



Live Space Modeling and Location Tracking For Emergency Evacuations: Application of TIPPERS Builder

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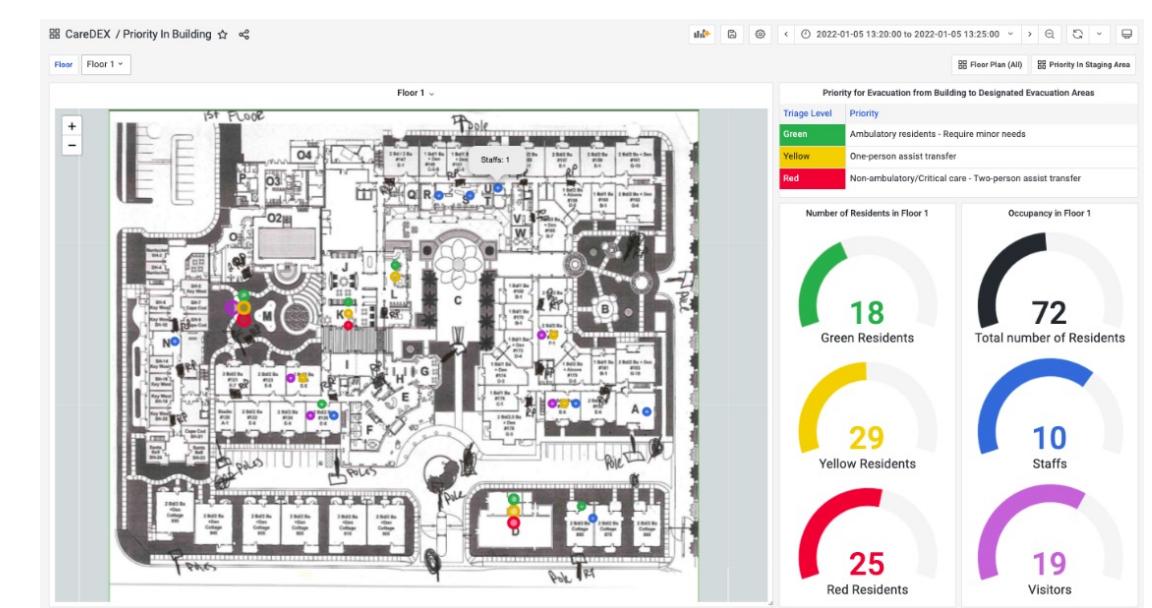
"Design digital representations of smart space environments using the TIPPERS Builder tool to aid emergency evacuations."

Goals and Overview

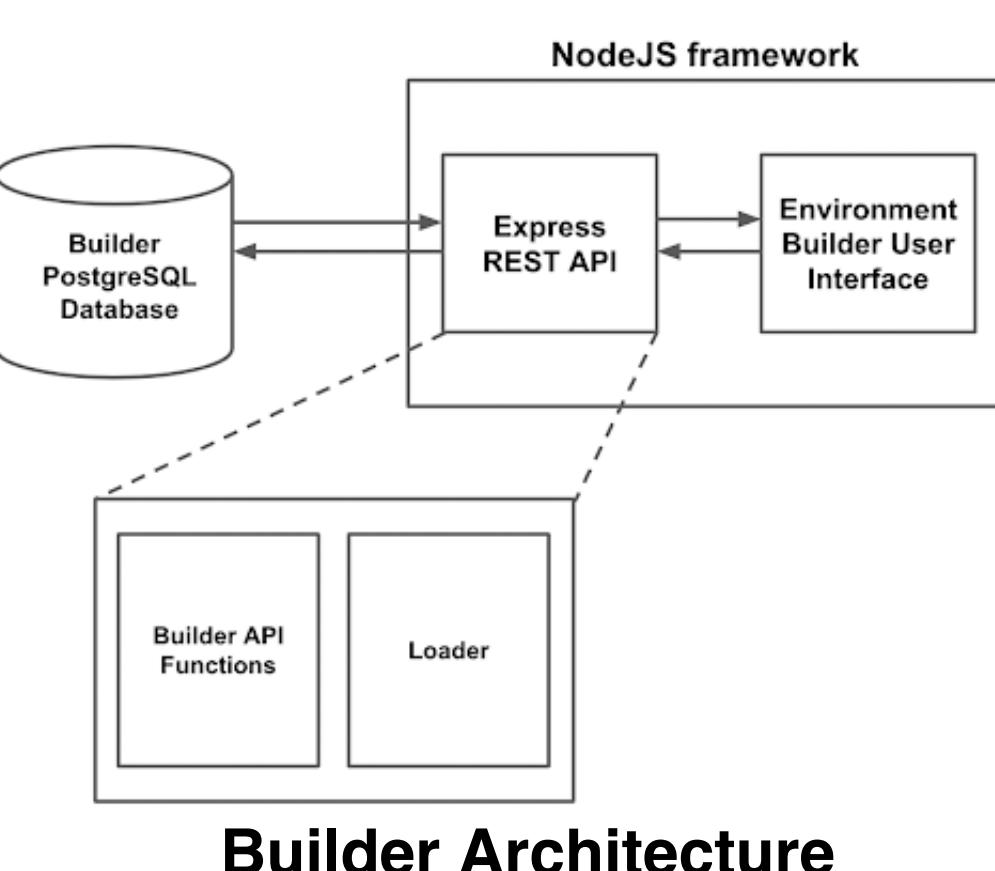
- Design digital representations of smart spaces through space models of physical environments and structures and emulate smart spaces such as the Donald Bren Hall at the University of California, Irvine, and also a senior care facility centered around assisted living based in Southern California.
- Many older adults live in age-friendly communities and senior health facilities (SHFs) that promote independent living.
- Due to a variety of physical illnesses (need for life-sustaining equipment, limited mobility) and cognitive afflictions (e.g., dementia, Alzheimer's), older persons are frequently unable to shelter safely in place or escape on their own during a crisis.



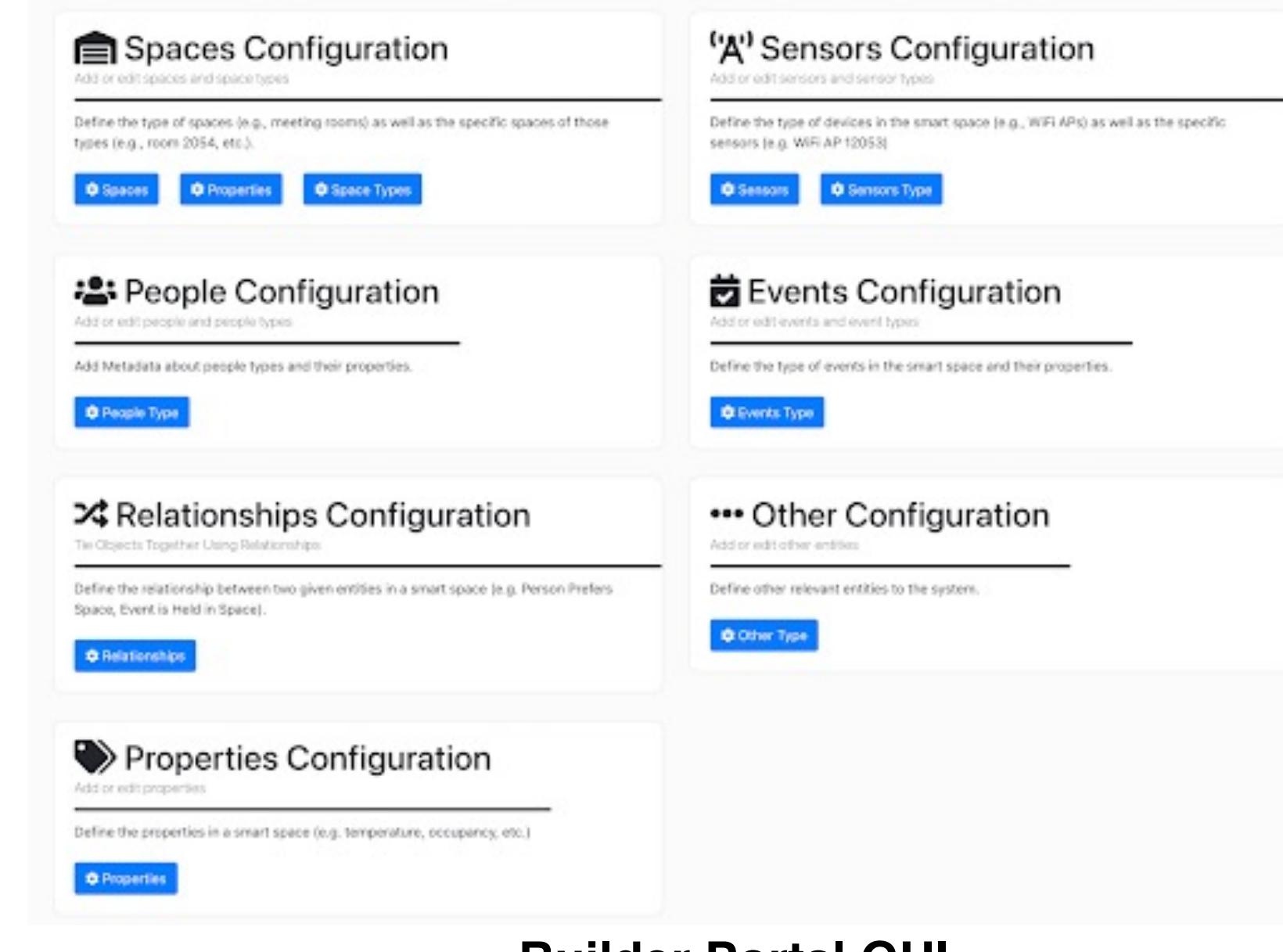
- Empower first responders by providing them with live dashboard maps to improve response outcomes during disasters by having seamless access to information about the living facilities (e.g., floor plans, operational status, number of residents), the residents, and regional impact of a disaster event along with support for evacuation decision-making.



Overview of TIPPERS Builder



Builder Architecture



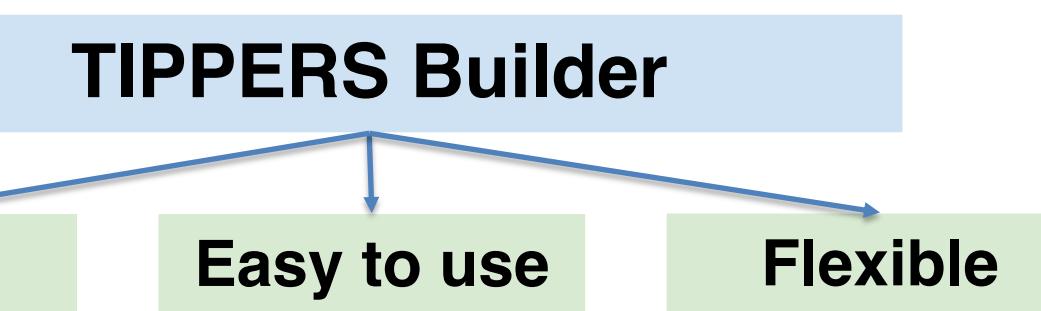
Comparison To Related Tools

There are tools related to the TIPPERS Builder which also enable users to create digital twins of smart spaces. However, compared to these tools, the TIPPERS Builder tool offers certain advantages to users as it provides features that encourage and enable simplicity, ease of use, and flexibility.

Disadvantages of VANTIQ
Does not provide a portal interface for designing digital representations of smart space environments and instead, only provides a code base for developers to create their own applications and then create digital twins

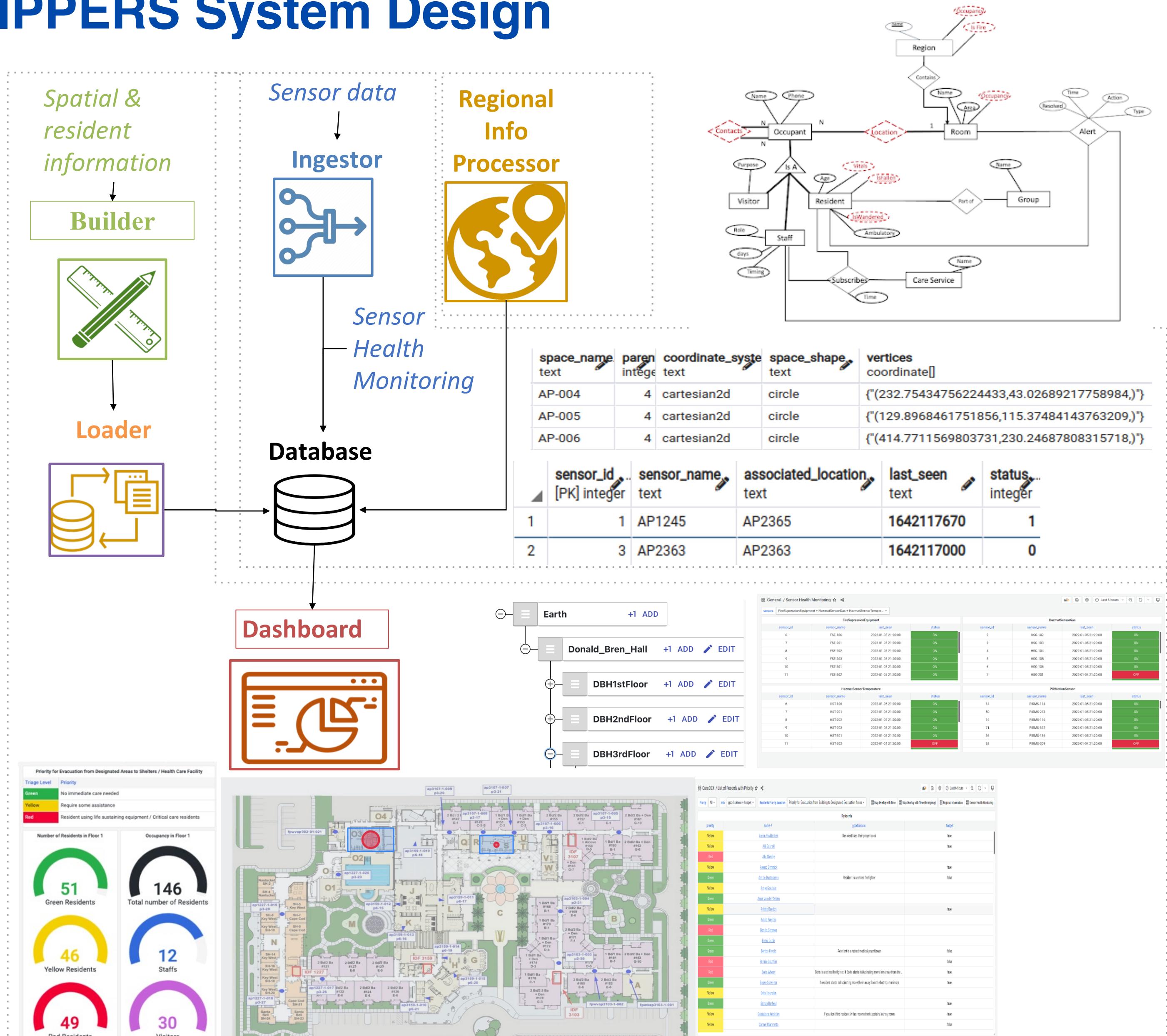
Disadvantages of Ubisense's SmartSpace® software and Microsoft's Azure Digital Twins
Not open source and cannot translate spaces from 2D to GPS coordinates

Disadvantages of ArcGIS and QGIS
Have a steep learning curve and complex interfaces. Also do not provide the ability to add semantic metadata to spatial objects



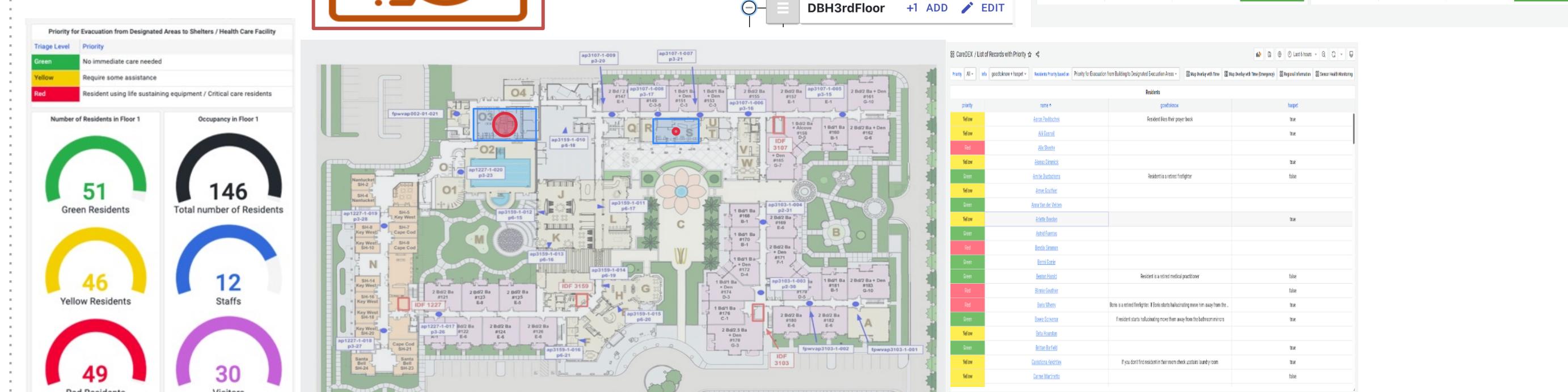
TIPPERS System Design

Component	Function
Builder	Provides a tool to create representation of spatial data and resident information
Dashboard	Provides first responders with on-demand access to critical information in emergency evacuation scenarios



Representation of occupants, along with their properties, present in spaces in the TIPPERS system

people	
PK	person_id
	integer
	name
	organization
	username
	credential

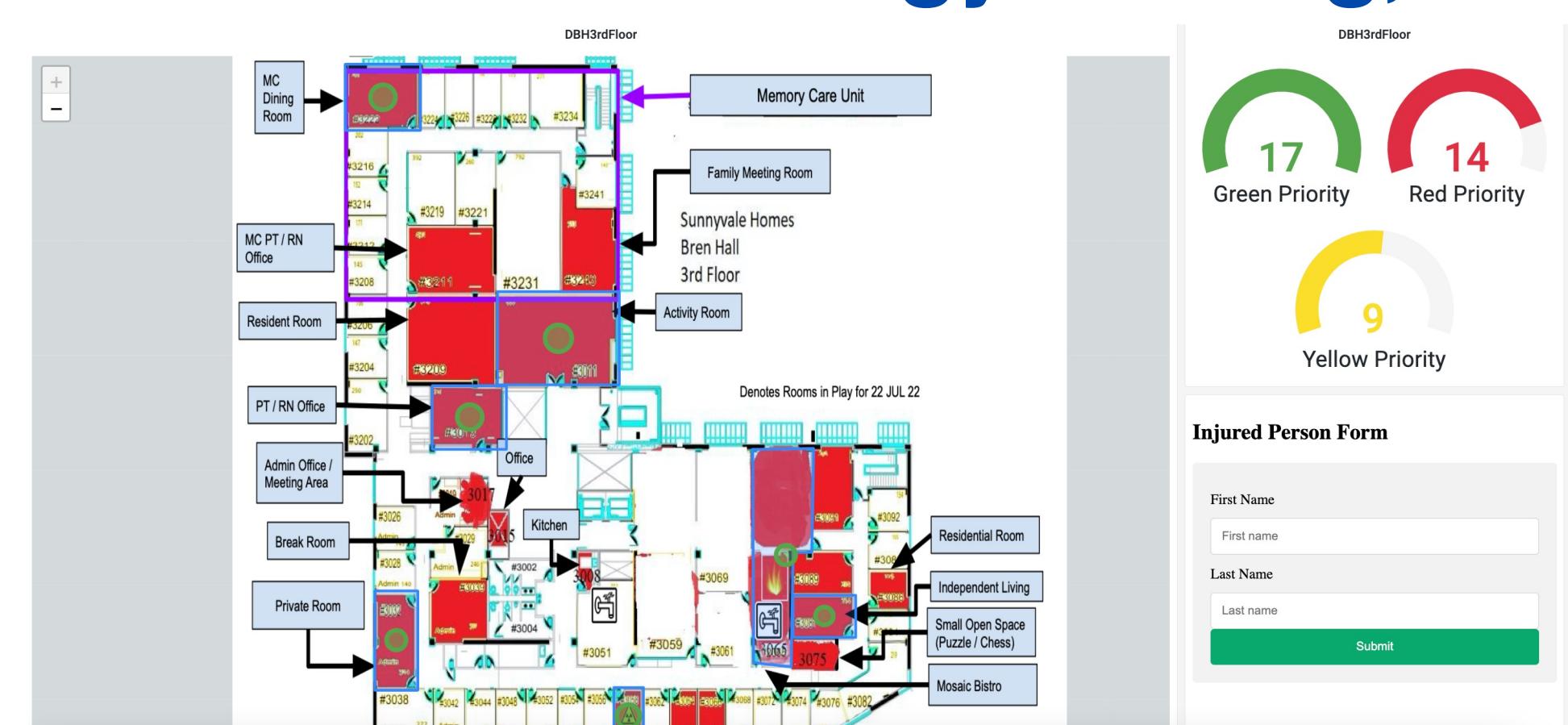


Representation of type id, parent type id and associated properties of occupants present in spaces in the TIPPERS system

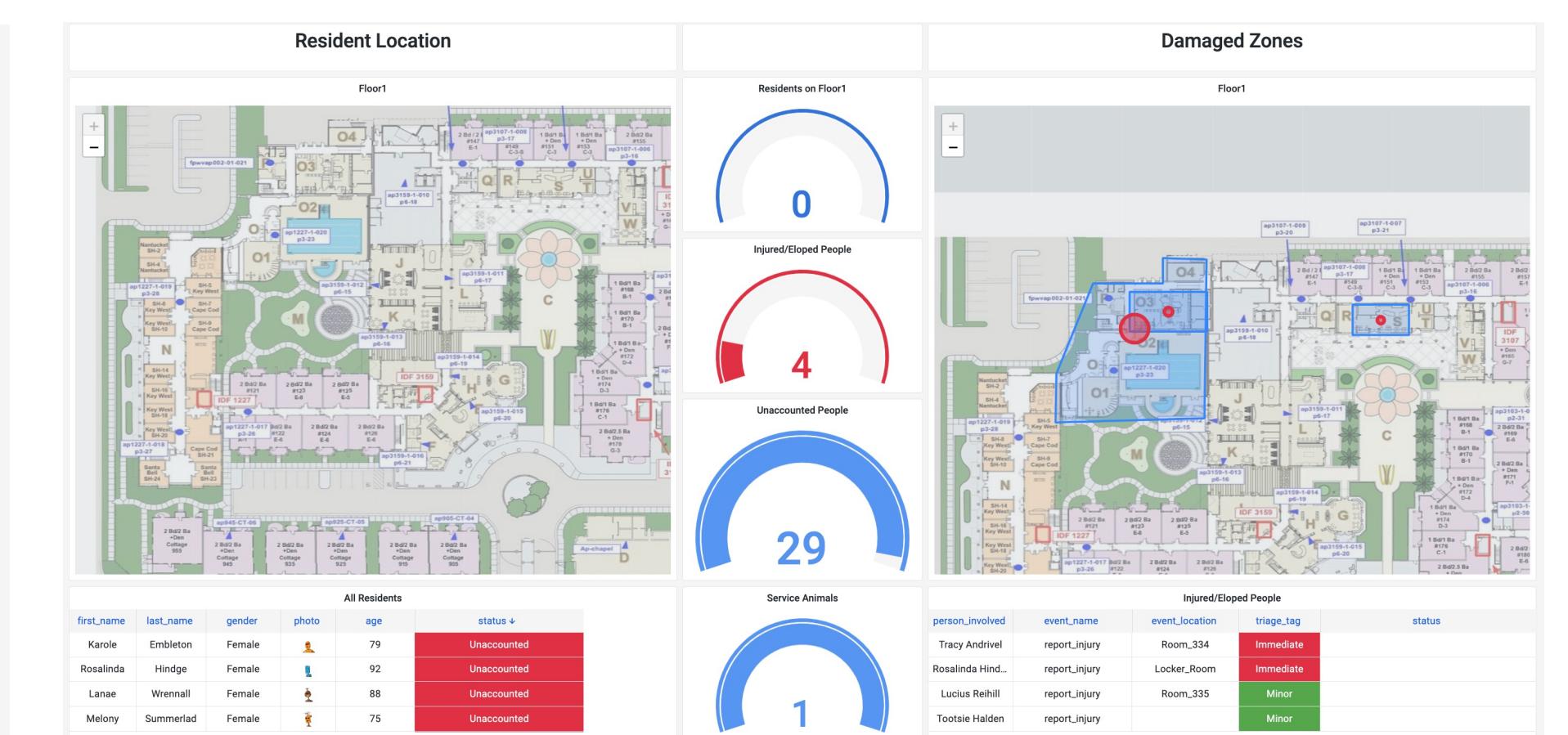
people_types	
PK	type_id
	serial
	type_name
FK	parent_type_id
	type_properties

Representation of type id, parent type id and associated properties of occupants present in spaces in the TIPPERS system

Technology Testing, Evaluation and Validation



The first responders at the Donald Bren Hall evacuation drill indicated that the live dashboard map of the digital representation of Donald Bren Hall helped them locate individuals and also identify reports of those requiring paramedic response.



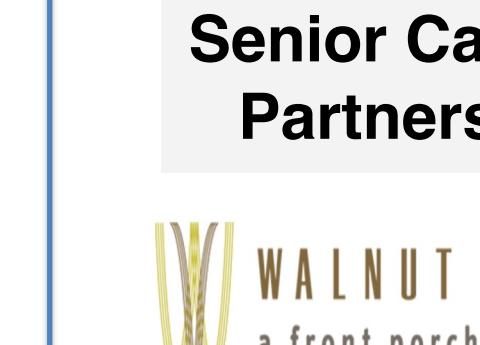
The emergency personnel and firefighters at the evacuation of the senior residential and care facility as part of the Great Shakeout confirmed that the live dashboard map of the digital representation of the senior care facility helped alert the response team that 8 residents were still missing after the primary evacuation, and they were able to identify and locate these residents with the help of this live dashboard map.

Critical Task	Without Use of TIPPERS Builder in Evacuation Drill	Using TIPPERS Builder in Evacuation Drill
Locating Missing Individuals	Lower Certainty of Success	Higher Certainty of Success
Providing Paramedic Response to Injured Individuals	Lower Certainty of Success	Higher Certainty of Success
Rescuing Trapped Individuals	Lower Certainty of Success	Higher Certainty of Success

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Disaster Resilience Partners



front porch
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