



# Hybrid PDM, PLM and ERP

Sync data between cloud and  
on-premises systems

MFG500644

Christian Gessner  
Technical Evangelist | COOLORANGE

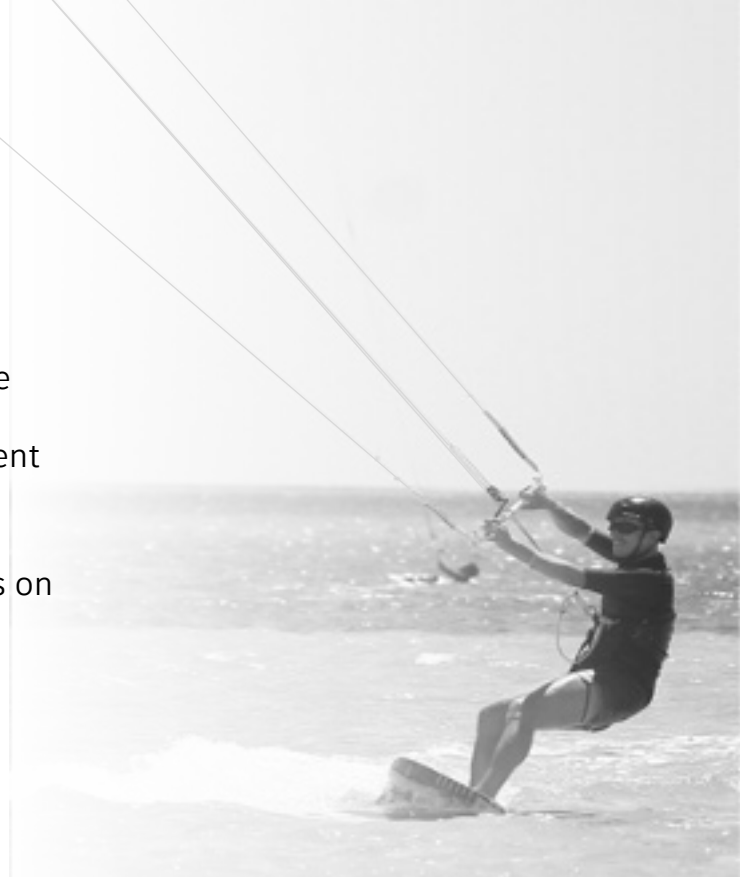
# About the Speaker

## Christian Gessner

is a co-founder and Technical Evangelist at COOLORANGE. In this role, he helps customers and resellers to use the right technology and tools to successfully design, implement and customize Autodesk data management solutions.

He has over 15 years of experience in software development with a focus on Autodesk data management products and Microsoft development technologies.

Prior to COOLORANGE, Christian was member of the data management software engineering team at Autodesk.



[www.coolorange.com](http://www.coolorange.com)

# Hybrid PDM, PLM and ERP

## Sync data between cloud and on-premises systems

### Agenda

- Introduction
- Hybrid systems
- Webhooks
- IPaaS (Integration Platform as a Service)
- Behind the Scenes
- Use Cases





# Who is COOLORANGE?

Introduction

# About COOLORANGE

- Founded in 2009
- By former Autodesk employees
- 20+ years in software development in data management
- Our locations include Italy, Germany, Spain, USA
- 100% commitment to Autodesk PDM/PLM



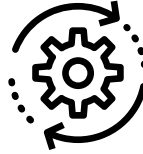
# Solutions for Engineering

Efficiency & Data Quality



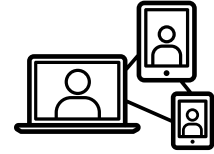
## LOAD

powerLoad



## AUTOMATE

powerJobs



## CONNECT

powerGate

powerPLM

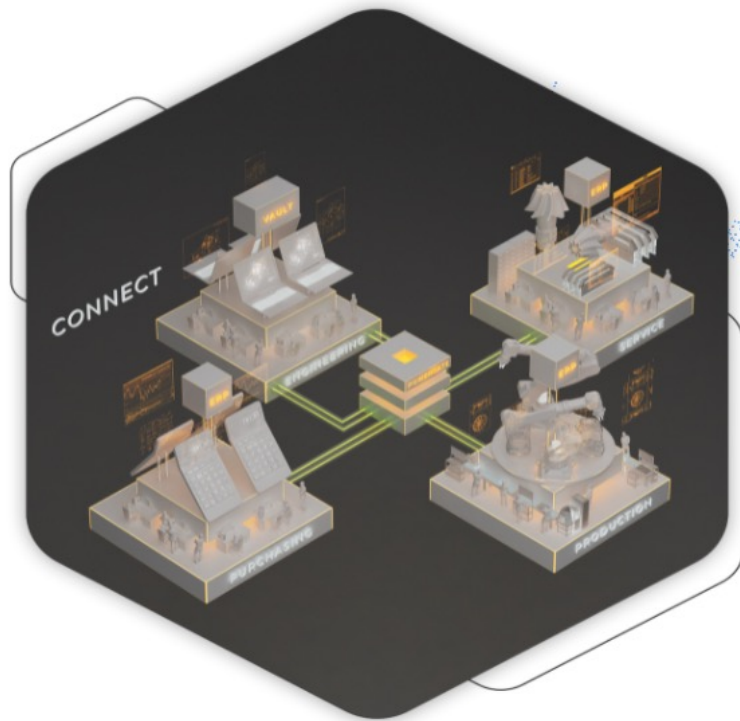
# powerGate



## Connecting Autodesk Vault to your ERP system with powerGate

**powerGate** is the best-in-class connection software for Autodesk Vault customers, helping engineers and designers **cut the time on creating, updating and transferring engineering BOM's** to the ERP System while improving the quality and accessibility of the documentation needed by other teams.

**powerGate** connects Vault to ERP in just a few weeks, offering complete flexibility in terms of customization.





SAP Business One



Microsoft Dynamics 365 Business Central



Microsoft Dynamics NAV



Microsoft Dynamics AX

ORACLE<sup>®</sup>  
FUSION APPLICATIONS

EPICOR



Visual



Syteline



M3



monitor  
ERP SYSTEM

RAMSAUER STÜRMER  
BUSINESS SOFTWARE

myfactory

abas ERP

PRO ALPHA

reflex<sup>®</sup>  
plus

radix

DOXIS 4

ams  
Die ERP-Lösung



Baan

GP PLUS

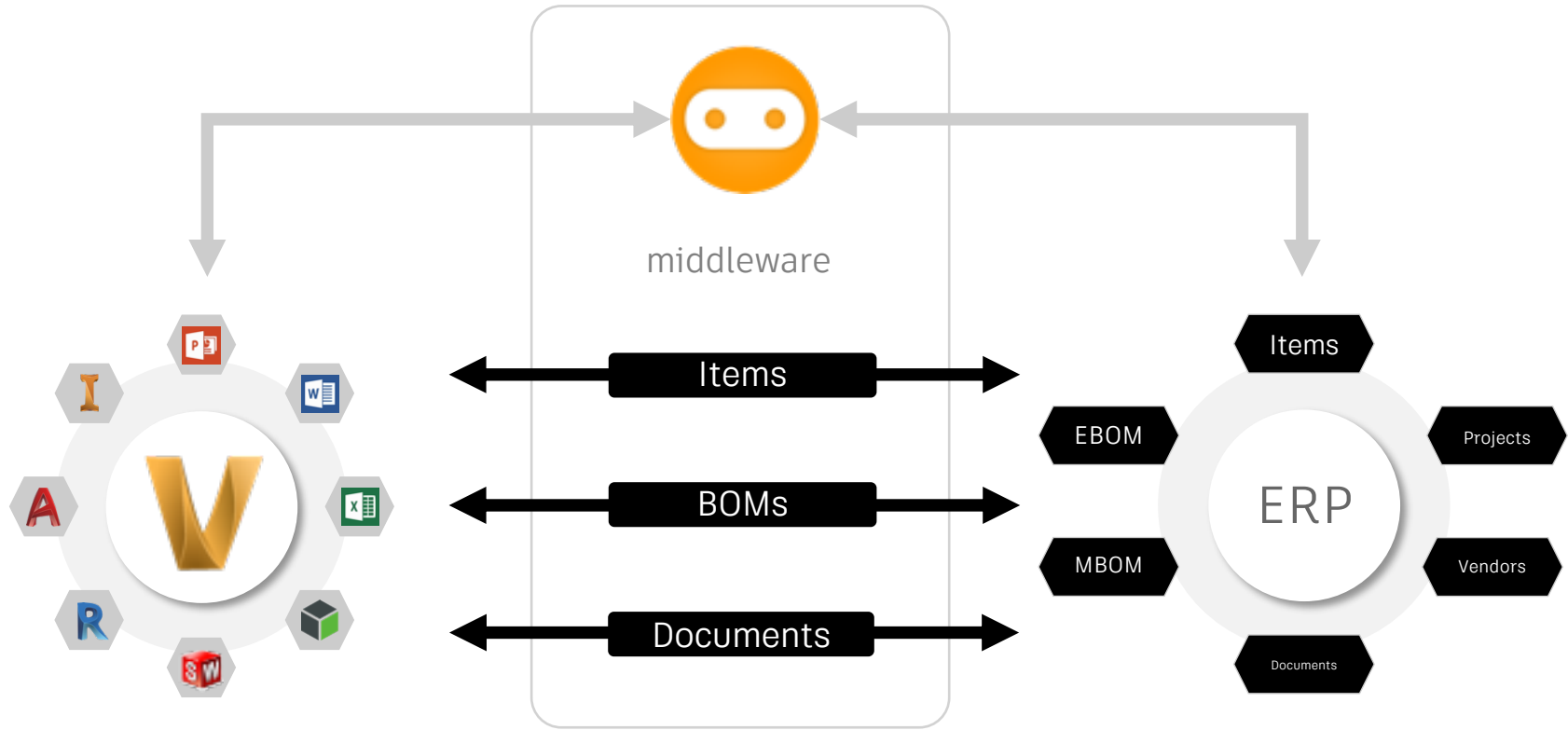
PSI  
PSIPENTA

BMD BUSINESS SOFTWARE



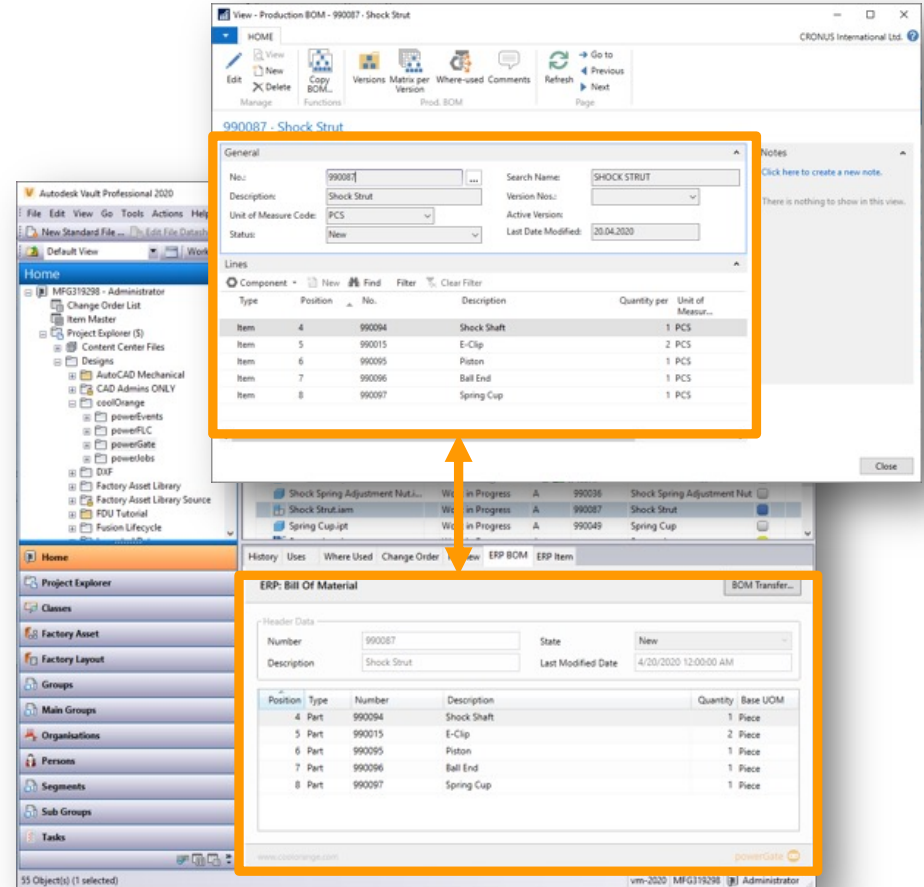


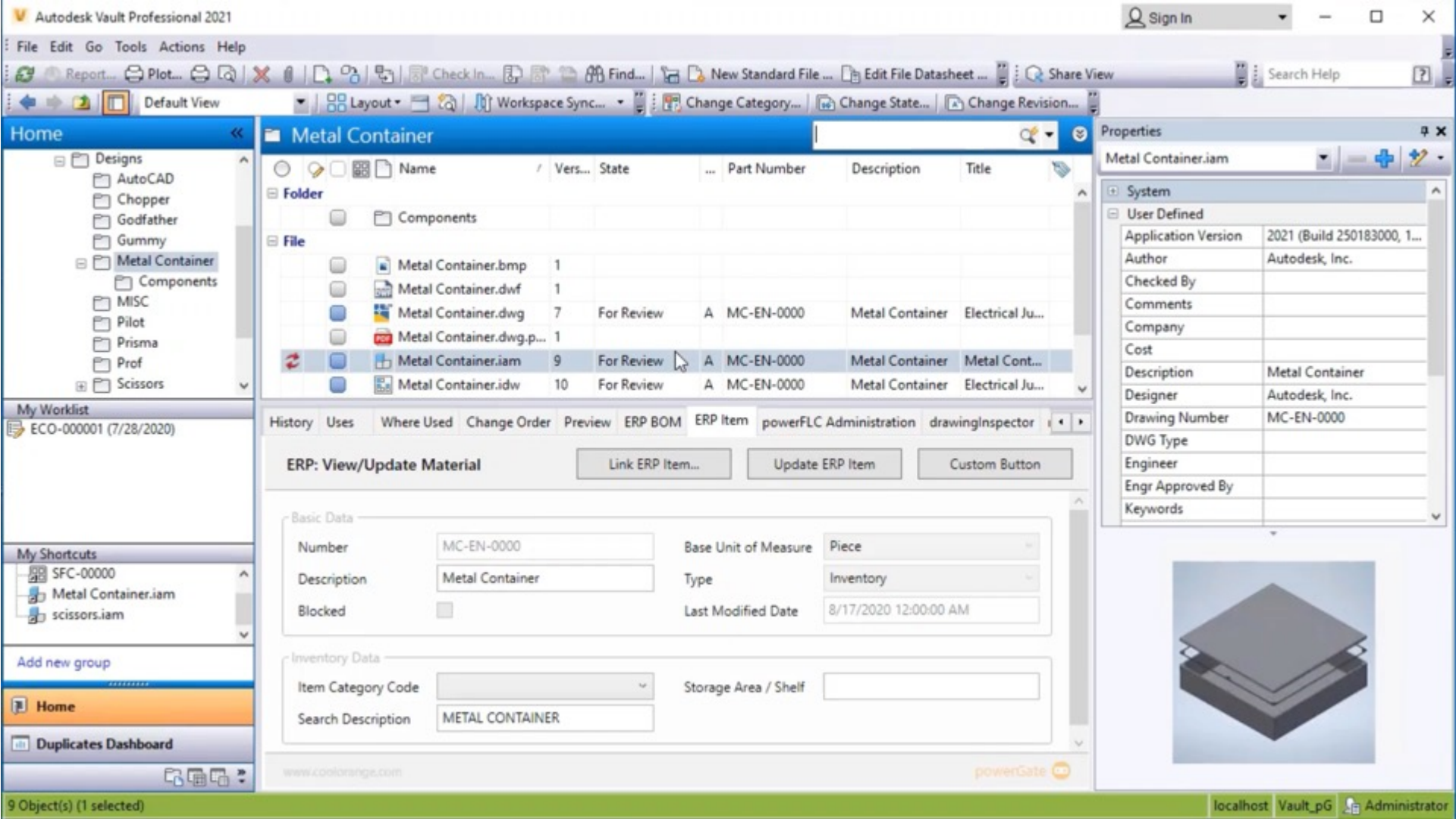
# powerGate – Middleware



# powerGate – Overview

- Integrated in Vault + Inventor
- Brings ERP data into Vault + Inventor (bi-directional & live)
- Synchronizes Items and BOMs
- Inserts raw materials and virtual components from ERP into your CAD data
- Embedded in Vault workflows to ensure data integrity
- Works with item master or files
- Customizable





Autodesk Vault Professional 2021

File Edit Go Tools Actions Help

Report... Plot... Check In... Find... New Standard File ... Edit File Datasheet ... Share View Search Help

Default View Layout Workspace Sync... Change Category... Change State... Change Revision...

Home

Designs

- AutoCAD
- Chopper
- Godfather
- Gummy
- Metal Container
  - Components
- MISC
- Pilot
- Prisma
- Prof
- Scissors

My Worklist

- ECO-000001 (7/28/2020)

My Shortcuts

- SFC-00000
- Metal Container.iam
- scissors.iam

Add new group

Home

Duplicates Dashboard

9 Object(s) (1 selected)

Metal Container

	Name	Vers...	State	...	Part Number	Description	Title
Folder	Components						
File	Metal Container.bmp	1					
	Metal Container.dwf	1					
	Metal Container.dwg	7	For Review	A	MC-EN-0000	Metal Container	Electrical Ju...
	Metal Container.dwg.p...	1					
	Metal Container.iam	9	For Review	A	MC-EN-0000	Metal Container	Metal Cont...
	Metal Container.idw	10	For Review	A	MC-EN-0000	Metal Container	Electrical Ju...

History Uses Where Used Change Order Preview ERP BOM ERP Item powerFLC Administration drawingInspector

ERP: View/Update Material

Link ERP Item... Update ERP Item Custom Button

Basic Data

Number	MC-EN-0000	Base Unit of Measure	Piece
Description	Metal Container	Type	Inventory
Blocked	<input type="checkbox"/>	Last Modified Date	8/17/2020 12:00:00 AM

Inventory Data

Item Category Code		Storage Area / Shelf	
Search Description	METAL CONTAINER		

www.coolorange.com powerGate

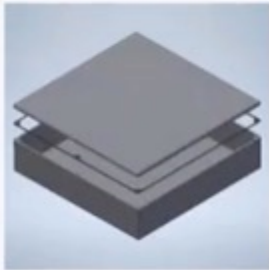
Properties

Metal Container.iam

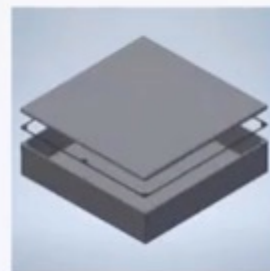
System

User Defined

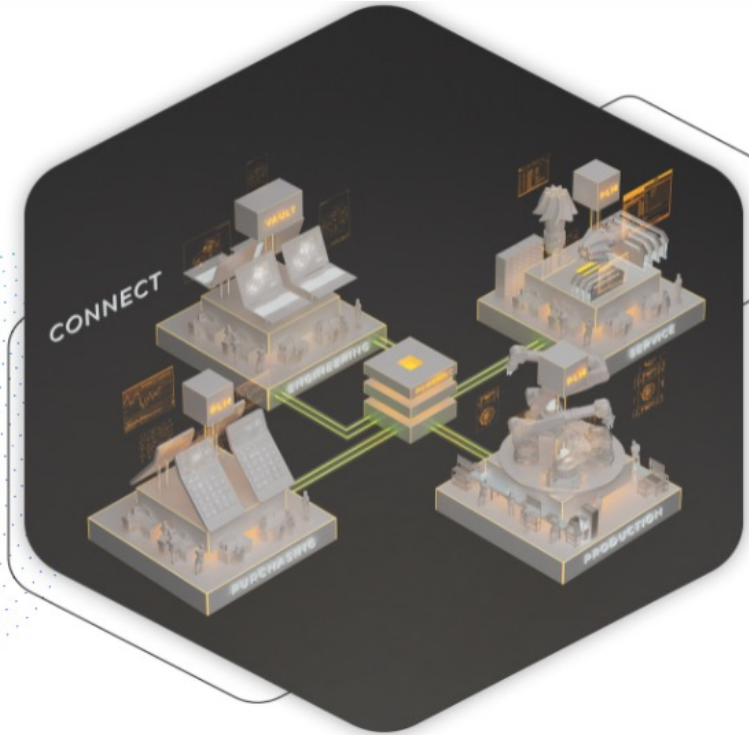
Application Version	2021 (Build 250183000, 1...
Author	Autodesk, Inc.
Checked By	
Comments	
Company	
Cost	
Description	Metal Container
Designer	Autodesk, Inc.
Drawing Number	MC-EN-0000
DWG Type	
Engineer	
Engr Approved By	
Keywords	



localhost Vault\_pg Administrator



# powerPLM



## Connecting Autodesk Vault to PLM with powerPLM

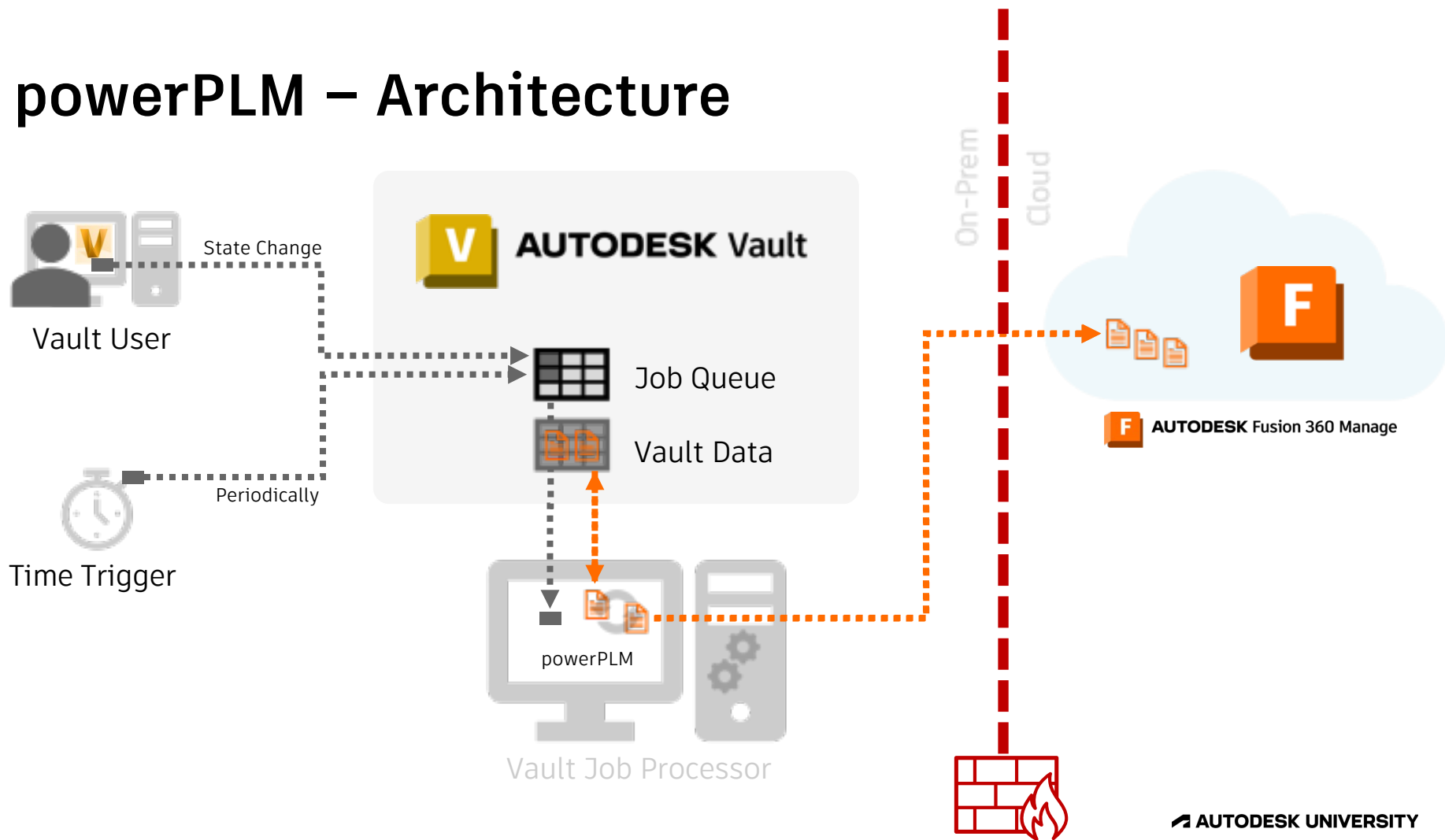
**powerPLM** is the 100% Autodesk-focused solution deeply integrated with engineering tools such as Autodesk Inventor and Autodesk Vault, with direct connection to Autodesk Fusion 360 Manage.

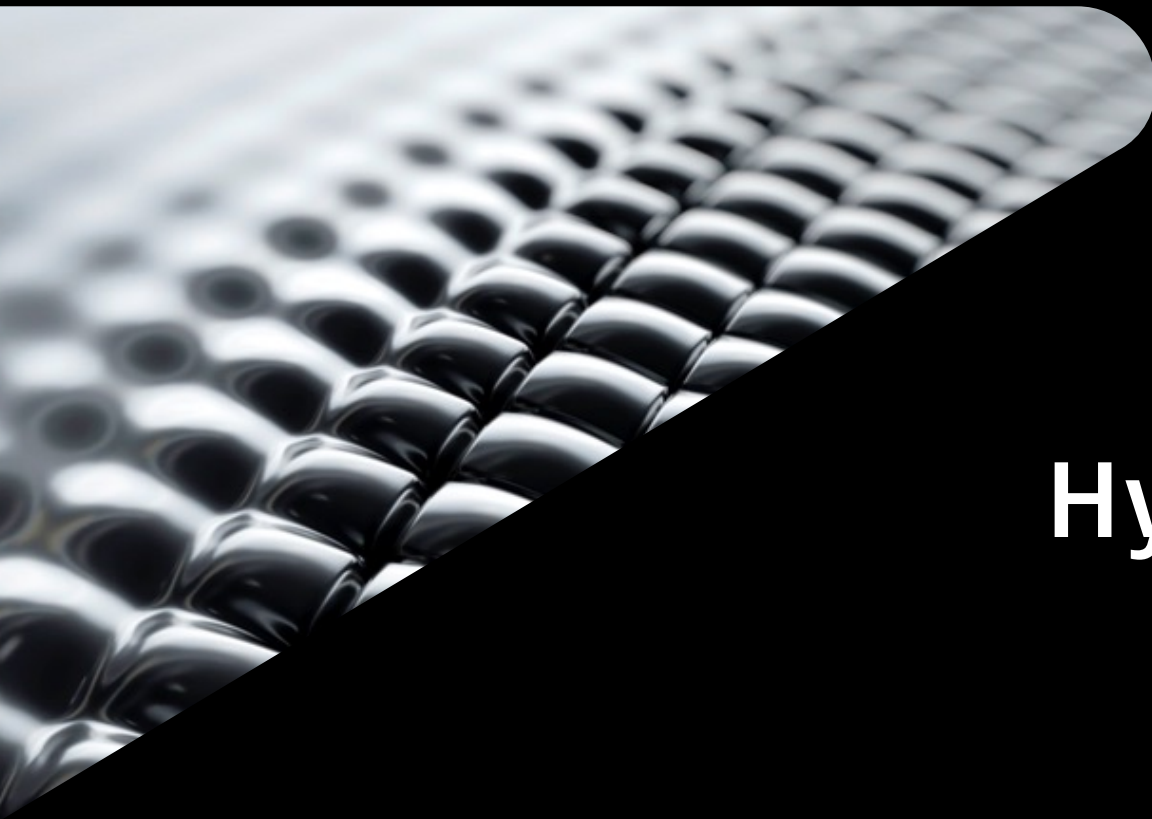
# powerPLM – Overview



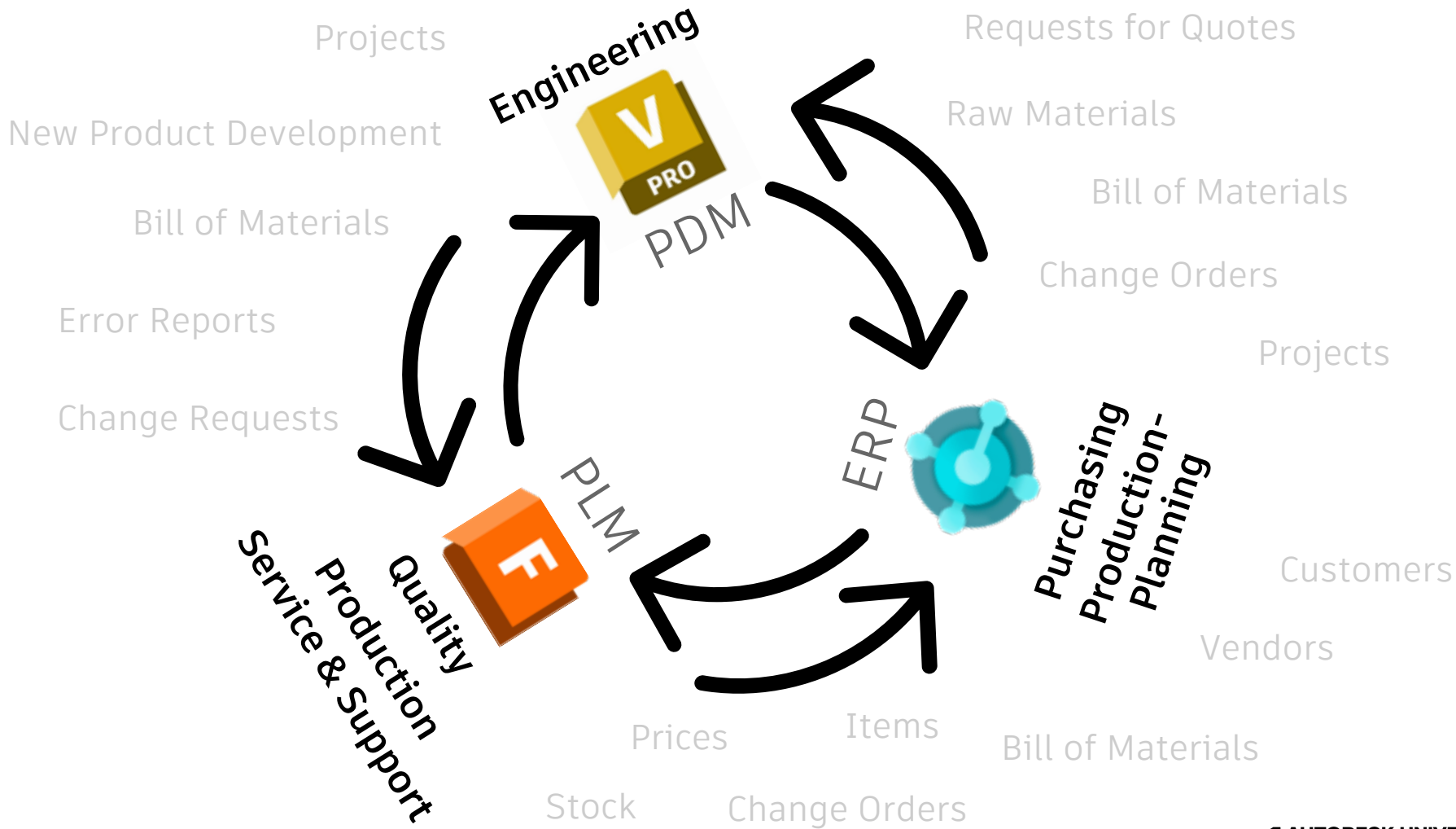
- **Items & BOMs workflow (Vault Items)**
  - Items and BOMs
  - Primary linked file metadata
  - Vault thin- and thick client links
  - Raw Materials + Virtual Components
  - BOM Merge functionality
  - Uploads Vault Item Attachments
- **Client components available**
- **Customizable**
  - Based on PowerShell
- **Change Management Workflow**
  - ECO in Vault automatically created
  - Affected Items automatically attached
  - Attachments saved to Vault
  - Change Orders in Fusion 360 Manage updated from Vault
- **Additional workflows available on GitHub**
  - Items and BOMs (w/o Vault Items)
  - Drawing upload
  - NPI

# powerPLM – Architecture





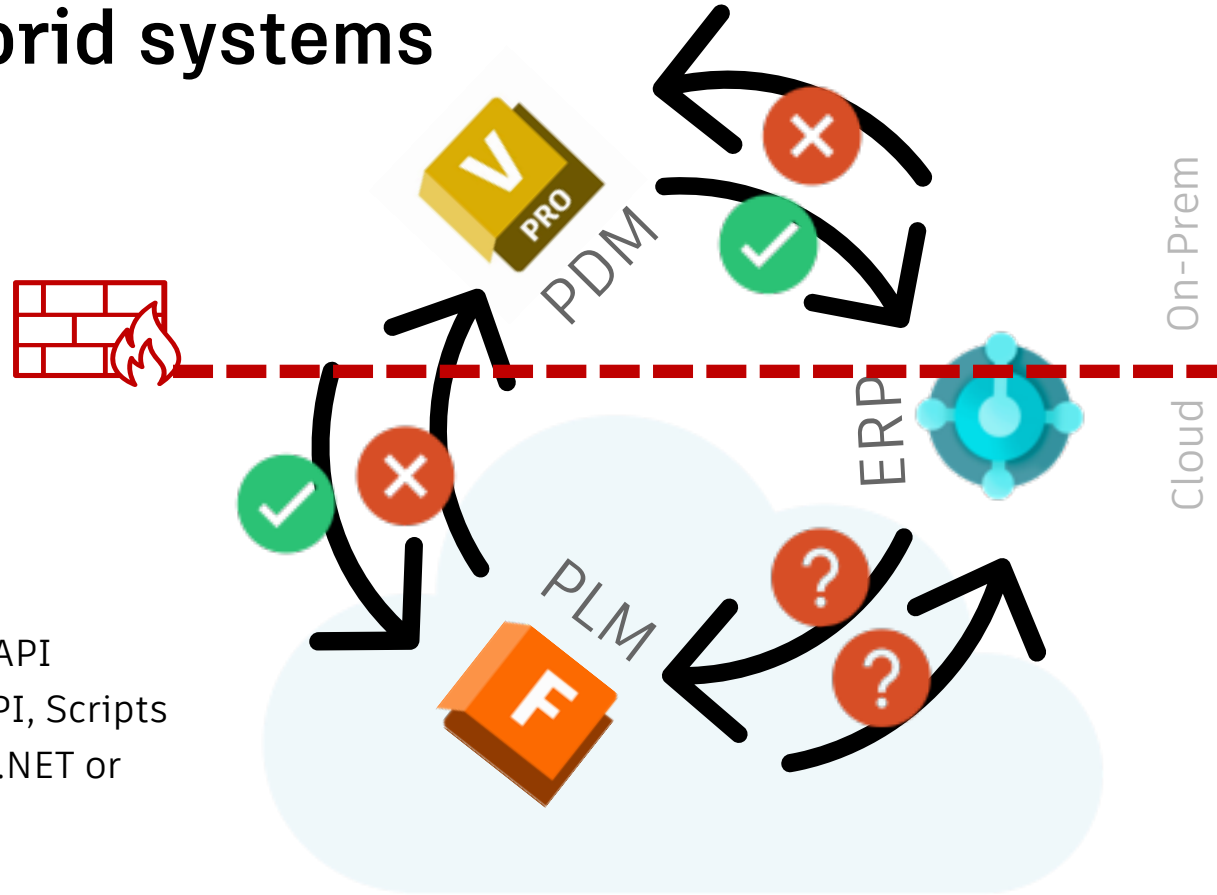
# Hybrid systems





# Challenges of hybrid systems

- Cloud & On-Prem
- Firewalls & VPN
- Polling
- Inbound & Outbound
- Different APIs
  - Vault SDK: .NET Framework API
  - Fusion 360 Manage: REST API, Scripts
  - ERP: SOAP or REST or DB or .NET or other APIs (e.g. SAP BAPI)



# What can we do to meet the challenges?



## Polling

Source needs to be queried regularly

Many calls stress the systems



## Custom Webservice

Firewall needs to be opened

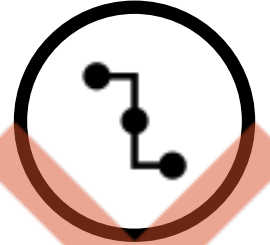
Custom code needs to be written



## Manual Synchronization

User can forget and make mistakes

Not really automated



## Vault Gateway

Designed for native Vault clients, not for API calls

Requires .NET Framework

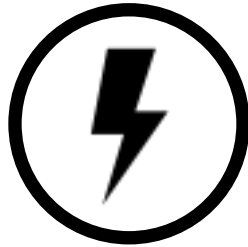
# What do we need?



## On-Prem & Cloud

Target and/or source systems are installed on-prem or cloud-based  
-

The firewall must not be opened



## Instant Feedback

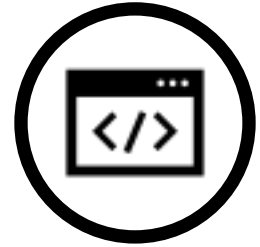
Source system sends change notifications immediately

-  
no need to poll data from the target system



## Complete Data

Source data is complete or can be enriched to be “digestible” by the target system



## Common Language

Target systems must “understand” the data and the instructions



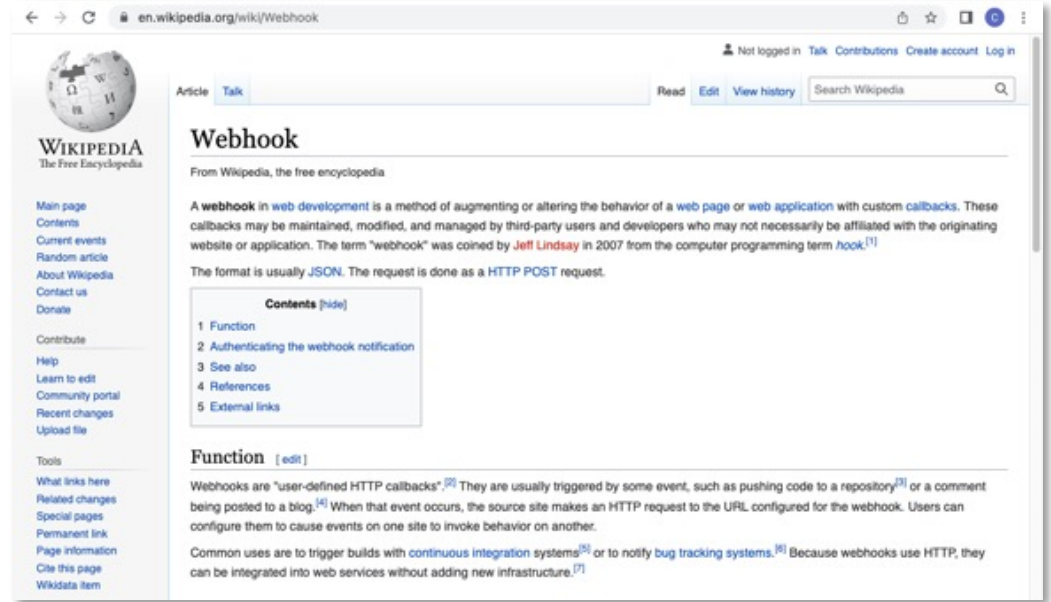


# Webhooks

# What is a Webhook?

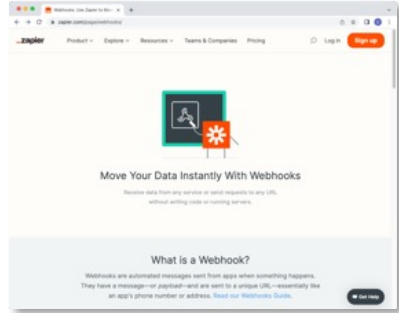


- Based on HTTP standards
- Callback sent immediately when resource is created, updated or deleted
- Fusion 360 Manage supports webhooks and HTTP notifications
- Upchain supports webhooks
- Most ERP systems can send webhooks or HTTP notifications
- Online services (SaaS) available that can receive and process the webhook



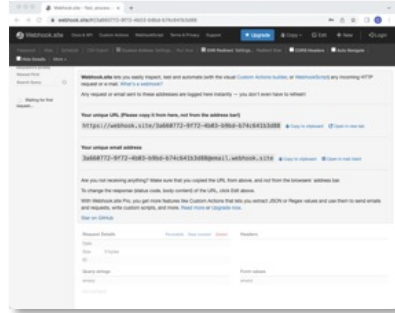
*“Webhooks are “user-defined HTTP callbacks”. They are usually triggered by some events...”*

# SaaS / IPaaS to receive callbacks



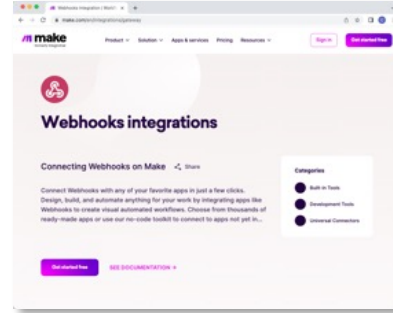
## Zapier.com

- Receive callbacks
- Runs scripts and custom actions
- Integration for SAP Business One
- Tutorial for Fusion 360 Manage available from Autodesk



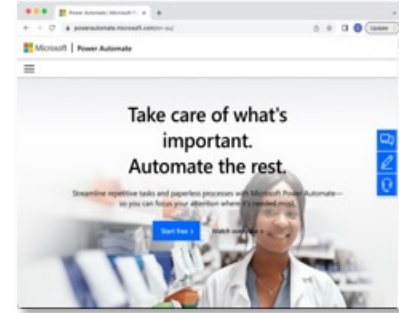
## Webhook.site

- Receive callbacks
- Runs scripts and custom actions



## Make.com

- Receive callbacks
- Integration for SAP S/4HANA
- Integration for Infor M3



## Many more...

- Receive callbacks
- Process data
- Forward to other systems

Limited to cloud apps

# Webhook data (payload)

- Payload does not contain all needed information
- Links to resources
- Dataset needs to be queried
- Samples
  - Business Central callback
  - Fusion 360 Manage callback

## Business Central

```
1 {
2   "value": [
3     {
4       "subscriptionId": "7a819a78447e4d7885e1389f83be93",
5       "clientState": "Lorem ipsum ",
6       "lastModifiedDateTime": "2022-06-23T07:24:27.533Z"
7     },
8     {
9       "resource": "api/v2.0/companies(f04e3664-0fe2-ec11-bb47-000d3a21e44e)/items(c15df38f-0fe2-ec11-bb47-000d3a21e44e)",
10      "changeType": "updated",
11      "lastModifiedDateTime": "2022-06-23T07:24:27.533Z"
12    }
13  ]
14 }
```

## Fusion 360 Manage

```
1 {
2   "version": "1.0",
3   "resourceUrn": "urn:adsk.plm:tenant.workspace.item:DEFAULTTRAIN61.79.14547",
4   "hook": {
5     "hookId": "361babfb-cdb1-4a2e-8d6d-80ca8764f9f3",
6     "tenant": "DEFAULTTRAIN61",
7     "callbackUrl": "https://powergate.online/api/callback?tenant=61458640-e007-4d92-974c-88d445cb",
8     "createdBy": "200907170821730",
9     "event": "item.update",
10    "createdDate": "2022-06-23T21:24:34.072+00:00",
11    "lastUpdatedDate": "2022-06-23T21:24:34.072+00:00",
12    "system": "adsk.flc.production",
13    "creatorType": "02User",
14    "status": "active",
15    "scope": {
16      "workspace": "urn:adsk.plm:tenant.workspace:DEFAULTTRAIN61.79"
17    },
18    "autoReactivateHook": false,
19    "urn": "urn:adsk.webhooks:events.hook:361babfb-cdb1-4a2e-8d6d-80ca8764f9f3",
20    "callbackWithEventPayloadOnly": false,
21    "__self__": "/systems/adsk.flc.production/events/item.update/hooks/361babfb-cdb1-4a2e-8d6d-80ca8764f9f3"
22  },
23   "payload": {
24     "ItemUrn": "urn:adsk.plm:tenant.workspace.item:DEFAULTTRAIN61.79.14547",
25     "ItemDescription": "Wheel - Wheel.ipt"
26   }
27 }
```





Login

Connect your systems - live, bi-directional and in real-time

# powerGate Online

PLM, ERP or DMS systems need to exchange data. powerGate is a middleware that connects Autodesk Vault with ERP- and DMS-systems. powerGate Online is a powerful service that compliments the on-premises functionality of powerGate with features for online connectivity and callbacks.

Let's get started...

Synchronize and digitally transform PDM, PLM and ERP data



**AUTODESK** Vault



Microsoft Dynamics 365  
Business Central

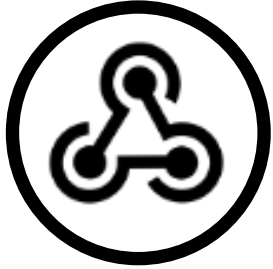


**AUTODESK** Fusion 360 Manage





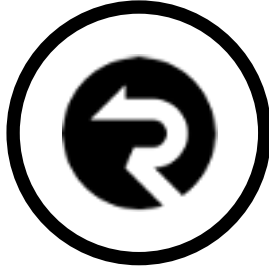
# powerGate Online...



**...receives  
callbacks from  
any apps**

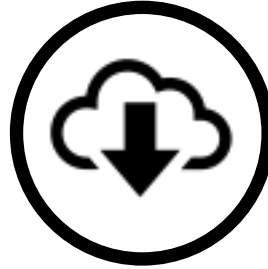
From cloud- or on-prem-  
applications.

Once received, it immediately  
forwards the webhook to a  
local Agent.



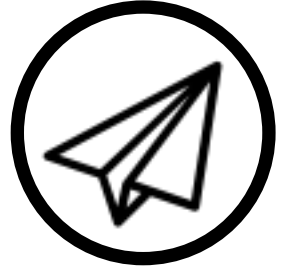
**...executes  
on-prem**

A local Agent service receives  
the callback data without the  
need to open the firewall



**...queries  
missing data**

A PowerShell scripts can  
query missing data and  
transform the dataset before  
the data gets sent to the  
target system



**...sends data to  
any target**

The PowerShell script finally  
connects to on-prem or cloud  
systems, including Vault.

Wrappers for Vault, Fusion  
360 Manage and ERP systems  
are available.

Autodesk Vault Professional 2023

File Edit View Go Tools Actions Help

Report... Plot... Check In... Find... Search Help Share View

Layout Workspace Sync... Change Category... Change State...

Projects

Search Projects

Name State Rev... Part Nu...

Entity Type: Folder

P0068 Bid

Properties

P0068

System

Category Name Project

Create Date 31/08/2022 14:35

Created By Administrator

Folder Path S:/Designs/Projects/P0068

Lifecycle Definition Project Flow

Name P0068

Obsolete False

Property Compliance Noncompliant policies

State Bid

User Defined

Customer

Date End

Date Start

Description Autodesk University 2022 - Ne...

Project Number P0068

Title Autodesk University 2022

Reports | Datasheet

Report Templates: <Select report template> Configure...

100%

1 Object(s) (1 selected)

vm-2023 Vault administrator

powerGate - Callback Queue P0067 - IoT devices - Fusion 360

defaulttrain61.autodeskplm360.net/plm/workspaces/86/items/itemDetails?view=full&tab=details&m...

AUTODESK Fusion 360 Manage

Home Projects

P0067 - IoT devices

Planning Workflow actions

Project Files (0) Phase / Gate Process Tasks In Work (0) Gantt (10) More +

Edit

Basic (1 of 13)

Number P0067

Title IoT devices

Description Manage new ideas for IoT devices

Start Date 08/18/2022

Template Generic

Priority Assessment is missing

Details (2 of 13)

KPIs (3 of 13)

	Progress	Budget Consumpti...	Status	Current Phase	Phase Progress
Project KPIs	G1 G2 G3 G4 G5	NO BUDGET	S R D R		

Project Phases (4 of 13)

	Specificati...	Concept	Developme...	Validation	Production
Planned Completion	08/30/2022	09/13/2022	10/13/2022	12/05/2022	12/21/2022
Expected Completion					
Actual Completion					
Plan Deviation (d)	1	-13	-43	-96	-112
Phases	<	r	n	v	Production

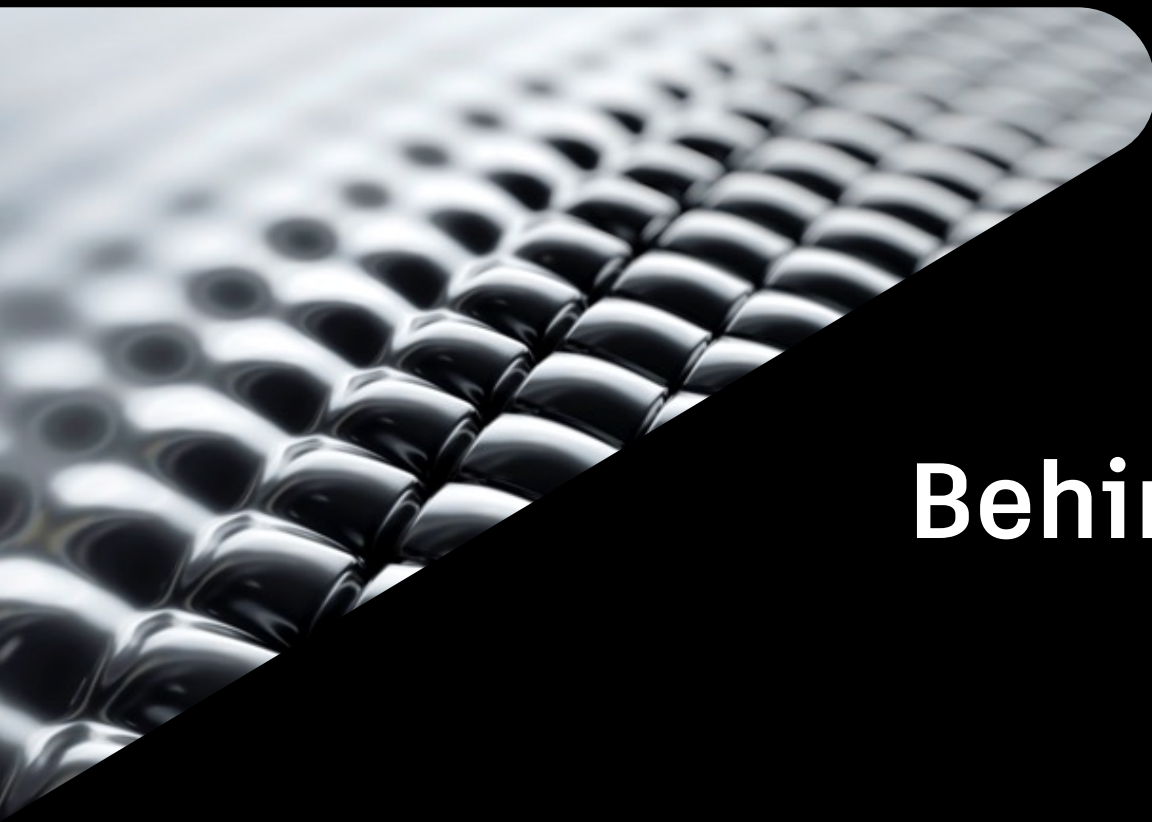
AUTODESK

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AUTODESK Fusion 360 Manage

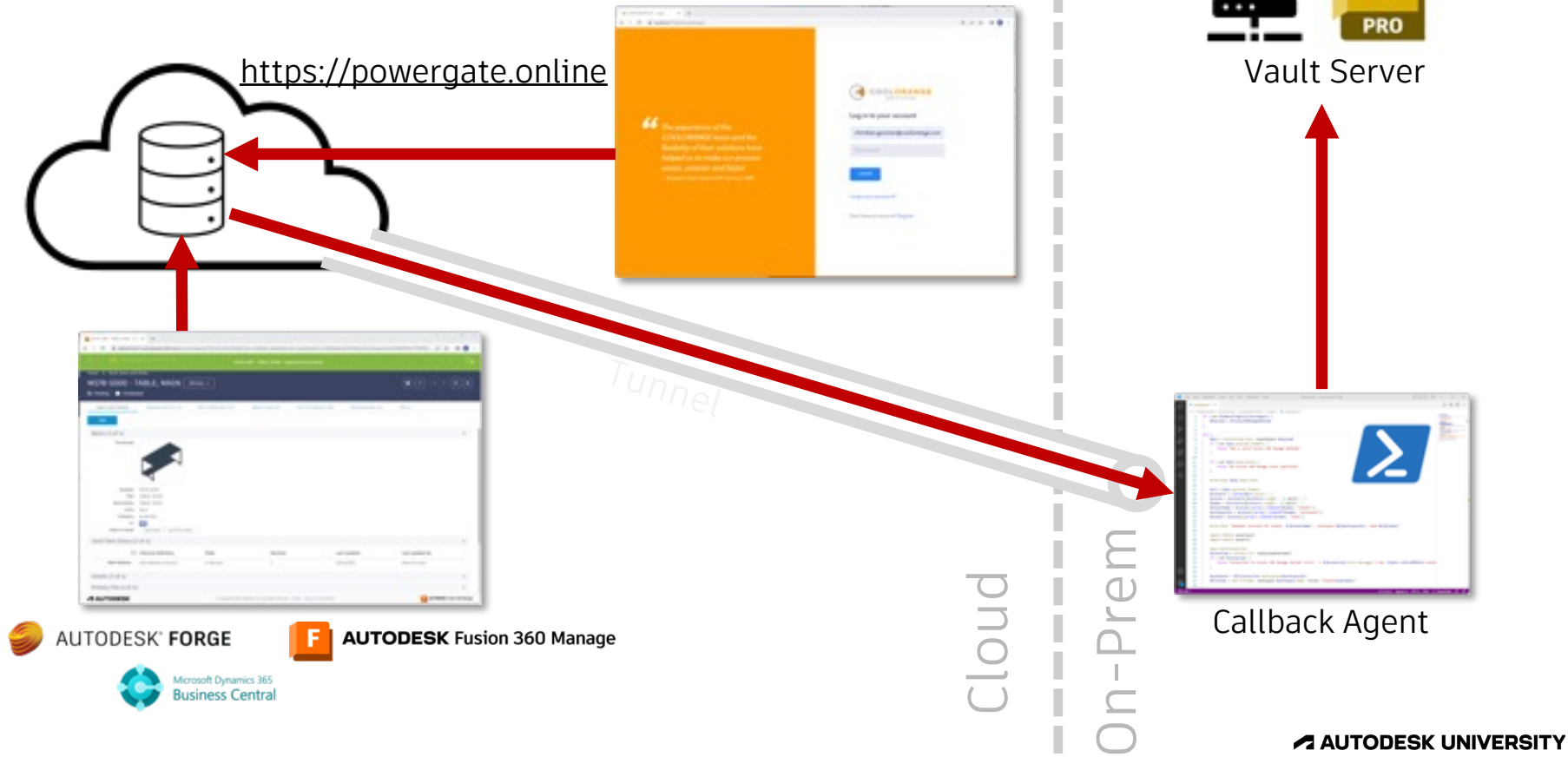
65°F Raining now

14:37 31/08/2022



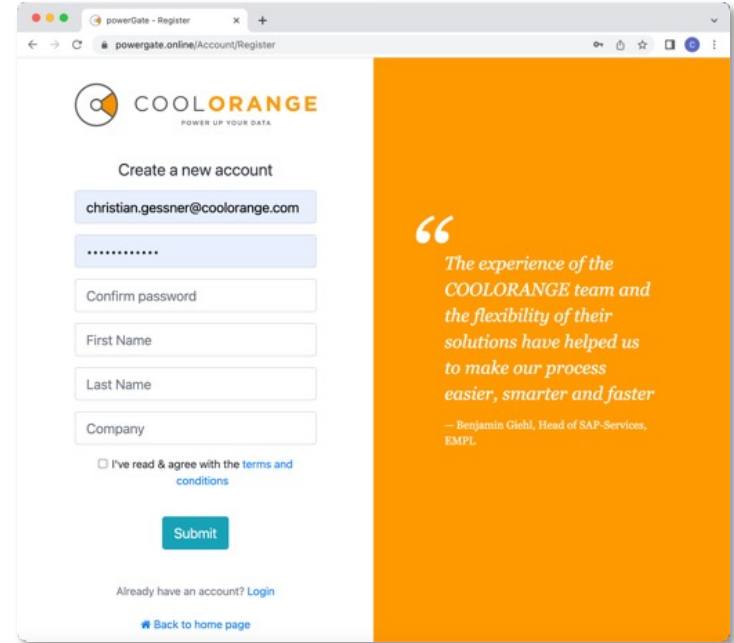
**Behind the scenes**

# Service Architecture



# Installation and Configuration

- 1) Register your personal account at <http://powergate.online>
- 2) Download and install the agent service
- 3) powerGate.Agent.Tray application
  - 1) Start the system tray application
  - 2) Provide credentials
- 4) powerGate.Agent window service
  - 1) Change “log on as” to regular user
  - 2) Start the service
- 5) Register a Webhook
- 6) Create a script that processes the callback



powerGate Online receives callbacks from cloud systems. This technology is often called 'Webhooks'. This service makes callbacks available to your on-premise Windows environment. An agent service that runs on your local server executes a Microsoft PowerShell script once the cloud systems sends a callback to the endpoint URL below.

### Step 1 - Download the Agent Application

Download

Specify the name of your PowerShell script file. This file needs to be created on your local server in 'C:\ProgramData\coolOrange\powerGateOnline\Scripts'

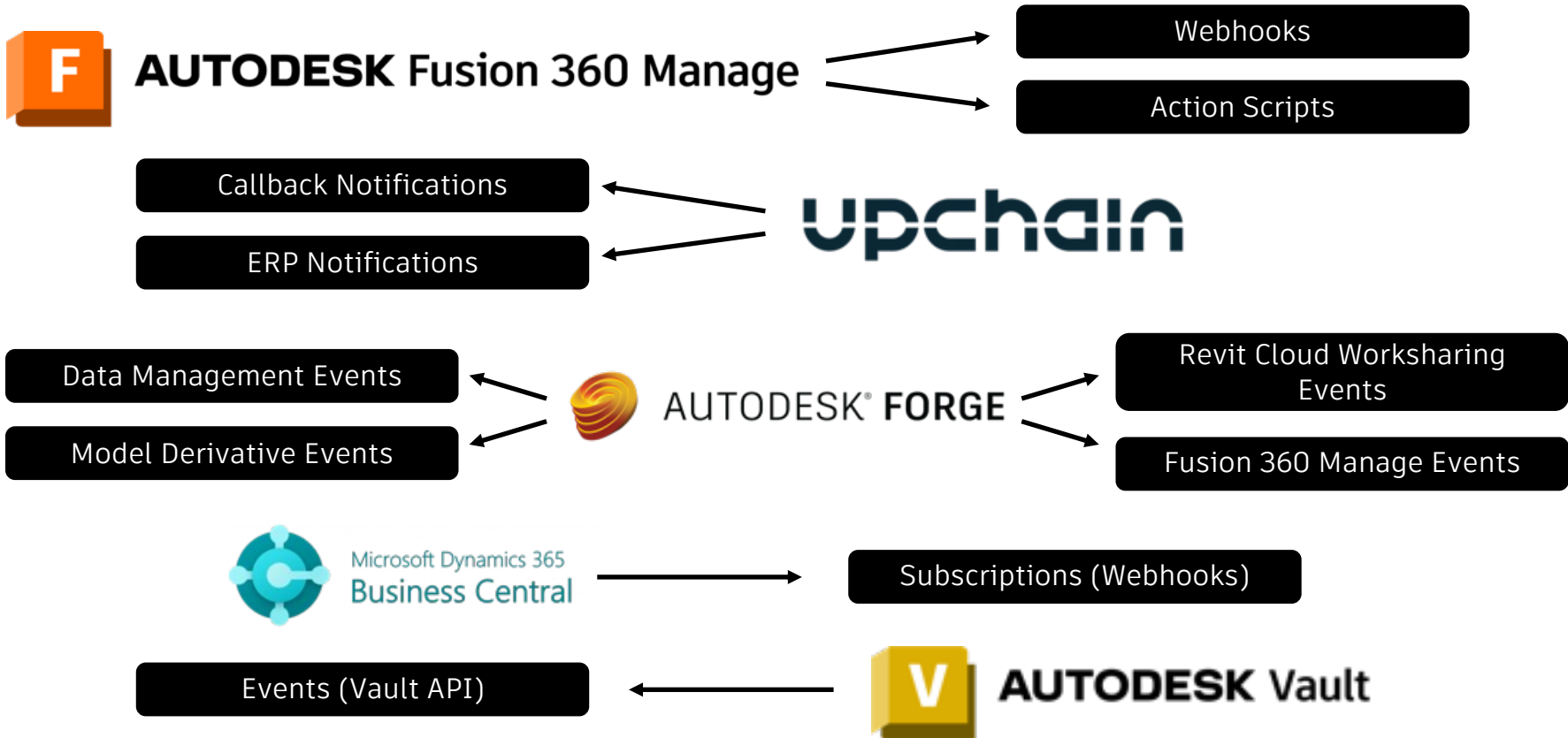
### Sample

C:\ProgramData\coolOrange\powerGateOnline\Scripts\Sample.ps1

Copy the link below and configure your cloud system (e.g. Fusion 360 Manage or your ERP system) to send a POST request to this exact Callback URL

Callback URL

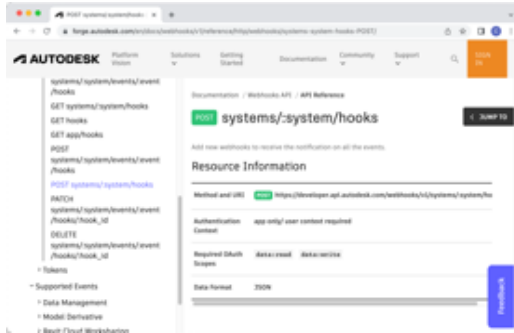
# Endless Possibilities



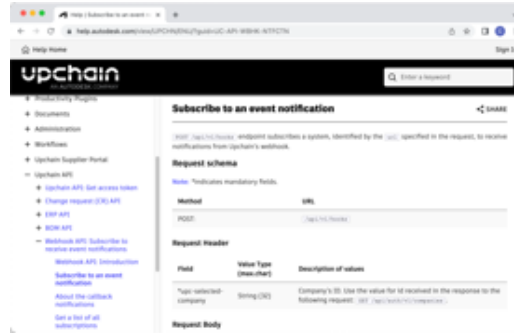
# Subscribe to events with Postman



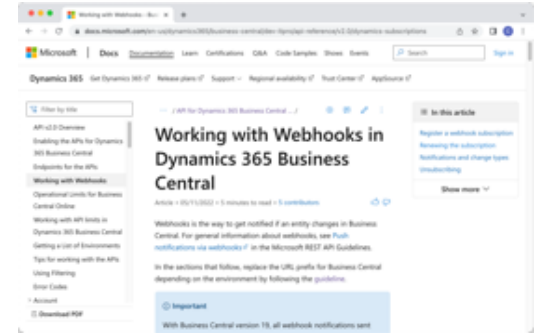
Postman can be used to create webhooks for e.g.



Fusion 360 Manage  
(using Forge)



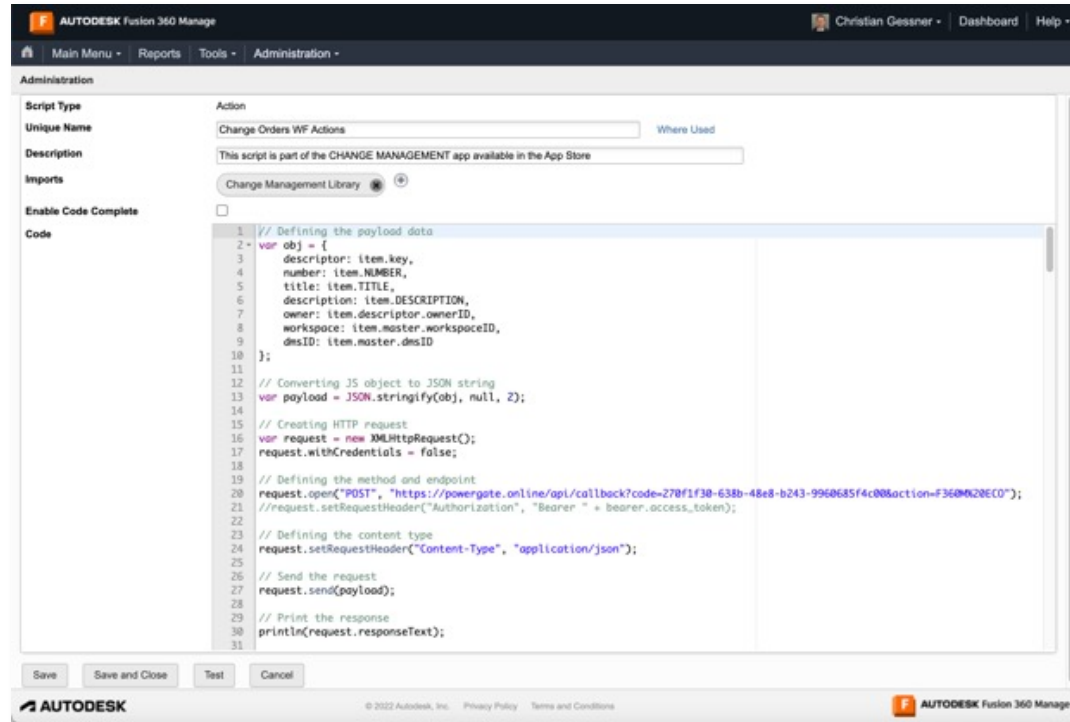
Upchain



Microsoft  
Business Central



# Send HTTP messages with scripting



## Fusion 360 Manage Action scripts

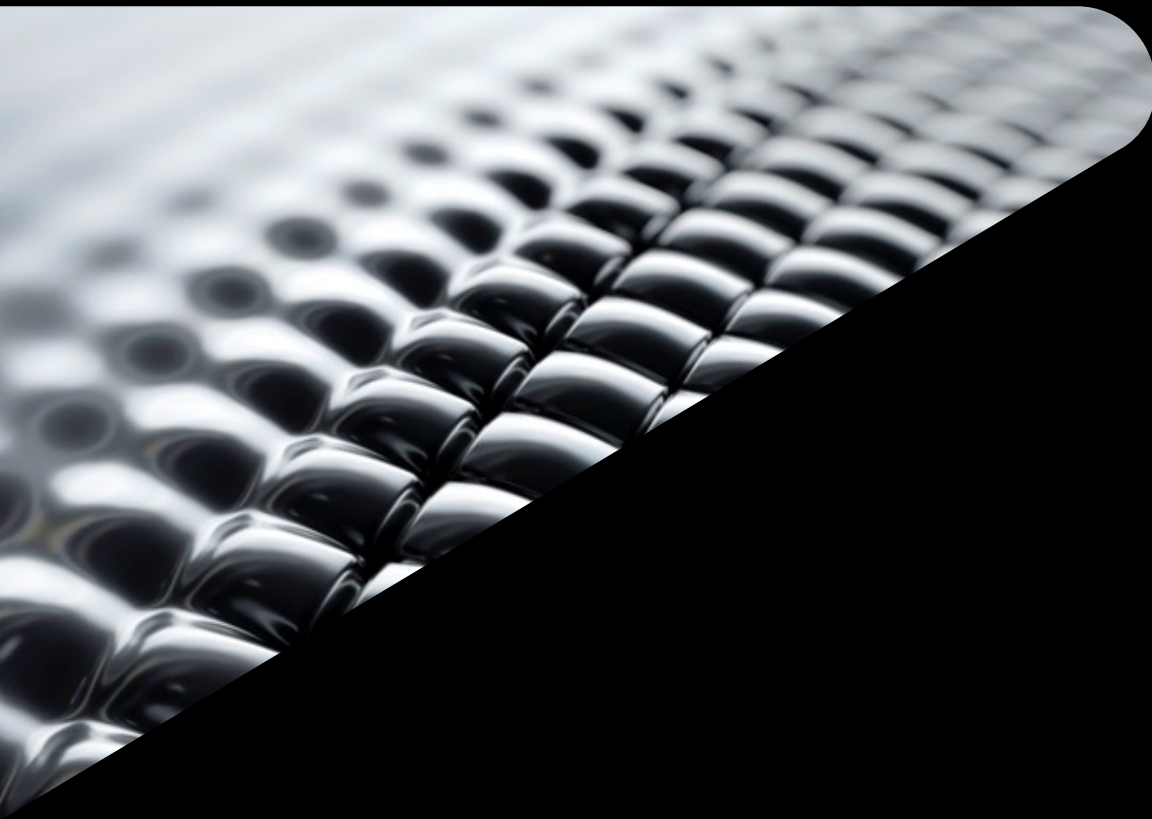
- Trigger
  - “Workflow Actions”
  - “Additional Actions” (manually)
- Javascript
- JSON.stringify()
- XMLHttpRequest

# Business Logic with PowerShell



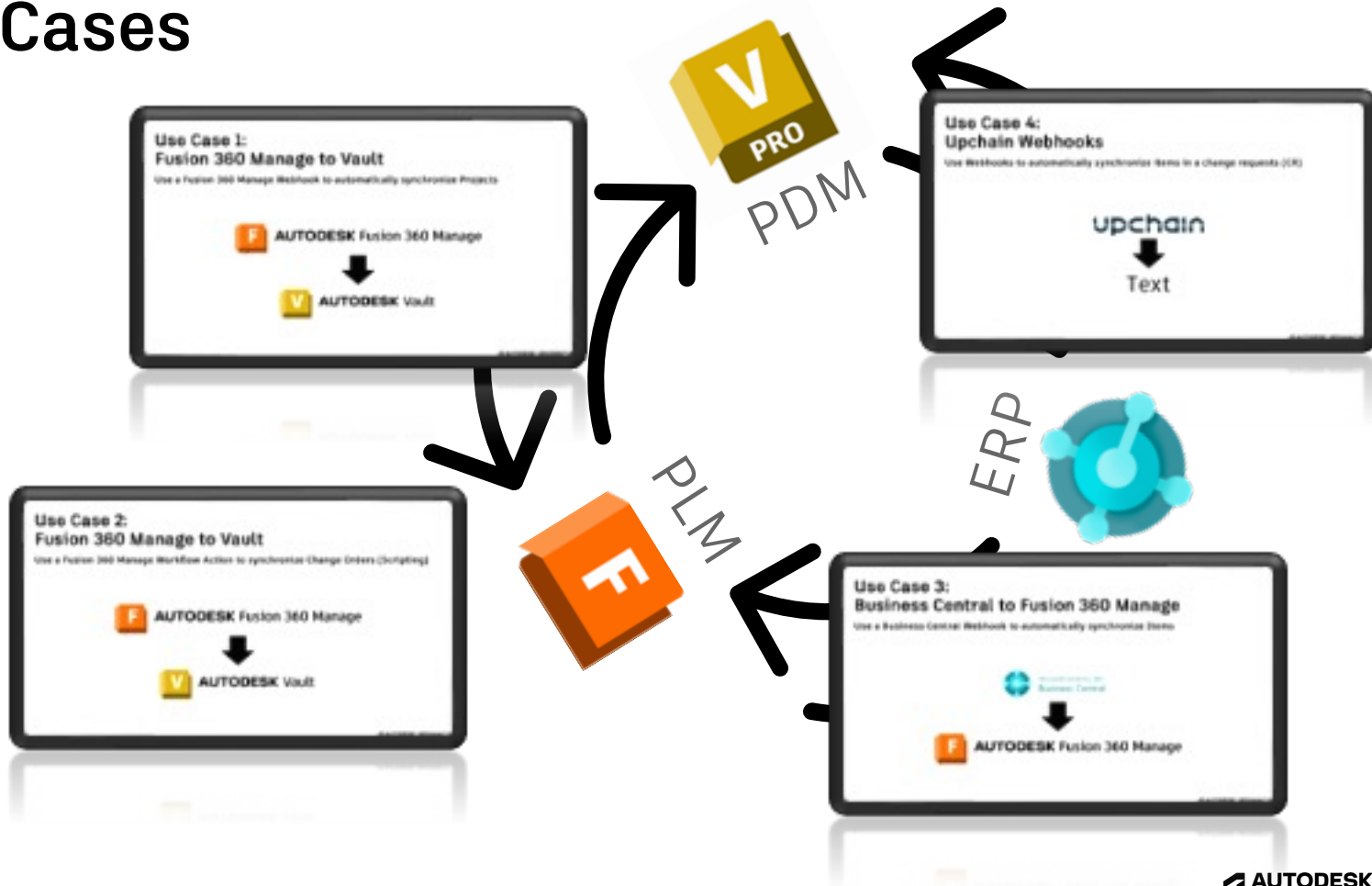
- JSON payload to objects
- powerVault cmdlets to communicate with Vault
- powerPLM cmdlets to communicate with Fusion 360 Manage
- Invoke-RestMethod to communicate with REST- or OData-APIs
- Variables
  - \$IAMRunningInCallbackAgent
  - \$Payload





# Use Cases

# Use Cases

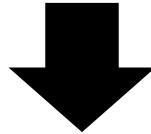


# Use Case 1: Fusion 360 Manage to Vault

Use a Fusion 360 Manage Webhook to automatically synchronize Projects



**AUTODESK** Fusion 360 Manage



**AUTODESK** Vault

powerGate - Getting StartedP0068 - Autodesk University - Fusion 360

defaulttrain61.autodeskplm360.net/plm/workspaces/86/items/itemDetails?view=full&tab=details&mode=view&itemid=urn%60adsk.plm%60tenant.workspace.item%60DEFAULTTRAIN%61.86.14748&cached=false

☰

F

AUTODESK Fusion 360 Manage

🔍🔔🌐👤

Home > Projects

P0068 - Autodesk University

📍 PlanningWorkflow actions

ProjectFiles (0)Phase / Gate ProcessTasks In Work (0)Gantt (10)Relationships (0)Change Log

Edit

Basic (1 of 13)

Number

P0068

Title

Autodesk University

Description

Autodesk University 2022 - New Orleans

Start Date

09/01/2022

Template

Industrial Machinery

Priority

Assessment is missing

Details (2 of 13)

KPIs (3 of 13)

📊

Progress

Budget Consumption

Status

Current Phase

Phase Progress

Project KPIs

6062636465

NO BUDGET

S R B R

Project Phases (4 of 13)

📊

Specification

Concept

Development

Validation

Production

Planned Completion

09/13/202209/27/202210/27/202212/22/202201/12/2023

Expected Completion

Actual Completion

Plan Deviation (d)

-13-27-57-113-134

Phases

SpecificationConceptDevelopmentValidationProduction

Next Gate Review (5 of 13)

AUTODESK

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F

AUTODESK Fusion 360 Manage

65°F  
Raining now

🖥️🔍📁📧📅📌📎📧📧📧

14:32  
31/08/2022

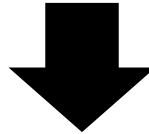
# Use Case 2:

## Fusion 360 Manage to Vault

Use a Fusion 360 Manage Workflow Action to synchronize Change Orders (Scripting)



**AUTODESK** Fusion 360 Manage



**AUTODESK** Vault

powerGate - Getting Started

CO-000034 - Hobbyist CNC Parts Kit - Wheels

defaulttrain61.autodeskplm360.net/plm/workspaces/84/items/itemDetails?view=split&tab=details&mode=view&itemId=urn%60adsk.plm%60tenant.workspace.item%60DEFAULTTRAIN61.84.14263



# Use Case 3: Business Central to Fusion 360 Manage

Use a Business Central Webhook to automatically synchronize Items



powerGate - Getting Startedx000001 - Kumho Tire - Fusion 360xItems - Dynamics 365 Business Central


businesscentral.dynamics.com/2f975c6c-1264-471f-a313-47c70f0f58e4/sandbox?node=0000233e-fd3e-0000-0c46-0f00836bd2d2&page=31&company=CRONUS%20IT&dc=0

COOLORANGE Dynamics 365 Business CentralSandbox

CRONUS IT | FinanceCash ManagementSalesPurchasingShopify


Items: AllSearchNewDeleteProcessReportItemPrices & DiscountsRequest ApprovalInventoryAttributesMore options

You can get the sales forecast updated automatically every week. Set Up Scheduled Forecasting | Don't ask again




000001  
Kumho Tire  
0.00

0  
PZ




000002  
Wheel  
0.00

0  
PZ




000003  
Hub  
0.00

0  
PZ




000004  
Spring Plate  
0.00

0  
PZ




000005  
Brake Caliper  
0.00

0  
PZ




000006  
Brake Caliper Assembly  
0.00

0  
PZ




000007  
Brake Disc  
0.00


0  
PZ





000008  
Disc Bell  
0.00

0  
PZ









DetailsAttachments (0)

Item Details - Invoicing

Item No.

000001

Costing Method

FIFO

Cost is Adjusted

Yes

Cost is Posted to G/L

Yes

Standard Cost

0.00

Unit Cost

0.00

Overhead Rate

0.00

Indirect Cost %

0

Last Direct Cost

0.00

Profit %

0

Unit Price

0.00

Item Details - Planning

Item No.

000001

Reordering Policy

Reorder Point

0

Reorder Quantity

0

Maximum Inventory

0

Overflow Level

0

Time Bucket

Lot Accumulation Period

Rescheduling Period

62°F  
Rain to stop

16:58  
31/08/2022

# Use Case 4: Upchain Webhooks

Use Webhooks to automatically synchronize items in a change requests (CR)

upchain



Text

powerGate - Getting StartedUpchain

live.upchain.net/?project=13449&page=30

upchainProjectsTeam+ Create project

Previously viewed: CR112293-10001SearchAdvanced search

112293 - Autodesk Universi...Christian GessnerLowENGINEERINGACTIVE

Change requests (CR)

All (2)0 Draft1 In Progress0 Pending0 Completed1 Cancelled

Name	Status	Priority	Thumbnail	Markup	Assignee	Creator	Creation Date	Documents	Description	Customer
> CR112293-10002	CANCELLED						Aug 29, 2022			coolOrange
> CR112293-10001	IN PROGRESS						Aug 29, 2022		Change Wheel and Tyre	coolOrange

RequirementsInvestigation requestsChange requestsChange noticesQuality assurance

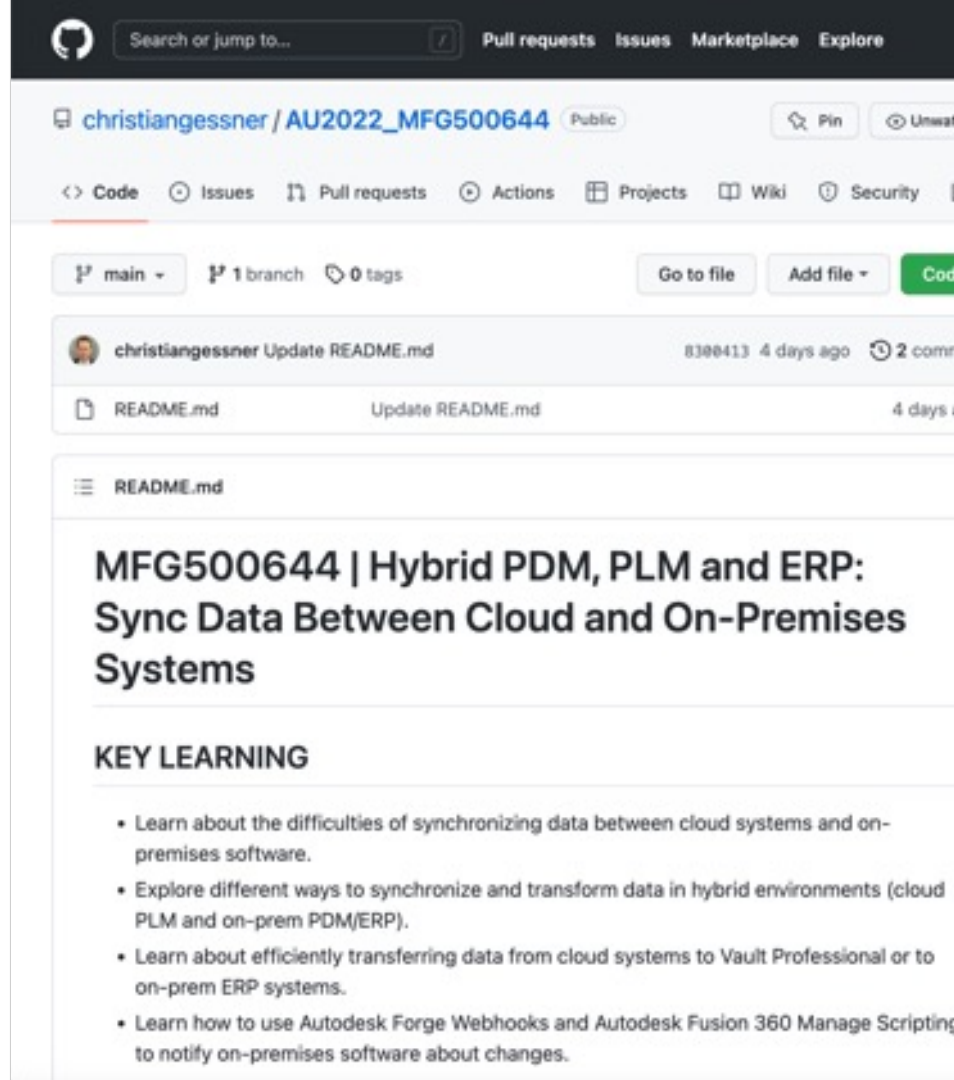
62°F Rain to stop17:25 31/08/2022

A close-up, black and white photograph of a textured surface, possibly a metal mesh or a woven material, with a grid of raised, rounded squares. The texture is highly detailed and occupies the left side of the slide.

# **Additional Resources**

# Source code on GitHub

- Presentation and Handout
- Scripts
  - Vault
  - Fusion 360 Manage
  - Business Central
  - Upchain
- Postman collection
  - Forge Webhooks
  - Fusion 360 Manage
  - Business Central
  - Upchain



## Share your Bill of Materials: Connecting PDM, PLM and ERP SD500011

Christian Gessner

Technical Evangelist | COOLORANGE

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## Synchronizing Change Orders between Vault and Fusion 360 Manage MFG500023

Christian Gessner

Technical Evangelist | COOLORANGE

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## Joint Effort: Vault and Fusion Lifecycle as the new dream couple

Christian Gessner

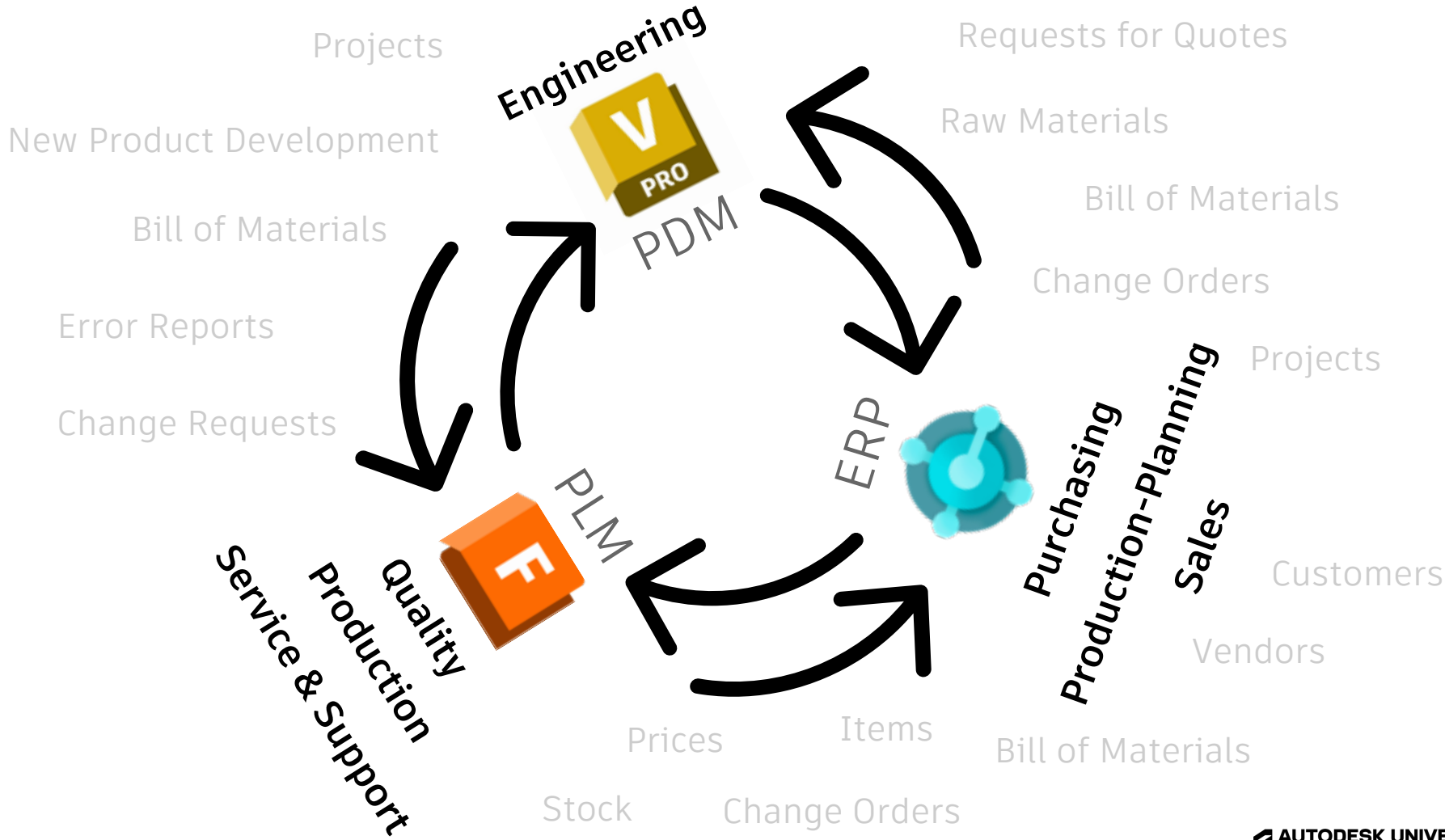
Technical Evangelist | coolOrange

## Connect Vault with ERP

Marco Mirandola

coolOrange







[info@coolorange.com](mailto:info@coolorange.com)





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