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Development Methodologies for the future

Eric Wauters

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





Visual Studio | Marketplace

Visual Studio

Visual Studio Code

Azure DevOps

Subscriptions

waldo



2 Results



waldo's CRS AL Langu

waldo

33.1K

Make working with the
(Dynamics NAV / 365) AL
Language easier and more...



FREE



AL Extension Pack

waldo

4.5K

Everything you need for AL
development (Microsoft
Dynamics 365 Business...



FREE

Development Methodologies for The future

The future

Symbols UserControl Web Client API Event Recorder
FileNameConventions SaaS - OnPrem Dependencies
NAVContainerHelper AL DotNet In-Client Designer
Extensions Profiles Label Syntax Don'tNet Views
PerTenantExtensions XLIFF Code Analysis
Migration DevOps Git VSCoDe Page Inspector
Profiles Page Customization Publish Testability
Sandbox Apps Install Table Extensions AI Upgrade
Page Extensions Wrappers JSON Events
Manifest ControlAddin Builds Sync
Personalization CodeCops Docker

Development Methodologies

A matter of applying simple rules...

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Don'tNet

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Embracing Dependencies

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Strict guidelines

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Extendable patterns

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Avoid breaking changes

When it's hard in al, it doesn't belong in al

Development Methodologies

A matter of applying simple rules...

Don'tNet
Embracing Dependencies
Strict guidelines
No Test, no approval
Extendable patterns
Avoid breaking changes
When it's hard in al, it doesn't belong in al
...

Embracing Dependencies when moving to AL

moving to AL

Migrate to
Code Customized AL

Migrate to a
Monolith extension

Rebuild monolith
from scratch

Rebuild a set of apps
with Dependencies

moving to AL

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moving to AL

Migrate to
Containerized AL

Migrate to a
Monolith extension

ch

Rebuild a set of apps
with Dependencies



Dependencies

Dependencies – Why?

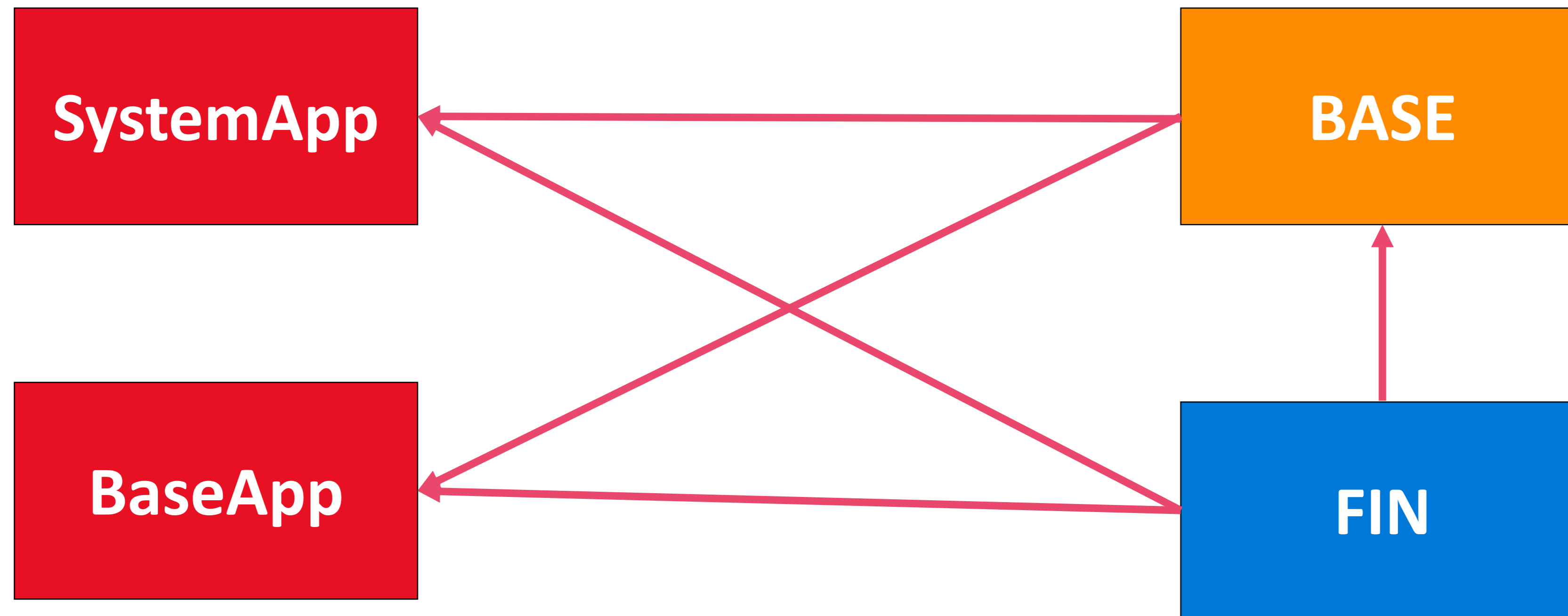
- An extension can depend on another extension
- Help structure more complex deployment scenarios
- Boost code and business logic reusability
- Increase maintenance flexibility
- Sell independently
- Frameworking
- Secure parts of the product
- Force modules design
- ...

Dependencies – How?

- Dependency is declared in the manifest file (app.json)
- Dependency declaration must include
 - Guid (app id)
 - Name
 - Publisher
 - Version

```
"dependencies": [  
  {  
    "appId": "e6be63d0-1892-4ee9-ba45-9d76f28fabf3",  
    "name": "MyBaseApp",  
    "publisher": "Default Publisher",  
    "version": "1.0.0.0"  
  }  
],
```

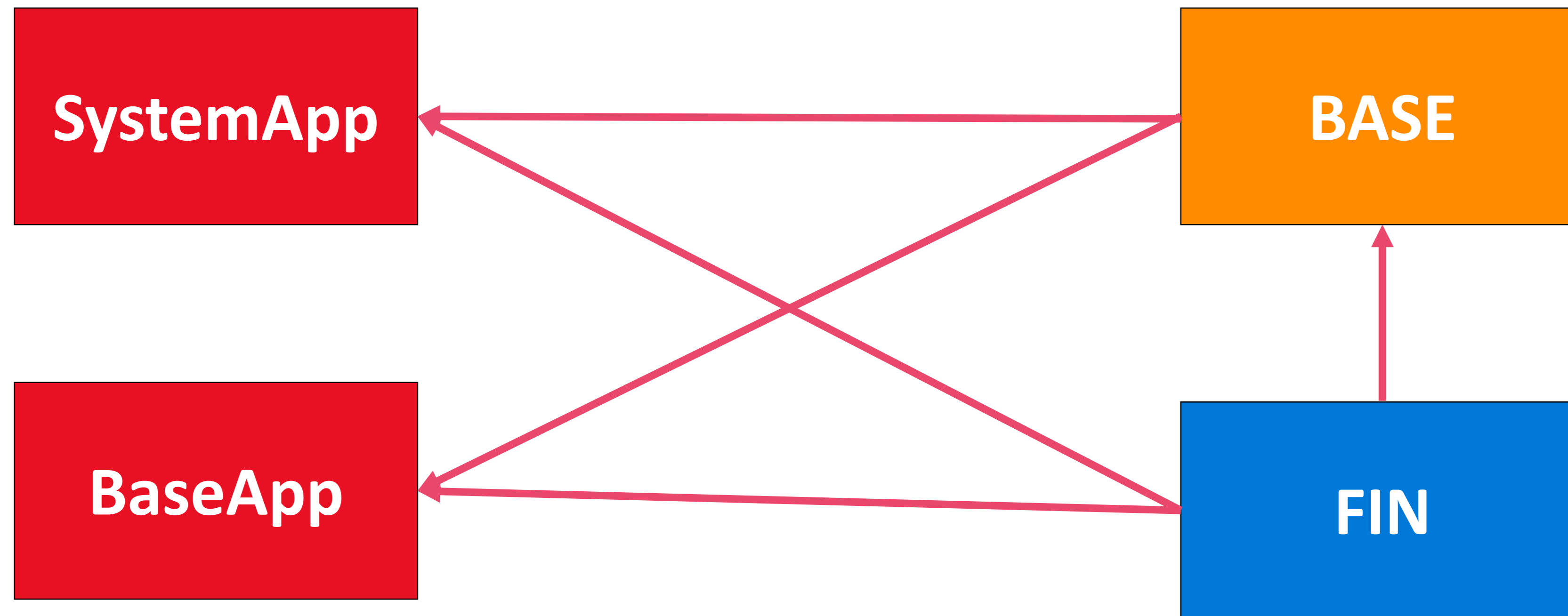
Dependencies



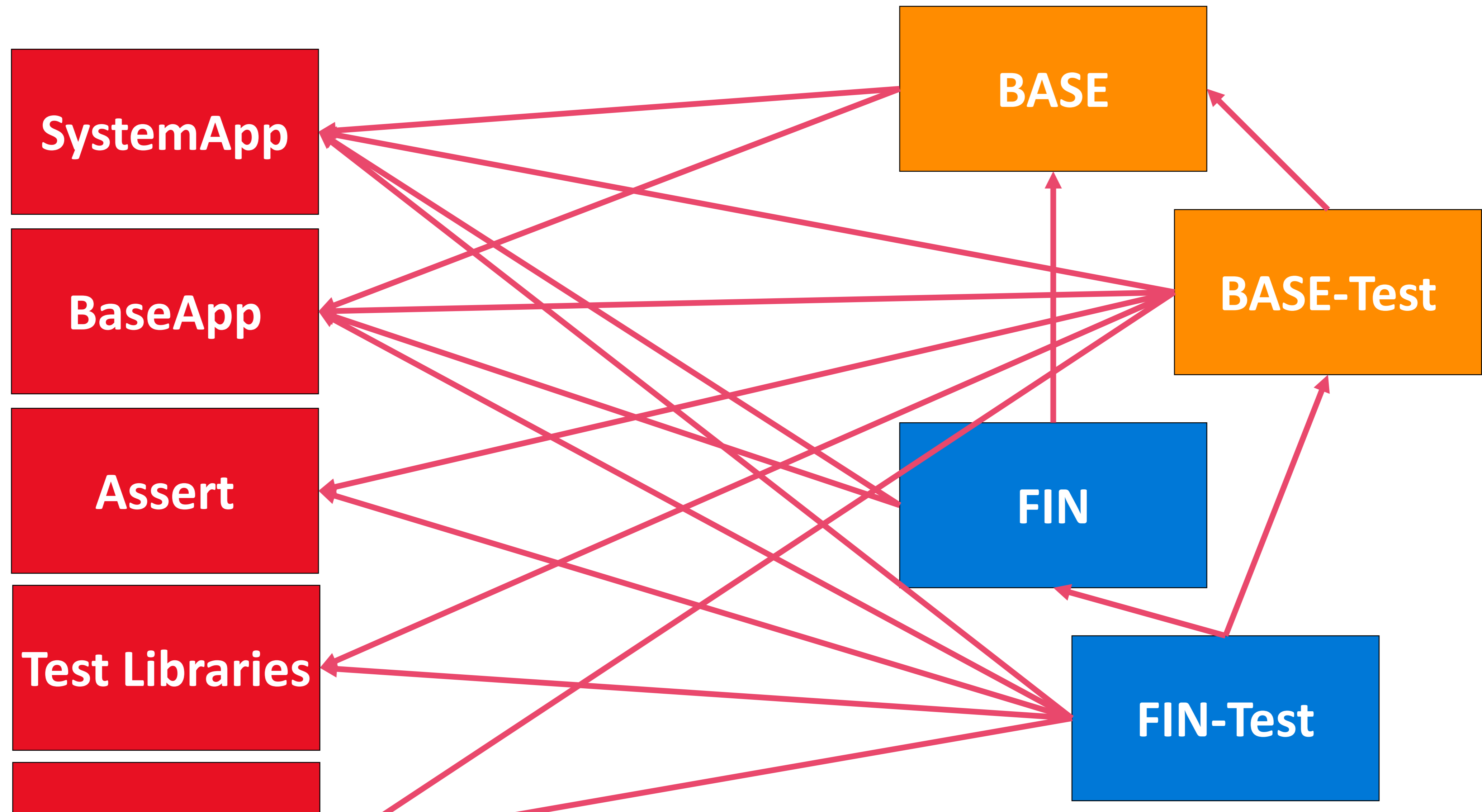
Let's look at an example...

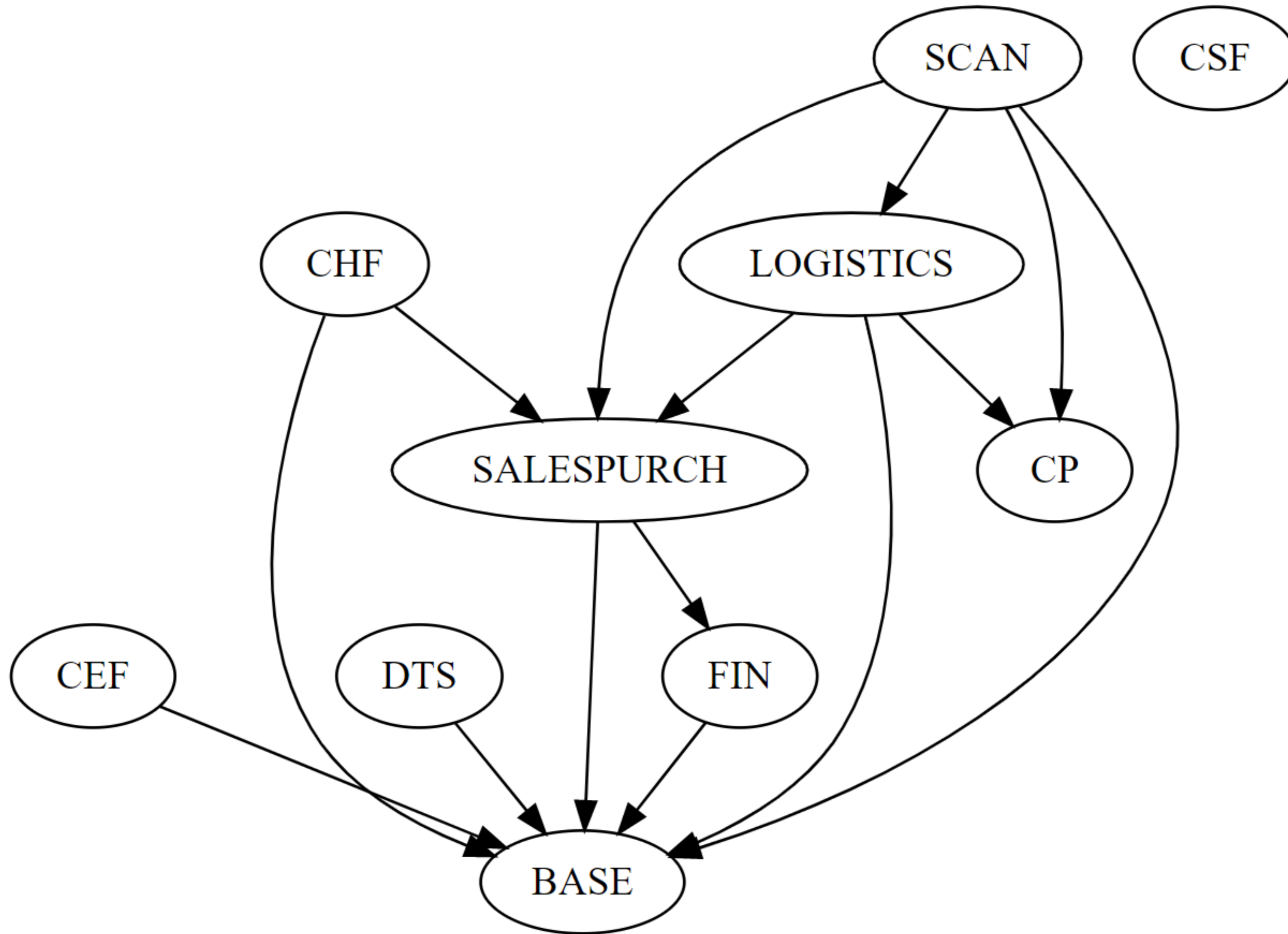


Dependencies



Dependencies



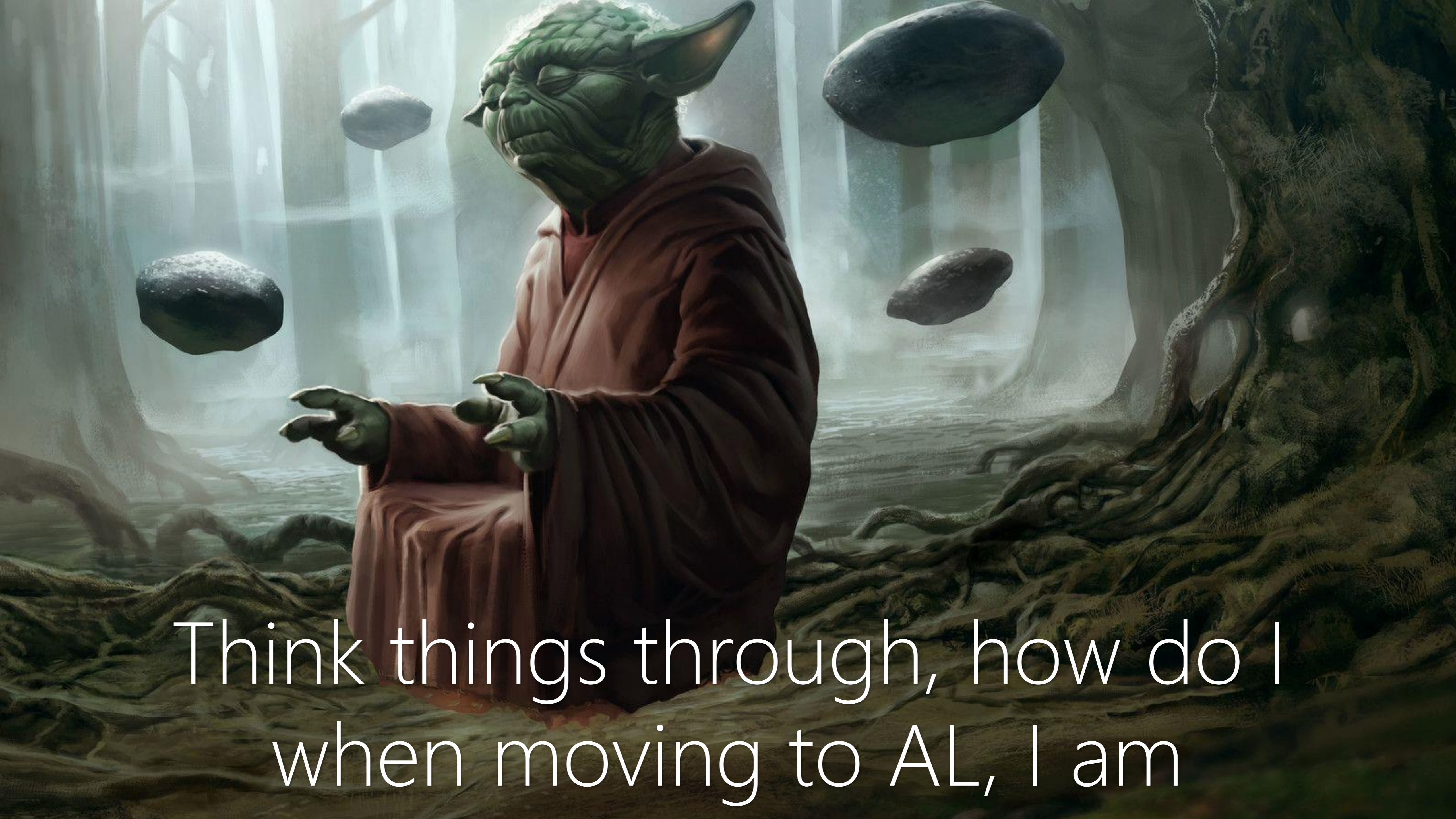


Please think things through ...

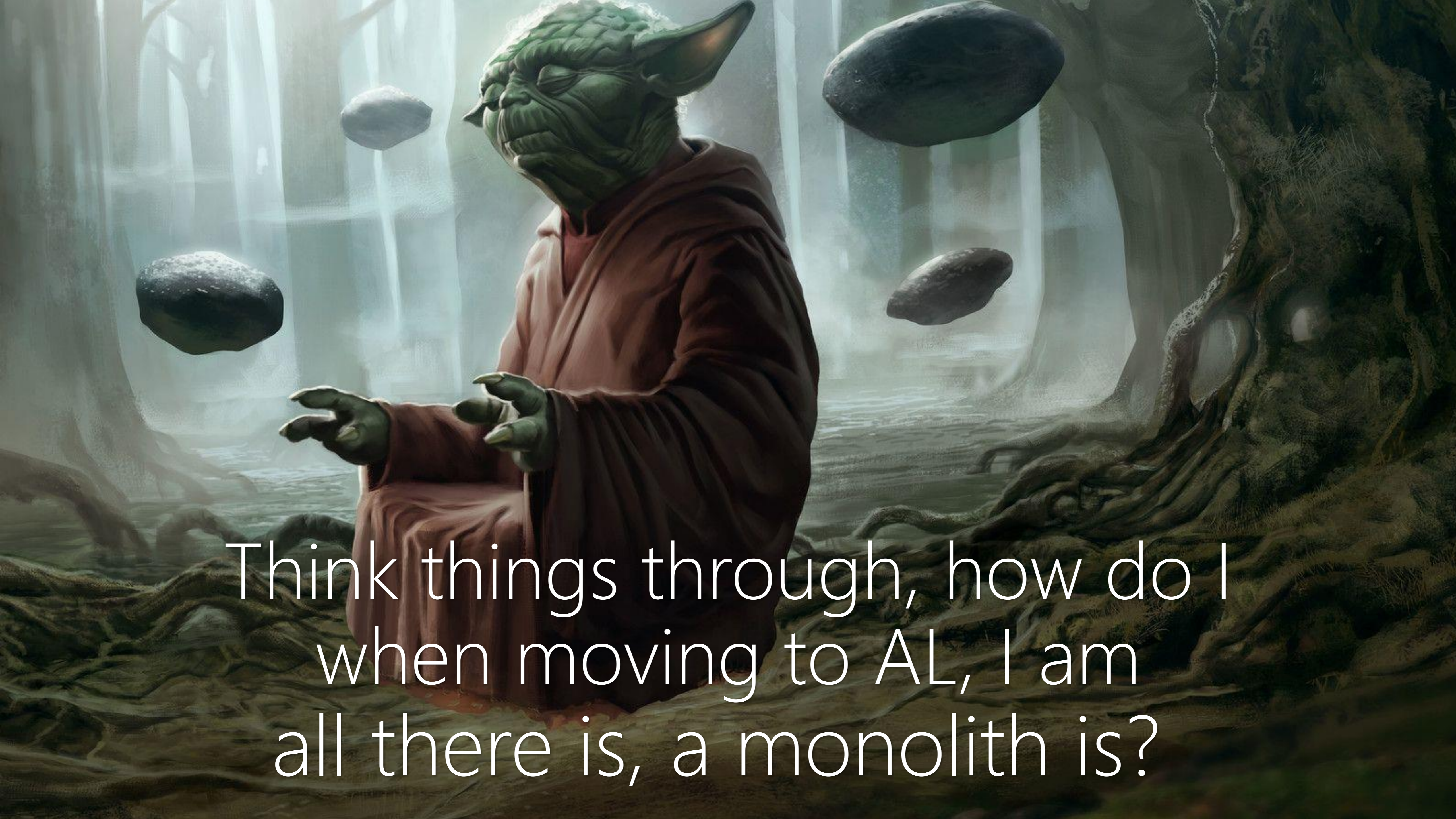




Think things through, how do I



Think things through, how do I
when moving to AL, I am



Think things through, how do I
when moving to AL, I am
all there is, a monolith is?

Dependency Analysis

c/al



Dependency Analysis based on c/al

Before we start coding, we should know which apps we end up with

- **Startpoint:** one big codebase (txt-file)
- **Endpoint:** a collection of apps which work together
- **Automated:**
To not leave anything behind
Because the product is too big for your memory
- **Tools:**
waldo.Model.Tools
PowerShell Scripts to analyze code
Business Central as database & business logic

waldo.Model.Tools

A tool to perform **source code analysis** on C/AL

Based on **Microsoft.Dynamics.Nav.Model.Tools**, which:
is used by the PowerShell Merge Tools (modeltools)
builds an object model from a txt file
does not include the actual code

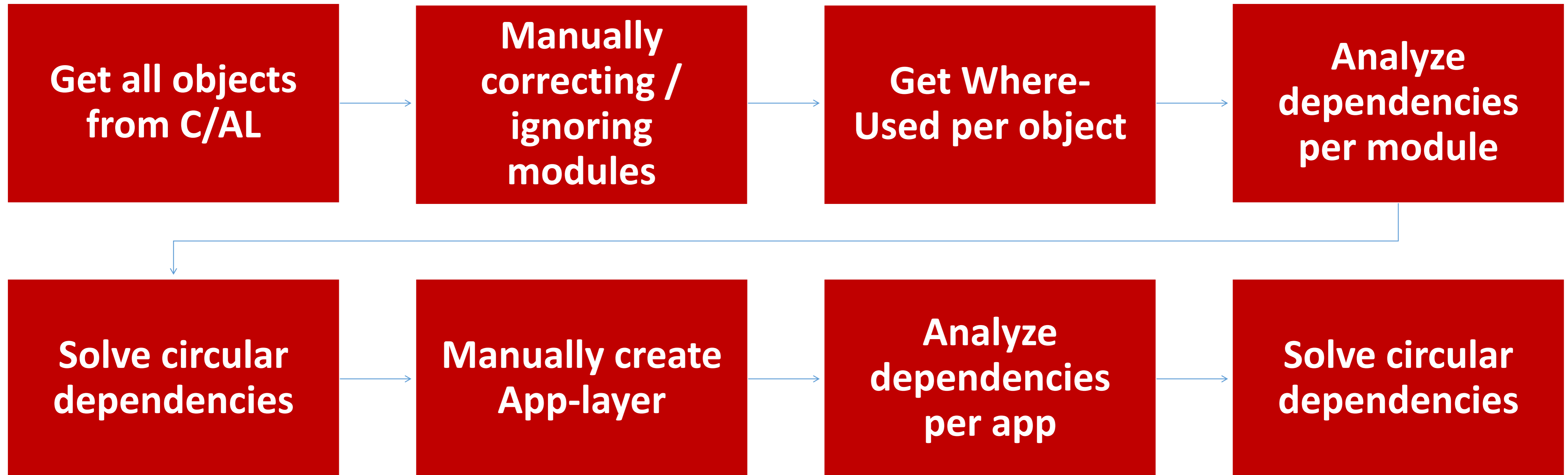
Available in **PowerShell**

→ scripts to **automate Source Code Analysis**

<https://github.com/waldo1001/Waldo.Model.Tools>

Some examples...

Flow



Get all objects from C/AL & tag all objects with a "module"

Get all objects
from C/AL

- Goal:
 - define an **intent** for each object
 - Intent = module
 - Save it to a database
 - So we can manually edit it to refine the new product architecture
- Tag automatically

```
3 references
Procedure GetModuleName(ObjectId: Integer; ObjectName: Text; ModuleName: Text): Text;
begin
    if (ObjectId < 2000000) or (ObjectId > 99000000) then
        exit('_BASEAPP');

    if ObjectName.ToLower().Contains(' hook') then
        exit('_HOOK');

    if ObjectName.ToLower().Contains(' functions') then
        exit('_FUNCLIB');

    if ((ModuleName <> ModuleName.ToUpper()) or (strlen(ModuleName) > 10)) then
        ModuleName := '_UNKNOWN';

    exit(ModuleName);
end;
```

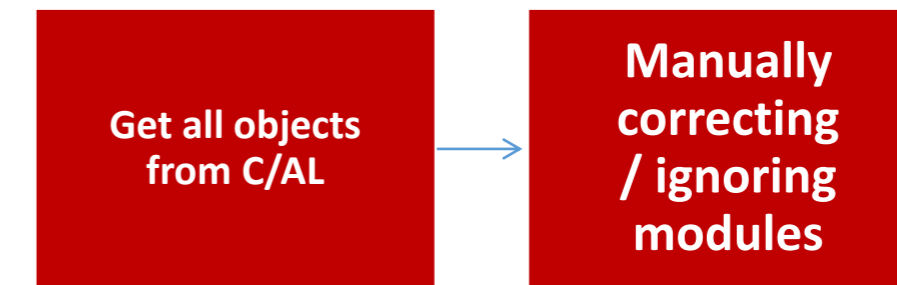
Get all object objects with

- Goal:
 - define an ir
 - Intent = mo
 - Save it to a
 - So we can i
- Tag automat

TABLE	7312	Warehouse Entry	_BASEAPP
TABLE	7316	Warehouse Receipt Header	_BASEAPP
TABLE	2036886	NTT Number Translation	NTT
TABLE	2036904	CSF Setup	CSF
TABLE	2036905	CSF Table	CSF
TABLE	2036906	CSF Table To	CSF
TABLE	2036907	CSF Fields Template	CSF
TABLE	2036908	CSF Fields Template Line	CSF
TABLE	2036909	CSF Queue	CSF
TABLE	2036910	CSF Queue KeyFields	CSF
TABLE	2036911	CSF Mapping	CSF
TABLE	2036912	CSF Mapping Line	CSF
TABLE	2036913	CSF Table Filter	CSF
TABLE	2036936	CHF Complaint Header	CHF
TABLE	2036937	CHF Complaint Line	CHF
TABLE	2036938	CHF Complaint Action	CHF
TABLE	2036939	CHF Complaint Category	CHF
TABLE	2036940	CHF Complaint Sub Category	CHF
TABLE	2037220	NF Batch Document Setup	NF
TABLE	2037221	NF Batch Doc. Output Master Q.	NF
TABLE	2037222	NF Batch Doc. Output Queue	NF
TABLE	2037223	NF Batch Doc. Archive Setup	NF
TABLE	2037236	PERF Profiler Events	PERF
TABLE	2037237	PERF Profiler Archive	PERF
TABLE	2037238	PERF Session Archived	PERF

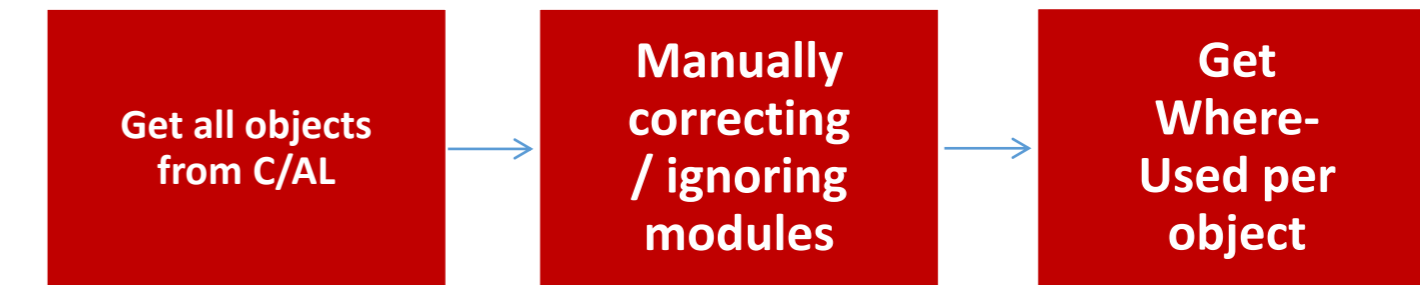
ture

Manually correcting/ignoring modules



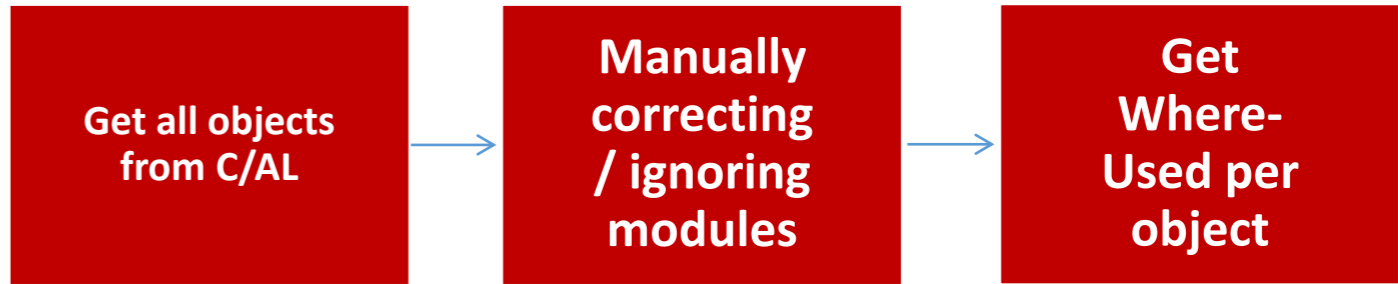
- Goal:
 - Every single object needs to be categorized in a module
- Why?
 - Unknown Objects
 - Refactoring is necessary
 - Some modules might have become **useless**
- How?
 - Ignore useless modules
 - Create new modules when necessary

Get Where-Used per object



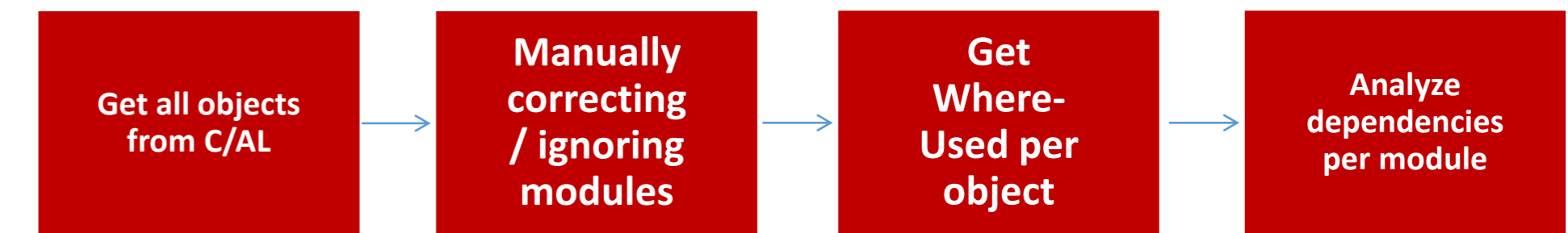
- Goal?
 - Find the **dependencies** between modules
- How?
 - Use “**Where-Used**” links from Model.Tools
 - Save in database so it can be analysed (and edited)

Get Where-Used per object



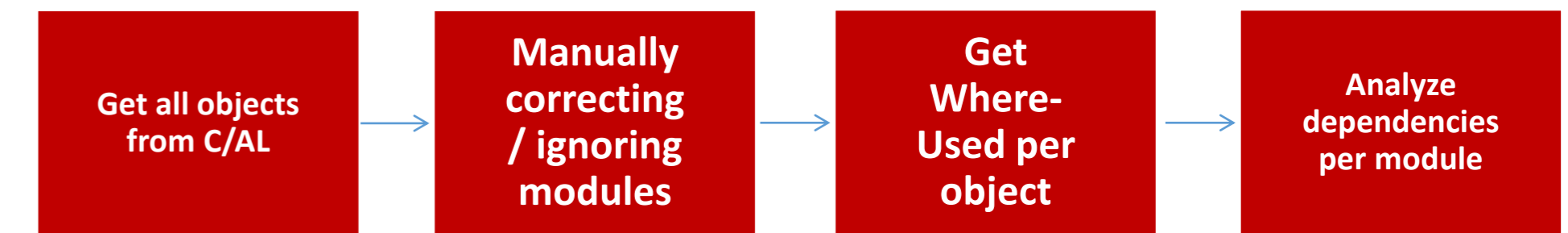
SOURCE OBJECT TYPE		SOURCE OBJECT ID	SOURCE MODULE	SOURCE ELEMENT	TARGET OBJECT TYPE ▼	TARGET OBJECT ID ▼	TARGET MODULE	TARGET ELEMENT
TABLE		2036779	HIS	Table<HIS Purchase Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		38	_NAV	Table<Purchase Header>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		37	_NAV	Table<Sales Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		38	_NAV	Table<Purchase Header>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036779	HIS	Table<HIS Purchase Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036776	HIS	Table<HIS Sales Header>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036777	HIS	Table<HIS Sales Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036778	HIS	Table<HIS Purchase Header>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036777	HIS	Table<HIS Sales Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		36	_NAV	Table<Sales Header>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036777	HIS	Table<HIS Sales Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		36	_NAV	Table<Sales Header>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036779	HIS	Table<HIS Purchase Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
CODEUNIT		2036779	HIS	Codeunit<HIS Search Document...	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036777	HIS	Table<HIS Sales Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE	⋮	39	_NAV	Table<Purchase Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036779	HIS	Table<HIS Purchase Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036777	HIS	Table<HIS Sales Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036779	HIS	Table<HIS Purchase Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036777	HIS	Table<HIS Sales Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
CODEUNIT		2036847	OP	Codeunit<OP Open Page Iface>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
TABLE		2036779	HIS	Table<HIS Purchase Line>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...
CODEUNIT		2036847	OP	Codeunit<OP Open Page Iface>	CODEUNIT	2036778	HIS	Codeunit<HIS Search Documen...

Analyze dependencies per module

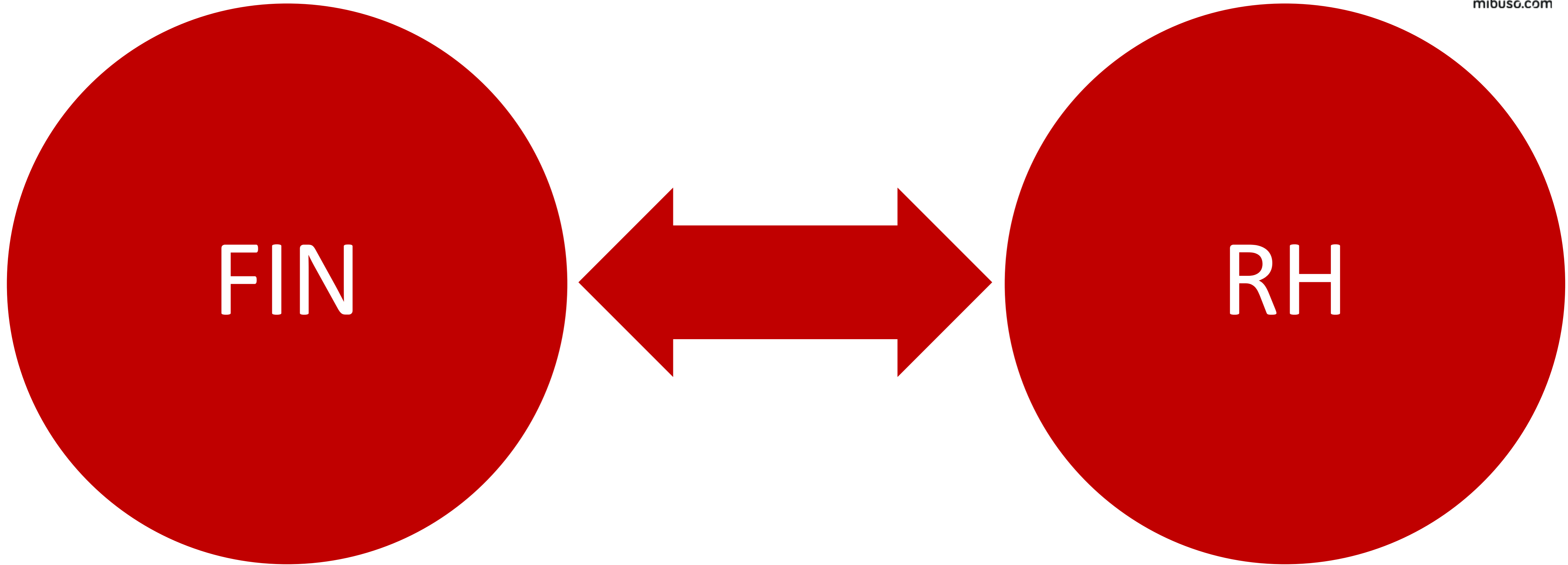


- Goal: Find “circular dependency”
- Graphical with [Webgraphviz](#)

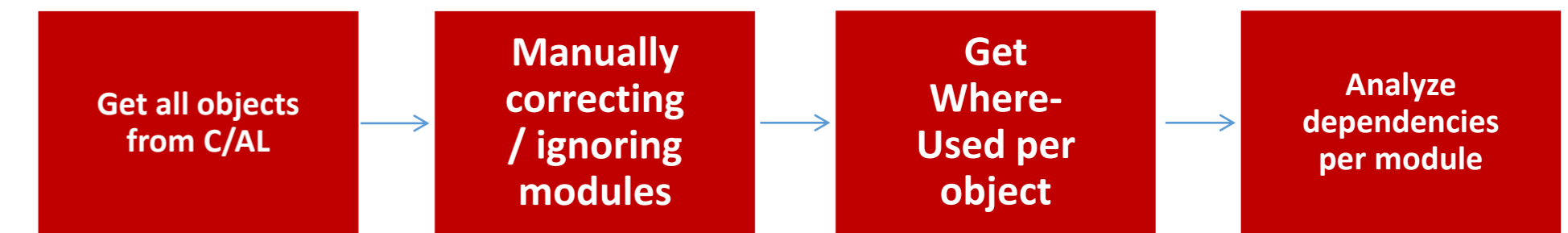
What is a circular dependency?



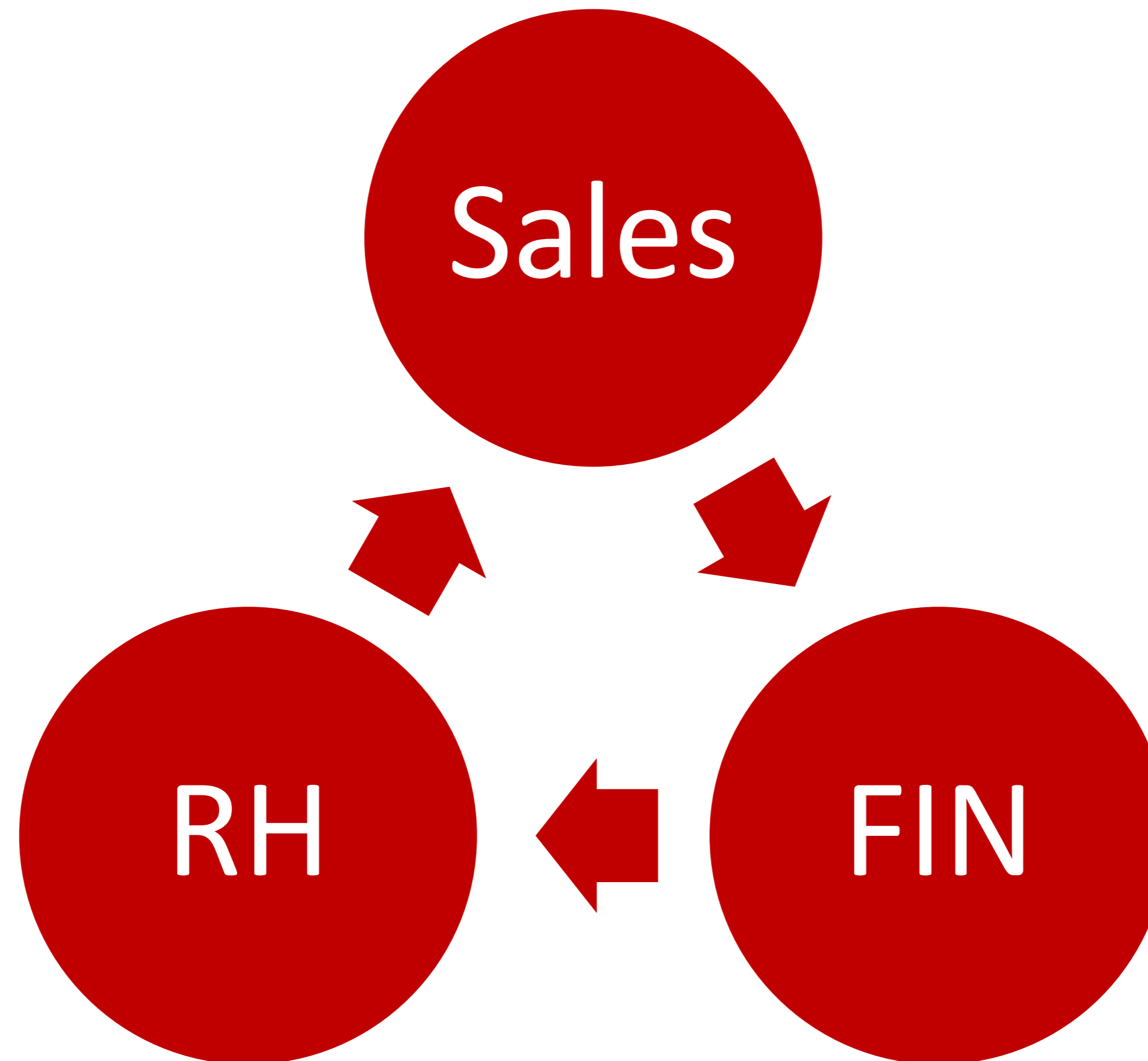
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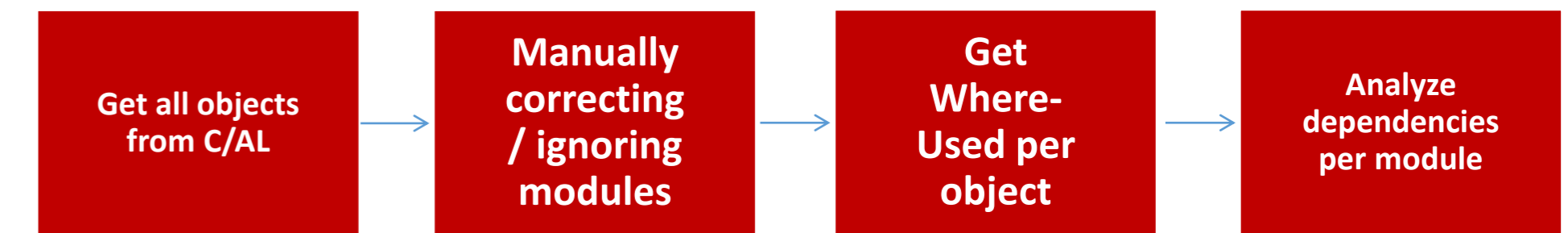
What is a circular dependency?



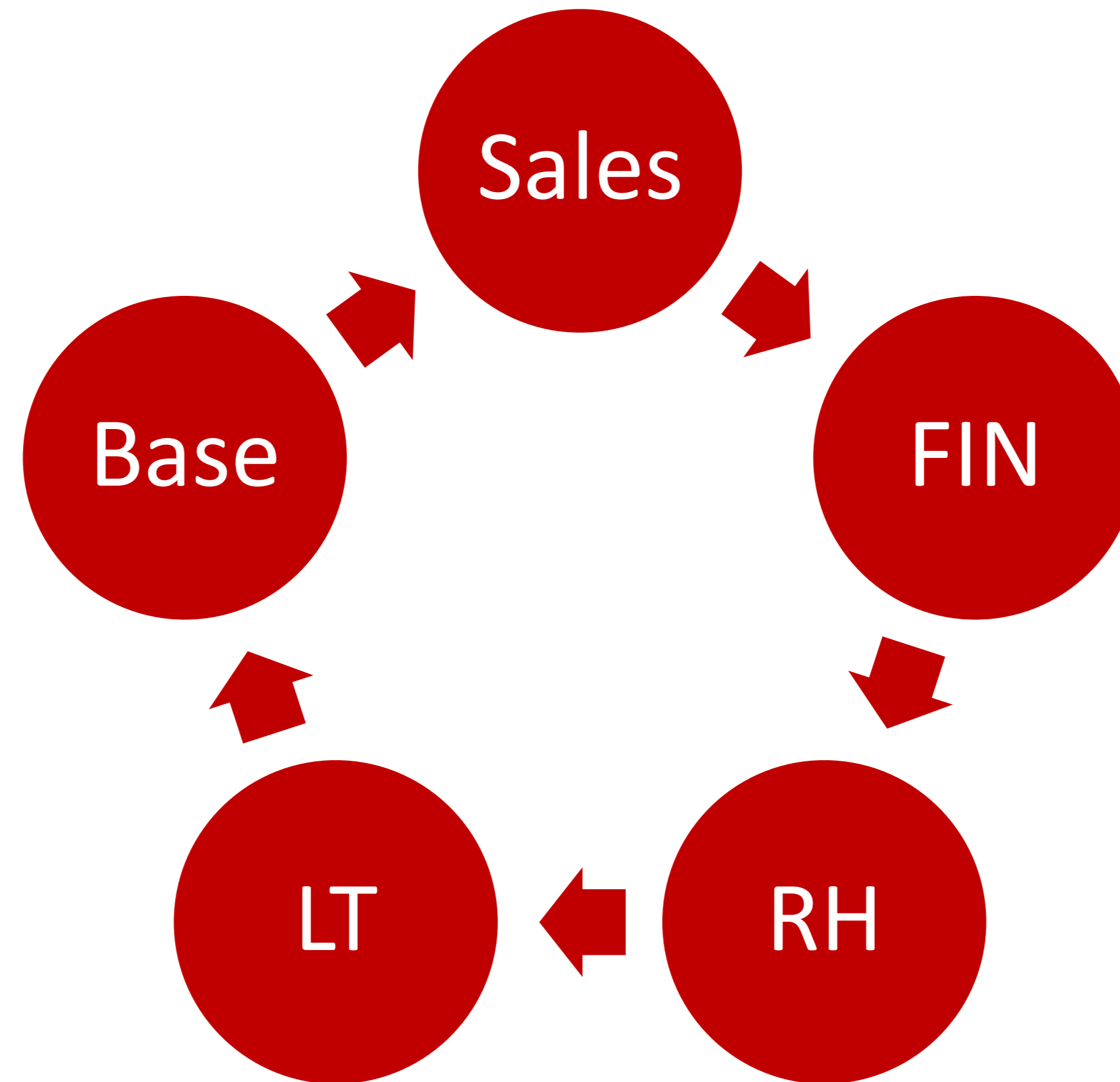
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What is a circular dependency?

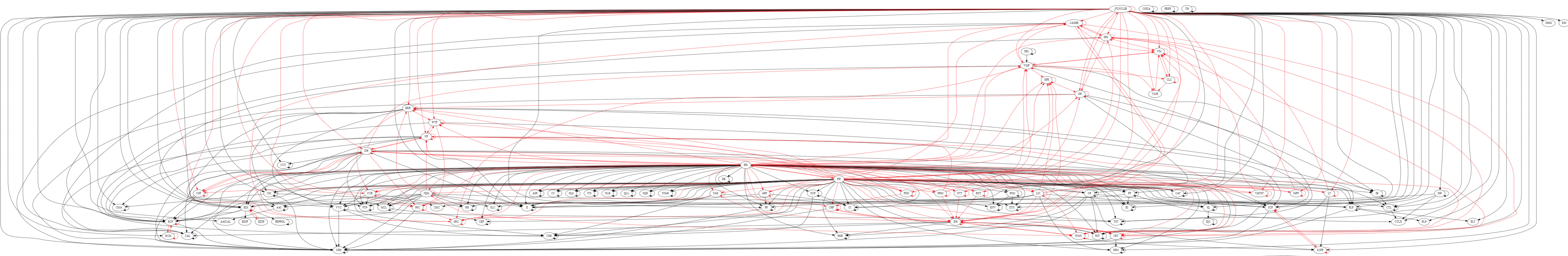


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Get all objects
from C/AL

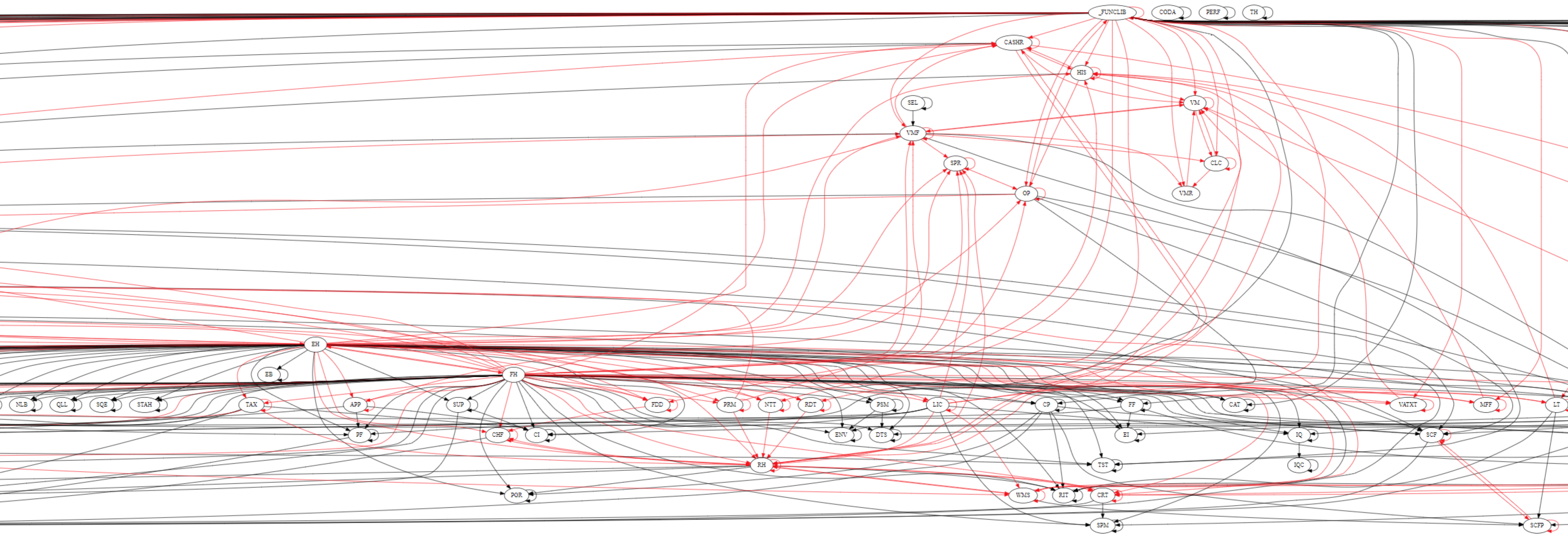
Manually
correcting
/ ignoring
modules

Get
Where-
Used per
object

Analyze
dependencies
per module

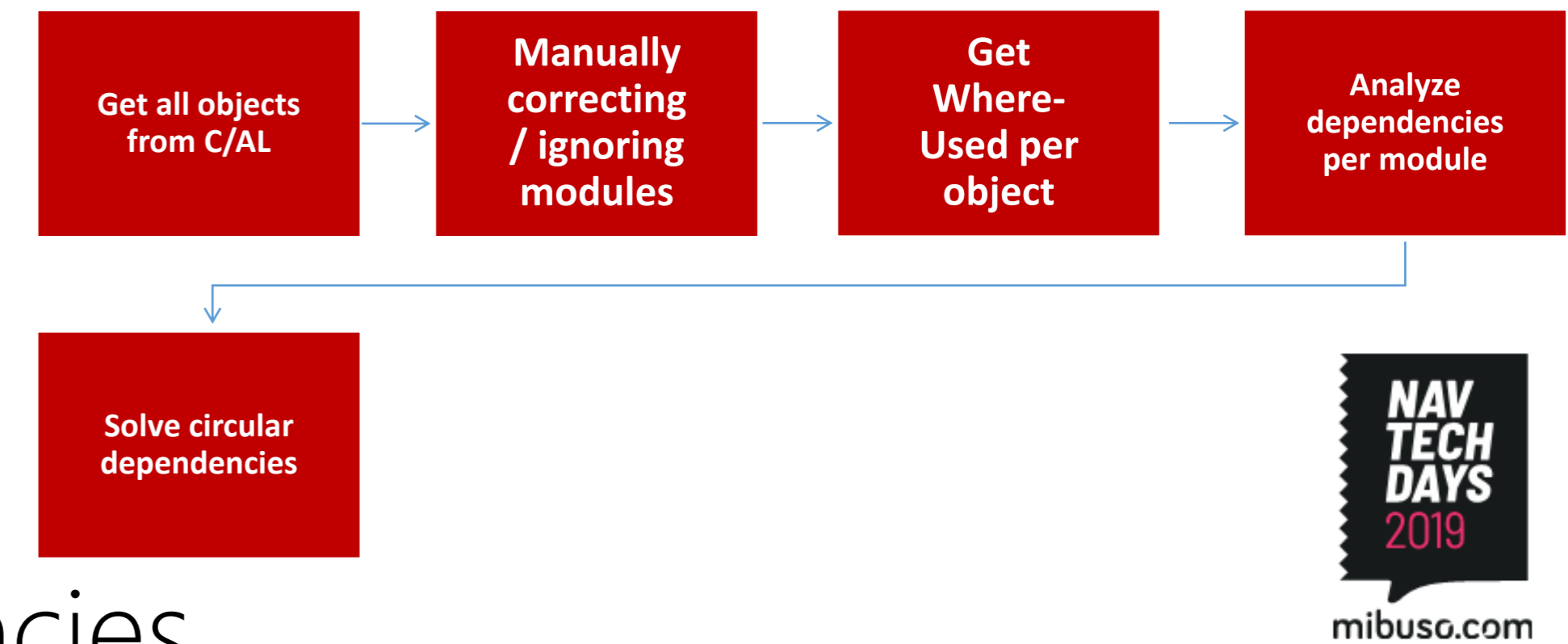


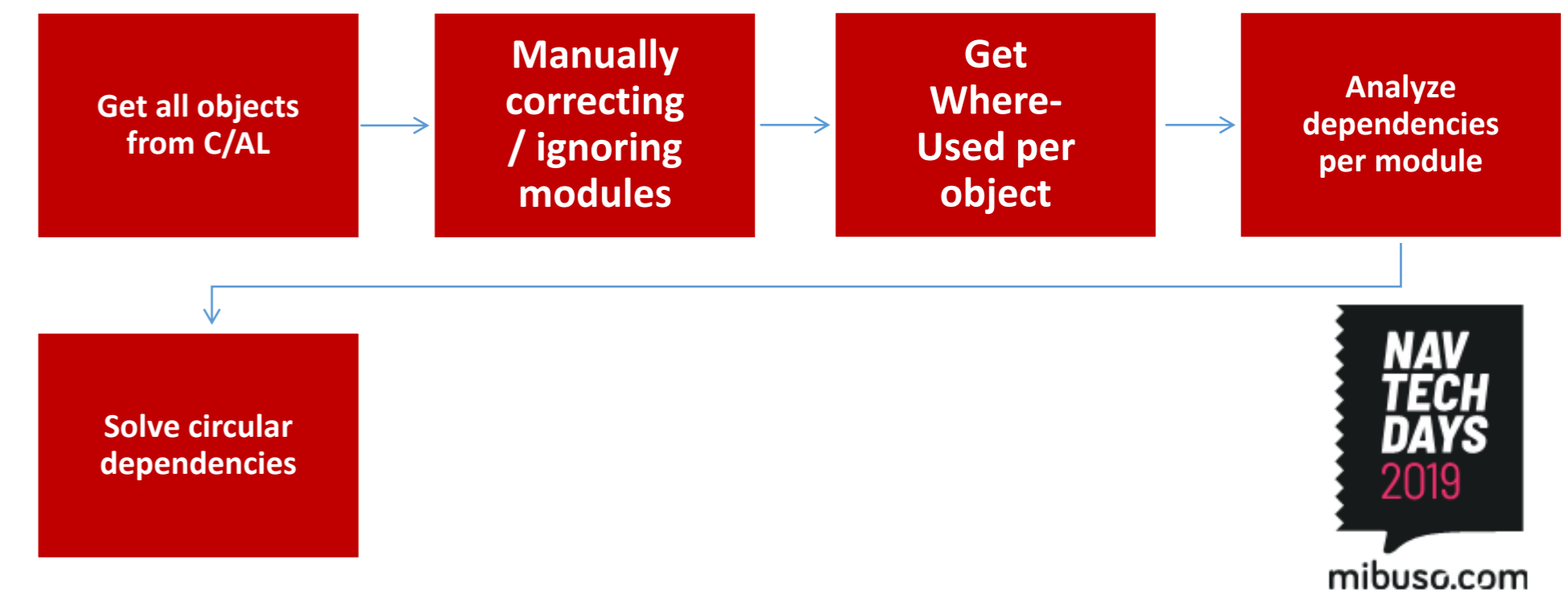
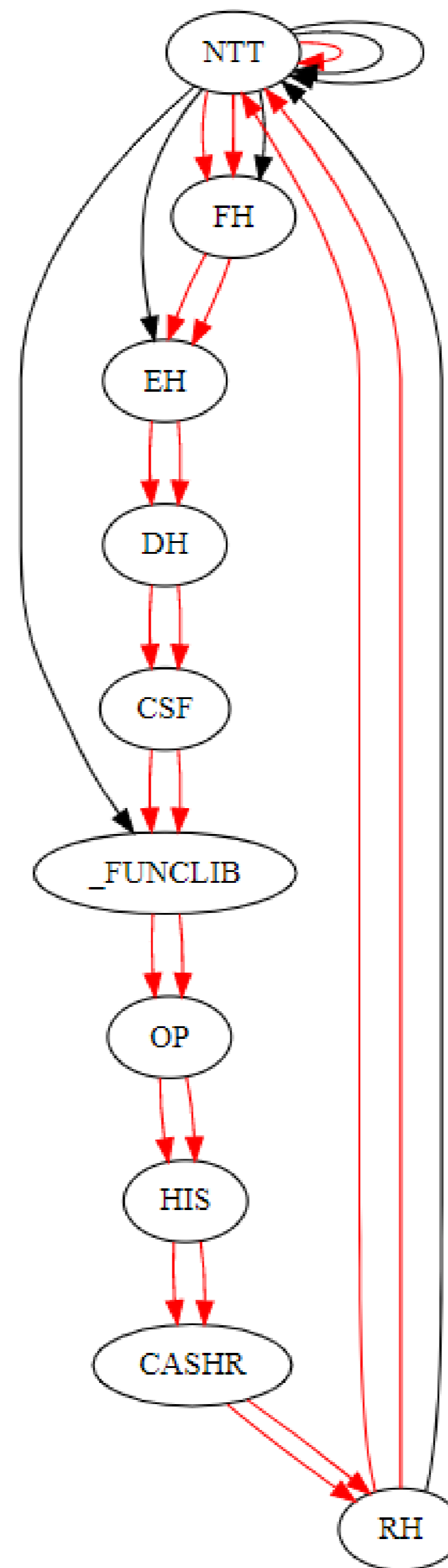
mibuso.com

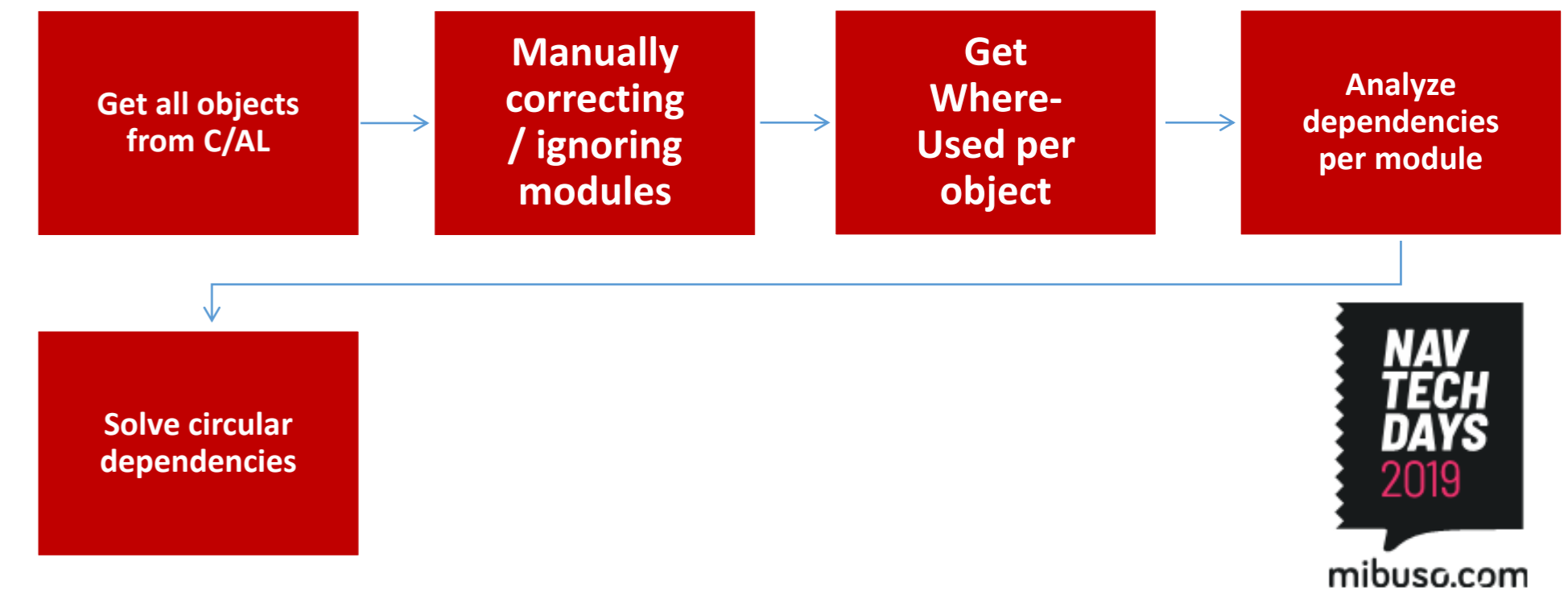
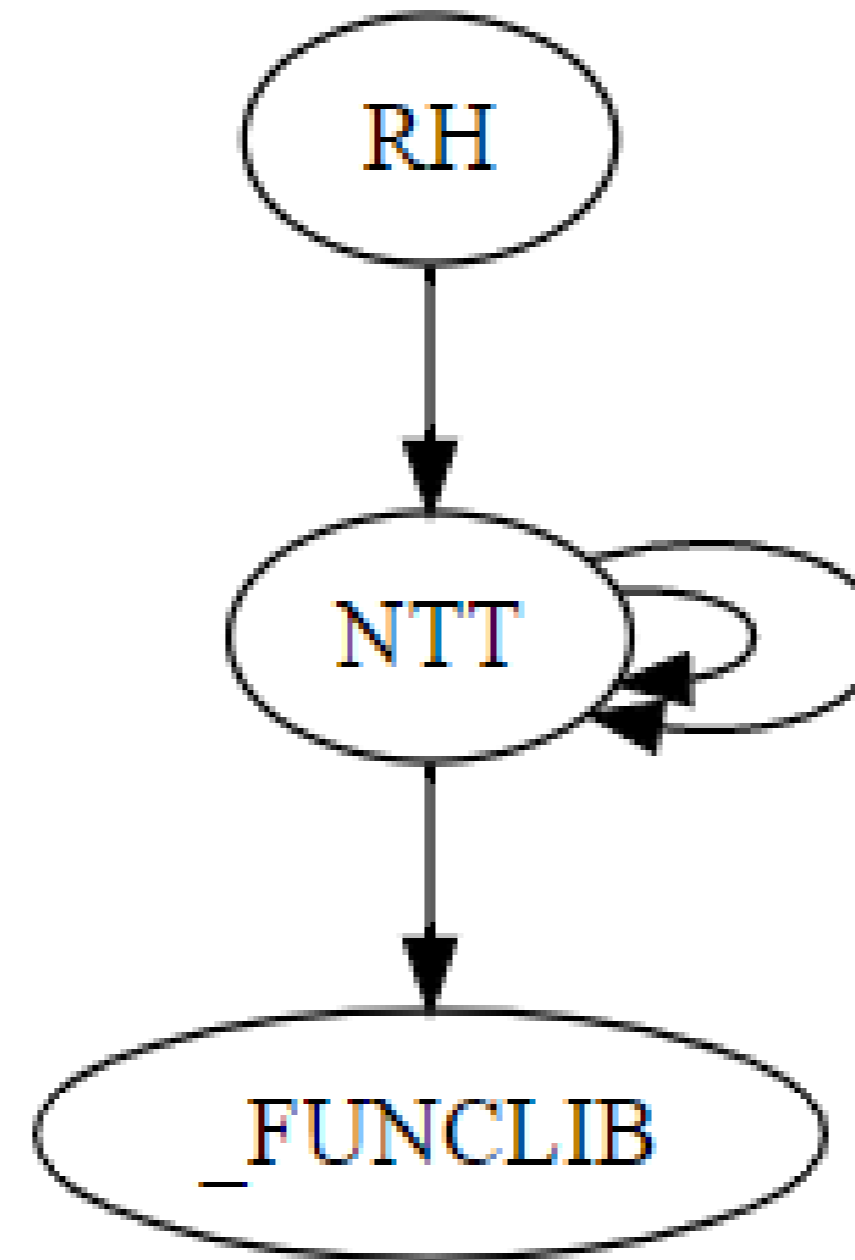


Solve circular dependencies

- Why?
 - You can't create apps with circular dependencies
- How?
 - Remove (ignore) modules
 - Combine modules

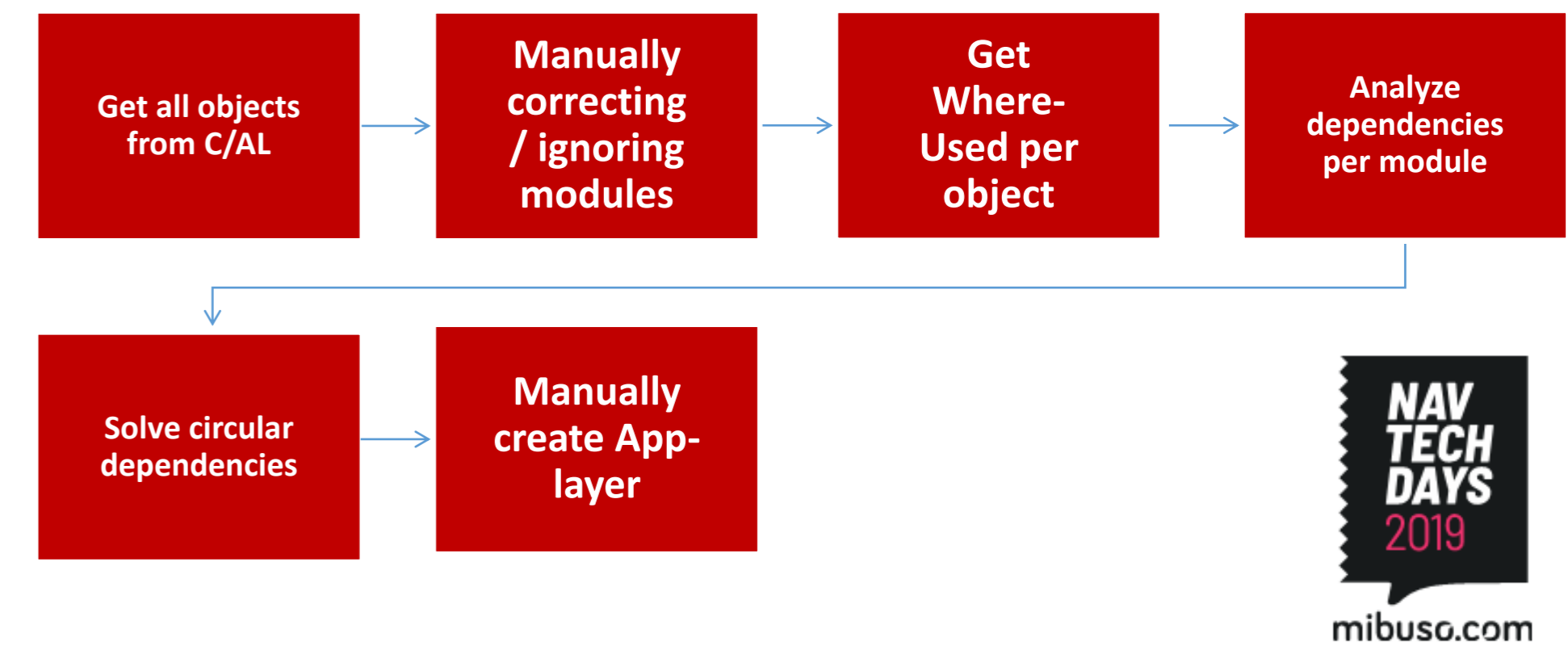






Manually create App-layer

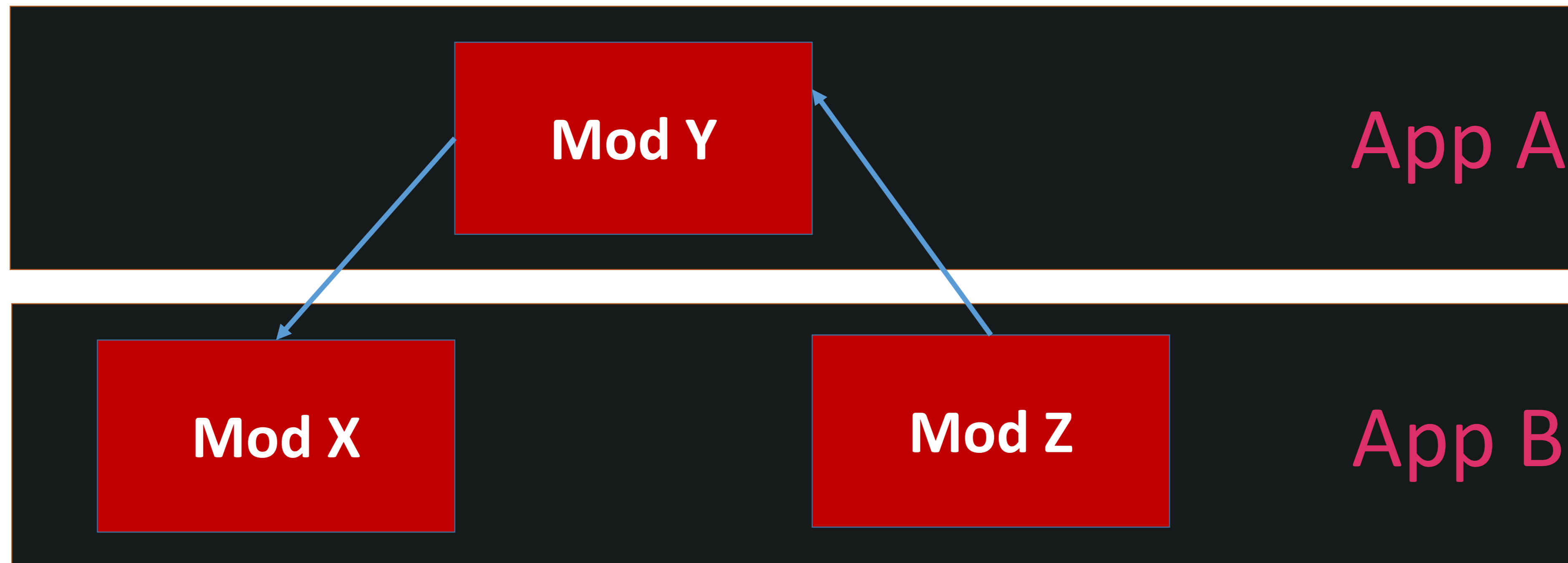
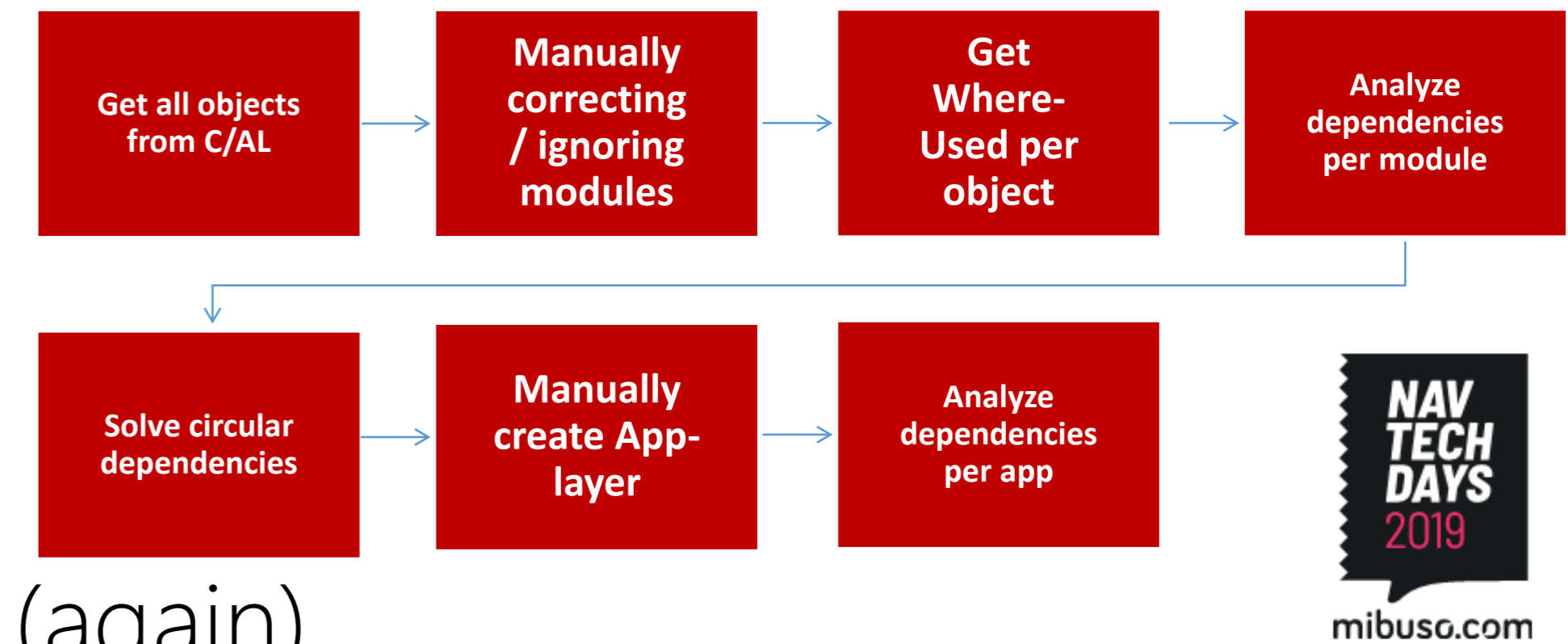
- Why?
 - Define
 - Sellable apps
 - Reuseable apps
 - Framework apps
 - Protected apps
 - Base apps
 - ...
- How?
 - Create record in Apps-table
 - Assign an app to each module



Analyze dependencies per app

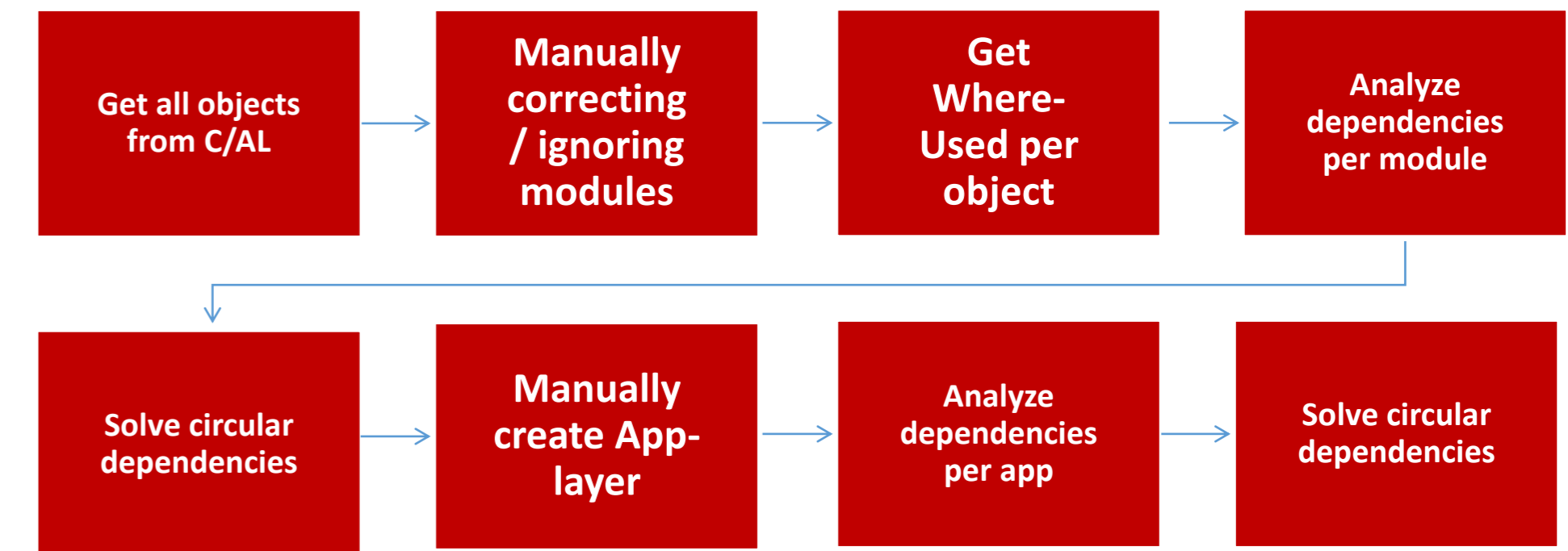
Why?

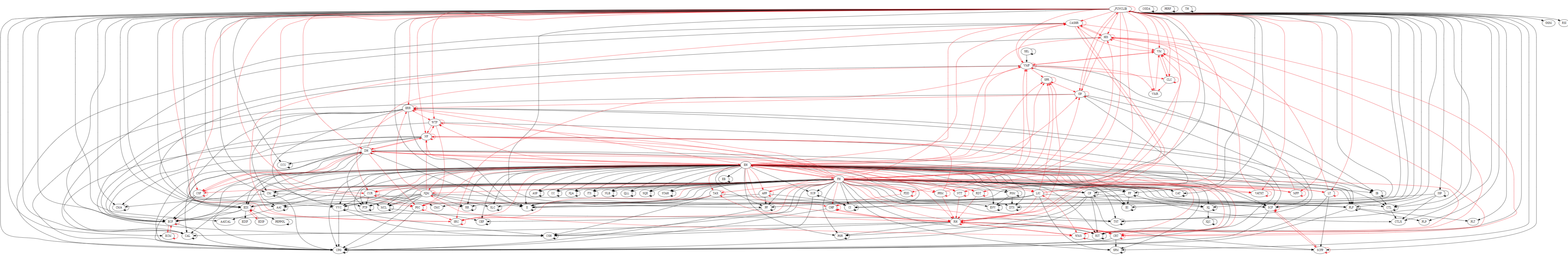
You might have ended up with circular dependencies (again)



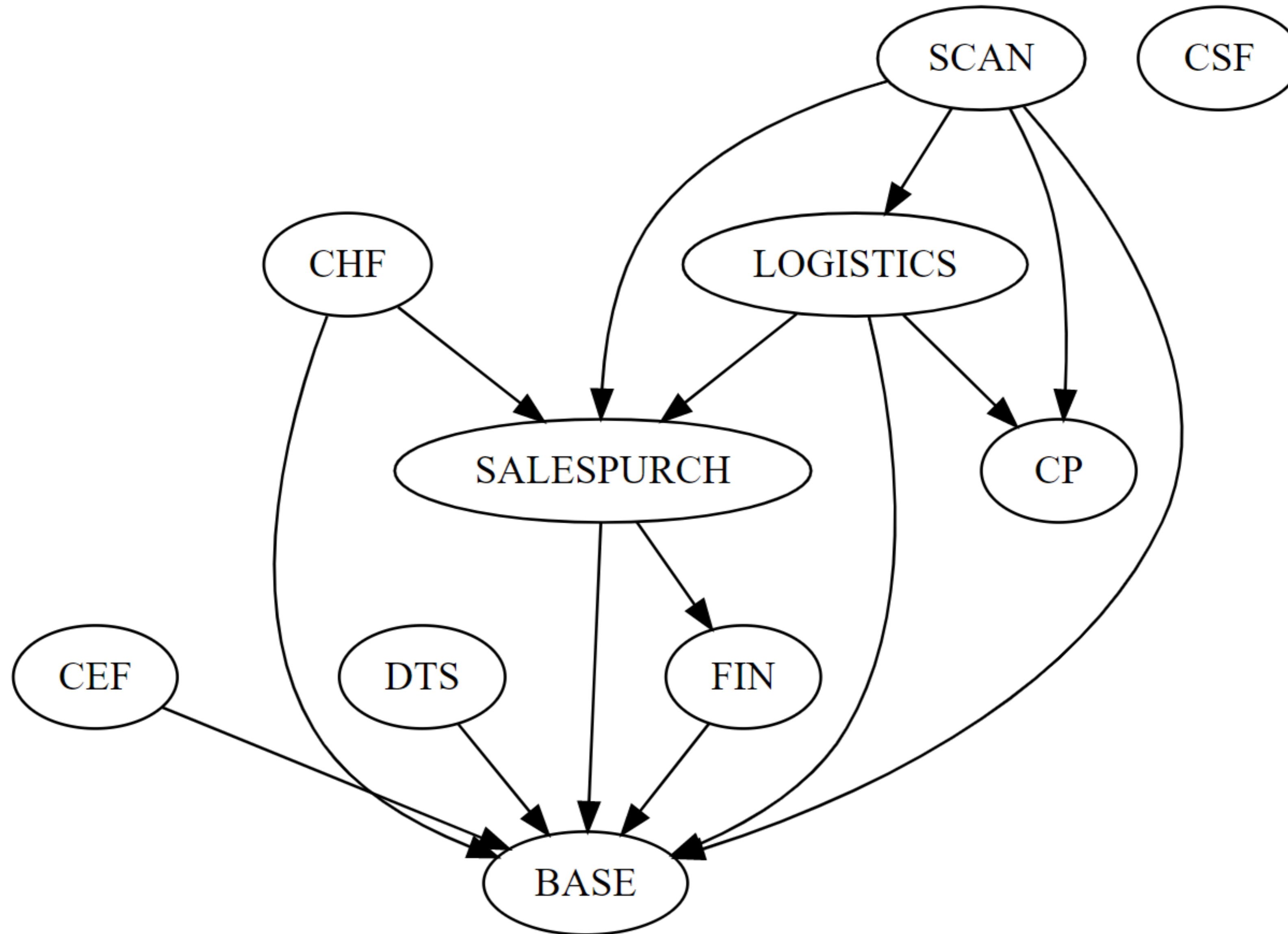
Solve circular dependencies

- Why?
 - You can't create apps with circular dependencies
- How?
 - **Combine** modules in one app
 - **Move** modules to a new or existing app
 - **Split** objects/modules **into new apps**
 - **Remove** modules



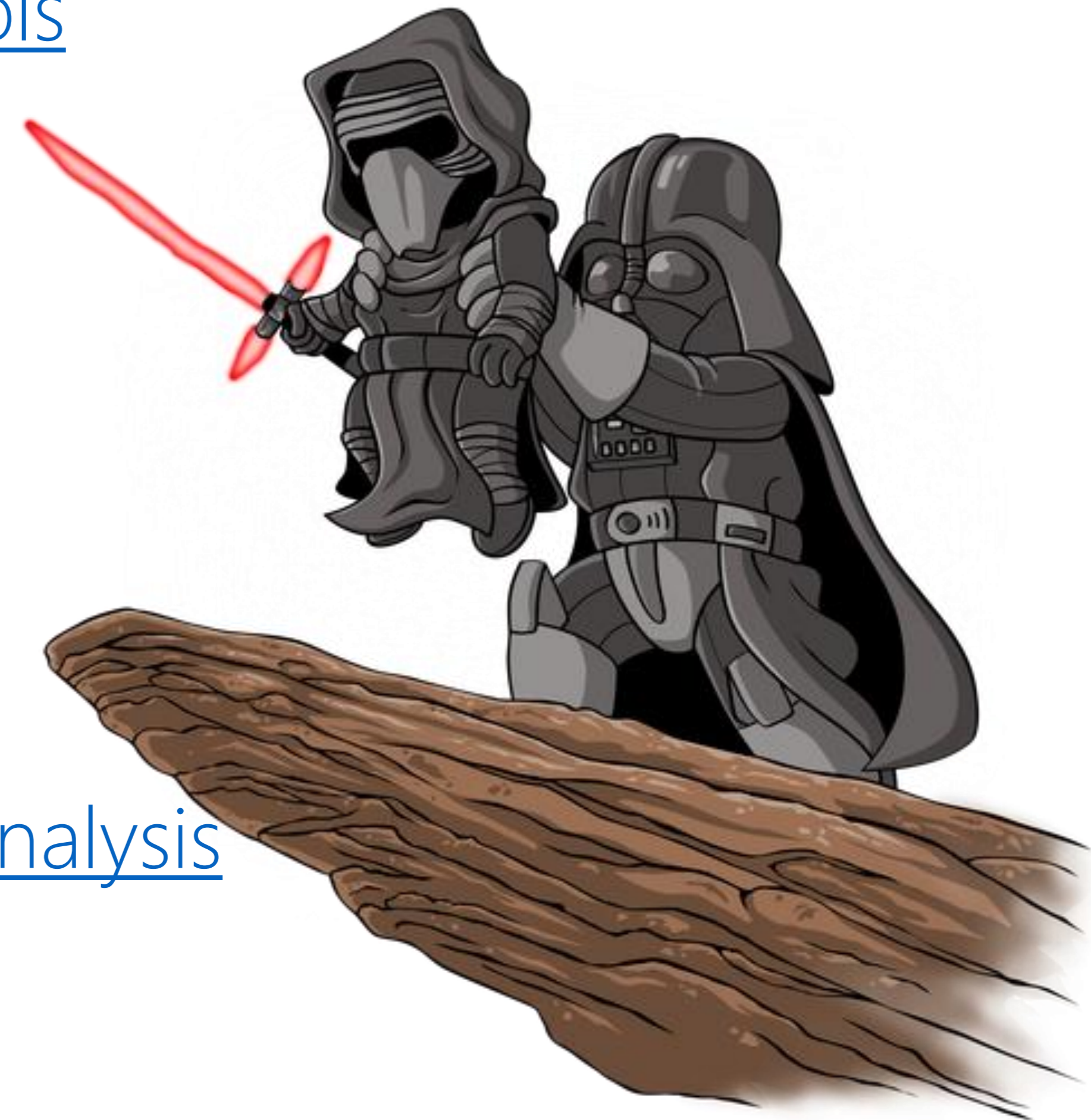


Result

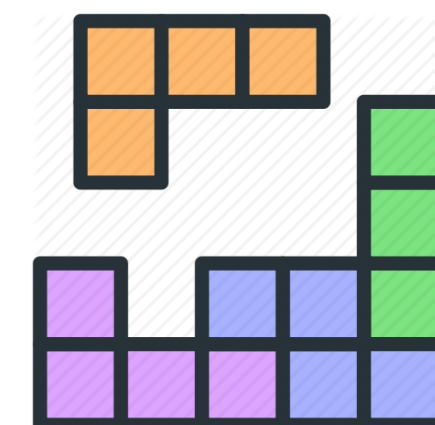
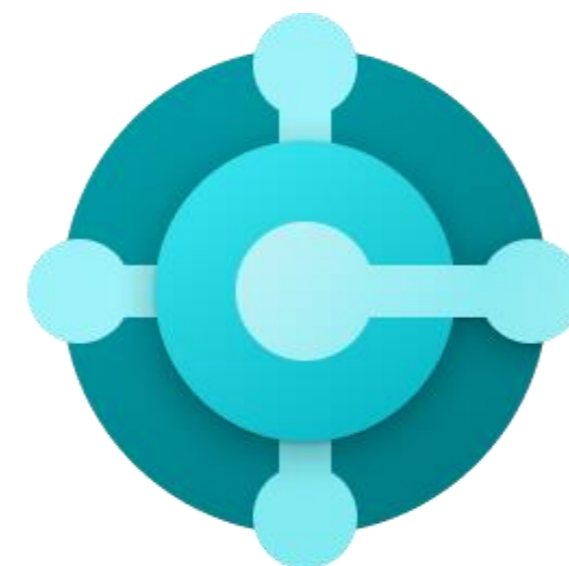
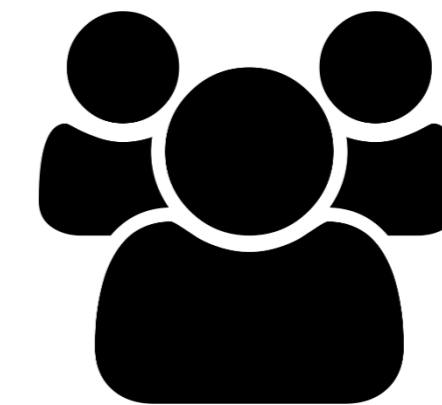
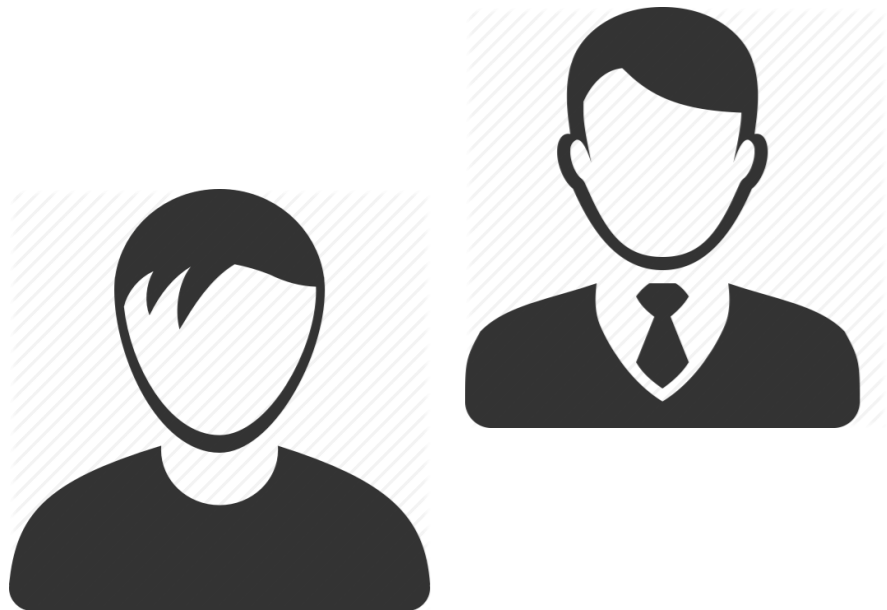


Tools we used are available for you ...

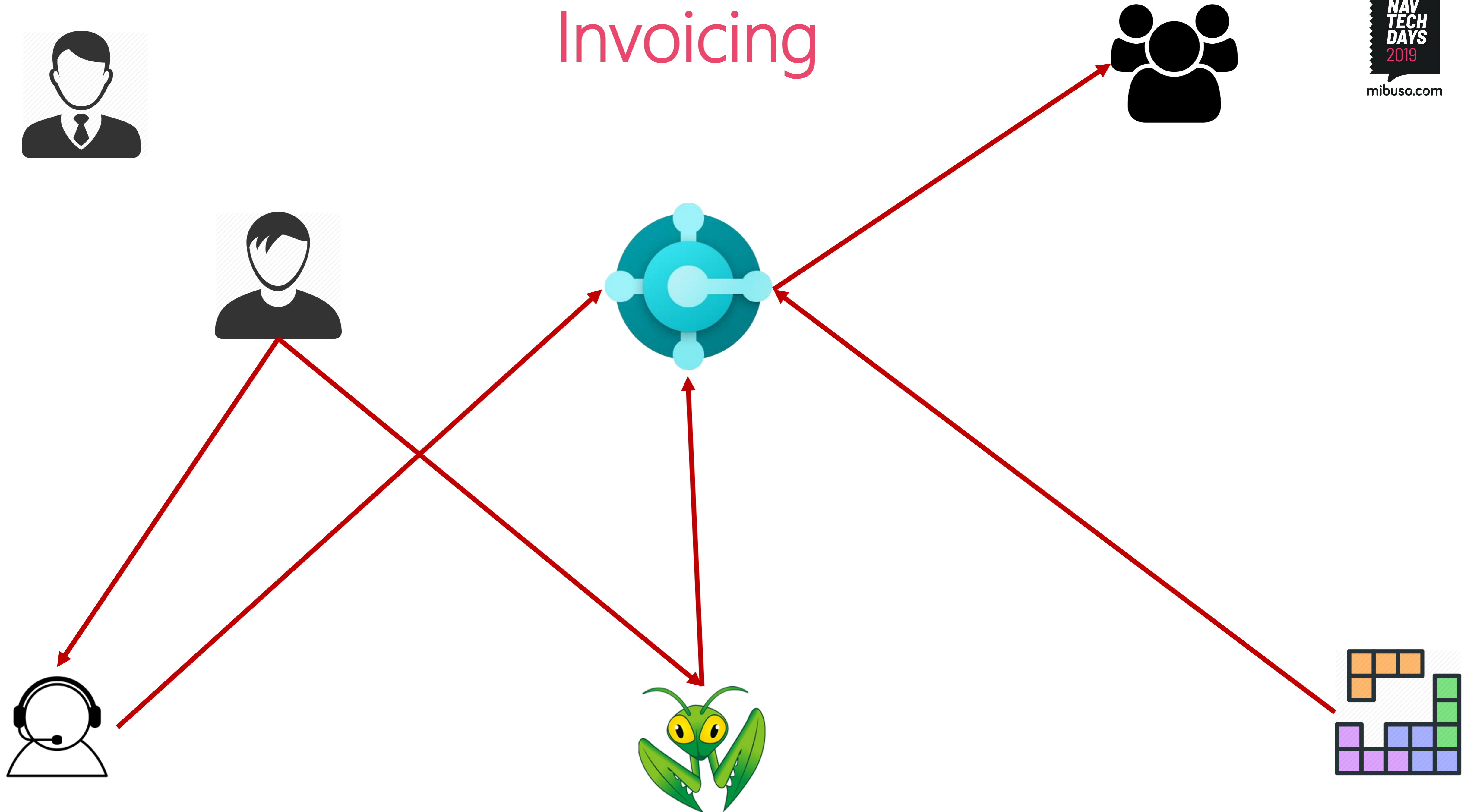
- Waldo.Model.Tools
 - <https://github.com/waldo1001/Waldo.Model.Tools>
 - Analyze C/AL Code in PowerShell
- PowerShell
- (Web)graphviz
 - to visualize the dependencies
 - <http://www.webgraphviz.com/>
- Custom BC Extension
 - With API to upload data from PowerShell
 - <https://github.com/waldo1001/ALDependencyAnalysis>



Let's take this dependency-stuff a bit further...

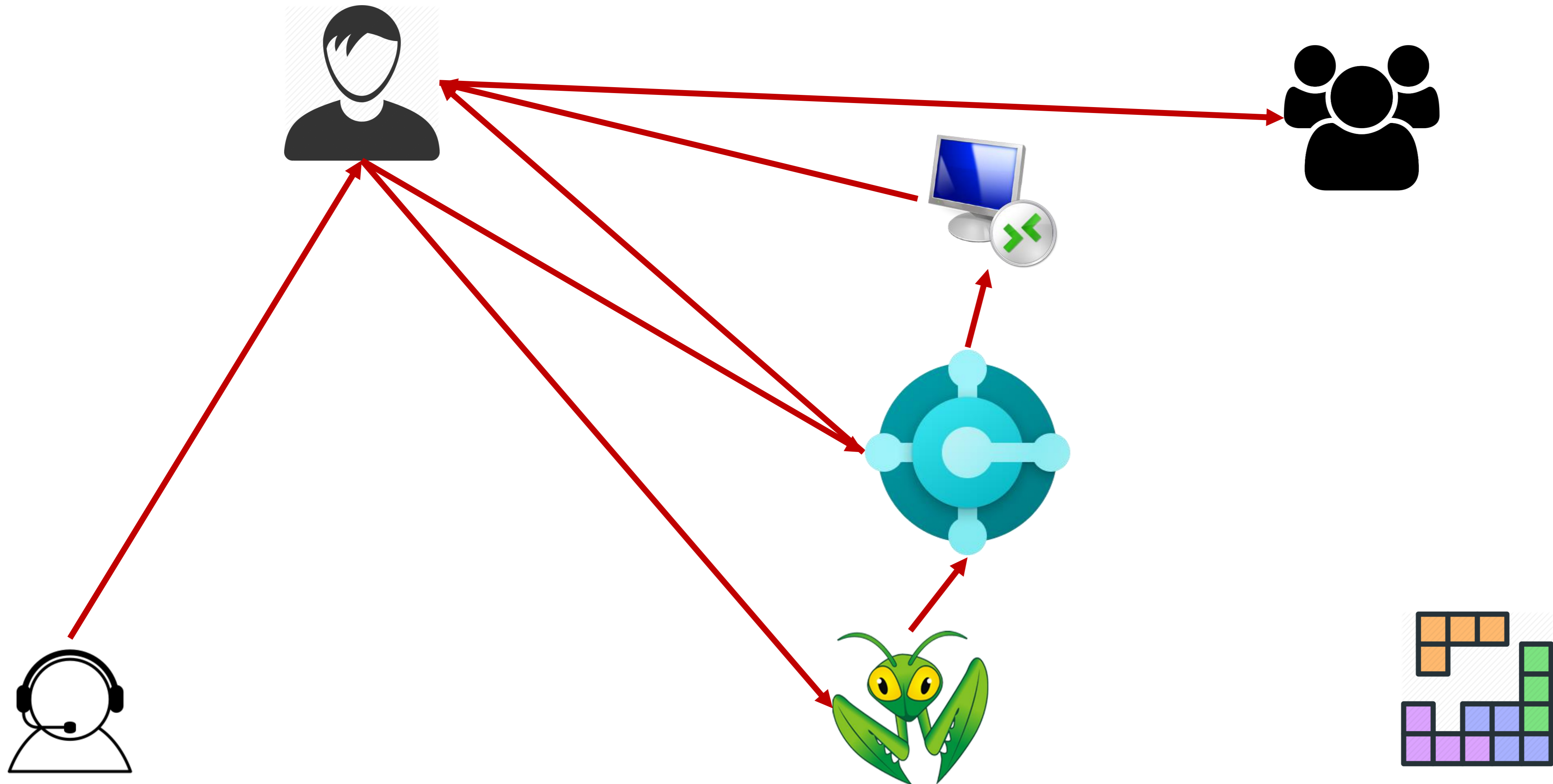


Invoicing

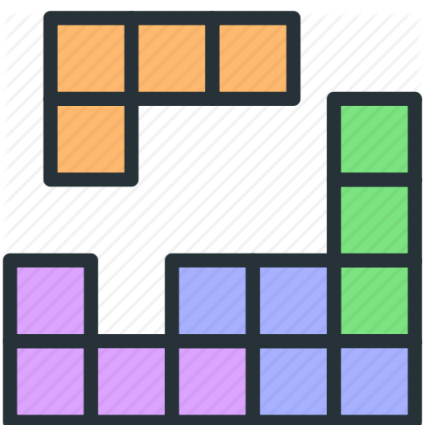
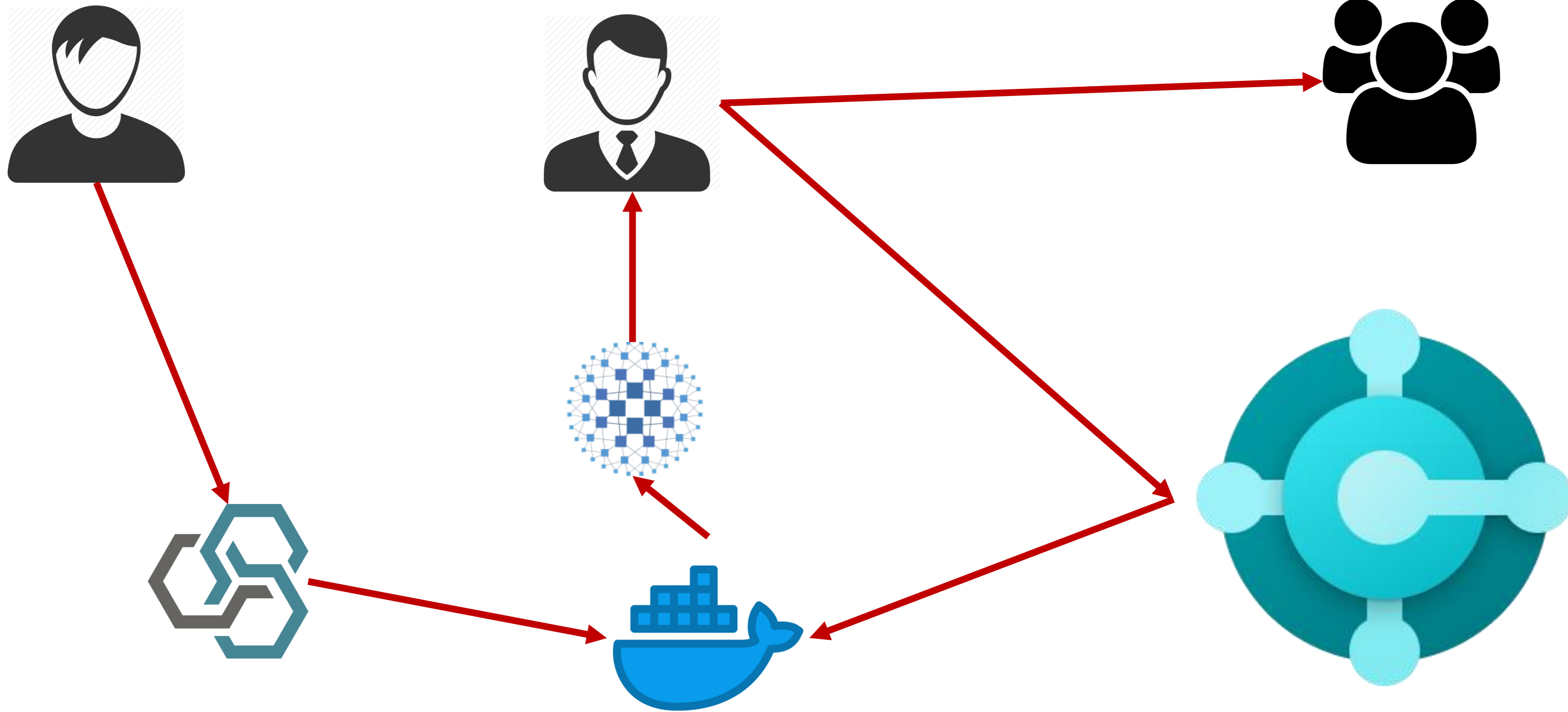


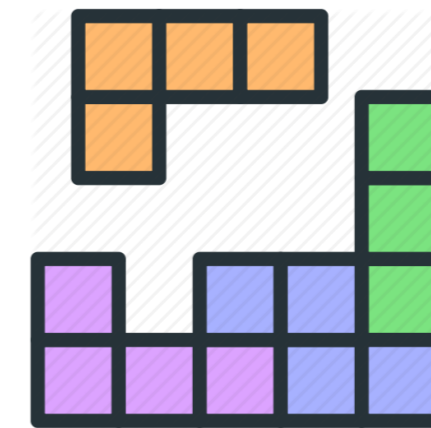
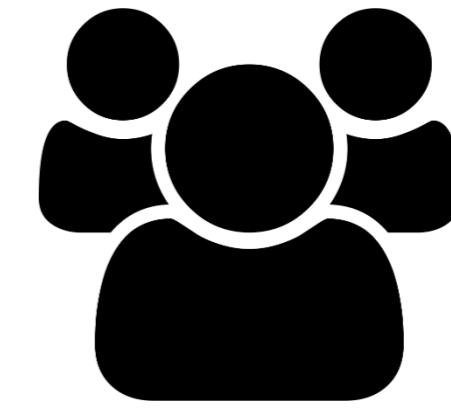
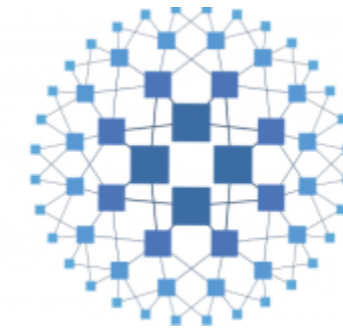
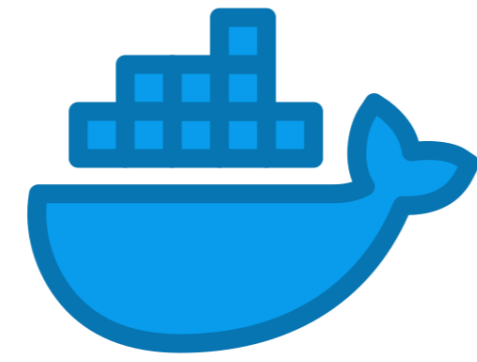
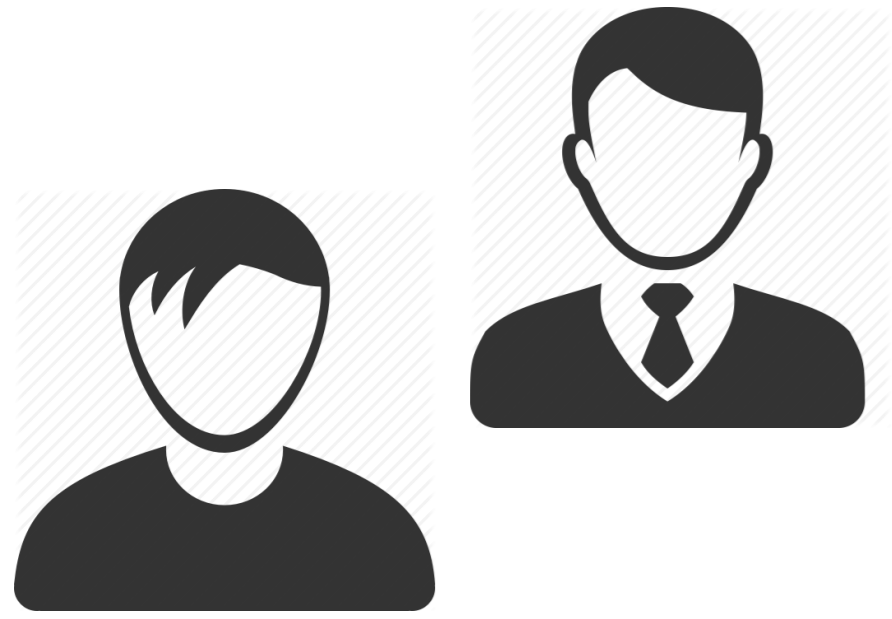


Support



Presales





How to architect?

Just break it down into
understandable and feasible
challenges

To be able to invoice ...



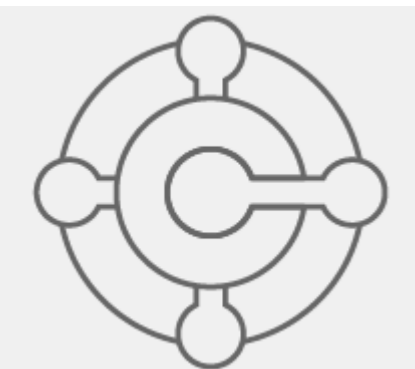
Read data from Mantis



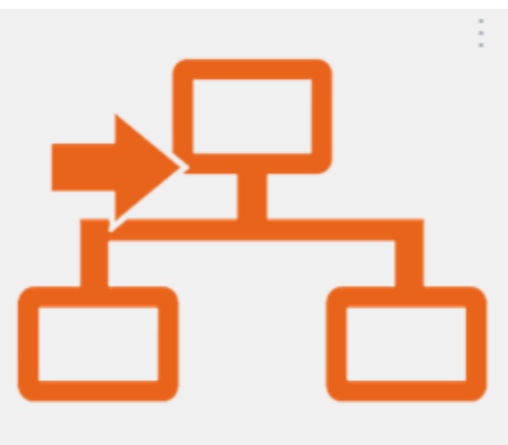
Read data from ION



Read data from TopDesk

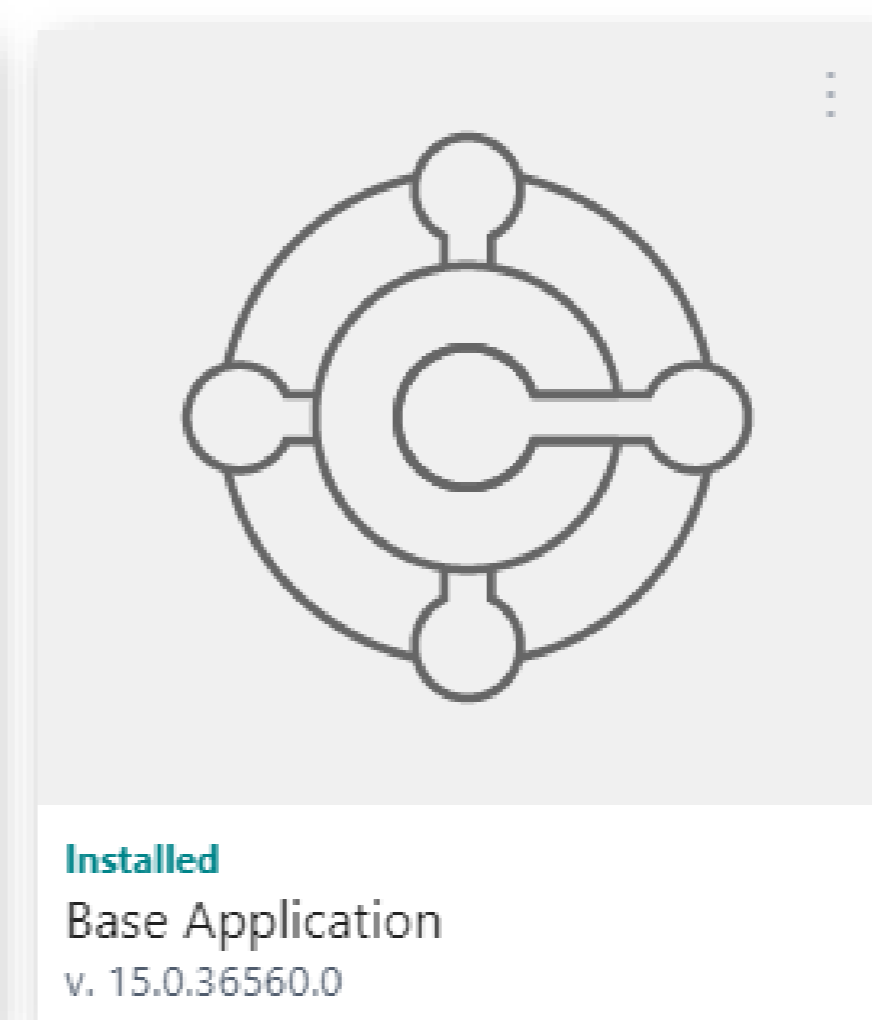
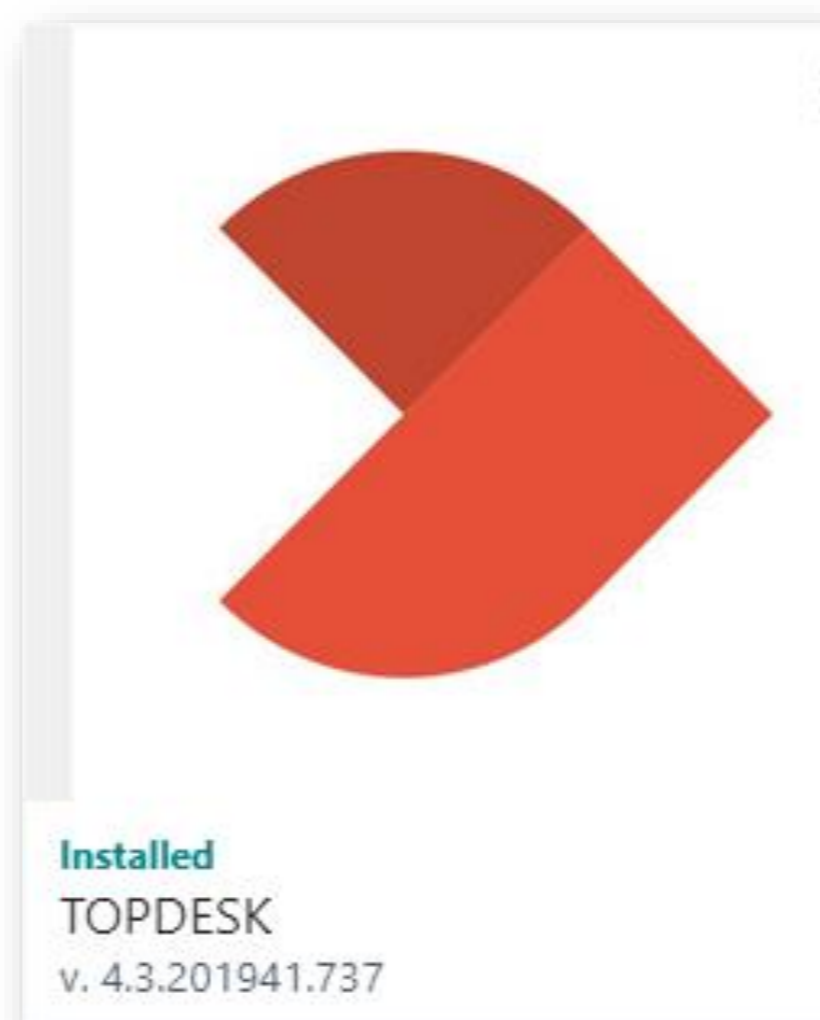
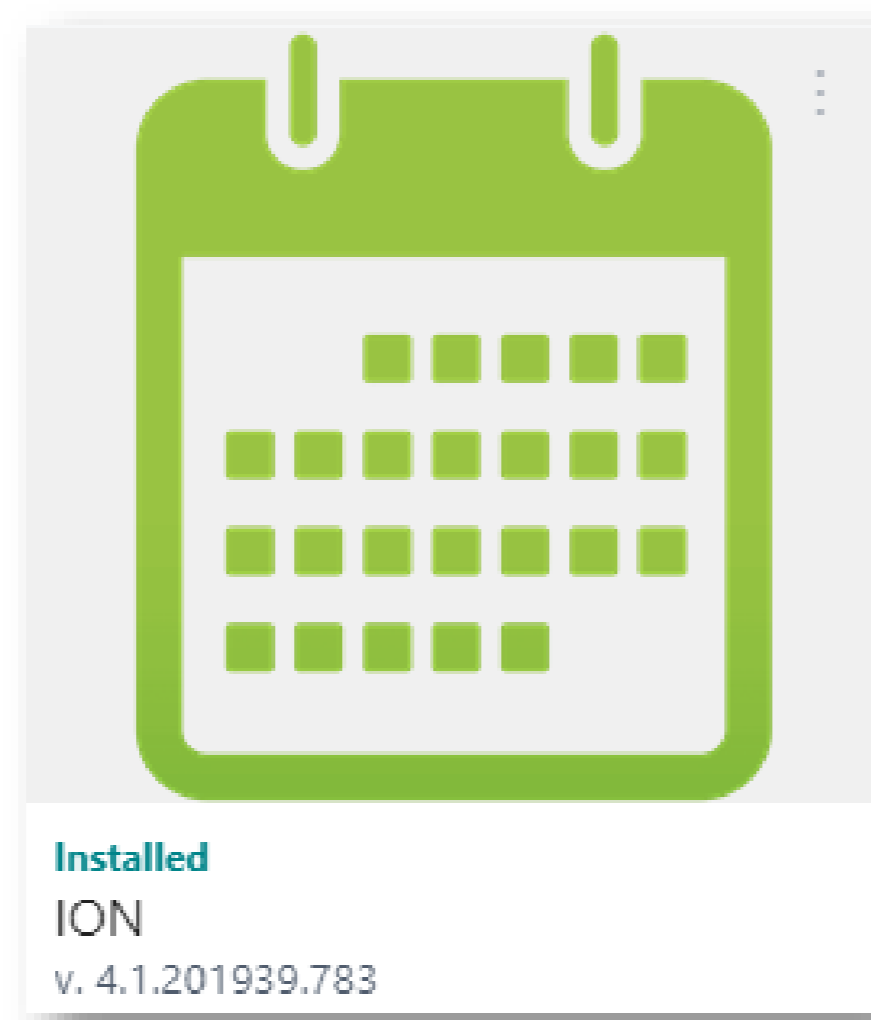


Get that data in Business Central

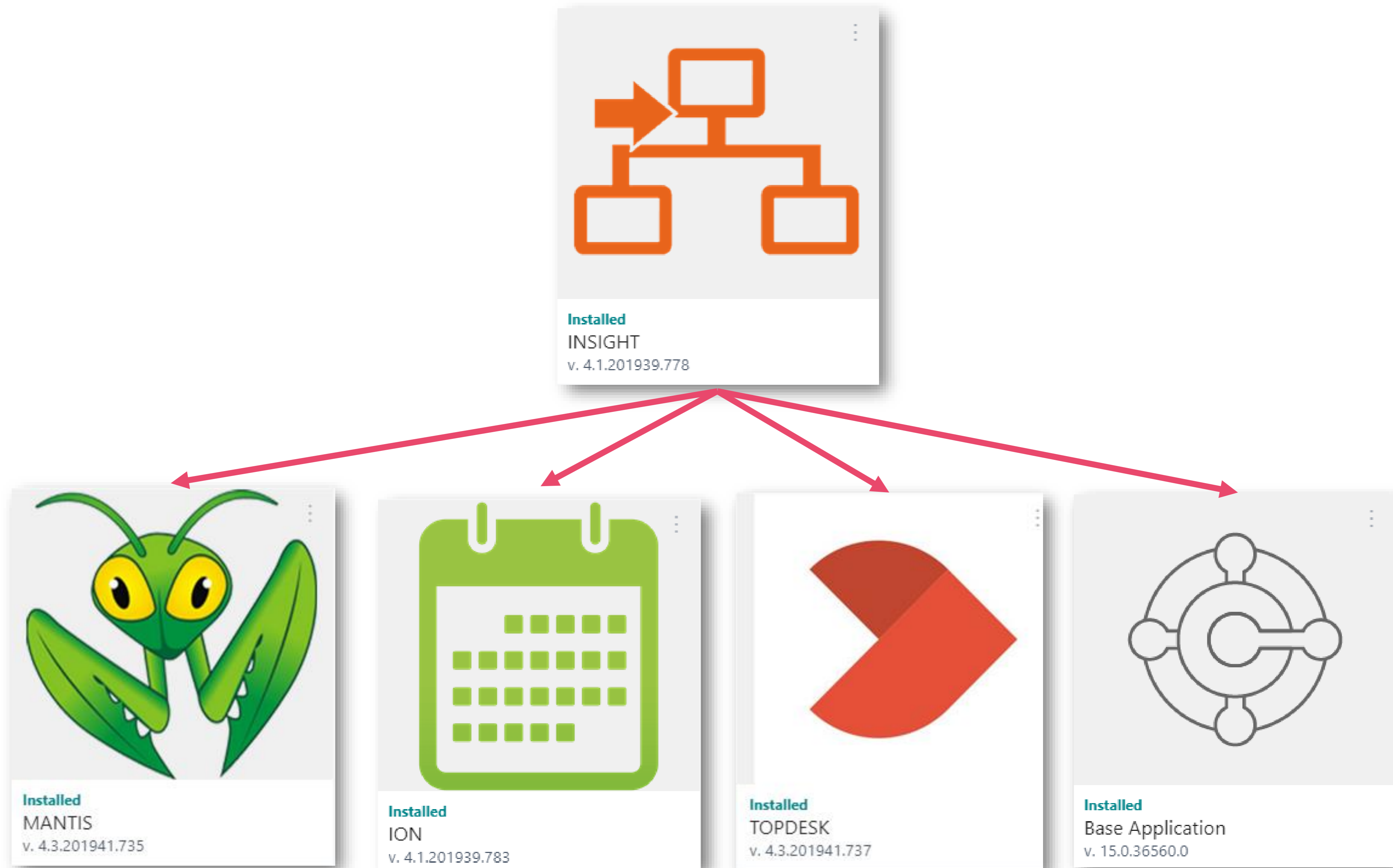


And use it for invoicing

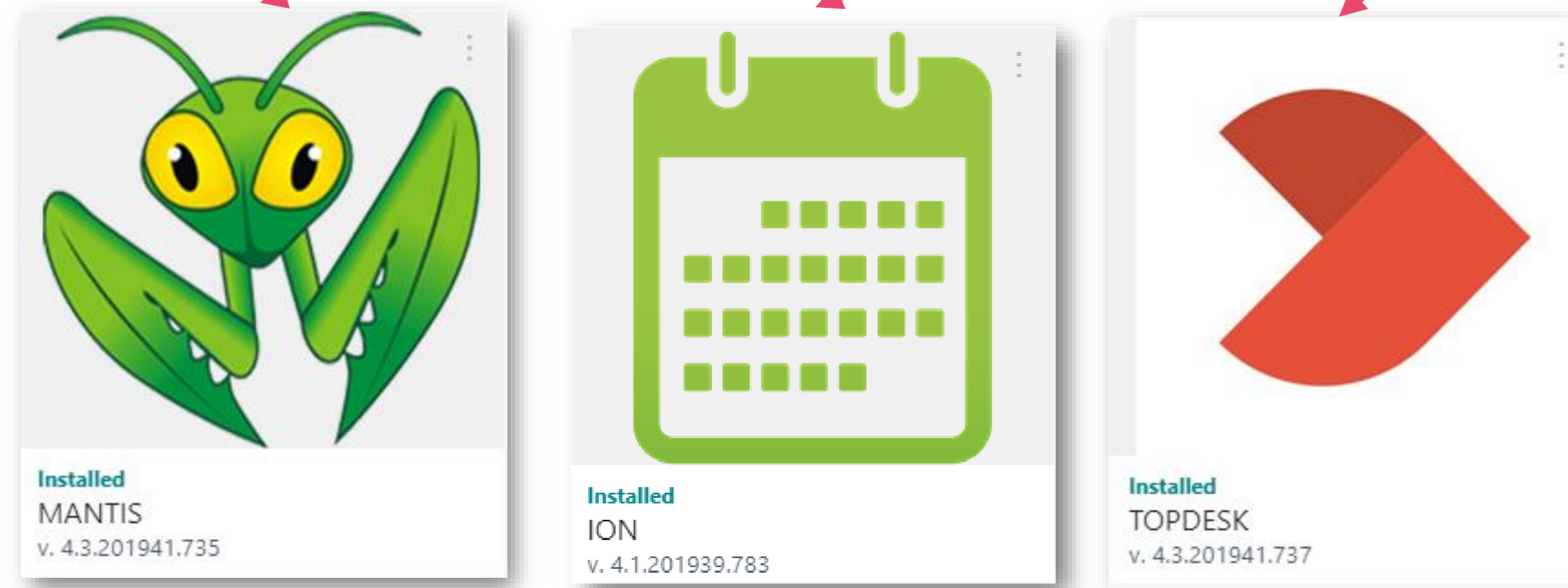
To be able to invoice ...



To be able to invoice ...



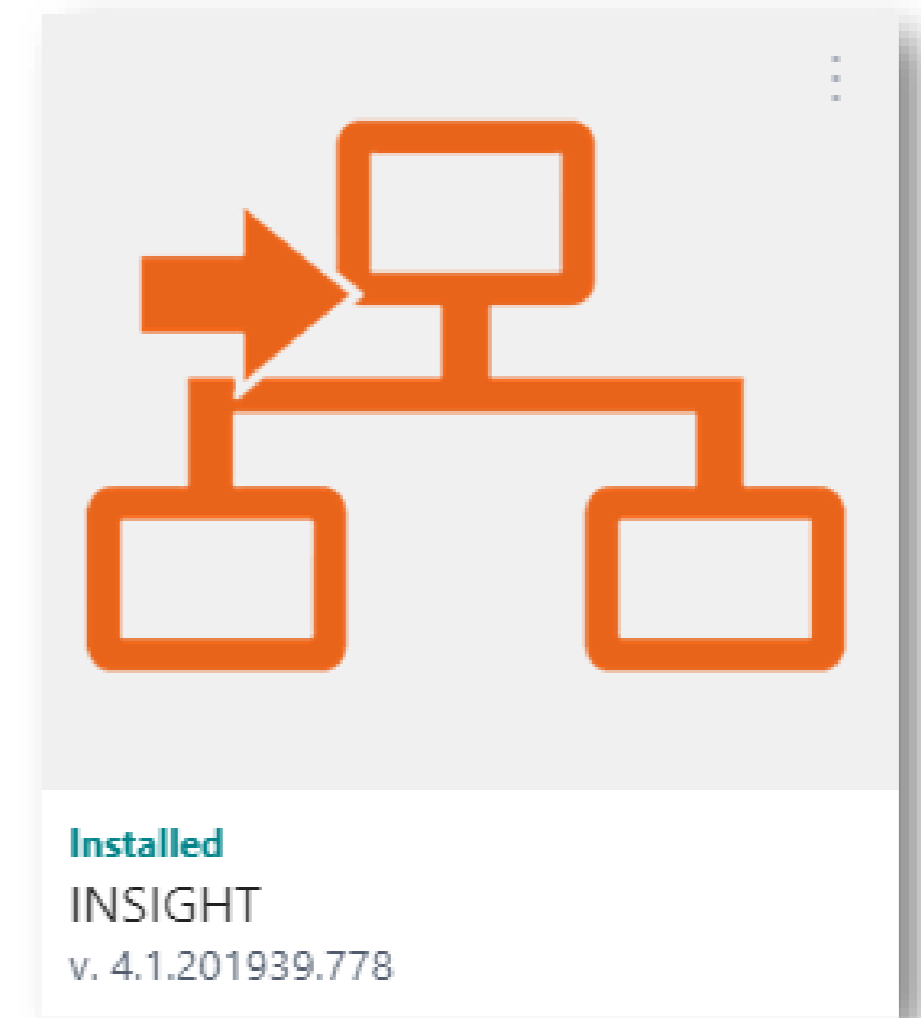
To be able to invoice ...



- Only know how to "talk" to the software.
- Contain the (interfaced) data
- Raise events
- Contain a clear and understandable interface to the functionality
- Nothing more!
→ "no" dependencies

To be able to invoice ...

- Connects the functionality
- Enhances Business Central with (e.g.) the invoicing functionality, like:
 - Suggest timesheet lines from planning
 - Calculate invoiceable amount from planning
 - Throw warning when something is planned, but no issues at hand
 - Reporting / Forecasting with combined data
 - Automatically create records in all systems
 - Role Center
 - Raise alerts



ACTIONS

> Connect RDP > IONUsersFix

Insights

Inventory

CUSTOMERS

128

>

AGENTS

433

>

CONNECTED

12

>

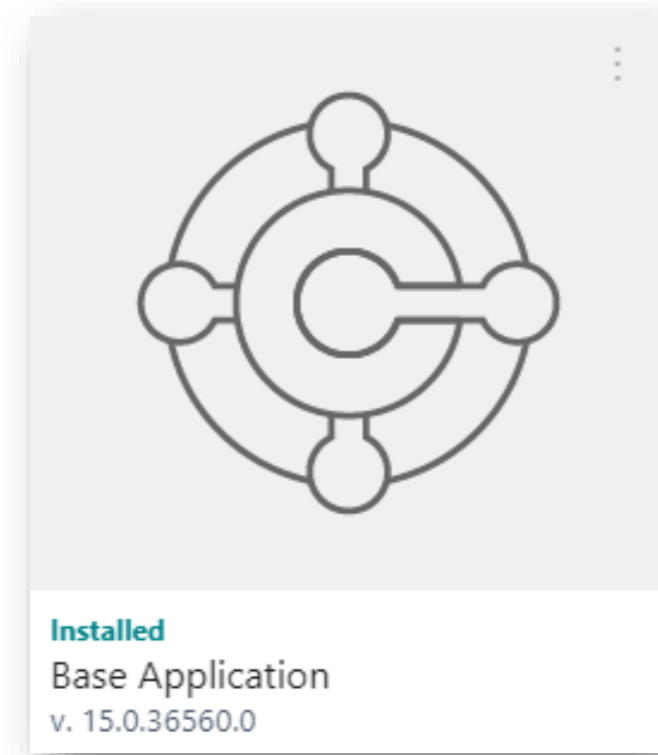
Connection History

Created ↓		Customer	Agent
6-7-2019 12:46	⋮	Stanley	ams-p-nas0
6-7-2019 12:45		Stanley	ams-p-nas0
6-7-2019 12:44		Stanley	ams-p-nas0
6-7-2019 12:43		Stanley	ams-p-nas0
6-7-2019 12:42		Stanley	ams-p-nas0
6-7-2019 12:31		Stanley	ams-p-nas0
6-7-2019 12:11		Stanley	ams-p-nas0
6-7-2019 12:11		Stanley	ams-p-nas0
6-7-2019 12:10		Stanley	ams-p-nas0

My Connections

Custom... ↑		Agent	Account ↑	Description
Abramo	⋮	sq1	IFACTO.HELP...	_
Stanley		ams-p-na...	IFACTO	NEW-NAS
Stanley		ams-p-na...	IFACTO	NEW-NAS
Stanley		ams-p-na...	IFACTO	NEW-NAS

To be able to set up demo environments..

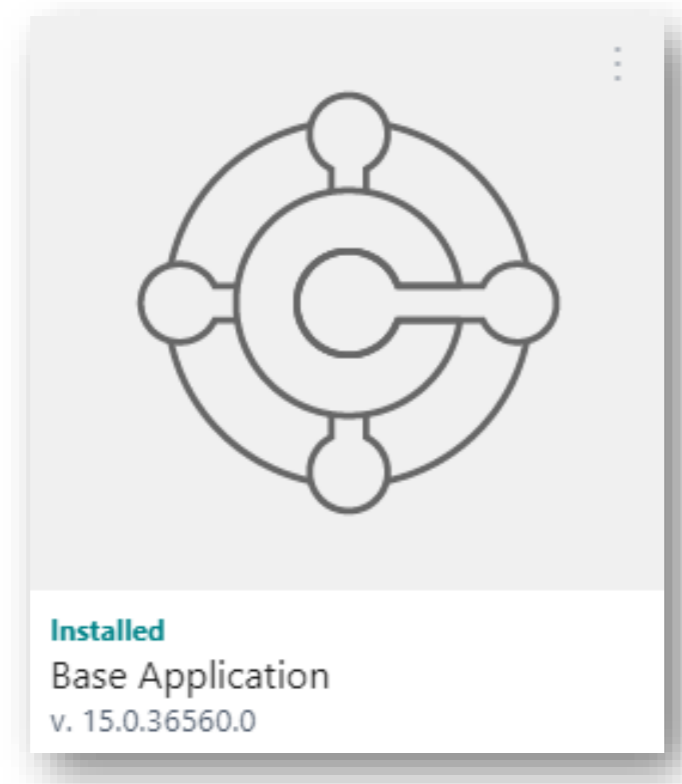


Software where users can request a new environment



Software that can handle that request

To be able to set up demo environments..



Software where users can request a new environment

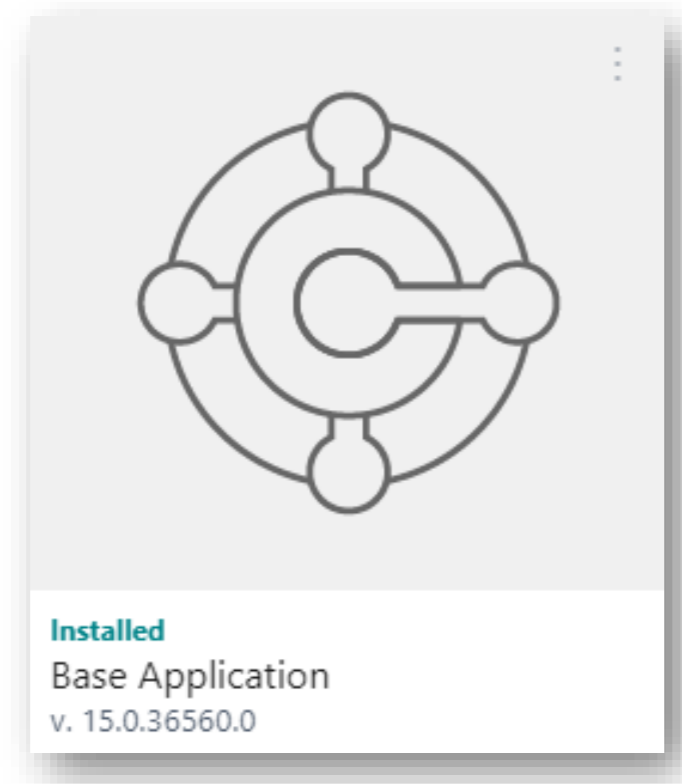


Software that can handle that request



Create an environment in the right localization and version

To be able to set up demo environments..



Software where users can request a new environment

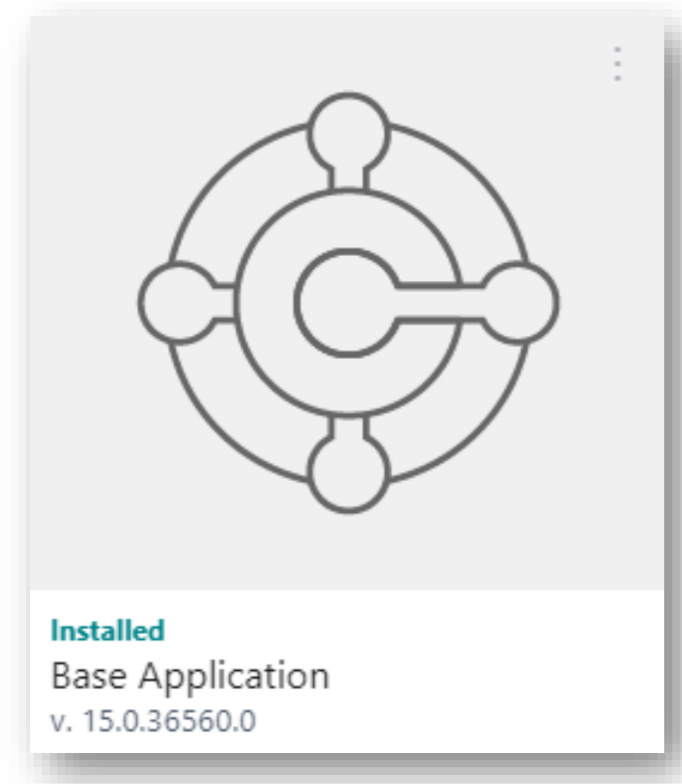


Software that can handle that request



Make it available from the cloud

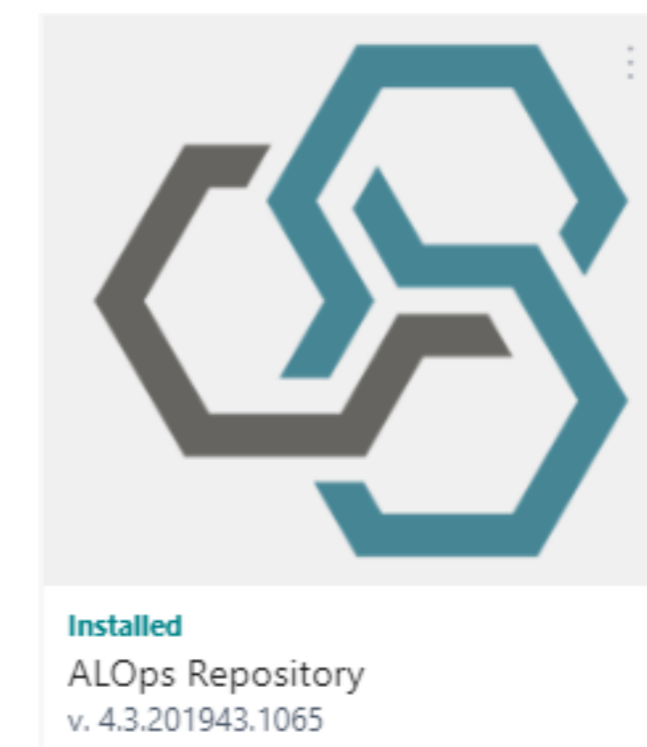
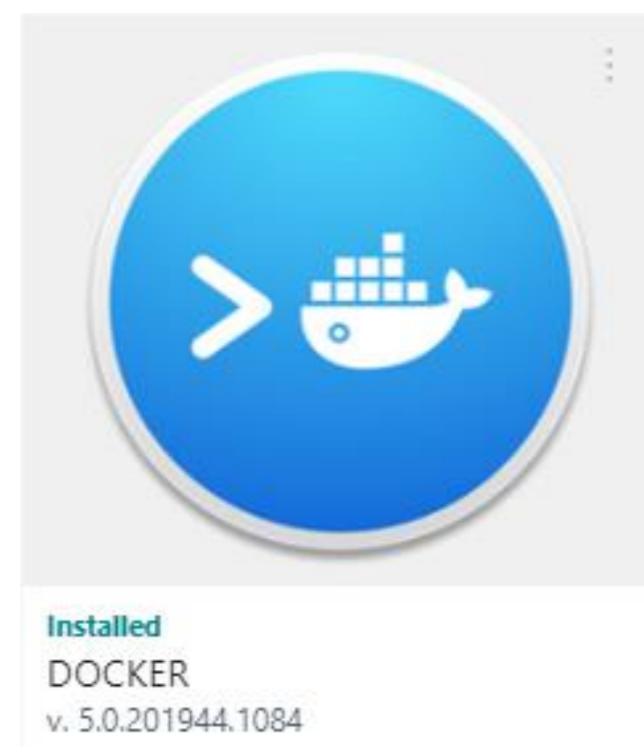
To be able to set up demo environments..



Software where users can request a new environment



Software that can handle that request



Install the right extensions right away

To be able to set up demo environments..

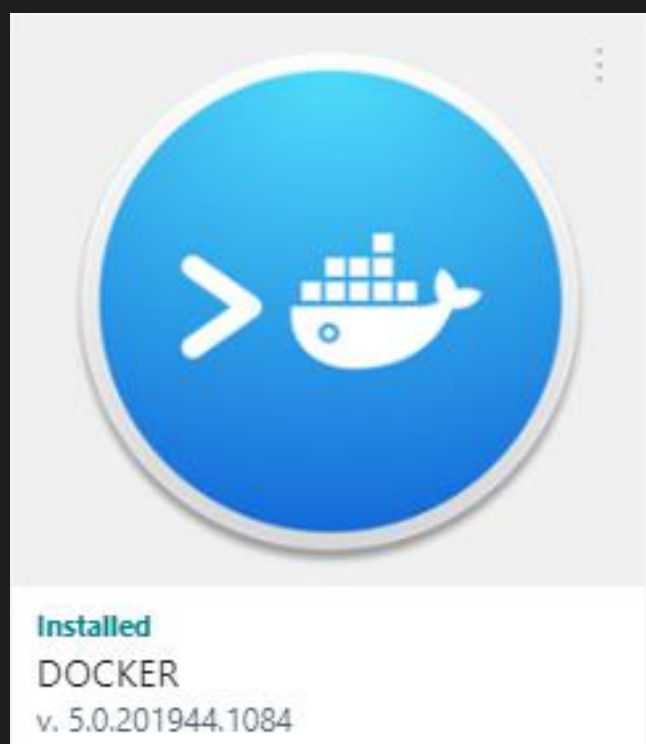




How it looks in the app



How it looks in code



1 reference

```
procedure StopContainer(var DOCKERContainer: Record "DOCKER Container")
var
    DOCKERHost: Record "DOCKER Host";
begin
    DOCKERHost.Get(DOCKERContainer.Host);
    DOCKERHost.InvokeAPICall('Post', '/containers/' + DOCKERContainer.API_ID() + '/stop');
    DOCKERContainer.GetContainer();
end;
```

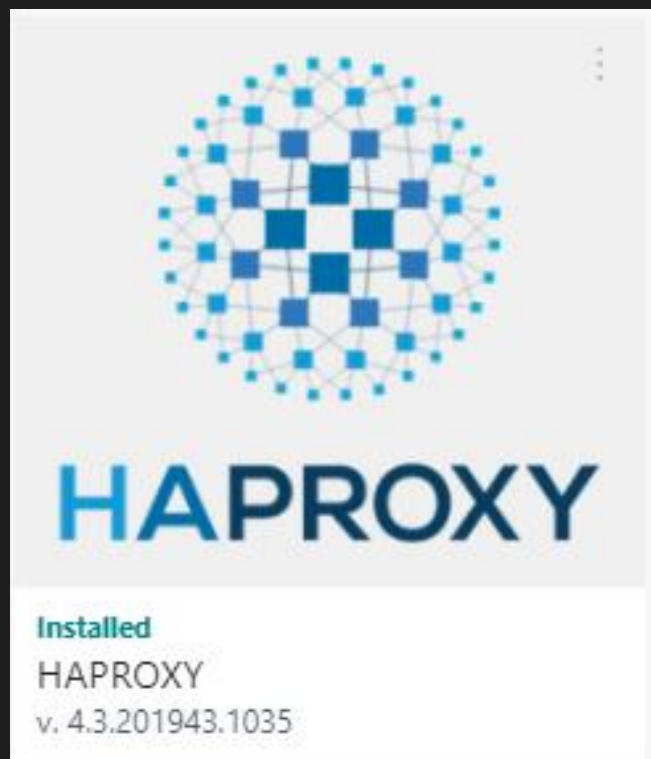
1 reference

```
procedure RestartContainer(var DOCKERContainer: Record "DOCKER Container")
var
    DOCKERHost: Record "DOCKER Host";
begin
    DOCKERHost.Get(DOCKERContainer.Host);
    DOCKERHost.InvokeAPICall('Post', '/containers/' + DOCKERContainer.API_ID() + '/restart');
    DOCKERContainer.GetContainer();
end;
```

You, a month ago • Infra v2

1 reference

```
procedure PauseContainer(var DOCKERContainer: Record "DOCKER Container")
var
    DOCKERHost: Record "DOCKER Host";
begin
    DOCKERHost.Get(DOCKERContainer.Host);
    DOCKERHost.InvokeAPICall('Post', '/containers/' + DOCKERContainer.API_ID() + '/pause');
    DOCKERContainer.GetContainer();
end;
```



2 references

```
procedure NewACL(ParentType: Text; ParentName: Text; ACLName: Text; Criterion: Text; FilterValue: Text)
var
    ACLObject: JsonObject;
    QueryString: Text;
    TransactionID: Text;
begin
    TransactionID := CurrentTransactionObject.AsText('id');

    ACLObject.Add('id', 0);
    ACLObject.Add('acl_name', ACLName);
    ACLObject.Add('criterion', Criterion);
    ACLObject.Add('value', FilterValue);

    QueryString := StrSubstNo('transaction_id=%1&parent_type=%2&parent_name=%3', TransactionID, ParentType, ParentName);

    InvokeAPICall('Post', '/services/haproxy/configuration/acls', QueryString, ACLObject);
end;
```

```

        Container.SetImage(HADOCKContainerRequest.GetFullImage());

    **** Pull Image
    HADOCKContainerRequestLo
    HADOCKContainerRequest.G
    HADOCKContainerRequest.S
    HADOCKContainerRequest.M
    Commit();

    clear(I **** Upload L
    DOCKERF clear(HADOCKBl
    DOCKERF clear(Base64St
    HADOCK( HADOCKBase64.G
    HADOX
    DOCKI ****
    DO *****
    if (
        //Container.AddEnvironmentVariable('isBcSandbox=Y');
        //Container.AddEnvironmentVariable('enableWarningsInLog=Y');
        //Container.AddEnvironmentVariable('multitenant=Y');
    end;

    if (HADOCKContainerRequest."Source Container" <> '') then begin
        DOCKERContainerSource.Get(HADOCKContainerRequest."Source Container");
        DOCKERContainerSource.TestField("HADOCK SQL Backup Path");
        Container.AddEnvironmentVariable(StrSubstNo('bakfile=%1', DOCKERContainerSource."HADOCK SQL Backup Path"));
    end;

    Container.AddLabel('HAProxy', HADOCKContainerRequest."Public DNS");

    Container.AddPortBinding(443, 'tcp', HADOCKContainerRequest."IIS Port");
    Container.AddPortBinding(7049, 'tcp', HADOCKContainerRequest."NST Port");

    ContainerID := DOCKERHost.CreateContainer(Container);

```

Status::Processing);



Installed
HADOCK
v. 4.3.201945.1100

```

procedure SQLBackupContainer(var DOCKERContainer: Record "DOCKER Container")
var
    DOCKERHost: Record "DOCKER Host";
    Script: TextBuilder;
begin
    DOCKERHost.Get(DOCKERContainer.Host);
    DOCKERHost.TestField("HADOCK SQL Backup Path");
    if (not DOCKERHost."HADOCK SQL Backup Path".EndsWith('\')) then
        DOCKERHost."HADOCK SQL Backup Path" += '\';

    DOCKERContainer.Get(DOCKERContainer.RecordId());
    DOCKERContainer."HADOCK SQL Backup Path" := StrSubstNo('%1\%2.bak', DOCKERHost."HADOCK SQL Backup Path", DOCKERContainer.ID);
    DOCKERContainer.Modify();

    Script.AppendLine('Import-Module "C:\Program Files\Microsoft Dynamics*\*\Service\Microsoft.Dynamics.Nav.Apps.Management.dll" -Verbose:$false');
    Script.AppendLine('Import-Module "C:\Program Files\Microsoft Dynamics*\*\Service\Microsoft.Dynamics.Nav.Management.dll" -Verbose:$false');

    Script.AppendLine(StrSubstNo('$BackupFolder = "%1"', DOCKERHost."HADOCK SQL Backup Path"));

    Script.AppendLine('$NavServerInstance = (Get-NAVServerInstance | Select-Object -First 1).ServerInstance.Replace(''MicrosoftDynamicsNavServer$', '')');
    Script.AppendLine('$DatabaseInstance = Get-NAVServerConfiguration -ServerInstance $NavServerInstance -KeyName "DatabaseInstance"');
    Script.AppendLine('$DatabaseServer = Get-NAVServerConfiguration -ServerInstance $NavServerInstance -KeyName "DatabaseServer"');
    Script.AppendLine('$DatabaseName = Get-NAVServerConfiguration -ServerInstance $NavServerInstance -KeyName "DatabaseName"');

    Script.AppendLine('$SQLInstance = $DatabaseServer');
    Script.AppendLine('if (-not ([string]::IsNullOrEmpty($DatabaseInstance))){}');
    Script.AppendLine('    $SQLInstance += "\"$($DatabaseInstance)"    ');
    Script.AppendLine('}');

    Script.AppendLine('if (!(Test-Path -Path $BackupFolder)) {}');
    Script.AppendLine('    New-Item -Path $BackupFolder -itemtype Directory | Out-Null');
    Script.AppendLine('}');

    Script.AppendLine('$SourceDatabase = $DatabaseName');
    Script.AppendLine(StrSubstNo('$BackupFile = "%1"', DOCKERContainer."HADOCK SQL Backup Path"));

    Script.AppendLine('if (Test-Path -Path $BackupFile) {}');
    Script.AppendLine('    Remove-Item -Path $BackupFile -Confirm:$false -Force:$true | Out-Null');
    Script.AppendLine('}');

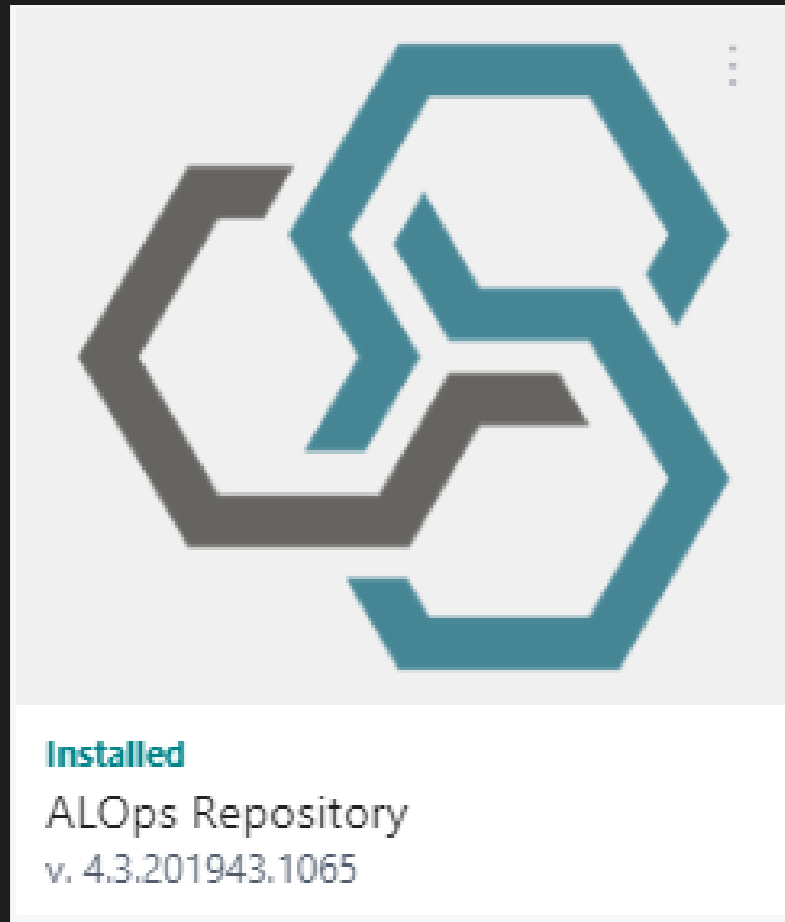
    Script.AppendLine('$SQLCmd = "BACKUP DATABASE [$SourceDatabase] TO DISK = N''$BackupFile'' WITH COPY_ONLY, NOFORMAT, INIT, NAME = N''$SourceDatabase-Full I
    Script.AppendLine('Invoke-Sqlcmd -ServerInstance $SQLInstance -Database "master" -Query $SQLCmd -QueryTimeout 600 -Verbose');

    DOCKERContainer.ExecutePowershell(Script.ToText());

    DOCKERContainer.Get(DOCKERContainer.RecordId());
    DOCKERContainer."HADOCK Last SQL Backup" := CurrentDateTime();
    DOCKERContainer.Modify();
end;

```

The App Catalogue



```
- task: ALOpsRepositoryPublish@1
  displayName: 'Publish to ALOps-Repo'
  inputs:
    usedocker: true
    fixed_tag: ${{ parameters.publish
alops_repository_endpoint: 'https
alops_repository_username: '$(alo
alops_repository_password: '$(alo
app_artifact_filter: ${{ paramete
upload_c_applications: true
```

```
page 75023 "ALOPS App API"
{
  PageType = API;
  Caption = 'alopsApp';
  APIPublisher = 'bartbourgeois';
  APIGroup = 'alops';
  //APIVersion = 'VersionList';
  EntityName = 'alopsApp';
  EntitySetName = 'alopsApps';
  SourceTable = "ALOPS App";
  ODataKeyFields = "App Id", Version;
  DelayedInsert = true;

  You, 18 days ago | 1 author (You)
  layout
  {
    0 references | You, 18 days ago | 1 author (You)
    area(Content)
    {
      0 references
      repeater(GroupName)
      {
        You, a month ago * v1
        0 references
        field(uid; "App Id")
        {
          Caption = 'uid';
          ApplicationArea = All;
        }

        0 references
        field(name; Name)
        {
          Caption = 'name';
          ApplicationArea = All;
        }

        0 references
        field(publisher; Publisher)
        {
          Caption = 'publisher';
          ApplicationArea = All;
        }

        0 references
        field(description; Description)
        {
          Caption = 'description';
        }
      }
    }
  }
}
```

artbourgeois/alops/beta/alopsApps'



ALOPS CATALOG

Search

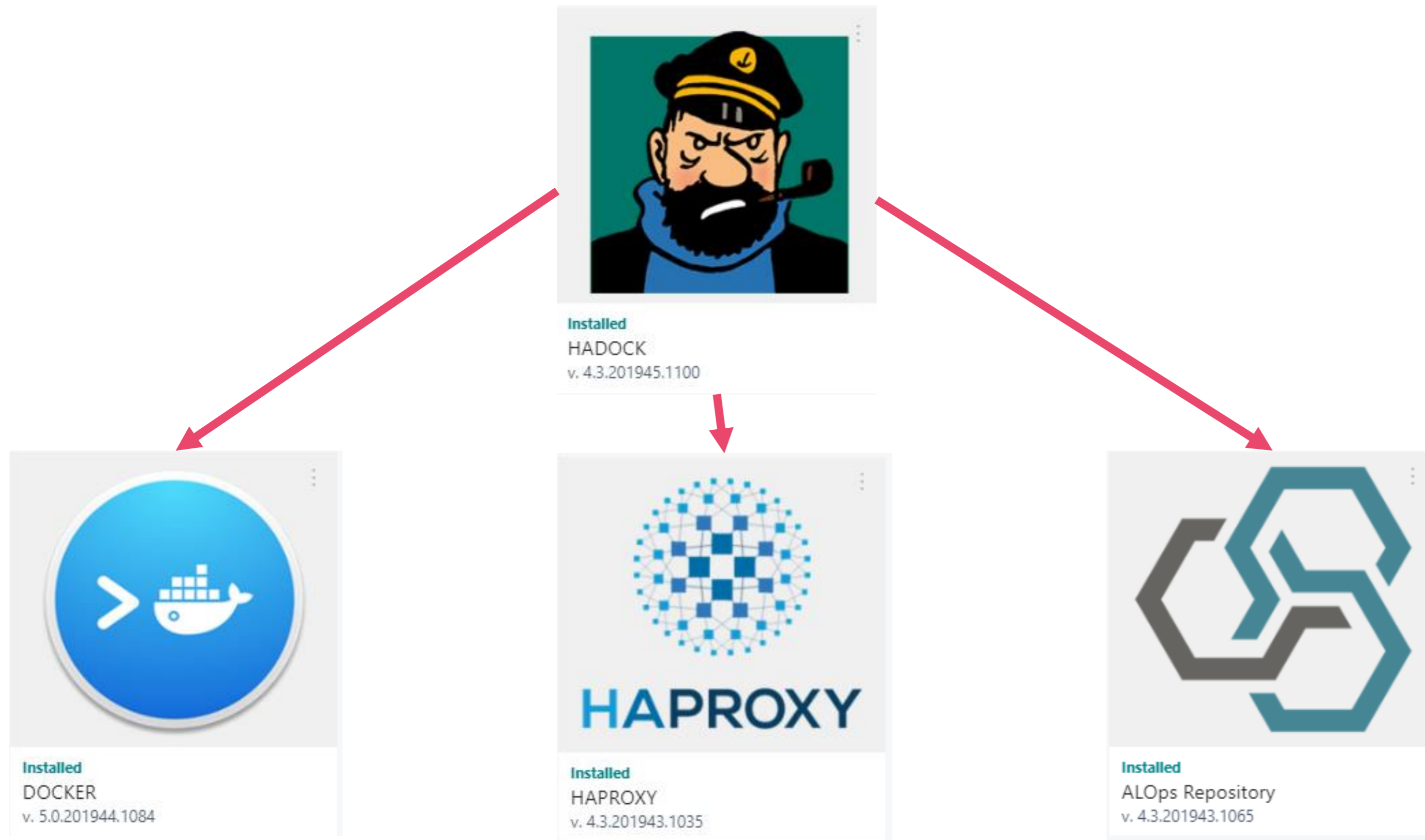
New

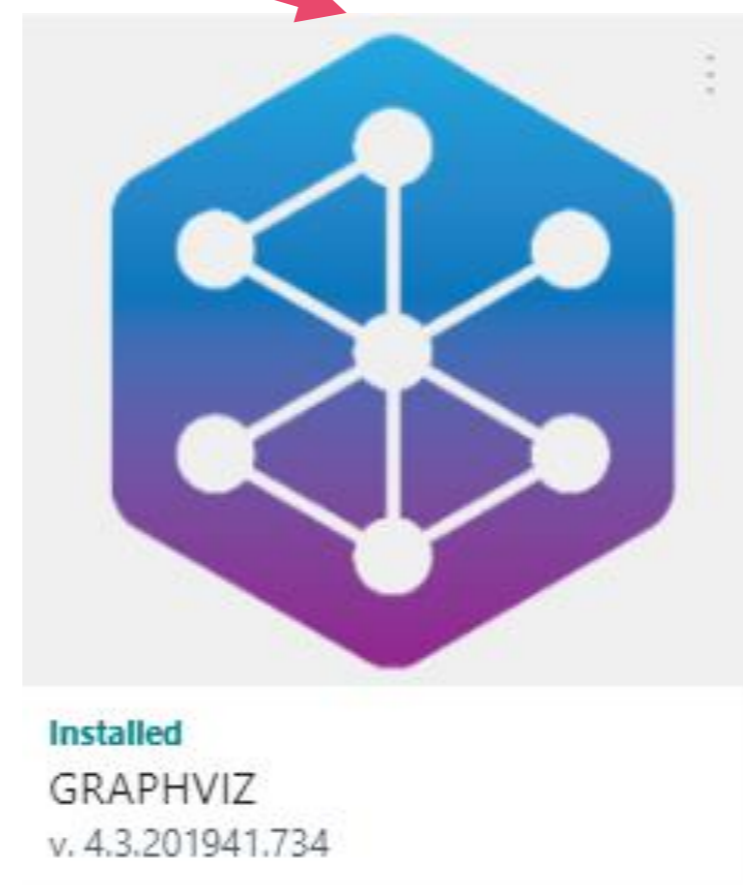
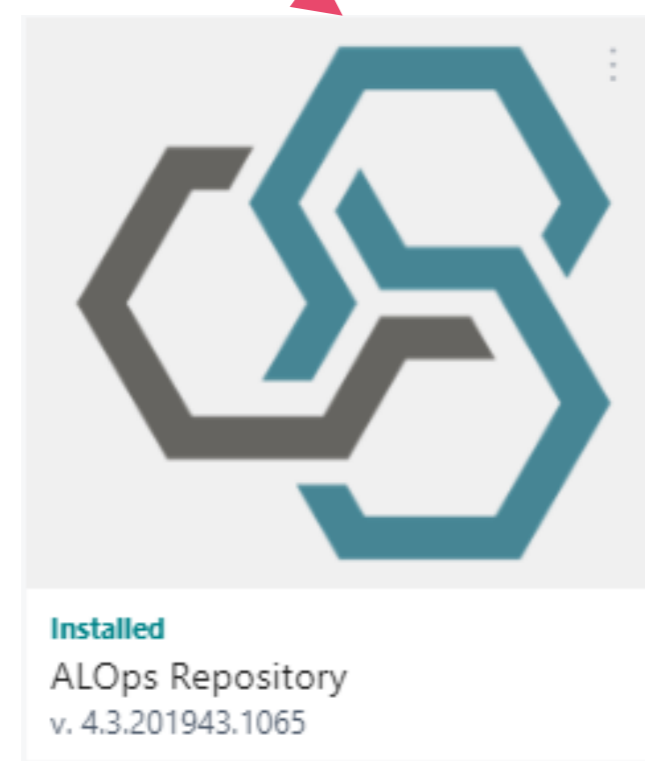
Manage

Open in Excel

More options

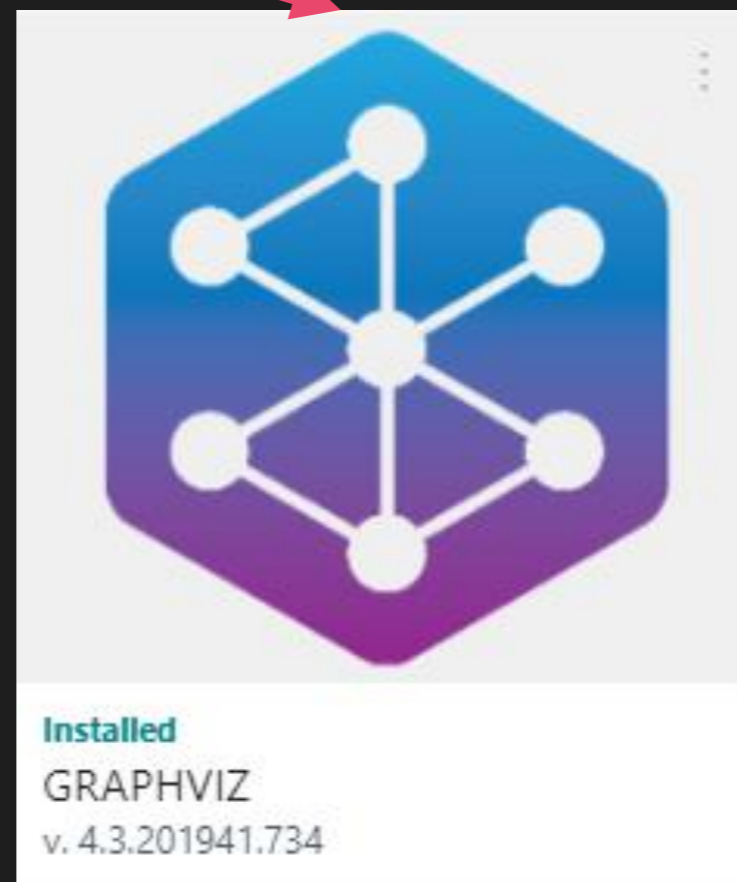
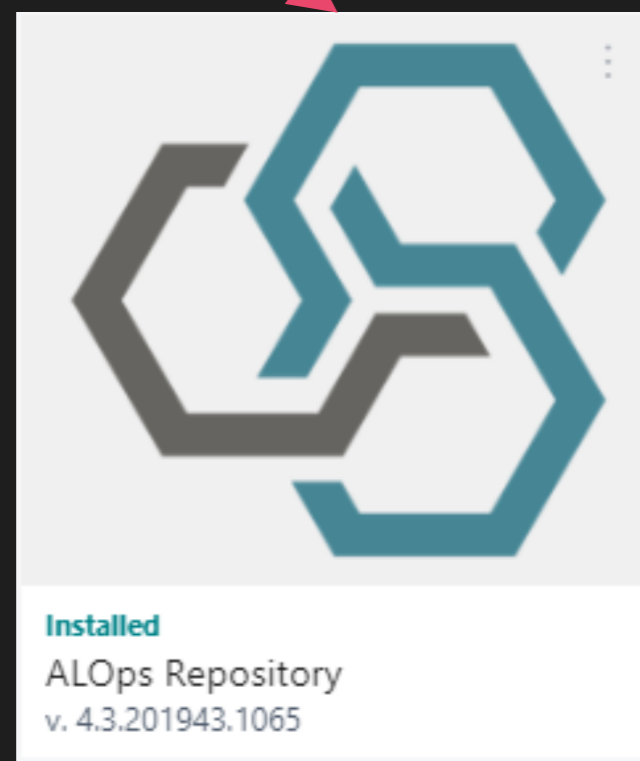
<div><div><div></div><div></div></div></div> <div><div><div>Exclude_APIV1_15.0.36560.0</div><div>Microsoft</div></div></div> <div>ONPREM</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>Exclude_APIV1_ Tests15.0.36560.0</div><div>Microsoft</div></div></div> <div>ONPREM</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>Exclude_ClientAddIns_15.0.36560.0</div><div>Microsoft</div></div></div> <div>EXTENSION</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>ALOps Repository4.3.201943.1065</div><div>Bart Bourgeois</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>AMC Banking 365 Fundamentals15.0.36560.0</div><div>Microsoft</div></div></div> <div>ONPREM</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>Any15.0.36560.0</div><div>Microsoft</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>Base Application15.0.36560.0</div><div>Microsoft</div></div></div> <div>ONPREM</div> <div>4.0</div>
<div><div><div></div><div></div></div></div> <div><div><div>BulkSMS4.3.201941.729</div><div>Bart Bourgeois</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>Business Central Intelligent Clo...15.0.36560.0</div><div>Microsoft</div></div></div> <div>ONPREM</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>Business Central Intelligent Clo...15.0.36560.0</div><div>Microsoft</div></div></div> <div>ONPREM</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>CompanyWeb4.0.201945.464</div><div>iFacto Business Solutions NV</div></div></div> <div>EXTENSION</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>CompanyWeb-TEST4.0.201945.464</div><div>iFacto Business Solutions NV</div></div></div> <div>EXTENSION</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>ControlCenter4.2.201940.843</div><div>iFacto Business Solutions NV</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>DISTRI-BASE4.0.201945.436</div><div>iFacto Business Solutions NV</div></div></div> <div>CLOUD</div> <div>4.0</div>
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<div><div><div></div><div></div></div></div> <div><div><div>DISTRI-SALESPURCH-TEST4.0.201945.445</div><div>iFacto Business Solutions NV</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>DISTRI-SCAN4.0.201945.418</div><div>iFacto Business Solutions NV</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>DISTRI-SCAN-TEST4.0.201945.418</div><div>iFacto Business Solutions NV</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>DOCKER5.0.201944.1084</div><div>Bart Bourgeois</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>Essential Business Headlines15.0.36560.0</div><div>Microsoft</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>Essential Business Headlines Test15.0.36560.0</div><div>Microsoft</div></div></div> <div>ONPREM</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>EVENTER4.3.201944.1080</div><div>Bart Bourgeois</div></div></div> <div>CLOUD</div> <div>4.0</div>
<div><div><div></div><div></div></div></div> <div><div><div>GRAPHVIZ4.3.201941.734</div><div>Bart Bourgeois</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>HADOCK4.3.201945.1100</div><div>Bart Bourgeois</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>HAPROXY4.3.201943.1035</div><div>Bart Bourgeois</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>INSIGHT4.2.201940.844</div><div>Bart Bourgeois</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>Intelligent Cloud Base15.0.36560.0</div><div>Microsoft</div></div></div> <div>ONPREM</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>Intelligent Cloud Base Tests15.0.36560.0</div><div>Microsoft</div></div></div> <div>ONPREM</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>ION4.2.201940.847</div><div>Bart Bourgeois</div></div></div> <div>CLOUD</div> <div>4.0</div>
<div><div><div></div><div></div></div></div> <div><div><div>KPI4.2.201940.424</div><div>Bart Bourgeois</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>KTN-FIN-BE2.0.201945.6537</div><div>Katoen Natie</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>KTN-FIN-BE-TEST2.0.201945.6537</div><div>Katoen Natie</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>KTN-FIN-REP2.0.201945.6541</div><div>Katoen Natie</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>KTN-FIN-REP-TEST2.0.201945.6541</div><div>Katoen Natie</div></div></div> <div>CLOUD</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>KTN-FIN-REST2.0.201945.6534</div><div>Katoen Natie</div></div></div> <div>ONPREM</div> <div>4.0</div>	<div><div><div></div><div></div></div></div> <div><div><div>KTN-FIN-REST-TEST2.0.201945.6534</div><div>Katoen Natie</div></div></div> <div>ONPREM</div> <div>4.0</div>
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OpenSource software
<https://www.graphviz.org/download/>
Has an API

Graphviz



```
1 reference
procedure MakeGraph(var GRAPHVIZRequest: Record "GRAPHVIZ Request")
var
    GRAPHVIZConfiguration: Record "GRAPHVIZ Configuration";
    RESTRequest: Record "REST Request";
    RESTTransaction: Codeunit "REST Transaction";
    GraphStream: InStream;
begin
    GRAPHVIZConfiguration.GetConfiguration();
    GRAPHVIZConfiguration.TestField("REST Endpoint UID");

    RESTTransaction.StartTransaction(GRAPHVIZRequest.RecordId(), 'Make Graph');

    clear(RESTRequest);
    RESTRequest."Endpoint UID" := GRAPHVIZConfiguration."REST Endpoint UID";
    RESTRequest.Method := RESTRequest.Method::Post;
    RESTRequest.SetBodyContent[MakeGraphCode(GRAPHVIZRequest)];
    RESTRequest.Insert(true);
    Commit();
    RESTRequest.InvokeAPICall();

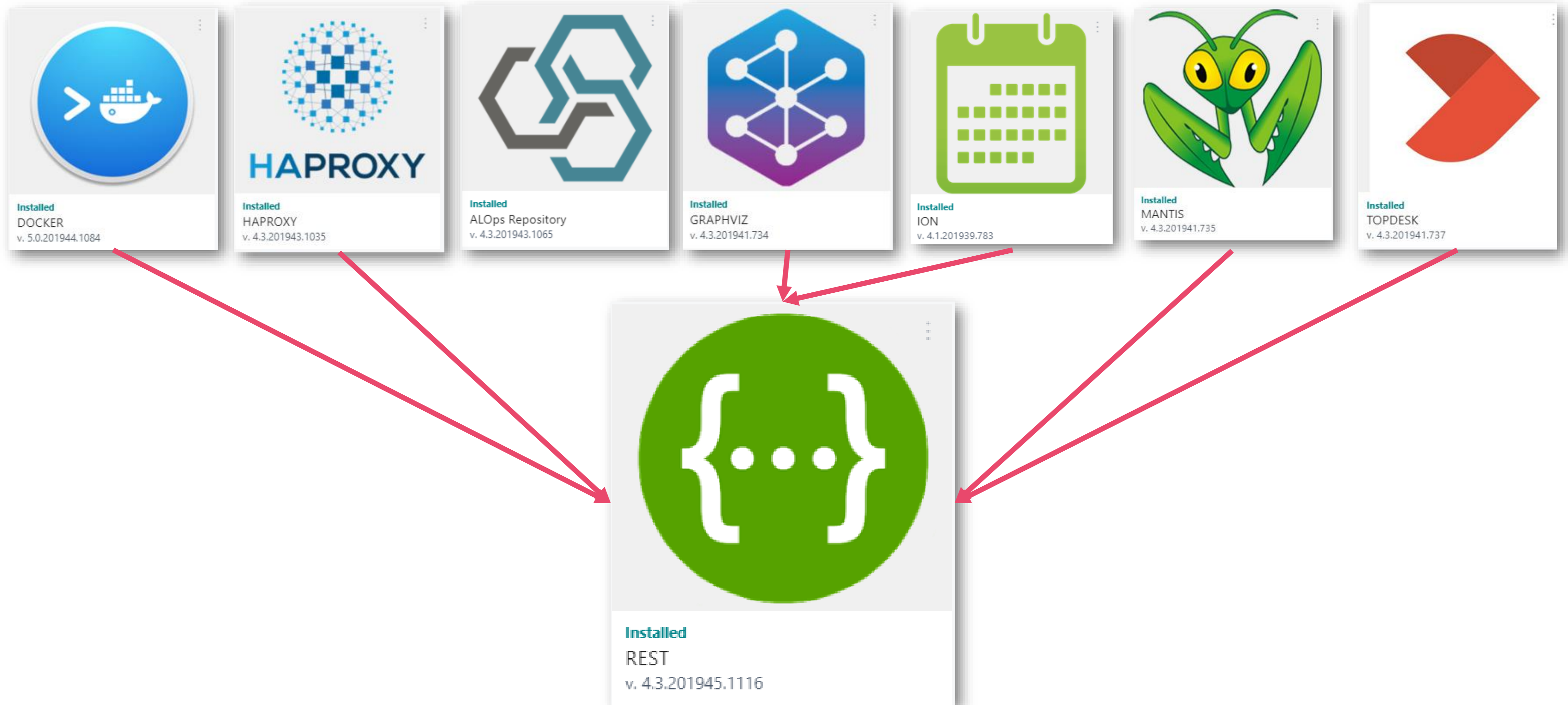
    RESTRequest.CalcFields("Response Blob");
    RESTRequest."Response Blob".CreateInStream(GraphStream);
    clear(GRAPHVIZRequest.Graph);
    if (GRAPHVIZRequest.Graph.Count() > 0) then
        GRAPHVIZRequest.Graph.Remove(GRAPHVIZRequest.Graph.Item(1));
    GRAPHVIZRequest.Graph.ImportStream(GraphStream, 'Graph');

    GRAPHVIZRequest."Graph Blob" := RESTRequest."Response Blob";

    GRAPHVIZRequest.Modify();
    Commit();

    RESTTransaction.StopTransaction();
```

REST



4 references

```
procedure InvokeAPICall(var DOCKERHost: Record "DOCKER Host"; Method: Text; ApiPath: Text; QueryString: Text; Content: Text) ResponseContent: Text;
var
    RESTRequest: Record "REST Request";
begin
    DOCKERHost.TestField("REST Endpoint UID");

    clear(RESTRequest);
    RESTRequest."Endpoint UID" := DOCKERHost."REST Endpoint UID";
    Evaluate(RESTRequest.Method, Method);
    RESTRequest."Relative Path" := ApiPath;
    RESTRequest."Query String" := QueryString;

    // Text Content
    if (StrLen(Content) > 0) then begin
        RESTRequest."Content Type" := 'application/json; charset=utf-8';
        RESTRequest.SetBodyContent(Content);
    end;

    if (NextTimeout > 0) then begin
        RESTRequest.Timeout := NextTimeout;
        clear(NextTimeout);
    end;

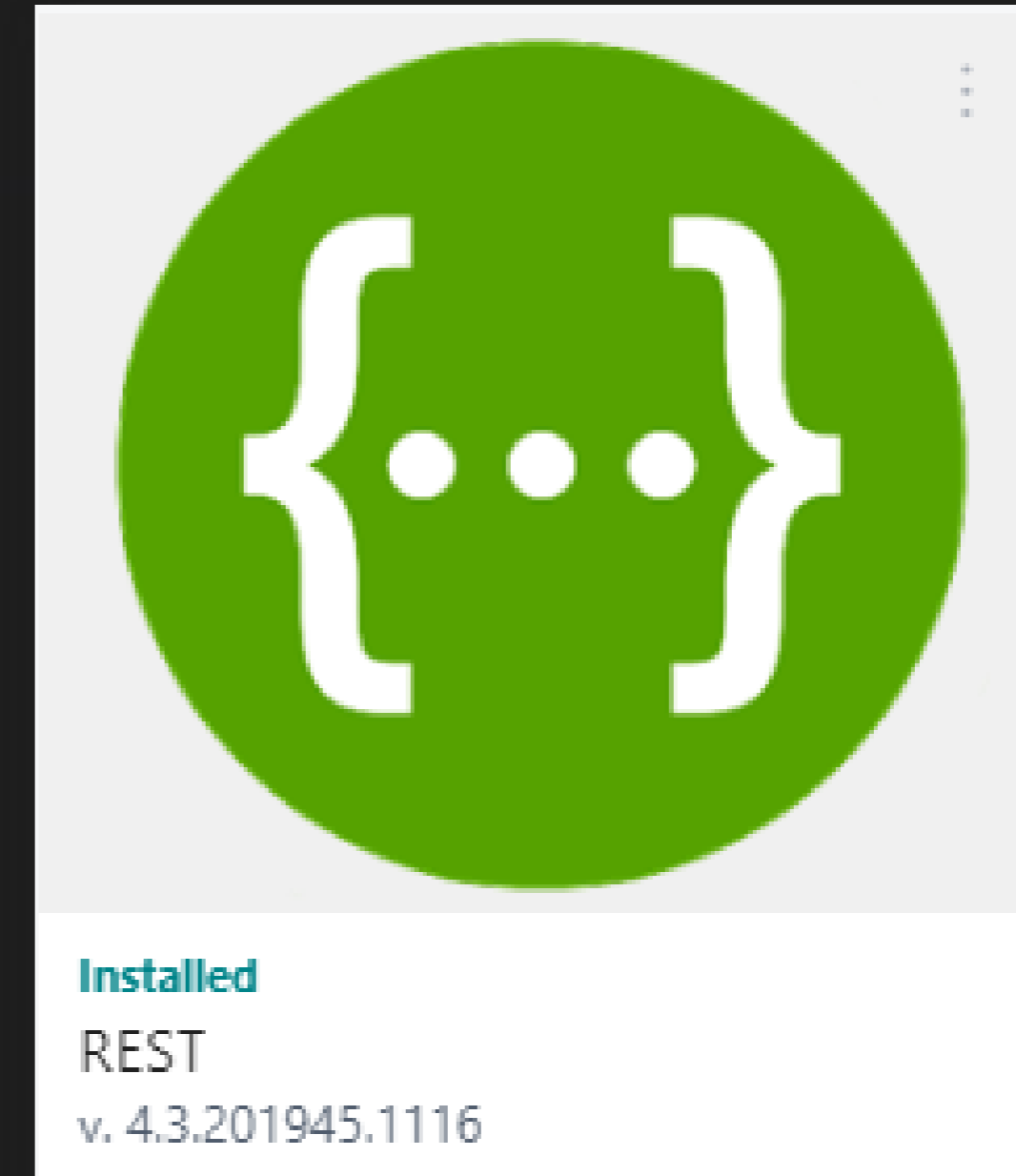
    RESTRequest."Ignore Error" := true;
    RESTRequest.Insert(true);
    Commit();

    ResponseContent := RESTRequest.InvokeAPICall();

    LastRESTRequest := RESTRequest;

    if (((RESTRequest."Response Status Code" < 200) or (RESTRequest."Response Status Code" > 299)) and (RESTRequest."Response Status Code" <> 304)) then
        Error(StrSubstNo('Status %1: %2', RESTRequest."Response Status Code", RESTRequest.GetResponseContent()));

    exit(ResponseContent);
end;
```



Don't miss ...



Wauters Eric (BE)
waldo.be



Babic Vjekoslav (HR)
Vjeko.com

Tomorrow 11am

{Connect app}²

LEVEL: 400 - EXPERT

SESSION

ROOM 8

What if you have to create an iOS or Android app, and safely connect it to NAV, with your own tables, in the cloud or OnPrem. We will show you the ins and outs to do just that, and even enable it with the prime of technology like AI and Cognitive Services to enable your app with what is needed to be ready for the future.

You know connect apps? When you hear Microsoft talk about those, they are always payroll, expense management, yadda-yadda, boring stuff. Bear with us - and forget about those! Connect apps can be fun, and we are about to convince you of that. And that's the first ten minutes of our session. The remaining eighty will be sheer fun, for us two, at least.

In this session we are taking you on a rollercoaster of technology integrations, including React Native, Azure functions, machine learning, cognitive services, and yes, there will be some Business Central, too. Our goal is to show you how to build a full-blown sexy (oh yeah!) mobile connect app that uses Business Central APIs in, well, let's settle for "unconventional" ways, shall we? We are pretty sure that what we build in front of you won't get past Microsoft's App Source marketing validation, but from the technical angle, it'll blow your socks off.

This session will be heavy on code, demos, and technology. Just keep count of how many languages we'll use to glue all that stuff together (Dutch and Croatian excluded).



Wauters Eric (BE)

waldo.be



Babic Vjekoslav (HR)

Vjeko.com

DotNet

Don't Net

Don't forget

Don't forget
In the future, on-premises will
follow the cloud rules

Some other more hands-on
development methodologies

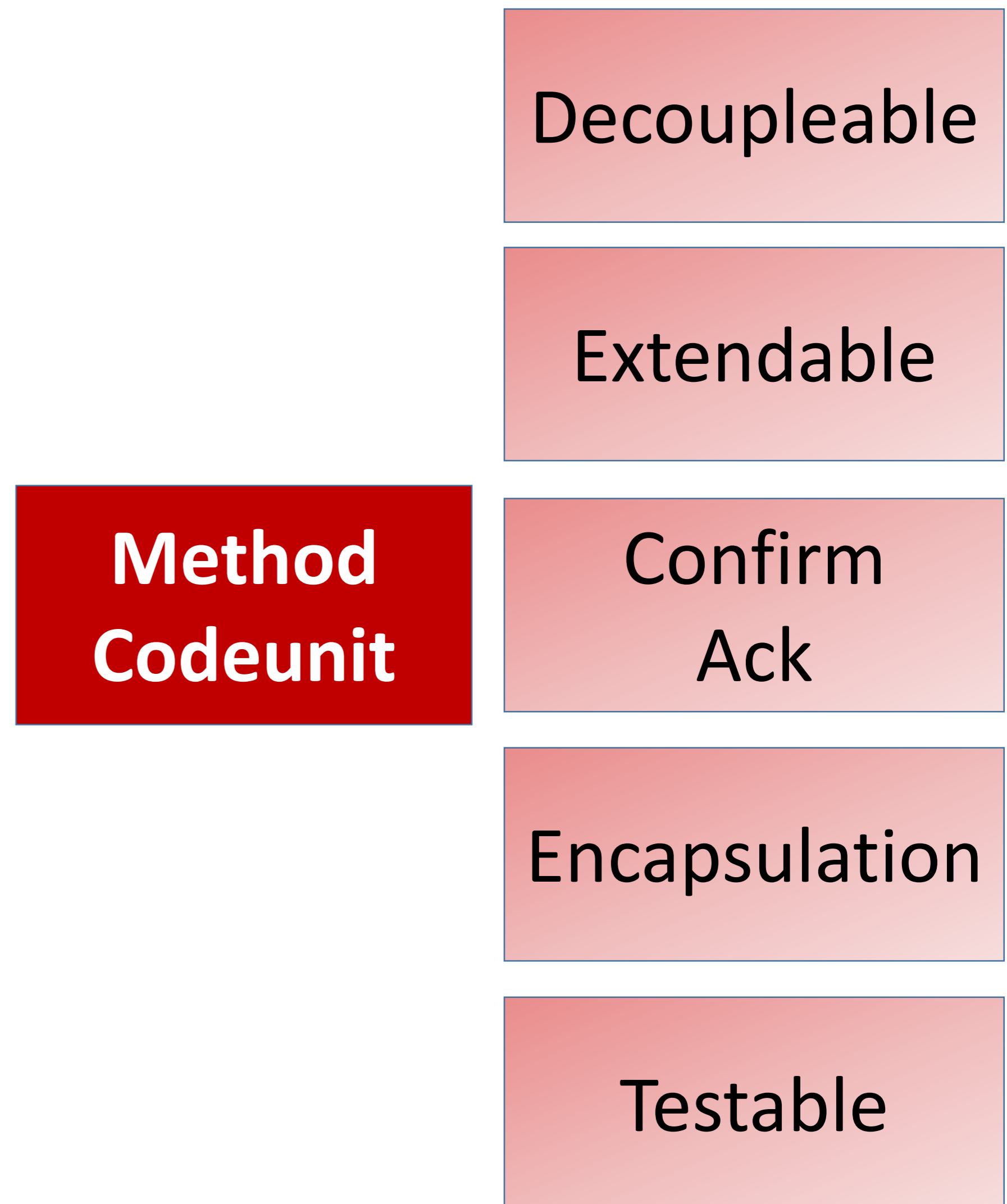
Where do we put business logic?

Where do we put business logic?

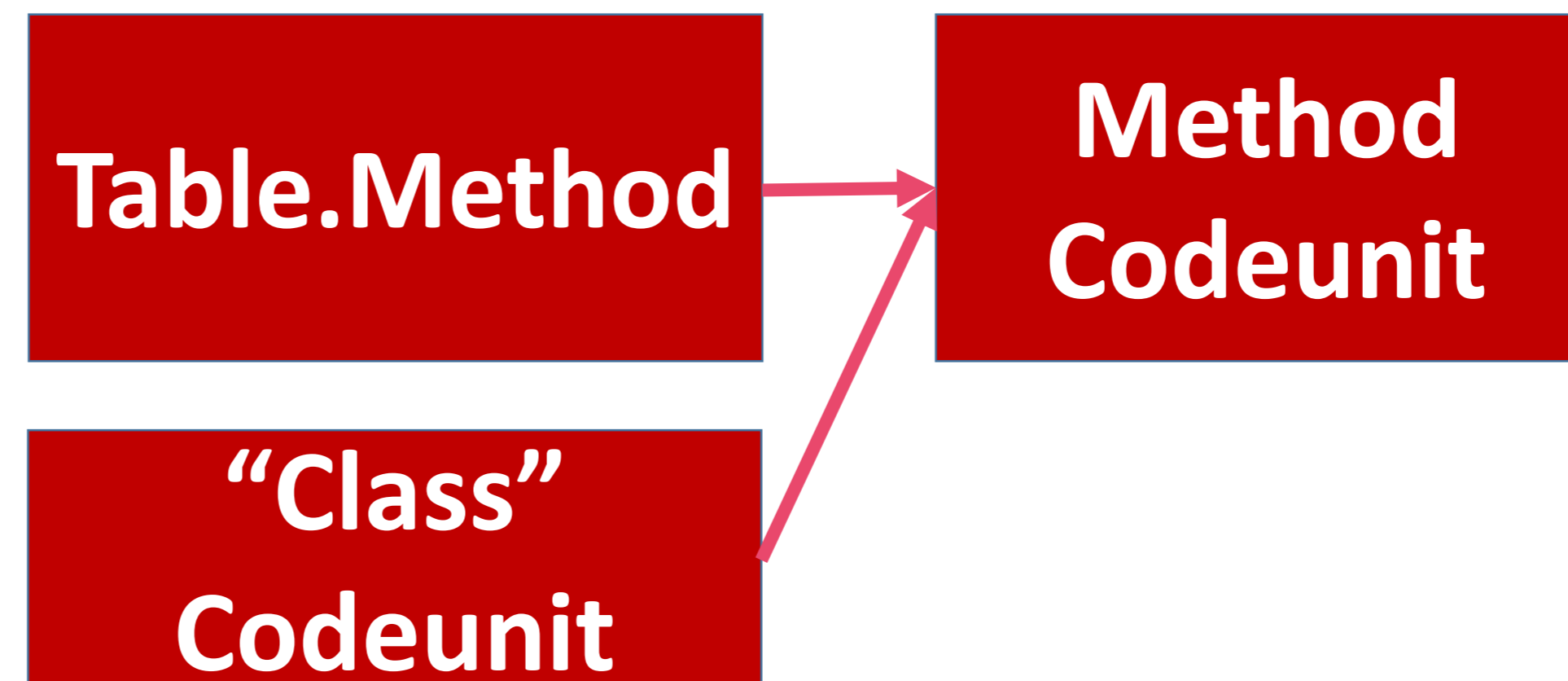


**Method
Codeunit**

Where do we put business logic?



Where do we put business logic?



Decoupleable

Extendable

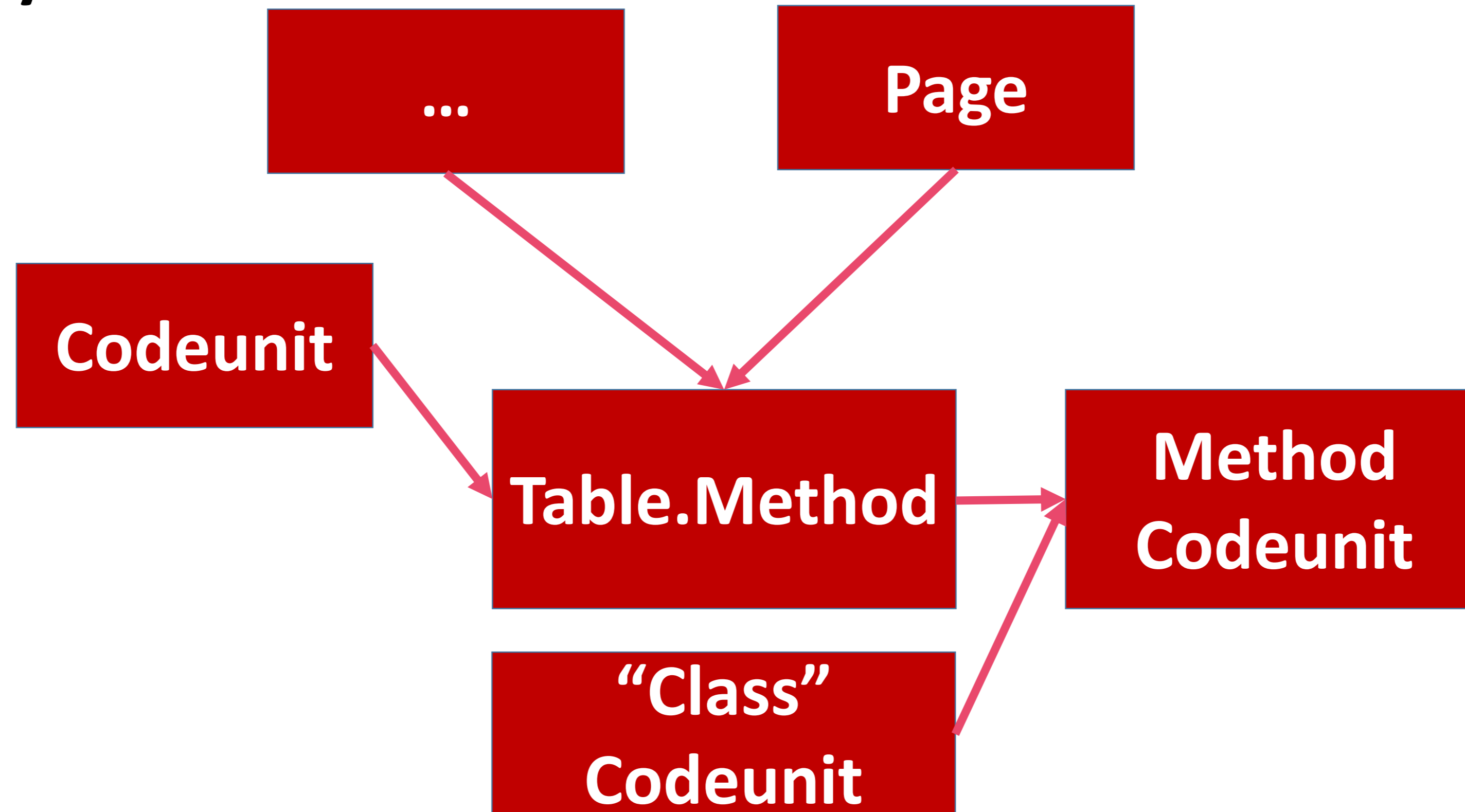
Confirm
Ack

Encapsulation

Testable

Where do we put business logic?

My Extension



Decoupleable

Extendable

Confirm
Ack

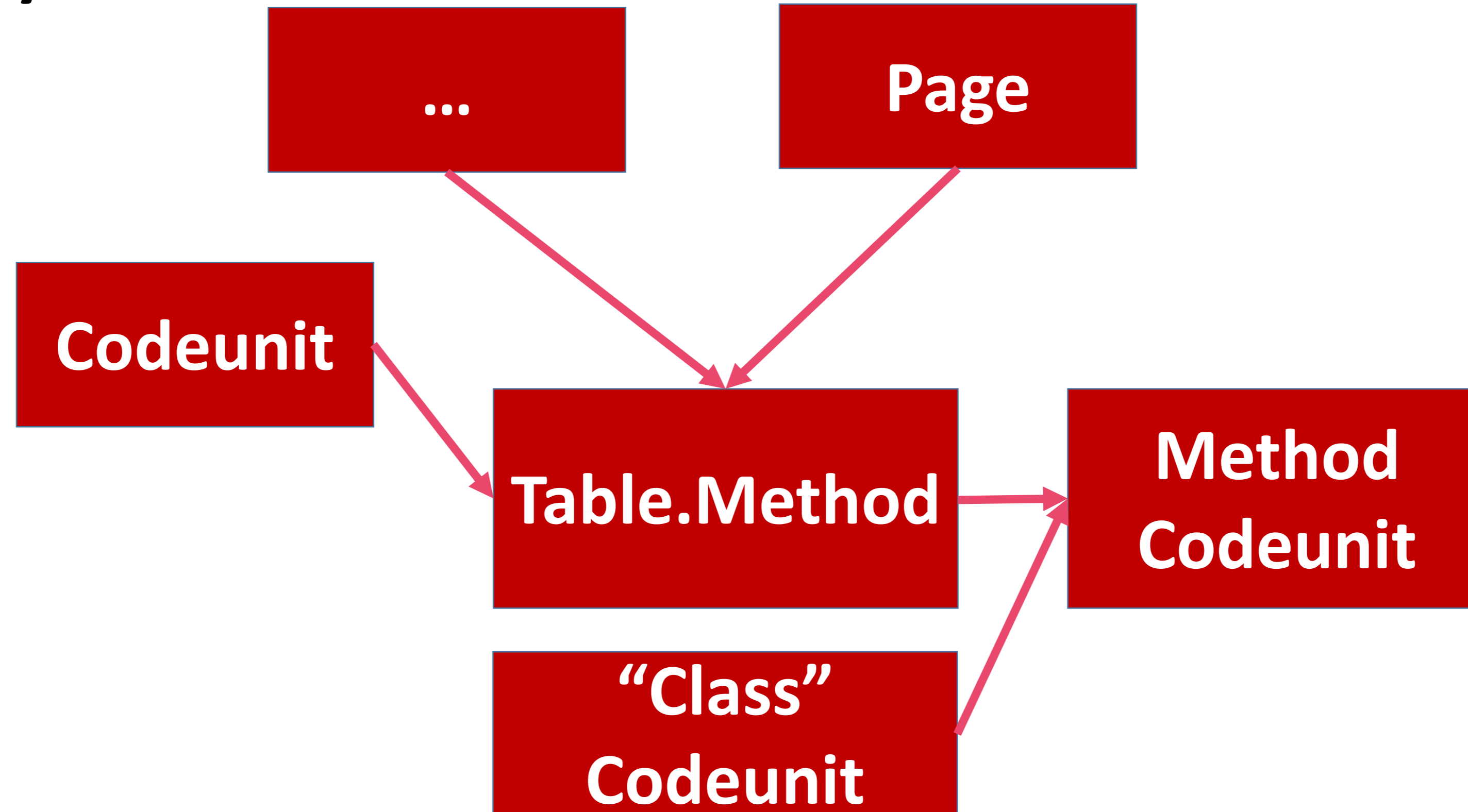
Encapsulation

Testable

Where do we put business logic?

**Dependent
Extension**

My Extension



Decoupleable

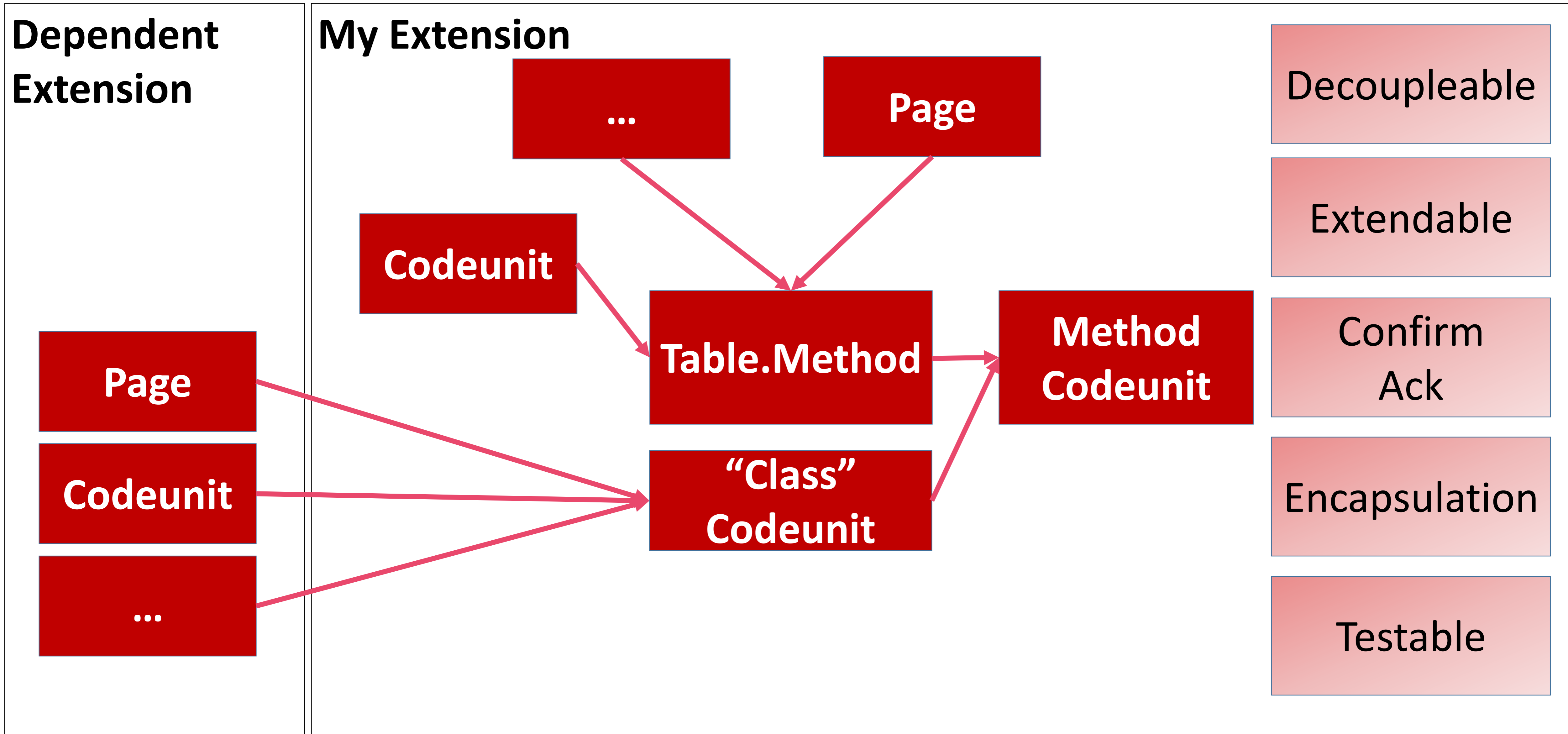
Extendable

Confirm
Ack

Encapsulation

Testable

Where do we put business logic?



Let's see this in practice

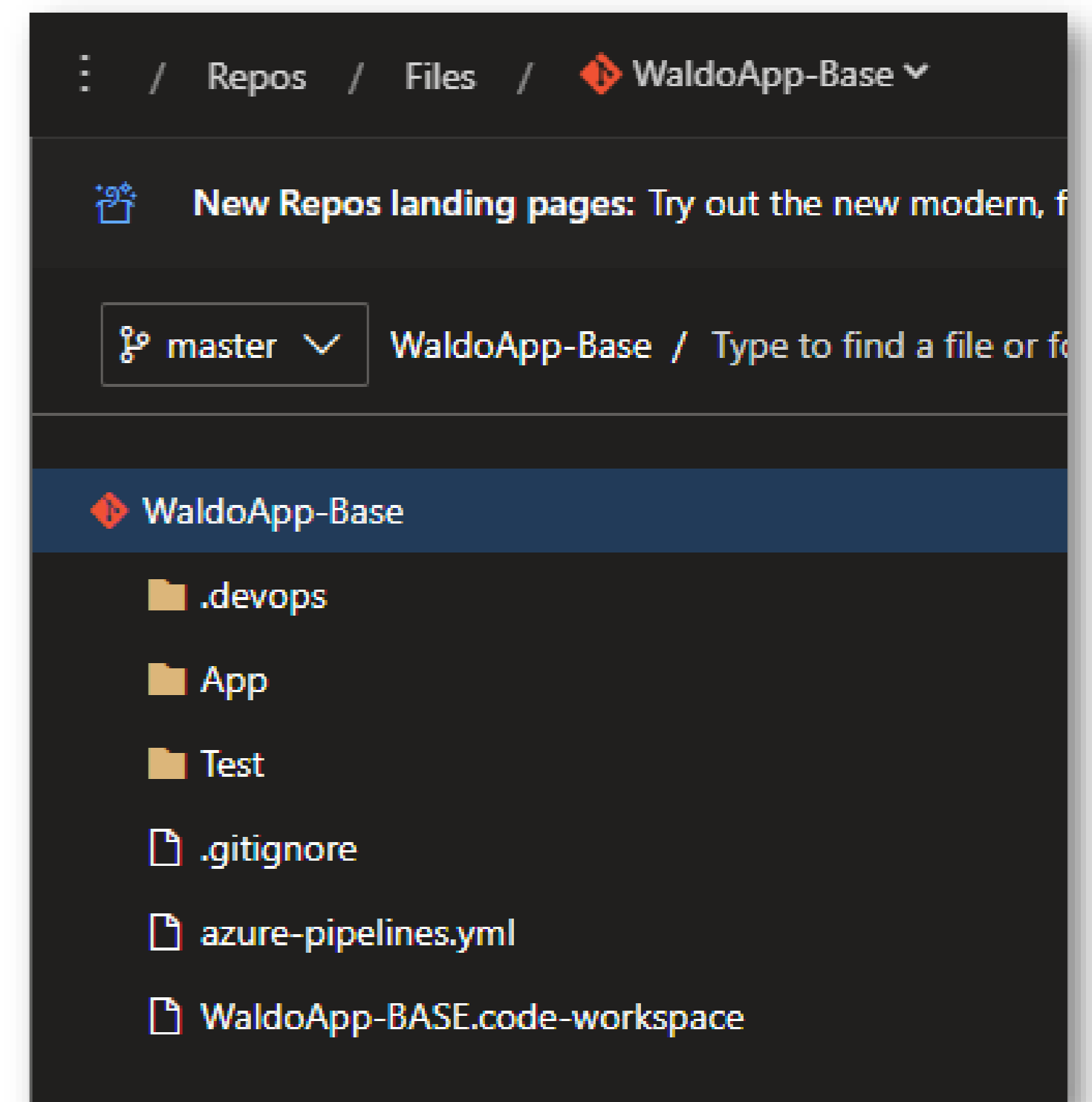


One App, One Repository

One Repo contains:

- The app
- The unit-test-app
- The pipeline
- The workspace settings
- ..

One App is responsible for himself, not for the ones that is dependent from it.



Test Driven Development

Code Review: No Test, No Approval

Unit Tests

- Methods
- Bugs
- In DevOps – only the app's tests will be executed

Integration Tests

- Tests when all apps in the db
- Also the methods – but altered if necessary
- Microsoft tests that make sense
- Separate app with dependencies to all apps that need to be integrated



Automated Testing in Microsoft Dynamics 365 Business Central

Efficiently automate test cases in Dynamics NAV and Business Central

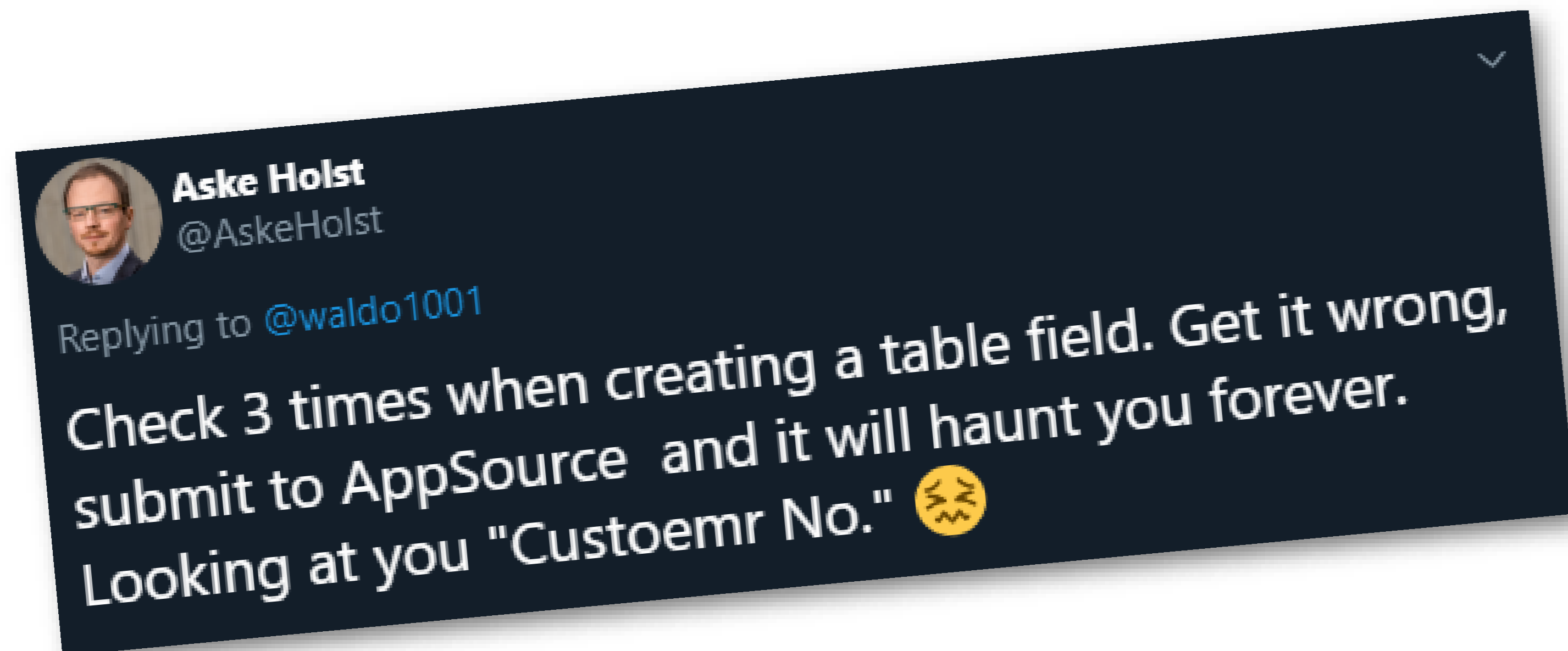
Luc van Vugt

Packt>

www.packt.com


Breaking Changes

There is no "force" when you need it...



Number Series

- Create a management tool to manage
 - Object Numbers
 - Field Numbers
- Make sure 1 person is doing 1 functional area at a time
- Never use object numbers in code.



```
[Test]
[HandlerFunctions('DisabledMethodMessage')]
0 references
procedure "Customer_BlockActionExecuted_CustomerIsBlocked"()
var
    Cust: Record Customer;
    LibrarySales: Codeunit "Library - Sales";
    Assert: Codeunit Assert;
    CustShouldBeBlockedErr: Label 'Customer Should be blocked';
begin
    // [GIVEN] Customer
    LibrarySales.CreateCustomer(Cust);
```

Translations

- At the end of a development cycle (sprint, release, ...)
- Automate as much as possible
 - lcs.dynamics.com
 - MultiLingual Editor
- Do not translate after each workitem
- Consider to put the translation-file in the .gitignore



```
.gitignore X
c:\> Users > EricWauters > Dropbo
Eric Wauters, 6 hours ago
1 *.zip
2 rad.json
3 launch.json
4 Base.g.xlf
5 *.app
6 *.g.xlf
7
```



mibuso.com

Development Methodologies

Don'tNet
Embracing Dependencies
Strict guidelines
No Test, no approval
Extendable patterns
Avoid breaking changes
When it's hard in al, it doesn't belong in al
...

WHO'S
YOUR
DADDY



I WILL FIND YOUR LACK



OF QUESTIONS DISTURBING

"Uuuuuuuuuur Ahhhhhrrrrr
Urrrr Ahhhhhrrrrr
Aaaargh..."



- Chewbacca

Questions



Is that
your lightsaber?



ARE YOU SURE...

I'M NOT YOUR FATHER?