveiled significant security challenges. Unlike traditional computing devices, IoT devices often lack robust security features, and they are typically resource-constrained by design since they are usually meant to serve a specific functionality. This makes them prime targets for malicious actors seeking to exploit vulnerabilities for various nefarious purposes, including data breaches and disruption of critical infrastructure. From Botnet attacks to Ransomware and Espionage, there have been several large-scale IoT security breaches reported over the last 5 years such as [Mirai Botnet](#) attacks and Dish Network Ransomware attacks.

The Manufacturer Usage Description (MUD) standard addresses some of these security concerns at the network-level by requiring the IoT devices to specify their intended network behavior. This enables network operators to implement automatic access control policies, restricting device communication to necessary operations hence mitigating unauthorized access and attacks. This proactive approach to network security helps reduce the risks associated with unauthorized access and malicious attacks, thereby safeguarding the integrity of IoT deployments.

By leveraging their combined expertise, UNSW Sydney and CNLABS have developed a Conformance Certification Framework (MUD-CCF) to enhance security of IoT device deployments for different use cases.

We discuss the objectives, methodology, details of certification and the potential impact of the MU-CCF in this whitepaper.

## MUD Conformance Certification Framework (MUD-CCF)

The MUD-CCF is a comprehensive set of standardized testing methodologies and procedures for evaluating the conformance of IoT devices to MUD Specification. The framework provides a structured, transparent, dependable, and consistent approach for assessing device conformance to MUD requirements.

The primary goals and considerations of the MUD Conformance Certification are outlined below.

### ✚ Identification of test requirements

IETF's [RFC 8520](#) describes the MUD Specification requirements for IoT devices, focusing on the needs and perspectives of IoT product development teams. To ensure that IoT devices comply with these specifications, there is a need to identify the technical test requirements. These requirements are the foundation of the MUD Conformance Test Specification.

### ✚ Developing a comprehensive Testing Methodology

To create a robust testing methodology encompassing test scenarios, topologies, procedures, and expected behavior to evaluate IoT devices' adherence to MUD specifications. The test methodology development shall include thorough and systematic testing of IoT devices to verify their conformance with MUD specification requirements.

### ✚ Developing an automated Conformance Test Tool

The MUD Conformance Test Tool tests an IoT device's conformance to the MUD Specification and is validated to test the requirements of the MUD Conformance Test Specification. The automated test framework provides speed and scale to certify multiple IoT devices simultaneously for large IoT deployments.

### ✚ Establishing Standardized Certification Criteria

By setting standardized certification criteria, the program seeks to provide clear guidelines for assessing IoT devices' conformance with MUD specifications. These criteria will serve as benchmarks for determining the eligibility of devices that will receive the MUD Conformance Certification.