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Using Docker and the ContainerHelper to convert your C/AL solution to an AL solution

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MICROSOFT DEVELOPMENT CENTER COPENHAGEN

When you are passionate about
Microsoft Dynamics NAV/365 Business Central

Objectives

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1	Overview of entire upgrade process (The big picture)
2	Converting your code
3	Upgrade process explained in detail
4	Pitfalls, obstacles and plans to resolve them
5	Do everything in Docker – NAVContainerHelper

Introducing…

A Twitter hashtag for the AL community

Follow **#bcalhelp** on Twitter to learn about other people's issues (and help out if you can)

Include **#bcalhelp** in a tweet with a question. Maybe someone out there knows the answer

This is not controlled by Microsoft.

Let's kick this off, shall we?

Many questions

How to upgrade to the latest version (15.x) ?

System Application ?

How to convert existing code to extensions ?

How to get to the cloud?

What was discontinued?

The Discontinuation Overview

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Discontinued:

C/AL – replaced with AL

Cside – Replaced by VS Code

Windows Client – replaced by Web Client

Tomorrow: 9:00 Levering the power of the cloud - Accessing on-prem hardware/resources from the cloud

XML Profiles – AL Profiles (in code)

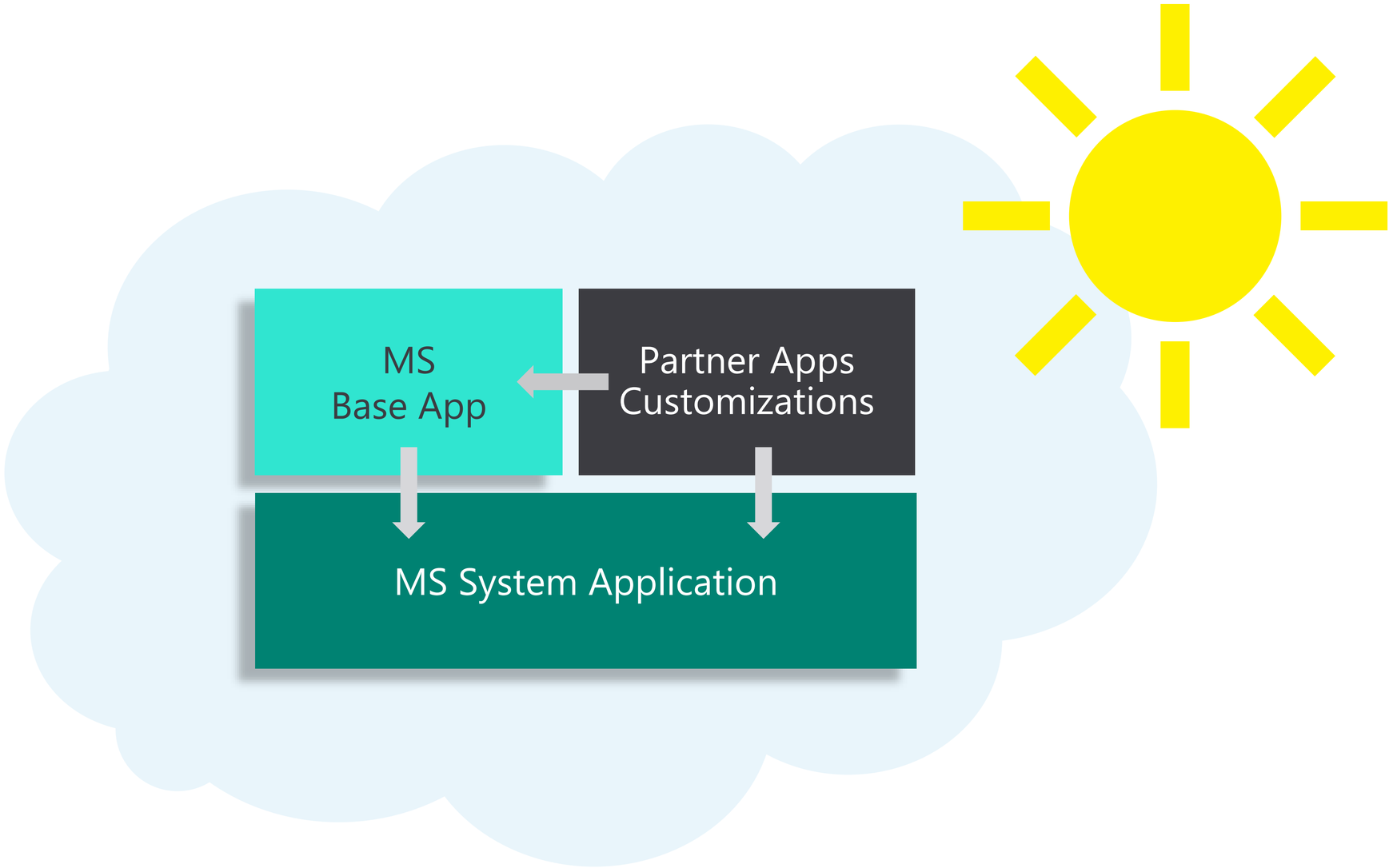
Planning to discontinue:

Integration management – replaced by $systemId (Integration Records)

Refactoring:

System App

Upgrade journey – The Destination



Upgrade journey – the plan

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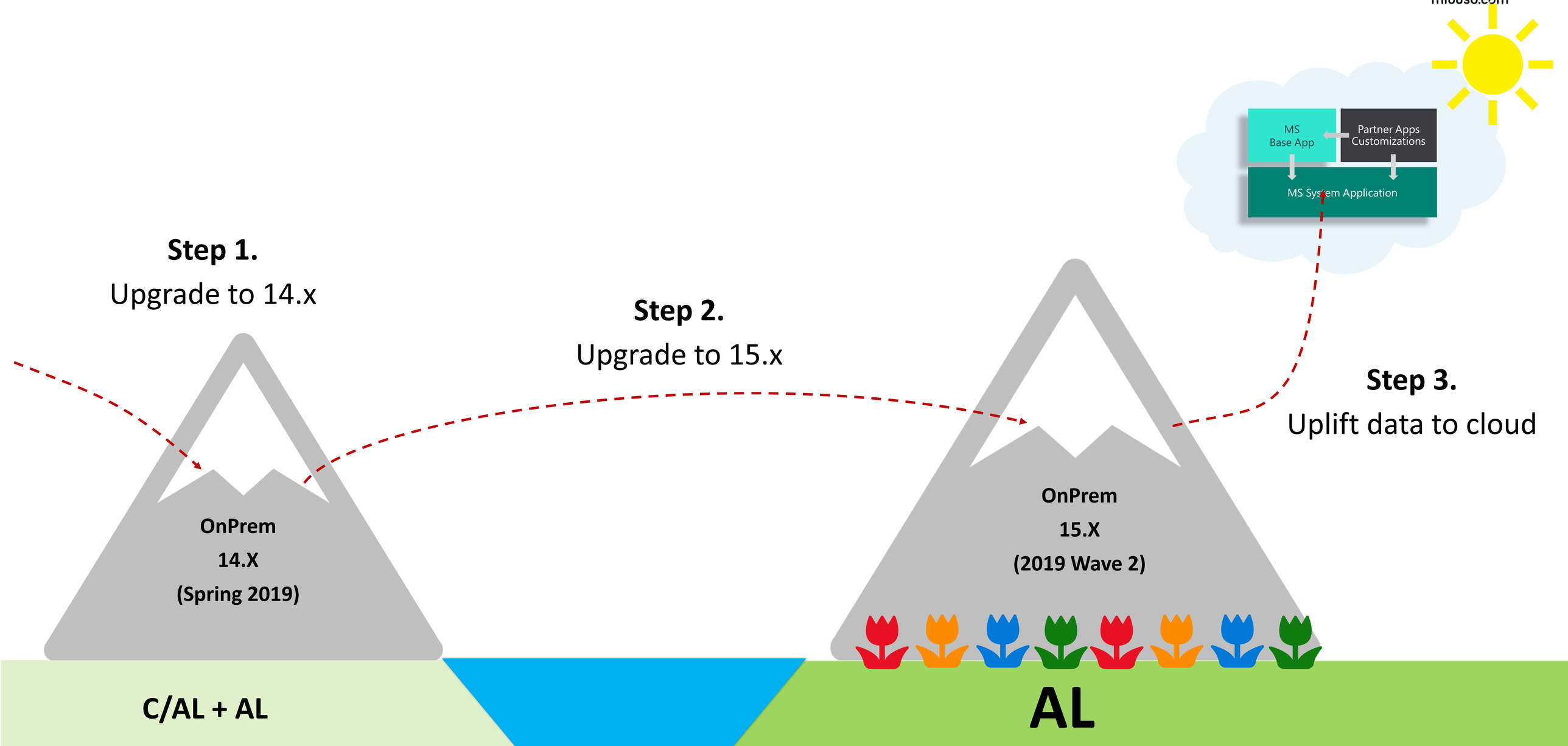

Important considerations

AL is amazing!!!

❤ Interfaces

It has one weakness:

SQL Schema changes

No Breaking SQL Schema changes

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Sounds hard

Property	Value
Field No.	
Name	**Document Type**
Caption	Document Type
CaptionML	**ENU=Document Type**
Description	<>
Data Type	**Option**
Enabled	<Yes>
InitValue	<Undefined>
FieldClass	<Normal>
OptionString	**Quote,Order,Invoice,Credit Memo,Blanket Order,Return Order**
OptionCaption	Quote,Order,Invoice,Credit Memo,Blanket Order,Return Order
OptionCaptionML	**ENU=Quote,Order,Invoice,Credit Memo,Blanket Order,Return Order**
BlankNumbers	<DontBlank>
BlankZero	<No>
SignDisplacement	<0>
AutoFormatType	
AutoFormatExpr	<>
CaptionClass	<>
Editable	<Yes>
MinValue	<>
MaxValue	<>
NotBlank	<No>
ValuesAllowed	<>
TableRelation	<Undefined>
ValidateTableRelation	<Yes>
TestTableRelation	<Yes>
AccessByPermission	<Undefined>
ExtendedDatatype	<None>
ObsoleteState	<No>
ObsoleteReason	<>
DataClassification	<CustomerContent>
Extensible	<No>
EnumTypeId	
EnumTypeName	<>

Field name, type, length

But it is not

Table names

```
CREATE TABLE [dbo].[CRONUS International Ltd_$Unit of Measure](
    [timestamp] [timestamp] NOT NULL,
    [Code] [nvarchar](10) NOT NULL,
    [Description] [nvarchar](50) NOT NULL,
    [International Standard Code] [nvarchar](10) NOT NULL,
    [Symbol] [nvarchar](10) NOT NULL,
    [Last Modified Date Time] [datetime] NOT NULL,
    [Id] [uniqueidentifier] NOT NULL,
CONSTRAINT [CRONUS International Ltd $Unit of Measure$0] PRIMARY KEY CLUSTERED
```

Keys (primary, secondary)

Not on the backlog

Breaking SQL Changes C/AL

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C/AL Handles breaking changes well

Refactor out any breaking SQL change on Microsoft owned objects before going to 15.x

```
[TableSyncSetup] GetTableSyncSetupW1(VAR TableSynchSetup : Record "Table Synch. Setup")
// The purpose of this method is to define how old and new tables will be available for dataupgrade

// The method is called at a point in time where schema changes have not yet been synchronized to
// the database so tables except virtual tables cannot be accessed

// TableSynchSetup."Table ID":
// Id of the table with schema changes (i.e the modified table).

// TableSynchSetup."Upgrade Table ID":
// Id of table where old data will be available in case the selected TableSynchSetup.Mode option is one of Copy or Move , otherwise

// TableSynchSetup.Mode:
// An option indicating how the data will be handled during synchronization
// Check: Synchronize without saving data in the upgrade table, fails if there is data in the modified field/table
// Copy: Synchronize with saving data in the upgrade table, the modified table contains data in matching fields
// Move: Synchronize with moving the data in the upgrade table,the changed table is empty; the upgrade logic is handled only by appl
// Force: Synchronize without saving data in the upgrade table, disregard if there is data in the modified field/table

DataUpgradeMgt.SetTableSyncSetup(DATABASE::"Credit Trans Re-export History",
  DATABASE::"UPG Credit Trans Reexport Hist",TableSynchSetup.Mode::Copy);
DataUpgradeMgt.SetTableSyncSetup(452,DATABASE::"UPG Approval Setup",TableSynchSetup.Mode::Move); // Approval Setup
DataUpgradeMgt.SetTableSyncSetup(464,DATABASE::"UPG Approval Templates",TableSynchSetup.Mode::Move); // Approval Templates
DataUpgradeMgt.SetTableSyncSetup(465,
  DATABASE::"UPG Additional Approvers",TableSynchSetup.Mode::Move); // Additional Approvers
DataUpgradeMgt.SetTableSyncSetup(453,0,TableSynchSetup.Mode::Force); // Approval Code
DataUpgradeMgt.SetTableSyncSetup(470,0,TableSynchSetup.Mode::Force); // Job Queue
```

AL Breaking changes OnPrem

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You have direct access to SQL and Server

MVPs have written some tooling

No official tooling supports this

Additive changes

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- Adding Tables

[Table 50101 ABC - Reward Provider - Table Designer]

E...	Field No.	Field Name	Data Type	Length	Description
✔	1	Provider ID	Integer		
✔	2	Description	Text	250	
✔	3	Points	Integer		
✔	4				

- Adding Fields to existing tables

[Table 18 Customer - Table Designer]

E...	Field No.	Field Name	Data Type	Length	Description
✔	9005	Contact ID	GUID		
✔	9006	Contact Graph Id	Text	250	
✔	50100	ABC - Reward Points	Integer		
✔	50101	ABC - Gold Customer	Boolean		

Upgrade to 14.x Important considerations

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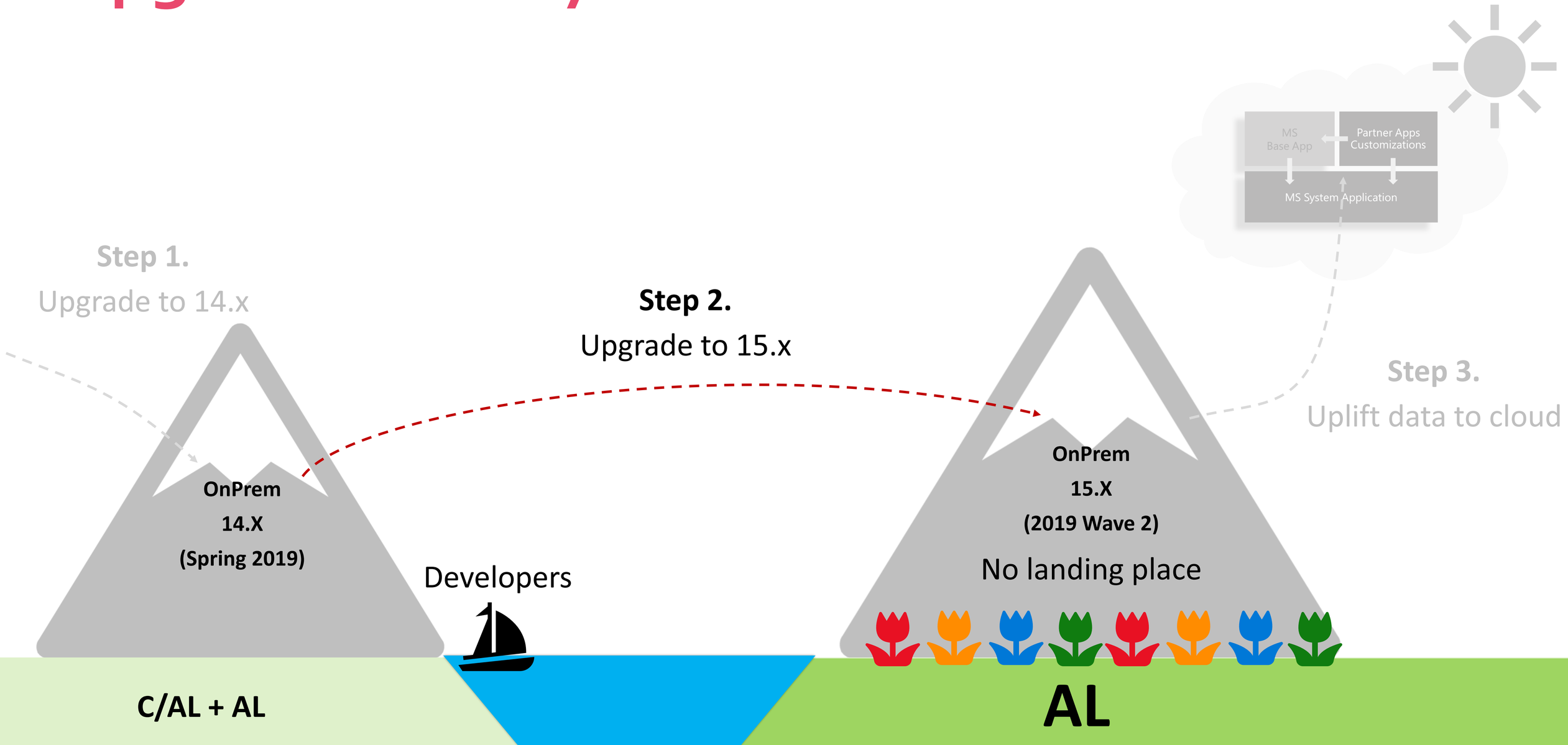
Make sure SQL Schema contains ONLY ADDITIVE changes

Minimize the number of modified objects (Ideally only added fields)

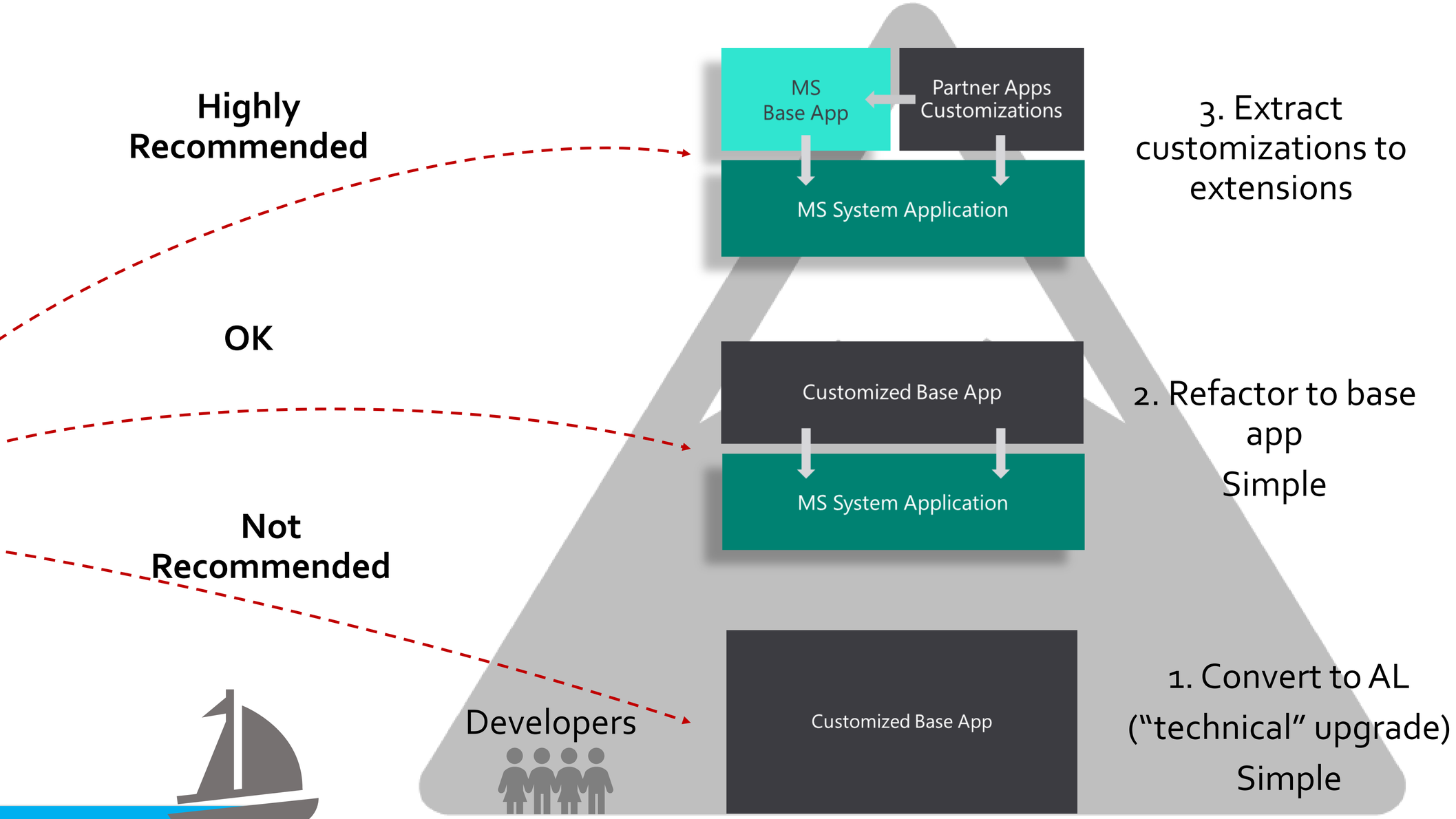
Renumber and rename to ISV Range (App store) or PTE Range (Per tenant extension) if you want to get to SaaS now

Platform support may come soon (Feature is investigated)

Upgrade Journey



15.x Target architectures



Let's climb the 15.x mountain

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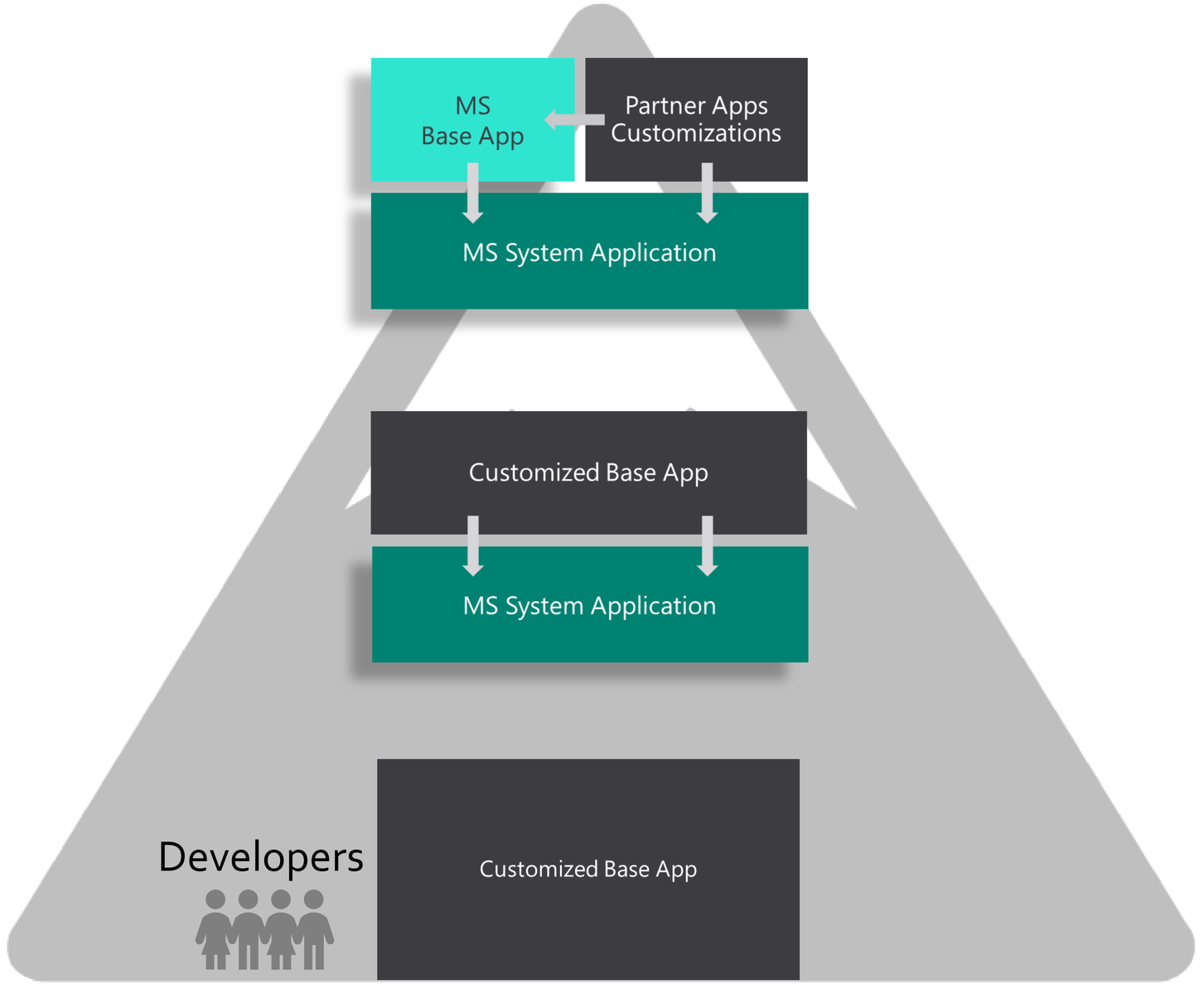


15.X

Prepare solution before conversion and convert directly to extension…

No breaking SQL Schema changes
Clean up Properties and Code (for txt2al)
Move Code Customizations to events
No modifications of objects in System App
No deleted fields, no deleted controls
No code modifications

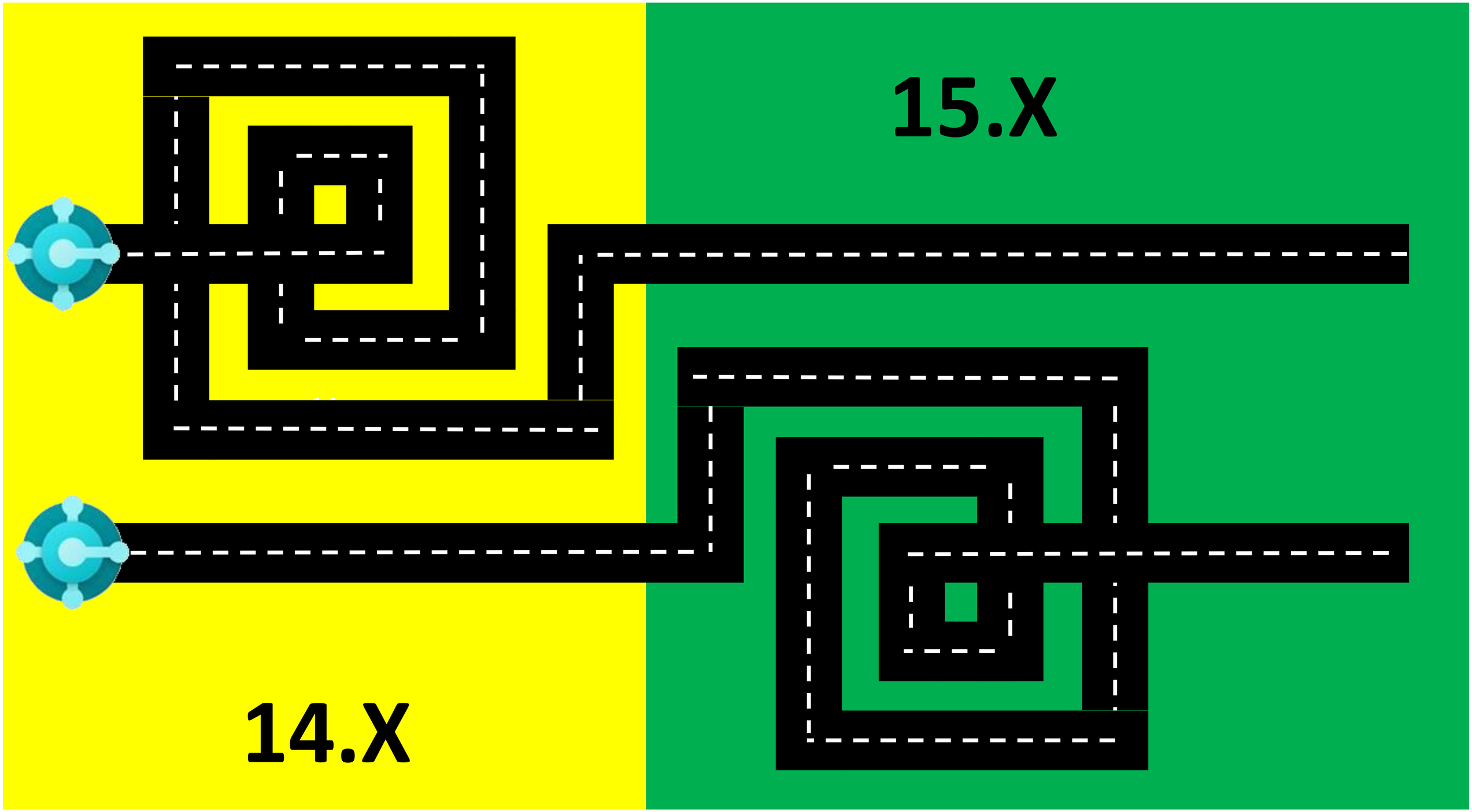
Uptake System Application changes

Convert to code customized solution and refactor to extension…

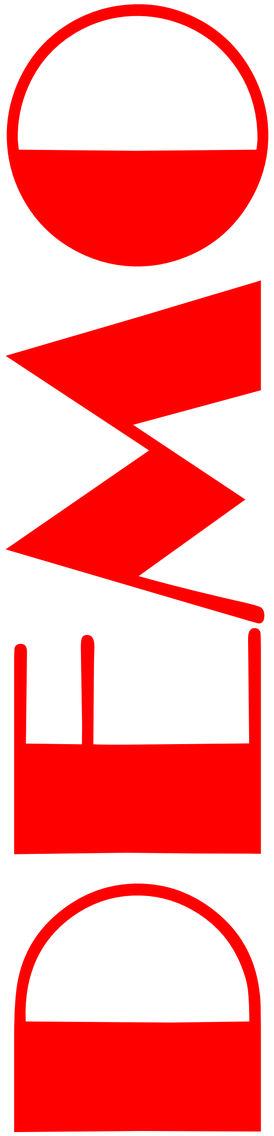
No breaking SQL Schema changes
Clean up Properties and Code (for txt2al)
Convert 14.x C/AL to 14.x AL

Merge with 15.x AL
Uptake System Application changes
Move Table Customizations to Table Extensions
Move Page Customizations to Page Extensions
Move Code Customizations to Events

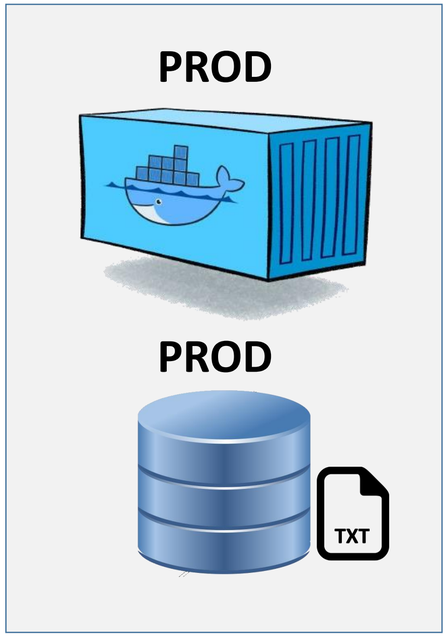
14.X


15.X
14.X

Convert to AL extension



14.X
Code Customized C/AL



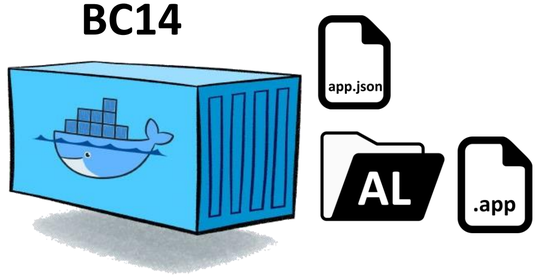
Code Conversion

Step 1: Create 14.x dev container
Step 2: Import Objects
Step 3: Compile Objects
Step 4: Convert my modifications to AL app
Step 5: Create AL Project
Step 6: Compile AL Project

Data Upgrade

New Table - ✓
Customized Table - ✘

BC14



Convert to code customized solution

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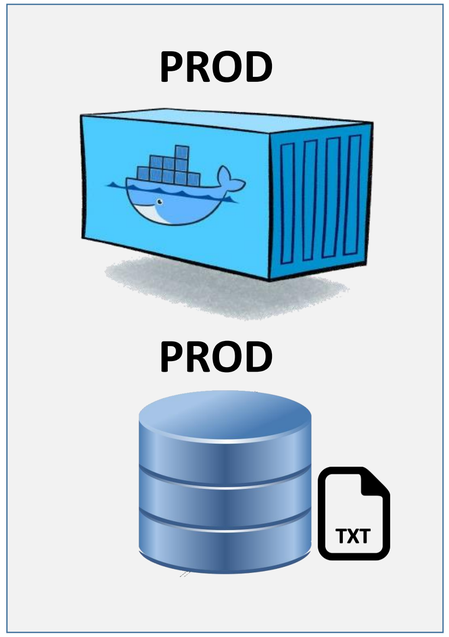
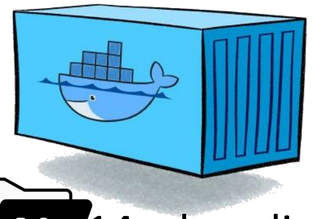
14.X
Code Customized C/AL



Code Conversion

Step 1: Create 14.x dev container
Step 2: Import Objects
Step 3: Compile Objects
Step 4: Create 14.x baseline in AL
Step 5: Create my baseapp (14.x) in AL
Step 6: Create 15.x dev container
Step 7: Create 15.x baseline in AL
Step 8: Merge

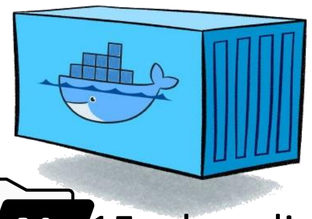
BC14



AL 14.x baseline

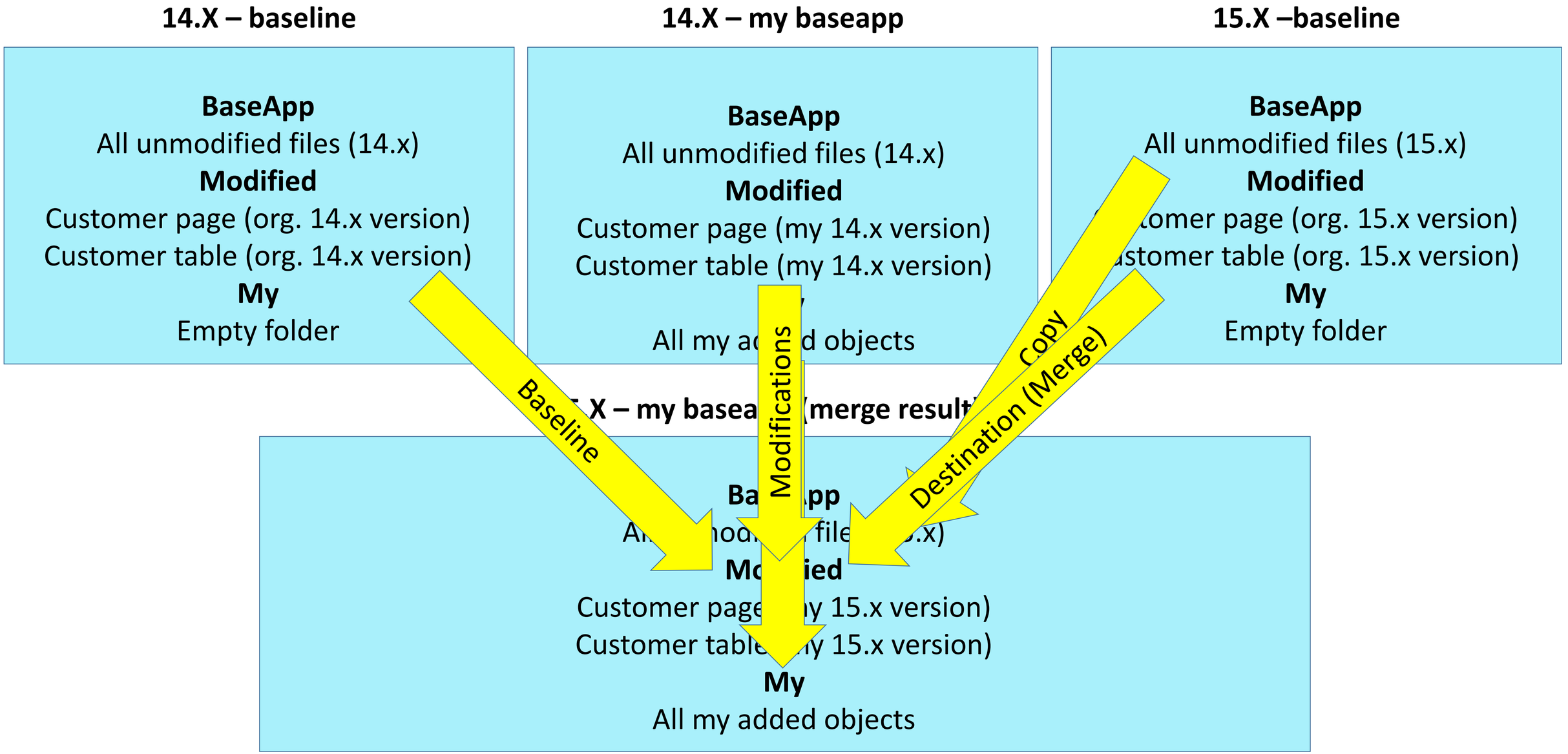
AL 14.x my baseapp

BC15



AL 15.x baseline

Merge


14.X – baseline
BaseApp
All unmodified files (14.x)
Modified
Customer page (org. 14.x version)
Customer table (org. 14.x version)
My
Empty folder
14.X – my baseapp
BaseApp
All unmodified files (14.x)
Modified
Customer page (my 14.x version)
Customer table (my 14.x version)
All my added objects
15.X –baseline
BaseApp
All unmodified files (15.x)
Modified
Customer page (org. 15.x version)
Customer table (org. 15.x version)
My
Empty folder
Baseline
Modifications
Copy
Destination (Merge)
My
All my added objects

Convert to code customized AL

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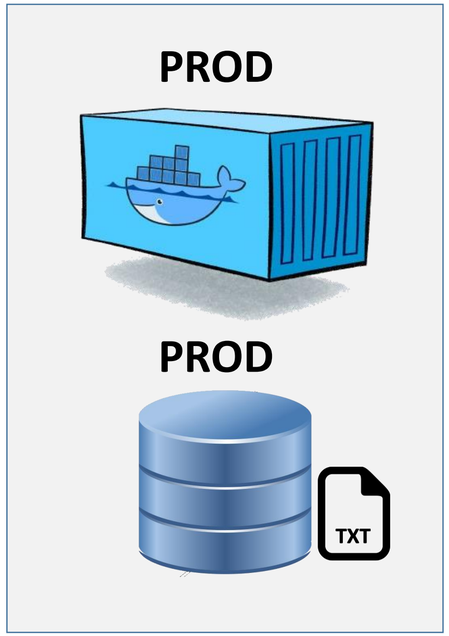
DEMO

14.X
Code Customized C/AL



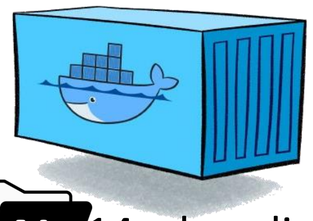
Code Conversion

Step 1: Create 14.x dev container
Step 2: Import Objects
Step 3: Compile Objects
Step 4: Create 14.x baseline in AL
Step 5: Create my baseapp (14.x) in AL
Step 6: Create 15.x dev container
Step 7: Create 15.x baseline in AL
Step 8: Merge

Data Upgrade

New Table - ✘
Customized Table – (✓)

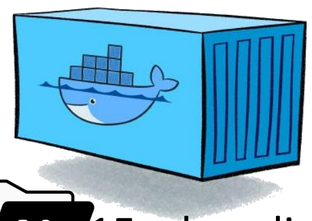
BC14



AL 14.x baseline

AL 14.x my baseapp

BC15



AL 15.x baseline

AL 15.x my baseapp

“AL Hybrid”

14.X

15.X

Prepare solution before conversion and convert directly to extension but leave table modifications behind…

No breaking SQL Schema changes
Clean up Properties and Code (for txt2al)
Move Code Customizations to events
No modifications of System App objects
No deleted fields, no deleted controls
No code modifications

Uptake System Application changes
Move Table Customizations to Table Extensions

Convert to “AL Hybrid”

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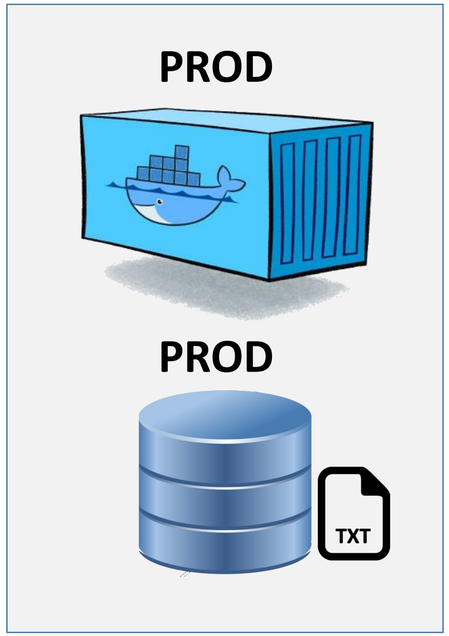
DEMO

14.X
Code Customized C/AL



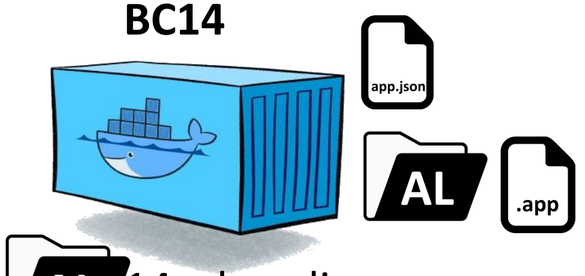
Code Conversion

Step 1: Create 14.x dev container
Step 2: Import Objects
Step 3: Compile Objects
Step 4: Create 14.x baseline in AL
Step 5: Create my baseapp (14.x) in AL
Step 6: Create 15.x dev container
Step 7: Create 15.x baseline in AL
Step 8: Merge table mods only
Step 9: Convert my modifications to AL app
Step 10: Remove Table Ext. & Create Project
Step 11: Compile BaseApp and App

Data Upgrade

New Table - ✓
Customized Table – (✓)

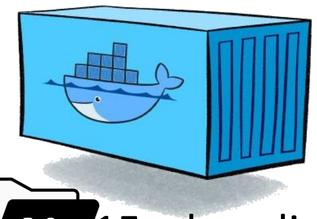
BC14



AL 14.x baseline

AL 14.x my baseapp

BC15



AL 15.x baseline

AL 15.x my baseapp .app

Let’s upgrade

Step 1.

Upgrade to 14.x

Step 2

Upgrade t

o cloud

OnPrem

14.X

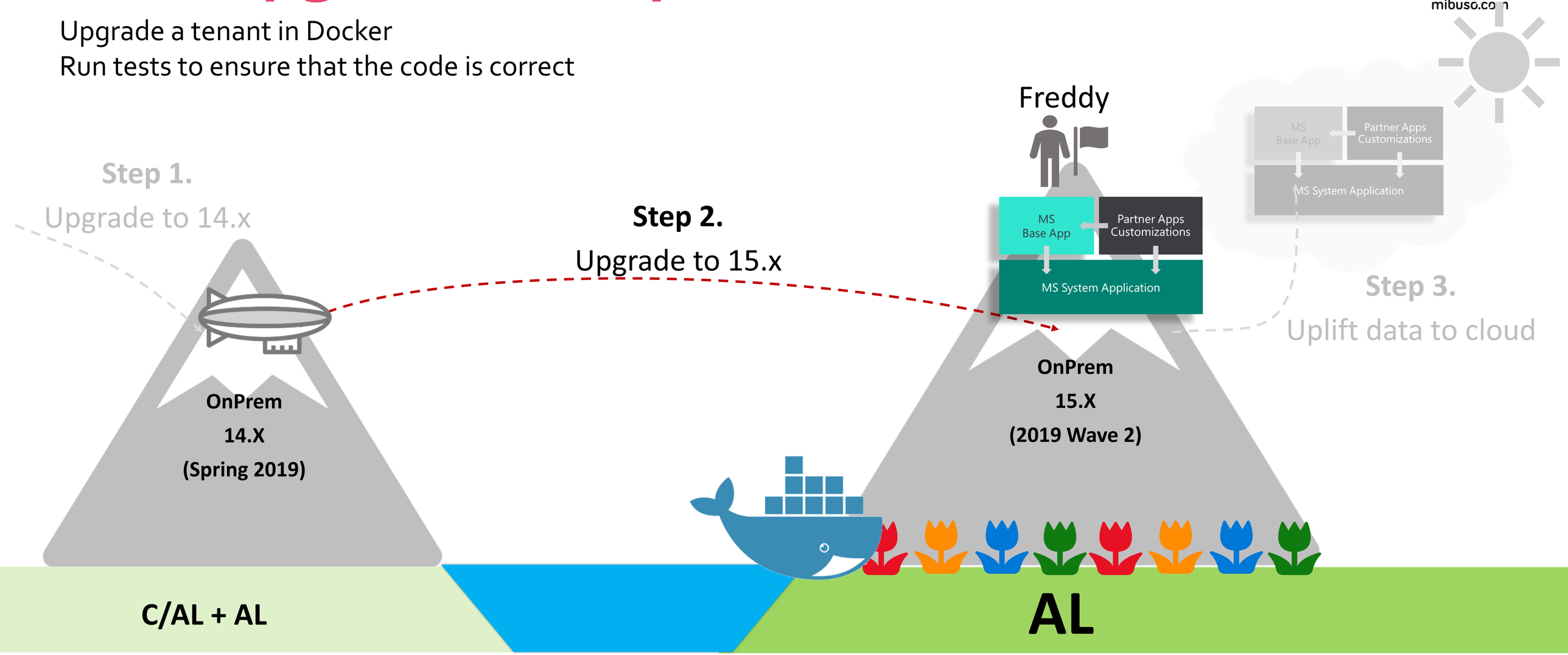
(Spring 2019)

C/AL + AL

AL

Let's upgrade – Step 2

Upgrade a tenant in Docker
Run tests to ensure that the code is correct



Added tables – Moved automatically if Name and ID Match

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C/AL – Base App

[Table 50101 ABC - Reward Provider - Table Designer]

	E...	Field No.	Field Name	Data Type	Length	Description
	✔	1	Provider ID	Integer		
	✔	2	Description	Text	250	
	✔	3	Points	Integer		
✱	✔	4				

dbo.CRONUS International Ltd_$ABC - Reward Provider

Freddy's app

```
table 50101 "ABC - Reward Provider"
{
    fields
    {
        // Unique reward provider
        5 references
        field(1; "Provider ID"; Integer)
        {
        }

        3 references
        field(2; Description; Text[250])
        {
            NotBlank = true;
        }

        4 references
        field(3; Points; integer)
        {

        }
    }
```

dbo.CRONUS International Ltd_$ABC - Reward Provider$58623bfa-0559-4bc2-ae1c-0979c29fd

Cannot move between extensions – in progress

Looking into allowing renumbering and renaming during the move

Moving fields to table extensions

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1. Mark existing fields as removed

```
table 18 Customer
{
        6 references
        field(50100; "Reward Points"; Integer)
        {
            ObsoleteState = Removed;
            ObsoleteReason = 'Moved to extension';
        }

        3 references
        field(50101; "Gold Customer"; boolean)
        {
            ObsoleteState = Removed;
            ObsoleteReason = 'Moved to extension';
        }
```

Add table extension

Field no and name must be different

```
tableextension 50100 "ABC - Reward Provider" extends Customer
{
    fields
    {
        3 references
        field(50200; "ABC - Reward Points"; Integer)
        {
        }

        2 references
        field(50201; "ABC - Gold Customer"; boolean)
        {
        }
    }
```

2. Loop over and copy from Upgrade or OnInstall trigger

```
local procedure MoveDataFromBaseAppToTableExtension()
var
    Customer: Record Customer;
    UpgradeTag: Codeunit "Upgrade Tag";
    ABCUpgradeTags: Codeunit "ABC - Upgrade Tags";
begin
    if (UpgradeTag.HasUpgradeTag(ABCUpgradeTags.GetMoveBaseAppFieldsToExtensionTag())) then
        exit;

    if not Customer.Findset() then
        exit;

    repeat
        if (Customer."ABC - Gold Customer") then
            Error('ABC - GOLD Customer has alredy be set');

        if (Customer."ABC - Reward Points" > 0) then
            Error('Reward points are aleady set');

        Customer."ABC - Gold Customer" := Customer."Gold Customer";
        Customer."ABC - Reward Points" := Customer."Reward Points";
        Customer.Modify();
    until Customer.Next() = 0;

    UpgradeTag.SetUpgradeTag(ABCUpgradeTags.GetMoveBaseAppFieldsToExtensionTag());
end;
```

Feature:
Move fields automatically AL to AL
Currently In Progress

DestinationAppsForMigration

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```
Microsoft.Dynamics.Nav.Management\Set-NAVServerConfiguration -ServerInstance $serverInstanceName
    -KeyName "DestinationAppsForMigration"
    -KeyValue '[
        {
            "appId":"63ca2fa4-4f03-4f2b-a480-172fef340d3f",
            "name":"System Application",
            "publisher":  "Microsoft"
        },
        {
            "appId":"437dbf0e-84ff-417a-965d-ed2bb9650972",
            "name":"Base Application",
            "publisher": "Microsoft"
            }
        ]'
```

1. Resolves references for manifests before 15.x

2. Installs apps automatically during upgrade
(Publish the extension, Sync and call Start-NAVDataUpgrade)

Old manifest file

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DestinationAppsForMigration will resolve missing application version to the extension if it is listed

```
{
  "id": "d612d720-63b9-4b26-b062-a0c09c4ed433",
  "name": "Microsoft Dynamics 365 - Accountant Hub",
  "publisher": "Microsoft",
  "brief": "Provides a dedicated experience for external accountants to view cl
  "description": "This application provides a portal with summary data for each
  "version": "2.0.0.0",
  "privacyStatement": "https://go.microsoft.com/fwlink/?LinkId=724009",
  "EULA": "https://go.microsoft.com/fwlink/?LinkId=847985",
  "help": "https://go.microsoft.com/fwlink/?LinkId=849257",
  "url": "https://go.microsoft.com/fwlink/?LinkId=724011",
  "logo": "ExtensionLogo.png",
  "capabilities": [],
  "dependencies": [],
  "screenshots": [],
  "platform": "13.0.0.0",
  "application": "13.0.0.0",
  "target": "Internal",
  "showMyCode": false
}
```

How to upgrade an app

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Start-NAVDataUpgrade will upgrade only destination app for migration

If it is not marked as a migration app after DestinationAppForMigration upgrade, you need to:

1. Publish-NAVApp
2. Sync-NAVApp
3. Start-NAVAppDataUpgrade

Integration Record to $systemId

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Every record got a new immutable key – $systemId (Guid)

We plan to remove Integration records

Integration ID === $systemId (for now)

Upgrade moves Integration Id to system ID
during sync step:

- Make sure Integration record table is up to date before upgrade
- Delete Int. Records if you don't use them

```
// Get by System Id
if SalesHeader.GetBySystemId(MySystemId) then
    Message(Format(SalesHeader.SystemId));

SalesHeader.SetRange(SystemId, MySystemId);
SalesHeader.FindFirst();

// Insert defined system ID
SalesHeader.SystemId := MySystemId;
SalesHeader.Insert(true, true);

// RecRef Example
RecRef.Open(Database::"Sales Header");
RecRef.Field(RecRef.SystemIdNo).SetRange(MySystemId);
RecRef.FindFirst();
```

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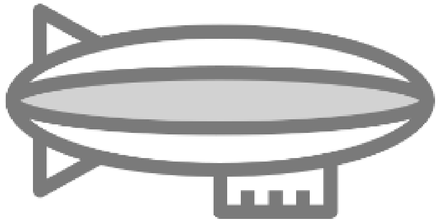
Back to demo



Let’s upgrade a tenant !!!

Before operating a zeppelin you need to learn some theory….

Where is the upgrade toolkit?

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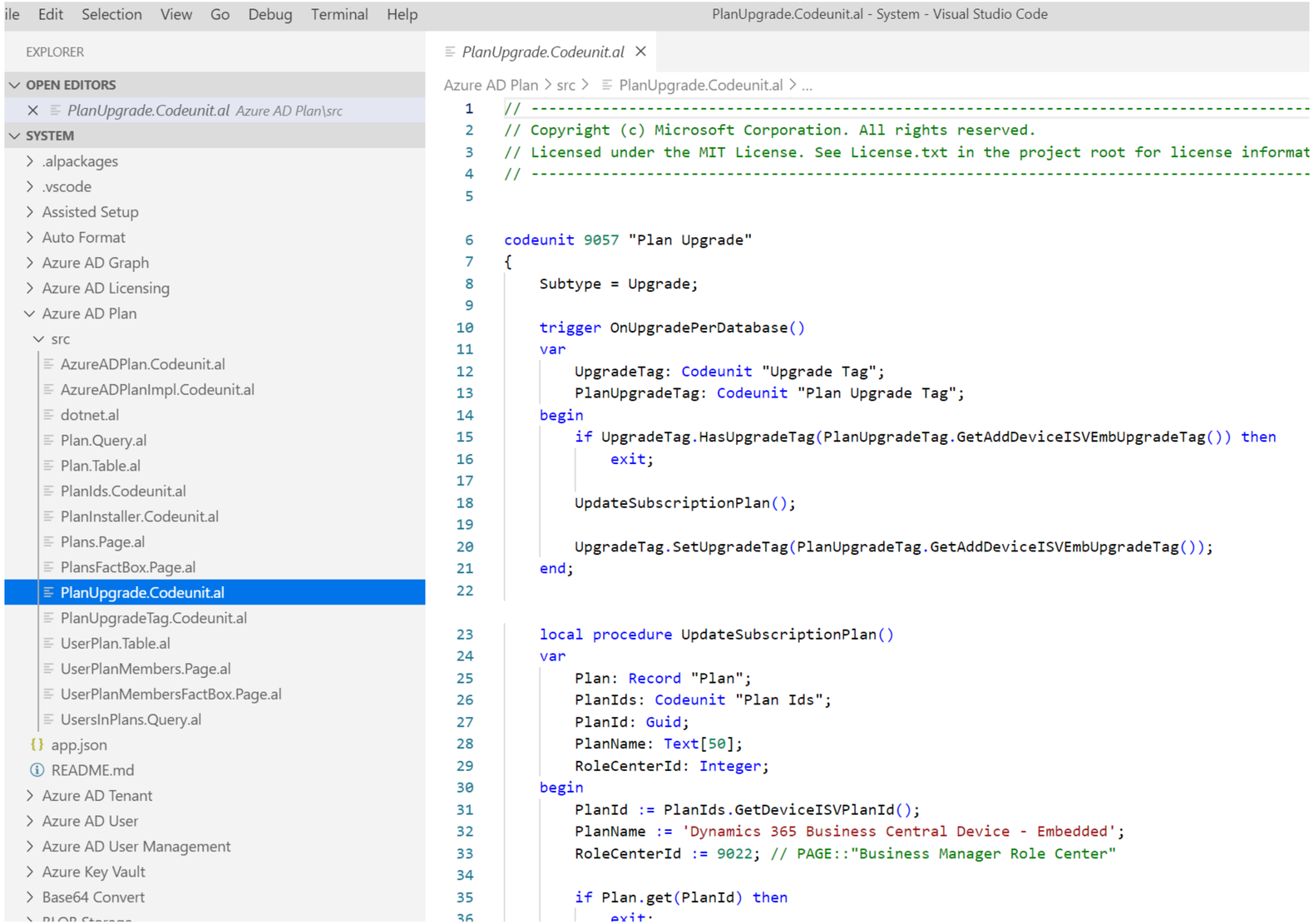
Included in every app

Stays as part of the app

Close to the code it upgrades



Base app upgrade toolkit

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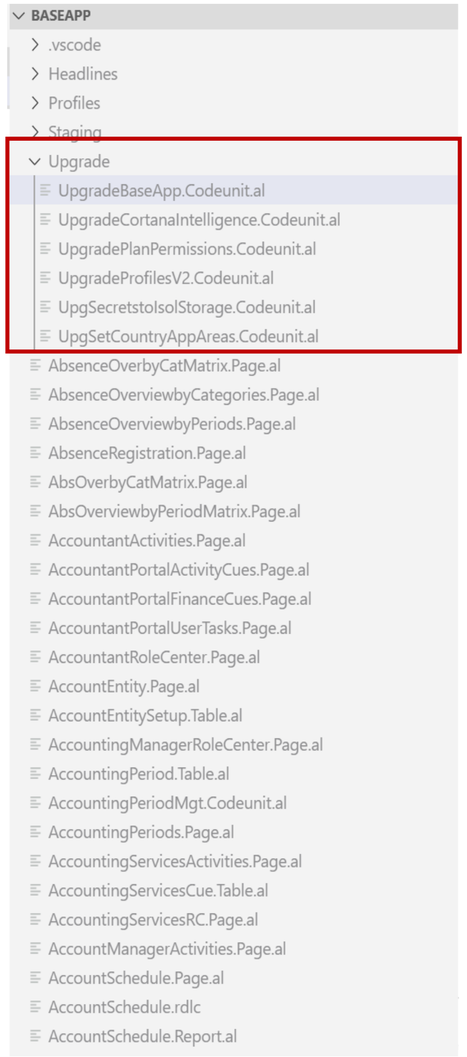
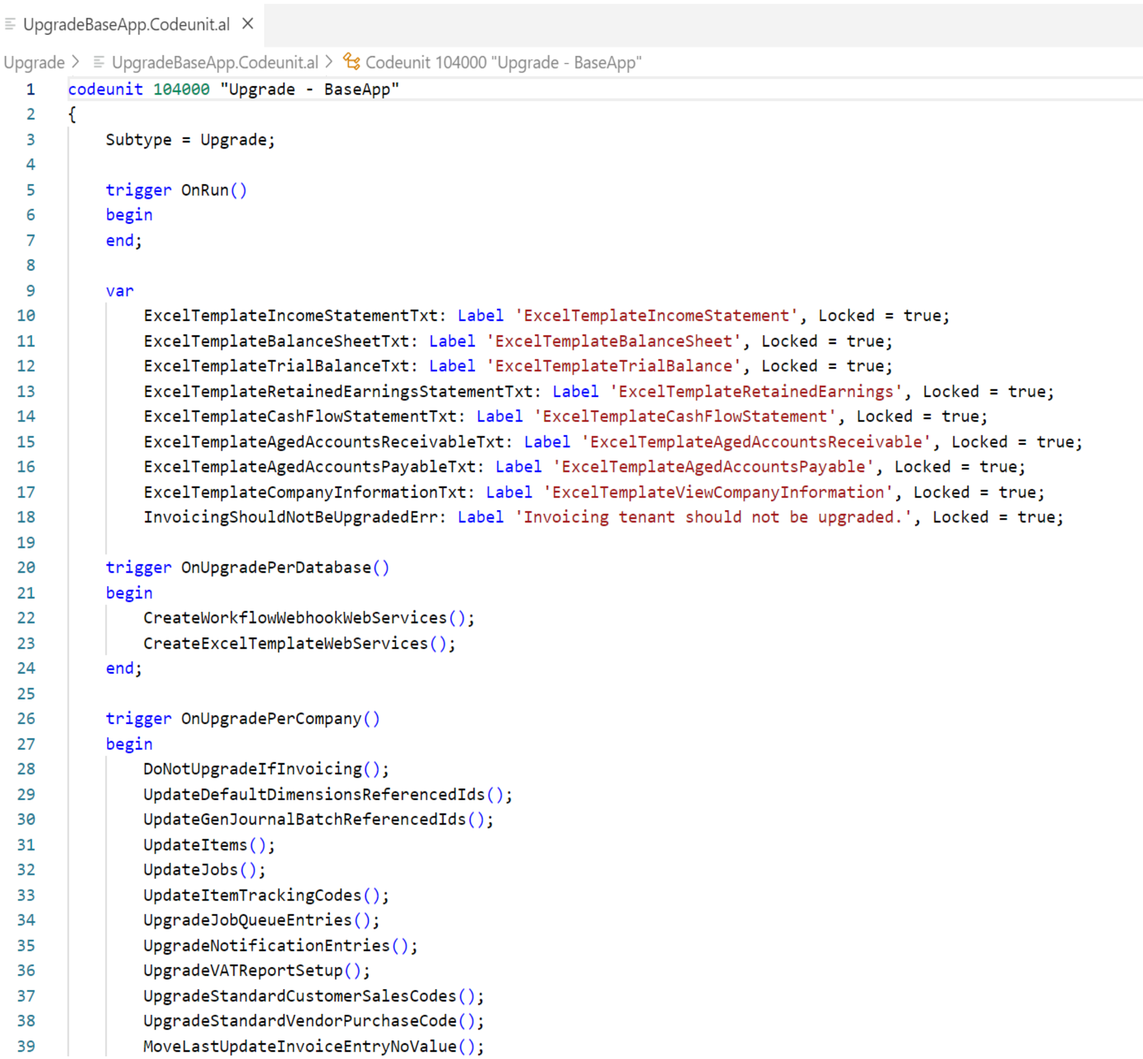
In upgrade folder

(because it is not fun to search in 6151 objects)

Separate areas = Separate codeunits

(the order must not matter)





Upgrade codeunit structure

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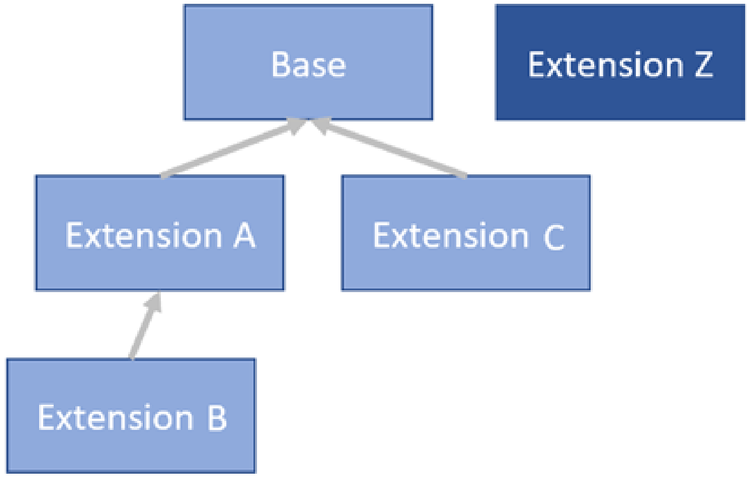
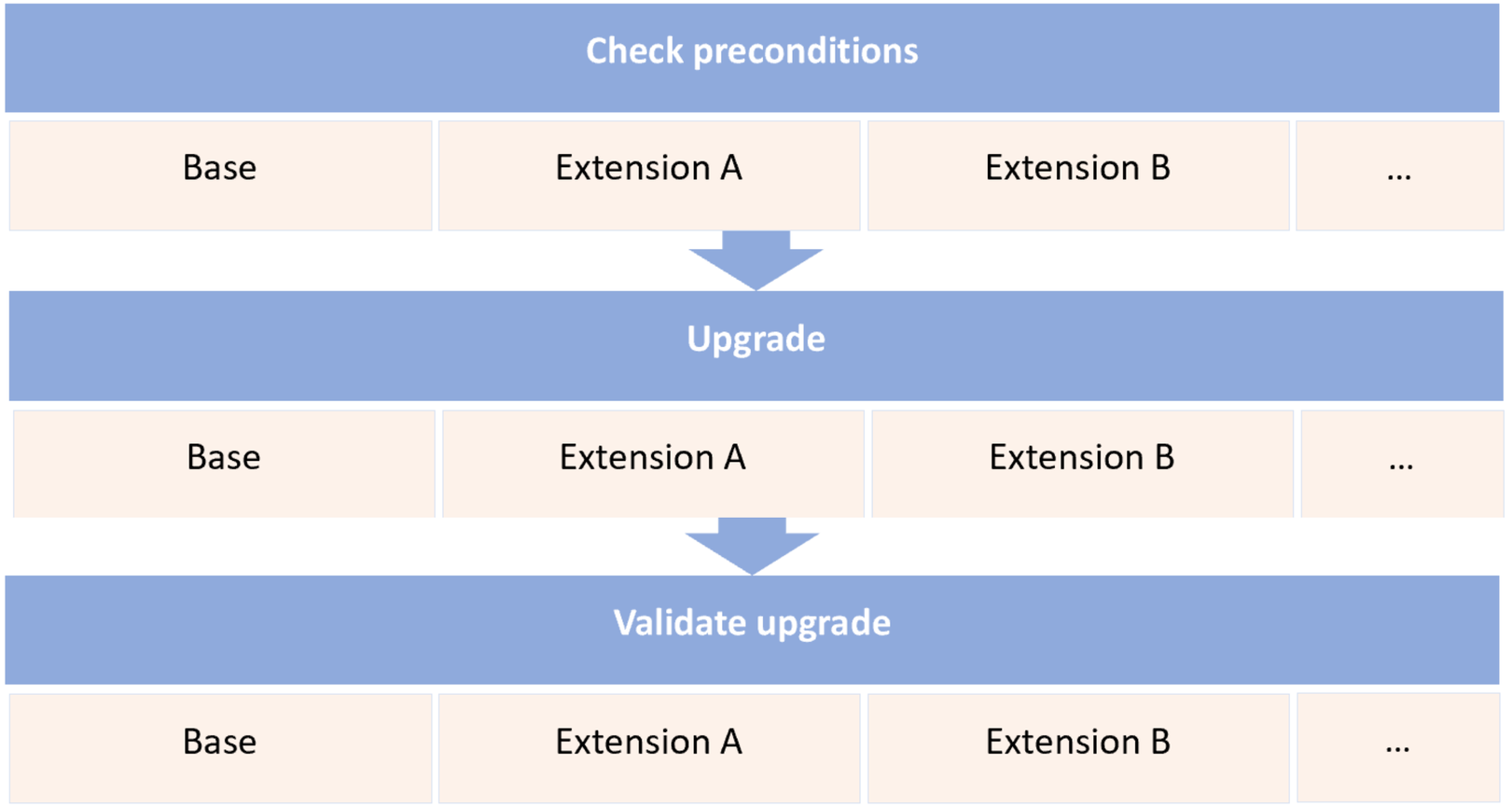
Check Preconditoins and Validate methods can be time consuming

Make sure methods run only if necessary (not on every upgrade)

```
codeunit [ID] [NAME]
{
    Subtype=Upgrade;

    trigger OnCheckPreconditionsPerDatabase()
    begin
        // Code to make sure DataPerCompany=No tables are OK to upgrade.
    end;

    trigger OnCheckPreconditionsPerCompany()
    begin
        // Code to make sure company is OK to upgrade.
    end;

    trigger OnUpgradePerDatabase()
    begin
        // Code to perform DataPerCompany=No table upgrade tasks
    end;

    trigger OnUpgradePerCompany()
    begin
        // Code to perform company related table upgrade tasks
    end;

    trigger OnValidateUpgradePerDatabse()
    begin
        // Code to make sure that DataPerCompany=No  successful for each company
    end;

    trigger OnValidateUpgradePerCompany()
    begin
        // Code to make sure that upgrade was successful for each company
    end;
}
```

Upgrade codeunit – Execution order





Upgrade codeunit structure

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Check Preconditoins and Validate methods can be time consuming

Make sure methods run only if necessary (not on every upgrade)

```
codeunit [ID] [NAME]
{
    Subtype=Upgrade;

    trigger OnCheckPreconditionsPerDatabase()
    begin
        // Code to make sure DataPerCompany=No tables are OK to upgrade.
    end;

    trigger OnCheckPreconditionsPerCompany()
    begin
        // Code to make sure company is OK to upgrade.
    end;

    trigger OnUpgradePerDatabase()
    begin
        // Code to perform DataPerCompany=No table upgrade tasks
    end;

    trigger OnUpgradePerCompany()
    begin
        // Code to perform company related table upgrade tasks
    end;

    trigger OnValidateUpgradePerDatabse()
    begin
        // Code to make sure that DataPerCompany=No  successful for each company
    end;

    trigger OnValidateUpgradePerCompany()
    begin
        // Code to make sure that upgrade was successful for each company
    end;
}
```

Fixing upgrade gone wrong

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Task - Split Name to First Name and Last Name

Update 13

No Upgrade
(Best Upgrade)

Update 14.1

```
if ((BaseAppModuleInfo.DataVersion().Major = 14)
    and (BaseAppModuleInfo.DataVersion().Minor > 1)
    and (BaseAppModuleInfo.DataVersion().Build < 32522))
    then
    FixWrongFirstNameLastNameSlipt()
else
    DoCorrectFirstNameLastNameSplit();
```

Update 14.3

```
if ((BaseAppModuleInfo.DataVersion().Major = 14)
    and (BaseAppModuleInfo.DataVersion().Minor > 3)
    and (BaseAppModuleInfo.DataVersion().Build < 32572))
    then
    FixWrongFirstNameLastNameSlipt()
else
    DoCorrectFirstNameLastNameSplit();
```

Update 15

```
if ((BaseAppModuleInfo.DataVersion().Major = 15)
    and (BaseAppModuleInfo.DataVersion().Minor > 0)
    and (BaseAppModuleInfo.DataVersion().Build < 35572))
    then
    FixWrongFirstNameLastNameSlipt()
else
    DoCorrectFirstNameLastNameSplit();
```

Version numbers, version number everywhere...

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```
if ((BaseAppModuleInfo.DataVersion().Major = 14) and (BaseAppModuleInfo.DataVersion().Minor > 5)) then
    UpdateDefaultDimensionsReferencedIds();

if ((BaseAppModuleInfo.DataVersion().Major = 12) and (BaseAppModu
    UpdateGenJournalBatchReferencedIds();
    UpdateItems();
    UpdateJobs();
    UpdateItemTrackingCodes();
end;

if ((BaseAppModuleInfo.DataVersion().Major = 15) and (BaseAppModu
    UpgradeJobQueueEntries();

if ((BaseAppModuleInfo.DataVersion().Major = 11) and (BaseAppModu
    UpgradeNotificationEntries();

if ((BaseAppModuleInfo.DataVersion().Major = 14) and (BaseAppModu
    UpgradeVATReportSetup();

if ((BaseAppModuleInfo.DataVersion().Major = 12) and (BaseAppModu
    UpgradeStandardCustomerSalesCodes();
    UpgradeStandardVendorPurchaseCode();
    MoveLastUpdateInvoiceEntryNoValue();
    CopyIncomingDocumentURLsIntoOneFiled();
    UpgradeAPIs();
end;

if ((BaseAppModuleInfo.DataVersion().Major = 14)
and (BaseAppModuleInfo.DataVersion().Minor > 3)
and (BaseAppModuleInfo.DataVersion().Build < 32572))
then
    FixWrongFirstNameLastNameSlipt()
else
    DoCorrectFirstNameLastNameSplit();
end;
```

```
if ((BaseAppModuleInfo.DataVersion().Major = 12) and (BaseAppModuleInfo.DataVersion().Minor > 2)) then begin
    UpgradeStandardCustomerSalesCodes();
    UpgradeStandardVendorPurchaseCode();
    MoveLastUpdateInvoiceEntryNoValue();
    CopyIncomingDocumentURLsIntoOneFiled();
    UpgradeAPIs();
end;

if ((BaseAppModuleInfo.DataVersion().Major = 14) and (BaseAppModuleInfo.DataVersion().Minor > 5)) then
    UpdateDefaultDimensionsReferencedIds();

if ((Ba
    Upda
    Upda
    Upda
    Upda
end;
```

```
837     local procedure CopySalesDocumentShipmentMethodFields(var SourceRecordRef: RecordRef; var TargetRecordRef: RecordRef)
838     var
839         SalesHeader: Record "Sales Header";
840         SalesOrderEntityBuffer: Record "Sales Order Entity Buffer";
841         ShipmentMethod: Record "Shipment Method";
842         CodeFieldRef: FieldRef;
843         IdFieldRef: FieldRef;
844         EmptyGuid: Guid;
845     begin
846         CopyFieldValue(SourceRecordRef, TargetRecordRef, SalesHeader.FIELDNO("Shipment Method Code"));
847         CodeFieldRef := TargetRecordRef.FIELD(SalesOrderEntityBuffer.FIELDNO("Shipment Method Code"));
848         IdFieldRef := TargetRecordRef.FIELD(SalesOrderEntityBuffer.FIELDNO("Shipment Method Id"));
849         IF ShipmentMethod.GET(CodeFieldRef.VALUE) THEN
850             IdFieldRef.VALUE := ShipmentMethod.Id
851         ELSE
852             IdFieldRef.VALUE := EmptyGuid;
853     end;
```

+5 other codeunits

Upgrade tags – Wrap code within upgrade tag

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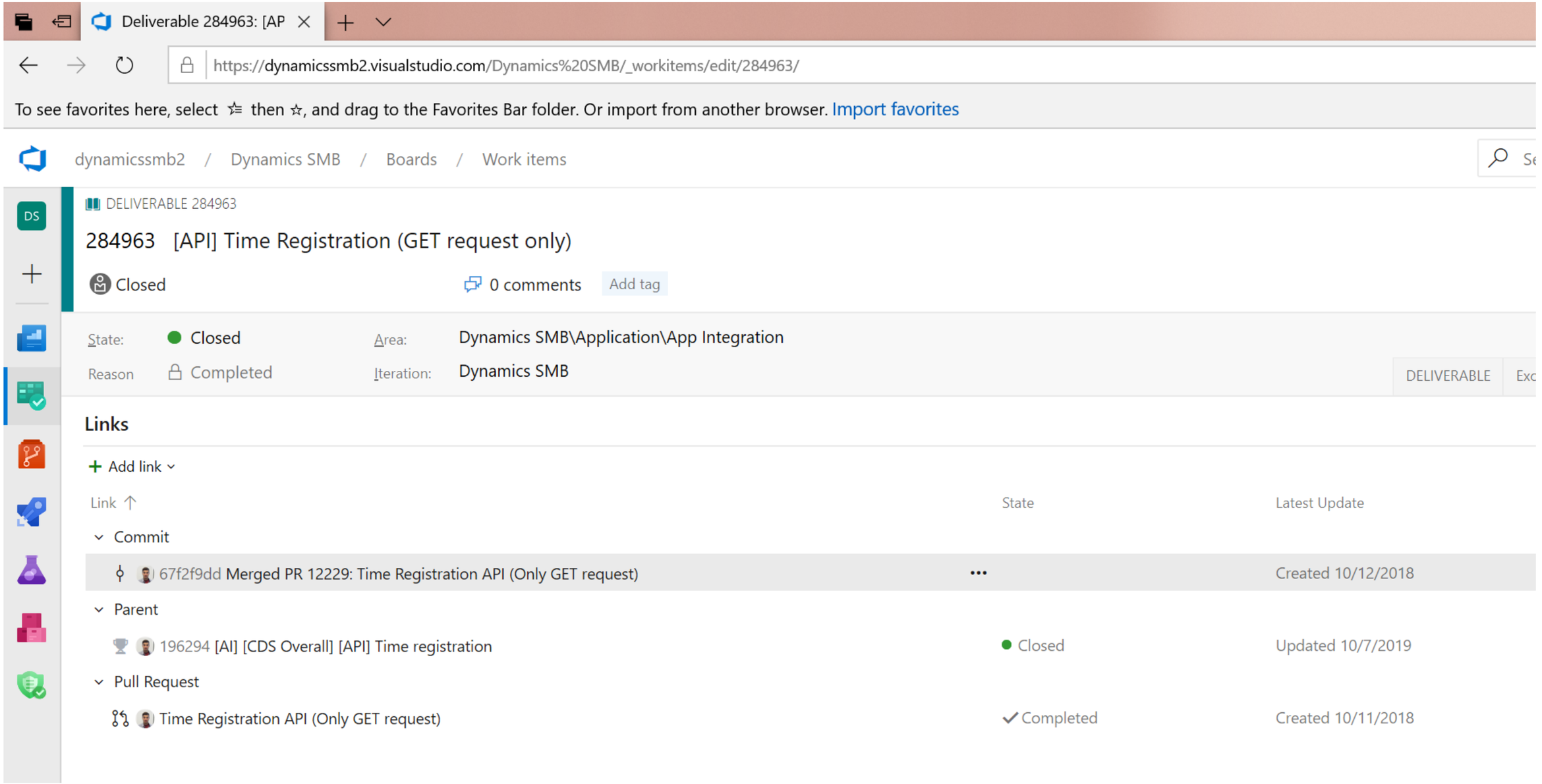
```
MyFeatureTag
 // ThreeLetterPrefix-Unique ID-Description-YYYYMMDD
'MS-317081-PurchInvoiceAddingMultipleAddresses-20190731'


 local procedure MyFeatureUpgrade()
 var
     UpgradeTag: Codeunit "Upgrade Tag";
     UpgradeTagDefinitions: Codeunit "Upgrade Tag Definitions";
 begin
     if UpgradeTag.HasUpgradeTag(UpgradeTagDefinitions.MyFeatureTag()) then
         exit;

     DoUpgradeMyFeature();

     UpgradeTag.SetUpgradeTag(UpgradeTagDefinitions.MyFeatureTag());
 end;
```

Unique ID – we use TFS IDs



Upgrade tags table

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```
/****** Script for SelectTopNRows command from SSMS  ******/
SELECT TOP (1000) [timestamp]
      ,[Tag]
      ,[Company]
      ,[Tag Timestamp]
      ,[Skipped Upgrade]
      ,[$systemId]
  FROM [Demo Database BC (15-0)].[dbo].[Upgrade Tags$63ca2fa4-4f03-4f2b-a480-172fef340d3f]
```

100 %

Results | Messages

	timestamp	Tag	Company	Tag Times
1	0x0000000000009207	284963-TIMEREGISTRATIONAPI-READONLY-20181010	CRONUS INTERNATIONAL LTD.	2019-09-0
2	0x0000000000009208	291121-JOBQUEUEENTRYMERGINGERRORMESSAGEFIELDS-20...	CRONUS INTERNATIONAL LTD.	2019-09-0
3	0x0000000000009204	315647-PROFILEREFERENCESDATABASE-20190814		2019-09-0
4	0x0000000000009222	315647-PROFILESREFERENCESCOMPANY-20190814	CRONUS INTERNATIONAL LTD.	2019-09-0
5	0x0000000000009221	319444-DEPRECATEURLFIELDSINCOMINGDOCS-20190724	CRONUS INTERNATIONAL LTD.	2019-09-0
6	0x0000000000009209	323517-NOTIFICATIONENTRYMERGINGERRORMESSAGEFIELDS...	CRONUS INTERNATIONAL LTD.	2019-09-0
7	0x0000000000009213	MS-267101-MOVECURRENCYISOCODE-20190209	CRONUS INTERNATIONAL LTD.	2019-09-0
8	0x0000000000009211	MS-275328-BALACCOUNTNOONJOURNALAPI-20180823	CRONUS INTERNATIONAL LTD.	2019-09-0
9	0x0000000000009210	MS-275427-DEFAULTDIMENSIONAPI-20180719	CRONUS INTERNATIONAL LTD.	2019-09-0
10	0x0000000000009212	MS-279686-ITEMCATEGORYONITEMAPI-20180903	CRONUS INTERNATIONAL LTD.	2019-09-0
11	0x0000000000009201	MS-281716-EXCELTEMPLATEWEBSERVICES-20180907		2019-09-0

Fixing upgrade gone wrong

Task - Split Name to First Name and Last Name

Update 13

No Upgrade
(Best Upgrade)

Update 14.1

```
if UpgradeTagMgt.HasUpgradeTag(SplitFirstNameLastNameWRONG) then
   exit;
DoWRONGFirstNameLastNameSplit;

UpgradeTagMgt.SetUpgradeTag(SplitFirstNameLastNameWRONG);
```

Update 14.5

```
if UpgradeTagMgt.HasUpgradeTag(SplitFirstNameLastNameCorrect) then
   exit;

if UpgradeTagMgt.HasUpgradeTag(SplitFirstNameLastNameWRONG) then
   FixWrongSplit
else
   DoCorrectFirstNameLastNameSplit;

 UpgradeTagMgt.SetUpgradeTag(SplitFirstNameLastNameCorrect);
```

Update 15

```
if UpgradeTagMgt.HasUpgradeTag(SplitFirstNameLastNameCorrect) then
   exit;

if UpgradeTagMgt.HasUpgradeTag(SplitFirstNameLastNameWRONG) then
   FixWrongSplit
else
   DoCorrectFirstNameLastNameSplit;

 UpgradeTagMgt.SetUpgradeTag(SplitFirstNameLastNameCorrect);
```

Upgrade tags Definition

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```
codeunit 50108 "ABC - Upgrade Tags"
{
    trigger OnRun()
    begin

    end;

    [EventSubscriber(ObjectType::Codeunit, Codeunit::"Upgrade Tag", 'OnGetPerCompanyUpgradeTags', '', false, false)]
    0 references
    local procedure RegisterUpgradeTags(var PerCompanyUpgradeTags: List of [Code[250]])
    begin
        PerCompanyUpgradeTags.Add(GetMoveBaseAppFieldsToExtensionTag());
        PerCompanyUpgradeTags.Add(GetIncreaseRewardPointsBy1000Tag());
    end;

    3 references
    procedure GetMoveBaseAppFieldsToExtensionTag(): Text
    begin
        exit('291121-MoveBaseAppFieldsToExtension-20191121');
    end;

    1 reference
    procedure GetIncreaseRewardPointsBy1000Tag(): Text
    begin
        exit('301332-IncreaseRewardPointsTo1000-20191201');
    end;
```

New companies
First time app installation
Need to register the existing tags

RegisterUpgradeTags – used to register on Company Initialization

SetAllUpgradeTags – register all tags on the system:

```
var
    UpgradeTag : Codeunit "Upgrade Tag";
begin
    UpgradeTag.SetAllUpgradeTags();
end;
```

Famous last words

It is safe

This code cannot fail

The proper question

What is the worst thing that can happen?

What is the worst that can happen?

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Hindenbugs

- **Hindenbug**: A catastrophic, data-destroying bug.

Definition - What does *Hindenbug* mean?

A Hindenbug is a catastrophic bug that destroys data, and may also shut down systems or cause other major problems with an IT system. It is a general IT slang word for a major bug that does more than just create a nuisance or an annoyance for users.

Oh, the humanity!

No Hindenbug's

1. Design for upgrade

Disaster Recovery plans in place and tested (Detection, backups…)
Are we able to upgrade? Review if the features are upgradable (blobs, large amount of data…)

2. Keep the upgrade code simple

Short upgrade codeunits, no hacks
5 min code review rule

3. Test the upgrade

Correct data is written
Ensure we do not run upgrade twice

Hindenbug example – Obsolete removed

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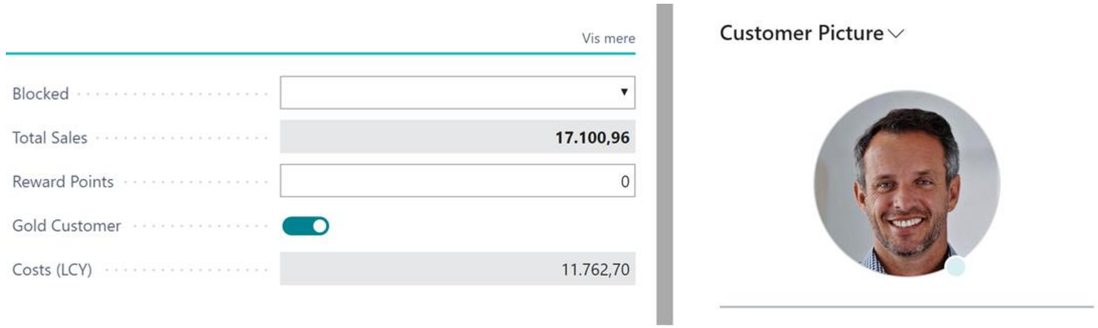
```
procedure UpgradeCustomerRewardPoints()
var
    Customer: Record Customer;
begin

    if not Customer.FindSet() then
        exit;

    repeat
        Customer."ABC - Gold Customer" := Customer."Gold Customer";
        Customer."ABC - Reward Points" := Customer."Reward Points";
        Customer.Modify();
    until Customer.Next() = 0;
end;
```

Obsolete removed fields – reward points 50.000



Customer has spent the points

We upgrade next version – he is back on 50.000 points

Not safe to run twice – example 2

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```
WITH Vendor DO BEGIN
  SETRANGE("IRS 1099 Code",'DIV-05','DIV-11');
  IF FINDSET(TRUE,FALSE) THEN
    REPEAT
      IF "IRS 1099 Code" IN ['DIV-11','DIV-10','DIV-09','DIV-08','DIV-06','DIV-05'] THEN BEGIN
        CASE "IRS 1099 Code" OF
          'DIV-11':
            "IRS 1099 Code" := 'DIV-12';
          'DIV-10':
            "IRS 1099 Code" := 'DIV-11';
          'DIV-09':
            "IRS 1099 Code" := 'DIV-10';
          'DIV-08':
            "IRS 1099 Code" := 'DIV-09';
          'DIV-06':
            "IRS 1099 Code" := 'DIV-07';
          'DIV-05':
            "IRS 1099 Code" := 'DIV-06';
        END;
        MODIFY;
      END;
    UNTIL NEXT = 0;
END;

WITH VendorLedgerEntry DO BEGIN
  SETRANGE("IRS 1099 Code",'DIV-05','DIV-11');
  IF FINDSET(TRUE,FALSE) THEN
    REPEAT
```

IRS 1099 upgrade code

Writing safe upgrade code

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```
local procedure MoveDataFromBaseAppToTableExtension()
var
    Customer: Record Customer;
    UpgradeTag: Codeunit "Upgrade Tag";
    ABCUpgradeTags: Codeunit "ABC - Upgrade Tags";
begin
    if (UpgradeTag.HasUpgradeTag(ABCUpgradeTags.GetMoveBaseAppFieldsToExtensionTag())) then
        exit;

    if not Customer.Findset() then
        exit;

    repeat
        if (Customer."ABC - Gold Customer") then
            Error('ABC - GOLD Customer has alredy be set');

        if (Customer."ABC - Reward Points" > 0) then
            Error('Reward points are aleady set');

        Customer."ABC - Gold Customer" := Customer."Gold Customer";
        Customer."ABC - Reward Points" := Customer."Reward Points";
        Customer.Modify();
    until Customer.Next() = 0;

    UpgradeTag.SetUpgradeTag(ABCUpgradeTags.GetMoveBaseAppFieldsToExtensionTag());
end;
```

1. Use upgrade tags
2. Add safety checks
3. Add tests
4. Register for new companies / fresh app installation

```
codeunit 50108 "ABC - Upgrade Tags"
{
    trigger OnRun()
    begin

    end;

    [EventSubscriber(ObjectType::Codeunit, Codeunit::"Upgrade Tag", 'OnGetPerCompanyUpgrad
    0 references
    local procedure RegisterUpgradeTags(var PerCompanyUpgradeTags: List of [Code[250]])
    begin
        PerCompanyUpgradeTags.Add(GetMoveBaseAppFieldsToExtensionTag());
        PerCompanyUpgradeTags.Add(GetIncreaseRewardPointsBy1000Tag());
    end;
```

Execution context API

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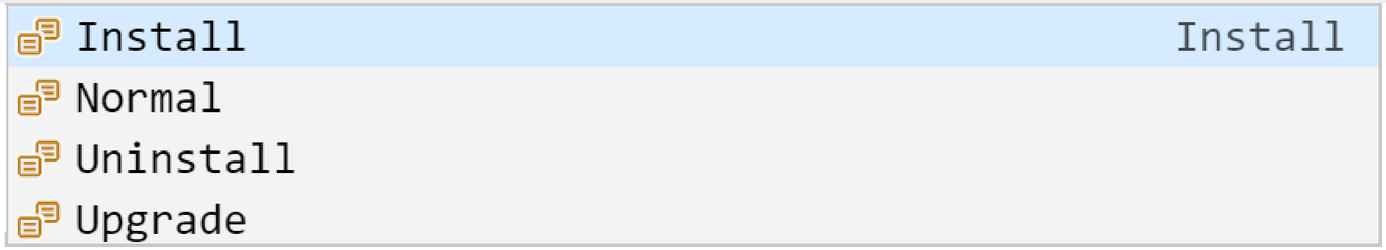
```
ExecutionContext::
```




```
// Get the general execution context of the current session
// What is happening in the system as a whole
Session.GetExecutionContext();

// Get the execution context of the current module
// What is happening with my extension
Session.GetCurrentModuleExecutionContext();

// Get the context of the specific module
// What is happening with a specific extension
Session.GetModuleExecutionContext(GUID);
```

Defending Sensitive code example

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```
[EventSubscriber(ObjectType::Codeunit, Codeunit::"Purch.-Post", 'OnAfterPurchInvHeaderInsert', '', false, false)]
0 references
local procedure PrintCheque(var PurchHeader: Record "Purchase Header"; var PurchInvHeader: Record "Purch. Inv. Header")
begin
    if Session.GetExecutionContext() <> ExecutionContext::Normal then
        if Session.GetCurrentModuleExecutionContext() <> ExecutionContext::Normal then
            Error('Should not be printing cheque')
        else begin
            Log('Printing cheque detected');
            exit;
        end;
    CallWebServiceToPrintCheque(PurchInvHeader);
end;
```

Upgrade journey – Step 3.

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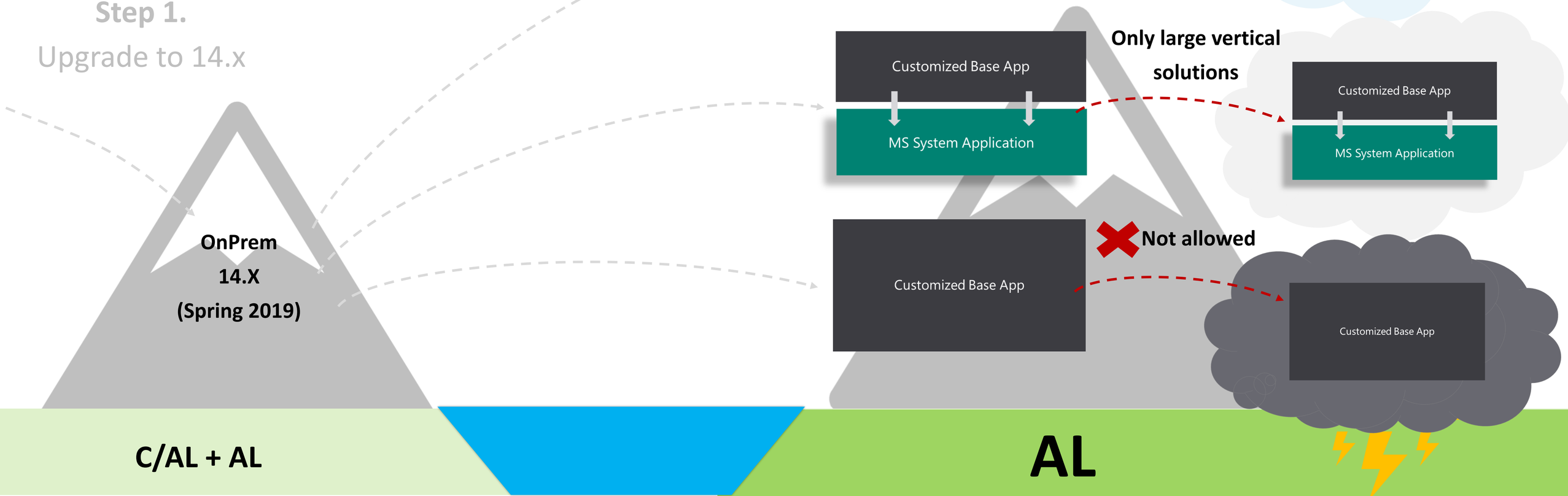
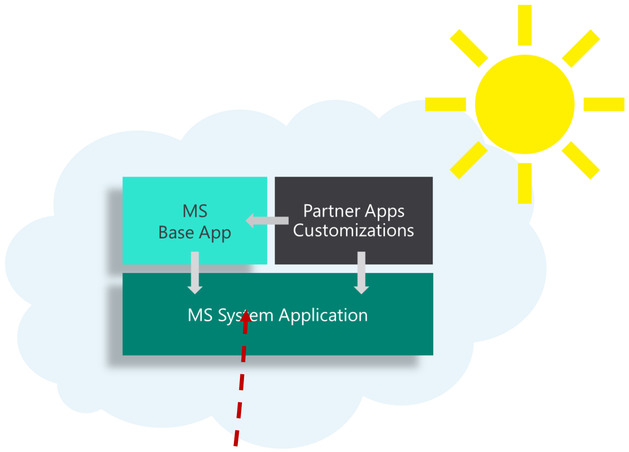
Step 3.
Uplift data to cloud

Step 2.
Upgrade to 15.x

Step 1.
Upgrade to 14.x

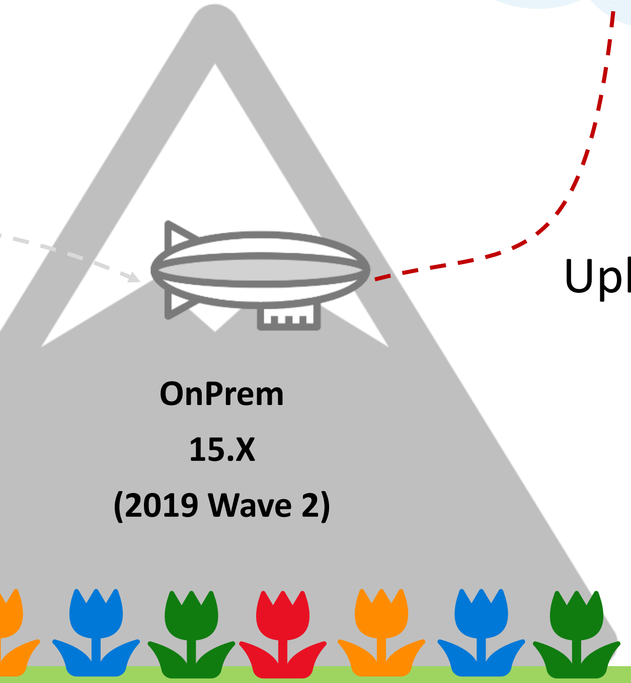


Upgrade journey: The cloud – Friday 22nd



Step 3.

Uplift data to cloud



AL

13:30 - 15:00

Migrate your customers to the cloud, and manage them there

LEVEL: 200 - INTERMEDIATE | SESSION | ROOM 8

How do you migrate your customers to the Business Central cloud?
How do you manage your customers when they are in the cloud?

In this session, we will go through the process of migrating a customized on-prem solution to the Business Central cloud. We will also cover how you manage your Business Central environments in the cloud, including upgrading, troubleshooting, etc.

Topics:

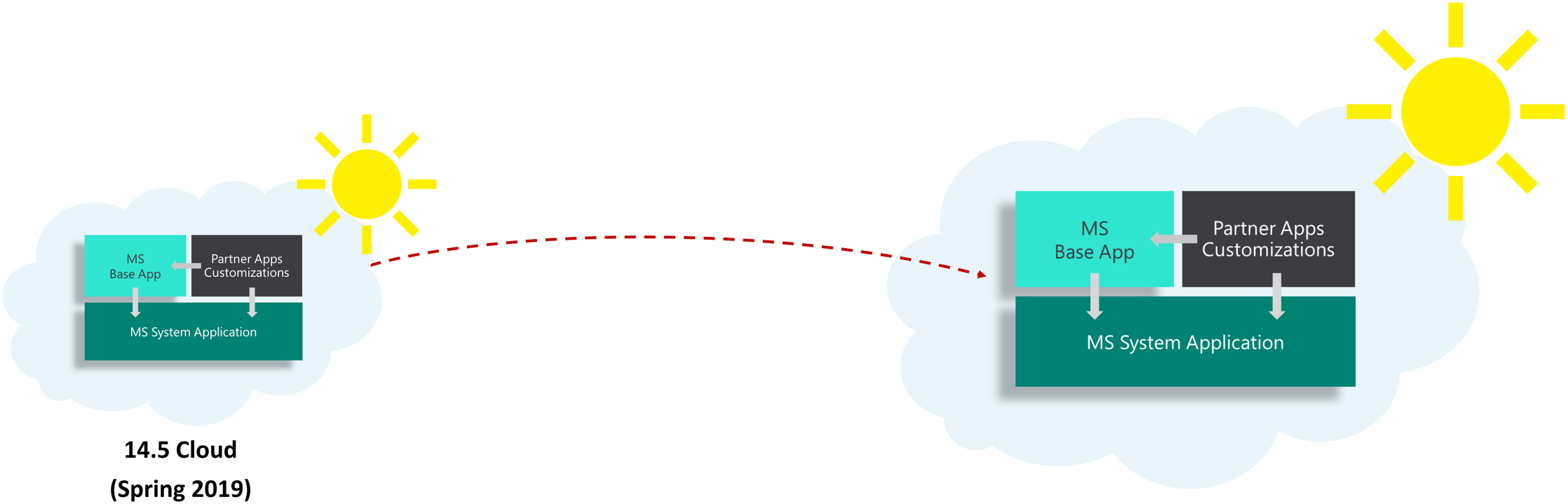
- Preparing the code for the cloud
- Migrating customer data to the cloud
- Troubleshooting and debugging
- Application Insights telemetry
- Managing upgrades
- Creating backups
- Managing multiple environments across countries

Heide Damm Christian (DK)
Microsoft Development Center Copenhagen

Ardaya Heckl Esteban (DK)
Microsoft Development Center Copenhagen

Sauber Roman (DK)
Microsoft Development Center Copenhagen

Have you forgotten?
What about SaaS to SaaS Upgrade?



14.5 Cloud

(Spring 2019)

15.0 Cloud

(2019 Wave 2)

Broken extension – What to do?

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1. If you had the CI/CD then you will already know. Otherwise we will call you

2. Fix the issue

   + Set the application / platform dependencies

4. Publish new extension to app store

(Upload if it is PTE – Per tenant Extension)

Once we update the tenant to specified application/platform version we will upgrade the app automatically

app.json

```
{
    "id": "126dbf0e-84ff-417a-965d-ed2bb9650861",
    "name": "My Application",
    "publisher": "Microsoft",
    "version": "16.0.0.0",
    "dependencies": [
                        {
                            "appId": "63ca2fa4-4f03-4f2b-a480-172fef340d3f",
                            "name": "System Application",
                            "publisher": "Microsoft",
                            "version": "16.0.0.0"
                        }
                    ],
    "platform": "15.0.0.0",
    "target": "Cloud",
    "showMyCode": true
}
```

Getting the docker builds

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https://blogs.msdn.microsoft.com/freddyk/2018/04/16/which-docker-image-is-the-right-for-you/

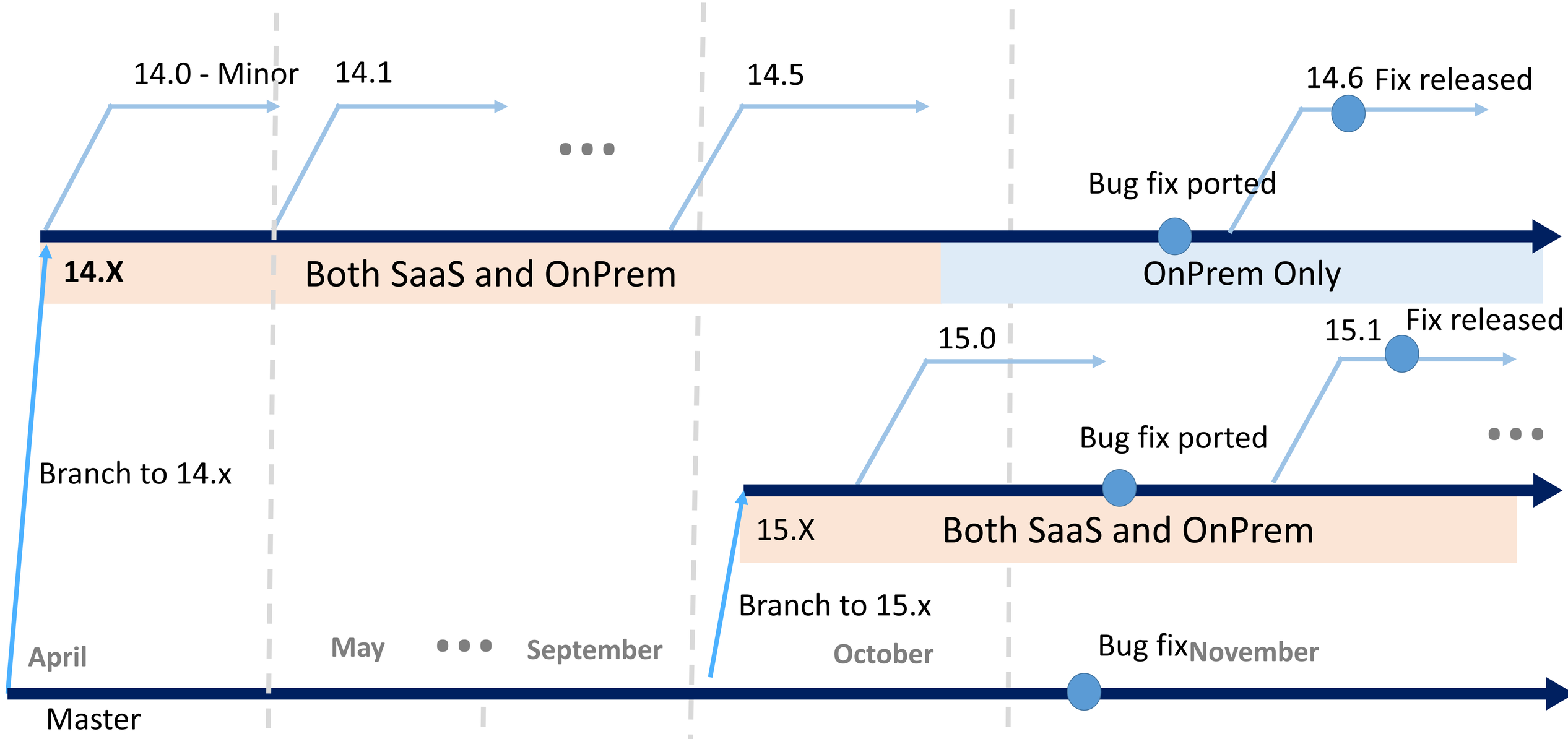
Maintaining an app in AppSource for Dynamics 365 Business Central

If you have published an app in AppSource, you should continuously test that the app works with the next version of Dynamics 365 Business Central. You will be able to get insider builds of Business Central from a private registry called bcinsider.azurecr.io and the credentials for this private registry is available through Microsoft Collaborate.

The insider builds are normally updated daily and the Dynamics 365 Business Central servers are updated monthly to this version. When the Dynamics 365 Business Central servers are updated, the image will also be deployed on the public docker hub under microsoft/bcsandbox (see previous section).

The image name follows the same tagging strategy as the public Dynamics 365 Business Central images:

Compatible Builds – version numbers



Always upgrade to Latest Compatible CU

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Contains the latest bug fixes and ported features
15.1 contains a number of fixes in upgrade

Do not attempt upgrade to a version released before:
Do not try upgrading **14.6** released in **November** to **15.0** released in **October**

You risk undoing bug fixes / ported features

CU Article will contain the minimum supported target upgrade build

Thank you!

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The BIG Deck

https://aka.ms/BCUpgradeDeck

Please join, review, provide feedback if something is unclear or incorrect and ask questions.

We will upgrade the upgrade deck based on your feedback.

Summary

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Refactor away breaking SQL changes before moving to AL

Functionality to move fields automatically is currently being developed
We are looking into renumbering and renaming tables and fields
(no promises if and when it will be done)

Write safe upgrade code (No Hindenbugs)

Use Docker to extract extensions

Use Docker to test the upgrade process (setup CI/CD)

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Q&A

Any Questions?

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Thank You!