

IoT All the Things

An audit of popular chipsets
for your product.

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Kevin Hoyt

Developer Advocate

Cloud Strategy

IBM

- Internet of Things
- Microservices
- Cognitive/AI
- Web Standards
- Emerging Technology



Transportation
Security
Administration

NOTICE OF BAGGAGE INSPECTION

To protect you and your fellow passengers, the Transportation Security Administration (TSA) is required by law* to inspect all checked baggage. As part of this process, some bags are opened and physically inspected. Your bag was among those selected for physical inspection.

During the inspection, your bag and its contents may have been searched for prohibited items. At the completion of the inspection, the contents were returned to your bag.

If the TSA security officer was unable to open your bag for inspection because it was locked, the officer may have been forced to break the locks on your bag. TSA sincerely regrets having to do this, however TSA is not liable for damage to your locks resulting from this necessary security precaution.

For packing tips and suggestions on how to secure your baggage during your next trip, please visit:

www.tsa.gov

We appreciate your understanding and cooperation. If you have questions, comments, or concerns, please feel free to contact the TSA Contact Center:

Toll-free telephone: 1.866.289.9673



NAME: Electric Imp

SIZE: 10.0 x 7.90mm

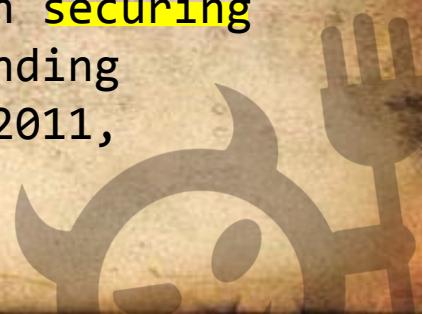
GPIO: 23

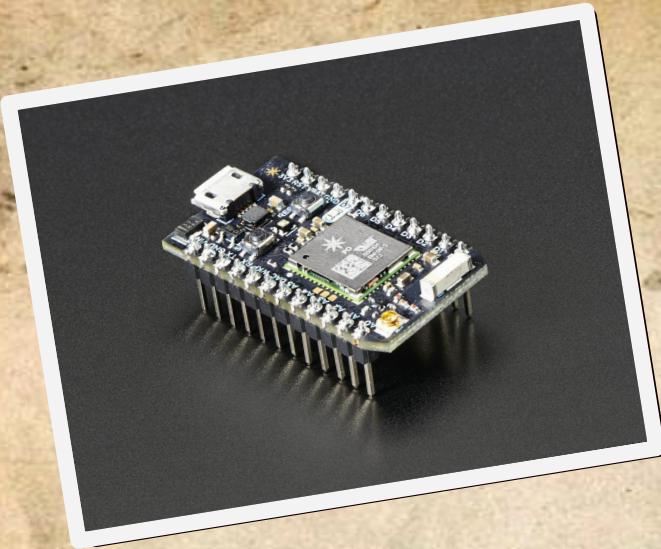
CPU: ARM M4F (144MHz)

RAM: 130kb (application)

WIFI: BlinkUp

With a penchant for sleeping down to 6uA, the Imp is ideal for extended battery deployment. Obsessive focus on securing communications between device and cloud. Patent pending BlinkUp pairing method can be finicky. Founded in 2011, customers include Budweiser and Quirky (GE).





NAME: Particle Photon

SIZE: 20 x 28mm

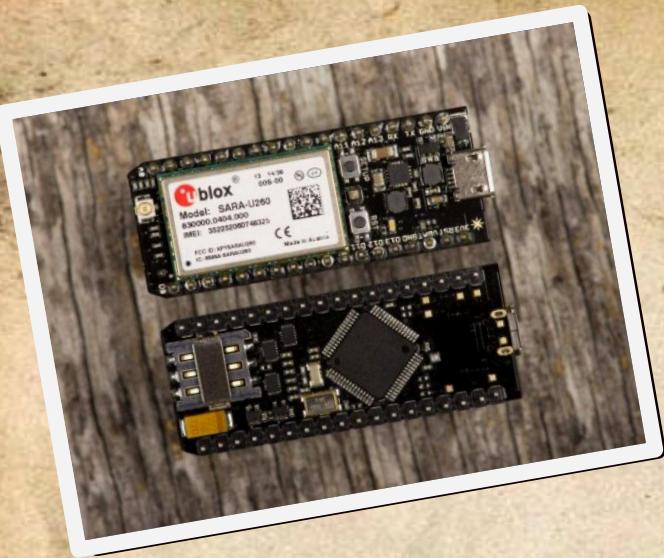
GPIO: 18 mixed-signal

CPU: ARM M3 (120MHz)

RAM: 1Mb flash, 128kb RAM

WIFI: Soft AP

This young, hip, kid is a Kickstarter phenomenon. With open source tendencies and robust tooling, the path to production is clearly mapped. Struggles with security. Occasional awkwardness as features blaze the trail ahead. Watch out for requirements on exposing hardware [REDACTED], project.



NAME: Particle Electron

SIZE: 0.80 x 2.05"

GPIO: 30 mixed-signal

CPU: ARM M3 (120MHz)

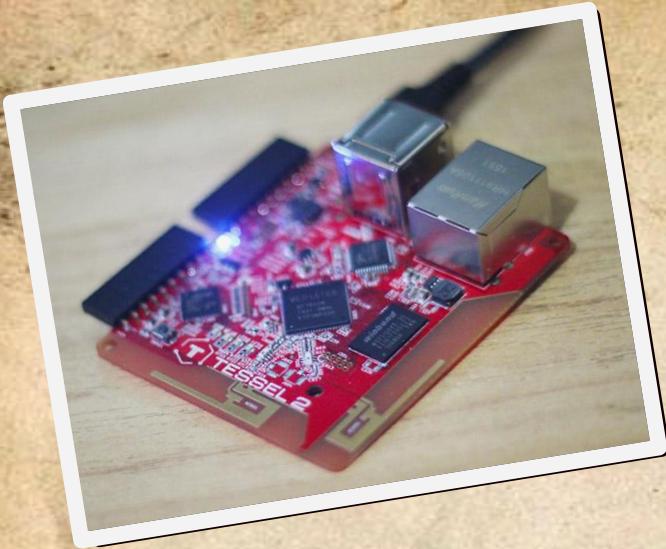
RAM: 1Mb flash, 128kb RAM

WIFI: Cellular

No pairing! Cellular wireless connectivity in over 100 countries. Preference for UDP passes along data cost savings.

Vendor is an MVNO which streamlines configuration and deployment. Ideally suited for M2M/industrial IoT deployments. Watch that battery consumption.





NAME: **Tessel 2**

SIZE: 0.80 x 2.05”

GPIO: 16 (7 analog), USB

CPU: Mediatek (580MHz)

RAM: 32Mb flash, 64Mb RAM

WIFI: Manual, Ethernet

Really a **single board computer** that presents itself like a microcontroller. **OpenWRT** operating system runs **Node.js**. Modules make for easy expansion, while USB makes it even easier. **Unclear path to production**, but product is FCC and CE certified. **Open governance**.





NAME: Intel Edison

SIZE: 35.5 x 25.0mm

GPIO: 70, 40 interfaces

CPU: Atom dual-core

RAM: 4Gb flash, 1Gb RAM

WIFI: Manual, Bluetooth

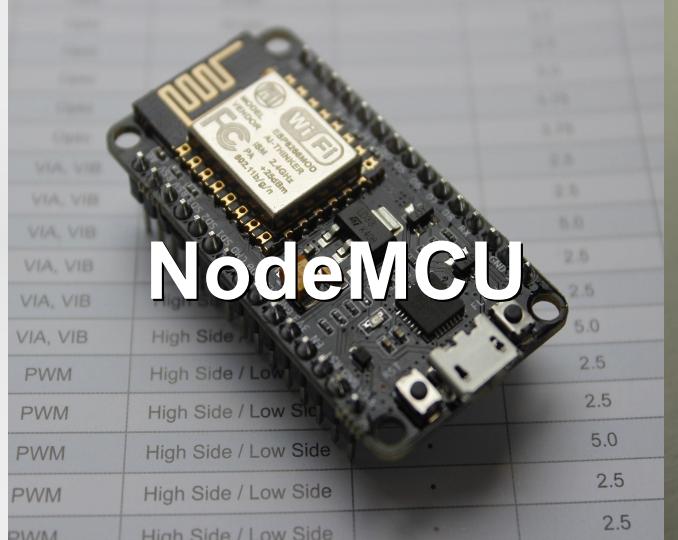
A powerhouse platform, especially adept when **performance is key** (audio, video, robotics). System on module form factor makes for **difficult integration**. Runs off **1.8V** making it incompatible with most other sensors without additional circuitry. ~~Updated March 2016~~



**SparkFun
Thing**



NodeMCU



**Arduino
MKR1000**



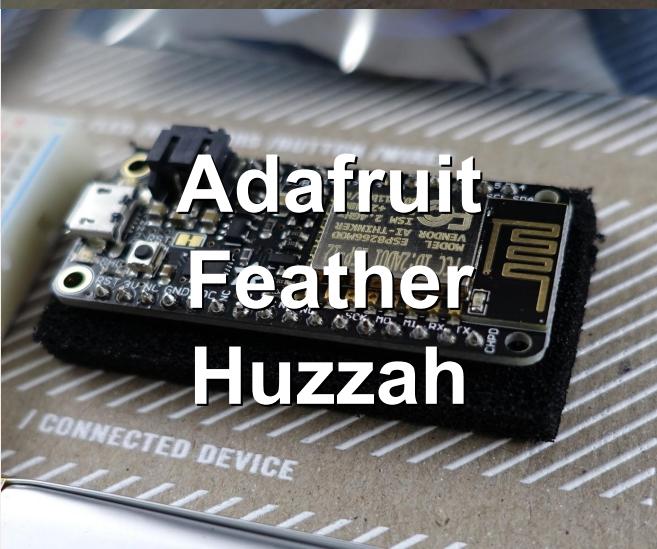
**Light Blue
Bean**



**Onion
Omega**



**Adafruit
Feather
Huzzah**



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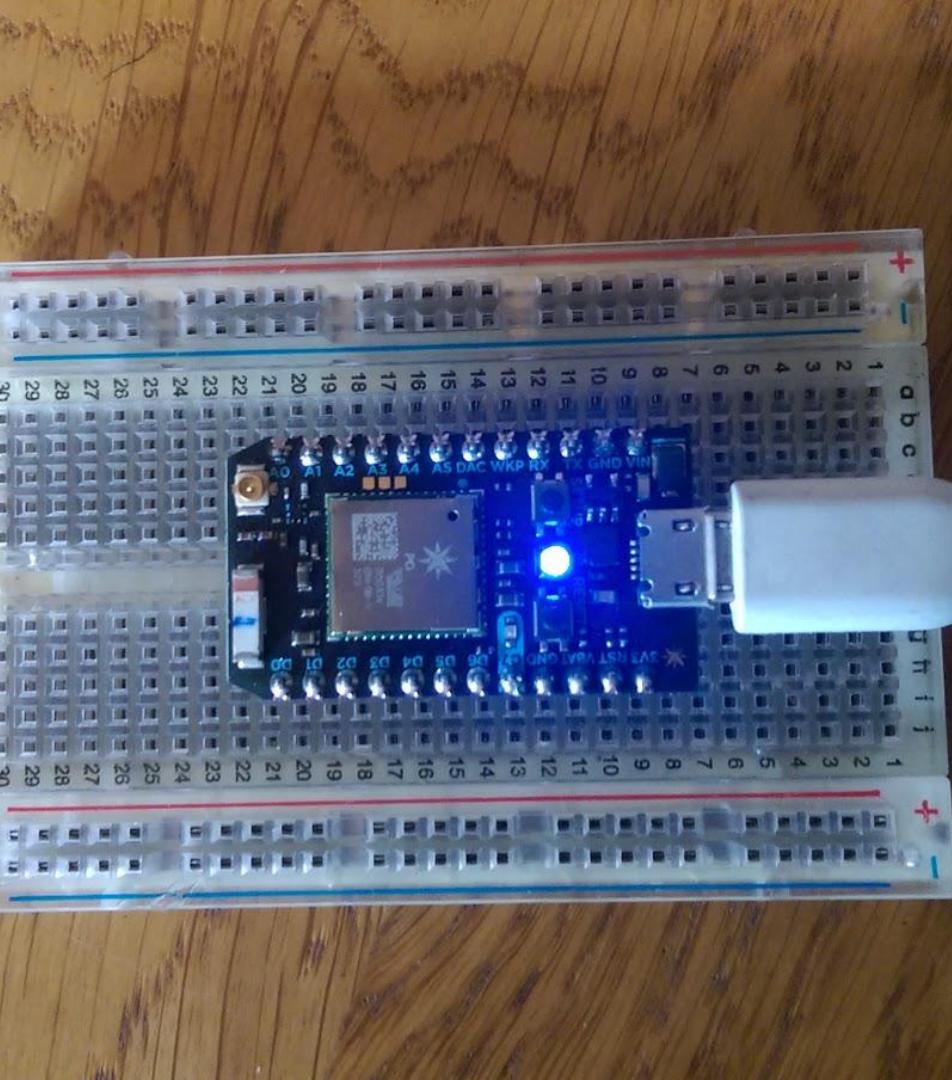
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Electric Imp

Page O' Data (Electric Imp)

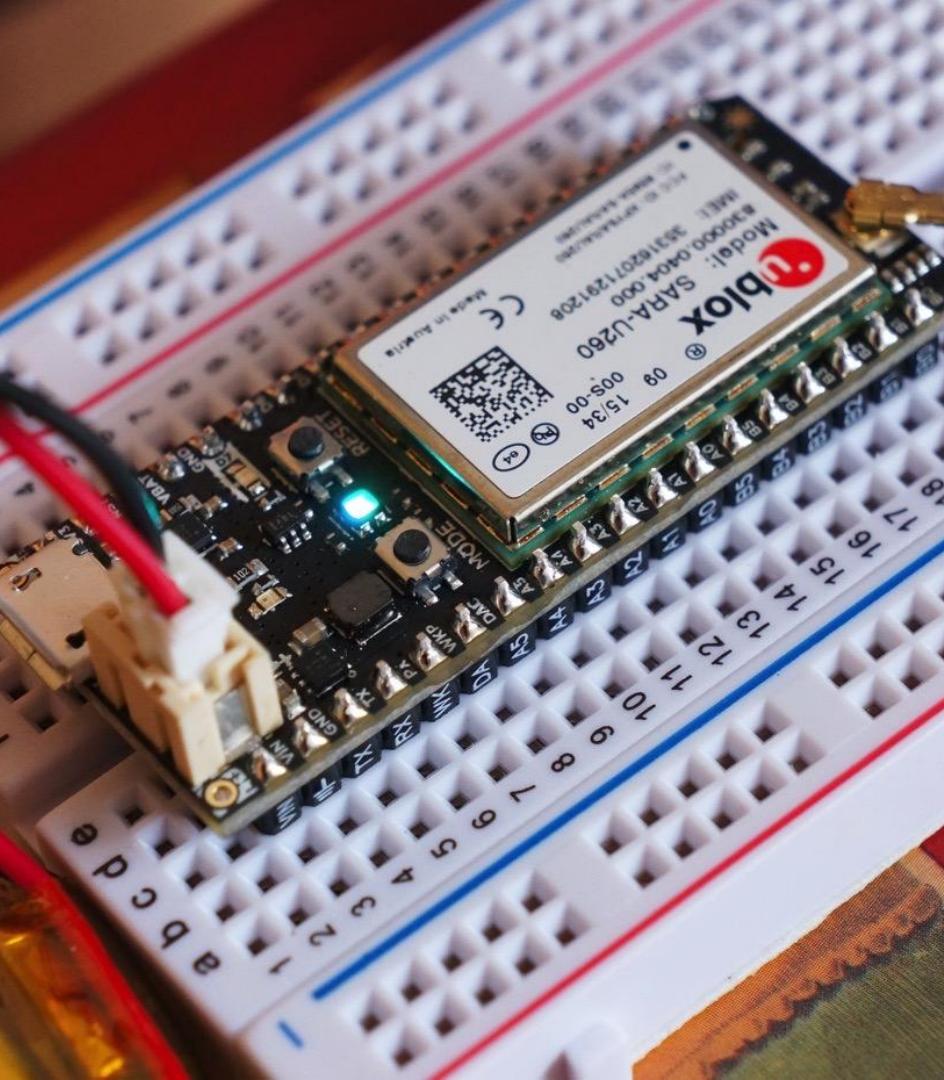
- Founded in 2011, launches in 2012, customers in market by 2013
- Customer relationships with Budweiser, Quirky (and GE), Lockitron
- Imp 001 (SD card), Imp 002 (SMD), Imp 003 (Murata mass production)
- Hardware runs Imp OS, which is an RTOS based on eCos (modified)
- Imp Cloud is the only endpoint devices can connect to, running agents (TLS)
- Imp BlinkUp is a patent pending method for communicating wireless settings
- ARM Cortex M3, six I/O (UART, SPI, I2C, analog, PWM, GPIO), 802.11 b/g/n
- Sleep down to 6uA, program with browser-based Imp IDE using Squirrel
- Hundreds of skeptical comments on SparkFun, almost all answered by Hugo
- Imp BlinkUp can be finicky (or unavailable), but an otherwise stellar platform



Particle Photon

Page O' Data (Particle Photon)

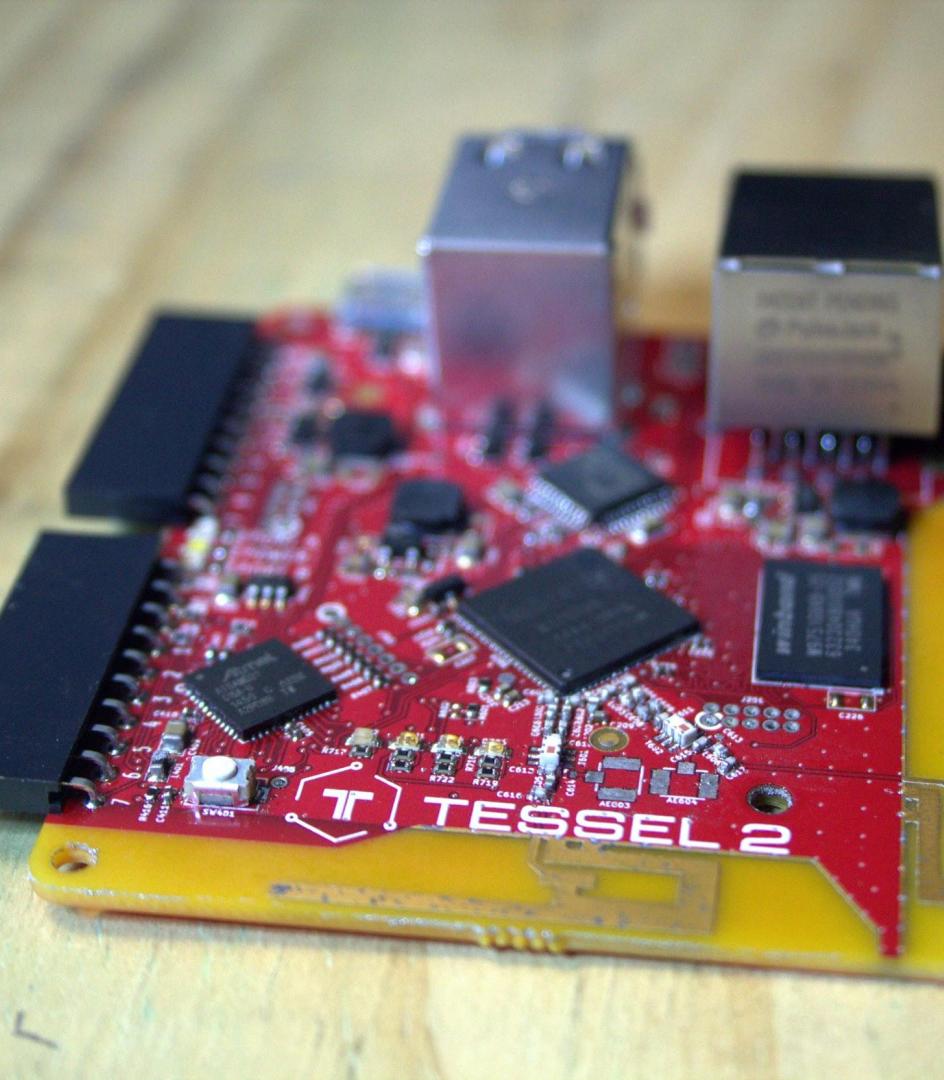
- Originally Spark Core, launched on Kickstarter in May 2013
- Rebranded to Particle, launched Photon in November 2014
- Development board at \$19, with SMD options at \$12 and \$10
- ARM Cortex M3 using Broadcom WICED module for wireless
- 1MB Flash, 128KB RAM, 802.11 b/g/n, FCC/CE/IC certified
- Same Wiring framework as Arduino, with cloud-based IDE
- Mobile SDKs for custom UI, CLI, JavaScript (Node.js, browser)
- Robust Particle Cloud for OTA, REST API, and WebHooks
- Schematic, firmware, and Cloud software all open source
- Products require surfacing RGB LED and at least one button



Particle Electron

Page O' Data (Particle Electron)

- 2G/3G board that gives you global cellular connectivity (u-blox)
- 2G kit (global) at \$49.00, with 3G kit (America/Aus or Eur/Asia/Afr) at \$69.00
- ARM Cortex M3 and other MCU specifications identical to Particle Photon
- 36 pins (28 GPIO) at 2" x 0.08" x 0.03" (0.05" with headers)
- Particle is a Mobile Virtual Network Operator (MVNO), 100+ countries
- Data cost \$2.99 per month (with 1MB), and \$0.99 per additional 1MB
- Development locally (avoid OTA costs) or through Particle Build (browser)
- Uses UDP for data savings; 67 bytes for message, 61 bytes ping (23 minutes)
- Can use HTTP and sockets, but with more data cost versus publish function
- IoT everywhere is awesome, but may be more than many projects require

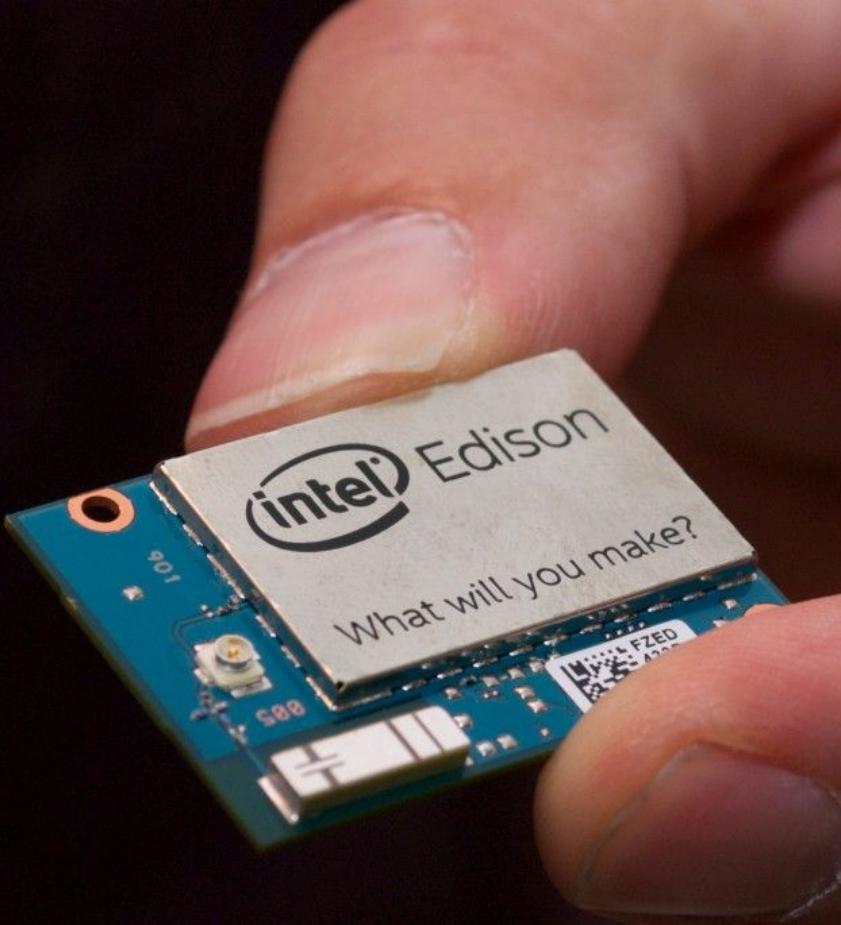


Technical Machines

Tessel 2

Page O' Data (Tessel 2)

- Original Tessel funded through Dragon Innovation in October 2013
- Tessel 2 announced in March 2015 with a \$35 price point (half \$75 original)
- 580MHz router system on a chip (Mediatek) running OpenWRT (Linux)
- 64MB of RAM, 32MB flash storage, 2 x USB 2.0 ports, micro USB, ethernet
- 48MHz ARM Cortex M0, 802.11 b/g/n, 16 GPIO as two “module” ports
- Wide assortment of pre-built “modules” make it easy to add sensors
- Supports development with JavaScript (Node.js on V8), Python, Rust
- Need one more line
- Open source, but also open governance, so you can be involved in the future
- The original Tessel fit nicely in an Altoids tin, while Tessel 2 is awkward



Intel Edison

Page O' Data (Intel Edison)

- Announce in January 2014 with release in September 2014 at \$50
- Initially heavy marketing around wearables (35.5mm x 25mm x 3.9mm)
- Intel Atom dual-core CPU at 1.8V runs Yocto Linux, Ubilinux (Debian)
- Fast enough to run OpenJDK and a MySQL database without problems
- 802.11 b/g/n and Bluetooth 4.0 with 1GB RAM and 4GB flash storage
- 70 pin connector nets 20 GPIO (4 PWM), six analog, Rx/Tx, I2C, SPI
- System on module (SoM) design requires additional boards to be useful
- Gigantic Arduino development kit, or SparkFun “blocks” shield form factor
- Development kit update to 3.0 in March 2016 includes System Studio IDE
- Currently popular where performance is critical (audio/video, robotics)

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Appendix

