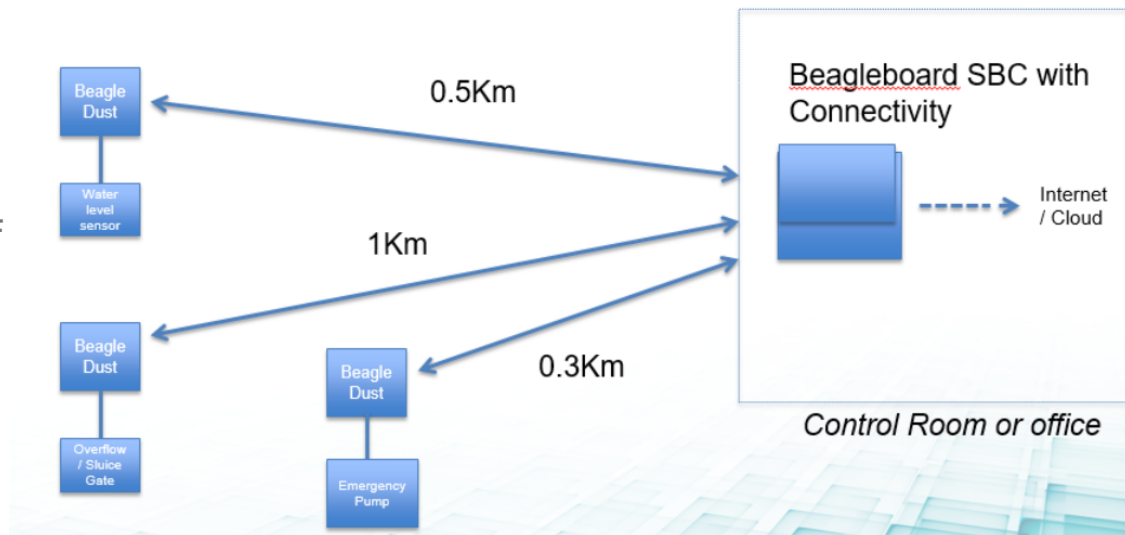


beagleconnect

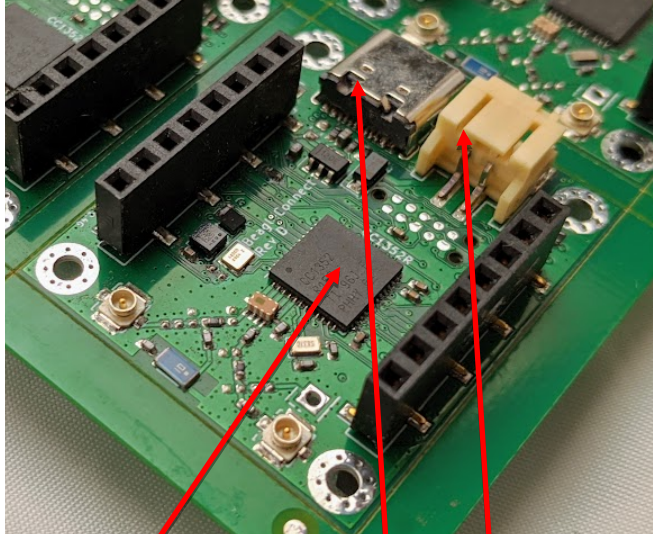
The Concept

- **Digital Dust** -> A low cost sub \$10, low-profile edge node that is easily deployed almost anywhere
 - Sub 1GHz network based on TI-15.4 stack
- User experience is simple and seamless with out of box setup taking minutes
- Adaptable by Makers and Professionals alike for it's plug and play usability
 - Professionals would use for proof of concept, assume higher volumes would result in design / manufacturing customization opportunities and the wider portfolio of IoT services



BeagleConnect Leash Feature Set

FRONT

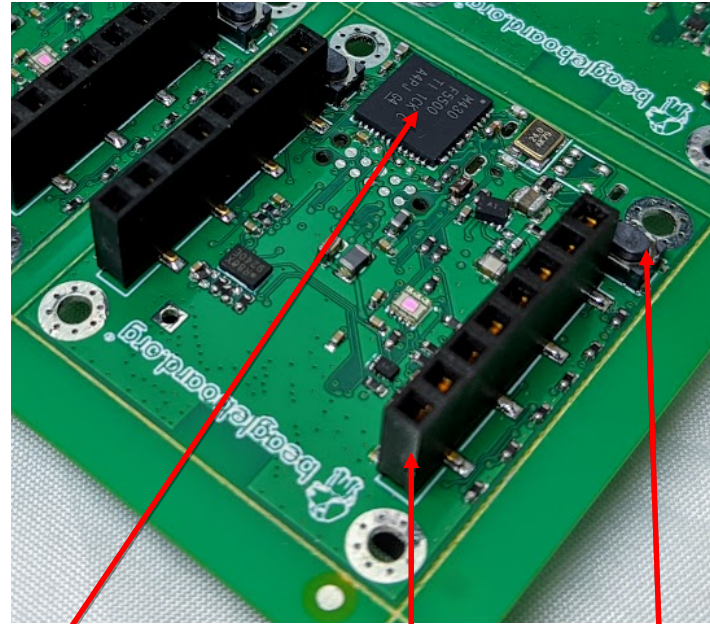


CC1352
(wireless
MCU)

USB
(debug/
flash/power)

Power

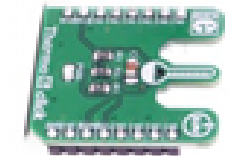
BACK



MSP430
(USB MCU)

2x mikroBUS
headers

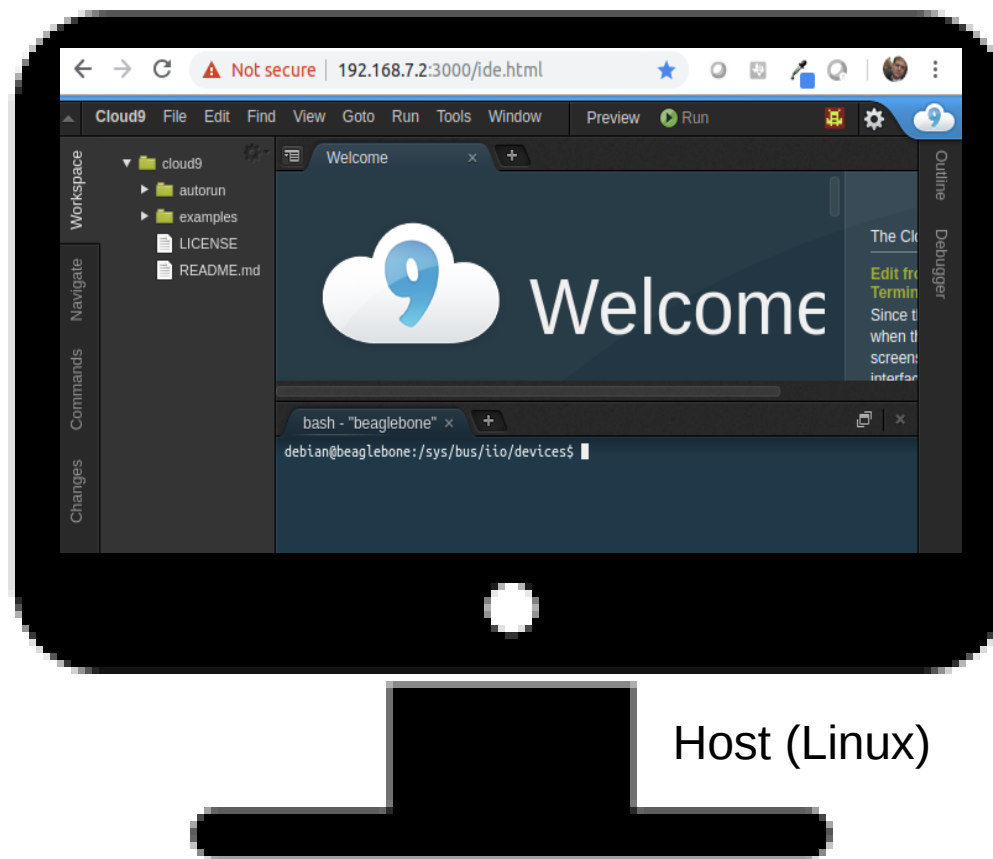
2x buttons



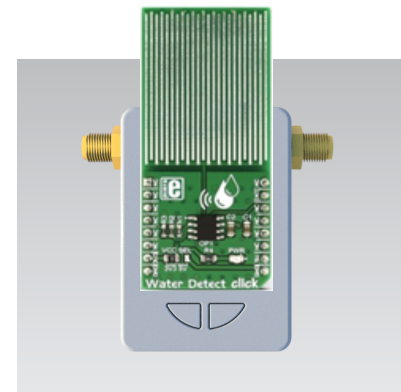
mikroBUS add-
on boards

The User Experience

Step 1 – Gateway login



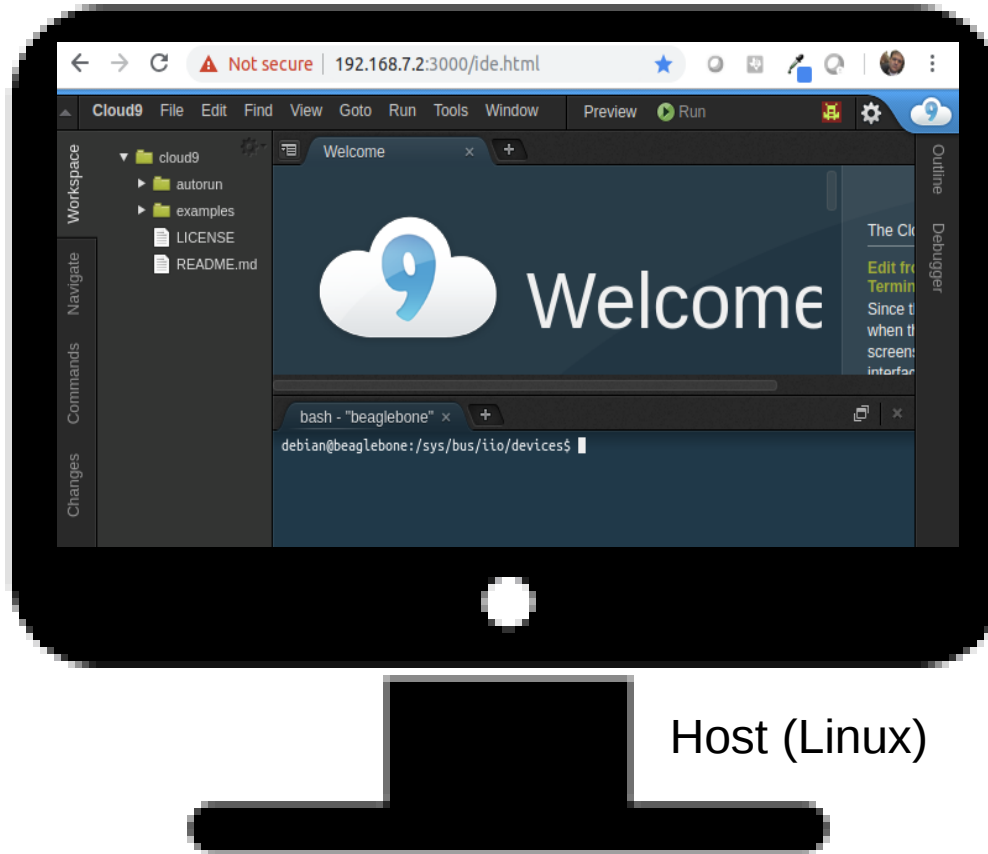
Gateway
(BeagleConnect Leash)



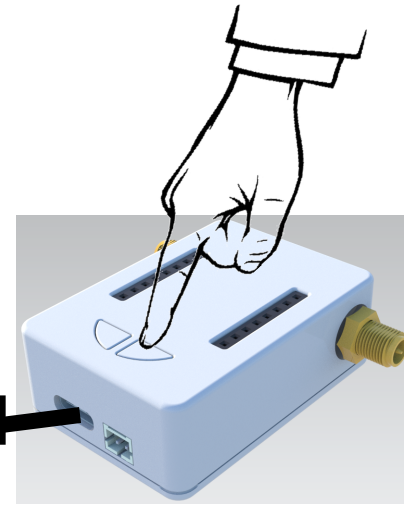
Node
(BeagleConnect Leash +
mikroBUS add-on board)

The User Experience

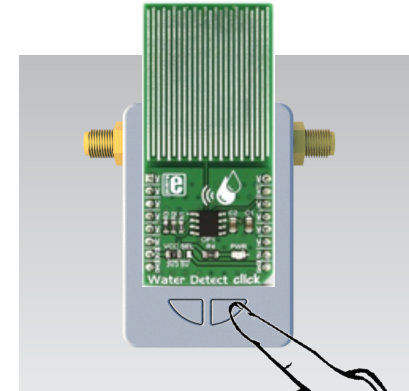
Step 2 – Connect with button push



Host (Linux)



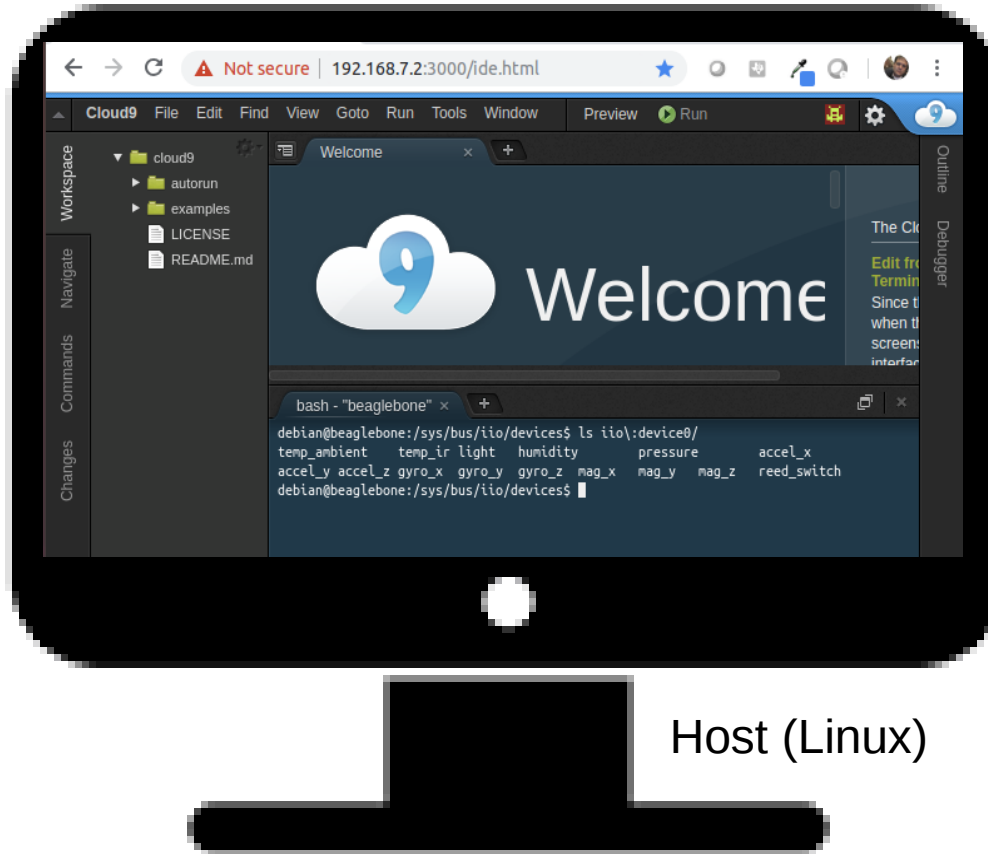
Gateway
(BeagleConnect Leash)



Node
(BeagleConnect Leash +
mikroBUS add-on board)

The User Experience

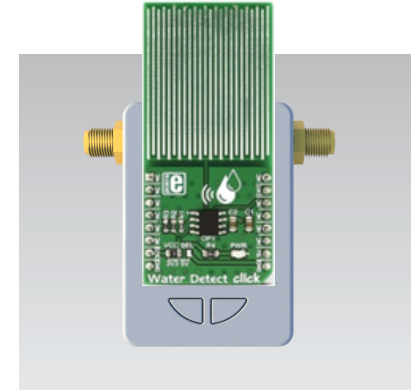
Step 3 – Live edge data automatically appears



Host (Linux)



Gateway
(BeagleConnect Leash)



Node
(BeagleConnect Leash +
mikroBUS add-on board)

User Experience Value Proposition

1. Automatic provisioning for I2C, SPI, GPIO, UART, ADC, and PWM
2. No cut-and-paste
 1. No device specific code lives my program
 2. Driver maintenance is owned by Linux kernel
3. No “firmware” development
 1. Everything a developer needs to do sits above the OS in any language
4. All sensor data is readily accessible in read and write files
5. Every programming language supported
 1. No language specific libraries
6. Out of the box support for ecosystem of 500+ mikroElektronika click boards

The Ask

1. Marketing Support

1. How can TI drive market awareness – what does TI need from BB.org to do this?

2. Software and Hardware Development

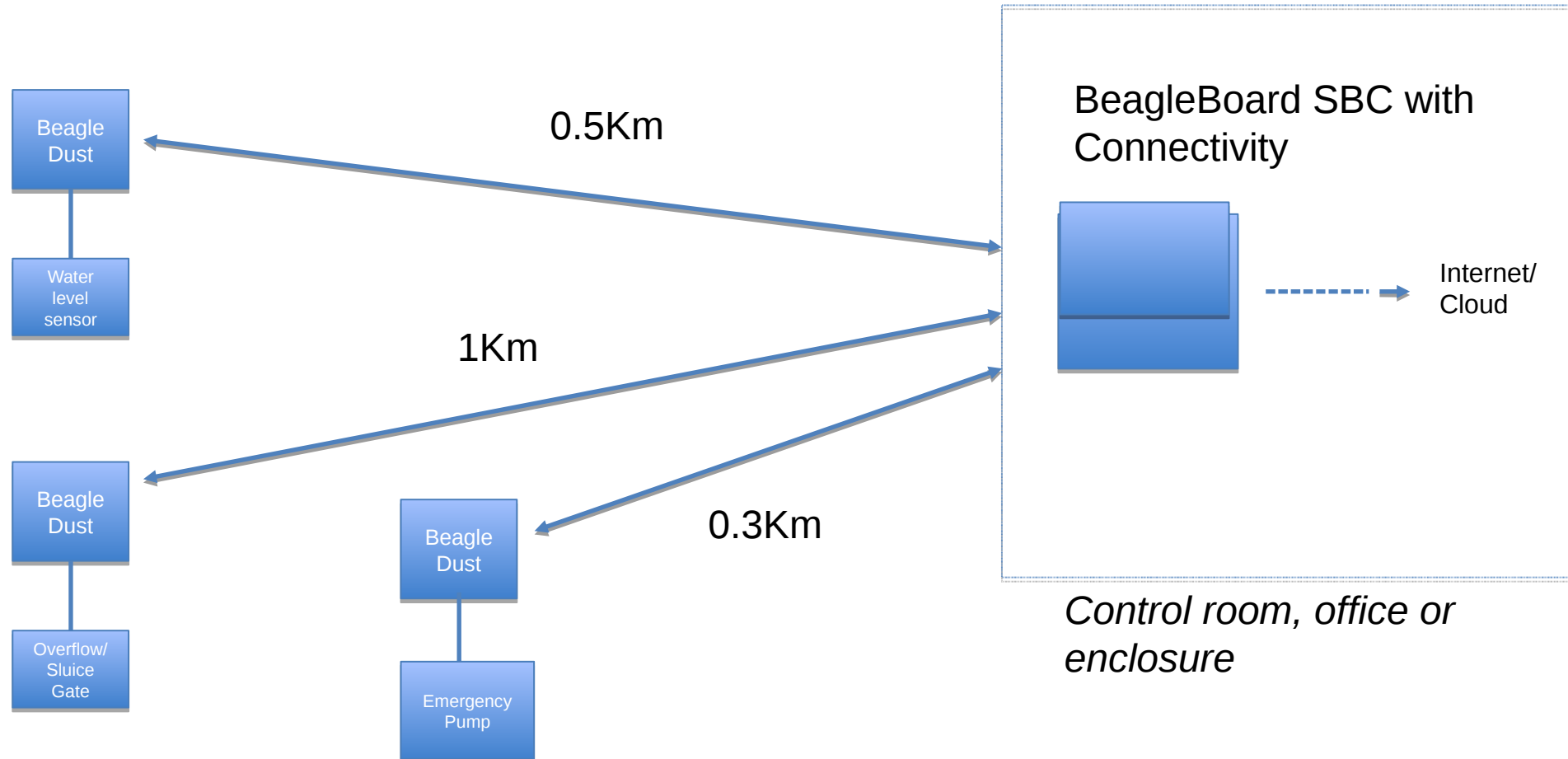
1. Design support and consultancy for discrete implementation of CC13xx
 1. Required to achieve pricing targets
2. Split cost of 6 months firmware development, ~\$150k

3. Pricing

1. Target BOM cost is \$3 to achieve a MSRP of <\$10

Appendix

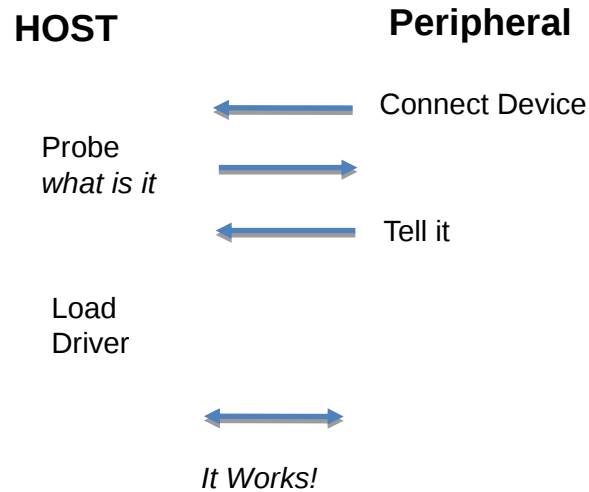
Example: flood mitigation system



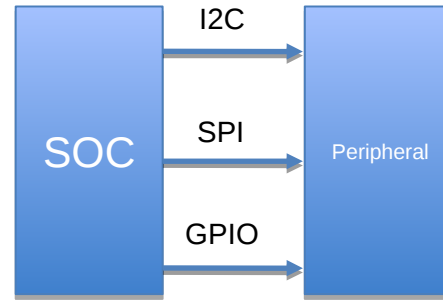
Software Proposition

- Greybus: automatic provisioning for I2C, SPI, and GPIO

USB in Linux Today

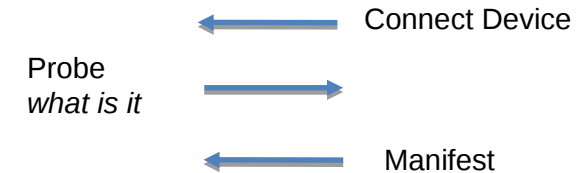
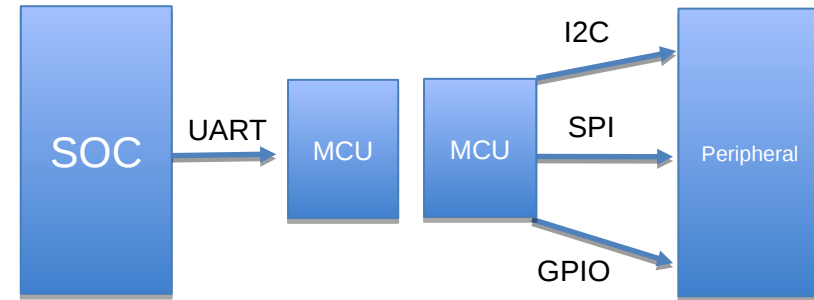


Before Greybus



Specific device tree required

With Greybus



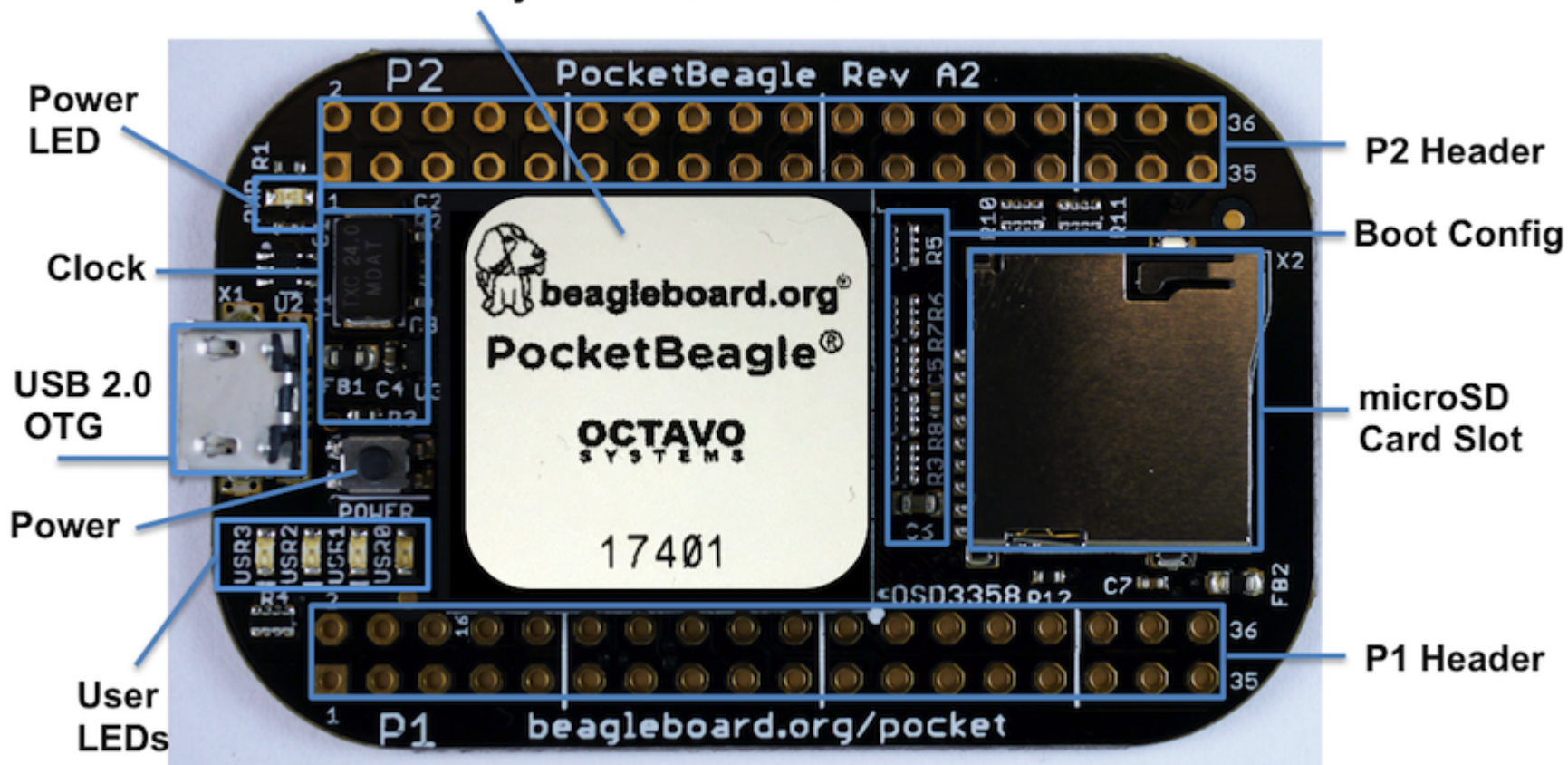
The Concept

- Low cost (< \$10), low-profile edge node that is easily deployed almost anywhere
- Adaptable by Makers and Professionals alike for it's plug and play usability
 - Professionals would use for proof of concept, assume higher volumes would result in design / manufacturing customization opportunities and the wider portfolio of IoT services
- Features Long Range Radio comms (Sub-GHz TI 15.4 compare with LoRA) module with on-board MCU for control and uFL connector
- Low power with ample GPIO for easily sensor attachments
- Compatible with MikroBus interface, allowing for deployment of MikroE click sensor & actuator boards
- Works (& communicates) out-of-the-box with PocketBeagle or BBB, enabled with their respective Long Range Comms cape
- Debug / Programming via header / JTAG connector / USB option(s)
- Battery-holder for Li-Ion coin-cell
- Power-management with appropriate voltage translations

- What is probing and a probable bus?
-

PocketBeagle top

Octavo Systems OSD3358-SM

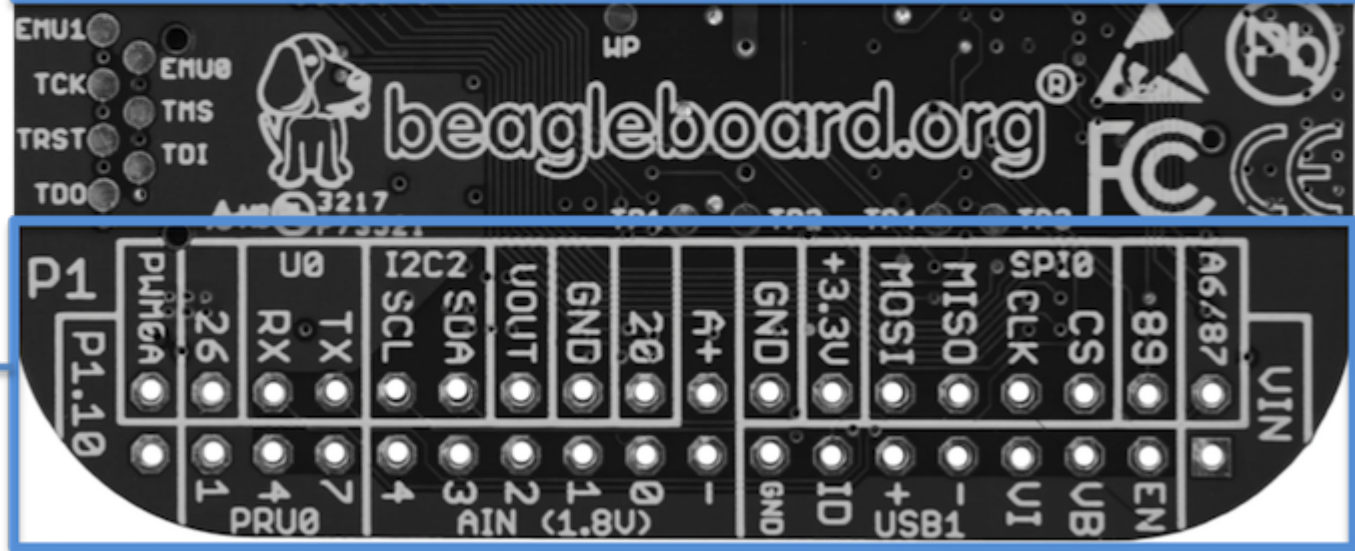


PocketBeagle bottom

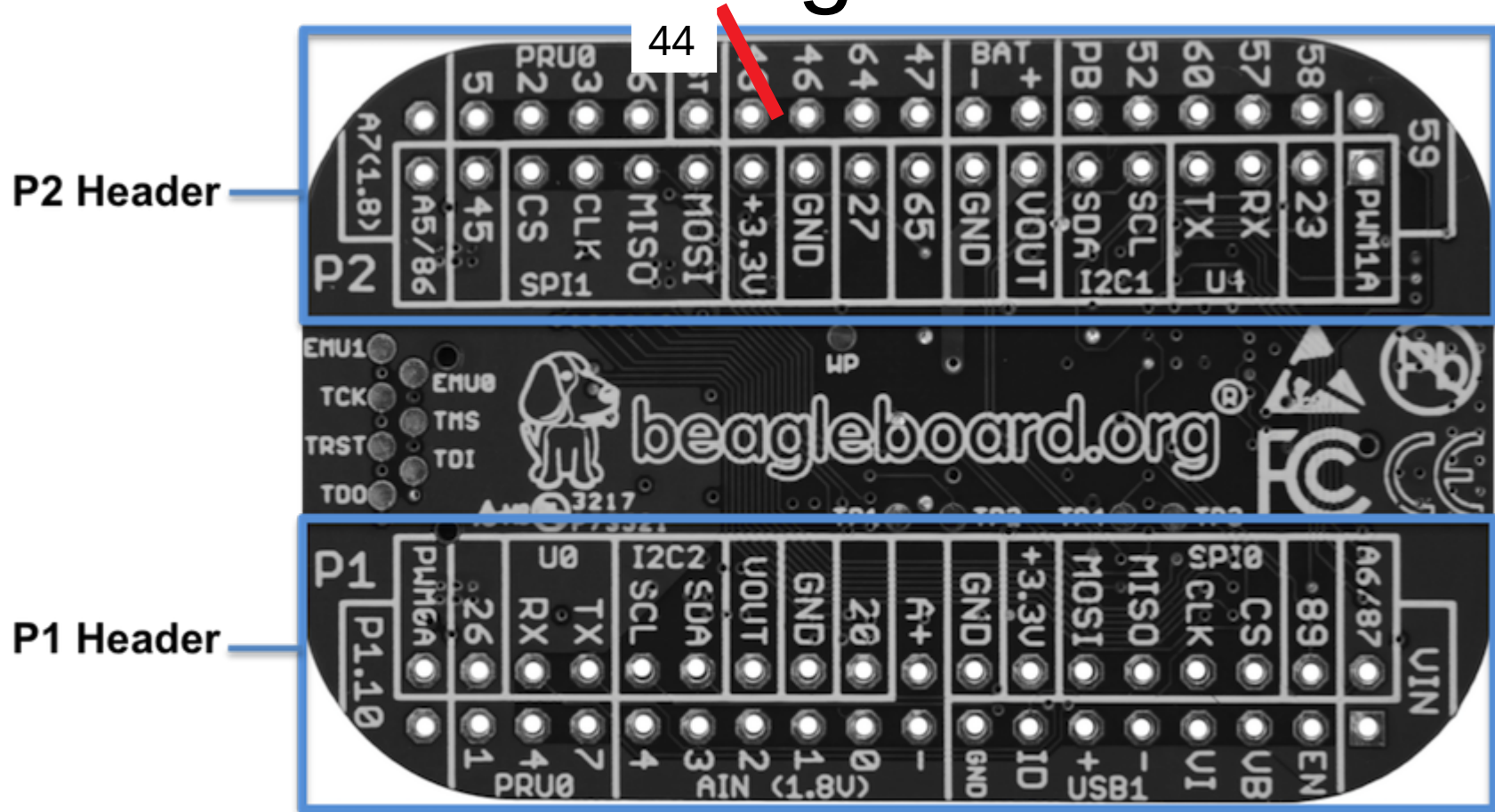
P2 Header



P1 Header



PocketBeagle bottom



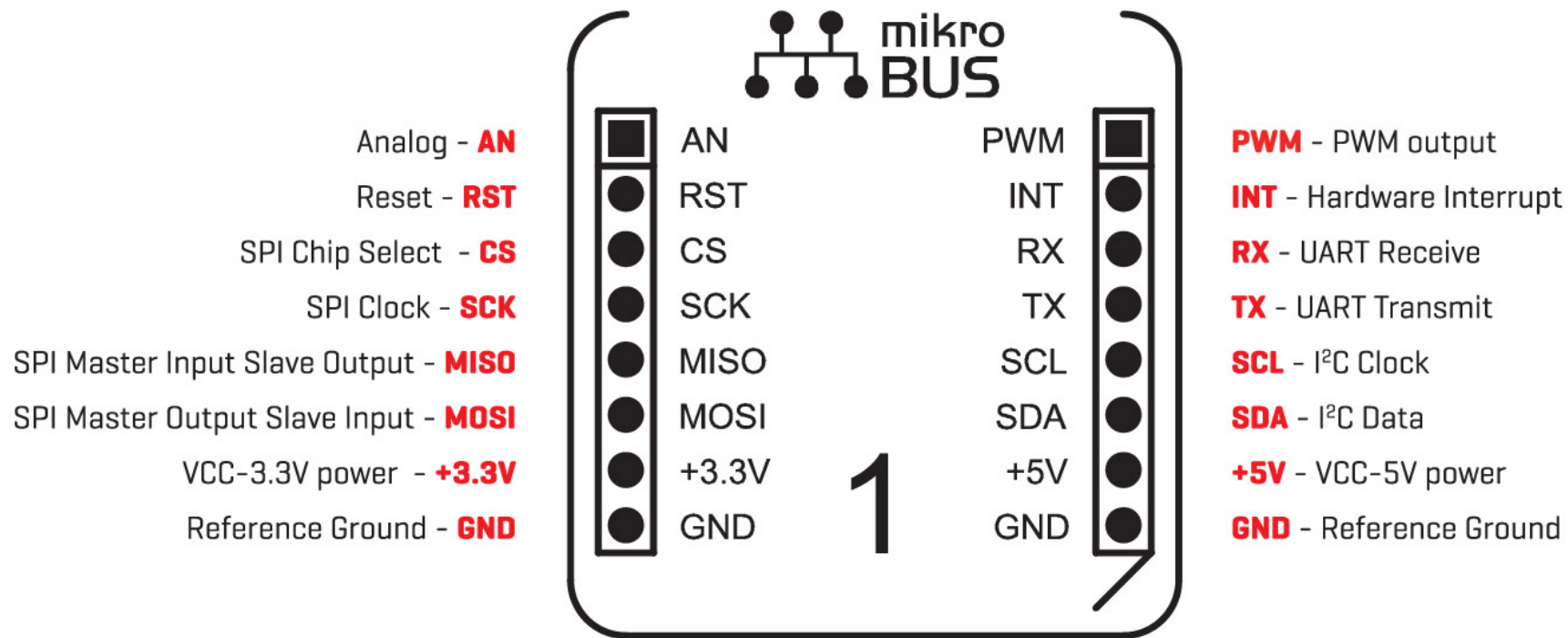
PocketBeagle expansion

PocketBeagle Expansion Headers (Rev A2a)

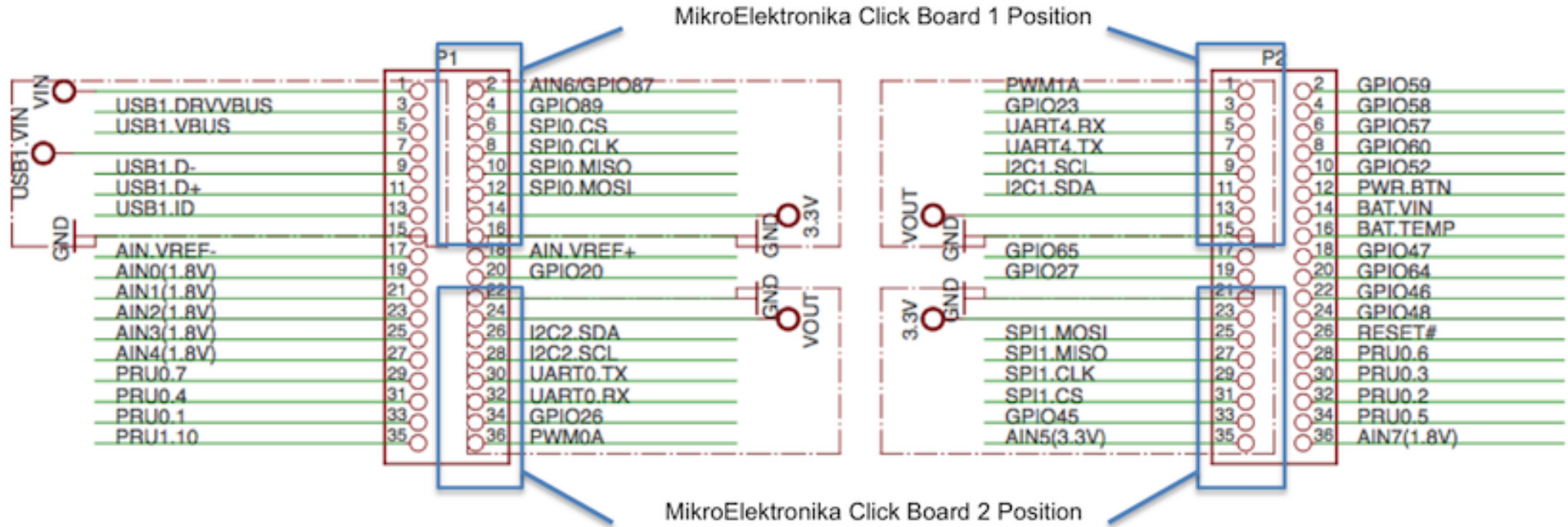
P1											
SYS			VIN	1	2	87		6	AIN 3.3V	9	PRU1
USB1	V_EN	GPIO	109	3	4	89				11	PRU1
USB1			VBUS	5	6	5	GPIO	CS	SPIO	TX	PRU
			VIN	7	8	2		CLK		RX	UART2
			DN	9	10	3		MISO		TX	UART2
			DP	11	12	4		MOSI		RX	PRU
			ID	13	14	3.3V					
			GND	15	16	GND	SYS				
			REF-	17	18	REF+	AIN 1.8V				
			0	19	20	20	GPIO			16(in)	PRU0
AIN 1.8V			1	21	22	GND	SYS				
			2	23	24	VOUT					
			3	25	26	12		SDA	I2C2	TX	CAN0
			4	27	28	13		SCL		RX	CAN0
PRU0	7	QEP0	STRB		117	29	30	43	GPIO	15	PRU1
	4		A		114	31	32	42		14	PRU1
	1	PWM0	B		111	33	34	26			
PRU1	10				88	35	36	110		A	PWM0

P2													
PWM1				A	GPIO	50	1	2	59	GPIO			
PWM2				B		23	3	4	58				
UART4				RX		30	5	6	57				
				TX		31	7	8	60				
CAN1	RX	I2C1	SCL	15		9	10	52					
	TX		14	11	12	PWR BTN	SYS						
SYS					VOUT	13	14	VIN	BAT				
					GND	15	16	TEMP					
GPIO					65	17	18	47	GPIO	STRB	QEP2	15i	PRU0
					27	19	20	64					
SYS					GND	21	22	46	GPIO	IDX	QEP2	14(in)	PRU0
					3.3V	23	24	44		A		14(out)	
CAN1	RX	SPI1	MOSI	GPIO	41	25	26	NRST	SYS				
	TX		MISO		40	27	28	116	GPIO	IDX	QEP0	6	PRU0
PRU	eCAP		CLK		7	29	30	113				3	
PRU1	16(in)	CS	19		31	32	112				2		
PRU0	15(out)	QEP2	B		45	33	34	115	B	QEP0	5		
PRU1	8	AIN 3.3V	5	86	35	36	7	AIN 1.8V					

mikroBus Click

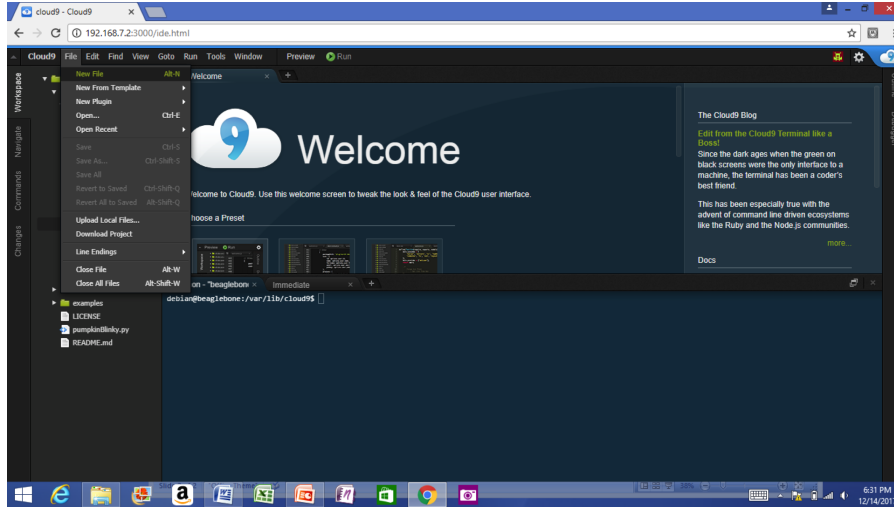


Connecting mikroBus Clicks



Single cable development

- Power, network, develop
- You can add a network and power many other ways



Download image



The screenshot shows the BeagleBoard.org website. The browser address bar displays `https://beagleboard.org/latest-images`. The website header includes the BeagleBoard.org logo, social media icons for Facebook, Twitter, LinkedIn, YouTube, and Google+, and a navigation bar with links: Start, Discover Boards, Learn, Explore, and Collaborate. The main content area is titled 'BeagleBoard.org Latest Firmware Images'. Below the title, a paragraph lists various BeagleBoard and BeagleBone models. A blue arrow points to the 'Recommended Debian Images' section. Under this section, there are three sub-sections: 'Stretch IoT (non-GUI) for BeagleBone and PocketBeagle via microSD card', 'Stretch for BeagleBone via microSD card', and 'Jessie for SeedStudio BeagleBone Green Wireless via microSD card'. Each sub-section contains a list of Debian images with their respective checksums.

BeagleBoard.org > latest-images

BeagleBoard.org Latest Firmware Images

Download the latest firmware for your BeagleBoard, BeagleBoard-xM, BeagleBoard-X15, BeagleBone, BeagleBone Black, BeagleBone Black Wireless, BeagleBone Blue, SeedStudio BeagleBone Green, SeedStudio BeagleBone Green Wireless, SanCloud BeagleBone Enhanced, element14 BeagleBone Black Industrial, Arrow BeagleBone Black Industrial, Mentor! BeagleBone uSOMIQ, Neuromeka BeagleBone Air, or PocketBeagle

See the [Getting Started guide](#) and the [community wiki page](#) for hints on loading these images.

Recommended Debian Images

Stretch IoT (non-GUI) for BeagleBone and PocketBeagle via microSD card

- Debian 9.2 2017-10-10 4GB SD IoT image for PocketBeagle, BeagleBone, BeagleBone Black, BeagleBone Black Wireless, BeagleBone Blue, SeedStudio BeagleBone Green, SeedStudio BeagleBone Green Wireless, SanCloud BeagleBone Enhanced, element14 BeagleBone Black Industrial, Arrow BeagleBone Black Industrial and Mentor! BeagleBone uSOMIQ - more info - bmap - sha256sum: be1eac7a5e526930155520215329a6c39071b82199c0745c300e68b7e6c7180b

Stretch for BeagleBone via microSD card

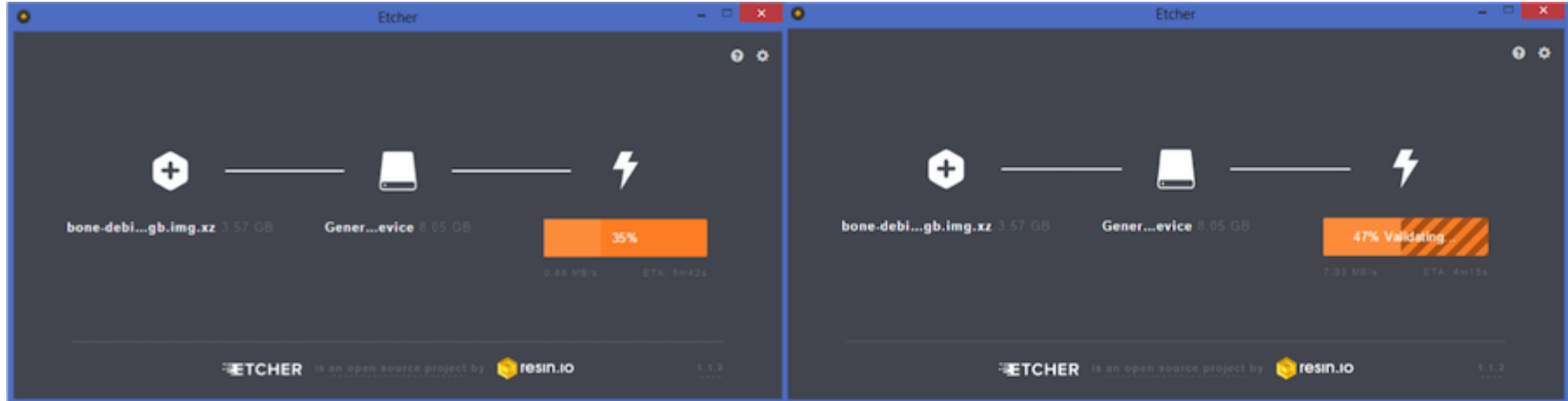
- Debian 9.1 2017-08-31 4GB SD LXQT image for BeagleBone, BeagleBone Black, BeagleBone Black Wireless, BeagleBone Blue, SeedStudio BeagleBone Green, SeedStudio BeagleBone Green Wireless, SanCloud BeagleBone Enhanced, element14 BeagleBone Black Industrial, Arrow BeagleBone Black Industrial and Mentor! BeagleBone uSOMIQ - more info - bmap - sha256sum: bc8292d97458987481d45da025ef9868b8ccf8477a72f11b541bf97d329a6d7e

Jessie for SeedStudio BeagleBone Green Wireless via microSD card

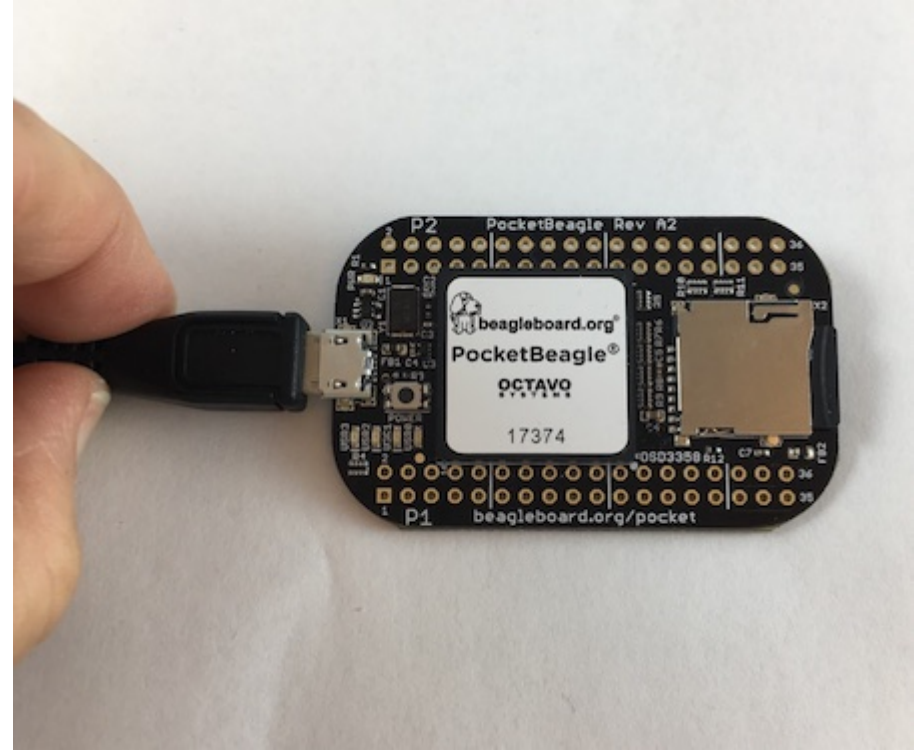
- Debian 8.6 2016-11-06 4GB SD SeedStudio IoT image for SeedStudio BeagleBone Green Wireless - more info - bmap - sha256sum: 48582b8a1a134679ff324eacc1e0b4af612cdabfb56dafb6b932fe11129b404f

Stretch for BeagleBoard-X15 via microSD card

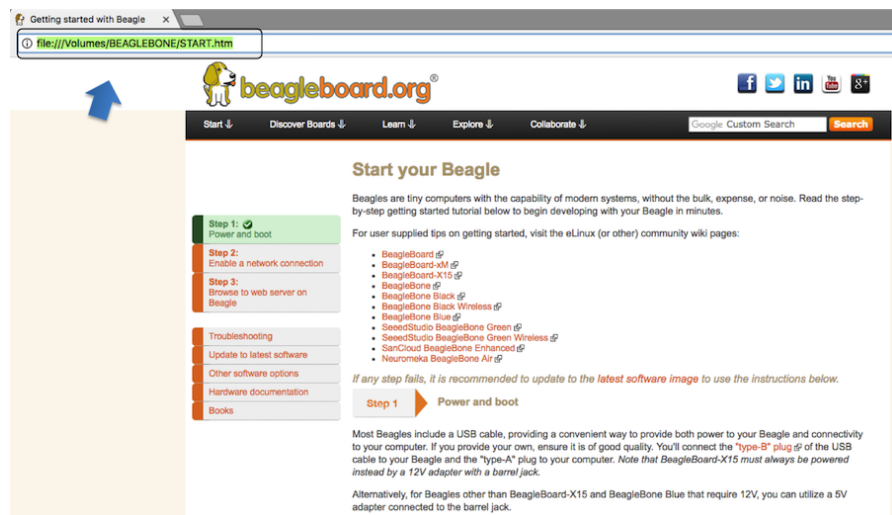
Write image to microSD with Etcher



Insert microSD and boot



Connect to the USB network



Getting started with Beagle

file:///Volumes/BEAGLEBONE/START.htm

beagleboard.org

Start ↓ Discover Boards ↓ Learn ↓ Explore ↓ Collaborate ↓ Google Custom Search Search

Start your Beagle

Beagles are tiny computers with the capability of modern systems, without the bulk, expense, or noise. Read the step-by-step getting started tutorial below to begin developing with your Beagle in minutes.

For user supplied tips on getting started, visit the eLinux (or other) community wiki pages:

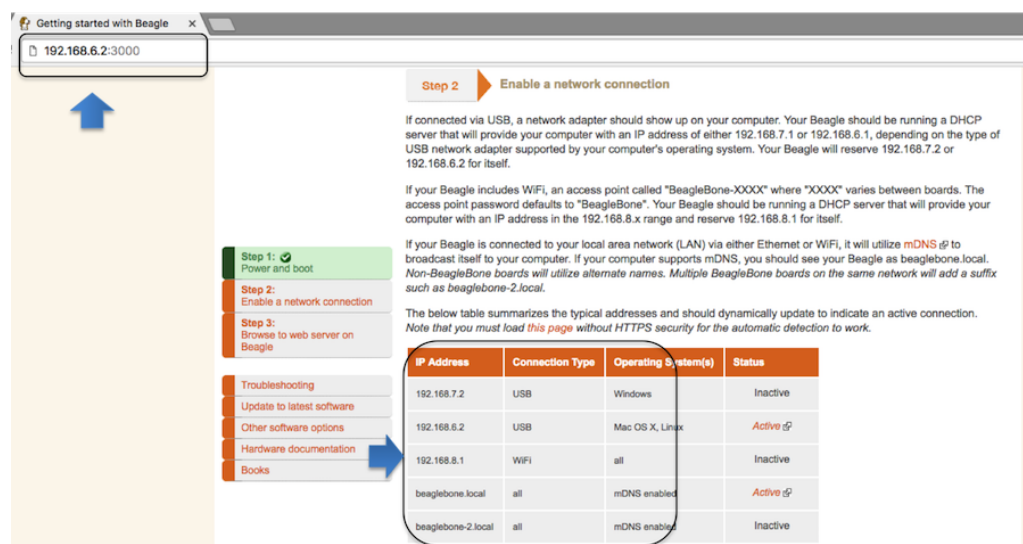
- BeagleBoard g
- BeagleBoard-xM g
- BeagleBoard-X15 g
- BeagleBone g
- BeagleBone Black g
- BeagleBone Black Wireless g
- BeagleBone Blue g
- SeedStudio BeagleBone Green g
- SeedStudio BeagleBone Green Wireless g
- SanCloud BeagleBone Enhanced g
- NeuroMeka BeagleBone Air g

If any step fails, it is recommended to update to the [latest software image](#) to use the instructions below.

Step 1 → Power and boot

Most Beagles include a USB cable, providing a convenient way to provide both power to your Beagle and connectivity to your computer. If you provide your own, ensure it is of good quality. You'll connect the "type-B" plug of the USB cable to your Beagle and the "type-A" plug to your computer. *Note that BeagleBoard-X15 must always be powered instead by a 12V adapter with a barrel jack.*

Alternatively, for Beagles other than BeagleBoard-X15 and BeagleBone Blue that require 12V, you can utilize a 5V adapter connected to the barrel jack.



Getting started with Beagle

192.168.6.2:3000

Step 2 → Enable a network connection

If connected via USB, a network adapter should show up on your computer. Your Beagle should be running a DHCP server that will provide your computer with an IP address of either 192.168.7.1 or 192.168.6.1, depending on the type of USB network adapter supported by your computer's operating system. Your Beagle will reserve 192.168.7.2 or 192.168.6.2 for itself.

If your Beagle includes WiFi, an access point called "BeagleBone-XXXX" where "XXXX" varies between boards. The access point password defaults to "BeagleBone". Your Beagle should be running a DHCP server that will provide your computer with an IP address in the 192.168.8.x range and reserve 192.168.8.1 for itself.

If your Beagle is connected to your local area network (LAN) via either Ethernet or WiFi, it will utilize mDNS to broadcast itself to your computer. If your computer supports mDNS, you should see your Beagle as beaglebone.local. *Non-BeagleBone boards will utilize alternate names. Multiple BeagleBone boards on the same network will add a suffix such as beaglebone-2.local.*

The below table summarizes the typical addresses and should dynamically update to indicate an active connection. *Note that you must load [this page](#) without HTTPS security for the automatic detection to work.*

IP Address	Connection Type	Operating System(s)	Status
192.168.7.2	USB	Windows	Inactive
192.168.6.2	USB	Mac OS X, Linux	Active g
192.168.8.1	WiFi	all	Inactive
beaglebone.local	all	mDNS enabled	Active g
beaglebone-2.local	all	mDNS enabled	Inactive

Open the IDE

