The IVY5661, which measures only 6cm x 3cm, is a micro-development board manufactured by uCRobotics. IVY5661 follows the Linaro 96boards IoT hardware design specification. Utilizing the 28nm UniSoC UWP5661 SoC, it has an embedded ARM Cortex-M4 CPU with a frequency range of 416MHz. Built-in 32Mbit storage space; supports Wi-Fi IEEE 802.11ac 2x2 and Bluetooth 5. High-capacity storage and rich RF capabilities help users develop more complex and diverse IoT software.

When it comes to software issues that developers are most concerned about, IVY5661 supports the Zephyr [1] operating system. We all know that Zephyr is a real-time operating system for IoT devices from the Linux Foundation. Zephyr's strengths are not only that it is born, but also that it

1. supports modularity: you can use the native Zephyr RTOS, or you can customize your own solution.
2. Improve the integrated communication protocol stack, including device-to-device connections. The Zephyr team has joined the networking capabilities. The low-power Bluetooth (BLE) implementation was written from the ground up, and the IP protocol stack in the open source Contiki RTOS was ported to support IPv6, including low-power 6LoWPAN. Thanks to Zephyr's comprehensive network protocol stack support, the IVY5661's dual-mode RF solution is being leveraged.
3. Security: A Zephyr image can only be run as a single application, statically linked at compile time, and run in a single address space. Dynamically loaded modules are not supported, which greatly reduces malware attacks.
4. Zephyr offers a wide range of services: multi-threaded services, interrupt services, synchronization between threads, data transfer services between threads, power management services, and more.
5. Lightweight: The size of the Zephyr program of IVY5661 is less than 200kb. The memory usage is low.
6. Real-time: The advantage of the real-time operating system compared to the traditional operating system is self-evident, and the application direction is also an area where the data transmission speed is relatively high, which cannot be applied by the traditional operating system.
7. Community Support: Zephyr is an open source system sponsored by the Linux Foundation. Community support is perfect.

[1] The Zephyr
The Zephyr Project, a Linux Foundation hosted Collaboration Project, is an open source collaborative effort uniting leaders from across the industry to build a best-in-breed small, scalable, real-time operating system (RTOS) optimized for resource-constrained devices, across multiple architectures. The Zephyr Project's goal is to establish a neutral project where silicon vendors, OEMs, ODMs, ISVs, and OSVs can contribute technology to reduce the cost and accelerate time to market for developing the billions of devices that will make up the majority of the Internet of Things The Zephyr Project is perfect for building simple connected sensors, LED wearables, up to modems and small IoT wireless gateways. Because the Zephyr OS is modular and supports multiple architectures, developers are able to easily tailor an optimal solution to meet their needs. As a true open source project, the community can evolve the project to

support new hardware, developer tools, sensor and device drivers. Enhancements in security, device management capabilities, connectivity stacks and file systems can be easily implemented. The Zephyr kernel is derived from Wind River's commercial VxWorks Microkernel Profile for VxWorks. Microkernel Profile has evolved over 20 years from DSP RTOS technology known as Virtuoso. The RTOS has been used in several commercial applications including satellites, military command and control communications, radar, telecommunications and image processing. The most recent example of the technology's success is the successful Philae Landing on Comet Churyumov–Gerasimenko and the accompanying Rosetta Orbiter.

Next, let's take a look at the hardware parameters of the IVY5661.

| SoC | UWP5661@28nm |
|---|---|
| CPU | ARM Cortex-M4 Daul Core |
| Clock freq | 416MHz |
| Storage | 32Mbit |
| Wi-Fi | IEEE802.11ac 2x2 |
| Bluetooth | Bluetooth 5 |
| USB | 2 x MicroUSB |
| Expansion Interface | UART/I2C/SPI/I2S/GPIO |
| LED | 4 user LED |
| Button | 2 Reset and User button |
| Power Source | Micro USB |
| OS Support | Zephyr |
| Size | 60 x 30mm |

Application Case:
In recent years, more and more smart devices have entered the homes of ordinary people. Large pieces such as smart speakers, smart TVs, small pieces such as smart tea cups, key chains and so on. Most devices fall into the category of applications for the Internet of Things. Developer manufacturers are also struggling to find new application scenarios and new selling points. We made two simple demos:
1. Wi-Fi Repeater
You can download the pre-compiled Zephyr application for IVY5661 on github. Use the phone app to connect to the IVY5661 and configure it. The IVY5661 is connected to the Internet via a wireless router while emitting Wi-Fi signals. At this point, you can use the wireless connection device such as mobile phone, tablet, notebook, etc. to connect to the IVY5661 to use the Internet.
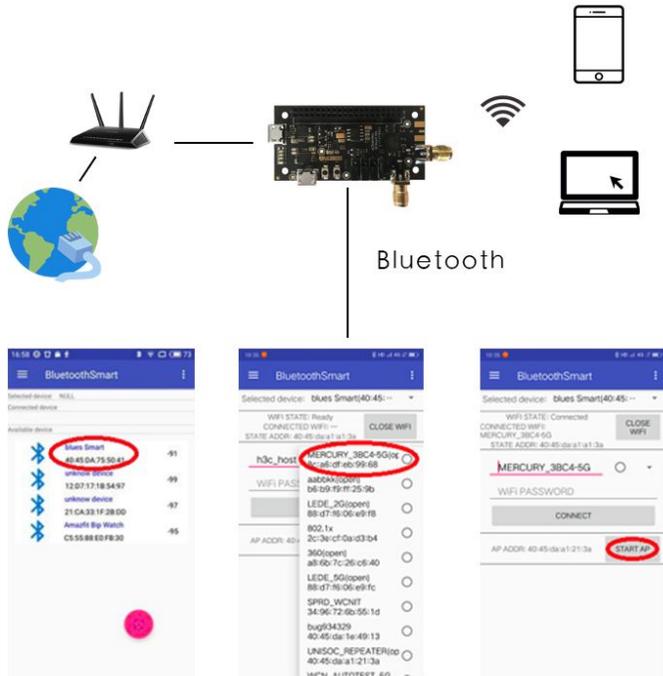
## 2. BT Mesh
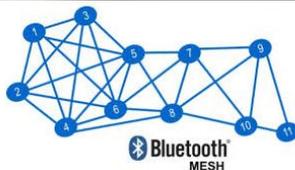


BT mesh network The
Bluetooth Mesh network is a new network topology for Bluetooth Low Energy (also known as Bluetooth LE) for establishing many-to-many (many) device communication. It allows you to create large networks that give multiple devices. The network can contain dozens, hundreds or even thousands of Bluetooth Mesh devices. These devices can exchange information with each other. Undoubtedly, such an application form is building automation. Wireless sensor networks, asset tracking and other solutions provide the ideal choice.

You can download the pre-compiled Zephyr application for IVY5661 on github. In this simple demo, all the IVY5661 are powered up, then all the IVY5661 will flash as long as you press the

user button on the IVY5661. This means that data is transmitted and synchronized in these IVY5661.

About Linaro:
Linaro leads collaboration in the Arm ecosystem and helps companies work with the latest open source technology. The company has over 300 engineers working on more than 70 open source projects, developing and optimizing software and tools, ensuring smooth product roll outs, and reducing maintenance costs. Work happens across segments including datacenter & cloud, edge & fog, IoT & embedded, consumer, machine intelligence, telecom & networking, autonomous vehicles, and high performance computing. Linaro is distribution neutral: it wants to provide the best software foundations to everyone by working upstream, and to reduce non-differentiating and costly low-level fragmentation. The effectiveness of the Linaro approach has been demonstrated by Linaro's growing membership, and by Linaro consistently being listed as one of the top five company contributors, worldwide, to Linux kernels since 3.10.

About 96boards:
96Boards is a range of hardware specifications created by Linaro to make the latest ARM-based processors available to developers at a reasonable cost. The specifications are open and define a standard board layout for SoC-agnostic (processor independent) development platforms that can be used by software application, hardware device, kernel and other system software developers. Boards produced to the 96Boards specifications are suitable for rapid prototyping, hobbyist projects or incorporation into new systems for a wide range of applications including desktop and laptop computing, the digital home, digital signage, point of sale (POS), high-end audio, robotics and drones, artificial intelligence, virtual reality, IoT and industrial control. Standardized expansion buses for peripheral I/O have led to a wide range of compatible add-on mezzanine boards that will work across a variety of 96Boards products. Users have access to a wide range of boards with different features at various price points. In addition, some SoC vendors have announced long term availability of the SoC to encourage their use in products with long life cycles.

About:
uCRobotics is a Hi-tech company which is the focus of Intelligent Platform, System Integration, and the development of Embedded System, etc. In the meanwhile, uCRobotics is the Hardware Manufacturing and Software Development Partner of 96Boards under the International Standard of Linaro. Bubblegum-96 (uCRobotics) is the 4th intelligence development platform based on the Linaro Standard, which can provide the embedded solution including: 3D Cloud Printing , UAV Data Processing, Intelligent Robot, Wearable Devices, Mobile Desktop, OpenStack/Docker, AR/VR, etc. uCRobotics advocate the spirit of open source, focusing on the embedded GNU/Linux, automation technology, 3D Cloud Printing Control, and Image recognition process etc. The core members of the team are Senior Engineers and Business Supervisors which can provide effective protection on technical support and market development.