



Advantech Service-IoT Whitepaper

All in One Computers and Kiosks

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The Ideal Platform for Service IoT scenarios

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Summary: The Platform for Customer-Friendly Computing

All in One (AiO) computers offer important advantages in what we term Service IoT (SIoT) scenarios. These are use cases that need to combine edge intelligence, connection to cloud and/or back-end enterprise IT, and the ability to support human interaction. They exist principally in sectors such as retail and hospitality, as well as warehousing and logistics, manufacturing, healthcare, and equipment installed in public spaces such as public transport ticketing systems. An internet connection is usually needed, a touchscreen is usually preferred for user interaction, and flexibility is required to connect various accessories such as a card-payment terminal or barcode reader.

Compared with alternatives such as the conventional desktop-type format with separate PC and monitor, or a custom-designed embedded PC, AiO PCs are convenient to install and set up, robust, flexible, scalable, easy to use, and typically benefit from long-term commitment by the supplier.

Service IoT Scenarios

1. Retail Self-Serve

The trend towards customer self-service in retail and hospitality, as well as public amenities such as transportation, had been entrenched well before the pandemic and has only accelerated since. With social distancing restrictions in place, and likely to remain for some time, self-service facilities can help organisations demonstrate compliance and ensure greater safety for customers. These benefits are in addition to the known commercial advantages, which include extra freedom to optimise staffing, faster transactions, and more efficient utilisation of available space.

Customer self-service applications also include fast-food restaurants and fine dining establishments, using kiosks and eMenus to let customers browse choices and place and pay for orders. Customers can enjoy their experience and make selections at their own pace, while the business continues to operate at maximum speed and efficiency.

Point-of-sale systems, customer-facing digital signage, and staff information systems are also used throughout retail premises and fast-food restaurants. One example is kitchen display systems, which accurately track fulfilment times to help improve operating efficiency. They can also simplify the cooking process and help to reduce waste by eliminating the need for paper receipts.

The self-service trend is also evident in air travel, including passenger self-check-in terminals that must connect to airline back-end systems and provide functions such as document scanning and barcode printing that are easy to use for passengers.

2. IoT in industry

Warehousing and logistics applications require employees to be able to interact with the warehouse management system infrastructure, to handle goods received and to consign products for shipment. When receiving goods, staff need to access information about products ordered, to be able to check the parts received and ensure that quantities are accurate. In addition to checking goods-in, staff typically need to assign suitable storage locations for received items and print new identification labels. When preparing products for consignment, users require real-time access to stock inventories, which can help eliminate paper pick lists and accelerate request fulfilment.

3. Manufacturing

On a factory floor, although many tasks are automated – such as collecting and storing product-inspection results and production-status information – some processes are overseen and milestones reported by managers by interacting with manufacturing management and enterprise IT systems. In addition, digital signage is used throughout factories for purposes such as sharing important company information with employees in real time.

Evaluation of Terminals for SLoT Applications

Where there is a self-service terminal or digital signage – or any point of presence, whether for use by customers or authorised staff - there is usually a computer. This may be a conventional desktop-type PC comprising a box or tower connected to a monitor or a custom machine based on an embedded single-board computer. An all-in-one (AiO) PC that combines the computer and monitor in a single integrated unit can deliver a more convenient, cost-effective and robust solution.

Often, a desktop type terminal is just that: a consumer-oriented system that lacks the robustness needed for an SLoT setting. There are also installation challenges: where to put the box so as to be out of sight and not easily accessible to passers-by, how to fix the screen in a position to be easily visible and allow touch interaction, connecting the two subsystems and handling cable management, and installing any peripherals required, such as a barcode reader or payment terminal. It may be necessary to buy or design special furniture, probably through a different supplier than the source of the computer equipment, and coordinate delivery and integration of the various elements that make up the solution.

On the other hand, a custom embedded-type platform typically presents engineering challenges, such as specifying a suitable single-board computer and integrating the required peripherals and touchscreen, as well as designing and making an enclosure. The solution must be sure to withstand environmental hazards such as rainwater or extremes of temperature in an outdoor setting, offer resistance to accidental impacts or vandalism, and deliver optical performance such as screen brightness in high ambient lighting and any filters needed to handle reflections, glare, or to ensure privacy. A wide variety of skills and manufacturing capabilities are needed to produce a workable terminal. Project costs are incurred, as well as waiting time to receive the custom terminals ready to install.

An AiO PC can offer a convenient and capable solution, delivered as a standard product, off the shelf, with minimal set-up required out of the box. Selecting an AiO PC avoids the typical challenges and overheads associated with conventional desktop or custom systems. A wide range of sizes is often available: Advantech's portfolio covers screen sizes from 7-inch to 42.5-inch, with slim and ultra-slim case options that have thickness as little as 12mm. An AiO can be specified with all needed peripherals already integrated and the underlying industrial design typically caters for aspects such as cable management and installing the unit in various scenarios such as floor-standing, desk-mounted, ceiling-mounted, or wall-mounted.

Advantech's portfolio of AiOs for SLoT applications are designed with industrial robustness in mind. With various options including Intel® Pentium, Celeron, Core™ i5, and Arm® processors, a choice of Microsoft® Windows® operating systems and well as Linux and Android is available. The units combine high performance with fanless operation, which is not only quiet but also permits the enclosure to be sealed against ingress of moisture, dust, crumbs in areas where food may be present, or airborne hazards such as steam, chemicals or kitchen grease. A touchscreen is pre-integrated and ready to use, and AiOs typically provide large numbers of PC-industry standard interfaces such as USB, Ethernet, HDMI/DisplayPort, and VGA that give flexibility to connect additional external peripherals. They are typically Wi-Fi enabled, and Bluetooth® and NFC can often be specified to allow interaction with users' mobiles.

The portfolio comprises conventional AiO PCs such as the UTC-100, UTC-200, UTC-300, UTC-500, UTC-700 and UTC-Tough series. In addition, the UTK series are AiO PCs designed for kiosk applications with a choice of integrated peripherals suited to self-service tasks. Examples include a camera, barcode scanner, payment terminal, magnetic stripe reader. A selection of enclosures and pedestals suitable for a wide variety of applications and environments is offered.

Assured longevity is another strength typical of AiO computers designed for IIoT applications. Advantech's AiO ranges are designed to have a supported lifetime of at least 15 years, being available to purchase on the open market for at least seven years with direct support continuing for a further seven to eight years.

Accessories and Software

Whereas desktop and embedded PCs usually provide a handful of interfaces such as USB and Ethernet for external devices and communications, AiO units aimed at industrial applications typically offer greater expandability by providing multiple interfaces of each type. It is quite common for there to be four or more USB ports, at least two Gigabit Ethernet ports, multiple serial connections, as well as HDMI and audio outputs.

When ordering their AiO PC, customers can choose from a variety of special features and peripheral to be supplied pre-integrated, such as a camera, barcode reader, smart card reader, RFID reader, fingerprint scanner, and iBeacon.

Working with co-creation partners, Advantech can offer additional hardware and software options including applications created to perform specific functions in industries such as food retailing.

An example is the opportunity to specify dedicated pick-assist capability in terminals destined for warehousing order-picking applications. Advantech has developed pick-to-light and voice-based technologies that help picking station operators pick an appropriate quantity of a specified item and place them into the correct order bin to be transported to packing and shipping stations. The order picking terminals show the SKU information and picking instructions of every order and, thanks to the assistive technologies, enable operators to manage multiple order bins simultaneously.

Advantech co-creation partners have created a variety of application-specific solutions. They include an automatic fruit and vegetable recognition system that can automatically distinguish between different types of produce, as well as different varieties within a sub-group, such as apples, to deliver an enhanced customer experience and help vendors with pricing and stock management.

Key Design Features

Studying some examples from the Advantech AiO PCs portfolio can highlight some of the key features that make AiO PCs and kiosks a strong choice for SIoT applications.

Among the UTC series options, the latest UTC-100 series features a thin form factor, a choice of 15.6-inch and 21.5-inch displays, and supports multiple operating systems including Windows 10 IoT Enterprise, Linux, and Android 10.1 to permit easy integration in any existing enterprise computing environment.

The UTC-200 series are open-frame panel PCs that combine AiO convenience of an all-in-one PC with the flexibility of an embedded solution. A fanless system with the latest Intel® Pentium®/Celeron® processor at its heart, the UTC-200 delivers excellent performance in a compact design. It offers industrial-grade reliability, a wide range of screen sizes, multiple OS support, and flexible mounting options.

The UTC-300 series comprises fanless all-in-one touch computers available in 7-, 10.1-, 15.6-, 18.5- and 21.5-inch sizes, providing lightweight AiO solutions for applications such as self-service terminals and digital signage. Each model boasts the latest Intel® processor which supports Android, Windows and Linux OS.

Featuring the company's latest industrial-grade computing solutions in a stylish and compact design, Advantech UTC-500 series products offer the ideal all-in-one system for diverse applications in retail and hospitality. Specifically engineered for maximum uptime and reliability, the range comes in 10" - 42" sizes and is powered by an Intel® CPU with a fanless system delivering quiet, power-efficient operation.

The UTC-7000 series offers screen sizes of 15.6 to 21.5 inch and is designed for high-performance applications. The front panel is IP65-rated for extreme durability and optional components include a thermal printer, barcode scanner, NFC/RFID reader, smart card reader, and magnetic stripe reader. For harsher environments, the stainless-steel enclosure of the UTC-Tough combines high impact and corrosion resistance with IP65 ingress protection. The wide temperature range, from -10°C to 50°C, and optional waterproofed Wifi antenna make these ideal for outdoor point-of-presence in publicly accessible places.

Further features of these AiO computers include conveniently placed expansion slots for adding extra peripherals, quick-swap M.2 SSD or SATA HDD storage that eases installation and maintenance, and built-in provision for cable routing.

It is also possible to leverage the convenience of the AiO computer as part of an optimised kiosk system that comes with selected peripherals already integrated. Examples include the Advantech UTK-615 indoor mini self-service kiosk with ARM Cortex™ processor and 15.6" touchscreen, which has a QR code scanner, NFC reader, and receipt printer built-in. It can be flexibly configured for a wide range of self-service applications and has features to allow remote device control and management. The UTK-7000 series of kiosks feature selected UTC touch computers, in a desktop or free-standing configuration that features a frame with a side groove for flexible peripheral installation.

AiO Market Opportunities and Future Development

Market analysis by Gartner (<https://www.gartner.com/explore/initiatives/overview/16136>) has recognised that the main professional opportunities for all-in-one computers lie in verticals such as hospitality and retail. These are applications where space savings, easy touch-enabled input, and the pleasing appearance of AiO machines strengthen the business case for investing.

The effect of the pandemic is expected to increase reliance on technology as, for example, premises owners in some territories are obliged to track the numbers of people in store at any time and must be able to display the data. Data regarding footfall and customer flow, however, has additional value to retailers (for example) who are looking for commercially important insights and help to create new services for customers. Systems that can track customers using techniques such as head-counting, body-counting and heat mapping could become quickly adopted. Building on experience using AiO PCs to set up customer self-service facilities, retailers could quickly introduce additional systems using application-specific person detection cameras with people-monitoring applications available on a connected platform such as Advantech's WISE-PaaS.

As customers become more comfortable with self-service as a faster and safer way of accessing goods and services such as travel, new ways of interacting such as by voice and gesture/touchless-touch control could be among new capabilities to be found in future generations of AiO machines and touch kiosks.

Point-of-presence terminals based on AiO computers are also ideal platforms for new capabilities such as demographic identification and customer recognition enabling vendors to tailor interactions for a better customer experience. Advantech's products are compatible with AI toolkits such as Intel OpenVINO™, to help build the applications of the future. By leveraging the Intel vPro® platform to optimise performance and power efficiency, we can look forward to future generations of compact and economical AiO-based systems that are capable of maintaining natural and seamless interactions with customers of all types.

Conclusion

As is typical with IoT development in general, SIoT applications in sectors such as retail, logistics, and manufacturing are driving computing out towards the edges of the network. In these cases, the edges are at the interface with humans that may be customers, operators or business managers. A pleasing appearance and simple interactions – usually involving touch - are critical to ensure a good user experience. In addition, system robustness, durable construction, and security are essential. Equipment owners also need to rely on flexibility and scalability to ensure the system meets their needs throughout its entire lifetime.

Relative to all these requirements, the All-in-one PC offers strong credentials and outperforms alternatives such as desktop and embedded PCs through advantages such as greater endurance, superior longevity, easier deployment, and lower cost of ownership.

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