

# Leading the Next Industrial Revolution

Raising the bar for reliability, security, and performance in HMI and control with the Intel® Atom™ processor E3800 product family



Experience proven reliability  
with industrial solutions  
from Intel

## Challenges

- **Devices on the factory floor are highly interconnected and interdependent**, making exceptional reliability a must to keep production running.
- **Systems and data of all types need to be protected against adept cybercriminals**, necessitating improved system protection and the widespread use of data encryption.
- **Human machine interface (HMI) and control are increasingly compute-intensive**, driving a need for higher performance at lower power consumption.
- **Factory floor space is at a premium**, requiring OEMs to minimize equipment size without sacrificing performance.

## Solutions

- **High reliability features**, like industrial temperature range support (-40° to 110° C) on selected SKUs, low power (5-10W), and error-correcting code (ECC), provide added protection against extreme environmental conditions and soft errors.
- **New security capabilities**, such as Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI)<sup>1</sup> and Secure Boot, use hardware-assisted capabilities to encrypt/decrypt data and allow only trusted software to run on the device.
- **Microarchitecture enhancements**, including quad-core processing and out-of-order instruction execution, significantly increase performance: up to double per core and four times per CPU compared to prior generations.<sup>2,3</sup>
- **The small, single-chip footprint** of the Intel® Atom™ processor E3800 product family provides higher performance at significantly less power than the previous generation, helping industrial managers save space, while increasing intelligence and connectedness on the factory floor.

## Trusted Supplier

In industrial automation, engineers and technical decision makers face growing performance demands, exacting deadlines, and increasingly challenging customer requirements.

Fundamental to meeting these challenges and building competitive products is finding a trusted, reliable silicon vendor. With a strong reputation earned after supplying leading-edge silicon for nearly half a century, Intel is a dedicated partner to the industrial industry. Intel offers the reliability, proven innovation, quality products, and responsive customer support developers need to respond to demanding customer requirements and deadlines.

## Extensive Ecosystem

Intel's scalable architecture, extensive development tools, and leading-edge silicon – with built-in graphics and virtualization technology – enable faster time to market, lower total cost of ownership, and enhanced security and efficiency. At the same time, Intel's decades of experience delivers deep ecosystem relationships, end-to-end security expertise, and a broad portfolio of solutions spanning hardware, software, and other critical components that help OEMs offer differentiated solutions.



## Intel developed a complete set of hardware-based virtualization features designed to improve performance and security for virtualized applications

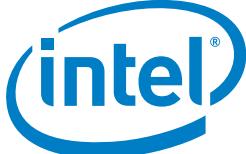
### Development Support

Faster time to market is critical for industrial equipment manufacturers, and that's why access to the world's largest base of mature development tools - Intel® tools - is critical to success. Speed up the development process with off-the-shelf hardware options like controllers, sensors, HMI displays, and more. Multi-core designs deliver outstanding energy efficiency and support real-time deterministic control, virtualization capabilities, and real-time I/O, including PCI Express\* and fast, real-time Ethernet.

### Software Flexibility

Wide support from popular operating systems - both general purpose and real-time - allows developers to optimize for usability, visualization, and real-time performance at the same time. OEMs can develop a single code base that scales between Intel® Atom™, Intel® Core™, and Intel® Xeon® processors because they share a common microarchitecture that makes it easy to migrate code. Thus, developers can focus their development efforts on writing software that makes systems unique, rather than on drivers and other lower level aspects that worked previously on other Intel® processors.

SOLUTION PROVIDED BY:



### Benefits of a Virtualized Platform

Hardware-based Intel® Virtualization Technology<sup>4</sup> (Intel® VT-x) is used in a wide variety of embedded applications to improve trust and protect critical applications. An important benefit is running functions, like HMI and control, on a single Intel Atom processor, which can help reduce bill of materials (BOM) costs and design complexity, while accelerating time to market.

Intel VT also helps improve the fundamental flexibility and robustness of traditional software-based virtualization solutions by accelerating key functions of the virtualized platform. For instance, Intel VT performs various virtualization tasks in hardware, like memory address translation, which reduces the overhead and footprint of virtualization software and improves its performance.

Many embedded developers are using virtualization to run multiple operating systems on their devices, enabling them to:

- Simplify the porting of legacy applications onto new platforms
- Increase the determination of time-critical functions
- Improve the security and stability of safety-critical code

Many industrial systems, like programmable logic controllers and motion controllers, require a combination of low-latency, deterministic response and full-featured user

interfaces. Virtualization enables systems to simultaneously run real-time and general-purpose operating systems, each on dedicated processor cores of an Intel® multi-core processor. This configuration can increase the speed and determinism of time-critical applications because they operate unencumbered by non-real-time tasks that otherwise compete for CPU resources. Furthermore, virtualization enables equipment manufacturers to combine functions running on multiple boards onto one board, which lowers platform cost and reduces system size.

### Multi-layer Security

Keeping factory operations secure, the Intel Atom processor E3800 product family offers security enhancements not available on previous Intel Atom processors, including:

- Faster data encryption with McAfee\* Endpoint Encryption\* that utilizes Intel AES-NI
- Rootkit detection and removal with McAfee Deep Defender\*, which uses Intel VT-x to protect below the operating system
- Malware protection using whitelisting supported by McAfee Embedded Control\*

Learn more about Intel solutions for industrial automation at [www.intel.com/industrial](http://www.intel.com/industrial).

<sup>1</sup>Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI) requires a computer system with an Intel AES-NI-enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. Intel AES-NI is available on select Intel® processors. For availability, consult your reseller or system manufacturer. For more information, see <http://software.intel.com/en-us/articles/intel-advanced-encryption-standard-instructions-aes-ni/>.

<sup>2</sup>Based on transition from the Intel® Atom™ processor N2000/D2000 product family and benchmark testing : CINT2006 Rate and CFP2006 Rate and (integer and floating point).

<sup>3</sup>Performance results are based on certain tests measured on specific computer systems. Any difference in system hardware, software or configuration will affect actual performance. For more information go to <http://www.intel.com/> performance.

<sup>4</sup>Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, and virtual machine monitor (VMM). Functionality, performance or other benefits will vary depending on hardware and software configurations. Software applications may not be compatible with all operating systems. Consult your PC manufacturer. For more information, visit <http://www.intel.com/go/virtualization>.

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL® PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS. INTEL ASSUMES NO LIABILITY WHATSOEVER AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. A "MISSION CRITICAL APPLICATION" IS ANY APPLICATION IN WHICH FAILURE OF THE INTEL PRODUCT COULD RESULT, DIRECTLY OR INDIRECTLY, IN PERSONAL INJURY OR DEATH. SHOULD YOU PURCHASE OR USE INTEL'S PRODUCTS FOR ANY SUCH MISSION CRITICAL APPLICATION, YOU SHALL INDEMNIFY AND HOLD INTEL AND ITS SUBSIDIARIES, SUBCONTRACTORS AND AFFILIATES, AND THE DIRECTORS, OFFICERS, AND EMPLOYEES OF EACH, HARMLESS AGAINST ALL CLAIMS COSTS, DAMAGES, AND EXPENSES AND REASONABLE ATTORNEYS' FEES ARISING OUT OF, DIRECTLY OR INDIRECTLY, ANY CLAIM OF PRODUCT LIABILITY, PERSONAL INJURY, OR DEATH ARISING IN ANY WAY OUT OF SUCH MISSION CRITICAL APPLICATION, WHETHER OR NOT INTEL OR ITS SUBCONTRACTOR WAS NEGLIGENT IN THE DESIGN, MANUFACTURE, OR WARNING OF THE INTEL PRODUCT OR ANY OF ITS PARTS.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined." Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request. Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order. Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or go to: <http://www.intel.com/design/literature.htm>.