



# FLEXIBLE MODULES ENABLE REAL-TIME VIDEO FOR AMBULANCE TELEMEDICINE

## Introduction

Modern technologies are expanding the ways medical care can be delivered and bringing unparalleled efficiency. This is especially significant for emergency medical services (EMS), where seconds can make the difference between life and death. With the advancements in telecommunication bandwidth and real-time mobile technologies, an ambulance-to-hospital emergency care system can be developed to save more lives.

For example, intravenous tissue plasminogen activator (IV tPA) is a clot-busting drug often used to treat ischemic stroke patients, but the drug ideally should be given within four-and-a-half hours of the start of symptoms to improve chances of recovery and minimize aftereffects. According to a study

published in the March 8, 2017, online issue of *Neurology*, the medical journal of the American Academy of Neurology, people who are experiencing a stroke and are brought to the hospital in an ambulance equipped with a mobile CT scanner and telemedicine capabilities are evaluated and treated nearly two times faster than those who are taken in a regular ambulance.

Telemedicine makes it possible for a physician at the hospital to see a patient in an ambulance via video conferencing and evaluate the patient's vital signs as detected by in-vehicle sensors and transmitted to the hospital server via wireless communications in real time. Patient temperature, blood pressure, heart rate, respiration, etc., in

addition to medical imaging data such as CT scans and X-ray images can all be made available at a distance. The doctor can instruct an emergency medical technician (EMT) onboard the ambulance for remote triage as well as administration of primary care services such as injections, and preparations for in-hospital treatment can be started earlier to save every minute possible in order to save lives.

In the case of rescuing automobile accident victims, the emergency and trauma physicians can guide EMTs as they conduct primary fracture treatment onboard, for example, and prepare a surgery team if needed at the hospital, prior to the patient's arrival. If they realize that their available hospital resources are not adequate for a particular situation, they can reroute those patients to other medical facilities earlier than would otherwise be possible.

## Application Requirements

An ambulance-based telemedicine system requires a high-performance IPC that can receive medical imaging and vital signs data from vehicle-based equipment, support wireless communication (Wi-Fi/3G/4G/others) for streaming data, and most importantly, implement video data processing that enables real-time video conferencing. The challenge is that most medical images do not have standard video data profiles, thus the system needs to incorporate a device able to connect to all types of medical imaging equipment.

## Solution

As there are many different types of interfaces for data source from different pieces of third-party equipment, traditionally it takes some effort to customize an embedded system with data input modules that meet all requirements of a specific application.

Advantech's new, innovative ARK series embedded systems solve the problem by providing interchangeable [iDoor I/O modules](#) and [ARK Plus expansion modules](#) that can be selected to fit different application projects to meet end-customer requirements. With flexible [iDoor](#) and [ARK Plus modules](#), over 100 I/O combinations can be created on an embedded system to facilitate quick customization with minimum time and cost.

For this telemedicine ambulance application, Advantech suggested the use of an Advantech [modular fanless embedded computer ARK-2250L](#), combined with a MOS-4140H video iDoor that provided an HDMI interface that let the system fetch data from a video camera and enabled video conferencing with multiple displays onboard the vehicle.

[Embedded PC ARK-2250L](#) is a compact, super rugged system with an Intel® 6th Gen Core™ U-series (i3/i5/i7) processor that delivers unparalleled computing power for video processing. The system also has 3G/4G wireless support embedded, as well as support for VGA and HDMI dual displays and an optional 3rd display, suitable for developing real time video conferencing applications.

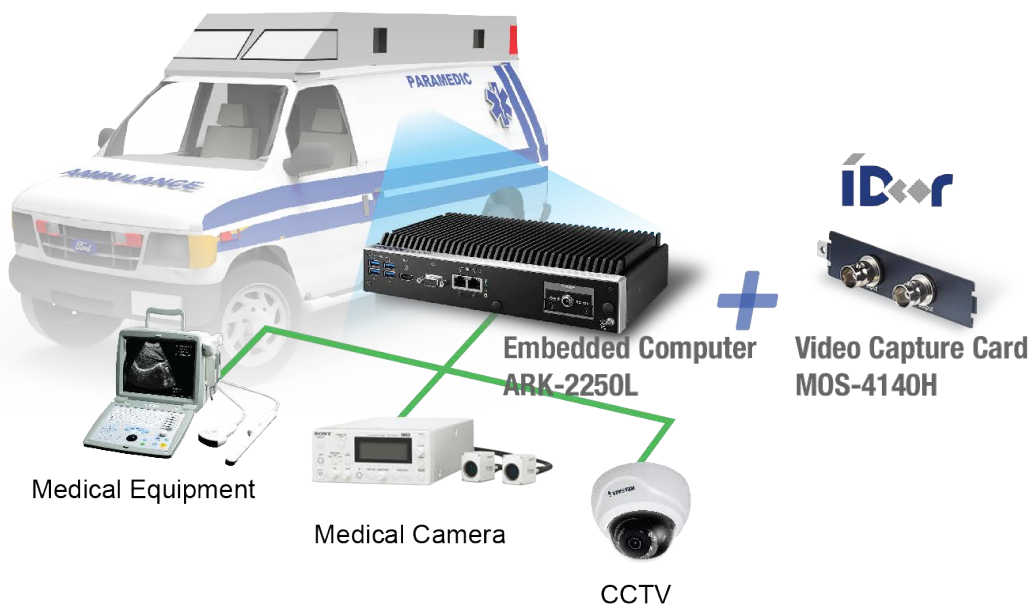
In terms of in-vehicle ruggedness, a 9-36V wide voltage power module is provided with a lockable DC jack for power input, ensuring power supply reliability in a high-vibration environment. The fanless design was adopted to prevent dust ingress, and the -20 ~ 60 °C wide operating temperature range makes it ideal for demanding environments. Most important of all, [embedded computer ARK-2250L](#) is compatible with Advantech [iDoor](#) and [ARK Plus modules](#), which system integrators can freely choose to create I/O and storage configurations that best fit their projects, with minimum extra cost or time for implementation. The flexible combinations of different iDoor and ARK Plus modules make [embedded computer ARK-2250L](#)

capable of connecting with a wide range of medical device interfaces. In terms of hard- and soft-ware integration, [embedded computer ARK-2250L](#) comes with the Advantech [WISE-PaaS IoT software platform](#) preinstalled, which provides comprehensive software resources for developing IoT and edge computing applications. An intuitive graphic-guided Software Development Kit (SDK) is also provided that lets system developers create their own medical software applications with great ease.

## Benefits

- Optional [I/O modules](#) and [ARK Plus](#) expansion modules provide great flexibility for configurations
- Reliable fanless/wide-voltage/wide-temperature/ lockable DC jack designs ensure ruggedness for in-vehicle applications
- High-end computing power and rich video interface support real-time video processing that meets telemedicine requirements
- Advantech [WISE-PaaS](#) and SDK software tools facilitate easy application development with fast time-to-market
- Customization time is reduced from months to weeks

## System Diagram



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Advantech's Embedded Computers check out  
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