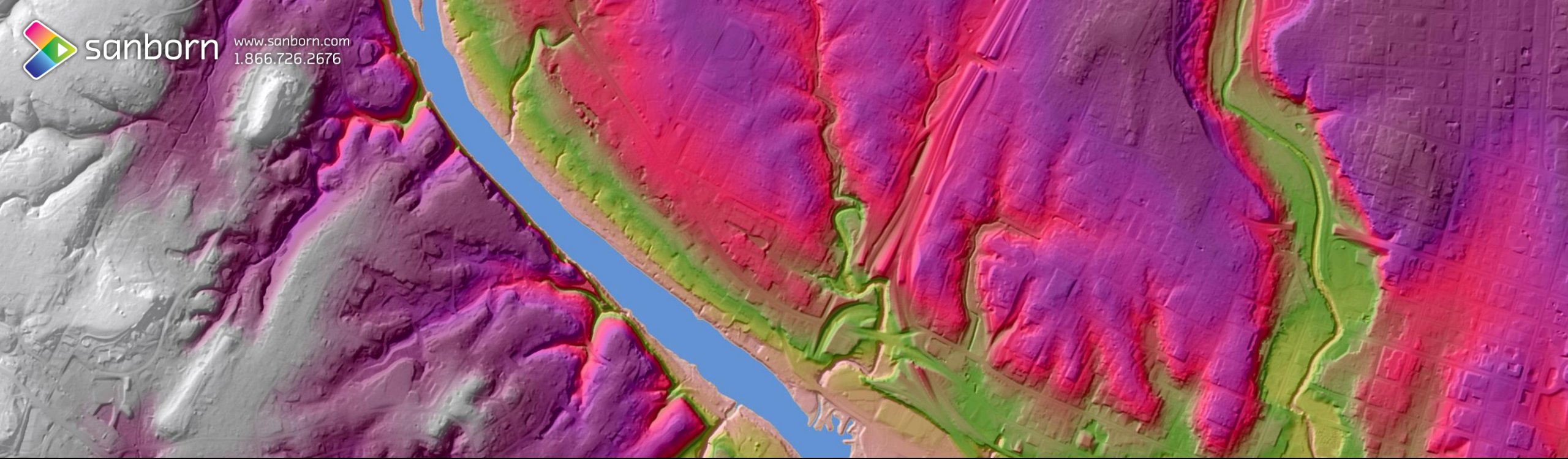




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Digital Twins for Smart Government Initiative

For the Attention of:
Texas GIS Forum 2022

Presented by:

Kimberly Nale

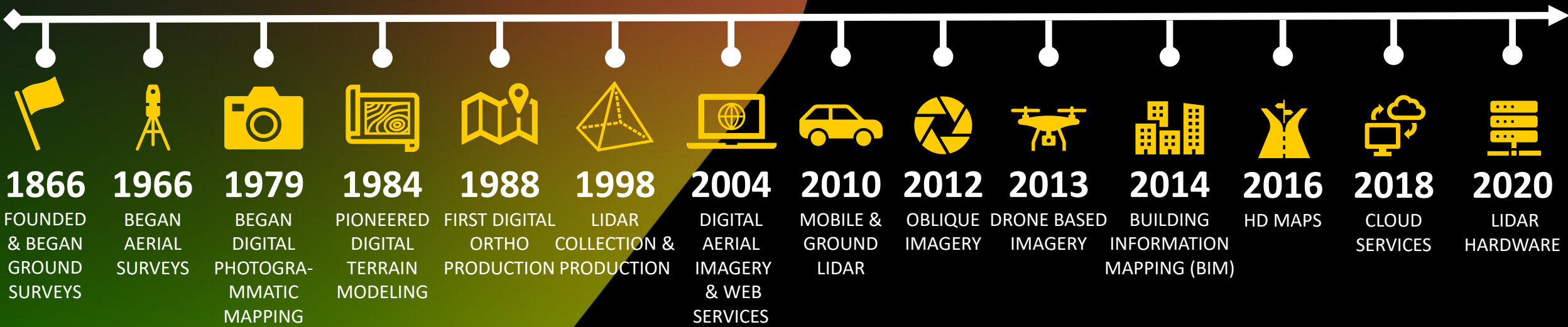
Director of Strategic Accounts – Southeast

Sanborn History

1866

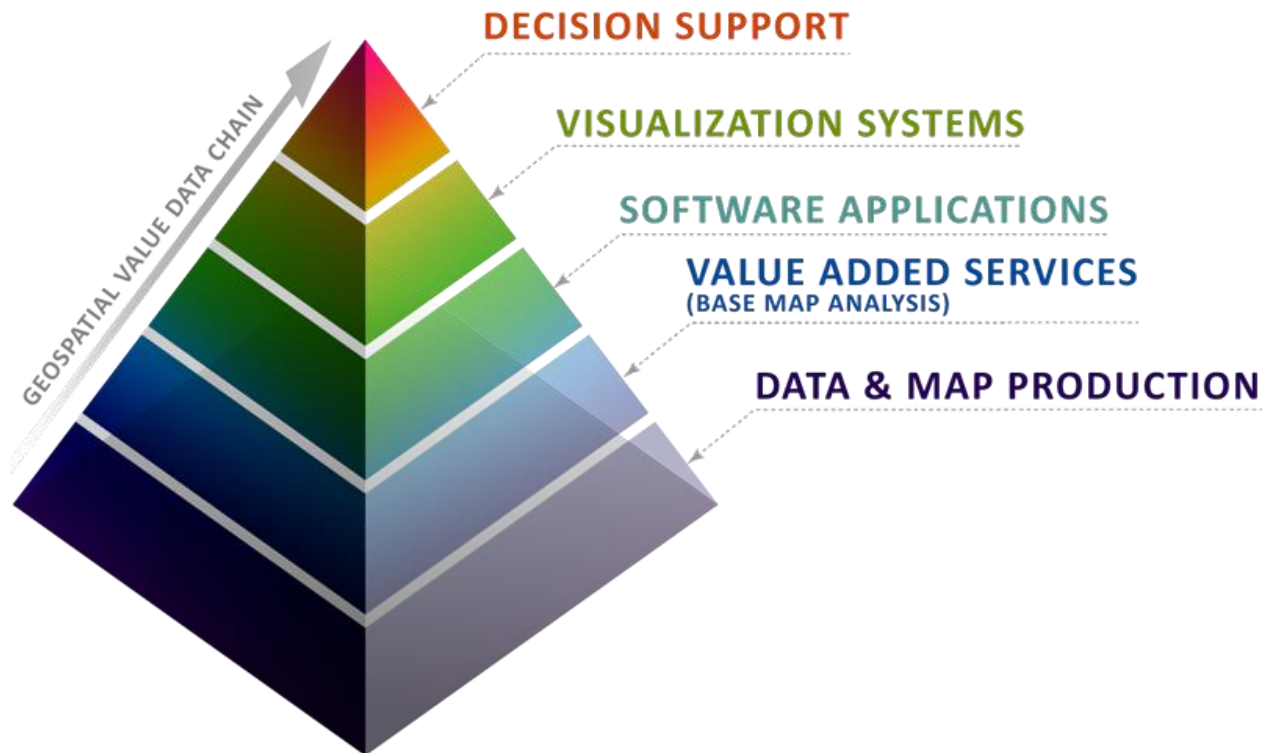


2021



Full Range Of Services

Sanborn enables superior information and decisions with a broad range of products and services.



Decision Support

- Wildfire Management
- Forestry and Ecosystem Management
- Emergency Response

Visualization Systems

- 2D and 3D
- Prism 4D
- Common Operating Picture

Software Applications

- GIS Software Development (Enterprise/Desktop/Web)
- Cloud Services
- Portals and Distribution Tools

Value-Added Services

- Land use and land cover analyses
- Change detection
- Other imagery analysis services

Data & Map Production

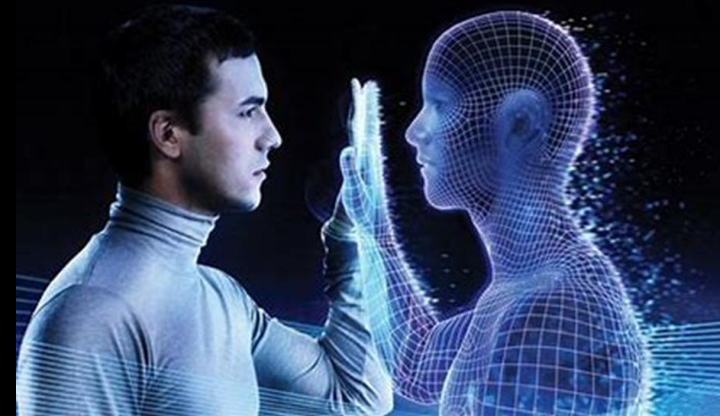
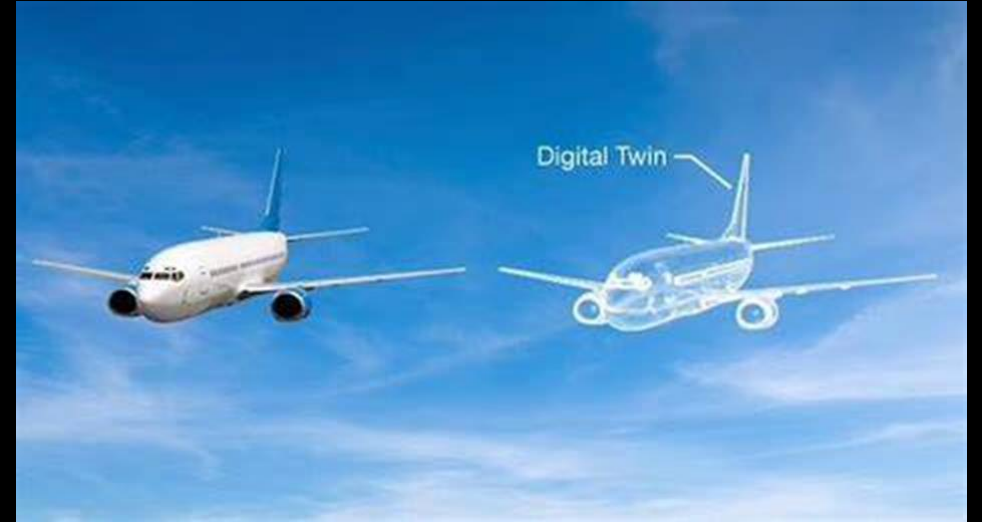
- Lidar, Digital Orthoimagery, Photogrammetric, Topographical Maps

Data Acquisition

- Sanborn is an industry leader in terms of acquisition resources and data processing throughput, assets included:
- Aircraft (12)
- UltraCam Eagle Digital (4)
- UltraCamD (2)
- 5-way oblique system (5)
- Airborne GPS systems (8)
- Inertial Navigation Systems (6)
- Trimble GPS survey equipment
- IT Infrastructure : Over 6 Petabytes of active onsite storage, multi-core distributed processing clusters for both CPU and GPU software packages, networking capabilities up to 100Gbps and multi-host virtual environment

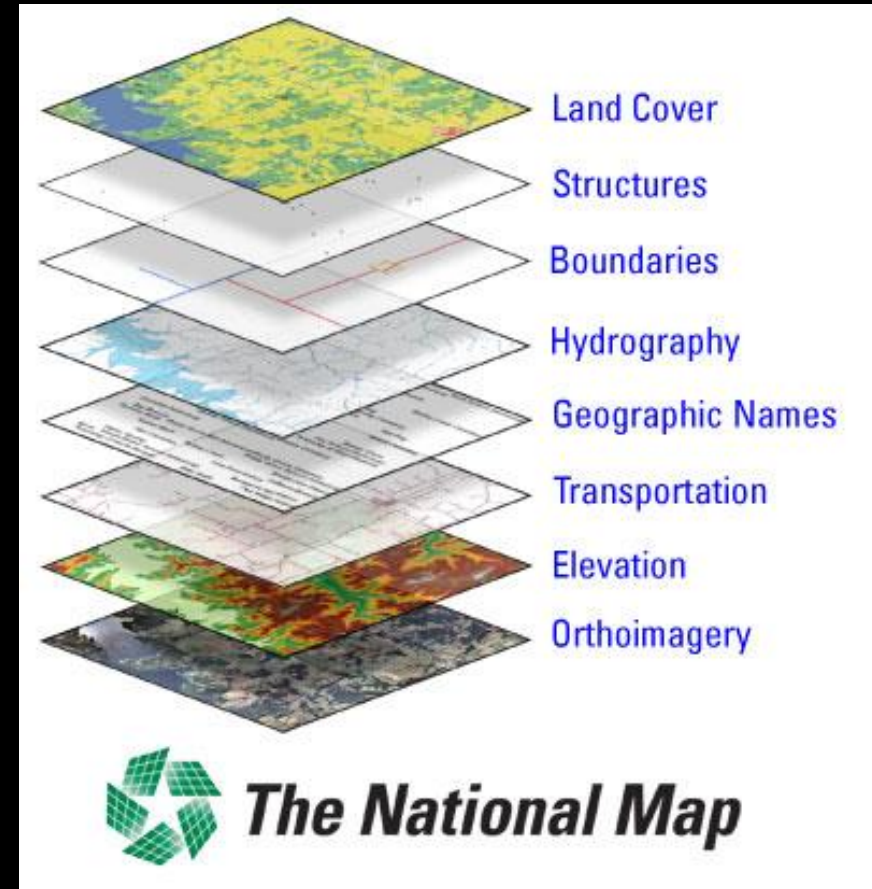
What is a Digital Twin

- Digital realistic representation of a physical object, product, entity, city etc.



What is A Digital Twin

- Digital Twin typically requires connection to the real world
 - Wi-Fi, Video, data, etc.
 - Live data flows from sensors; A device on a pole means next to nothing unless it is exchanging and generating information
 - The 'Internet of Things' allows for more robust Twin models
- Combines multiple assets and their attributes together in one model/system



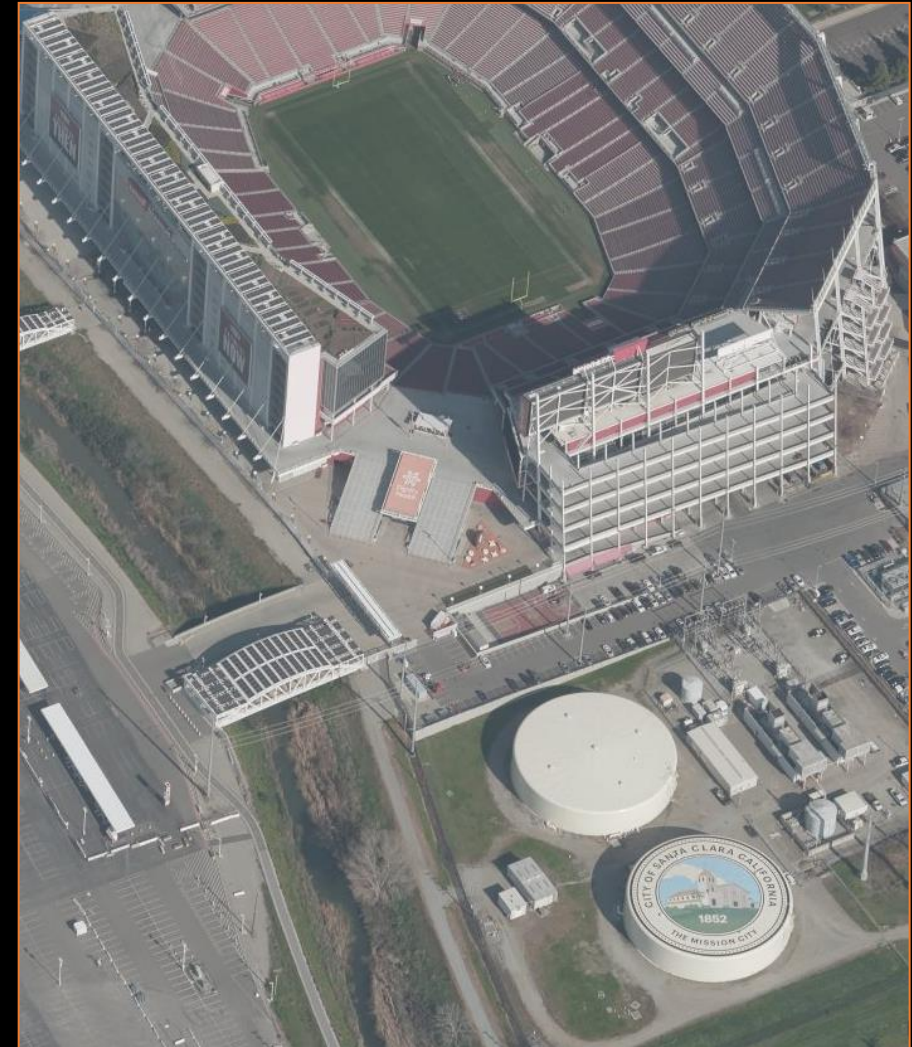
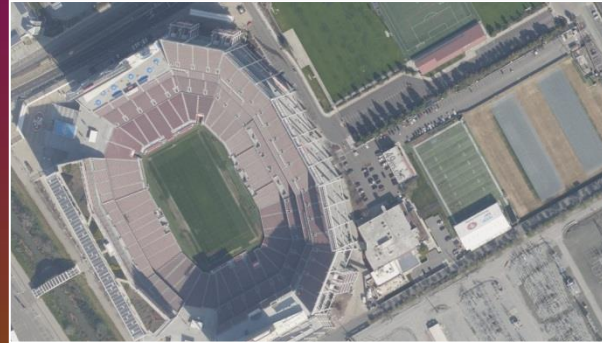
Benefits of a Digital Twin

- Test/Model the effects on the real world; testing on digital rather than the physical
- Faster, more efficient than physical prototyping
- Minimizes Risk
- Enables improvement of operational efficiency
- Enables Smart Cities
 - Simulation and Scenario Planning
 - Planning, Design, Maintenance, Optimization
 - Controlling, Analyzing



Digital Twin Geospatial Source Data

- Imagery
 - Aerial Oblique Imagery
 - Aerial Orthoimagery
 - Terrestrial Imagery
- Lidar
 - Aerial
 - Terrestrial



Input	Output
Vertical Imagery	Geometry LandCover/Planimetric (attribution to geometry) Texture for top of building only
Oblique Imagery	Geometry LandCover/Planimetric (attribution to geometry) Texture for both top and side of building
Aerial Lidar	Geometry Only
Ground Based Imagery	Geometry for lower level of building Texture for lower-level side of building Attribution to geometry
Ground based Lidar	Geometry for lower level of building

Basic Components for a Digital Twin Base Map

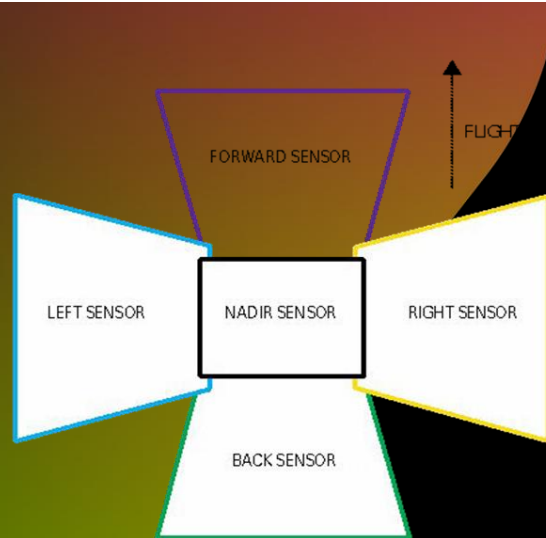
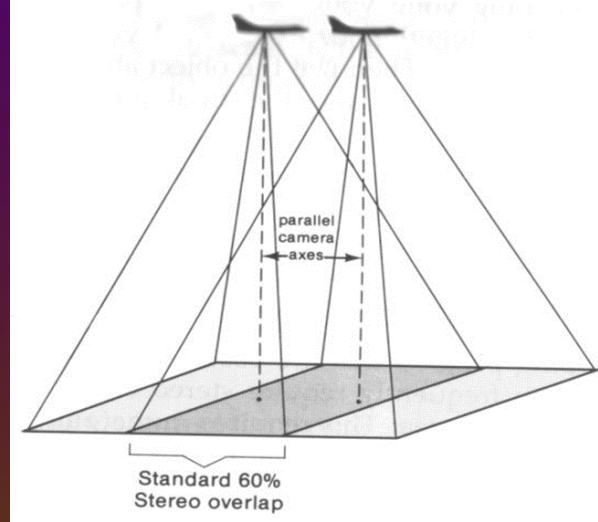
Geometry



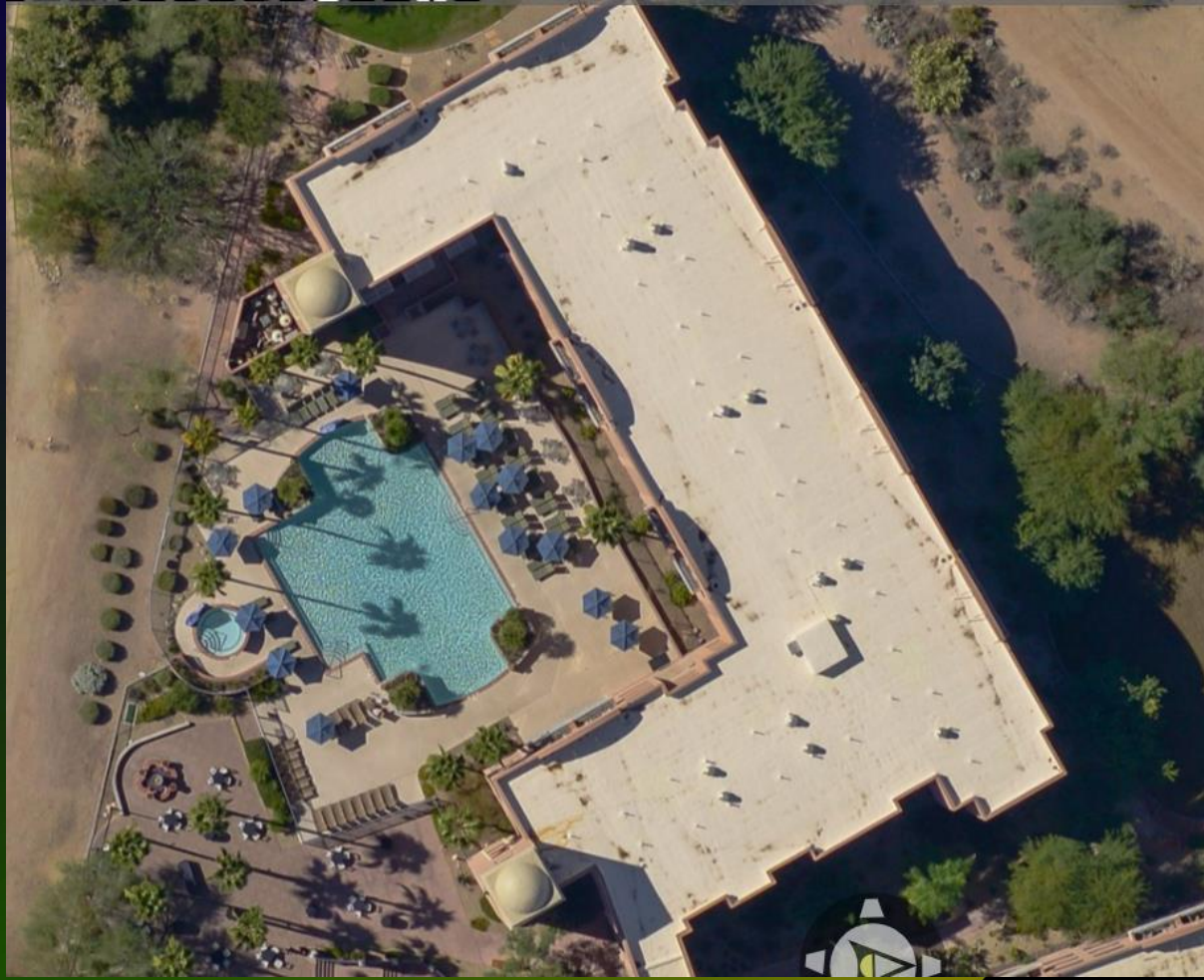
Texture



High Resolution Aerial Imagery

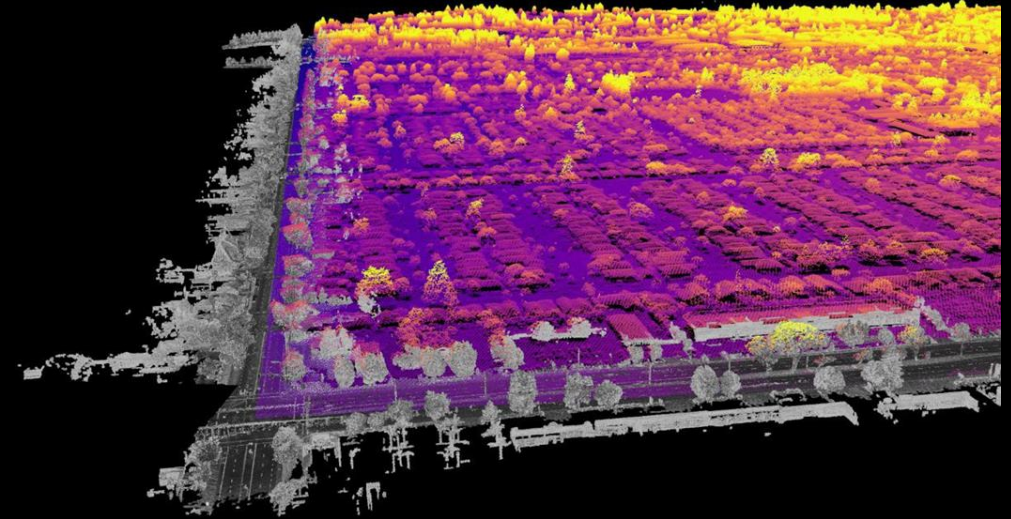
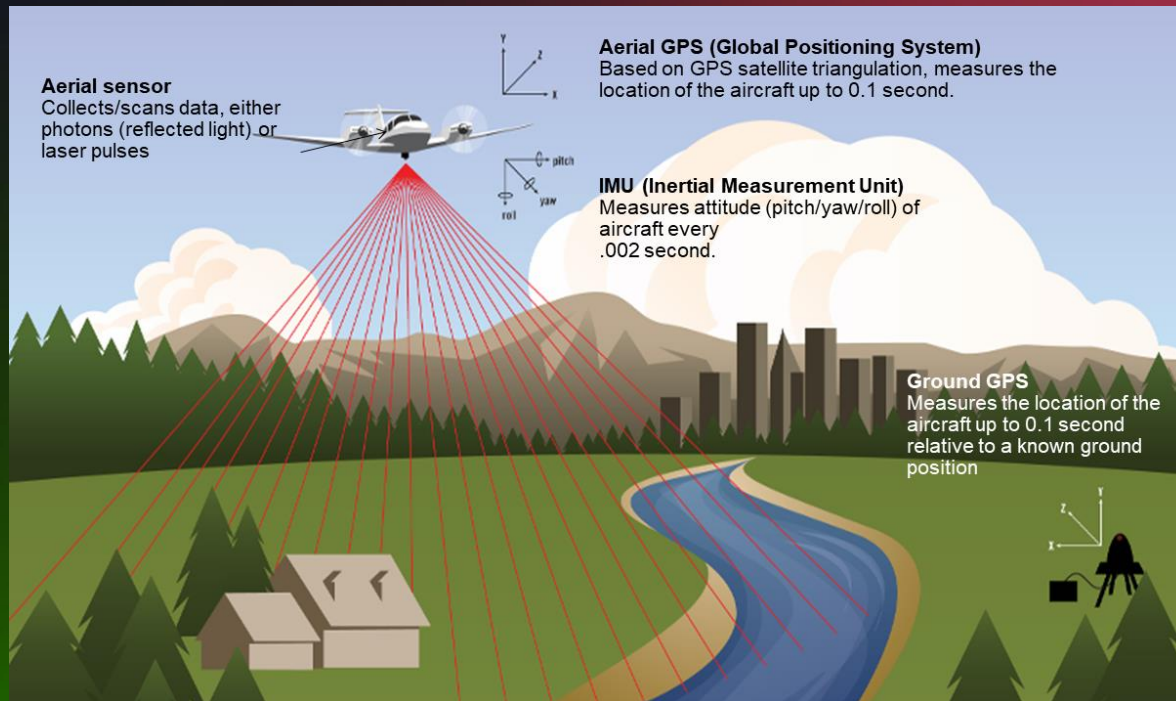


Vertical and Oblique Imagery



Lidar: Light Detecting and Ranging

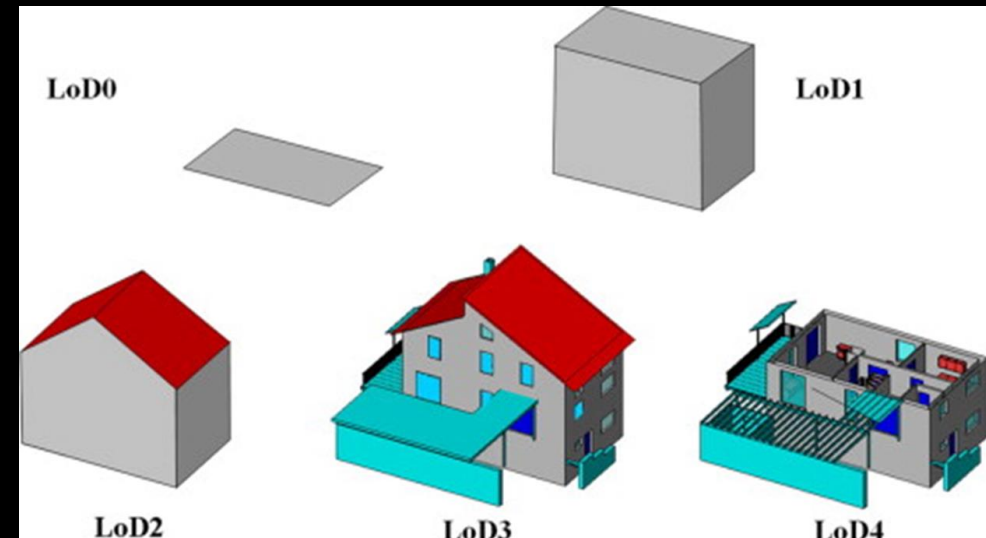
- Lidar; Lasers, GNSS technology, enables direct geo-referencing of billions of points
- Lidar provides high resolution, high accuracy elevation models
- Vegetation and Structures Commonly Extracted
- Extraction of Utilities Expanding
- Lidar allows for 3D feature extraction



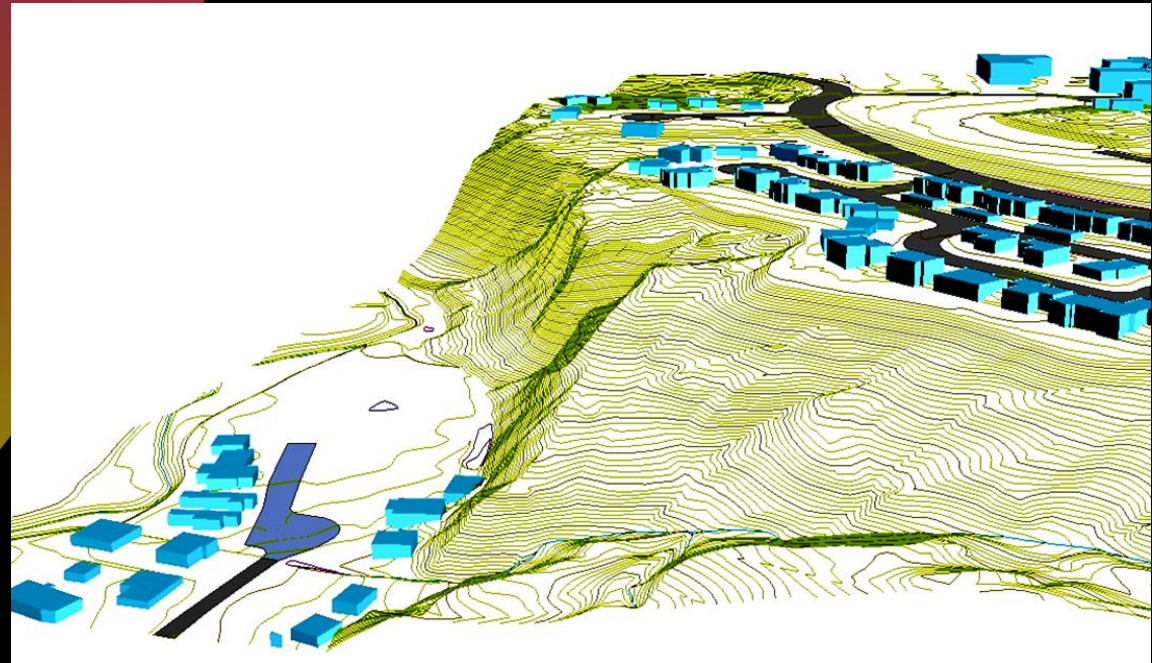
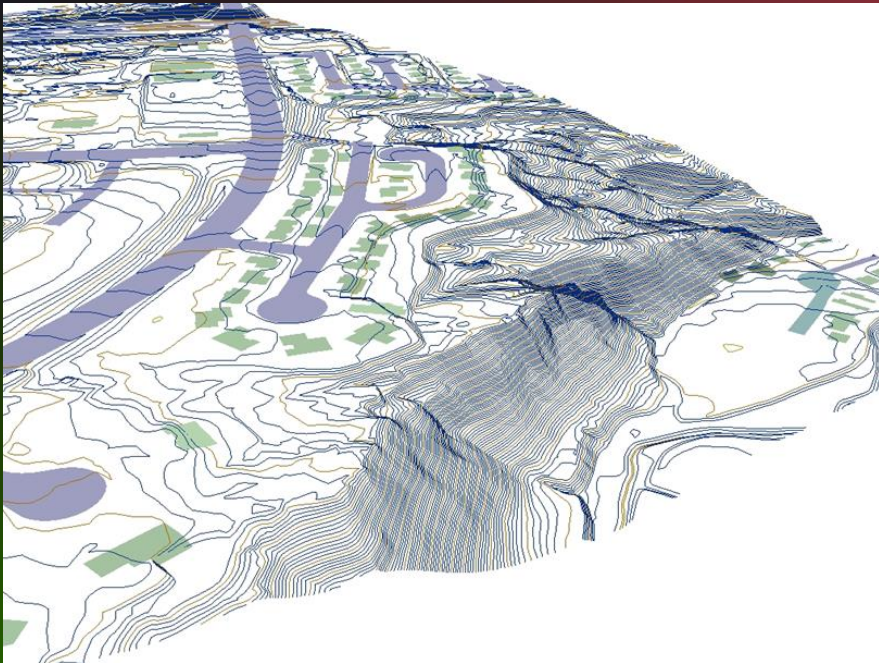
How to Define a Quality Level

- Architectural Detail; LOD0-LOD4
 - LOD0 – 2D footprint
 - LOD1 – Extruded building
 - LOD2 – Extruded building with roof types
 - LOD3 – Full architectural features including doors, window, etc.
 - LOD4 – Interior modeling

Currently there is no industry standard for quality levels of visualization and texturing of Digital Twins therefore it is very important to work closely with end user to understand level of specifications for final product.



- LOD0 - Standard 2D Building footprint
- LOD1 - Building footprint with single elevation
 - 2-1/2 Dimension
 - 'Sugar-Cube'
 - Sample with no Texture



- LOD2 – Extruded building with roof types
- LOD3 – Full architectural features including doors, window, etc.

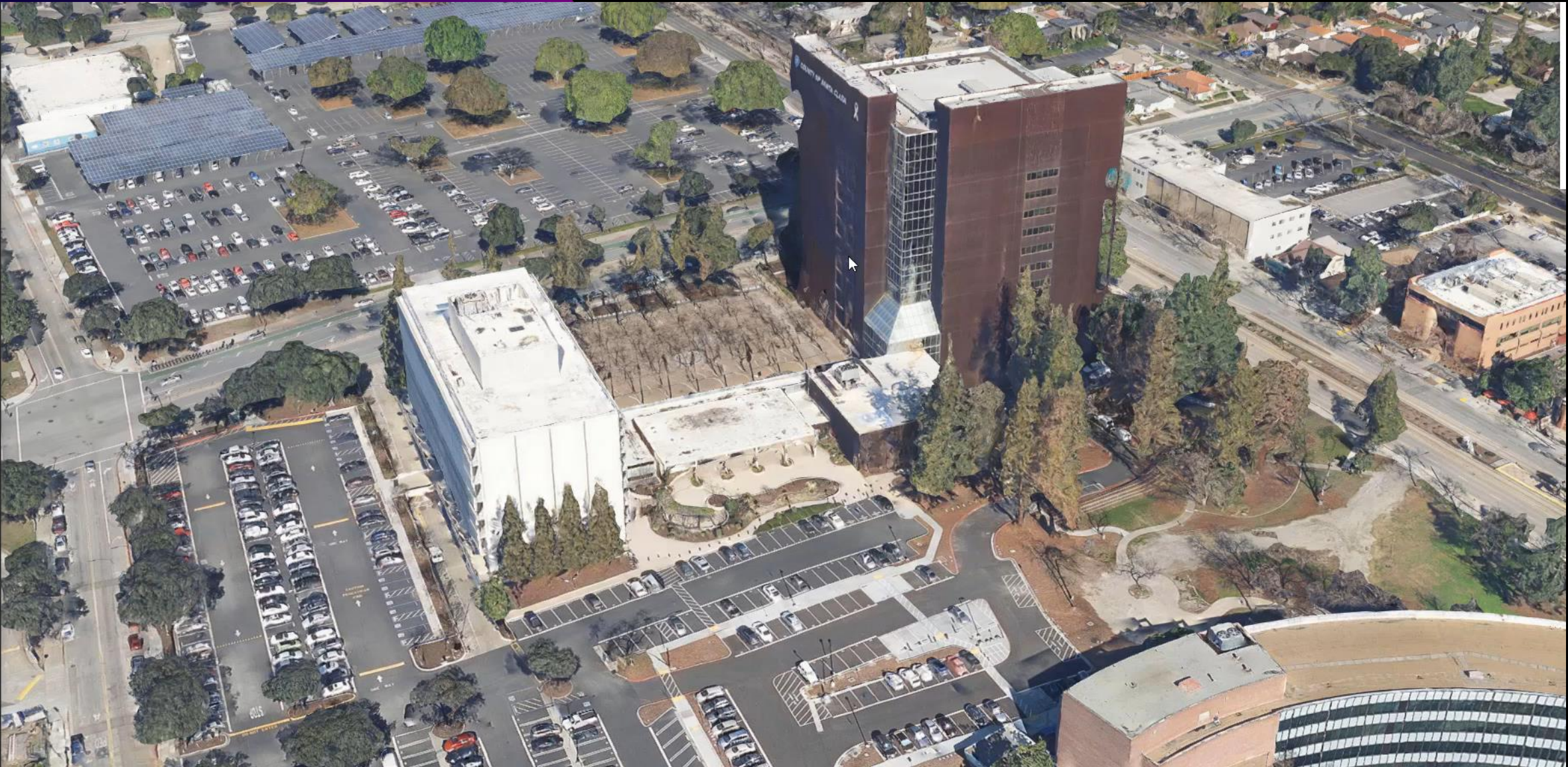


Interior Mapping



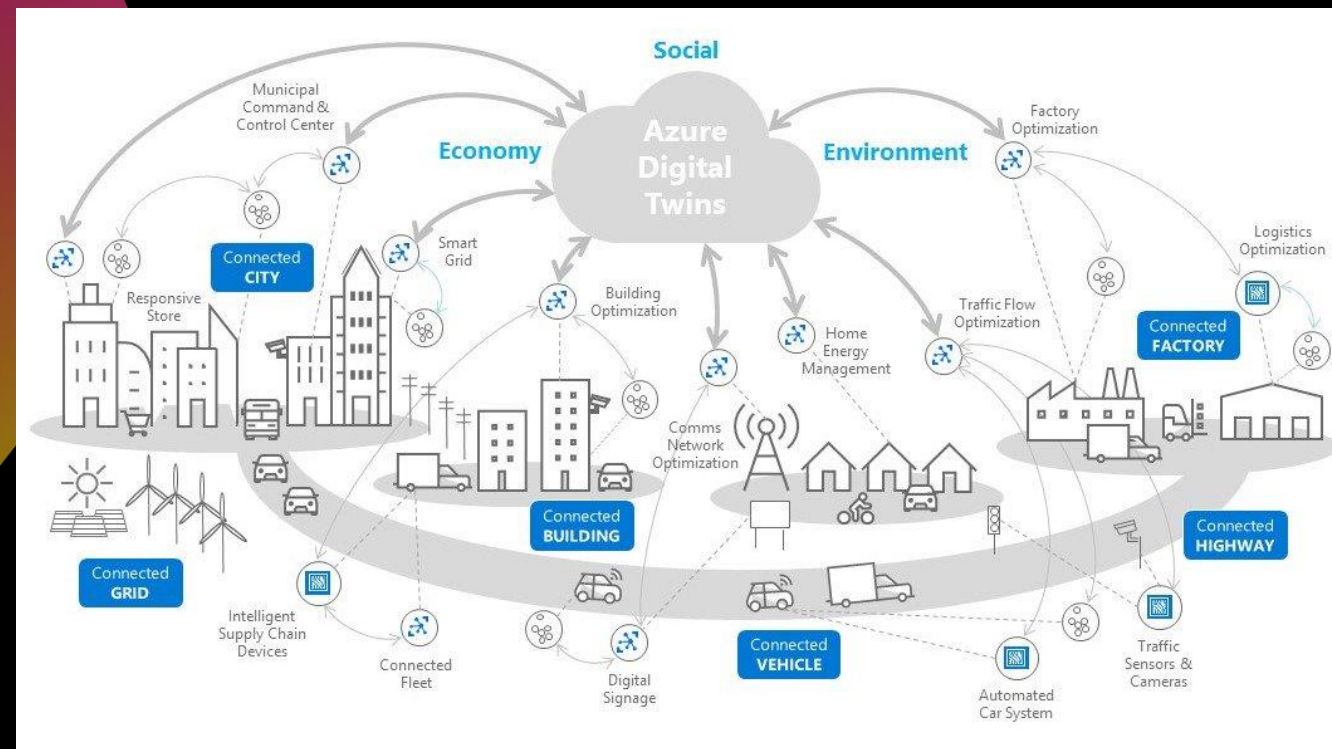
Sanborn's Experience in 3D

- Recently completed Santa Clara, California
 - 500sqmi
 - 3D Web Mesh created from Oblique imagery
 - Dense urban environment
 - Lots of tall buildings and meandering roads



Digital Twin Applications: Smart Cities

- Essential Tool for Smart Cities
 - Urban Planning
 - Land Use Optimization
 - Transportation
 - Energy Consumption
 - Water/Sewer/Electric analysis
 - NG911/Emergency Response
 - Traffic
 - Weather



Digital Twin Applications: Utility Asset Mapping



Country of Qatar



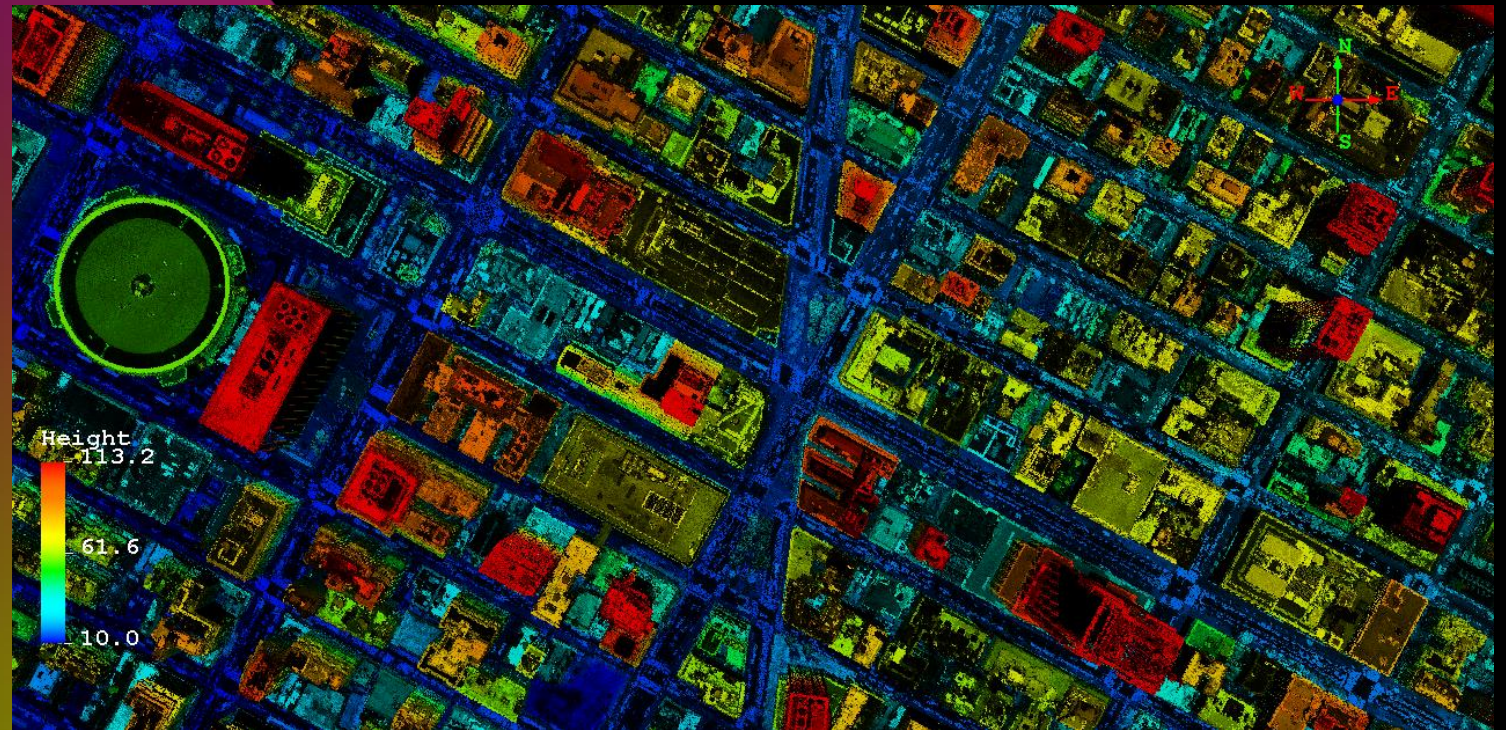
Digital Twin Applications: Autonomous Driving

- Digital twin of road network and assets in 3D
 - Roads and road markings, Lanes
 - Signs and poles, Buildings
 - Sidewalks/crosswalks
 - Parking spots, Park benches
 - Overpass, Barriers
 - Vegetation, Signal vectors
 - Street Landmarks
- Add intelligence to the data
 - Direction of traffic flow
 - Color of painted lanes
 - Type of sign (speed, turn, restriction, warning, etc)



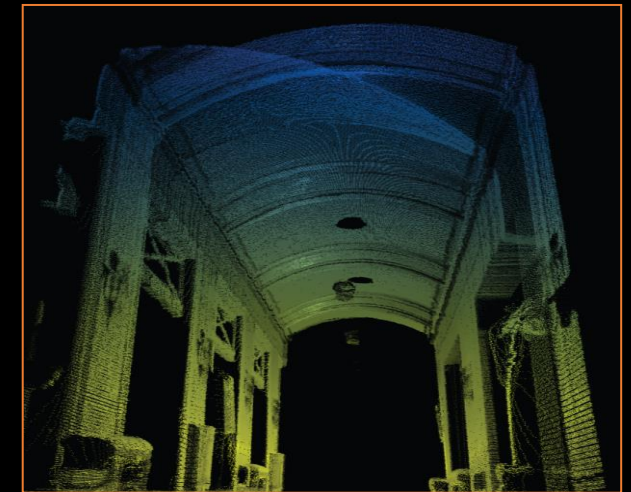
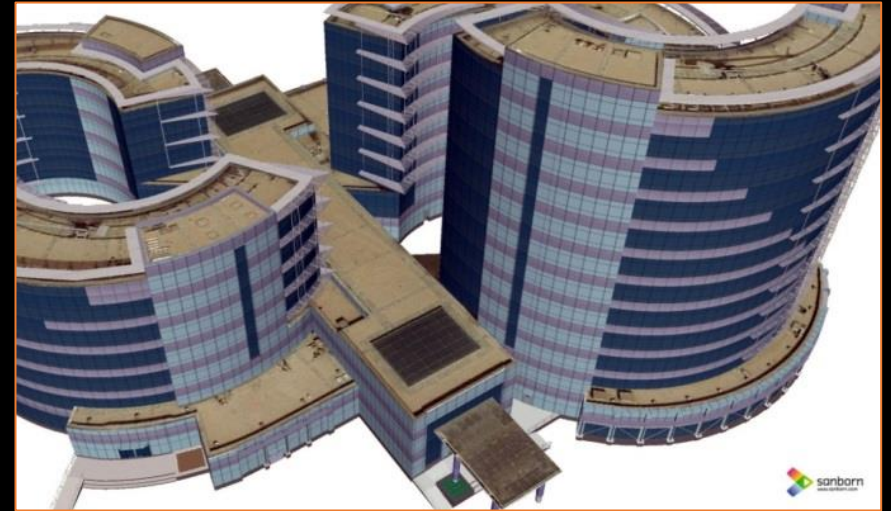
Digital Twin Applications: Solar Mapping; Insolation

- Determine 'Insolation' (Power of the Sun)
 - Building Height
 - Roof slope
 - Compass direction
 - Surrounding buildings
 - Shadows
- Energy Savings
- Location Planning



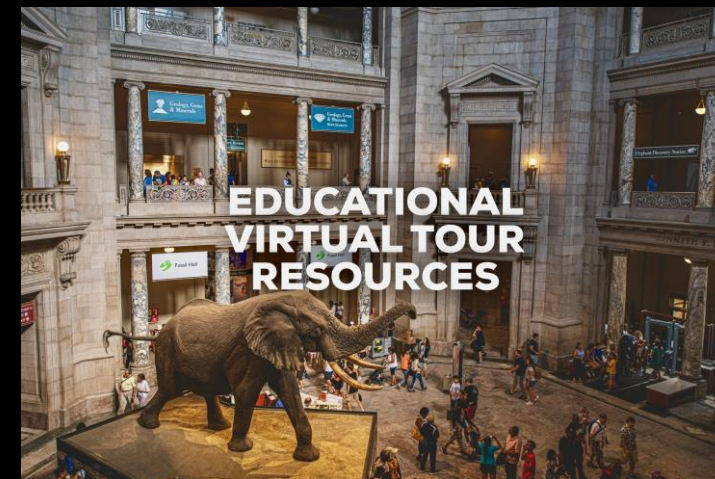
Digital Twin Applications: Indoor Mapping

- Emergency Response
 - Doorways
 - Emergency Exits
 - Fire Extinguishers
 - Laboratory/Chemicals
- Facility Management
 - Monitor Location of people
 - Document management; As-Builts, Service history and maintenance



Digital Twin Applications: Tourism & Advertising

- Virtual Tourism
- Travel/Leisure Directories
- Restaurant Directories
- Education
- Advertising/Shopping Assistant
- Real-time Advertising Channel
- Consumer Convenience/Education



Digital Twins – Beyond Visualization

We all know the magic of 3D Visualization.... It appeals to our senses – we see and understand spatial information the way we view our world.



