AUTODESK UNIVERSITY

Forge and SAP Bringing Sustainability to Digital Twins

MFG502117 | Case Study

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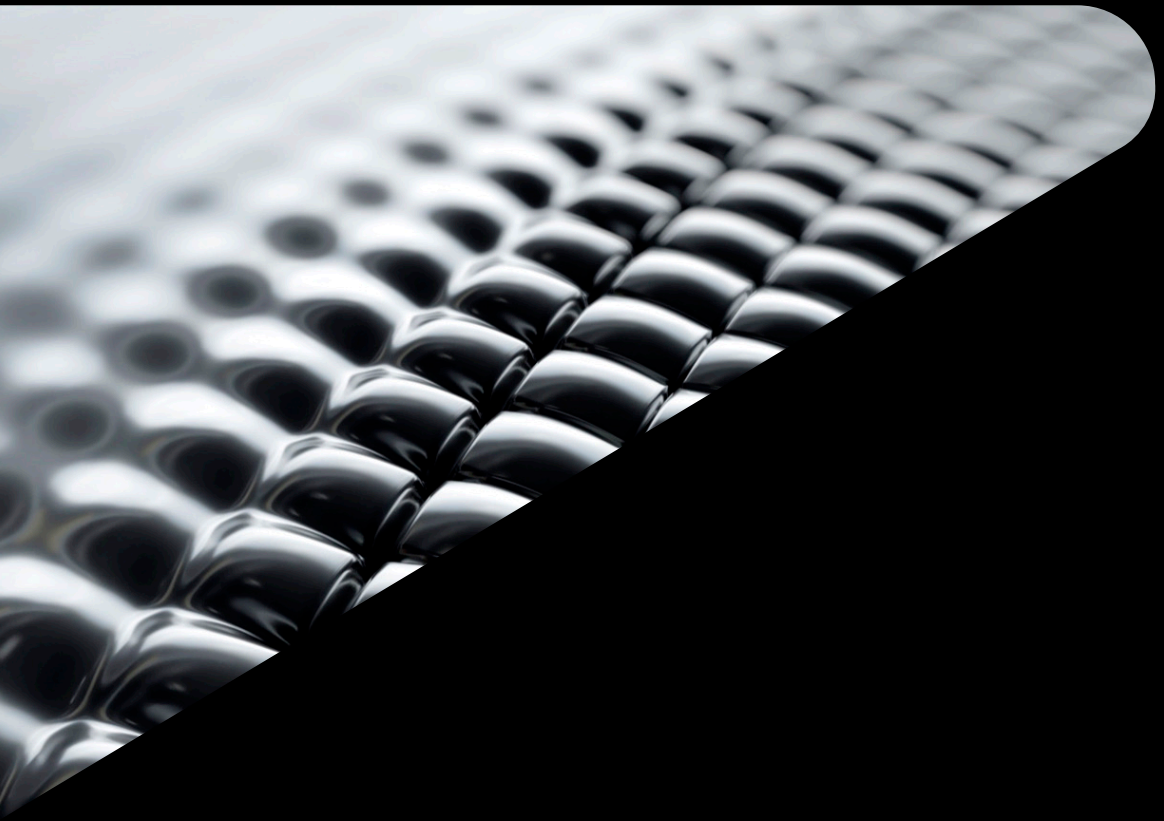
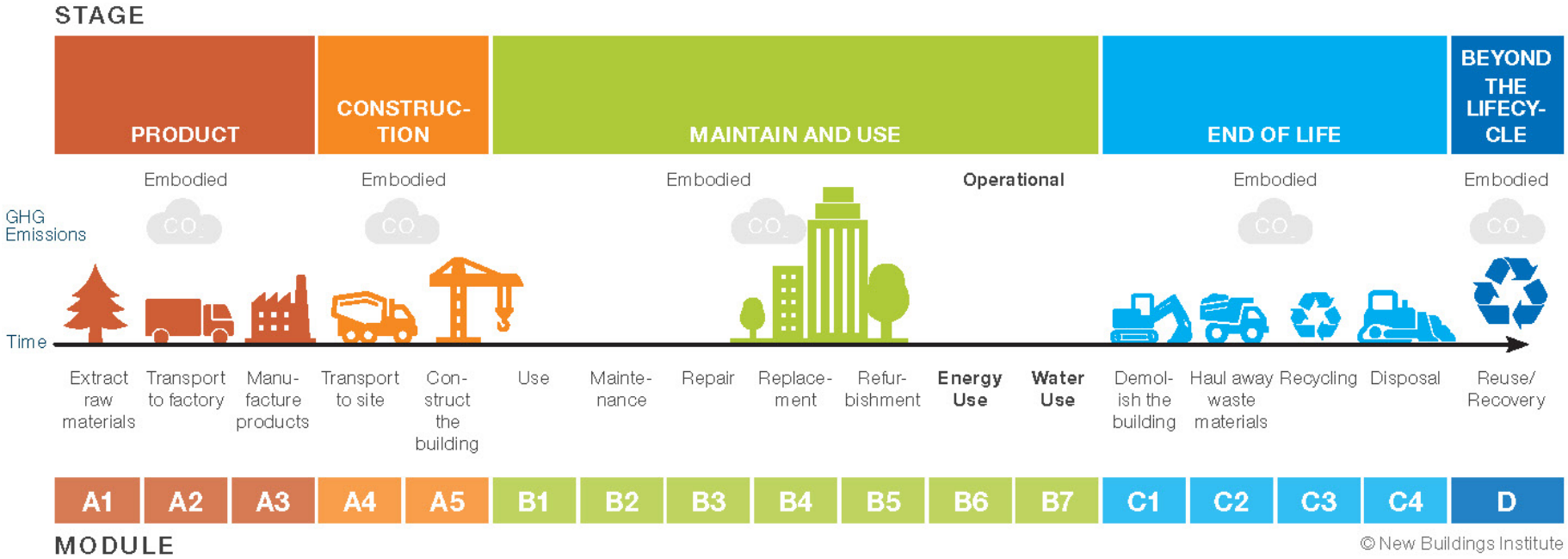
Agenda

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



Problem Statement

Carbon Footprint in AEC



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

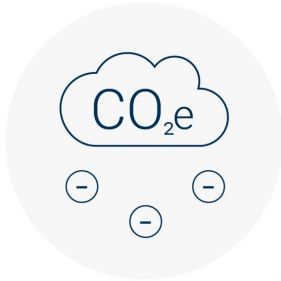
Carbon Footprint in MFG

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 fossile energy.



RECYCLING

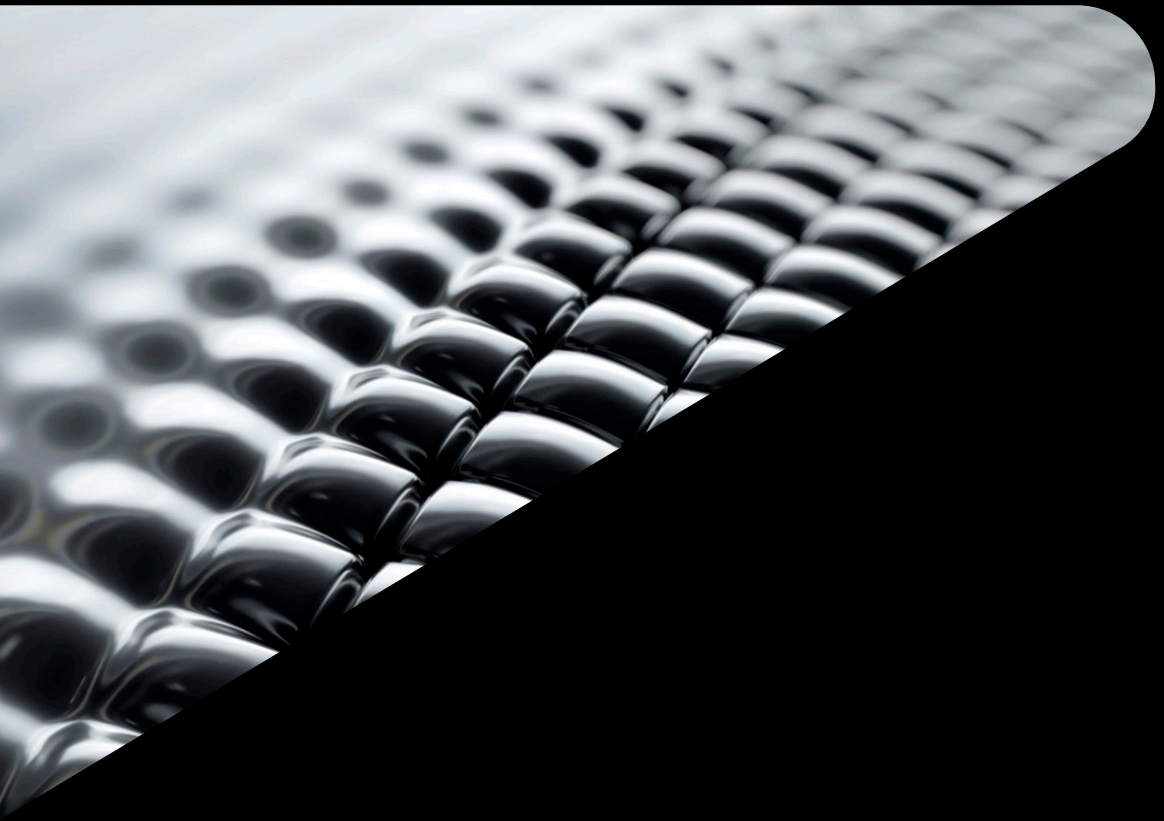
Reducing our carbon emissions through recycling by avoiding incineration and raw materials extraction.

LOGISTICS

Using cleaner fuels, optimising routes and loading.

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

Sustainability-driven business decisions?



Proposed Solution

Proposed Solution

- Connect design, business, and carbon footprint data
- Automated CO_2 estimation
- Better-informed decisions

Forge & SAP

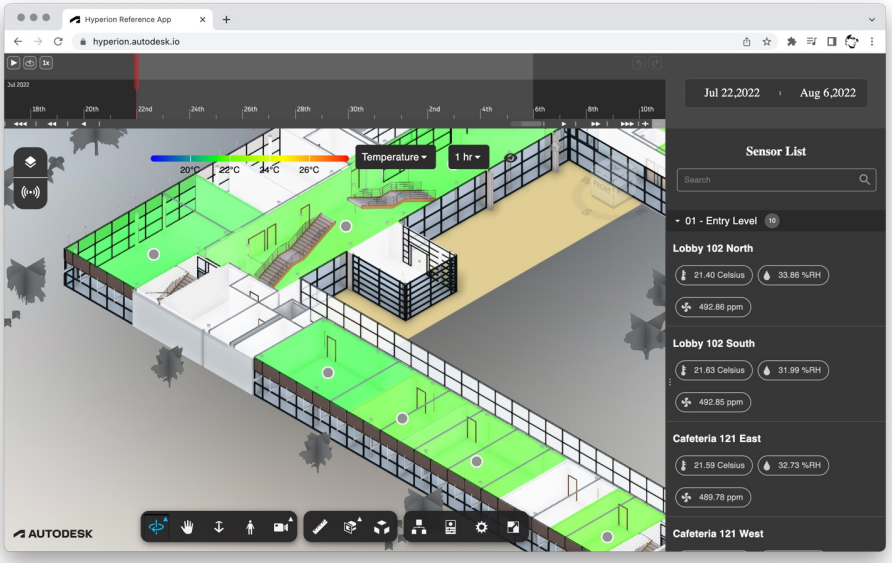
Autodesk Forge

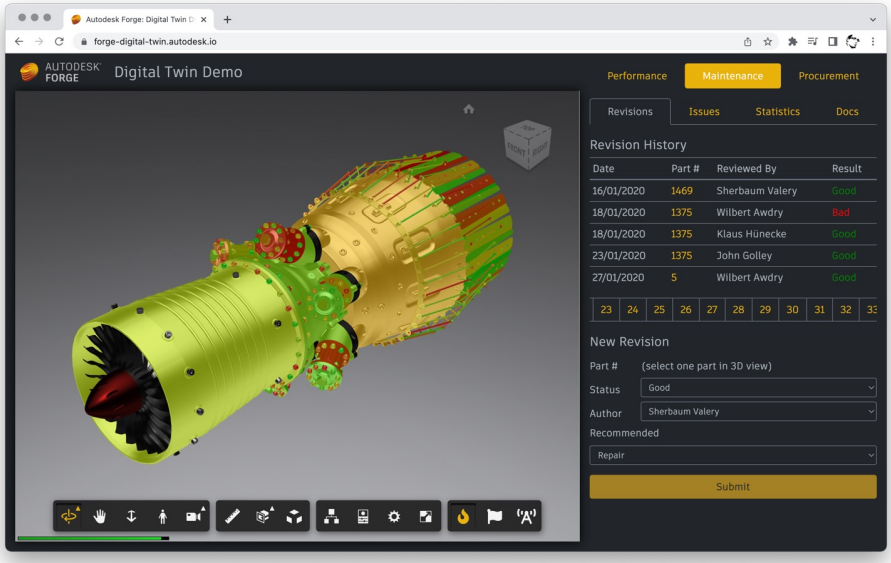
Viewing	Planning	Schedules	Cost Estimating	Fabrication	ERP	Sales & Marketing	Inspections	Maintenance Services	Purchasing

AUTODESK Forge

60+
File Formats

Autodesk Forge: Digital Twins

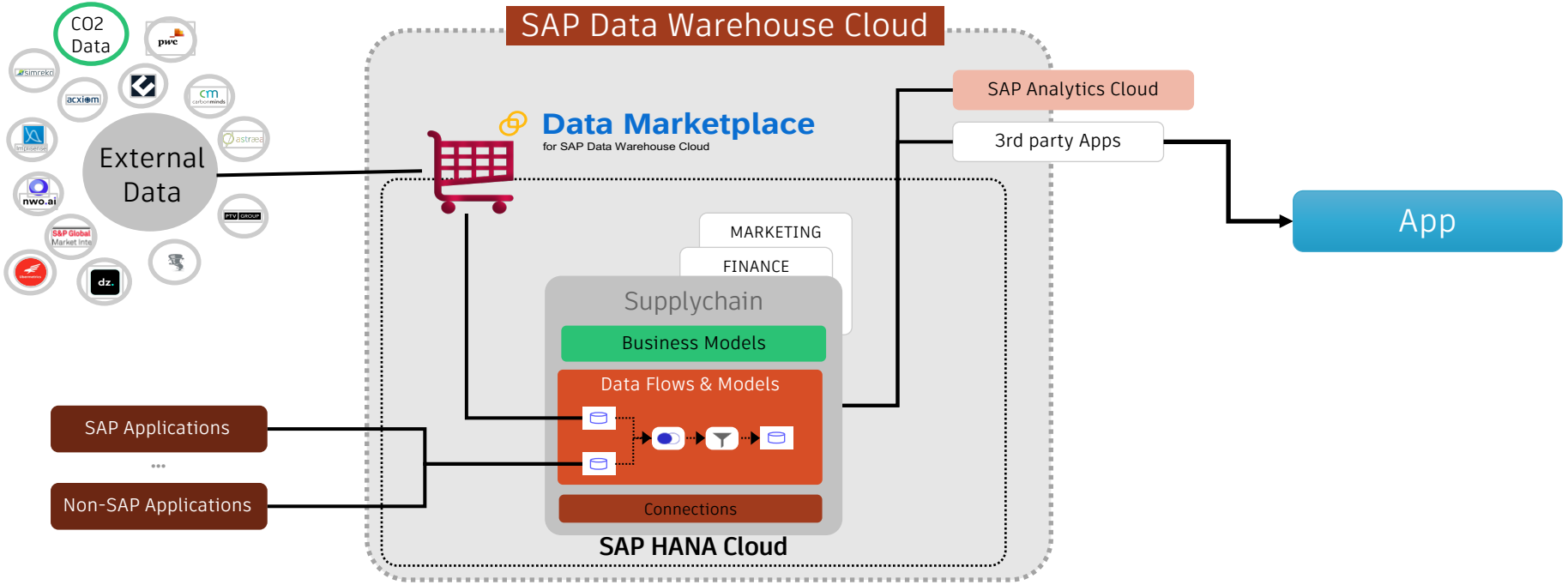


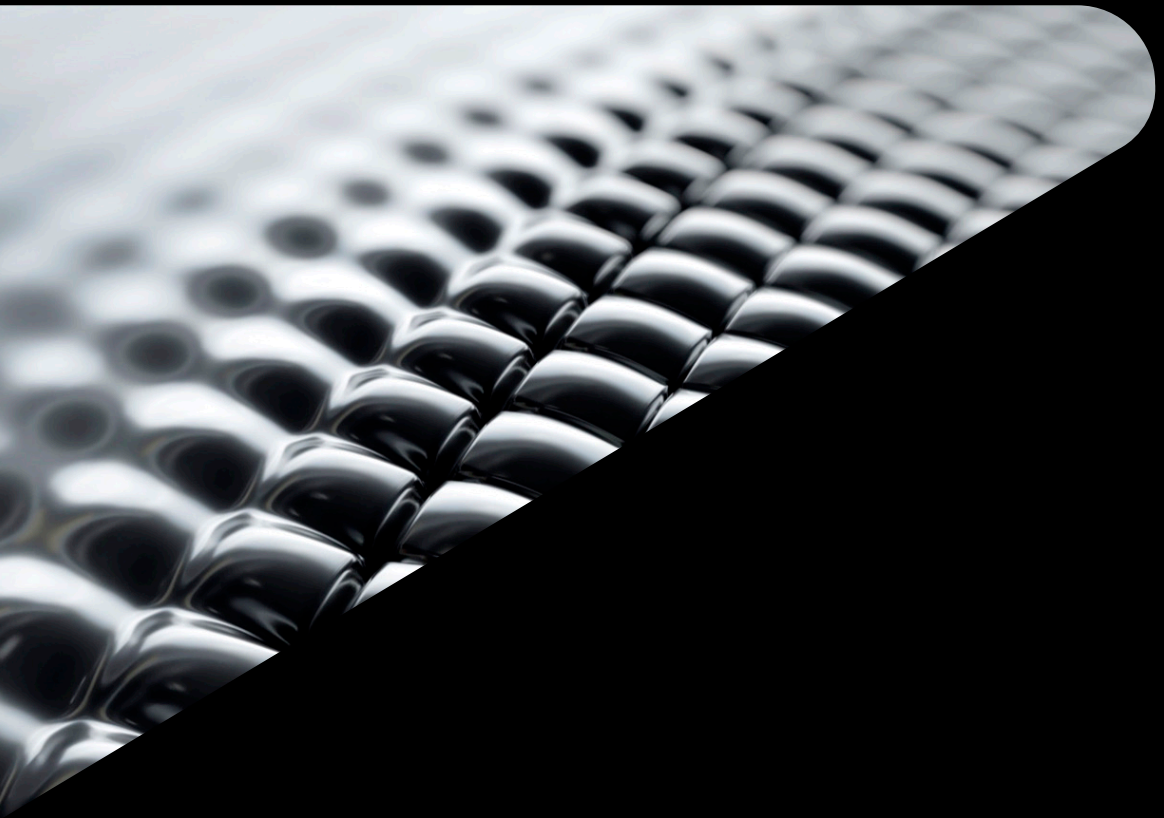


SAP

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

SAP: Data Warehouse Cloud

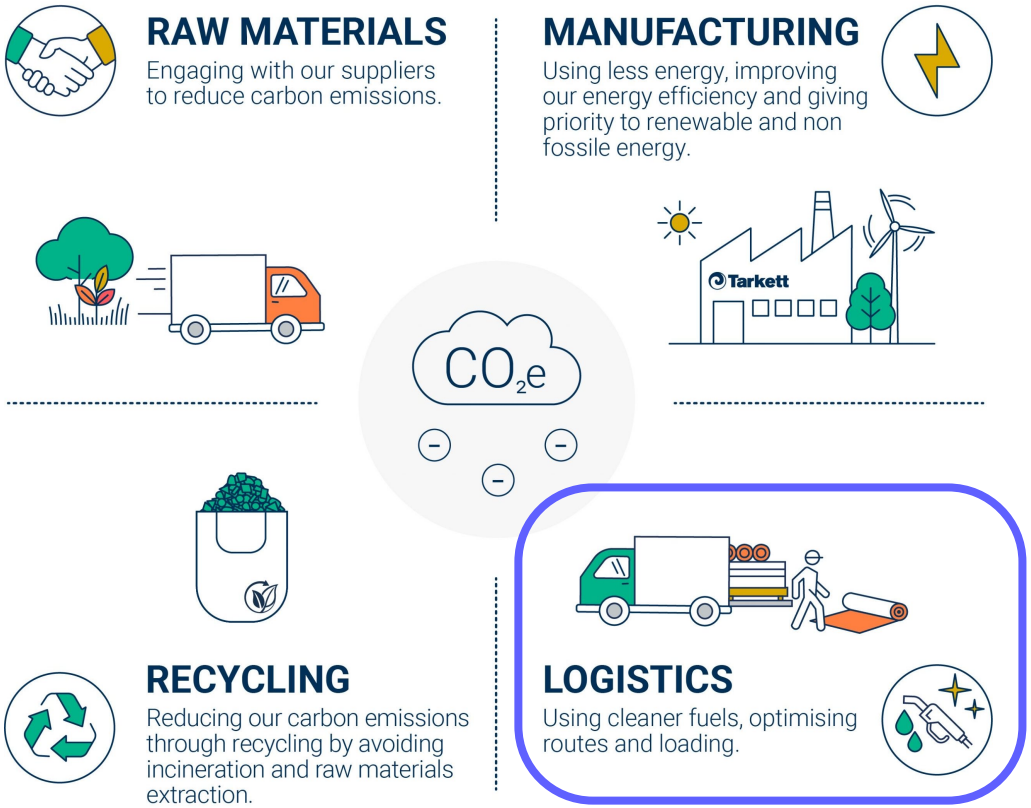




Prototype & Demo

Use Case

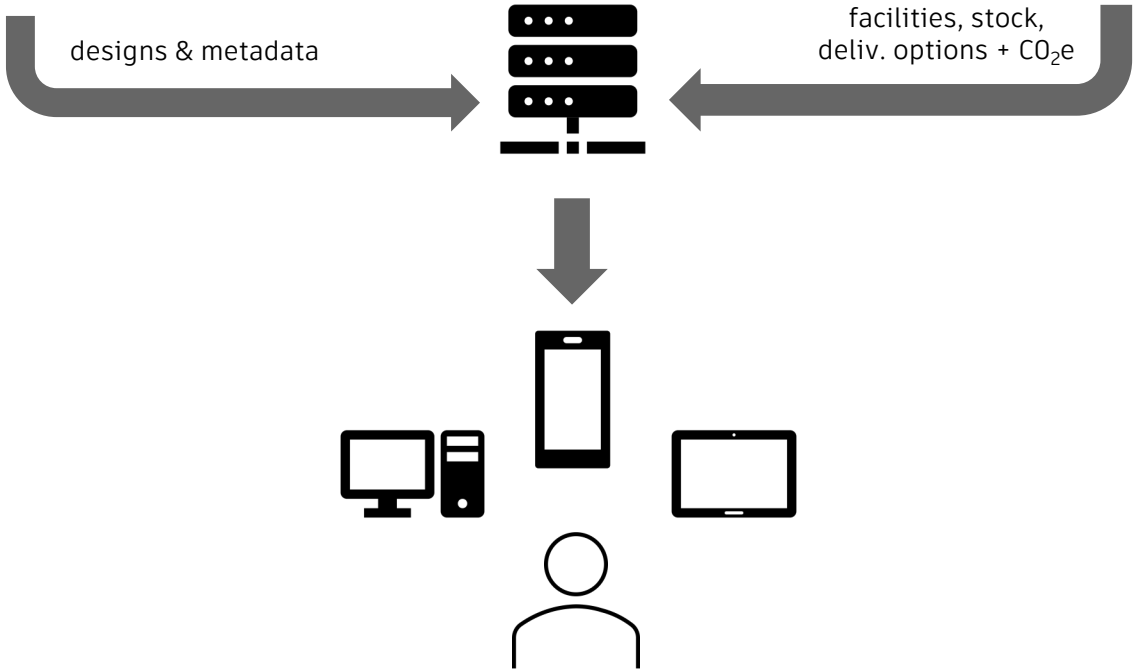
- Bike manufacturer
- Multiple shops/warehouses
- Shipping of replacement parts
- Multiple delivery options



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

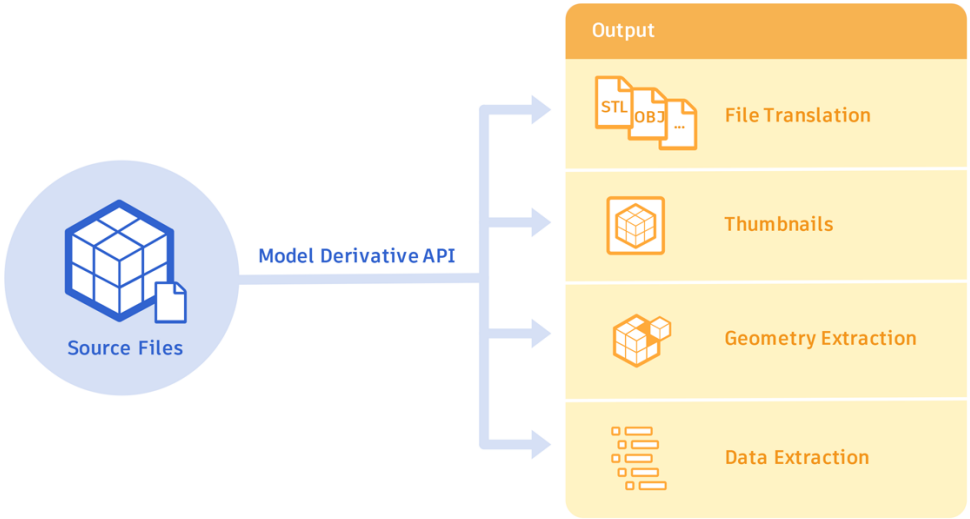
Autodesk Forge

SAP Data Warehouse Cloud

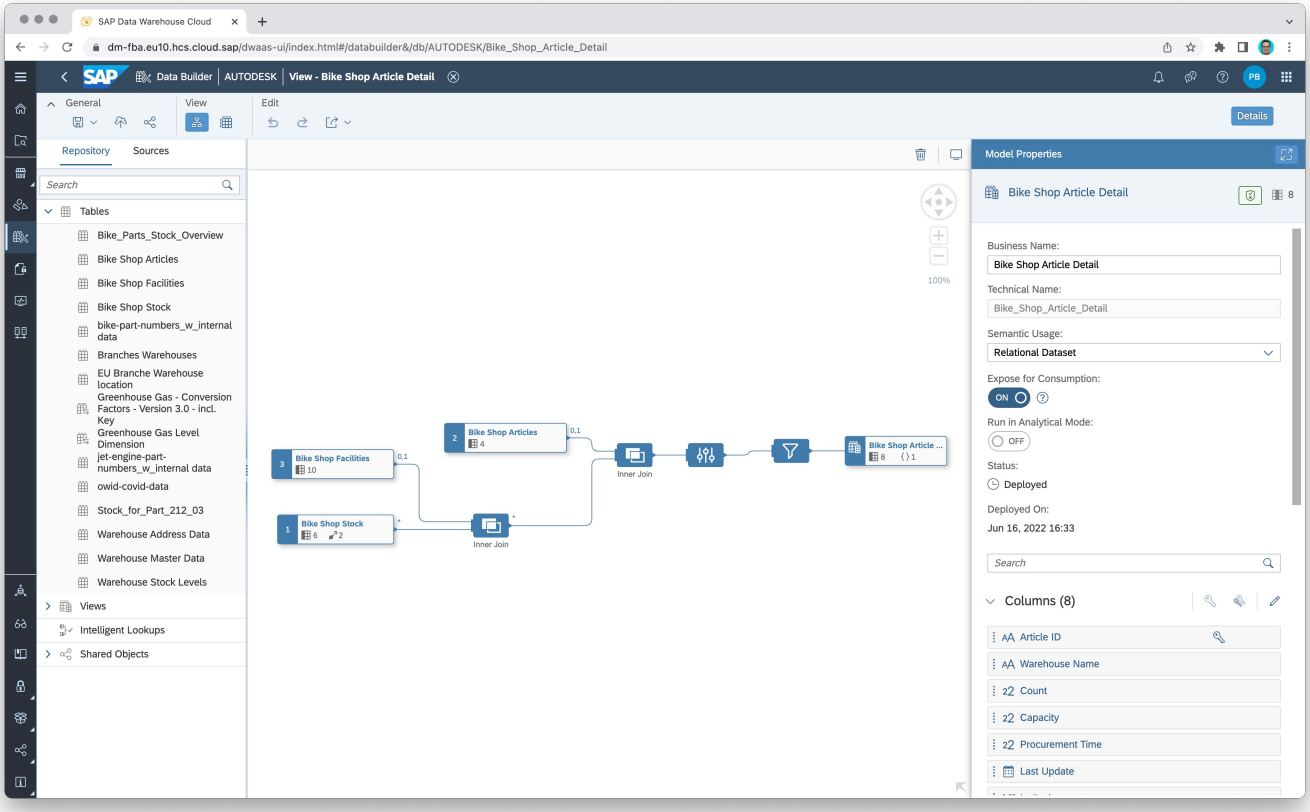


Design Data

- Forge Data Management service
- Forge Model Derivative service



Stock & CO_2 Data



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);
            }
        });
    });
}
```

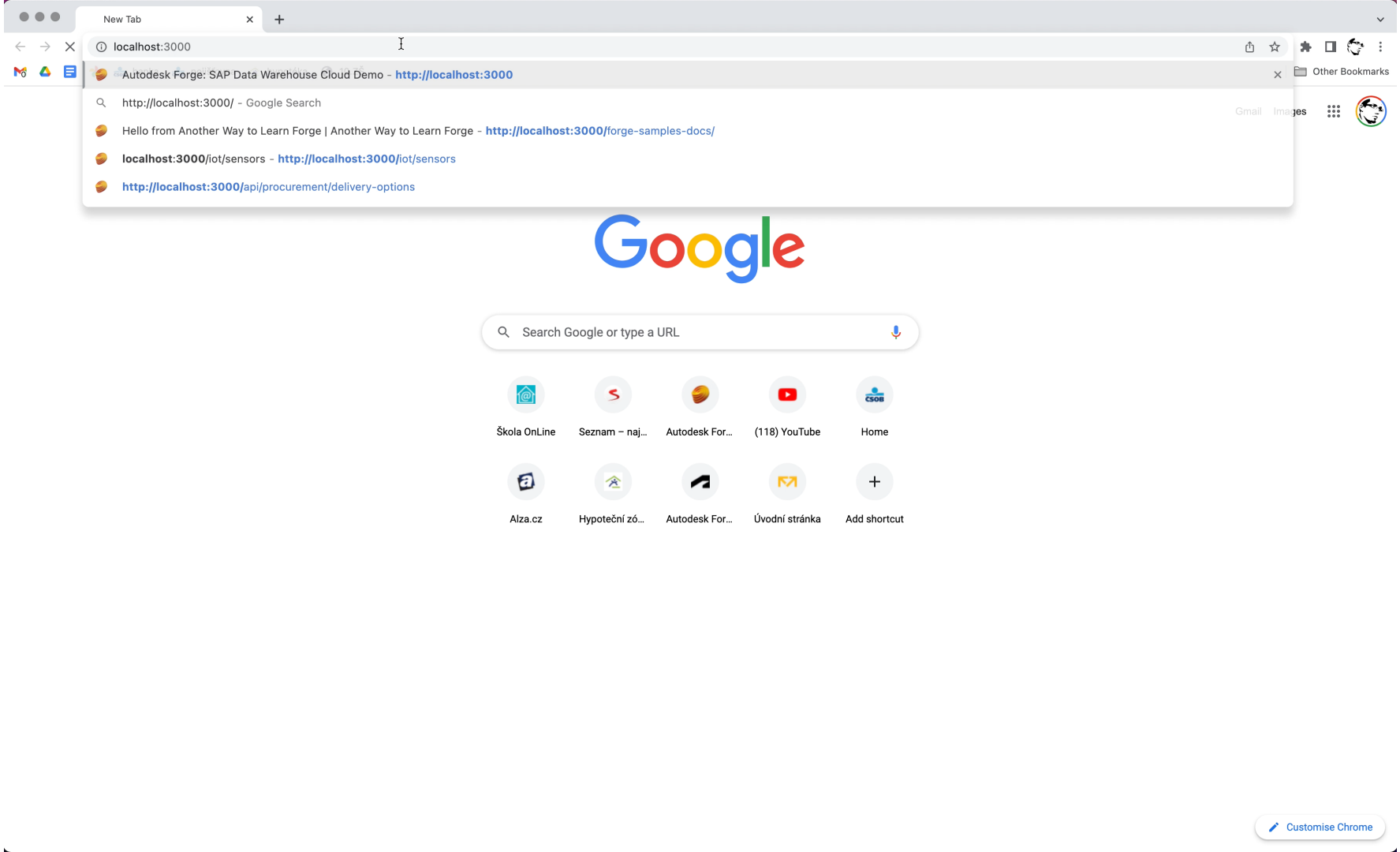
ui

- Forge Viewer

```
export async function initViewer(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);
    });
}
```

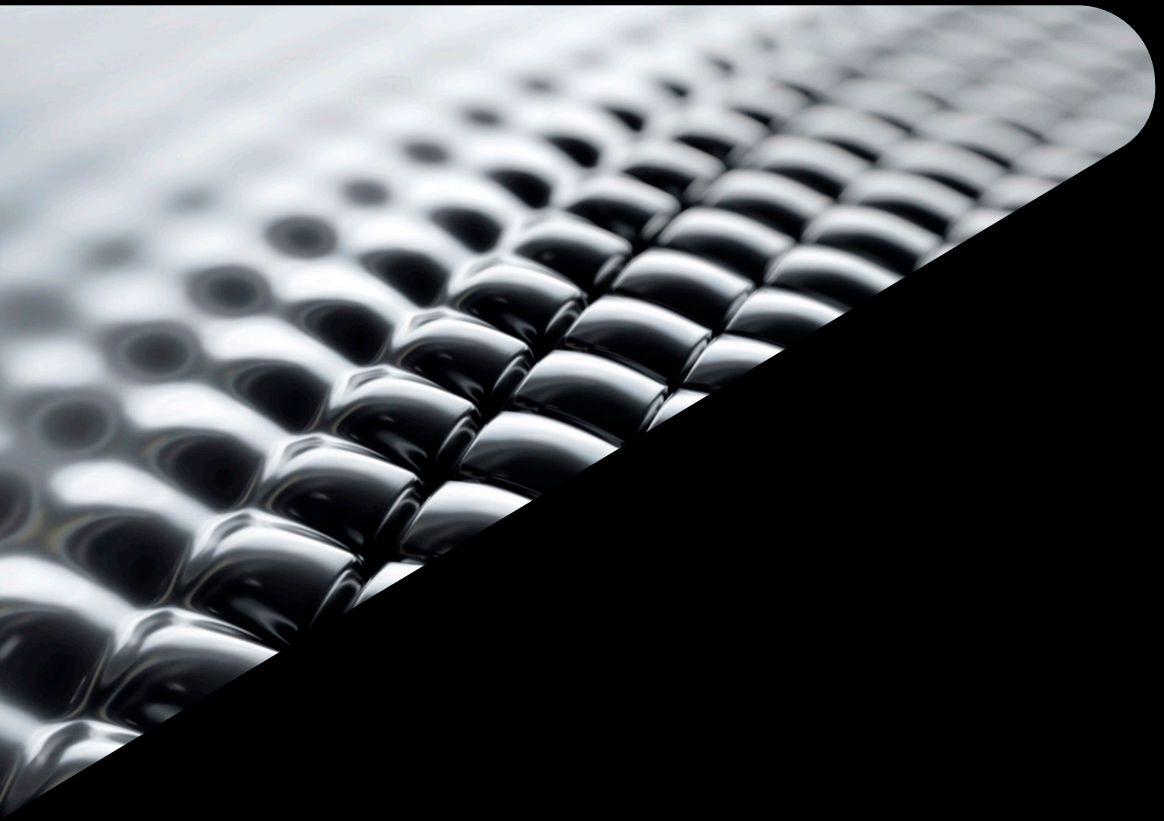
- Svelte

```
<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
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
Other Bookmarks
Gmail
Images
Google
Search Google or type a URL
Škola OnLine
Seznam – naj...
Autodesk For...
(118) YouTube
Home
Alza.cz
Hypoteční zó...
Autodesk For...
Úvodní stránka
Add shortcut
Customise Chrome

Source Code

https://github.com/petrbroz/forge-sap-poc



What’s Next

Future Plans

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

Thank you!

Q&A

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