



UCL

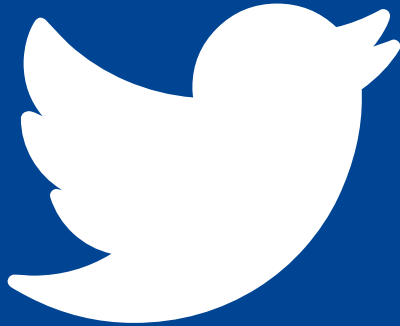
30 REPO

Non-linear Version Control using NoSQL MongoDB

Dr Jozef Doboš



UCL



@3DRepo

Non-linear Version Control using NoSQL MongoDB

Dr Jozef Doboš

3D REPO

Version 3D Repository

3D REPO

<https://3drepo.io>

- Award winning

3D REPO

3D REPO

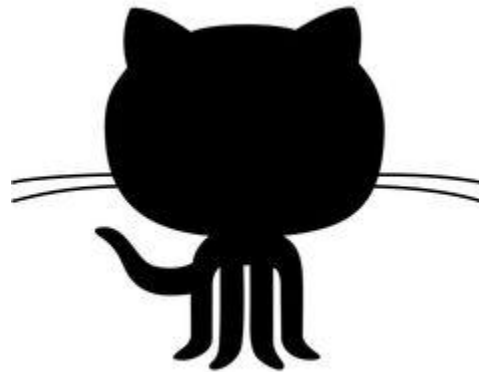
3D REPO

3D REPO

3D REPO







<http://github.com/3drepo>



COGNICITY
CANARY WHARF



ROYAL
ACADEMY OF
ENGINEERING



EPSRC

Engineering and Physical Sciences
Research Council

BiTE
BREAKTHROUGH INFORMATION
TECHNOLOGY EXCHANGE

UCL
Engineering
Doctorate

Virtual Environments
Imaging & Visualisation





3D for everyone

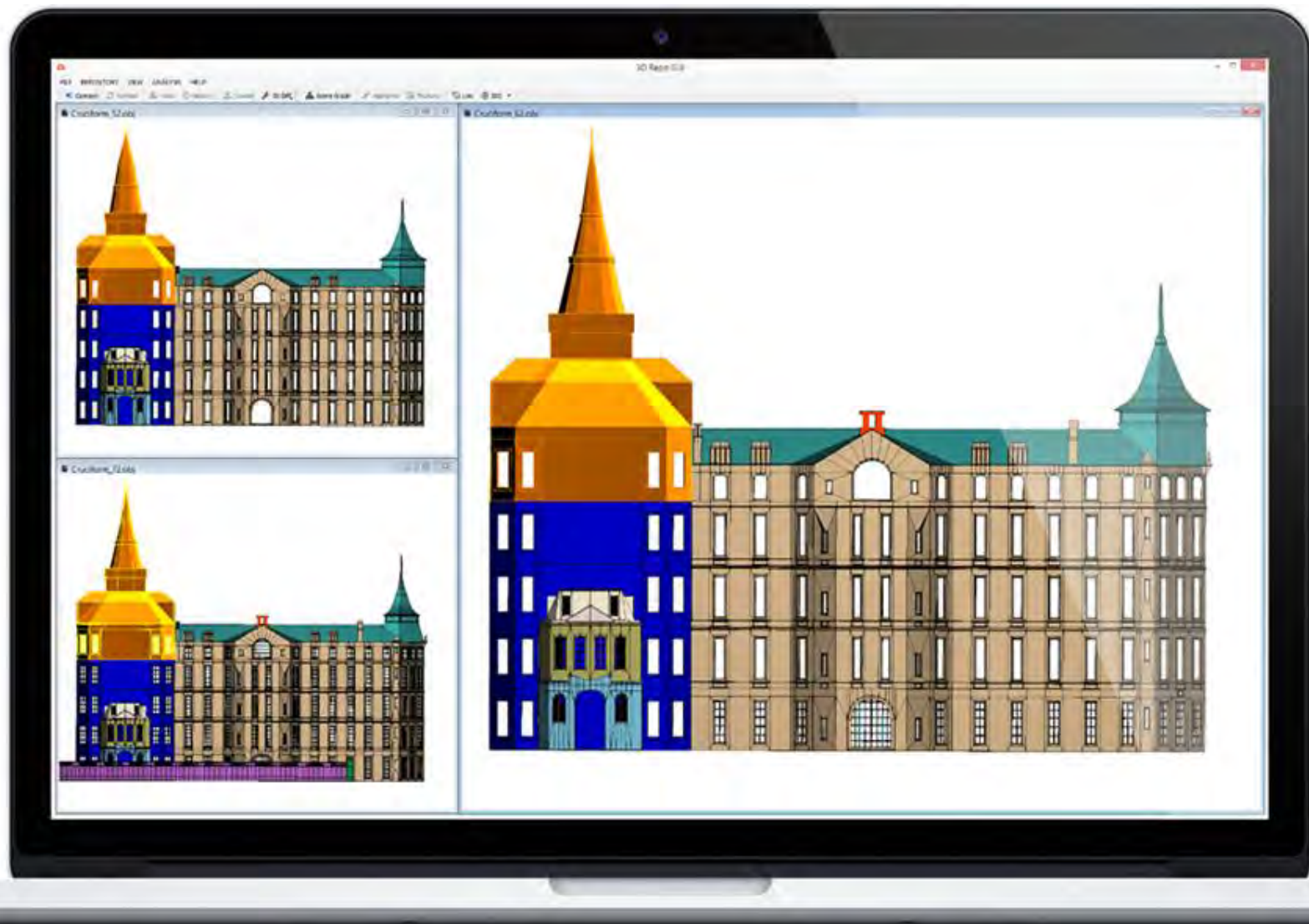
- Collaborative repository
- Open source

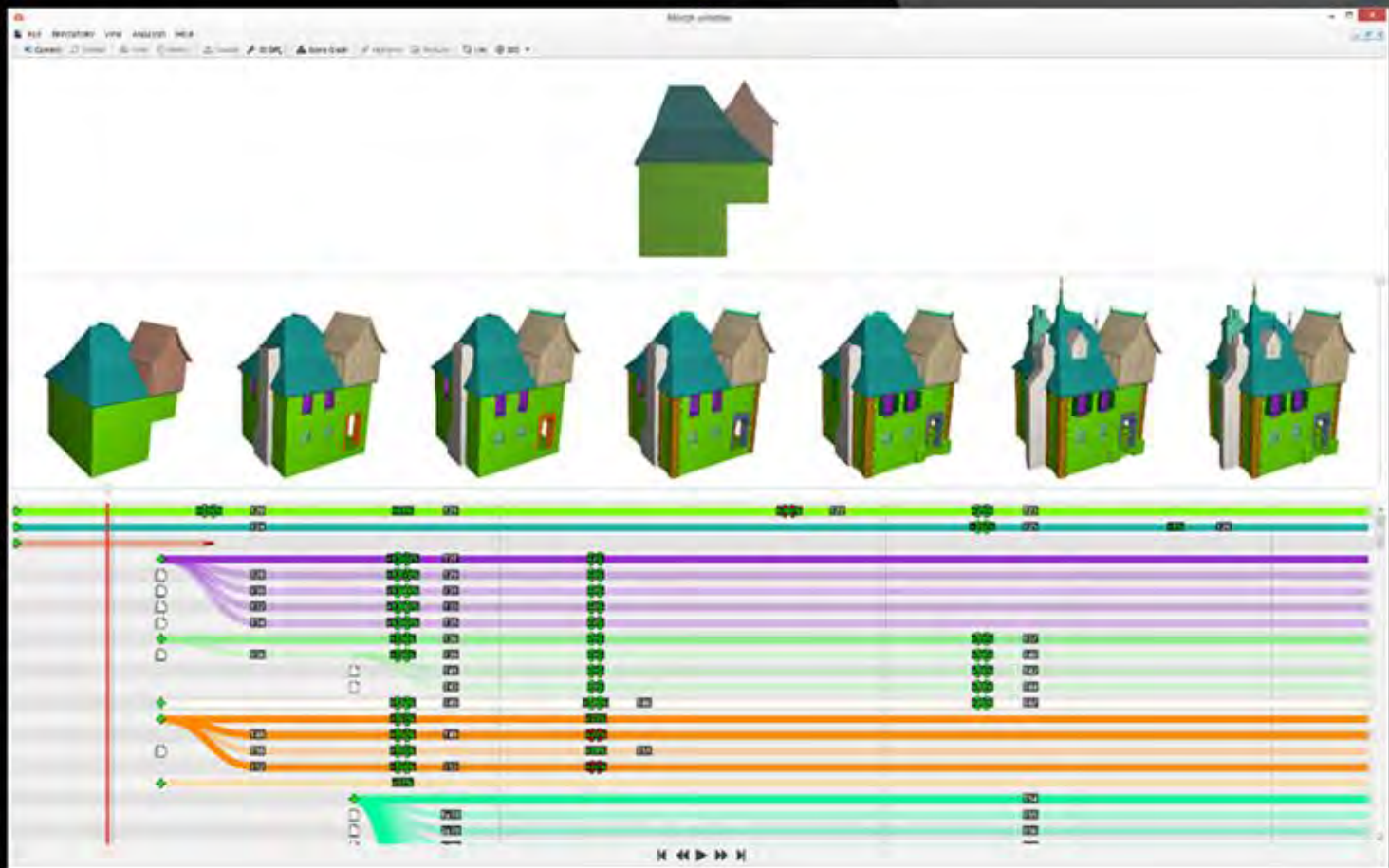
Highly scalable

- Cloud for best performance
- Web and mobile accessible

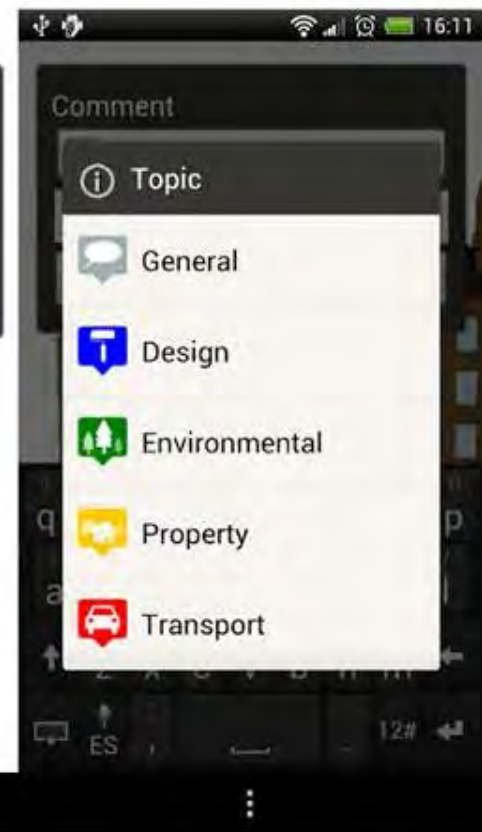
Cost effective

- Freemium access
- Reduced risk

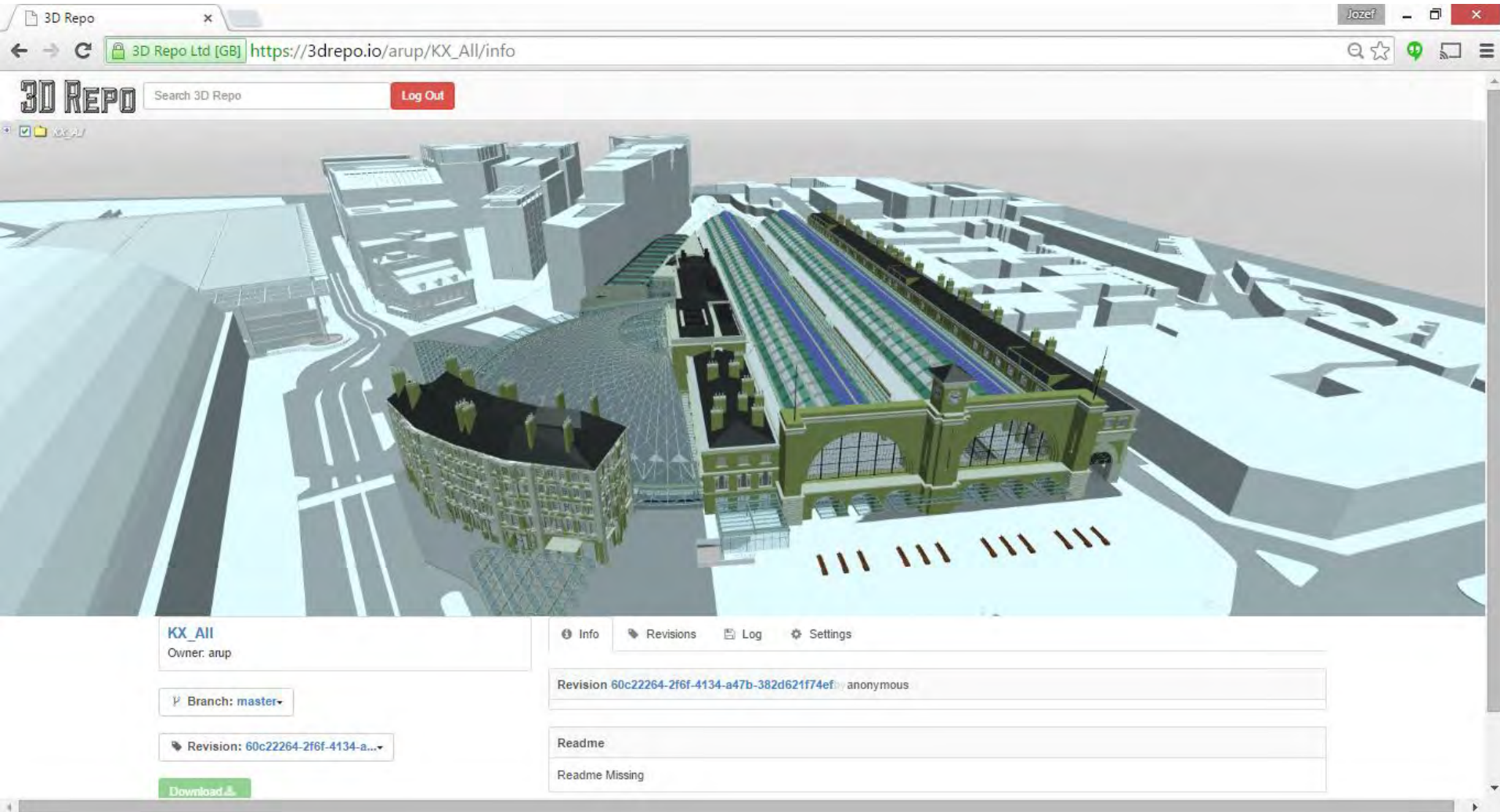








King's Cross Redevelopment



Olympic Stadium Transformation

3D Repo Ltd [GB] <https://3drepo.io/balfourbeatty/OSTFed/info>

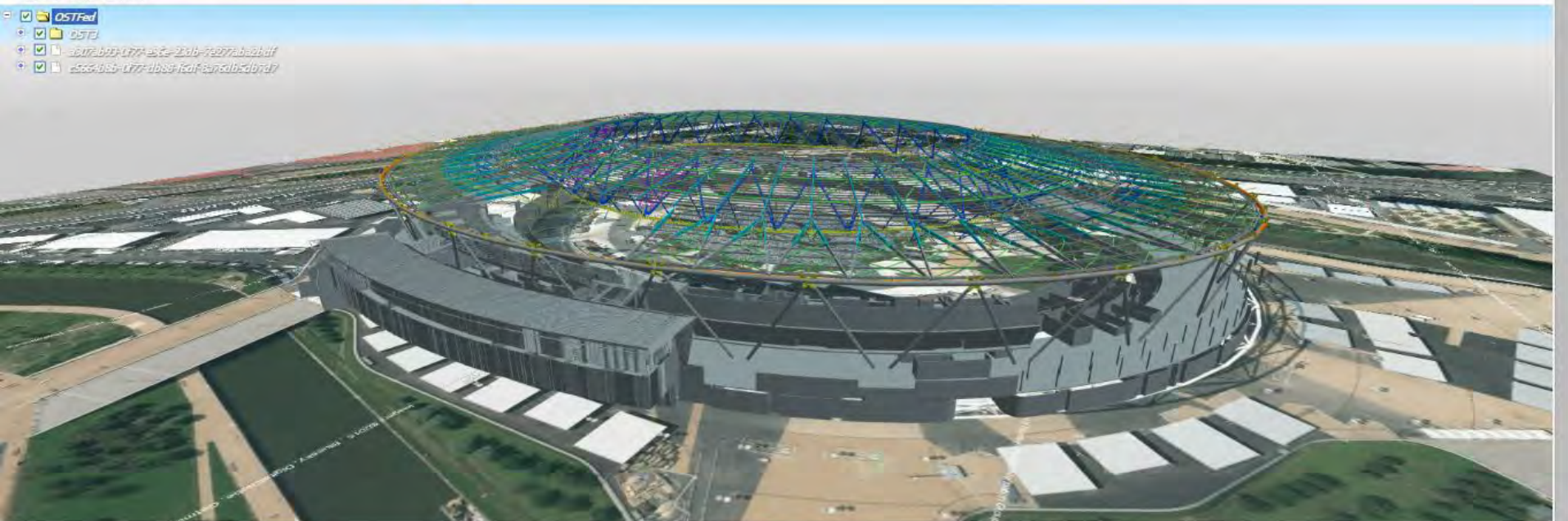
3D REPO Search 3D Repo Log Out

OSTFed

OSTFed

3cf11644-975f-9269-b6df-8f5cfbe6ac75

3cf11644-975f-9269-b6df-8f5cfbe6ac75



OSTFed

Owner: hary

Branch: master

Revision: 3cf11644-975f-9269-b...

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Info Revisions Log Settings

Revision 3cf11644-975f-9269-b6df-8f5cfbe6ac75 anonymous

Readme

Olympic Stadium transformation project - Balfour Beatty



*“Most VR experiences
are based on Unity
which is wrong!”*

- Jozef Doboš





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Building information modeling

From Wikipedia, the free encyclopedia

This article is about Building information modeling. For other uses, see [Bim \(disambiguation\)](#).

Building information modeling (BIM) is a process involving the generation and management of digital representations of physical and functional characteristics of places. **Building information models (BIMs) are files** (often but not always in proprietary formats and containing proprietary data) which can be exchanged or networked to support decision-making about a place. Current BIM software is used by individuals, businesses and government agencies who plan, design, construct, operate and maintain diverse physical infrastructures.

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Why  mongoDB ?

Because it's polymorphic,

scalable

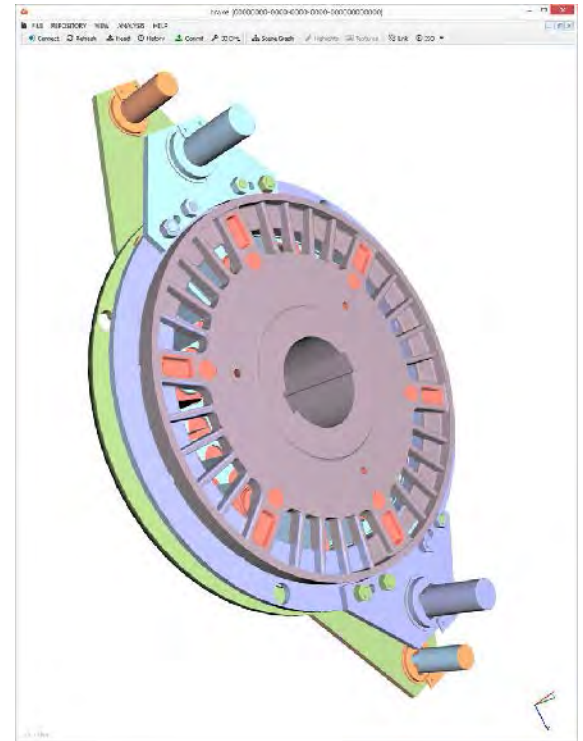
and binary



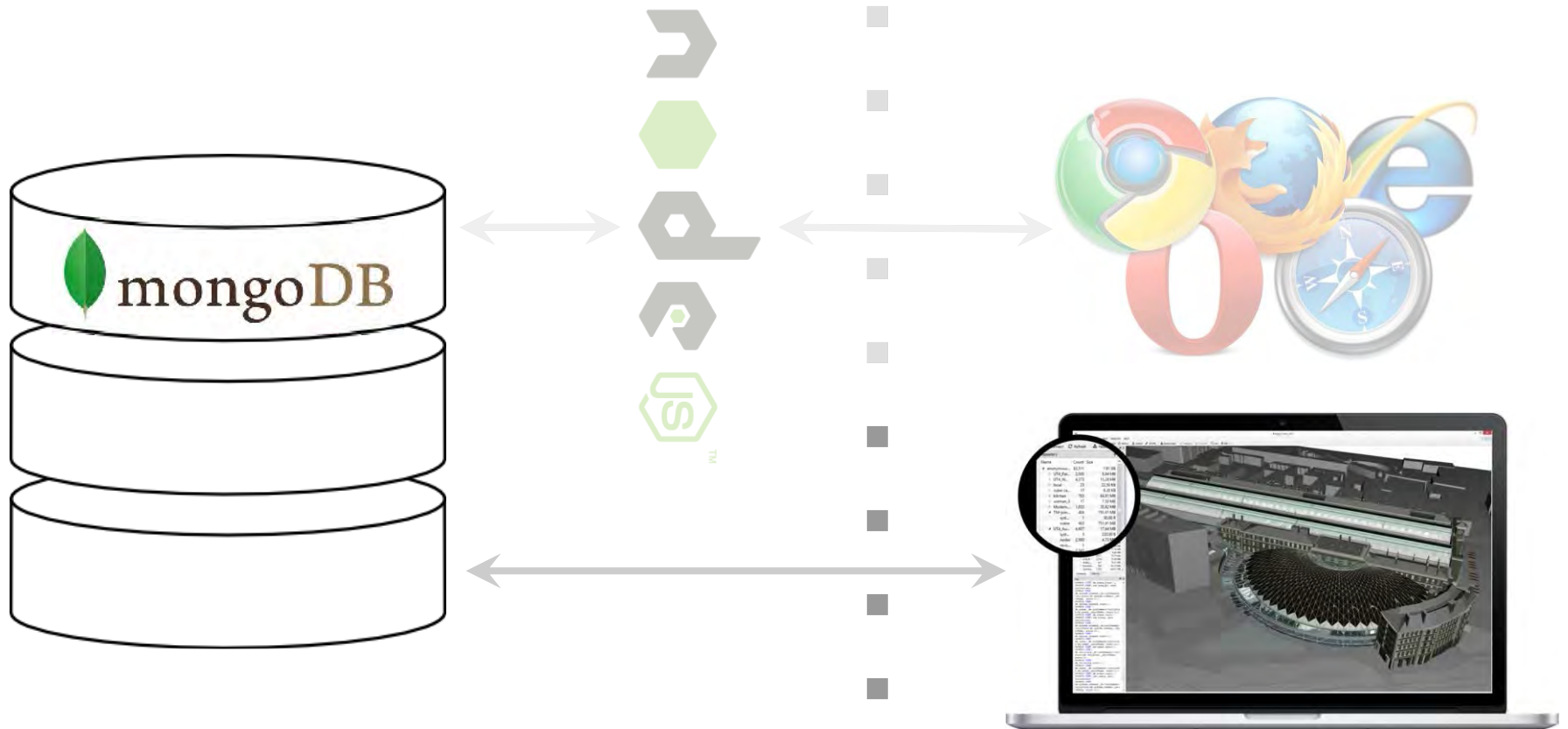
Engineering



Creative Industries



Manufacturing



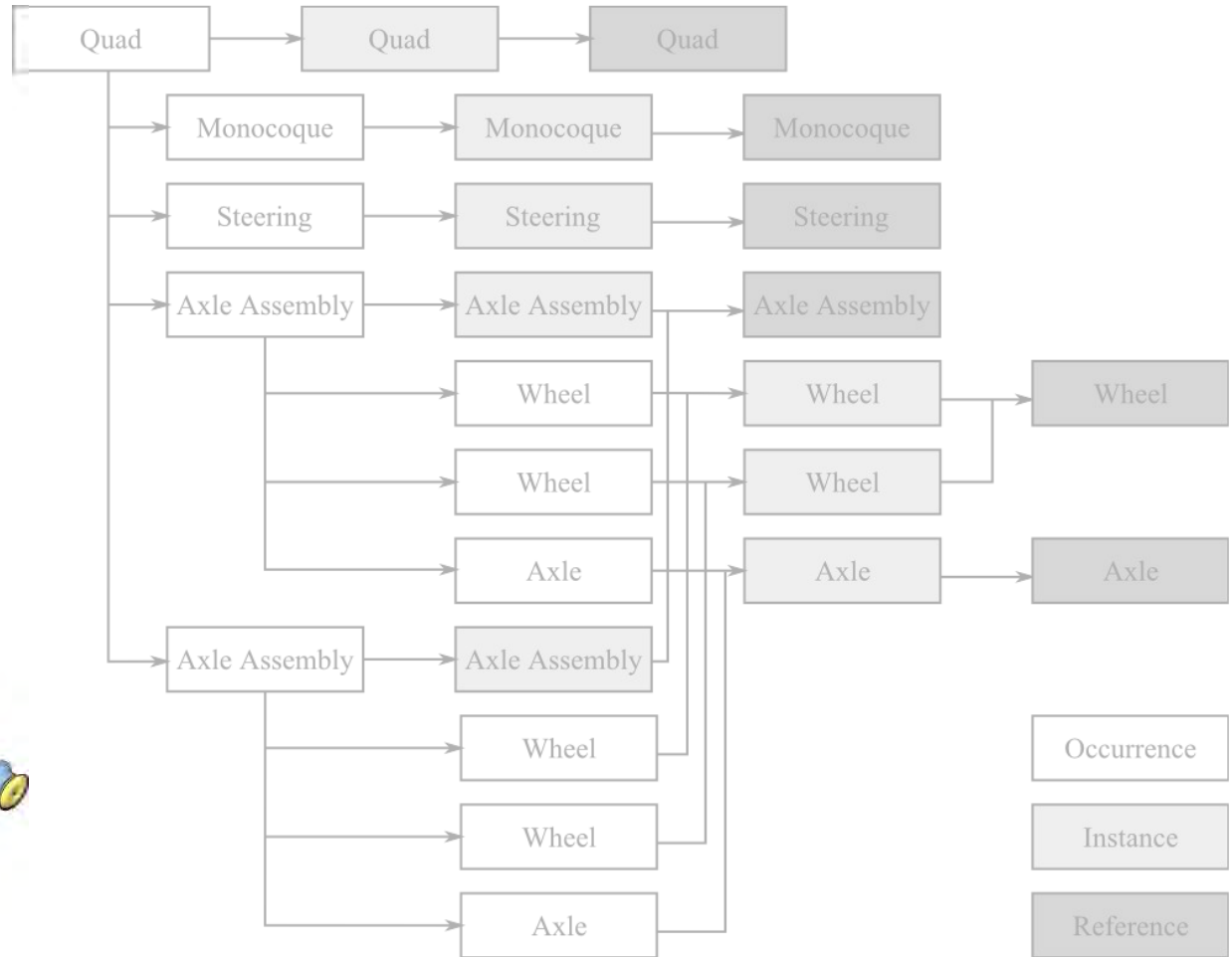
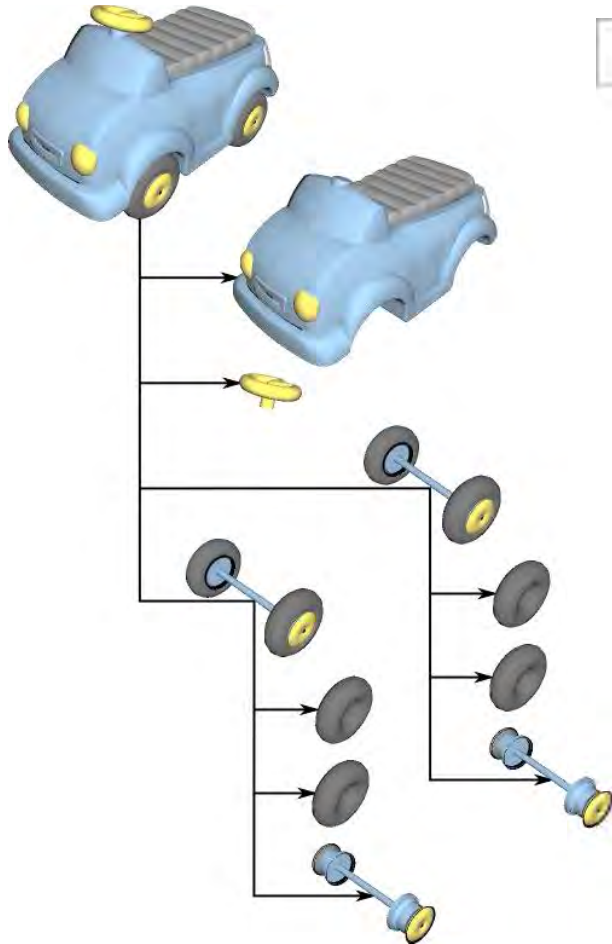


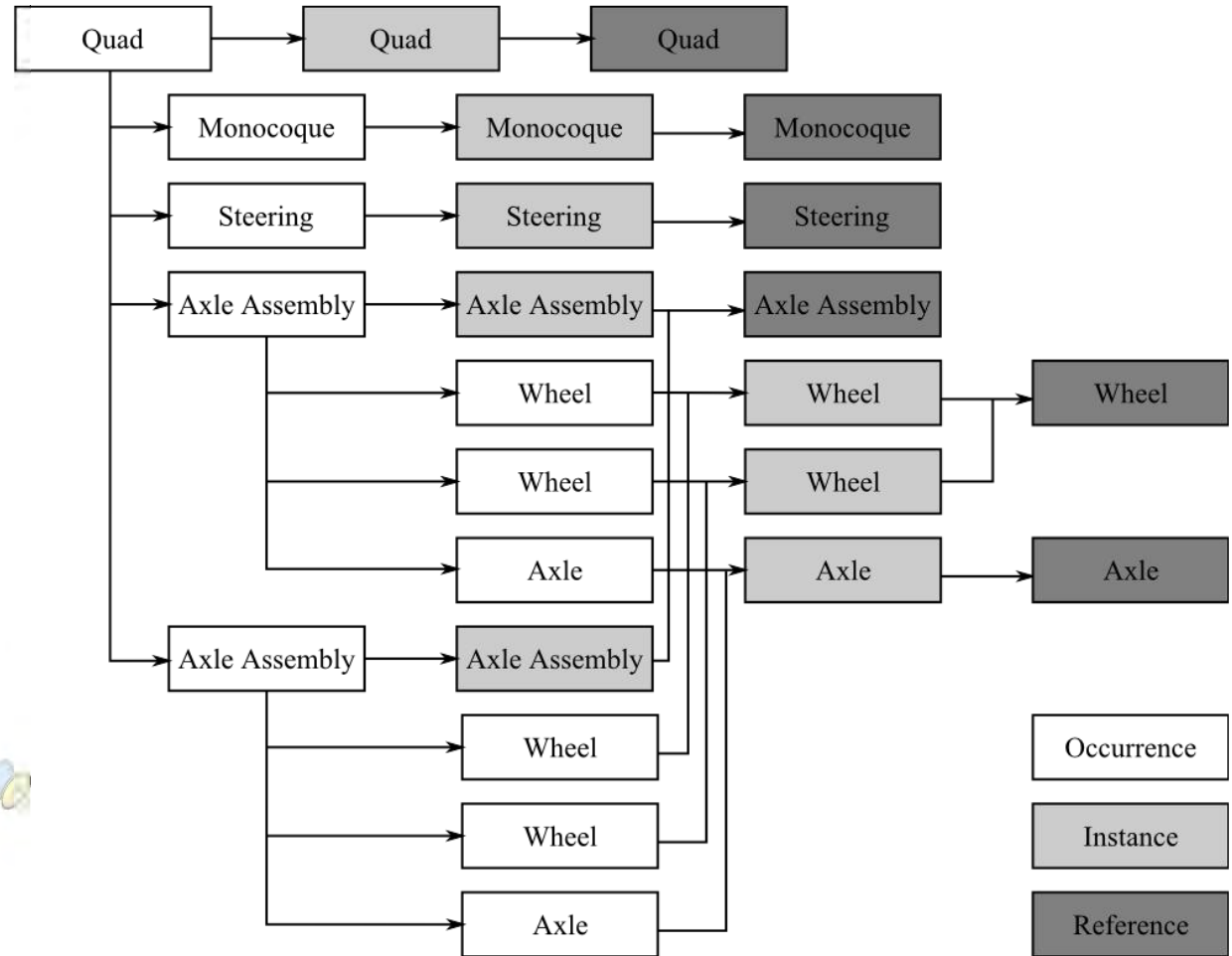
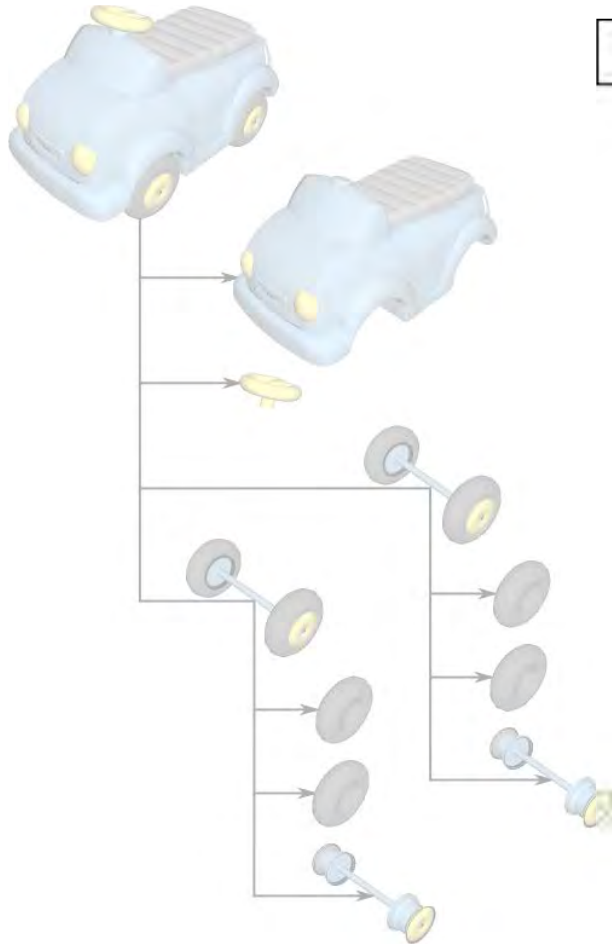
App level version control



Plain vanilla  mongoDB

- 1) Scene graph of components
- 2) Non-linear revision history
- 3) Streamable 3D geometry





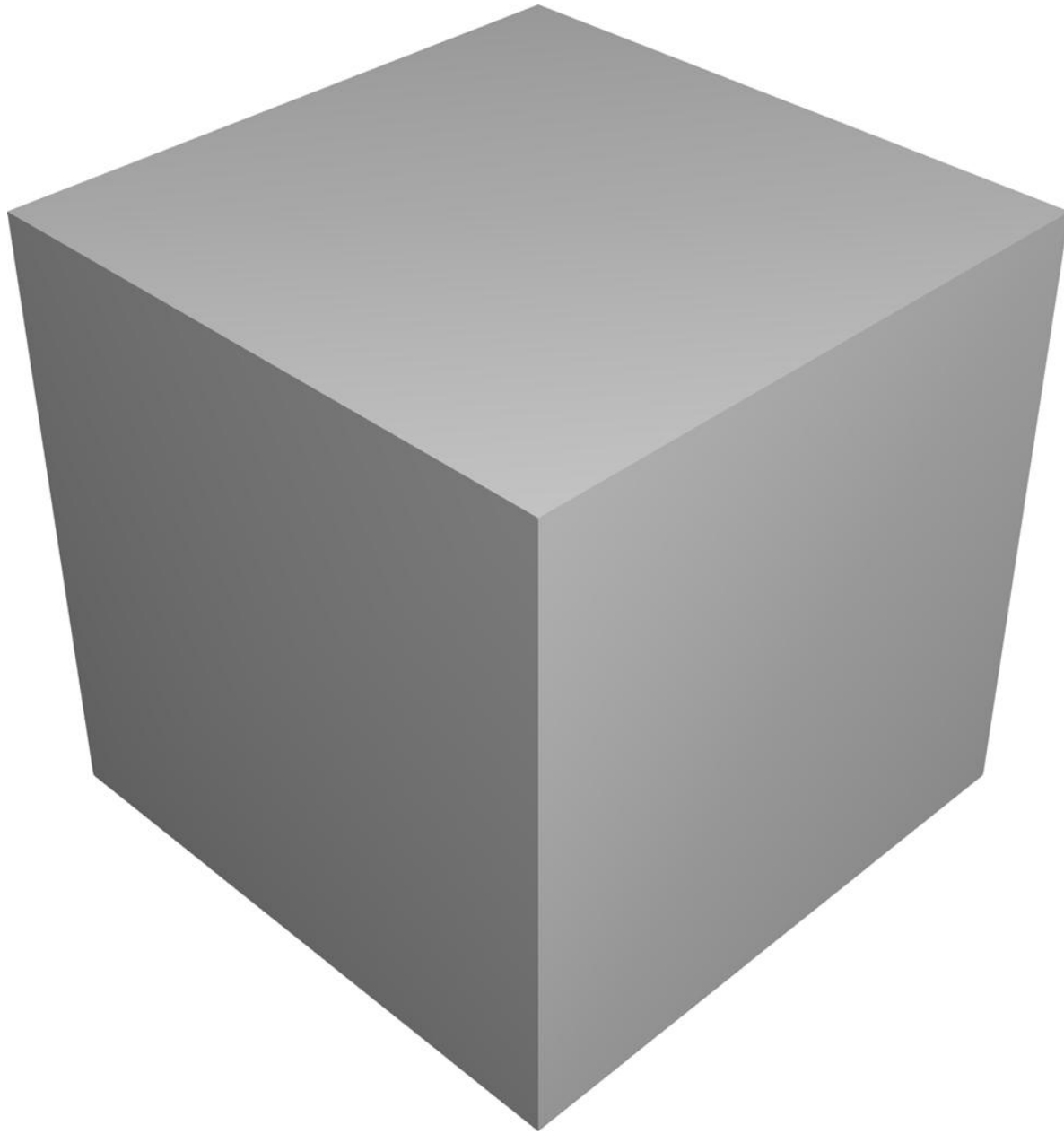
Schemaless schema?

Each component is a logical unit

Properties are key-value pairs

BSON is limited to 16MB

Mesh



Mesh

```
1 {
2   _id : BinData(3,"10XvtFihRm6aH+nh+cioGw=="),           // Unique UUID
3   api : 1,                                                  // API level
4   bounding_box : [[-1.0, -1.0, -1.0],                      // Min xyz
5                  [ 1.0,  1.0,  1.0]],                      // Max xyz
6   faces : BinData(0,"AwAAAAAAAAABAAAAAgAAAAAAAA... "),   // Faces array
7   faces_byte_cout : 192,
8   faces_count : 12,
9   normals : BinData(0,"AAAAAAAAAgL8AAAAAAAAAAAAA... "),  // Normals
10  outline : [[-1, -1], [1, -1], [1, 1], [-1, 1]],
11  paths : [[BinData(3,"MAU5l5mEVI1CQAAAAAAACA==")]], // Paths from root
12  shared_id : BinData(3,"MAU5l5mEVI1CQAAAAAAACA=="), // Shared UUID
13  type : "mesh",
14  name : "cube",
15  vertices : BinData(0,"AACAPwAAgLL8AAIC/AACAPw... "), // Vertices array
16  vertices_byte_count : 288,
17  vertices_count : 36,
18 }
```

Mesh

```
1 {
2   _id : BinData(3,"1OXvtFihRm6aH+nh+cioGw=="),           // Unique UUID
3   api : 1,                                                 // API level
4   bounding_box : [[-1.0, -1.0, -1.0],                     // Min xyz
5                  [ 1.0,  1.0,  1.0]],                     // Max xyz
6   faces : BinData(0,"AwAAAAAAAAABAAAAAgAAAAAAAA... "),  // Faces array
7   faces_byte_cout : 192,
8   faces_count : 12,
9   normals : BinData(0,"AAAAAAAAAgL8AAAAAAAAAAAAA... "), // Normals
10  outline : [[-1, -1], [1, -1], [1, 1], [-1, 1]],
11  paths : [[BinData(3,"MAU5l5mEVIlCQAAAAAAACA==")]], // Paths from root
12  shared_id : BinData(3,"MAU5l5mEVIlCQAAAAAAACA=="), // Shared UUID
13  type : "mesh",
14  name : "cube",
15  vertices : BinData(0,"AACAPwAAgLL8AAIC/AACAPw... "), // Vertices array
16  vertices_byte_count : 288,
17  vertices_count : 36,
18 }
```

Vertices

```
1  [  
2      [ 1.0,1.0,1.0], [ 1.0,1.0,-1.0], [ 1.0,-1.0,1.0], [ 1.0,-1.0,-1.0],  
3      [-1.0,1.0,1.0], [-1.0,1.0,-1.0], [-1.0,-1.0,1.0], [-1.0,-1.0,-1.0]  
4  ]
```

```
1  {  
2      0 :  
3          {  
4              0 : 1.0,  
5              1 : 1.0,  
6              2 : 1.0,  
7          },  
8      1 :  
9          {  
10             0 : 1.0,  
11             1 : 1.0,  
    ...
```

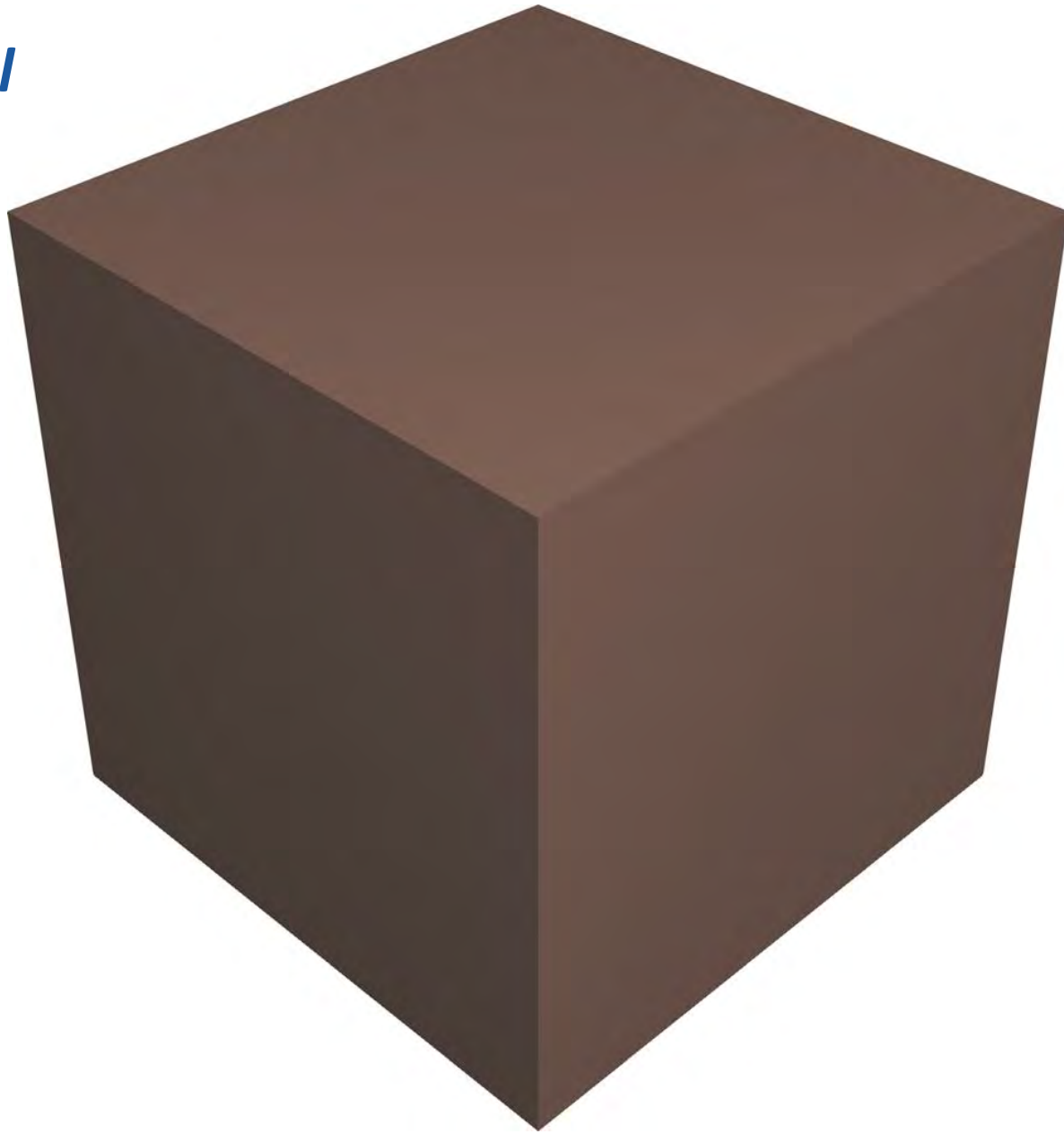
Vertices

```
1  [  
2      [ 1.0, 1.0, 1.0], [ 1.0, 1.0, -1.0], [ 1.0, -1.0, 1.0], [ 1.0, -1.0, -1.0],  
3      [-1.0, 1.0, 1.0], [-1.0, 1.0, -1.0], [-1.0, -1.0, 1.0], [-1.0, -1.0, -1.0]  
4  ]
```

```
1  {  
2      0 :  
3          {  
4              0 : 1.0,  
5              1 : 1.0,  
6              2 : 1.0,  
7          },  
8      1 :  
9          {  
10             0 : 1.0,  
11             1 : 1.0,  
... }
```

Massive overhead

Material



Material

```
1 {
2     _id : BinData(3,"YUHQ09687daqQ+nh+cioGw=="),           // Unique UUID
3     ambient : [0, 0, 0],
4     api : 1,
5                                     // API level
6     diffuse : [0.28, 0.12, 0.06],
7     name : "Material",
8     opacity : 1,
9     paths : [[BinData(3,"MAU5l5mEVI1CQAAAAAAACA==")]], // Paths from
root
10     shared_id : BinData(3,"MAU5l5mEVI1CQAAAAAAACA=="), // Shared UUID
11     shininess : 384.313,
12     specular : [ 0.98, 0.98, 0.98],
13     two_sided : true,
14     type : "material",
15     wireframe : true,
16 }
```

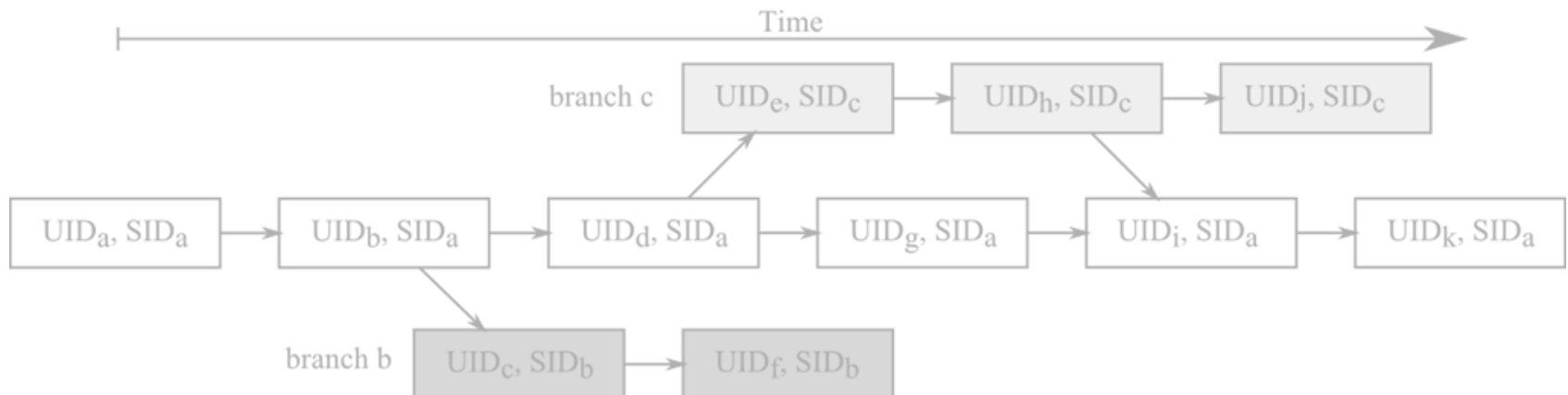
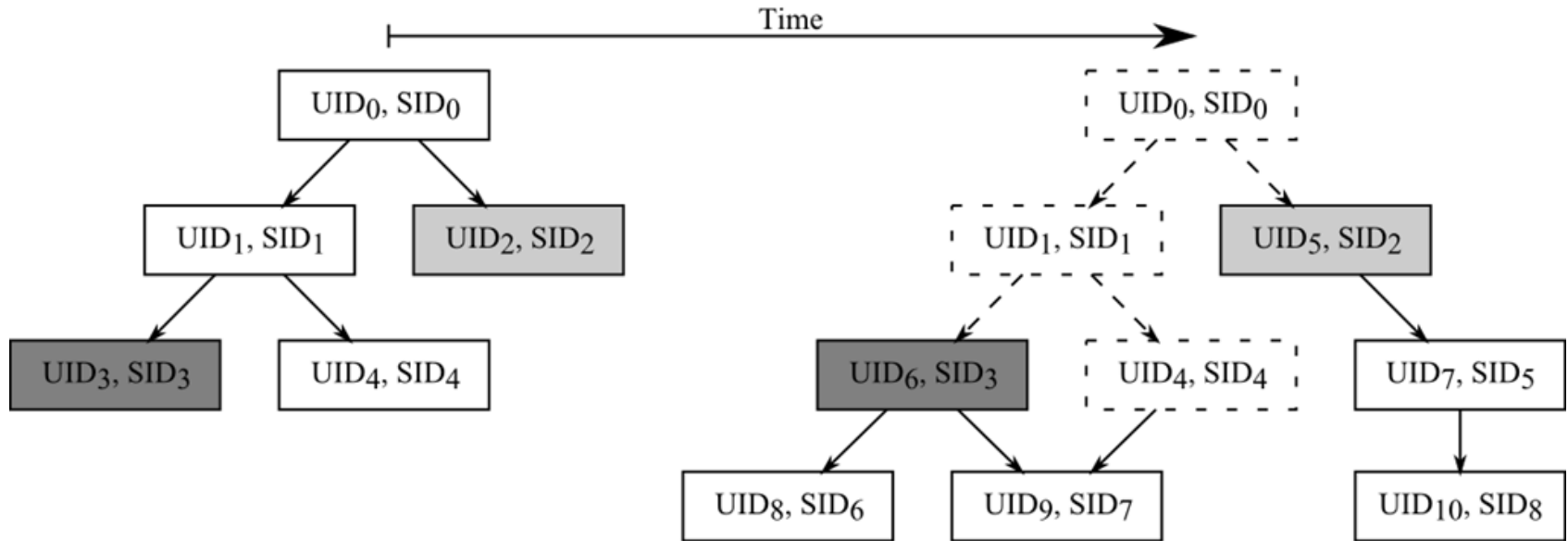
Texture



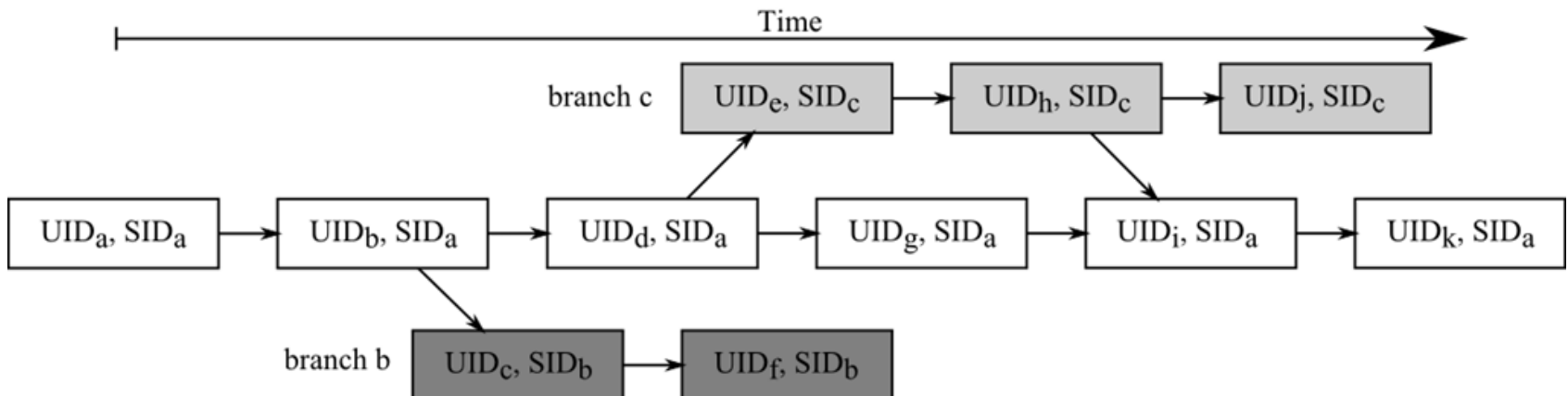
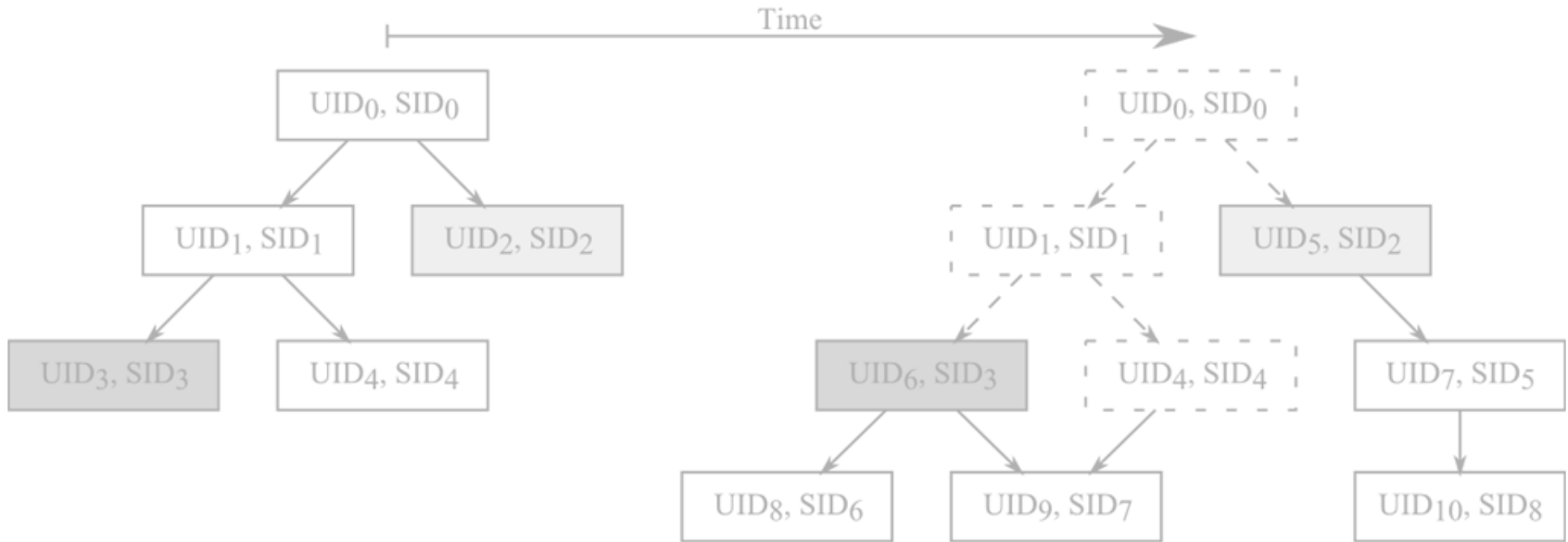
Texture

```
1 {
2   _id : BinData(3,"HWQOIJDDEF775GQnh+cioGw=="),           // Unique UUID
3   api : 1,                                                  // API level
4   data : [[BinData(3,"MAU5l5mEVI1CQAAAAAAACA==")]],       // Texture
5   data_byte_cout : 190622,
6   height : 894,
7   mime : "image/jpeg",
8   name : "crate diffuse",
9   paths : [[BinData(3,"MAU5l5mEVI1CQAAAAAAACA==")]], // Paths from root
10  shared_id : BinData(3,"MAU5l5mEVI1CQAAAAAAACA=="), // Shared UUID
11  type : "texture",
12  width : 894,
13 }
```

Unique_id (UID) vs shared_id (SID)

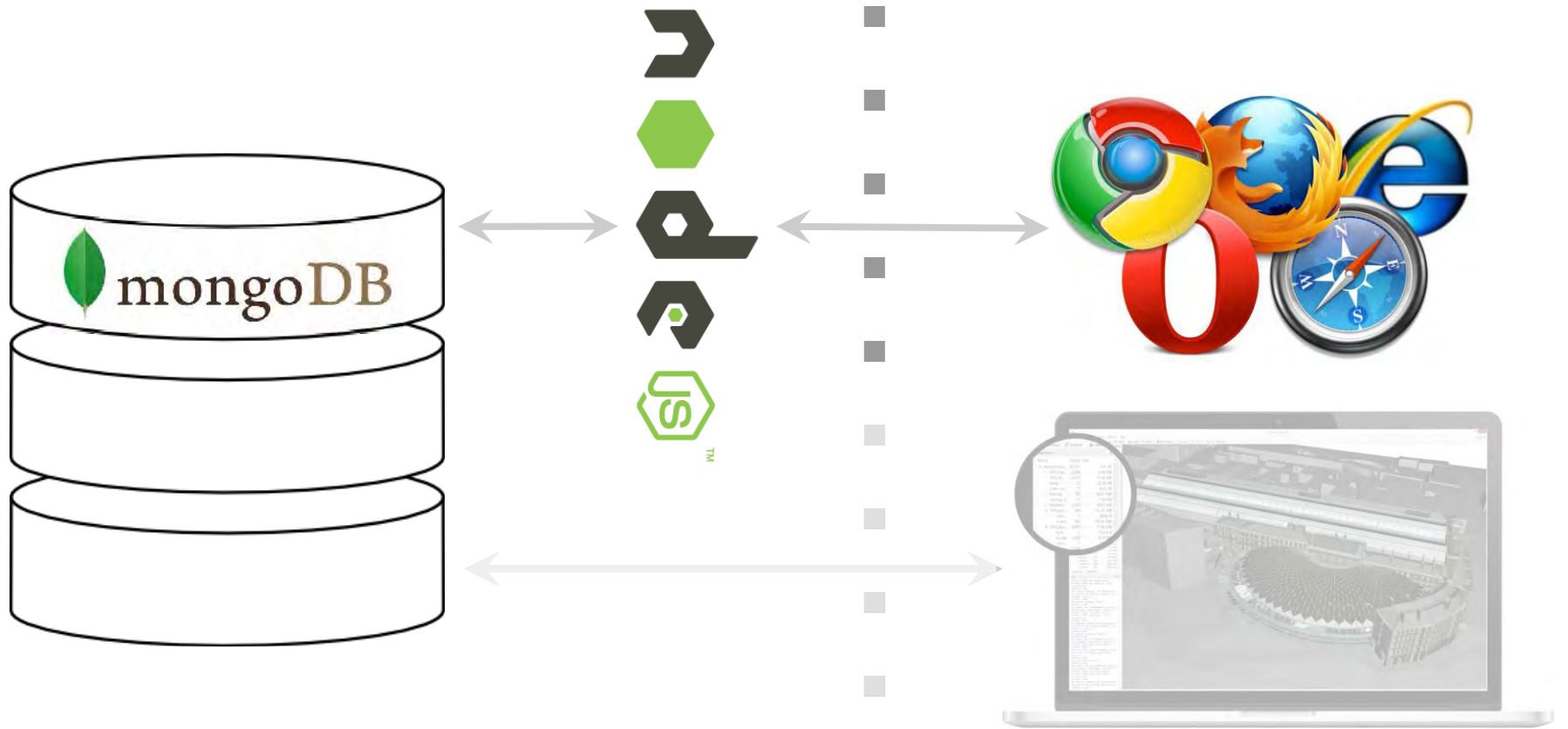


Unique_id (UID) vs shared_id (SID)

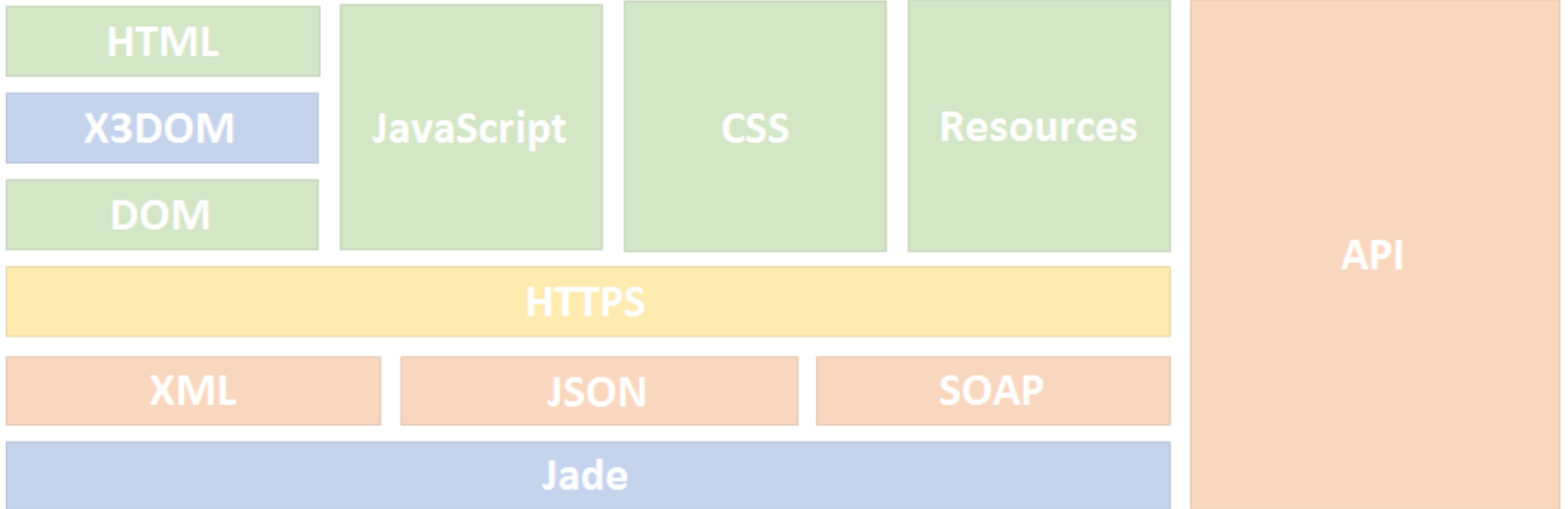


Revision

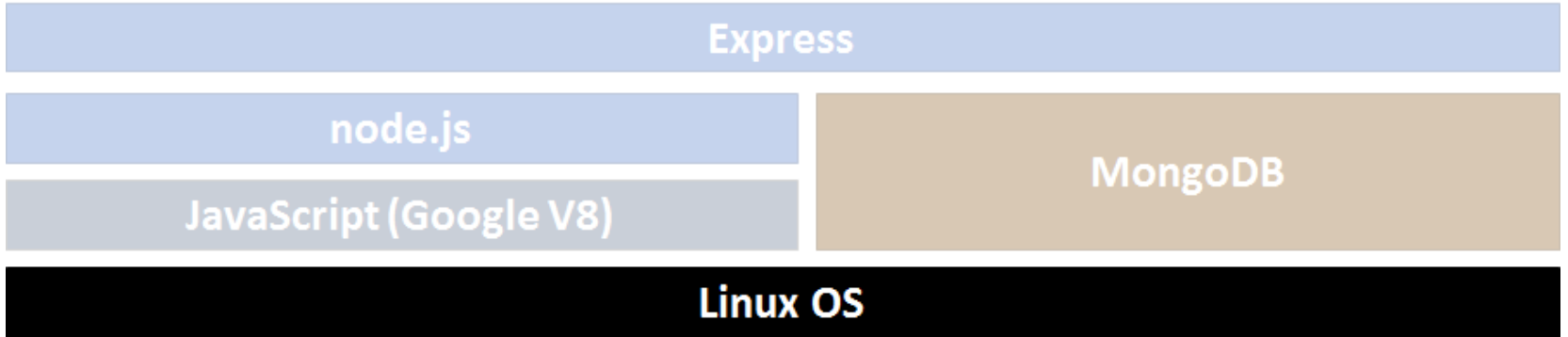
```
1 {
2   _id : BinData(3,"YUHQ09687daqQ+nh+cioGw=="),           // Unique UUID
3   added : [[BinData(3,"1OXvtFihRm6aH+nh+cioGw==")], ...],
4   api : 1,                                                // API level
5   author : "jozef",
6   current : [[BinData(3,"1OXvtFihRm6aH+nh+cioGw==")], ...],
7   name : "master",
8   message : "My very first commit.",
9   paths : [[BinData(3,"MAU5l5mEVI1CQAAAAAACA==")]], // Paths from root
10   shared_id : BinData(3,"AAAAAAAAAAAAAAAAAAAAAAAA"), // Shared UUID
11   timestamp : ISODate("2014-11-06T10:02:09Z"),
12   type : "revision",
13 }
```

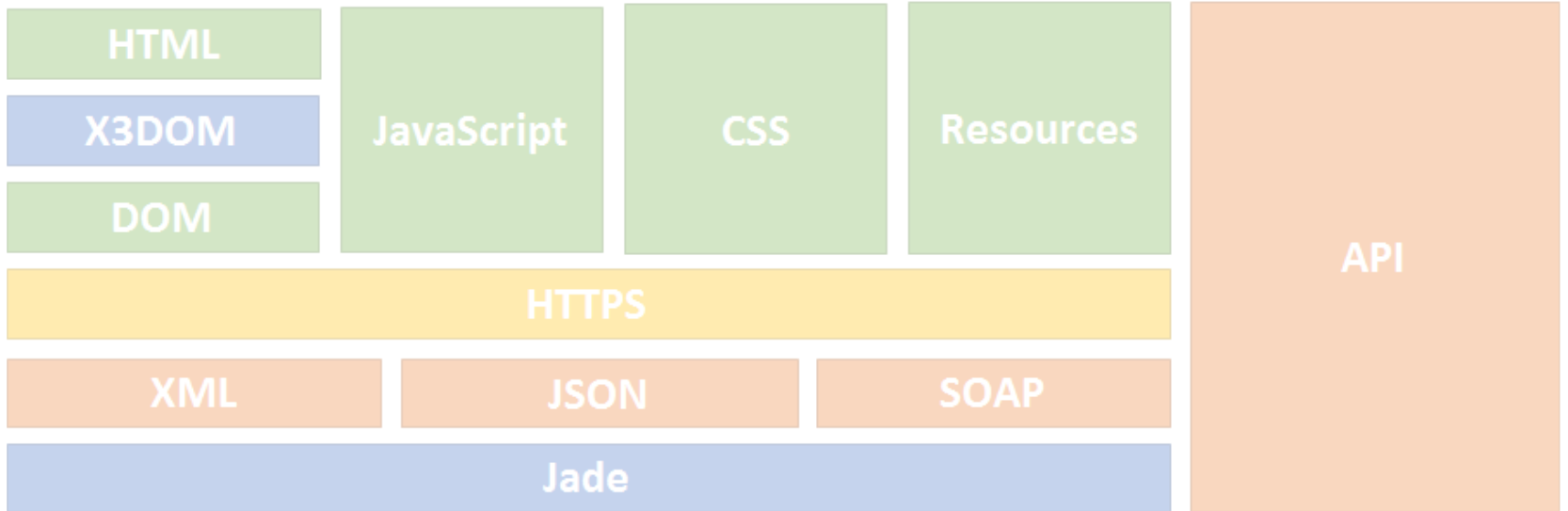
Client



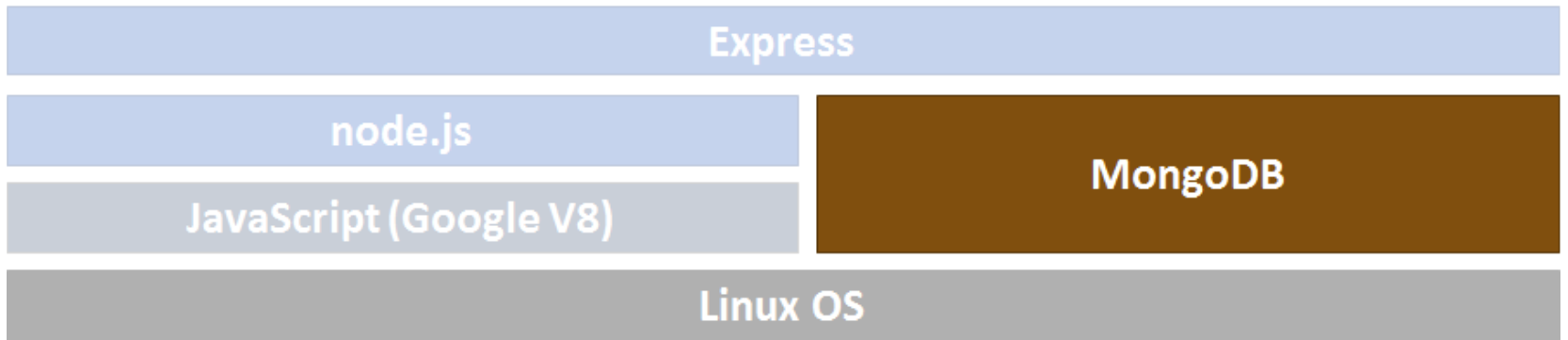
Server



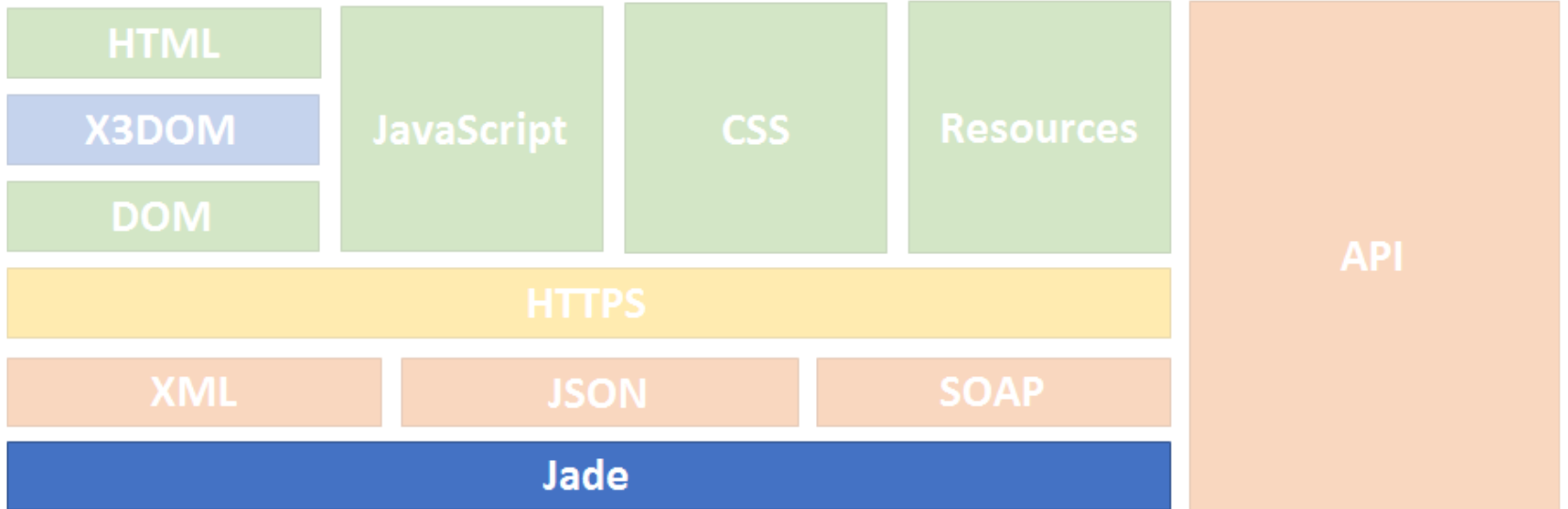
Client



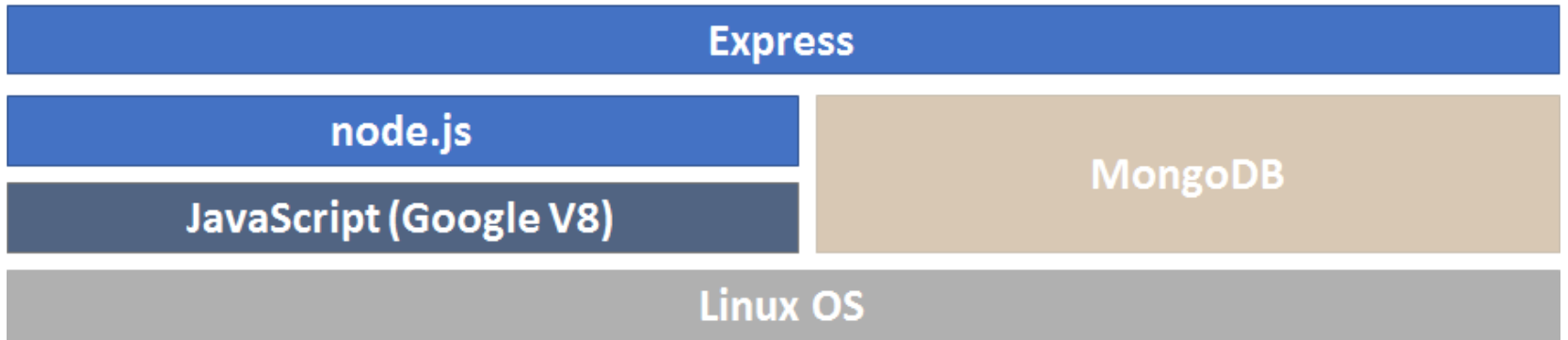
Server



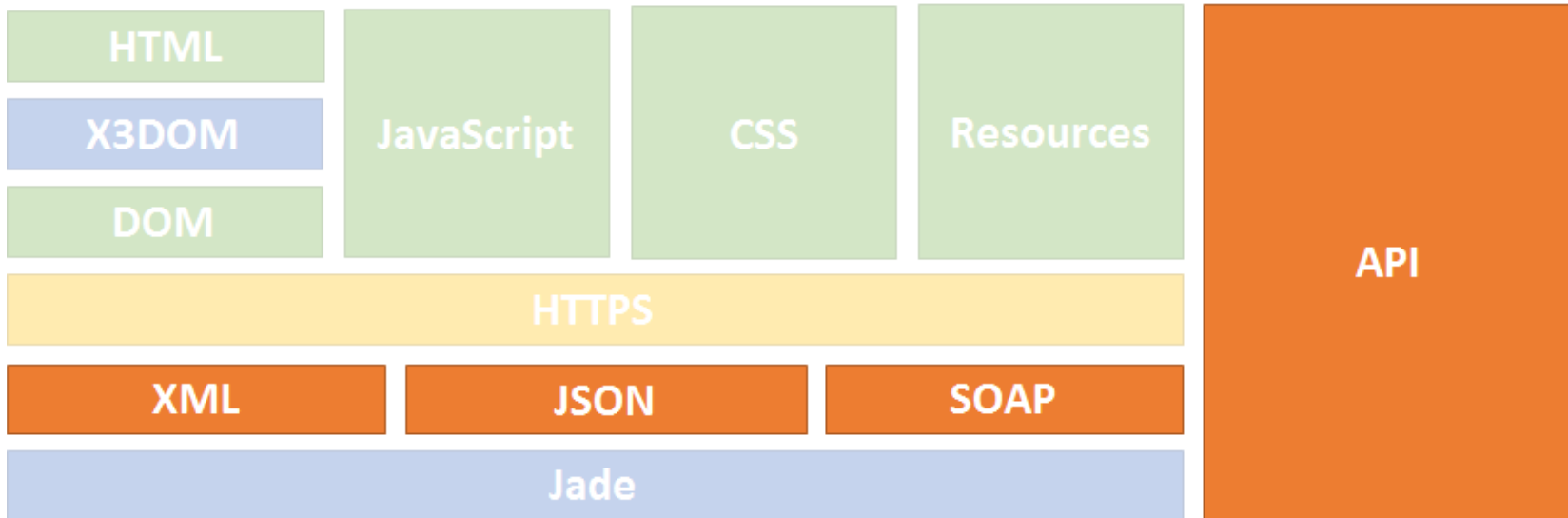
Client



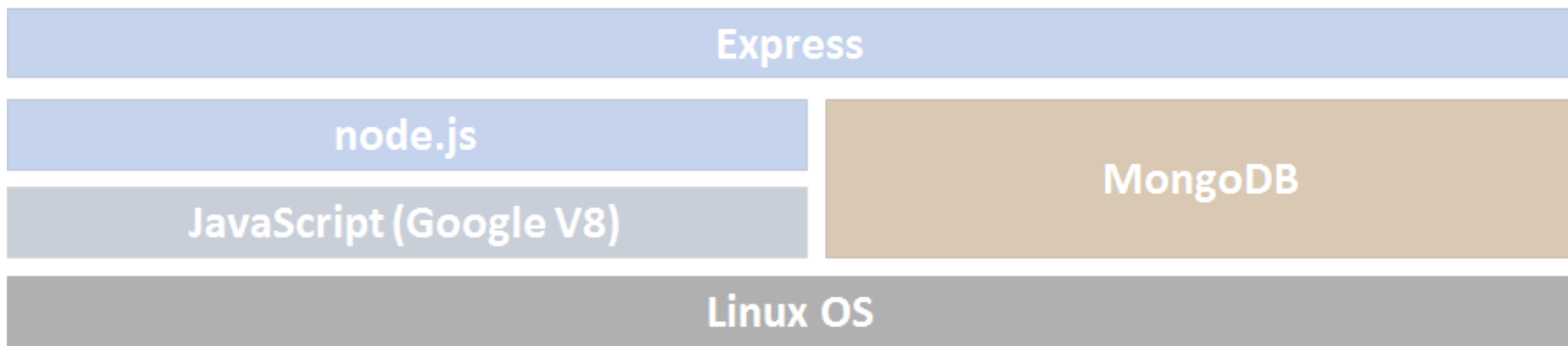
Server



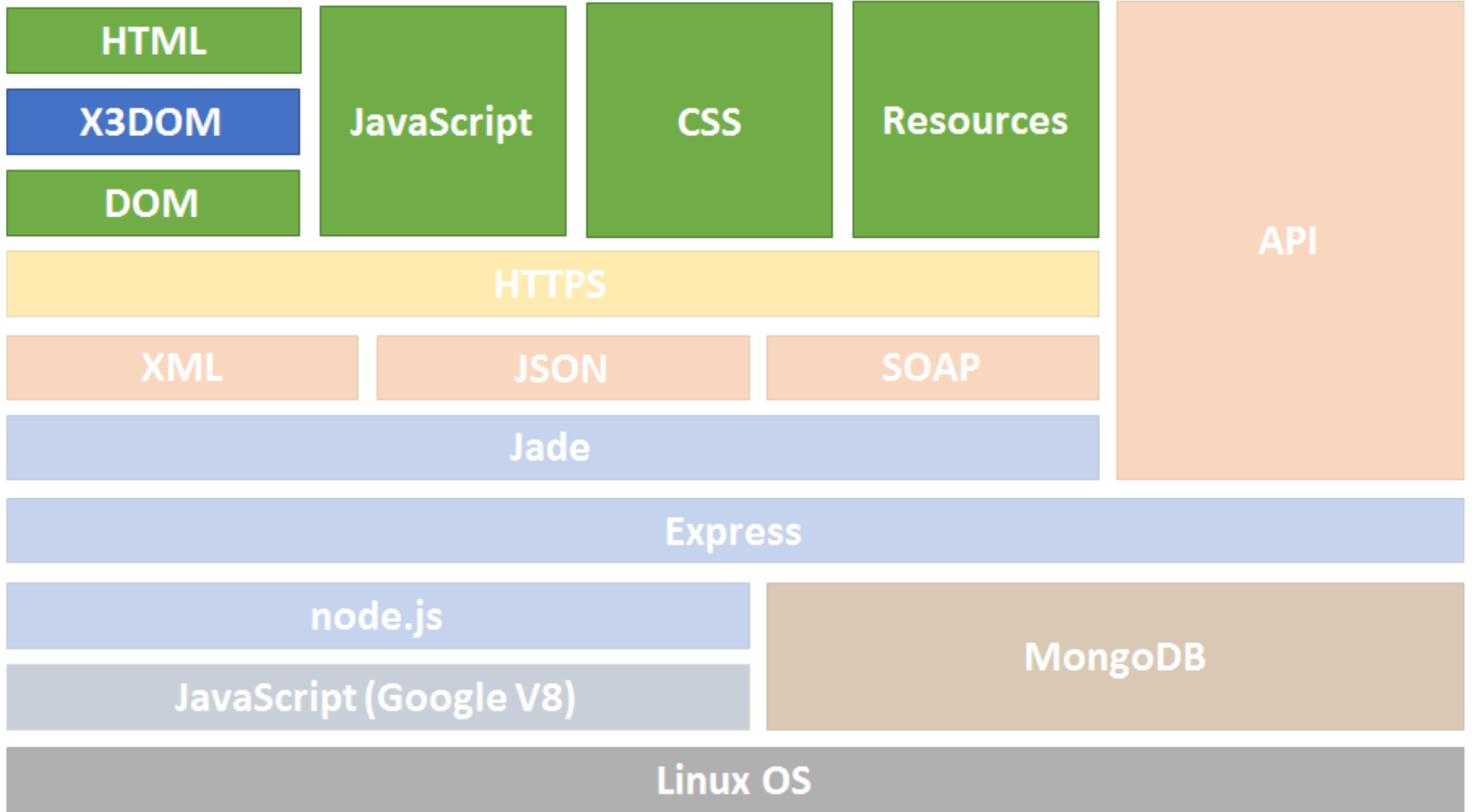
Client



Server

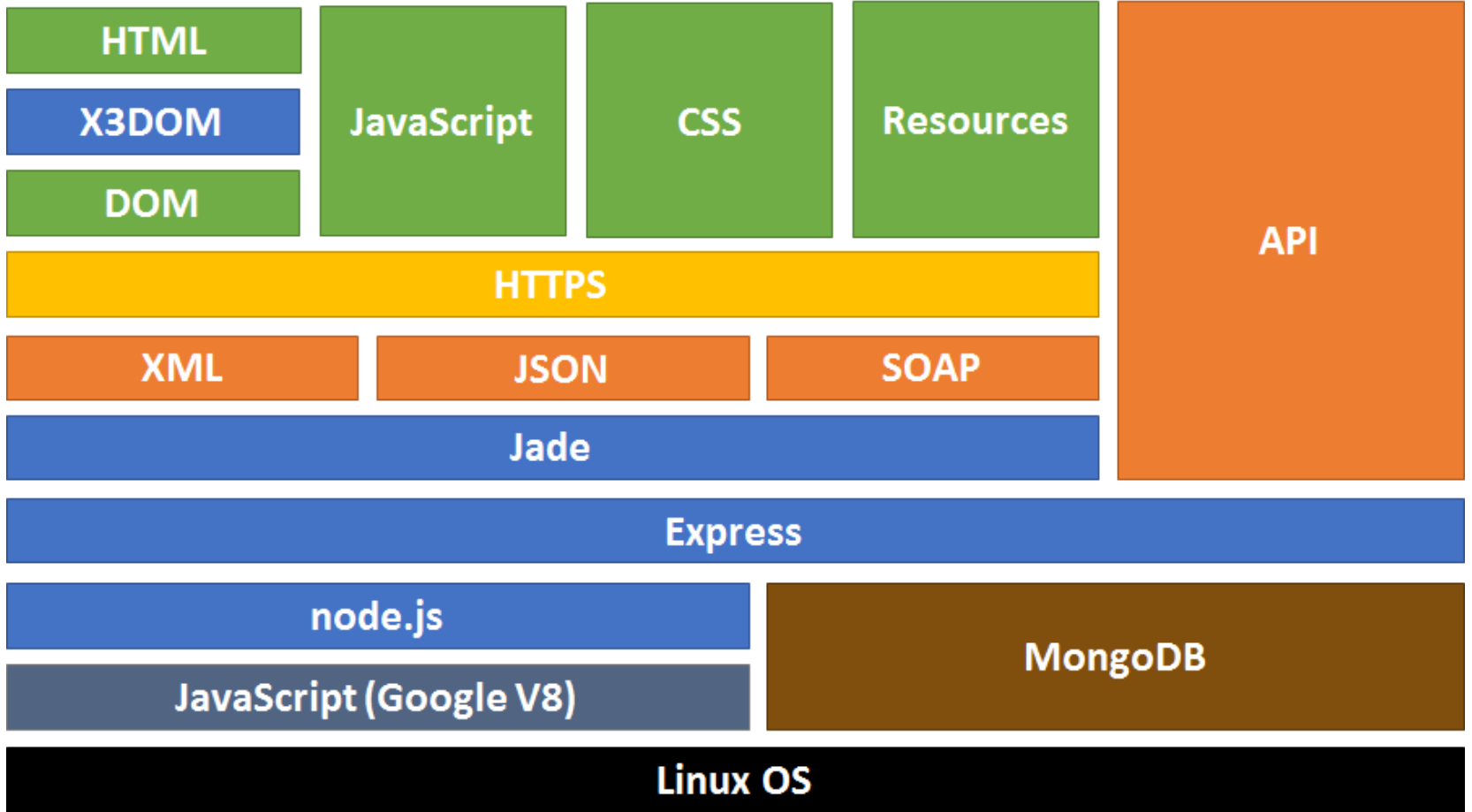


Client

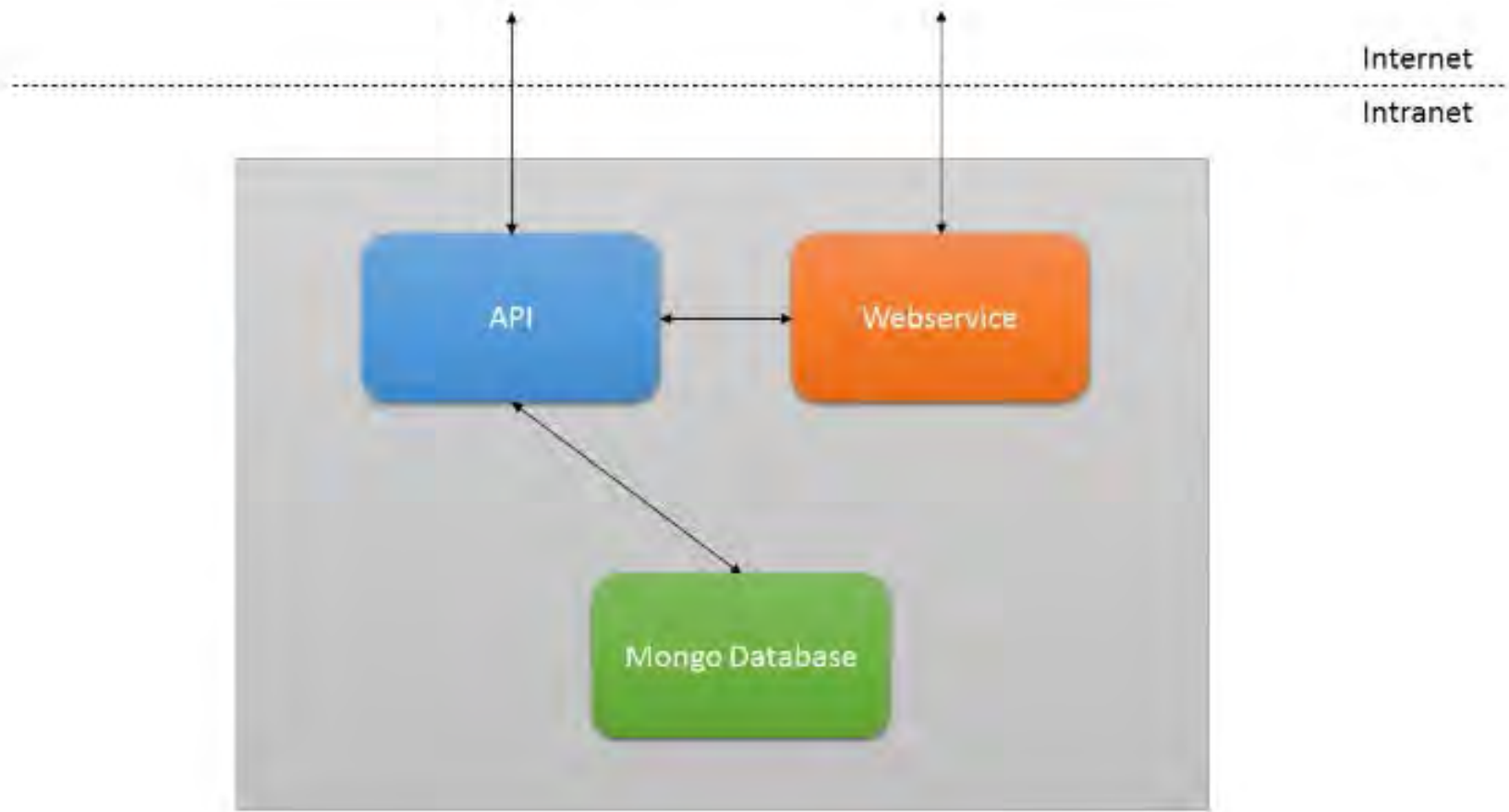


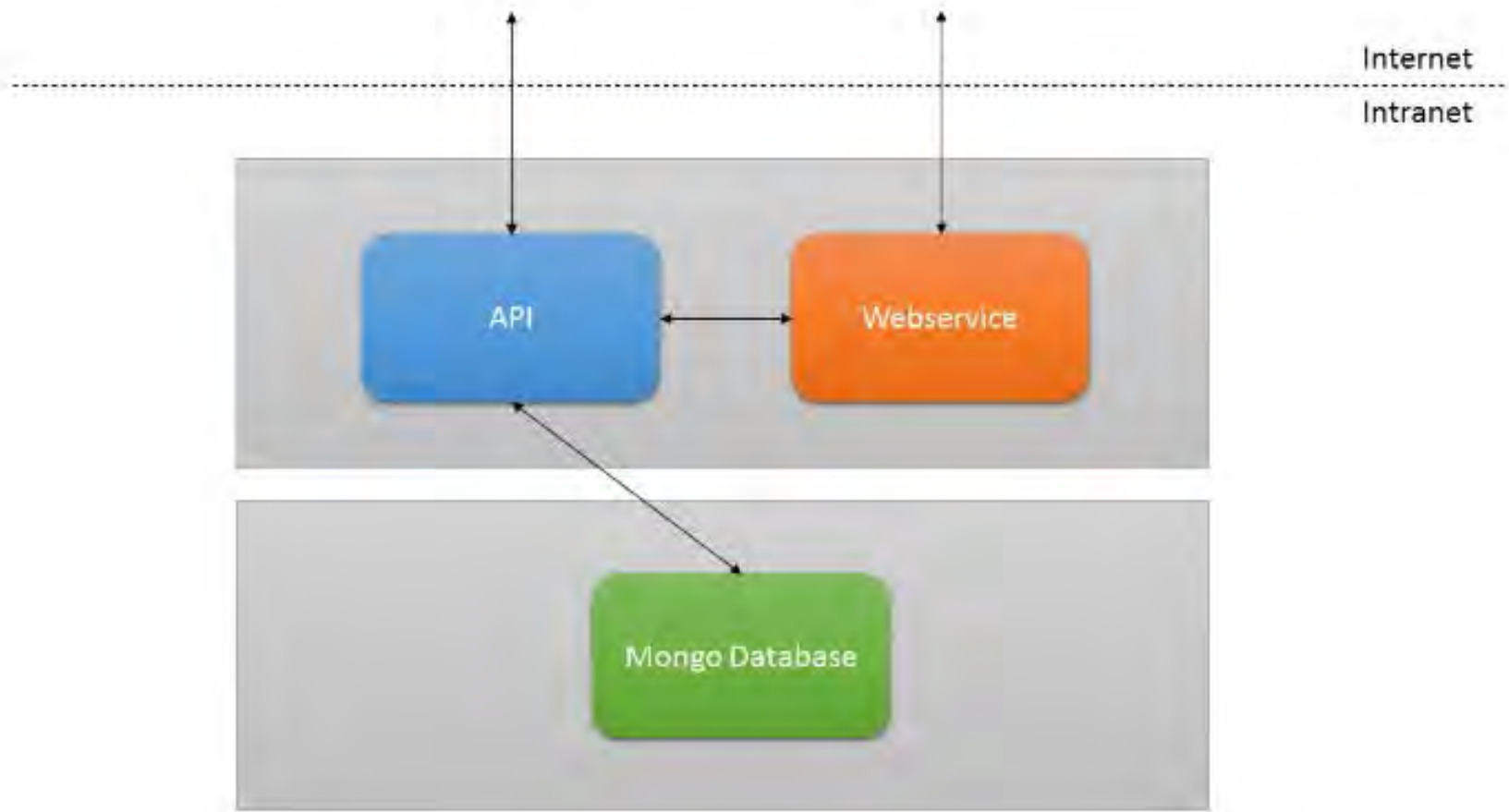
Server

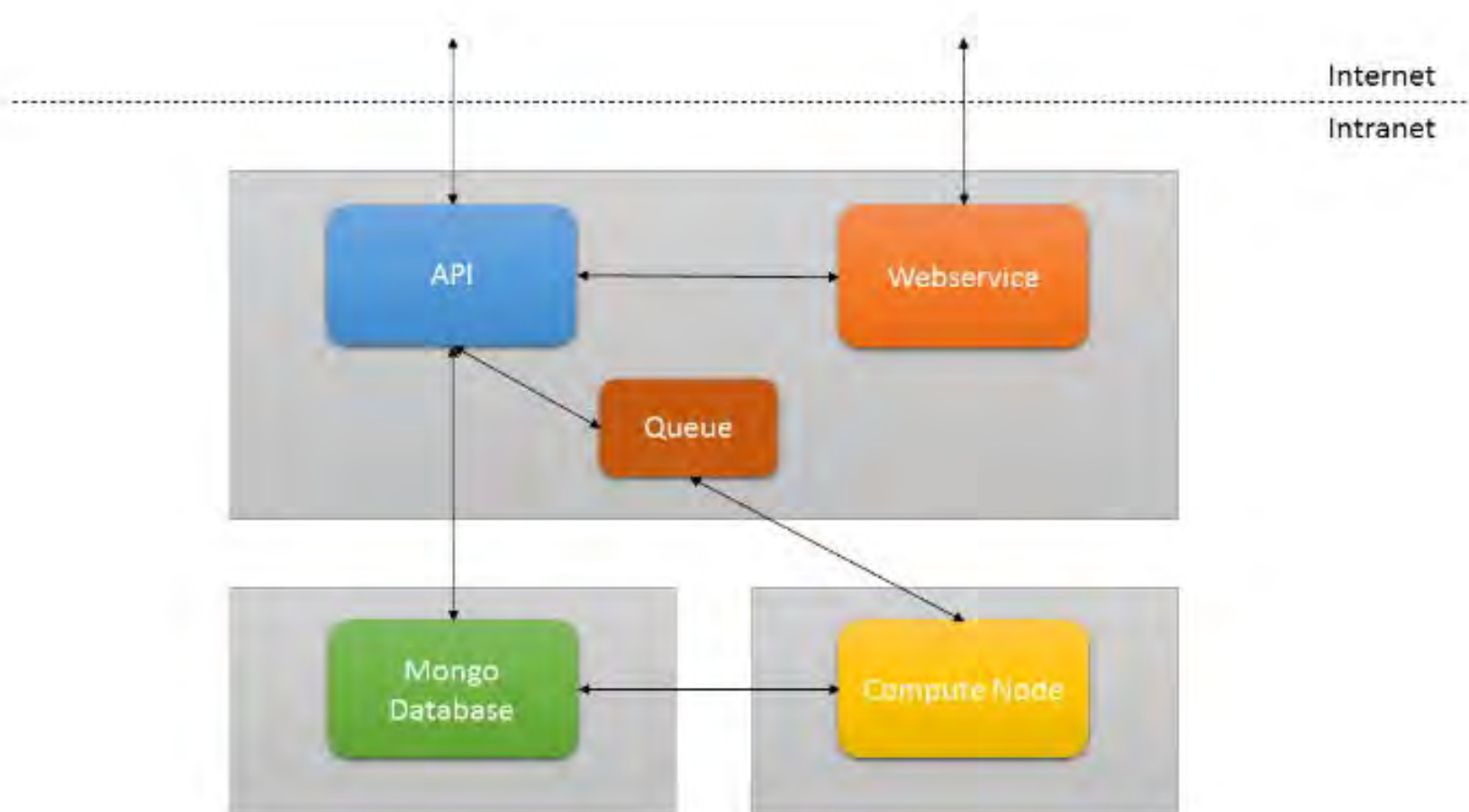
Client

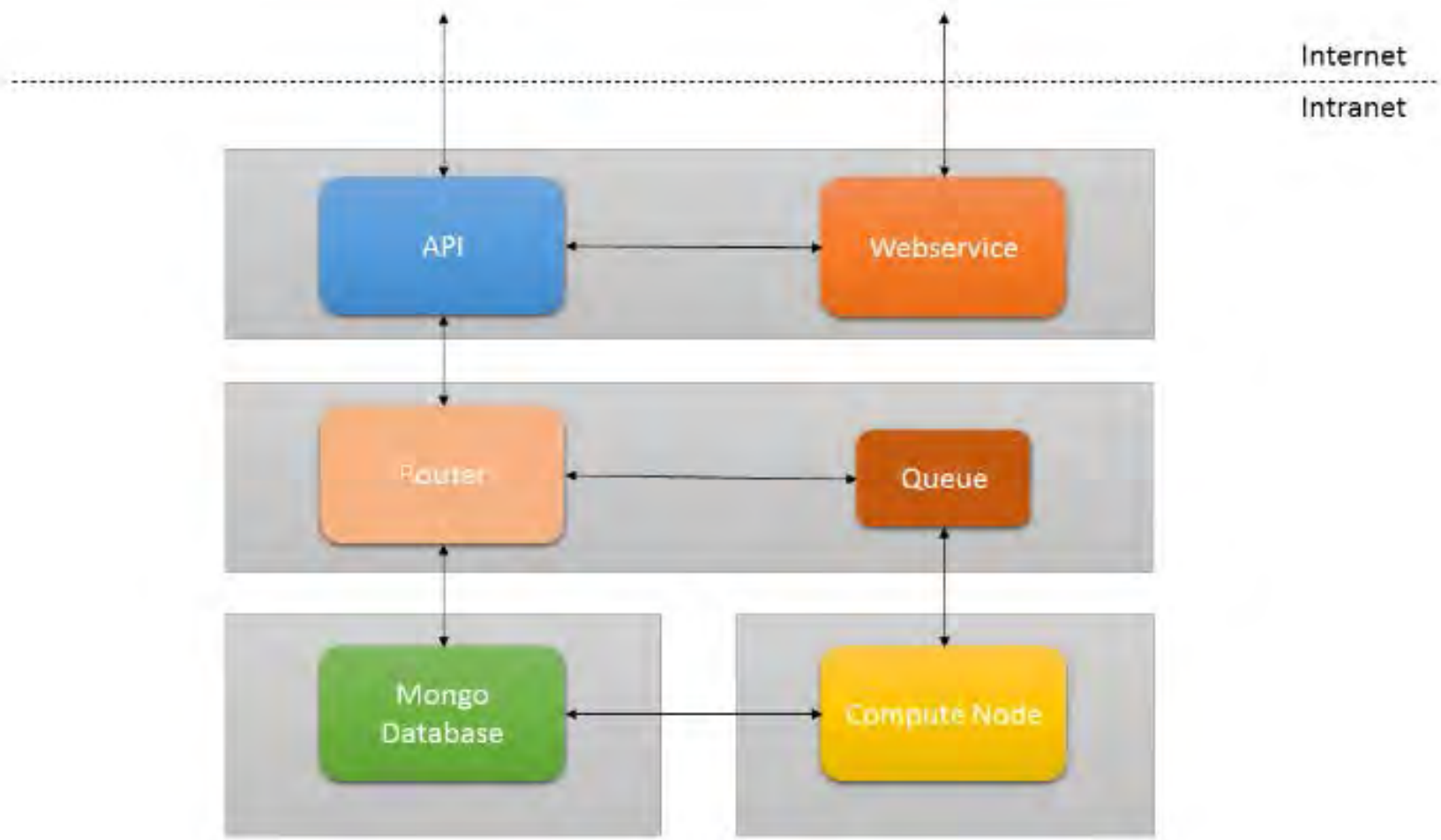


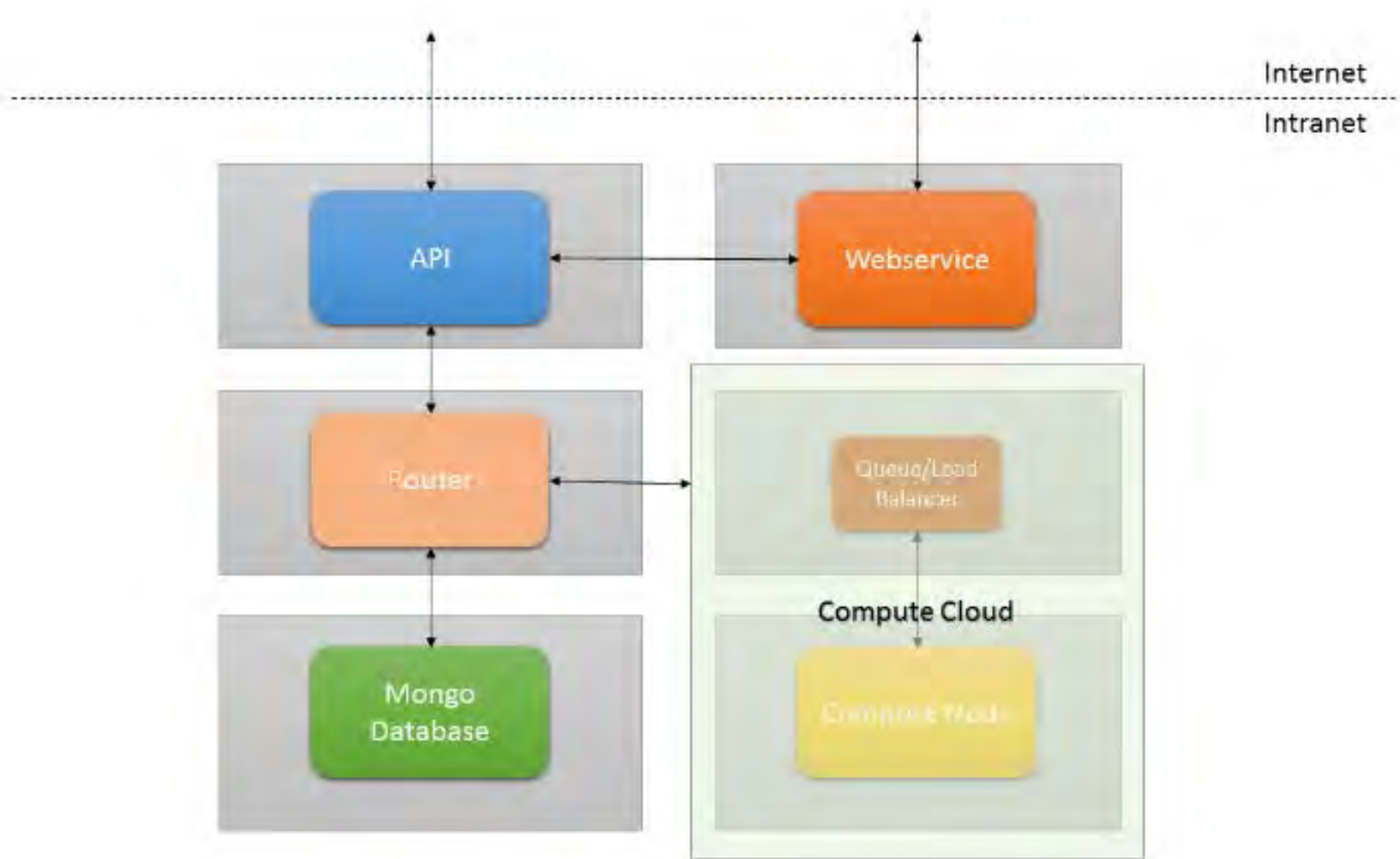
Server











GridFS

`repo.cache.chunks`

`repo.cache.files`

What about the security?

Public/private keys

User roles at the application level

What about the future?

Streaming of geometry from cache



http://x3dom.org/src/files/Web3d2014_SRC.pdf

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THALES

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AUTODESK



HIGHWAYS
AGENCY

