Deploying the Internet of Things

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IoTG Intel Corporation.

Your solutions. Our technology.
Smarter together.
A look Ahead: Confident Predictions

New generations: Born connected

Rise of Mega-cities

A new middle class is emerging

10Bn people by 2050, 1 Planet Pressure on resources

Healthcare and Education For Billions of People
What’s making this all possible?

The SMAC Stack

Social Mobile

Analytics Cloud
“A strategic inflection point is an event that changes the way we think and act.”
Andrew Grove
Entrepreneur, Former Intel CEO
Gartner’s Hype Cycle

Are we heading into trough of disillusionment?
Convergence... Market Trends Driving IoT

EVERYTHING CONNECTED
- Pervasive
- Inexpensive

COMPUTE ECONOMICS
- Moore’s Law
- Storage to Sensors

BIG DATA AND ANALYTICS
- Data Science
- Cloud

Intel - Delivering Device to Cloud
INTERNET OF THINGS X BIG DATA: Unprecedented Value

- New devices being added every day – In 2013, .5 Billion “non-personal” devices were added to the network. *

- 85% of deployed systems are unconnected, do not share data with each other or the cloud. *

- $2.7 to $6.2 trillion of estimated global economic impact in 2025*

Sources: AMR, Pricewaterhouse, Gartner, IDC, McKinsey Global Institute, and various other industry analysts and commentators

THINGS - DATA - VALUE

Intel® Technology Provider
Connected Devices: Depend on Data Centers

SMARTPHONES
~400 DEVICES
drives
1 SERVER\(^1\)

CONNECTED FACTORY TOOLS
~40 DEVICES
drives
1 SERVER\(^2\)

MEDICAL WEARABLE DEVICES
~100 DEVICES
drives
1 SERVER\(^2\)

DIGITAL SIGNS
~20 DEVICES
drives
1 SERVER\(^2\)

1: Intel and 3rd party analysis
2: Intel estimate based on various end user proofs of concepts
What is the Internet of Things?
The Internet of Things is...

Devices that are connecting to the internet, integrating greater compute capabilities, and using data analytics and decision engines to extract meaningful information.
What is a Gateway?

Intel definition:

• Bolt on: Connect existing systems
• Aggregate sensor data
• Analyze data locally: filtering, real-time response
• Provide security to deliver trust, reliability
Intel Solutions
Intel’s Approach to IoT Gateways:

Aligning Assets to Deliver Value

Integrated, highly optimized platforms
Essential Tenets of Edge to Cloud IoT Solutions

- Monetize HW, SW, and Data Management
- Actionable Analytics
- Data Normalization
- Discovery and Provisioning
- Security as the Foundation - HW and SW
Benefits of Intel Gateway Solutions

Connectivity
- Pre-integrated connected capabilities enable rich network options to save development time and costs.
- Provides an extensive network of connectivity
  - Wired
  - Wireless
  - Cellular
  - Short-range

Security
- Protect devices for trust and control
- Protect the Device
- Protect the application
- Protect the data at rest and in flight

Manageability
- Enable common provisioning frameworks
- Enable remote, secure upgrades
- Provide web-based configuration utilities

All products, dates, and figures specified are preliminary based on current expectations, and are subject to change without notice.
Intel Gateways Solutions for IoT Software

Intel BSP: Board and Modules (Intel® Quark™ SoC, Intel® Atom™ SoC)

**Cloud Connector**
- Intel® BSP: Board and Modules
- Linux* 5.0.1

**Ecosystem**
- Apps & Services
- SI/ITOs, Customers

**Manageability**
- OMA DM
- TR-069
- Web Config
- Lua*
- Java*
- OSGi*

**Security**
- OpenSSL* Library
- SRM Signing Tool
- Certificate Management
- Secure Boot
- Application Integrity Monitor
- Application Resource Control
- Secure Package Management
- Encrypted Storage
- McAfee* Embedded Control

**Connectivity**
- 2G/3G/4G
- Bluetooth*
- Ethernet
- Zigbee*† Stack
- Serial / USB
- VPN
- WiFi Access Point
- MQTT

**Runtime Environment**
- McAfee* Embedded Control

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*Other names and brands may be claimed as the property of others.
†Enabled by third party hardware.
**Bay Trail On-A-Page**

**CORE**
- Intel® Atom™ 22nm Process Technology
- Estimated Speeds – 1.2GHz to 2.4GHz
- 1, 2 and 4 core SKUs
- 512Kb L2 cache per core
- Intel® 64, Intel® VT, XD Bit
- Extended Temp SKUs
- AEC Q100 Auto Qualified SKUs

**GRAPHICS, DISPLAY & MEDIA**
- 4 Intel Gen 7 Graphics Engines, x2 Display Pipes
  - Decode - H.264, MPEG1, MPEG2, MPEG4, VC1/WMV9
  - Encode – H.264, MPEG2
- 1 Integrated Imagination Technology* VXD392 Decode Engine
  - Decode - H.264, JPEG, VP8

**MEMORY**
- Dual & Single Channel SKUs
- DDR3L-1067/1333, ECC capable in single channel mode
- LPDDR2-800
- Max 8GB
- 32/64 bit width

**PACKAGES**
- Type-3 27x25mm, 0.593mm Ball Pitch
- Type-4 “HDI” 17x17mm, 0.4mm Ball Pitch

**STATUS: Launched since 8-OCT13**

**I/O HIGHLIGHTS**
- PCI Express® Gen II - Up to x4 lanes
- Intel® HD Audio or Low Power Audio
- Image Co-Processor
- MIPI-CSI Camera Interface
- Security Engine
  - Secure Boot
  - Blu-Ray* Content Protection (currently for automotive use)
- Wide Range of I/O (e.g. SATA2, USB 2.0 Host, USB 3.0, SDIO, SPI, I²C, PS, UARTs)
Intel® Quark™ “Liffy Island” (LFI) SoC – The Right Stuff

- **Quark™ Processor Core**
  - Single Quark CPU Core, Single Thread
  - 32 bit, 533MHz
  - 64KB L1 with ECC
  - ~1.5 DMIPs/MHz

- **Processor UnCore**
  - 2GB DDR3/DDR3L @ 1066MTs
    - ECC-On-Chip
  - 1MB Embedded SRAM
  - Legacy Block
    - PC compatible IO ports, APICs, etc.
    - 50MHz Quad Legacy SPI for boot code
  - Low cost 5-pin JTAG Port

- **Physical**
  - NEW Package
  - FC BGA bare die
  - 0.593 Ball Pitch
  - Enables FR4 SFF Board

- **Industry Standard Software Support**
  - Standard Compiler Support
  - Pentium ISA Compatibility (.586)
  - Runs unmodified Linux Kernels
  - Yocto based distribution
  - Validated w/ Moon Island and VxWorks
  - Open Source UEFI EDK II
  - GRUB boot loader support
  - Open OCD Debugging support
  - Compliant with PCIe, USB, ACPI standards

- **Security**
  - Secure Boot Technology
  - Supervisory Mode Execution Protection
  - Secure Recovery for UEFI FW
  - Secure Remote Upgrade w/ WR IDP
  - Custom Keys (Field Programmable Fuses)
  - Secure Attestation updates

- **Industry Standard I/O Hardware**
  - 2 - x1 PCIe* with Root and End Point
  - 2 - GbE w AVB Switch option
  - 2 - USB2 host ports (EHCI, OHCI)
  - 4 - HS UART controller
  - 4 – 25 MHz SPI ports for peripherals
  - 1 – USB2 HS Device port
  - 1 - SD/SDIO/eMMC interface
  - 3 – I2C Host controller
  - 1 - 8 Channel ADC
  - 1 – CAN bus with HS/LS port
  - 1 – 12S support for Audio
  - 40+ - GPIOs w prog interrupts
  - Up to 24 PWM

- **Electricals**
  - Single xtal for internal/external clocks
  - Enabled Single std external VR solution

- **Thermals**
  - TDP = ~2W with LP skus available <1.5W
  - Extended temp -40 to +85°C
  - Programmable Thermal sensor

*PCle Gen 2 features, Gen1 speed to save power
E2E Compute Scalability: Flexible Intelligence

Edge Compute

Gateway

Network/Cloud Compute

Intel® Technology Provider
Combines the simplicity of the Arduino development environment with the performance of Intel technology and the capabilities of a full Linux software stack.
Intel® Edison Family:
Supporting the long tail via Expansion Boards
Use Cases
Industries with Highest Potential Value

Industrial Automation  
Energy Grid  
Transportation
…Have Long Replacement Cycles

Industrial Automation: 5-25 Years
Energy Grid: 10+ Years
Transportation: 5-10 Years

Gateways “bolt on” to existing assets
Capture existing data and address the installed base
Fleet Management

**Problem**
Rising fuel costs, environmental concerns, driver safety, and unpredictable maintenance problems

**How It Works**

Vehicle sensor data is collected

*Other names and brands may be claimed as the property of others*
Smart Building - HVAC

**Problem**
Equipment and building control are not integrated. HVAC units require technicians to maintain and adjust the unit for optimal performance.

**How It Works**

- Reduced Energy Costs
- End-to-End Security
- Connecting New and Legacy Units

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Connected Beer Keg

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Summary

Intel has launched scalable gateway solutions for IoT

Integrated with foundational HW, SW, and security building blocks

Securely connects and aggregates data from the edge to the cloud

Simplifies the development process and deployment of IoT gateways

Delivers value by accelerating business transformation
For More Information Go To: www.intel.com/iot