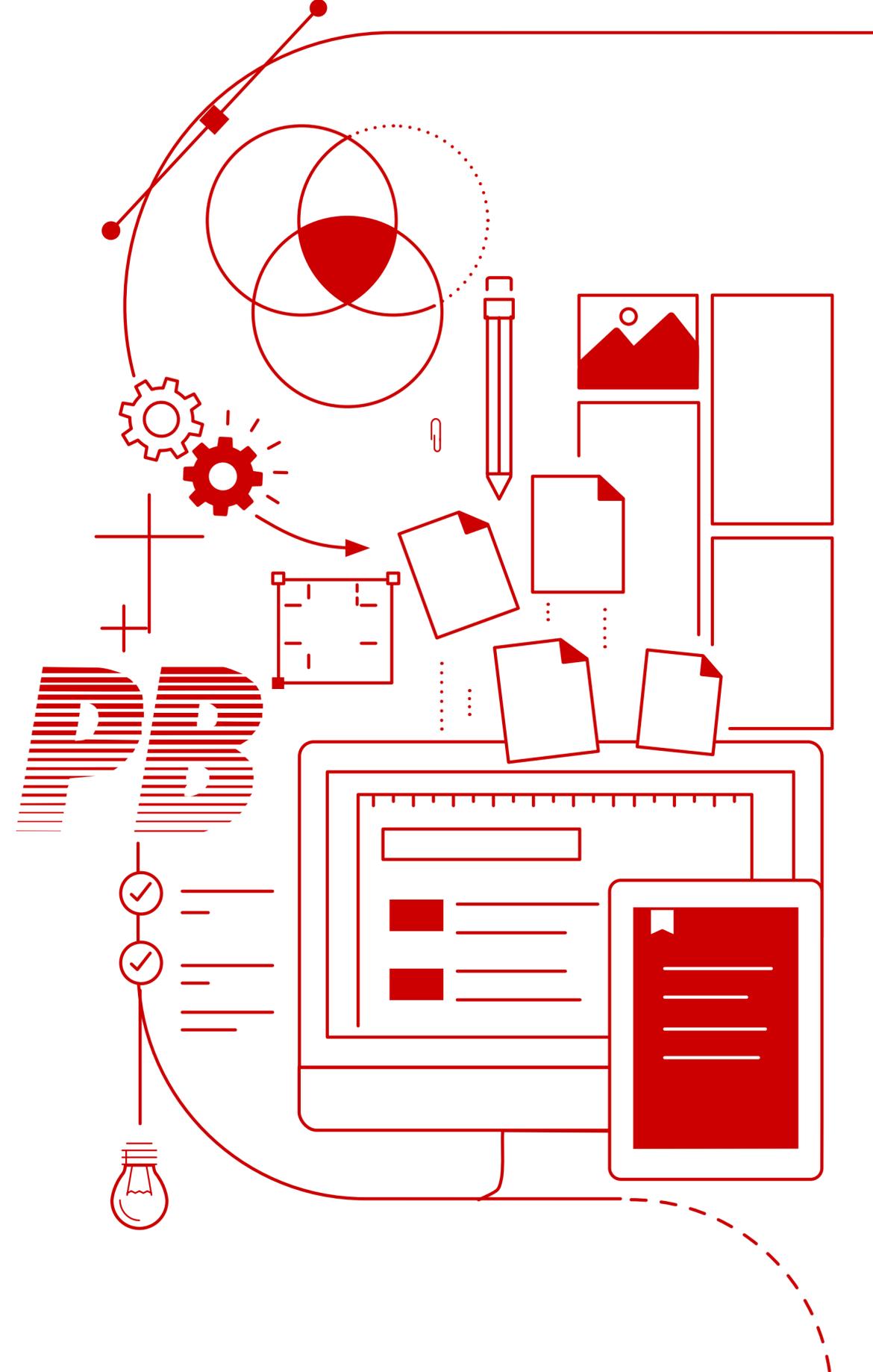


mobilize.NET

Migrating PowerBuilder DataWindows to Web

by John Browne | 06.12. 2020



The DataWindow object is the cornerstone of [PowerBuilder application development](#). PowerBuilder apps are largely designed around accessing databases, typically for [CRUD](#) (Create, Read, Update, Delete) operations.

In fact, most business applications—especially legacy client/server applications—are forms over data: screens contain a host of data-bound controls designed to build queries against database tables, return results, and allow for CRUD updates.

For example, a fairly typical screen for this kind of application might look like this one:

In this screen—from Mobilize.Net's demo app (Salmon King Seafood)—we have some text fields for entering search strings, a grid control that returns the results of a SQL query built from the text box values, another grid control, some calculated fields displayed as text boxes, and a couple of command buttons. Very typical.

PowerBuilder was a tool designed to build these kinds of apps quickly and easily, using an approach that today is known as "low code." With PowerBuilder, you created windows (forms) with controls and set properties on those controls.

This, in itself, was no different from VB6. But PowerBuilder took the concept as far as possible, particularly in the use of DataWindows.

The screenshot shows a 'Create Order' window with the following components:

- Search Section:** Text boxes for 'Company' (containing 'w'), 'First Name', and 'Last Name'.
- Customer Results Table:**

Customer	Company	First Name	Last Name	City
2	Wappec	Ronald J.	Ratzlaff	Lexington
11	World of Fun	Jessica L.	Sexton	Scotts Hill
- Form Fields:** 'Customer Company' (Wappec), 'Contact' (Ronald J. Ratzlaff), 'Required by' (2/25/2019), and 'Promised by' (2/25/2019).
- Product Details Table:**

Quantity	Code	Product	Unit Price	Price	Existence	Ordered	Quantity
24	SH22	Shark	2.25	54	0	103	2qr
- Summary Section:** 'Quantity' (empty), 'Sales Tax' (empty), 'Freight' (empty), 'Total' (54.00), 'Total Tax' (0.00), and 'Sub Total' (54.00).
- Buttons:** 'Save' and 'Close'.

PowerBuilder DataWindows

A DataWindow is an object unique to PowerBuilder.

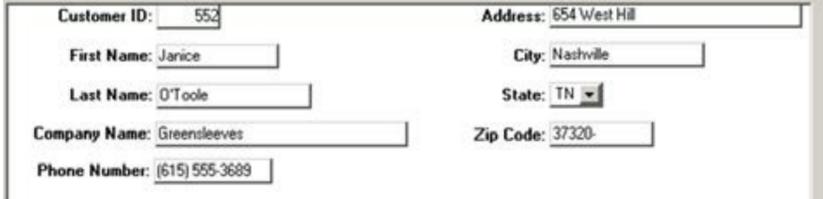
The window object is bound to a data source, and the results of the associated DB query can be displayed in a variety of ways or views.

Here, for example, is a DataWindow running in the PowerBuilder 12.5 tutorial—in this case it's displaying data in a grid view:



Customer ID	First Name	Last Name	Company Name
101	Michael	Devlin	The Power Group
102	Beth	Reiser	AMF Corp.
103	Erin	Niedinghaus	Darling Associates
104	Meghan	Mason	P.S.C.
105	Laura	McCarthy	Arno & Sons
106	Paul	Phillips	Ralston Inc.
107	Kelly	Colburn	The Home Club

And here, in the same app, is a second DataWindow displaying the same query, but in a forms view:



Customer ID: 552 Address: 654 West Hill
First Name: Janice City: Nashville
Last Name: O'Toole State: TN
Company Name: Greensleeves Zip Code: 37320
Phone Number: (615) 555-3689

Selecting a row in the first DataWindow updates the display in the bottom one:



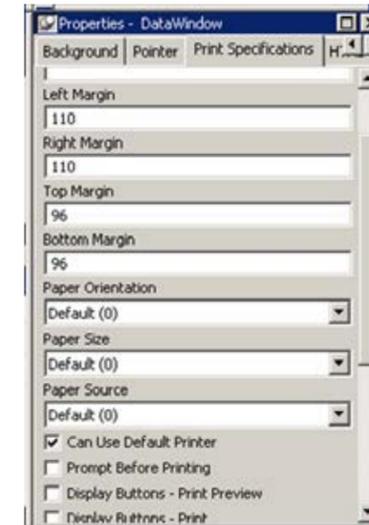
Customer ID	First Name	Last Name	Company Name
550	Tony	Antolini	Flat Landers
551	Tom	Cruz	Raceway Engines
552	Janice	O'Toole	Greensleeves
553	Stevie	Nickolas	It's a Hit!
555	Philippe	Fernandez	Quaker Fashions
661	Jennifer	Stutzman	Stutzman Advertising
665	William	Thompson	The Apple Farm

Customer ID: 665 Address: 91 Washington Street
First Name: William City: Manchester
Last Name: Thompson State: NY
Company Name: The Apple Farm Zip Code: 11700
Phone Number: (516) 555-2549

Views and Reports

In addition to DataWindows presenting the results of DB queries in a variety of formats, they also integrate some basic printing concepts directly into the application user interface.

Remembering that in the 1990s, when PowerBuilder was at its peak of popularity, paper was still a ubiquitous aspect of office life. DataWindows can include headers, footers, page numbers, and formatting designed for almost any kind of physical printer. In the DataWindow properties panel, a Print Specifications tab lets you manage all these parameters:

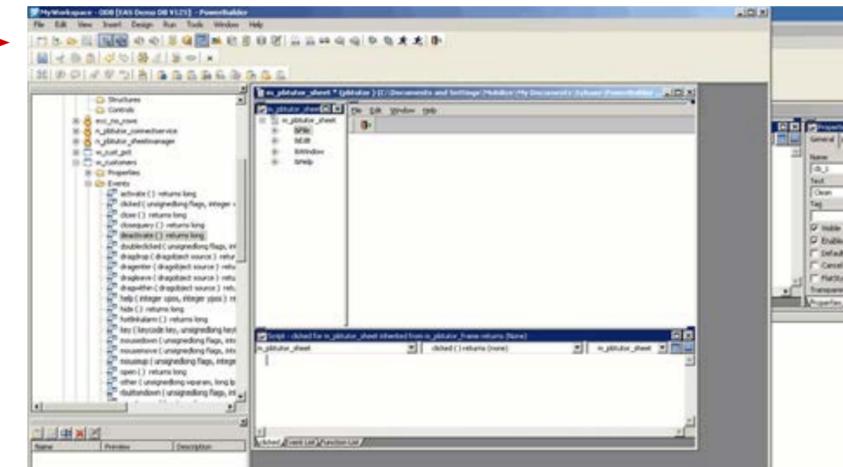


Where's the Code?

DataWindows can have controls with properties and events, and of course they can have code that responds to events. So where's the code? The idea behind PowerBuilder is to minimize the amount of actual coding the developer has to perform, so as much as possible the integrated development environment (IDE) allows you to create your application using a more interactive method.

Let's look at an example:

What are we looking at here? On the left side you can see all the available events for the w_customers DataWindow. The animation shows how you can get PowerBuilder to add scaffolding for code structures directly into the script window (PowerBuilder calls code "scripts"). You can see all the code behind an object, like this w_customers DataWindow, by right clicking on the object name and selecting "show source":

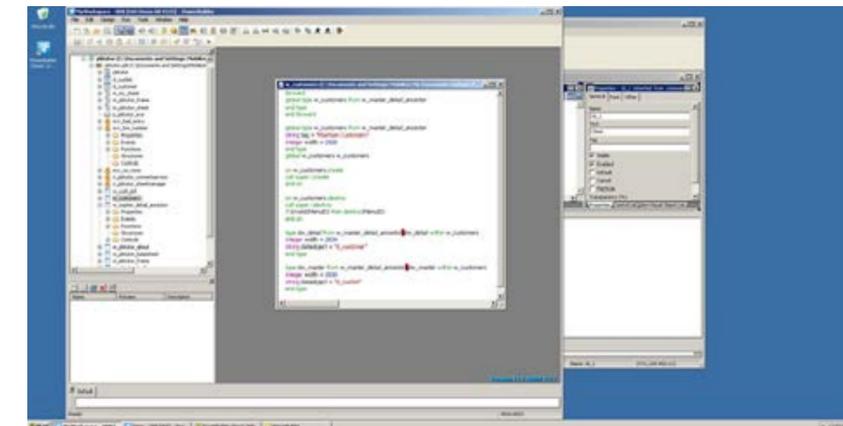


If we take a closer look at code—this time from a different, simpler, demo app—we can see it looks pretty straightforward:

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Some declarations:

```
global type w_main from window
end type
type cb_2 from commandbutton within w_main
end type
```



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```
global type w_main from window
end type
type cb_2 from commandbutton within w_main
end type
```

Some constructors:

```
on w_main.create
this.cb_2=create cb_2
this.cb_1=create cb_1
this.dw_2=create dw_2
this.dw_1=create dw_1
this.Control[]={this.cb_2,&
this.cb_1,&
this.dw_2,&
this.dw_1}
end on
```

Some setters:

```
global type w_main from window
integer width= 3374
integer height = 1408
boolean titlebar = true
string title = "Untitled"
boolean controlmenu = true
boolean minbox = true
boolean maxbox = true
boolean resizable = true
long bgcolor = 67108864
string icon = "AppIcon!"
```

Some destructors:

```
on w_main.destroy
destroy(this.cb_2)
destroy(this.cb_1)
destroy(this.dw_2)
destroy(this.dw_1)
end on
```

...at least, that's what I think they are.

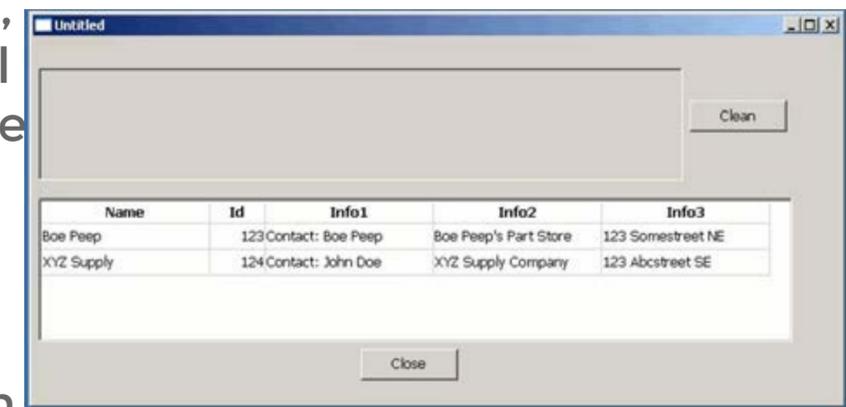
Migrating DataWindows to C#

Now that we know more about what PowerBuilder DataWindows look like, how would we go about [migrating DataWindows to the web](#) using non-PowerBuilder technologies.

Over the last few years, Mobilize.Net has made significant improvements to its PowerBuilder migration tools, allowing for modernization/migration from [PowerBuilder to Java](#) or ASP.NET Core.

Both use Angular, HTML, JavaScript, and Kendo for Angular to create a modern, well-architected web front end and performant back end server. In this case, I'll show a demo app and how the code is migrated to the web using ASP.NET Core.

First, let's look at our PowerBuilder demo app:



This looks (and basically is) a trivial example, but there are several interesting things going on in this demo. First, there are two DataWindows, one a free form style, and the other (lower) a grid presentation.

Each DataWindow has a command button, and the top command button invokes a message box (modal dialog). How do these get re-created after migrating these PowerBuilder DataWindows to a C# web app?

Creating a Modern Web App with WebMAP

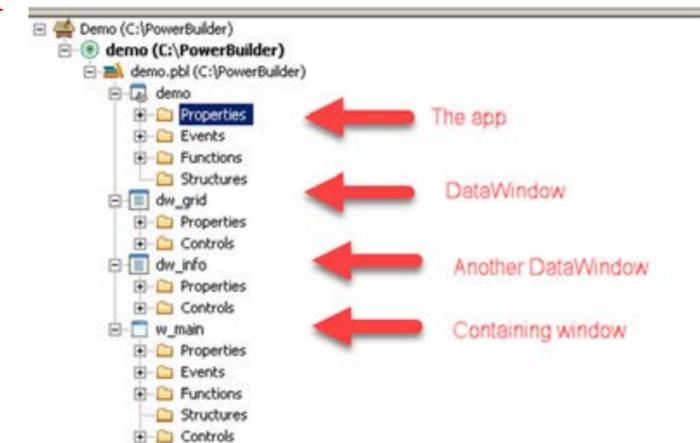
Let's now show how WebMAP can [migrate PowerBuilder DataWindows to a modern web app](#).

Let's look at the "System Tree" (sort of a solution explorer):

A convention for PowerBuilder apps is to prefix the names of things with what they are (see [Hungarian notation](#)).

So the parent window is called a `w_main` and the DataWindows are called `dw_grid` and `dw_info` respectively.

And because this is so familiar to PowerBuilder developers, we want to keep this naming convention in the `C#` code after we migrate it, even though Hungarian notation is out of favor today.



How does the migration work?

WebMAP is the tool from Mobilize that can convert desktop apps into web apps, working at the source code level. If you are unfamiliar with our tools, the idea is that you point WebMAP at the root folder of your PowerBuilder solution and it will generate a completely new folder tree with all new code. Then all you have to do is compile the new code and voila! There's your modern web app.

If only it were that simple.

In reality, moving from desktop to web—regardless of the source programming language or framework—exposes a number of disconnects between the two platforms, something [I've blogged about in the past](#). Without some kind of assistance from automation like WebMAP this kind of effort can take years for significant apps.

For example, take those DataWindows. As we mentioned before, the presentation of data in a DataWindow can be formatted like a paper report—in fact, it's a key property of DataWindows. But printing from a web application is completely different from a desktop app. Desktop (Windows) apps can call Windows services that manage printers and print queues. They can offer the user a choice of all the installed printers—whether attached or networked, allow for specific control of the printer, show a preview of the output, and more. The browser can't even talk to the hardware. So web apps typically handle printing by creating a digital print—like a PDF file—and offering the user a link to download the file to the local machine for handling (viewing or printing) outside of the application.

Applications with no connections to printers, scanners, cash registers, or other hardware are arguably simpler to migrate—at least from that standpoint—than those that have those kinds of connections. (NB: lots of apps DO have hardware dependencies, and we've developed a way to connect the web apps to physical devices, but that's a topic for another blog.)

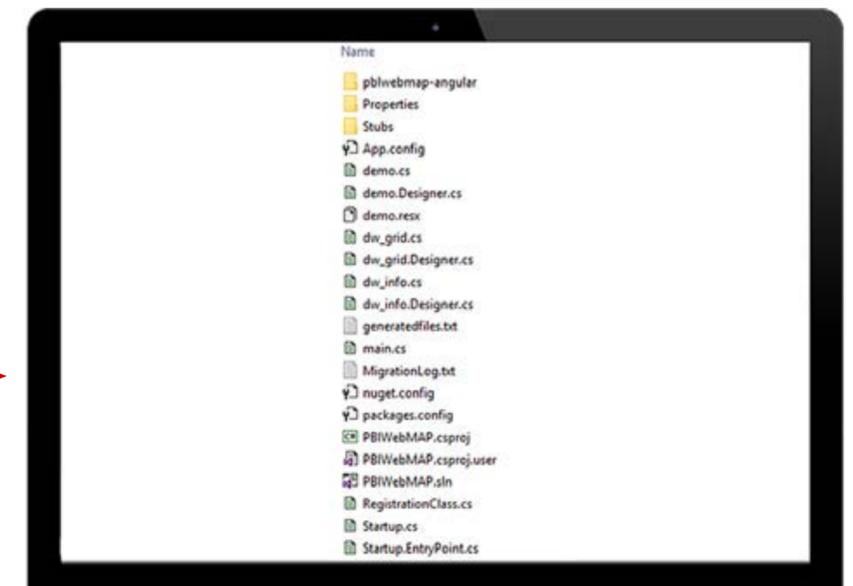
Our little PowerBuilder demo app doesn't need any hardware, so we can skip that step in our migration.

Let's migrate.

Ok, it's done.

Wait, what? Where's the migration step?

Actually the migration process itself is boring. Pick a source path, an output path, and push "go." There is literally nothing interesting to see, until it's done, then we see this:



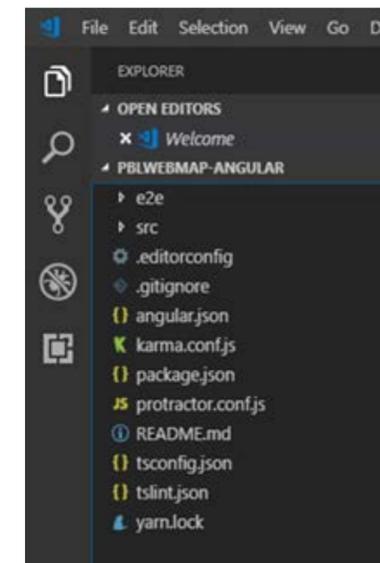
There are a lot of files there, so let me break it down a bit. Of the three folders, you can ignore Properties and Stubs (those are support files). The pblwebmap-angular folder is our front-end (client side) project. We'll come back to that shortly.

Among all the remaining files (at the root) we see a .cs and a Designer.cs file for each of our PowerBuilder windows: the app (demo) and both the DataWindows (info and grid) as well as a standard main.cs file.

For various reasons we have split the front-end (client side) code from the back-end (server side) code in our code tree. At the moment, it's a little easier to work with Angular, JavaScript, HTML, and CSS using [Visual Studio Code](#) (as opposed to Visual Studio). And, likewise, [Visual Studio](#) (not Code) has amazing capabilities when writing and debugging C# and .NET apps.

Let's start with the client side code. I'm going to open the demo1Site-angular folder in Code:

Let's home in on a couple of things we can find here, starting with the package.json file:



```
package.json - demo1Site-angular - Visual Studio Code
package.json x
1 {
2   "name": "samples",
3   "version": "0.0.0",
4   "scripts": {
5     "ng": "ng",
6     "start": "ng serve",
7     "build": "ng build",
8     "test": "ng test",
9     "lint": "ng lint",
10    "e2e": "ng e2e"
11  },
12  "private": true,
13  "dependencies": {
14    "@angular/animations": "^6.0.2",
15    "@angular/common": "^6.0.2",
16    "@angular/compiler": "^6.0.2",
17    "@angular/core": "^6.0.2",
18    "@angular/forms": "^6.0.2",
19    "@angular/http": "^6.0.2",
20    "@angular/platform-browser": "^6.0.2",
21    "@angular/platform-browser-dynamic": "^6.0.2",
22    "@angular/router": "^6.0.2",
23    "@mobilize/pbcomponents": "1.0.0-rc0131",
24    "@progress/kendo-theme-default": "^2.54.0",
25    "core-js": "^2.5.4",
26    "rxjs": "^6.0.0",
27    "zone.js": "^0.8.26"
28  },

```

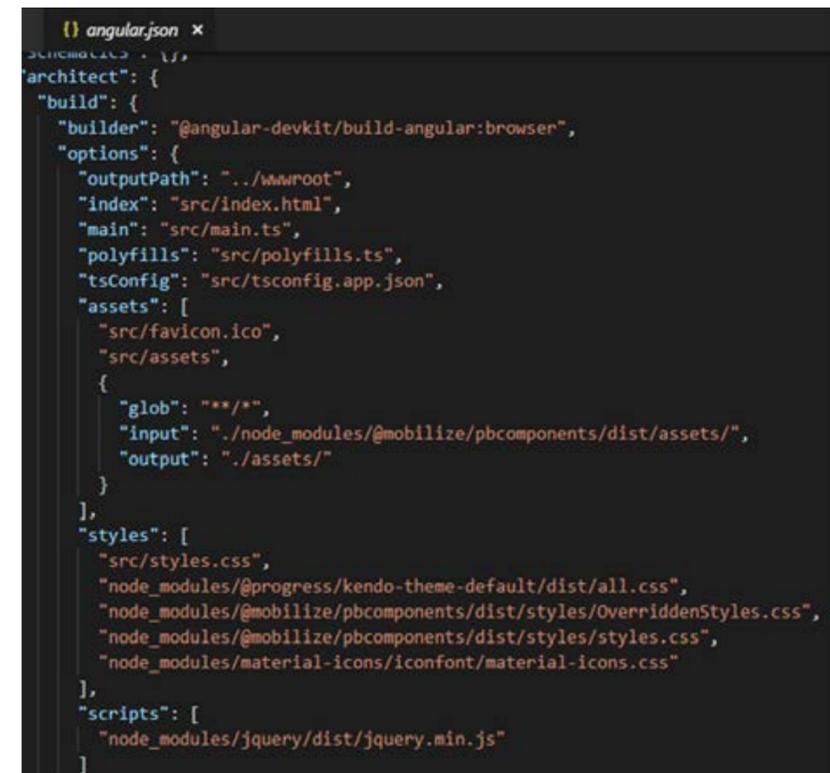
This shows us the dependencies our client-side app requires. What's notable here is that we're using [Angular 7, Kendo UI for Angular](#), and some PowerBuilder components from Mobilize.

Looking at another key file: angular.json, we see a few more interesting things:

Note here that the CSS styles that are imported include the [Kendo default theme](#) and some specific CSS files from Mobilize to handle PowerBuilder requirements.

Progress has three themes for their Angular UI elements that can be [swapped as easily as editing this file](#) here.

Or, you can [build your own with their Theme Builder](#). In any event, having the UI created in HTML with cascading style sheets gives you a lot of control over the look and feel of your application.



```
{
  "architect": {
    "build": {
      "builder": "@angular-devkit/build-angular:browser",
      "options": {
        "outputPath": "../wwwroot",
        "index": "src/index.html",
        "main": "src/main.ts",
        "polyfills": "src/polyfills.ts",
        "tsConfig": "src/tsconfig.app.json",
        "assets": [
          "src/favicon.ico",
          "src/assets",
          {
            "glob": "**/*",
            "input": "./node_modules/@mobilize/pbcomponents/dist/assets/",
            "output": "./assets/"
          }
        ],
        "styles": [
          "src/styles.css",
          "node_modules/@progress/kendo-theme-default/dist/all.css",
          "node_modules/@mobilize/pbcomponents/dist/styles/OverriddenStyles.css",
          "node_modules/@mobilize/pbcomponents/dist/styles/styles.css",
          "node_modules/material-icons/iconfont/material-icons.css"
        ],
        "scripts": [
          "node_modules/jquery/dist/jquery.min.js"
        ]
      }
    }
  }
}
```

Note: the standard output for Mobilize.Net's tools attempts to mirror the look and feel of the source (legacy) application in order to avoid user confusion or the need for retraining. That doesn't mean it's the right answer for every application, just the one the majority of our customers request.

Template file

The app (which we'll see in a bit) has two DataWindows inside a container called demo. Looking at the HTML template, we see it contains our two DataWindows (dw_info1 and dw_grid1) and two command buttons (cb_1 and cb_2):

```
demo.component.html x
1 <div *ngIf="model">
2   <wm-window [model]="model" id="demo" class="PBlWebMAP_demo">
3     <ng-template let-model>
4       <div class="demo">
5         <p-bl-web-map-dw_info name="dw_info1" [model]="model.dw1">
6         <wm-button id="cb_1" tabindex="2" class="cb_1" [model]="model">
7         <p-bl-web-map-dw_grid name="dw_grid1" [model]="model.dw2">
8         <wm-button id="cb_2" tabindex="1" class="cb_2" [model]="model">
9       </div>
10    </ng-template>
11  </wm-window>
12 </div>
13
```

There really isn't much to see here.

Style (CSS)

Let's look at the style sheet file

```
# demo.component.css x
1 .PBlWebMAP_demo {
2   left: -1px;
3   top: -1px;
4 }
5 .PBlWebMAP_demo .demo {
6   width: 723px;
7   height: 327px;
8   overflow: hidden;
9 }
10 .PBlWebMAP_demo .dw1 {
11   border-style: inset;
12   left: 3px;
13   top: 12px;
14   position: absolute;
15   width: 575px;
16   height: 116px;
17 }
18 .PBlWebMAP_demo .cb_1 {
19   left: 584px;
20   top: 44px;
21   position: absolute;
22   width: 93px;
23   height: 34px;
24   padding: 0px 0px 0px 0px;
25   display: table-cell;
26   vertical-align: middle;
27   display: table-cell;
28 }
29 .PBlWebMAP_demo .dw2 {
30   background-color: rgba(255, 255, 255, 1);
31   border-style: inset;
32   left: 3px;
33   top: 134px;
34   position: absolute;
35   width: 683px;
36   height: 120px;
37 }
```

Again, we're trying to position all the visual elements to resemble as closely as possible the original runtime UX of the PowerBuilder app. Of course, since this is CSS you can easily override all the stylings; you can set global styles with the styles.css file, or add your own JavaScript to do magical dancing elves. Whatever, it's going to be your app.

Component definition

Finally, here's the component file—note we use [TypeScript](#) which gets transpiled into JavaScript when the app is built for deployment. If you're unfamiliar with TypeScript, it's just a better JavaScript with stuff like types and classes.

What do we see here? Looking at the import statements, we see we're getting a lot of stuff from angular/core, plus some specific Mobilize WebMAP components. All of these pieces are delivered as packages when you build the front end.

```
1 import { Component, ChangeDetectorRef, ElementRef, Output, Renderer2, ViewEncapsulation } from '@angular/core';
2 import { EventEmitter, DataTransfer } from '@mobilize/base-components';
3 import { FormComponent } from '@mobilize/visual-forms-components';
4 import { WebMapService } from '@mobilize/angular-client';
5
6 @Component({
7   selector: 'p-h1-web-map-du_info',
8   styleUrls: ['./du_info.component.css'],
9   templateUrl: './du_info.component.html',
10  encapsulation: ViewEncapsulation.None
11 })
12 @dataTransfer(['@mobilize/du_info'])
13 export class Du_InfoComponent extends FormComponent {
14   protected webService: WebMapService;
15
16   constructor( webService: WebMapService, changeDetector: ChangeDetectorRef, renderer2: Renderer2, elem: ElementRef ) {
17     super(webService, changeDetector, renderer2, elem);
18   }
19 }
```

Building the front end

A complete tutorial on how to build an Angular app is beyond the scope of this blog; the short version is you have to download/update all the dependent packages, build the app, and export the minified results. In our case this becomes a folder called wwwroot, which our Visual Studio solution file requires. So without further ado, as they say, let's look at:

Server-side code

To be clear: PowerBuilder is not a language per se; it's a 4GL with its own scripting language. It's familiar looking, certainly readable, but it's not some ANSI standard programming language. When we migrate PowerBuilder using WebMAP, we can turn the scripting language—as well as all the runtime functions, object properties, and events—into either C# using ASP.NET Core or Java using the Spring MVC pattern.

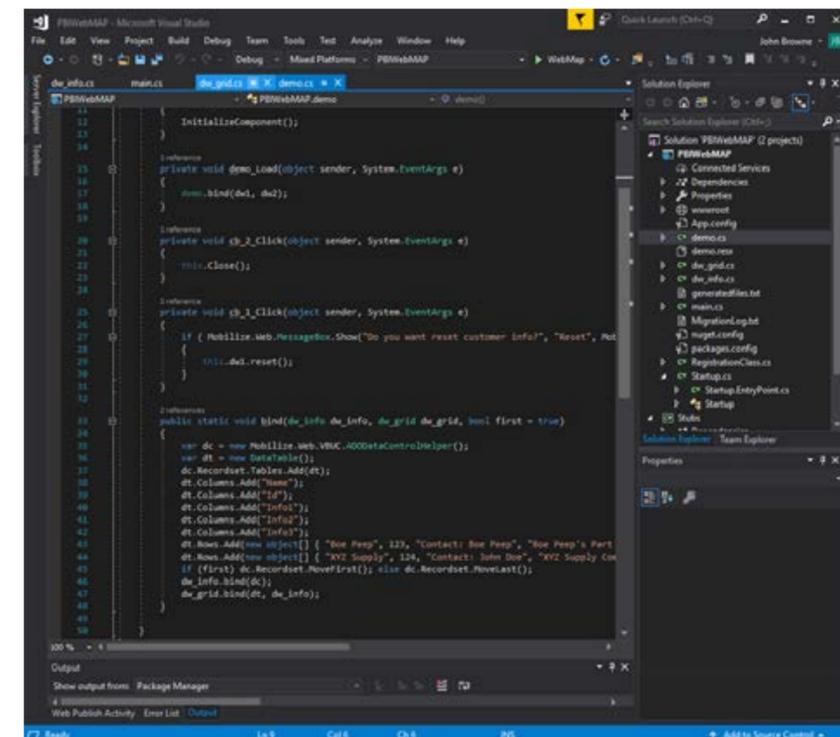
Today we'll look at converting PowerBuilder to ASP.NET Core. In a future blog we'll show the Java version. `

Let's open our solution file in Visual Studio:

Let's look at the Solution Explorer—we have our wwwroot folder, which we talked about above.

Everything the app needs for the front end is in that folder. We have three C# files: demo.cs, dw_grid.cs, and dw_info.cs.

We also have a main.cs file, which is just an app entry point.



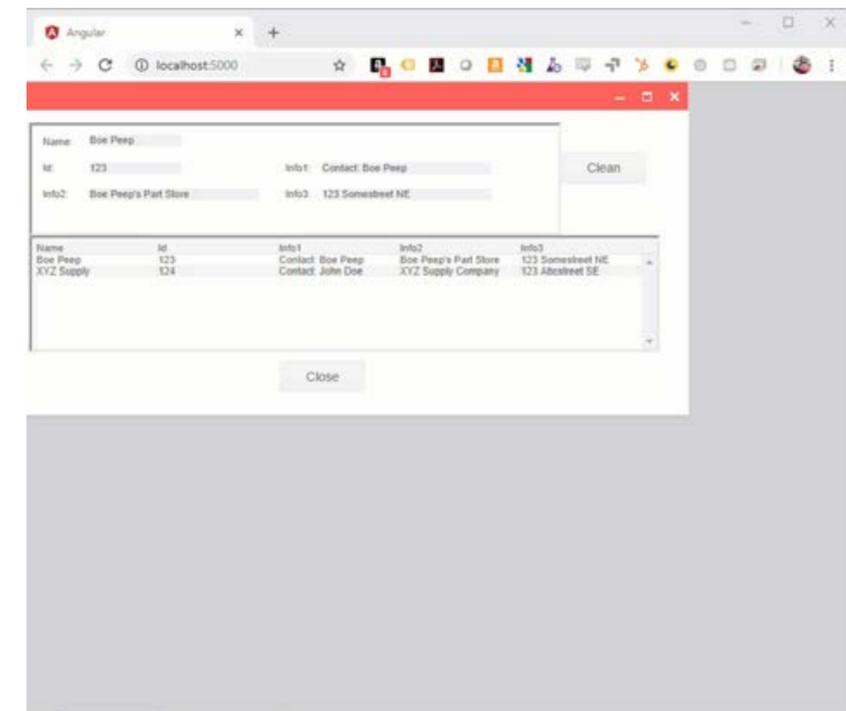
Before we dive into the code, let's see what this migrated app looks like running in Chrome.

Wow, the same app but running as a native web app in a browser! Again, it may look trivial, but there's several interesting things going on in this app.

Let me call your attention to the "Clean" command button—when that is pressed we see a dialog box asking if we want to reset the customer information ("Yes" "No"). This is basically a Windows message box—common on all desktop apps. But on the web it gets tricky—which is why you don't normally see these in a web application.

The problem with modal dialogs on a web app is that they require a suspension of action until the dialog is dismissed. On Windows this isn't an issue.

Windows is a single-user, multi-tasking OS, so each application has its own process space and thread. Suspension of thread execution doesn't cause problems for any other process. A web server, on the other hand, is designed to support multiple user sessions simultaneously: that single execution thread can't be suspended just because one user can't make a decision.



When we migrate PowerBuilder message boxes to the web, we have to manage that suspension of state in a reasonably elegant fashion, so that it doesn't damage other session's responsiveness and yet is quickly retrievable when the user dismisses the modal dialog. I could tell you how we do it, but then I'd have to kill you.

The beauty of this—from your perspective as a developer—is the code that you work with. Normally handling a modal dialog, with all that entails on a web app, would require a boatload of source code. Instead, through the magic of WebMAP, the code looks like this:

```
private void (b_1_Click(object sender, System.EventArgs e)
{
    if ( Mobilize.Web.MessageBox.Show("Do you want reset customer info?", "Reset", Mobilize.Web.MessageBoxButtons.YesNo) == Mobilize.Web.DialogResult.Yes)
    {
        del.reset();
    }
}
```

Look familiar? It should, if you've ever written any Windows Forms code at all. Of course, there's a lot going on behind the scenes to keep the source code that simple and elegant. We'll get to that in another blog.

As a matter of fact, this one has gone on too long.

In the next step, we get down and dirty with all the code in the new, migrated web application.

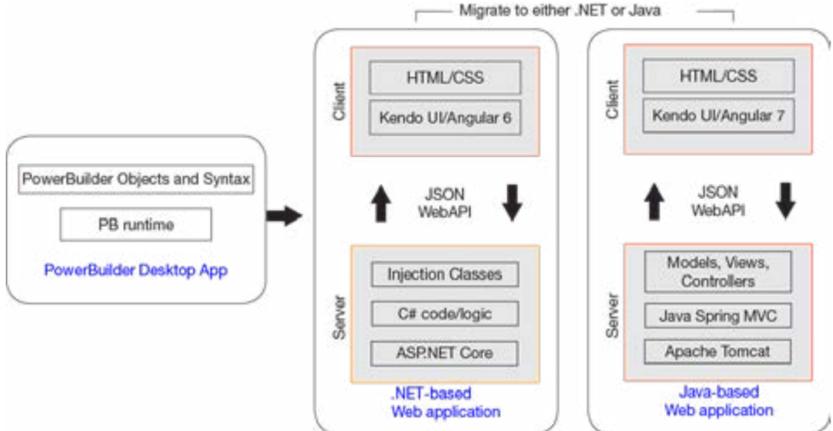
Review the Code

Having migrated our PowerBuilder DataWindows from our sample app using WebMAP, in this final chapter we'll take a deeper dive into the generated code. Let's begin with an overview of what the generated application looks like:

Notice the option to migrate from PowerBuilder to .NET or Java. WebMAP can convert your PowerBuilder app—including DataWindows—to either C# running on ASP.NET Core or Java using the Spring MVC pattern. In either case, the client-side code is identical, using Kendo UI for Angular and Angular 7.

In Part 2 we reviewed the front end files, including the component, template, and styling files. In this post we'll look at the back end in more detail.

In our original PowerBuilder app, we had two data windows: a grid presentation (dw_grid) and a form-style presentation (dw_info). Each DataWindow contained some data-bound controls and a command button. Each command button had an event handler for a click event.



That structure has been preserved in our C#/ASP.NET version as well. Our app consists of four C# files: main.cs, demo.cs, dw_grid.cs, and dw_info.cs.

The simplest of the four is main.cs, which is just the application entry point. It has just one method:

```
public
static void Main()
    {new demo().Show();}
```

The demo.cs file is a little more interesting: we handle the click events for each of the two command buttons and define our data table for the DataWindows:

```
private void cb_2_Click(object sender, System.EventArgs e)
{
    this.Close();
}

private void cb_1_Click(object sender, System.EventArgs e)
{
    if ( Mobilize.Web.MessageBox.Show("Do you want reset customer info?", "Reset", Mobilize.Web.
    MessageBoxButtons.YesNo) == Mobilize.Web.DialogResult.Yes)
    {
        this.dw1.reset();
    }
}
```

```

public static void bind(dw_info dw_info, dw_grid dw_grid, bool first = true)

{
    var dc = new Mobilize.Web.VBUC.ADODataControlHelper();

    var dt = new DataTable();

    dc.Recordset.Tables.Add(dt);

    dt.Columns.Add("Name");
    dt.Columns.Add("Id");
    dt.Columns.Add("Info1");
    dt.Columns.Add("Info2");
    dt.Columns.Add("Info3");

    dt.Rows.Add(new object[] { "Boe Peep", 123, "Contact: Boe Peep", "Boe Peep's Part Store", "123
Somestreet NE" });

    dt.Rows.Add(new object[] { "XYZ Supply", 124, "Contact: John Doe", "XYZ Supply Company", "123
Abcstreet SE" });

    if (first) dc.Recordset.MoveFirst(); else dc.Recordset.MoveLast();
    dw_info.bind(dc);

    dw_grid.bind(dt, dw_info);
}

```

Note that just as in the original PowerBuilder app this demo inserts actual data (two rows) instead of connecting to an actual database. Sheer laziness but it's just as instructive for this purpose.

Modal dialogs and other witchery

Notice again the `MessageBox.Show` method: it looks surprisingly like you would expect to see a "normal" C# Winforms dialog invocation. Except for the "`Mobilize.Web`" namespace decoration, it would be exactly like a standard .NET Framework `MessageBox()` invocation.

How is this possible?

Super short answer: it's complicated. Slightly longer answer: we use code weaving and aspect-oriented programming (AOP), courtesy of the Roslyn compiler. For a more detailed discussion, check out this three-part series on the complete WebMAP architecture. An easy way to think about this is that we're just letting the compiler do the heavy lifting.

A `Mobilize.WebMessageBox()` method handles all the issues that make a modal dialog difficult on a web app: suspending the session (in effect), caching the user state, maintaining all the other sessions with no penalty, and timing out the invoking session if necessary. Normally you would have to write a bunch of code to handle this kind of an event on a web app, which is why you don't see them very often. But virtually every desktop app has this pattern—saving a file, for example. And so moving those desktop apps to web apps presents this modality problem at least once and more commonly multiple times.

WebMAP, however, makes it simple.

The converted DataWindow files

We have a new C# file for each DataWindow object that was in the original PowerBuilder project. Let's look at dw_info.cs first:

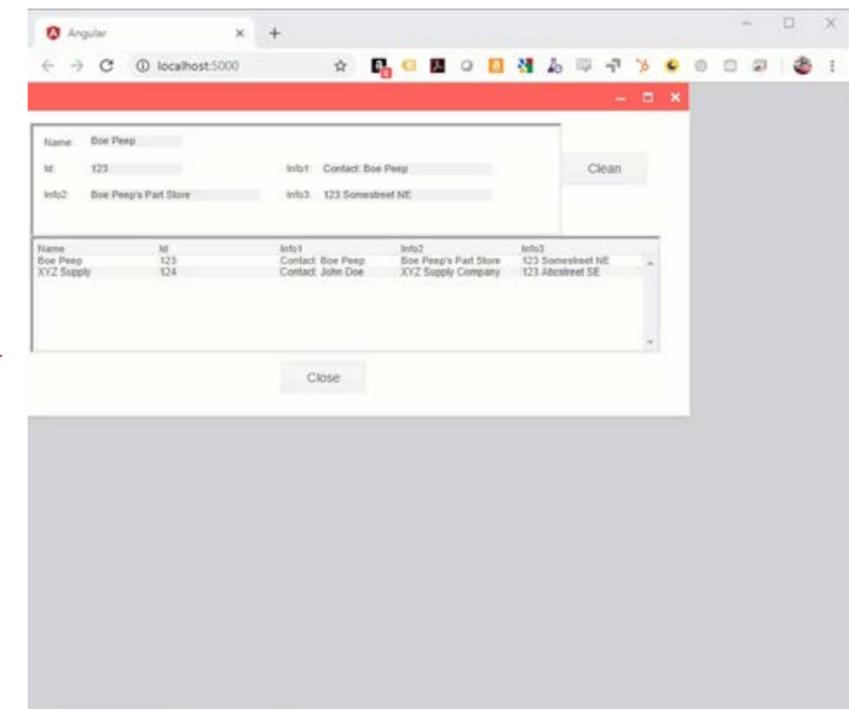
```
        public partial class dw_info : Mobilize.Web.UserControl
    {
        public dw_info()
        {
            InitializeComponent();
        }

        public void reset()
        {
            this.theName.Text = "";
            this.theId.Text = "";
            this.info1.Text = "";
            this.info2.Text = "";
            this.info3.Text = "";
        }

        internal void bind(Mobilize.Web.VBUC.ADODataControlHelper dc)
        {
            this.theName.Text = dc.Recordset.CurrentRow["Name"].ToString();
            this.theId.Text = dc.Recordset.CurrentRow["Id"].ToString();
            this.info1.Text = dc.Recordset.CurrentRow["Info1"].ToString();
            this.info2.Text = dc.Recordset.CurrentRow["Info2"].ToString();
            this.info3.Text = dc.Recordset.CurrentRow["Info3"].ToString();
        }
    }
```

Points of interest:

- + We inherit from `Mobilize.Web.UserControl`, which is the parent class for all our UI objects. Notice that `dw_info()` is a partial class, which means that some of the implementation is somewhere else; in this case it's in a designer file (`dw_info.Designer.cs`) that we will explore in a moment.
- + We have three methods in this class: a constructor, `reset()` which clears the data, and a `bind()` method that binds the UI elements to the database model.
- + The `reset()` method is called from the click event handler (see the `demo.cs` listing above). It clears the upper `DataWindow` here: 
- + Finally, the database model (the `bind()` method) maps the model to the actual client-side UI. Remember our HTML template file (see Part 2)?



Here's what the HTML for this DataWindow's Angular component looks like:

```
1 <div *ngIf="model">
2 <div [ngStyle]="setMyStyle()" [ngClass]="class" class="PB1WebMAP_dw_info" name="dw_info">
3 <um-textbox id="name" tabindex="6" class="name" [model]="model.theName"></um-textbox>
4 <um-label id="name_t" tabindex="6" class="name_t" [model]="model.name_t">Name:</um-label>
5 <um-label id="id_t" tabindex="7" class="id_t" [model]="model.theId">Id:</um-label>
6 <um-textbox id="id" tabindex="7" class="id" [model]="model.theId"></um-textbox>
7 <um-label id="info1_t" tabindex="8" class="info1_t" [model]="model.info1_t">Info1:</um-label>
8 <um-textbox id="info1" tabindex="8" class="info1" [model]="model.info1"></um-textbox>
9 <um-label id="info2_t" tabindex="9" class="info2_t" [model]="model.info2_t">Info2:</um-label>
10 <um-textbox id="info2" tabindex="9" class="info2" [model]="model.info2"></um-textbox>
11 <um-label id="info3_t" tabindex="10" class="info3_t" [model]="model.info3_t">Info3:</um-label>
12 <um-textbox id="info3" tabindex="10" class="info3" [model]="model.info3"></um-textbox>
13 </div>
14 </div>
15
```

You can see that the user-interface control names match the model in the C# file. And if we look in the associated CSS file we'll see the styling for those UI elements as well:

```
54 }
55 .PB1WebMAP_dw_info .info1 {
56   background-color: # rgba(240, 240, 240, 1);
57   border-width: 0px;
58   padding: 0px;
59   left: 317px;
60   top: 40px;
61   position: absolute;
62   width: 185px;
63   height: 13px;
64 }
65 .PB1WebMAP_dw_info .info2_t {
66   white-space: nowrap;
67   overflow: hidden;
68   left: 12px;
69   top: 68px;
70   position: absolute;
71   width: auto;
72   height: auto;
73 }
74 .PB1WebMAP_dw_info .info2 {
75   background-color: # rgba(240, 240, 240, 1);
76   border-width: 0px;
77   padding: 0px;
78   left: 63px;
79   top: 68px;
80   position: absolute;
81   width: 185px;
82   height: 13px;
83 }
84 .PB1WebMAP_dw_info .info3_t {
85   white-space: nowrap;
86   overflow: hidden;
87   left: 277px;
88   top: 68px;
89   position: absolute;
90   width: auto;
91   height: auto;
92 }
```

The designer file

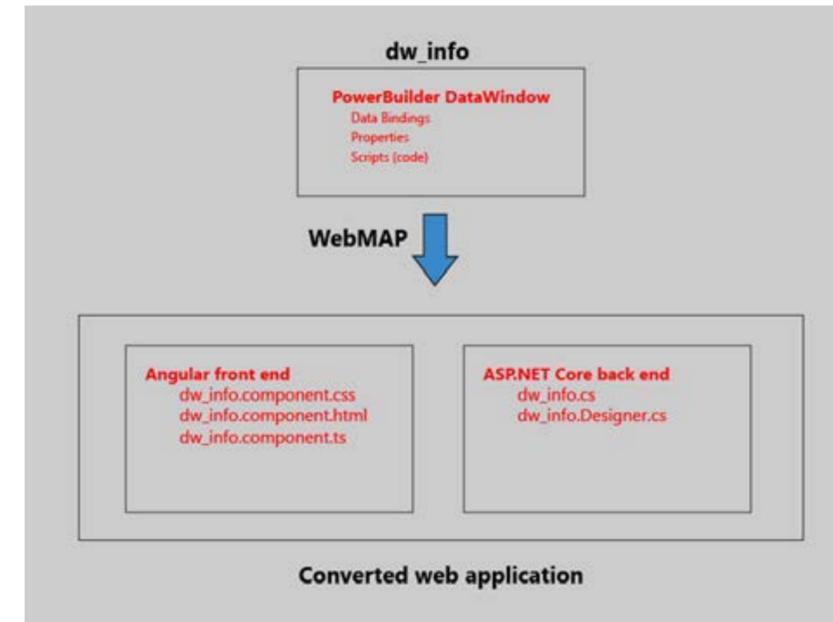
I noted (above) that the `dw_info()` class defined in `dw_info.cs` is a partial class; partial classes in C# have their implementations spread over more than one file. In our case the `dw_info()` class is also implemented in the `dw_info().Designer.cs` file.

Confused yet? Try this:

So turning our attention to the last file we haven't yet looked at (`dw_info().Designer.cs`), we see the following:

```
partial class dw_info
{
    [Mobilize.WebMap.Common.Attributes.Intercepted]
    ///
    /// Required designer variable.
    ///
    private
    System.ComponentModel.IContainer components { get; set; }
}

protected override void Dispose(bool disposing)
{
    if (disposing && (components != null))
    {
        components.Dispose();
    }
}
```



```
}
```

```
[Mobilize.WebMap.Common.Attributes.Designer]
```

```
[Mobilize.WebMap.Common.Attributes.Intercepted]
```

```
private Mobilize.Web.Label name_t { get; set; }
```

```
[Mobilize.WebMap.Common.Attributes.Intercepted]
```

```
private Mobilize.Web.Label id_t { get; set; }
```

```
[Mobilize.WebMap.Common.Attributes.Intercepted]
```

```
private Mobilize.Web.Label info2_t { get; set; }
```

```
[Mobilize.WebMap.Common.Attributes.Intercepted]
```

```
private Mobilize.Web.Label info1_t { get; set; }
```

```
[Mobilize.WebMap.Common.Attributes.Intercepted]
```

```
private Mobilize.Web.Label info3_t { get; set; }
```

```
[Mobilize.WebMap.Common.Attributes.Intercepted]
```

```
private Mobilize.Web.TextBox theName { get; set; }
```

```
[Mobilize.WebMap.Common.Attributes.Intercepted]
```

```
private Mobilize.Web.TextBox theId { get; set; }
```

```
[Mobilize.WebMap.Common.Attributes.Intercepted]
```

```
private Mobilize.Web.TextBox info2 { get; set; }
```

```
[Mobilize.WebMap.Common.Attributes.Intercepted]
```

```
private Mobilize.Web.TextBox info1 { get; set; }
```

Notice the `Intercepted` attribute used extensively here. Interception in this instance is a way to handle "cross-cutting concerns" via [Aspect Oriented Programming \(AOP\)](#).

Notice that all the visual objects in the C# version of our DataWindow have only `get()` and `set()` methods.

The implementation is handled by the interceptors—all this witchery is made possible by the Roslyn compiler (AKA Visual Studio Compiler Platform) which in turn is why we rely on Visual Studio 2017 or 2019 for the ASP.NET Core code (as opposed to Visual Studio Code).

Roslyn makes it possible to implement AOP in such a way that the code that we actually look at and work on is de-cluttered.

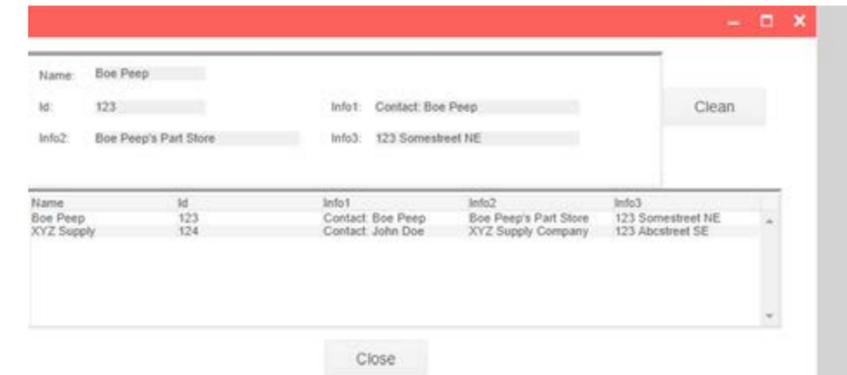
The good news is you don't have to worry about it.

But if you want to learn more, [check out this short video](#) by our own Rick LaPlant explaining how to use Roslyn to de-clutter your own code.

You can learn more about how WebMAP implements AOP [here \(PDF\)](#) and [here \(blog post\)](#).

The view is not the model

Let's go back to our running Angular app again:



I don't like the labels of "Info1", "Info2", and "Info3." While they are consistent with the original PowerBuilder app labels, they don't really tell me what they represent. I'd like the user to see more representative field names like "Contact", "Company", and "Address." And I'd like all the labels to be in a bold font, to make the upper DataWindow a little easier to read.

Every experienced web developer who is reading along now just snickered and thought something like, "Well, that's trivial in a web application. Just edit the HTML and CSS."

Bingo.

So bear with me, because I know that many of our Dear Readers aren't experienced web developers. So they might enjoy seeing how simple this is.

Unlike the original PowerBuilder app, or many legacy desktop apps written in various languages like Visual Basic or even C/Win32, the view/presentation/user interface is not part and parcel of the actual business logic.

Instead, the view in this app is handled exclusively by the HTML and CSS, with Kendo UI and Angular behind the scenes doing the heavy lifting.

The model—the internal business logic representation of all the visual elements—is in the ASP.NET Core C# code running on the web server. The model doesn't need to know anything about the view and the view doesn't need to know anything about the model: we have separation of concerns via the MVC (model view controller) pattern.

Ok, enough theory. Let's fix the UI. Fortunately this is not only easy, it's something someone untrained in C# or advanced programming can easily do. Here's how I like to do this.

Modifying the UI

With the app running in Chrome, right click the "Info1:" label and select Inspect. This opens Chrome developer tools with the focus on that HTML element:



On the right we see all the HTML and the blue highlighted code tells us that the label is a member of the class "k-form-field info1_t" (k-form-field being from the Kendo UI for Angular component library we are using), that it is from the wmcontrols Angular library from WebMAP, and that the value is "Info1:".

Let's change the label to "Contact":

Zooming in. Changing this:

```
<div class="info1_t" style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;">

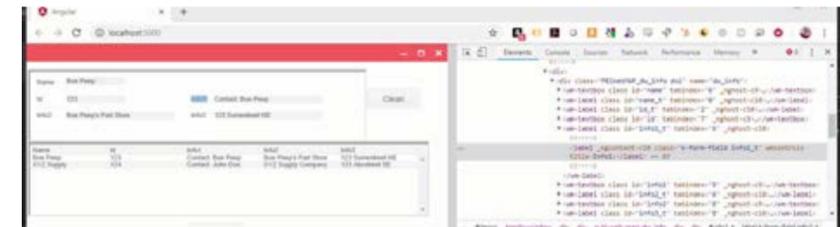
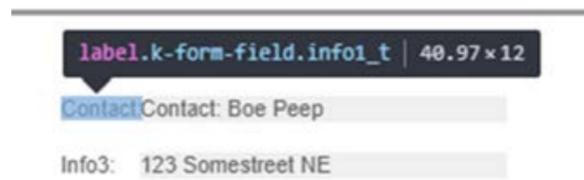
Info1:


```

Info2:

Info3:

Changes this:



So that's pretty easy—changing the HTML in the Chrome developer tools lets us see exactly how those changes will change the app running in the browser.

Note this doesn't change our source code—if we refresh the browser our changes will be lost.

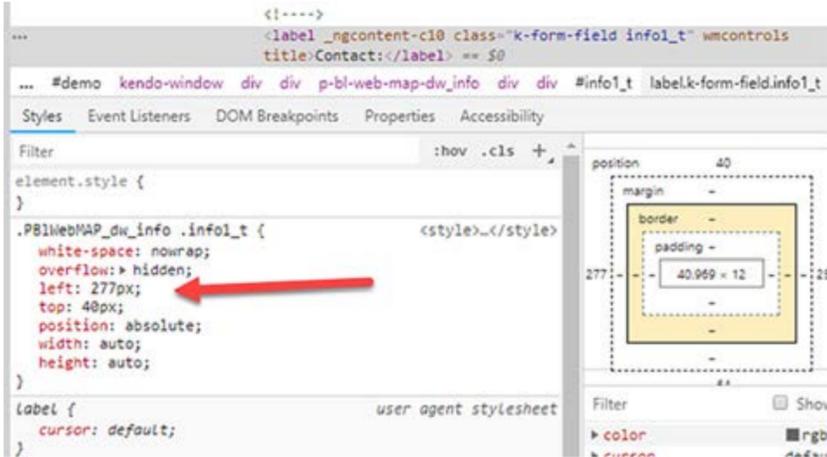
This is a way to get things how we want them, or play around with the presentation. Once we know what the changes are, we have to make them in the original HTML and CSS files and rebuild the client-side code.

Let's keep going. Notice that our label now bumps into the text box. Can we change the position? Remember the styling (including positioning) comes from our CSS file:

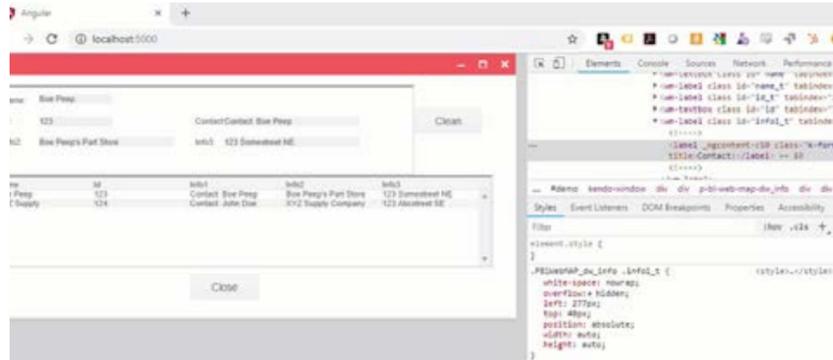
```
# dw_info.component.css x
40  .PBIWebMAP_dw_info .info1 {
41  top: 40px;
42  position: absolute;
43  width: 100px;
44  height: 13px;
45  }
46  .PBIWebMAP_dw_info .info1_t {
47  white-space: nowrap;
48  overflow: hidden;
49  left: 277px;
50  top: 40px;
51  position: absolute;
52  width: auto;
53  height: auto;
54  }
55  .PBIWebMAP_dw_info .info1 {
56  background-color: rgba(240, 240, 240, 1);
57  border-width: 0px;
58  padding: 0px;
59  left: 317px;
60  top: 40px;
61  position: absolute;
62  width: 185px;
63  height: 13px;
```

The controlling factor for our problem is the "left: 277px;" line. Remember that in order to have the migrated Angular app look as much as possible like the original PowerBuilder app we have to position all the elements precisely on the browser window—in this case these values (left and top) are offsets from the upper left corner of the browser's area for rendering HTML. If we didn't use the "absolute" property for the position element, these labels and text boxes could be scattered all over the browser space.

Since our label .info1_t runs into the text box (info1), we need to shift its position left. Let's try a value of 250 pixels. How do we do that? It's not in the HTML, but Chrome developer tools also shows us all the styles, in their cascading order, like this:



Notice how the CSS matches what's in the view above. We can change it here to 250 pixels and see if that fixes our problem:

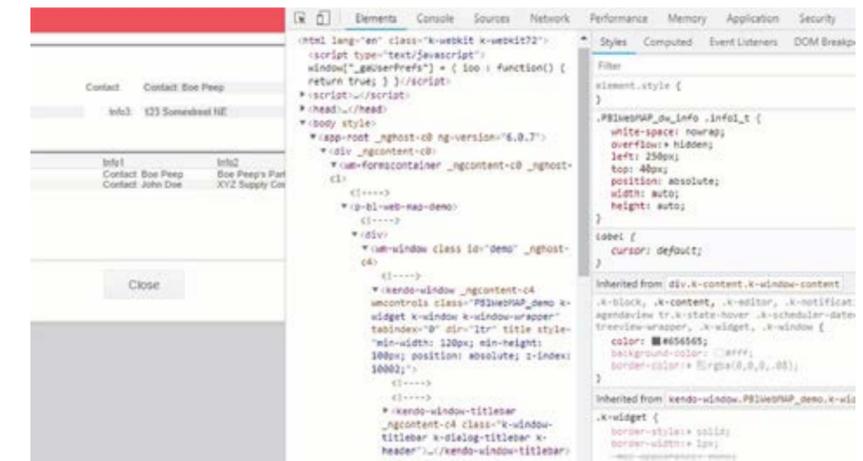


We can change anything we want if it's CSS: let's make the label bold. Notice how Chrome suggests things like Visual Studio's "Intellisense":

Clearly, we'd want to adjust everything so it aligns correctly, maybe make the label font a little larger and prominent, and so on.

And we don't have to make notes about what we did: it's easy in Chrome to associate the original CSS and HTML source files—in our Angular folder—with the running app so all our changes are saved back into our project.

All we have to do then is rebuild the wwwroot folder (using "ng build") and the app is automatically updated. We don't even have to recompile the ASP.NET Core solution in Visual Studio.

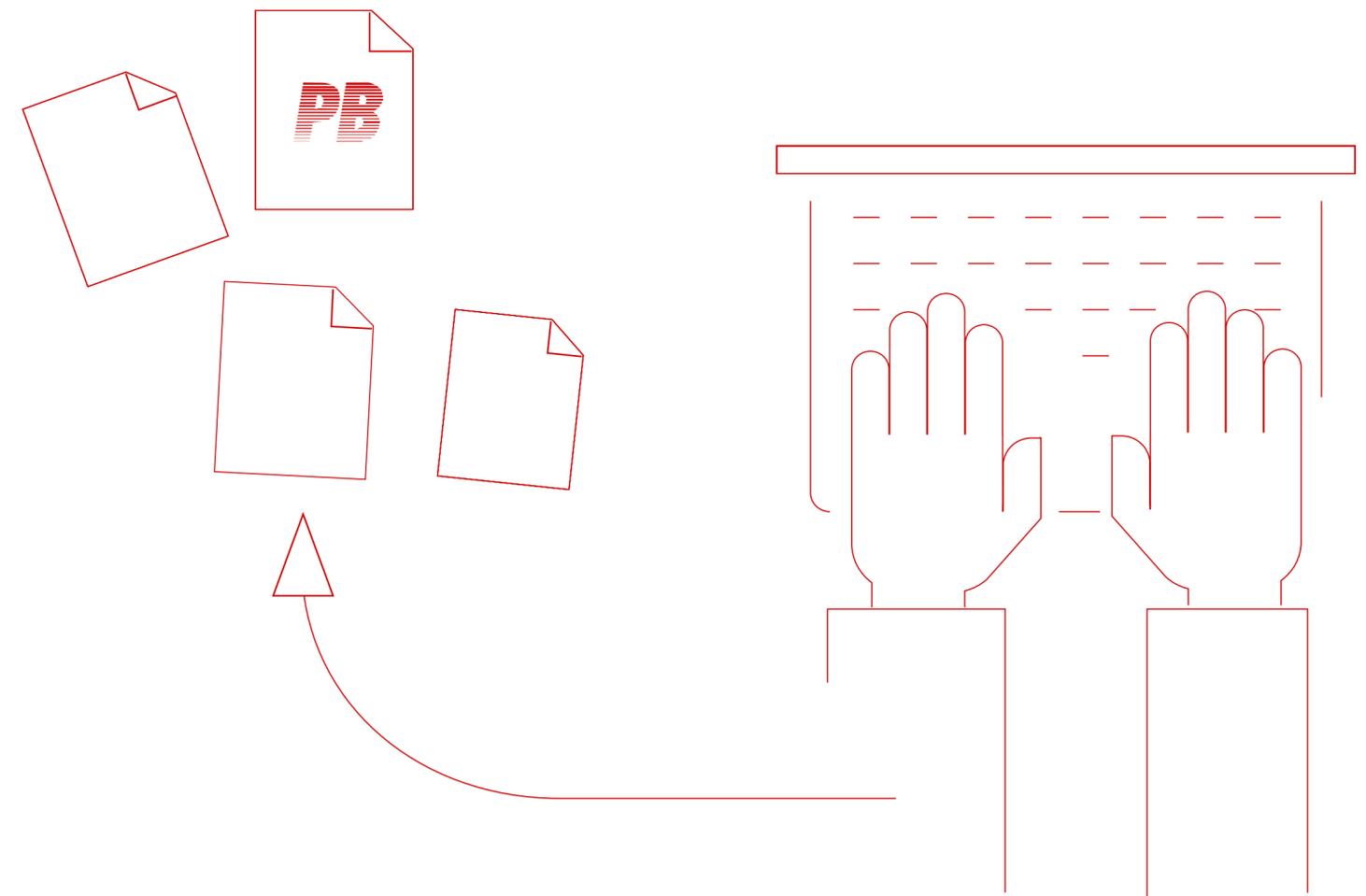


Wrapping up

When I talk to developers about PowerBuilder, the first thing I usually hear is, "Wow, I can't believe how much PowerBuilder is still out there." If they have PowerBuilder, the second thing I usually hear is, "It's hard/difficult/impossible to find developers anymore."

The world has changed. PowerBuilder belongs to a different, older world. Today it's all about cloud-native apps. If you've still got PowerBuilder, I hope this series of posts gives you some useful information about options to get rid of it.

And have something far, far better.



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