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# DEEP DIVE INTO THE NEW DEVELOPMENT TOOLS

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# Disclaimer

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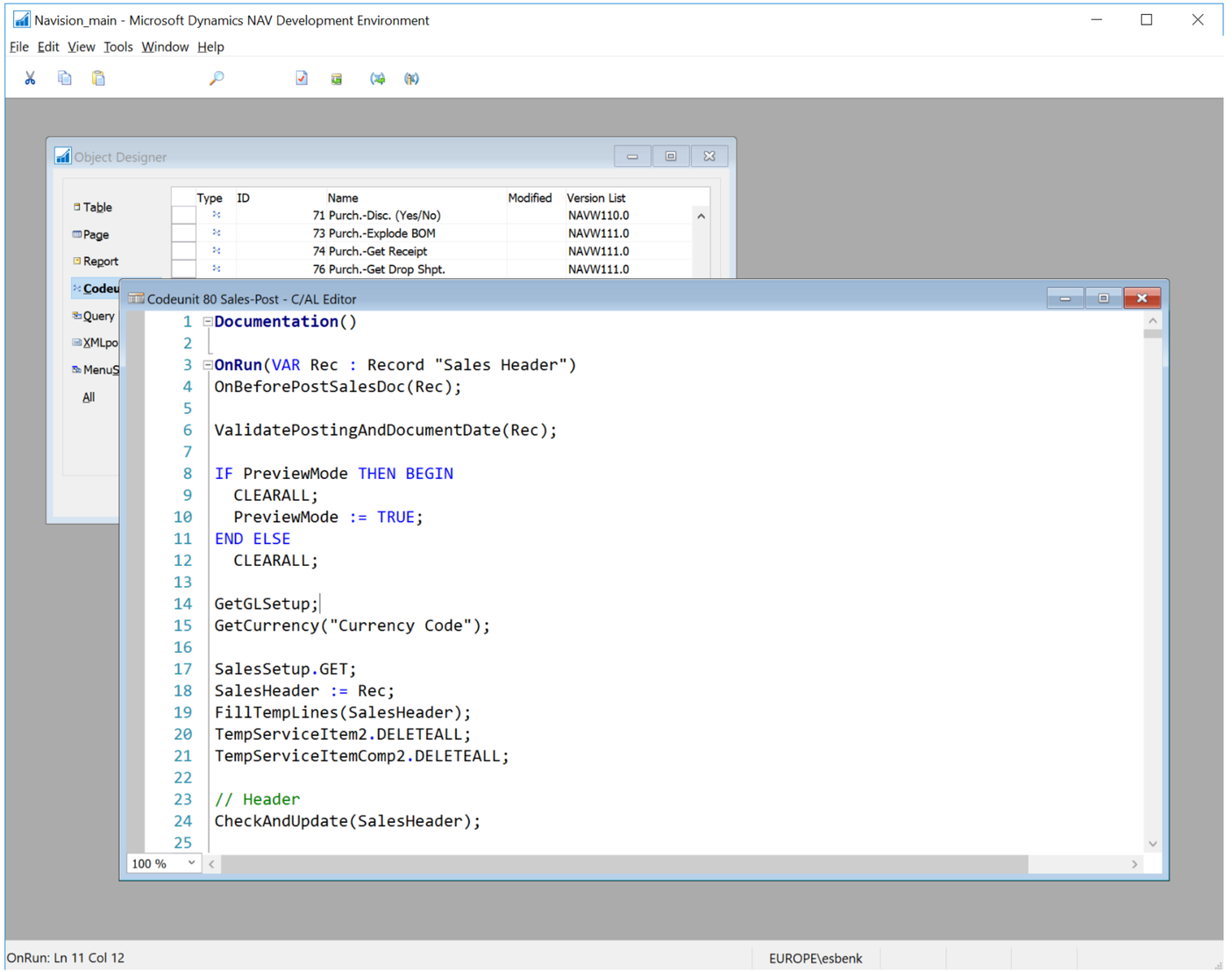
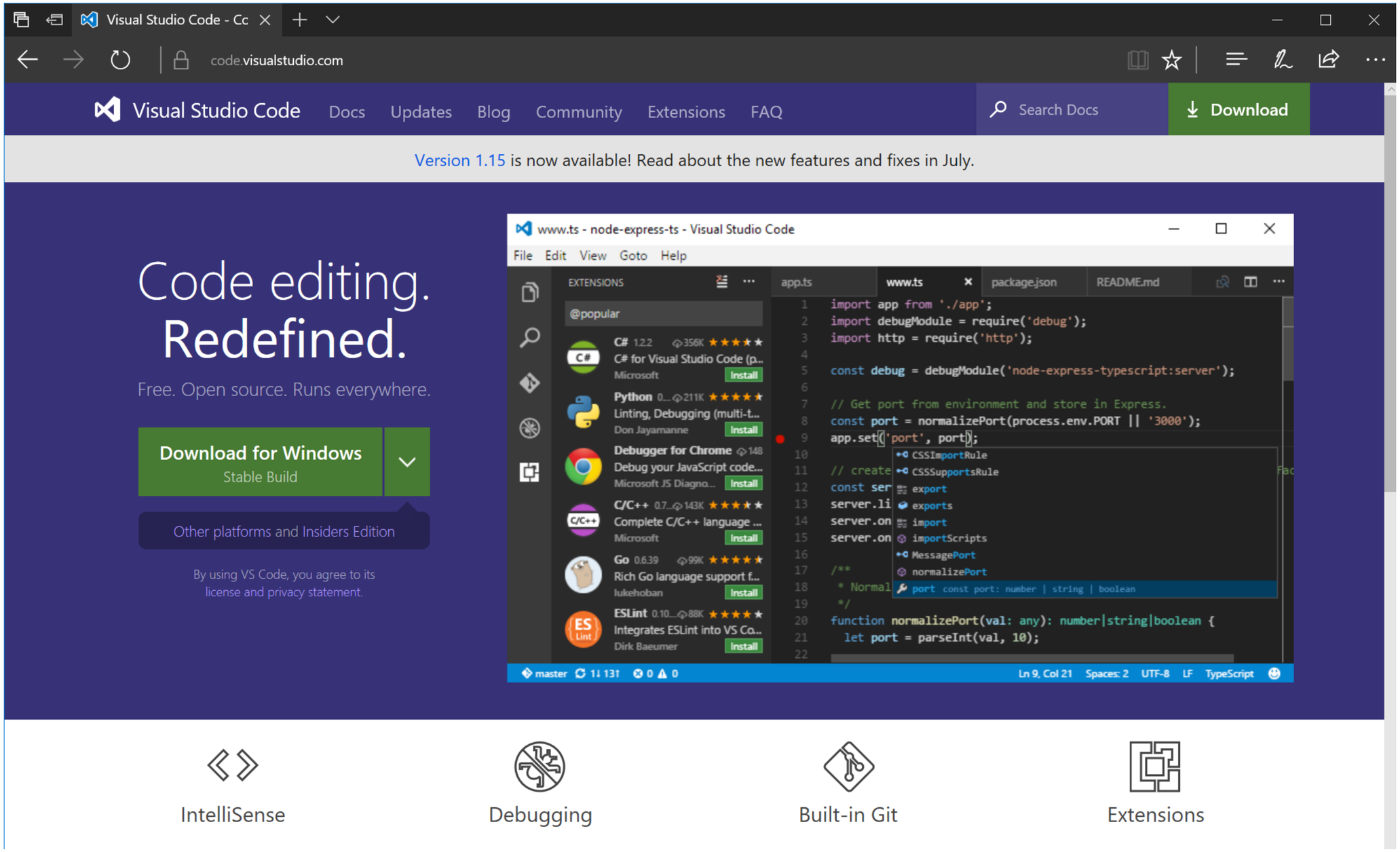
Sample code included in this presentation is made available AS IS.


Navision_main - Microsoft Dynamics NAV Development Environment
File Edit View Tools Window Help
Object Designer
Table
Page
Report
Codeu
Query
XMLpo
MenuS
All
Type ID Name Modified Version List
71 Purch.-Disc. (Yes/No) NAVW110.0
73 Purch.-Explode BOM NAVW111.0
74 Purch.-Get Receipt NAVW111.0
76 Purch.-Get Drop Shpt. NAVW111.0
Codeunit 80 Sales-Post - C/AL Editor
1 Documentation()
2
3 OnRun(VAR Rec : Record "Sales Header")
4 OnBeforePostSalesDoc(Rec);
5
6 ValidatePostingAndDocumentDate(Rec);
7
8 IF PreviewMode THEN BEGIN
9 CLEARALL;
10 PreviewMode := TRUE;
11 END ELSE
12 CLEARALL;
13
14 GetGLSetup;
15 GetCurrency("Currency Code");
16
17 SalesSetup.GET;
18 SalesHeader := Rec;
19 FillTempLines(SalesHeader);
20 TempServiceItem2.DELETEALL;
21 TempServiceItemComp2.DELETEALL;
22
23 // Header
24 CheckAndUpdate(SalesHeader);
25
100 %
OnRun: Ln 11 Col 12
EUROPE\esbenk

# To-do list for a new Developer Experience



State of the art development experience
Better development story for extensions
Protect existing partner investments
Support for standard SCM – file based
Ability to add new features quickly
Faster compile time
Componentized compiler
Support for modularization
Cloud deployment
Appeal to new developers



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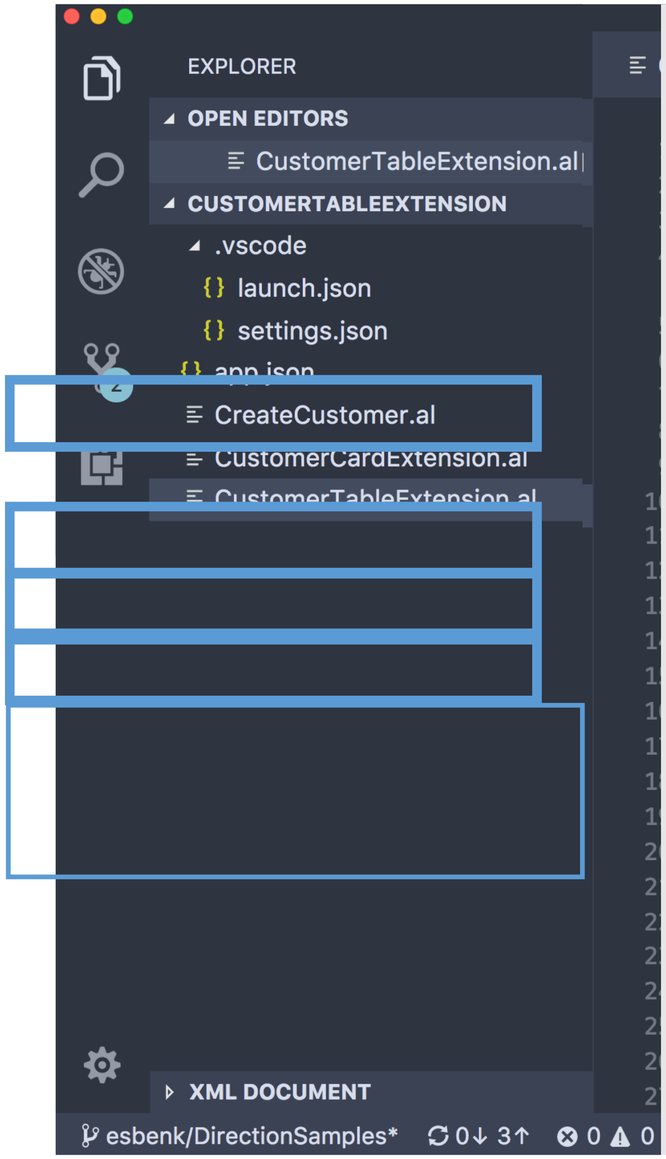
# Demo – Hello World

# Project = Folder




Our configuration contains:

It should NOT be included in SCM

# JSON (JavaScript Object Notation)



**JSON** (JavaScript Object Notation) is a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate. It is based on a subset of the JavaScript Programming Language, Standard ECMA-262 3rd Edition - December 1999. JSON is a text format that is completely language independent but uses conventions that are familiar to programmers of the C-family of languages, including C, C++, C#, Java, JavaScript, Perl, Python, and many others. These properties make JSON an ideal data-interchange language.

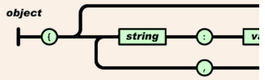
JSON is built on two structures:

- A collection of name/value pairs. In various lang
- An ordered list of values. In most languages, this

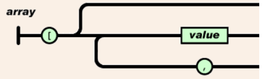
These are universal data structures. Virtually all mode

In JSON, they take on these forms:

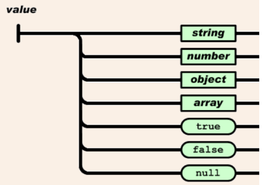
An *object* is an unordered set of name/value pairs. An



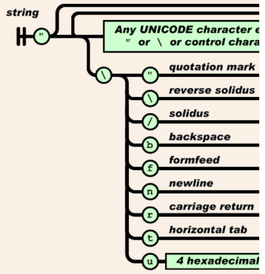

An *array* is an ordered collection of values. An array



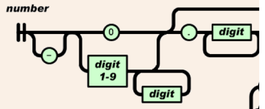

A *value* can be a *string* in double quotes, or a *number*,




A *string* is a sequence of zero or more Unicode charac




A *number* is very much like a C or Java number, exce




```
{
  "id": "1d6b6366-cc04-4b3e-a426-4daca84b85e1",
  "name": "ALProject1",
  "publisher": "Default publisher",
  "brief": "",
  "description": "",
  "version": "1.0.0.0",
  "compatibilityId": "1.0.0.0",
  "privacyStatement": "",
  "EULA": "",
  "help": "",
  "url": "",
  "logo": "",
  "capabilities": [],
  "dependencies": [],
  "screenshots": [],
  "platform": "11.0.0.0",
  "application": "11.0.0.0",
  "idRange": {
    "from": 50100,
    "to": 50149
  }
}
```

```
object
    {}
    { members }
members
    pair
    pair , members
pair
    string : value
array
    []
    [ elements ]
elements
    value
    value , elements
value
    string
    number
    object
    array
    true
    false
    null

string
    ""
    " chars "
chars
    char
    char chars
char
    any-Unicode-character-
      except-" -or-\-or-
      control-character
    \"
    \\
    \/
    \b
    \f
    \n
    \r
    \t
    \u four-hex-digits
number
    int
    int frac
    int exp
    int frac exp
int
    digit
    digit1-9 digits
    - digit
    - digit1-9 digits
frac
    . digits
exp
    e digits
digits
    digit
    digit digits
e
    e
    e+
    e-
    E
    E+
    E-
```

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# Demo – Hello World, Continued

# What did we just see

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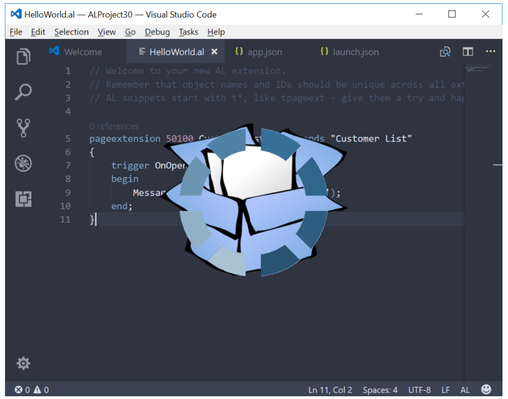
Visual Studio Code with the AL Language extension

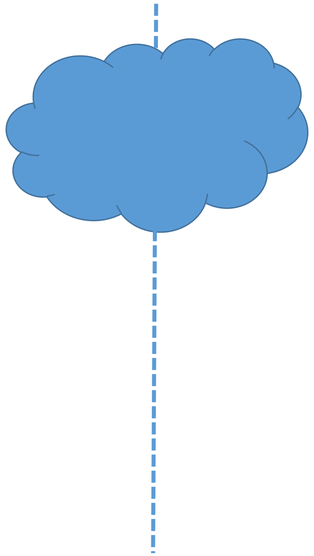
App deployed to a Dynamics 365 in Azure/On-Prem

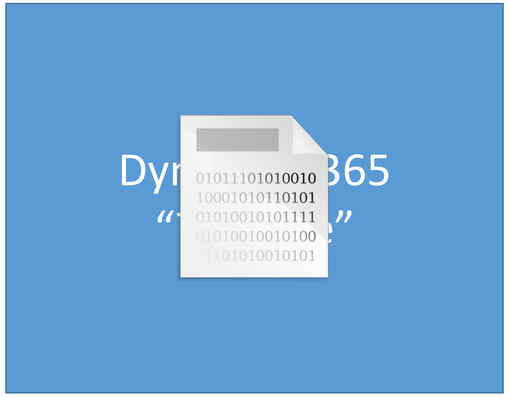
A simple page extension

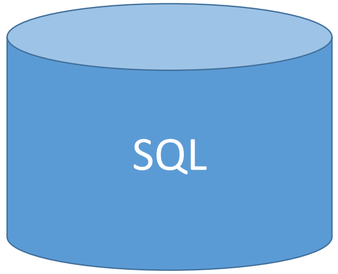
# How does the deployment work




Ctrl+F5 (⌘+F5)

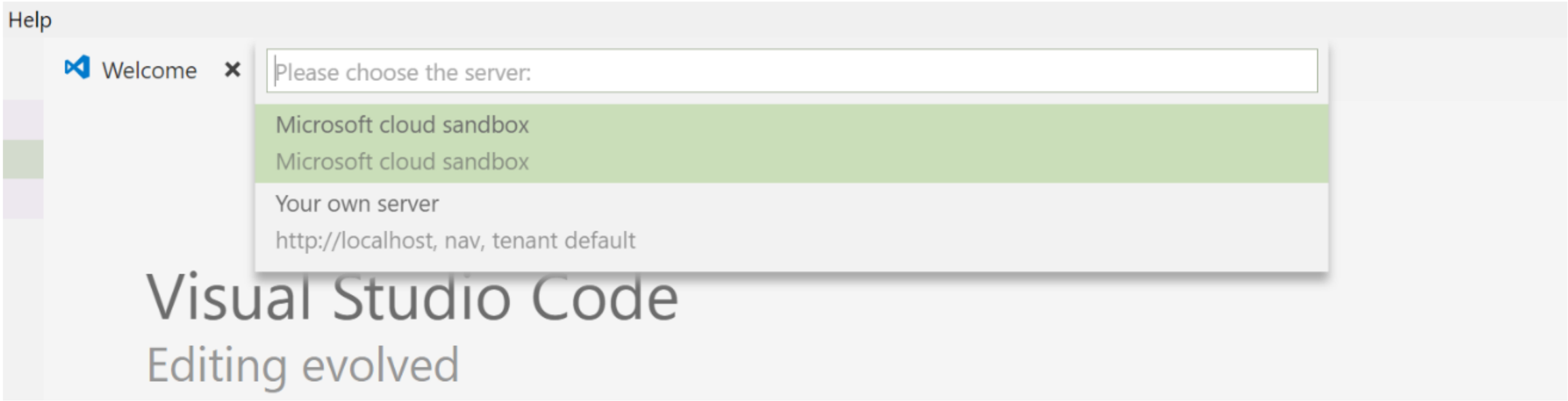




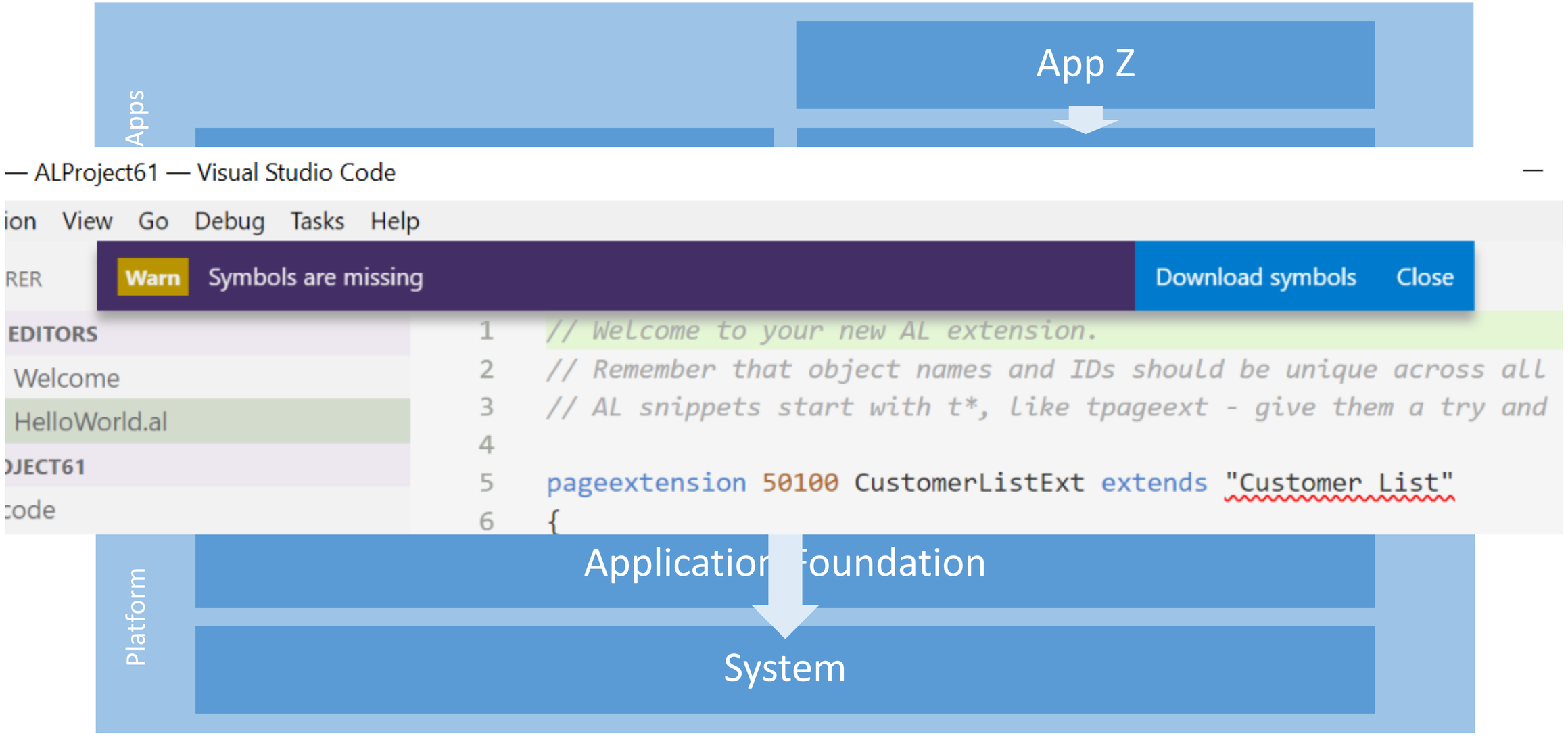
# Deployment Options

launch.json




```
        ]
    }
```

# Symbols and Modules



# The syntax



Codeunit.al | Page.al ● | Table.al

```
1   page 50100 MyPage
6       layout {
7           area(content) {
8               group(GroupName) {
9                   Caption = 'Nice Group';
10
11                  field(Name;Name)
12                  {
13                      Caption = 'Customer Name';
14                      Visible = true;
15                      ToolTip = 'This is the Customer name';
16
17                      trigger OnValidate();
18                      begin
19                          // Some validation
20                      end;
21                  }
22              }
23          }
24      }
```

Properties

Triggers

Methods

```
36      begin
37      end;
38  }
```

# Where are my designers

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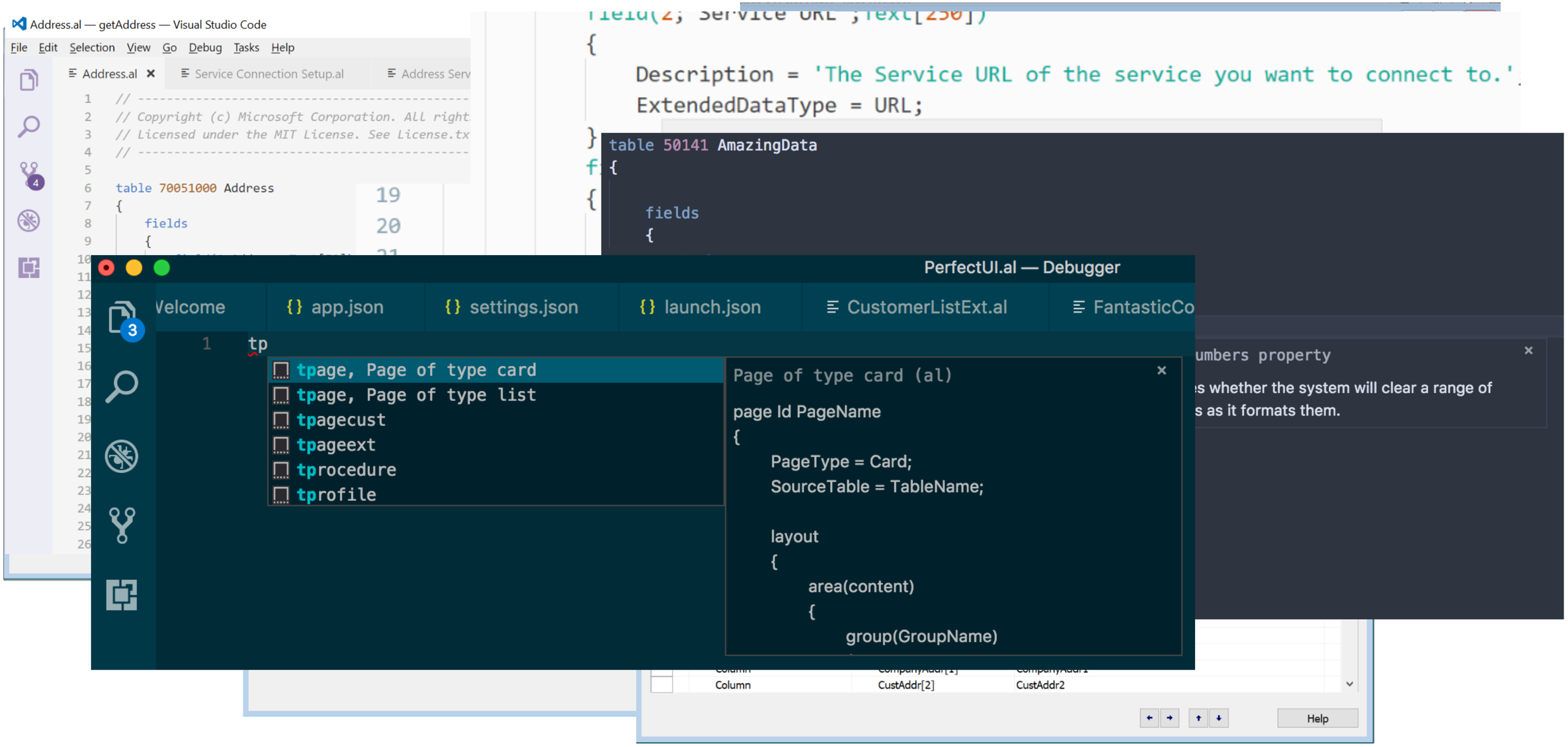

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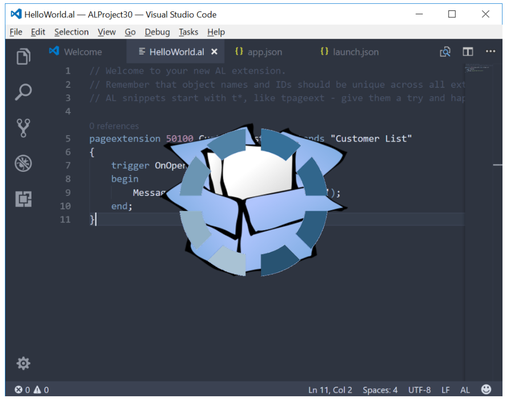
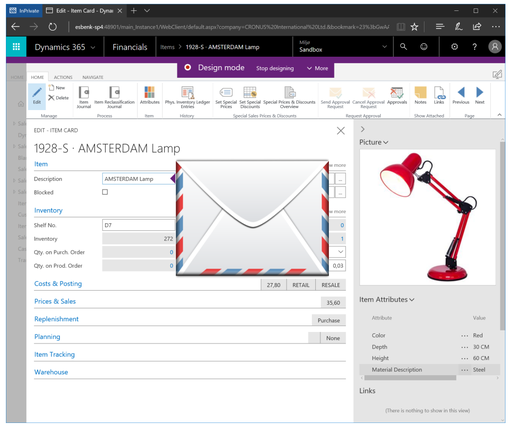
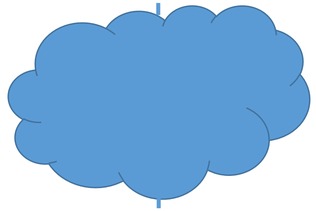
# Demo – Designer

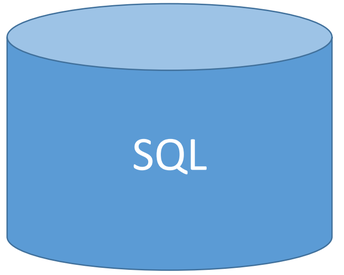
# Designer




F7 extension=219165b6-9b1f-4204-9475-01657a0172ee



# Developing for the cloud

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## You are not alone in the cloud

## Resources are shared => Resource Governance

## Data is not shared => Sandboxing

## Restrictions

Some platform API's are blocked
Certain application methods are blocked
.net interop is not supported

# What about .net

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## New native AL types

| JSON | XML | TextBuilder | HttpClient | List | Dictionary | String Functions |
|---|---|---|---|---|---|---|

## Move .net functionality to Azure functions

Use native HttpClient to call Azure functions (or other web-services)

## Submit pull request to the C/AL Open Library

Requests will be sanitized and if accepted be included in the base application
https://github.com/Microsoft/cal-open-library

# JSON support

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```
{
  "books": [
    {
      "title": "Pride And Preju
      "price": "24.95",
      "genre": "novel",
      "ISBN": "1-861001-57-8"
    },
    {
      "title": "The Handmaid's
      "price": "29.95",
      "genre": "novel",
      "ISBN": "1-861002-30-1"
    },
    {
      "title": "Sense and Sensi
      "price": "19.95",
      "genre": "novel",
      "ISBN": "1-861001-45-3"
    }
  ]
}
```

```
LOCAL PROCEDURE CreateBooks@7(
  VAR JObject@1001 : DotNet "'Newtonsoft.Json, ...'.Newtonsoft.Json.Linq.JObject");
VAR
  JArray@1000 : DotNet "'Newtonsoft.Json, ...'.Newtonsoft.Json.Linq.JArray";
  local procedure CreateBooks() JObject: JsonObject;
  var
      JArray: JsonArray;
  begin
      JArray.Add(
          CreateBook('Pride And Prejudice', 24.95, 'novel', '1-861001-57-8'));
      JArray.Add(
          CreateBook('The Handmaid''s Tale', 29.95, 'novel', '1-861002-30-1'));
      JArray.Add(
          CreateBook('Sense and Sensibility', 19.95, 'novel', '1-861001-45-3'));

      JObject.Add('books', JArray);
  end;

  local procedure CreateBook(
      Title: Text; Price: Decimal;
      Genre: Text; ISBN: Text) JObject: JsonObject;
  begin
      JObject.Add('title', Title);
      JObject.Add('price', Format(Price));
      JObject.Add('genre', Genre);
      JObject.Add('ISBN', ISBN);
  end;
  JObject.Add(JProperty.JProperty('genre', Genre));
  JObject.Add(JProperty.JProperty('ISBN', ISBN));
  JToken := JObject;
END;
```

# XML Support

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```
1   <?xml version="1.0" enc
2   <books>
3       <book genre="novel"
4           <title>Pride An
5           <price>24.95</p
6       </book>
7       <book genre="novel"
8           <title>The Hand
9           <price>29.95</p
10      </book>
11      <book genre="novel"
12          <title>Sense an
13          <price>19.95</p
14      </book>
15  </books>
```

```
LOCAL PROCEDURE CreateBooks@2(
  VAR Document@1003 : DotNet "'System.Xml, ...'.System.Xml.XmlDocument");
VAR
  Book@1000 : DotNet "'System.Xml, ...'.System.Xml.XmlElement";
  Books@1001 : DotNet "'System.Xml, ...'.System.Xml.XmlElement";

  Book.AppendChild(Element);

  Book.SetAttribute('genre', Genre);
  Book.SetAttribute('ISBN', ISBN);
END;
```

```
local procedure CreateBooks() : XmlDocument;
var
    Document : XmlDocument;
    Node: XmlNode;
begin
    Document.Add(
        XmlElement.Create('books',
            CreateBook('Pride And Prejudice', 24.95, 'novel', '1-861001-57-8'),
            CreateBook('The Handmaid''s Tale', 29.95, 'novel', '1-861002-30-1'),
            CreateBook('Sense and Sensibility', 19.95, 'novel', '1-861001-45-3')));

    exit(Document);
end;

local procedure CreateBook(Title: Text; Price: Decimal;
    Genre: Text; ISBN: Text) Element: XmlElement;
begin
    Element := XmlElement.Create('book',
        XmlElement.Create('title', XmlText.Create(Title)),
        XmlElement.Create('price', XmlText.Create(Format(Price))));

    Element.Attributes.Set('genre', Genre);
    Element.Attributes.Set('ISBN', ISBN);
end;
```

# TextBuilder

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```
procedure BuildUsingText() Result : Text;
var
    i : Integer;
begin
    for i := 1 to 100000 do
        Result += Format(i);
end;
```

25 sec

```
procedure BuildUsingBigText() Result : Text;
var
    i : Integer;
    bt : BigText;
begin
    for i := 1 to 100000 do
        bt.AddText(Format(i));

    bt.GetSubText(Result, 1);
end;
```

24 sec

```
procedure BuildUsingTextBuilder() : Text;
var
    i : Integer;
    tb : TextBuilder;
begin
    for i := 1 to 100000 do
        tb.Append(Format(i));

    Exit(tb.ToText());
end;
```

72 ms

# New Text Functions

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```
procedure TextFunctions();
var
    t : Text;
    idx : Integer;
    b : Boolean;
    t2 : Text;
    list : List of [Text];
begin
    t := 'Hello World';

    b := t.Contains('llo'); // b = true

    b := t.EndsWith('Odd'); // b = false

    b := t.StartsWith('Hello'); // b = true

    idx := t.IndexOf('World'); // idx = 7

    idx := t.LastIndexOf('l'); // idx = 10

    t := 'Hi';
    t2 := t.PadLeft(4); // t2 = '  Hi'
    t2 := t.PadRight(4, '-'); // t2 = 'Hi--'

    t2 := t.ToLower(); // t2 = 'hi';

    t := 'Mon,Tue,Wed,Thu,Fri,Sat,Sun';
    list := t.Split(','); // list contains 7 weekdays

    // Fluent interface
    t := 'Hello World';
    b := t.ToUpper().Contains('WORLD'); // b = true
end;
```

# Generic types in AL – List, Dictionary

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```
0 references
procedure CountCharactersInCustomerName(customerName : Text; var counter : Dictionary of [Char, Integer]);
var
    i : Integer;
    c : Integer;
begin
    clear(counter);

    for i := 1 to StrLen(customerName) do begin
        if counter.Get(customerName[i], c) then
            counter.Set(customerName[i], c + 1)
        else
            counter.Add(customerName[i], 1);
    end;
end;
```

```
1 reference
procedure PrintCustomerNames(customerNames : List of [Text]);
var
    customerName : Text;
begin
    foreach customerName in customerNames do
        Message(customerName);
end;
```

```
1 reference
procedure WorkWithListOfCustomers();
var
    customerNames : List of [Text];
begin
    // adding an element to a list
    customerNames.Add('John');

    // checking if the list contains an element
    if customerNames.Contains('John') then
        Message('John is in the list.')
    else
        Message('John is not in the list.');

    // getting an element using its index
    Message('Element retrieved at index - 1 : ' + customerNames.Get(1));

    // setting an element at an index
    customerNames.Set(1, 'Marc');

    // getting an element using its index
    Message('Element retrieved after updating element at index - 1 : ' + customerNames.Get(1));

    // inserting a new element at index 1
    customerNames.Insert(1, 'Simon');

    // getting an element using its index
    Message('Element retrieved after inserting element at index - 1 : ' + customerNames.Get(1));

    // removing an element at index 1
    customerNames.RemoveAt(1);

    // getting an element using its index
    Message('Element retrieved after deleting element at index - 1 : ' + customerNames.Get(1));

    // checking whether list has got any elements
    Message('Is List empty: ' + Format(customerNames.Count = 0));
end;
```

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# Demo – Putting it together

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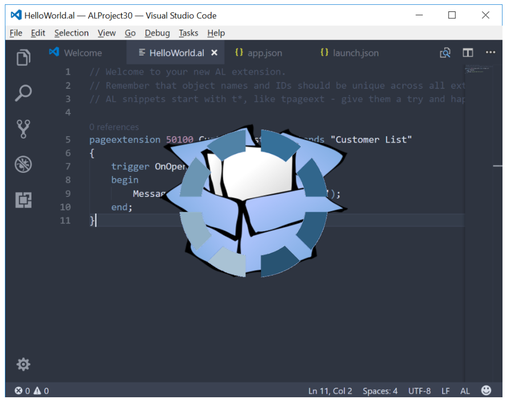
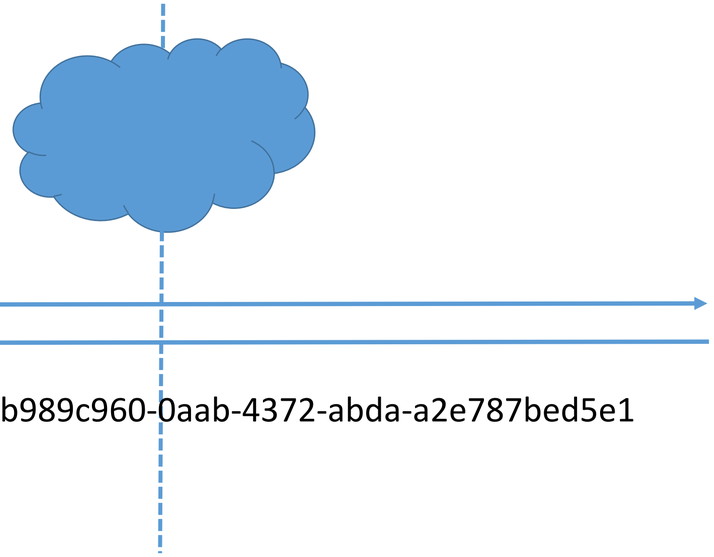
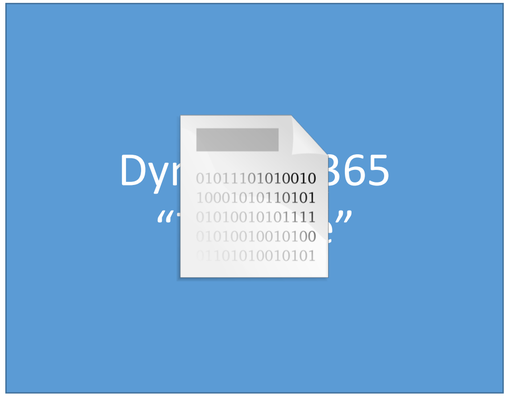
# Demo – Debugger

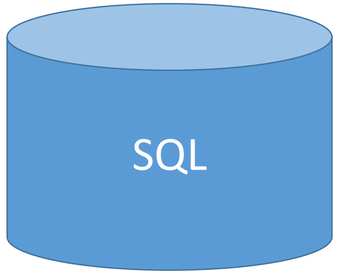
# Debugging flow

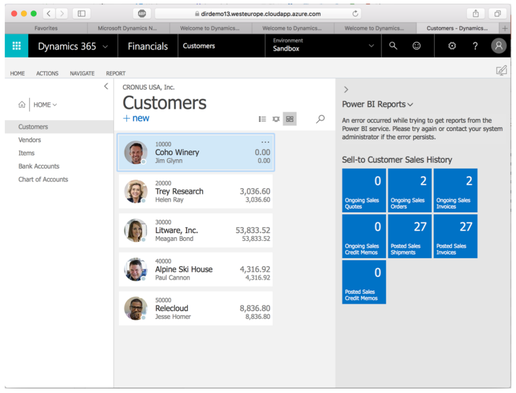



debuggingcontext = b989c960-0aab-4372-abda-a2e787bed5e1



# Dependencies

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Apps can depend on apps

Dependencies are specified in app.json

```
"dependencies": [ {
  "appId": "4805fd15-75a5-46a2-952f-39c1c4eab821",
  "name": "WeatherLibrary",
  "publisher": "Microsoft",
  "version": "1.0.0.0"
}],
```

Symbols are the key

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# Demo – Client Add-ins

# Embedded resources

## PermissionSet

```
Export-NAVAppPermissionSet
```

## Translations

```
C/SIDE → Export translation
```

## Extension table data

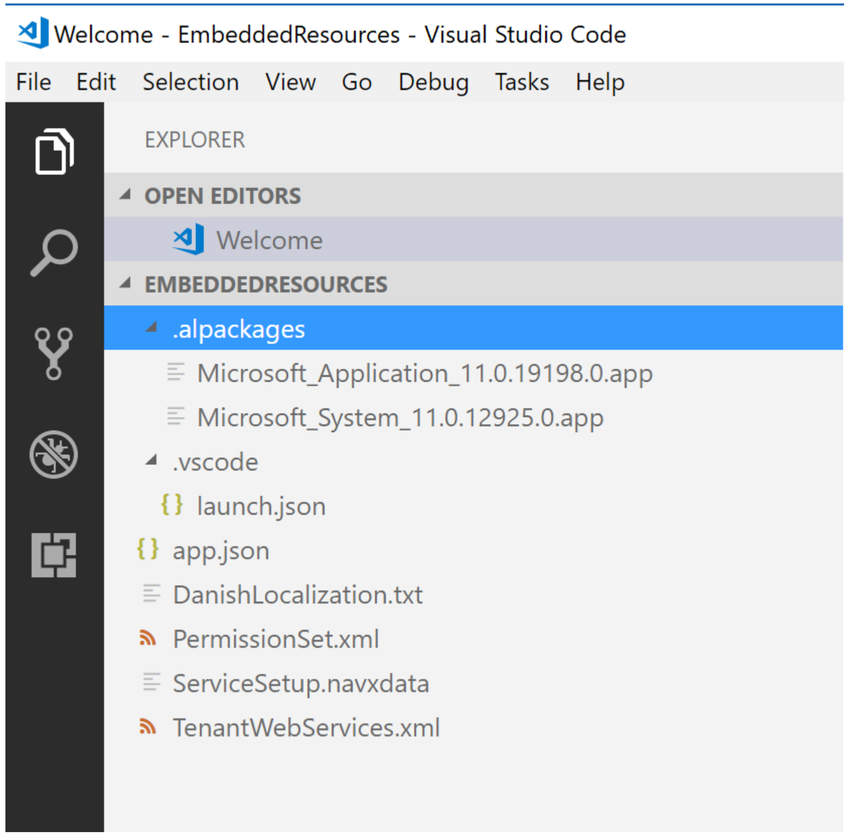
```
Export-NAVAppTableData
```

## Web service definitions

```
Export-NAVAppTenantWebService
```

## Custom report layouts

```
Export-NAVAppReportLayout
```



# New approach to translations

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## New syntax for labels

```
field(51; CurrencyAmount; Decimal)
{
    Caption = 'Outstanding amount in %1', Comment = '%1 - currency', MaxLength = 40;
}

var
    0 references
    ErrorMessage : label 'Web service configuration missing', Locked = true;
```

## Generation of XLIFF files

```
<trans-unit id="Table 892477493 - Field 3208725453 - Property 2879900210" maxWidth="40" s
  <source>Outstanding amount in %1</source>
  <note from="Developer" annotates="general" priority="2">%1 - currency</note>
  <note from="Xliff Generator" annotates="general" priority="3">Table - Field</note>
</trans-unit>
```

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# Demo – XLIFF based translations

# What about MenuSuites?

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```
pageextension 50102 ExtendNavigationPane extends "Business Manager Role Center"
{
  actions
  {
    addlast(Embedding)
    {
      0 references
      action("Open my new page")
      {
        RunObject = page "Customer Bank Account List";
        ApplicationArea = All;
      }
    }
  }
}
```

# Install experience

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New Install codeunits and new triggers

```
codeunit 50103 InstallCodeunitForExtension
{
    Subtype = Install;

    trigger OnInstallAppPerCompany();
    var
        context : ExecutionContext;
        info : ModuleInfo;
    begin
        context := GetCurrentModuleExecutionContext();
        NavApp.GetCurrentModuleInfo(info);
        info.
    end;
}
```

AppVersion
DataVersion
Dependencies
Id
Name
Publisher

procedure AppVersion() : Version

# Demo – Installation & Navigation

# Profile Objects



```
profile SalesRepresentative
{
    Description = 'Sales Representative Profile';
    RoleCenter = "Sales & Relationship Mgr. RC";
    Customizations = SimplifiedCustomer;
}
```

1 reference

```
pagecustomization SimplifiedCustomer customizes "Customer Card"
{
    layout
    {
        modify("Balance (LCY)")
        {
            Visible = false;
        }

        moveafter(Address;"E-Mail")
    }

    //Variables, procedures and triggers are not allowed on Page Customizations
}
```

# Move from C/AL to AL

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Upgrade the source code

```
finsql.exe Command=ExportToNewSyntax
```

```
txt2al.exe --source --target --rename --type --extensionStartId
```

```
    SubType = Upgrade;

    var
        archiveRef : RecordRef;
    begin
        if (NavApp.GetArchiveVersion() <> '') then begin
            // Compatible schema
            NavApp.RestoreArchiveData(50102);
            // Incompatible schema or partial upgrade
            NavApp.GetArchiveRecordRef(50102, archiveRef);
        end;
    end;
}
```

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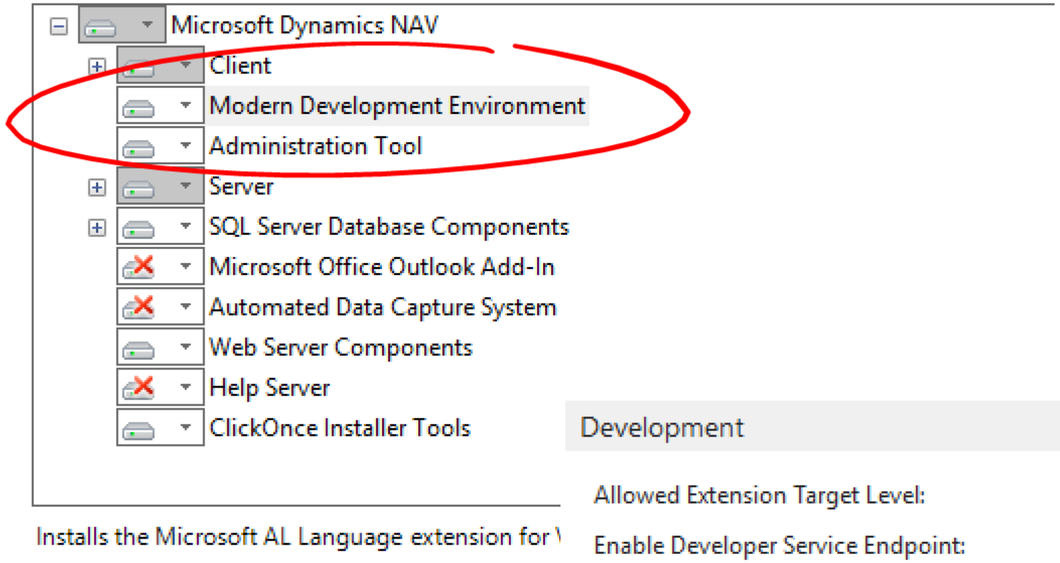
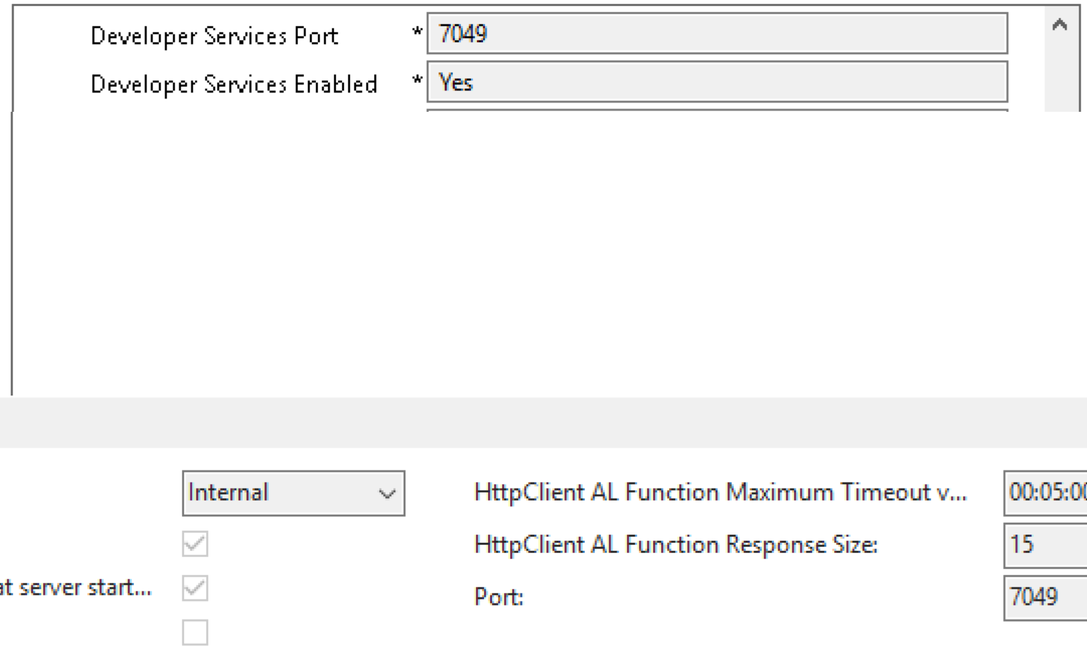
## Customize the installation




## Specify parameters



# Demo – Symbol generation from C/SIDE

# Testability

## Testability is still supported.

Test codeunits, Page testability,

## Tests can be written in modules

Separating tests from production code.

## Running the tests is still work in progress

We want to provide an integrated experience

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# What is next

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# Demo – Last one

# Not only a technical change



Important new member of our team – you, the community!

GitHub – be part of shaping the future of Modern Dev

GitHub – contribute samples and snippets

GitHub – suggest new events

C/AL Open Library – create .NET wrappers to help move into extensions V2

VS Code extensions around AL Language

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# THANK YOU!!

https://aka.ms/GetStartedWithApps

https://github.com/microsoft/AL/issues

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