Meeting the Demand: Expanding Infrastructure for the AI-Powered Healthcare Edge

The Impact of Edge AI in Healthcare

Technology has revolutionized healthcare, with Artificial Intelligence (AI) as a key driver of transformation within the medical field.

AI adoption has helped enable the evolution and acceleration of pharmaceutical research and testing, disease detection, diagnosis and treatment, robotic surgery, precision imaging, and remote patient monitoring, to name a few.

AI technology at the edge, with its embedded compute and advanced operating systems, plays a crucial role in providing real-time insight and generating valuable data. This leads to faster, more accurate diagnosis, treatment, and improved overall patient care.

Edge Infrastructure Needs

Robust critical infrastructure is essential to fully harness AI's potential in healthcare. This may include support for AI medical devices, server installations, and dedicated server room closets for larger installations and multiple device support. Any latency or disruptions can have serious, costly repercussions for healthcare organizations and their patients, hence the importance of the infrastructure considerations. Initially, placing compact server units adjacent to equipment close to the source can support AI medical devices. Beyond the device build and embedded components, server support can go directly in the room. For larger installations and to support multiple devices, on-premise rack systems, micro data centers, or backup power sources such as UPS, complete with cooling and monitoring, can be installed in dedicated server room closets.

Worldwide spending on edge computing is forecast to reach $378 Billion in 2028*

The overall AI market will be worth $909 Billion by 2030**

*Source: IDC - This includes combined enterprise and service provider spending on hardware, software, professional services, and provisioned services for edge solutions. **Source: GlobalData - Forecast overall AI Market

Infrastructure Upgrades

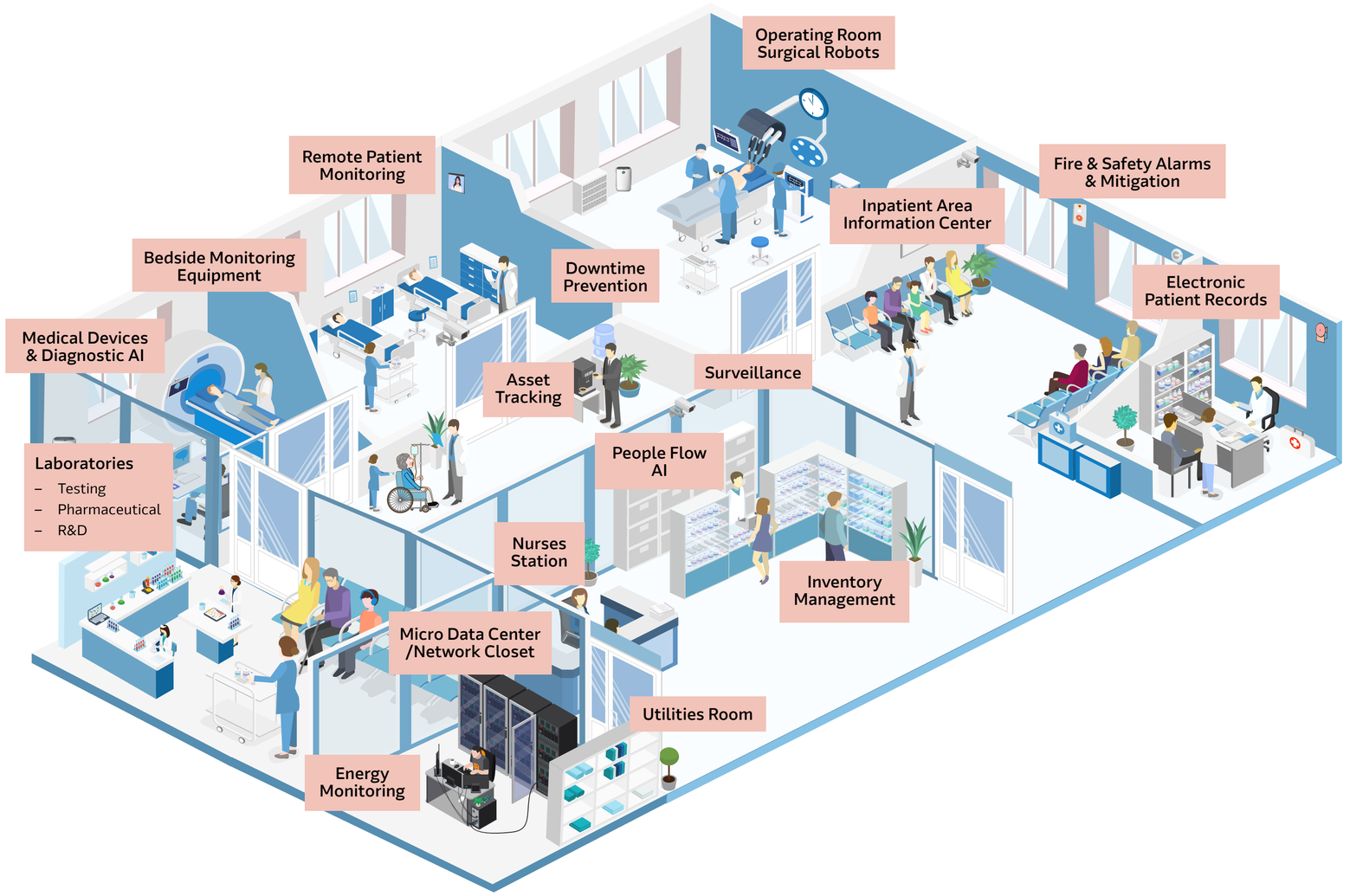
The proliferation of AI in healthcare is driving demand for infrastructure expansion and upgrades including:

- Increased Server Capacities
- Enhanced Compute Power
- Expanded Data Storage
- Reliable Power Sources

How Arrow Can Help

From board-level compute and operating systems to software, servers, and micro data centers, Arrow works with technology providers such as Supermicro, APC, and Microsoft to support you in developing certified, high-performing AI-ready devices and infrastructure. We help you modify, expand, and scale existing architecture and design new configurations as needed. Our integrated solutions help lead the way in edge AI solutions for healthcare.

Critical Infrastructure at the Healthcare Edge



AI Architecture

Flexibility and scalability are vital characteristics of AI installations. Whether looking for an immediate solution or designing a future framework, consider that AI will continue to transform. Server capacities, backup power needs, and cooling must scale as AI demands increase.

What is Driving AI Infrastructure Upgrades in Healthcare?

- **Increasing Densities:** Higher data processing requirements require enhanced server capabilities
- **Compute Power:** Greater computational power is needed to support advanced AI algorithms
- **Storage Solutions:** Expanding data storage capacity to accommodate ever-growing datasets
- **Power & Cooling Requirements:** Ensuring reliable backup power sources are available to support advanced technologies while efficiently cooling larger heat loads
- **Monitoring:** Continuous monitoring of equipment and energy usage to pre-empt anomalies, accelerate issue response, and resolution

Use Case Example: AI Infrastructure Options to Support Medical Imaging

Imaging technologies such as X-ray, Ultrasound, MRI, PET, and CT scanners are vital tools for the early detection and diagnosis of diseases. This invaluable equipment requires a stable power supply to avoid interruption or compromise in scan quality. Adequate compute and server storage is also critical to real-time processing and storing the vast amounts of data generated by this equipment. Below is a range of infrastructure scenarios employed to support healthcare imaging technologies.

Embedded Components and Operating Systems (OS)

Modern AI-ready medical equipment built with embedded components, compute, and operating systems.

On-Premises Micro Data Center

Micro data centers with UPS, cooling and monitoring software, and larger servers/racks in dedicated closets or separate rooms to serve multiple applications.

Close to Source Servers

Single compact server units in the same room as the device for added support.

AI-edge architectures and individual facility requirements lead organizations to take different approaches to critical infrastructure. While there is a demand for redesign and infrastructure overhaul to manage future AI needs, there are also immediate short-term solutions that may be more convenient as facilities take the time to evaluate and plan expansions or redesigns.

Regardless of your needs, Arrow can help you create a successful design plan and work with you, your designers, and installers to determine optimum solutions to meet budget and operational needs.

Solution Stack

Embedded

Supermicro

- Board-level solutions complete with Intel® and NVIDIA CPUs & GPUs

Microsoft

- Windows 11 IoT

Close to Source

Supermicro

- Server solutions complete with Intel® Core processors and built-in AI accelerators

Microsoft

- Windows 11 IoT for Industrial PCs and Workstations
- Windows Server IoT/Windows SQL Server IoT for Servers

On-Premise Micro Data Center

Supermicro

- Server solutions complete with Intel® Core and Xeon processors and built-in AI accelerators

Microsoft

- Windows Server IoT
- Windows SQL Server IoT

APC

- UPS, cooling, and software infrastructure

Arrow

- Design, deployment, support, professional services
- Engineering services, supply chain, integration, and logistics

Efficient, Sustainable Servers and Storage Systems

Supermicro is a global technology leader committed to delivering first-to-market innovation in **AI, edge IT Infrastructure,** and other technologies and industries. A rack-scale complete IT solutions provider, Supermicro designs and builds efficient, sustainable servers, storage systems, switches, and software.

Featured Server Products for Medical and AI Applications

SYS-111AD-HN2

Compact 1U Embedded System Edge Platform (287mm)

- Single socket Intel® LGA-1700, support 12th/13th Gen Intel® Core™ i9/i7/i5/i3/Pentium/Celeron Processors with R680E chipset
- Low noise 200W AC-DC PWS; 1 PCIe 5.0 x16 HHHL slot
- Quad independent display by 1x HDMI, 2x DP, 1x DVI
- Configurable with 1 single slot AI accelerator card such as NVIDIA RTX™ A400

Ideal for:

- Smart medical expert systems
- Image processing (e.g. X-ray, MRI, CT scan, etc.)

SYS-E403-14B-FRN2T

X14 Edge AI Box PC

- Single socket Intel® Xeon® 6700 Processor with E-cores
- 3 PCIe 5.0 x16 FHFL slots
- Configurable with 1 double slot AI accelerator card such as NVIDIA L40S or 2 single slot cards such as NVIDIA RTX™ 4500 Ada

Ideal for:

- Edge AI inferencing
- Machine learning
- Medical expert systems

SYS-222HE-FTN

X14 Hyper-E (574mm)

- Dual socket Intel® Xeon® 6700 Processors with E-cores
- Short-depth, front I/O system for space-constrained environments
- Configurable with up to 2 double slot AI accelerator cards such as NVIDIA H100 or 3 double slot cards such as NVIDIA L40S

Ideal for:

- Edge AI inference
- Machine learning

SYS-E100-12T-H

Ultra-Compact Fan-less Edge System

- Single Socket FCBGA-1449 11th Gen Intel® Core™ i7-1185GRE Processor
- Silent, fan-less operations
- AI accelerator card such as Hailo-8™
- Configurable with 1 M.2
- Operating temperature -30°C to 50°C

Ideal for:

- Smart medical expert systems
- Image processing (e.g. X-ray, MRI, CT scan, etc.)

SYS-E300-13AD

Mini-1U Embedded Edge System

- Single socket Intel® LGA-1700, support 12th/13th Gen Intel® Core™ i9/i7/i5/i3/Pentium/Celeron Processors with Q670E Chipset
- 1 PCIe 5.0 x16 LP slot for AI accelerator support
- Configurable with 1 single slot AI accelerator card such as NVIDIA L4
- Quad independent display by 2x HDMI and 2x DP

Ideal for:

- Smart medical expert systems
- Image processing (e.g. X-ray, MRI, CT scan, etc.)

SYS-111AD-WRN2

Compact 1U Embedded System Edge AI Platform (429mm)

- Single socket Intel® LGA-1700, support 12th/13th/14th Gen Intel® Core™ i9/i7/i5/i3 Processor with R680E Chipset
- 1 PCIe 5.0 x16 slot or 2 PCIe 5.0 x8 slots support FHFL
- 1 PCIe 4.0 x4 slot support HHHL
- Configurable with double slot AI accelerator card such as NVIDIA L40S or NVIDIA RTX™ 4500 Ada

Ideal for:

- Edge AI inference and Smart medical expert systems

Protection and Continuous Operation

Elite Partner APC IT Solution Provider Schneider Electric

APC products are designed to protect IT equipment and its continuous operation while being reliable, connected, integrated, and secure to ensure data accessibility and security for dynamic IT environments such as healthcare, where downtime is not an option. APC also offers a comprehensive suite of software and monitoring services, including EcoStruxure™ IT, a vendor-neutral data center infrastructure management (DCIM) solution that offers remote monitoring and management. These software and products play a vital role in healthcare organizations, helping to minimize downtime and build resilience.

APC NetShelter Soundproof Racks

Server-room-in-a-box design to conveniently deploy IT in non-dedicated spaces.

- All in one cost-effective rack
- Easy to deploy
- Integrated PDU and cable management
- Whisper-quiet thermostat controlled fans
- Robust design - supports up to 1500 kg of equipment
- Soundproof insulation
- Secure locking front, rear, and side door access
- Available from 23 to 38U

APC Smart UPS Ultra

Compact, powerful, reliable power protection.

- Compact design
- Lightweight
- Extended runtime options
- Rack, tower, wall and ceiling/desk mount
- Lithium-ion batteries
- Cost-efficient solution
- 2.2, 3, 5, 8 & 10kW

EcoStruxure™ Micro Data Center C-Series 6U Wall Mount

Innovative wall mount Micro Data center.

- Quick, easy deployment
- Compact form factor
- 113 kg weight load capacity
- Ideal for edge server deployment
- Integrated UPS, security and remote management
- Next gen DCIM platform
- Reliable power and pro-active analytics
- Pre-integrated enclosure speeds deployment
- Camera monitoring; Pre-lock doors
- Intrusion detection

EcoStruxure™ IT Expert

Improve the performance of IT infrastructure.

- Cloud and IoT-enabled platform
- Secure monitoring and management
- Vendor neutral monitoring of remote assets
- Live data & smart alarming
- Actionable, real-time assessments
- 24/7 visibility of critical infrastructure
- Multi-sensor graphing and custom dashboards
- Convenient subscription model for any size environment

Secure Platforms

Microsoft

Windows IoT products are designed for fixed-function devices that require a stable platform with long-term support. They are ideal for applications that need to run flawlessly for years without unexpected feature updates or changes that could disrupt operation. Microsoft's suite of IoT-enabled platforms offers security, scalability and robust data management features, making them ideal for seamless integration in intelligent healthcare devices.

Windows 11 IoT

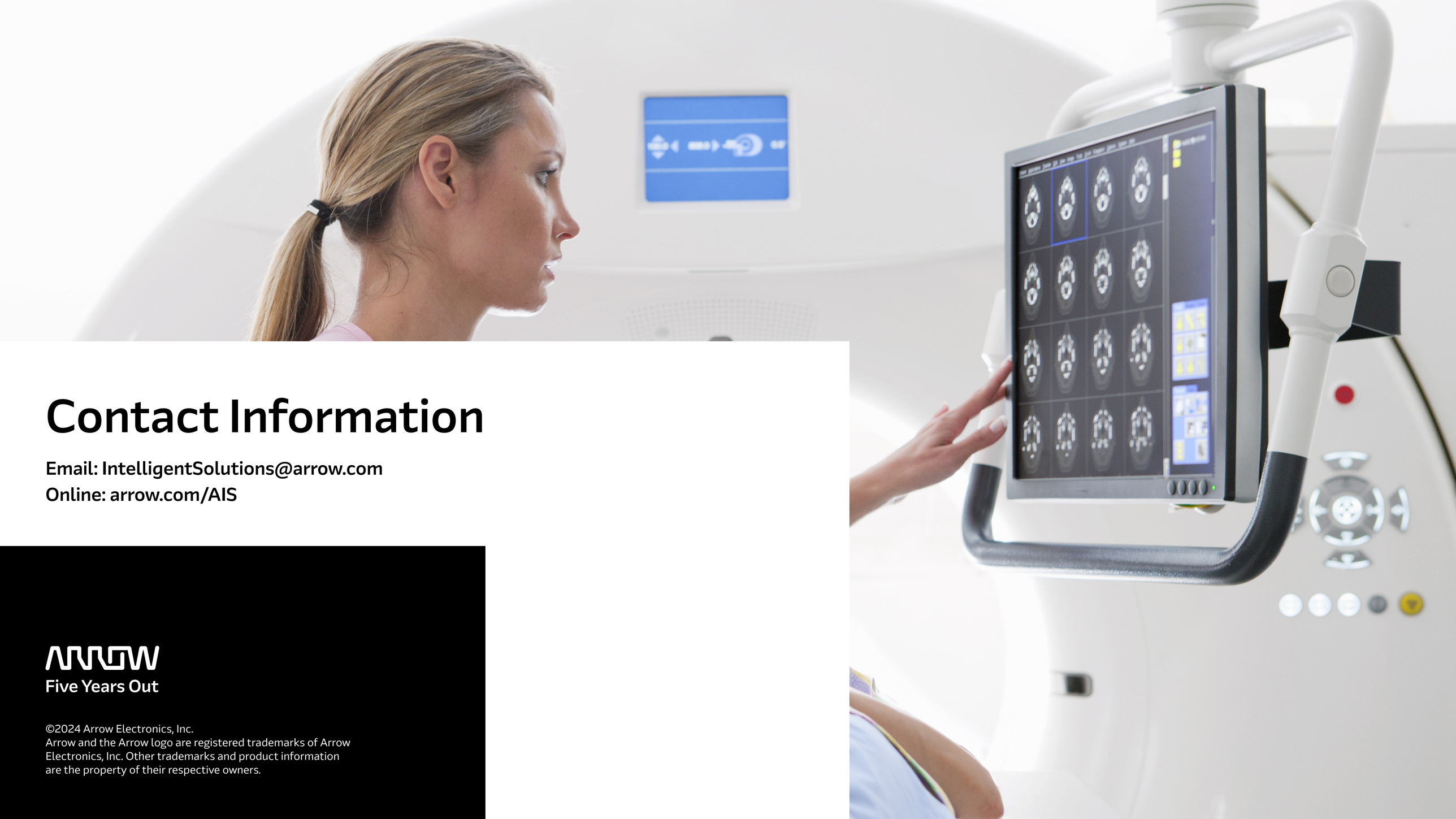
Windows 11 IoT Enterprise LTSC 2024 is the latest generation of the Windows IoT operating system. It includes features focused on enhancing end-user experience and increased security. Windows 11 IoT Enterprise LTSC 2024 offers support for newer hardware features like Wi-Fi 6 and USB4.

Windows SQL Server IoT

SQL Server IoT is designed specifically for fixed-function edge and embedded devices. This powerful platform offers enhanced security, edge intelligence, increased scalability, improved management and monitoring, and easier development. With SQL Server IoT, organizations can efficiently manage and process large volumes of IoT-generated data, enabling them to make better decisions and unlock new insights.

Windows Server IoT

Windows Server IoT includes advanced multi-layer security, hybrid capabilities with Azure, and a flexible platform to modernize applications with containers. Hyper-V, an abstraction layer between the Windows server IoT and physical hardware, allows multiple virtual machines to run simultaneously on the same hardware. Windows Server IoT supports business-critical and large-scale applications. Licensing is only available through the OEM channel under special dedicated use rights.



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Five Years Out