Edison Overview

Ajay Mungara
Senior Product Manager
Software and Services Division
Intel Corporation
The Internet of Things is... Intelligence Everywhere

50B Devices

44 Zettabytes

Sensors

Home/Industrial

Gateway

Network

DC/Cloud

Mobile

Cost of Sensors Past 10 Years: 2x

Cost of Bandwidth Past 10 Years: 40x

Cost of Processing Past 10 Years: 60x

* IDC

** IMC/EDC: The Digital Universe of Opportunities

*** Goldman Sachs

New Devices Group

Intel
The Intel® Edison development platform is designed to lower the barriers to entry for a range of Inventors, Entrepreneurs and consumer product designers to rapidly prototype and produce IoT and wearable computing products.
The Intel® Edison Offering

Maker

Pro-Maker & Entrepreneur

Consumer IoT

Light Ind. IoT

Hardware

Edison Module + Derivatives

Expansion Boards

Software

Yocto + Various Runtimes, IDE & Developer Tools

Cloud

Developer cloud solution and partner-based solutions for scale

Support

Managed on-line community, trouble ticketing, drawings, schematics, datasheets, code libraries, webinars, etc.

Ecosystem

ISVs, Incubators, Crowd Source funders & SIs

Pro-

Maker & 
Entrepreneur

IoT

No extended temp or life

Cloud

Developer cloud solution and partner-based solutions for scale
Retail Configurations

- **Maker**
  - **Intel® Edison Kit for Arduino***
    - $85 RCP

- **Pro-Maker & Entrepreneur**
  - **Intel® Edison Breakout Board Kit**
    - $60 RCP

- **Consumer IoT**
  - **No extended temp or life**

- **Light Ind. IoT**

- **Intel® Edison Module**
  - $50 RCP
Intel® Edison
Compute Module
What will you make?
Intel® Edison Mechanical Layout

Top Side
- eMMC 4Gbyte
- WiFi/BT 4.0 module
- Embedded 2.4/5 GHz Antenna
- Antenna COAX
- USB ULPI Transceiver

Bottom Side
- 70 PIN I/O Connector
- Processor and DDR POP Memory
- PMIC

Dimensions:
- 25mm
- 35.5mm
## Physical

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form Factor</td>
<td>Board with 70-pin connector</td>
</tr>
<tr>
<td>Dimensions</td>
<td>35.5 x 25.0 x 3.9 mm max</td>
</tr>
<tr>
<td>C/M/F</td>
<td>Blue PCB with Shields / No enclosure</td>
</tr>
<tr>
<td>Connector</td>
<td>Hirose DF40 Series (1.5mm, 2.0mm, or 3.0mm stack height)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 – 40 degC</td>
</tr>
</tbody>
</table>

## External Interfaces

Total of 40 GPIOs which can be configured as:

<table>
<thead>
<tr>
<th>Interface</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD Card</td>
<td>1 Interface</td>
</tr>
<tr>
<td>UART</td>
<td>2 Controllers (1 full flow control, 1 RX/TX)</td>
</tr>
<tr>
<td>I2C</td>
<td>2 Controllers</td>
</tr>
<tr>
<td>SPI</td>
<td>1 Controller with 2 chip selects</td>
</tr>
<tr>
<td>I2S</td>
<td>1 Controller</td>
</tr>
<tr>
<td>GPIO</td>
<td>Additional 12 (with 4 capable of PWM)</td>
</tr>
<tr>
<td>USB 2.0</td>
<td>1 OTG Controller</td>
</tr>
<tr>
<td>Clock Output</td>
<td>32 KHz, 19.2 MHz</td>
</tr>
</tbody>
</table>

## Power

<table>
<thead>
<tr>
<th>Input</th>
<th>3.3V – 4.5V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output</td>
<td>100ma @3.3V and 100ma @ 1.8V</td>
</tr>
<tr>
<td>Power</td>
<td>Standby (No radios): 13mW</td>
</tr>
<tr>
<td></td>
<td>Standby (BT 4.0): 21.5mW (BTLE in Q4’14)</td>
</tr>
<tr>
<td></td>
<td>Standby (WiFi): 35 mW</td>
</tr>
</tbody>
</table>

## Major Edison Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SoC</td>
<td>22-nm Intel® SoC that includes a dual-core, dual-threaded Intel® Atom™ CPU at 500Mhz and a 32-bit Intel® Quark™ microcontroller at 100 MHz</td>
</tr>
<tr>
<td>RAM</td>
<td>1 GB LPDDR3 POP memory (2 channel 32bits @ 800MT/sec)</td>
</tr>
<tr>
<td>Flash Storage</td>
<td>4 GB eMMC (v4.51 spec)</td>
</tr>
<tr>
<td>WiFi</td>
<td>Broadcom* 43340 802.11 a/b/g/n; Dual-band (2.4 and 5 GHz)</td>
</tr>
<tr>
<td></td>
<td>On board antenna or external antenna</td>
</tr>
<tr>
<td></td>
<td>SKU configurations</td>
</tr>
<tr>
<td>Bluetooth</td>
<td>BT 4.0</td>
</tr>
</tbody>
</table>

## Firmware + Software

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU OS</td>
<td>Yocto Linux* v1.6</td>
</tr>
<tr>
<td>Development Environments</td>
<td>Arduino* IDE</td>
</tr>
<tr>
<td></td>
<td>Eclipse supporting: C, C++, &amp; Python</td>
</tr>
<tr>
<td></td>
<td>Intel XDK supporting: Node.JS &amp; HTML5</td>
</tr>
<tr>
<td>MCU OS</td>
<td>RTOS</td>
</tr>
<tr>
<td>Development Environments</td>
<td>MCU SDK and IDE</td>
</tr>
</tbody>
</table>

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(e) = Electronic component
Intel® Edison
Expansion Boards
Intel® Edison Family: *Supporting the long tail via Expansion Boards*
Intel® Edison Board for Arduino*

**Market position:** Similar to Arduino Yun (Arduino Sketch, Linux, WiFi & BT)

**Board I/O:** Compatible with Arduino Uno (except only 4 PWM instead of 6 PWM)

- 20 digital input/output pins including 4 pins as PWM outputs
- 6 analog inputs
- 1 UART (RX/TX)
- 1 I2C
- 1 ICSP 6-pin header (SPI)
- Micro USB device connector OR (via mechanical switch) dedicated standard size USB host Type-A connector
- Micro USB device (connected to UART)
- SD Card connector
- DC power jack (7V – 15V DC input)
Market position: The Edison Breakout board is for non-Arduino users. This breakout board has a minimalistic set of features and is slightly larger than the Edison module.

Board I/O:

- Exposes native 1.8V I/O of the Edison module
- .1” grid I/O array of through-hole solder points
- USB OTG with USB Micro Type-AB connector
- USB OTG power switch
- Battery Charger
- USB to device UART bridge with USB Micro Type-B connector
- DC power supply jack (7V – 15V DC input)
Software included in the IoT Dev Kit:

• The Yocto* Linux system
  • Provides resources for creating applications in various programming languages: C/C++, Python, Node.js and visual programming

• Integrated Development Environments (IDEs) and Tools
  • Allows developers to create, run and debug applications directly on the Galileo and Edison boards: Eclipse* (C/C++), Intel® XDK IoT Edition (Node.js), Wyliodrin* (Visual)
  • Intel® System Studio for IoT: development suite that provides deep hardware and software insights to speed development, testing and optimization

• Intel® IoT Analytics
  • Provides cloud APIs for data collection, data visualization, reports, rules engine and analytics

• Middleware libraries
  • Provides developers high level API access to Galileo and Edison boards and middleware libraries to easily control the various sensors and actuators
Edison Developer Options

Cloud
- Arduino* Developer
- Java script Developer
- Embedded Developer
- Visual Programming
- MCU Developer

IDE
- Arduino* IDE Win */ Mac*
- Intel XDK Win*/ Mac*/ Linux*
- Eclipse Win*/ Mac*/ Linux*
- Wyliodrin* Web
- Win*/ Mac*/ Linux*

Programming Language
- Arduino* Sketch C++
- Javascript (Node JS)
- C/ C++/Python
- Visual Javascript
- C/C++

Tools/ Libraries
- Arduino* Libraries
- Intel XDK
- ISS
- Wyliodrin*
- MCU SDK

OS / Boot Image
- Yocto Linux* 1.6
- RTOS

Coming mid 4Q (subject to change)

Coming late Sept.

* Windows is a registered trademark of Microsoft Corporation in the United States and other countries. Other names and brands may be claimed by the property of others by all third party name and the notation.
Edison Release 1 Software Stack

**Software License Types**
- GPL License
- MIT License
- Branded or Licensed Binary
- On Die Silicon based ROM
- PaaS

**Tools / Support Software**
- Native SDK
- Flash Tools
- Debug
- GDB
- Yocto Build System

**Edison Cloud**
- Cloud Services Portal
- Device Registration
- User Profile

**Middleware**
- Messaging
- D2D / D2C Connectivity
- mDNS
- MQTT
- 0MQ
- Connman
- IO LibC

**Arduino (Hosted Software)**
- Arduino IDE
- Core Libraries
- Download Client
- Cross-Compilers

**Poky-Linux v3.10 Platform BSP**
- Tangier Support in Kernel
- USB Gadget
- USB Storage
- Supplicant
- Wi-Fi STA
- BlueZ
- BT + LE
- GPIO
- I2C Master
- PWM
- SPI Master
- UART
- RTC
- Thermal
- Watchdog

**OS Loader**
- U-boot

**Firmware**
- IFWI
- Wi-Fi
- BT

**Trusted Boot**
- Trusted Boot ROM
# Intel® Edison R1 Software Support

## Firmware
- Intel IFWI (Integrated Firmware Image) in binary

## OS Loader
- U-Boot version (2nd stage bootloader in source)

## Kernel/BSP
- Yocto Linux 1.6
- Linux kernel v3.10.17

## Tools
- Native SDK
  - Standard compiler support (GCC 4.8.2), GLIB 2.38.2
  - Standard debugger support GDB 7.6.2
- Custom Tools: Flash tools (DFU-Util ; XFSTK for stitching & flashing)

## Additional Developer Tools & Environments
- Arduino IDE for Mac, Windows and Linux OS
  - Cross compilers for each of the host
  - Core Arduino Libraries
- Node.js (Supported by Intel® XDK)
- Python (This package is part of BSP)

## Cloud
- Web Portal, Identity Management, User Profile
- Device Registration; Device Data Upload/Visualization

## WLAN/BT Connectivity (BCM43340)
- Firmware in Binary: WiFi STA and BT+LE
- Drivers in source: BRCM kernel drivers, WiFi Supplicant and BlueZ

## Middleware
- Connectivity framework for simplified D2D and D2C
  - Networking, Messaging, privacy/security
## Intel® Edison R2 Software Support - December 2014

### Firmware
- Intel IFWI (Integrated FirmWare Image) in binary

### OS Loader
- U-Boot version (2nd stage bootloader in source)

### Kernel/BSP
- Yocto Linux 1.6
- Linux kernel v3.10.17

### Tools
- Native SDK
  - Standard compiler support (GCC 4.8.2), GLIB 2.38.2
  - Standard debugger support GDB 7.6.2
- Custom Tools: Flash tools (DFU-Util ; XFSTK for stitching & flashing)

### Additional Developer Tools & Environments
- Arduino IDE for Mac, Windows and Linux OS
  - Cross compilers for each of the host
  - Core Arduino Libraries
- Node.js (Supported by Intel® XDK)
- Python (This package is part of BSP)

### WLAN/BT Connectivity (BCM43340)
- Firmware in Binary: WiFi STA and BT+LE
- Drivers in source: BRCM kernel drivers, WiFi Supplicant and BlueZ

### Middleware
- Connectivity framework for simplified D2D and D2C
  - Networking, Messaging, privacy/security
- Connectivity Framework Enhancements
  - Bluetooth Support
- Expanded I/O Library Support
  - JavaScript & Python Bindings, Additional Sensors

### Cloud
- Web Portal, Identity Management, User Profile
- Device Registration; Device Data Upload/Visualization
- Portal Enhancements & Back-end Integration
- RESTful Device Data Access
- Device Messaging & Notification with Third-Party Service Integration
- OTA Software Installation & Update
- Logging Features
- Hosted IDE for Cloud-based Services
- Online Forums

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**Release 2 Deltas from Release 1 in blue**
Intel® IoT Analytics Platform

• Provides seamless Device to Device and Device to Cloud communication
• Ability to run rules on your data stream that trigger alerts based on advanced analytics
• Foundational tools for collecting, storing, and processing data in the cloud
• Free for limited and non-commercial use
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Rev.  4/15/14