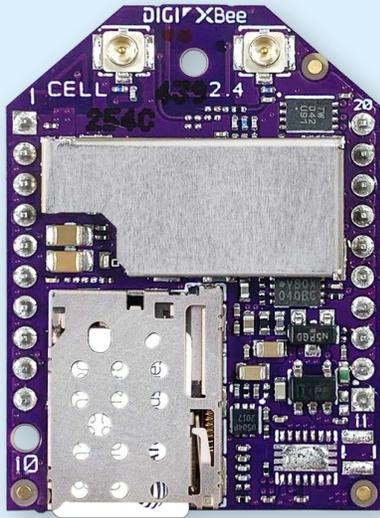# THE ADVANTAGES OF
DIGI XBEE 3 CELLULAR

Native MicroPython Programming, Digi TrustFence®
Security, Software Flexibility and USB Option Open Up
New Markets and Applications to OEMs

In the pages that follow, you'll learn about some of the key advantages of the Digi XBee® 3 Cellular solution:

- Native MicroPython Programming

- Digi TrustFence Security

- Software Flexibility

MICROPYTHON PROGRAMMABILITY

MicroPython is an open-source programming language based on Python 3 that has been optimized to fit on small devices with limited hardware resources (e.g., microcontrollers). It includes an interactive read-evaluate-print loop (REPL) that enables you to connect to an embedded board and execute code without compiling or uploading, making it ideal for quick testing of code blocks and prototyping. It also includes extensive built-in software libraries to accelerate and simplify programming tasks like network socket connections or I/O pin management.

The Digi XBee 3 Cellular module offers native support for MicroPython programmability. With 24 KB of RAM and 8 KB of flash available in this MicroPython "sandbox," you have the power and flexibility to develop and integrate your own unique features. For basic sensing/actuating applications, it can eliminate the need for an external microcontroller, saving PCB space and simplifying your hardware design.

MicroPython is ideal for reading and/or controlling Digi XBee 3 I/O lines (13 digital I/Os, four analog 10-bit inputs). It can also reduce cellular data consumption by adding local intelligence that dictates what data should and should not be sent over the air.

EXPANDING THE DIGI XBEE ECOSYSTEM

With the Digi XBee 3 Cellular family of embedded modems, developers can bring together the power and flexibility of the Digi XBee ecosystem with the latest 4G cellular technology. That means a faster path to embedding 4G cellular technology into their devices and applications without time-consuming, expensive FCC and carrier end-device certifications.

With a full set of standard Digi XBee 3 API frames and AT commands, Digi XBee customers can seamlessly transition to this new modem with only minor software adjustments. When OEMs add the Digi XBee 3 Cellular modem to their design, they create a future-proof product with flexibility to switch between wireless protocols or frequencies as needed, ideal for any business with an agile roadmap.

MICROPYTHON TERMINAL IN XCTU

Digi XCTU® includes a MicroPython terminal, which allows you to interact with MicroPython on the Digi XBee 3 Cellular modem. Through the serial interface in the terminal, you can interact with the REPL to test, load, and run MicroPython code.

Of course, many prefer to use their own terminal program like Tera Term or Putty and can continue to do so. But with the terminal in XCTU, you have the option to discover, configure, and program your Digi XBee 3 Cellular modem through a single interface.
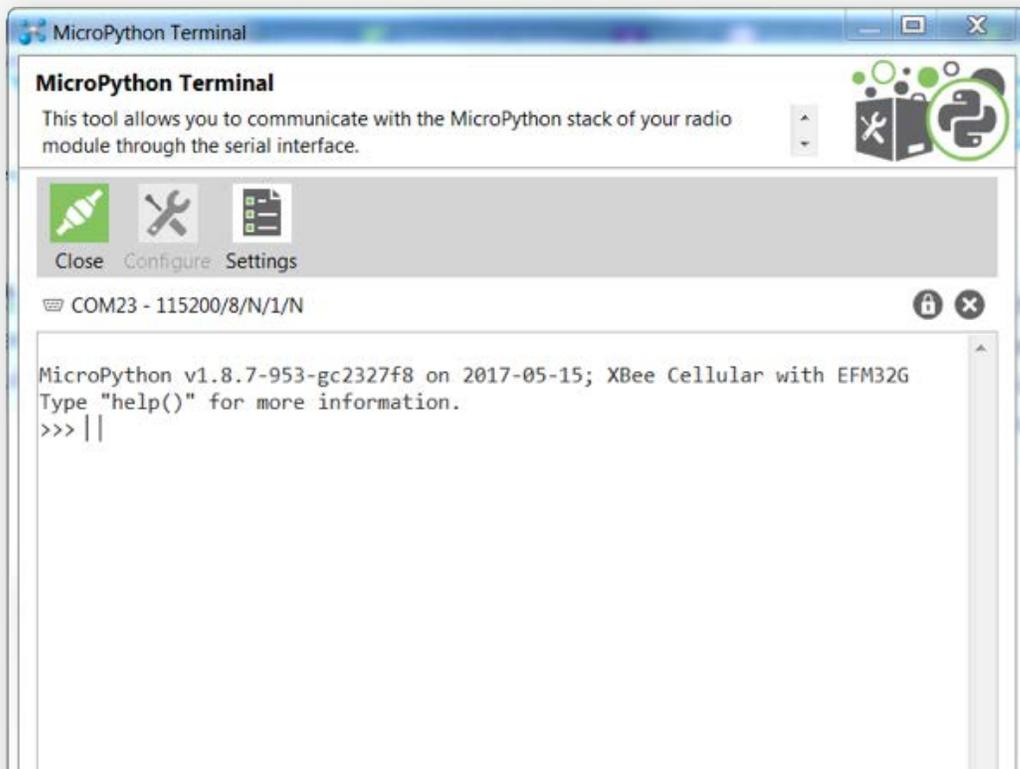
FIND OUT MORE ABOUT MICROPYTHON

Check out the following four resources to learn more about MicroPython and Digi XBee 3 Cellular:

- Get Started with MicroPython
  (Section in User Guide 90001525)

- Digi MicroPython Programming Guide
  (90002219)

- MicroPython Homepage (micropython.org)

- MicroPython Github
  (https://github.com/micropython)

DIGI TRUSTFENCE: STRONGER SECURITY FOR THE IOT

Network connectivity means IoT applications and devices face significant new risks and threats, which makes embedded security a critical requirement. Digi TrustFence® provides a tested and fully integrated security framework for the long product life of embedded devices that use Digi XBee 3 Cellular devices.

The Digi TrustFence security framework is a series of critical features that ensure top-to-bottom security, including secure connections, authenticated boot, secure physical ports, and more. Digi XBee 3 Cellular implements key elements of the Digi TrustFence framework, including:

✓ **Secure Boot** — Digi TrustFence ensures only signed software images run on a device.

✓ **Encrypted Storage** — Security keys are protected by an onboard security chip.

✓ **Protected JTAG** — The programming interface is locked to prevent tampering.

✓ **Secure Connections** — SSL/TLS v1.2 encryption secures your data transmissions.

✓ **Lifecycle Longevity** — Digi maintains a future-proof platform architecture.

Security threats to embedded devices in IoT solutions are increasingly common, and the sophistication of these attacks is growing. They can include confidentiality breaches, service theft, data integrity, and reduced service availability. IoT systems have unique security requirements and challenges, mostly due to resource limitations. Digi XBee 3 Cellular embedded modems use Digi TrustFence for out-of-the-box, integrated security that lets you build secure, connected products.
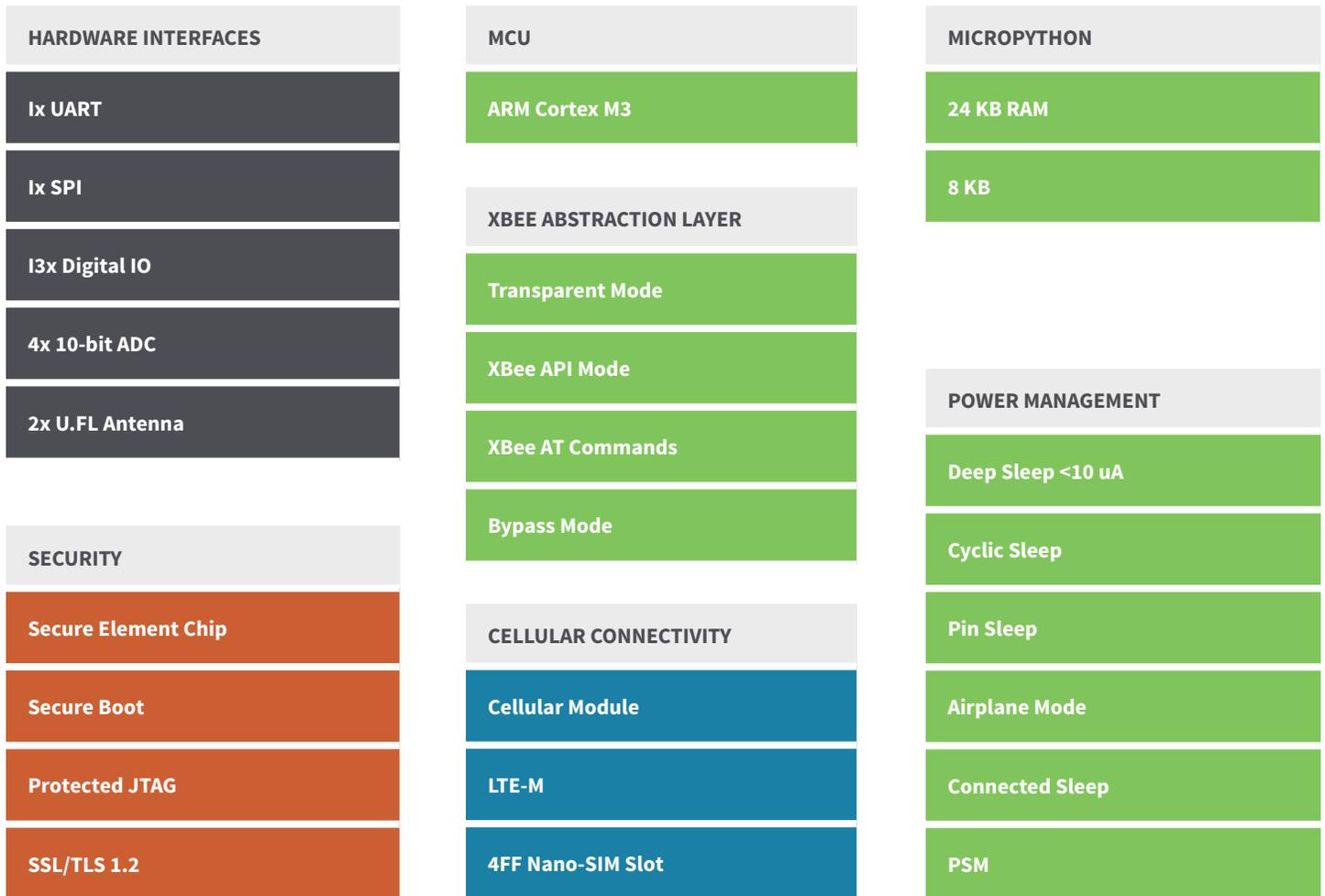
SOFTWARE FLEXIBILITY

The Digi XBee 3 cellular module leapfrogs the typical breakout boards in its features, functionality, and ease of development. A typical breakout board "breaks out" the pins of an underlying cellular module onto a printed circuit board, so you can access and use individual pins, but usually offers little or no additional functionality. Some breakout boards include end-device certification, a SIM slot, a simple power supply, and an antenna connector. That leaves you with the tasks of designing in an external microcontroller to manage the module, integrating security elements into the design, and other complex development tasks.

By contrast, Digi XBee 3 Cellular hardware is fully integrated with an onboard cellular module, ARM Cortex M3 microcontroller, power regulator, and security chip, all packed into a compact 24.4 mm x 32.9 mm Digi XBee 3 through-hole footprint. This provides numerous useful features unavailable on other cellular modules or breakout boards.

SEE FIGURE 1 (next page)

FIGURE 1: DIGI XBEE 3 CELLULAR LTE-M BLOCK DIAGRAM

HARDWARE INTERFACES
Ix UART
Ix SPI
I3x Digital IO
4x 10-bit ADC
2x U.FL Antenna

SECURITY
Secure Element Chip
Secure Boot
Protected JTAG
SSL/TLS 1.2

MCU
ARM Cortex M3

XBEE ABSTRACTION LAYER
Transparent Mode
XBee API Mode
XBee AT Commands
Bypass Mode

CELLULAR CONNECTIVITY
Cellular Module
LTE-M
4FF Nano-SIM Slot

MICROPYTHON
24 KB RAM
8 KB

POWER MANAGEMENT
Deep Sleep <10 uA
Cyclic Sleep
Pin Sleep
Airplane Mode
Connected Sleep
PSM

Digi XBee 3 software interface — The Digi XBee 3 software interface runs on the onboard microcontroller and provides an abstraction layer for software designers, including a common AT command interface for configuration and control, an API mode for external devices to intelligently communicate with the XBee, and a transparent serial mode for simple and transparent communications through the UART, over the cellular network, to the destination IP address or phone number.

A future-proof design — The Digi XBee 3 software interface is consistent across all current and future Digi XBee modules that all share the same footprint. That means you can easily drop new wireless technologies into your design — including LTE-M, NB-IoT and LoRa.

Deep sleep mode — In this mode, Digi XBee 3 Cellular consumes less than 10 uA. This feature can be configured as cyclic sleep or pin-activated sleep. By contrast, other breakout boards support "low power modes" that, in fact, draw significantly more power.

SERIAL INTERFACE OPTIONS

Digi XBee 3 Cellular modules offer several interface options for connecting to a microcontroller or host device:

- UART, or Universal Asynchronous Receiver-Transmitter, is an asynchronous serial communication in which the data format and transmission speeds are configurable.

- SPI, or Serial Peripheral Interface, provides faster communications as it separates clock and data lines, along with a select line to choose the device you wish to talk to.

- I²C, or Inter-Integrated Circuit, is a protocol intended to allow multiple "slave" digital integrated circuits ("chips") to communicate with one or more "master" chips. Like the Serial Peripheral Interface (SPI), it is only intended for short distance communications within a single device.

- USB 2.0 provides an easy way for the Digi XBee 3 cellular to be configured as a network device in most operating systems.

CONCLUSION

When considering embedded cellular connectivity, be sure to consider all of the additional components and work involved in getting your design to fruition. If time-to-market and ease-of-use are vital to your project, be sure to evaluate the Digi XBee 3 Cellular development kit, which include a Digi XBee 3 end-device-certified modem, a development board, an easy to activate SIM, and the antennas and accessories needed to get your cellular device up and running in minutes.

For more Digi XBee 3 Cellular resources, visit www. digi.com/xbeecellular or contact Digi Wireless Design Services.

Contact a Digi expert and get started today

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