

Single-board solutions: a buyer's guide to wireless

Rapid IoT growth means many projects now involve wireless connectivity. Farnell's regional solutions marketing manager, Ankur Tomar, explores some of the one-step wireless options available

Wireless connectivity is a necessity for many embedded applications as it provides easy access for the internet of things. Depending on the application, there are a range of wireless connectivity options available:

Short-range: For use in the home or office, Bluetooth and WiFi offer low power and high bandwidth. In larger installations WiFi gateways and mesh networking can extend the operational range.

Mid-range: Wireless networks such as LoRaWAN and Sigfox make it possible to access devices at ranges of tens of kilometres at a very low cost. These networks are designed to transport small amounts of data and can provide service in remote locations.

Long-range: When more widespread coverage is required, and the application can support pay-per-use billing, 2G, 3G and 4G cellular networks are an option.

Adding complexity

In the past, the development of efficient RF interfaces to enable wireless connectivity was difficult and time-consuming. High-frequency signals need delicate handling to ensure a high signal-to-noise ratio while antenna design can greatly impact performance. In addition, wireless systems need to pass stringent tests that determine whether the system will interfere with other users, even in bands that do not need a specific radio licence, such as the 2.4GHz bands employed by Bluetooth and WiFi.

Traditional single-board computers (SBCs) did not

have wireless connectivity, forcing the development of custom modules, but as ecosystems around Raspberry Pi, BeagleBone and Arduino developed, ready-made modules that could be used with core SBCs were developed.

Although add-on wireless modules reduced the time associated with hardware design, they did not cut out the time associated with other aspects of wireless integration such as software development or testing to ensure compliance with regional legislation covering RF emissions.

Off-the-shelf wireless

As wireless connectivity has become more popular, SBC manufacturers and integrated hardware-software developers have taken a variety of paths to provide wireless-enabled products. Choices include integrated solutions featuring microcontrollers that incorporate direct support for wireless protocols; and modular architectures that provide a choice of wireless connectivity options for use with a common base board.

Integrated modules bring several advantages not least of which is that the complete SBC, including wireless connectivity, has been tested for compliance with RF emissions legislation. Consequently, integrated solutions can result in lower overall development time, often with smaller form factors compared to multiple boards.

There are several high-integration solutions available including the Raspberry Pi 4 Model B

Computer, which boasts excellent processor speed, multimedia performance, memory and connectivity. Alternatively, the BeagleBone Black replaces the Ethernet controller of its original SBC design with 2.4GHz WiFi interface and a Bluetooth 4.1 and BLE transceiver.

For simpler designs, the Particle Photon couples a Cortex-M3 microcontroller from STMicroelectronics with a Cypress WiFi controller. The Particle Electron takes the same core processor complex and applies it to a 3G cellular transceiver to build IoT nodes that do not need a local gateway to connect to the cloud.

Modular solutions provide another route to wireless connectivity. Choose from a variety of Arduino modules, known as Shields, to add an RF interface to a base board. The Shields in the MKR family add local or wide-area

wireless network connectivity and can be mounted on a carrier board such as the Genuino Zero or the Due.

Thanks to a rich portfolio of platforms that range from prototyping kits to off-the-shelf SBCs, OEMs can easily take advantage of wireless connectivity in the age of IoT without having to deal with the complexities of RF design.

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High-integration solutions such as the Raspberry Pi 4 Model B Computer can increase time to market

