Embedded Conference Helsinki

TinyML – The 3rd Wave of Embedded Compute

May 2019

Zach Shelby
VP Developers, Arm

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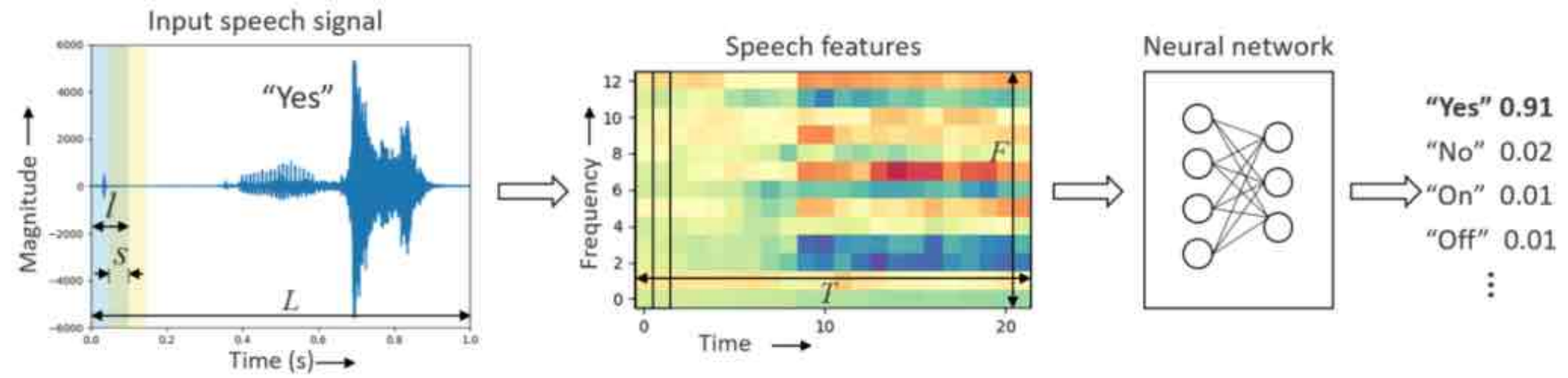
Machine learning

Tiny
Machine learning



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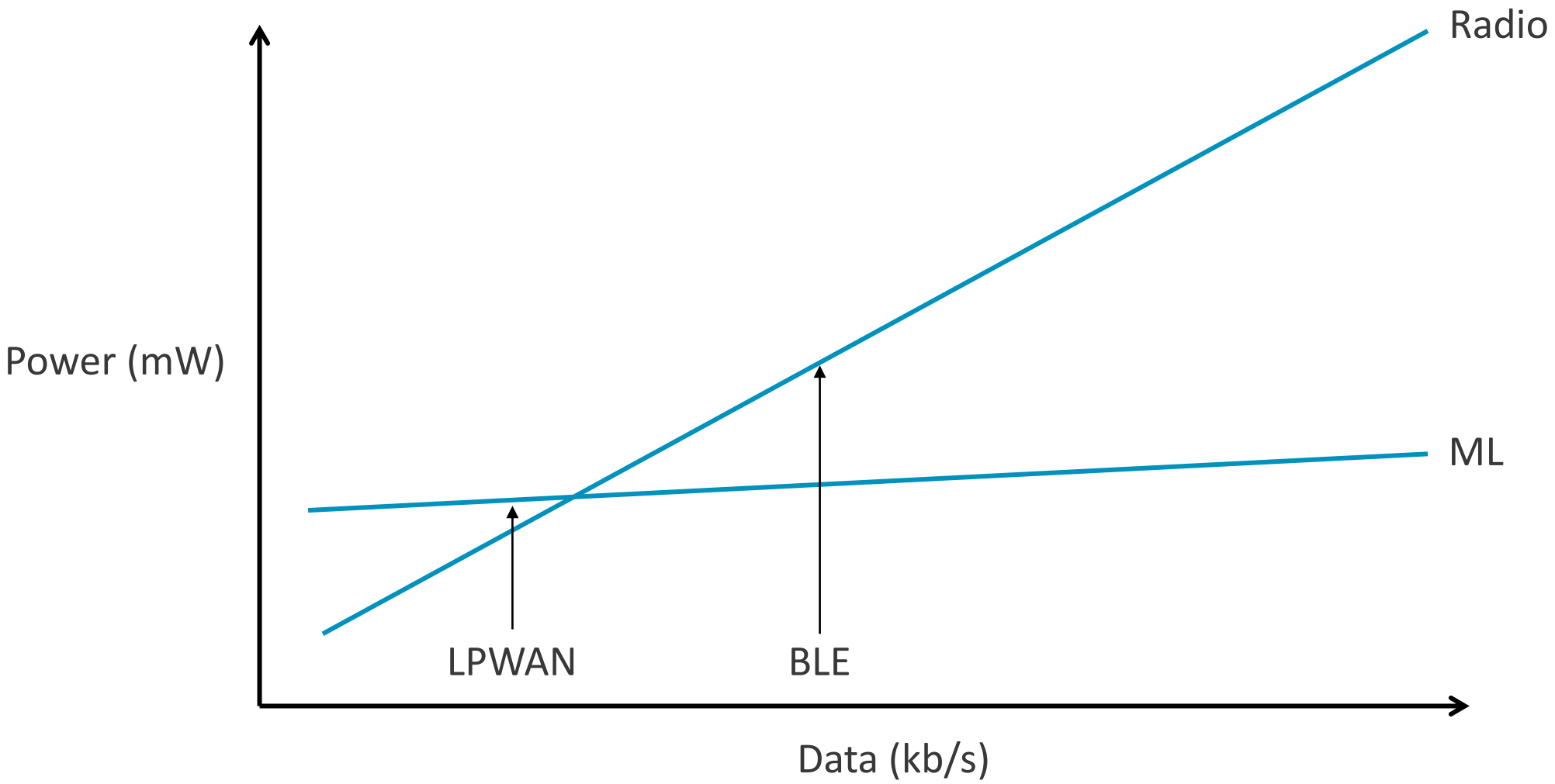
The Compute or Transmit Tradeoff



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The 1st Wave – Code Things

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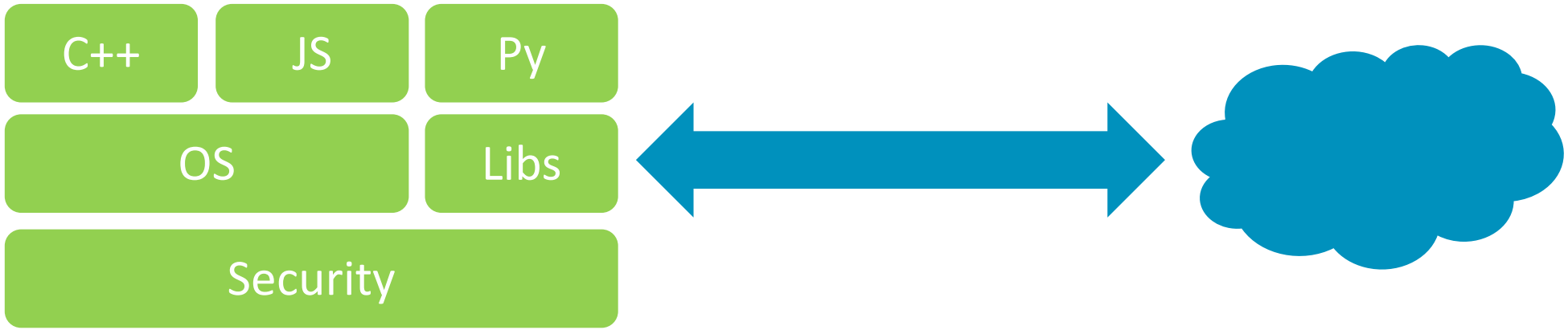
The 2nd Wave – Connect Things



2010s Interpreted, Connected, Secure

1980s Machine Code, Embedded, Safety

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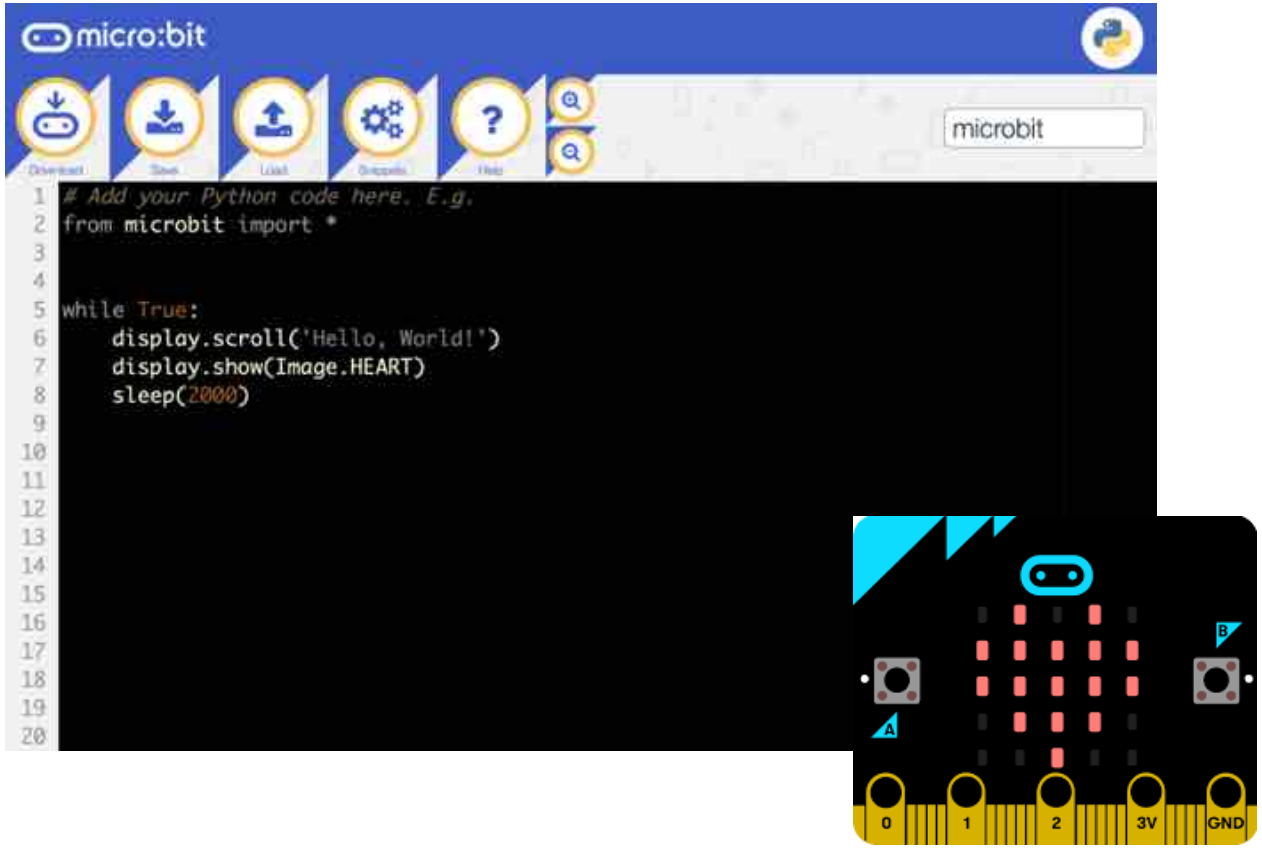
Application Developers - Here to Stay



http://mbed.com/js

http://microbit.org

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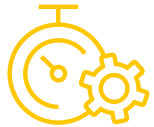
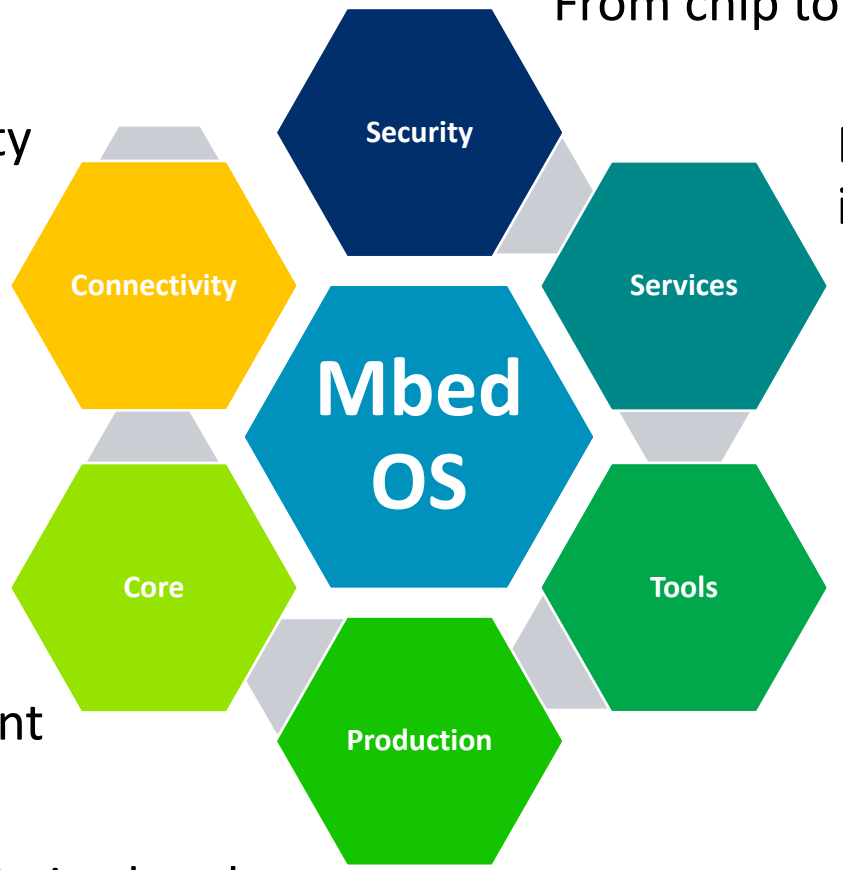
Mbed – Driving the Transition to Platform OS

Comprehensive connectivity from BLE to Wi-Sun

From chip to cloud

Data to any cloud and integrated management





Partners

Customers Developers

Low-power and minimal footprint

Productivity for professionals

Optimized path to production and scale

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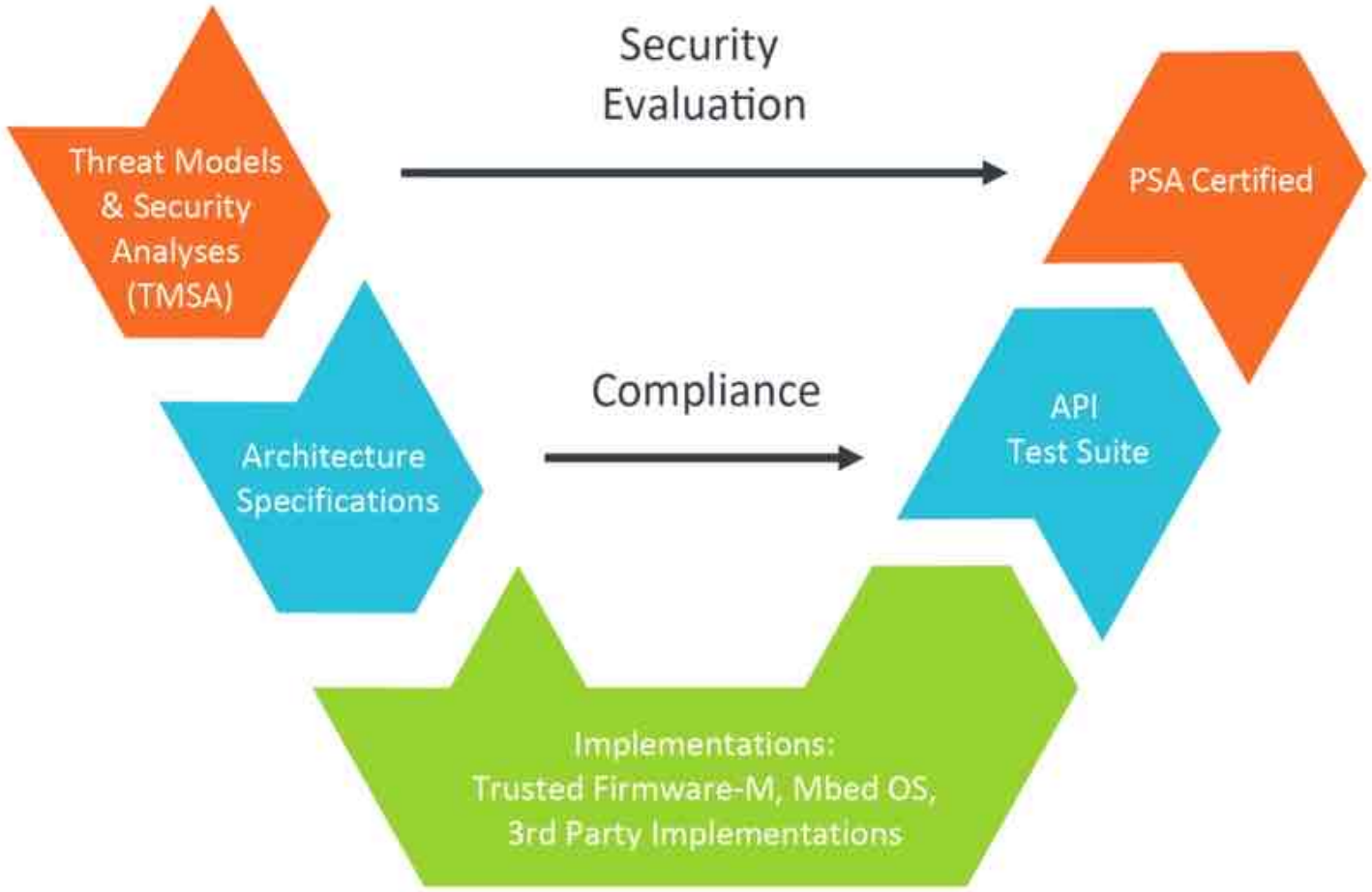
Platform Security Architecture (PSA)

PSA security framework

- PSA Functional API Certification checks compliance to PSA architectural specifications.
- PSA Certified tests that the correct level of security robustness has been implemented, as defined by the analyze phase.



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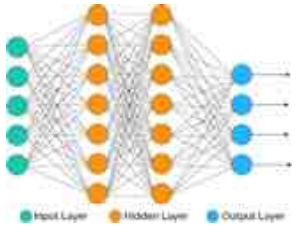
The 3rd Wave – Train Things!

App | App | ML

OS | Libs

Security



2020s Machine Learning

2010s Interpreted, Connected, Secure

1980s Machine Code, Embedded, Safety

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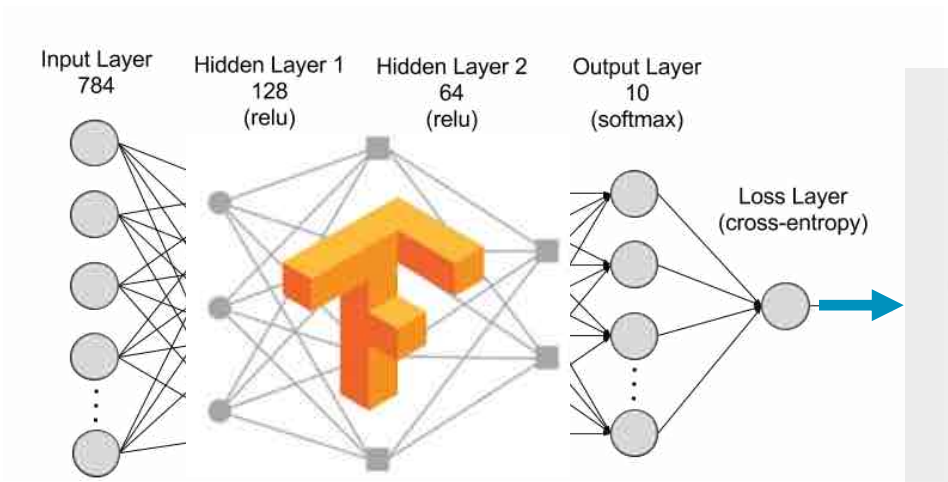
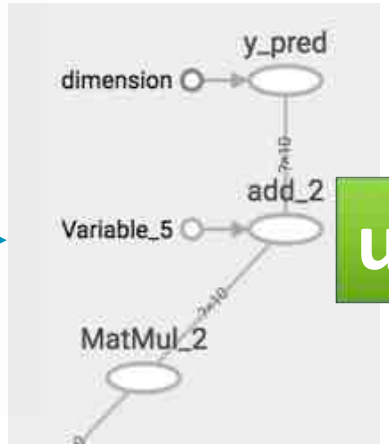
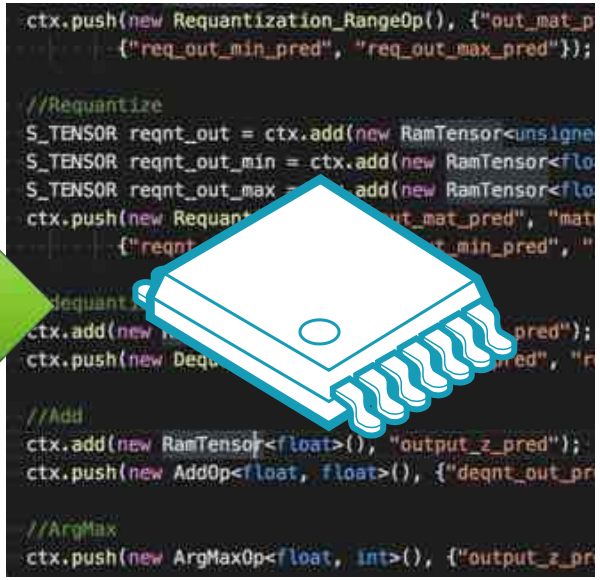
uTensor





Graph

uTensor



C++

Tensorflow

Mbed

http://utensor.ai

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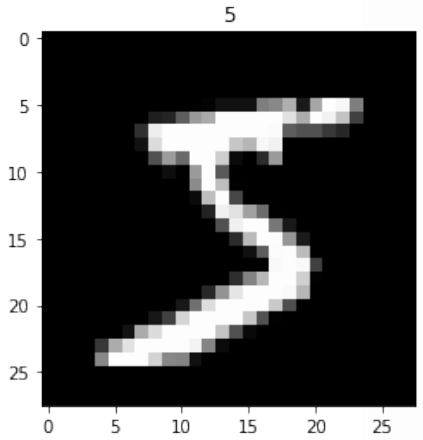
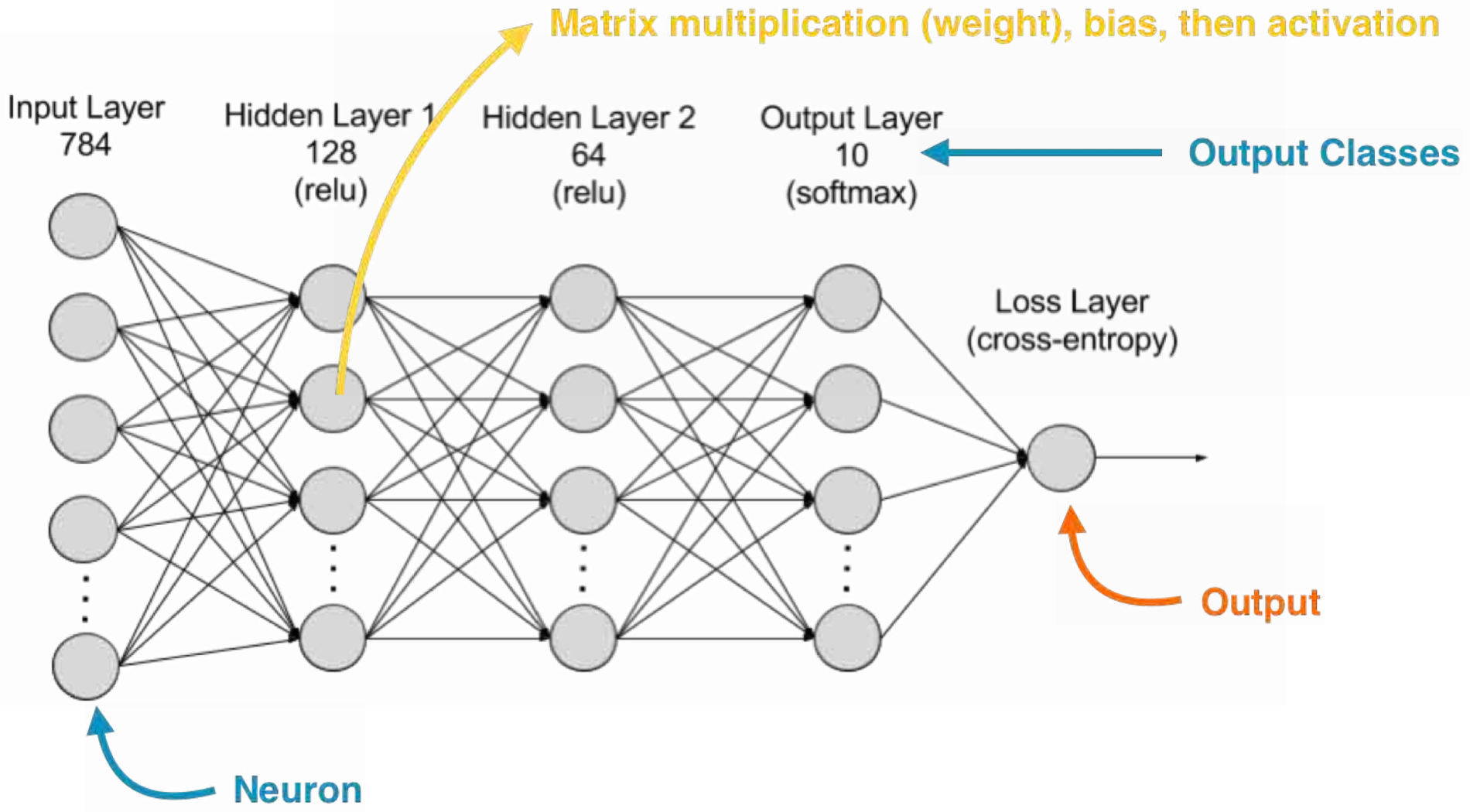
This is a Neural Network





https://mxnet.incubator.apache.org/tutorials/python/mnist.html

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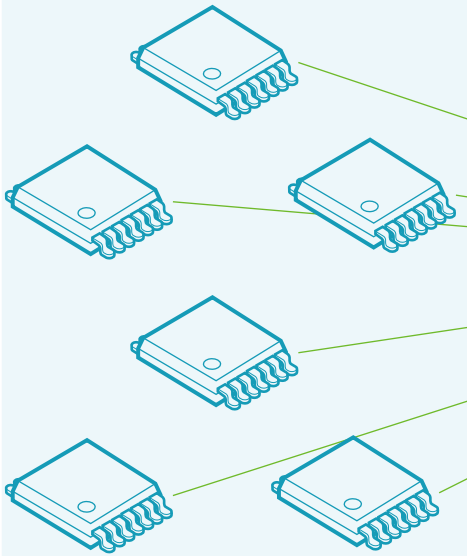
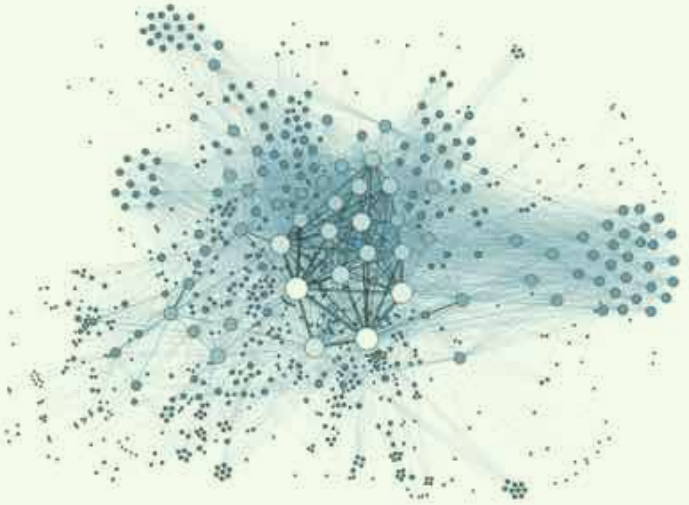
Use-Case: Anomaly Detection



LoRa

arm PELION
CONNECTIVITY MANAGEMENT



Devices

Cloud

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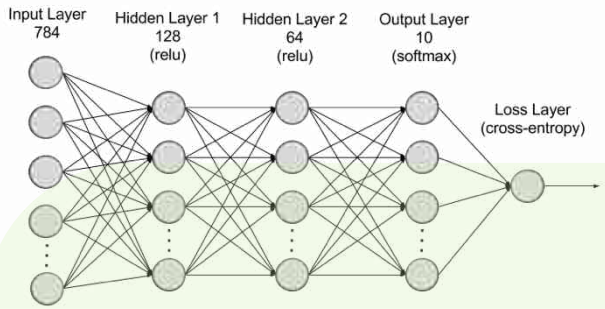
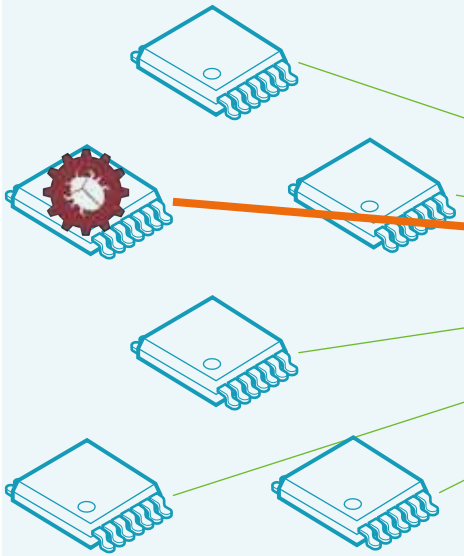
Neural Network Update via FOTA





LoRa

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Devices

Cloud

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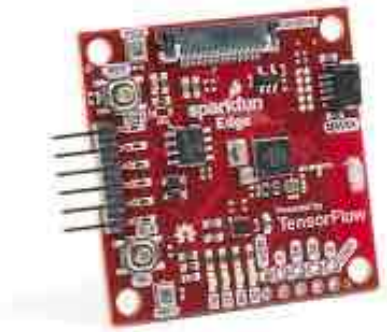
TensorFlow Lite + arm microTensor



https://www.tensorflow.org/lite/microcontrollers/overview

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TinyML is Coming…. Ready?

- Within 5 years, ML will be common in embedded products
- 40% of all developers want to learn more about ML [Slashdata]
- It’s just math!

https://developers.google.com/machine-learning/crash-course/

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