Visualizing Sensor Data With Angular

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Tara Z. Manicsic

tzmanics@gmail.com

Introduction

- **What We Will Cover**
  - Hardware Selection
    - Tessel 2
  - Hardware Setup
    - Installing the Tessel 2 & its Modules
    - Sending Sensor Data to Firebase
  - Displaying the Sensor Data
    - Creating the Angular App with Kendo UI Charts
    - Populating the Charts with Sensor Data from Firebase

Speaker: Tara Z. Manicsic

- Developer Advocate for Progress
- @tzmanics
- Maker of Things

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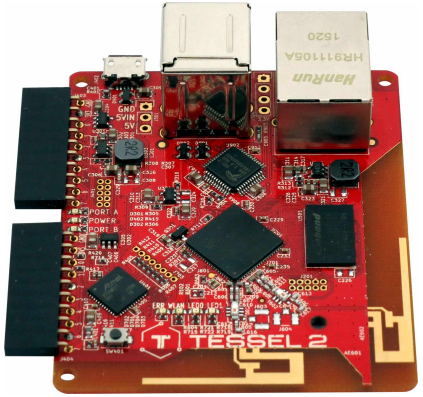
Kelsey Breseman

@ifoundtheme

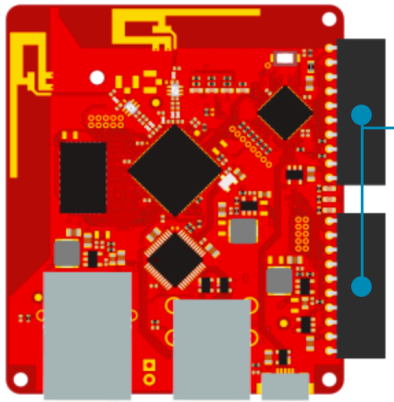
Hardware Selection

Tessel 2 Microcontroller

- Created in 2013 by Tessel to help web developers with IoT
- Plug n' Play sensor modules using npm
- Code in JavaScript



TESSEL



TESSEL 2 FEATURES

EVERYTHING YOU NEED TO GET UP AND RUNNING.

- **2 Tessel Module ports**
  add sensors and actuators in one step
- **2 USB ports**
  use peripherals like cameras and 3G/4G dongles
- **802.11bgn Wifi**
  connected out of the box and wirelessly programmable
- **Ethernet**
  an ultra-reliable, wired connection
- **580MHz Mediatek MT7620n**
  execute your program faster
- **64 MB DDR2 RAM & 32 MB Flash**
  plenty of space for your code
- **48MHz Atmel SAMD21 coprocessor**
  realtime I/O and better power management
- **microUSB**
  power and tethered programming

10-PIN MODULES


Accelerometer


Ambient


Relay


Climate

Infrared

USB MODULES

BLE


Cellular


MicroSD


Camera


Audio

COMMUNITY-CREATED MODULES


Distance


Color Sensor


Keypad


Lights/LEDs


Motion

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Limerick Rhyming Structure

Poltergeist sticking charm *A*
Troll umbrella stand flying *A*
Golden locket Lily *B*
Potter pumpkin juice *B*
Wave your wand out glass *A*

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LIMERICK CHALLENGE!!!!!!

With IoT you shouldn't *wrestle*
Just plug in sensors to tightly *nestle*
Grab data you need
With ease and speed
Plug, install & play with **TESSEL**!

Hardware Setup

Finding Tessel & Setting Network

```
┌[kiwish-4.2]-(~)-[58%]
└> t2 list
INFO Searching for nearby Tessels...
        USB     Tessel-02A386F29F22
```

```
┌[kiwish-4.2]-(~)-[57%]
└> t2 wifi -n tzmanics -p angularmix
INFO Looking for your Tessel...
INFO Connected to Tessel-02A386F29F22.
INFO Wifi Enabled.
INFO Wifi Configured. (SSID: tzmanics, password: a********x, security: psk2)
INFO Wifi Connected.
```

Hardware Setup

Create Project Directory & Initialize

```
mkdir tessel-sensor-data && cd tessel-sensor-data
```

```
┌[kiwish-4.2]-(~/tessel-sensor-data)-[57%]
└> t2 init
INFO Initializing new Tessel project for JavaScript...
INFO Created ".npmrc".
INFO Created ".tesselinclude".
INFO Created "index.js"
INFO Created "package.json".
```

Hardware Setup

Installing the Ambient Module

```
┌[kiwis-4.2]-(~/tessel-sensor-data)-[57%]
└> npm install ambient-attx4
npm notice created a lockfile as package-lock.json. You should commit this file.
+ ambient-attx4@0.2.11
added 5 packages in 1.779s
```

```
  "readme": "A bare bones Tessel 2 blinky script.",
  "dependencies": {
    "ambient-attx4": "^0.2.11"
  }
}
```

package.json

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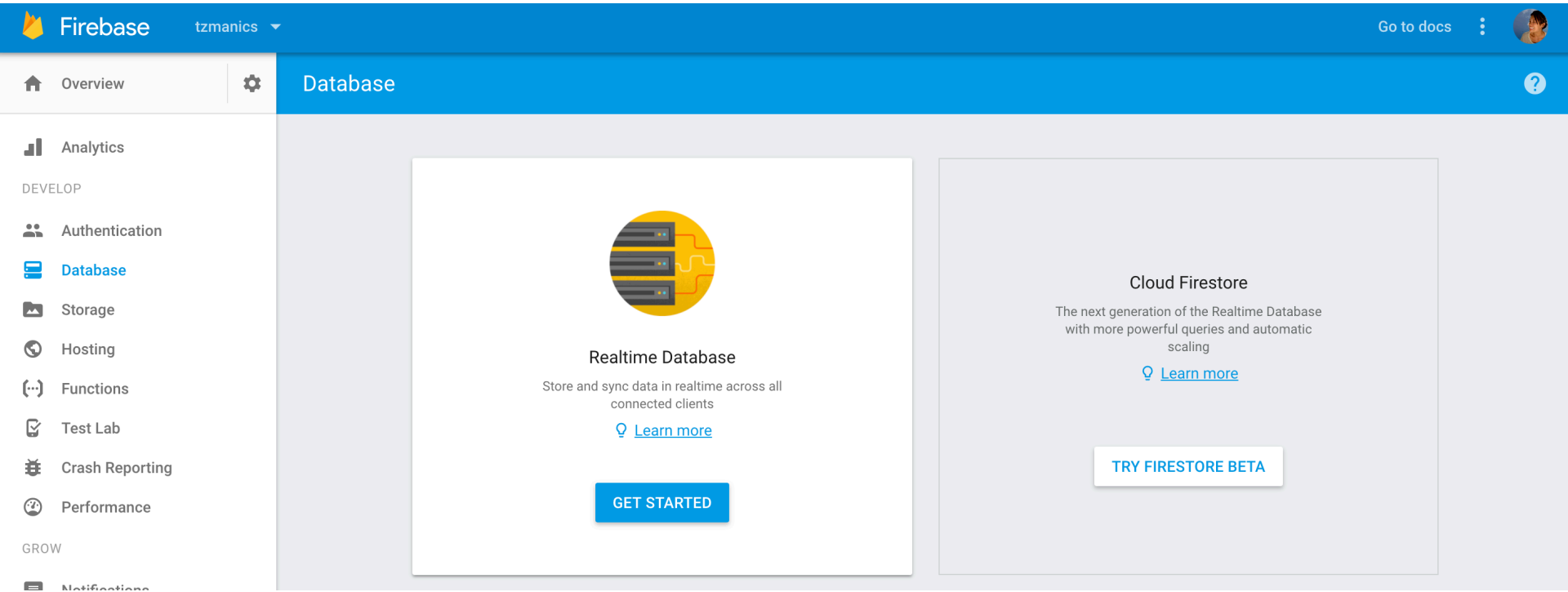
Firebase DB Creation



Installing Firebase

```
┌[kiwish-4.2]-(~/tessel-sensor-data)-[52%]
└> npm i firebase
+ firebase@4.5.0
added 24 packages in 1.675s
```

Collecting and Sending Data

Using Firebase Realtime Database

```
const ambientlib = require('ambient-attx4');
const firebase = require('firebase');
const tessel = require('tessel');

const ambient = ambientlib.use(tessel.port['A']);

const config = {
  apiKey: "AIzaSyACbmF3GzX81P2TNY9-yJ__mrBETc",
  authDomain: "visualizing-sensor-data-4900f.firebaseapp.com",
  databaseURL: "https://visualizing-sensor-data-4900f.firebaseio.com",
  projectId: "visualizing-sensor-data-4900f",
  storageBucket: "visualizing-sensor-data-4900f.appspot.com",
  messagingSenderId: "543703649"
};
```

index.js

Collecting and Sending Data

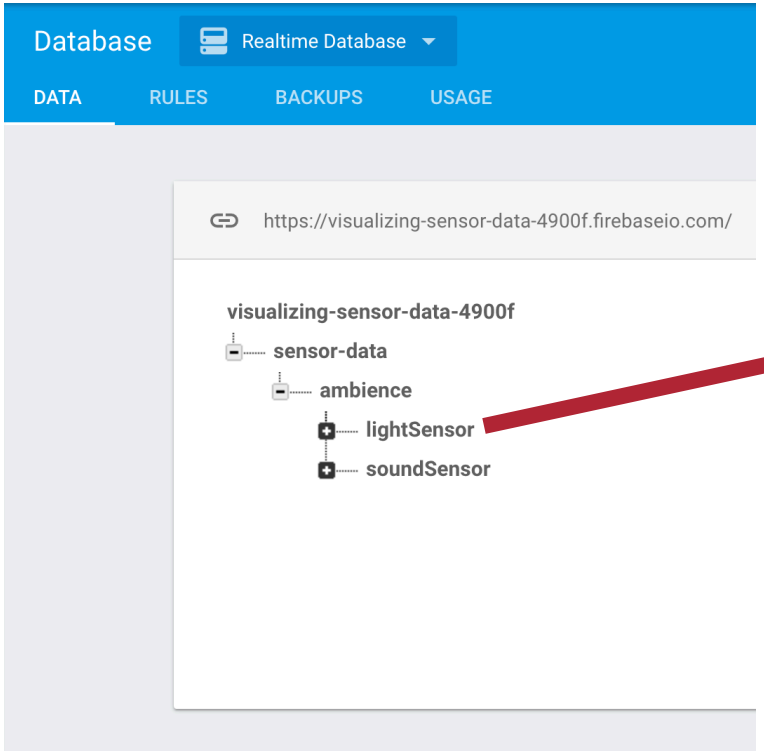
Using Firebase Realtime Database

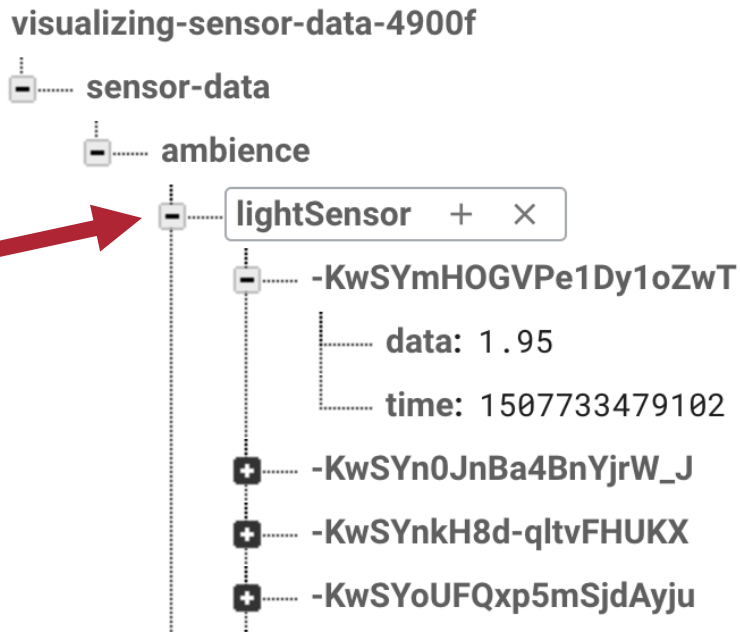
```
ambient.on('ready', () => {
  setInterval(() => {
    ambient.getLightLevel( (err, lightdata) => {
      if (err) throw err;
      ambient.getSoundLevel( (err, sounddata) => {
        if (err) throw err;
        const lightSensorRef = ref.child('ambience/lightSensor');
        const soundSensorRef = ref.child('ambience/soundSensor');
        lightSensorRef.push().set({
          data: lightdata.toFixed(4) * 100,
          time: Date.now()
        });
        soundSensorRef.push().set({
          data: sounddata.toFixed(4) * 100,
          time: Date.now()
        });
      });
    });
  }, 3000);
});

ambient.on('error', (err) => {
  console.log('Ambient error:', err);
});
```

index.js (cont'd)

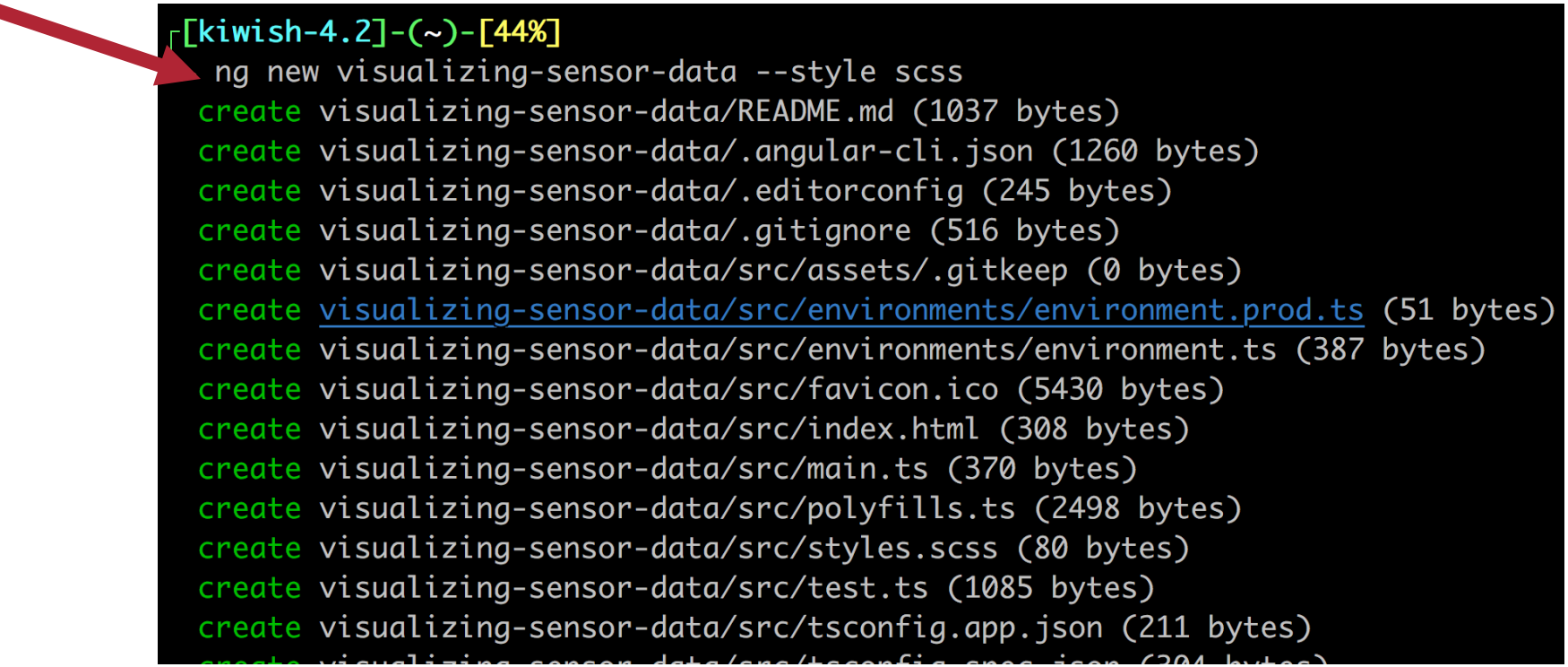
Sensor Data in Firebase DB





Displaying the Sensor Data

Creating an Angular App with the CLI



```
┌[kiwish-4.2]-(~)-[44%]
└ ng new visualizing-sensor-data --style scss
  create visualizing-sensor-data/README.md (1037 bytes)
  create visualizing-sensor-data/.angular-cli.json (1260 bytes)
  create visualizing-sensor-data/.editorconfig (245 bytes)
  create visualizing-sensor-data/.gitignore (516 bytes)
  create visualizing-sensor-data/src/assets/.gitkeep (0 bytes)
  create visualizing-sensor-data/src/environments/environment.prod.ts (51 bytes)
  create visualizing-sensor-data/src/environments/environment.ts (387 bytes)
  create visualizing-sensor-data/src/favicon.ico (5430 bytes)
  create visualizing-sensor-data/src/index.html (308 bytes)
  create visualizing-sensor-data/src/main.ts (370 bytes)
  create visualizing-sensor-data/src/polyfills.ts (2498 bytes)
  create visualizing-sensor-data/src/styles.scss (80 bytes)
  create visualizing-sensor-data/src/test.ts (1085 bytes)
  create visualizing-sensor-data/src/tsconfig.app.json (211 bytes)
```

Displaying the Sensor Data

Angular App File Structure

```
.angular-cli.json
.editorconfig
.git
.gitignore
README.md
e2e
karma.conf.js
node_modules
package-lock.json
package.json
protractor.conf.js
src
tsconfig.json
tslint.json
```

```
app
assets
environments
favicon.ico
index.html
main.ts
polyfills.ts
styles.scss
test.ts
tsconfig.app.json
tsconfig.spec.json
typings.d.ts
```

```
app.component.html
app.component.scss
app.component.spec.ts
app.component.ts
app.module.ts
```

```
environment.prod.ts
environment.ts
```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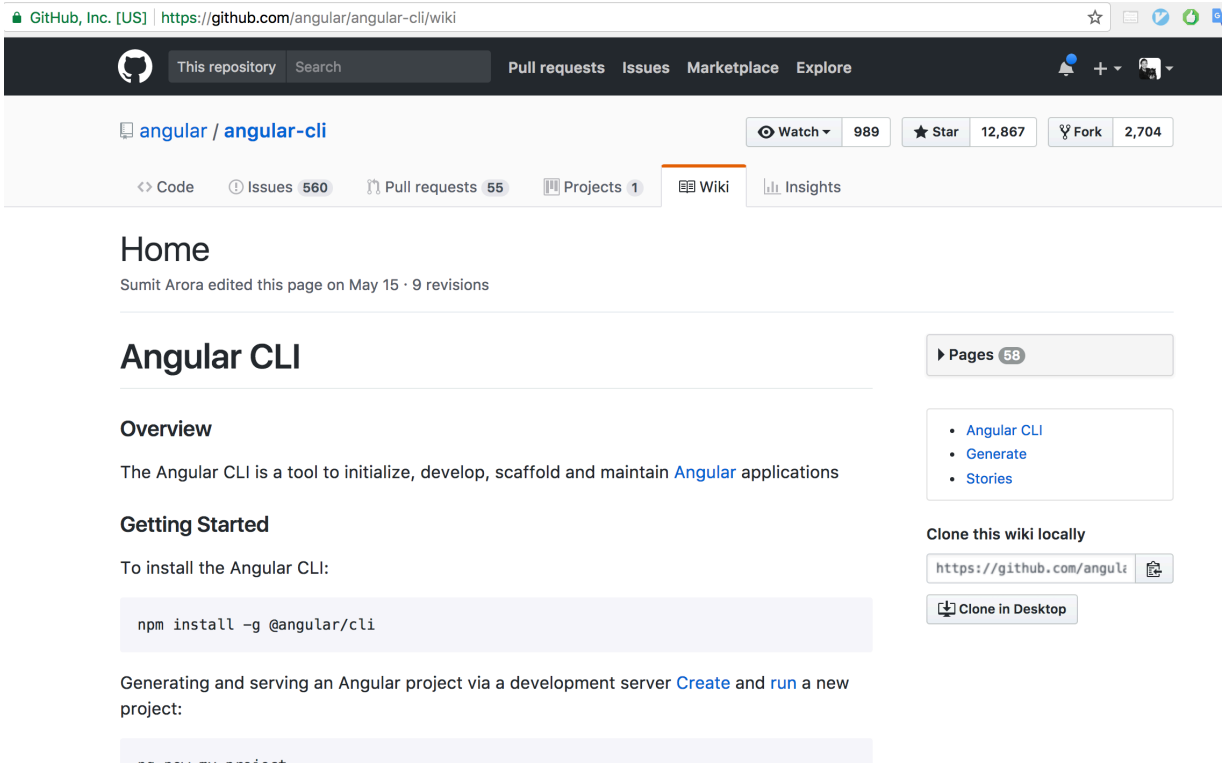
Angular CLI Wiki



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Displaying the Sensor Data

Kendo UI Angular Components

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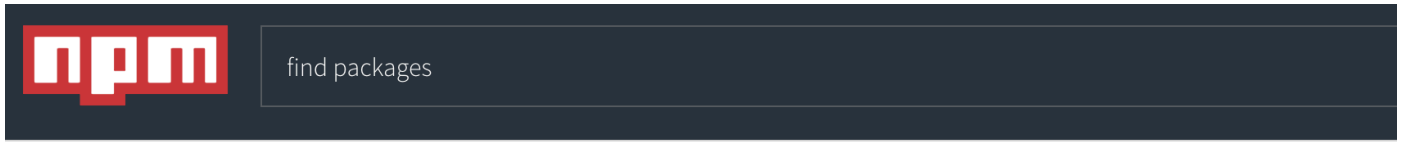
Displaying the Sensor Data

Kendo UI Modules



★ @progress/kendo-angular-dateinputs public

Kendo UI for Angular

This package is part of the **Kendo UI for Angular** suite.

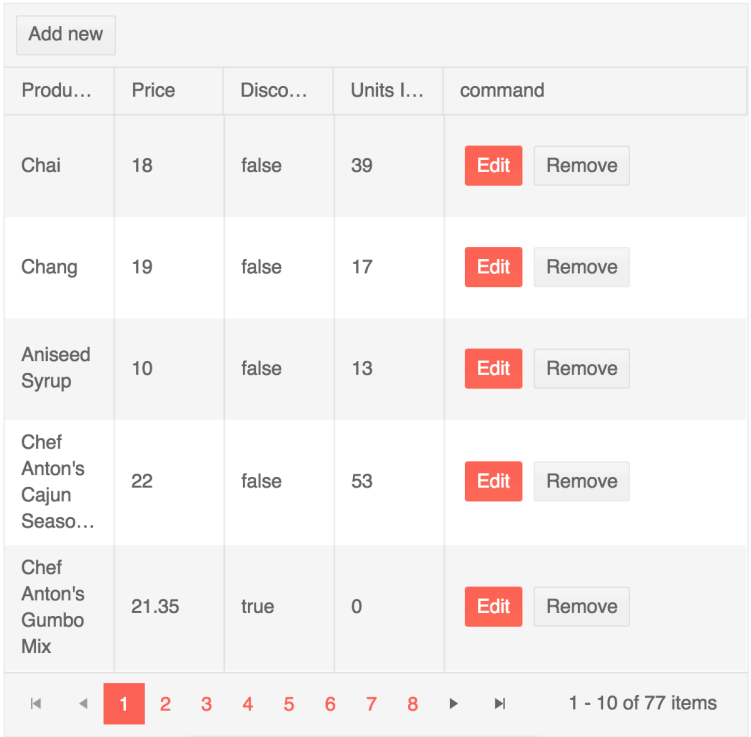
License

This is commercial software. To use it, you need to agree to the **Telerik End User License Agreement for Kendo UI Complete**. If you do not own a commercial license, this file shall be governed by the trial license terms.

Displaying the Sensor Data

Kendo UI Components for Angular

- AutoComplete
- Button
- ButtonGroup
- Calendar
- Charts
- ComboBox
- DateInput
- DatePicker
- Dialog
- DropDownButton
- DropDownList
- File Saver
- Grid
- Label
- MaskedTextBox
- MultiSelect
- NumericTextBox
- PanelBar
- Popup
- Ripple
- ScrollView
- Slider
- Sortable
- SplitButton
- Switch
- TabStrip
- TextBox
- TimePicker
- Upload



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Displaying the Sensor Data

Kendo UI Chart Component

Categorical

Categorical charts have built-in support for displaying dates. They are considered to be discrete because the categories represent unique values that bear no mathematical relationship to each other.


Area


Bar


Box Plot


Bullet


Line


Radar


RangeArea


RangeBar


Waterfall

LIMERICK CHALLENGE!!!!!!

Kiss complex code bye *bye*
And give this library a *try*
Build Angular apps
With no DOM wraps
It's time to use **Kendo UI**!

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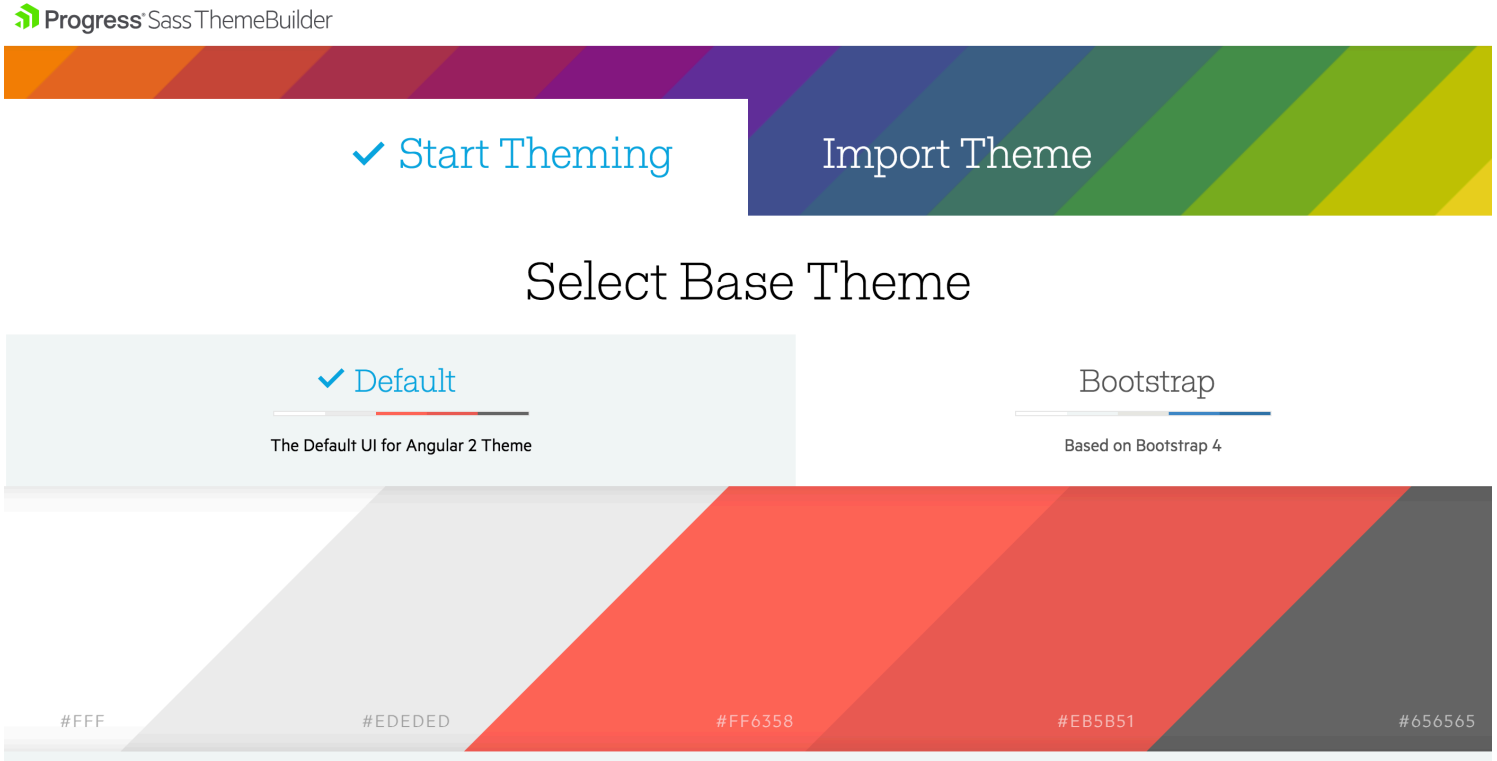
Displaying the Sensor Data

Install Kendo UI Component & Styling

```
┌[kiwish-4.2]-(src/environments)-[git:master]-[42%]
└> npm install --save @progress/kendo-angular-charts @progress/kendo-angular-intl
@progress/kendo-angular-l10n @progress/kendo-drawing hammerjs @angular/animations
+ hammerjs@2.0.8
+ @angular/animations@4.4.4
+ @progress/kendo-angular-charts@1.3.1
+ @progress/kendo-drawing@1.4.0
+ @progress/kendo-angular-intl@1.2.2
+ @progress/kendo-angular-l10n@1.0.4
added 11 packages and updated 1 package in 8.127s
```

```
┌[kiwish-4.2]-(src/environments)-[git:master*]-∞
└> npm install --save @progress/kendo-theme-default
+ @progress/kendo-theme-default@2.42.2
added 1 package in 5.409s
```

Theme Builder



Displaying the Sensor Data

Importing the Charts Module

```
import { AngularFireModule } from 'angularfire2';
import { AngularFireDatabase } from 'angularfire2/database';
import { BrowserModule } from '@angular/platform-browser';
import { BrowserAnimationsModule } from '@angular/platform-browser/animations';
import { ChartsModule } from '@progress/kendo-angular-charts';
import { NgModule } from '@angular/core';

import { AppComponent } from './app.component';
import { environment } from '../environments/environment';

import 'hammerjs';

@NgModule({
  declarations: [
    AppComponent
  ],
  imports: [
    AngularFireModule.initializeApp(environment.firebase),
    BrowserModule,
    BrowserAnimationsModule,
    ChartsModule
  ],
  providers: [AngularFireDatabase],
  bootstrap: [AppComponent]
})
export class AppModule { }
```

```
npm i angularfire2
```

src/app/app.module.ts

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Displaying the Sensor Data

Adding the Chart Component to the Template

```
<kendo-chart [transitions]="false" [categoryAxis]="{ labels: { rotation: -90 } }">
  <kendo-chart-title text="Ambient Sensor Data"></kendo-chart-title>
  <kendo-chart-legend
    position="bottom" orientation="horizontal"
  ></kendo-chart-legend>
  <kendo-chart-series>
    <kendo-chart-series-item
      [data]="lightSensorData | async"
      field="data"
      categroyField="time"
      name="Light Data"
      type="area"
      opacity=0.5
    ></kendo-chart-series-item>
    <kendo-chart-series-item
      [data]="soundSensorData | async"
      field="data"
      categroyField="time"
      name="Sound Data"
      type="area"
      opacity=0.5
    ></kendo-chart-series-item>
  </kendo-chart-series>
</kendo-chart>
```

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src/app/app.component.html

Displaying the Sensor Data

Grabbing Sensor Data from Firebase DB

```
import { Component } from '@angular/core';
import { AngularFireDatabase, AngularFireList } from 'angularfire2/database';
import { Observable } from 'rxjs/Observable';

@Component({
  selector: 'app-root',
  templateUrl: './app.component.html',
  styleUrls: ['./app.component.scss']
})
export class AppComponent {
  private title = 'Visualizing Sensor Data';
  private lightSensorDataRef: AngularFireList<any>;
  private lightSensorData: Observable<any[]>;
  private soundSensorDataRef: AngularFireList<any>;
  private soundSensorData: Observable<any[]>;

  constructor(db: AngularFireDatabase) {
    this.lightSensorDataRef = db.list('sensor-data/ambience/lightSensor');
    this.lightSensorData = this.lightSensorDataRef.valueChanges();
    this.soundSensorDataRef = db.list('sensor-data/ambience/soundSensor');
    this.soundSensorData = this.soundSensorDataRef.valueChanges();
  };
};
```

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src/app/app.component.ts

Observables

Telerik Developer Network | TOPICS | COMMUNITY | RSS | Telerik.com

MOBILE WEB

An Introduction to Observables for Angular Developers

Mobile by Jen Looper | January 23, 2017 | 8 Comments

Let’s Take a Look!

Please use EventsXD to fill out a session evaluation.

Thank you!

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And learn all the tips & *tricks*
Knowledge you can't beat
Amazing people to meet
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