

White Paper

Virtualizing I/O with Innodisk's InnoEx Expander



Introduction

Industrial computers are different from other types of computers for many reasons. They can be found in a variety of places, such as factory floors, warehouses, office buildings, and even inside cars. Because they can be used in so many different environments, the input and output requirements for these machines must be very diverse. Additionally, they need input and output that can handle both high and low performance levels, since they may need to support both older and newer interfaces.

Each time a new, higher performing interface is introduced, OEMs want the ability to offer this new level of performance. But at the same time, they don't want to tell their customer base that they have to give up their existing peripherals. Many of those customers will migrate to the higher performing interfaces over time, but it doesn't happen overnight. Hence the need to support everything.

Solutions

More I/O in Less Space

Another phenomenon that actually works against the need for more I/O is the push to employ smaller industrial computers. OEMs continue to try and squeeze more performance from the same size package, or in many cases, from smaller packages. While the space savings is always welcome, it too comes with tradeoffs. For example, dissipating the same amount of power, and thereby heat, in a smaller space makes cooling more difficult. Innovative use of fans and/or heat sinks is needed. Smaller space generally means a reduction of functionality.

Traditional interfaces include things like serial, CAN bus, HDMI, and USB, although even USB is throwing a wrench into the works as there are continual upgrades and they are not always backward compatible as the physical interface has changed. Ethernet also seems to be in continual upgrade mode, with 1-Gbit/s operation forming the lowest baseline in most cases.



Image 1: Design-in Effort

In most cases, it's the specific application that defines which I/O is required. However, the OEM doesn't always have the luxury of knowing where the industrial computer will end up. Hence, the need to support an array of interfaces.

Virtualize Your I/O

Another way of minimizing the physical I/O interfaces is to virtualize the connections. That's what Innodisk has been able to achieve through its InnoEx Virtual I/O system. InnoEx lets systems integrators expand their USB, CAN bus, serial, and HDMI I/O ports through the internet using I/O virtualization. At the same time, this configuration extends the I/O range from a few meters, and in many cases up to 120m from LAN to LAN. It's even possible to extend the length infinitely if configured properly.

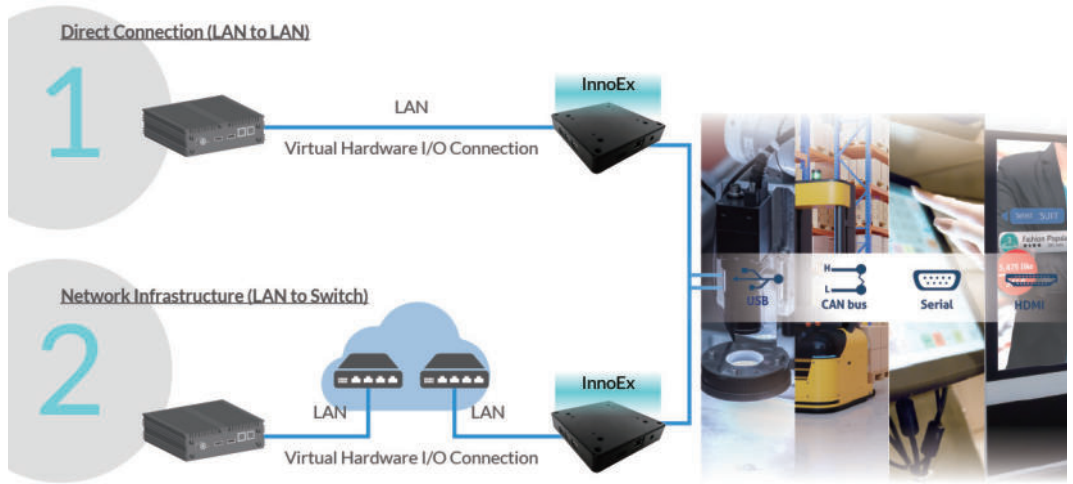


Image 2: The InnoEx virtual interface controller sits between the industrial computer and the I/O devices, connected via an Ethernet cable.

In operation, InnoEx-connected devices act as if they are connected directly to the system itself, and always maintain their original behavior. The operator simply installs the InnoEx IIOVT driver onto the industrial computer and connects the InnoEx device to the computer using an Ethernet (RJ45) cable. At the output side of the InnoEx device, users can connect to USB, CAN bus, serial, or HDMI interfaces. That's all handled virtually, thanks to the company's InnoEx IIOVT driver.

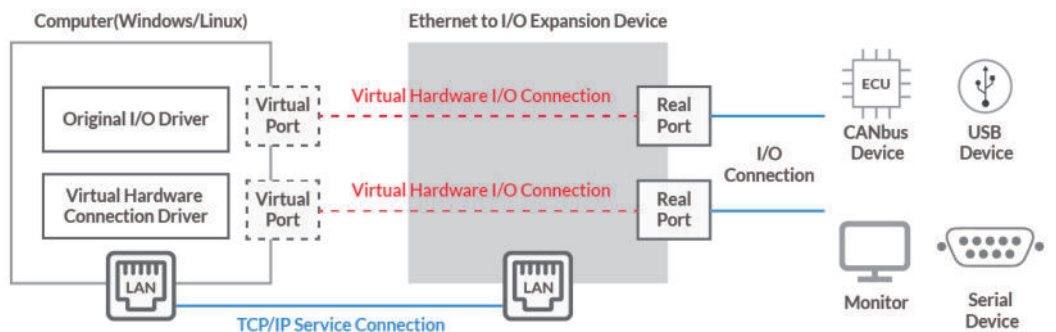
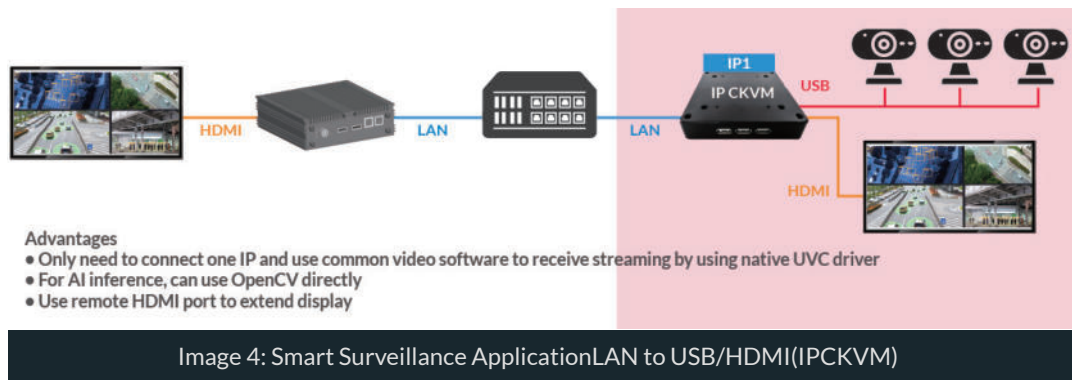


Image 3: The same I/O function as if plugged in directly

Application

The Benefit to Smart Surveillance

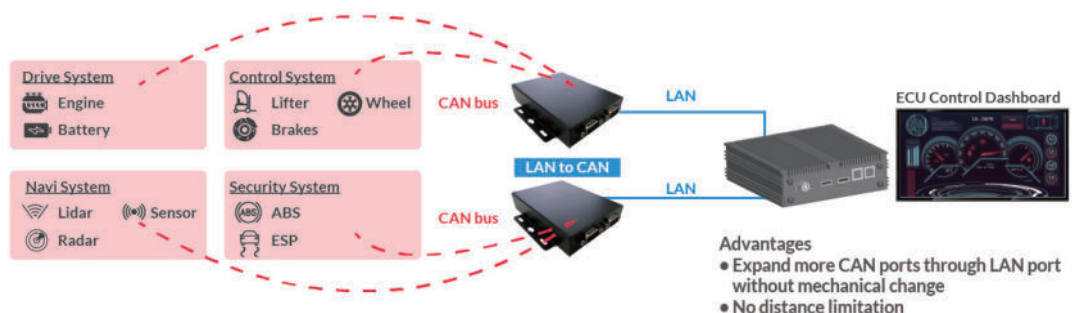
An example where the InnoEx is useful is in surveillance applications that use IP cameras. Each camera typically requires its own IP address, which can become unwieldy when there are many cameras. Additionally, many modern surveillance applications integrate AI, and IP cameras are not always well-suited for AI integration. InnoEx allows for multiple cameras to be connected using only a single IP address, greatly reducing the number of IP addresses that need to be managed, while also making it easier to integrate AI software.



The Benefit to Vehicles

Similarly, InnoEX can be used as a vehicle management system in automobiles due to its size, and is rated for high levels of shock and vibration. Connections can be made to four systems over CAN bus. In most cases, these systems would be the drive system (engine and battery), the control system (brakes and wheels), the navigation system (LIDAR, radar, and other sensors), and the security system (ABS and other electronic security). In this case, the “industrial computer” would be the vehicle’s ECU, which operates in a similar fashion as a traditional industrial computer.

You can easily see how this connection can be duplicated with similar or other interfaces, depending on the need. A key aspect of this configuration is that the industrial computer sees the same input, whether a traditional connection is employed or the information comes through the InnoEx device. Hence, aside from installing the single driver, no other changes are needed.



Conclusion

An engineer may ask what he or she can expect when working with Innodisk, and what separates the company from the competition. First, Innodisk is a global provider of industrial-grade storage and embedded peripherals, with a long track record in the industrial, automotive, aerospace, healthcare, retail, and automation industries, just to name a few. The company's experts are well aware of the pitfalls and challenges a device maker will encounter, and understands the path to success as well as the opportunities in the complex industrial market. Contact the company today and let them fill your needs.

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