

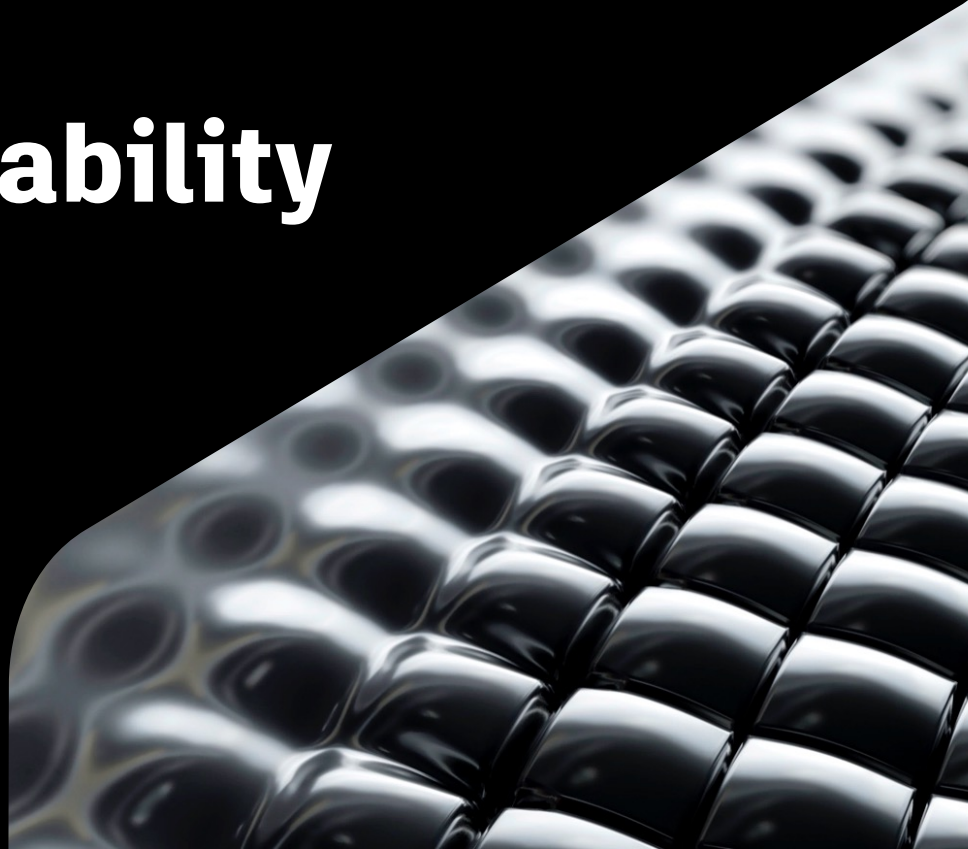


Forge and SAP Bringing Sustainability to Digital Twins

MFG502117 | Case Study

Petr Broz

Forge Developer Advocate | @ipetrbroz



Collaborators

SAP



Oliver Huth



Thomas
Bodenmueller-Dodek

Autodesk



Shakeel Mirza



Hassan Helmy

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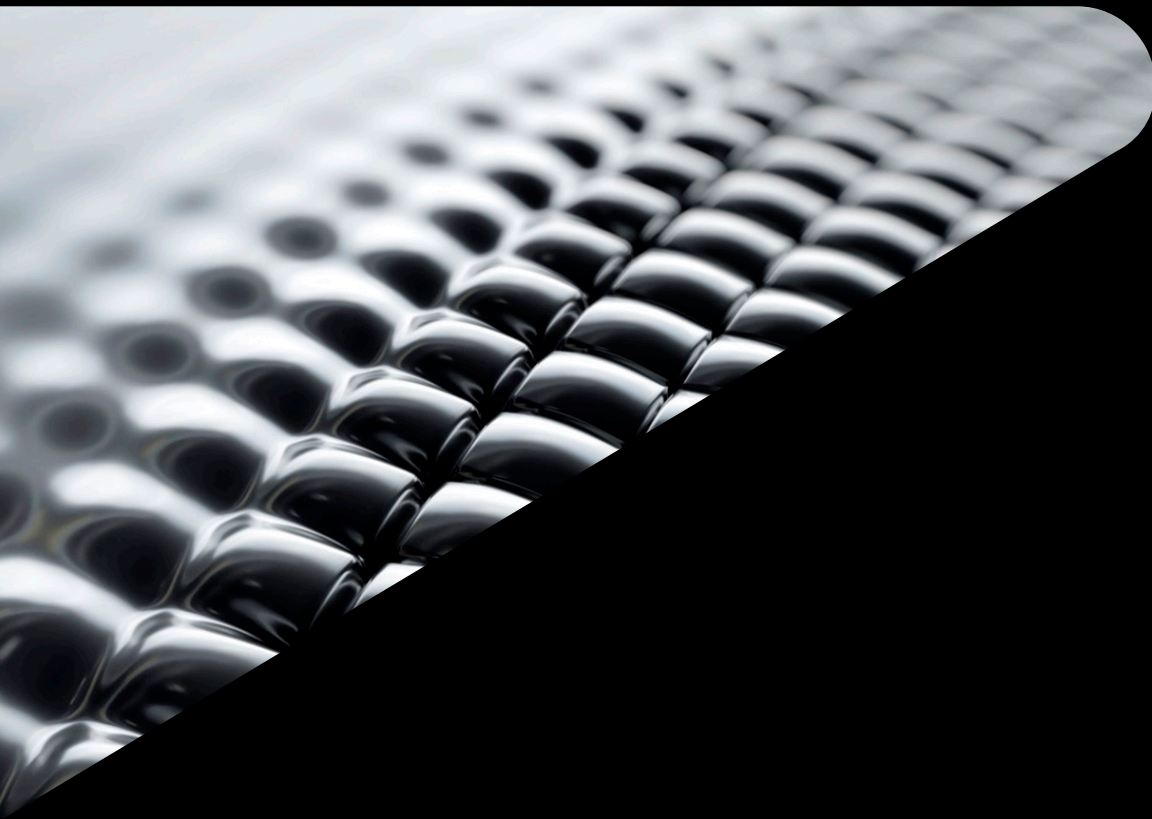
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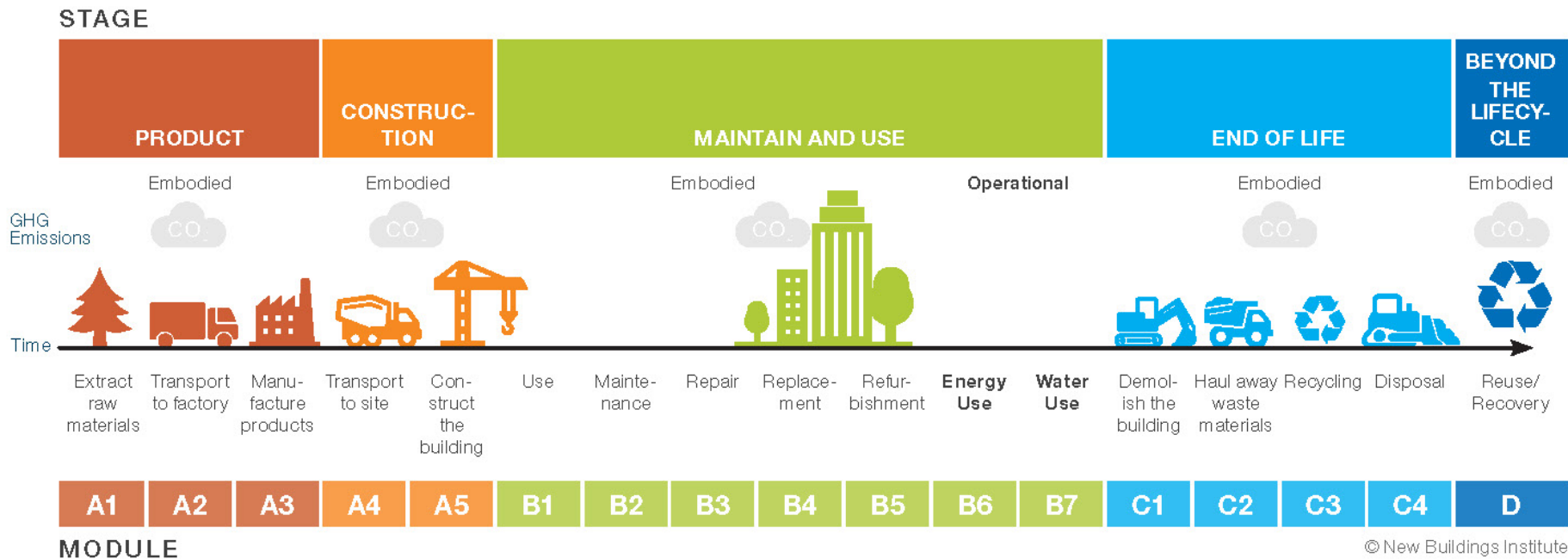
Agenda

- Problem Statement
- Proposed Solution
- Prototype & Demo
- What's Next



Problem Statement

Carbon Footprint in AEC



Source: https://newbuildings.org/code_policy/embodied-carbon

Carbon Footprint in MFG



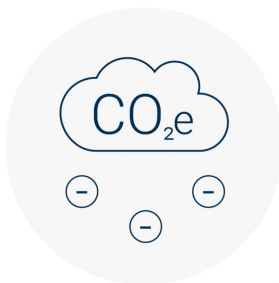
RAW MATERIALS

Engaging with our suppliers to reduce carbon emissions.



MANUFACTURING

Using less energy, improving our energy efficiency and giving priority to renewable and non fossil energy.



RECYCLING

Reducing our carbon emissions through recycling by avoiding incineration and raw materials extraction.

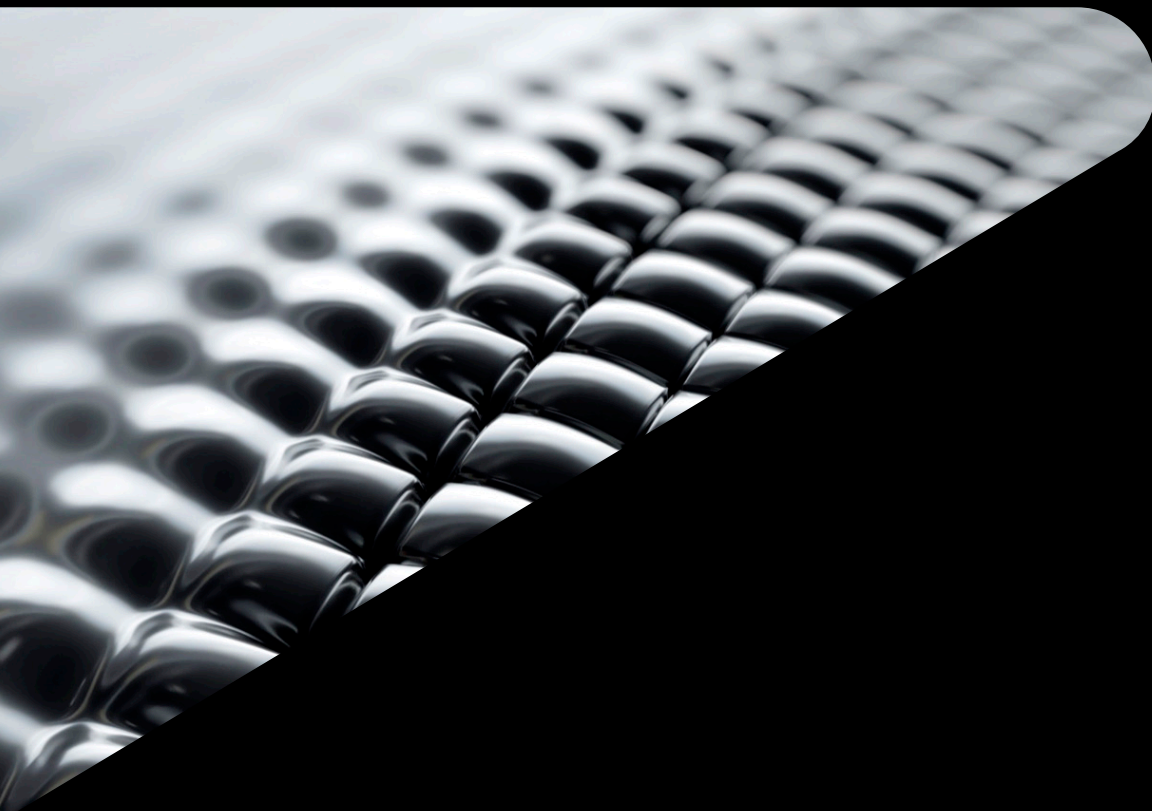


LOGISTICS

Using cleaner fuels, optimising routes and loading.



Sustainability-driven business decisions?



Proposed Solution

Proposed Solution

- Connect design, business, and carbon footprint data
- Automated CO₂ estimation
- Better-informed decisions

Forge & SAP

Autodesk Forge

Viewing

Planning

Schedules

Cost
Estimating

Fabrication

ERP

Sales &
Marketing

Inspections

Maintenance
Services

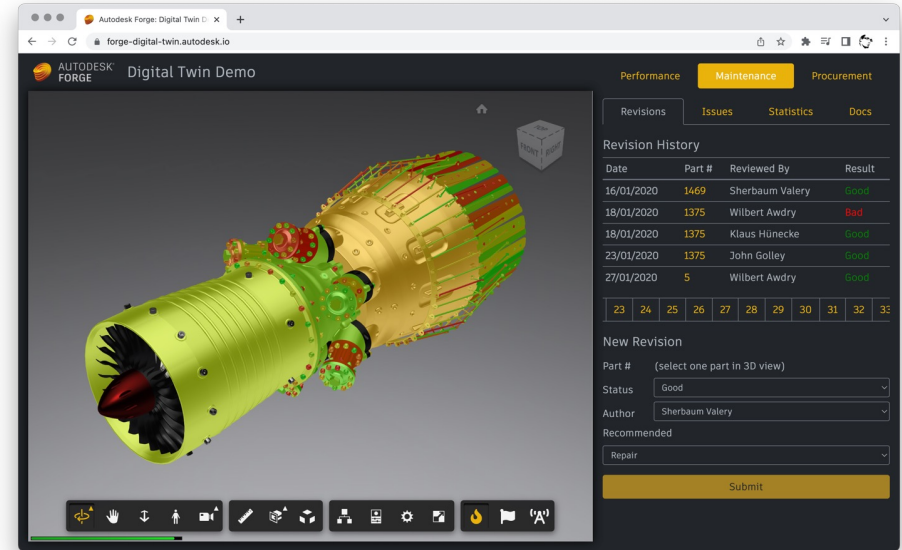
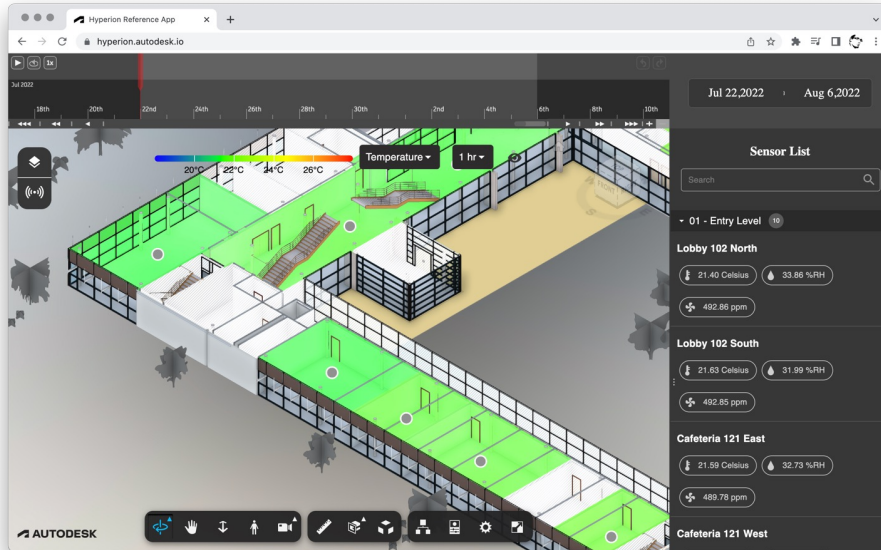
Purchasing

 **AUTODESK Forge**



60+
File Formats

Autodesk Forge: Digital Twins

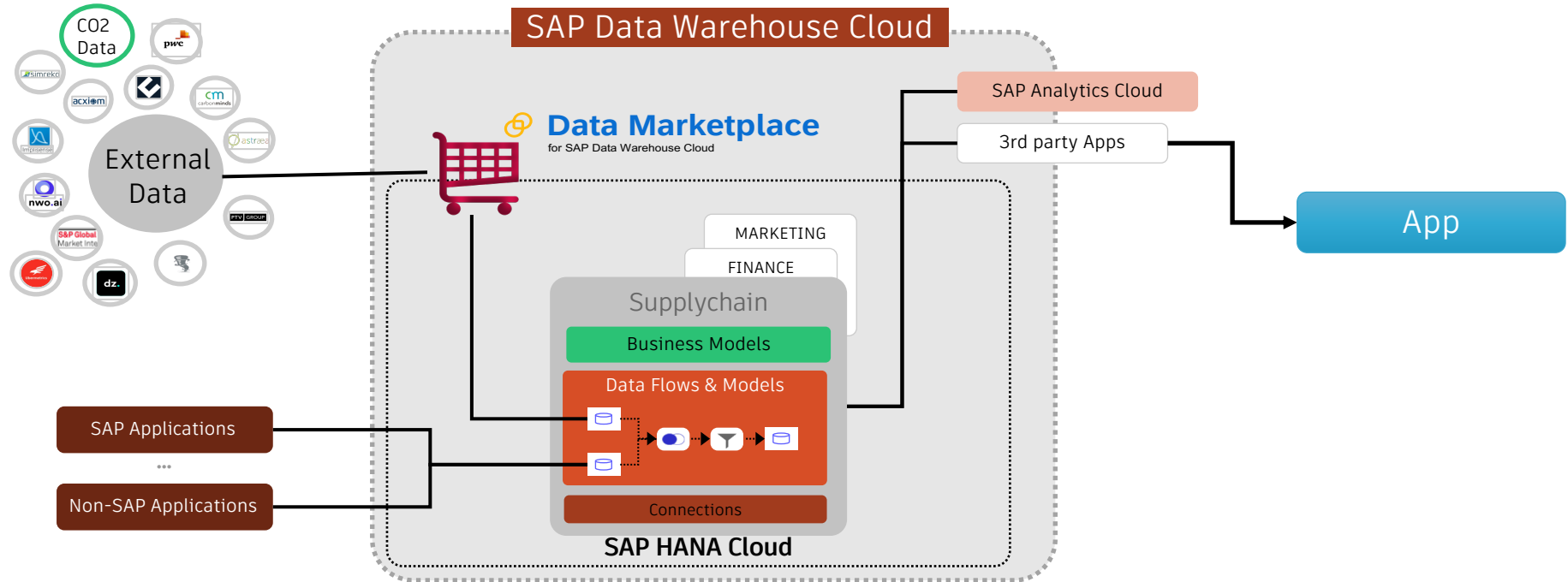


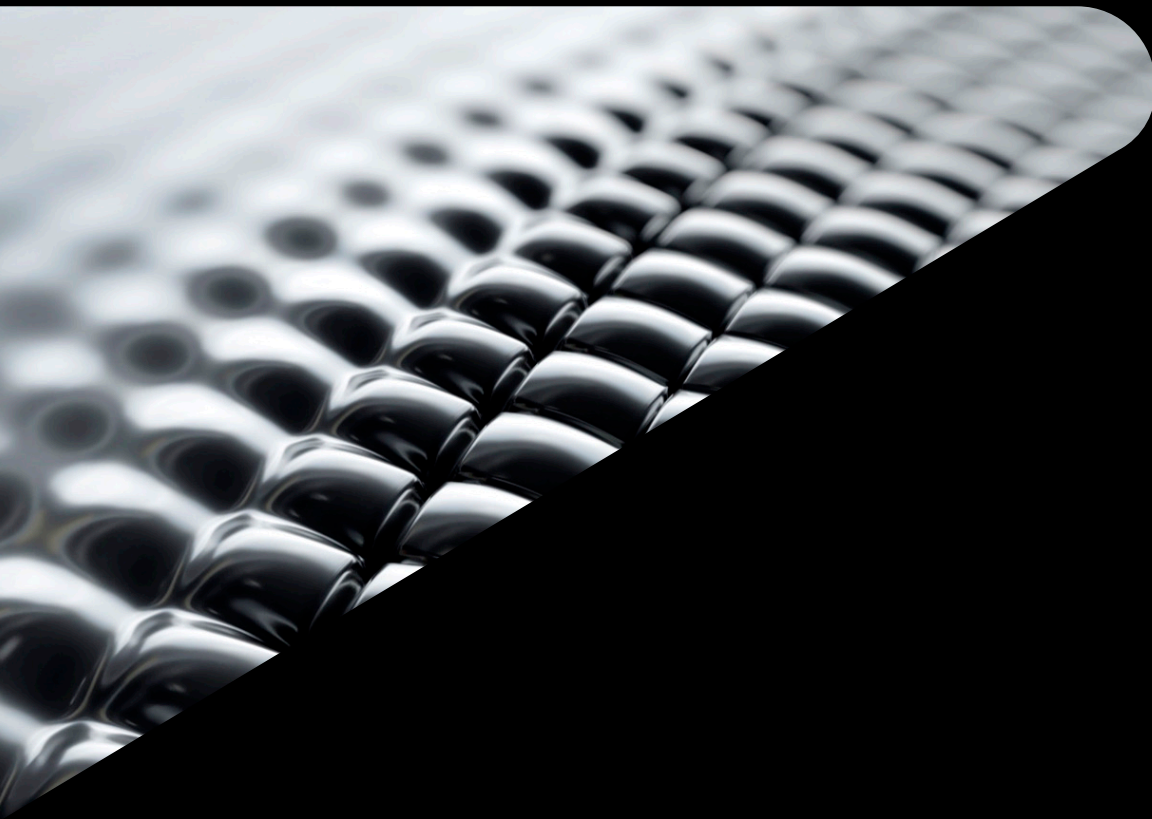
SAP



Source: <https://www.celum.com/en/blog/sap-content-management>

SAP: Data Warehouse Cloud





Prototype & Demo

Use Case

- Bike manufacturer
- Multiple shops/warehouses
- Shipping of replacement parts
- Multiple delivery options



RAW MATERIALS

Engaging with our suppliers to reduce carbon emissions.

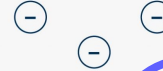


MANUFACTURING

Using less energy, improving our energy efficiency and giving priority to renewable and non fossil energy.



CO₂e



RECYCLING

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LOGISTICS

Using cleaner fuels, optimising routes and loading.



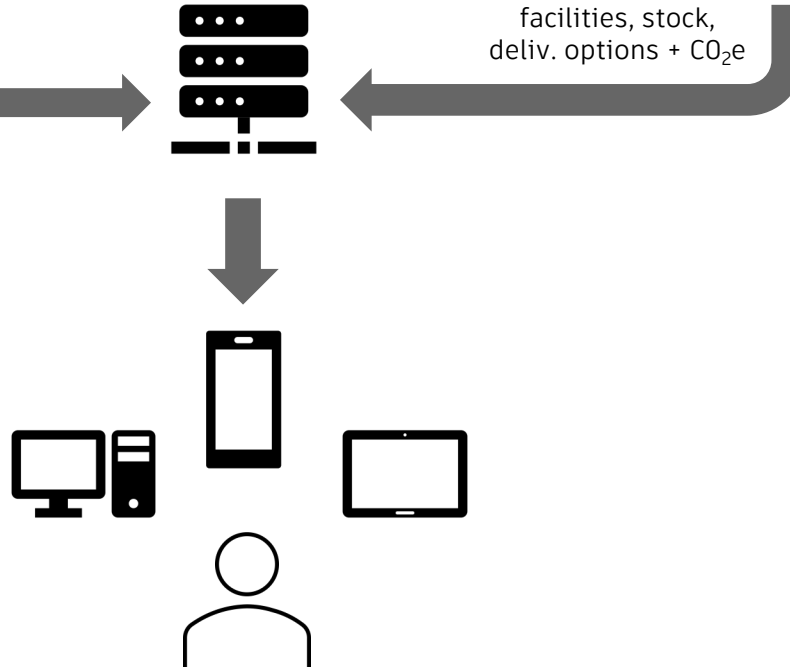
Source: <https://www.tarkett-group.com/en/climate-circular-economy/carbon-footprint>

**Autodesk
Forge**

**SAP Data
Warehouse
Cloud**

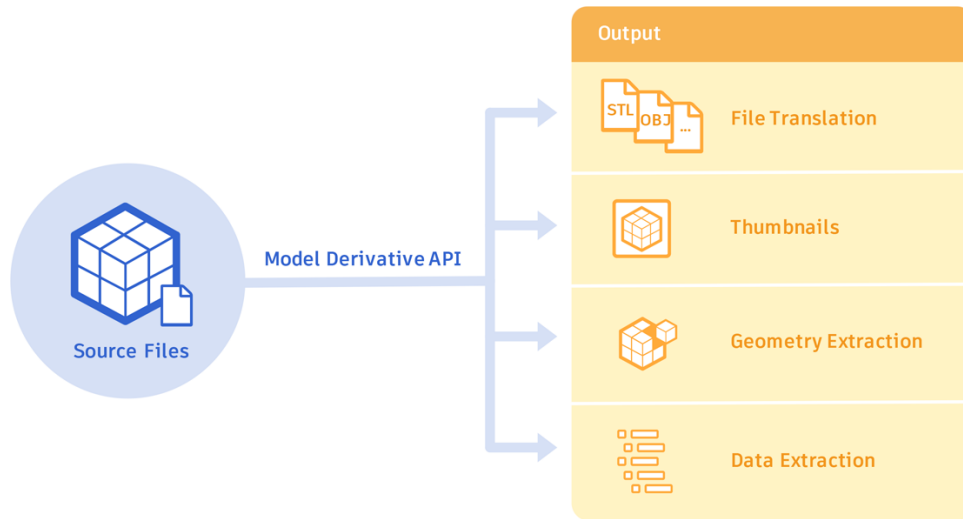
designs & metadata

facilities, stock,
deliv. options + CO₂e



Design Data

- Forge Data Management service
- Forge Model Derivative service



Stock & CO₂ Data

The screenshot displays the SAP Data Warehouse Cloud Data Builder interface. The browser address bar shows the URL: `dm-fba.eu10.hcs.cloud.sap/dwaas-ui/index.html#/databuilder/db/AUTODESK/Bike_Shop_Article_Detail`. The interface is divided into several sections:

- Left Panel (Repository):** Contains a search bar and a list of tables under the 'Tables' section. The tables listed include: Bike_Parts_Stock_Overview, Bike Shop Articles, Bike Shop Facilities, Bike Shop Stock, bike-part-numbers_w_internal data, Branches Warehouses, EU Branche Warehouse location, Greenhouse Gas - Conversion Factors - Version 3.0 - Incl. Key, Greenhouse Gas Level Dimension, jet-engine-part-numbers_w_internal data, owid-covid-data, Stock_for_Part_212_03, Warehouse Address Data, Warehouse Master Data, and Warehouse Stock Levels.
- Center Panel (Diagram):** Shows a data model diagram with the following components:
 - Table 1:** Bike Shop Stock (10 rows, 2 columns).
 - Table 2:** Bike Shop Facilities (10 rows, 10 columns).
 - Table 3:** Bike Shop Articles (4 rows, 4 columns).
 - Table 4:** Bike Shop Article Detail (8 rows, 11 columns).The diagram illustrates the relationships between these tables, including inner joins and filters.
- Right Panel (Model Properties):** Displays the properties for the 'Bike Shop Article Detail' model.
 - Business Name:** Bike Shop Article Detail
 - Technical Name:** Bike_Shop_Article_Detail
 - Semantic Usage:** Relational Dataset
 - Expose for Consumption:** ON
 - Run in Analytical Mode:** OFF
 - Status:** Deployed
 - Deployed On:** Jun 16, 2022 16:33

Server

- Node.js server
- Express.js framework
- Autodesk Forge SDK
- @sap/hana-client

```
const hana = require('@sap/hana-client');
const {
  SAP_HANA_SERVER,
  SAP_HANA_PORT,
  SAP_HANA_SPACE,
  SAP_HANA_USERNAME,
  SAP_HANA_PASSWORD
} = require('../config.js');

const options = { ...
};

function getStockOverview() {
  return new Promise(function (resolve, reject) {
    const client = hana.createConnection();
    client.connect(options);
    const stmt = client.prepare(`SELECT * FROM ${SAP_HANA_SPACE}.Bike_Shop_Stock_Overview``);
    stmt.exec([], function (err, results) {
      stmt.drop();
      client.disconnect();
      if (err) {
        reject(err);
      } else {
        resolve(results);
      }
    });
  });
}

function getArticleDetail(partNumber) {
  return new Promise(function (resolve, reject) {
    const client = hana.createConnection();
    client.connect(options);
    const stmt = client.prepare(`SELECT * FROM ${SAP_HANA_SPACE}.Bike_Shop_Article_Detail" (?)`);
    stmt.exec([partNumber], function (err, results) {
      stmt.drop();
      client.disconnect();
      if (err) {
        reject(err);
      } else {
        resolve(results);
      }
    });
  });
}
```

UI

- Forge Viewer

```
export async function initView(container) {
  return new Promise(function (resolve, reject) {
    Autodesk.Viewing.Initializer({ getAccessToken }, function () {
      const viewer = new Autodesk.Viewing.GuiViewer3D(container);
      viewer.start();
      resolve(viewer);
    });
  });
}

export async function loadModel(viewer, urn) {
  return new Promise(function (resolve, reject) {
    function onDocumentLoadSuccess(doc) {
      viewer.loadDocumentNode(doc, doc.getRoot().getDefaultGeometry())
        .then(resolve)
        .catch(reject);
    }
    function onDocumentLoadFailure(code, message, errors) {
      reject(message);
    }
    Autodesk.Viewing.Document.load('urn:' + urn, onDocumentLoadSuccess, onDocumentLoadFailure);
  });
}
```

- Svelte

```
<script>
  let count = 1;

  // the `${}` means 're-run whenever these values change'
  $: doubled = count * 2;
  $: quadrupled = doubled * 2;

  function handleClick() {
    count += 1;
  }
</script>

<button on:click={handleClick}>
  Count: {count}
</button>

<p>{count} * 2 = {doubled}</p>
<p>{doubled} * 2 = {quadrupled}</p>
```

New Tab x +

localhost:3000

Autodesk Forge: SAP Data Warehouse Cloud Demo - <http://localhost:3000>

http://localhost:3000/ - Google Search

Hello from Another Way to Learn Forge | Another Way to Learn Forge - <http://localhost:3000/forge-samples-docs/>











localhost:3000/iot/sensors - <http://localhost:3000/iot/sensors>

<http://localhost:3000/api/procurement/delivery-options>

Gmail Images



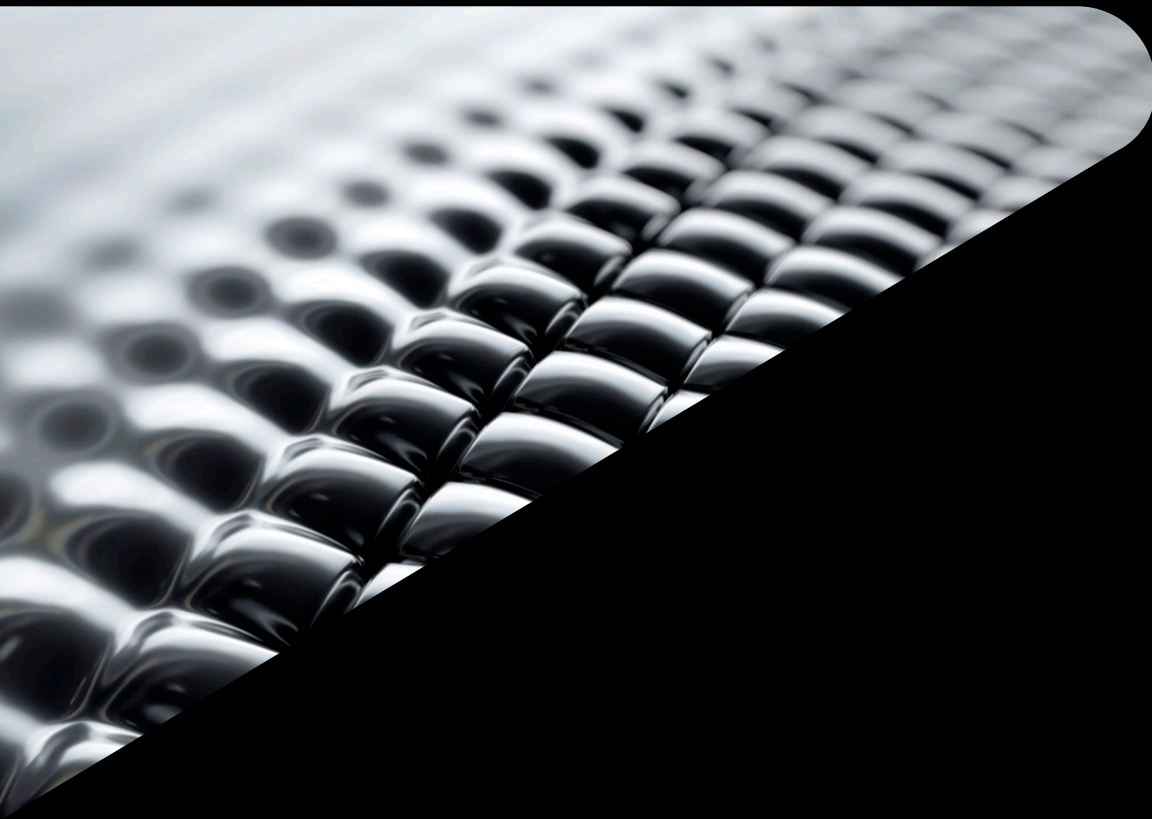
Search Google or type a URL

				
Skola OnLine	Seznam - naj...	Autodesk For...	(118) YouTube	Home
				
Alza.cz	Hypoteční zó...	Autodesk For...	Úvodní stránka	Add shortcut

Source Code

<https://github.com/petrbroz/forgesap-poc>





What's Next

Future Plans

- Transactional operations
- Invoicing
- “Distance matrix”
- Automated suggestions
- AEC/Digital Twins
- Other forms of EC

Thank you!

A man and a woman are standing in an industrial or warehouse-like environment, looking at a tablet together. The man is wearing a dark blue suit jacket over a light blue checkered shirt. The woman is wearing a white shirt with black vertical stripes and dots. They are both looking down at the tablet, which the woman is holding. The background features large windows and industrial structures. The text "Q&A" is overlaid in the center of the image.

Q&A



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