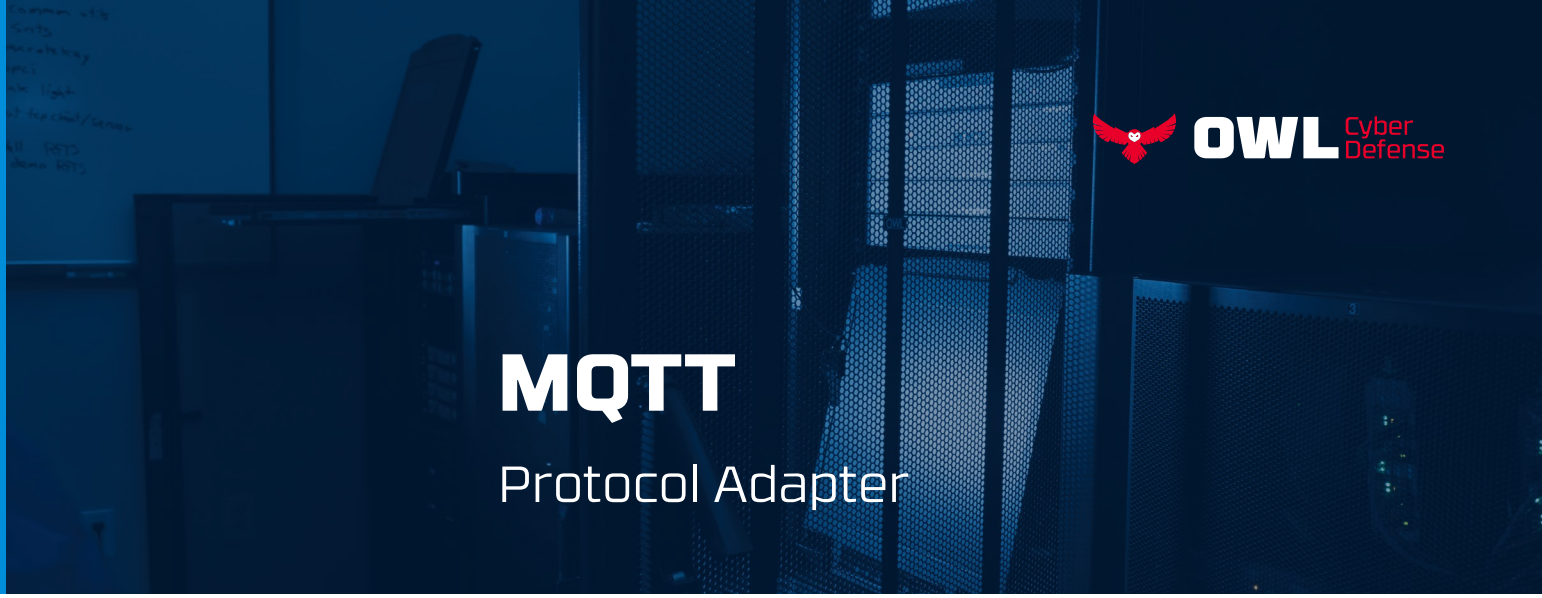
DATA SHEET



MQTT

Protocol Adapter

AT-A-GLANCE

- MQTT is one of the the most widely used protocols for moving IIoT data to the cloud
- Secure, one-way transfers of MQTT messages
- Protects IIoT and OT assets and enables secure cloud connectivity
- Seamless integration with Owl data diodes

ABOUT THE PROTOCOL

- Developed for constrained environments on low throughput networks
- Supports client to server (broker) architectures
- Publish and subscribe communication method
- Delivers messages in real-time and stores messages when clients are offline

Secure Transfer of MQTT Messages

As demands rise for connected systems and cloud connectivity, industrial organizations are leveraging one of the most widely used protocols for cloud-based data, MQ Telemetry Transport (MQTT). MQTT provides open communications, however once communications are opened, they need to be secured. Owl has developed a MQTT Protocol Adapter that allows MQTT two-way traffic to be sent over secure, one-way data diodes. The proxies allow Owl's hardware-enforced data diodes to securely transfer MQTT traffic across the Operational Technology (OT) network boundary to the cloud, corporate data centers, Security Operations Centers (SOC), remote monitoring centers, or anywhere, with no risk of threats entering back into the source network. The MQTT Protocol Adapter combined with a data diode integrates with Amazon Web Services (AWS), AZURE, and other common private clouds, while maintaining the confidentiality, integrity, and availability of OT systems and MQTT messages.

MQTT

MQTT is a lightweight messaging protocol that utilizes publish and subscribe operations to exchange data between clients and a server, also known as a broker. MQTT was designed for lightweight devices, like mobile devices and embedded systems, operating on minimum network throughput. Developed specifically for Machine to Machine (M2M) and Industrial Internet of Things (IIOT) environments, the MQTT Protocol Adapter paired with Owl data diodes provides a secure, hardware-enforced transfer of MQTT messages across network boundaries. Although MQTT is inherently a two-way communication protocol, data diodes create an air gap at the network boundary to provide secure, one-way transfers of MQTT messages, physically preventing threats from entering back into the IIoT or OT network. The MQTT Protocol Adapter securely transfers MQTT messages, in real-time, through a data diode to verified subscribers.

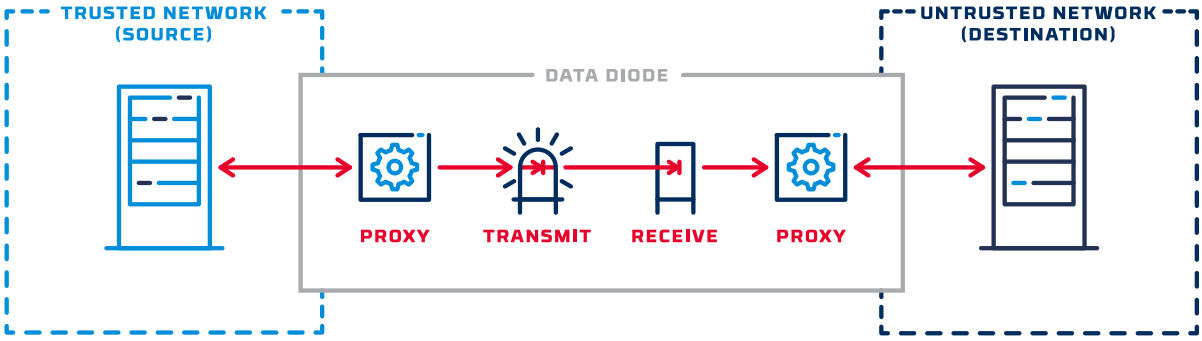
Brokers and Encryption

MQTT requires the use of a central broker to deliver messages. The role of a broker is to receive all messages, filter all messages based on topic, determine who is subscribed to each message, and deliver those messages to subscribed clients. The broker acts as a middle-man and all messages must pass through them to reach their destination. Most MQTT brokers allow the use of Transport Layer Security (TLS) to encrypt MQTT communications to the cloud or end destination. The Owl MQTT Protocol Adapter supports TLS communication to cloud based or external brokers. The MQTT Protocol Adapter works with commonly used products like Mosquitto, Ignition (Sparkplug B), and HiveMQ.

One-Way In A Two-Way World

A successful one-way data transfer of MQTT messages requires meeting the expectations of a two-way world. MQTT is inherently a two-way connection. A majority of network traffic involves some sort of acknowledgment or two-way connection in order to function. The “secret sauce” of data diodes paired with MQTT is in providing a one-way transfer, with a true separation between source and destination networks, while maintaining simultaneous two-way communications with both the source network and the destination network to avoid disruption. This is accomplished through using proxies that run on each side of a data diode.

The send side proxy communicates with the source network, acknowledging the receipt of packets before extracting the payload, and then sending it across the data diode. On the receive side, the proxy receives the payload, builds a new packet around it using the original protocol, and sends the data on its way over the two-way protocol. In this way, MQTT achieves a one-way transfer in the middle of two, two-way exchanges. This protocol termination also means data diodes protect network privacy by removing all source network routing and IP information when performing a one-way data transfer of MQTT messages.



Technical Specifications

VALIDATED BROKERS

- Ignition (Spark Plug)
- Mosquitto
- Hive MQ

SUPPORTED ON

- OPDS-100
- OPDS-100D
- OPDS-1000
- EPDS

Use Cases

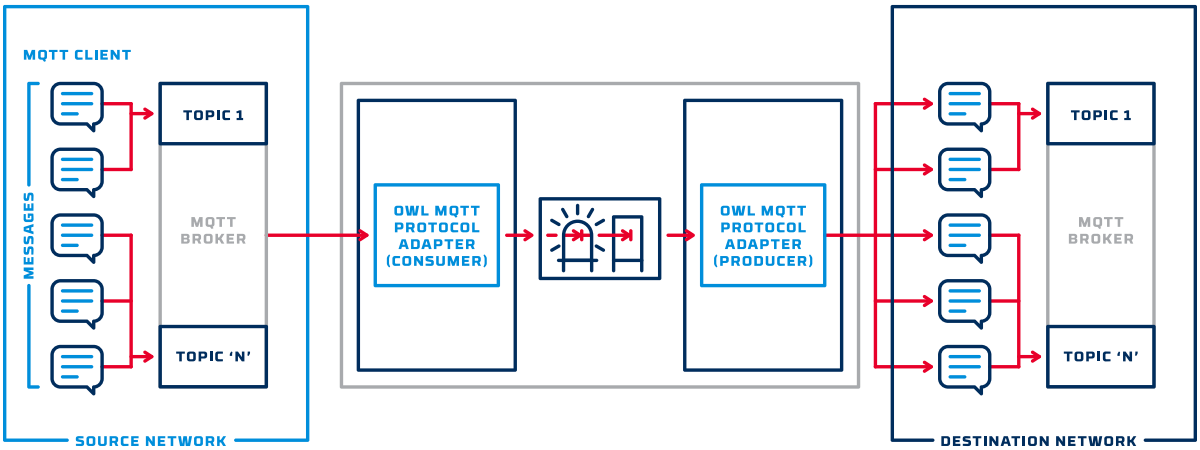
- One-way transfer to Internal Broker within the business network
- One-way transfer to External Broker such as HiveMQ
- One-way transfer to Remote Client
- One-way transfer to Cloud Services

USE CASE

MQTT Protocol Adapter

The MQ Client sends an MQTT message to a third-party broker. The source broker then sends the message, or a group of bundled messages, to the source diode IP and the Owl MQ Proxy (Consumer) sends the proxied message across the data diode. The Owl MQ Proxy (Producer) rebuilds the MQTT message and forwards it to a destination third-party broker. The Owl MQ Proxy can send messages directly to an internal or external broker.

1. Messages published to Topic Queues hosted on MQTT Broker
2. Topic Messages consumed by Owl MQTT Protocol adapter and passed across the diode
3. 
4. Messages received across the diode and re-produced by Owl MQTT Protocol Adapter
5. Messages published to respective Topic Queue by Owl MQTT Protocol Adapter



OWL Cyber Defense

Owl Cyber Defense Solutions, LLC leads the world in data diode and cross domain network cybersecurity. With a constant focus on customers in the military, government, critical infrastructure, and commercial communities, Owl develops market-first, one-way data transfer products to meet a variety of operational needs, from entry level to enterprise.

For more information on Owl, or to schedule a demo, visit www.owlcyberdefense.com

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