



Indoor Mapping and Navigation Pilot

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OGC

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Indoor Mapping and Navigation Pilot



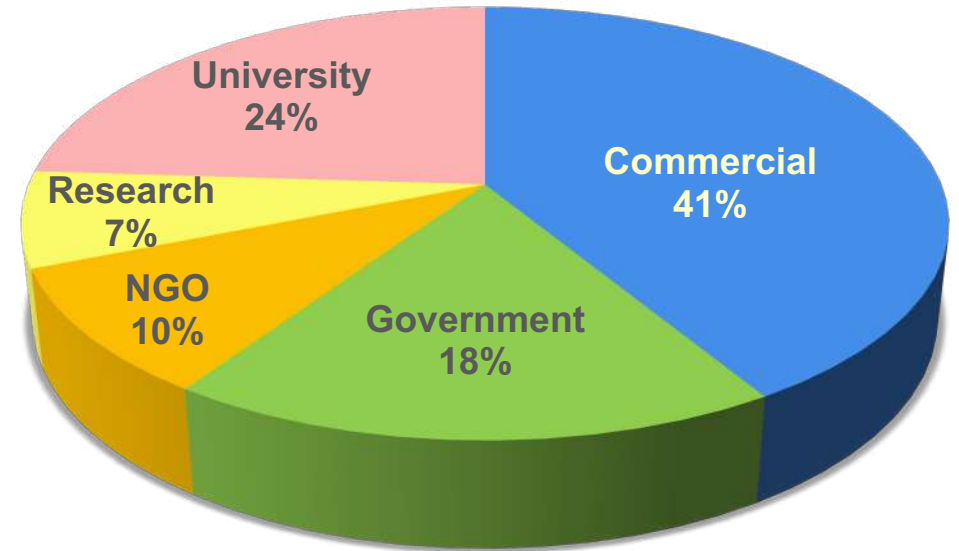
- Agenda – 20 min
 - Introduction
 - Context
 - Overview
 - Details - Pilot Activities
 - Conclusion



The Open Geospatial Consortium

Not-for-profit, international voluntary consensus standards organization;
leading development of geospatial standards

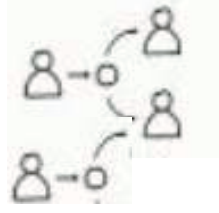
- Founded in 1994 with 8 charter members
- 520+ members
- Over 50 standards and related best practices
- Thousands of product implementations
- Broad user community implementation worldwide
- Alliances and collaborative activities with many other organizations



Requirements

Pull of sponsors

Funding



Organizations



**World
experts**

*Bring
Challenges*

*Agile
prototyping*

**INNOVATION
PROGRAM**

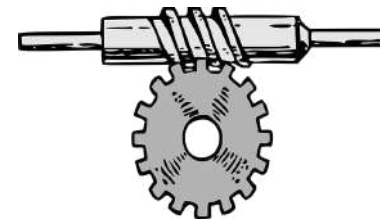
Testing
Acceptance



**Open
standards**

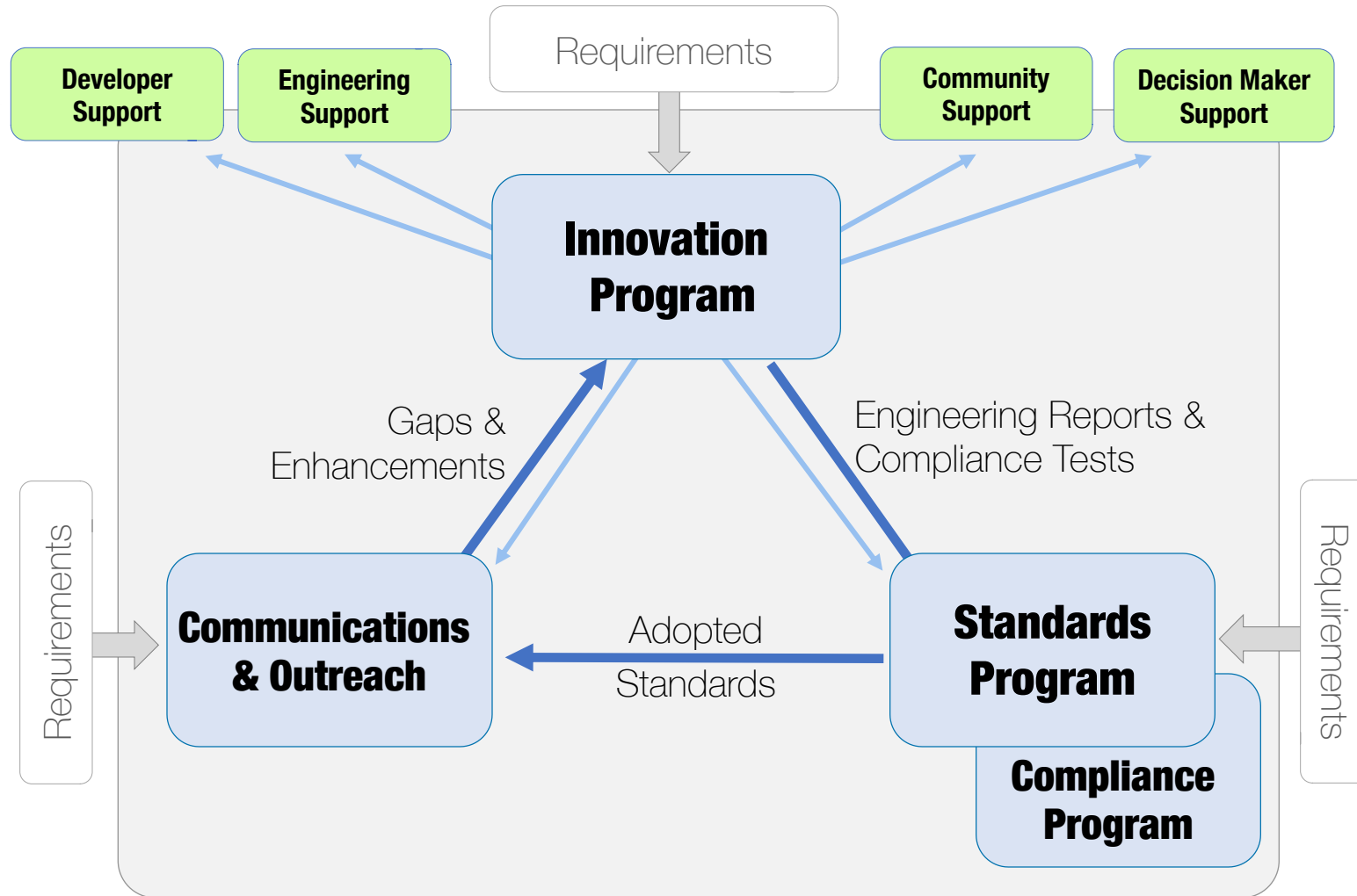
*Reduce
technology
risks*

*Help
Mobilize*



**New
technologies**

OGC Programs



Sponsor, Participants, Deliverables



- Sponsor: NIST Public Safety Communications Research Division
- Deliverables
 - (1 Building Data)
 - 2 Public Safety Features CityGML ADE
 - 3 Building Modeler Service
 - 4 Navigation Modeler Service
 - 5 Building Model Repository (CSW, WFS-T, 3DPS)
 - 6 Indoor Navigation Service
 - 7 Preplanning Tool Client
 - 9 Indoor Mapping and Navigation ER

- Participants
 - Compusult Ltd.
 - EcoDomus, Inc.
 - Faramoon Pty Ltd.
 - GIS Center, Feng Chia University (GIS.FCU).
 - Pusan National University, with contributions from University of New South Wales and TeeLabs.
 - Safe Software.
 - Skymantics, LLC.



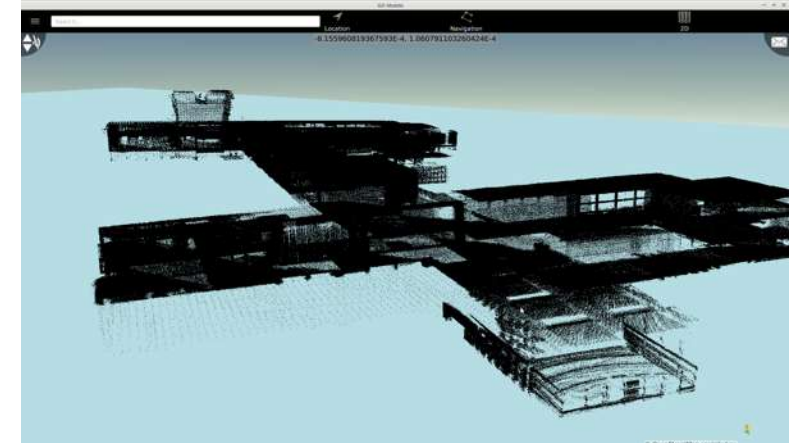
Pilot Overview – The Digital Transformation of Public Safety



First responders typically survey high-risk facilities in their jurisdiction for pre-incident planning, but they are often forced to create their own hand-drawn maps during the process.

Using mobile mapping systems equipped with LiDAR and a 360-degree camera, first responders could efficiently capture 3D point clouds, transform them into vector formats (CityGML, IndoorGML) to determine and modify navigable routes faster.

In an environment based on open standards

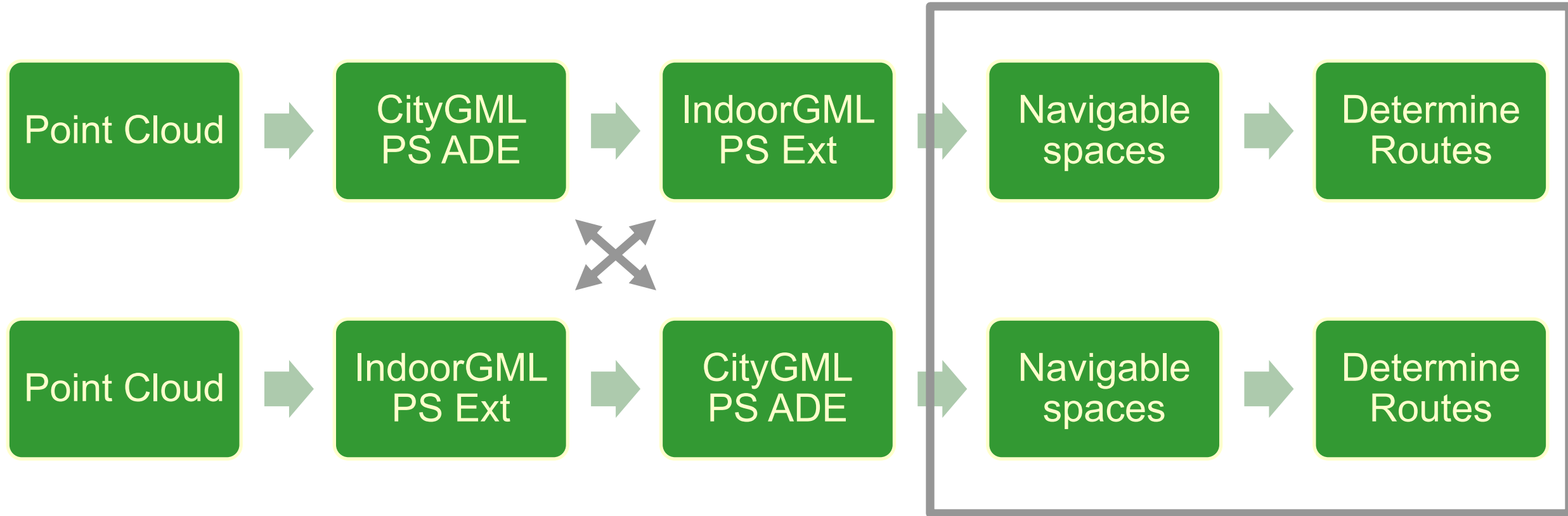




OGC Indoor Pilot

OVERVIEW

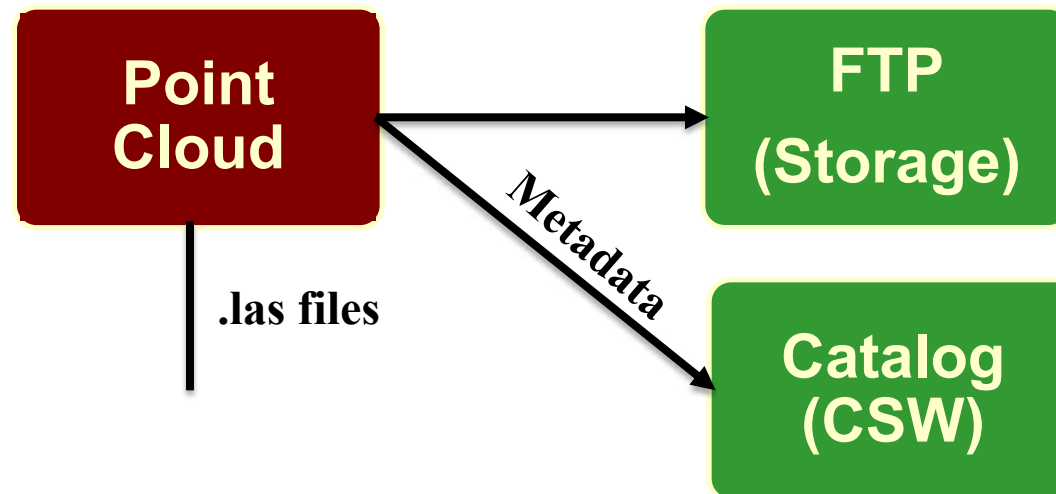
Pilot Overview



Pilot Overview



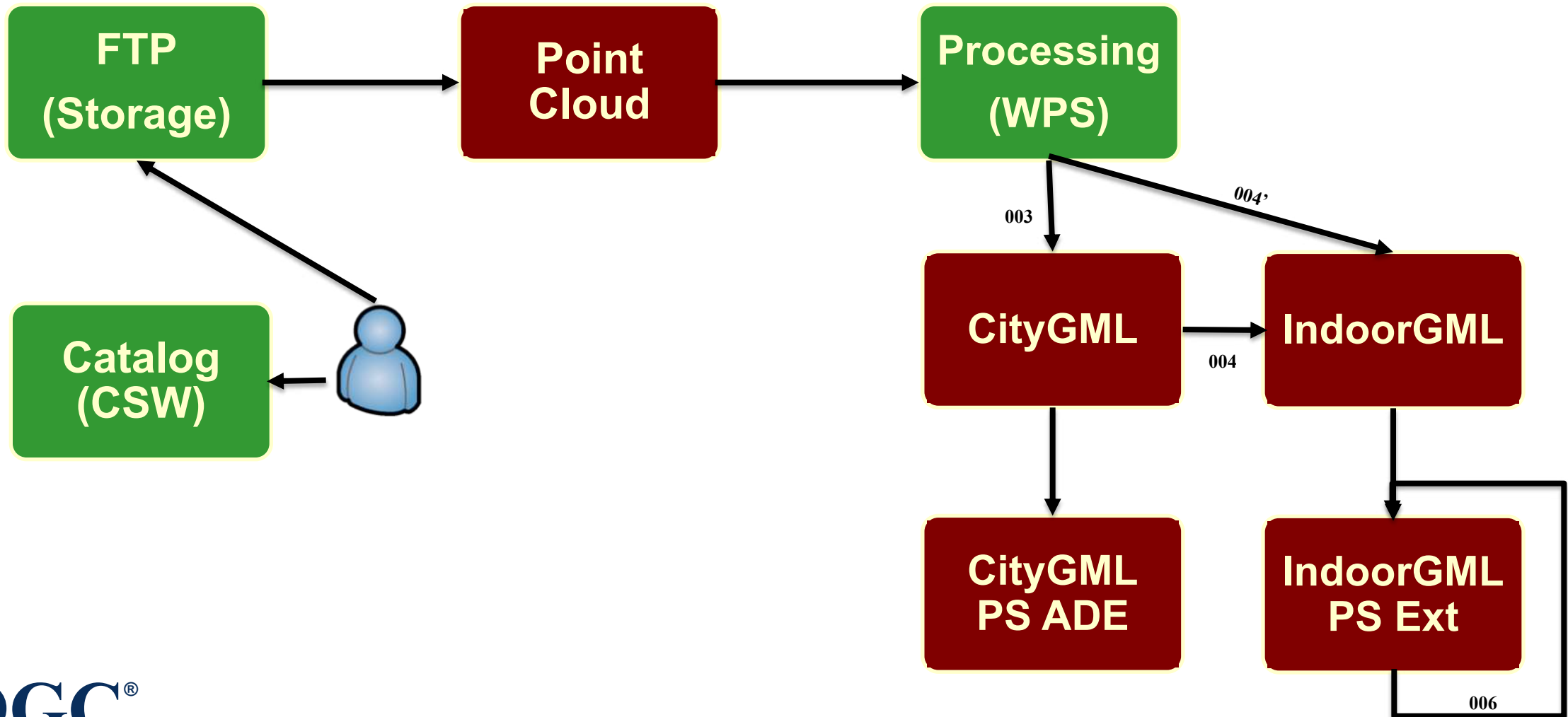
NIST005 Building the Model Repository



Pilot Overview



NIST003 Building Modeler Service &
NIST004 Navigation Modeler Service & NIST006 Indoor Navigation Service





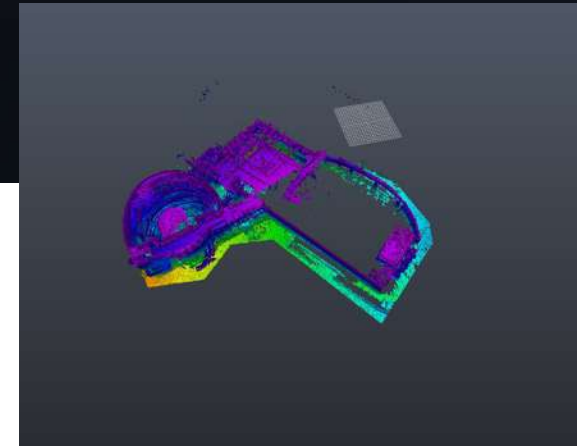
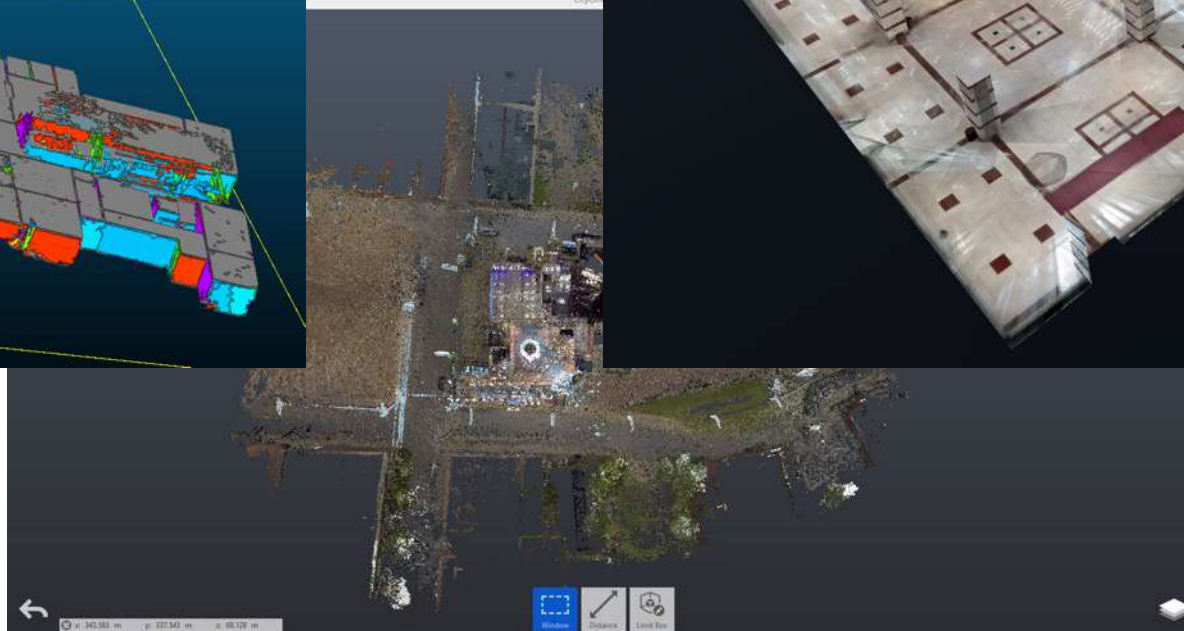
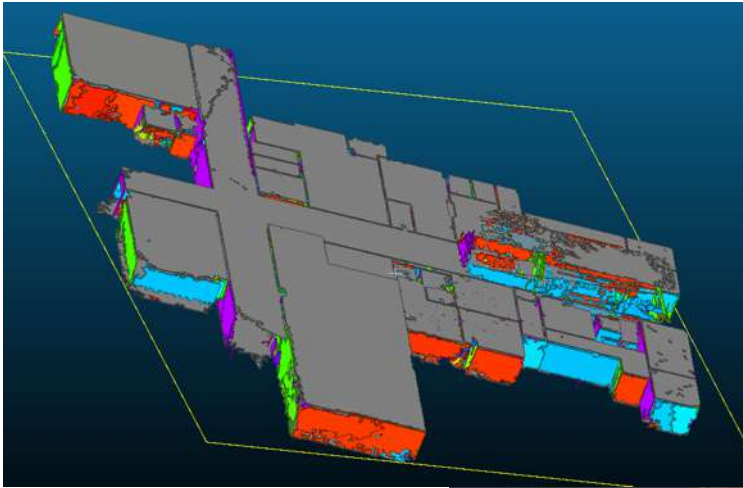
OGC Indoor Pilot

DETAILS – PILOT ACTIVITIES

The Point Cloud data



- Provided by the <> NIST project
 - Hancock county
 - Memphis



The CityGML Public Safety ADE

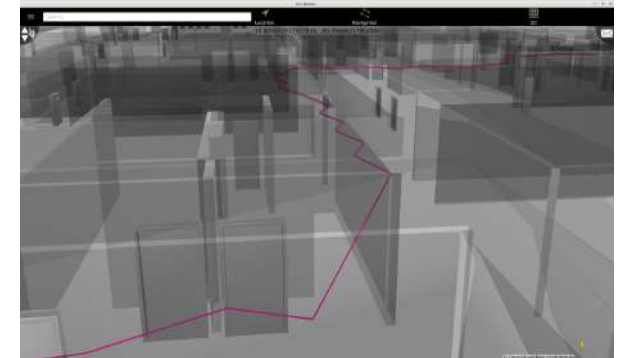
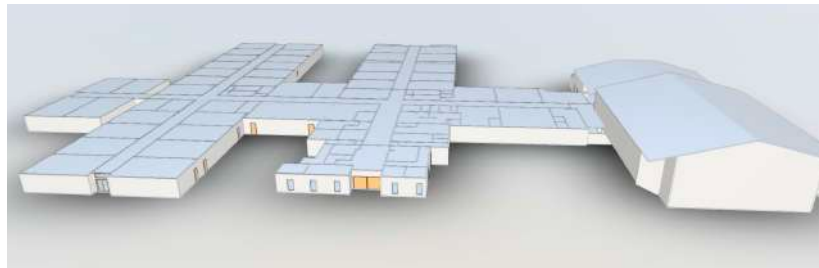
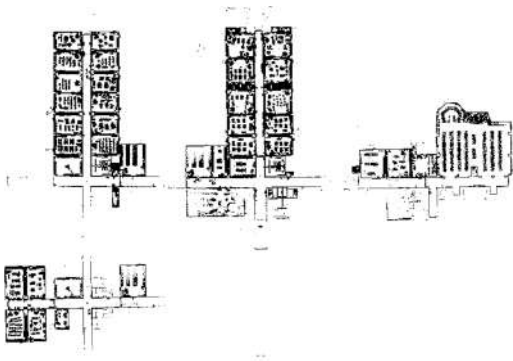


- CityGML is an open standardized data model and exchange format to store digital 3D models of cities and landscapes.
- The Application Domain Extension (ADE) is a built-in mechanism of CityGML to augment its data model with additional concepts required by particular use cases. The ADE is a mechanism for enriching the data model with new feature classes and attributes, while preserving the semantic structure of CityGML.
- Our use case is Public Safety and the new features are taken from the NAPSG Public Safety library of features. (<https://www.napsgfoundation.org>)

IndoorGML Public Safety Extension



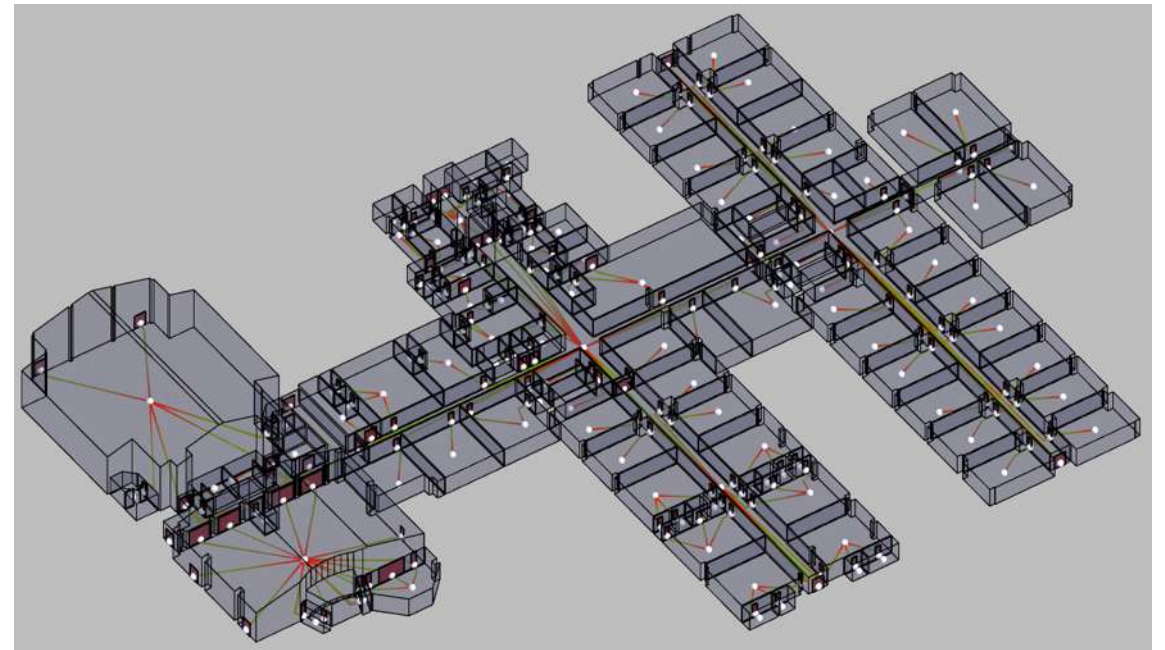
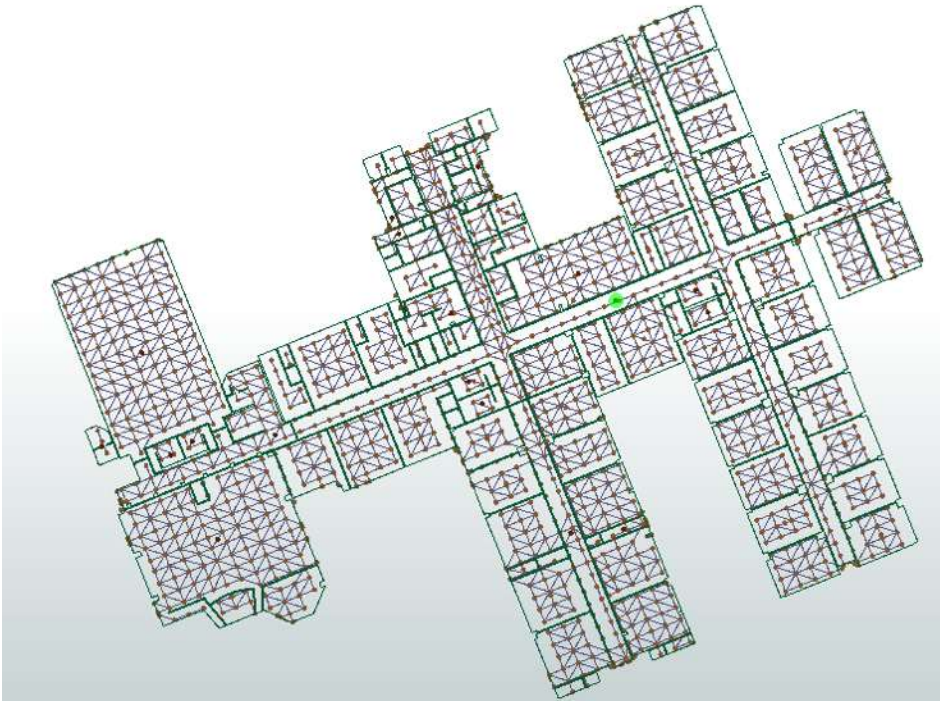
- IndoorGML is an OGC standard for an open data model and XML schema for indoor spatial information
- IndoorGML does not officially have an extension mechanism, but was needed to carry the PS features that were forwarded from the CityGML PS ADE
 - This functionally will be proposed to the OGC IndoorGML SWG for consideration
 - This is also used for the new upcoming IndoorGML 2 work



Calculating the Navigation points



- 2 methods to create the navigable routes
 - Calculate centroids for the rooms and navigable objects to create the nodes
 - Overlay a mesh and walls/doors (non-navigable object) cut the mesh, resulting in nodes



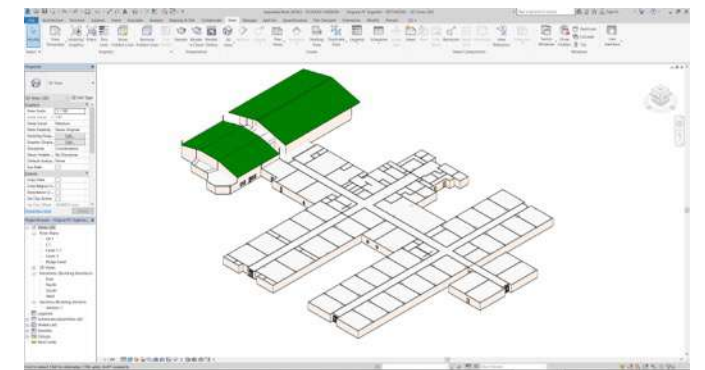
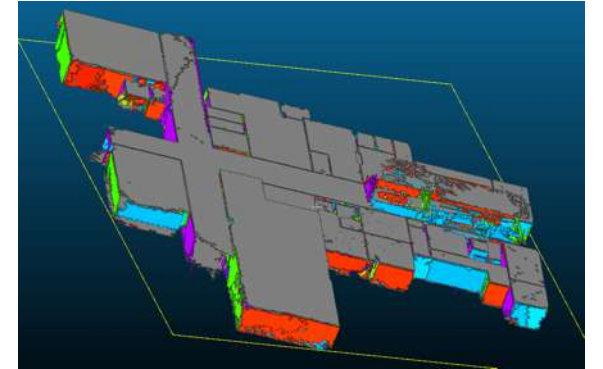
NIST006 and 007 Preplanning navigation



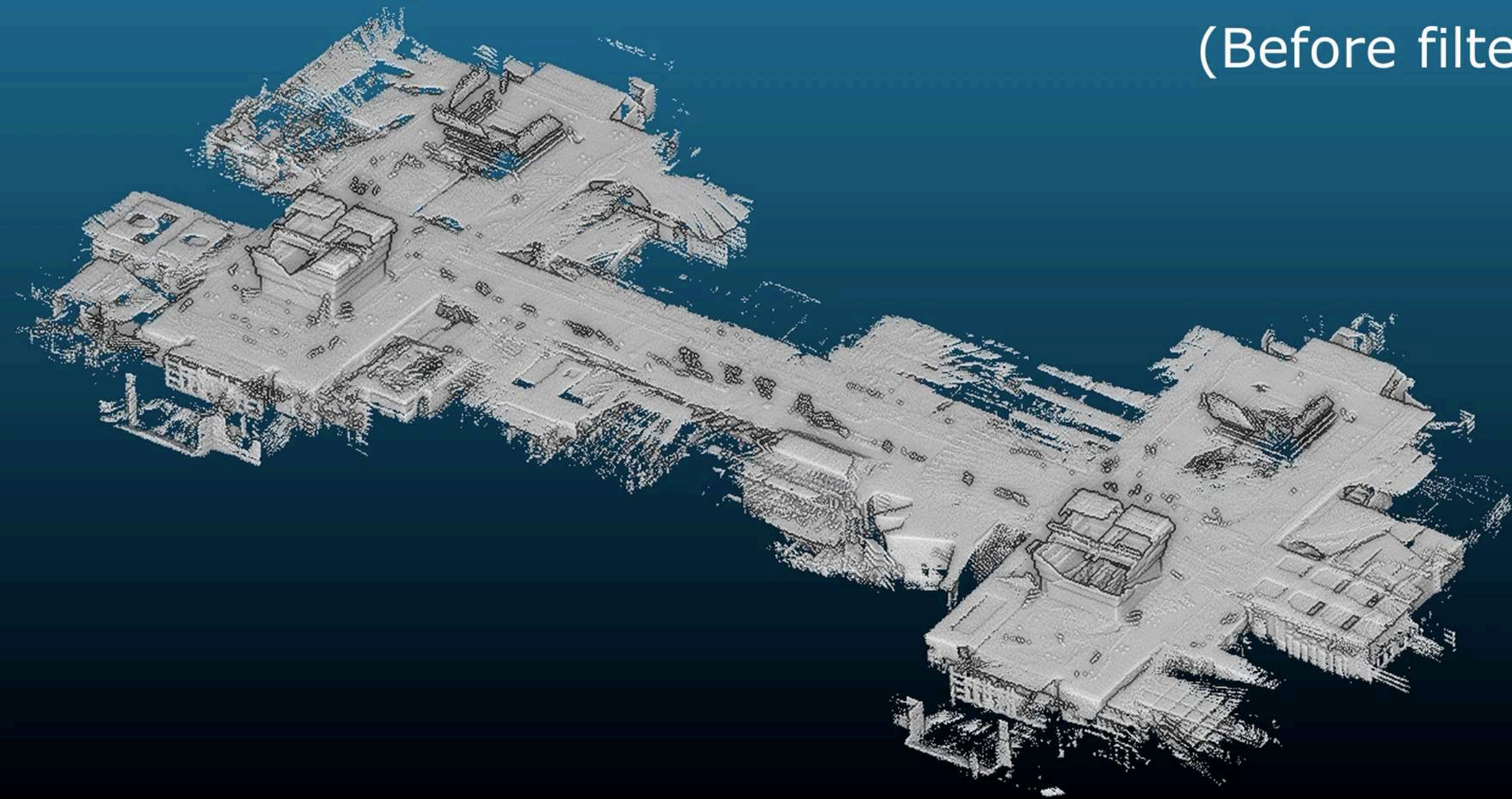
What worked – what needs more research



- Individual PointCloud files had the same reference point, and had to be manually positioned using a Google Maps basemap
- PC to CityGML / IndoorGML is non-trivial
 - A lot of manual editing is required
 - 2 ways of conversion
 - Manual editing
 - Using an ETL tool
- PS features can not be automatically detected
 - Manual annotation of CityGML
 - Using an IFC Editor (but needs IFC input/output)



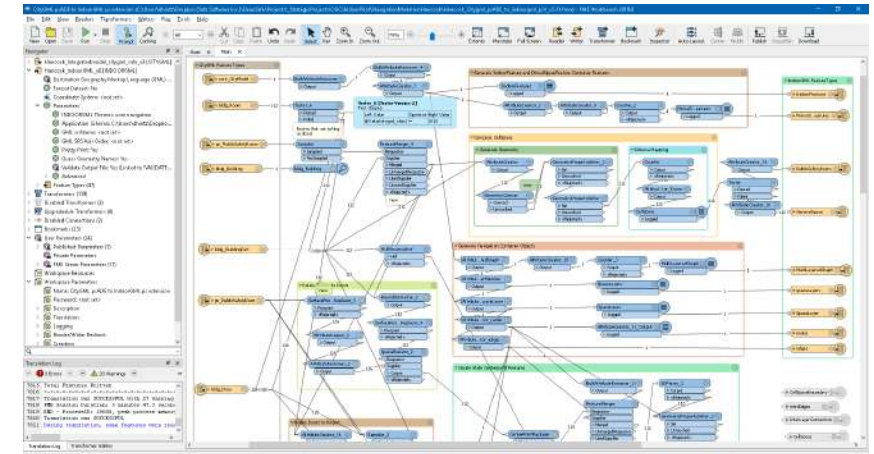
Point Cloud (Before filtering)



What worked – what needs more research



- CityGML PS ADE to IndoorGML Ext without issues
 - But needed a new IndoorGML Extension mechanism, that is currently not part of the specification
 - The method used will be briefed to the IndoorGML standards working group in Banff in September
 - Will also be proposed to the new version of IndoorGML
 - ETL tool for conversion
 - Including visualization



What worked – what needs more research (Cont)

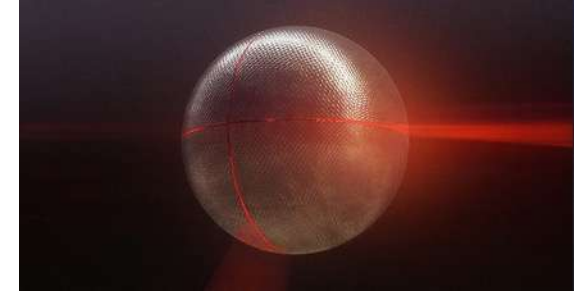


- Navigation Service
 - 2 methods need further development ...
- Current route calculation is too simple and does not match the expectations of the First Responders
 - Alternative/dynamic routes, based on hazard
 - Breakable walls
- Visualization of the Public Safety features can be better
 - Not the tools, but the data needs improvement
- OGC Engineering Reporting coming in September
 - Pending approval by the Standards Working Group and Technical Committee

Conclusion



- We demonstrated that we can transform a PC to CityGML PS ADE, IndoorGML PS Ext and visualized the PS data in the Preplanning tool using Open Standards and basic navigation capabilities
 - Extended IndoorGML (not part of the spec, considered for v2)
- We need to examine:
 - PC to CityGML PS ADE and IndoorGML PS Ext *
 - PS specific indoor routing (topic for IndoorGML 2)
 - Develop the 2 methods
 - Turn-by-Turn!
 - Visualization of PS objects in the Preplanning tool
 - Increased automation (more ML for feature recognition)
 - AR



Thank you



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<https://www.opengeospatial.org/projects/initiatives/indoor-pilot>



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Session**
1:35 PM