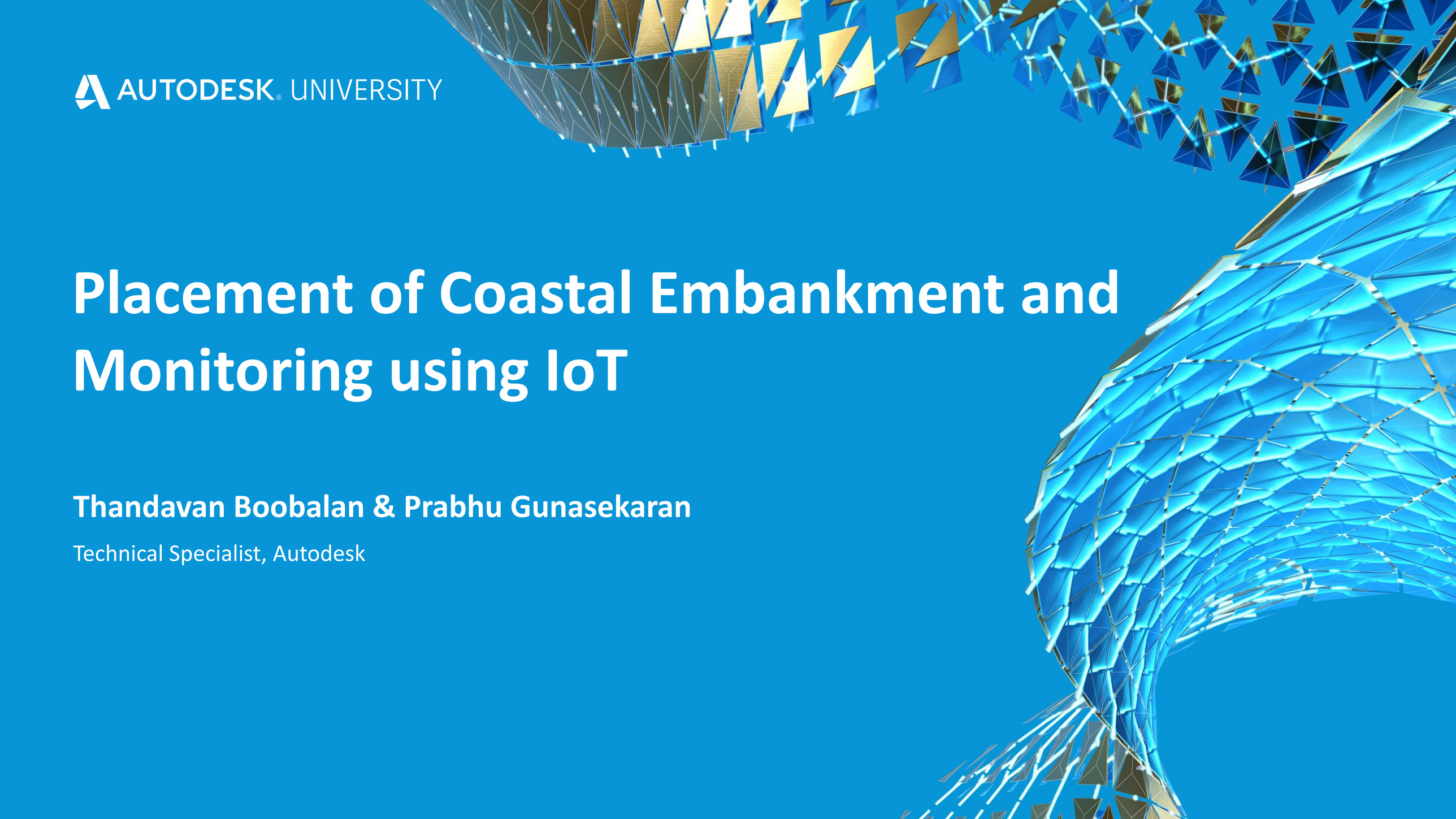
AUTODESK. UNIVERSITY

Placement of Coastal Embankment and Monitoring using IoT

Thandavan Boobalan & Prabhu Gunasekaran

Technical Specialist, Autodesk

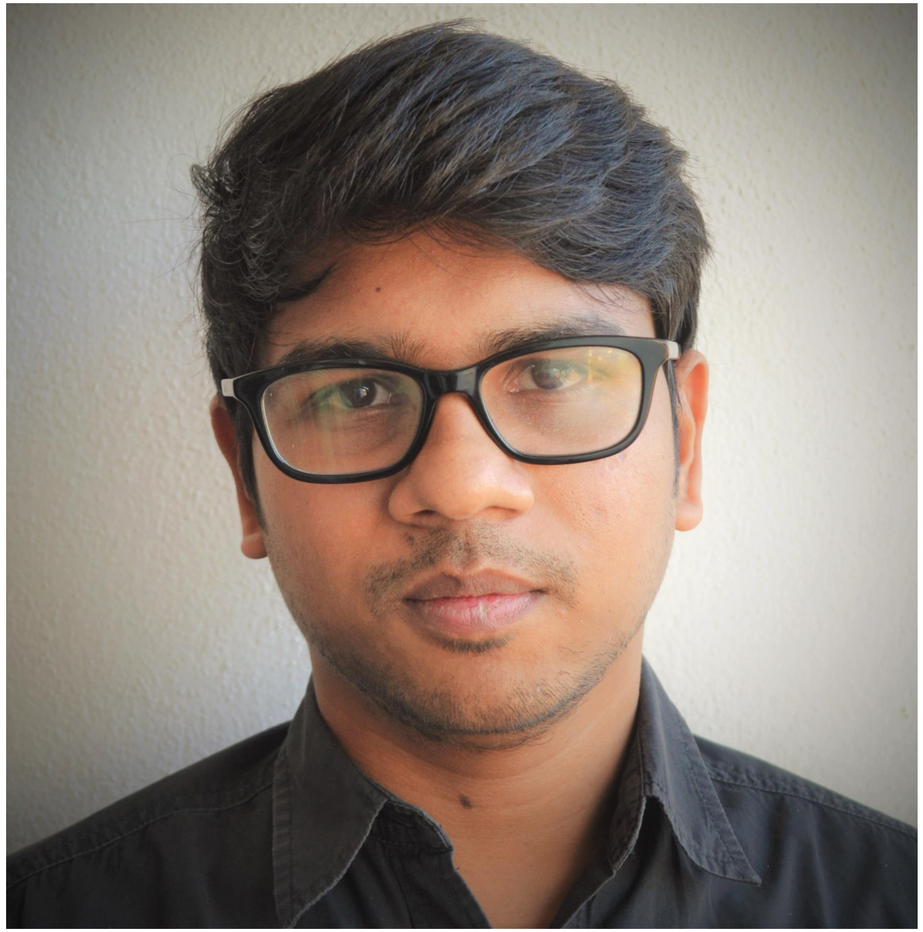


About the speaker

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.

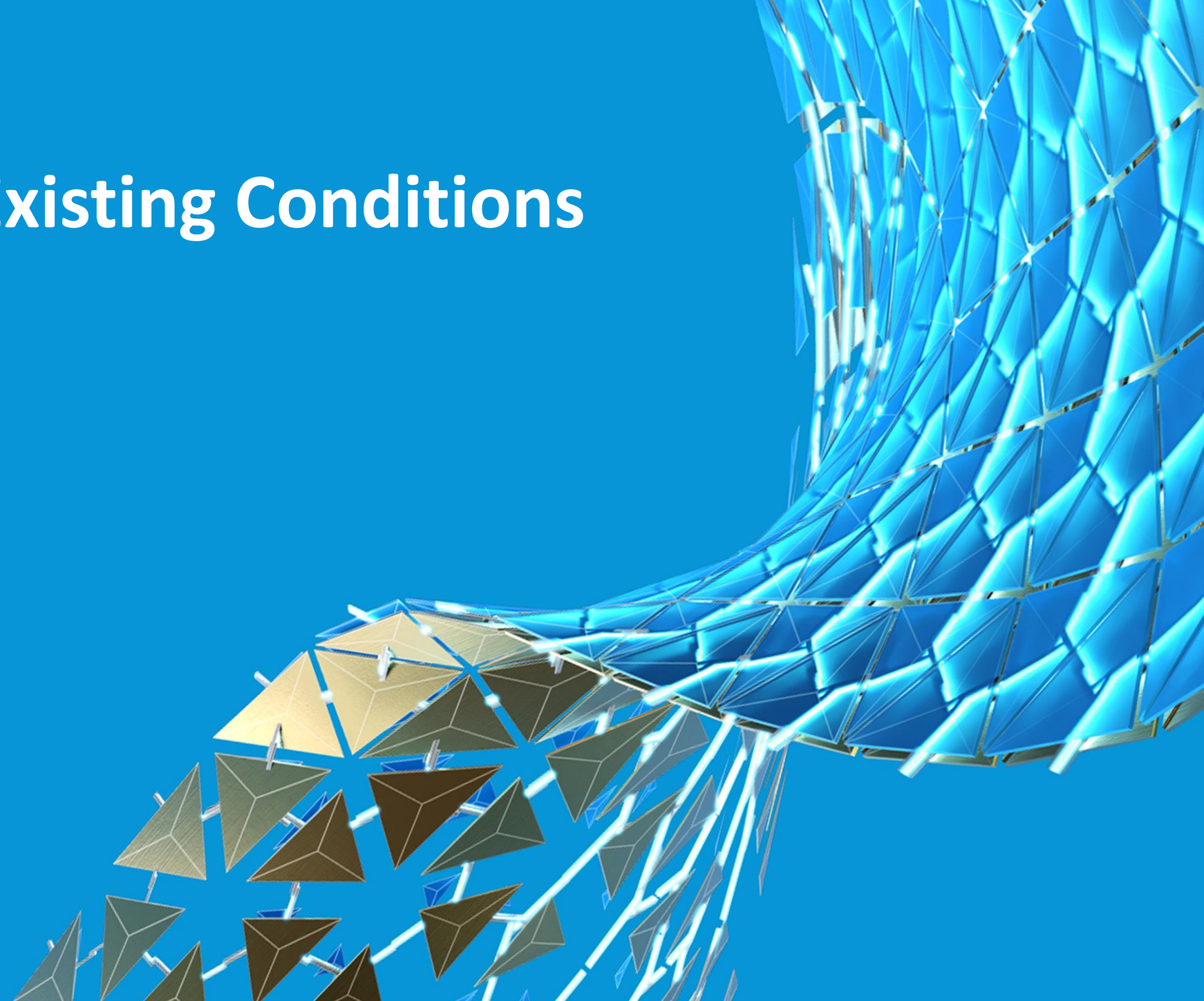
Building Information Modeling

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

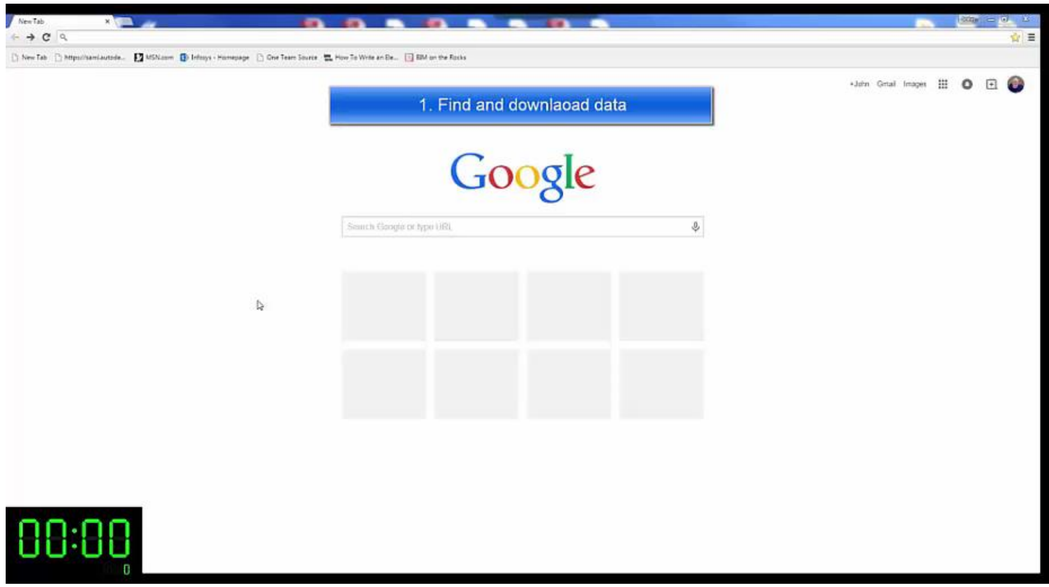
“A minimal increase in upfront costs of about 2% to support optimized design will lead on average to life-cycle savings of 20% on total costs.”

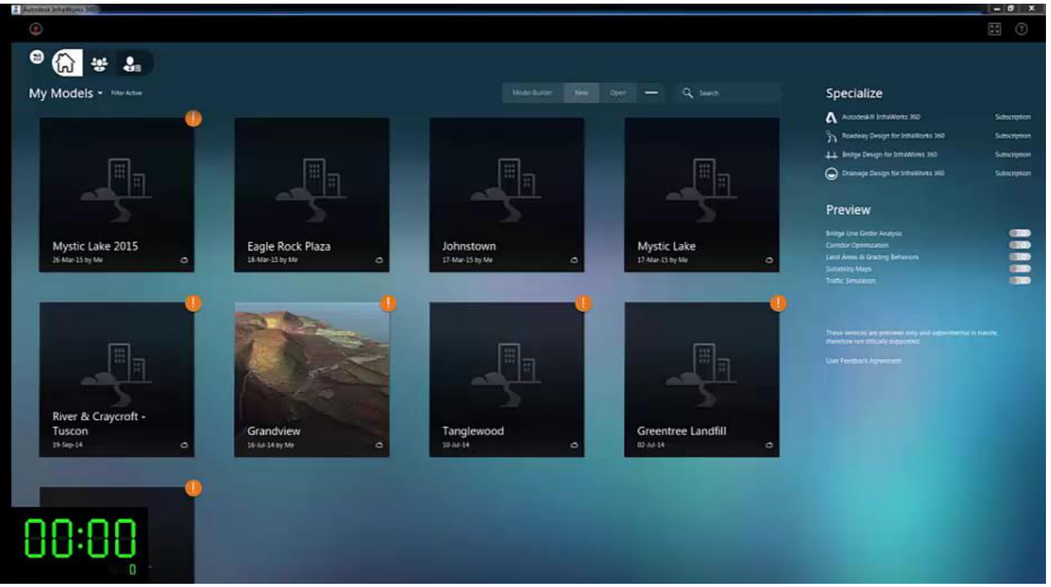
Building Information Modeling (BIM) is an intelligent 3D model-based process that gives architecture, engineering, and construction (AEC) professionals the insight and tools to more efficiently plan, design, construct, and manage buildings and infrastructure.

Establishing Existing Conditions



Establishing Existing Conditions





Doing it with AutoCAD – typical workflow

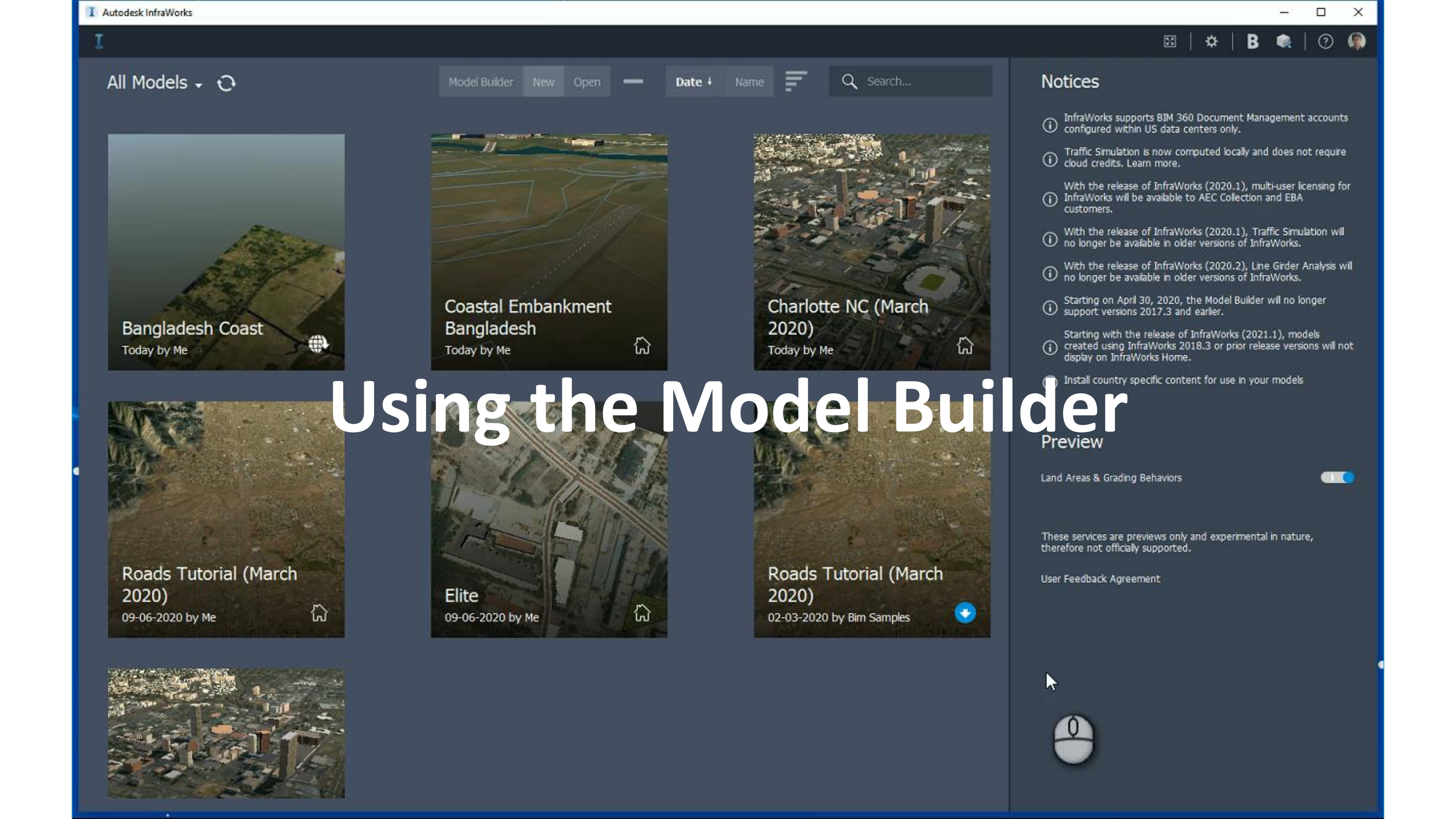
1. Acquire data
2. Translate format
3. Configure Civil 3D environment
4. Create a surface from GIS data
5. Capture imagery
6. Import vector data

End Result: Aerial image with contours and lines

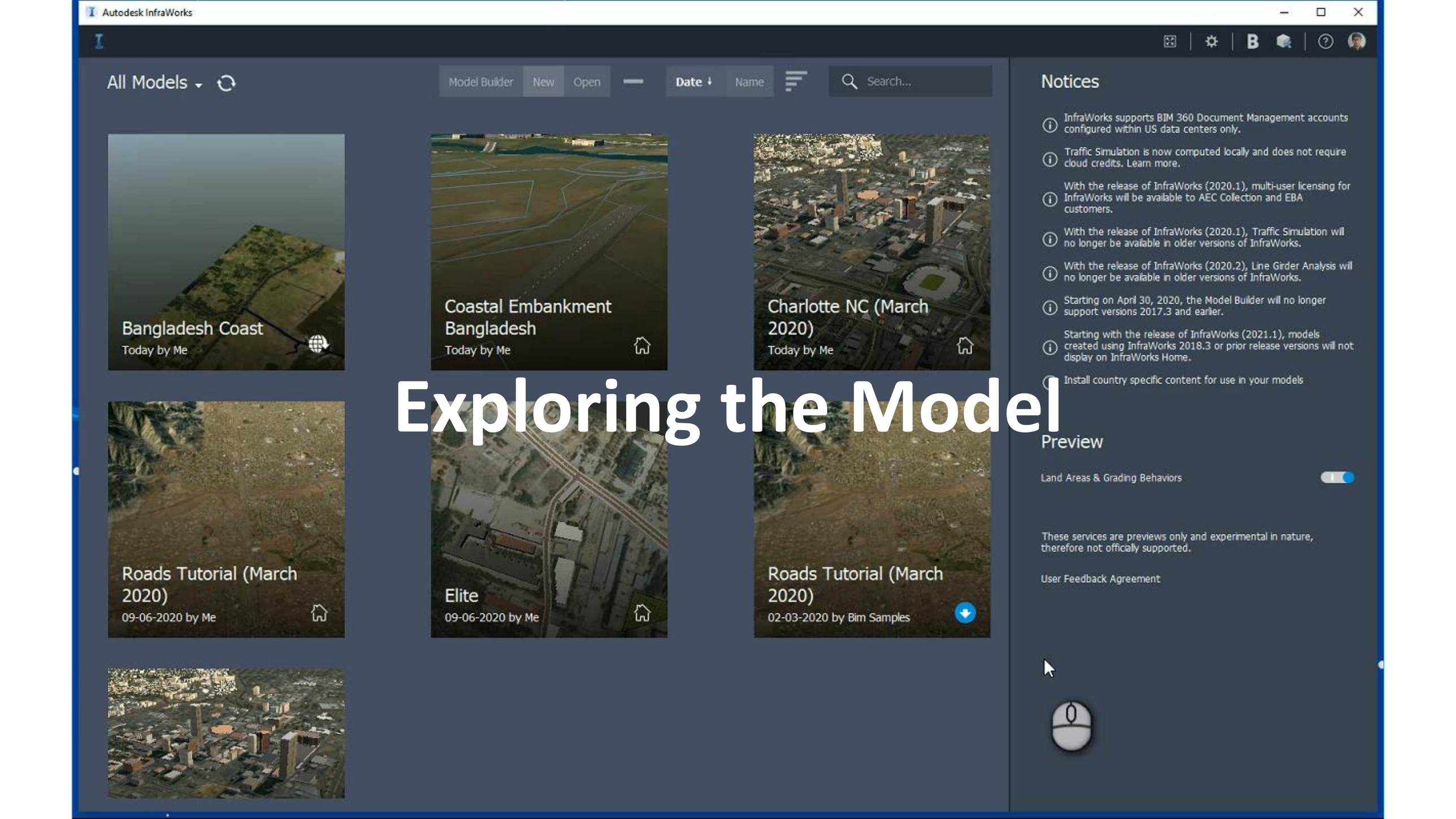
Doing it with InfraWorks 360

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

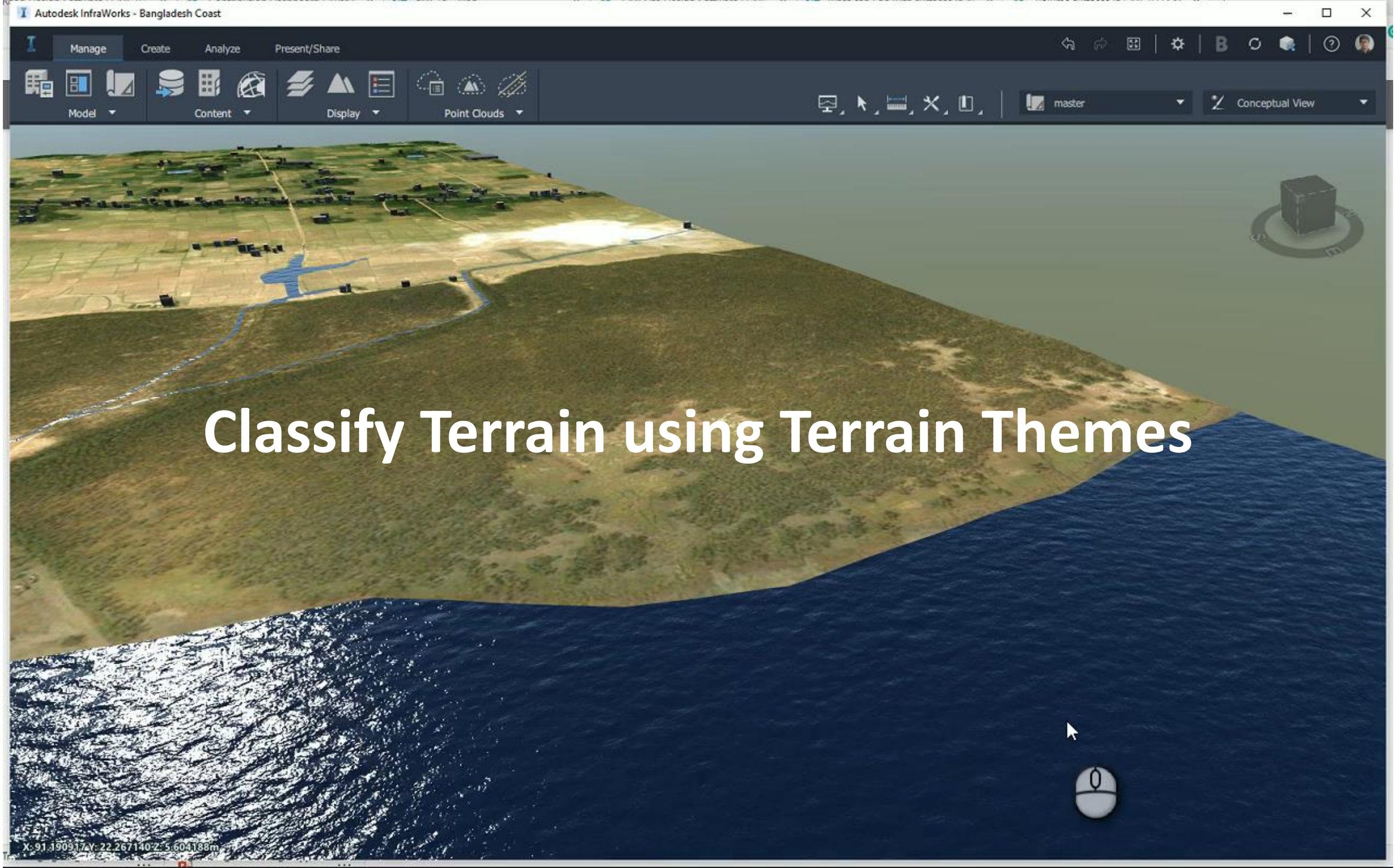
End Result: 3D model with terrain, draped aerial imagery, 3D roads. 3D water features, and 3D buildings



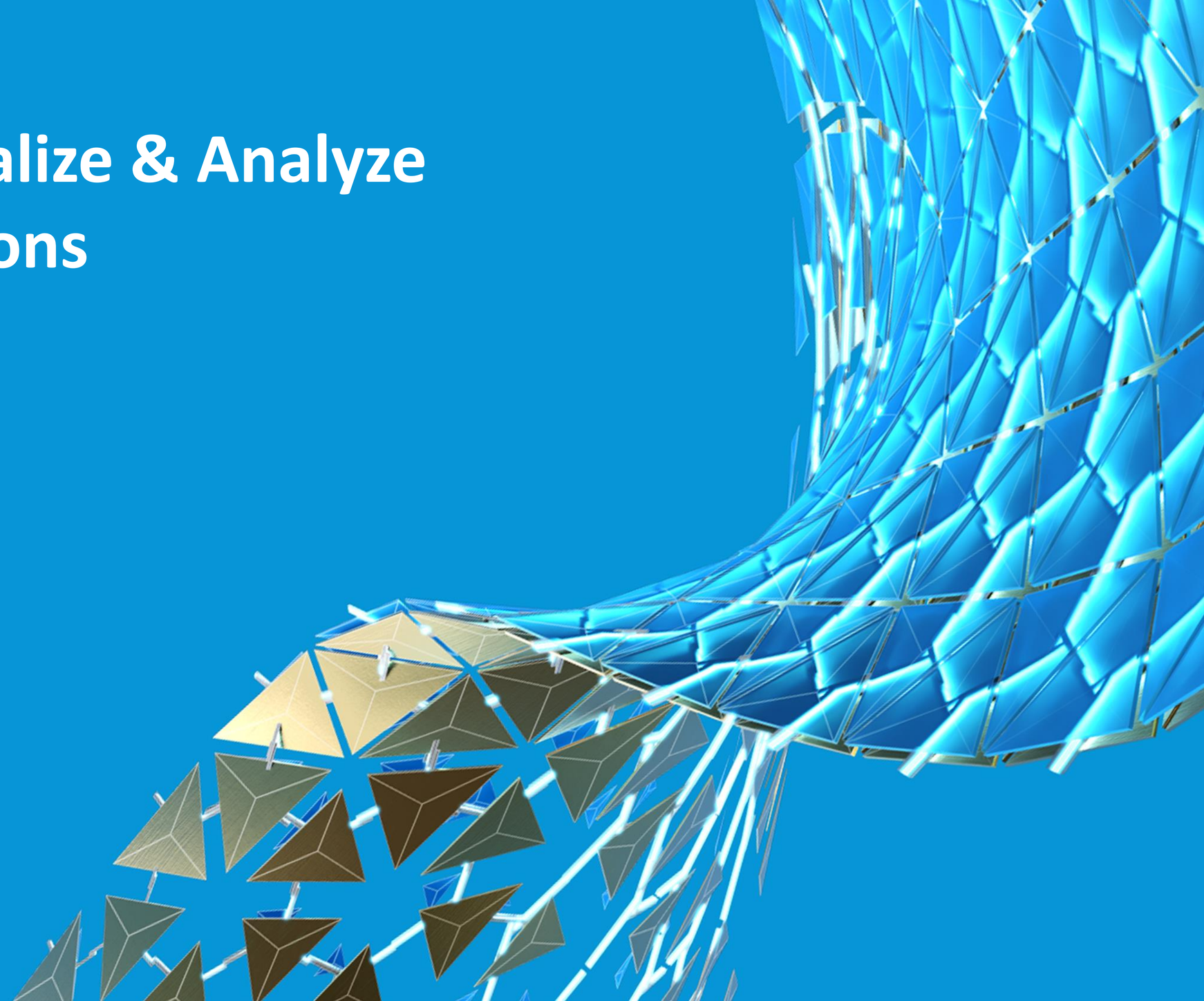
Using the Model Builder

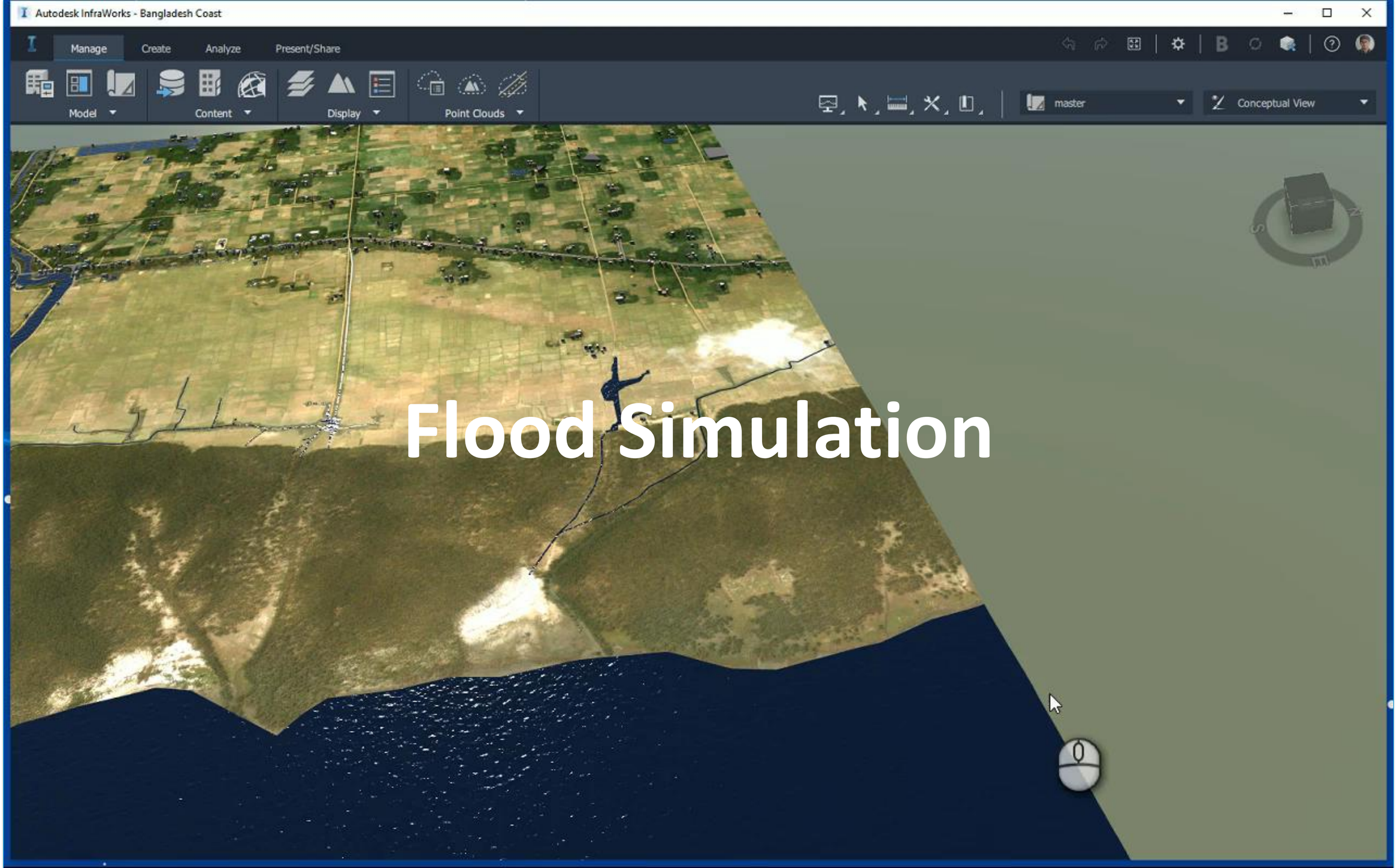


Exploring the Model


Autodesk InfraWorks - Bangladesh Coast
Manage
Create
Analyze
Present/Share
Model
Content
Display
Point Clouds
master
Conceptual View
Classify Terrain using Terrain Themes

Simulate, Visualize & Analyze Flood Simulations




Autodesk InfraWorks - Bangladesh Coast
Manage
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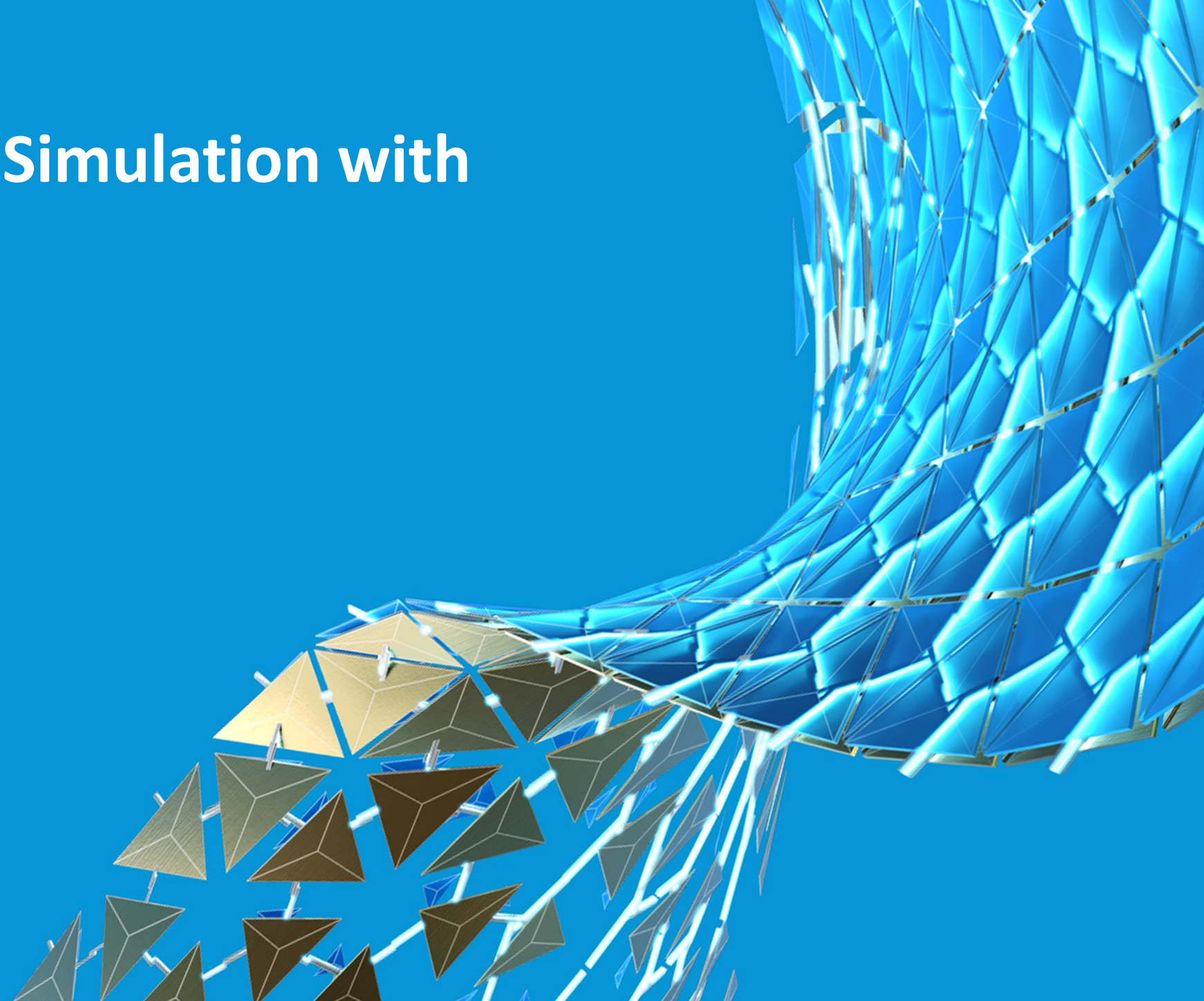
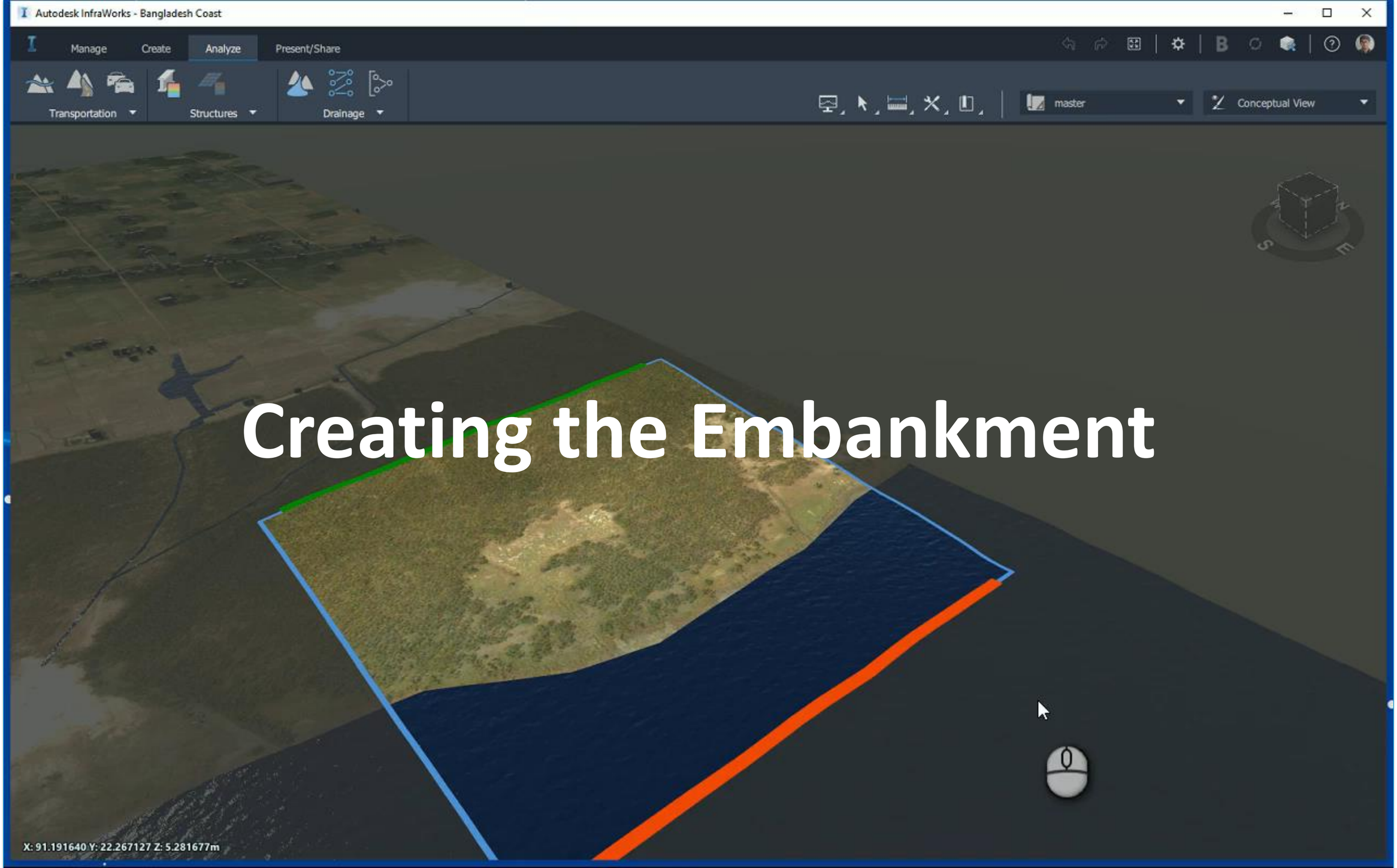
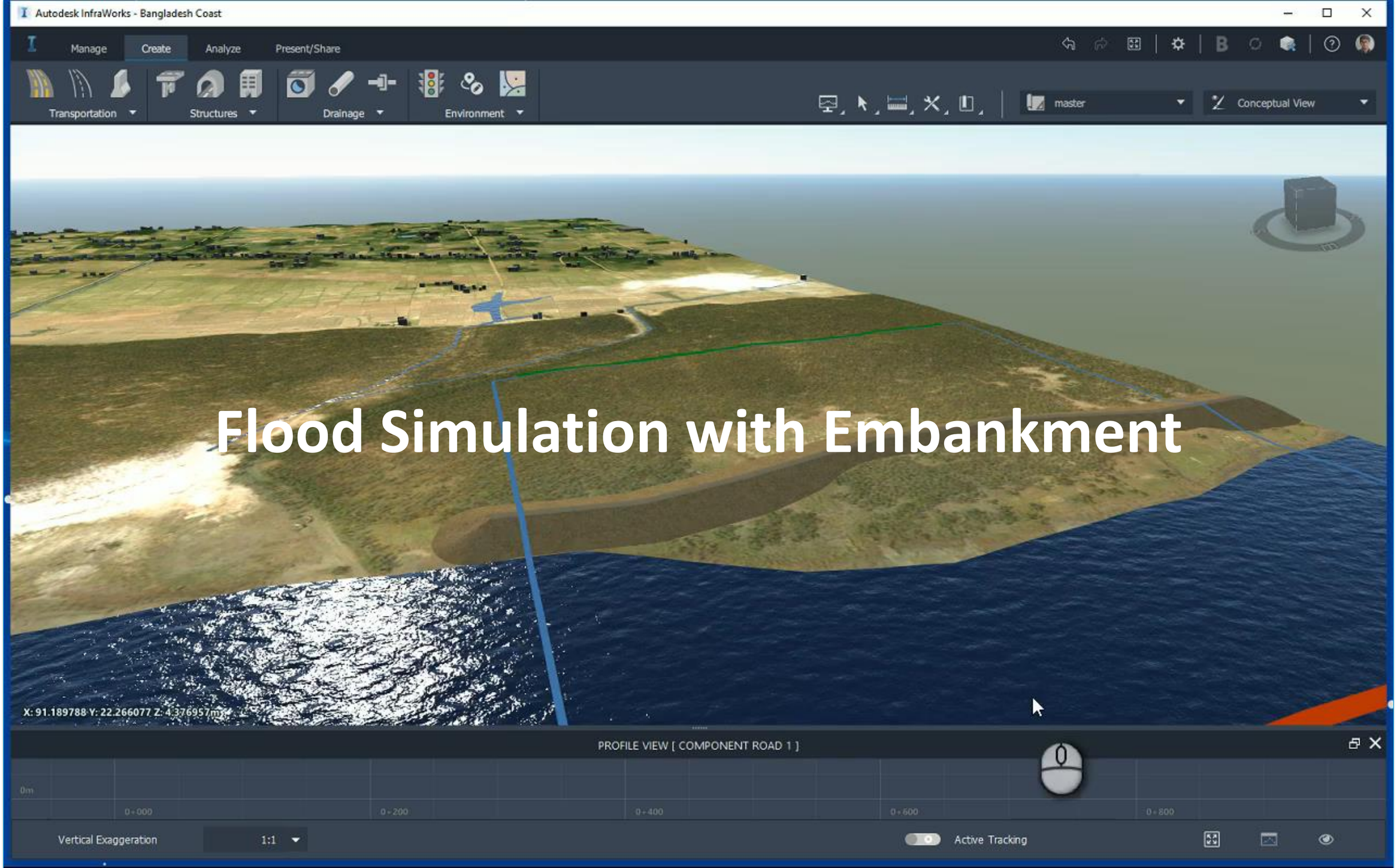
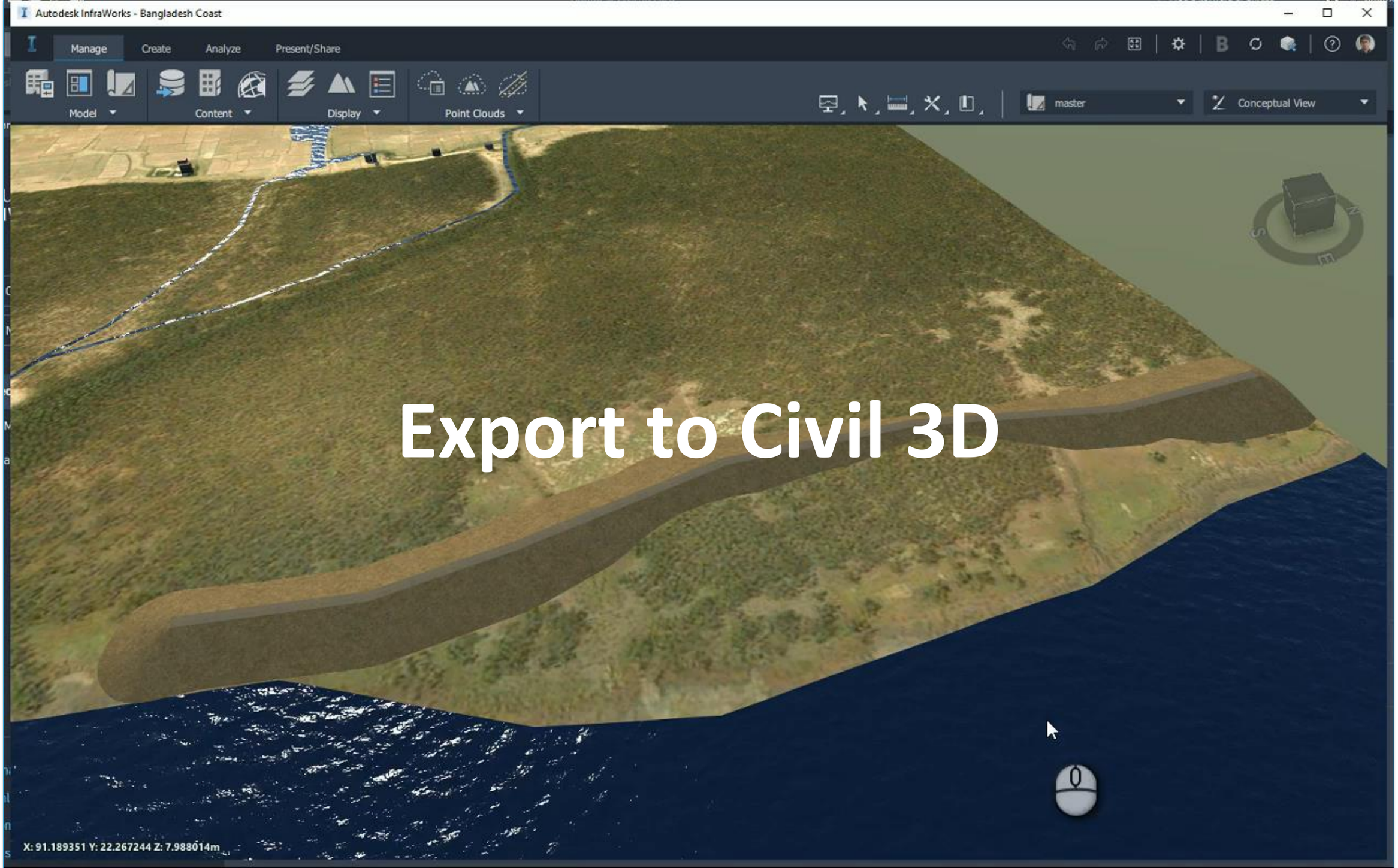
Content
Display
Point Clouds
master
Conceptual View
Flood Simulation

Running Flood Simulation with Embankment

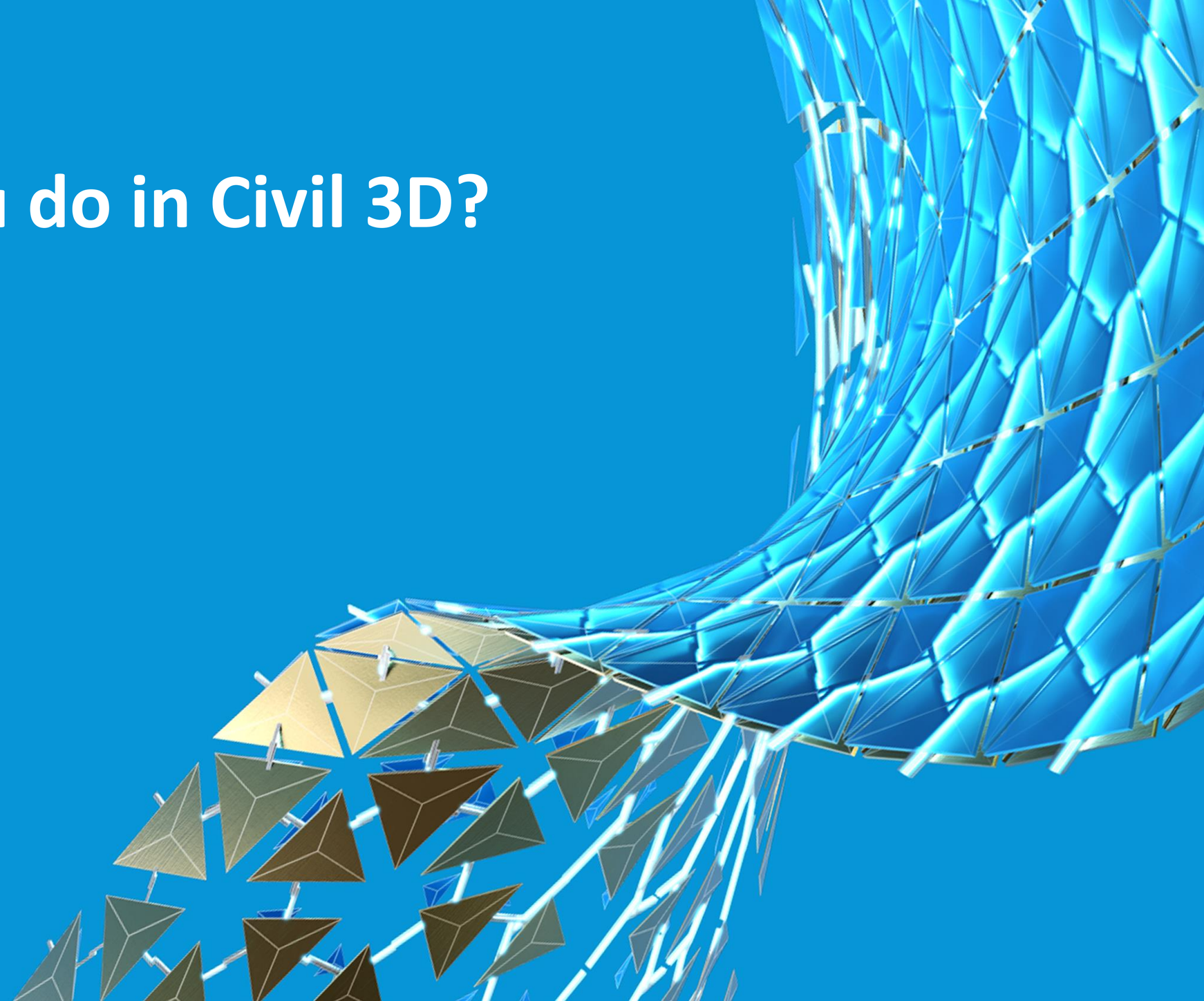



Autodesk InfraWorks - Bangladesh Coast
Manage
Create
Analyze
Present/Share
Transportation
Structures
Drainage
master
Conceptual View
Creating the Embankment
X: 91.191640 Y: 22.267127 Z: 5.281677m


Autodesk InfraWorks - Bangladesh Coast
Manage
Create
Analyze
Present/Share
Transportation
Structures
Drainage
Environment
master
Conceptual View
Flood Simulation with Embankment
X: 91.189788 Y: 22.266077 Z: 4.376957 m
PROFILE VIEW [COMPONENT ROAD 1]
0m
0+000
0+200
0+400
0+600
0+800
Vertical Exaggeration
1:1
Active Tracking

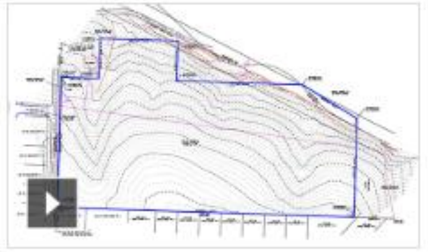

Autodesk InfraWorks - Bangladesh Coast
Manage
Create
Analyze
Present/Share
Model
Content
Display
Point Clouds
master
Conceptual View
Export to Civil 3D
X: 91.189351 Y: 22.267244 Z: 7.988014m

What can you do in Civil 3D?



Comprehensive, accurate designs

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



Survey

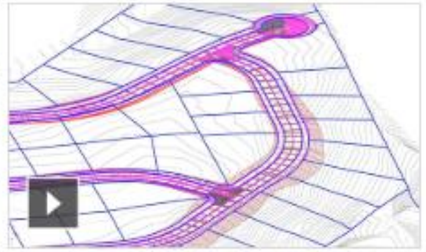
Download, create, analyze, and adjust survey data. Streamline the transfer of field-captured data to and from the office. (video: 11 sec.)

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

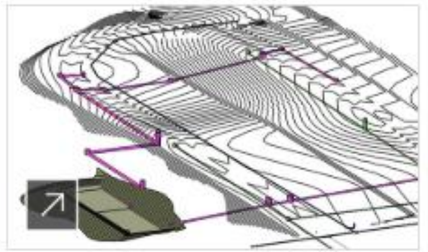
Create dynamic and data-rich corridor models for designs such as residential roads, curbs, and sidewalks, swales within a subdivision, and parking lot design. (video: 10 sec.)

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.)

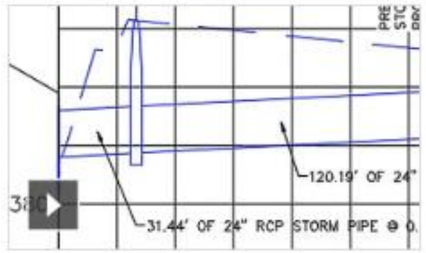
Learn more



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.

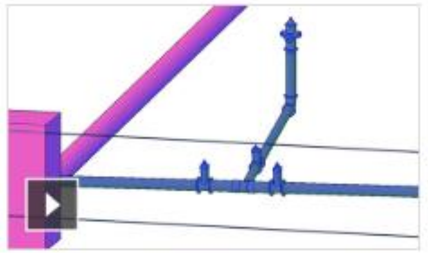
Learn more



Stormwater analysis

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

Learn more

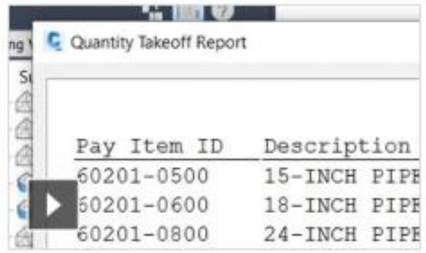


Pressurized utilities

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

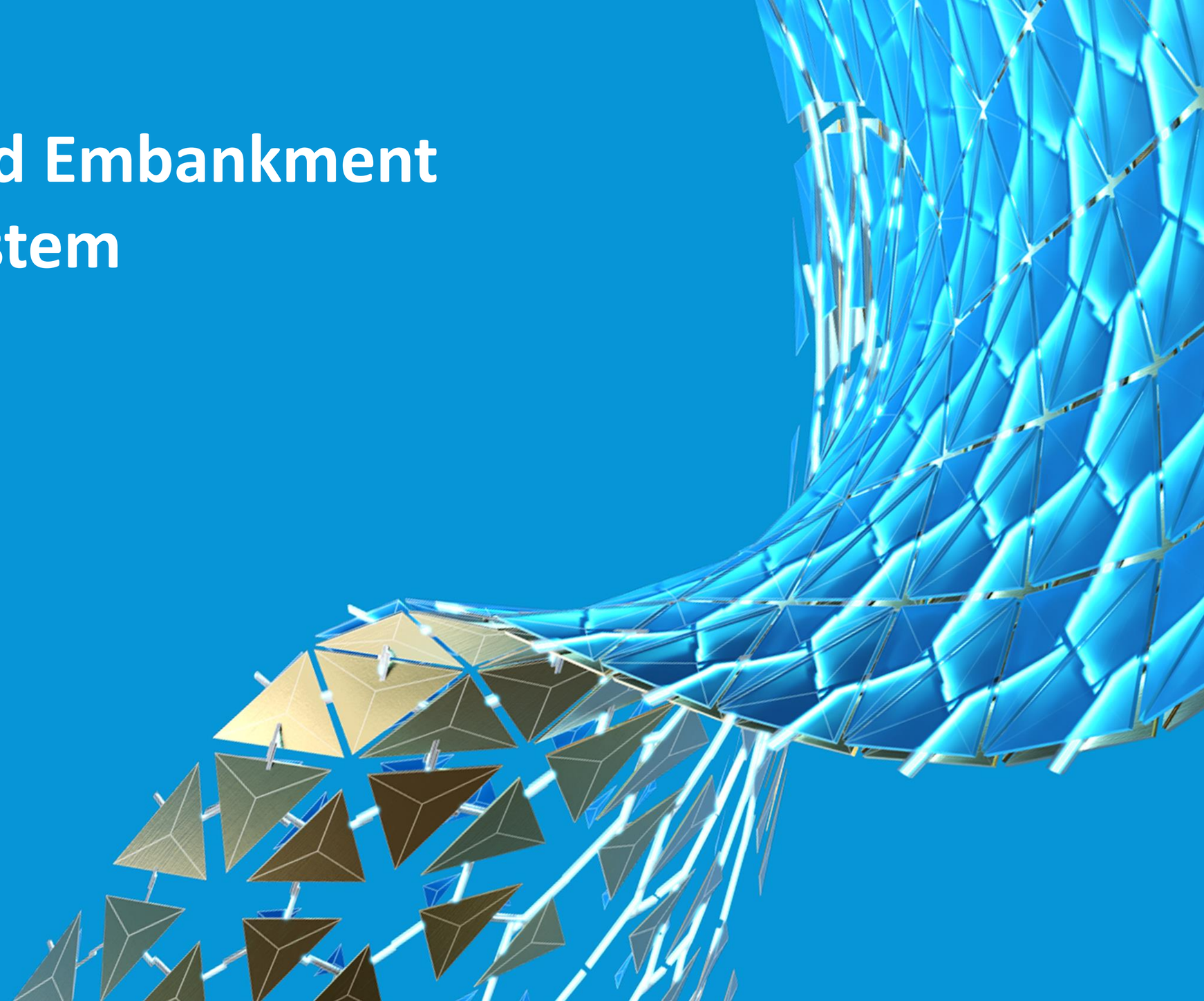
Use a visual programming application to generate scripts that automate repetitive and complex tasks. Save these scripts in a library and reuse them as needed. (video: 1:49 min.)



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**

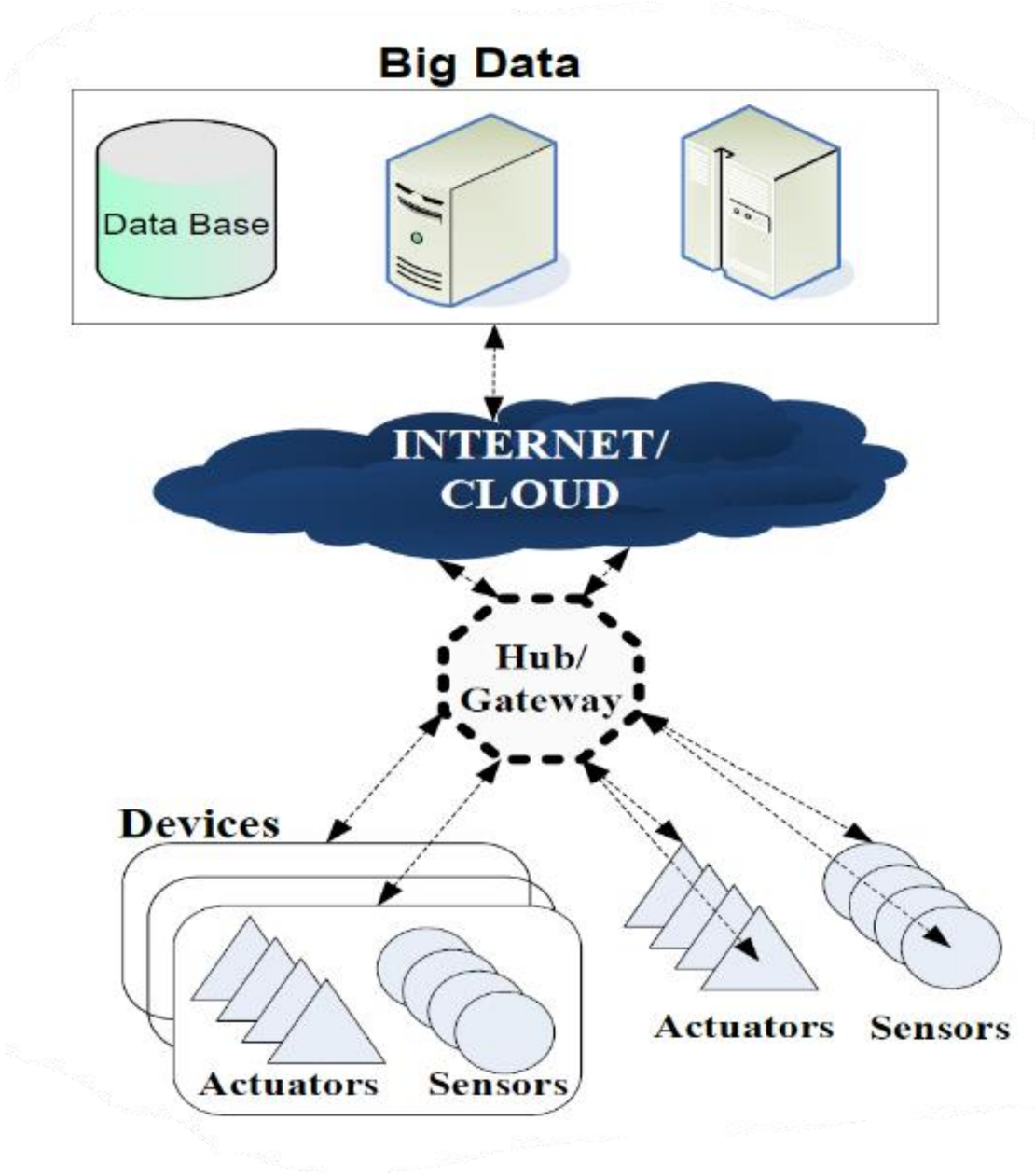
Why is the current system ineffective?

- **Continuous degradation of embankment structure**
- **Frequent Cyclones**
- **Erosion**

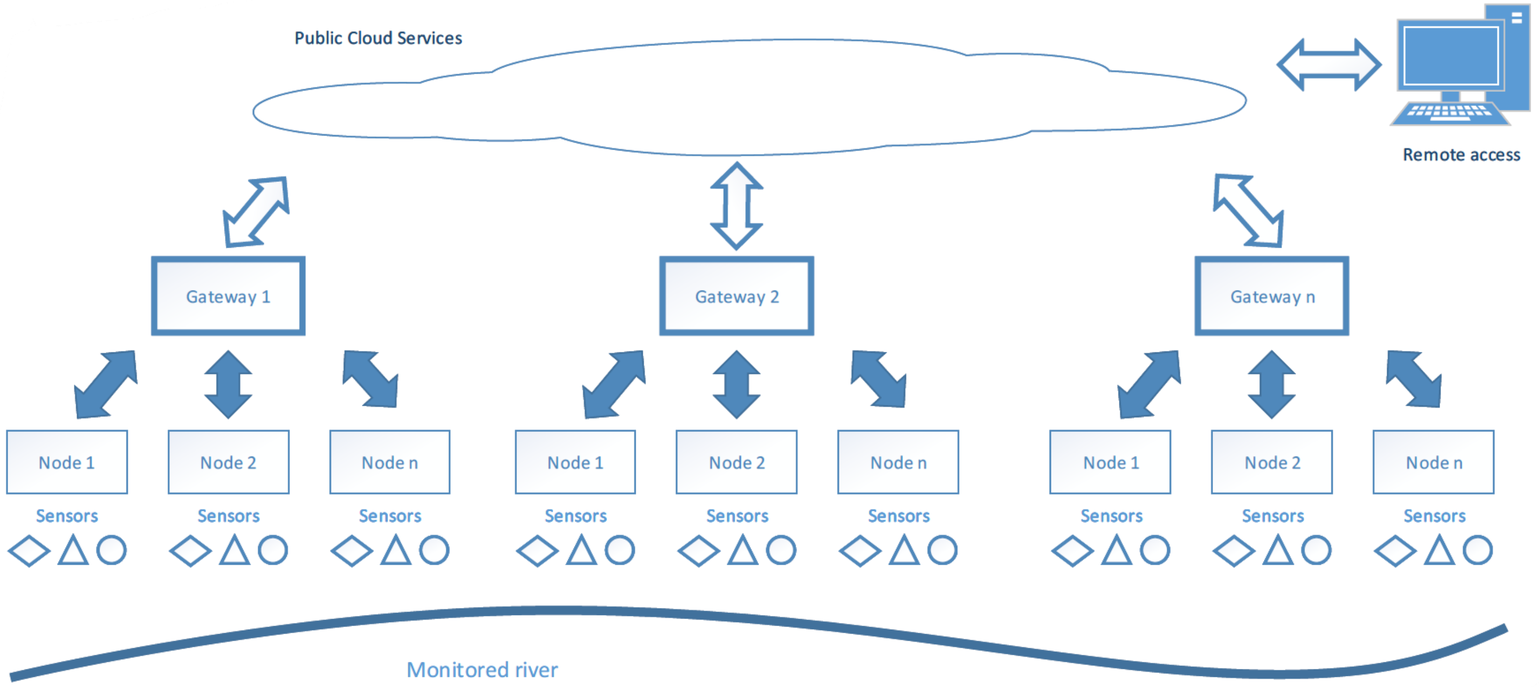
The proposed system will provide permanent and non-invasive monitoring of the floods and riverside areas, on the one hand to support flood protection for cities and rural areas (including agricultural areas), and on the other to support river ecosystems and discreet river control of the regulatory ecosystem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

Creating an Intelligent Environment

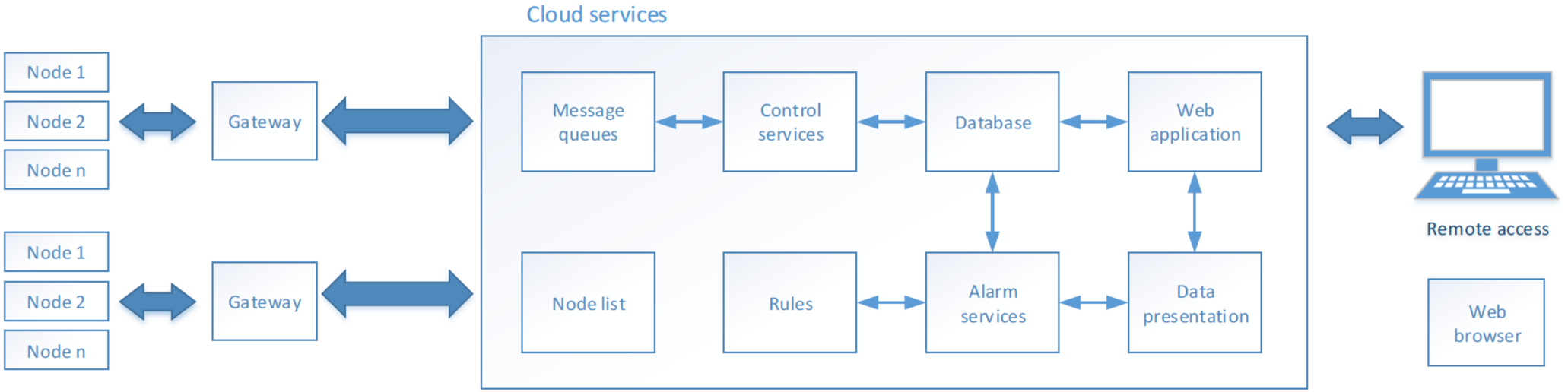
- Sensors
- Nodes
- Gateways
- Cloud Based Services



Flood Embankment Monitoring System



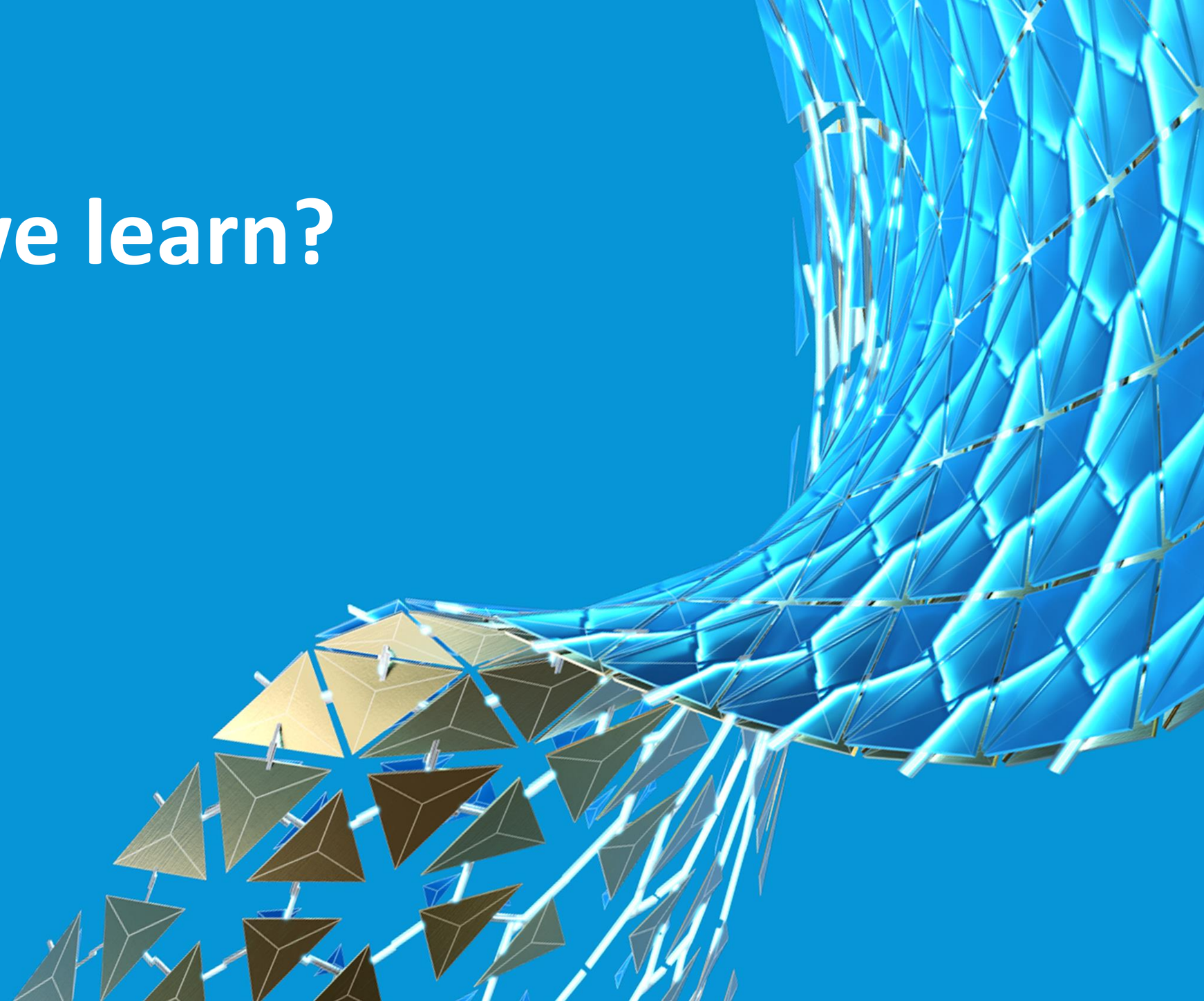
Cloud Service Architecture



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.