Fusion on Forge Data

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The Data Challenge
Data in the future

Where does the value lie?

Interoperability
- move data freely between apps

Collaboration
- share data between people

Search
- filter and query for data

Traceability
- track and audit data changes

Analytics
- gain insights from data
Data in the future
Where does the value lie?

Interoperability
- move data freely between apps

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- filter and query for data

Traceability
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Analytics
- gain insights from data
Data today
Where do the challenges lie?

- **Interoperability**: move data freely between apps
- **Collaboration**: share data between people
- **Search**: filter and query for data
- **Traceability**: track and audit data changes
- **Analytics**: gain insights from data
Data today
Where do the challenges lie?

Interoperability
- move data freely between apps
- spend time translating data, losing information along the way

Collaboration
- share data between people
- oversharining and data noise

Search
- filter and query for data
- time and computationally-expensive to search

Traceability
- track and audit data changes
- lack of granular data change persistence

Analytics
- gain insights from data
- significant analytics prep work due to inconsistent, noisy data
Data in the future

Where does the value lie?

- **Interoperability**: move data freely between apps
- **Collaboration**: share data between people
- **Search**: filter and query for data
- **Traceability**: track and audit data changes
- **Analytics**: gain insights from data
What are we doing to get there today?
Data today and in the future

Moving from “data walls” to “data windows”

Opaque & Inconsistent Data
Native to a particular application, inaccessible by other applications or only accessible via dedicated, bespoke APIs

Transparent & Standardized Data
Available independent of particular applications, expressed with standard data types, accessible via a standard API
Data transparency and standardization

HTML as an analogy: standard elements and structure

```html
<!DOCTYPE html>
<html>
<body>
<h1>My First Webpage</h1>
<p>This is a paragraph of text. It's not fancy in any way, but you can read it, even if you aren't software!</p>
<p>But cats cannot read this. Sorry cats.</p>
</body>
</html>
```

My First Webpage

This is a paragraph of text. It's not fancy in any way, but you can read it, even if you aren't software!

But cats cannot read this. Sorry cats.
Data transparency and standardization

What we are developing in Forge Data

data schemas
shared rules for app data

data models
standard ways to organize data
Data schemas

Ensuring data types are consistent and reusable
Data models

Data can be organized in a variety of ways

- **Graph**: ideal for CAD-based information
- **Hierarchy**: ideal for file and folder metadata
- **Library**: ideal for large amounts of static data
A hybrid approach in evolving from files to data

Data still contained in files, but more and more data stored in transparent databases

standardized & transparent data models / databases

files & opaque data models
Common data schemas and data models
Why Fusion on Forge Data?

‘We partnered, so we would define a complete product manufacturing platform that balances defensive and offensive/flexible data strategies’
Team Collaboration

FIREWALL

- Engineering Manager
- Mechanical Engineer
- Electrical Engineer
- Analyst
- Procurement Manager

Customers

Suppliers

Design Subcontractors
Team Data Management
Protect, Manage, Share

Benefits
- Invite internal & external stakeholders to participate in projects
- Securely share models & data
- Connect teams globally
- Auditable trail of when and where design decisions were made

Capabilities
- Version control
- Cloud Storage
- Commenting & Redlining
- File Management/ export
- User management
- Searching
Impact on Customer Workflows
Serial, Fragmented, and Proprietary

Copy
Paste

Fixture Design

Serial, Fragmented, and Proprietary

Redo CAM setup on every design change

Redo SIM setup on every design change

Job Sheet
## Data

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Part Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pololu Power HD Micro Servo HD-18000</td>
<td>Microwaving motors</td>
<td>6</td>
</tr>
<tr>
<td>Pololu Continuous Rotation Servo 1248</td>
<td>Tuning motors</td>
<td>6</td>
</tr>
<tr>
<td>Black Delrin rod 3/4&quot; diameter</td>
<td>Tuning peg attachments</td>
<td>6</td>
</tr>
<tr>
<td>Clear Polycarbonate 1/4&quot; sheet</td>
<td>Guitar stand material</td>
<td>1</td>
</tr>
<tr>
<td>Black Delrin bar 1&quot; thick</td>
<td>Guitar neck support material</td>
<td>1</td>
</tr>
<tr>
<td>National Instruments myRio-1900</td>
<td>Microcontroller</td>
<td>1</td>
</tr>
<tr>
<td>3D printed ABS plastic</td>
<td>Guitar pick holders</td>
<td>6</td>
</tr>
<tr>
<td>7&quot; LED strands, battery powered</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Diagram of a microcontroller](image1)

## Experience

- SketchUp
- SIMS
- Creo
- Box
- SOLIDWORKS
- Autodesk Meshmixer
- Autodesk Netfabb
- Autodesk AutoCAD
- Dassault Systemes
- Mastercam
- Matlab
- Siemens
- ANSYS
- Altair
- ANSYS
- Dropbox
- Adobe
- Autodesk Inventor
- ANSYS
- Adams
- PDF

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Manufacturing Data Framework

Empower D&M teams to design and make better products faster

- Data at the Center
- Support highly collaborative editing of Product data
- Support automation workflows
- Support Customization
- Enable Insights and Decision Making
Use Example | Extensible Properties

Without Fusion on Forge Data

- **Limited property availability**, all managed by Autodesk - only available in the Fusion Modeler and Derivative Service outputs
- Not available via Data API (i.e. no automation opportunity)
- All property edits dirty the model and version the file forward
- Concurrent edits clobber each other
- Potentially **inconsistent** (e.g. duplicate part numbers live within distinct files)

With Fusion on Forge Data

- Properties can surface in **any UI** – Autodesk or our partner applications
- **Extensible**, can define custom properties of varying types
- **Hyper-collaboration** by different roles and tools:
  - Edits happen outside the context of model, concurrently
  - No conflict on edits to different properties
  - High frequency edits model
- **Consistency** (e.g. unique part numbers managed in central Forge Data)
Without Fusion on Forge Data

- CAD-BOM relationships are encapsulated in the Fusion file
- Product-BOM relationships are either not managed or managed externally
- Any collaboration around BOM data requires export and import operations, making it impossible to identify the single source of truth

With Fusion on Forge Data

- All BOM relationships are managed in Forge Data providing a single source of truth
- Business rules can identify how to propagate changes in one type of BOM relationships to another or flag data as out of date
- Non-Design colleagues can contribute to Product Structure in upstream and downstream business workflows
Fusion Components Navigator (WORK IN PROGRESS)

- New web-based Components navigator
- Exposes entire design structure (xrefs and local components) outside Fusion 360 experience
- Selectively expose properties encapsulated within classic files
- Structure accessible via REST APIs by any partner application
- Interactive eventing of signification notifications and bidirectional writeback
Fusion 360, Team and Lifecycle Integration

WORK IN PROGRESS

- Advancing Data Management with Process Workflows
- Automated Numbering for Components and Drawings
- Engineering Release Process
  - Quick-Release
  - ECO Approval Workflow
- Automated Revisioning and Lifecycle States
Exposing Autodesk’s next generation of data APIs & components
Guiding principles for our next-gen data APIs / SDKs

1. Drive more **transparency** in our data models
2. Preserve customer **data / workflow longevity** by architecting clear technology interfaces
3. Ensure these services **perform reliably at scale**
4. Provide industry-leading **data governance and security**
5. Foster **extensibility** by delivering **powerful but easy-to-use** APIs / SDKs
Drive Targeted Internal Adoption

Scale Internal Adoption

Externalize APIs and SDKs
Conclusion and Questions


2. Forge Answer Bar
   a) Search for the Answer Bar from AU site, and then find the Forge specific one
   b) Time slots will be available around the clock during this year’s Virtual AU event!
   c) Also languages and experts will be advertised, so we can help you as much as possible in a “live” setting
