Increase your BIM workflow productivity and quality using Vault custom applications

Darius Šimkūnas

BIM & Application strategist – collaboration platforms

Magnus Svensson

BIM & Application strategist – Autodesk Civil

AUTODESK. UNIVERSITY

About the speaker

Darius Simkunas

Darius Šimkūnas is the BIM & Application strategist at Tyréns AB. He focuses on collaboration platforms and Autodesk Civil products. Darius has over 15 years of experience with Autodesk, Inc. products, consulting and training employees. He was an Autodesk University speaker in 2013, 2014, 2015 and 2016. He has been working with AutoCAD Civil 3D software since 2005 and has a portfolio of functionalities for specific regional and company needs. He is an AutoCAD Civil 3D Certified Professional, has been a member of the Autodesk Developer Network (ADN) since 2008, and he has been working on infrastructure projects using new technology and methodology. Since 2012 Darius has been responsible for implementation of Vault software. As a project manager, he directly participates in the stages of implementation, resolution of strategic and technical issues, and product functionality enhancement according to the company's needs.

About the speaker

Magnus Svensson

Magnus Svensson is BIM and application strategist with focus on Autodesk civil products. He has been working on the development of functionalities and working methods in AutoCAD Civil 3D and Infraworks, holding educations and acting as BIM and application strategist and advisor in large infrastructure projects. Magnus is engaged in Swedish and international network for developing Civil 3D and Infraworks. He has special skills in parametric sections for corridor design in Civil 3D and 25 years of experience from different areas of civil design and IT management in large organizations.

Agenda

- About Tyréns
- Introduction to a future standard of a Vault project
- VDC/ICE/BIM workflow optimization – real project example
- Sharing Vault outside the company network
- Expanding Vault possibilities with API
- Integrating Vault with other systems, ensuring project quality
- Automating processes using Job servers
- Automate automated processes using schedulers
- Questions

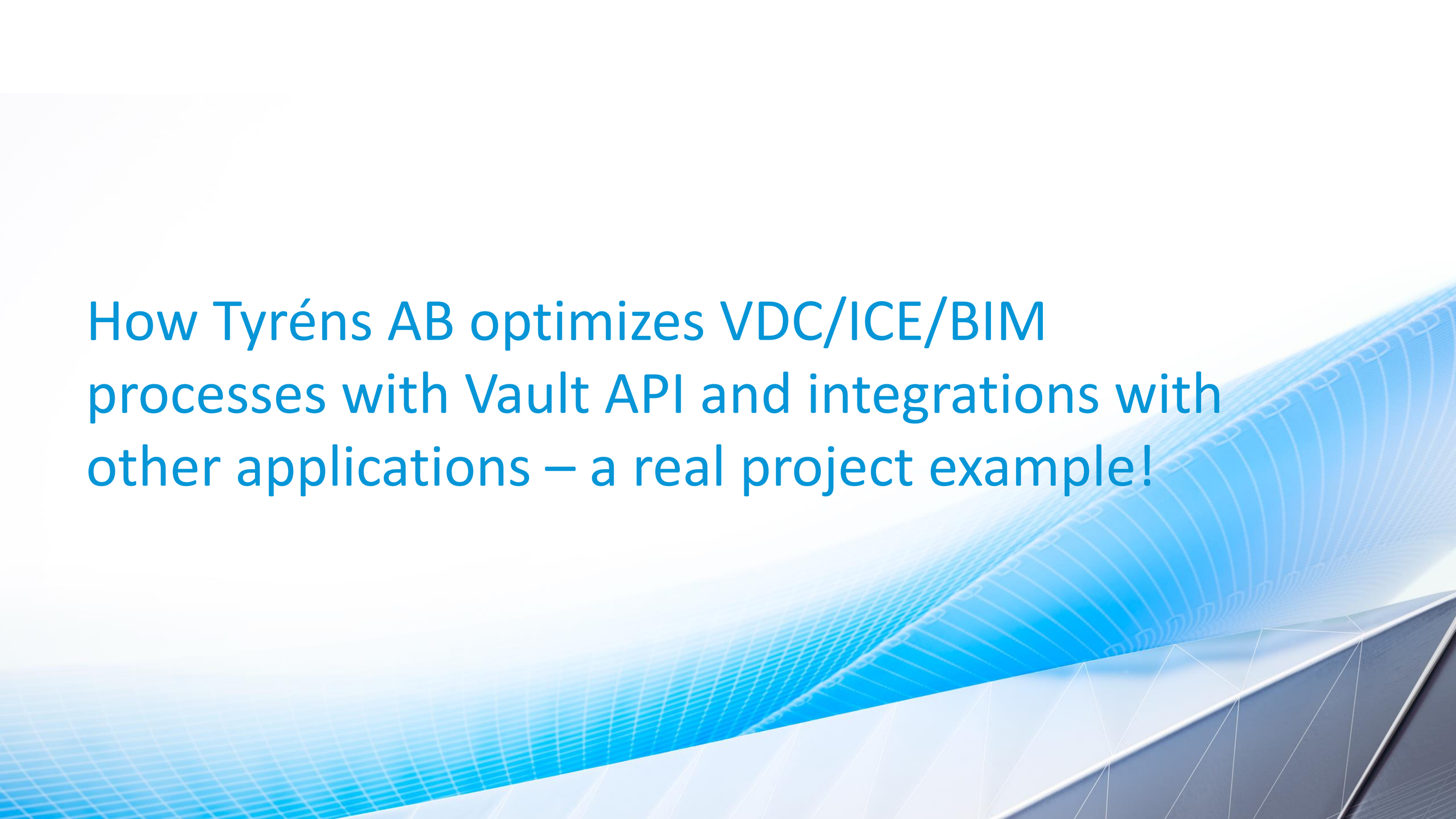
General information on Tyréns

Founded in 1940.
One of Sweden's leading multi-disciplinary consultancies
Specialists in urban planning and infrastructure
2,700 employees across Sweden, Denmark, the UK, Lithuania and Estonia
Offering custom solutions for sustainable development
Part of the international network SEEN with 6,000 experts

Most frequently used design software:

- Autodesk AutoCAD, **Civil 3D**, MEP
- Autodesk Revit
- Autodesk Navisworks
- Tekla
- Bentley Microstation, Power Civil / Rail Track, PW
- Bentley Navigator
- Esri ArcGIS
- **Autodesk Vault Pro**
- …

How Tyréns AB optimizes VDC/ICE/BIM processes with Vault API and integrations with other applications – a real project example!

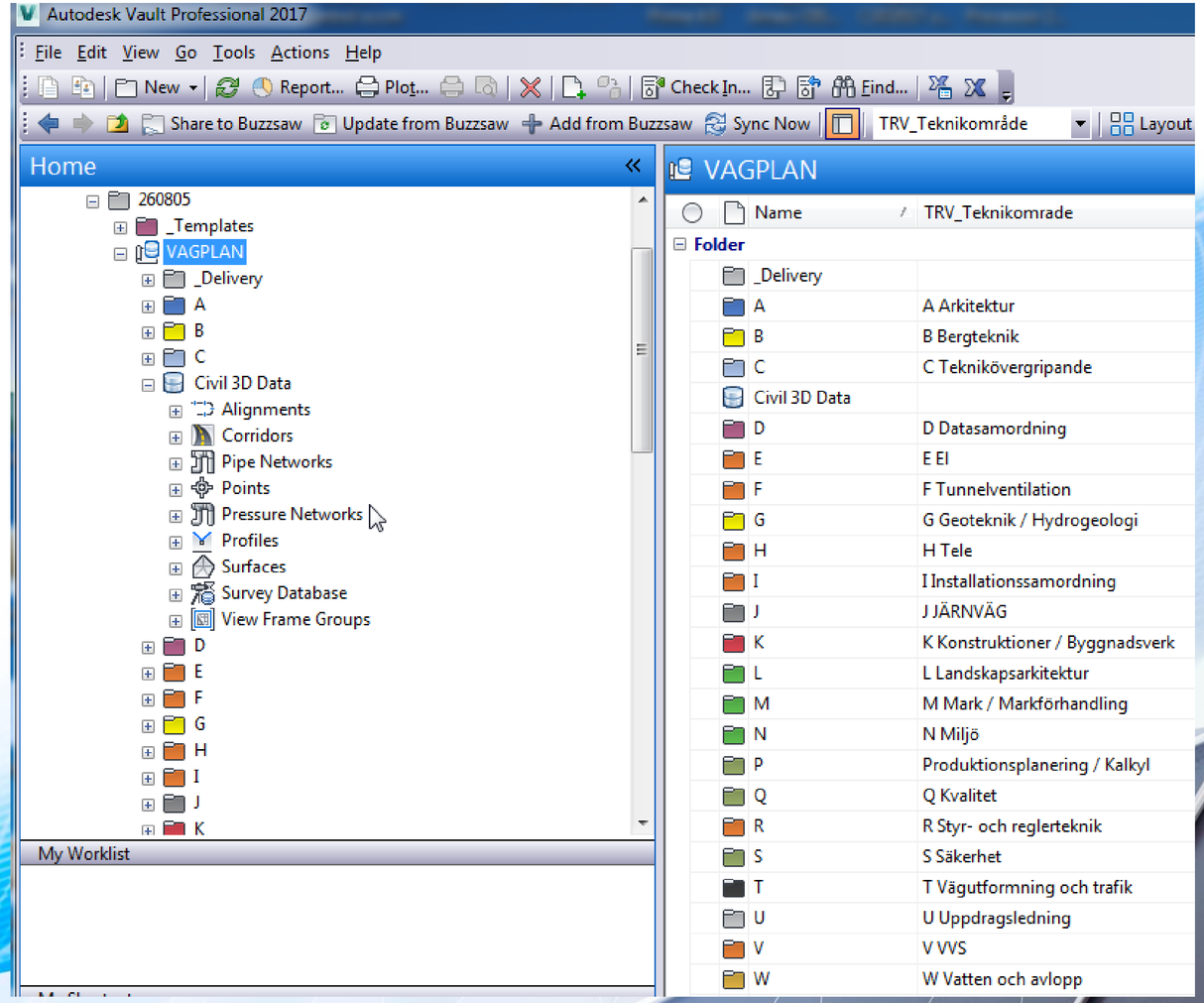


Bypass Södertörn

- **Vault** use since early-**2016**
- **Stage** – **preliminary design**
- New road length – 20 km (12.5 miles)
- **3+3 lanes highway**
- 3 main tunnels, length – over 5 km (3 miles)
- Up to **100 new bridges** and **overpasses**
- About **25** different **disciplines** involved in the project
- About **400 engineers** from different disciplines working on the project
- About **15** different **subcontractors** using Vault live from Sweden and abroad
- Customers use Vault for documents and model review.
- …

Bypass Södertörn statistic in Vault

- **~17,000 files.**
- **~120 GB**, latest versions only.
- **~4,000 DWG files** including **2,500 models**.
- **~4,000 Civil Data references** including over **2,000 shared surfaces**



Project demands

- <u>VDC/ICE working process</u>
- <u>ICE meetings and coordination models update once a week</u>
- **Model base delivery with drawings**
- **Classification system demands**
- Full team/project transparency for the client:
  - **access to the live model**
  - time reports
  - progress stage
  - meeting notes, etc.
- The client is part of the team with a special role.

Improving BIM workflow.
How to make a BIM model live?

What we need to get a live BIM model?

Data/Model management

- Single source of data 24/7

Cross-discipline collaboration

- Effective collaboration between disciplines

Classification system

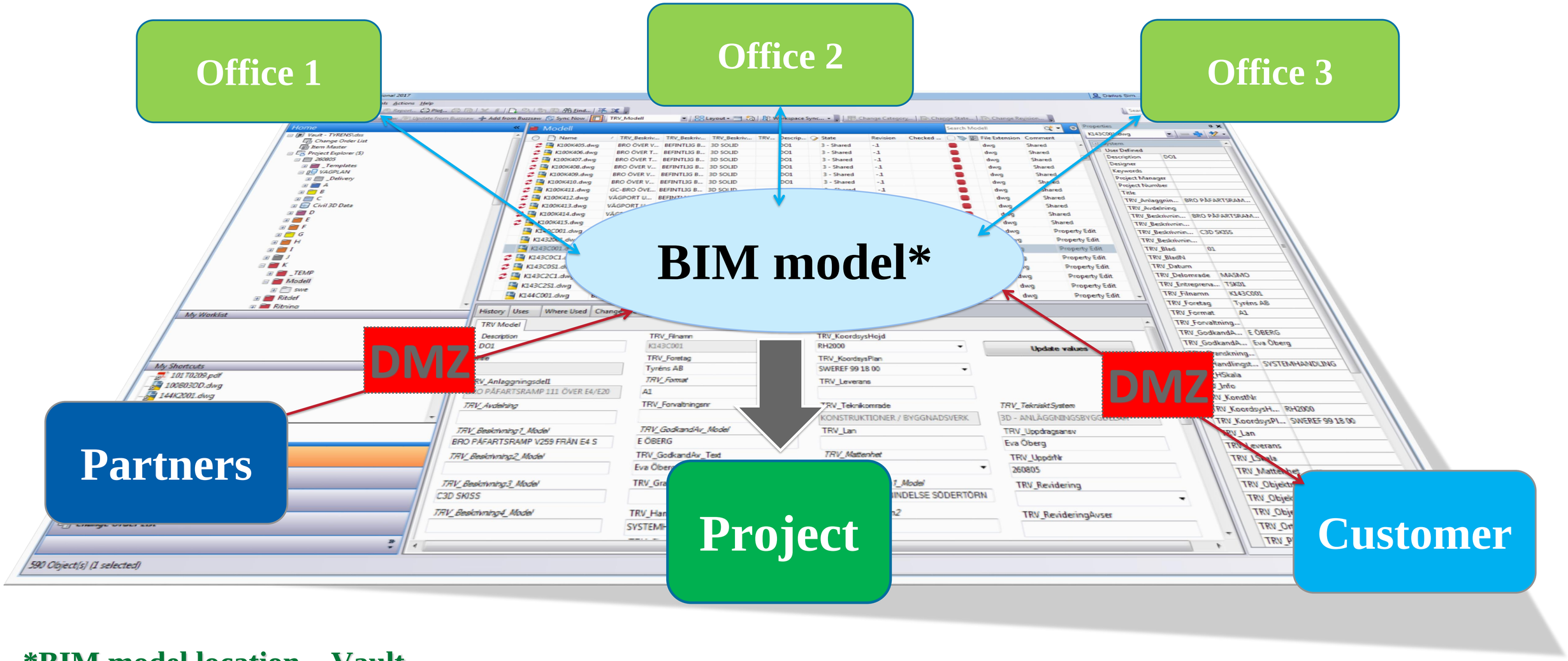
- Clear and easy to use automated control

CODES

Process automation

- Automate processes, avoid errors, ensure data relevancy

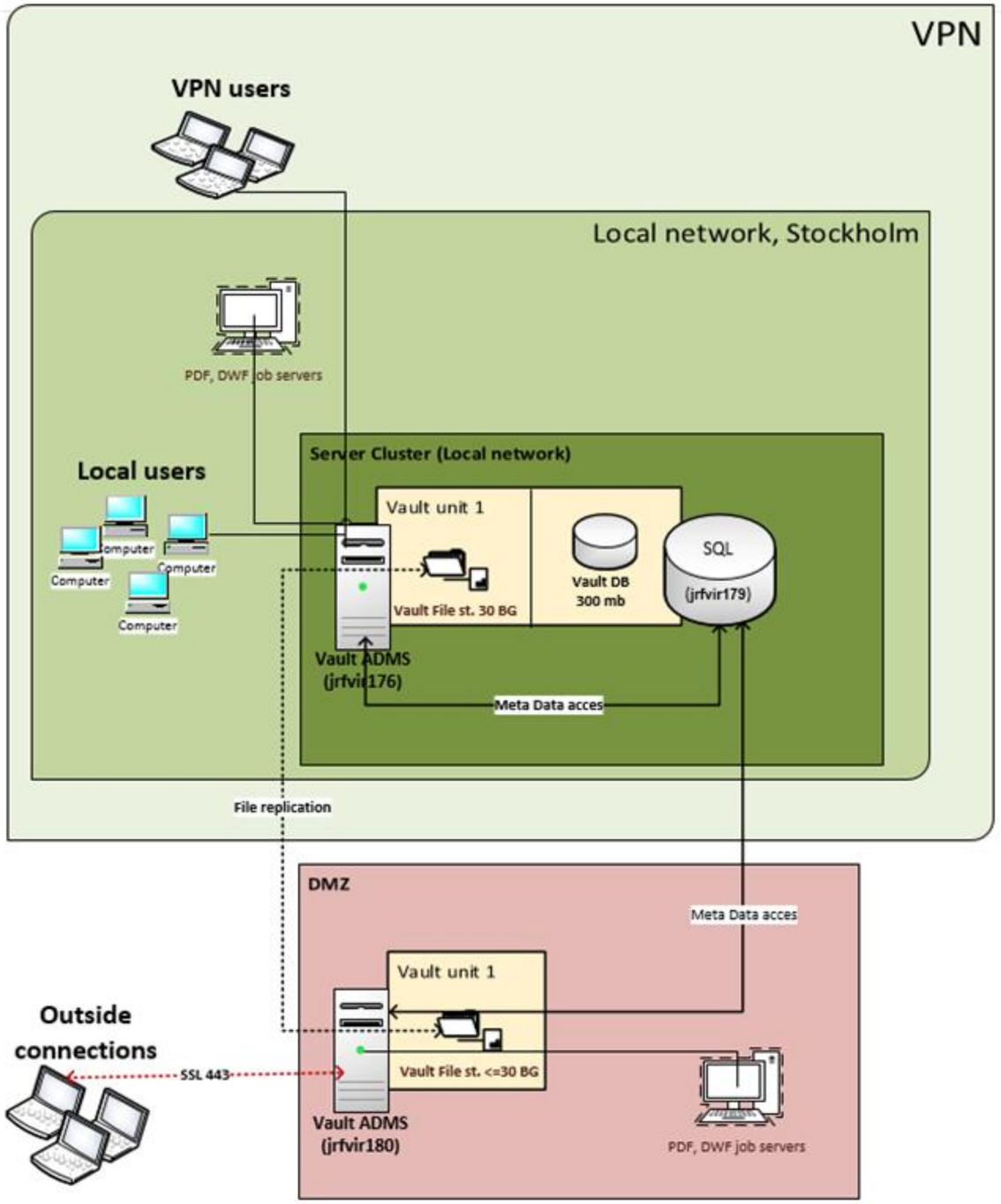
Data management – the entire project in a single place



*BIM model location – Vault

Sharing data with external partners and the client

- ADMS server on DMZ allows sharing Vault using the https protocol for external users in a secure way
- External partners work with Vault the same way as internal users
- We are using Vault to share templates, configurations files, etc.
- The Client can access the live model 24/7.



Coordination model – Navis works

Link to live model

Auto Covert

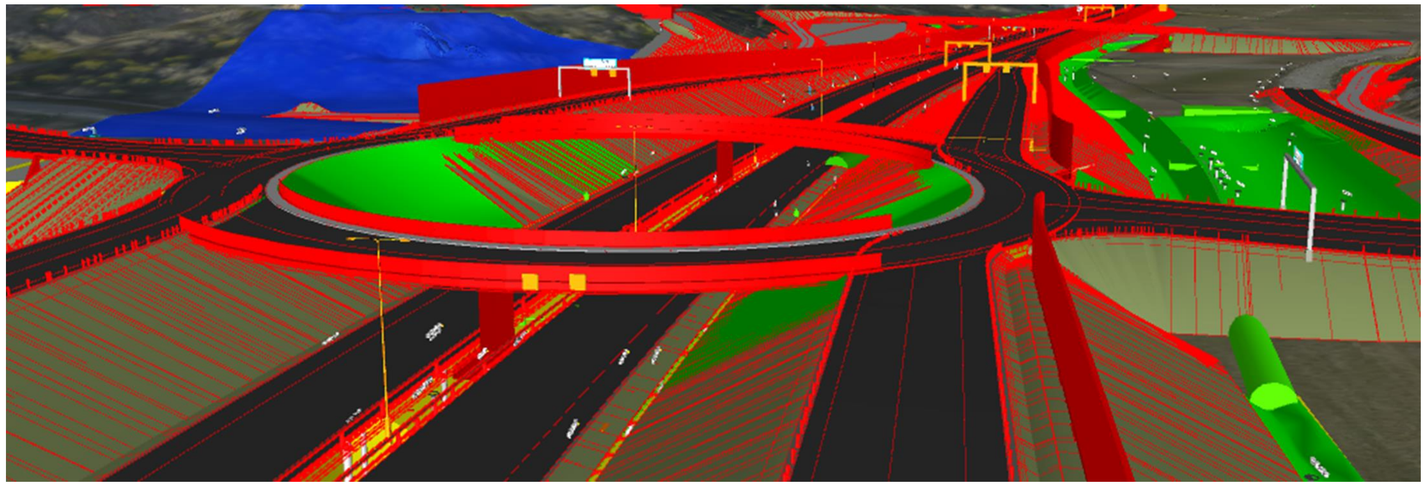
Manual Covert

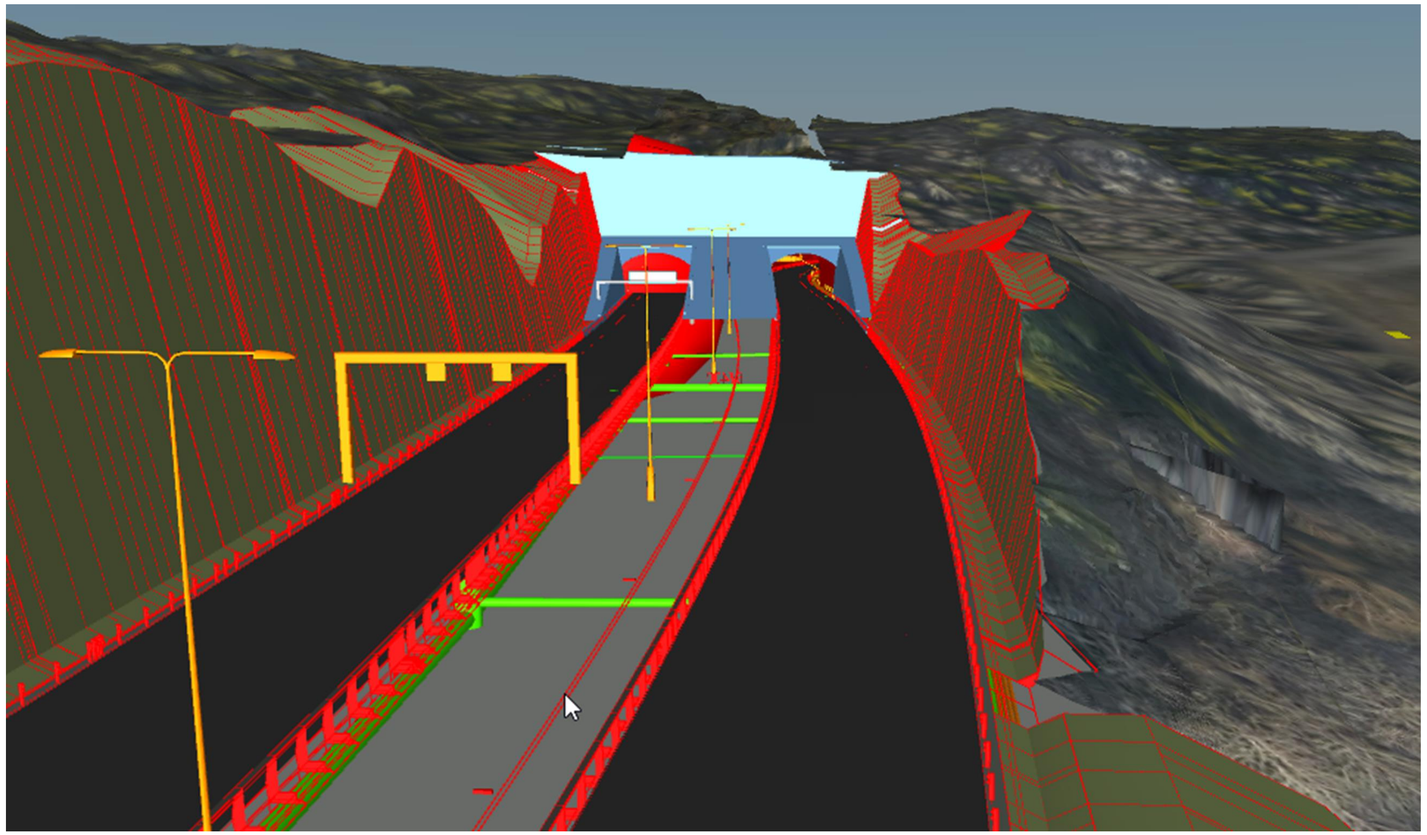
Source of information

Coordination model

Coordination model is not the final result, but a live source of information to make decisions and progress

- Main source of information for **live Civil 3D surfaces, alignments, corridors, pipe networks.**
- CAD 3D objects
- CAD 2D objects





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Cross-discipline collaboration – Level 1

Roads

Bridges

Pipes

Landscapes

Tunnels

Civil 3D model files

Surface DREF

Alignment DREF

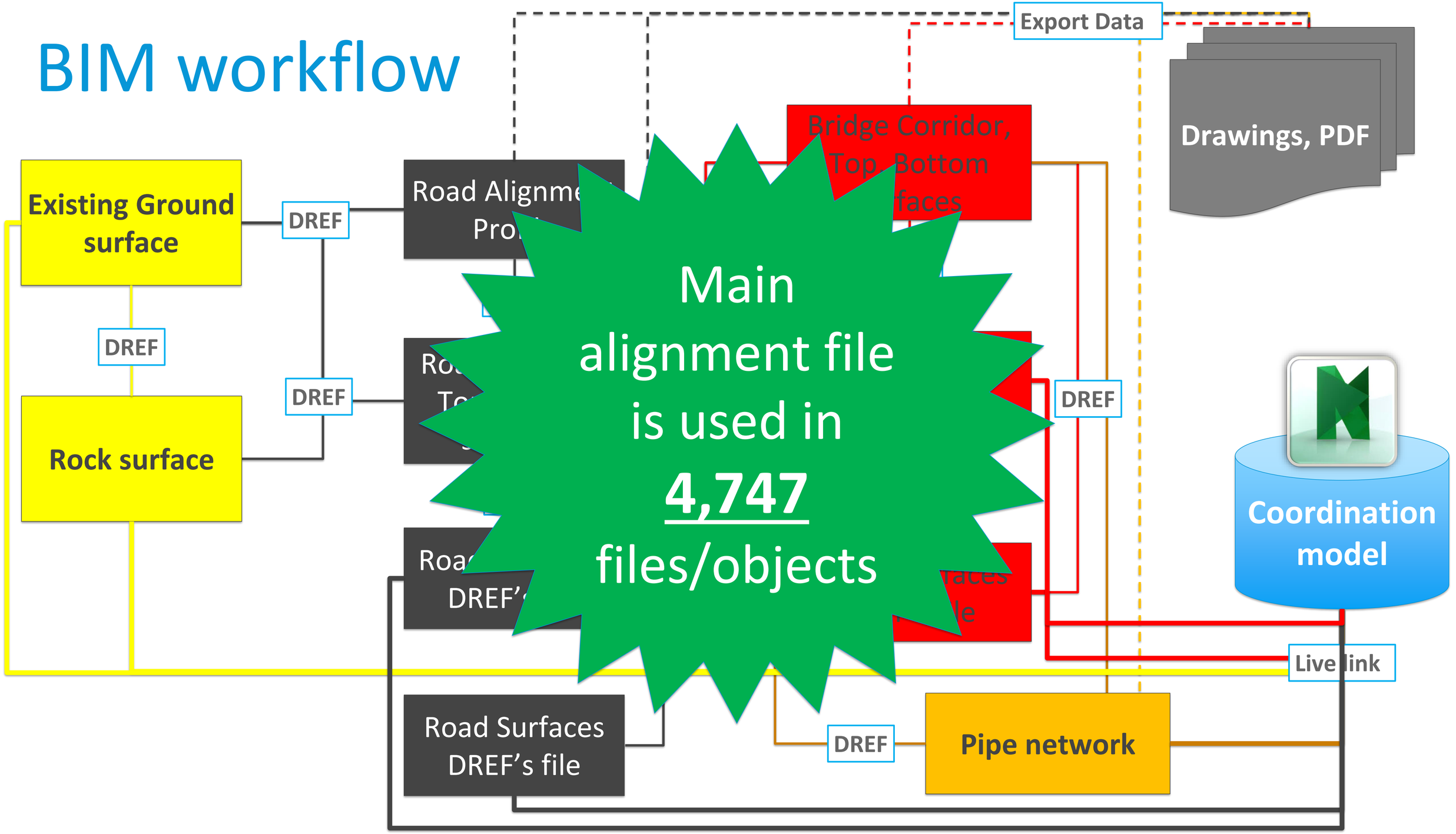
Corridor DREF

Pipe network DREF

Empty file with **Corridor** Drefs

Empty file with **Surface** Drefs

BIM workflow



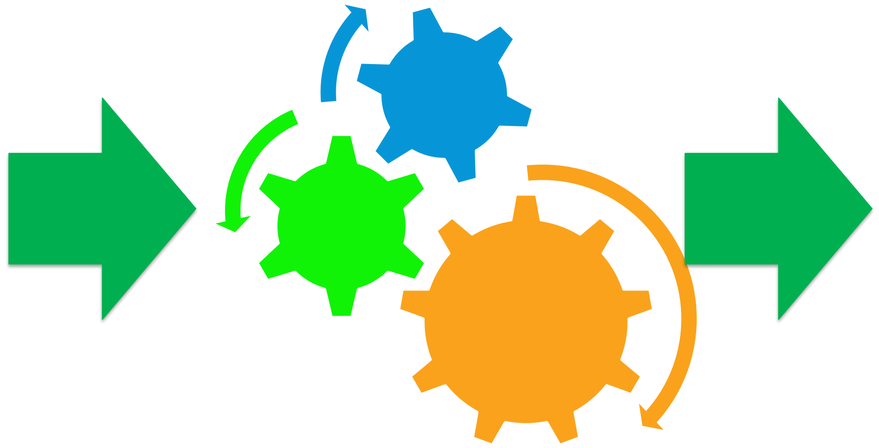
Cross-discipline collaboration – Level 2

Existing Ground or Rock surface input data

Laser scan

Measured information

Drill, scan information

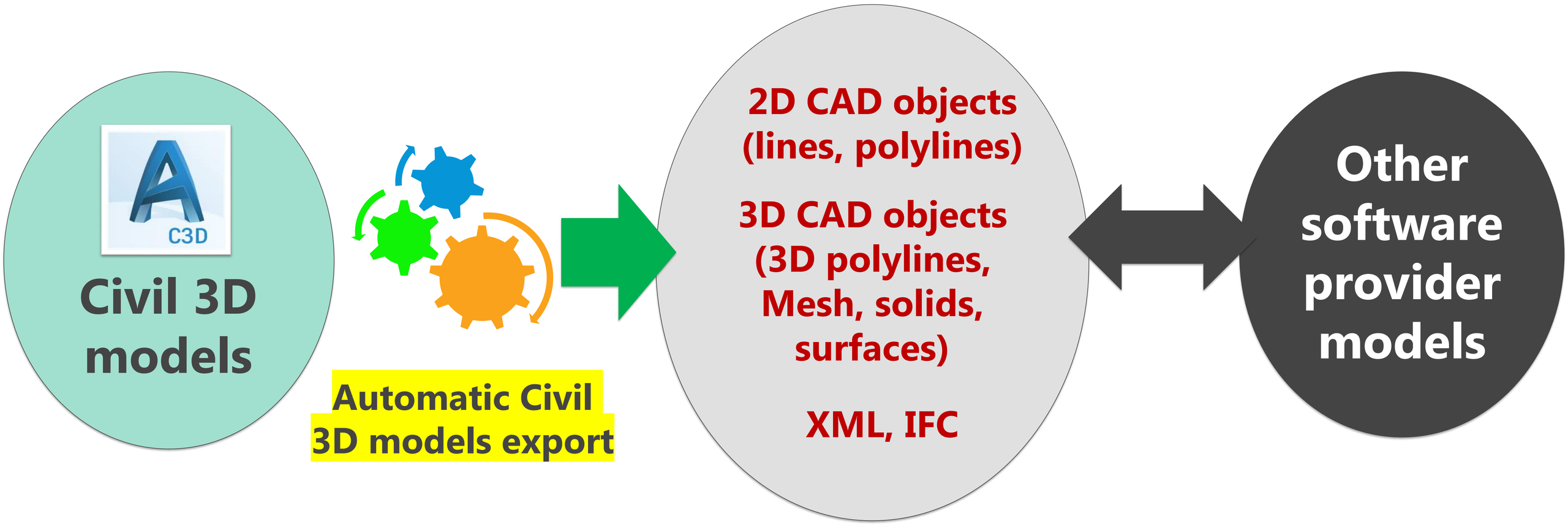


Automatic Civil 3D surface creation

Live Model collaboration

Civil 3D Surface

Cross-discipline collaboration – Level 3



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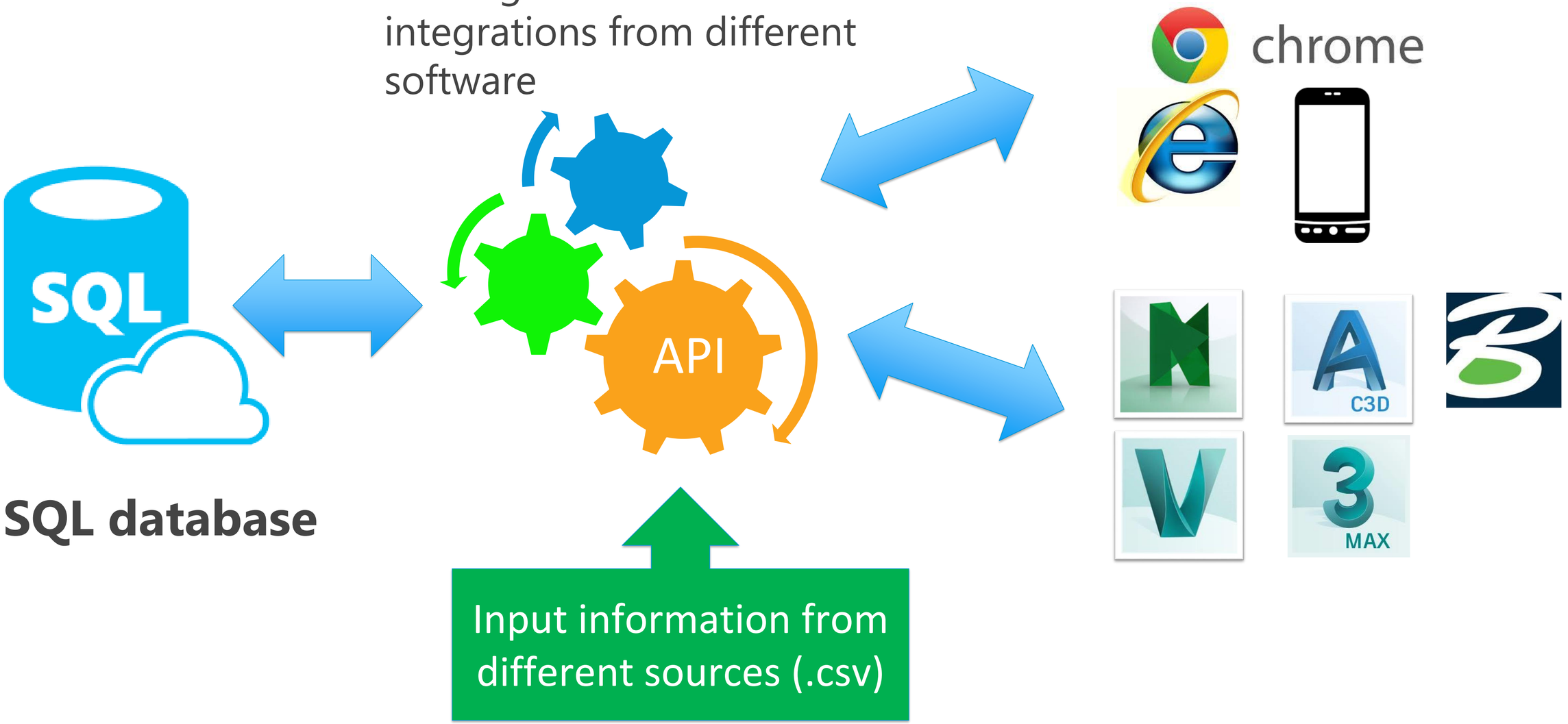
Classification system – Codes

API engines allow integrations from different software



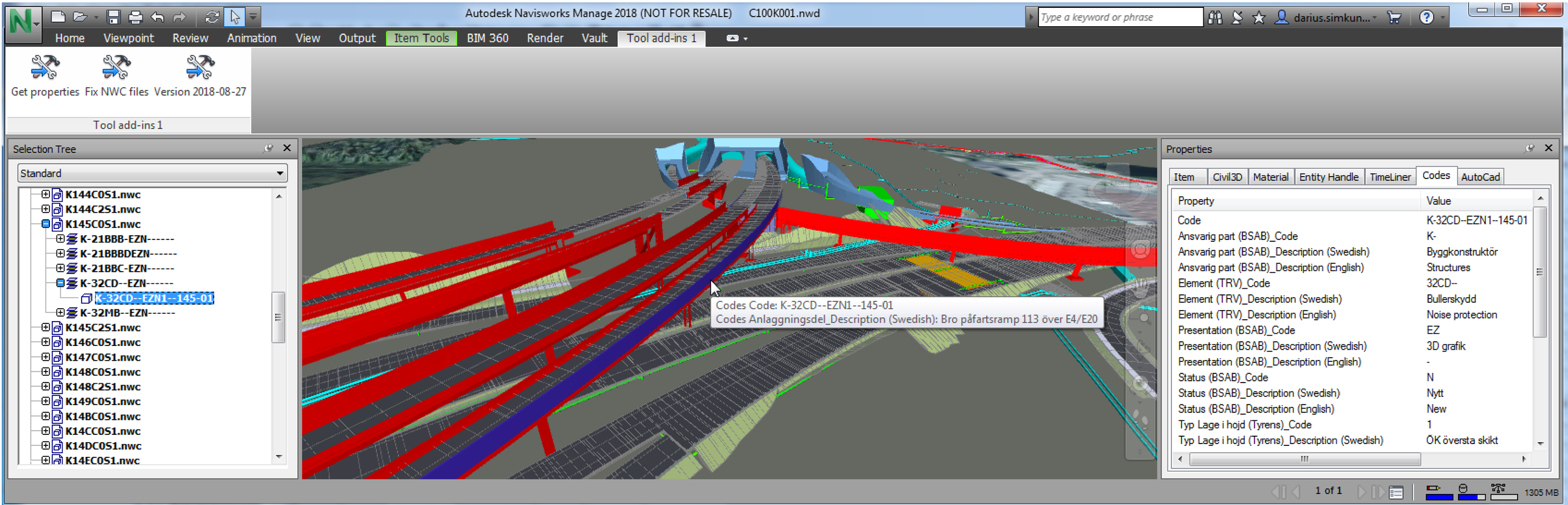
SQL database

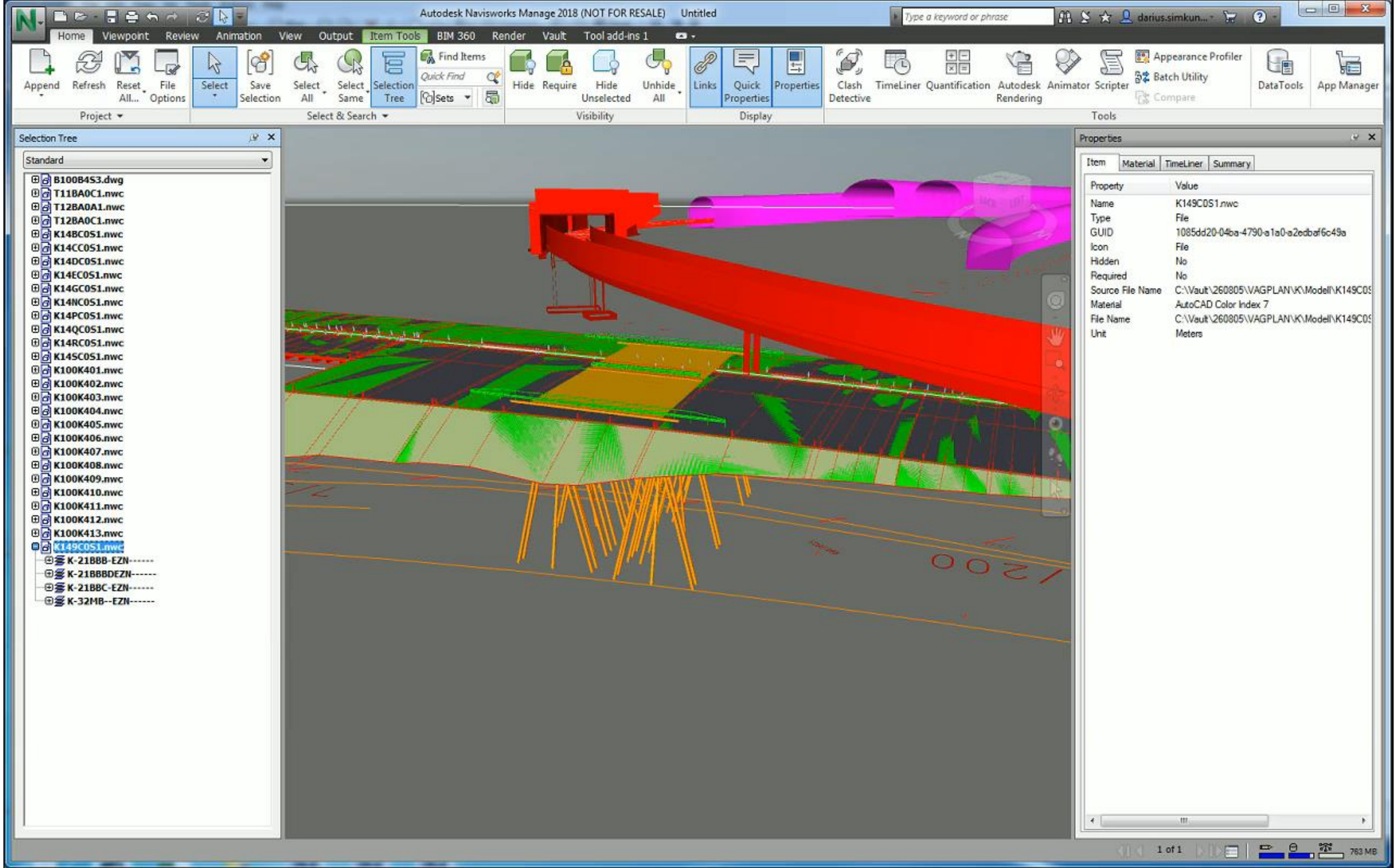
Input information from different sources (.csv)

Classification system and ICE meetings

K-32CD--EZN1--14G-01 ???

How to explain what it is to everybody in the meeting room?




Autodesk Navisworks Manage 2018 (NOT FOR RESALE) Untitled
Type a keyword or phrase
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Home Viewpoint Review Animation View Output Item Tools BIM 360 Render Vault Tool add-ins 1
Append Refresh Reset All... File Options
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Visibility
Links Quick Properties Properties
Display
Clash Detective TimeLiner Quantification Autodesk Rendering Animator Scripter
Appearance Profiler Batch Utility Compare
Tools
DataTools App Manager
Selection Tree
Standard
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T11BA0C1.nwc
T12BA0A1.nwc
T12BA0C1.nwc
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K149C0S1.nwc
K-21BBB-EZN------
K-21BBBDEZN------
K-21BBC-EZN------
K-32MB--EZN------
Properties
Item Material TimeLiner Summary
Property Value
Name K149C0S1.nwc
Type File
GUID 1085dd20-04ba-4790-a1a0-a2edbaf6c49a
Icon File
Hidden No
Required No
Source File Name C:\Vault\260805\VAGPLAN\K\Modell\K149C0S
Material AutoCAD Color Index 7
File Name C:\Vault\260805\VAGPLAN\K\Modell\K149C0S
Unit Meters
1200
1 of 1
763 MB

Classification system and TyrEngine

TyrEngine is a unique platform for visualizing sustainable spatial planning. By combining advanced graphics techniques from the world of gaming, a 3D environment is produced that demonstrates the results and impacts of projects in spatial planning, property and industrial developments.

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2017-06-01 15:00
Latitude: 64.430
Longitude: 20.702
Elevation: 174 m ASL
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3D VISUALISERING I REALTID FRÅN TYRÉNS

What we need to have a live BIM model?

Data management

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Cross-discipline collaboration

- Effective collaboration between disciplines

Classification system

- Clear and easy to use, automated control

CODES

Process automation

- Automate processes, avoid errors, ensure data relevancy

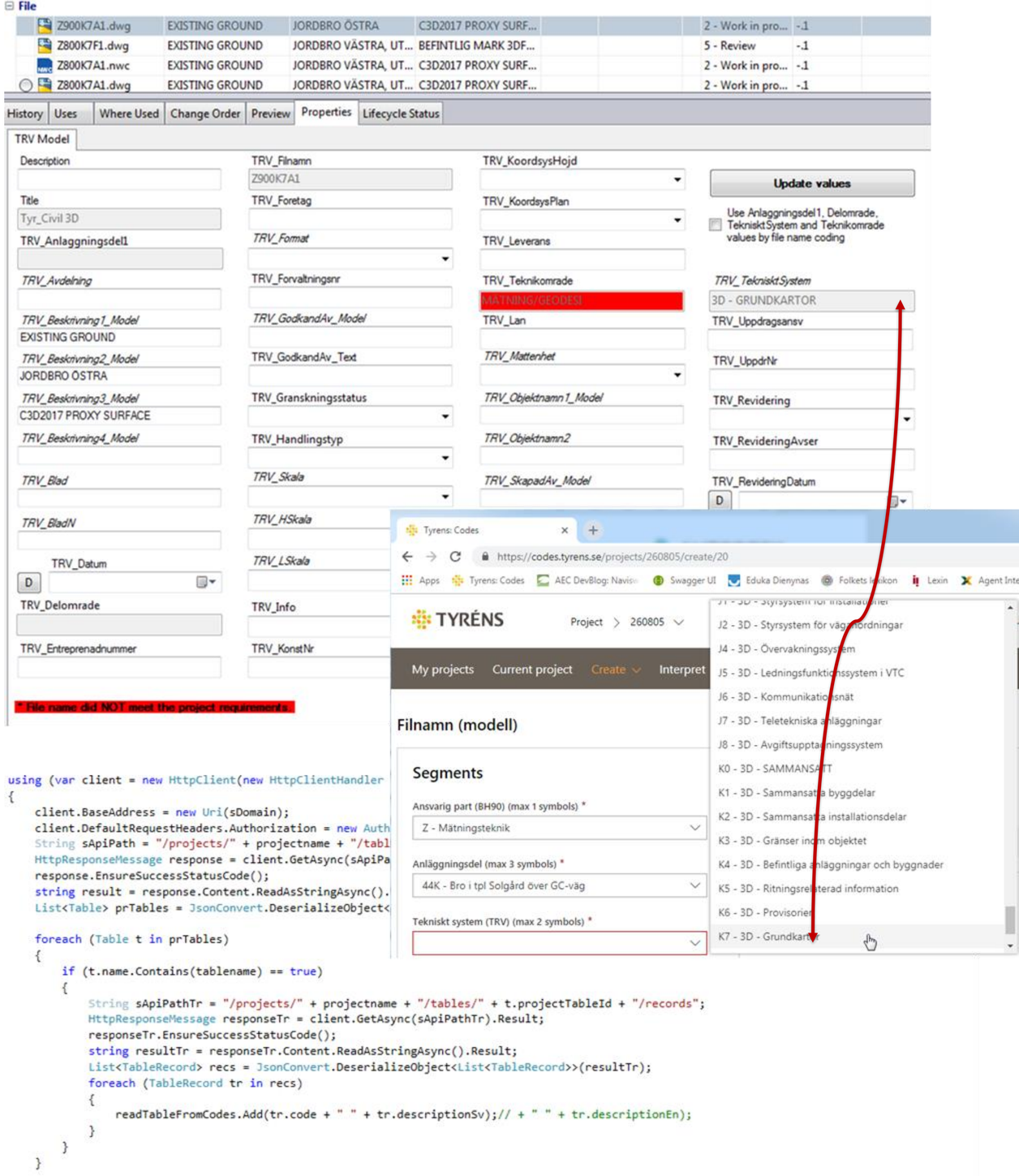
Expand Vault possibilities with API

Vault API possibilities

1. Vault client functionality
   - Additional functionalities of Vault client (properties tab, copy attribute values, etc.)
2. Event handler
   - Automatically run functionalities on specific events (Check in, Move, delete, etc.)
3. Vault + Civil3D, Excel, etc.
   - Vault initiates third applications and runs commands
4. Job server
   - Run user initiated functions on a Job server (publish to PDF, Export C3D file to AutoCAD, etc.)
5. Scheduled jobs
   - Scheduler runs jobs automatically without user input

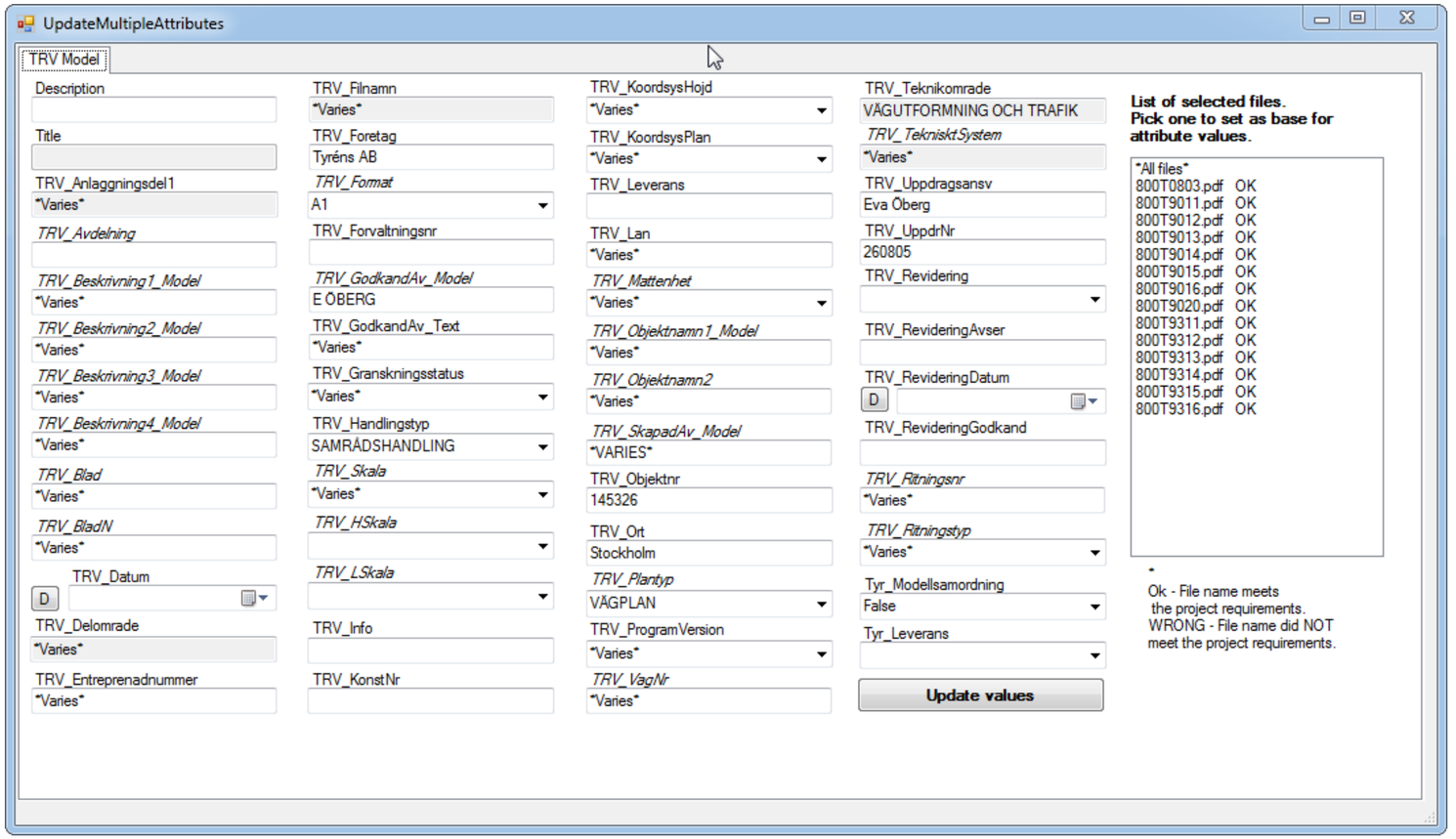
Vault client functionality

- **Smart properties tab**
  - File name was encoded in Codes and values checked
  - Using a special option values will be updated by Codes standard



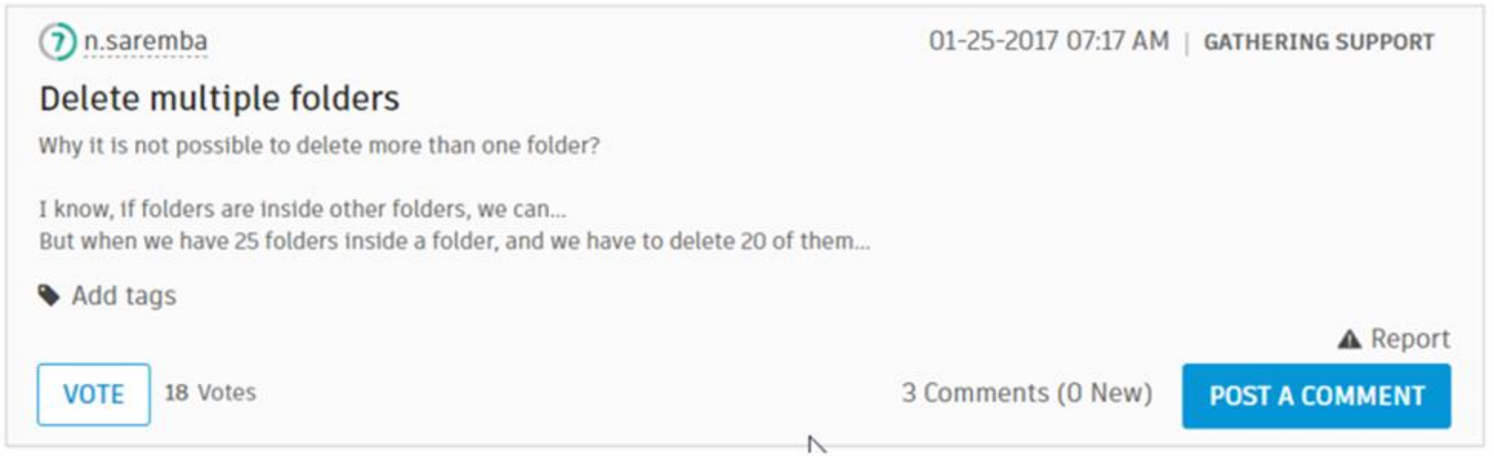
Vault client functionality

- **Update multiple file properties**
  - You can select one file as a base and copy values to other files
  - If the file name conforms to the Classification system standards, encoded attribute values will be updated by Codes



Vault client functionality

- **Deleting multiple folders**
  - You can delete more than one folder at once
  - Important! **Do not give regular users access to this function.** Administrators only!
  - Ask for approval to delete displayed folders.



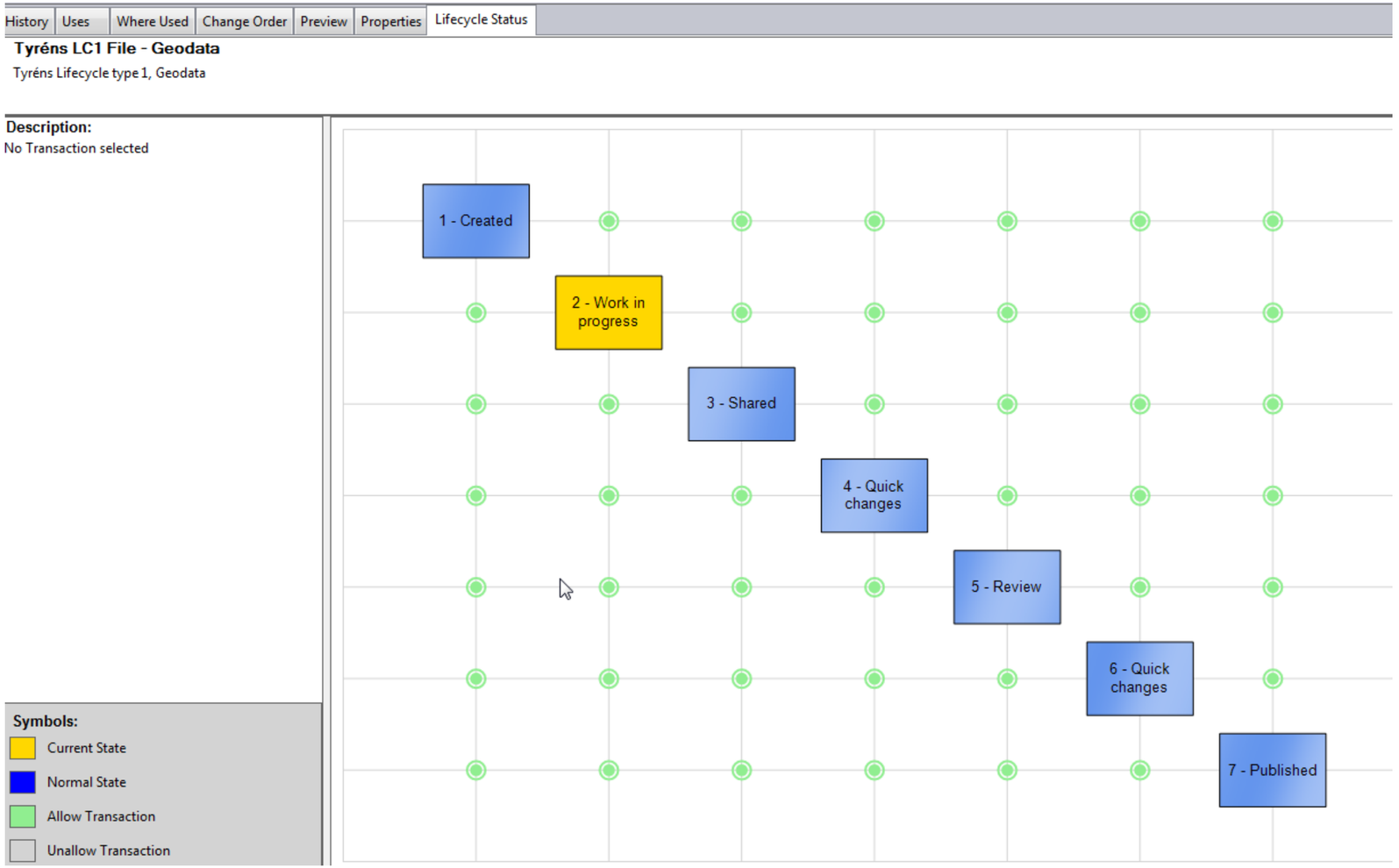

```
foreach (ISelection selection in e.Context.CurrentSelectionSet)
{

    if (selection.TypeId == SelectionTypeId.Folder)
    {
        selectedFolder = connection.WebServiceManager.DocumentService.GetFolderById(selection.Id);
        try
        {
            connection.WebServiceManager.DocumentService.DeleteFolderHierarchy(selectedFolder.Id);
        }
        catch (System.Exception ex)
        { }
```

```
.DocumentService.DeleteFolderHierarchy(selectedFolder.Id);
```

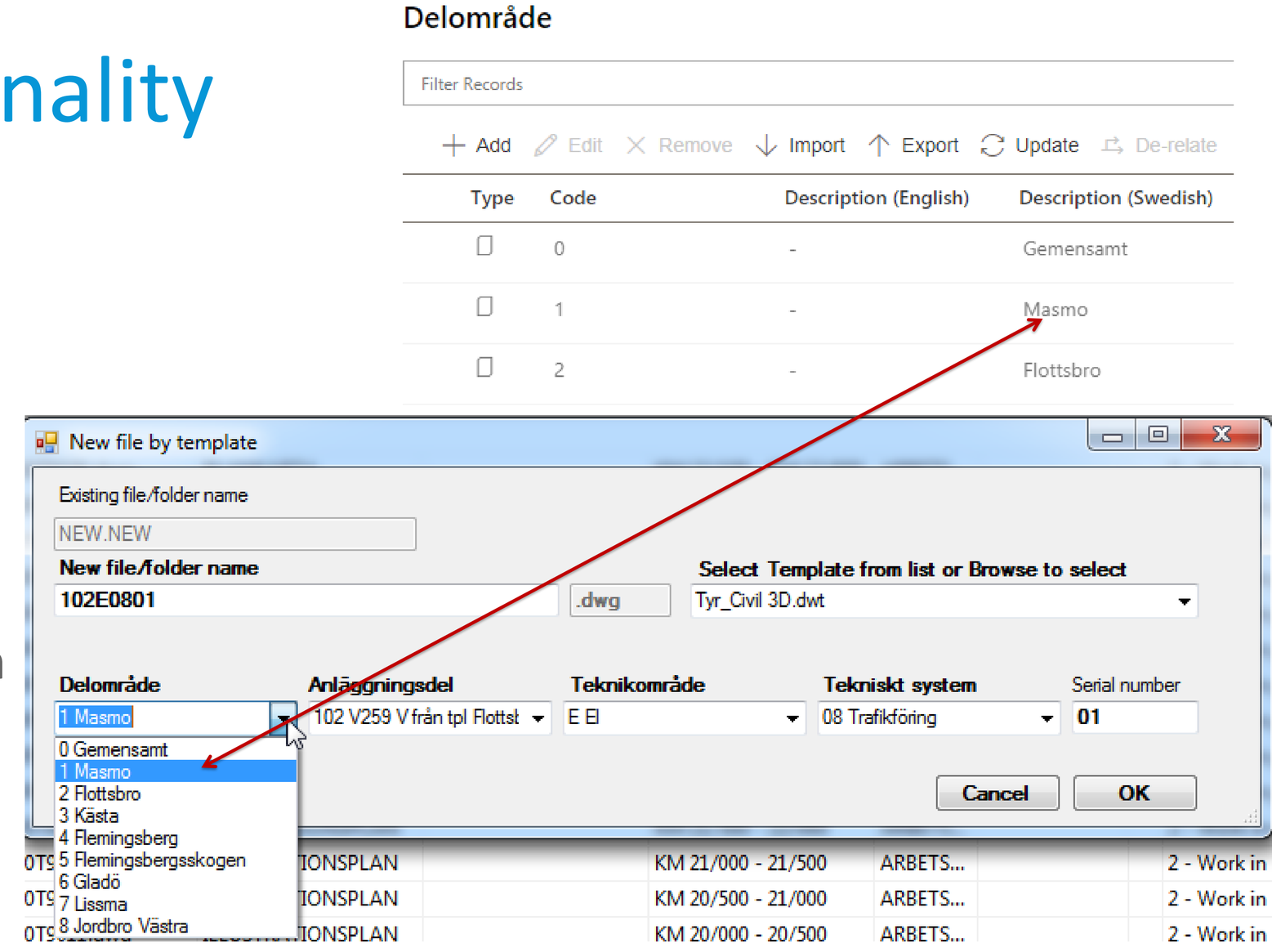
Vault client functionality

- **Visual life cycle**
- Special thanks to DOUG REDMOND
- Code example can be found at http://justonesandzeros.typepad.com



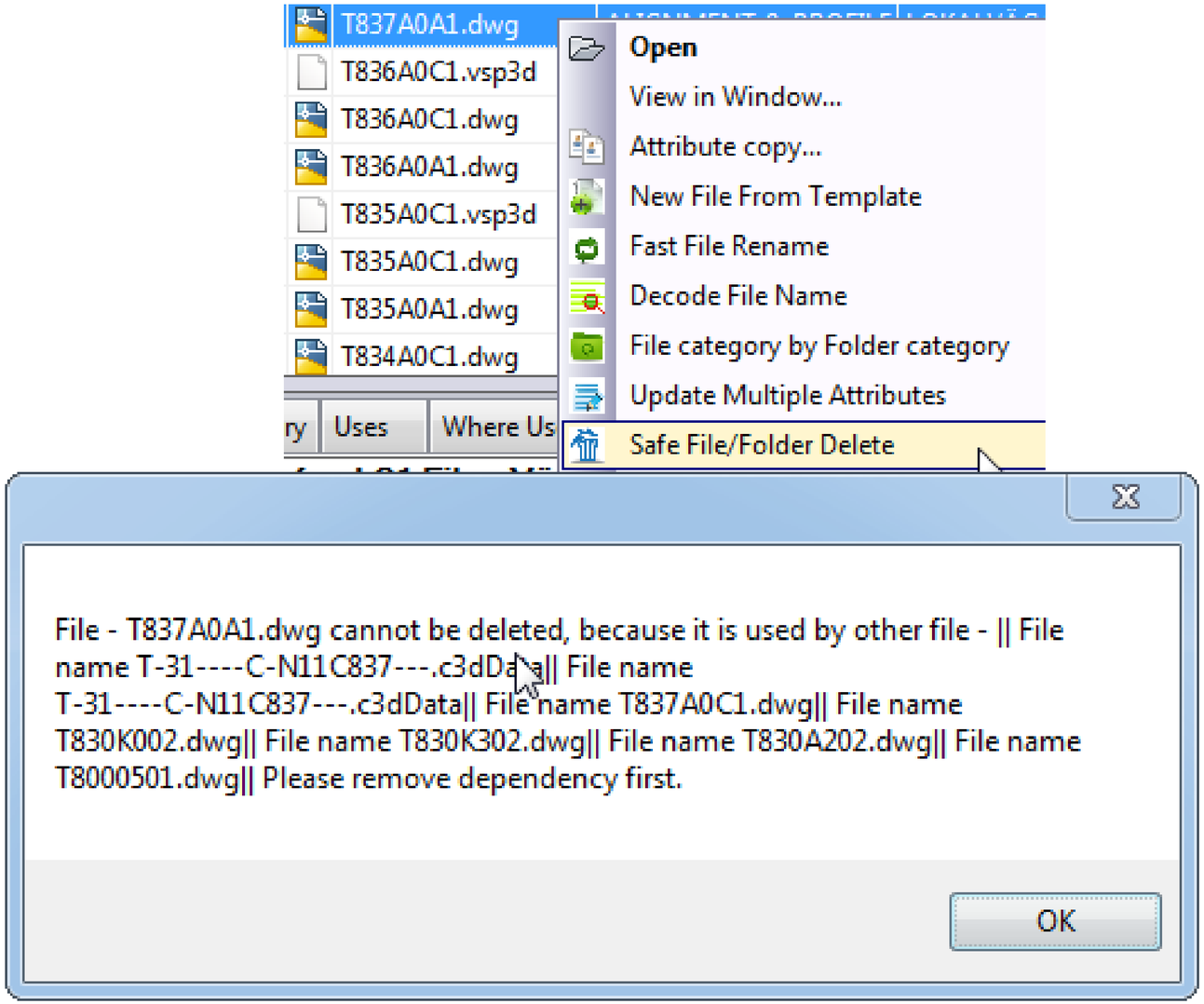
Vault client functionality

- **New file from a template**
  - Select a template stored in the Vault
  - Create a file name by selecting values from the list (values from Codes database)
  - Attributes will by filled in automatically



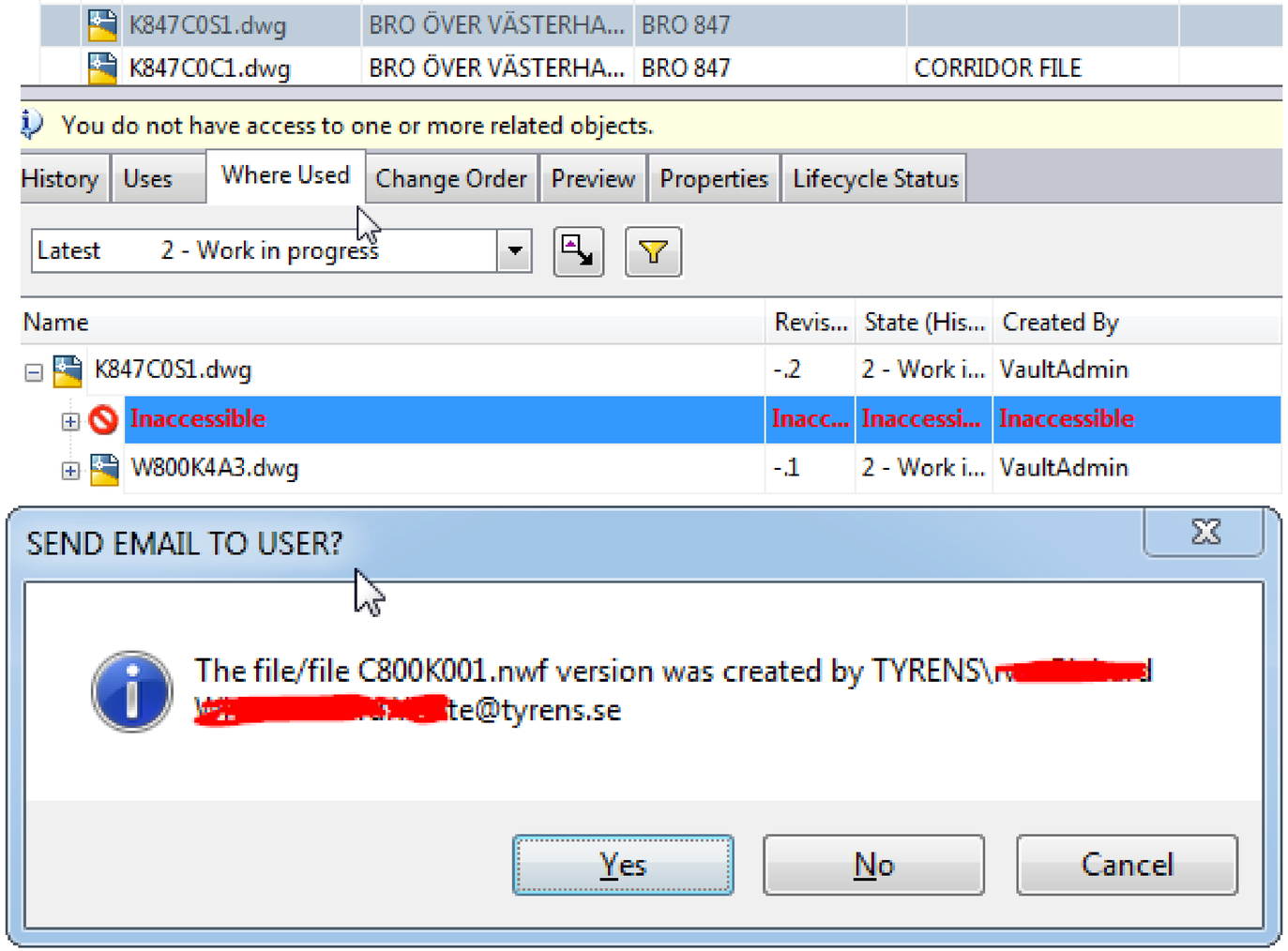
Vault client functionality

- **Safe deletion of files/folders**
  - Regular users do not have the right to delete files
  - Using a dedicated command files are renamed to _delete by an admin user
  - If the file is used, an error message information will be displayed.
  - _delete files are downloaded and backed up before automatically deleted from Vault.



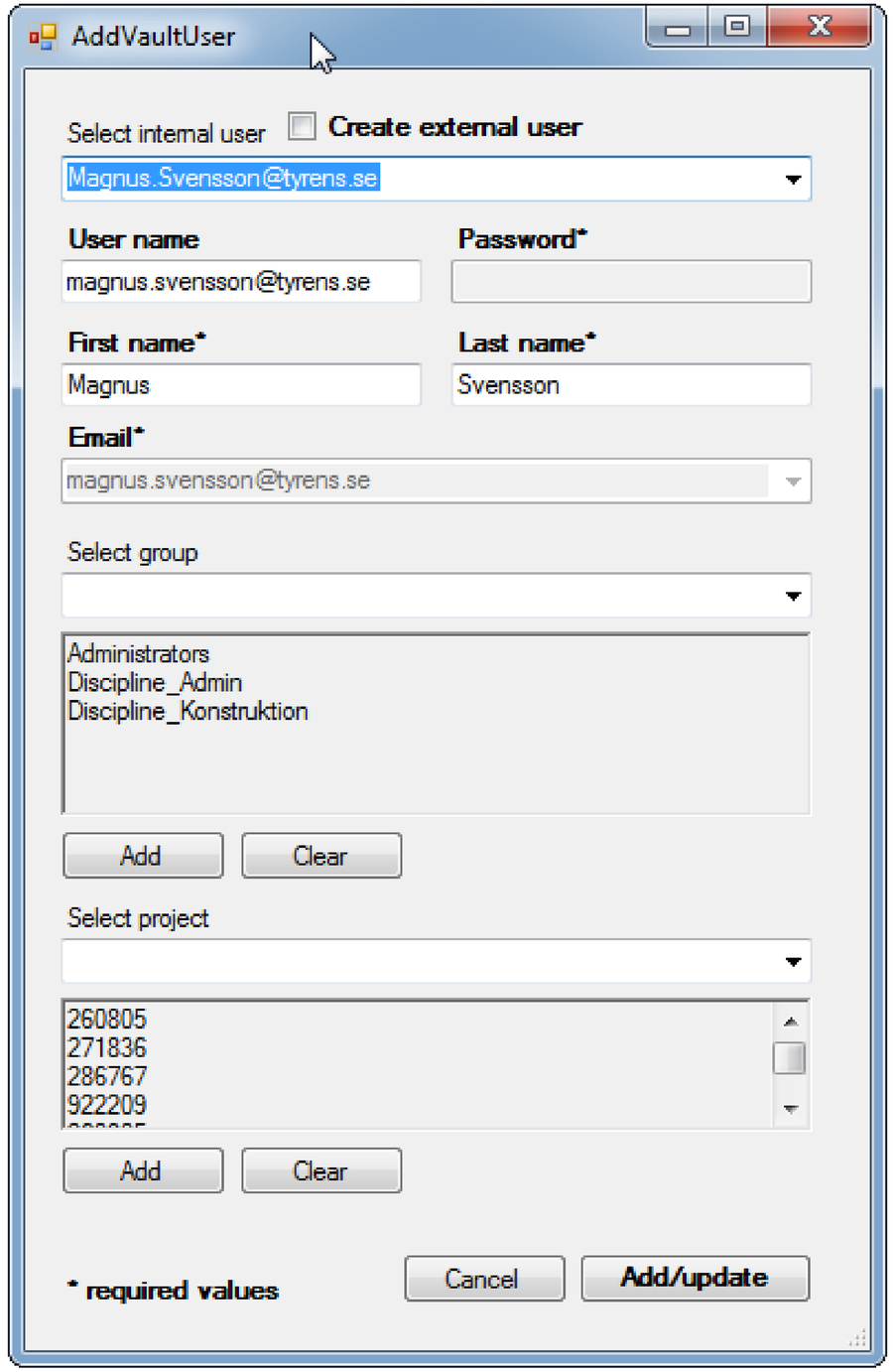
Vault client functionality

- **Copying files with attribute values** (taking values from a source file or a destination folder)
- **Getting user information** about who is using your file even if you do not have access to that file
- Write an e-mail directly



Vault client functionality

- **Creating users in Vault** even you are not an administrator
  - Select an internal user or create an external one
  - Select groups to add
  - Select projects to add
  - No possibilities to add to Admin groups and other restrictions



Vault API possibilities

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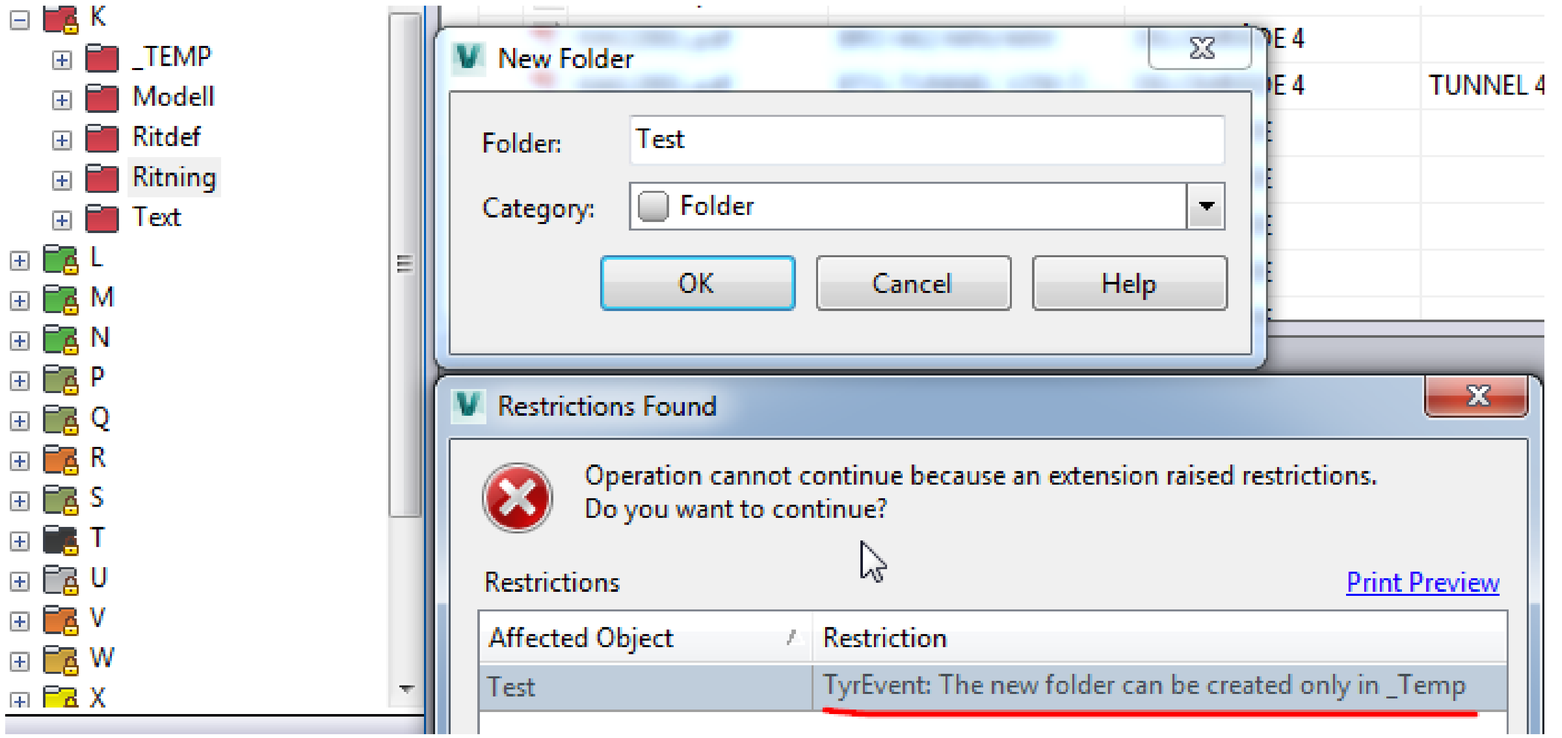
Event Handlers

- **Folder creation control**
  - Fixed/controlled folder structure
  - Regular users can create folders only in _Temp
  - Illegal actions will be forbidden




```
DocumentService.AddFileEvents.Post += new EventHandler<AddFileCommandEventArgs>(AddFileEvents_GetRestrictions);
DocumentService.AddFolderEvents.GetRestrictions += new EventHandler<AddFolderCommandEventArgs>(AddFolderEvents_GetRestrictions);
DocumentService.CheckinFileEvents.GetRestrictions += new EventHandler<CheckinFileCommandEventArgs>(CheckinFileEvents_GetRestrictions_Pre);
```

Event Handlers

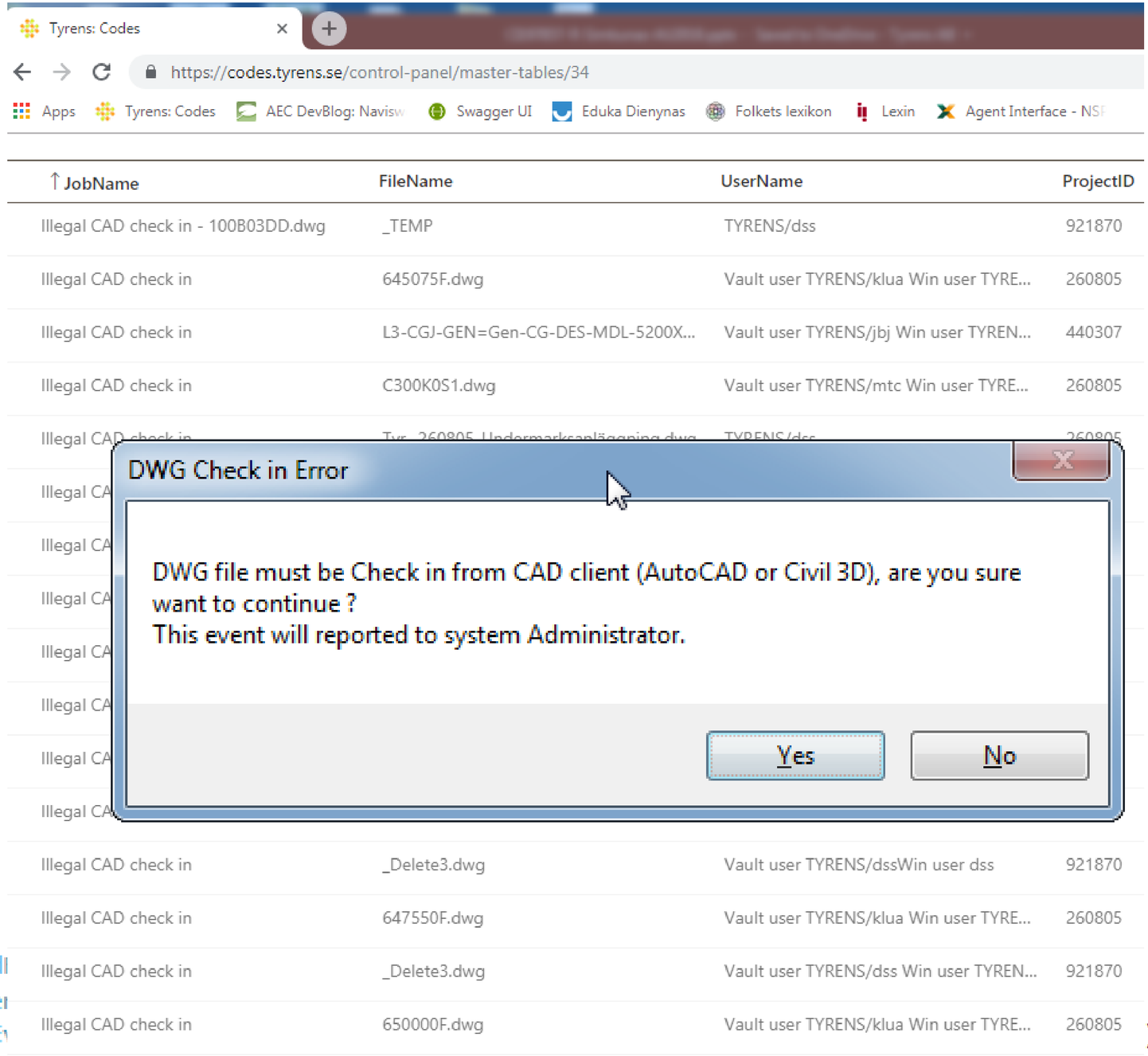
- **Adding new files**
  - Set a parent folder category to a file automatically
  - Copy parent folder property values to a file automatically

Folder category
Properties values

```
DocumentService.AddFileEvents.Post += new EventHandler<AddFileCommandEventArgs>(AddFileEvents_GetRestrictions);
DocumentService.AddFolderEvents.GetRestrictions += new EventHandler<AddFolderCommandEventArgs>(AddFolderEvents_GetRestrictions);
DocumentService.CheckinFileEvents.GetRestrictions += new EventHandler<CheckinFileCommandEventArgs>(CheckinFileEvents_GetRestrictions_Pre);
```

Event Handlers

- **Checking-in files**
  - Inform users that CAD files must be checked-in with CAD application integration.
  - Store illegal check-ins in database for administrator analysis




```
DocumentService.AddFileEvents.Post += new EventHandler<AddI
DocumentService.AddFolderEvents.GetRestrictions += new Even
DocumentService.CheckinFileEvents.GetRestrictions += new Ev
                                                          );
```

Event Handlers

- There is a list of events to catch
- What you need to Automate?

```
// File Events
DocumentService.AddFileEvents.GetRestrictions += new EventHandler<AddFileCommandE
DocumentService.CheckinFileEvents.GetRestrictions += new EventHandler<CheckinFile
DocumentService.CheckoutFileEvents.GetRestrictions += new EventHandler<CheckoutFi
DocumentService.DeleteFileEvents.GetRestrictions += new EventHandler<DeleteFileCo
DocumentService.DownloadFileEvents.GetRestrictions += new EventHandler<DownloadFi
DocumentServiceExtensions.UpdateFileLifecycleStateEvents.GetRestrictions += new E

// Folder Events
DocumentService.AddFolderEvents.GetRestrictions += new EventHandler<AddFolderComm
DocumentService.DeleteFolderEvents.GetRestrictions += new EventHandler<DeleteFold

// Item Events
ItemService.AddItemEvents.GetRestrictions += new EventHandler<AddItemCommandEvent
ItemService.CommitItemEvents.GetRestrictions += new EventHandler<CommitItemComman
ItemService.ItemRollbackLifeCycleStatesEvents.GetRestrictions += new EventHandler
ItemService.DeleteItemEvents.GetRestrictions += new EventHandler<DeleteItemComman
ItemService.EditItemEvents.GetRestrictions += new EventHandler<EditItemCommandEve
ItemService.PromoteItemEvents.GetRestrictions += new EventHandler<PromoteItemComm
ItemService.UpdateItemLifecycleStateEvents.GetRestrictions += new EventHandler<Up

// Change Order Events
ChangeOrderService.AddChangeOrderEvents.GetRestrictions += new EventHandler<AddCh
ChangeOrderService.CommitChangeOrderEvents.GetRestrictions += new EventHandler<Co
ChangeOrderService.DeleteChangeOrderEvents.GetRestrictions += new EventHandler<De
ChangeOrderService.EditChangeOrderEvents.GetRestrictions += new EventHandler<Edit
ChangeOrderService.UpdateChangeOrderLifecycleStateEvents.GetRestrictions += new E

// Custom Entity Events
CustomEntityService.UpdateCustomEntityLifecycleStateEvents.GetRestrictions +=new
```

Process automatization - Vault API

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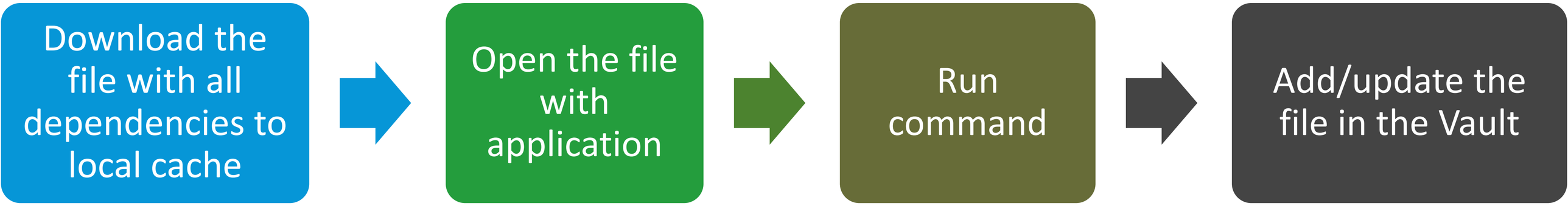
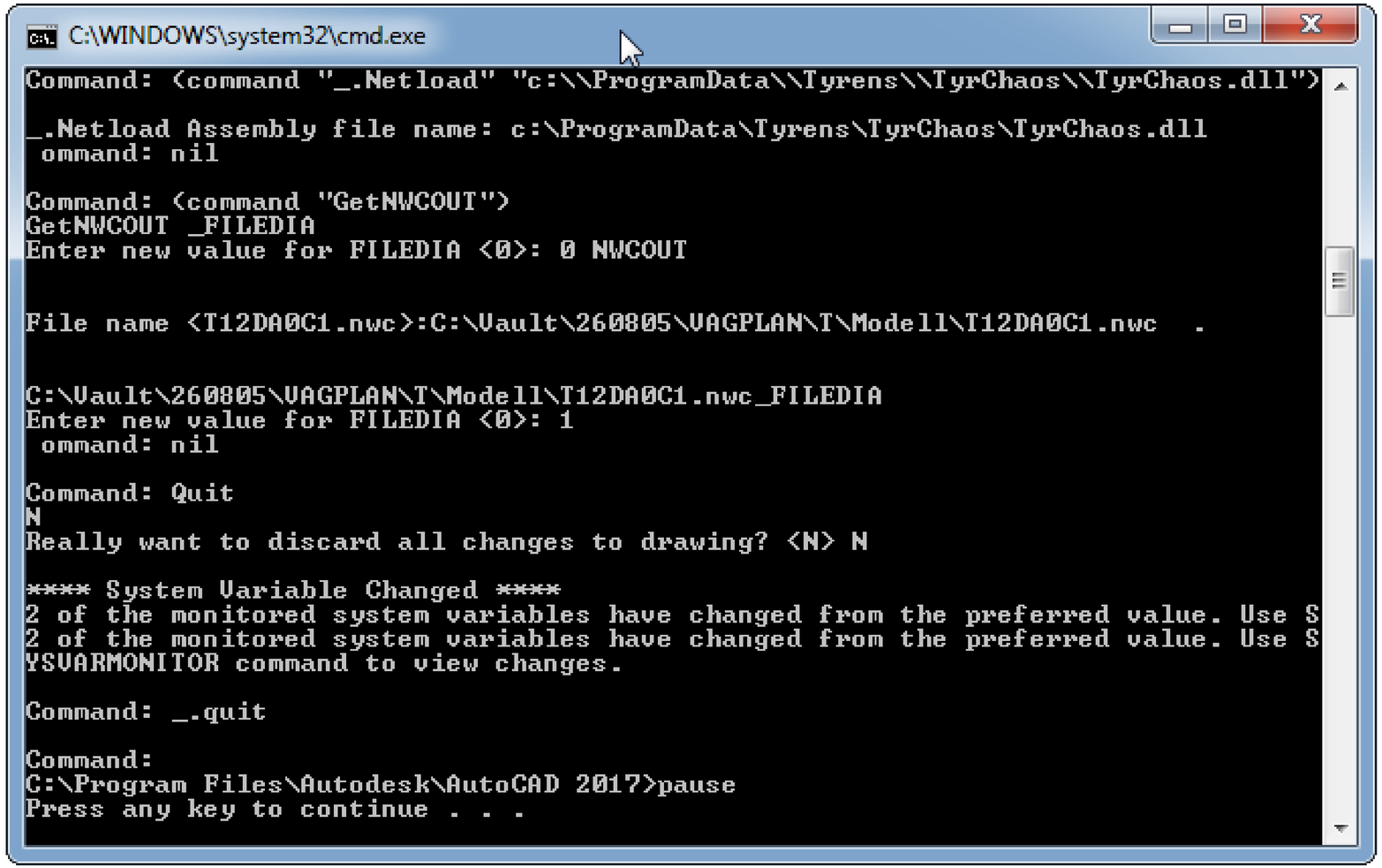
Vault integrations with other applications

1. Make sure you can run your commands without any user input
2. If the function does not exist or needs user input, write it using the software's API
3. Run function manually first
4. Run function in the Vault workflow



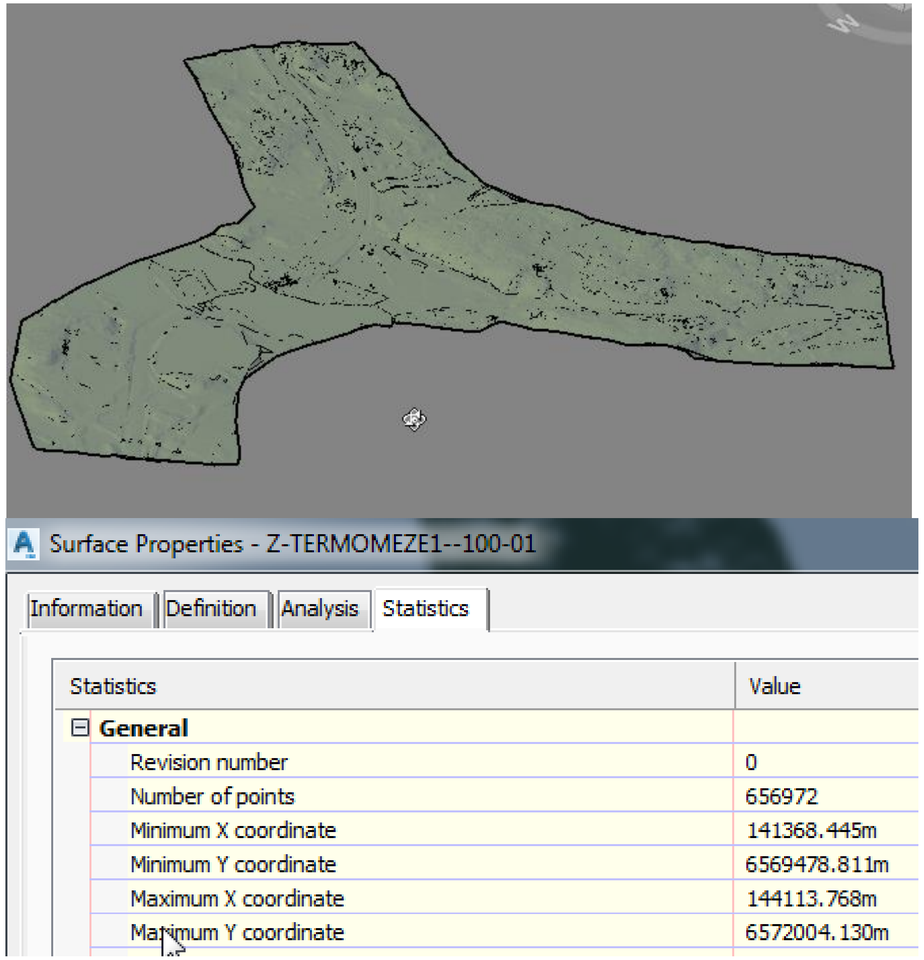
Vault integrations with other applications

- **Publish dwg to nwc**.
  1. Download files with dependencies to C drive
  2. Check out nwc files
  3. Open files with AutoCAD Accoreconsole
  4. Run NWCOUT
  5. Check in nwc files



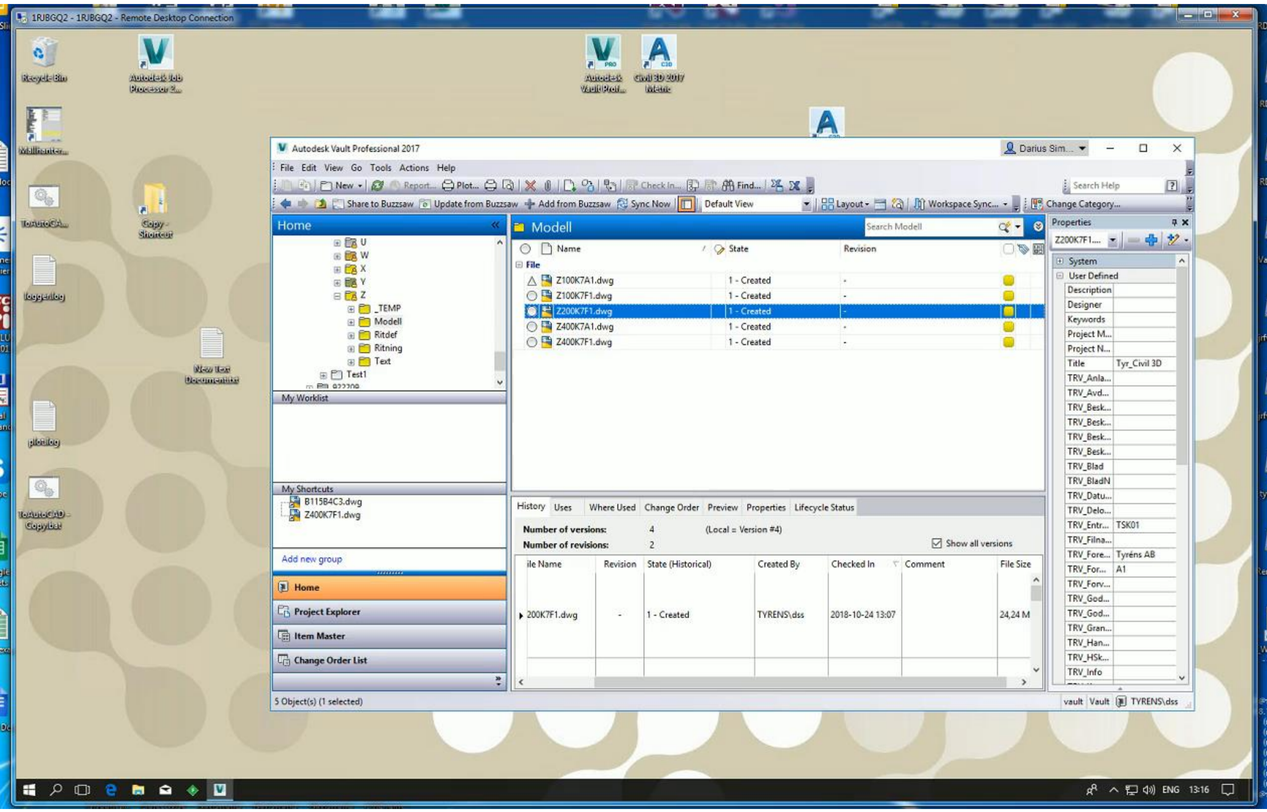
Vault integrations with other applications

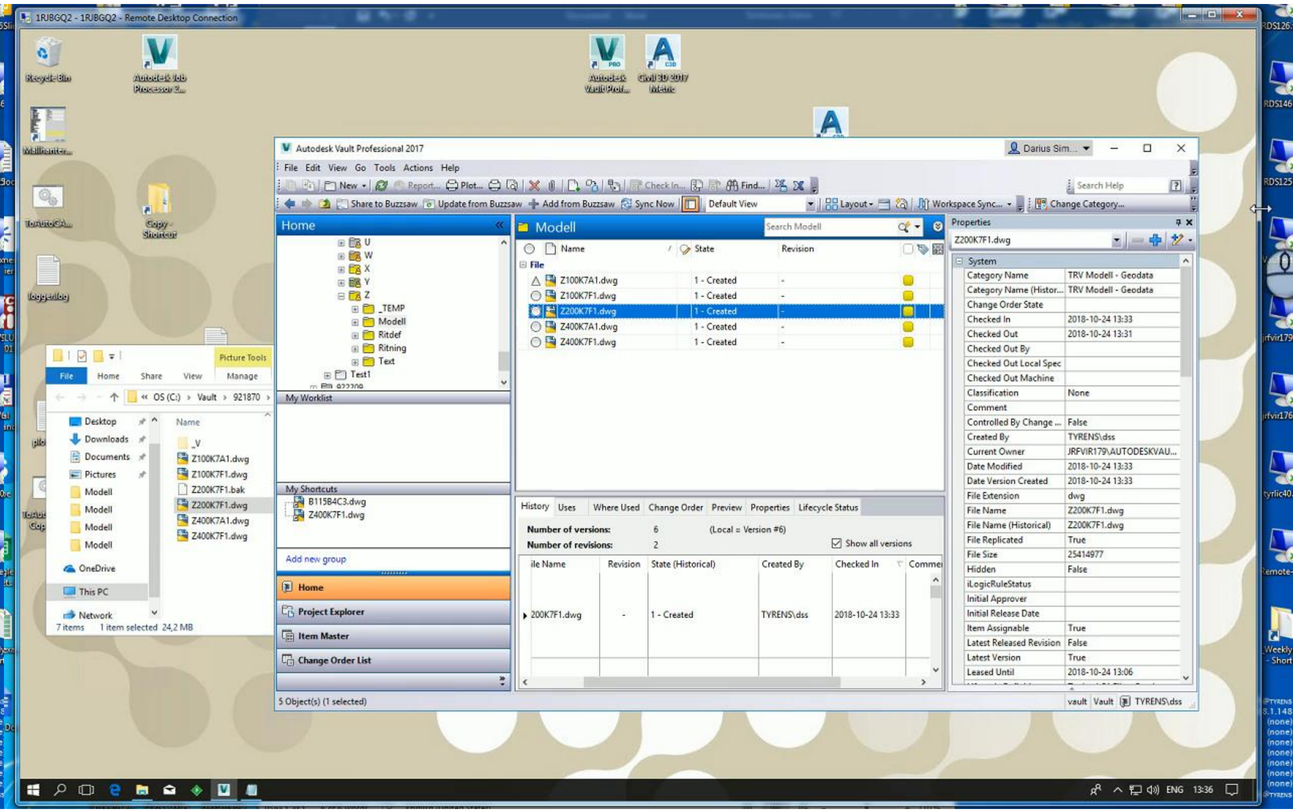
- **Create Civil 3D surfaces from 3D faces**
- Surveyors create surface in other applications and export 3D faces.
- One region can have about 500,000 3D faces. If you try to select all those 3D faces in Civil 3D it can take a very long time of crash software.
- This custom application adds 3D faces in portions (100,000) using Accoreconsole and a Job server.
- It takes a couple of minutes.



Vault integrations with other applications

Create Civil 3D surface from 3D faces (514828)





Create surface On Job server - 7 minutes

Create surface On Job server - 50 minutes

Vault integrations with other applications

- **Publishing Civil 3D to AutoCAD**
- **Publishing DWG to PDF**
- **Cleaning DWG files** (Audit, Purge, Purge reg. apps., detach not found Xrefs)
- **Other functions depending of project needs**

Run Accoreconsole from Vault API

```
// Run Accoreconsole.exe
string scriptpath = "c:\\ProgramData\\Tyrens\\TyrChaos\\RunGetAcadCmd.scr";
if (acad3dfaces==true)
{ scriptpath = "c:\\ProgramData\\Tyrens\\TyrChaos\\RunGetAcadFaceCmd.scr"; }

Thread workerThreadAc = TyrUtilities.Utilities.RunAccoreconsoleApp(AccoreConsoleAppPath,
    dwgFilePath, scriptpath, maxWaitTime, "");
do
{

} while (workerThreadAc.IsAlive);
```

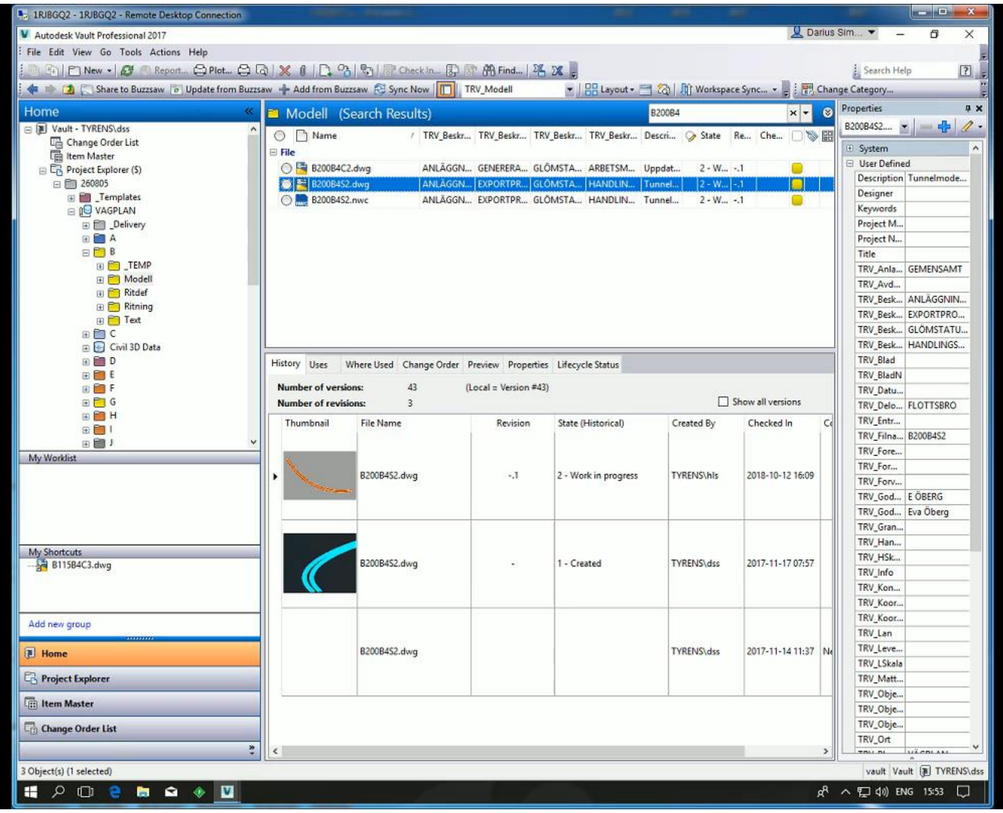
Run script - Load .dll and run command

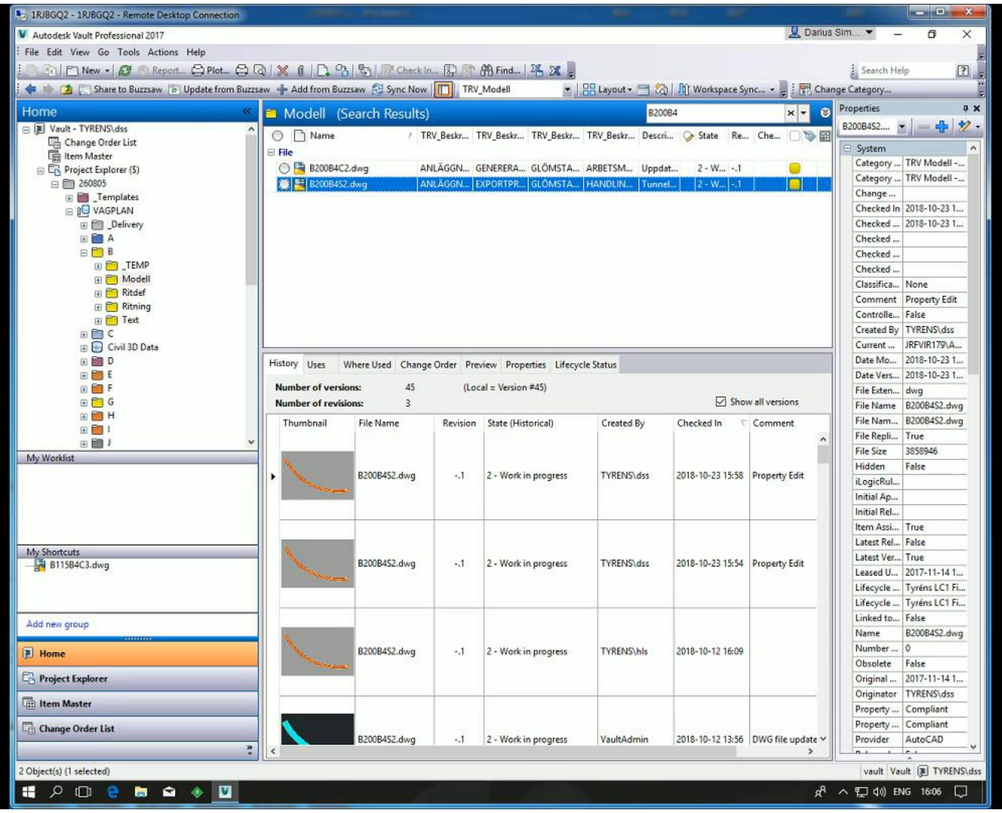
```
;Loading the .Net module
(command "_.Netload" "c:\\ProgramData\\Tyrens\\TyrChaos\\TyrChaos.dll")
;
; Run the command
(command "GetC3DTOACAD")
```

Write command with Civil 3D API

```
try
{
    FileName = path.Replace(".dwg", "_ACAD.dwg");
    ed.Command("AeccExportCivilDrawing", FileName,"Y");
}
```

Vault integrations with other applications





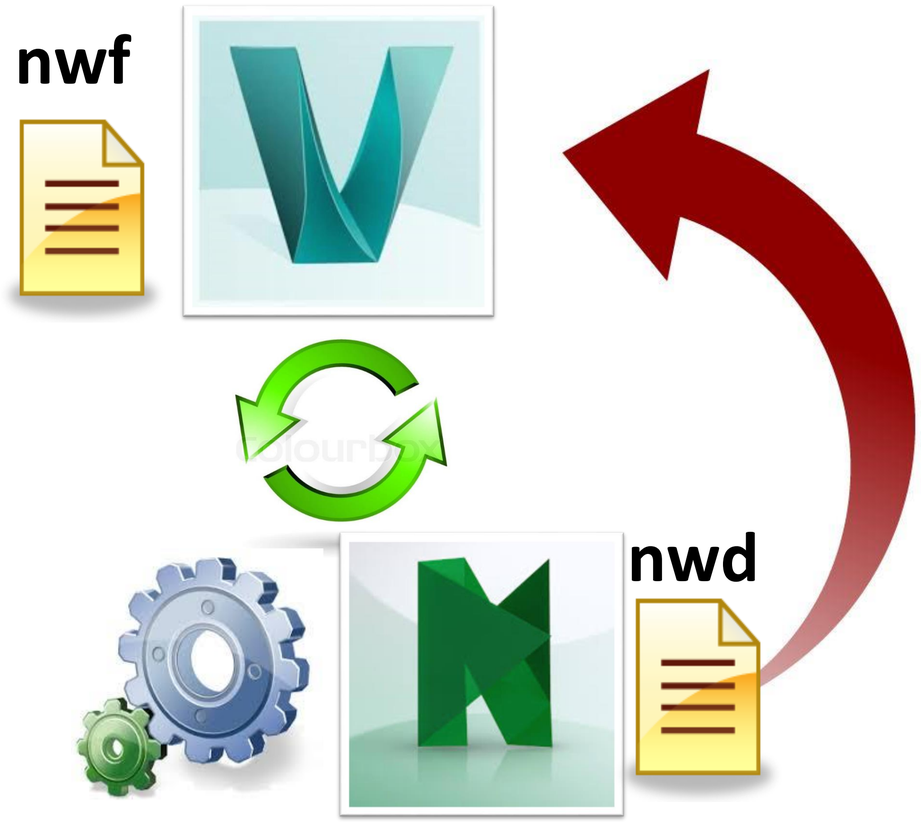
Automated process

Manual process

Vault integrations with other applications

- **Publishing nwf to nwd**

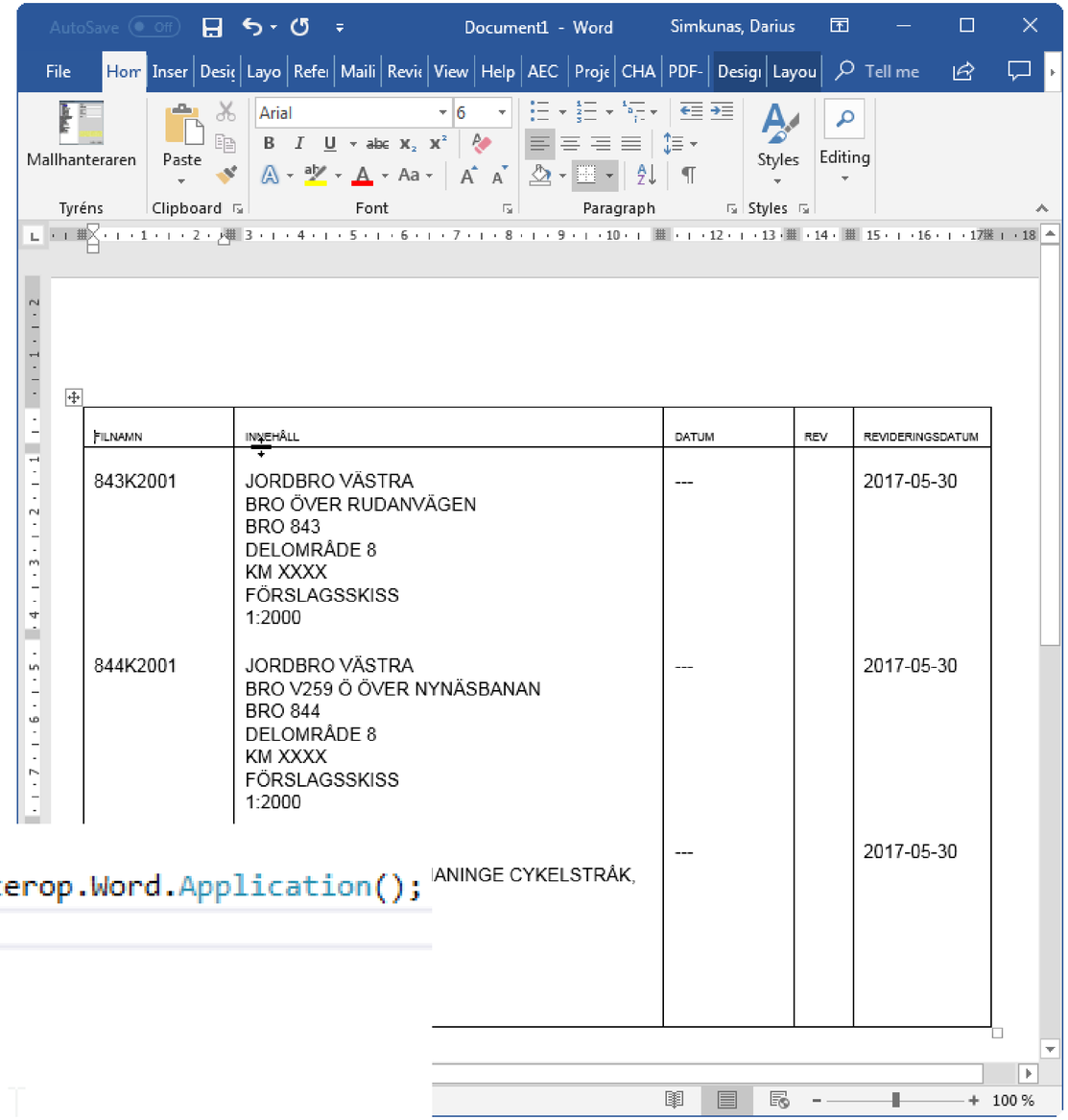
  1. Download nwf with all dependencies to a local drive
  2. Open the nwf file with Navis works
  3. Save the file as nwd
  4. Add/Check in the file to Vault




```
try
{
    if (nawisapp == null) { nawisapp = new Autodesk.Navisworks.Api.Automation.NavisworksApplication(); }
    nawisapp.OpenFile(nwsFilePath);
    nawisapp.SaveFile(nwdFilePath);
}
```

Vault integrations with other applications

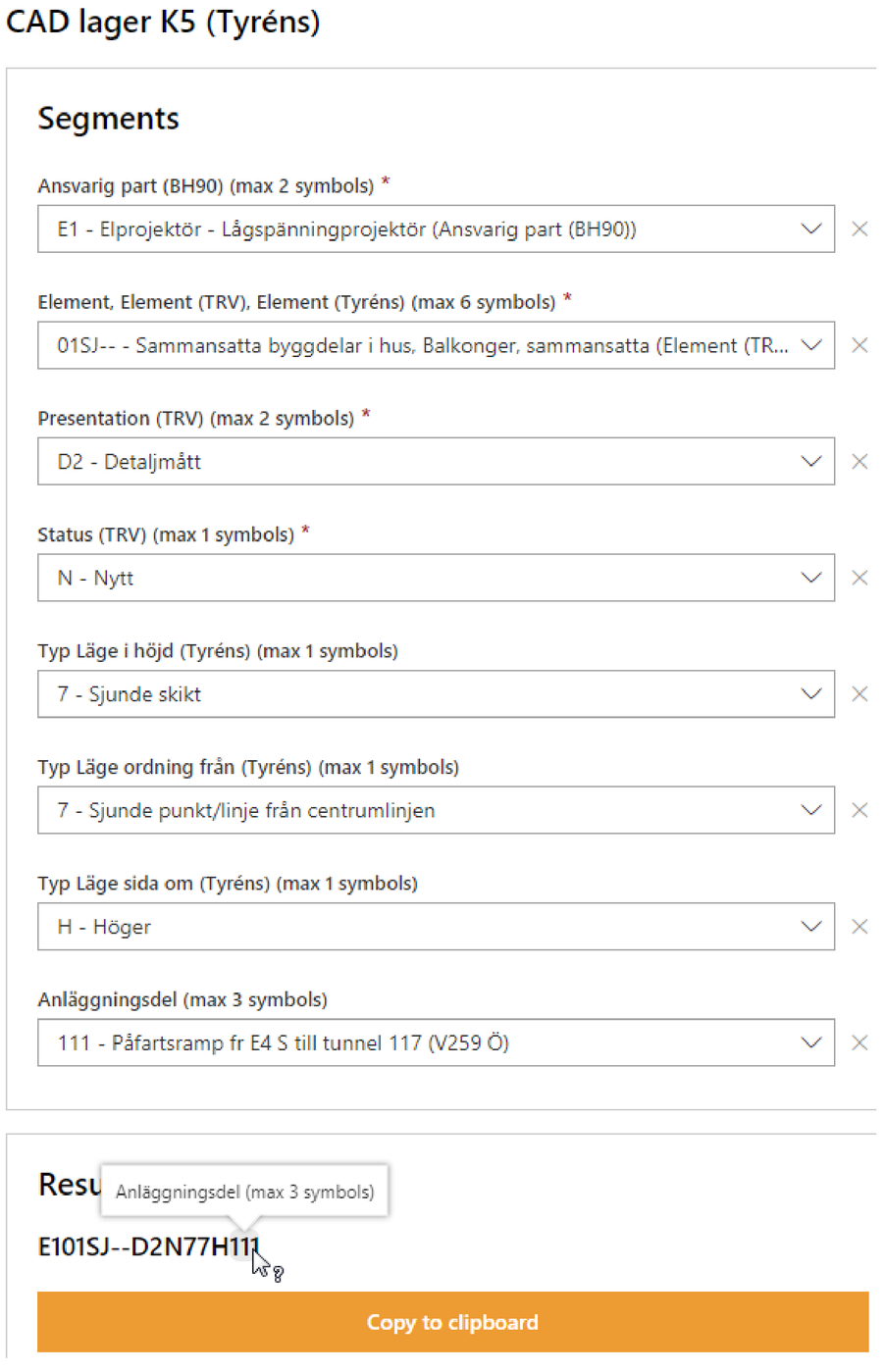
- **Create a drawing files report**
  1. Read selected files and their attributes
  2. Open the Word application
  3. Create tables with the Word API
  4. Write Vault attribute values
  5. Check in the report to Vault

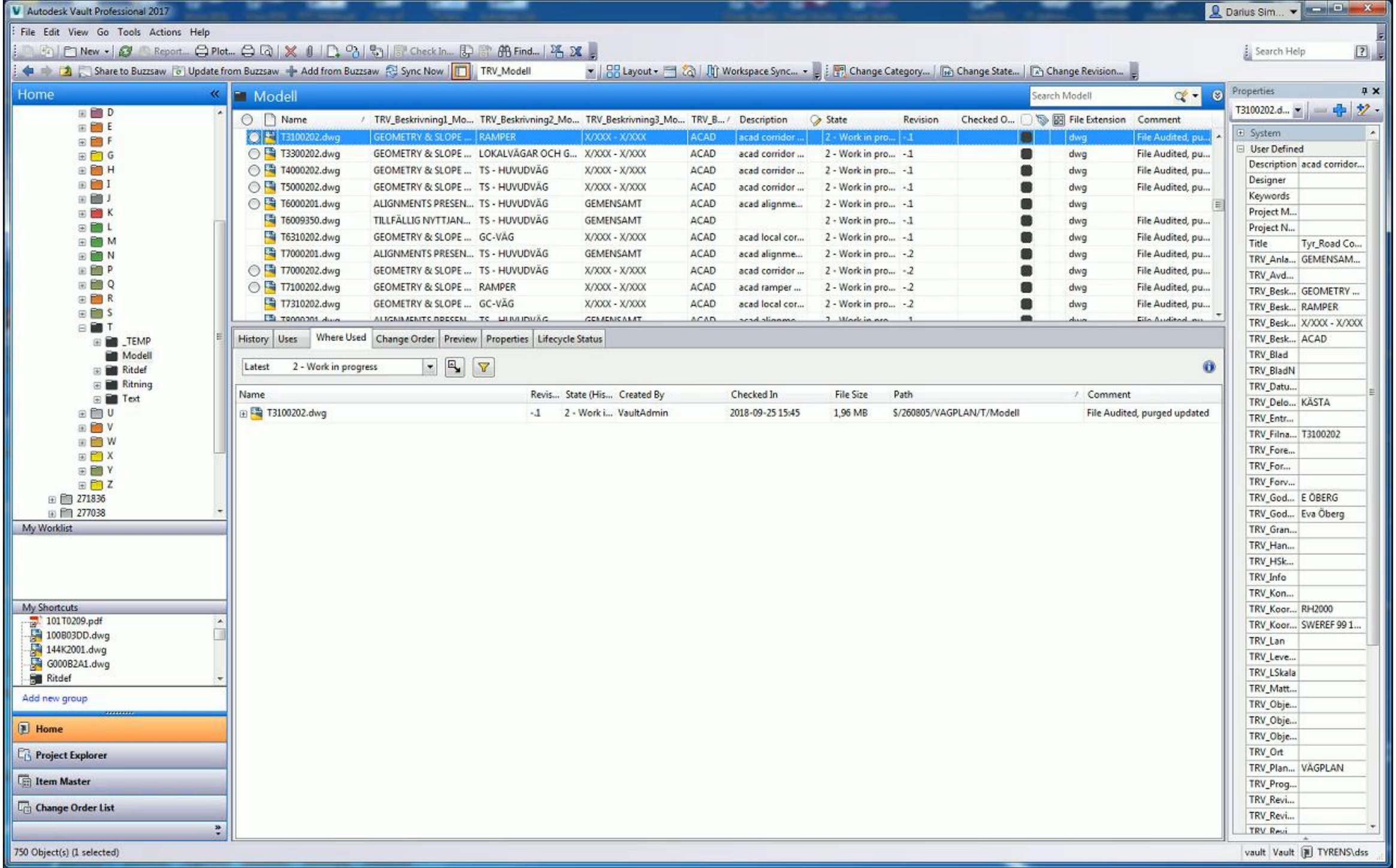



```
//Create an instance for word app
Microsoft.Office.Interop.Word.Application winword = new Microsoft.Office.Interop.Word.Application();
//Set animation status for word application
//Set status for word application is to be visible or not.
//Create a missing variable for missing value
object missing = System.Reflection.Missing.Value;
Microsoft.Office.Interop.Word.Document document = null;
```

Vault integrations with other applications – Quality control

- Each layer in an exported CAD drawing has to conform to the CAD standards
- Each drawing has to be cleaned, purged and checked before delivery




Autodesk Vault Professional 2017
Darius Sim...
File Edit View Go Tools Actions Help
New Report... Plot... Check In... Find...
Search Help
Share to Buzzsaw Update from Buzzsaw Add from Buzzsaw Sync Now
TRV_Modell
Layout Workspace Sync... Change Category... Change State... Change Revision...
Home
D E F G H I J K L M N P Q R S T
_TEMP
Modell
Ritdef
Ritning
Text
U V W X Y Z
271836
277038
My Worklist
My Shortcuts
101T0209.pdf
100B03DD.dwg
144K2001.dwg
G000B2A1.dwg
Ritdef
Add new group
Home
Project Explorer
Item Master
Change Order List
Modell
Search Modell
Name TRV_Beskrivning1_Mo... TRV_Beskrivning2_Mo... TRV_Beskrivning3_Mo... TRV_B... Description State Revision Checked O... File Extension Comment
T3100202.dwg GEOMETRY & SLOPE ... RAMPER X/XXX - X/XXX ACAD acad corridor ... 2 - Work in pro... -.1 dwg File Audited, pu...
T3300202.dwg GEOMETRY & SLOPE ... LOKALVÄGAR OCH G... X/XXX - X/XXX ACAD acad corridor ... 2 - Work in pro... -.1 dwg File Audited, pu...
T4000202.dwg GEOMETRY & SLOPE ... TS - HUVUDVÄG X/XXX - X/XXX ACAD acad corridor ... 2 - Work in pro... -.1 dwg File Audited, pu...
T5000202.dwg GEOMETRY & SLOPE ... TS - HUVUDVÄG X/XXX - X/XXX ACAD acad corridor ... 2 - Work in pro... -.1 dwg File Audited, pu...
T6000201.dwg ALIGNMENTS PRESEN... TS - HUVUDVÄG GEMENSAMT ACAD acad alignme... 2 - Work in pro... -.1 dwg
T6009350.dwg TILLFÄLLIG NYTTJAN... TS - HUVUDVÄG GEMENSAMT ACAD 2 - Work in pro... -.1 dwg File Audited, pu...
T6310202.dwg GEOMETRY & SLOPE ... GC-VÄG X/XXX - X/XXX ACAD acad local cor... 2 - Work in pro... -.1 dwg File Audited, pu...
T7000201.dwg ALIGNMENTS PRESEN... TS - HUVUDVÄG GEMENSAMT ACAD acad alignme... 2 - Work in pro... -.2 dwg File Audited, pu...
T7000202.dwg GEOMETRY & SLOPE ... TS - HUVUDVÄG X/XXX - X/XXX ACAD acad corridor ... 2 - Work in pro... -.2 dwg File Audited, pu...
T7100202.dwg GEOMETRY & SLOPE ... RAMPER X/XXX - X/XXX ACAD acad ramper ... 2 - Work in pro... -.2 dwg File Audited, pu...
T7310202.dwg GEOMETRY & SLOPE ... GC-VÄG X/XXX - X/XXX ACAD acad local cor... 2 - Work in pro... -.2 dwg File Audited, pu...
History Uses Where Used Change Order Preview Properties Lifecycle Status
Latest 2 - Work in progress
Name Revis... State (His... Created By Checked In File Size Path Comment
T3100202.dwg -.1 2 - Work i... VaultAdmin 2018-09-25 15:45 1,96 MB $/260805/VAGPLAN/T/Modell File Audited, purged updated
Properties
T3100202.d...
System
User Defined
Description acad corridor...
Designer
Keywords
Project M...
Project N...
Title Tyr_Road Co...
TRV_Anla... GEMENSAM...
TRV_Avd...
TRV_Besk... GEOMETRY ...
TRV_Besk... RAMPER
TRV_Besk... X/XXX - X/XXX
TRV_Besk... ACAD
TRV_Blad
TRV_BladN
TRV_Datu...
TRV_Delo... KÄSTA
TRV_Entr...
TRV_Filna... T3100202
TRV_Fore...
TRV_For...
TRV_Forv...
TRV_God... E ÖBERG
TRV_God... Eva Öberg
TRV_Gran...
TRV_Han...
TRV_HSk...
TRV_Info
TRV_Kon...
TRV_Koor... RH2000
TRV_Koor... SWEREF 99 1...
TRV_Lan
TRV_Leve...
TRV_LSkala
TRV_Matt...
TRV_Obje...
TRV_Obje...
TRV_Obje...
TRV_Ort
TRV_Plan... VÄGPLAN
TRV_Prog...
TRV_Revi...
TRV_Revi...
750 Object(s) (1 selected)
vault Vault TYRENS\dss

Classification system and Quality control

TRV_PROGRAMVERSION	
TRV_MÅTTENHET	
TRV_TEKNISKTSYSTEM	PLANER
TRV_HANDLINGSTYP	
TRV_PLANTYP	VÄGPLAN
TRV_BLAD	
TRV_BLADN	
KOORDINATSYSTEM PLAN	SWEREF 99 18 00
KOORDINATSYSTEM HOJD	RH2000
TRV_SKALA	
TRV_HSKALA	
TRV_LSKALA	
TRV_REVIDERING	
TRV_REVIDERINGAV	
TRV_REVIDERINGSDATUM	
TRV_REVIDERINGGODKÄND	

Meta data from Vault

FILEGENSKAPER	
LAYER 0 = EMPTY	YES
XREF = DETACHED?	YES
PURGE?	NO
FELAKTIGA LAGERNAMN	YES
OBJEKT PÅ Z=0 METER?	YES
UNITS	Meters
DWG VERSION	AutoCAD 2013-2017
RELEVANTA DREF?	NO

DWG file analysis information

Layer name Check result

LAGERLISTA

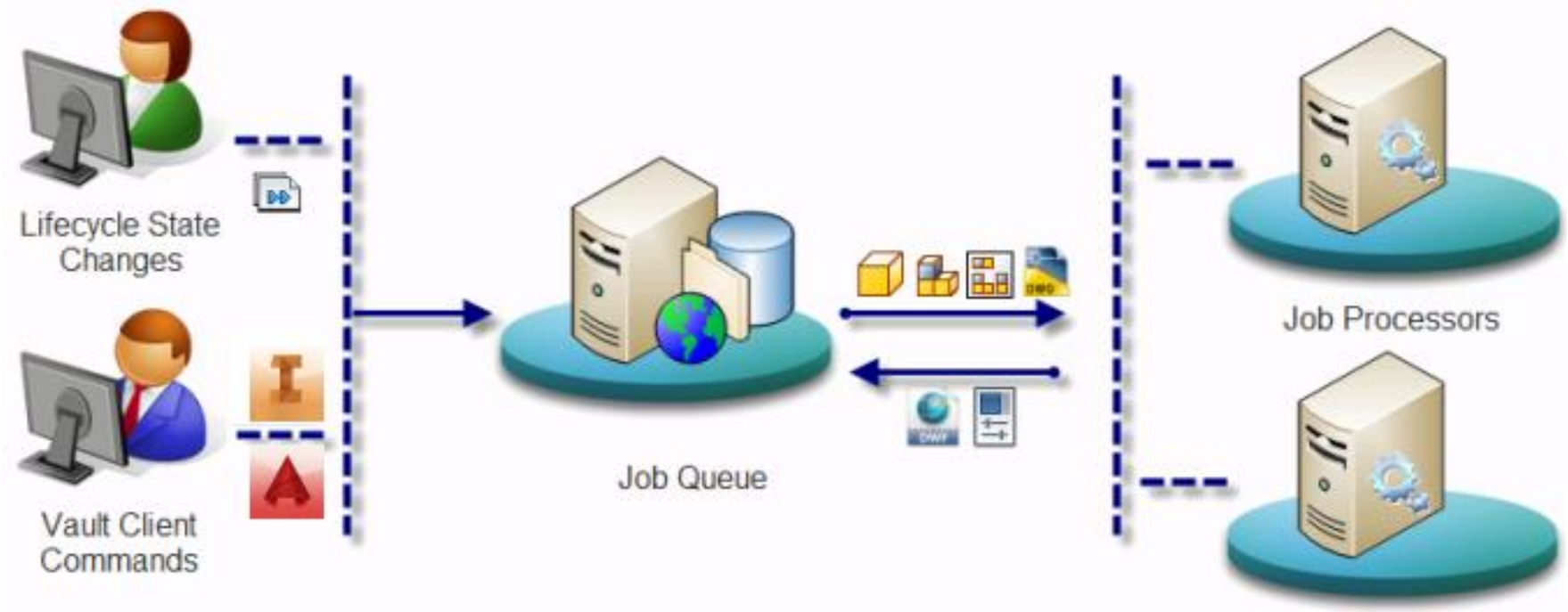
LAGERNAMN	LAGERBESKRIVNING	ANTAL TECKEN	ANTAL OBJEKT I AKTUELLT LAGER	ANSVARIG PART		ELEM	
				KOD	BESKRIVNING	KOD	BESKRIVNING
KORRIDOR	KORRIDOR	8	1271	KO	Err. No matching record found for this code segment	RRIDOR	Err. No matchi rd found for this code segment
VAG-SIKT-SYNLIG	VAG-SIKT-SYNLIG	15	1	VA	Err. No matching record found for this code segment	G-SIKT	Err. No mat record found for this code segment
VAG-SIKT-DOLD	VAG-SIKT-DOLD	13	1	VA	Err. No matching record found for this code segment	G-SIKT	Err. No m ing record found for this code segment
VAG-SIKT-DOLD2	VAG-SIKT-DOLD2	14	1	VA	Err. No matching record found for this code segment	G-SIKT	Err. No atching record found for this code segment
VAG-SIKT-DOLD-AREA	VAG-SIKT-DOLD-AREA	18	1	VA	Err. No matching record found for this code segment	G-SIKT	Err. No matching record found for this code segment
T-31BC--EJN10H---	T-31BC--EJN10H---	17	131	T-	Trafik- och vägprojektör	31BC--	Körbanor
T-31BC--EJN10V---	T-31BC--EJN10V---	17	890	T-	Trafik- och vägprojektör	31BC--	Körbanor
T-31BC--EJN11C---	T-31BC--EJN11C---	17	1016	T-	Trafik- och vägprojektör	31BC--	Körbanor
T-31BC--EJN12H---	T-31BC--EJN12H---	17	131	T-	Trafik- och vägprojektör	31BC--	Körbanor
T-31BE--EJN10H---	T-31BE--EJN10H---	17	1023	T-	Trafik- och vägprojektör	31BE--	Stödremsor
T-31BE--EJN10V---	T-31BE--EJN10V---	17	592	T-	Trafik- och vägprojektör	31BE--	Stödremsor
T-31EB--EJN10H---	T-31EB--EJN10H---	17	1037	T-	Trafik- och vägprojektör	31EB--	Innerslänt
T-31EB--EJN10V---	T-31EB--EJN10V---	17	383	T-	Trafik- och vägprojektör	31EB--	Innerslänt
T-31EC--EJN01V---	T-31EC--EJN01V---	17	392	T-	Trafik- och vägprojektör	31EC--	Ytterslänt
T-32EB--EJN1-V---	T-32EB--EJN1-V---	17	3	T-	Trafik- och vägprojektör	32EB--	Kantstöd
T-31EB--EJN12H---	T-31EB--EJN12H---	17	1023	T-	Trafik- och vägprojektör	31EB--	Innerslänt

Process automation – Vault API

1. Vault client functionality
   - Additional functions to Vault client (properties tab, copy attribute values, etc.)
2. Event handler
   - Automatically run functions on specific event (Check in, Move, delete, etc.)
3. Vault + Civil3D, Excel, etc.
   - Vault initiates third applications and runs commands.
4. Job server
   - Run user initiated functions on a Job server (publish to PDF, Export C3D file to AutoCAD, etc.)
5. Scheduled jobs
   - Scheduler runs jobs automatically without user input.

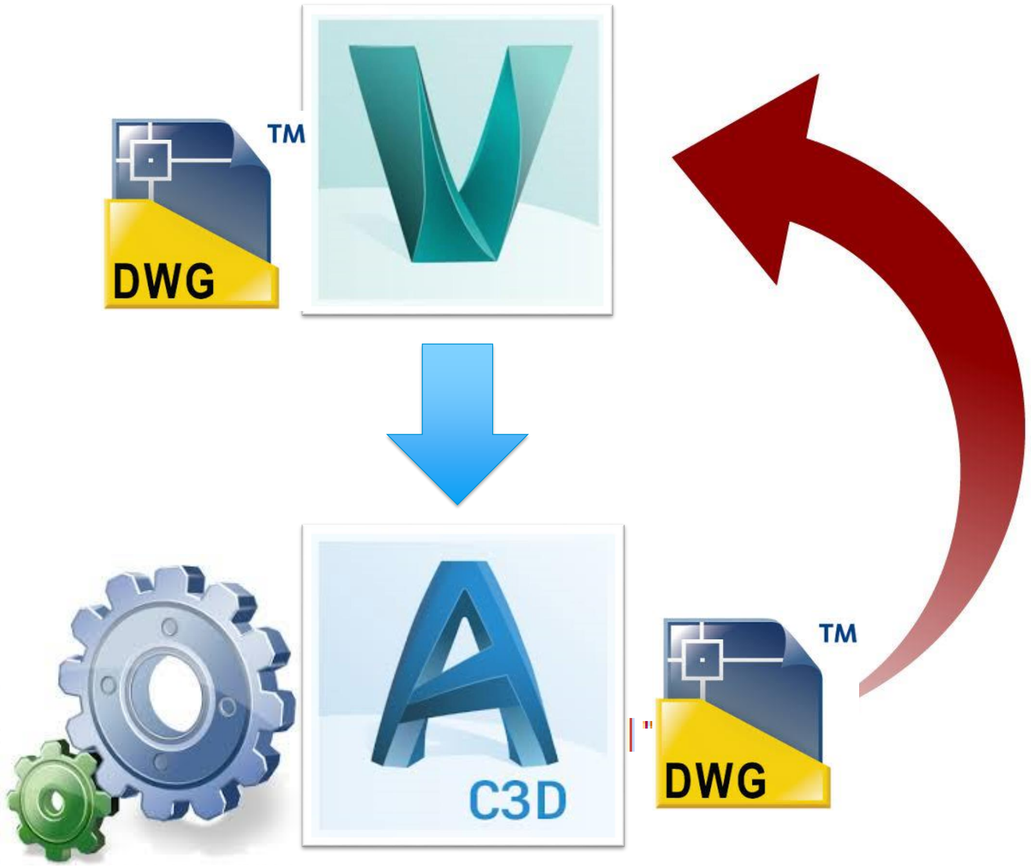
Job servers

- **If you can run your command from the Vault, then it is possible to run it on a Job server**
  - It allows to run works without interrupting user work
  - Jobs can be done at night or on weekends



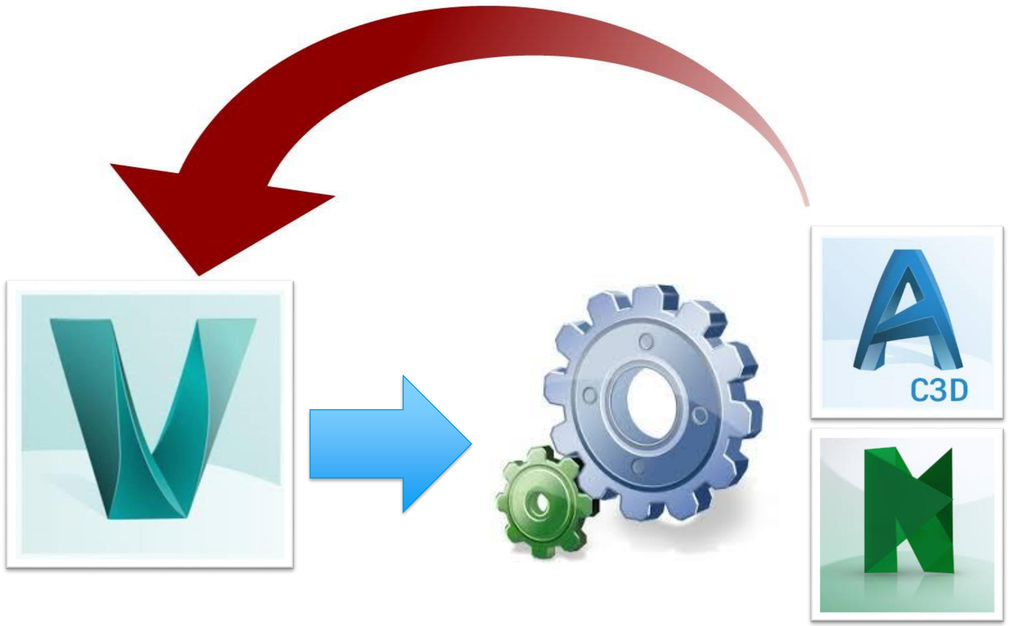
Job servers

- **Update Civil 3D file Xrefs and Drefs**.
  1. Download a file to a local disk of a Job server
  2. Check out the file
  3. Open the file with Civil 3D
  4. Run the command AeccSynchronizeReferences
  5. Save the file
  6. Check in the file to the Vault.




```
if (acApp != null)
{
    System.Threading.Th
    errorMessage = erro
    acApp.Visible = tru
    acApp.ZoomExtents()
    System.Threading.Th
    acApp.ActiveDocument.SendCommand("AeccSynchronizeReferences ");
    System.Threading.Thread.Sleep(2000);
    acApp.ActiveDocument.Save();
    System.Threading.Thread.Sleep(2000);
    acadupdated = true;
    acApp.Quit();
    System.Threading.Thread.Sleep(5000);
```

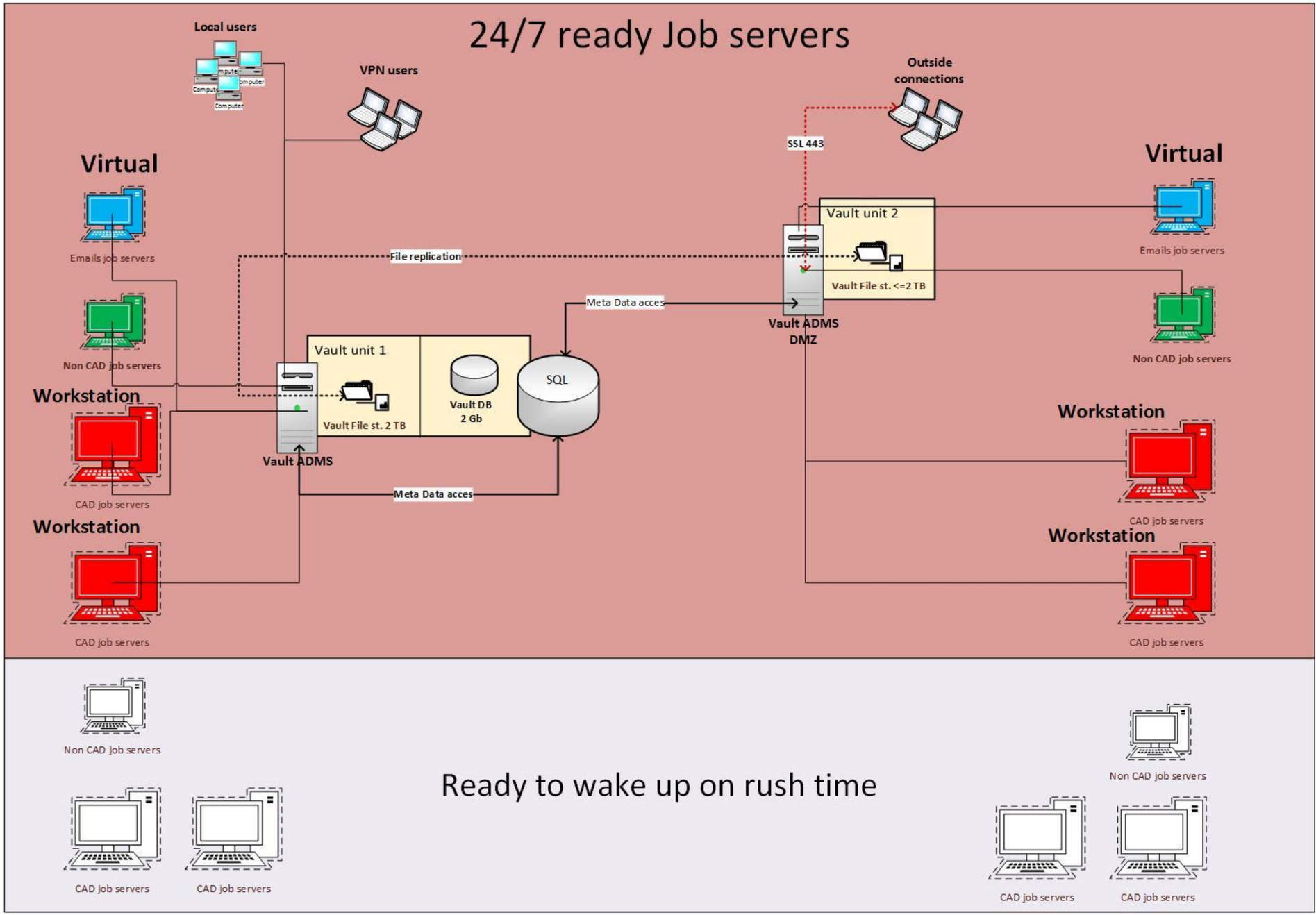
Job servers



- **Publish dwg to nwc**
- **Publish nwf to nwd**
- **Publish Civil 3D to AutoCAD**
- **Publish DWG to PDF**
- **Deliver a file** according to the client's requirements (copy the file to a specific folder, create a metadata file, layers list file, Xrefs list file)
- **Clean a DWG file** (Audit, Purge, Purge reg. apps., detach not found Xrefs)
- Other functions according to project requirements.

Job servers

- **Create a smart job server infrastructure**
- Do not run all types of jobs on all machines, split by tasks:
  - High speed hardware for CAD, Navis works tasks
  - Low level performance virtual machines for reports, e-mails, etc.
- Make sure you have enough machines for your tasks and track Job Queue



Process automation – Vault API

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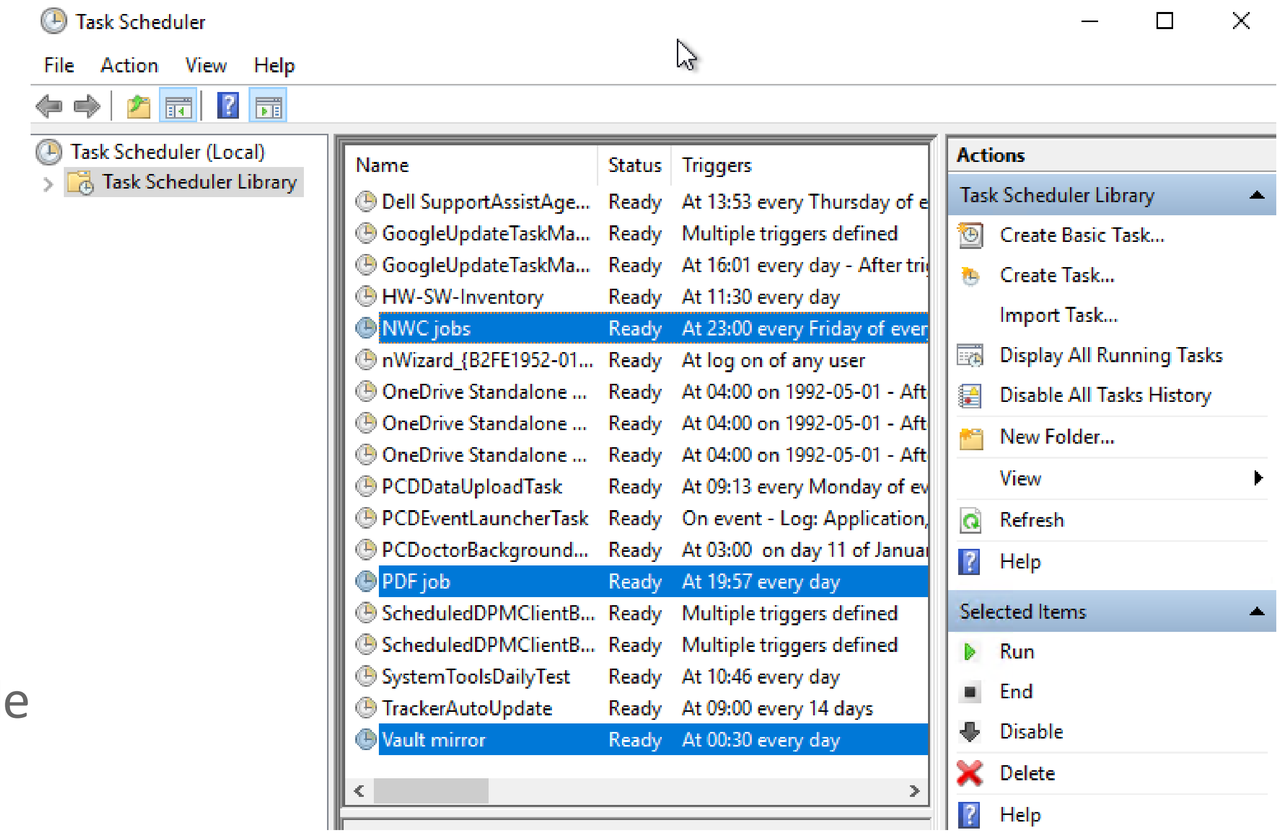
5. Scheduled jobs
   - Scheduler runs jobs automatically without user input.

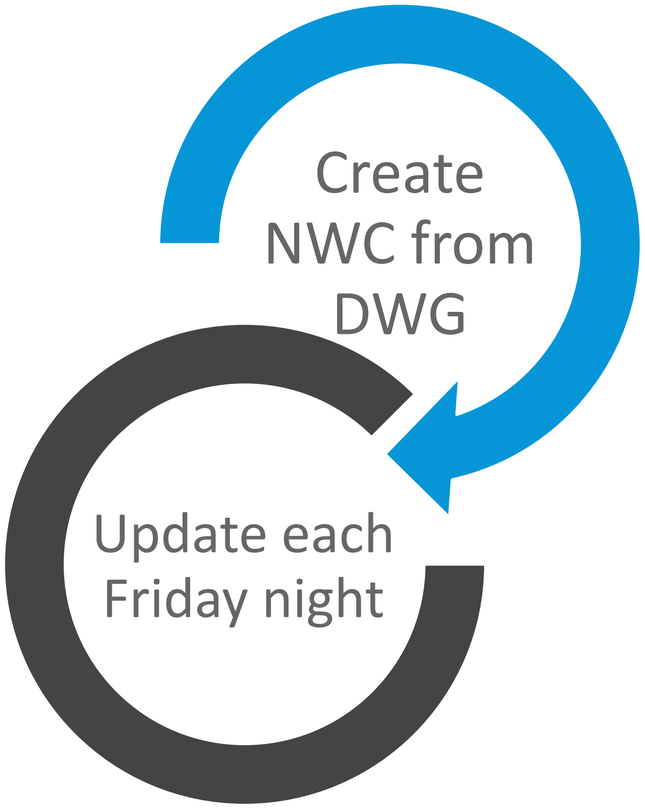
Automate automated processes

- **If a function can be run on a Job server, maybe it can be run without user input?**
- Create Vault functions that create jobs automatically according to specific search conditions:
  - File attribute value
  - Compare master file version with the output file version
- Run scheduler once per night or once per week to create jobs to job servers automatically



Automate automated processes

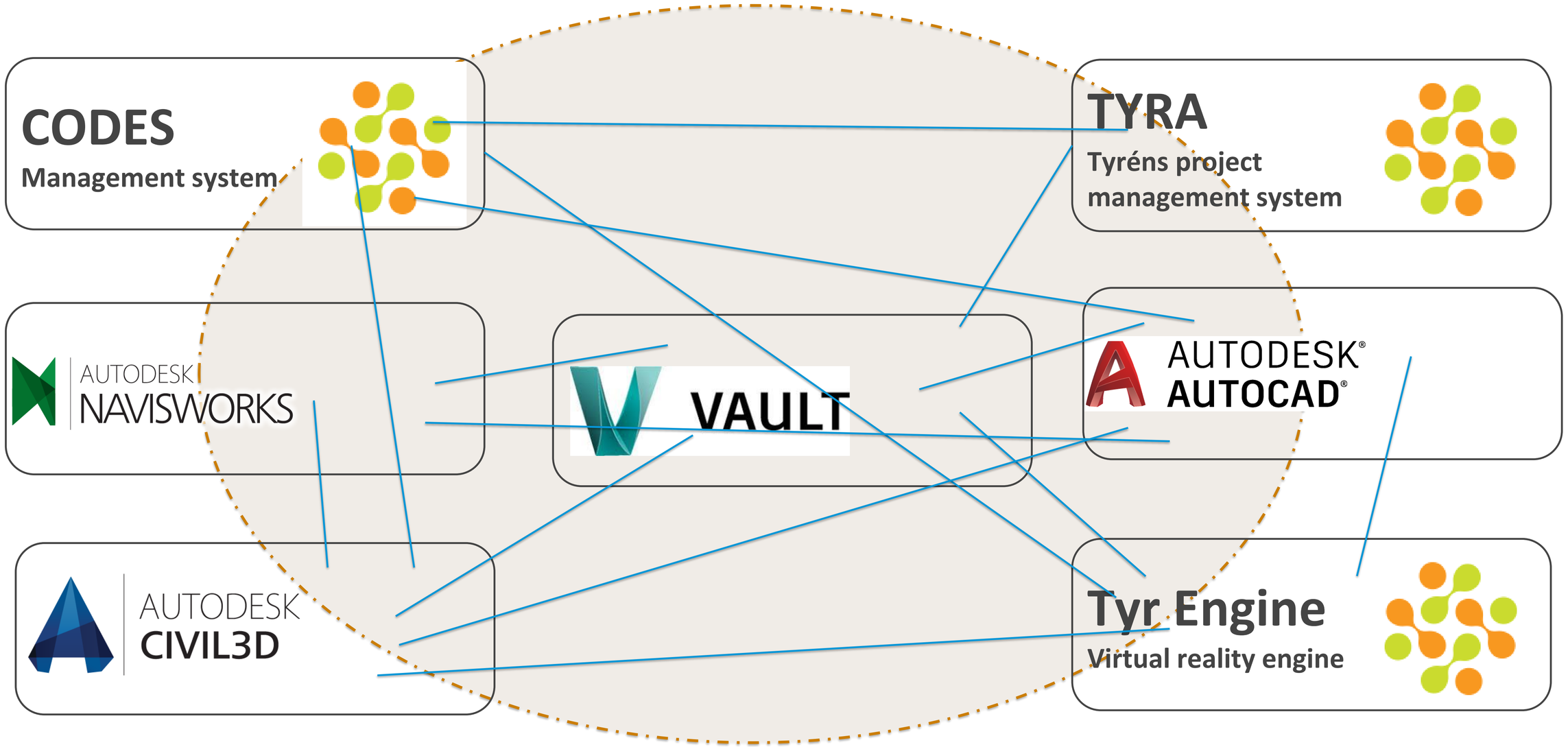
- **If a source file was updated, then the output file must be updated as well.**
- Export DWG to NWC
  - The first time the user creates a job by clicking a command.
  - Next Friday night, the Task Scheduler starts a Vault command, which searches all NWC files and if a DWG in newer, a job will be initiated automatically and a NWC will be updated.



Automate automated processes

- **One week statistics for a single project**
- 700 customs jobs
  - 242 PDFs created
  - 36 Civil 3D model files exported to CAD files
  - 109 Civil 3D model files exported to NWCs for the coordination model
  - **84** of them updated **automatically** without any user input

Design working platform



Design working platform

- Design working platform it a collection of different applications with specific configurations and custom applications working in the most optimal way with additional functionality and configurations.
- One of the most important things is to know how to use them in right way.

Questions

Thank you

Please Fill Out Your Surveys

Make sure your voice is heard by completing your surveys!

Please take the time to complete your survey for this and every class you attend at Autodesk University.

Autodesk uses this information to know what classes to offer in the future.