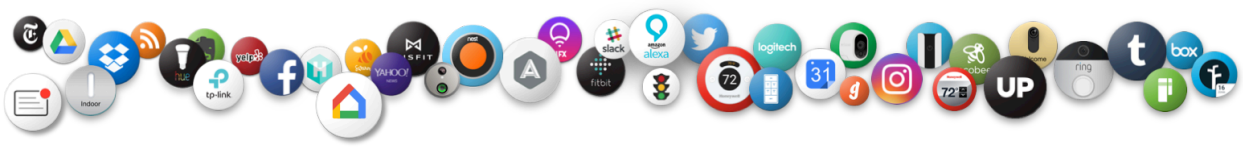


Stringify Developer Module (SDM)

Rev 0.3
June, 2017

Overview

Stringify already connects to more than 600 amazing products and services, but we recognize that some users want to connect even more Things, and have greater control of them.

In recognition of the growing maker and DIY community, Stringify is proud to announce a Node.js module that allows more advanced users to create and connect custom Things to our platform. We are calling it the Stringify Developer Module, or SDM for short.

With this module, you can connect just about anything that runs Node.js to Stringify. You can send and receive events and use your custom Thing in flows just like any other Thing.

The Developer module connects to Stringify and lets you write custom code in JavaScript to do just about anything you can imagine.

SDM can be installed on just about anything that runs Node.js.

Prerequisites

Before you install and use the Stringify Developer Module, you should be comfortable with:

- Basic Linux command line usage
- Using command line tools such as wget, tar (although you can cut and paste almost all the commands needed from this document)
- Building Stringify Flows
- Basic hardware wiring (if working with a Raspberry Pi)
- Writing JavaScript programs (if you intend to use the Developer Template plug-in)

Installing the Stringify Developer Module (SDM)

There are two ways to install SDM:

- Option 1. If you plan on installing SDM on a Raspberry Pi, the simplest method is to download the entire SDM Raspberry Pi image and all the necessary files (Node.js, SDM, etc.) will be installed.
- Option 2. If you plan on installing SDM on a device other than a Raspberry Pi, or have a Raspberry Pi you'd rather not wipe, then option 2 is for you.

Option 1. Install the Raspberry Pi image.

Requirements:
RPI model 3
16GB SD card minimum

Download the Raspberry Pi image here:
https://cdn.stringify.com/developer/stringify-pi.img.zip.

Follow the instructions to flash the image to a MicroSD card based on your operating system:

Linux:
https://www.raspberrypi.org/documentation/installation/installing-images/linux.md

Mac OS:
https://www.raspberrypi.org/documentation/installation/installing-images/mac.md

Windows:
https://www.raspberrypi.org/documentation/installation/installing-images/windows.md

Visit http://stringify-pi.local from a web browser on your local LAN.

That's it! The Stringify Developer Module is installed.

Option 2. Install SDM manually.

Installing Node.js

The first thing you'll need to do (if it is not already installed) is to install Node.js. If you've already installed Node.js, skip this section and jump to the Installing the Stringify Developer Module section.

Node.js is a JavaScript runtime built on Chrome's V8 JavaScript engine. Node is an event-driven, non-blocking I/O model that makes it lightweight and efficient. In essence Node.js runs JavaScript programs. The Stringify Developer module is written in Node.js and therefore requires Node.js to be installed in order for it to run.

If you are installing SDM on a Raspberry Pi, there are two ways to install Node.js

1. Using apt-get (the command-line tool for working with software packages), or
2. From the Node.js web site

If you are installing Node.js on a device other than a Raspberry Pi, jump to the *Installing Node.js from the Node.js web site* section below.

Using apt-get

Open up a terminal session on your Pi, then type:

```
apt-get install node.js (and press enter)
```

And simply follow the on-screen instructions.

Installing Node.js from the Node.js web site

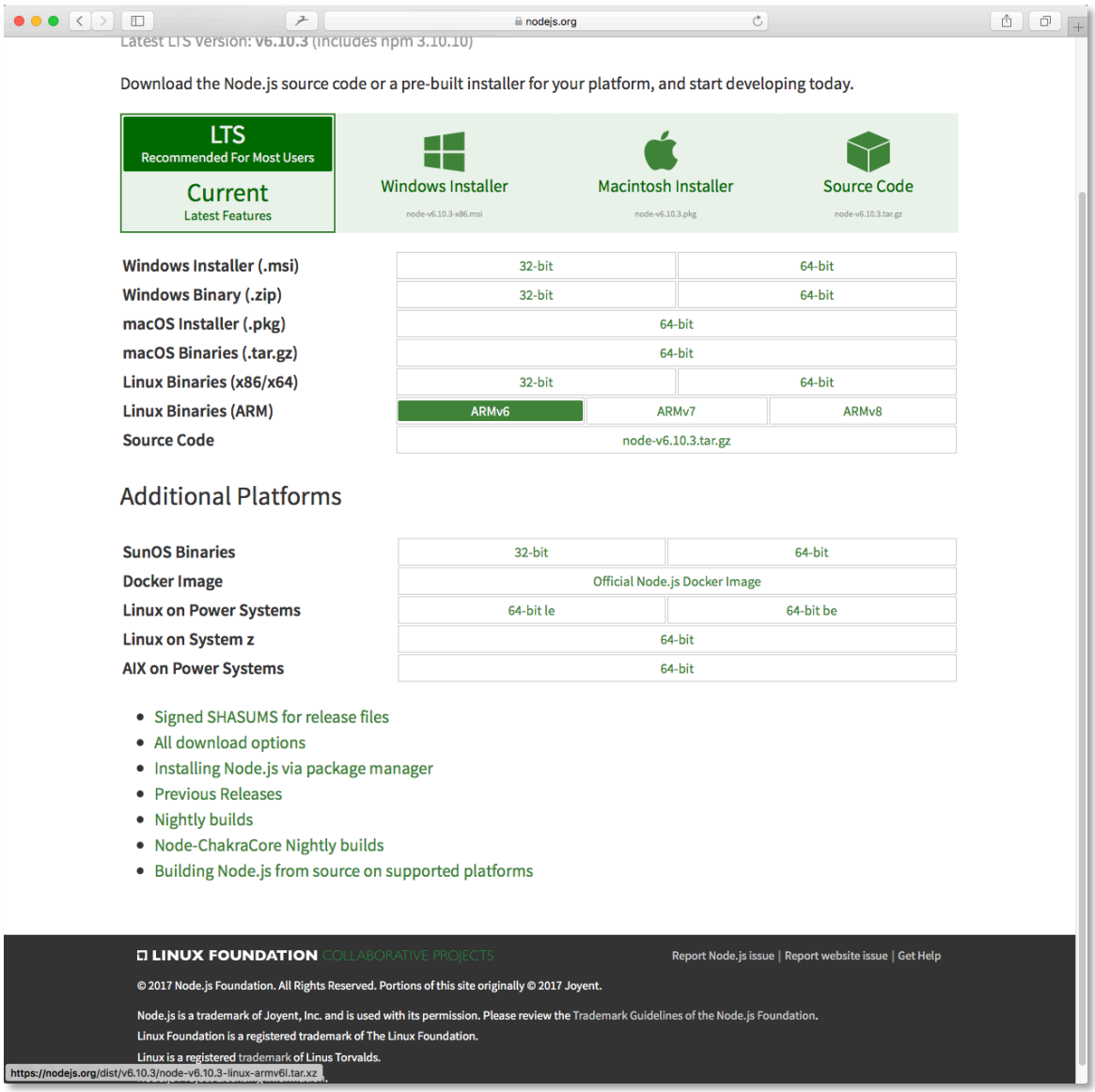
The latest version of Node.js can be found on the nodejs.org website in the downloads section: https://nodejs.org/en/download/

Simply download the correct installer for your platform.

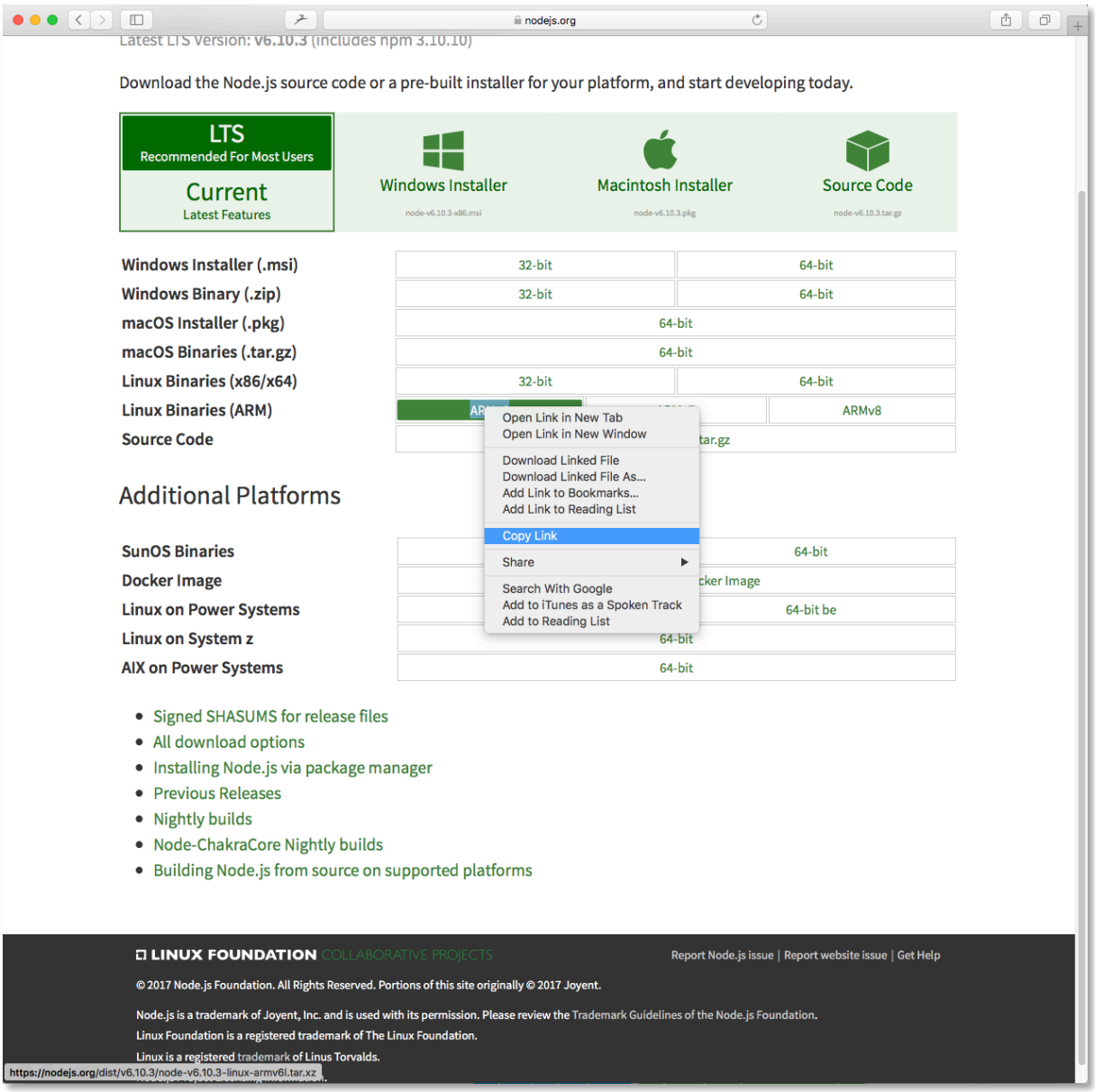
The following instructions explain how to install Node.js on a Raspberry Pi, there are a couple of more steps than installing Node.js on Windows or Mac OS X, but it's still pretty straight forward.

First, find out what the latest version of Node.js is. You can do this by going to the nodejs.org site and going to the downloads section: https://nodejs.org/en/download/

It looks something like this:



You'll need the Linux Binaries (ARM) version 6 link. To get the file name, simply however your mouse on the link or right click on the link and select Copy Link to copy the link to your clipboard. The screenshots here illustrate this on a Mac running Safari, but other browsers / operating systems will have a similar functionality.



Now that you have the link to the file you need to download, open up a terminal session on your Pi, then type:

```
wget paste_your_link_here (and press enter)
```

The command should look something like:

```
wget https://nodejs.org/dist/v6.10.3/node-v6.10.3-linux-
armv6l.tar.xz
```

Press enter, and this will download the Node.js binary.

Once downloaded, you'll need to unzip the binary. Do this by typing:

```
tar –xvf paste_your_link_here (and press enter)
```

The command should look something like:

```
tar -xvf https://nodejs.org/dist/v6.10.3/node-v6.10.3-linux-
armv6l.tar.xz
```

and press enter. This will unzip your files and place them in a directory called:

node-v6.10.3-linux-armv6l

Now type:

```
cd node-v6.10.3-linux-armv6l (and press enter)
```

This will place you into this newly created directory.

Finally, copy these files to /usr/local so they are globally accessible.

Type:

```
sudo cp -R * /usr/local/ (and press enter)
```

You'll be prompted to enter your password, then press enter again.

Double check to be sure you are in the node-v6.10.3-linux-armv6l directory when you do this.

That's it! Node.js is installed.

To verify that Node.js is properly installed and you have the correct version you just downloaded, type:

```
node –v (followed by enter)
```

and you should see v 6.10.3 displayed in the terminal window.

Installing the Stringify Developer Module

Now that Node.js is installed, let's install the Stringify Developer Module. This uses Node.js' package manager (npm) to install the module.

Open a terminal window (if one is not already open) and type:

```
npm install https://cdn.stringify.com/developer/stringify-developer-1.0.11.tgz -g (followed by enter)
```

The –g flag tells npm to install Stringify globally. There are two ways to install npm packages: locally or globally. You choose which kind of installation to use based on how you want to use the package. Be sure to include the –g flag here.

Note: It is possible that this install step could fail depending upon your npm settings (keep an eye on the terminal output). If it does fail, you may have to sudo to install the Stringify Developer Module. Simply preface the npm command with sudo:

```
sudo npm install https://cdn.stringify.com/developer/stringify-developer-1.0.11.tgz -g (followed by enter)
```

You'll be prompted to enter your password, then press enter again.

Depending upon your platform and configuration, the installation may take a minute and may prompt you to install some additional files, follow the instructions as prompted.

That's it! The Stringify Developer Module is installed.

Optional Install – Audio support

Note: There is one additional install you may wish to do if you want to play audio out of the Raspberry Pi's audio port, and that is to install an application called mpg123.

mpg123 is a free and open-source audio player. It supports MPEG audio formats, including MP3.

It's worth taking a moment to install this application as it will let you build flows that support sound and TTS (Text To Speech).

To install this application on a Raspberry Pi, open a terminal window (if one is not already open) and type:

```
sudo apt-get install mpg123 (and press enter)
```

You'll be prompted to enter your password, then press enter again.

That completes the Stringify Developer Module installation.

Launching the Developer Module

At this point you have all the necessary prerequisites installed to start using the Stringify Developer Module.

To launch the Stringify Developer Module, open a terminal window (if one is not already open) and type:

```
stringify (and press enter)
```

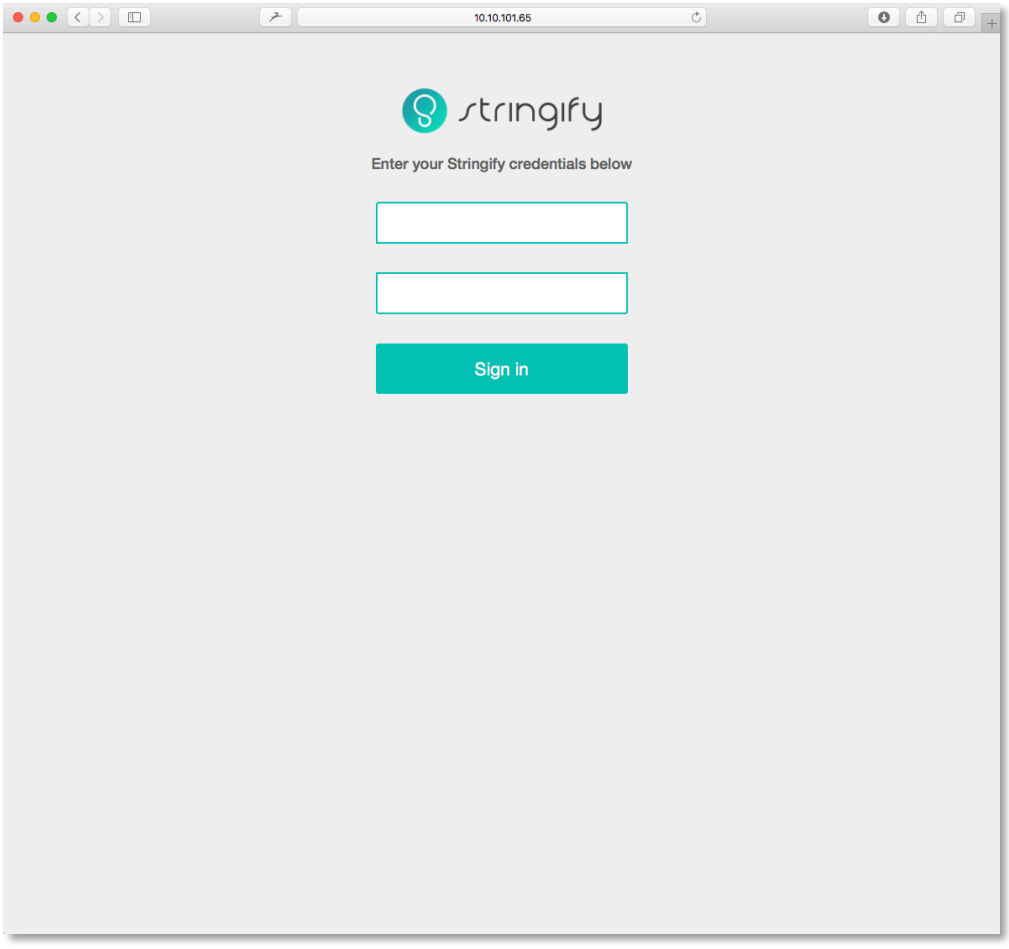
If a command not found message is displayed, navigate to /usr/local/bin and try again:

```
./stringify (and press enter)
```

Upon start-up you will see an informational message like the following, with instructions to log in via a web browser:

```
info: >>> Stringify Developer module starting up
debug: Not logged in. Please visit http://10.10.101.65:1337 in
your web browser.
```

Leave the process running, launch your web browser and go to the URL indicated; http://10.10.101.65:1337 in this example.

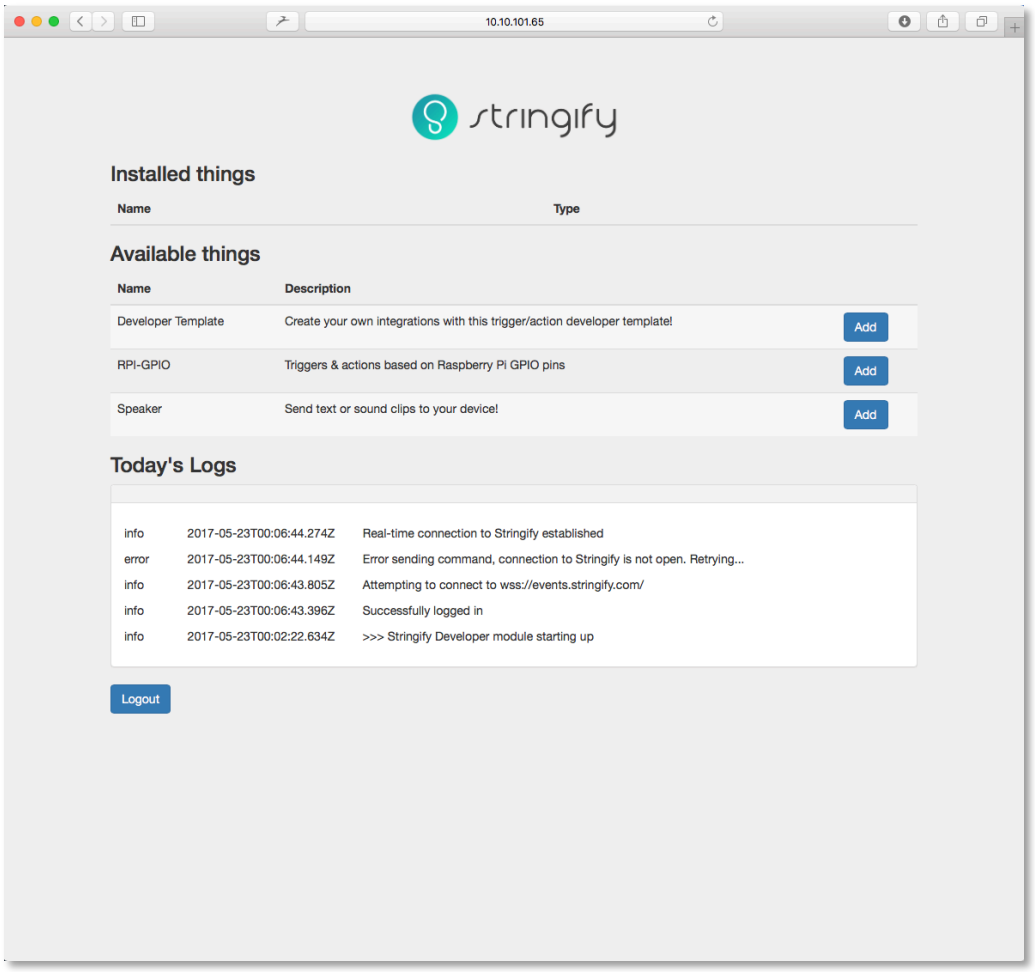


You will need a valid Stringify account to log in. If you do not have a Stringify account, use the iOS or Android client to create one.

Once logged in, the Stringify process in your terminal window will display logging information:

```
debug: Connection to browser established
info: Successfully logged in
debug: Testing user credentials...
debug: Please visit http://10.10.101.65:1337 in your web browser
to configure.
info: Attempting to connect to wss://events.stringify.com/
debug: Requesting list of your Things from Stringify for device
with mac ac:de:48:00:11:22
debug: Requesting list of available Things
error: Error sending command, connection to Stringify is not
open.  Retrying...
info: Real-time connection to Stringify established
debug: Requesting list of your Things from Stringify for device
with mac ac:de:48:00:11:22
debug: Requesting list of available Things
debug: Received 0 Things in your Stringify library
debug: Received 3 available Things
debug: Received 0 Things in your Stringify library
debug: Received 3 available Things
debug: Sending browser reload request
debug: Connection to browser established
```

and the web browser will display a Stringify welcome screen with Available Things:



The Stringify Developer Module uses a plug-in architecture so features can be easily added. There are three default plug-ins.

Developer Template

Use this to create your own integrations into Stringify. It supports Triggers and Actions and lets you write custom code.

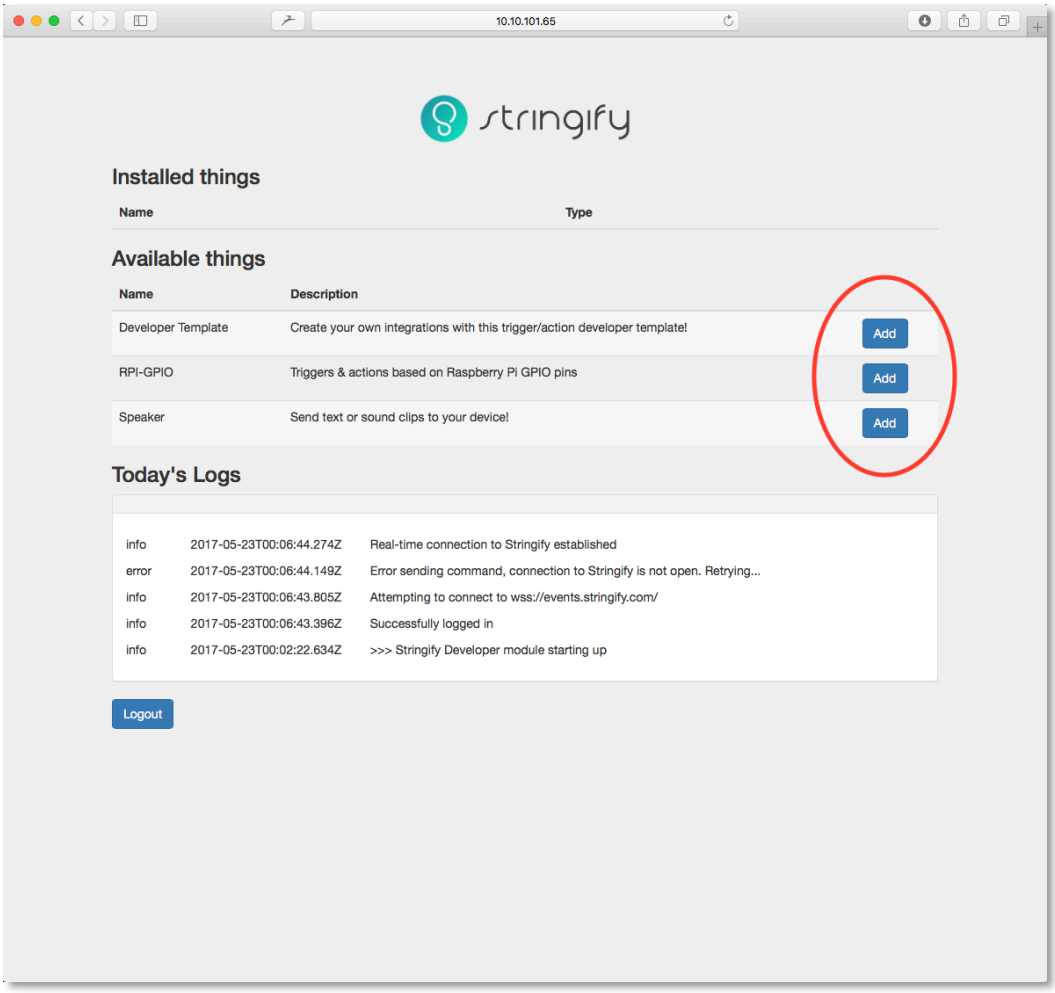
RPI-GPIO

Use this to create triggers & actions using the Raspberry Pi GPIO pins.

Speaker

Use this to send text or sound clips through the audio port of the Raspberry Pi.

Next to each option is an Add button where you can choose which plug-ins to install based upon your needs.



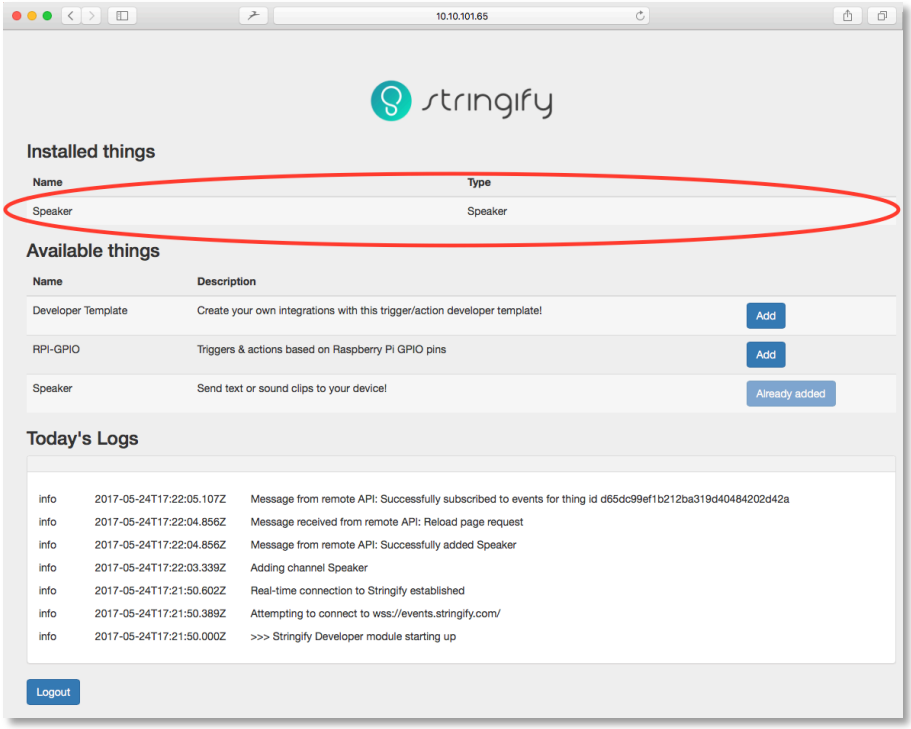
Once you click on Add, the Stringify process will indicate the addition of the plug-in via its logs. In the following example, we've clicked on the Speaker plug-in to Add it:

```
info: Adding channel Speaker
info: Message from remote API: Successfully added Speaker
info: Message received from remote API: Reload page request
```

```
debug: Requesting list of your Things from Stringify for device
with mac ac:de:48:00:11:22
debug: Requesting list of available Things
debug: Received 1 Things in your Stringify library
debug: Received 3 available Things
debug: Sending browser reload request
debug: Sending browser reload request
debug: stringify-developer-speaker: Module Initialized.
debug: Sending request to subscribe to events for Speaker (Thing
id d65dc99ef1b212ba319d40484202d42a)
debug: stringify-developer-speaker: Listening for events for
Speaker.
debug: Returning list of things from cache
info: Message from remote API: Successfully subscribed to events
for thing id d65dc99ef1b212ba319d40484202d42a
debug: Connection to browser established
```

Note that the Thing will be automatically added to your Thing library in your Stringify app on your mobile device:

and the Stringify application web page will reflect the plug-in added:



Note: Removing the Thing from your Stringify application via your mobile device will also uninstall the plug-in from the Stringify Developer Module.

Let's build a flow.

To demonstrate how this all works, let's build the classic "Hello, World" example using a Stringify Flow.

Build a flow using a Button Thing and the newly added Speaker flow. Call it "Hello World". It should look like this:

And the options for the Speaker Thing should look like this:

Enable your flow. The terminal window should show a confirmation:

```
debug: Sending request to subscribe to events for Speaker (Thing
id d65dc99ef1b212ba319d40484202d42a)
debug: stringify-developer-speaker: Listening for events for
Speaker.
debug: Returning list of things from cache
info: Message from remote API: Successfully subscribed to events
for thing id d65dc99ef1b212ba319d40484202d42a
debug: Connection to browser established
info: Message from remote API: You added an instance of Speaker
(instance id qOJ2KWCK7neyQoZ3sl36) to a flow
debug: stringify-developer-speaker: Listening for events for an
instance of the speaker in a flow.
```

Now, find your Button Thing in your Thing library in the Stringify app on your mobile device, tap on it, and you should hear “Hello, World” spoken out of your speakers.

The terminal window will also show an action received event:

```
debug: Received an action for Speaker
debug: Writing file
/var/folders/9r/drgbdkf12ybchqnf1zgy5hnw0000gn/T/lw0JhV1X.mp3
debug: Playing file
/var/folders/9r/drgbdkf12ybchqnf1zgy5hnw0000gn/T/lw0JhV1X.mp3
debug: Done playing, deleting file
```

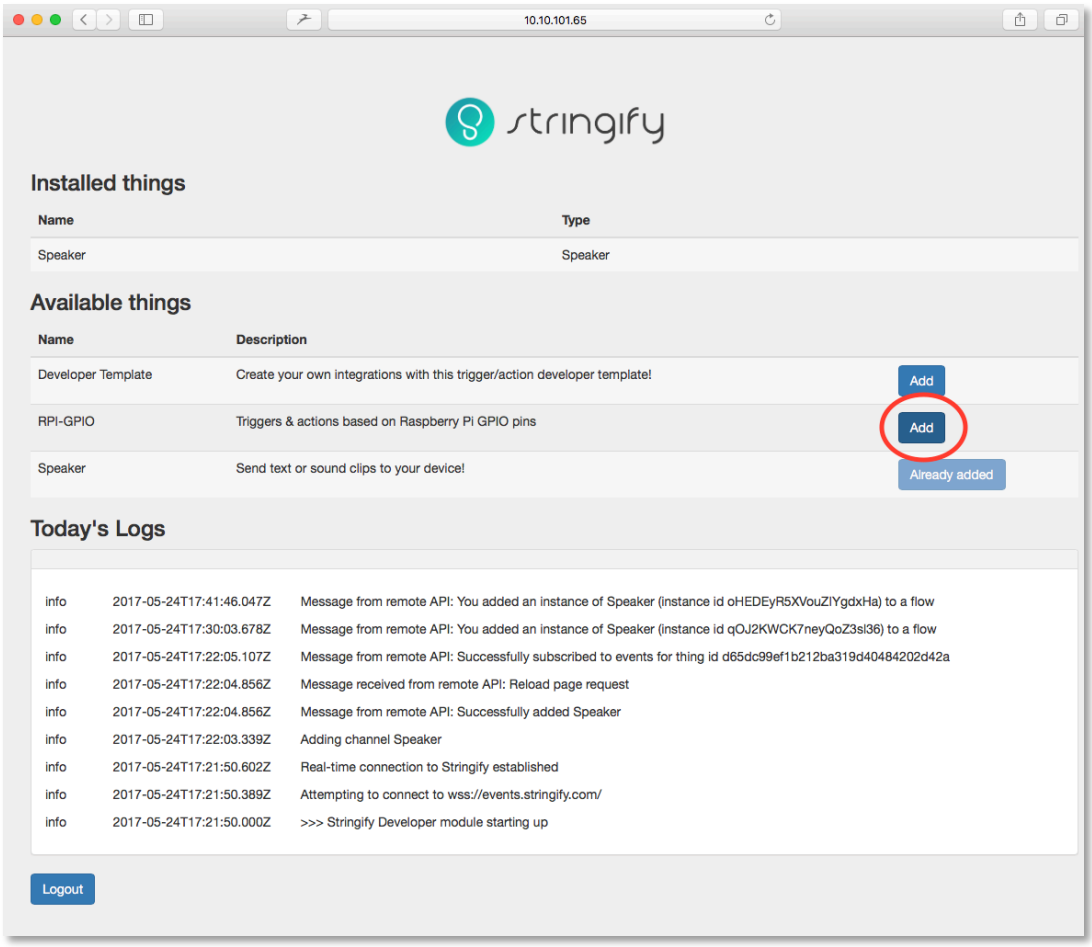
That’s it! You’ve created your first flow using the Stringify Developer Module.

Using the GPIO ports on the Raspberry Pi.

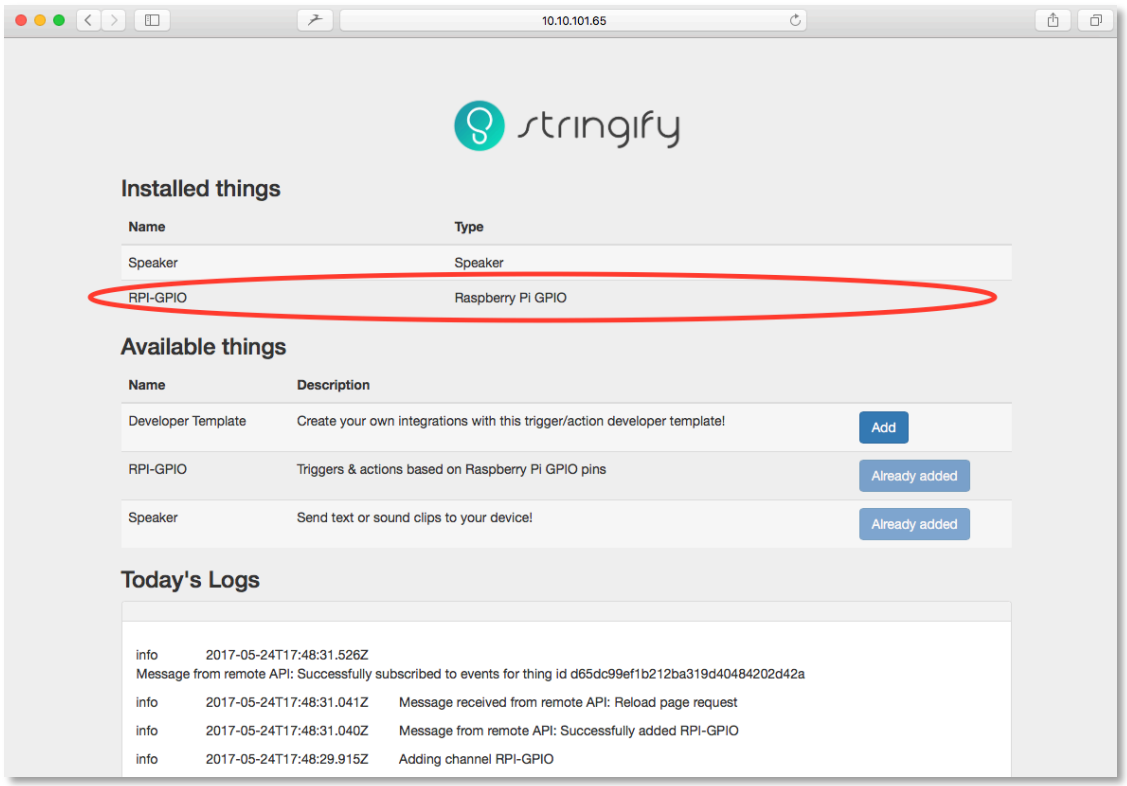
Next, we’ll build a simple Flow to turn on an LED on the Raspberry Pi when a button is pressed on a phone. This example can be easily extended to trigger a flow based on external events such as weather, motion, etc., but this Flow will illustrate the basic concepts.

NOTE: You will need to run the Stringify app under SUDO to access the GPIO ports on the Raspberry Pi.

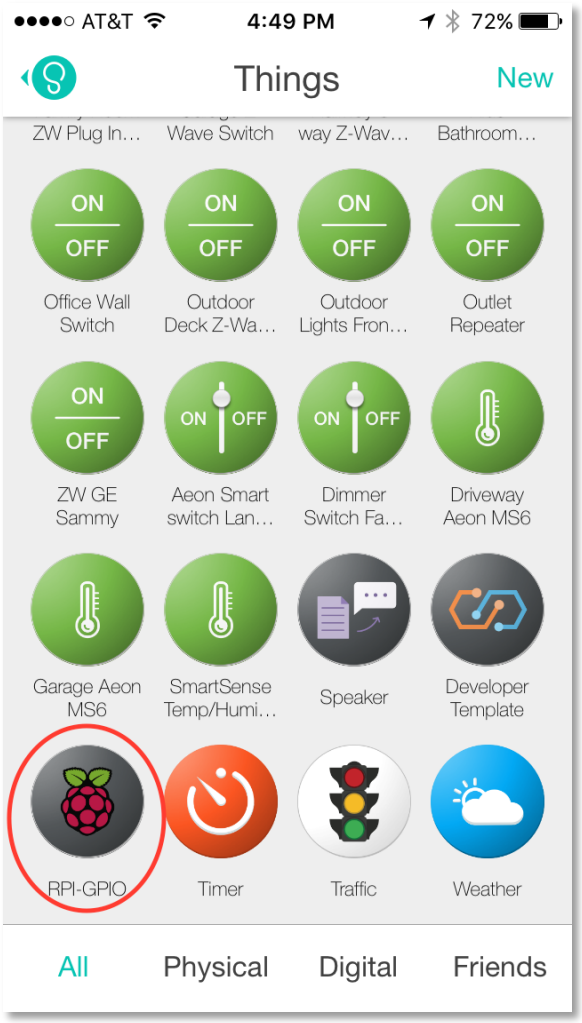
First, add the GPIO plug-in to the Stringify Developer Module. Do this the same way you added the Speaker plug-in:



Once added, you'll see the GPIO plug-in listed under Installed things on the web page:



and the GPIO Thing added to your Things library in the Stringify mobile app:



GPIO Flow

Now, we'll build a simple flow to demonstrate turning on an LED via a digital Button in the Stringify app.

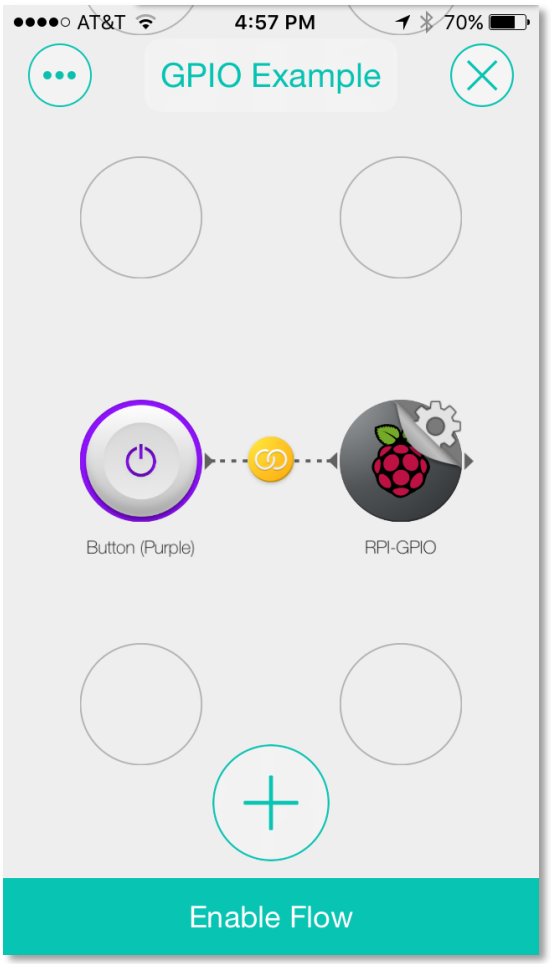
Before you can build the flow however, you'll need to make sure an LED is properly connected to the Raspberry Pi GPIO ports.

There are some excellent tutorials online for how to physically connect the necessary hardware to the Pi so this document will not go into detail on how to wire up an LED.

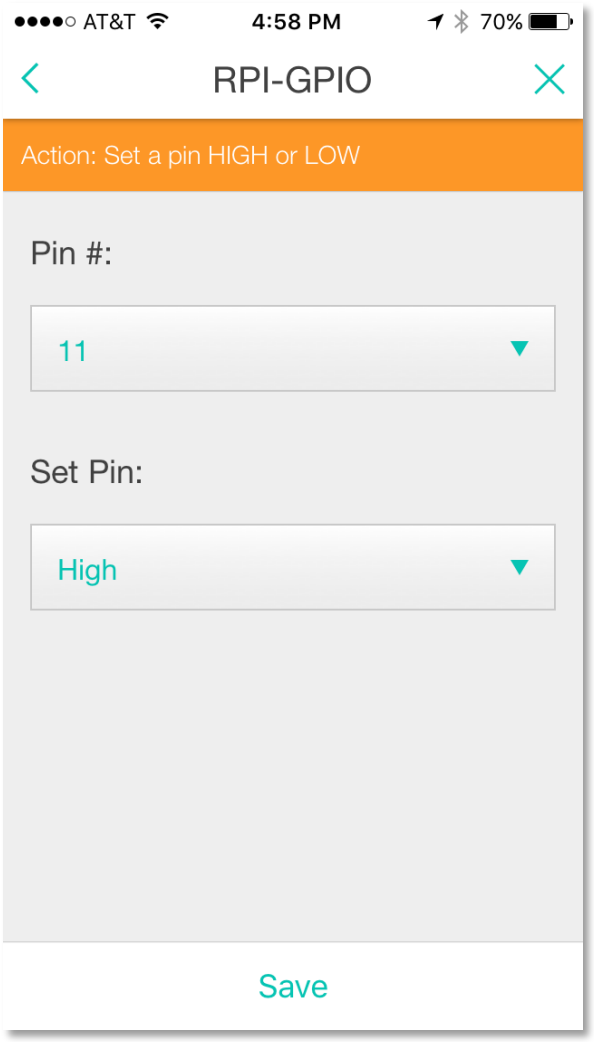
See Gordons Projects for one excellent example.

Now that your LED is wired up, let's build the flow.

Using the Stringify app on your mobile device, create a Flow using a Button Thing and the GPIO Thing as shown:



Configure the GPIO Thing settings to set pin 11 to high as shown:



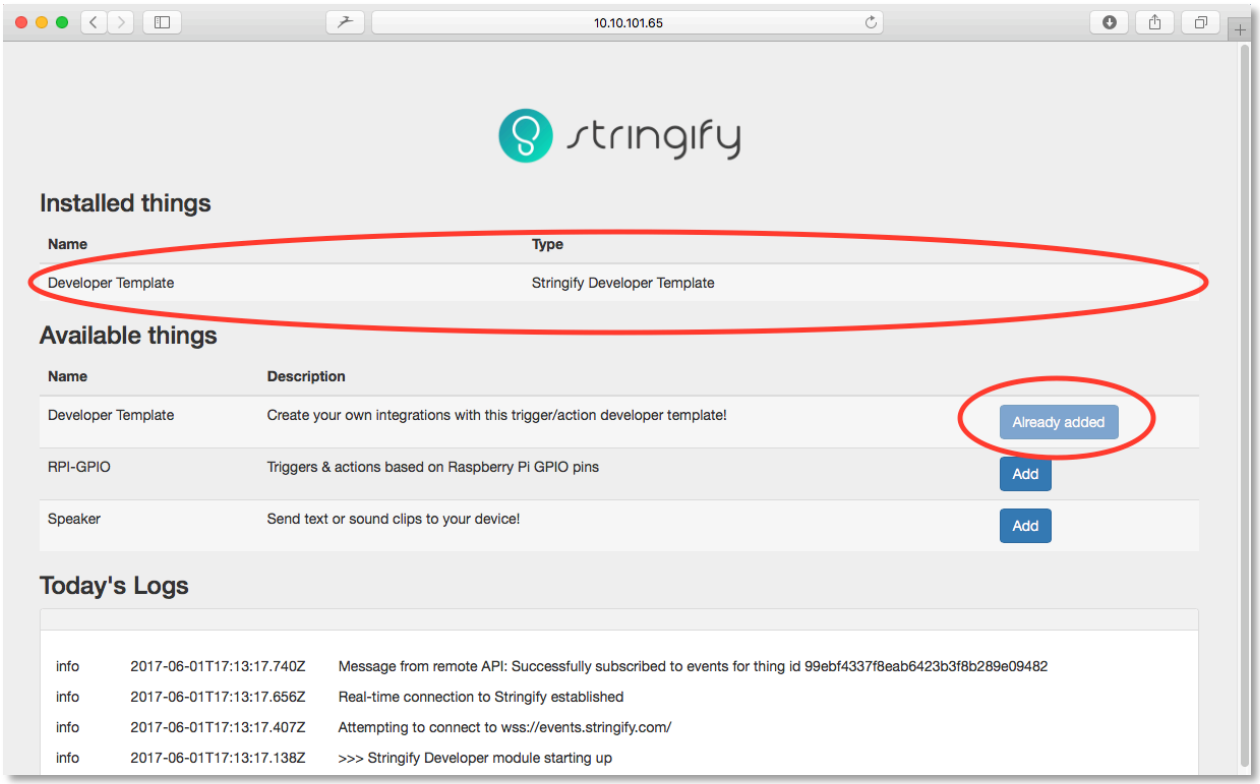
Now, when you press the digital Button Thing on the Stringify mobile app, the LED on the Raspberry Pi should turn on.

If it does not, be sure to check your wiring and pin assignments.

Developer Template

The Developer Template lets you create more sophisticated interactions with Stringify using Triggers and Actions. It is arguably the more powerful of the plug-ins as it lets you write custom JavaScript code to do exactly what you want.

Before you can begin writing any code, be sure to add the Stringify Developer Template via the web interface:



Once added, open up a terminal window and locate the directory *stringify-developer-template.* It will be located where you installed SDM. In our installation, on a Mac, it was found in:

/usr/local/lib/node_modules/stringify-developer/node_modules/stringify-developer-template

In this directory, you will find a JavaScript file called index.js:

```
drwxr-xr-x    6 nobody  staff   204 Jun  1 10:34 .
drwxr-xr-x  243 root    staff  8262 May 22 16:55 ..
-rw-r--r--    1 nobody  staff    98 Mar 14 07:37 .npmignore
-rw-r--r--    1 nobody  staff    98 Mar 14 08:31 README.md
-rw-r--r--    1 nobody  staff  2451 Jun  1 10:13 index.js
-rw-r--r--    1 nobody  staff  2419 May 22 16:54 package.json
```

This is the Developer Template file that you can edit to add your custom code to. This file handles all the communication to Stringify, so you can focus on your unique code.

In the following examples, we're using the Sublime text editor to edit index.js, but use whatever editor you are comfortable with.

Tip: If you've installed Sublime, you can create a symbolic link so you can open files directly from the command line:

```
ln -s /Applications/Sublime\
Text.app/Contents/SharedSupport/bin/subl /usr/local/bin/subl
```

Now you can edit the Developer Template (index.js) simply by typing:

```
subl index.js
```

Overview

Now that we have the Developer Template (index.js) file open, let's take a closer look. If you are a Node.js / JavaScript developer, you should immediately be comfortable with the syntax. There are 5 functions to make note of that are involved when something "interesting" happens within Stringify. These are functions you can extend with your own code. We'll examine each briefly here, then provide more detailed examples below.

this.action

This function gets invoked when a Flow containing the Developer Template uses an Action. A string can be passed from your Flow to this function which can then be examined to determine program flow. Said another way, a Flow can pass a string to this function and then your code can determine what to do based on the value of that string.

this.thingAdd

This function gets invoked when the Developer Template is added to your library.

this.flowAdd
This function gets invoked when a Flow containing the Developer Template is enabled.

this.thingDel
This function gets invoked when the Developer Template is removed from your library.

this.flowDel
This function gets invoked when a Flow containing the Developer Template is removed.

You can add debugging code (ex. console.log) in the Developer Template to see what functions are called when you perform different events via web interface and mobile app.

Now let's go into each one in more detail.

Using the Developer Template to handle events.

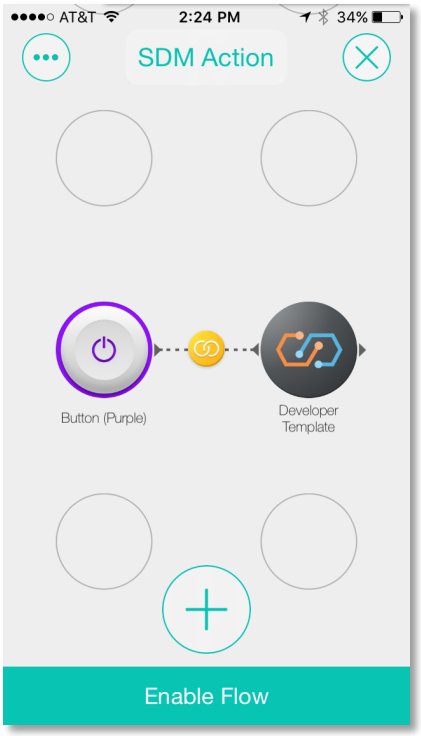
this.action
This function gets invoked when a Flow containing the Developer Template uses an Action. A string can be passed from your Flow to this function which can then be examined to determine program flow. Said another way, a Flow can pass a string to this function and then your code can determine what to do based on the value of that string.

Let's build a flow to demonstrate this function.

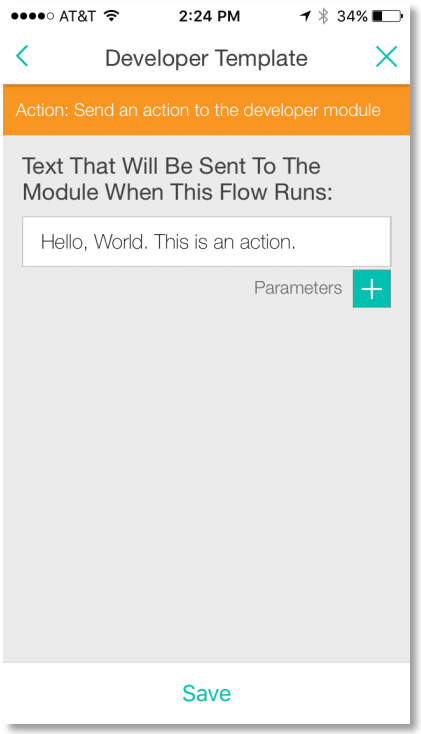
First, modify the *this.action* function to contain the following:

```
this.action = (message) => {
   console.log("Received message: " + JSON.stringify(message));
};
```

Next, using the mobile App, build a flow that uses a Button Thing to pass a string to the Developer Template. It will look something like the following:



Here we have a button (the Trigger) that when clicked will cause the Developer Template Thing to pass a string to the Node.js Developer Template process. The settings for the Developer Template Thing look like the following:



Here we have specified the string: *"Hello, World. This is an action."* which will be passed to the Developer Template *this.action* function.

Enable the Flow, go to your Thing Library and tap on the button you added to the Flow. (Make sure Stringify is running on your device). You may need to invoke it with:

```
sudo stringify
```

You should immediately see on the console, something similar to the following:

```
debug: Received an action for Developer Template
Received message:
{"id":"bVYku5wvZwvTJx3cls4M","flowId":"AOD1AQOvSYxlyBVI5mB2","co
ntrols":{"action":"Hello, World. This is an
action."},"action":"action"}
```

Due to the code change we made to *this.action* above:

```
this.action = (message) => {
   console.log("Received message: " + JSON.stringify(message));
```

```
};
```

Note that the message received:

```
{"id":"bVYku5wvZwvTJx3cls4M","flowId":"AOD1AQOvSYxlyBVI5mB2","co
ntrols":{"action":"Hello, World. This is an
action."},"action":"action"}
```

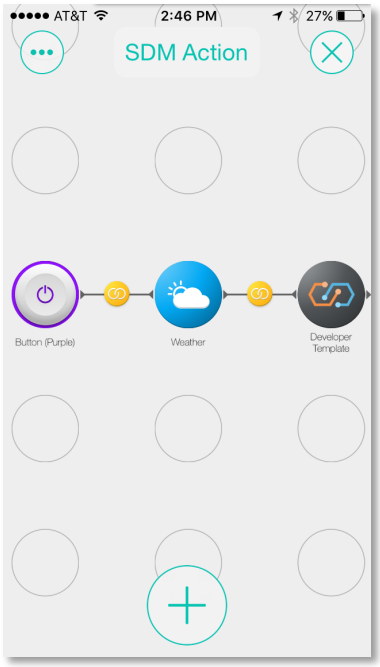
is a JSON object that can be easily parsed:

Explanation of the fields:

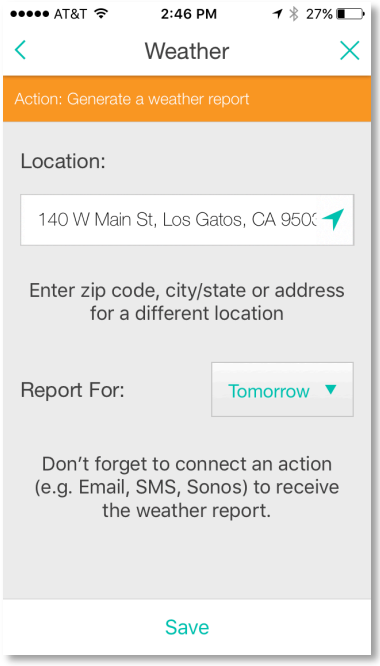
> *id* is the id of the Thing in the Flow. This can be used to uniquely identify Things in Flows.
>
> *flowId* is the id of the Flow. This can be used to uniquely identify Flows.
>
> *controls.action* is the string you passed to the Developer Template from your Flow. This can be examined to determine what action your code should take next.
>
> *action* is the type of event received. Currently there is only one.

Notice how the string you send to the Developer Template does not need be only static text as shown in our example. You can send text passed from other Things in a Flow. For example, you could send the weather temperature to the Stringify Developer Template and perform a task specific to the temperature.

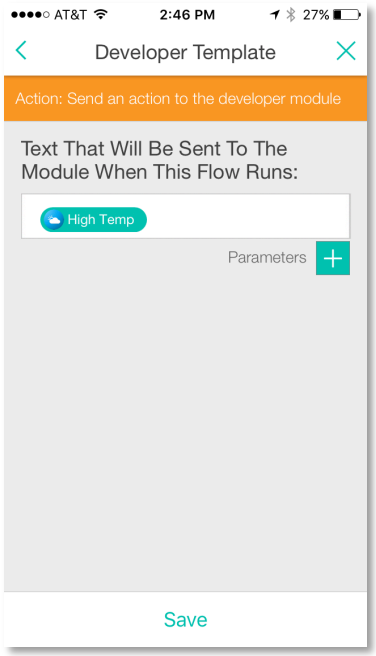
The following Flow shows an example of passing the Weather temperature to the Developer Template:



The following shows the Weather Thing Action settings:



And here we show passing the High Temp Parameter from Weather to the Developer Template:



When this Flow is run (by pressing the button that starts the Flow), it should result in the following console output:

```
debug: Received an action for Developer Template
Received message:
{"id":"lOiwSucFv3m0NzavzY3r","flowId":"AOD1AQOvSYxlyBVI5mB2","co
ntrols":{"action":"Tomorrow's high: 81F"},"action":"action"}
```

The *action* value (*"Tomorrow's high: 81F"*) could be examined, and program flow logic could execute based upon that value.

Note that the *action* value in this example is a full string: *"Tomorrow's high: 81F"* and not simply the numeric value *81*. This is because the Weather Thing passes a "*friendly*" string so that when the Weather Thing is used with other Things such as a connected speaker, it allows the text to be read aloud properly. If you want to extract only the numeric value 81, you could place our Text Thing in front of the Developer Template in your Flow. It has a function that can be used to strip out non-numeric values from a string.

this.thingAdd

This function gets invoked when the Developer Template is added to your library.

To see this in action, add a SDM plug-in via the web interface.

this.flowAdd

This function gets invoked when a Flow containing the Developer Template is enabled.

To see this in action, add and enable a Flow via the Mobile app.

this.thingDel

This function gets invoked when the Developer Template is removed from your library.

To see this in action, remove a SDM plug-in via the Mobile app.

this.flowDel

This function gets invoked when a Flow containing the Developer Template is removed.

To see this in action, remove a flow via the Mobile app.

Using the Developer Template as a Trigger.

As you have seen, the Developer Template can respond to Actions created via Flow. It can also send Triggers that Flows respond to.

A Trigger emitted from the Developer Template contains a string that must match a string specified in a Flow.

Let's see this in action.

First, modify *index.js* to emit a Trigger. Right after the *this.flowDel* function add the following code so *index.js* looks something like:

```
.
.
.
```

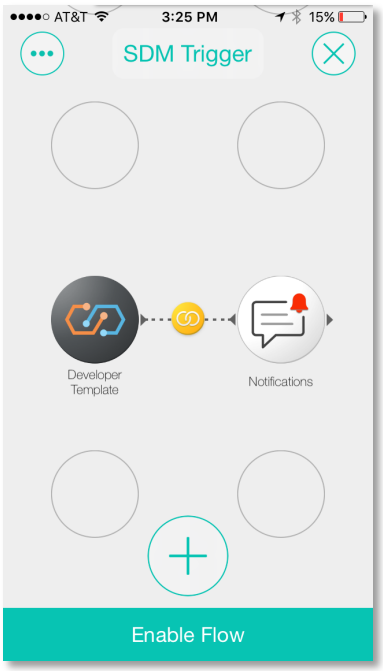
```
this.flowDel = ...

setInterval(function(){
  console.log('Emitting trigger hi');
     self.emit('trigger', {
     trigger: 'I am a trigger'
  });
},5000);

.
.
.
```

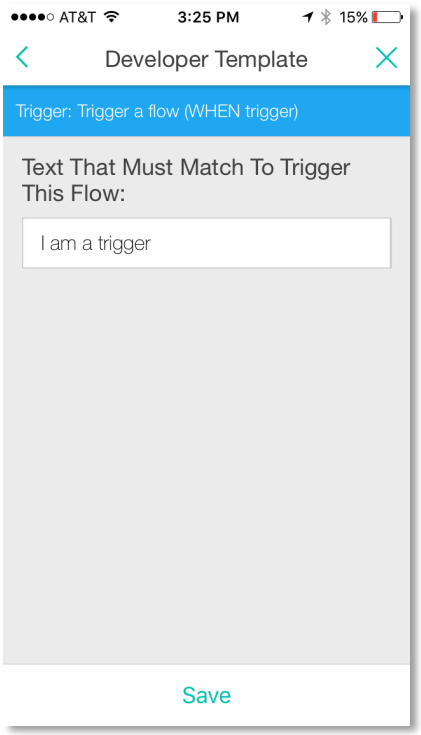
This example will cause the Developer Template to emit a Trigger every 5 seconds (5000 milliseconds) that the Stringify Flow engine will respond to.

In addition to this code change, create a Flow using the Mobile App that looks something like the following:

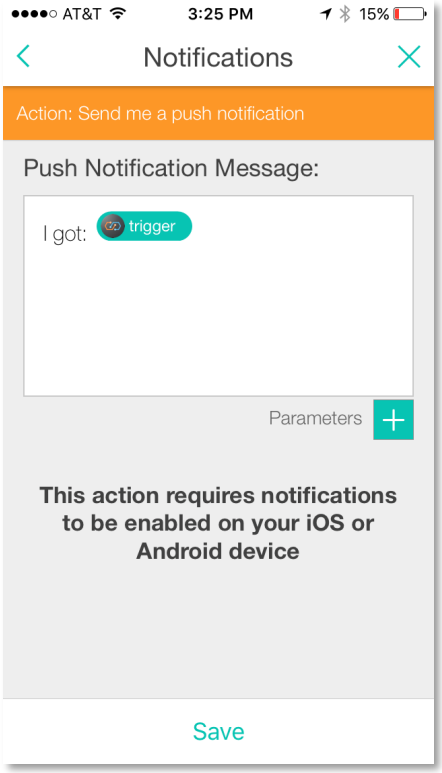


This tells the Developer Template Thing to send an Action containing a string to the Notification Thing. Of course, this could be any other Thing such as a Speaker Thing for performing Text To Speech (TTS).

The Developer Template Thing Action looks like the following:



And, finally, the Notification Thing looks like the following:



Now go ahead and run Stringify via your terminal session, and every 5 seconds you should get a notification on your phone that says “I am a trigger”. (Be sure your Flow is enabled via the Mobile App):

Be sure to disable your Flow on your Mobile App to stop receiving the notifications after you have tested this functionality.

That’s it! You can now write code that sends events to Stringify that can be used in your Flows, and you can create Flows that send events to your code.

This document just touches on the very basics of what you can do with SDM. We hope this helps get you started. If you have any questions or suggestions, don’t hesitate to reach out to us.