

An aerial photograph of a single railway track winding through a dense forest. The trees are heavily laden with autumn-colored leaves, ranging from deep reds and oranges to bright yellows and golds. The perspective is from above, looking down the length of the track, which disappears into the distance.

GTC 2024

Kawasaki Track Maintenance Platform



Ryoji Negi

e f T I P P r o d u c t O w n e r

K A W A S A K I



Chaffee Burke

P r o d u c t S t r a t e g y P r i n c i p a l

S L A L O M

Today, we're here to talk about how Kawasaki is going to change heavy rail in America.

Using data capture in novel compute devices and sensors with a strong machine learning platform, Kawasaki is transforming the maintenance of heavy rail and bringing a 200-year industry into the future.

History of Kawasaki



Shozo Kawasaki, the founder opens Kawasaki Tsukiji Shipyard (Tokyo).



Constructs Eitaibashi Bridge, Tokyo.



Begins production of motorcycles in the U.S.



Delivers the first LNG carrier built in Japan.



Opens state-of-the-art, fully integrated rolling stock factory unique in the U.S.



World's First Liquefied Hydrogen Carrier SUISO FRONTIER Launches.

1878

1926

1975

1981

2001

2019

1902

1941

1976

1996

2004

Finishes construction on Dry Dock at Kobe Shipyard.



Starts production of Hien fighter.



Develops GPS200 gas turbine generator.



Excavation on the Tokyo Bay Aqua-line completed by the world's largest shield machines.



Ships first 700T trainset to Taiwan High Speed Rail Corporation.



Expansion into the world

GLOBAL KAWASAKI



103 Consolidated subsidiaries

20 Equity method affiliates

Europe

UK	Russia
Italy	Germany
Netherlands	

Asia / Oceania

China	Singapore
Korea	Thailand
Taiwan	Philippines
Australia	Vietnam
India	Malaysia
Indonesia	UAE

The Americas

USA	Mexico
Canada	Brazil

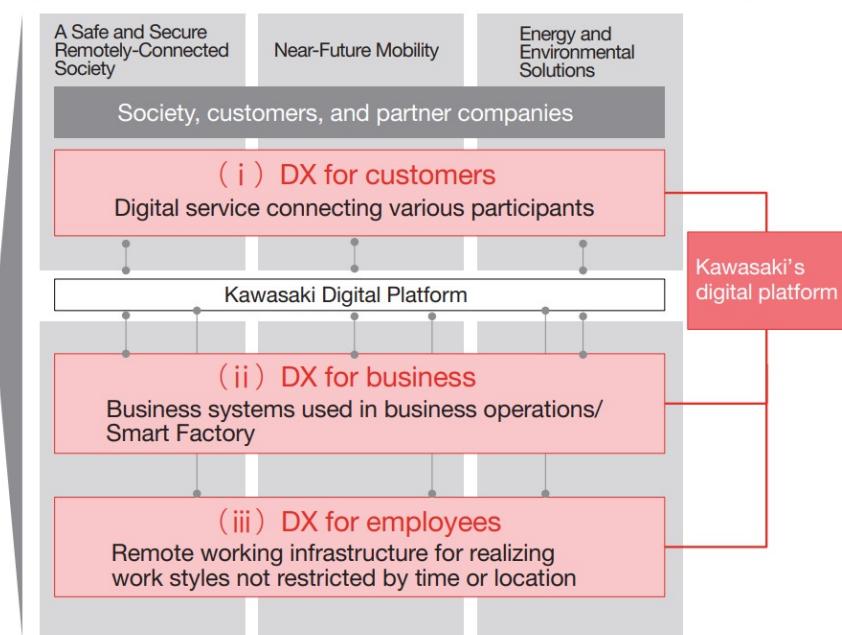
Our Vision

Aim to offer innovative solutions to social issues with digital technologies

Goals of Group Vision 2030

Focus fields	Goals
A Safe and Secure Remotely-Connected Society	<p>“Creating new value with remote technology”</p> <p>Creating a society in which everyone can live affluently and safely with peace of mind using remote technology</p>
Near-Future Mobility	<p>“Changing human and cargo transportation”</p> <p>Creating a society where people and cargo can be transported quickly, safely, and efficiently with new mobility</p>
Energy and Environmental Solutions	<p>“Realizing stable, clean energy”</p> <p>Realizing a low-cost, stable decarbonized society as soon as possible</p>

Kawasaki's three types of DX



“We wanted some skilled technology partners to help with our agile digital transformation”

WHAT WE DO

Slalom is a next-generation professional services company creating value at the intersection of business, technology, and humanity.

From strategy to implementation, our approach is fiercely human. We deeply understand our customers—and their customers—to deliver practical, end-to-end solutions that drive meaningful impact.

We help our customers achieve the outcomes they want and need most.



Data & AI

Use data & AI to power intelligent products.

Illuminate insights and intelligence through modern data architectures, AI, and machine learning.



Business strategy

Develop data-enabled business strategies.

Define and implement a holistic data and AI strategy to support your business goals and maximize the value of NVIDIA.



Product innovation & engineering

Dream up and build new products.

Design and build new, cloud-native, integrated digital solutions and experiences.

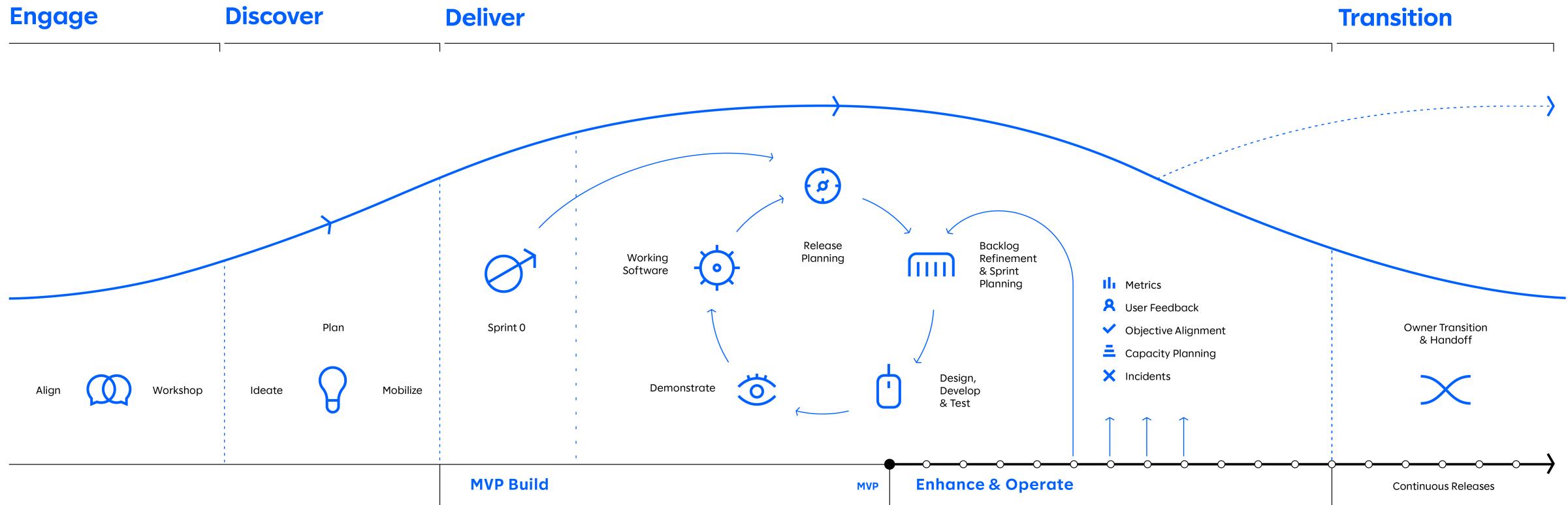


Organizational evolution

Evolve to get more from AI.

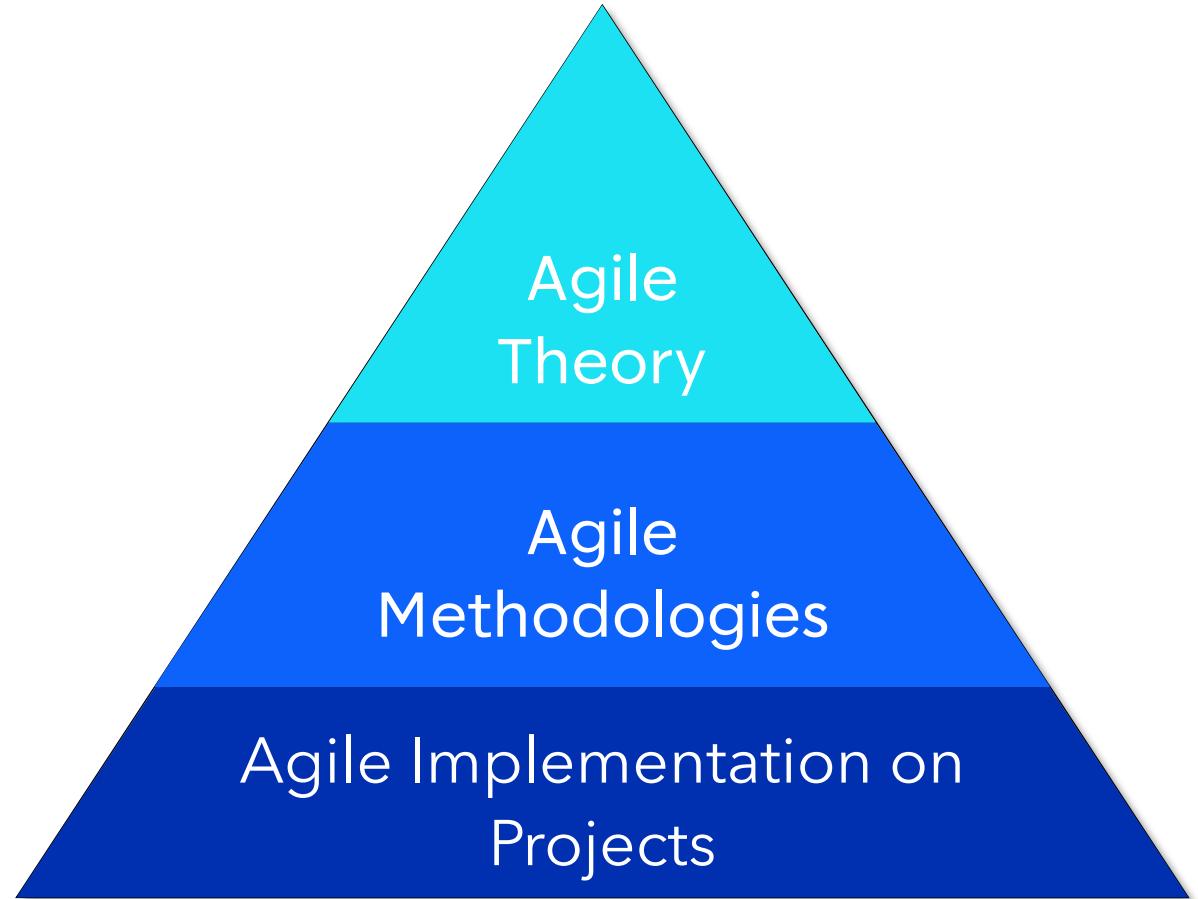
Bring the business and end users along for the journey by up-leveling skills and maturing processes.

Product Engineering Methodology (PEM)



Using Agile to build Digital Products

- Agile Principles
- Agile Frameworks (PEM, SAfE, LeSS)
- Agile Practitioners







American railroads are heavily investing
in bolstering system safety.



With over 140,000 miles of track to
constantly defend against **entropy...**



...North American rail companies use a series of **disjointed**, sometimes **disconnected** systems to ensure safe travel upon their systems.

The Machine Learning Shift for Rail Track Analytics

Competitors merely collect data through hardware products that measure track entropy issues, leaving rail companies to synthesize that data themselves.

The better approach combines raw data capture with machine learning to instantly reveal problems, eliminating the need for rail companies' separate data systems.



Kawasaki Rail Maintenance Platform

efTIP Platform

SENSING

Sensors built by KHI collect data and deliver track conditions to customers

- **Geometry System**
Deployed
- **Fastener System**
In-development

DEPLOYED

SHOWING

Easy-to-use products and graphical user interfaces support people and tasks

- Customer Portal
- KHI Management & Vendor Portal

DEPLOYED

SUPPORTING

Intelligence trained with relevant data will enable teams and outcomes at scale over time

- Maintenance Advisor

FEASIBILITY
PROVEN

SHARING

Third-party support enables partners and teams to expand the reach out outcomes

- **Maintenance Dispatcher**
Custom 3rd party integration
- **KHI APIs**
- **Existing APIs**
Weather, market data, etc.

THE NEXT FOCUS
AREA

efTIP Future State Architecture

IDEATE

1. Application

It provides user access via Customer and KHI Portals, enabling client/vendor management, reporting, and data usage tracking.

2. IoT

Azure IoT Services will be used to communicate with the Autonomous Measurement Systems.

3. ML Platform

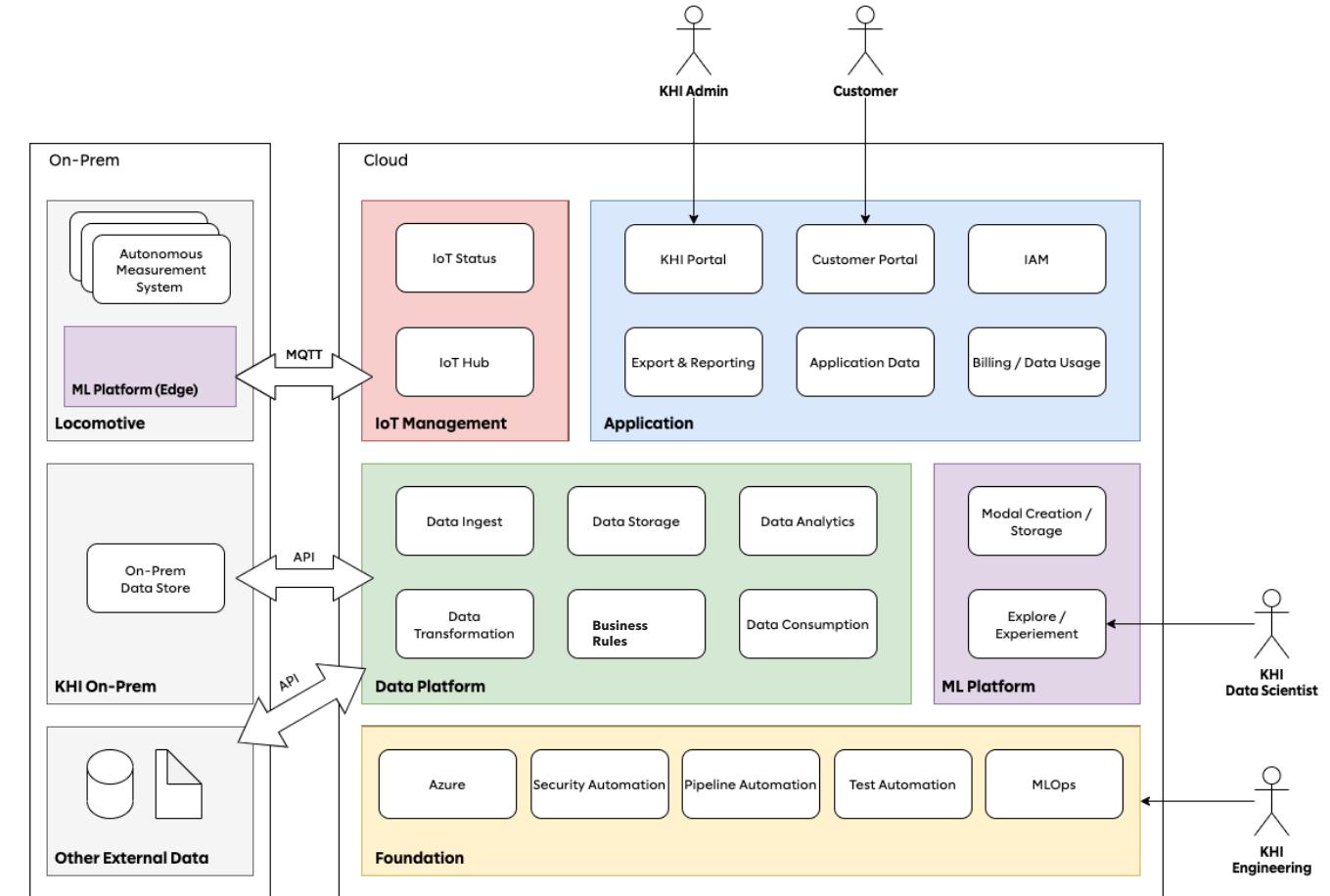
Provides a cloud-native platform for ML experimentation, model development, and model serving.

4. Data Platform

Enables and activates all capabilities that move, transform, ingest, or consume data to provide core platform services for end users.

5. Foundation

Manages the underlying Azure account structure, developer pipeline, security, test automation, MLOps, and developer access..





Step One

Remote monitoring systems

Locomotive Mounted vs Dedicated Inspection Car

While the competition chooses to focus on dedicated cars, we are focusing on locomotive mounted.



LOCOMOTIVE MOUNTED

Installed on locomotives in service operation

- ✓ Higher frequency with future prediction
- ✓ No interference with freight operation
- ✓ Locomotive operator needs nothing for track inspection



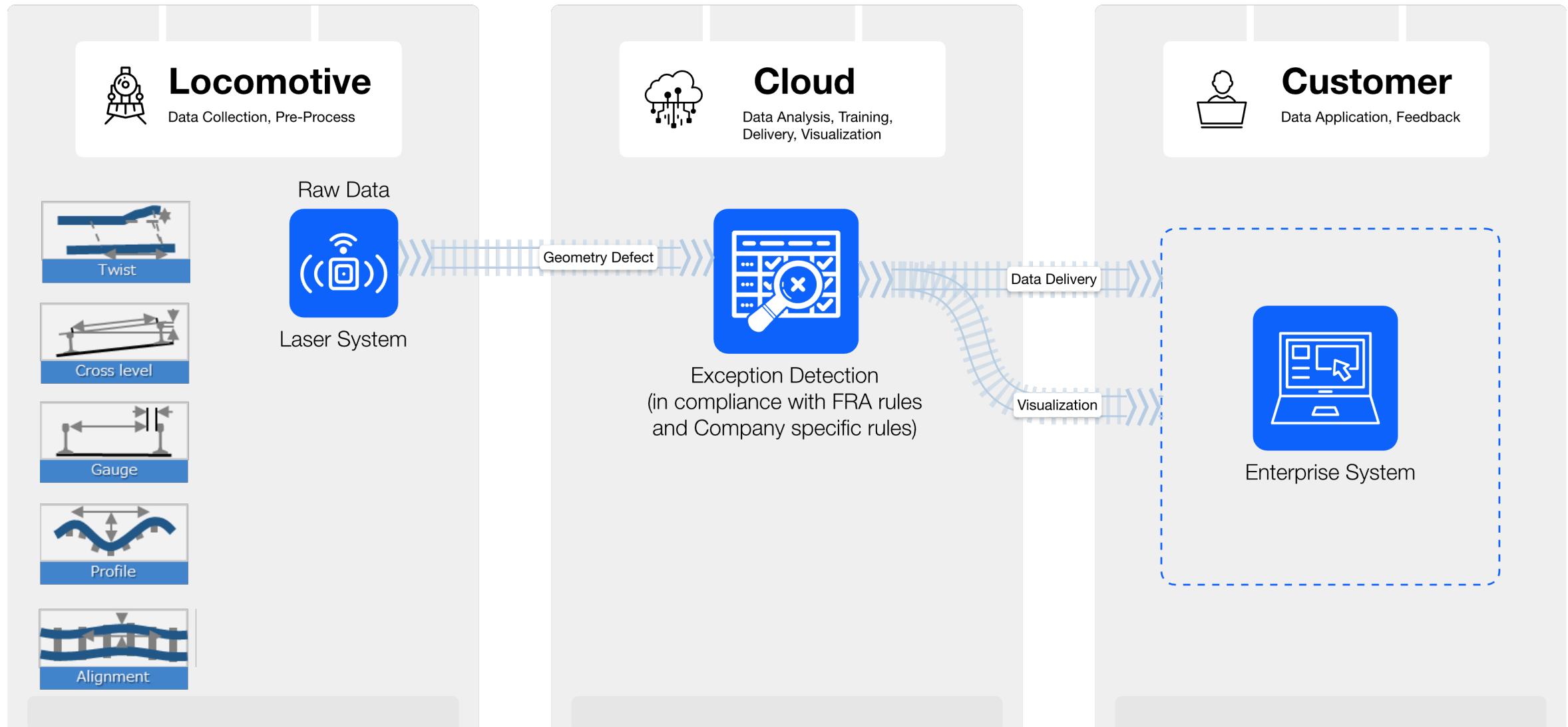
DEDICATED INSPECTION CAR

Installed dedicated inspection car or freight car

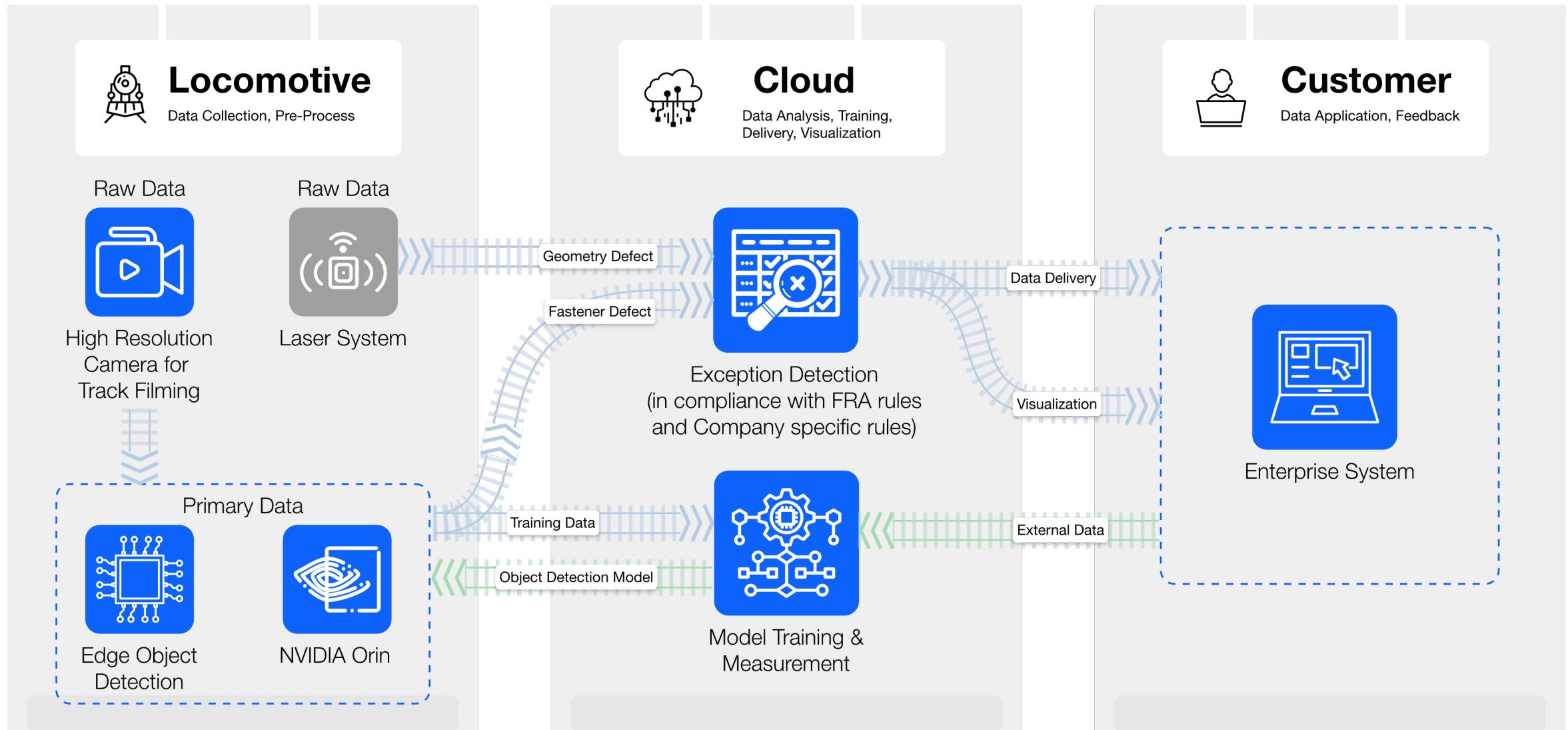
- Multiple monitoring methods in a car
- Not affected by locomotive schedule or locomotive repair
- Need manual operation of a car



Geometry System



Adding the Vision System

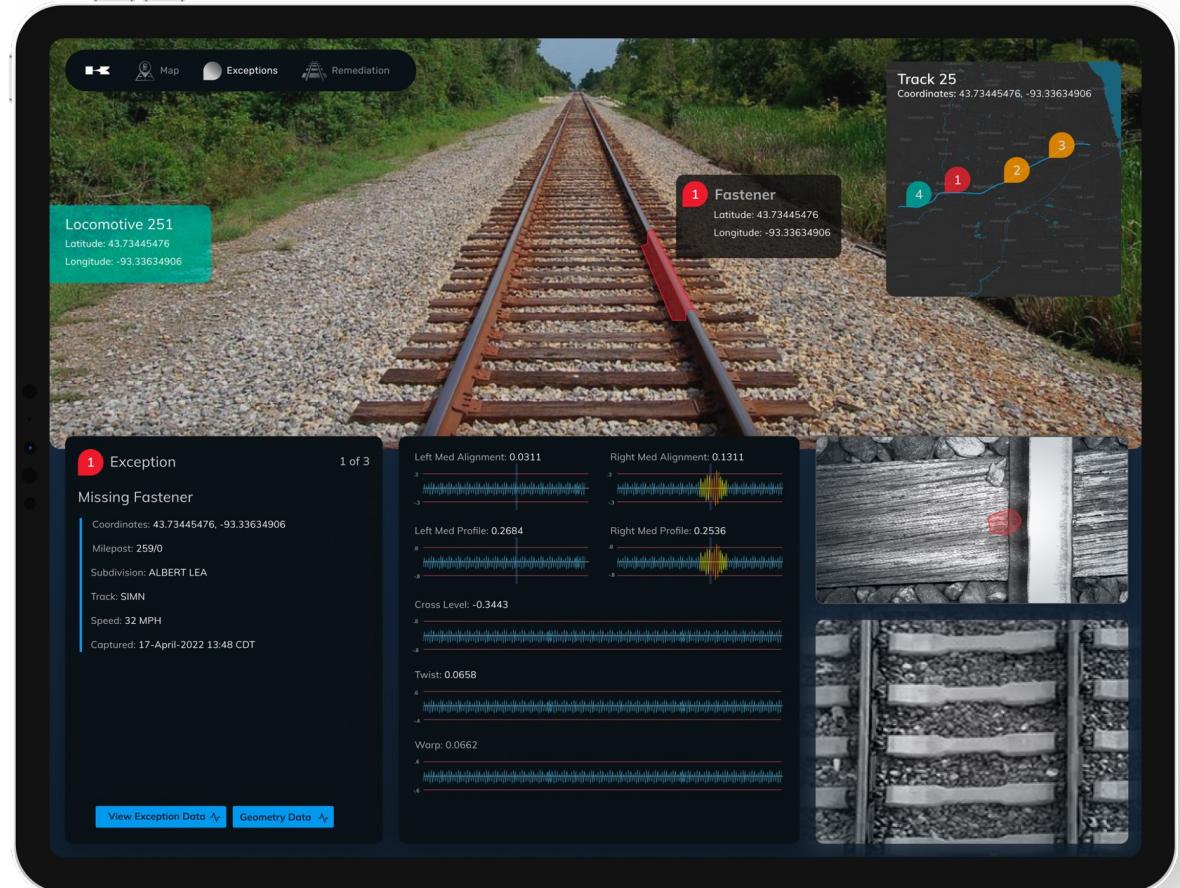


Data unlocks patterns But can overwhelm humans.

With this data, we now know where the problems are, and can start looking for patterns

However, humans still need to fix these problems, and, more importantly, we'll begin to overwhelm them with a lot of data.

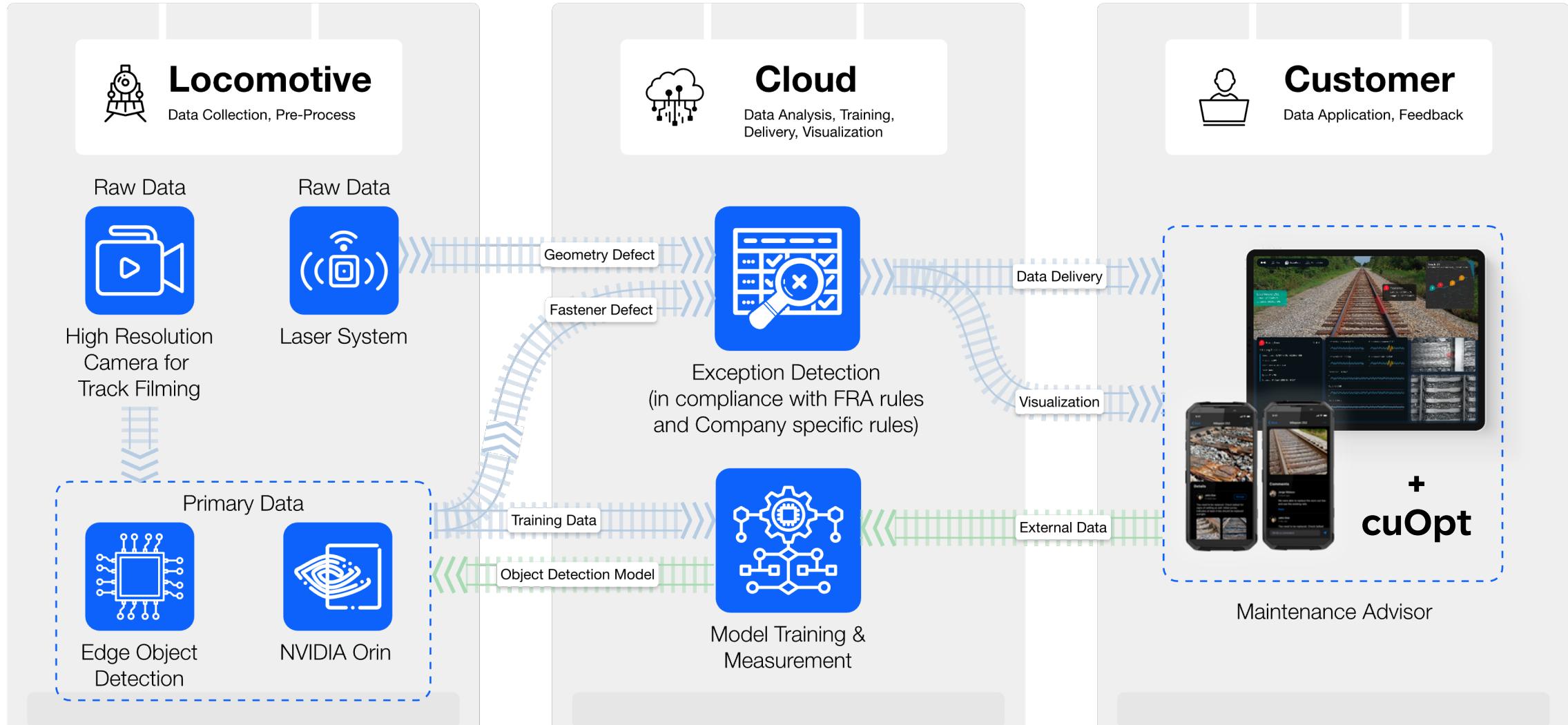
They need a prioritization solution before that happens.



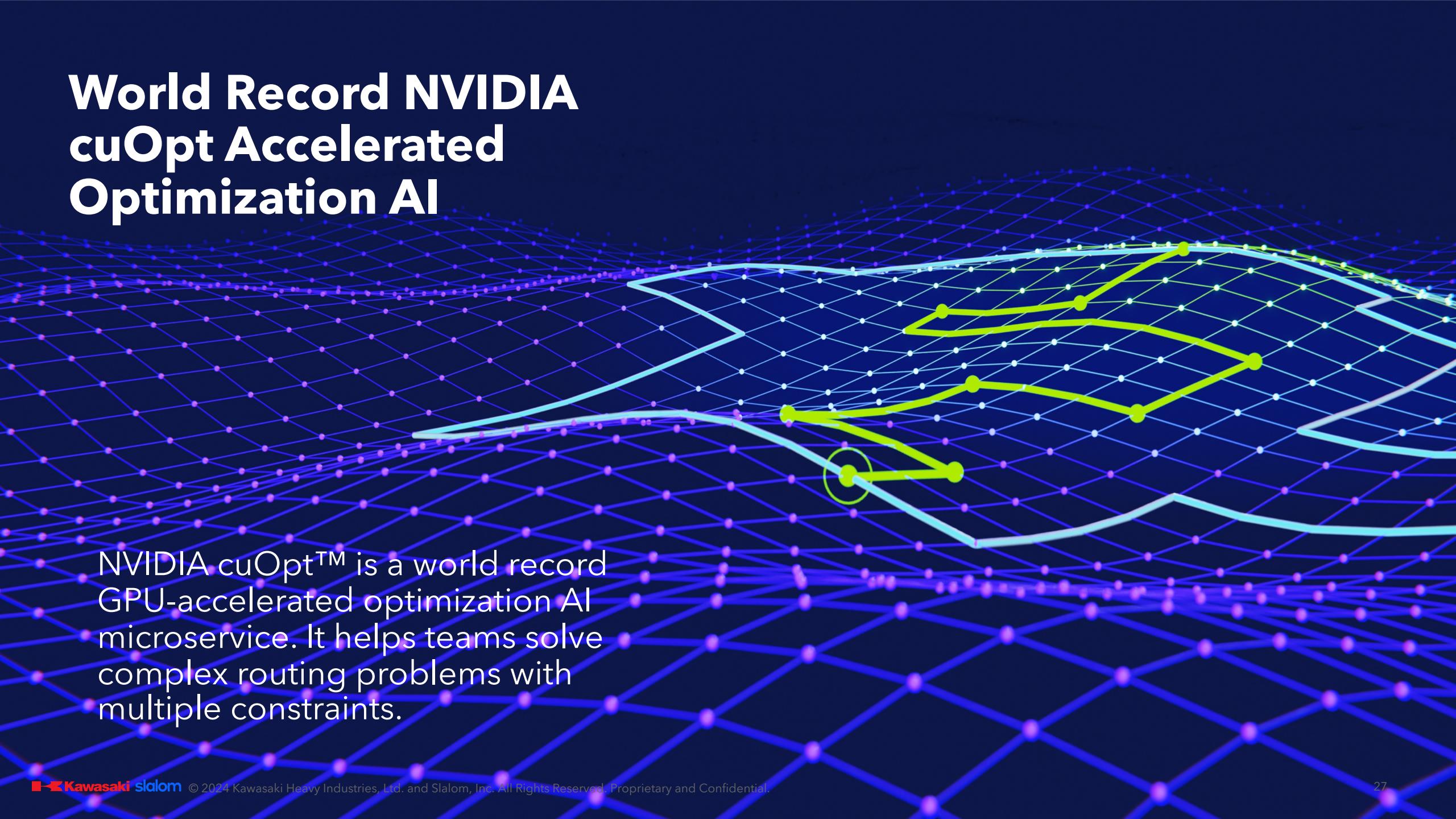


Step Two Maintenance Advisor leveraging cuOpt to optimize repair routing

So, We Built Maintenance Advisor



World Record NVIDIA cuOpt Accelerated Optimization AI

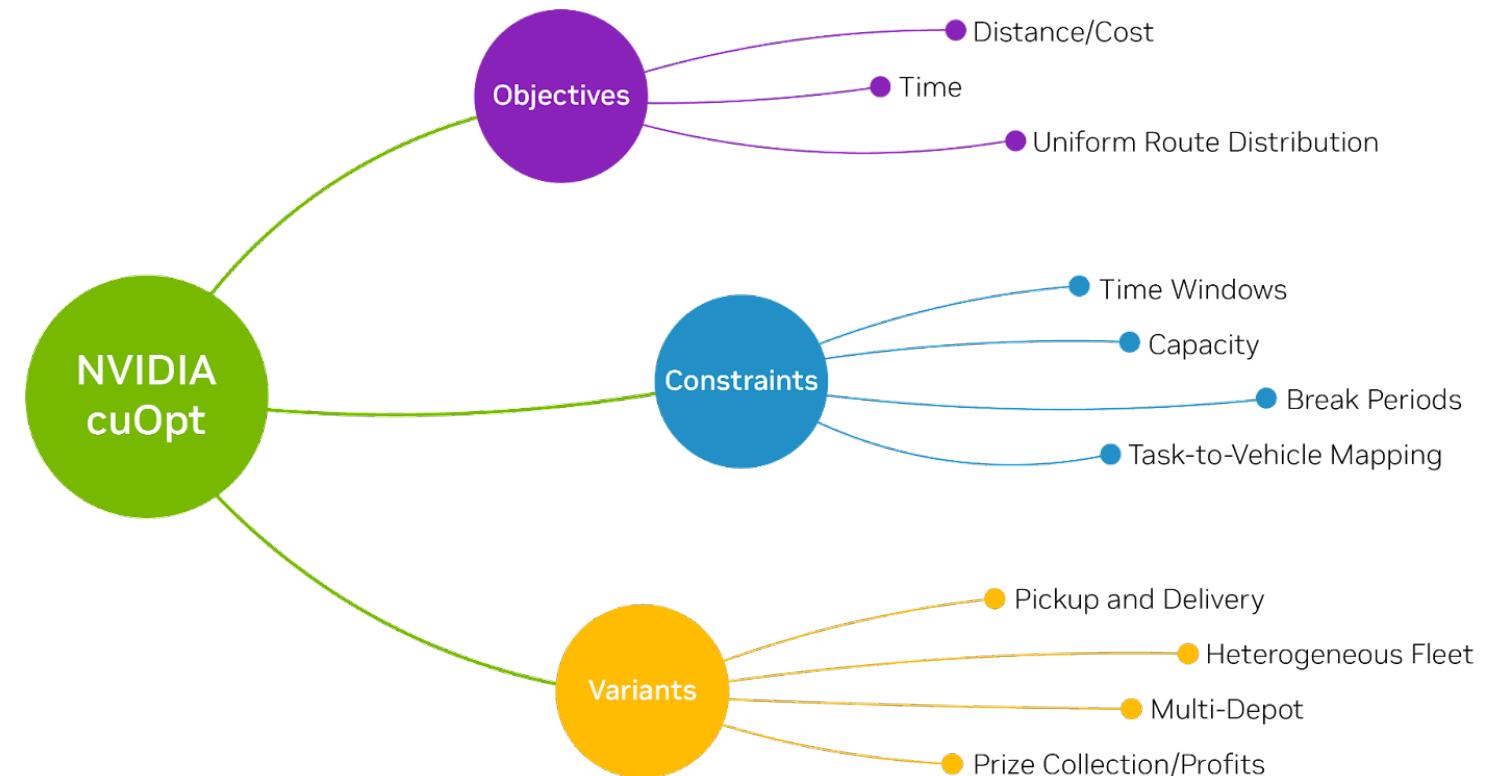


NVIDIA cuOpt™ is a world record GPU-accelerated optimization AI microservice. It helps teams solve complex routing problems with multiple constraints.

Flexible Optimization AI Supporting Hundreds of Complex Constraints

cuOpt is a GPU-accelerated solver that rapidly approximates solutions to complex vehicle routing problems with various constraints using heuristics and optimizations.

It supports asymmetric distance and time matrices and integrates with popular mapping providers.





Without use, there is no value

Human Centered design

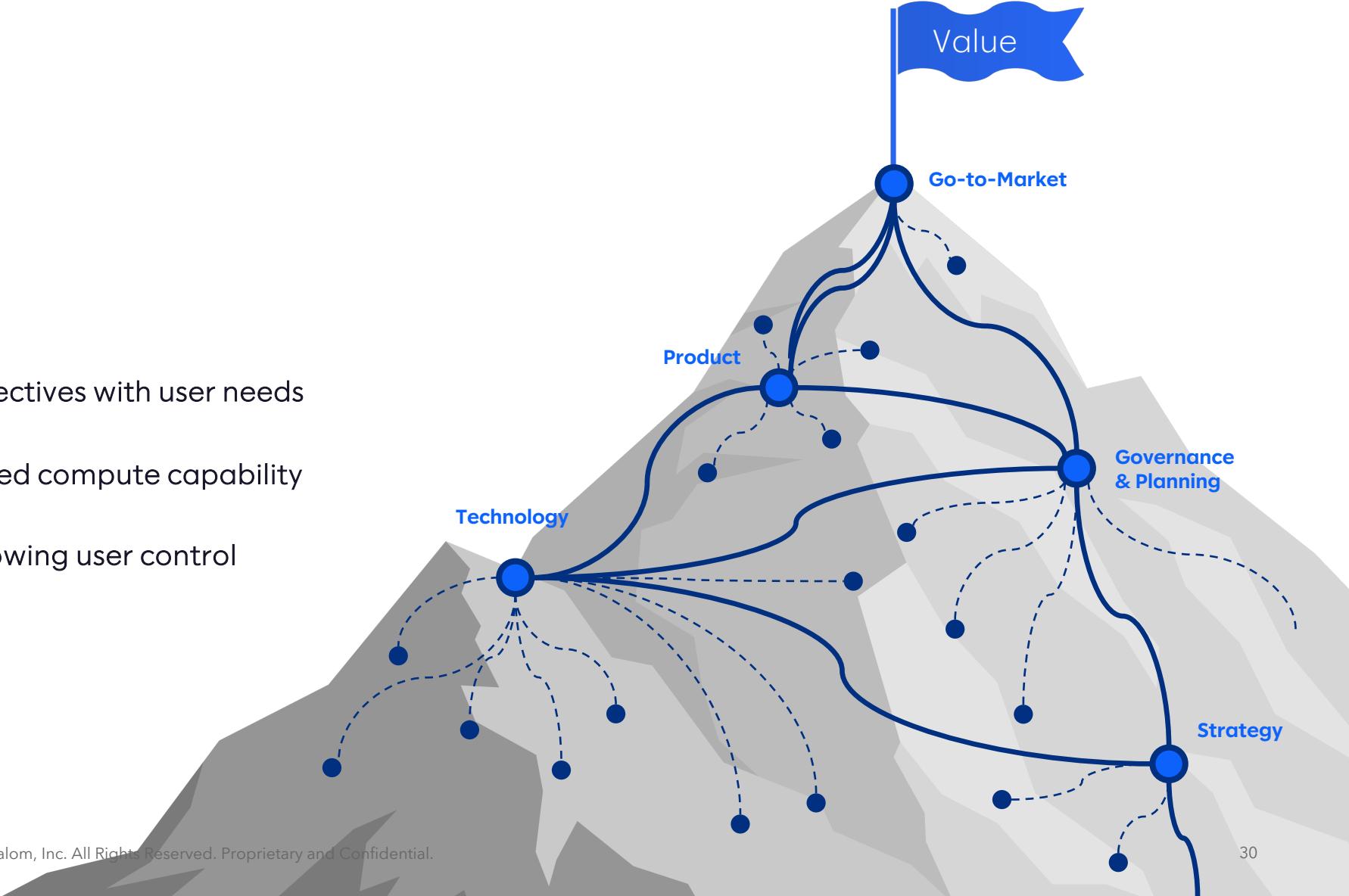
Today's experiences are becoming more complex. They're pulling from different parts of the ecosystem, crossing channels and platforms, and users' expectations are always increasing. Design is uniquely positioned to overcome silos, build alignment, and ultimately define products people love.

- If no one uses a product or deliverable, there is no value
- If a product can't be built, it's not producing value
- If a product isn't maintained, the value will dwindle

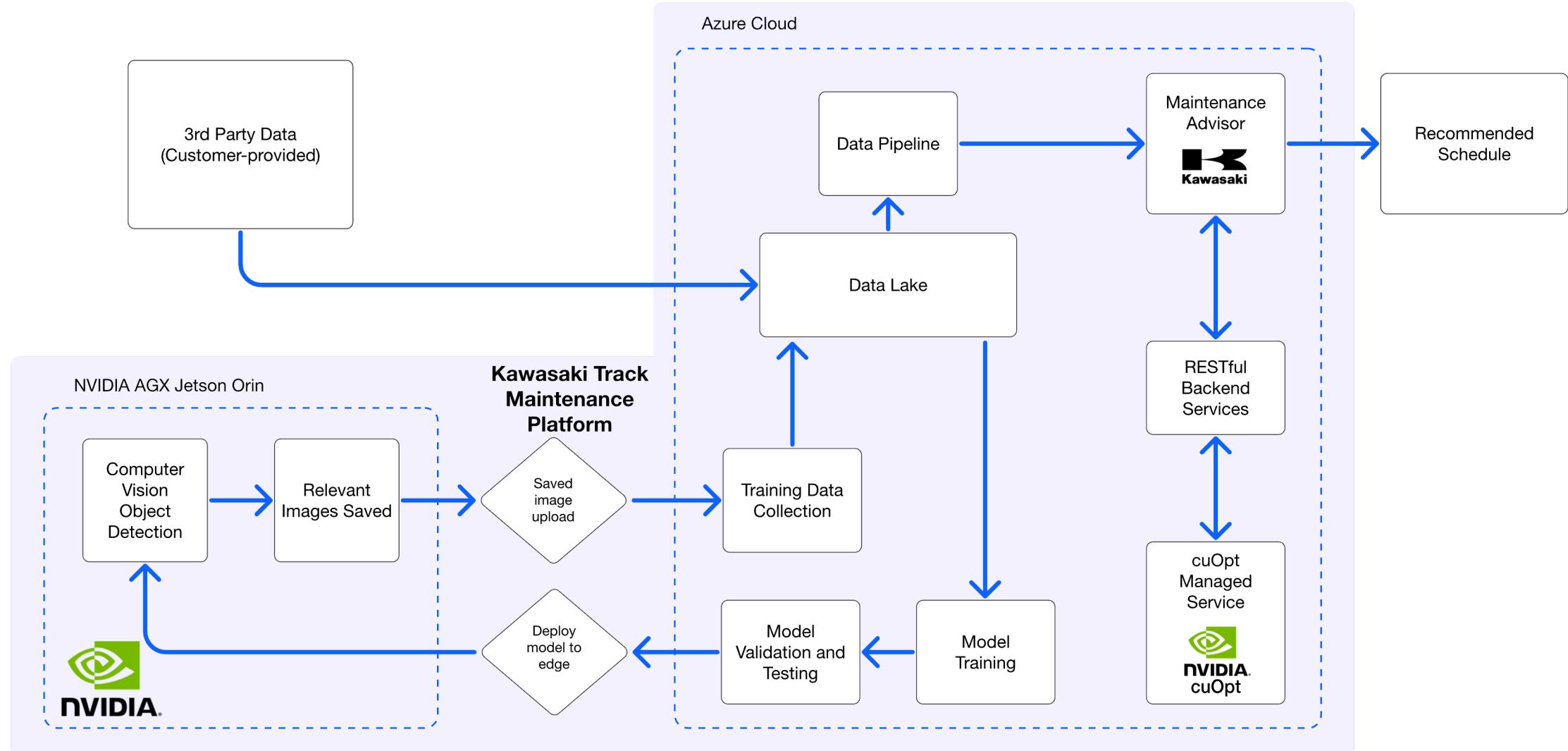
Design paves the path to value

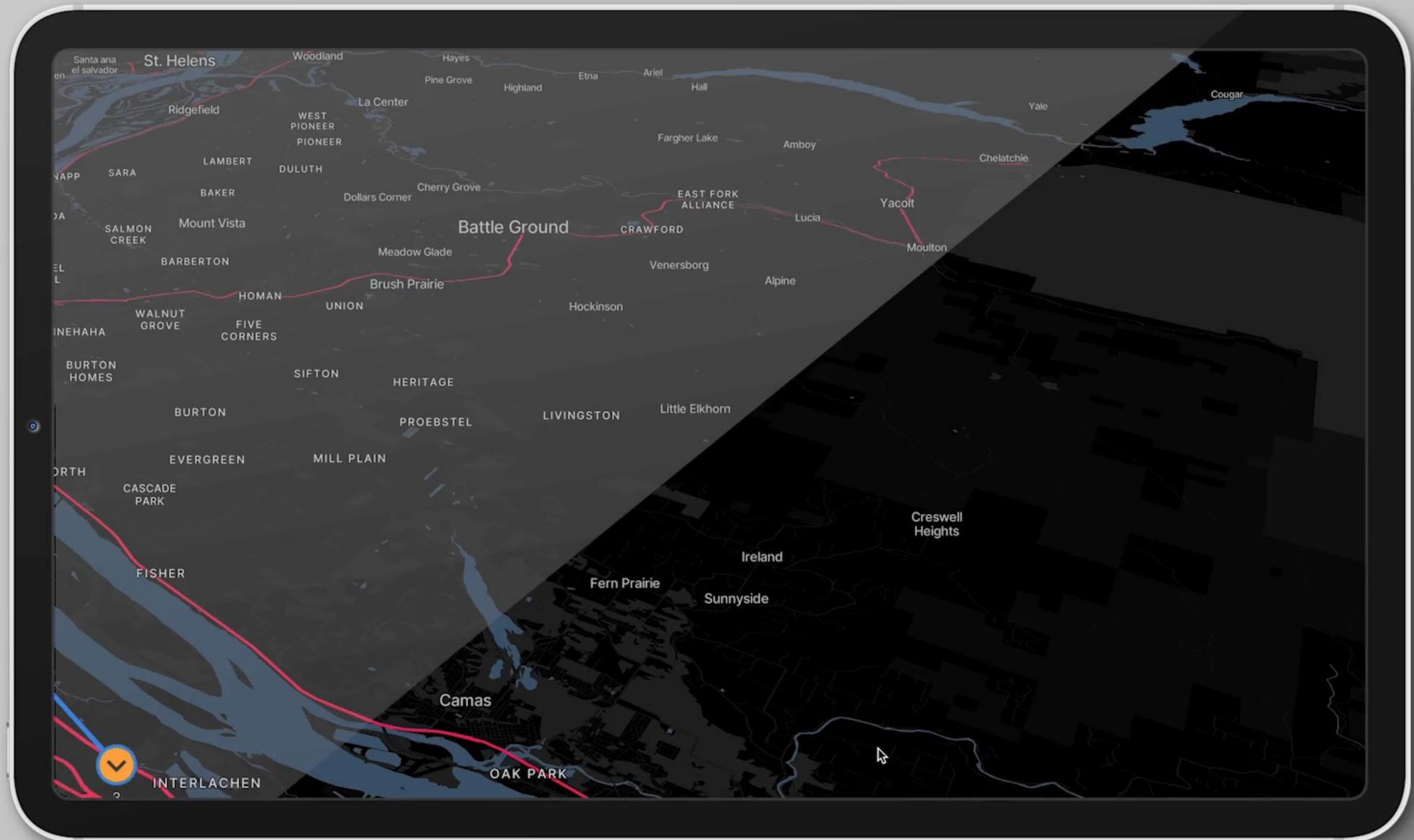
Human Centered Design

- Align corporate and business objectives with user needs
- Initial adoption of AI and advanced compute capability
- cuOpt meets objectives while allowing user control



MAD and Vision System Architecture





Impact of Vision System and NVIDIA cuOpt

26,600

hours saved per year

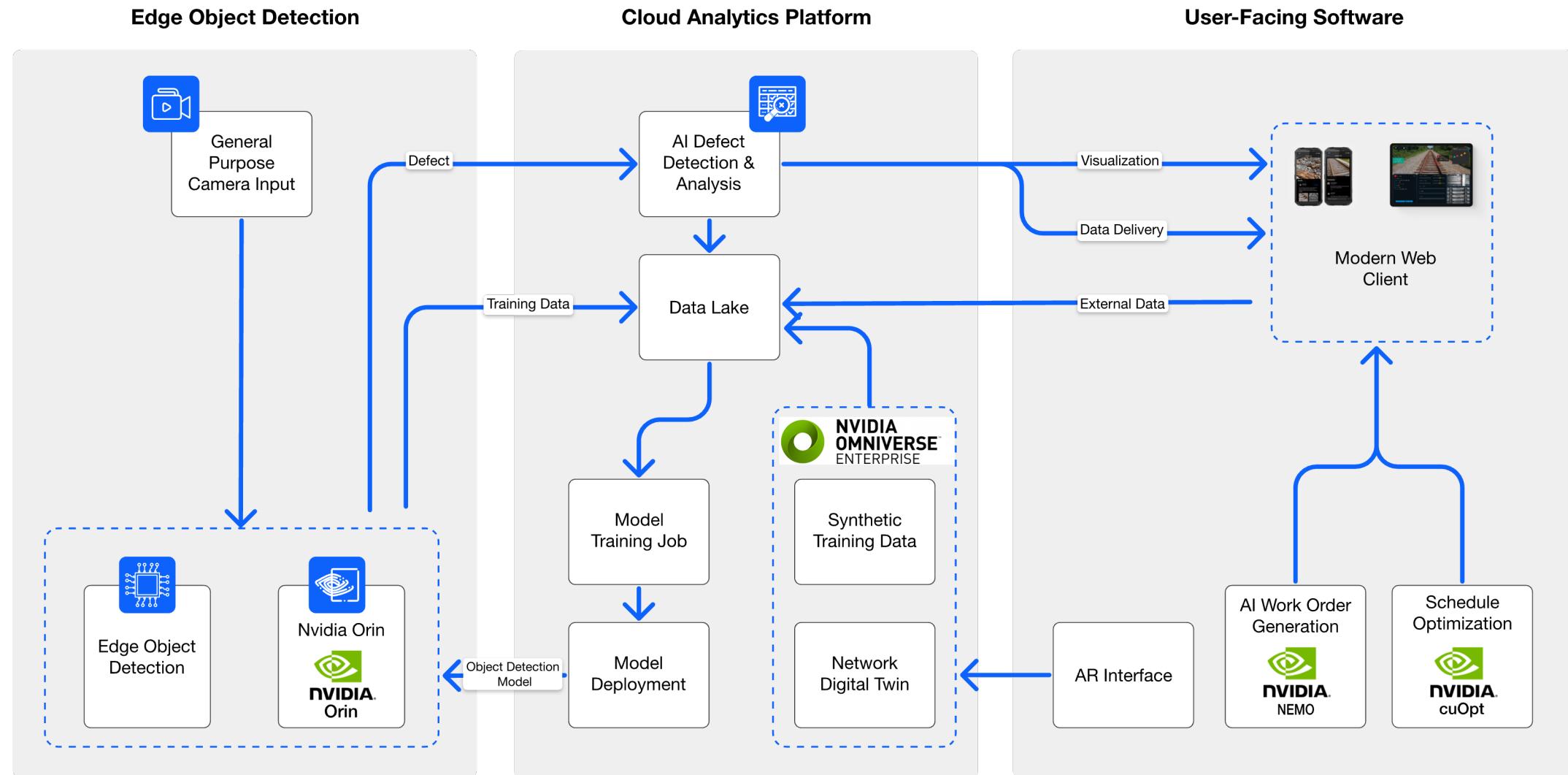
Estimated annual manager of track maintenance (MTM) hours saved per company = 5 hours per week MTM * 52 weeks per year * 100 MTMs per company

\$218.4M

saved per year

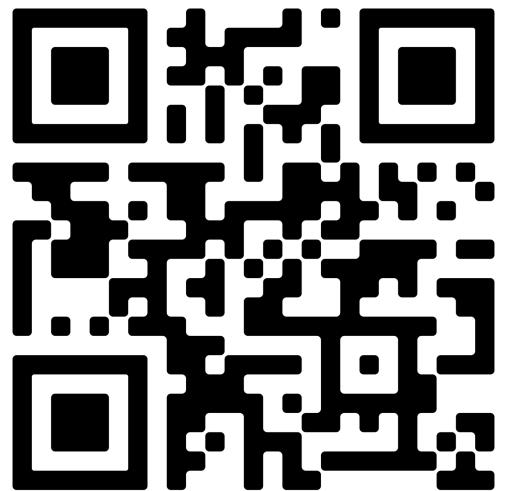
- Estimated annual cost savings from automating inspections = 150 inspectors per company *\$208,000 * 7 companies
- 5 hr./week is the estimated time MTM's spend manually creating repair schedules
- 100 is the estimated number of MTM's employed per Class 1 rail company
- 150 is 50% of the estimated number of track inspectors (300) in a Class 1 rail company, where an MTM had 3 full time inspectors
- \$208,000 is the calculated annual full loaded labor rate

Future Industrial Maintenance Architectural Patterns





Thank you!
Q&A



Slalom @ GTC24

Demo 1-2pm
**Slalom booth
#1819**

Contact us:
hellobuild@slalom.com