



## Solution Study

### Enhanced Thin Client Platforms

Intel® Atom™ Processor and Mobile  
Intel® 945GSE Express Chipset

**clientron**  
embedded system provider

# High-Performance, Energy-Efficient Thin Clients Bring New Benefits to Embedded Applications

Ultra-low power, fanless platform combined with remote boot technology provides an energy-efficient, green computing solution





Demand is growing for embedded systems that can deliver graphics-rich and interactive applications such as digital signage, gaming, retail POS, transaction and educational terminals. These systems must satisfy the diverse requirements of embedded applications with a combination of high compute power, wireless connectivity, energy-efficient operation, rich graphics, remote manageability and a fanless design. Intel describes this category of system as an “enhanced thin client.” It includes features that support highly interactive and visually compelling applications such as dual-independent display, touch-screen operation, high-definition audio and graphics.

Customers want these solutions with higher performance, better remote manageability, power efficiency and security than what is found in most thin clients today. That’s the objective that motivated Intel, Clientron, AMI and other developers to collaborate on the design of an application-ready, enhanced thin client platform that delivers new benefits and usage models for embedded applications. Core elements of the solution include:

- Intel® Atom™ processor for high-performance, ultra-low power computing in a small, fanless form factor
- Energy-efficient technology embedded into the hardware to ensure optimum power efficiency independent of the operating system
- Remote management technology that can power-on and power-off the system even if the operating system isn’t functioning

### Step 1: Low-Power Computing

Historically, some of the biggest obstacles to delivering high performance in the thin client have been the increases in power consumption and heat dissipation that tend to accompany an increase in computing power. That’s because many of the CPUs adopted from desktop and mobile PCs were developed to run high-performance operating systems and applications and were never expected to operate in a fanless environment; so they weren’t engineered to minimize energy use.

Intel solved this problem with the introduction of the Intel Atom processor family and several companion chipsets. These are super energy-efficient chips that were designed from the ground up for ultra-low power consumption and low TDP. They were built for operating in fanless environments and are supported for long life cycles. Yet nothing has been sacrificed in the way of performance for this new class of embedded applications. And they are compatible with the Intel microarchitecture of previous x86 processors for software compatibility and portability of your existing applications.

Companion chipsets for the Intel Atom processor (including the Intel® 945GSE Express chipset) deliver rich graphics performance that can support touch-screen applications, streaming video, gaming, interactive multimedia, and more. What’s more, an Intel Atom processor-based platform can run multiple common operating systems such as Windows\* and Linux.\*

Using new 45nm manufacturing process technology and a single-core microarchitecture, everything about the Intel Atom processor has been power and performance tuned for optimum performance per watt. The level 1 cache has been optimized for data at 24 KB and instructions at 32 KB. The chip supports SSE3 which improves performance on multimedia and interactive applications. Advanced power capabilities are delivered through dynamic level 2 cache allocation and dynamic clock gating that turns off clocks to data path and control logic when not in use. Loop detectors reduce fetch and decode power as well.



## Step 2: Add Energy-Efficient “Green” Features

Of course, it takes more than low power consumption and a fanless environment to maximize the energy efficiency of an embedded system. Many remote clients are only in use for a few hours each day, and they often switch to standby mode when not in use. If these systems were powered off instead of being put in standby mode, they would use even less energy.

Intel’s enhanced thin client platform therefore includes hardware-assisted remote manageability that enables the system to be completely turned on and off via a network connection, regardless of the state of the operating system. This remote manageability is based on the WS Management industry-standard specification for compatibility with all commonly used operating systems.

### Energy-Efficient Remote Client

Intel worked with a third-party software developer to create a hardware-based remote management agent based on the WS Management standard for remote manageability. Built into Intel’s enhanced thin client platform, the Energy-Efficient Remote Client enables the system to be switched on or off and even reset, remotely and independent of the state of the operating system. The Energy-Efficient Remote Client can function as long as there is an Ethernet connection to the device. This allows users with administrative rights to efficiently control devices that are deployed remotely, turning them on only during business hours, thus saving on energy-consumption costs.

## Step 3: Develop a Feature-Rich Platform

Intel collaborated with Clientron to build the feature-rich platform for its enhanced thin client solution. Two off-the-shelf versions have been developed to scale in performance and features according to the customer’s application requirements. Clientron customers may also request custom versions of this platform, removing various features to adapt the solution to their requirements. The specifications of the premium version are noted in the table nearby.

### Clientron’s Premium Thin-Client Platform Features

	Platform Features
Processor	Intel® Atom™ Processor
Chipset	Mobile Intel® 945GSE Express Chipset + ICH-7M
Storage	<ul style="list-style-type: none"> <li>▪ x 1 CF/DOM Interface (2x22-pin IDE port)</li> <li>▪ x 2 SATA</li> </ul>
Specification	<ul style="list-style-type: none"> <li>▪ 4 USB and 3 USB (pin headers)</li> <li>▪ 1 COM and 3 COM (pin headers)</li> <li>▪ 1 10/100 LAN</li> <li>▪ 1 Gigabit LAN</li> <li>▪ 1 MIC-in</li> <li>▪ 1 Line-out</li> <li>▪ 1 DVI-I</li> <li>▪ 1 VGA</li> <li>▪ 1 S-video</li> <li>▪ 1 PCI</li> <li>▪ 1 PCIe</li> <li>▪ 1 Wireless Mini-PCIe</li> <li>▪ 1 SD card slot</li> <li>▪ PS2</li> </ul>

Essential to this platform is a set of firmware that is transparent to the end users but enables remote management via a network connection. For this, Clientron and Intel chose to adopt the Aptio\* Unified EFI (UEFI) BIOS from AMI, which allows the platform to work seamlessly with today's software and network architectures. The BIOS includes support for network management features such as PXE boot and IPMI, and remote management features to allow the use of robust over-the-wire management applications such as telnet access and IPV6 networking.

AMI's Aptio BIOS provides customers the option of leveraging newer operating systems that take advantage of UEFI features (such as Linux and Microsoft Windows Vista\*) while maintaining compatibility with legacy operating systems that are x86 compatible. Aptio firmware leverages industry standards and advance Intel technology to provide remote management solutions.

The uEFI BIOS is both portable and scalable and allows Clientron to build fast-booting systems without sacrificing functionality. It also includes USB padlock, giving the BIOS the ability to lock individual USB ports for added security.

## Supporting a Variety of Form Factors

The enhanced thin client platform delivers a richer set of benefits targeted at enhancing the functions and usage models of existing thin clients while preserving the high level of security and low TCO. The Clientron solution can be customized in a variety of ways, including:

- **Mobile thin client** – Designed for a portable form factor without the moving parts of a DVD-ROM and hard disk. It has wireless support and remote manageability, but is protected with high security integration.
- **Integrated thin client** – Due to space constraints, manufacturers may choose to combine an LCD with the thin client system into a 2-in-1 design.

- **Dual independent display terminal** – The interactive display terminal with dual-independent displays can provide two different messages to two different audiences simultaneously. For example, bank tellers performing their tasks see one thing, while the customer views the bank's latest product promotion on an adjacent display.

## Conclusion

The availability of Intel Atom processors opens up a new set of possibilities for embedded applications in the thin client market segment. New benefits and usage models are enabled with the combination of higher performance and low power in a small form factor platform.

Intel's collaboration with Clientron, AMI and others brings the best in hardware design, energy efficiency and system solutions together to deliver a compelling platform for enhanced thin clients. Contact your Intel sales representative or Clientron to quickly deliver your next-generation enhanced thin client solution.

## For More Information

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[www.ami.com/aptio](http://www.ami.com/aptio)

[www.intel.com/go/embedded](http://www.intel.com/go/embedded)

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