

# Placement of Coastal Embankment and Monitoring using IoT

**Thandavan Boobalan & Prabhu Gunasekaran**

Technical Specialist, Autodesk





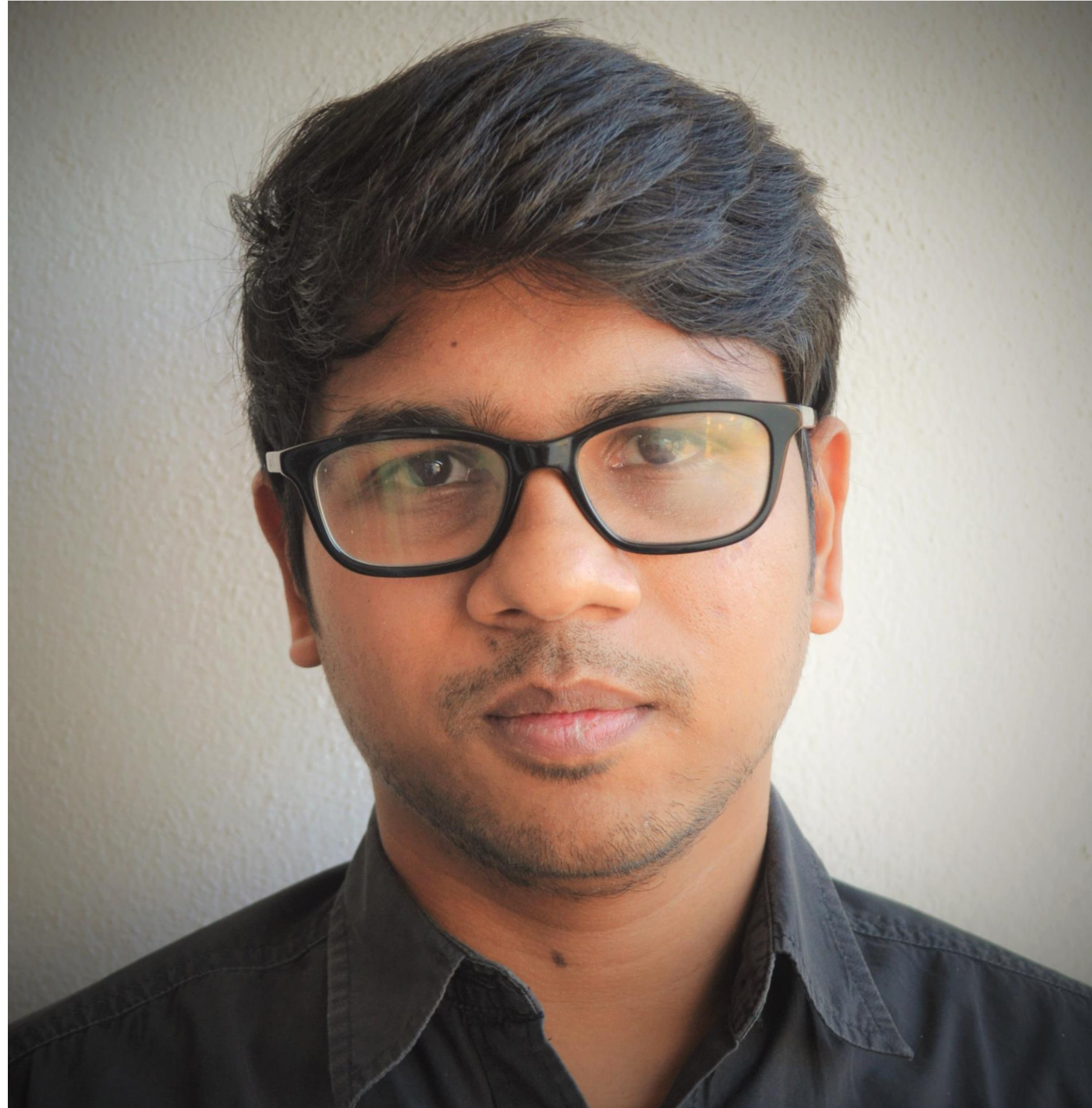
## About the speaker

### Thandavan Boobalan

**Carries 9 years of Experience in Pre-sales, Training & Technical Support on BIM for MEP Products, and our manufacturing product portfolio.**

**In his earlier assignments he worked as BIM Implementation Engineer & BIM Coordinator for projects across Middle East region.**





## About the speaker

### Prabhu Gunasekaran

Works to bring every person on every team, in the construction industry, closer together, to help them win in the future of connected construction.

A Civil & Structural Engineer, with over 8 years of experience in the Engineering Procurement & Construction Industry, working in multiple project execution teams, driving them towards technology adoption and digital transformation.





# Building Information Modeling

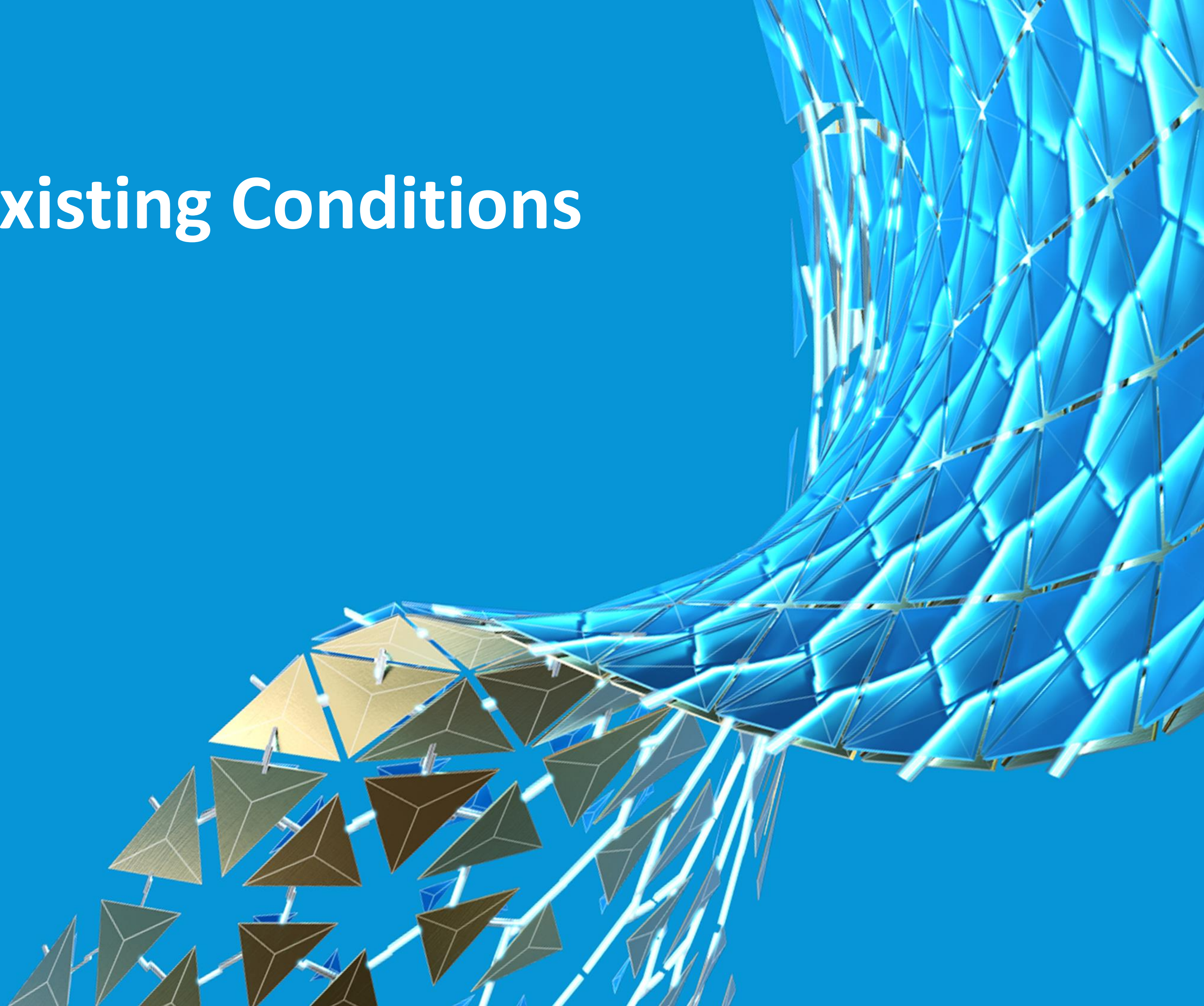
**...More efficiently plan, design, construct, and manage buildings and infrastructure.**

*“A minimal increase in upfront costs of about 2% to support optimized design will lead on average to life-cycle savings of 20% on total costs.”*

Building Information Modeling (BIM) is an intelligent 3D model-based process that gives architecture, engineering, and construction (AEC) professionals the insight and tools to more efficiently plan, design, construct, and manage buildings and infrastructure.

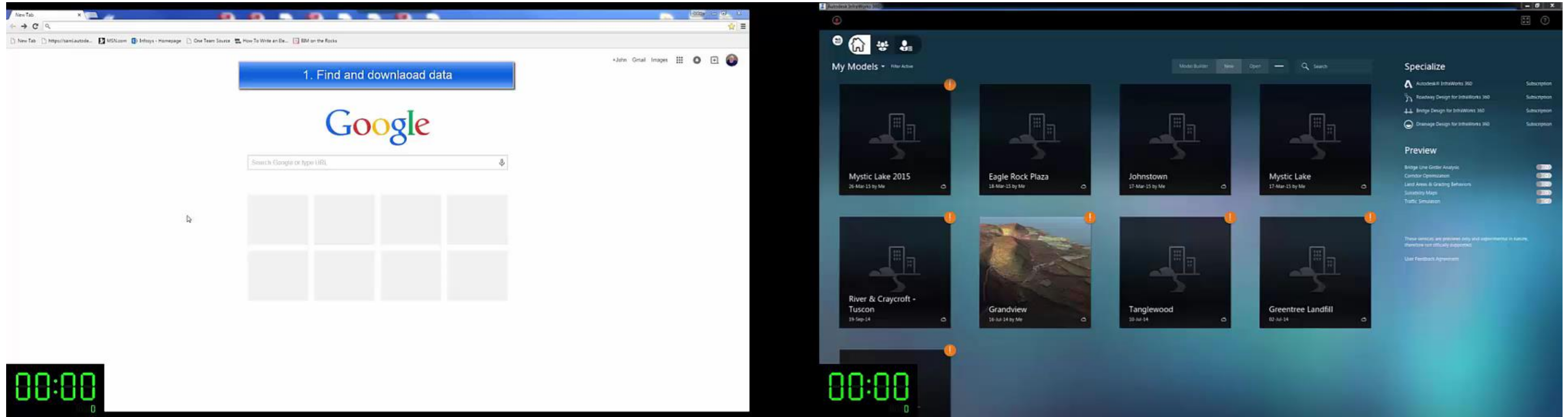


# Establishing Existing Conditions





# Establishing Existing Conditions



## Doing it with AutoCAD – typical workflow

- 1.Acquire data
- 2.Translate format
- 3.Configure Civil 3D environment
- 4.Create a surface from GIS data
- 5.Capture imagery
- 6.Import vector data

**End Result: Aerial image with contours and lines**

## Doing it with InfraWorks 360

- 1.Open Model Builder
- 2.Zoom into are of interest
- 3.Create model

**End Result: 3D model with terrain, draped aerial imagery, 3D roads. 3D water features, and 3D buildings**





All Models ▾ ↻

Model Builder

New

Open

Date ▾

Name

Search...

## Notices

- ① InfraWorks supports BIM 360 Document Management accounts configured within US data centers only.
- ① Traffic Simulation is now computed locally and does not require cloud credits. Learn more.
- ① With the release of InfraWorks (2020.1), multi-user licensing for InfraWorks will be available to AEC Collection and EBA customers.
- ① With the release of InfraWorks (2020.1), Traffic Simulation will no longer be available in older versions of InfraWorks.
- ① With the release of InfraWorks (2020.2), Line Girder Analysis will no longer be available in older versions of InfraWorks.
- ① Starting on April 30, 2020, the Model Builder will no longer support versions 2017.3 and earlier.
- ① Starting with the release of InfraWorks (2021.1), models created using InfraWorks 2018.3 or prior release versions will not display on InfraWorks Home.
- ① Install country specific content for use in your models

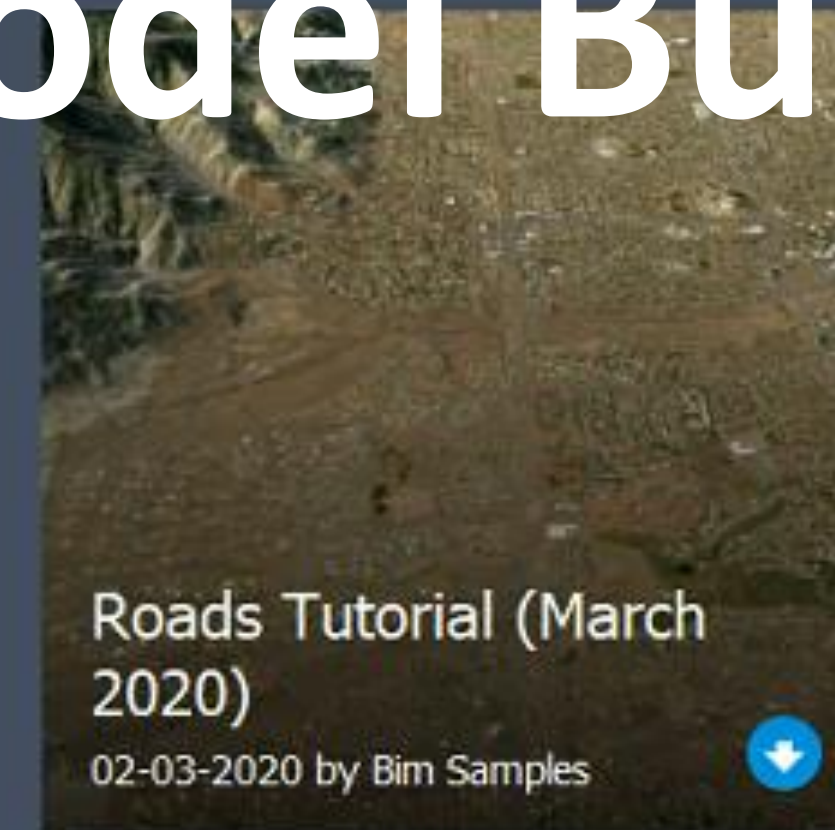
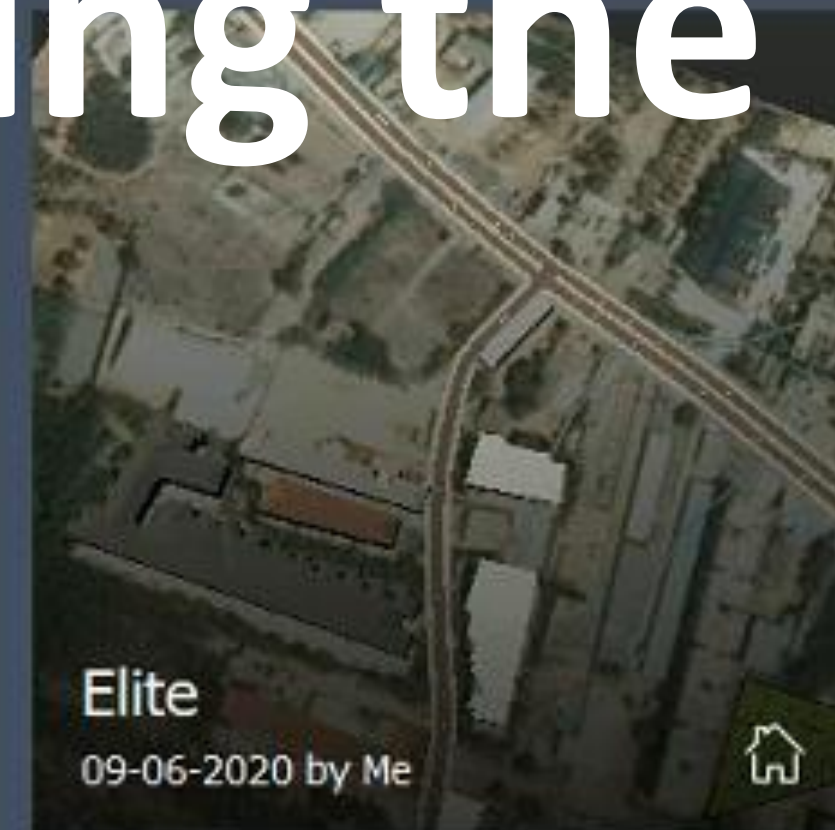
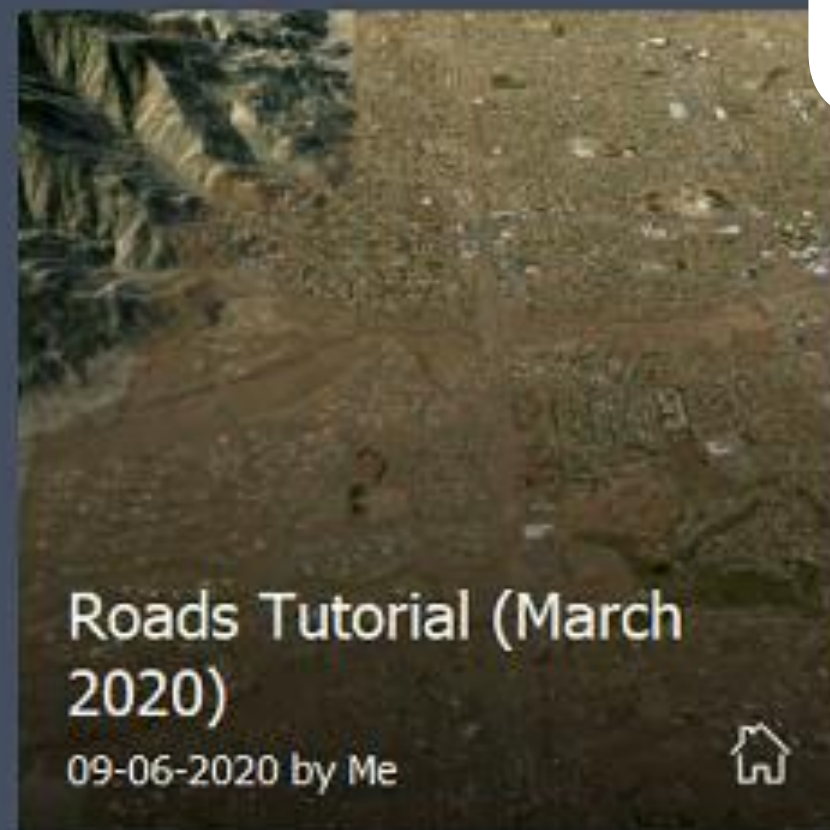
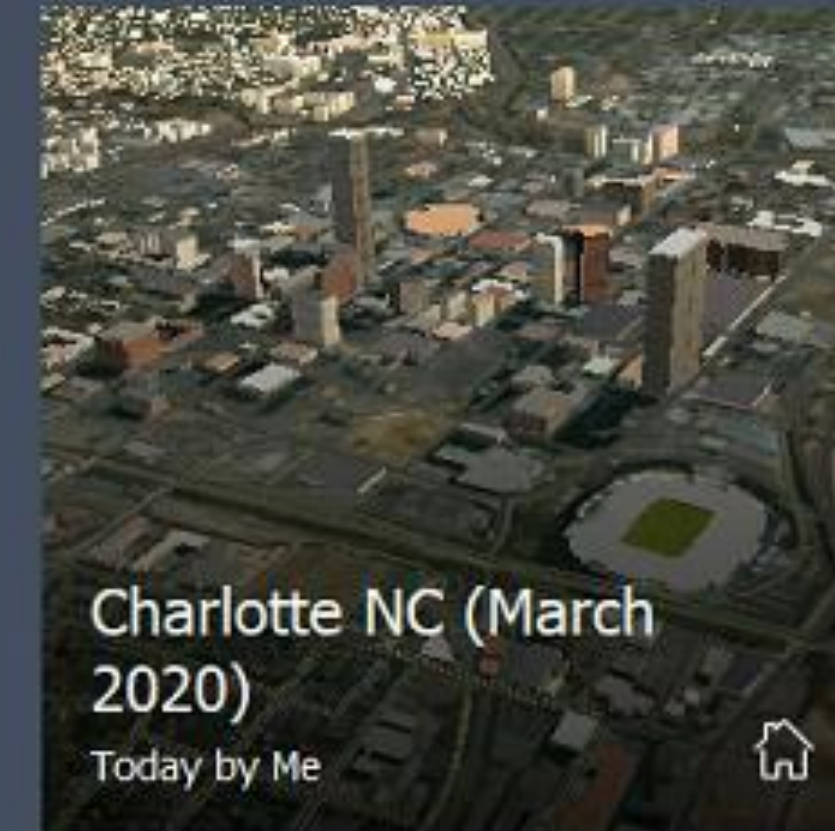
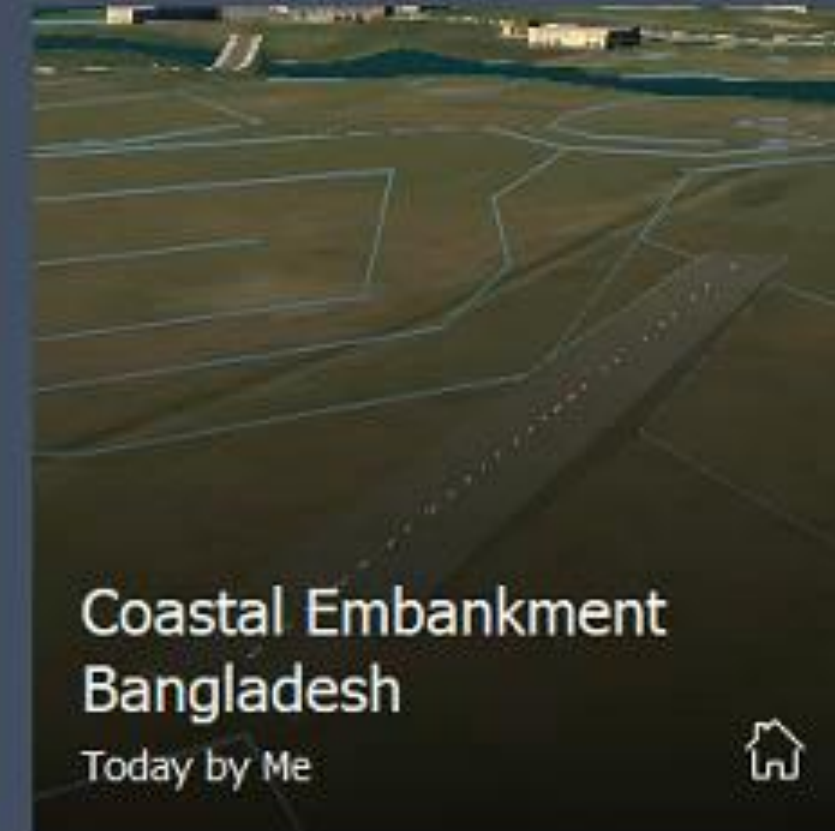
# Using the Model Builder

## Preview

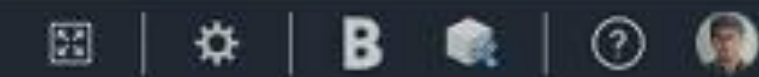
Land Areas & Grading Behaviors ☒

These services are previews only and experimental in nature, therefore not officially supported.

User Feedback Agreement







All Models ▾ ↻

Model Builder

New

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Date ↓

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Search...

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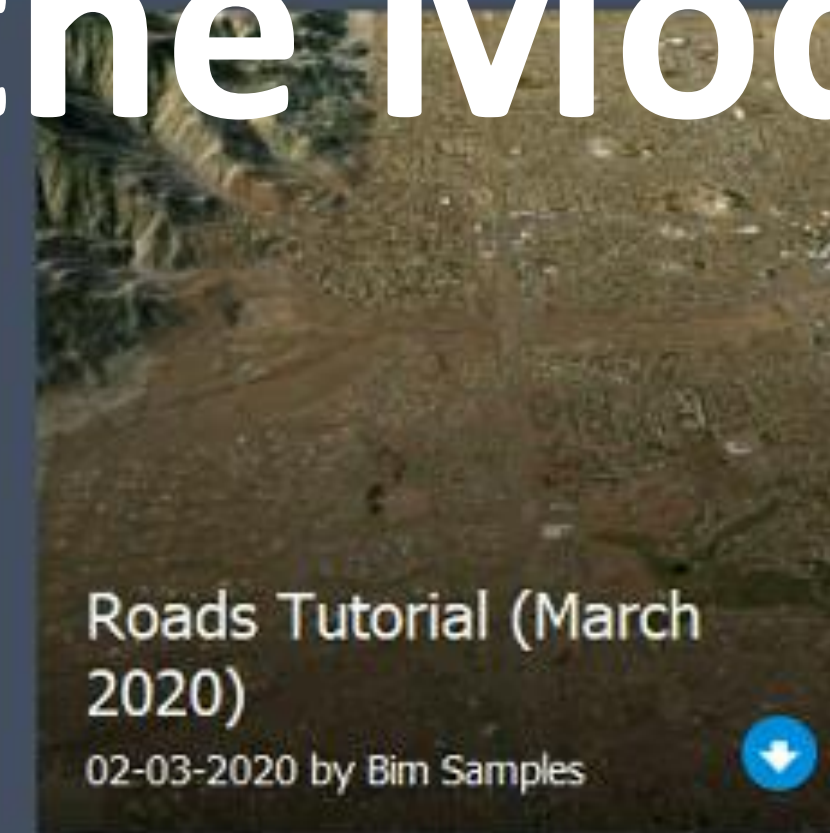
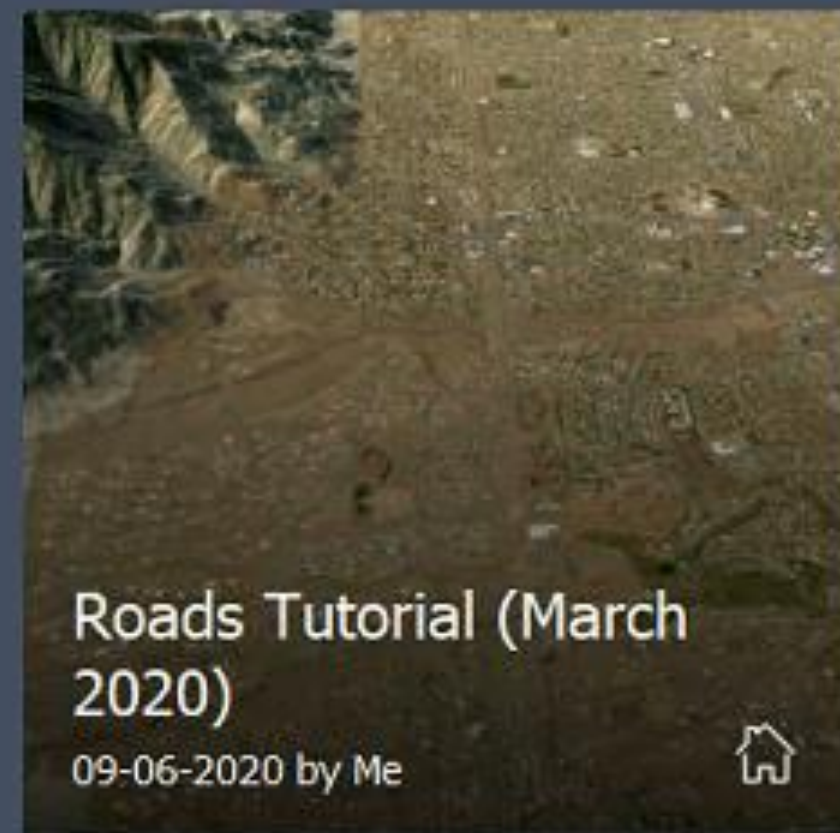
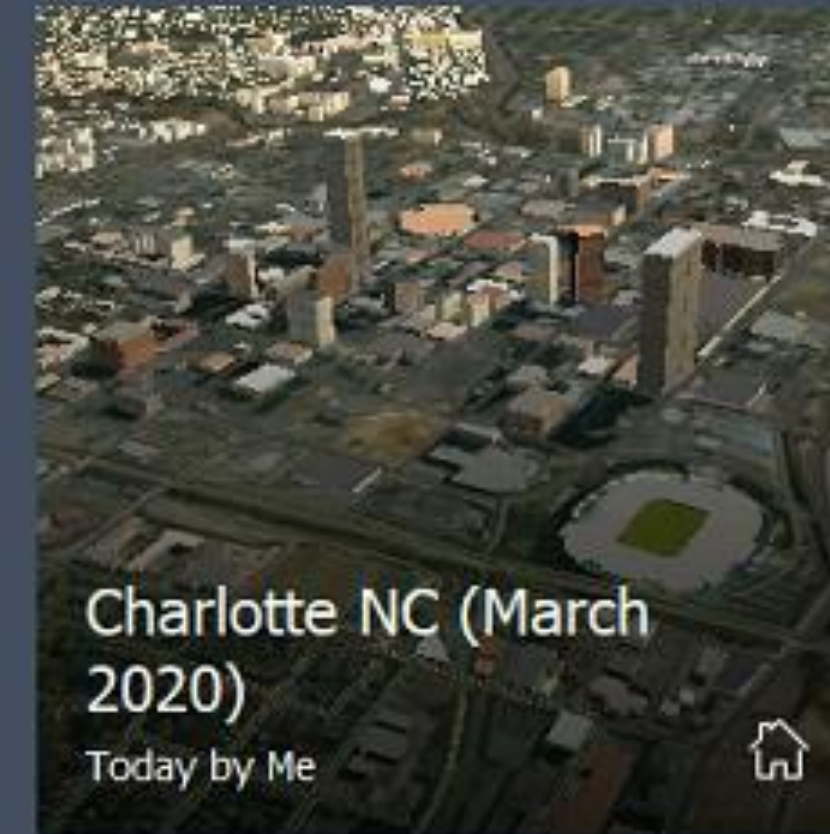
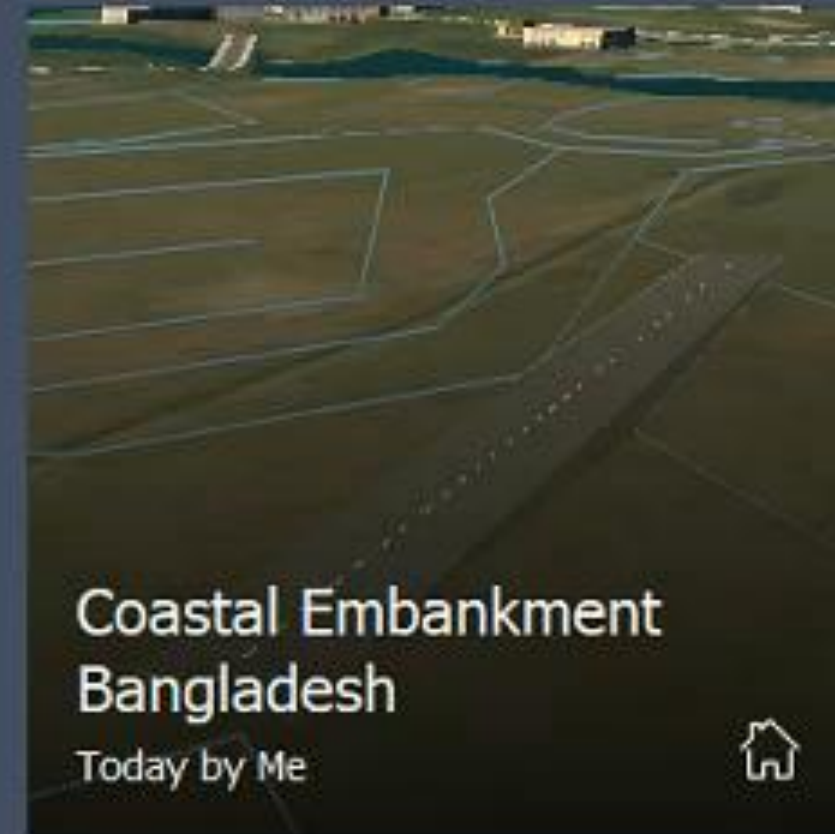
## Preview

Land Areas & Grading Behaviors ☒

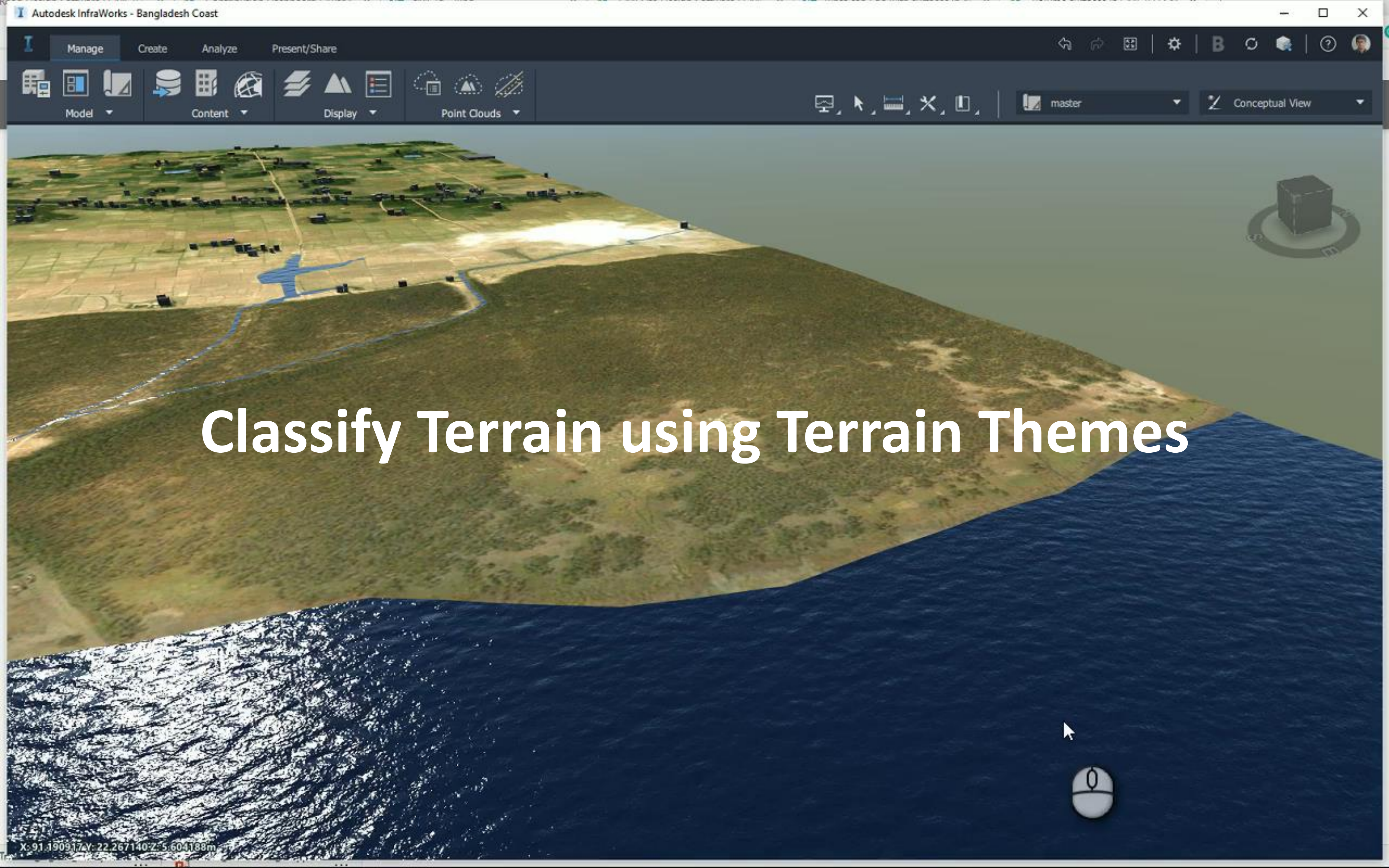
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# Exploring the Model



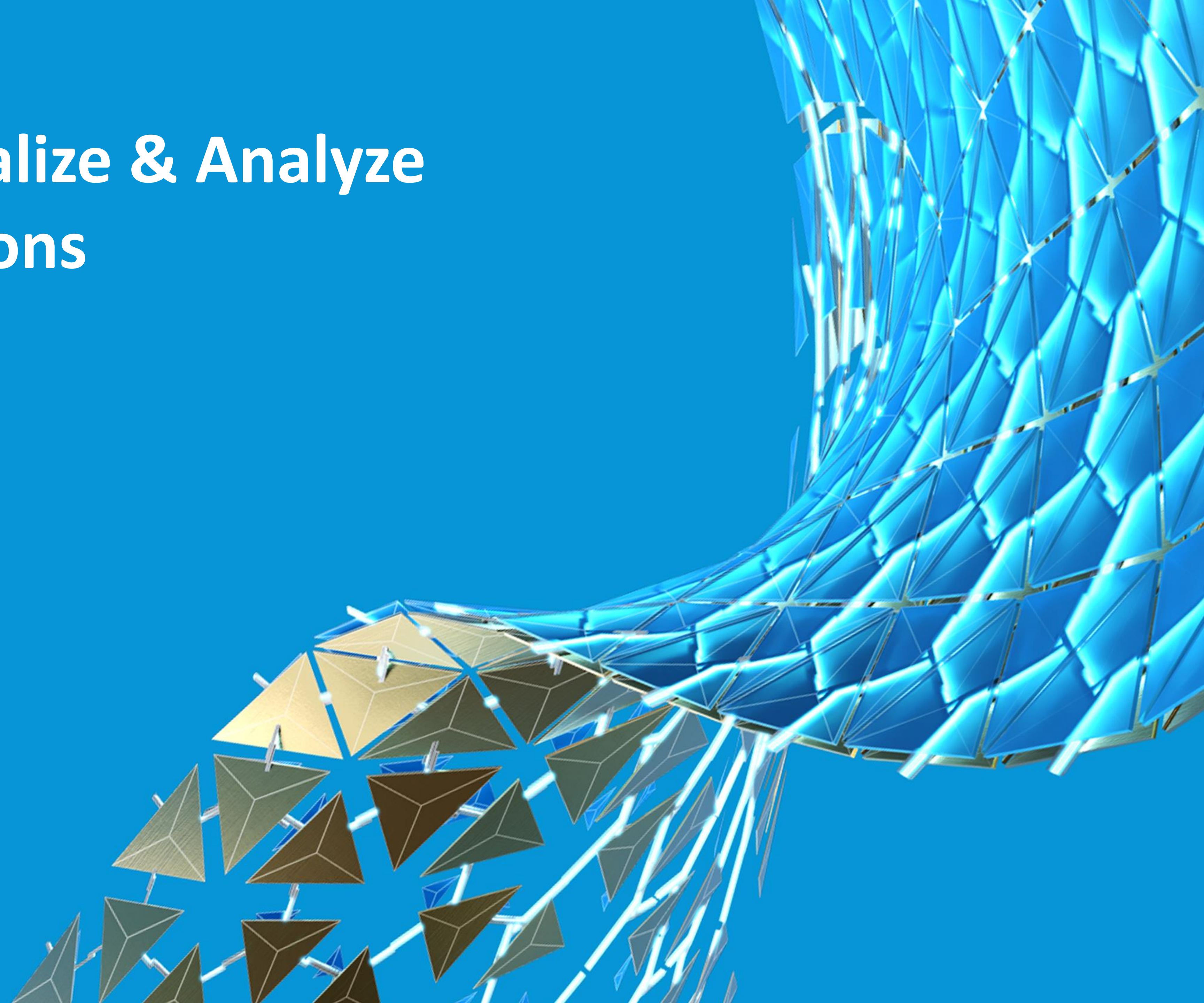




# Classify Terrain using Terrain Themes



# Simulate, Visualize & Analyze Flood Simulations





Manage

Create

Analyze

Present/Share

Model

Content

Display

Point Clouds

master

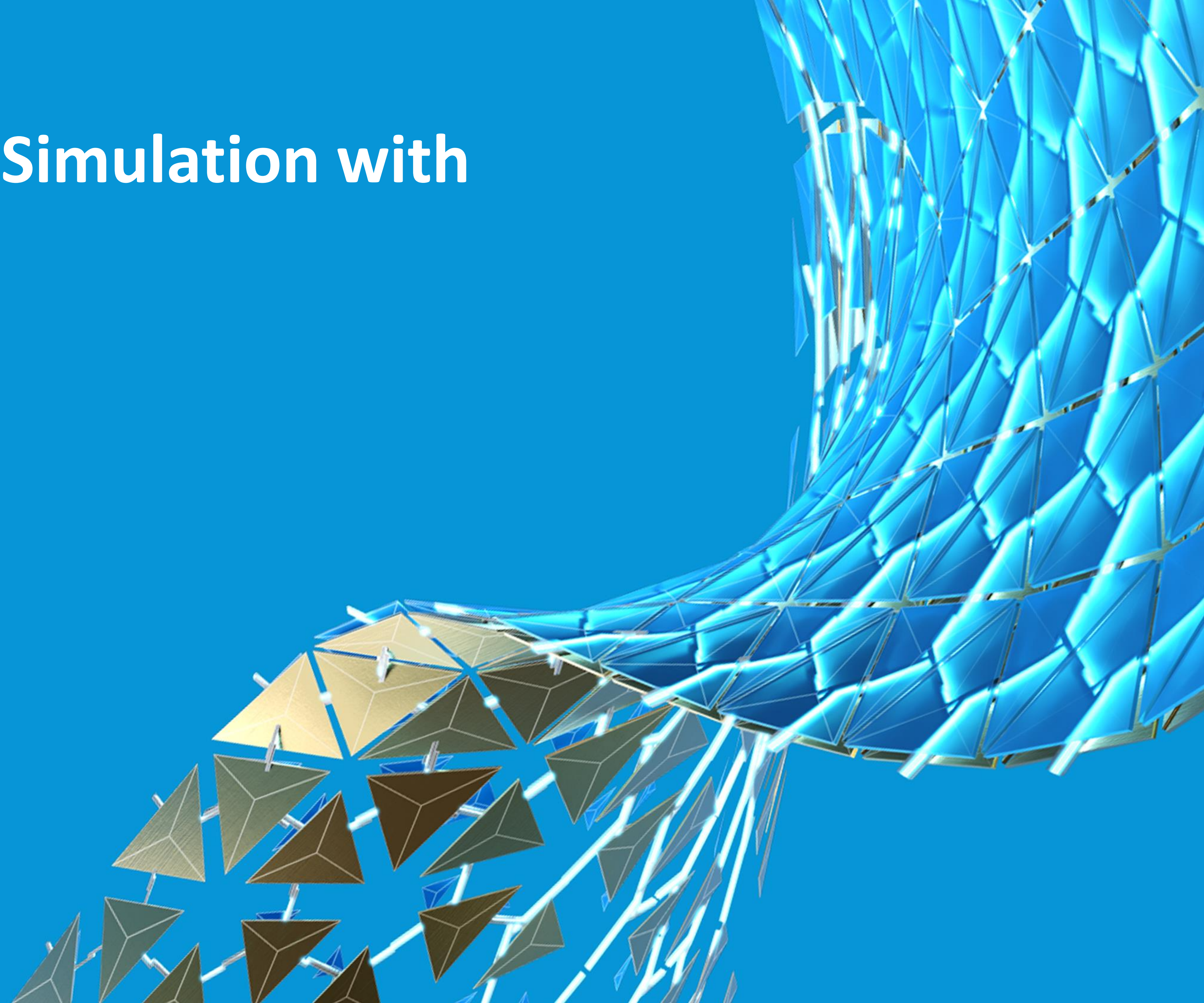
Conceptual View



# Flood Simulation



# Running Flood Simulation with Embankment





# Creating the Embankment



# Flood Simulation with Embankment

X: 91.189788 Y: 22.266077 Z: 4.376957m

PROFILE VIEW [ COMPONENT ROAD 1 ]

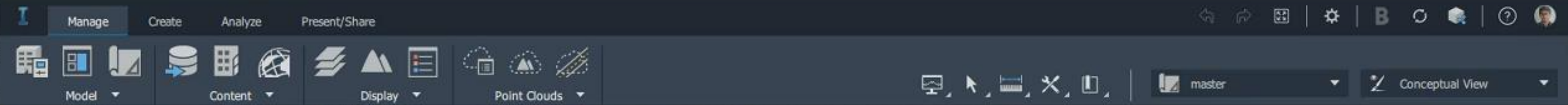


Vertical Exaggeration

1:1

Active Tracking

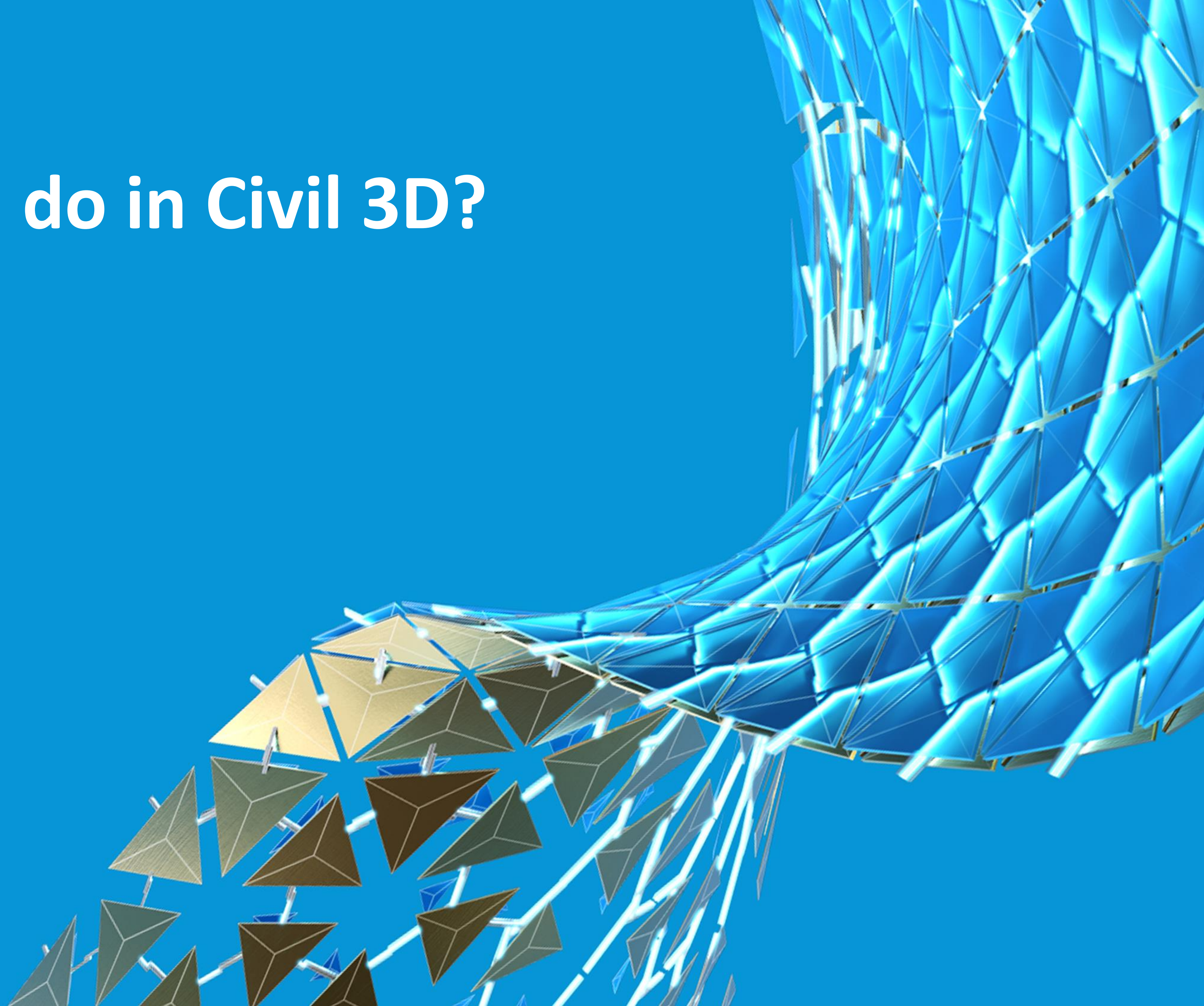




# Export to Civil 3D



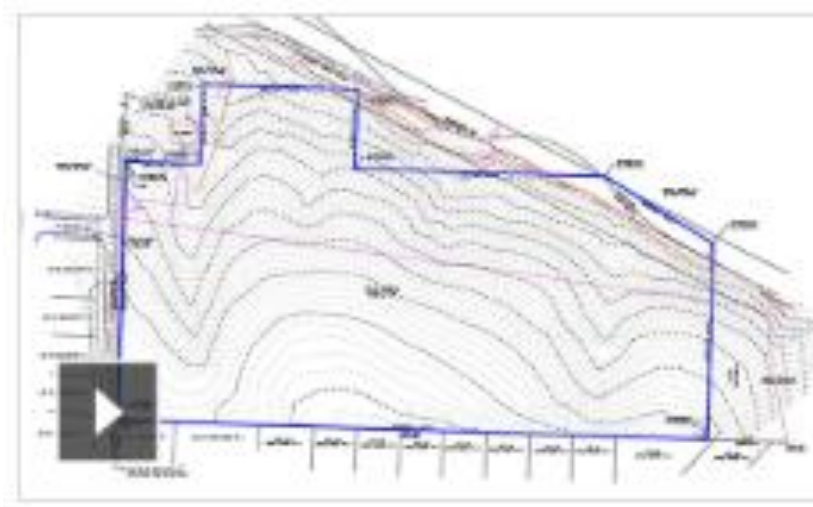
# What can you do in Civil 3D?





# Comprehensive, accurate designs

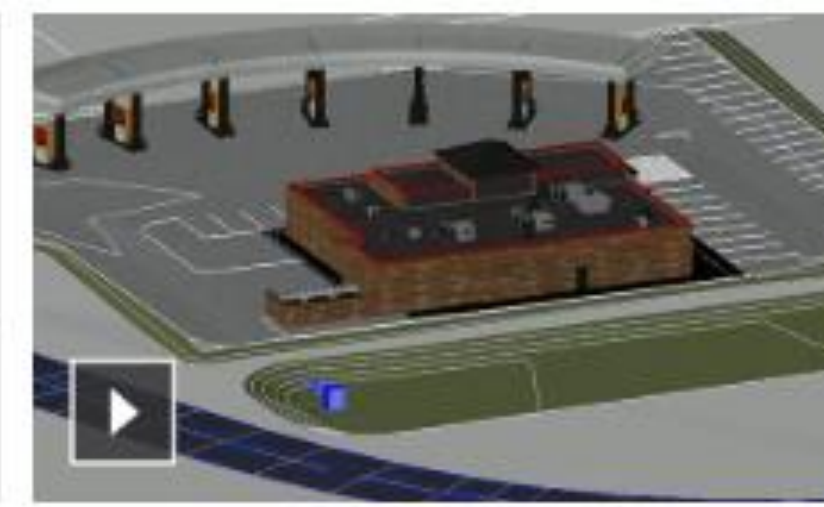
- Survey
- Terrain Modelling
- Stormwater Analysis (Pipe networks)
- Design automation
- Material Quantities



## Survey

Download, create, analyze, and adjust survey data. Streamline the transfer of field-captured data to and from the office. (video: 11 sec.)

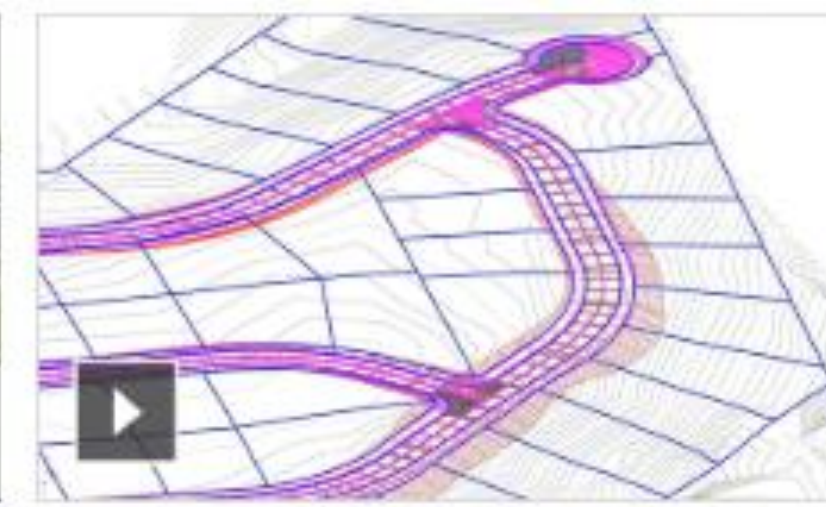
[Learn more](#)



## Terrain modeling

Create comprehensive digital models of ground topography for studies such as land-use feasibility, transportation system planning, and water flow simulations. (video: 14 sec.)

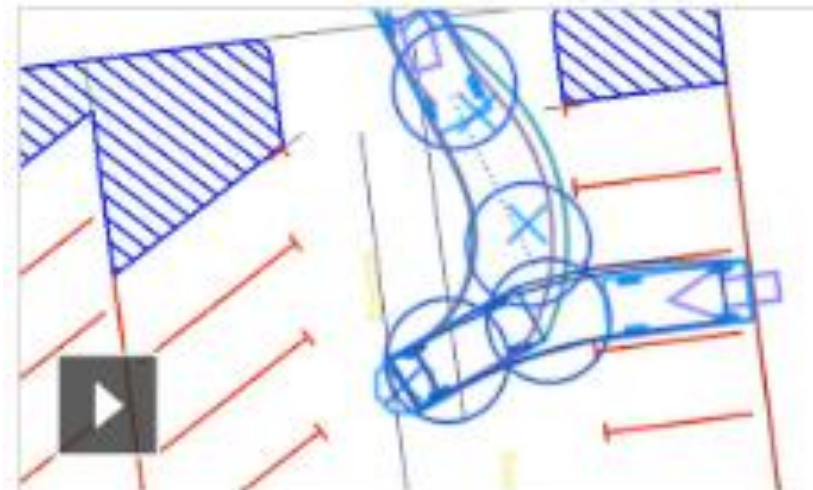
[Learn more](#)



## Corridor modeling

Create dynamic and data-rich corridor models for designs such as residential roads, curbs, and sidewalks, swales within a subdivision, and parking lot design. (video: 10 sec.)

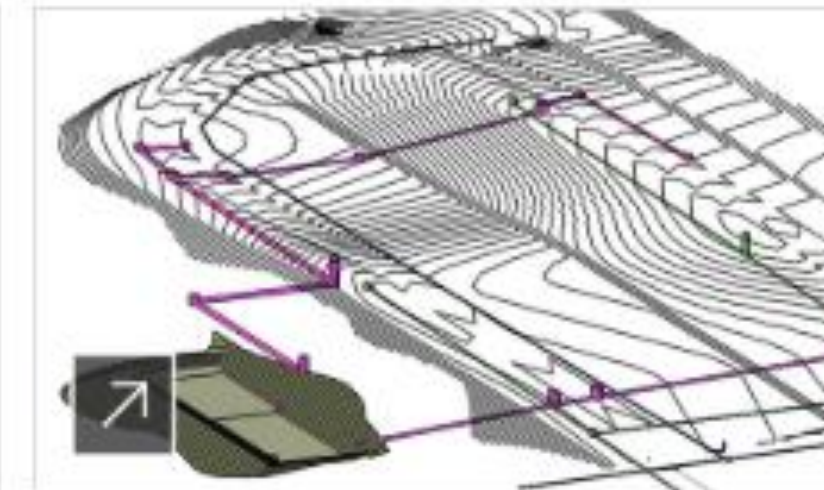
[Learn more](#)



## Vehicle tracking

Use swept path analysis to speed planning and evaluate safety standards compliance. Animate vehicle paths with 2D or 3D animations using multiple camera angles. (video: 20 sec.)

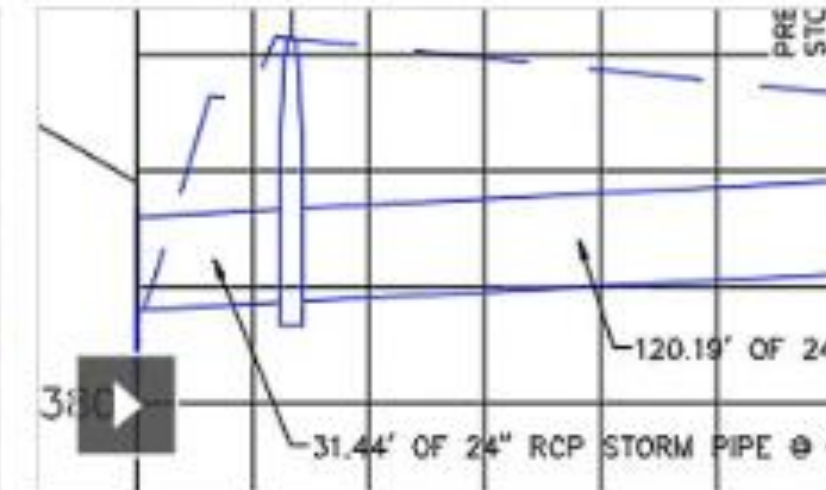
[Learn more](#)



## Stormwater and sanitary sewer

Model storm and sanitary sewer systems. Analyze networks to resize pipes, reset inverts, and compute energy and hydraulic grade lines according to HEC-22 standards.

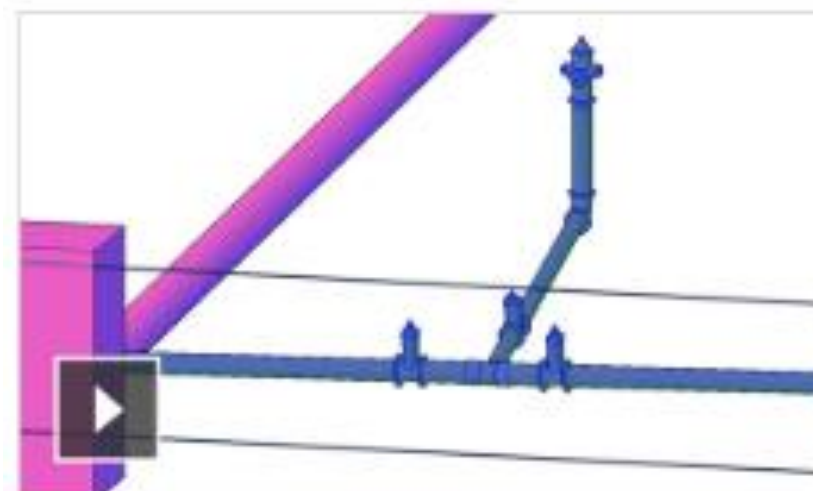
[Learn more](#)



## Stormwater analysis

Integrate stormwater and wastewater analysis during planning and design of urban drainage systems, storm and sanitary sewers. (video: 39 sec.)

[Learn more](#)



## Pressurized utilities

Lay out horizontal and vertical 3D design of pressure networks. Model deflected-curve pipe segments, and use design and depth checks to meet project standards. (video: 11 sec.)



## Design automation

Use a visual programming application to generate scripts that automate repetitive and complex tasks. Save these scripts in a library and reuse them as needed. (video: 1:49 min.)

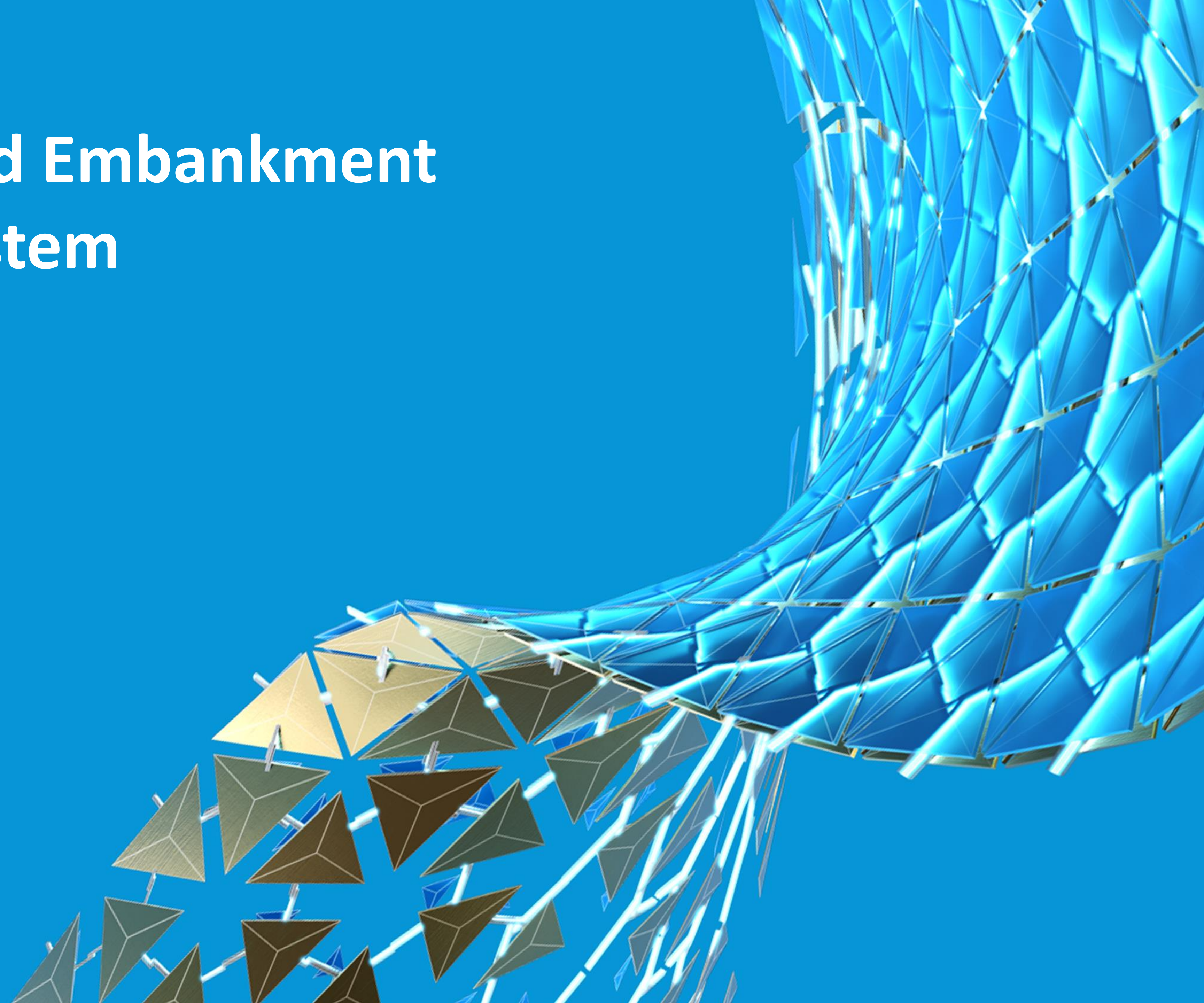
Pay Item ID	Description
60201-0500	15-INCH PIPE
60201-0600	18-INCH PIPE
60201-0800	24-INCH PIPE

## Materials and quantities

Use materials and sectional or profile information to create reports for volumes along an alignment, comparing design and existing ground surfaces, and quantity takeoff. (video: 13 sec.)



# IoT based Flood Embankment Monitoring System





# Current Monitoring Systems

- Geotechnical research (Field & laboratory)
- Visual research (unmanned systems & numerical maps)
- Geophysical methods





# Why is the current system ineffective?

- Continuous degradation of embankment structure
- Frequent Cyclones
- Erosion

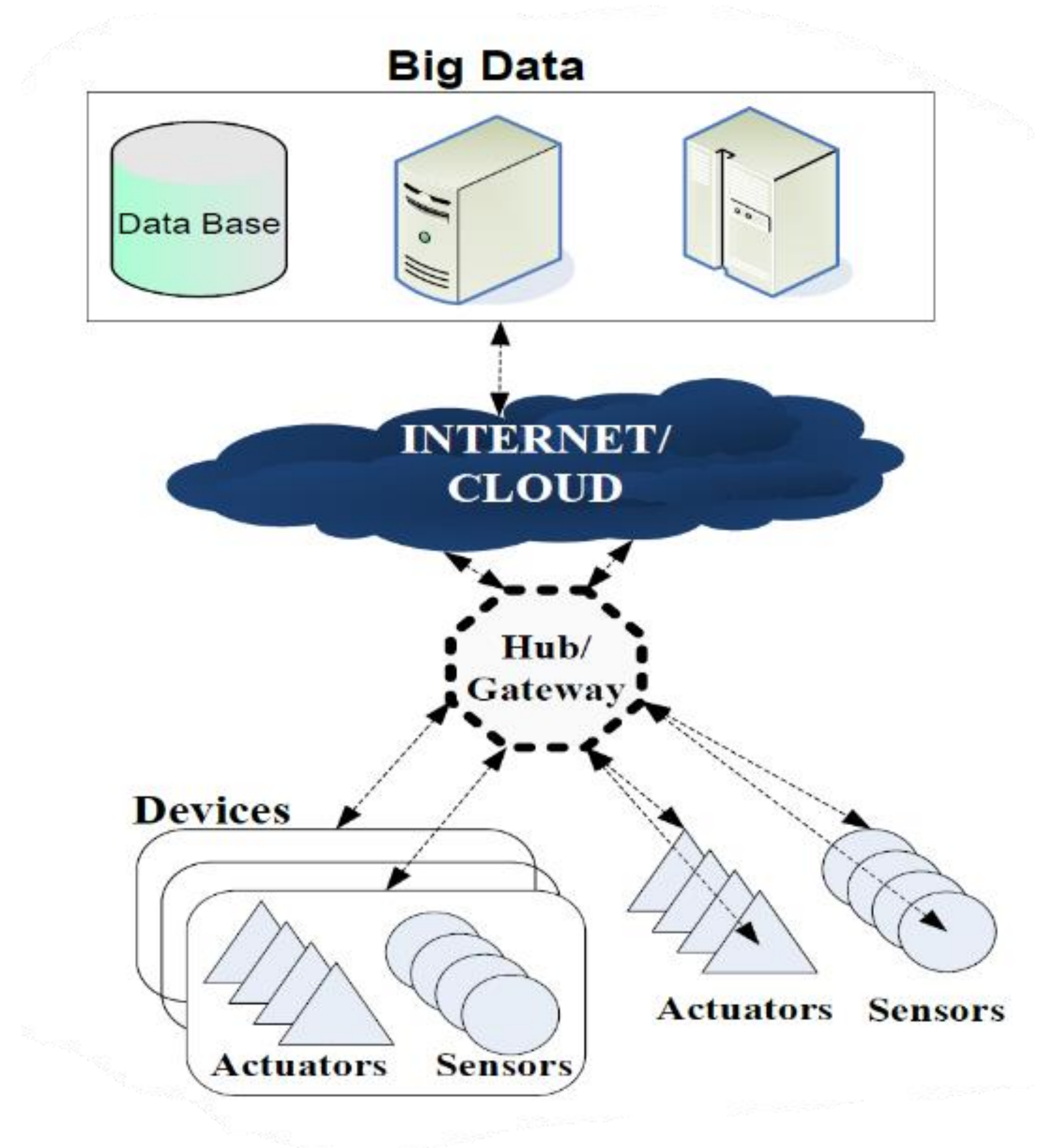
*The proposed system will provide permanent and non-invasive monitoring of the floods and riverside areas, on the one hand to support flood protection for cities and rural areas (including agricultural areas), and on the other to support river ecosystems and discreet river control of the regulatory ecosystem service especially in non-urban areas.*





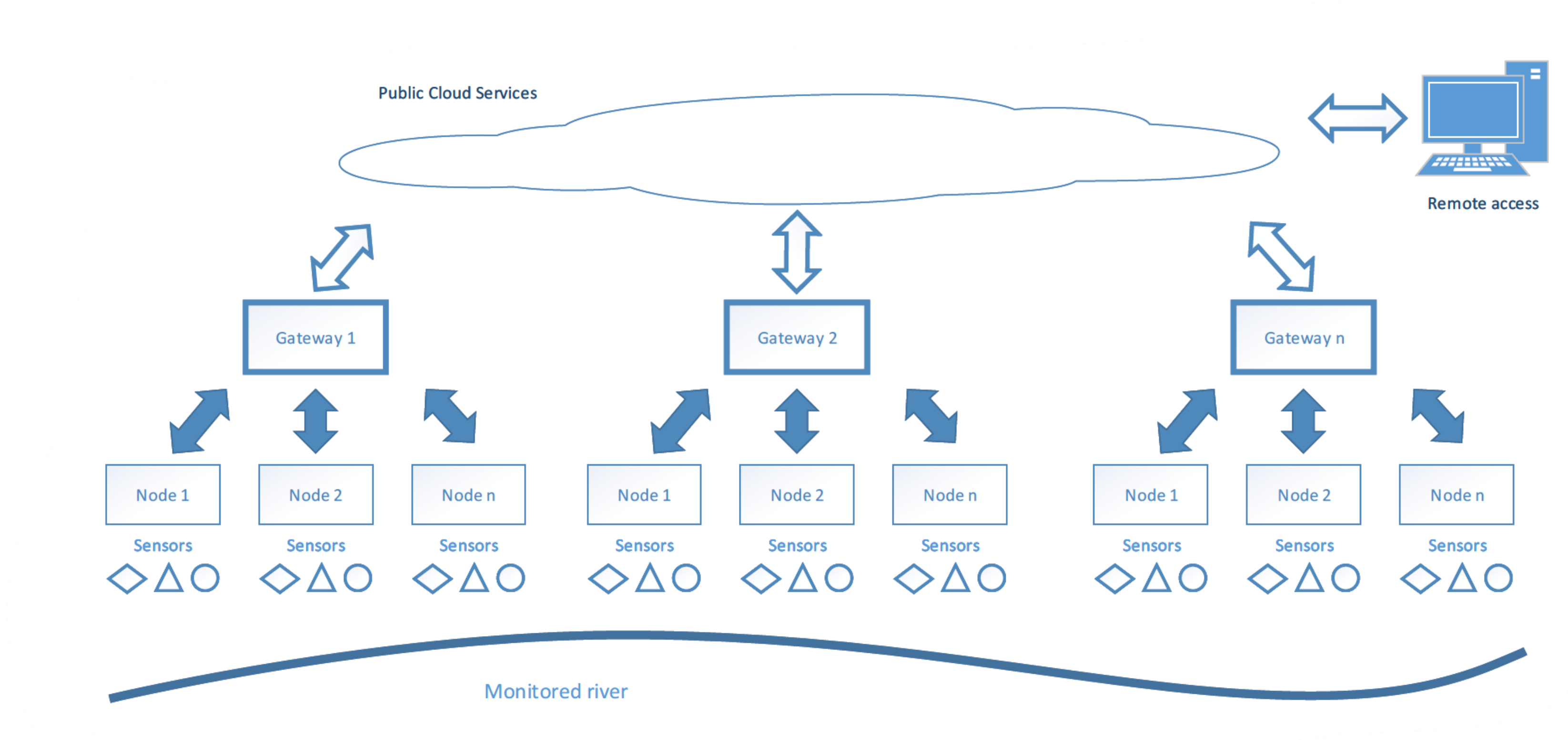
# Creating an Intelligent Environment

- Sensors
- Nodes
- Gateways
- Cloud Based Services



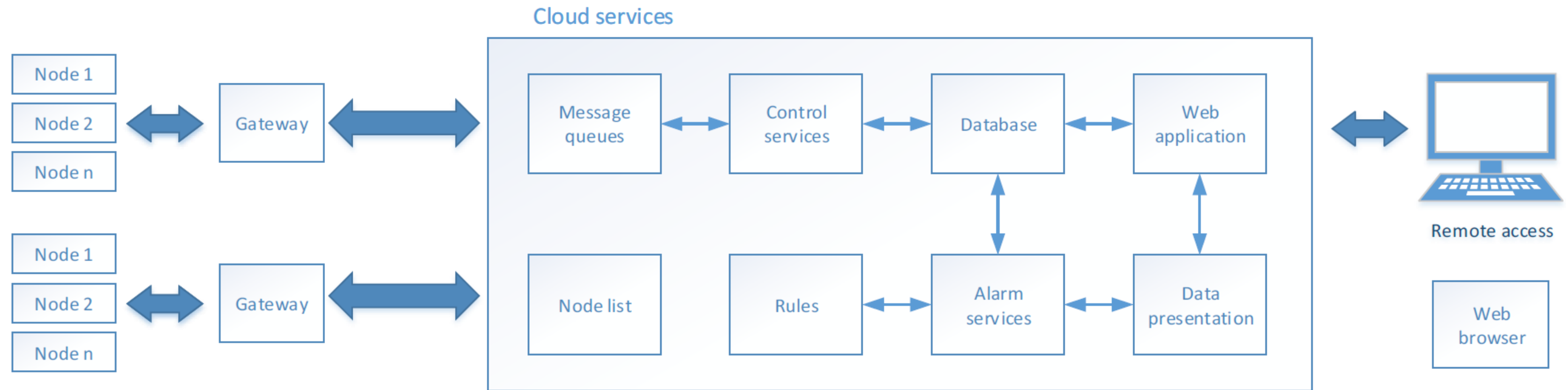


# Flood Embankment Monitoring System





# Cloud Service Architecture





# Security

- Providers of cloud computing services treat security with big attention
- Communication modules guarantee security level



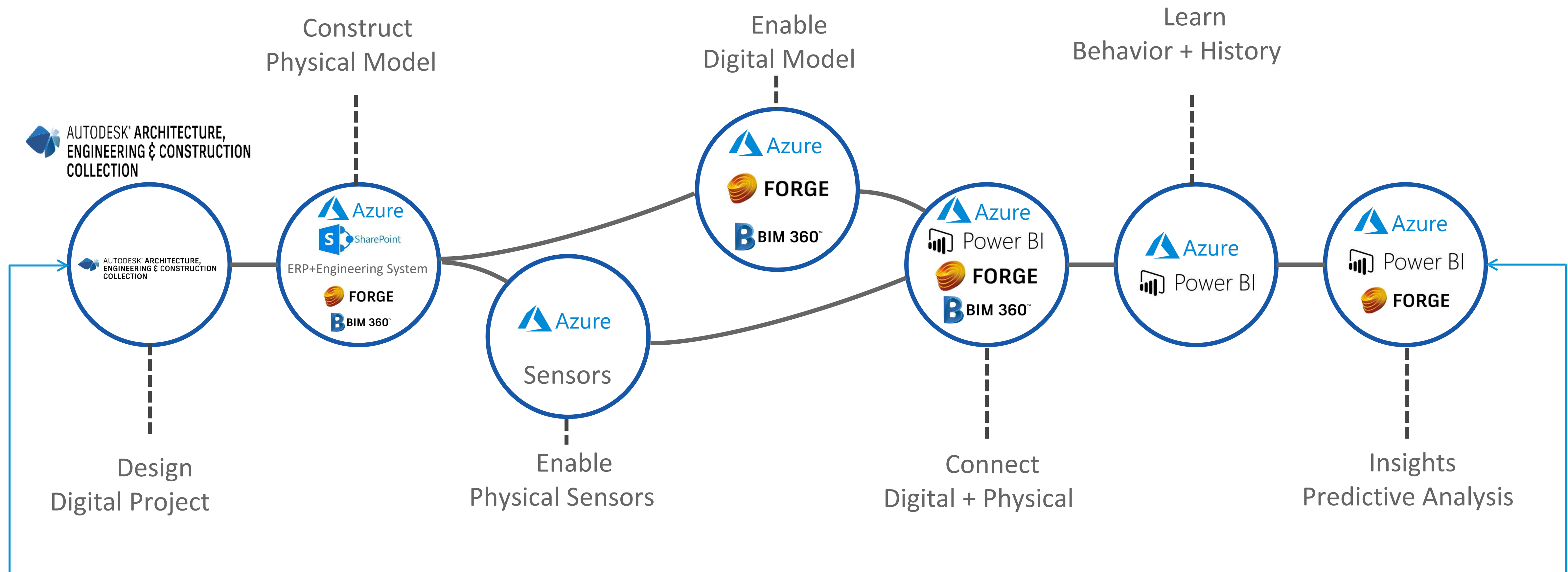


# What did we learn?





IoT technology, along with available cloud computing platforms, enables the construction of a real-time flood monitoring system.







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