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# REST API for Digital Thread Implementation

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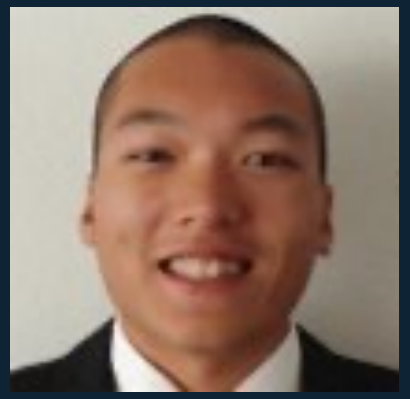

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# The Need for Digital Threads

## Authoritative Source of Truth (ASoT)

Modern systems are large and complex, and becoming more complex all the time. This can result in miscommunication and confusion around Key Performance Parameters (KPPs) crucial to the development of the system. A Digital Thread **facilitates an authoritative source** of these KPPs to align all areas of development, from mission identification to detailed design.

## Design Efficiency and Risk Reduction

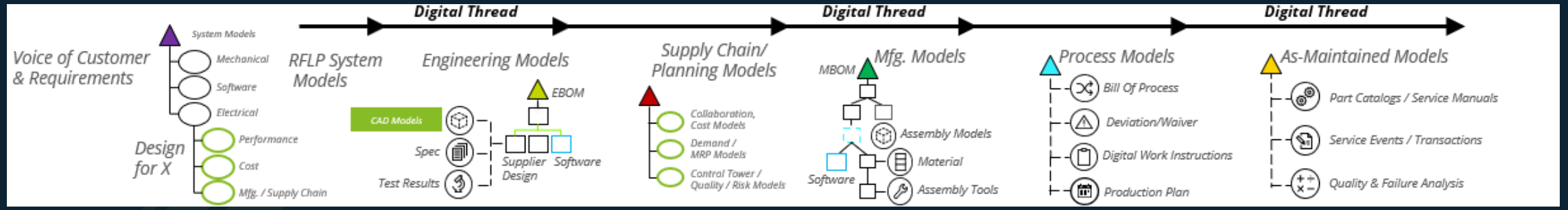
An ASoT facilitated by a Digital Thread inherently **improves design efficiency**, ensuring that all work is done to the most recent specifications and requirements available. In ensuring that system developers are on the same page, Digital Threads can **reduce the risk** of rework and schedule slip.

## Informed Decision Making

Armed with a Digital Thread, decision makers can alter a program in development to **meet changing system needs** imposed by external forces. Adding functionality to tackle new challenges, updating current requirements, and adapting to new regulations and world-states is streamlined across all areas of management and development.

# Digital Threads Today

Per the INCOSE MBSE Workshop earlier this year, engineers are currently managing controlled documents and isolated models, but struggle to integrate at the enterprise level. Despite successful proofs of the Digital Thread concept, the communication barrier between tools is still the primary obstacle that a successful Digital Thread must overcome.



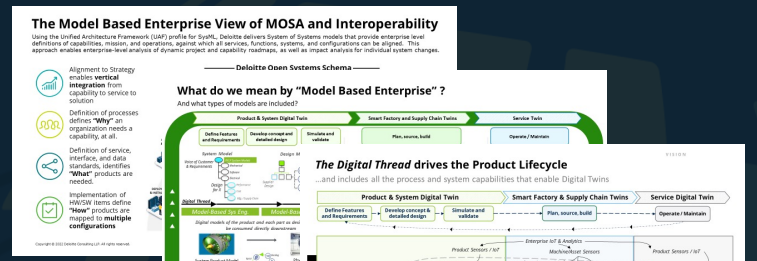

## Communication Challenges

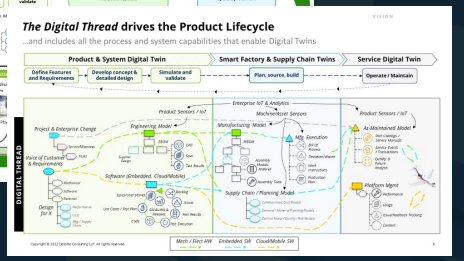
1. Models may be mature, but connecting them poses data mapping challenges from one domain to another

2. Existing tools may be suitable for some models and other data, but multi-domain connections are still limited by tool environment requirements or cost

We need a flexible, scalable, open-source solution

# Digital Threads **close the gap** between people and data during system development.




We define a Digital Thread as the **digitization** of connecting a point of knowledge to each location that it is **referenced, used, observed, or impacted**.

# Benefits of Representational State Transfer (REST)

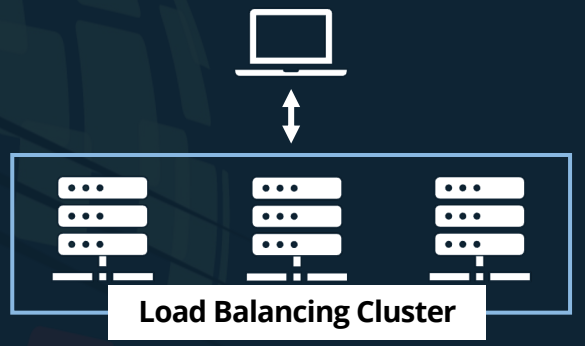
Leveraging a REST API allows us to securely connect several different clients together, without the need for complex integration mechanisms

## 1 Separated Client / Server Model

Separating the client and server allows our REST API to **easily integrate with other applications and plugins** using different technologies. This can often create a connection between clients operating in different technology stacks.

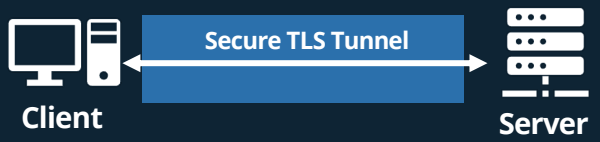

## 2 Scalable and Flexible

Due to the stateless nature of REST, additional servers can work in conjunction behind a load balancer to **easily scale to user influx**. No existing knowledge of the client is needed for the server to respond.



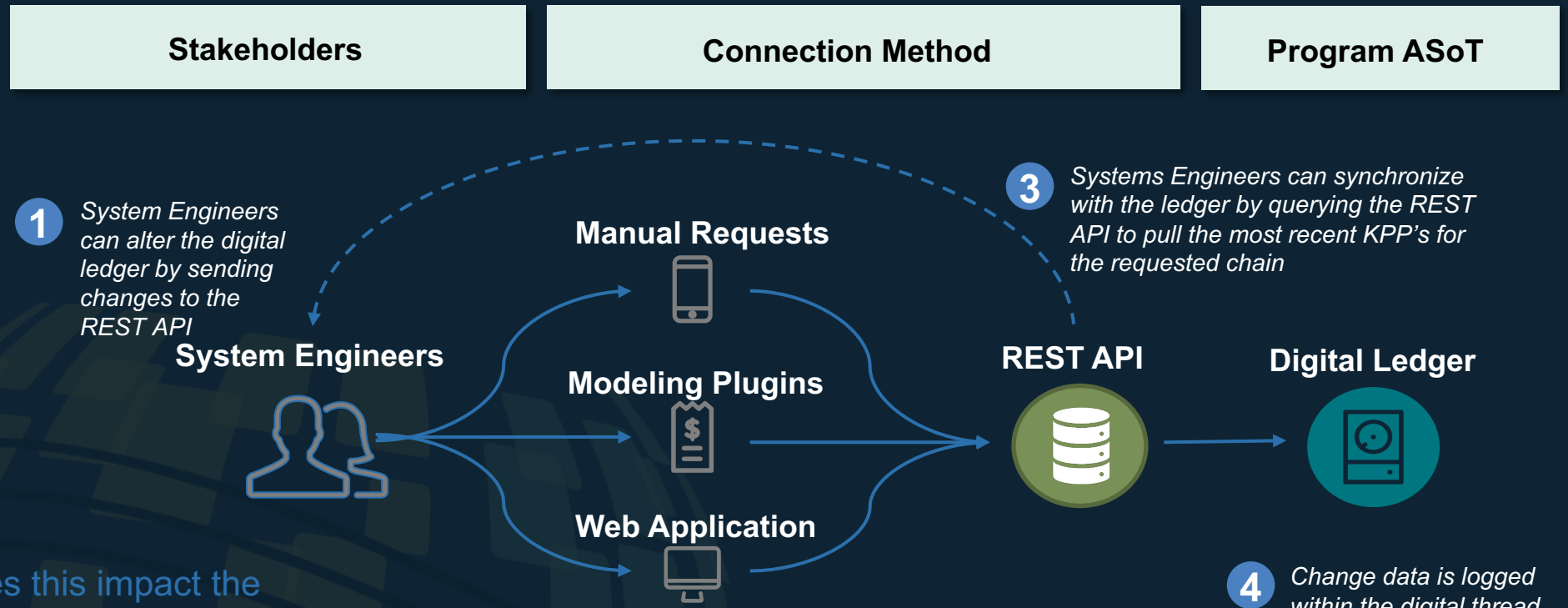

## 3 Secure

Relying on the HTTP standard, **REST can operate over a TLS connection (HTTPS) ensuring encrypted communication between the client and server**. Coupling REST with an authorization framework such as OAuth can add additional security measures



# Connecting Stakeholders to the Authoritative Source of Truth

How can we connect several stakeholders using different technologies to the same Authoritative Source of Truth? REST API's

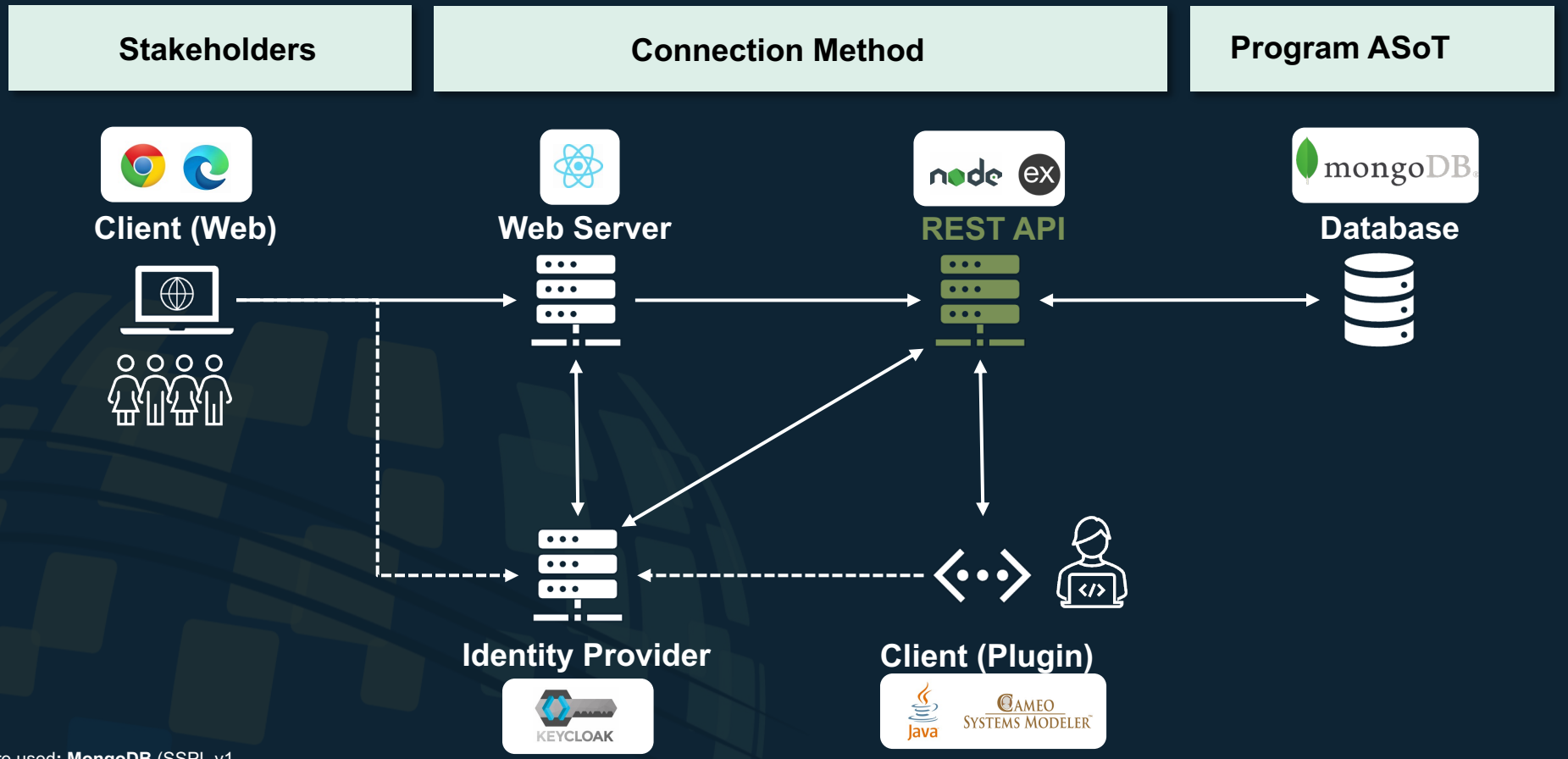



## How does this impact the stakeholder experience?

Systems engineers and program managers can view, read, and edit the same data across project teams, modeling software, and persona type. Additionally, stakeholders can view program status from a web application instead of having to open a model to view important data points

# How does this connection look in reality?

Leveraging a REST API allows us to securely connect several different clients together, without the need for complex integration mechanisms

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# Use Case– Electric Vehicle

New Electric Vehicle development program wants to implement Digital Thread for establishing an ASoT

Stakeholders
Program Managers
Chief Engineer

**Determine KPPs**

Stakeholders
Program Managers
Chief Engineer

**Capture KPPs in Digital Ledger**

Discipline Engineers

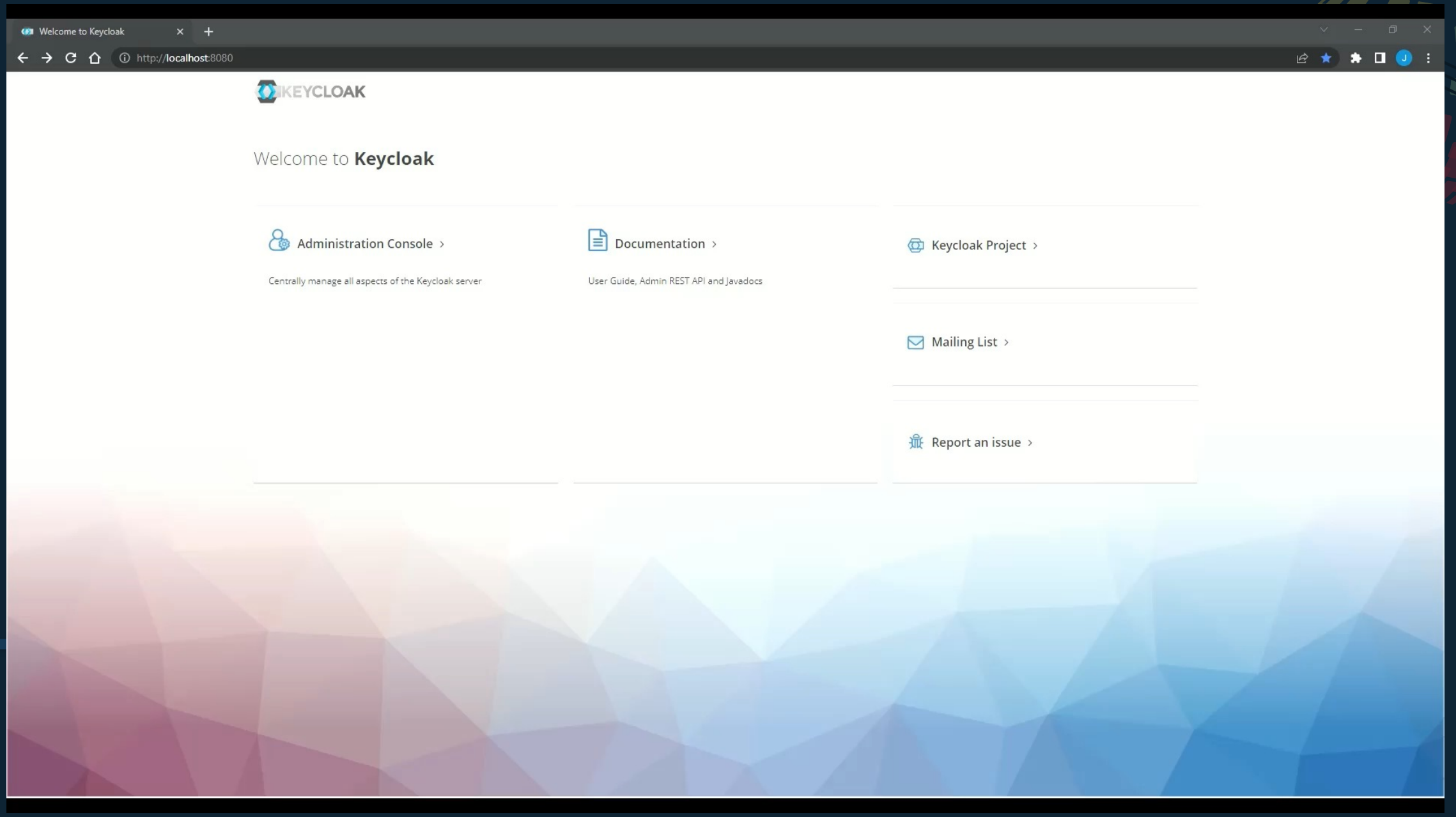
**Get latest data from Digital Ledger**

Discipline Engineers

**Solve problems**

# Demo

Using a custom REST API to demonstrate Digital Thread capability with Cameo Systems Modeler



# Outcome and Considerations

**REST API for Digital Thread Implementation**

## Realized Benefits

1. **Open-Source Approach Accepts Key Data**
   The REST API was able to accept KPP updates from Cameo and the web-based front end, and can supply this data as needed to any endpoint in the thread
2. **Scalable Authoritative Source of Truth**
   The source of truth will grow and adapt with the connected endpoints
3. **Program-Level Alignment Throughout Lifecycle**
   At all stages of the system's lifecycle the stakeholders, engineers, maintainers, and more will have equal access to authoritative data for informed decision making

## Lessons Learned

1. **Data Transformation and Mapping**
   Understanding which components of the data are used in each model is critical to mapping data from one model to the next appropriately
2. **Data Uses**
   Data that is available enterprise-wide may be extrapolated in unintended ways, requiring a shared understanding of the data in the digital thread to avoid misuse

# Contact Information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