Technology FAQ

There's a lot of information–and misinformation–out there about how ZigBee works in general, and how Daintree works specifically. Hopefully, this FAQ will help clear up any confusion about this technology.

Q: Does Daintree interfere with the corporate network?

A: No. Daintree has now been deployed at over 47 million square feet of facility space across the U.S. and Canada, in many building types, including industrial/warehouse, commercial office, multi-site retail branches and government buildings. In many such facilities, there is significant deployment and use of other wireless communications, including Wi-Fi and Bluetooth. Wi-Fi is often used in commercial offices for data networking, while many industrial/warehouse facilities use Wi-Fi for automation. In all these cases, Daintree has been operating reliably with no loss of performance under these conditions.

Q: What browser do I need in order to access ControlScope Manager (CSM) from my computer?

A: ControlScope Manager supports Mozilla Firefox® Version 20 and newer, Chrome, and Microsoft Windows Internet Explorer® Version 9, 10, and 11.

Q: I've heard that ControlScope's network operates in the same band as Wi-Fi. If that's true, why isn't there any interference between the two networks?

A: ControlScope uses ZigBee technology, and it uses the standard **as written**.

- ZigBee uses IEEE 802.15.4, which is driven by the standards body, the IEEE, that also defines Wi-Fi. A significant amount of engineering has been done to ensure that these two technologies can work side-by-side and co-exist even in the same frequency and channels and operate effectively and reliably next to each other.
- ZigBee is a low power technology. In most cases, ZigBee devices use 10 times less power than Wi-Fi and use the airwaves significantly less than Wi-Fi devices. As

mentioned above, ZigBee and 802.15.4 specifications deal with and mitigate such interference.

- This technology has been proven repeatedly to be reliable. It is the technology of choice for smart meters which are being rolled out nation-wide and globally, promoted by major utilities including PG&E and SCE, and driven by NIST, the government's standards organization. Many tens of millions of such meters have been rolled out across the U.S., the U.K. And Australia into residential environments with significant Wi-Fi activity.
- ZigBee is also being used in many other applications, including retail automation, home automation (Comcast is rolling out a service using ZigBee across millions of households), and healthcare (supported by the Continua Health Alliance, which include 220 of the most significant health care companies in the world).
- Proponents of proprietary systems often question ZigBee's reliability. ZigBee has had many hundreds of engineering years poured into it from hundreds of companies to ensure that this technology is secure and reliable. Numerous studies by many companies and organizations across the many applications described earlier have poked, prodded and tested the technology to ensure its reliability and robustness, under normal and abnormal operating conditions. Independent studies by security consultants have been done to ensure the security of the system. This includes a study by the Department of Homeland Security. One should ask the question – How much testing has been done by independent entities on these proprietary systems? The answer is almost always, **ZERO.**
- Specific details of features offered by the standards include:
    - Packet collision avoidance and back-off
    - Data integrity and re-transmission at the MAC, NWK and APP layer
    - Interference detection and automated frequency shifting under significant interference
    - Broad range of channel selection options and automated avoidance of used channel

Q: On which channel(s) within the 2.4GHz band does ControlScope's network operate?

A: ZigBee shares the 2.4GHz ISM band with other wireless technologies, the most well-known of which are WiFi (802.11) and Bluetooth. A total of 16 channels are provided within the band that are used by ZigBee. There are 4 channels (15, 20, 25, 26) that do not overlap with WiFi channels – as their center frequencies sit between the often used non-overlapping WiFi channels 1, 6 and 11 – therefore avoiding any interference. Even when overlapping channels are used, ZigBee employs methods to detect and avoid interference when sending messages.

The ControlScope software allows the ZigBee network to be started on any of the 16 ZigBee channels, and will automatically avoid used channels and by default select the channels that do not overlap with WiFi. Selected operating channels can also be easily changed at any time through the ControlScope software. In addition, ZigBee also supports mechanisms to automatically change frequency under significant interference (called frequency agility).

Q: Does Daintree rely solely on the ZigBee standard to provide the robust nature and high performance of ControlScope?

A: In addition to the underlying robustness of the ZigBee technology, Daintree has overlaid a significant amount of engineering work to increase the robustness of the system for the lighting control application in commercial/industrial facilities. In particular, this application has two critical requirements that are not often needed for other ZigBee applications – large scale networks and responsive/low-latency performance.

- Multiple algorithms, techniques and a workflow for ensuring reliable commissioning of hundreds through thousands of wireless nodes in a single facility.
- Network and traffic management techniques to ensure low-latency and rapid response to sensor or switch/dimmer stimulus in lighting applications.
- Network design and "under-the-hood" device management to manage network membership and sizes to simultaneously meet lighting control performance requirements and lighting control design requirements.

Q: How does Daintree overlay the additional engineering used for robustness and performance without making the ControlScope solution proprietary?

A: The essence of interoperability is ensuring that the over-the-air (or over-the-wire) protocol communication complies with the specifications written by the standards body. In the case of Daintree, this standards body, the ZigBee Alliance, has specified the format of all messages between lighting control devices (such as sensors, ballasts and switches/dimmers). DAintree preserves that format and ensures that it can work with devices built by vendors that also preserve that format. Where Daintree does its innovative (and proprietary) engineering is in the software that runs on its controllers (such as the Wireless Area Controller) to ensure that device operations meet the performance requirements for the application (such as lighting

which needs low latency and highly responsive operation), monitor and manage the network, and deliver an effective and easy to use installation and commissioning workflow.

Daintree has also developed innovative software that ensures reliable and scalable operation for wireless lighting control applications within the firmware within its wireless devices. As part of Daintree's belief in opening the system and encouraging products to built by multiple vendors, Daintree has released parts of this firmware as license-free open source firmware.

These capabilities are built into Daintree to ensure that the overall solution can be installed & commissioned easily, operates reliably and meets performance requirements for wireless lighting and building controls, and importantly, still preserve the formats specified by the standards to ensure interoperability between products offered up by multiple device vendors.

Q: Is ZigBee a secure technology?

A: The ZigBee standard defines a comprehensive security architecture and trust management model, which includes encryption, authentication and integrity at each layer of the ZigBee protocol stack. For all device communications ZigBee employs AES-128 data encryption, which has been classified by the National Security Agency (NSA) as appropriate for protection of SECRET information, requiring over 2 million years to crack.