

# Democratizing Linked Data

A picture is worth a thousand words, with embedded linked metadata.

1. Archilogic
2. Pixel Image Floor Plans
3. Linked Metadata
  
4. Democratizing Linked Data

# Who is speaking



- Tomas Polach 🇨🇭
- MSc ETH in architecture & urban planning
- Co-Founder at [Archilogic.com](https://www.archilogic.com)
- Former junior teaching assistant at ETH Zürich
- Co-Founder at Aero Architekten, Zürich

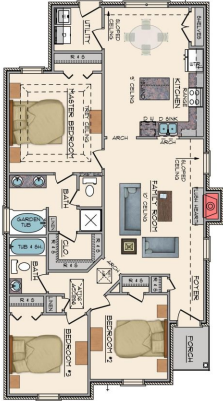
archilogic.com

**Our mission is to empower everyone to make the most out of the spaces they work and live in.**



- 2014: Spin-off ETH Zurich
- 2019: 15 employees
- Based in Zurich, Switzerland
- Serving customers in 50+ countries

# Archilogic 2014



Input:  
2D Pixel Image  
Floor Plan



## Data Conversion

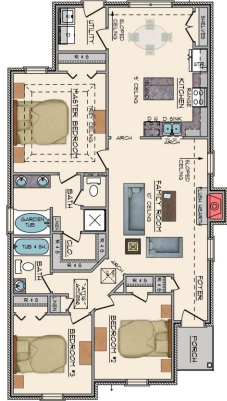


Semantic 3D Model

# Archilogic 2019

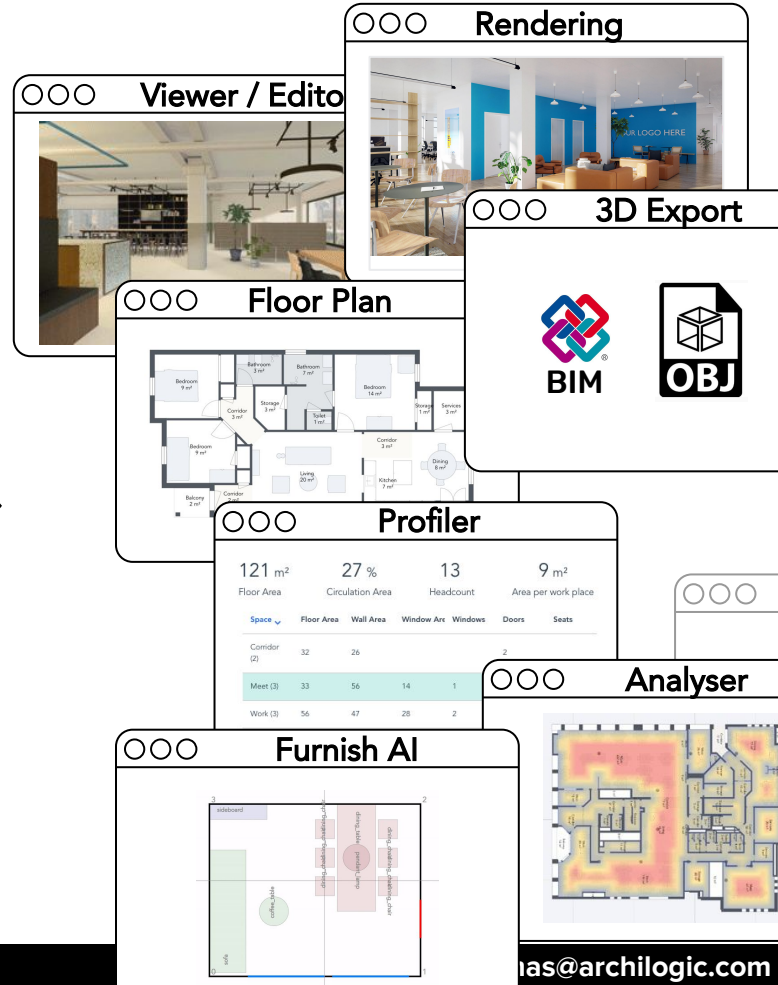
Platform: Apps & APIs

## Data Conversion



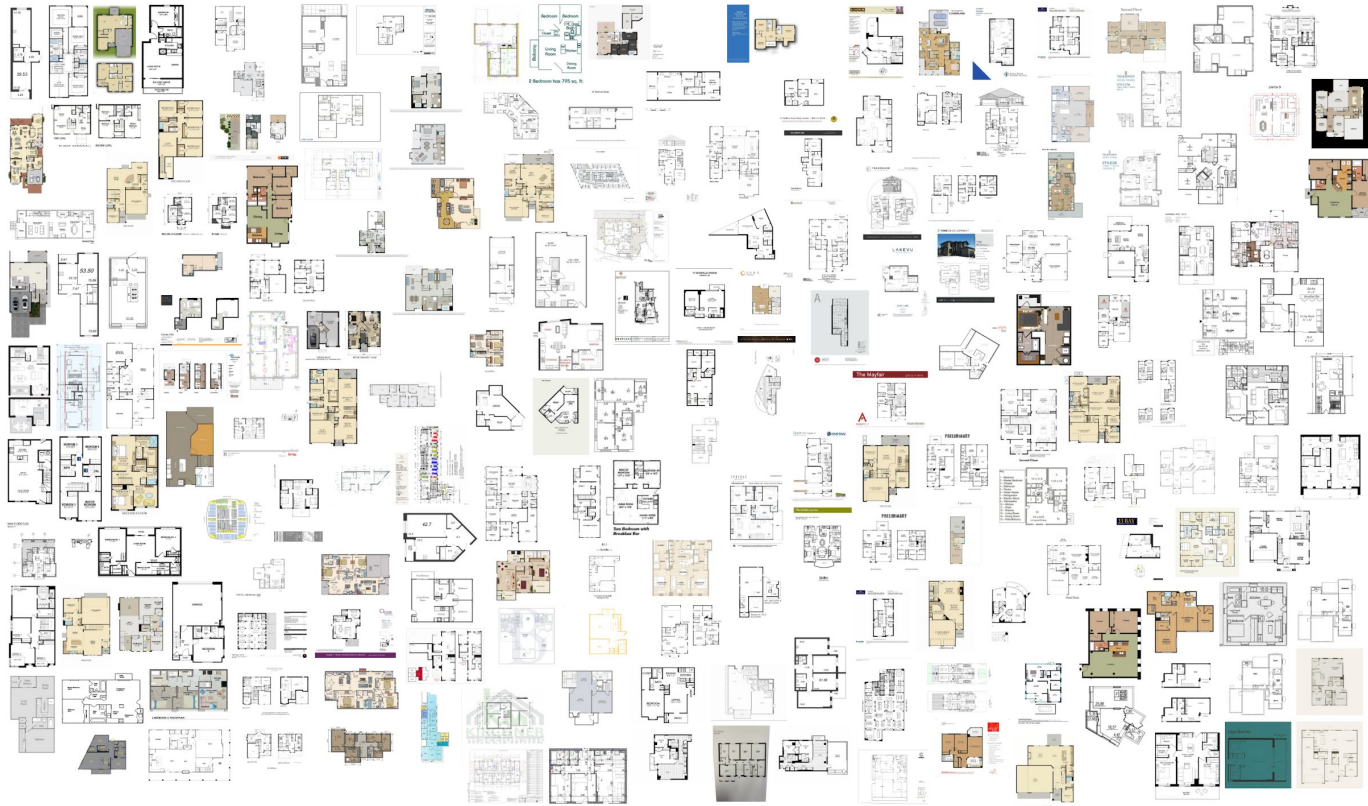
Input:  
2D Pixel Image  
Floor Plan

Semantic 3D Model

A collection of software application windows. The 'Viewer / Editor' window shows a 3D rendering of a modern office interior. The 'Rendering' window shows a similar 3D rendering with a logo placeholder. The '3D Export' window displays BIM and OBJ file format icons. The 'Floor Plan' window shows a 2D floor plan with room labels like 'Bedroom 14m²', 'Living 20m²', and 'Kitchen 7m²'. The 'Profiler' window displays a table of metrics: 121 m² Floor Area, 27% Circulation Area, 13 Headcount, and 9 m² Area per work place. The 'Analyser' window shows a heatmap of the floor plan. The 'Furnish AI' window shows a diagram of a room with furniture placement and a bar chart below it.

Space	Floor Area	Wall Area	Window Arc	Windows	Doors	Seats
Corridor (2)	32	26			2	
Meet (3)	33	56	14	1		
Work (3)	56	47	28	2		

# Pixel Floor Plan Conversion Training Set

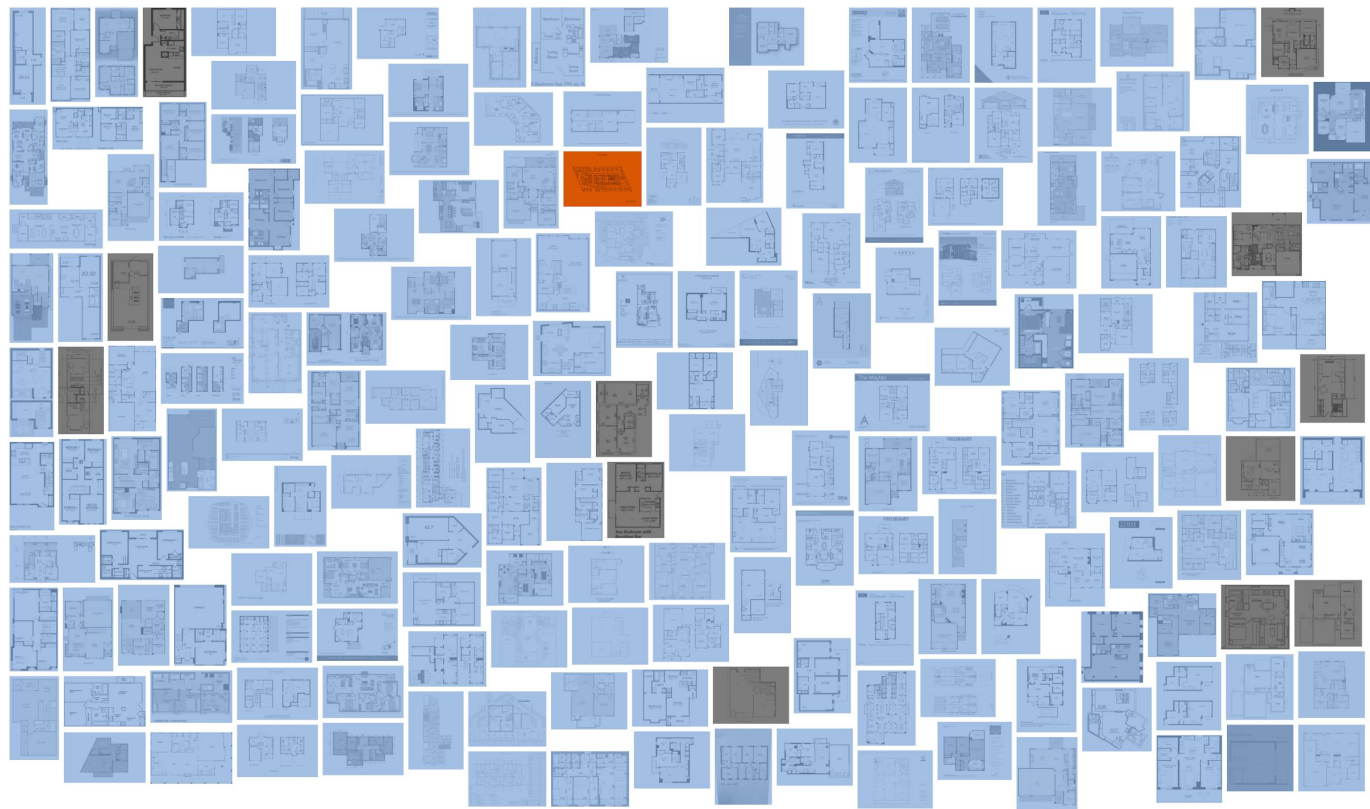


Random sample of  
200 floor plan images  
from larger training set.

[@Julia Pap](#)

Leading ML engineer at Archilogic

# Pixel Floor Plan Conversion Training Set



Random sample of  
200 floor plan images  
from larger training set.

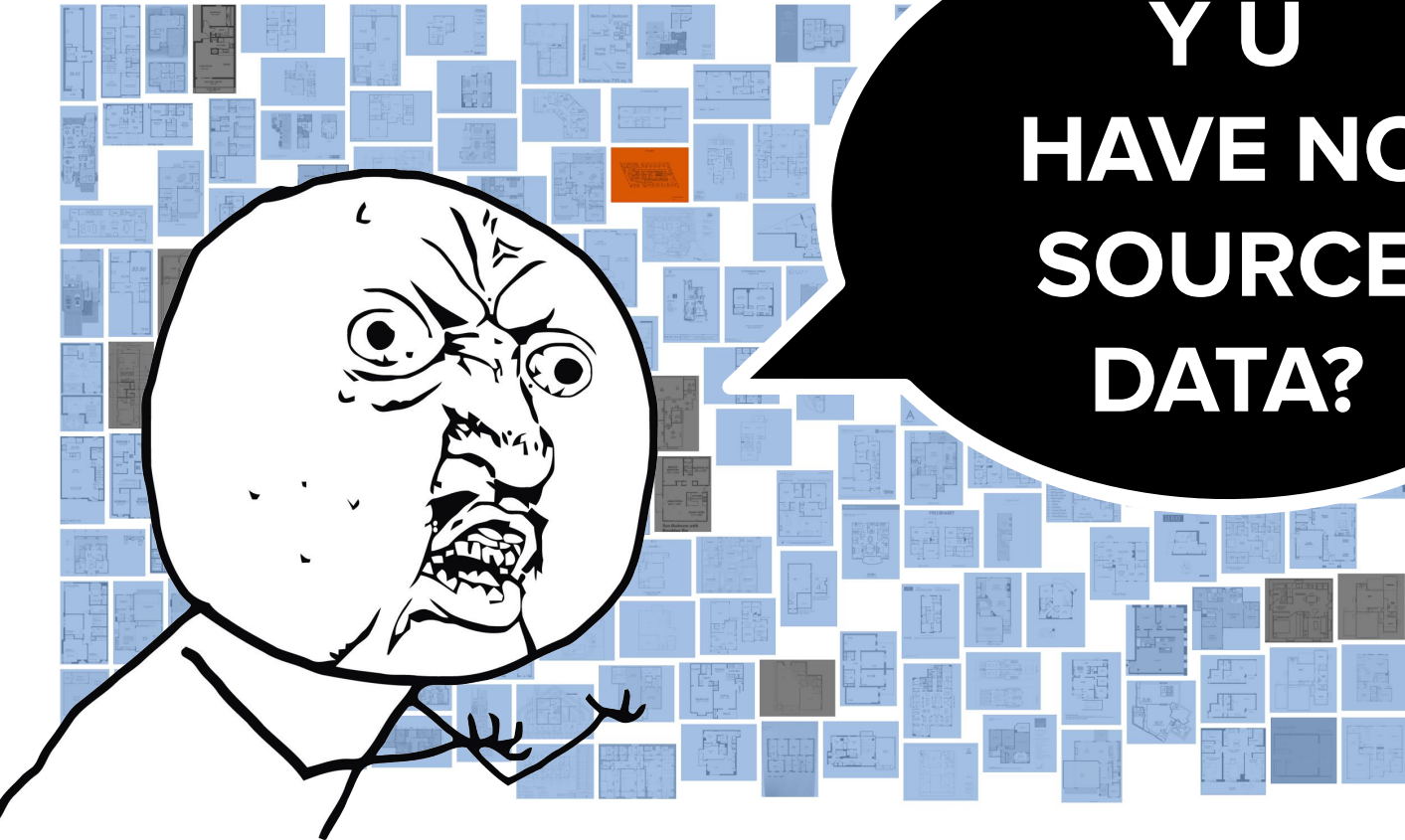
- Hand-drawn
- CAAD
- From Archilogic

**94% of all pixel floor  
plans have digital  
source data somewhere**

Julia Pap [@papjuli](https://twitter.com/papjuli)  
Leading ML engineer at Archilogic



# Pixel Floor Plan Conversion Training Set



YOU  
HAVE NO  
SOURCE  
DATA?

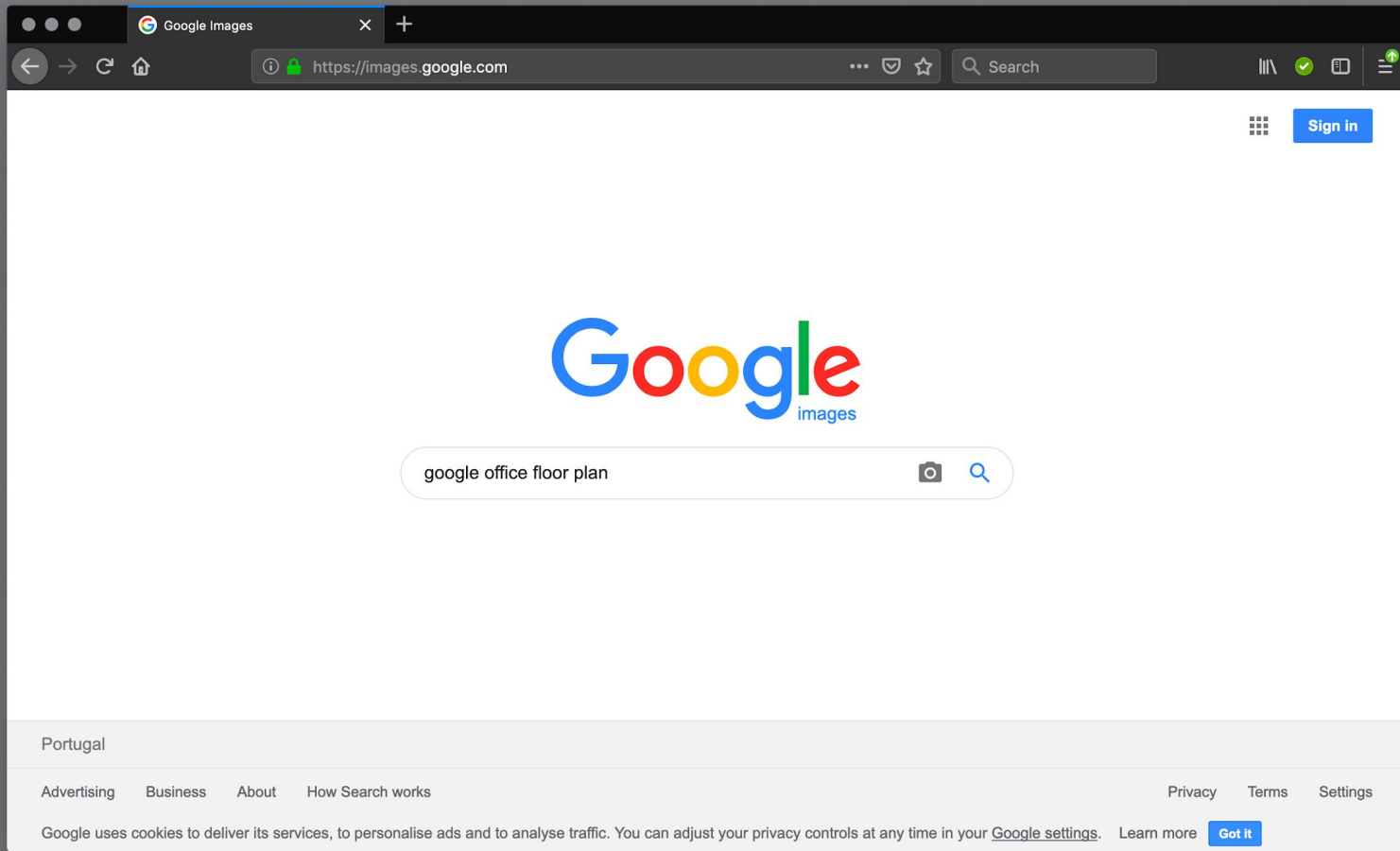
Random sample of  
floor plan images  
larger training set.  
d-drawn  
D  
m Archilogic  
s of all pixel floor  
plans have digital  
source data somewhere

Julia Pap [@papjuli](https://twitter.com/papjuli)

Leading ML engineer at Archilogic







google office zurich floor plan

google office zurich floor plan

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**FIRST RESULT!**

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Floor Plan Level 1 / Project Plans / Google Hub,Z... evolution-design.info

Project Plans / Google Hub,Zurich / Google / Offic... camenzindevolution.com

Google Headquarters Floor Plan | Floor plan. Lev... pinterest.com

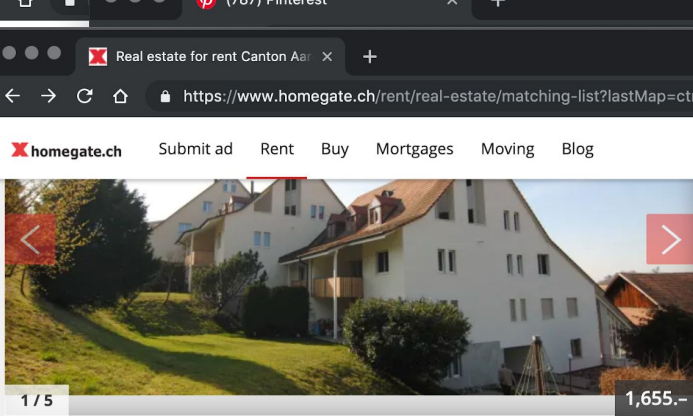
Floor Plan Level 4 / Project Plans / Google Offi... german-architecture.com

Google Engineering Hub | ... arch2o.com

Google Office in Zurich: Freedom and Div... ecophilialab.wordpress.com

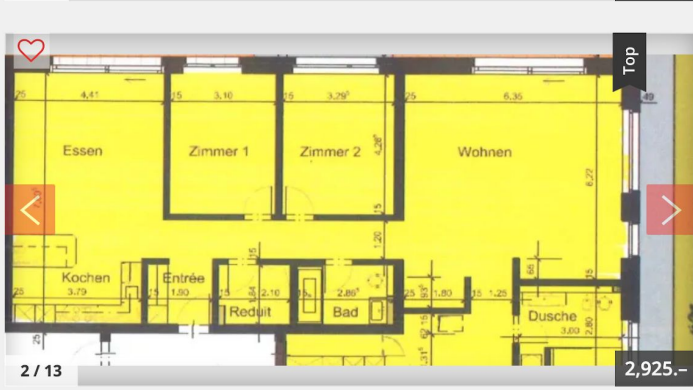
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How to set up your Service... blog.carrwoodpark.com



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dormebene  
Contact the advertiser

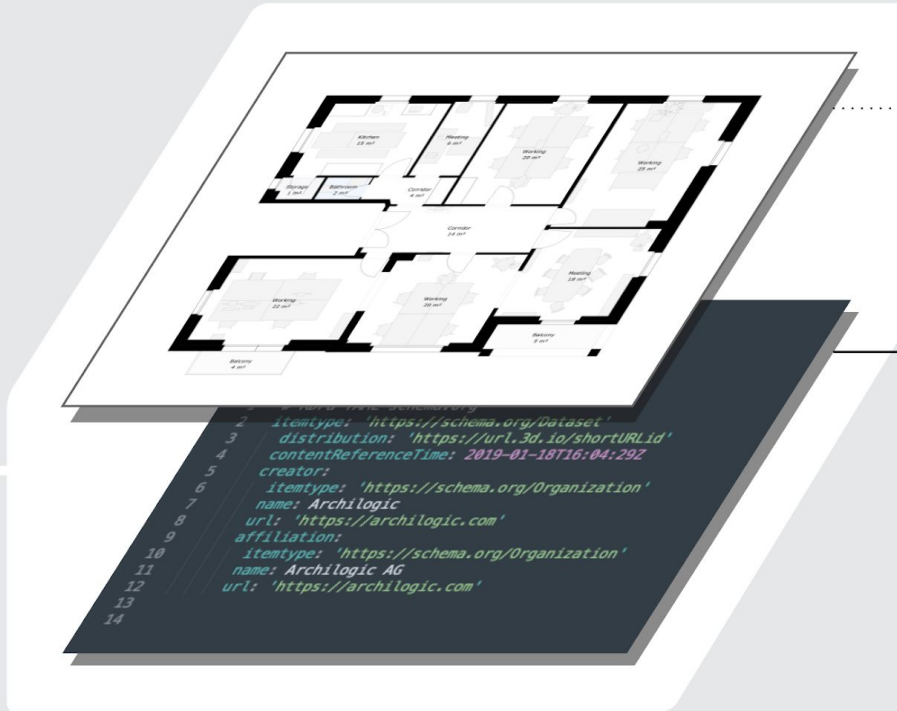
# Demo Time ...

*Archilogic Floor Plans with XMP metadata*

# Images as Vehicles for Linked Data



floor\_plan.jpg



## 👁 PIXEL LAYER

Human readable information stored as unstructured data in form of a 2D pixel array.

## 🔗 METADATA LAYER

Machine readable structured data in XMP format and Schema.org vocabulary.



3D Web App



Editable 3D Dataset



Creator Profile



# Image Metadata Formats

1985: **EXIF** Primarily digital camera information.  
Most popular.

---

1991: IPTC-IIM Mainly copyright information.  
Deprecated in 2005.

---

2001: **XMP** Extensible data format.

---

2005: **IPTC Core & Extensions** Uses XMP.



## = **Extensible Metadata Platform**

- Subset of W3C **RDF/XML** syntax
- Extensible with **custom namespaces**
- Created by Adobe in 2001
- ISO standard since 2012
- Supported file formats:

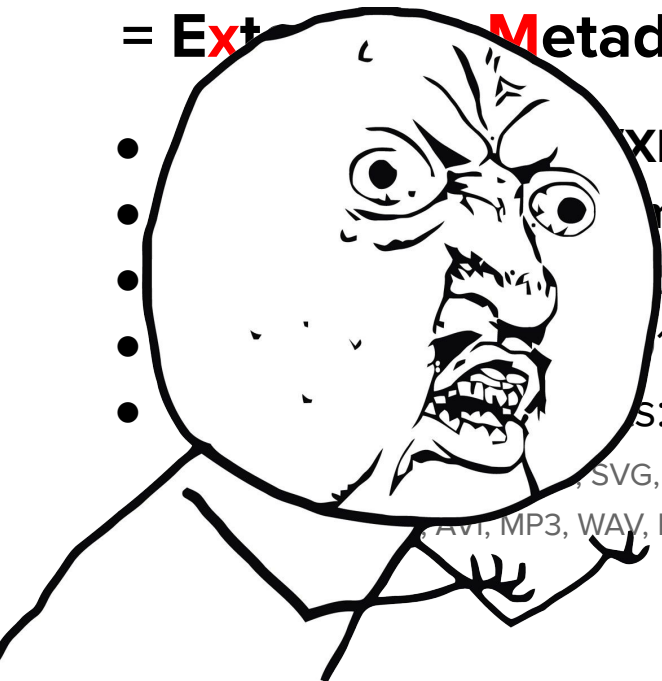
JPEG, PNG, GIF, PDF, WebP, SVG, TIFF, AI, PSD, PS,  
DNG, MP4, MOV, AVI, MP3, WAV, RF64, AIFF



Y U  
SHOW NO  
INNOVATION  
?

= Ext Metadata P

- XML syn'
- n n
- 001
- 12
- s:



, SVG, TIFF, AI, PSD, PS,  
AVI, MP3, WAV, RF64, AIFF

“What’s BIM?”

Directly visible  
in a web browsers

### Web Users

### Web Media



Home Buyer



AirBnb Guest



Shared Office Nomad



Museum Visitor



JPEG



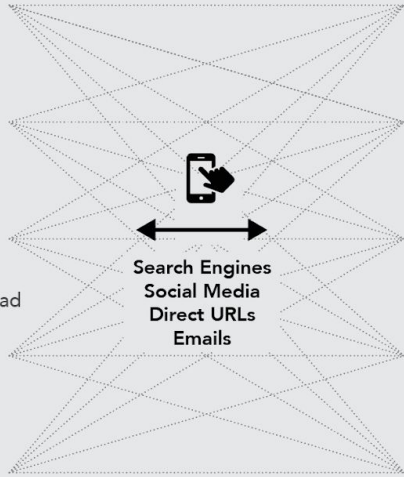
SVG



PDF



MP4



### Semantic Data

### Expert Users



Semantic Web



BIM Server



Archilogic APIs



Revit File



Planner



Facility Manager



Portfolio Manager



Incident Response



Specialized  
data silos

Pixel image  
= data loss

Exemplary scenario:  
Planner exports a 2D rendering from a BIM software and send an image via email.

### Web Users



Home Buyer



AirBnb Guest



Shared Office Nomad



Museum Visitor



### Web Media



JPEG



SVG



PDF



MP4



### Semantic Data



Semantic Web



BIM Server



Archilogic APIs



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Incident Response



... 2 years later: somebody finds the image in an old email and tries to obtain the source data.

### Web Users



Home Buyer



AirBnb Guest



Shared Office Nomad



Museum Visitor



### Web Media



JPEG



SVG



PDF



MP4



### Semantic Data



Semantic Web



BIM Server



Archilogic APIs



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### Expert Users



Planner



Facility Manager



Portfolio Manager



Incident Response





# Democratizing Linked Data:

Connecting the “visual surface” of the web to its “hidden” data layers:

## Web Users



Home Buyer



AirBnb Guest



Shared Office Nomad



Museum Visitor



## Web Media



JPEG



SVG



PDF



MP4



## Semantic Data



Semantic Web



BIM Server



Archilogic APIs



Revit File



## Expert Users



Planner



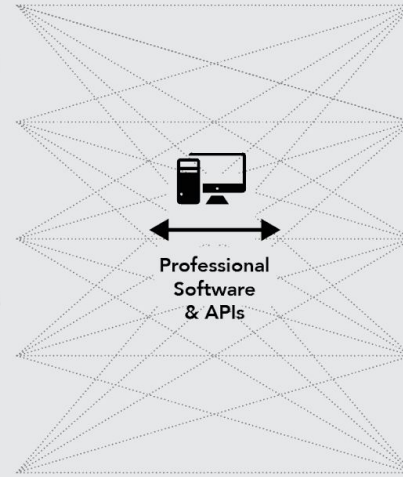
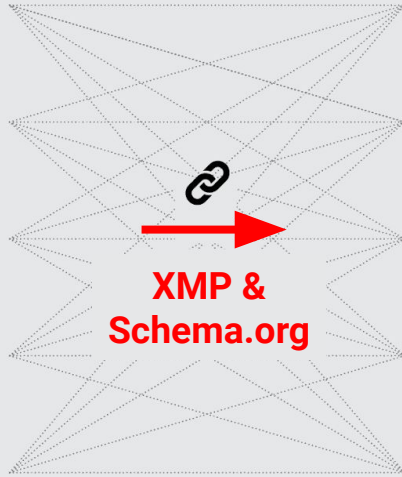
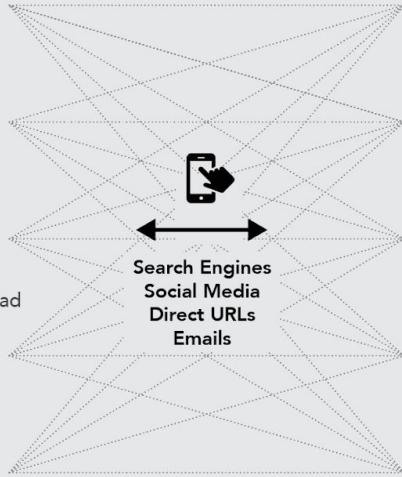
Facility Manager



Portfolio Manager



Incident Response

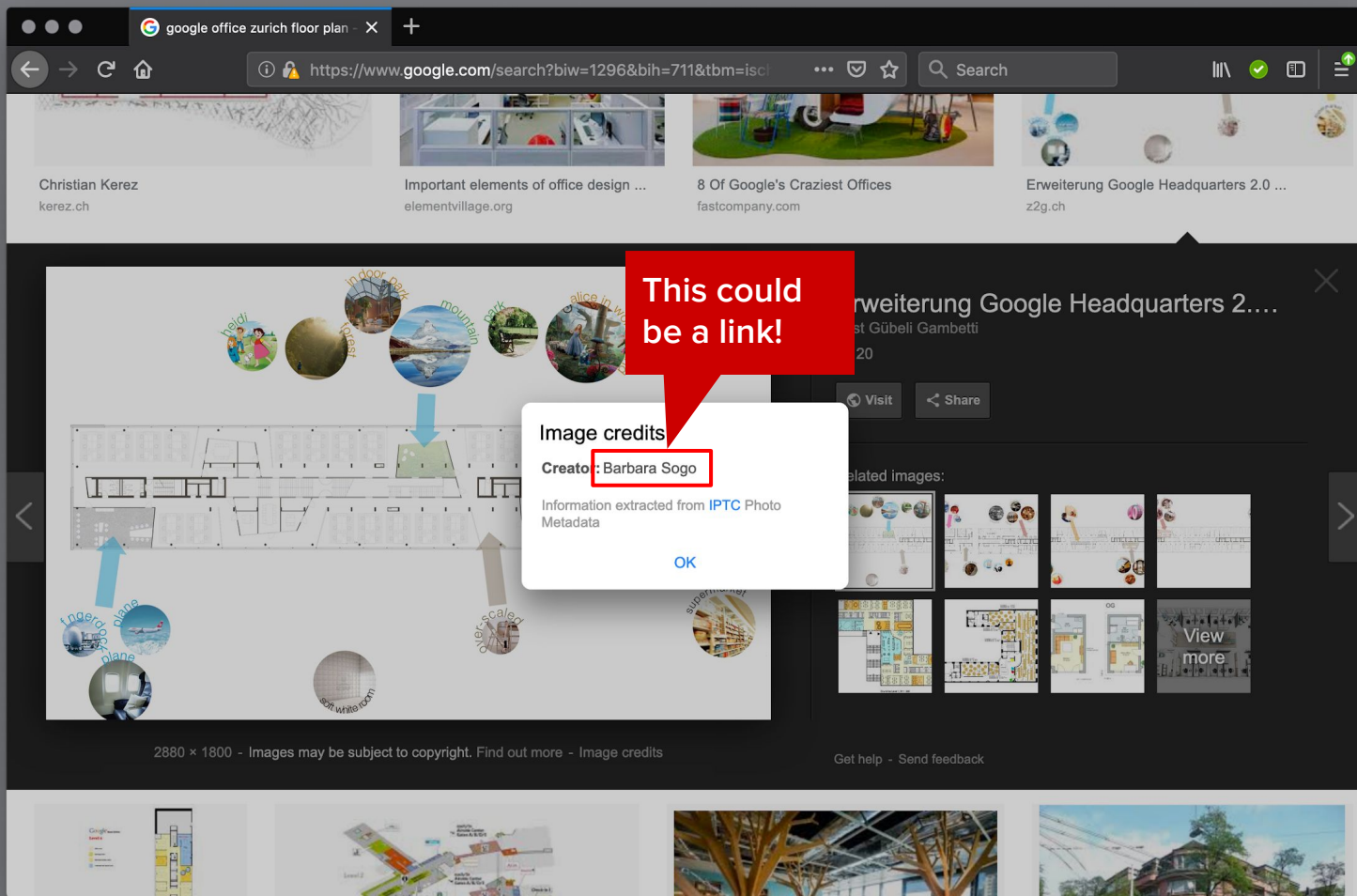


# Let's make linked data visible on the web!

3-step recipe:

1. **Add XMP** to image exports
2. **Include URLs** pointing to source data
3. **Support XMP** in UIs

Google Image Search supports XMP and IPTC since October 2018:

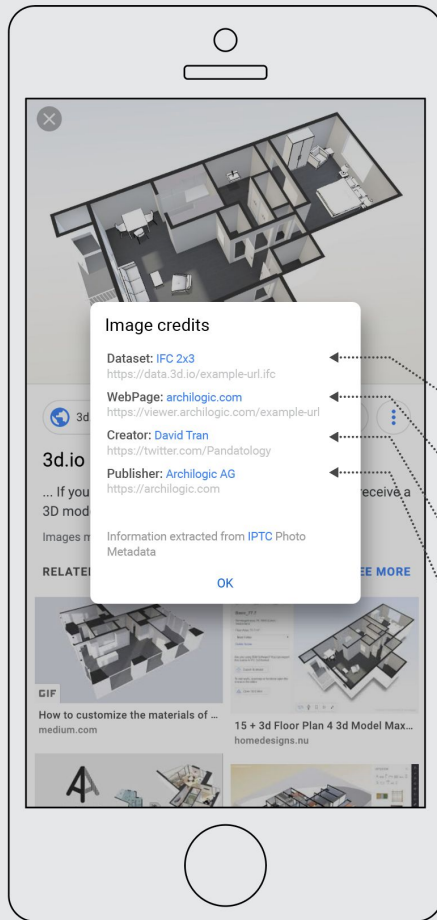


Democratizing Linked Data  
implementation ideas outside of  
Archilogic:

# #1 Search for Images to Find Semantic Data

XMP Code Sample:

<https://gist.github.com/tomas-polach/e687093448a25761597c26fa86f1e463>



## Image Search Providing Access to Embedded Linked Metadata

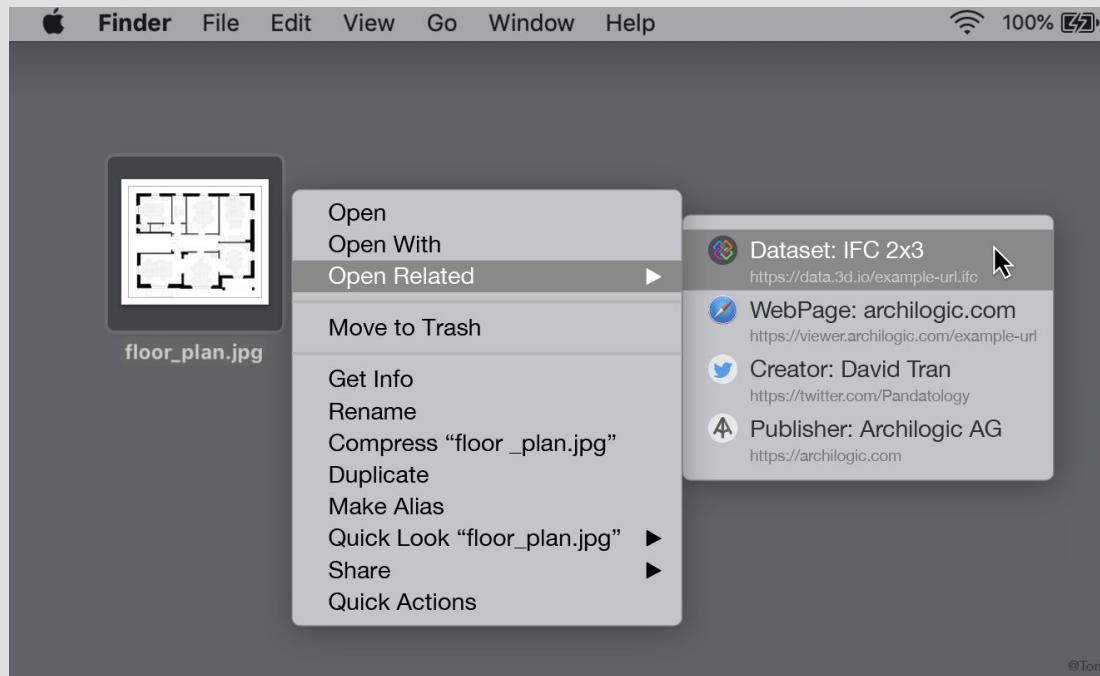
In this mock-up, linked metadata embedded within the image file is being used to generate a user interface providing direct access to related resources like the original 3D dataset from which the image was generated. The following snippet shows exemplary linked metadata in XMP format with Schema.org vocabulary.

```
1 <?xpacket begin="?" id="W5M0MpcHJHrreSzNTczkc9d">
2 <:xmpmeta xmlns:x="adobe:ns:meta/"
3   x:xmptk="Adobe XMP Core 5.4-c002 1.000000, 0000/00/00-00:00:00   "
4 <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
5   <rdf:Description xmlns:schema="http://schema.org/version/latest/schema.ttl">
6
7     <schema:description>
8       Architectural visualization rendered from a BIM dataset
9     </schema:description>
10
11     <schema:Dataset>
12       <schema:encodingFormat>IFC 2x3</schema:encodingFormat>
13       <schema:url>https://data.3d.io/example-url.ifc</schema:url>
14       <schema:contentReferenceTime>2019-01-18T16:04:29Z</schema:contentReferenceTime>
15     </schema:Dataset>
16
17     <schema:WebPage>
18       <schema:description>Interactive 3D viewer web app</schema:description>
19       <schema:url>
20         https://dashboard.archilogic.com/scene/1472c43aa-2746-4d6d-8371-d7b5f697af3f
21       </schema:url>
22     </schema:WebPage>
23
24     <schema:creator>
25       <schema:person>
26         <schema:name>David Tran</schema:name>
27         <schema:url>https://twitter.com/Pandatology</schema:url>
28       </schema:person>
29     </schema:creator>
30
31     <schema:publisher>
32       <schema:organization>
33         <schema:name>Archilogic AG</schema:name>
34         <schema:url>https://archilogic.com</schema:url>
35       </schema:organization>
36     </schema:publisher>
37
38   </rdf:Description>
39 </rdf:RDF>
40 </x:xmpmeta>
41 <?xpacket end="?">
```

Democratizing Linked Data  
implementation ideas outside of  
Archilogic:

## #2

# Images as Symbolic References to Semantic Data



# For the community, by Archilogic:

XMP Editor:

<http://xmp-editor.archilogic.com>

XMP Lib for JavaScript:

<https://github.com/archilogic-com/xmp-editor>