AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

IOT208

Connecting embedded devices doesn’t have to be complex

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IoT Device Services
AWS

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Founder & CEO
ēdn

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Agenda

Connecting to the cloud is hard

A maturing industry

Evolution of an idea: AWS IoT ExpressLink

Let’s get started

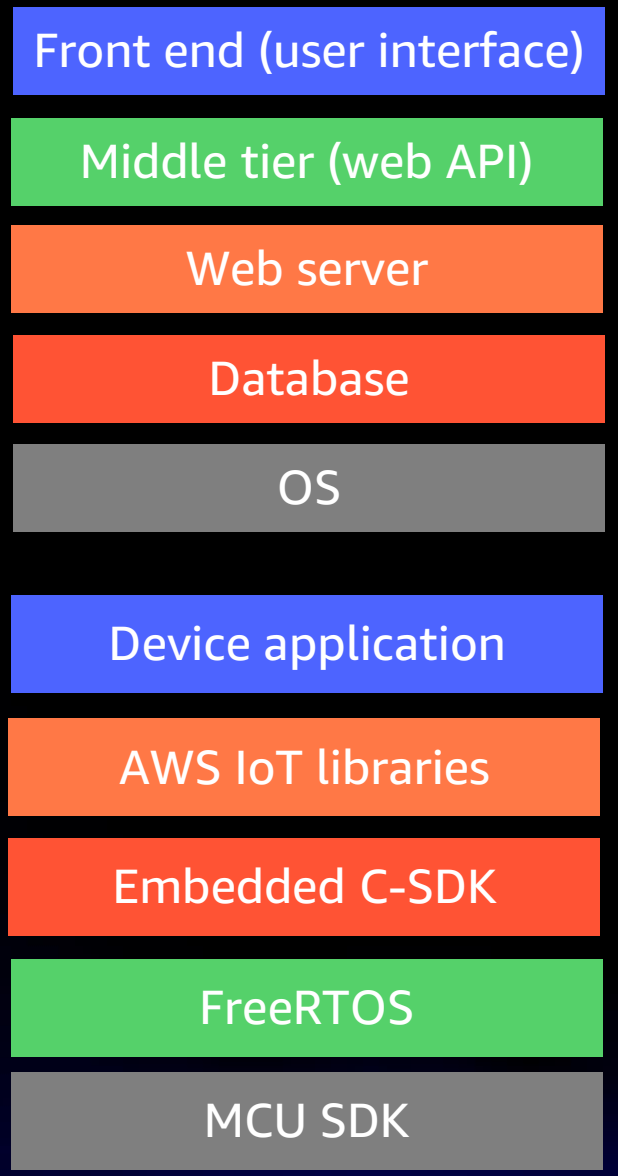
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Connecting to the cloud is hard

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How full is your stack?

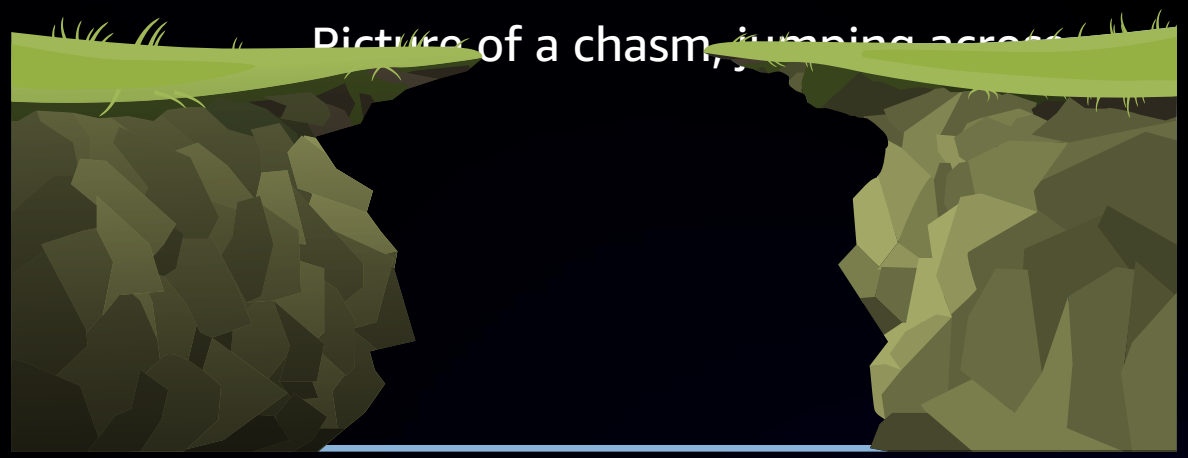
- The development stack describes the complexity of modern (web) application development
- A full stack developer is a precious commodity
- But the **IoT development stack** is even taller



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The gap

There is a large gap between device and cloud development expertise

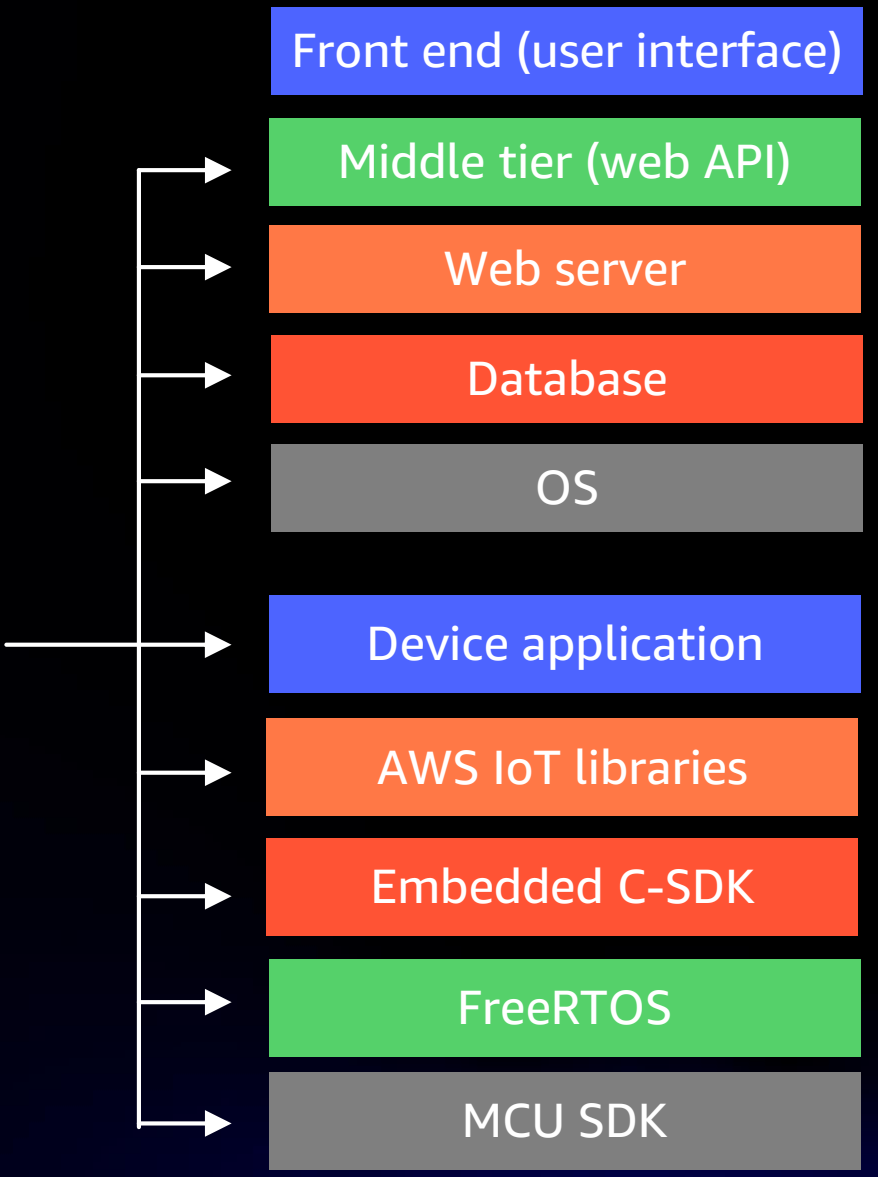


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Here be dragons

- Complexity hides vulnerabilities
- 50,000 LOC are not uncommon
- It's not enough to get it working
- It must be secure
- It must be maintained for years to come

- Full stack IoT developers are mythical creatures



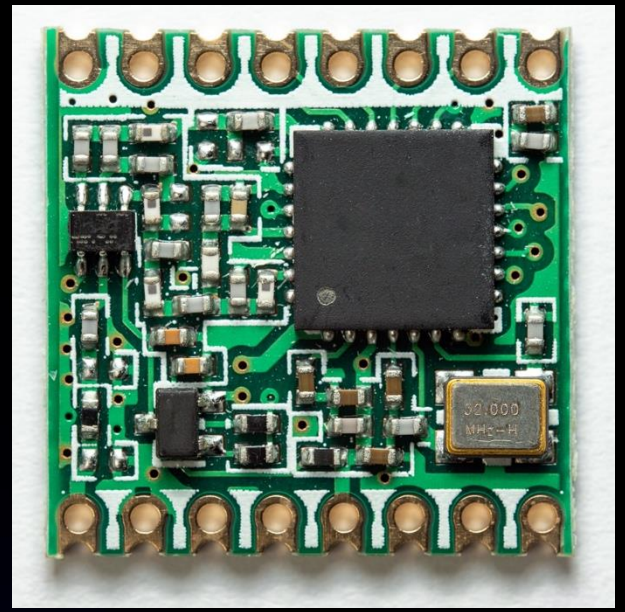
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Constrained devices

- All devices have limitations, embedded devices more so
  - RAM and flash memory
  - Processing speed
  - Power/battery life
  - Interfaces and I/Os
  - Size

- These make the IoT challenge even greater



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“. . . Survey Reveals Close to Three-Fourths of IoT Projects Are Failing”
https://newsroom.cisco.com/press-release-content?articleId=1847422



“Why do IoT projects fail?”
https://www.iot-now.com/2020/02/05/101076-iot-projects-fail/

“Why do IoT projects fail and how do the other 42% succeed?”
https://www.techaheadcorp.com/blog/why-iot-projects-fail/

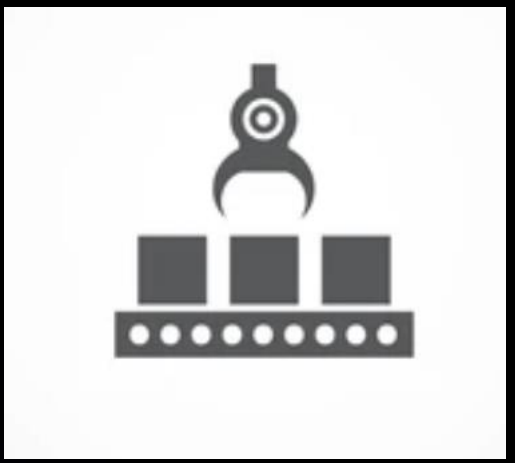
“100 Million More IoT Devices Are Exposed—and They Won’t Be the Last”
https://www.wired.com/story/namewreck-iot-vulnerabilities-tcpip-millions-devices/amp

aws

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Undifferentiated work

- All IoT devices connecting securely to the cloud must:
  - Connect to a physical layer (for example, Wi-Fi radio)
  - Establish TCP/IP communication
  - Reach an AWS IoT endpoint
  - Upgrade to a secure socket interface (TLS)
  - Perform mutual authentication
  - Log into an MQTT broker
  - Subscribe to topics
- **None** of this is related to the customer experience



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Introducing Ryan Woltz, Founder & CEO of ēdn

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“I am the Lorax. I speak for the trees. I speak for the trees for the trees have no tongues.”

Dr. Seuss, *The Lorax*

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ēdn now

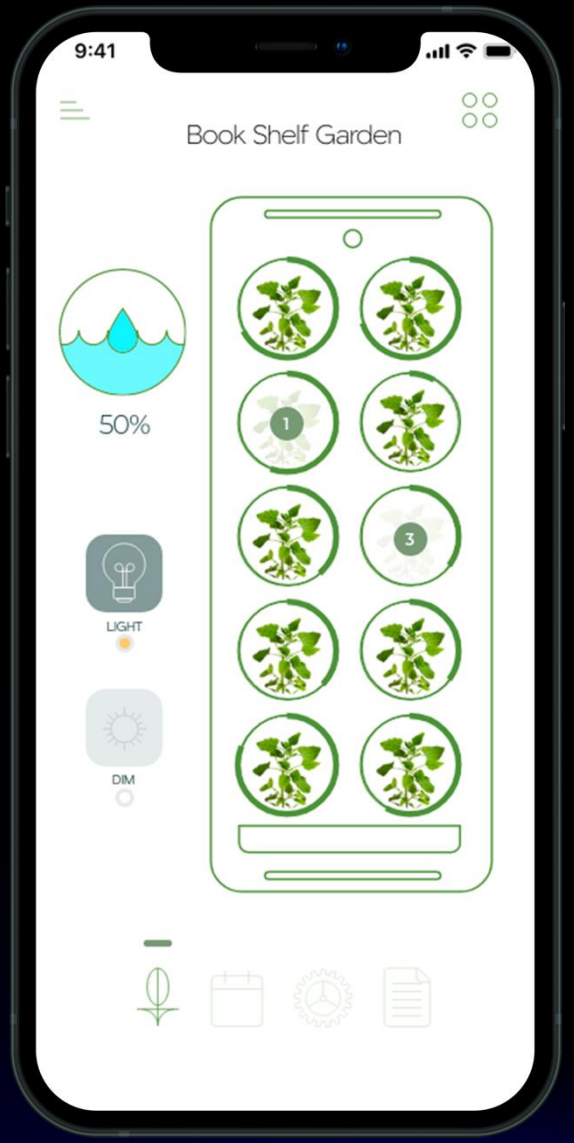
Cherry Tomatoes are ready!
Your cherry tomatoes are ready to harvest! Earn + 5pts by harvesting today!

ēdn today

Your friend Lori wants to share her garden!
Share Lori's garden to help her grow and maybe even share in the harvest!

ēdn tomorrow

Share your progress!
Share your progress on Instagram and join our growing community +10pts!



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IoT is the foundation

- The idea, prototyping, going to market, *Shark Tank*



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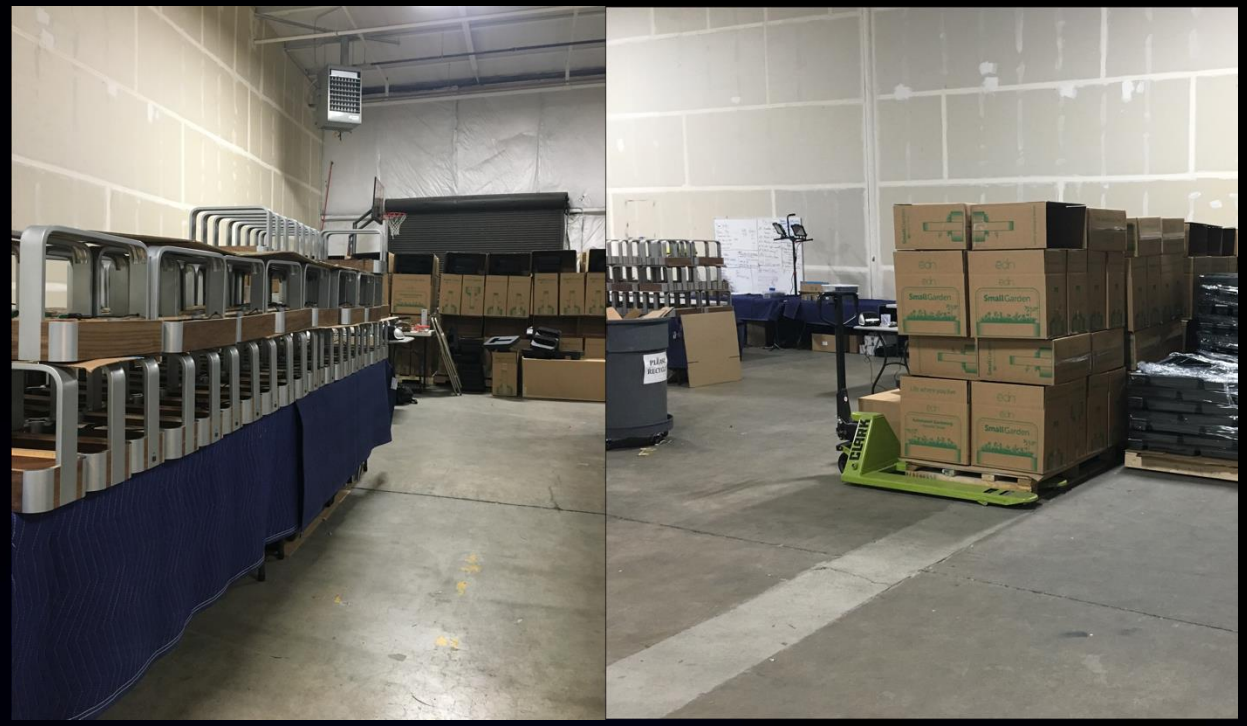
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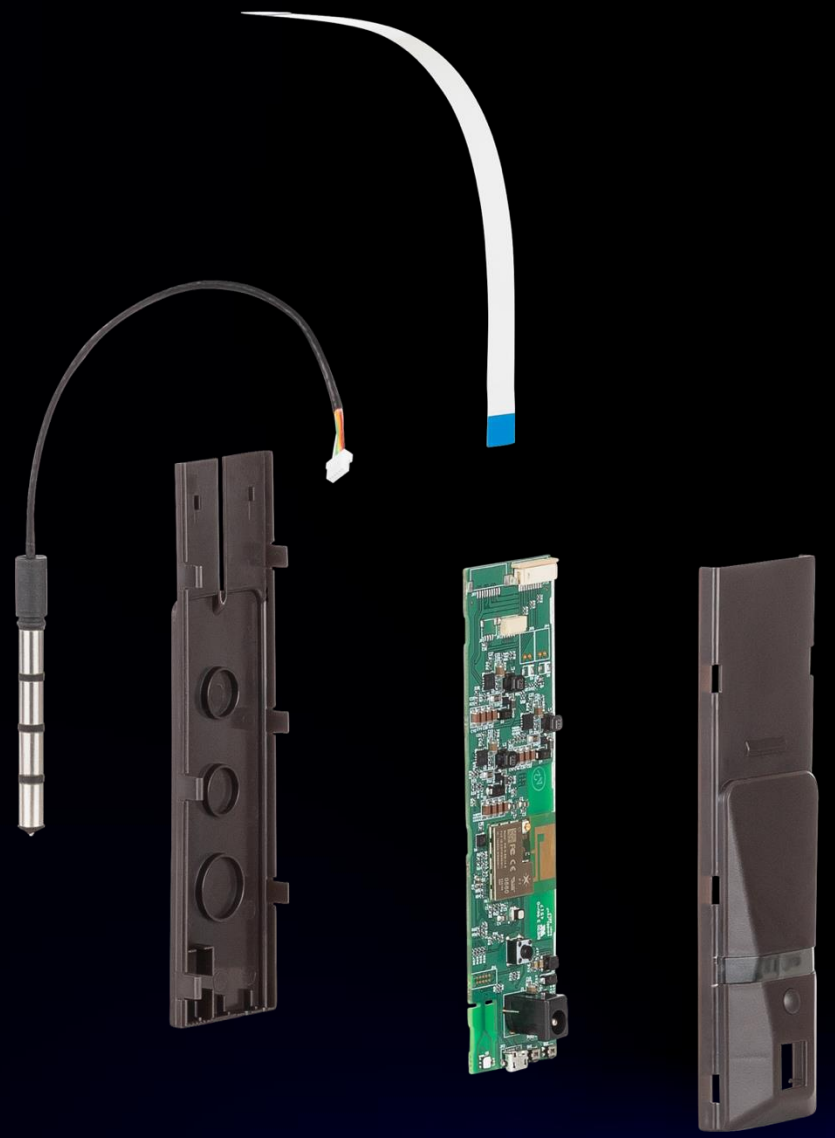
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IoT is the foundation

- The idea, prototyping, going to market, *Shark Tank*
- Making it IoT
  - Processors
  - Cloud providers



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IoT is the foundation

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  - Cloud providers
  - Firmware
  - Certifications

```
    if attribute in ['lightOn']:
        value = bool(strtobool(value))
    elif attribute in [
        'lightBrightness', 'growLightAutoOnTime', 'growLightAutoOnDuration', 'growLightAutoOnBrightness',
        'growLightAutoOffTime', 'growLightAutoOffDuration', 'growLightAutoOffBrightness', 'moistureSensorThreshold', 'debugEnable
        value = int(value)

    desired_dict['state']['desired'][attribute] = value

    payload = json.dumps(desired_dict)
    message_bytes = payload.encode('ascii')

    logger.debug('Sending shadow update to AWS IoT..')
    response = get_iot_data_client().update_thing_shadow(
        thingName=serial_number,
        payload=message_bytes
    )
    logger.debug('Response from AWS IoT is:')
    logger.debug(response['payload'].read())


def monitor():
    parser = argparse.ArgumentParser(description='Monitor attribute changes over time for a given serial number')

    parser.add_argument('serial_number', help='The serial number beginning with esgXXXXXXXXXX')
    parser.add_argument('attribute_of_interest', help='The attribute to monitor from the MQTT topic (e.g., debugOutput)')

    parser.add_argument('--out', help='A path to a directory to store the monitored results (e.g., /tmp)')
    parser.add_argument('--log-level', help='The log level to use (e.g., DEBUG)', default='INFO')
    args = parser.parse_args(sys.argv[ARGS_INDEX:])

    serial_number = args.serial_number
    attribute = args.attribute_of_interest
    out_path = args.out
    log_level = args.log_level

    log_level = logging.getLevelName(log_level)
    logger.setLevel(log_level)

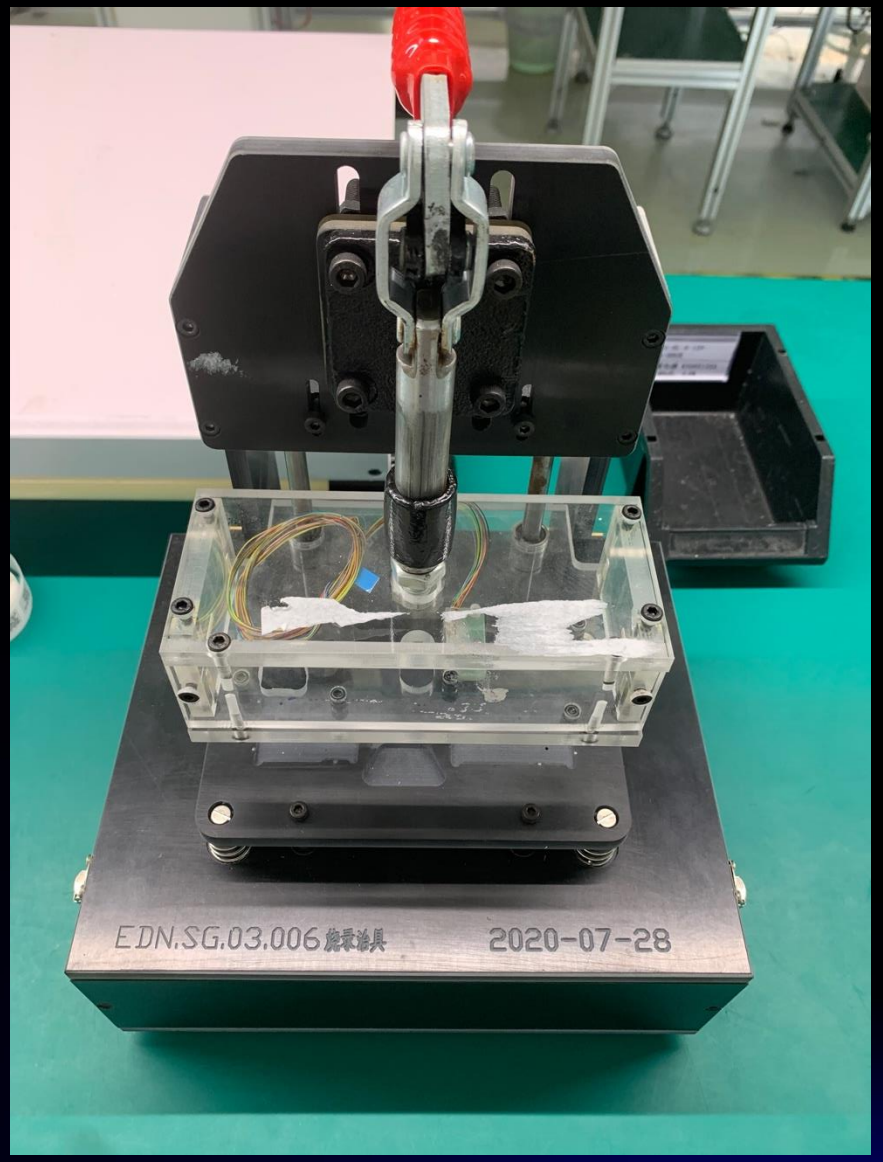
    mqtt_shadow_client = get_mqtt_shadow_client()
    mqtt_shadow_client.connect()
    logger.debug('Connection established')

    logger.debug('Registering shadow handler.')
    device_shadow_handler = mqtt_shadow_client.createShadowHandlerWithName(serial_number, True)
    # Shadow operations
    # device_shadow_handler.shadowRegisterDeltaCallback(ShadowDeltaCallback().callback)
```

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  - Cloud providers
  - Firmware
  - Certifications
  - Flashing fixtures



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  - Firmware
  - Certifications
  - Flashing fixtures
  - Testing, testing, testing



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IoT is the foundation

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  - Cloud providers
  - Firmware
  - Certifications
  - Flashing fixtures
  - Testing, testing, testing
  - Oh, and don’t forget security



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Firmware is harder than hardware

- Focus on innovating
- Recreating the wheel ≠ value
- Move quickly and easily to differentiate our product
- Security and reliability at scale



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A maturing industry

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A maturing industry

- Past the IoT hype curve, is IoT a maturing industry?
- In the early 1900s car manufacturers started from wood and sheet metal, assembling every part of a car bolt by bolt
- Today it's a tiered system of OEMs supplying modules and large subsystem: engines, dashboards, interiors, electronic systems
- We have witnessed a similar evolution (but faster) in the mobile phone world: Baseband module, Wi-Fi module, BLE module, display subsystem, capacitive touch, battery management, and more



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Accelerating IoT growth

- Modules and subsystems enable rapid development
- Specialization provides quality and reliability
- The result is growth and faster innovation

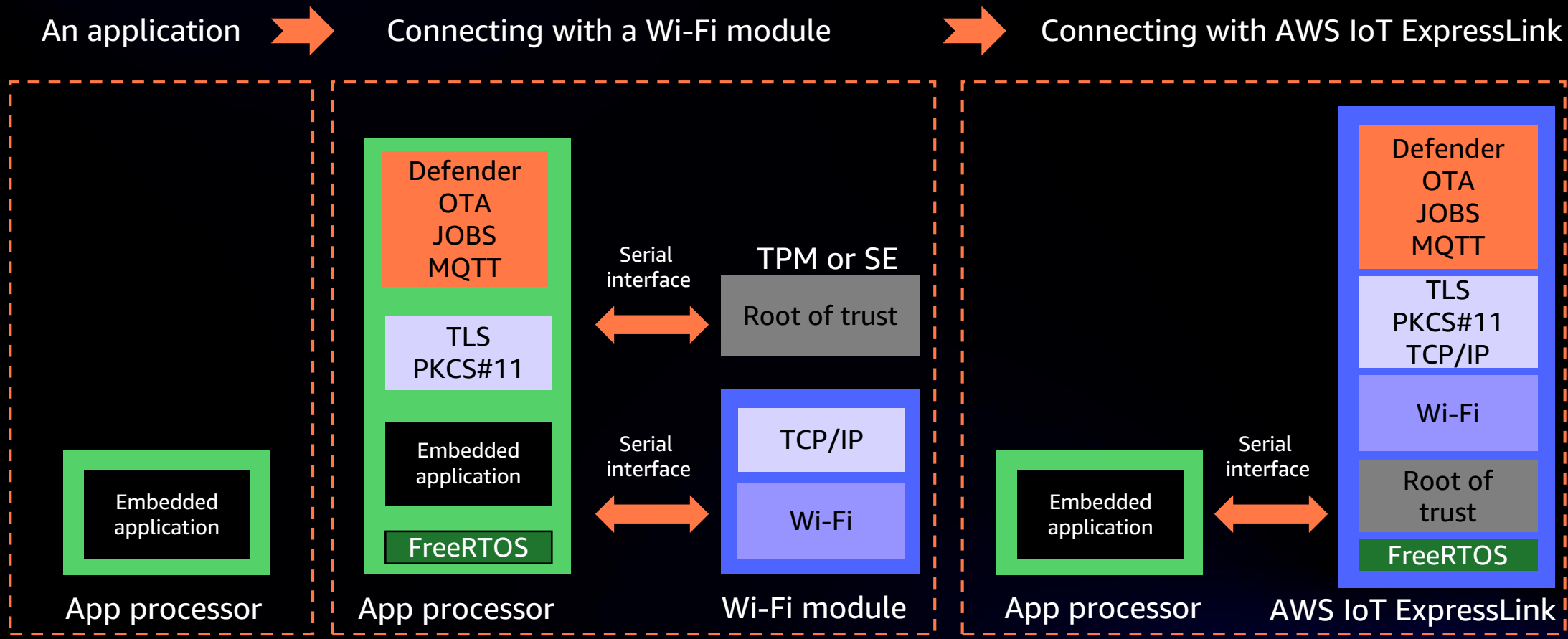


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Evolution of an idea

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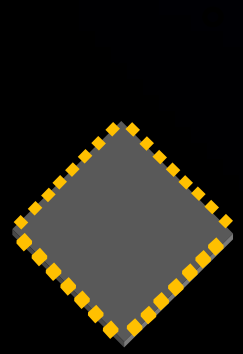
Evolution of an idea



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Introducing AWS IoT ExpressLink

QUICKLY AND EASILY DEVELOP SECURE IOT DEVICES



Microcontroller or microprocessor



AWS IoT ExpressLink

AWS IoT Core

AWS IoT Device Defender

AWS IoT Events

AWS IoT Analytics

AWS IoT SiteWise

AWS IoT Device Management

Amazon S3

Amazon EC2

AWS Lambda

Amazon Aurora

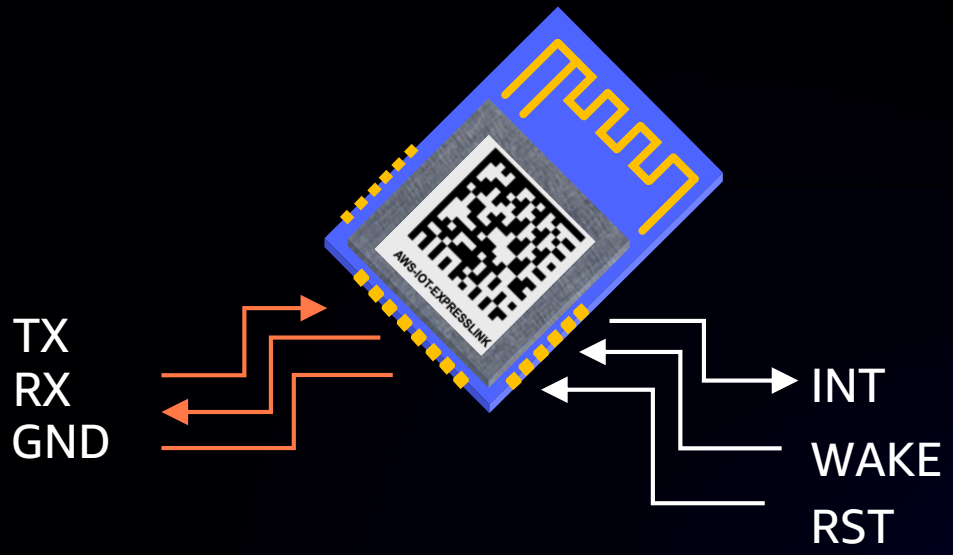
Amazon DynamoDB

Amazon SageMaker

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AWS IoT ExpressLink is quick

- AWS IoT ExpressLink takes care of all the complex and security-critical code and packs it into a single hardware component
- A 3-wire serial interface is all you need to connect **any** embedded device to the cloud



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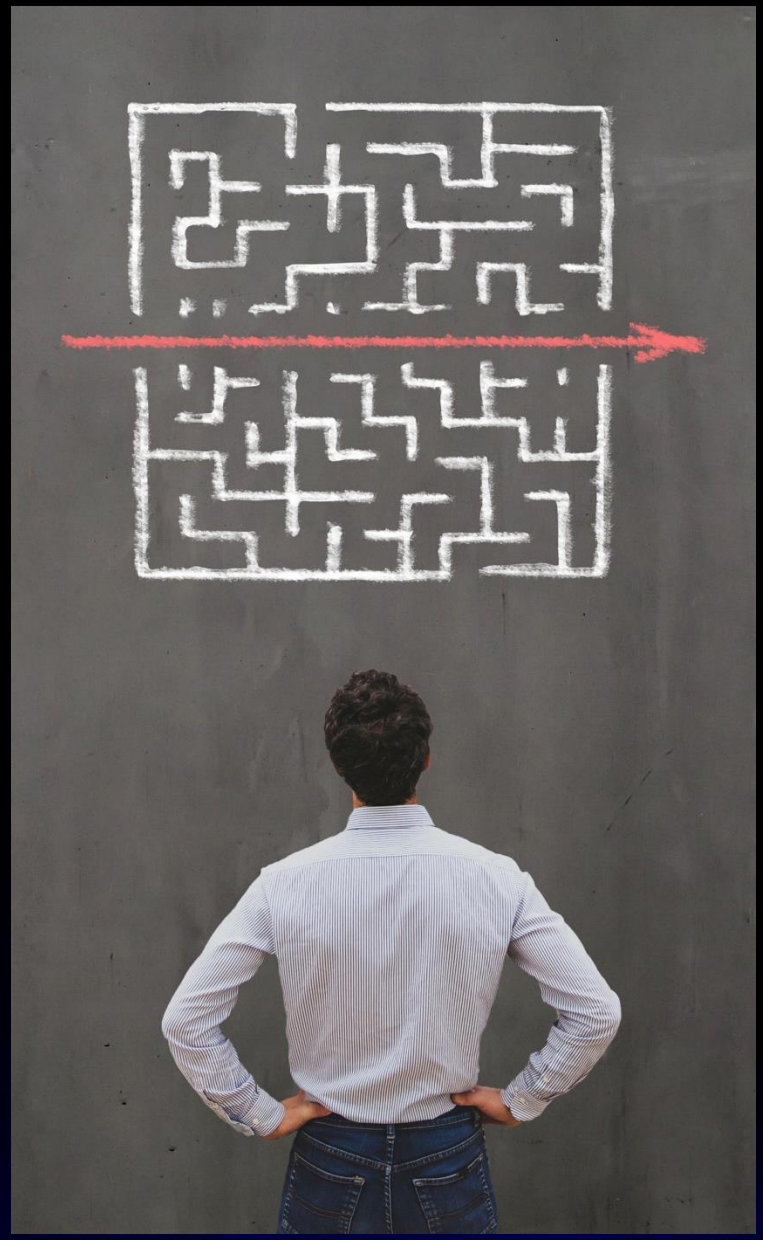
In 10 lines of code or less!

```
int main()
{
    print(“AT+CONNECT\n”);
    while(1){
        print(“AT+SEND data {\“A\”=%d}”, getSensorA());
        delays(1);
    }
}
```

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AWS IoT ExpressLink is easy

- A small set of AT commands to rule them all
- Media independent: CONNECT, SEND, SUBSCRIBE, GET
- Write to the application NOT to the media!
  - Wi-Fi
  - Cellular CAT-M1
  - Cellular NB-IoT?
  - LoRa?
  - …



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AWS IoT ExpressLink is secure

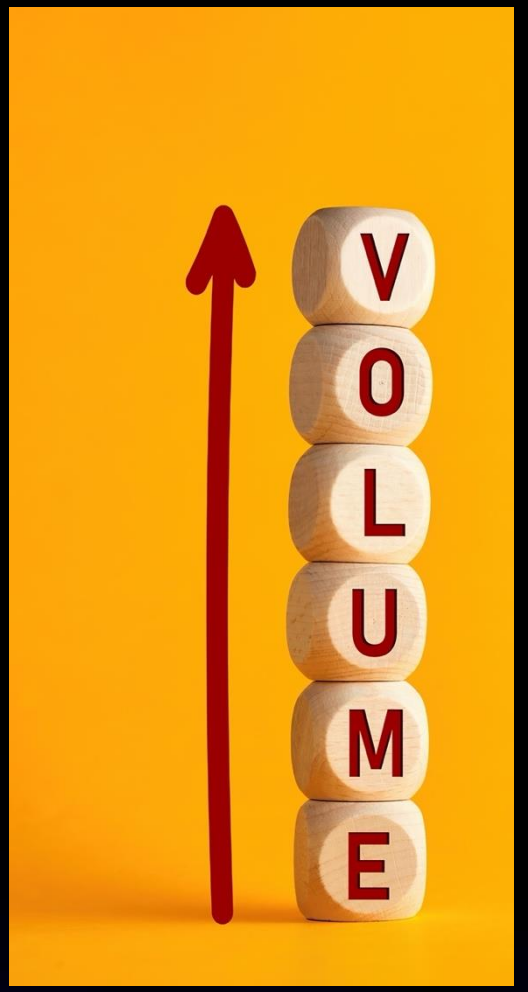
- AWS IoT ExpressLink connects securely out of the box
- AWS validated code, implements best-in-class security practices
  - Hardware root of trust
  - Secure secrets storage
  - Mutually authenticated
  - Encrypt all communication to and from the cloud
  - Updated over the air using AWS IoT OTA service
  - Secure boot
  - Support host processor OTA updates
  - Built-in support for AWS IoT Device Defender



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Deployed and managed at scale

- Modules ready to connect to the cloud out of the box
- Modules come pre-provisioned with a unique identifier and a birth certificate simplifying deployment at scale
- Support late-binding onboarding mechanism to reduce manufacturing time and cost, and increase flexibility
- Monitor devices' health and manage them as a fleet at scale with AWS IoT Device Management and AWS IoT Device Defender

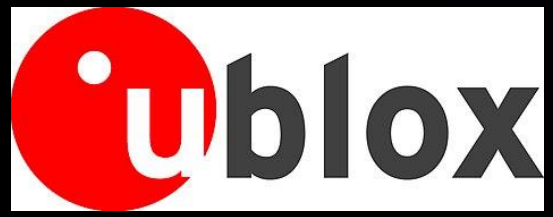


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Let’s get started

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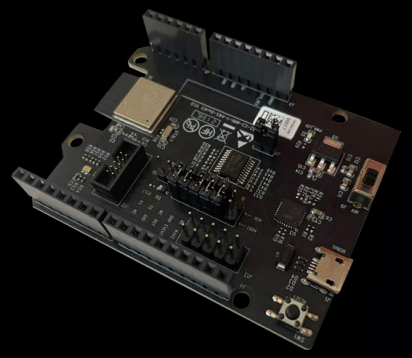
Three partners – Four modules

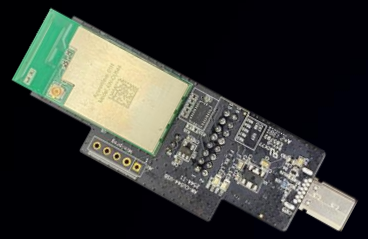
	Wi-Fi	ESP32-C3-Mini AWS IoT ExpressLink
	Wi-Fi	AIROC™ IFW56810 CCM
	Cellular Wi-Fi	Sara-R5 AWS IoT ExpressLink Nora-W256 AWS IoT ExpressLink

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Get started by choosing from four evaluation kits

Vendor	Evaluation Kit	Technology	Buy
Espressif	ESP32-C3 ExpressLink kit	Wi-Fi	AVAILABLE NOW
Infineon	AIROC™ IFW956810 CCM kit	Wi-Fi	AVAILABLE NOW
u-blox	USB-Nora-W256AWS	Wi-Fi	AVAILABLE NOW
u-blox	Sara – R5 Starter kit	Cellular	AVAILABLE NOW









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Thank you!

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