SDK in the Browser for Zephyr™

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Intel

Agenda

▸ Problem Statement

▸ Solution

▸ Demo

▸ How does it Work?

▸ JavaScript*

▸ Web USB

▸ Web Application

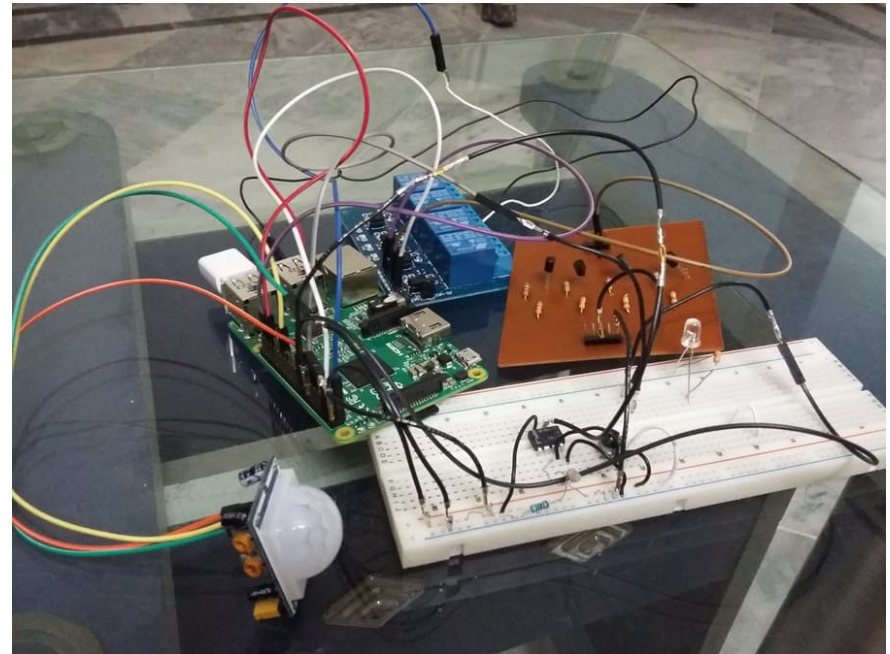**Zephyr**™

Problem Statement

IoT is Hard!

Starting New IoT Project is Hard
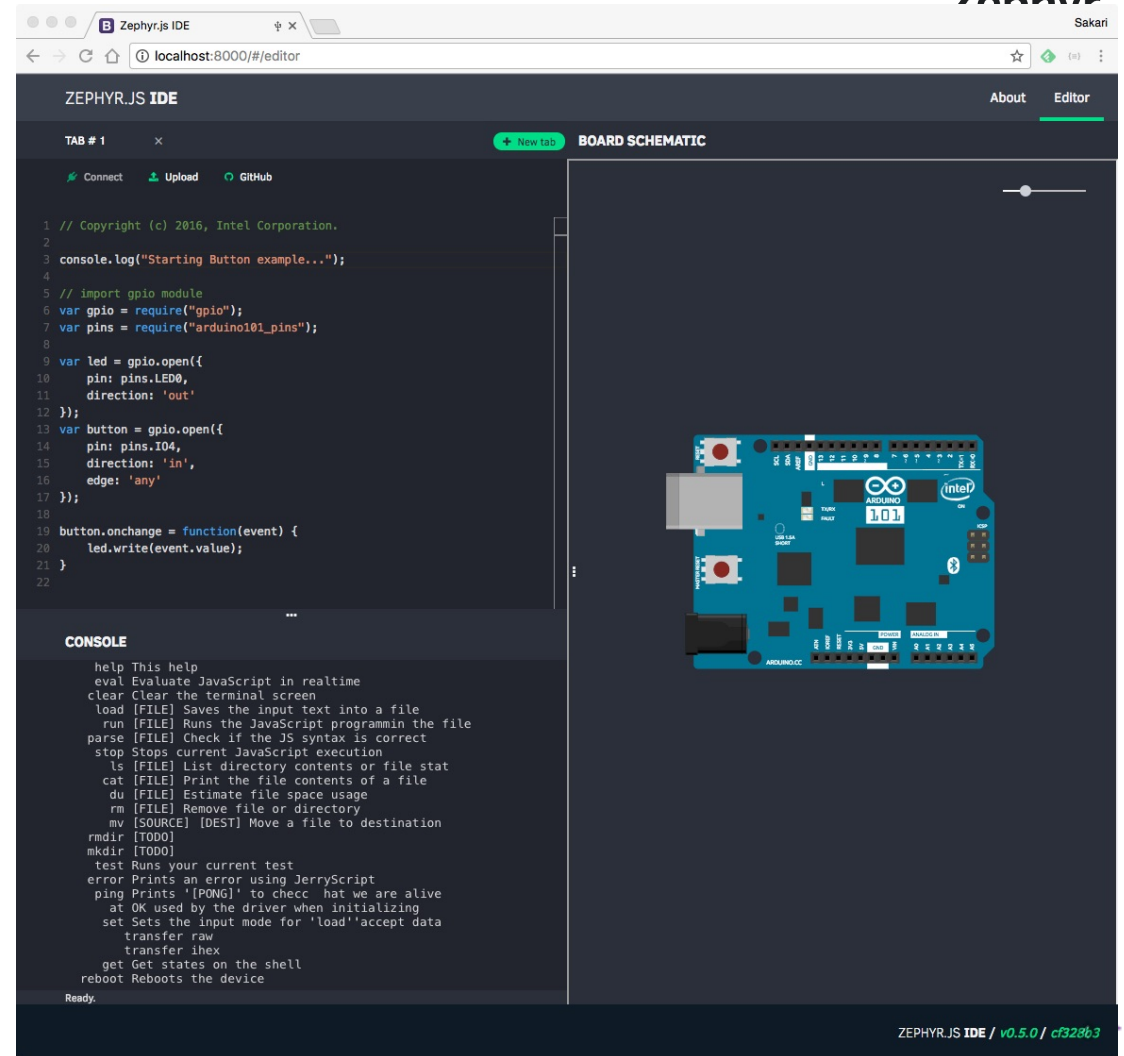
▶ Development Environment Setup

▶ Cables

▶ Sensors

▶ Documentation

▶ Sample code

▶ BIOS, firmware, OS updates

Solution

Zephyr™

What if…

▶ …this is all you need?
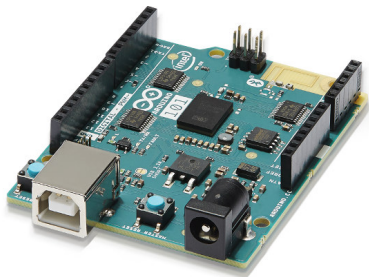
Demo

Zephyr™

How Does It Work?

How Does It Work?

Zephyr™

Web Site

5. Load Application

| JS Runtime | ashell |

1. Supported URLs

6. Connect

| JerryScript |

4. Get URL

| Zephyr | WebUSB |

DATA

| MCU |

3. Show USB Dialog

2. Tell URLs

USB Cable
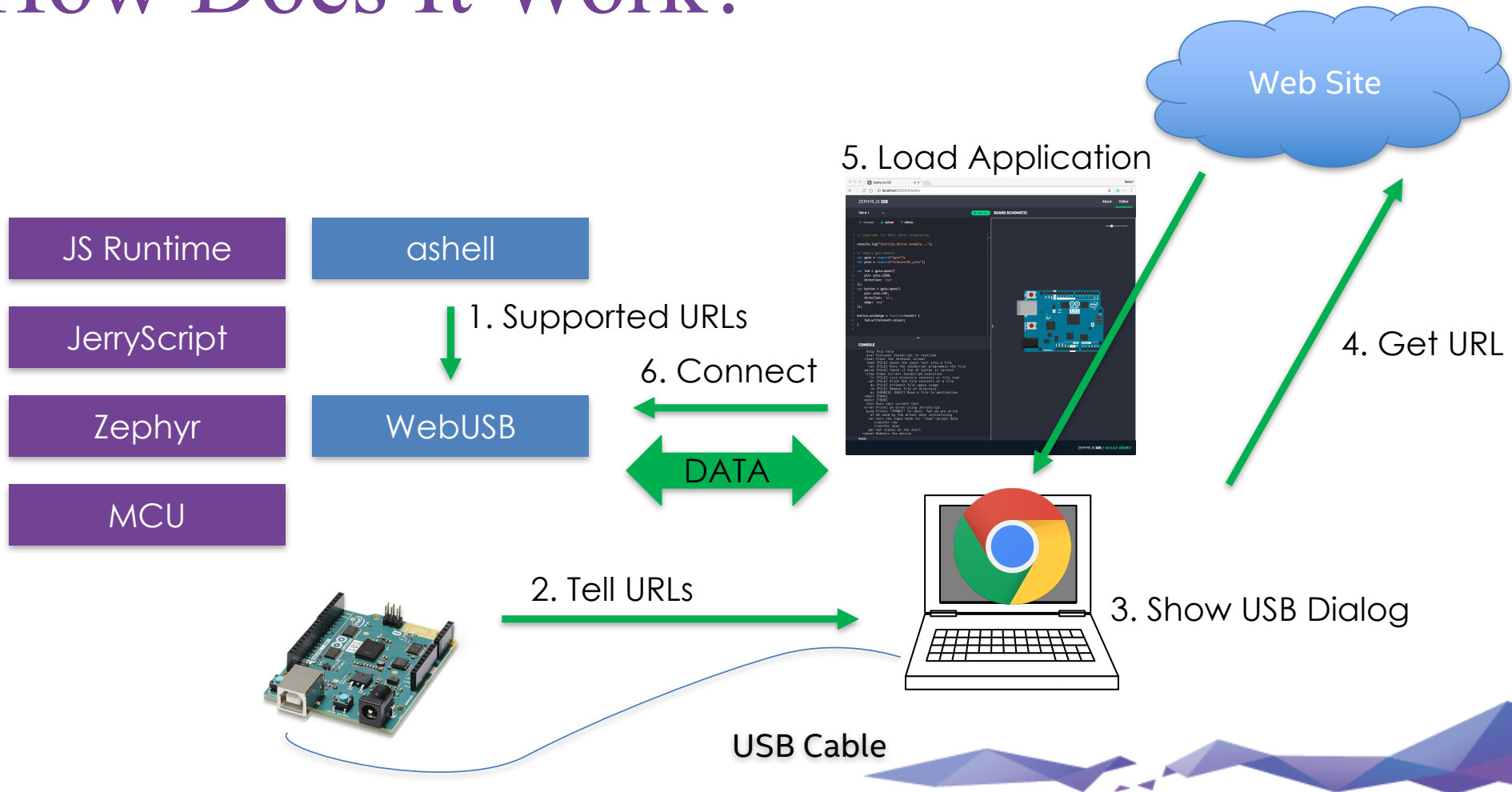
Development Flow

Native

- Edit
- Compile
- Reboot
- Flash
- Reboot
- Run

JavaScript*

- Edit — WebIDE
- Copy — WebUSB
- Run — JS Runtime for Zephyr
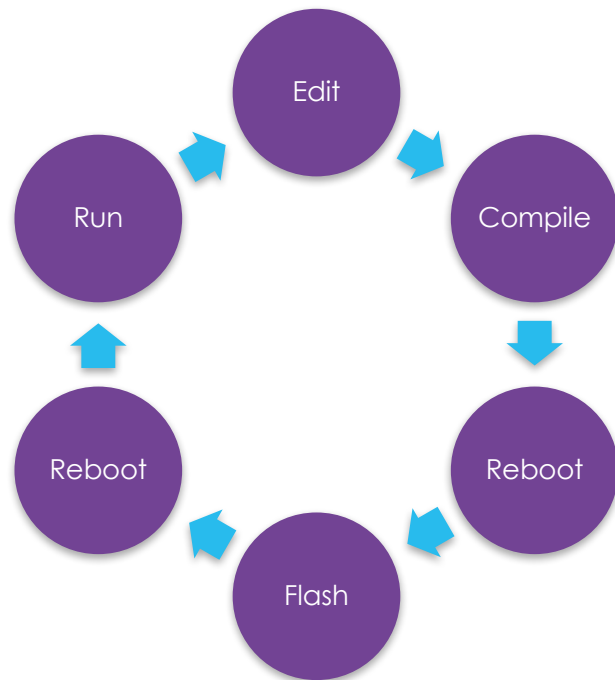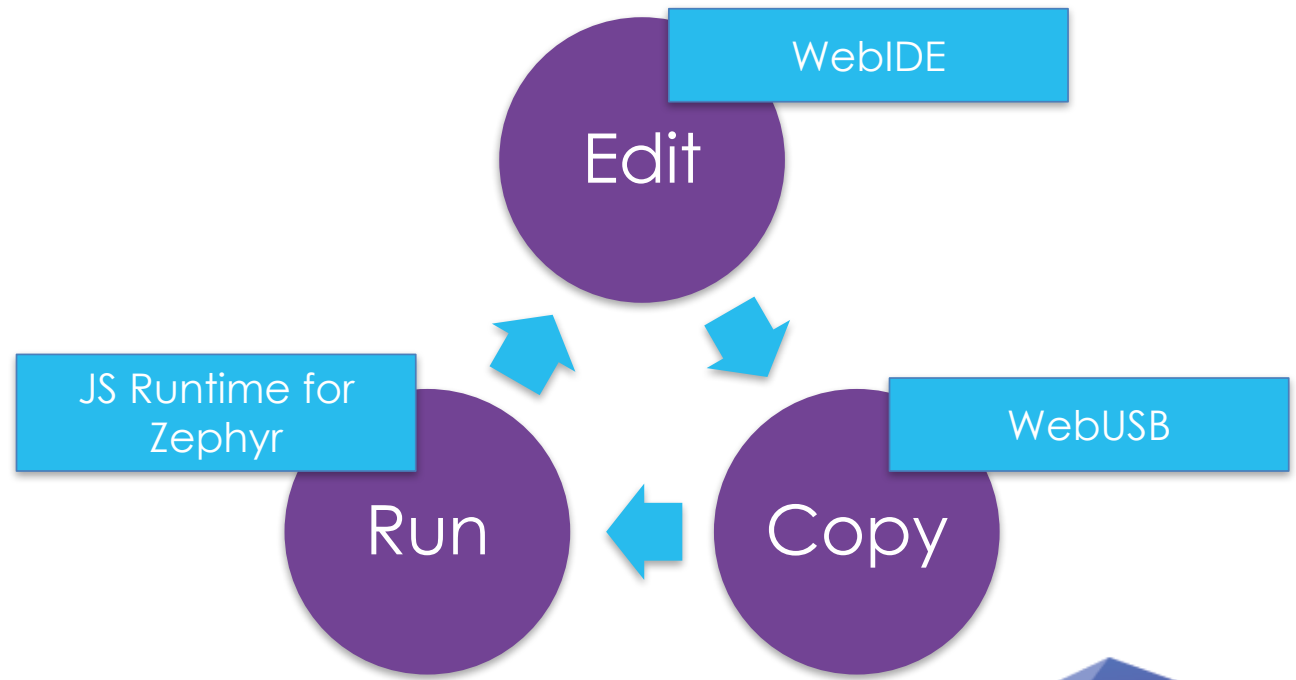
*Other names and brands may be claimed as the property of others.

JavaScript*

JavaScript* Runtime for Zephyr OS

- Enable **JavaScript** application development on Zephyr OS
- Address **large** JavaScript developer **community**
- **Fast** development cycle - No flashing, just copy .js files
- Based on open source JerryScript JS engine and **API layer**
- **Well known** JavaScript **APIs** (Node.js* like)
- Application **portability** between MCU and MPU platforms
- Support now for **Arduino101* board** and **FRDM-K64F**, all Zephyr OS supported boards in the future
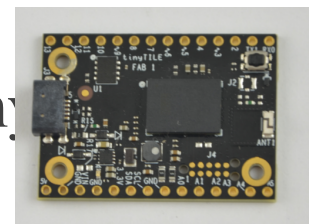
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Architecture

- JavaScript* App
  - Business logic by the app developer

- JS Runtime for Zephyr
  - API bindings
  - Build tools
  - Sample and demo apps
  - API docs
  - Open source (Apache 2.0)

- JS Engine
  - Micro JS engine - JerryScript
  - Open source (Apache 2.0)

JavaScript App — Application

JavaScript APIs

JS Runtime for Zephyr

JerryScript

Zephyr

MCU
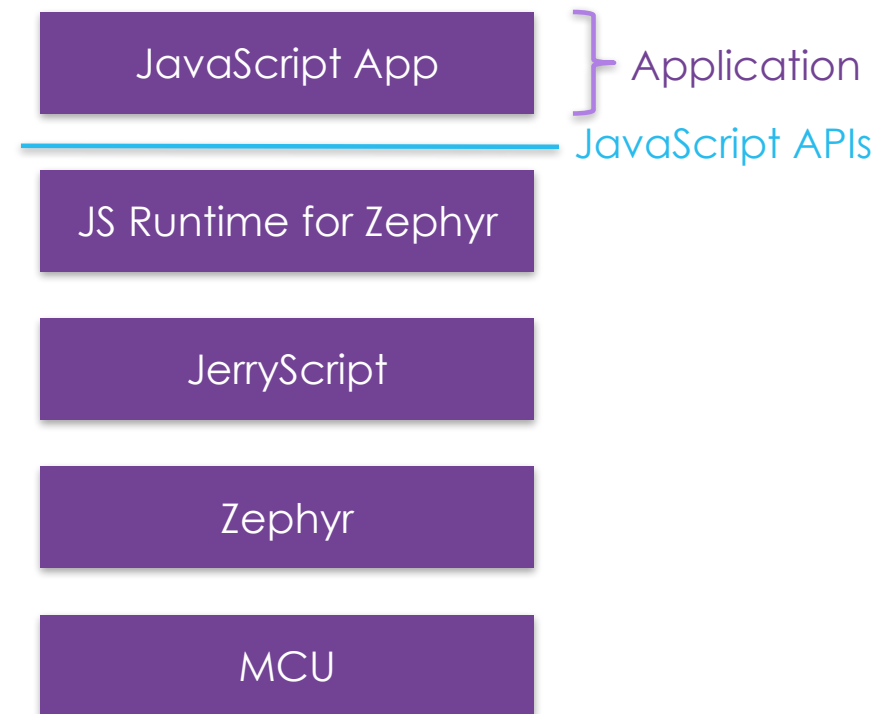
Two Modes

- Runtime Mode
  - JavaScript* source is converted into C string and embedded into zephyr.bin image
  - Only the embedded JavaScript application is executed

- Developer Mode
  - JavaScript application is executed from Zephyr OS filesystem
  - JavaScript application replaceable via USB or BLE using browser IDE or CLI tool

Build

```
$ git clone git@github.com/01org/zephyr.js
$ cd zephyr.js
$ make DEV=ashell
```

Building...

zephyr.bin

Developer Mode

Runtime Mode

$ make dfu

JavaScript* App

JS Runtime for Zephyr

JerryScript

Zephyr OS

MCU

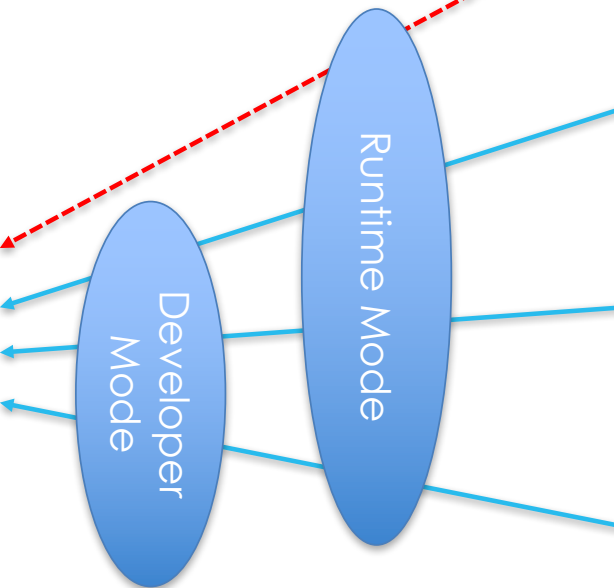*Other names and brands may be claimed as the property of others.
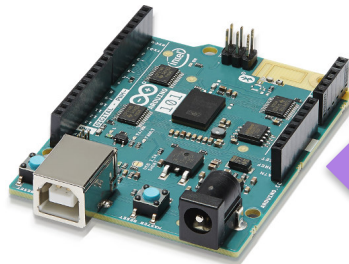
Browser IDE

- Only in DEV mode
- Copy-n-Run
- 3rd Party IDEs
- CLI Tools
- Web USB

JS

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JavaScript* App

JS Runtime

Web USB

Zephyr OS

USB/BLE

Host PC

ZEPHYR.JS **IDE**

TAB # 1   ×   + New tab

⚡ Connect   ⬆ Upload   ⎇ GitHub

```
1  // Copyright (c) 2016, Intel Corporation.
2
3  console.log("Starting Button example...");
4
5  // import gpio module
6  var gpio = require("gpio");
7  var pins = require("arduino101_pins");
8
9  var led = gpio.open({
10     pin: pins.LED0,
11     direction: 'out'
12 });
13 var button = gpio.open({
14     pin: pins.IO4,
15     direction: 'in',
16     edge: 'any'
17 });
18
19 button.onchange = function(event) {
20     led.write(event.value);
21 }
22
```

CONSOLE

```
   help This help
   eval Evaluate JavaScript in realtime
  clear Clear the terminal screen
   load [FILE] Saves the input text into a file
    run [FILE] Runs the JavaScript programmin the file
  parse [FILE] Check if the JS syntax is correct
   stop Stops current JavaScript execution
```

JavaScript* APIs

API	Zephyr OS	Node.js
Events, Timers, Console	**Now**	Core API
Buffer	**Now**	Core API
BLE	**Now**	Bleno NPM
GPIO, I2C, AIO, PWM, UART	**Now**	Johnny-Five like
OCF	**Now**	IoTivity-node NPM
CoAP	Planned	CoAP NPM
MQTT	Planned	MQTT NPM
W3C Sensors, Performance	**Now**	TBD
UDP	**Now**	Core API
TCP, HTTP	Coming	Core API
File System	Coming	Core API

Web USB

Web USB - Why It Matters

▶ USB is a de-facto standard for connecting devices over short distances

▶ It is fast, reliable and inexpensive

▶ It allows for powering devices while communicating

▶ Advances over Bluetooth® and other wireless techs

  ▶ Faster and more reliable - just works

  ▶ Works with laptop, desktop and phone

  ▶ Allows for powering the device

  ▶ Can be used in places where signals are disallowed (planes, hospitals)

  ▶ Access to a device can be guarded physically

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Introducing Web USB

Zephyr™

▶ A new W3C standard allowing web sites and apps access to USB devices

▶ New USB headers creates further security and allows for a popup when plugging in the peripheral

▶ Headers will become optional, but are recommended and required for popup

▶ Works in Chrome* today on Linux*, Macintosh*, and Windows*

Issues Web USB

- Linux*
  - modemmanager hijacks USB CDC devices unless their VID/PID are blacklisted
- Windows*
  - Does not autoload Web USB driver but requires MS OS descriptors (or INF file)
  - Earlier versions (< 10) of Windows, requires a signed "driver", which is basically a signed INF text file, binding the VIP/PID to usbser.sys (the default USB serial driver)
- Macintosh*
  - No issues !

Web Application

Zephyr™

Sakari

localhost:8000/#/editor

ZEPHYR.JS IDE

About   Editor

TAB # 1   ✕

+ New tab   **BOARD SCHEMATIC**

⚡ Connect   ⬆ Upload   ⭮ GitHub

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     parse [FILE] Check if the JS syntax is correct
      stop Stops current JavaScript execution
        ls [FILE] List directory contents or file stat
       cat [FILE] Print the file contents of a file
        du [FILE] Estimate file space usage
        rm [FILE] Remove file or directory
        mv [SOURCE] [DEST] Move a file to destination
     rmdir [TODO]
     mkdir [TODO]
      test Runs your current test
     error Prints an error using JerryScript
      ping Prints '[PONG]' to checc  hat we are alive
        at OK used by the driver when initializing
       set Sets the input mode for 'load''accept data
          transfer raw
          transfer ihex
       get Get states on the shell
    reboot Reboots the device
Ready.
```

ZEPHYR.JS IDE / v0.5.0 / cf328b3

Zephyr™

JavaScript* Web IDE for Zephyr OS

▶ Browser only Web Application - no server component

▶ JavaScript code editor (Monaco from Microsoft*)

▶ Console (Google* console module)

▶ Board Viewer (**new**)

▶ Web USB for device communication

▶ Multiple tabs and devices

▶ Git Hub Integration

▶ Angular2

JavaScript Web IDE for Zephyr OS (#2)

▶ Open Source

   ▶ https://github.com/01org/zephyrjs-ide

▶ Live site

   ▶ https://01org.github.io/zephyrjs-ide/

▶ Apache* 2.0

Next Steps and Summary

Next Steps

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- More boards to board viewer
- Communication between panels
- Proper API documentation to Monaco
- Plugins to other IDEs
- Flashing with Web USB
- Access to local file system
- WebUSB changes
- Arduino 101* board ROM size
- Testing with other boards

Join the Open Source Project !

We are looking for contributions
https://github.com/01org/zephyr.js
https://github.com/01org/zephyrjs-ide

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Summary

▸ Easy to use development environment

▸ Lower the entry barrier to start IoT Projects

▸ Good fit for class rooms, hackathons and demos

Join the Open Source Projects !

▸ We are looking for contributions

▸ https://github.com/01org/zephyr.js

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Questions ?

Try it Out @Hackathon
Wed 1-4 pm
Forum Suite
Space is limited, registration required

http://sched.co/9XjO

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