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Metro Government of Nashville
& Davidson County, Tennessee

VANDERBILT INITIATIVE FOR SMART CITIES OPERATIONS AND RESEARCH (VISOR)

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What are smart cities/smart and connected communities?

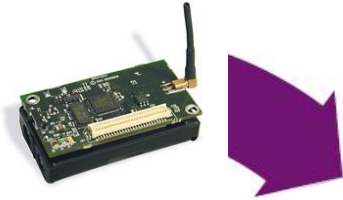
Smart and Connected Communities

- Smart and connected communities are human CPS with

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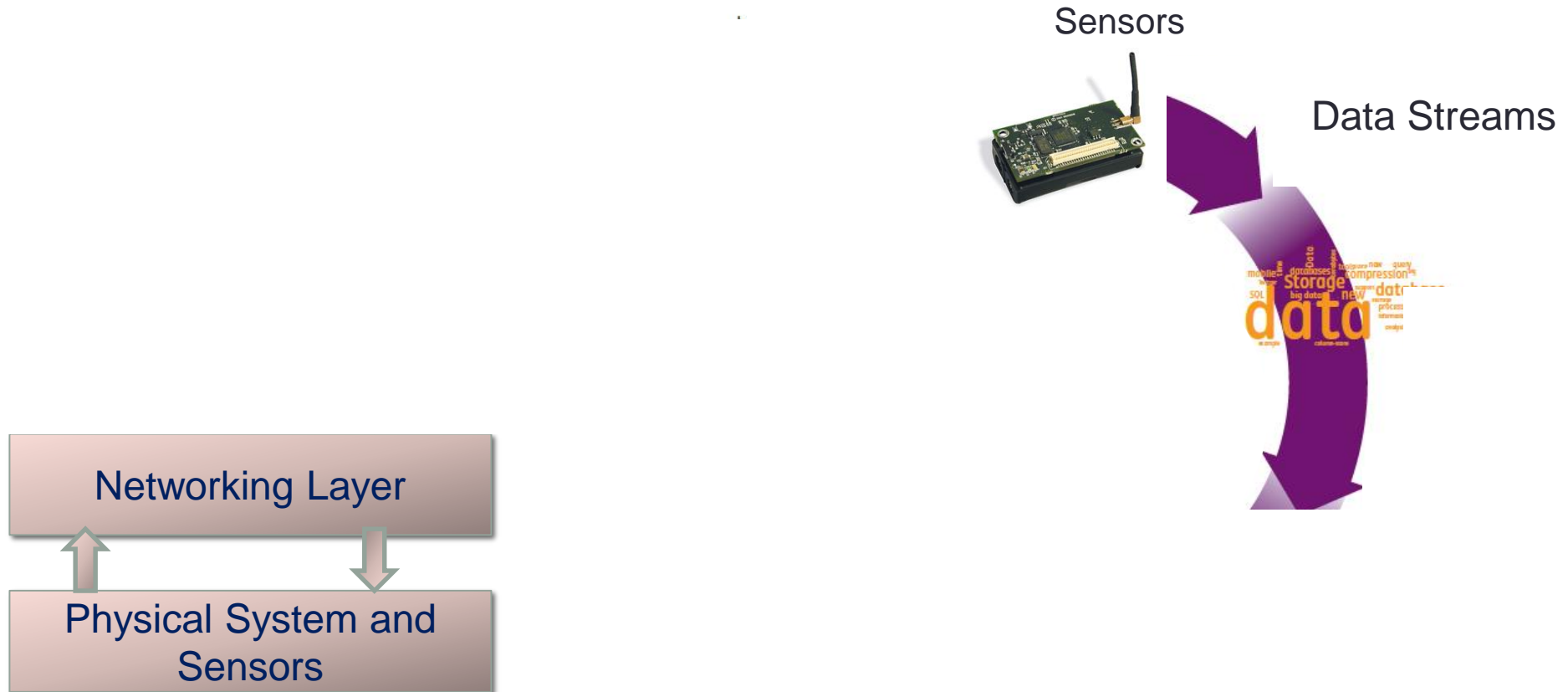
Sensors



Physical System and
Sensors

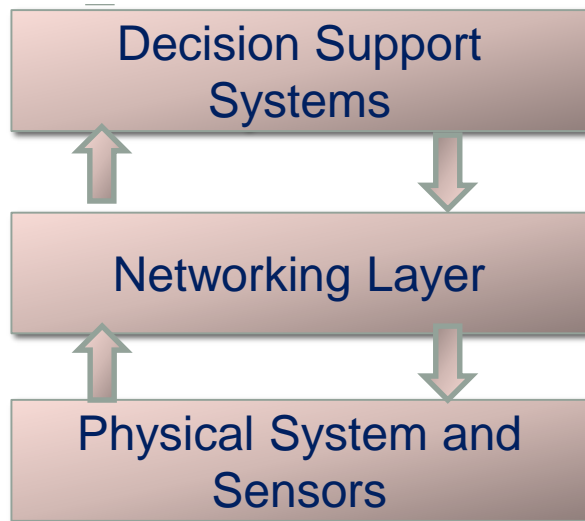
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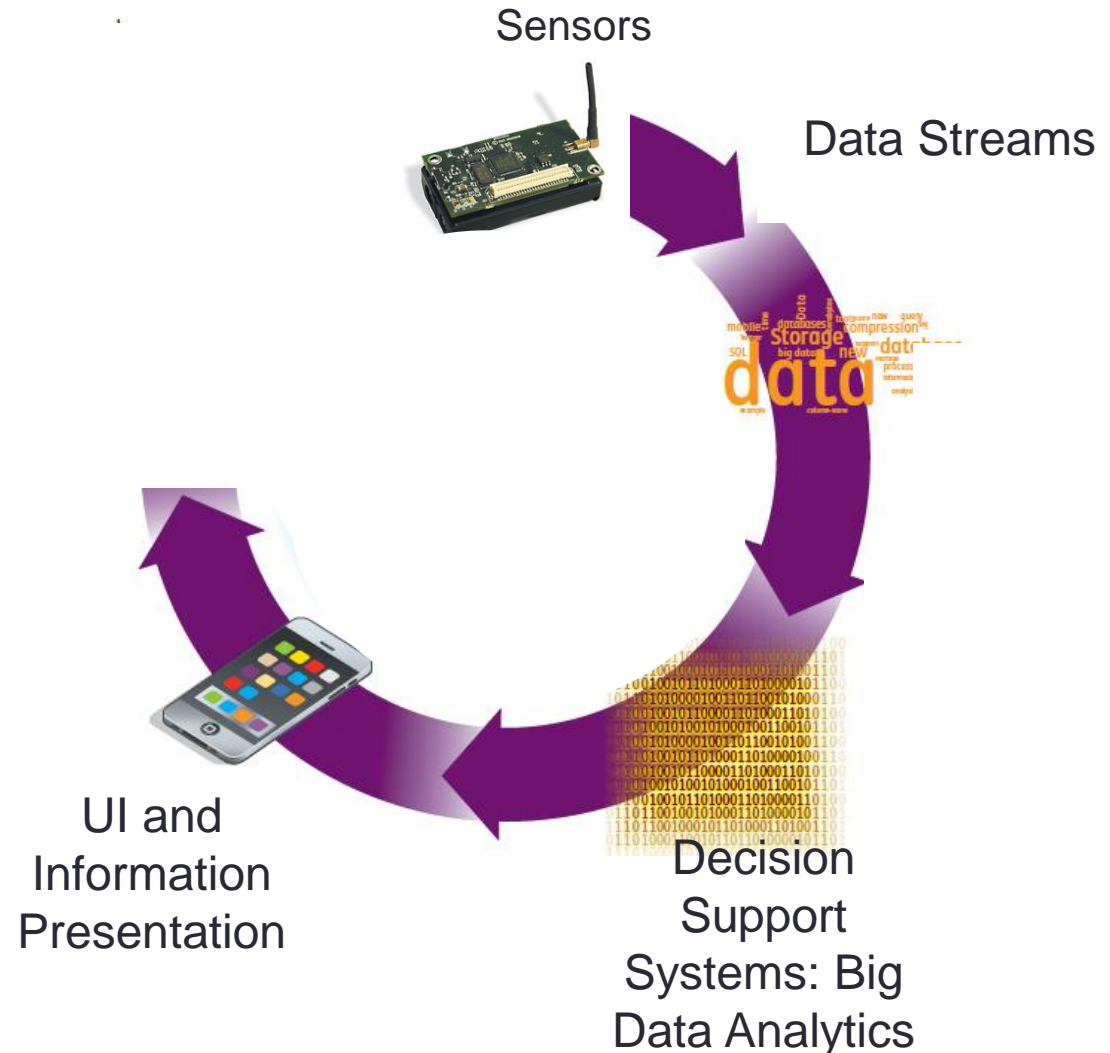
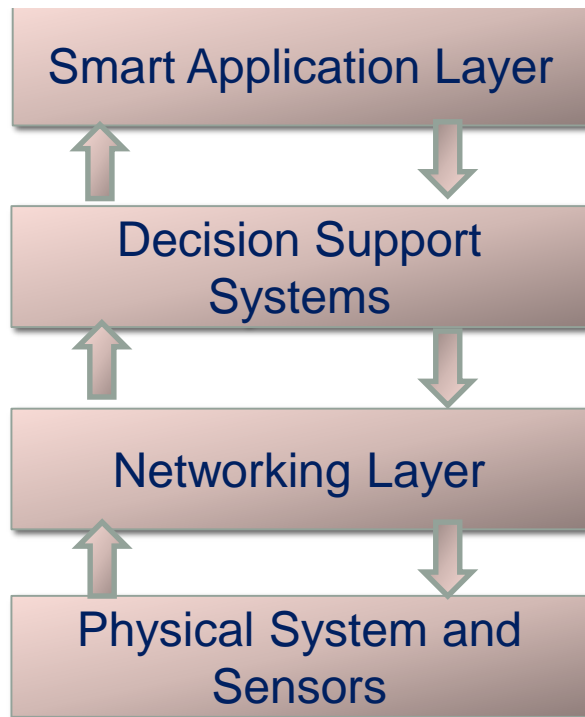
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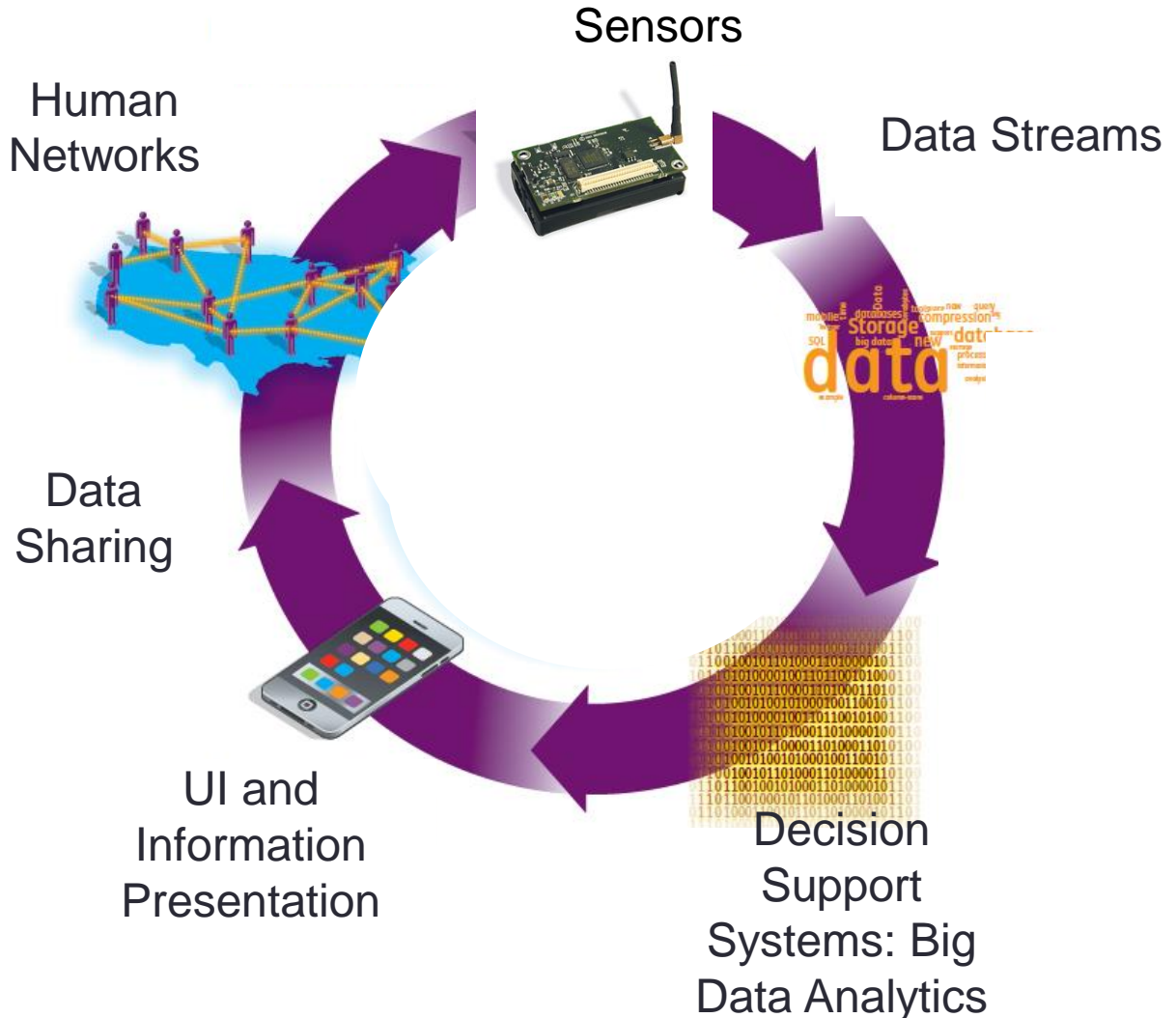
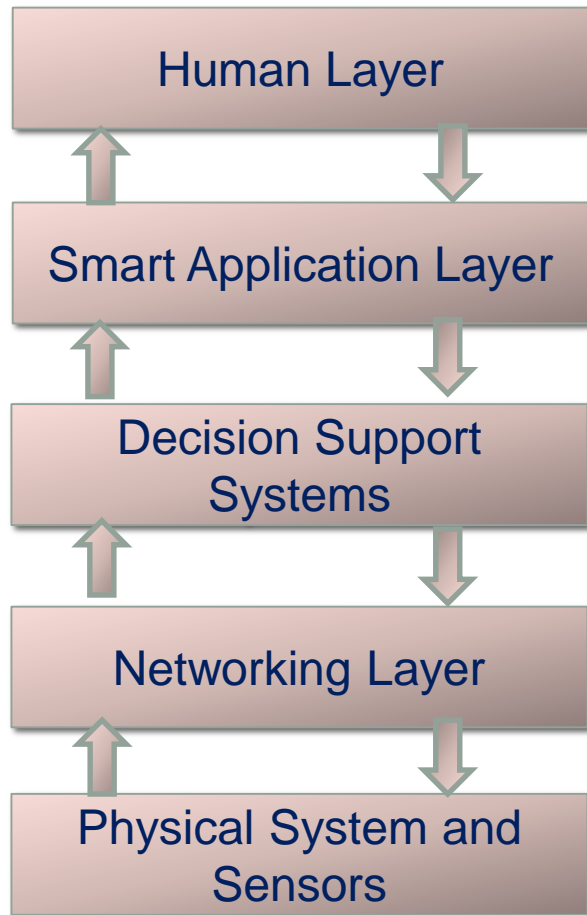
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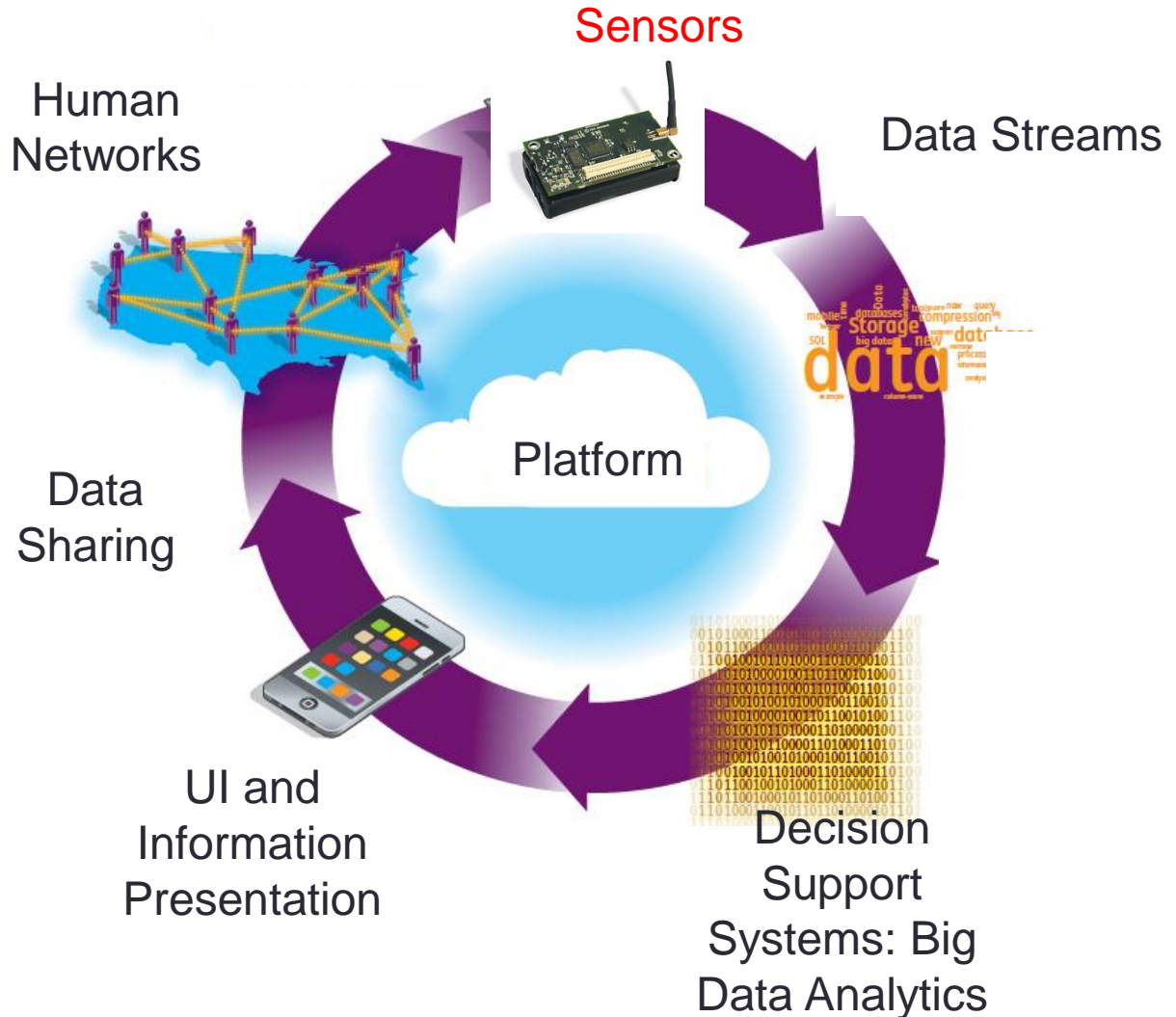
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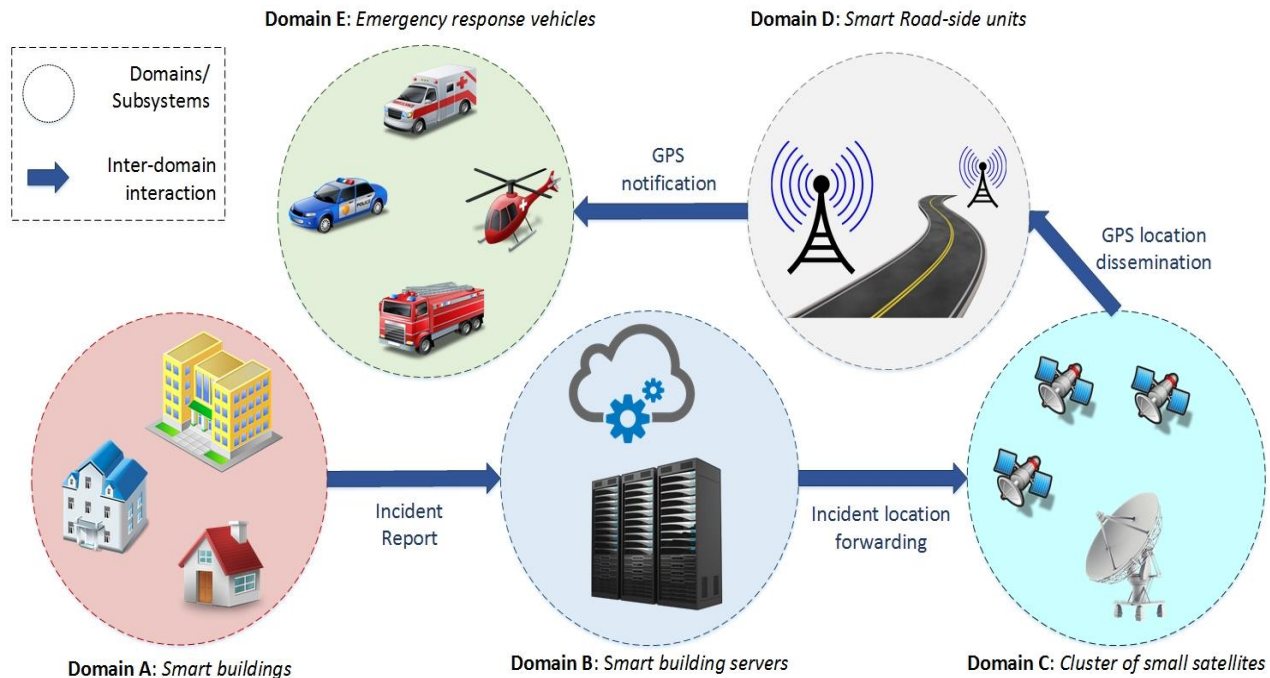
Smart and Connected Community - Challenges

- Data heterogeneity
 - Different characteristics



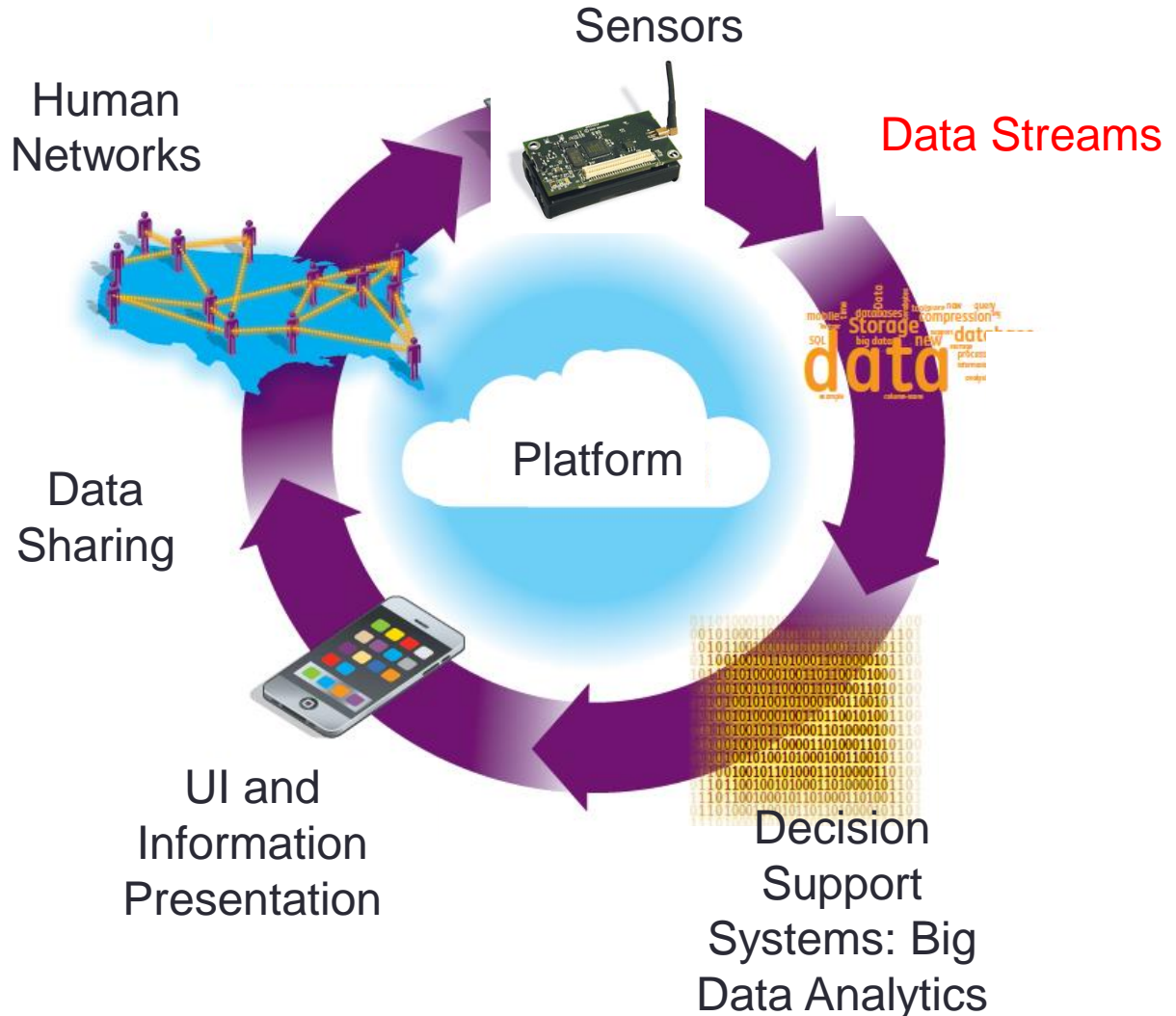
Smart and Connected Community - Challenges

- Data heterogeneity
 - Data comes from different domains
 - Different characteristics



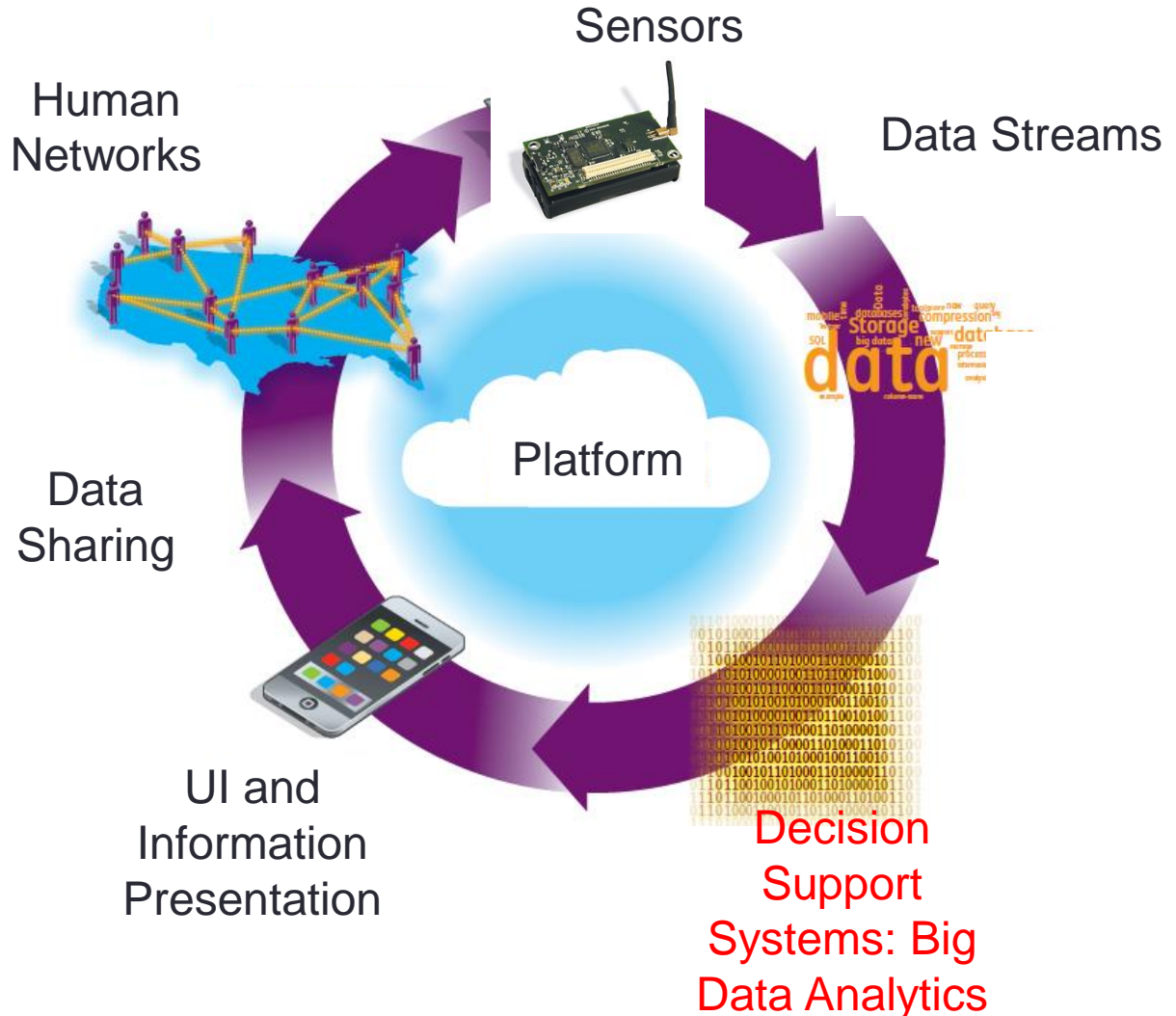
Smart and Connected Community - Challenges

- Varying network (primarily wifi) bandwidth
- The network bandwidth (latency) is an important factor in deciding how to deploy smart IoT technology.



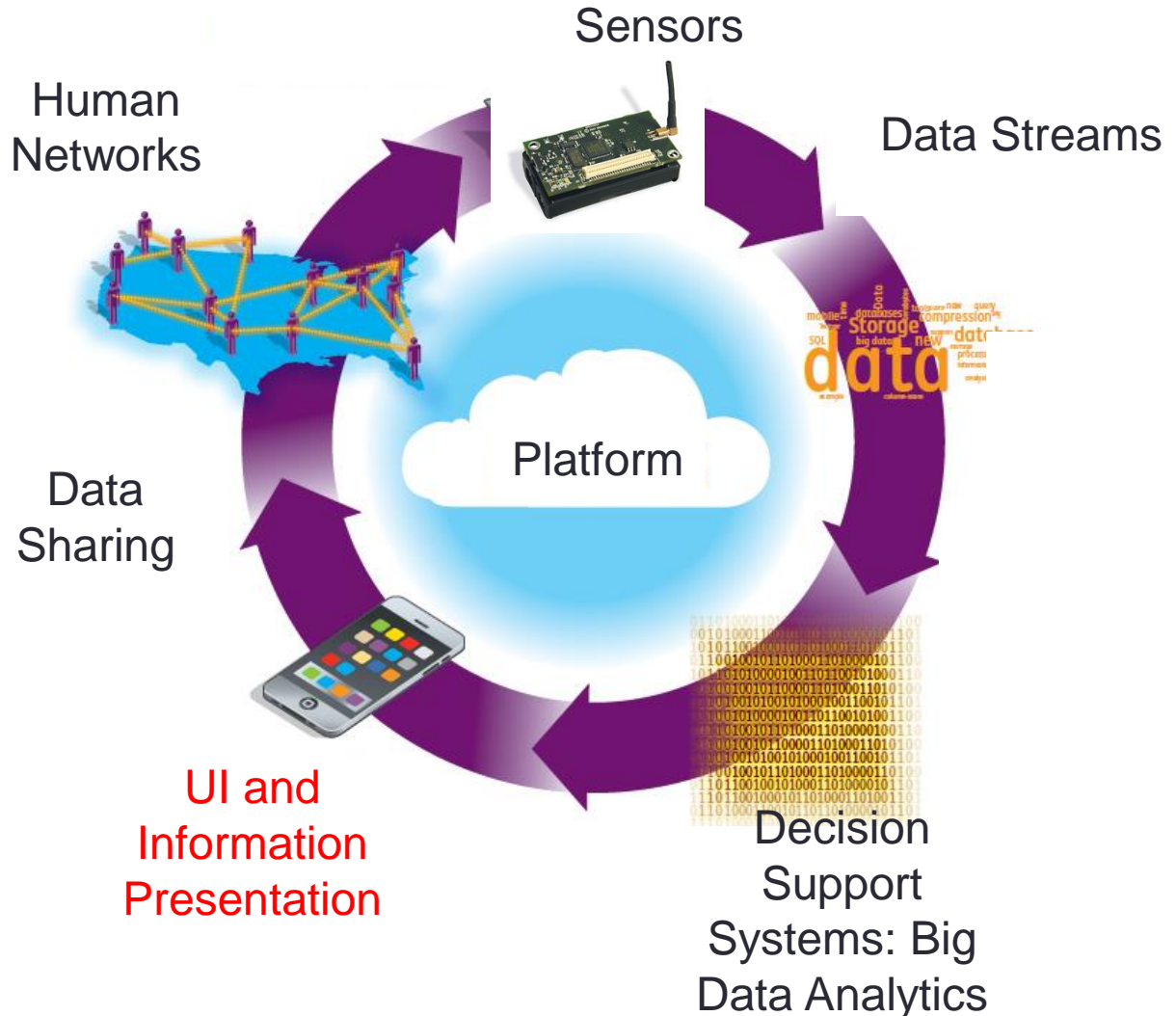
Smart and Connected Community - Challenges

- Different time scales
 - Real-time
 - Traffic light control.
 - Near Real-time
 - Smart parking and multimodal transportation planning.
 - Long term
 - Transit network design and evaluation



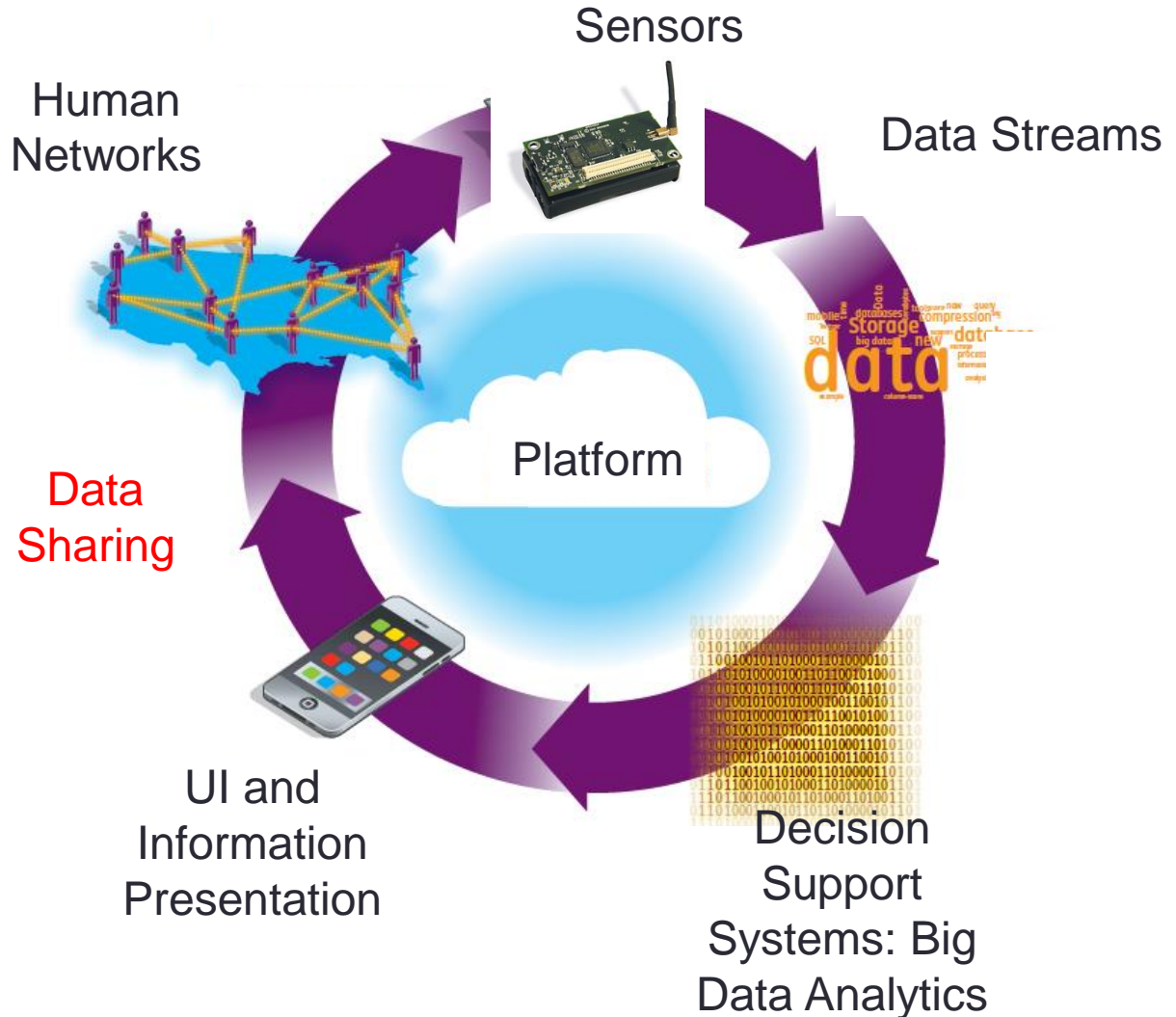
Smart and Connected Community - Challenges

- Human/Computer Interface
 - How to present information to humans?
 - What level of information should be presented?
 - Architecture for formulating and evaluating choices provided to human in the loop.



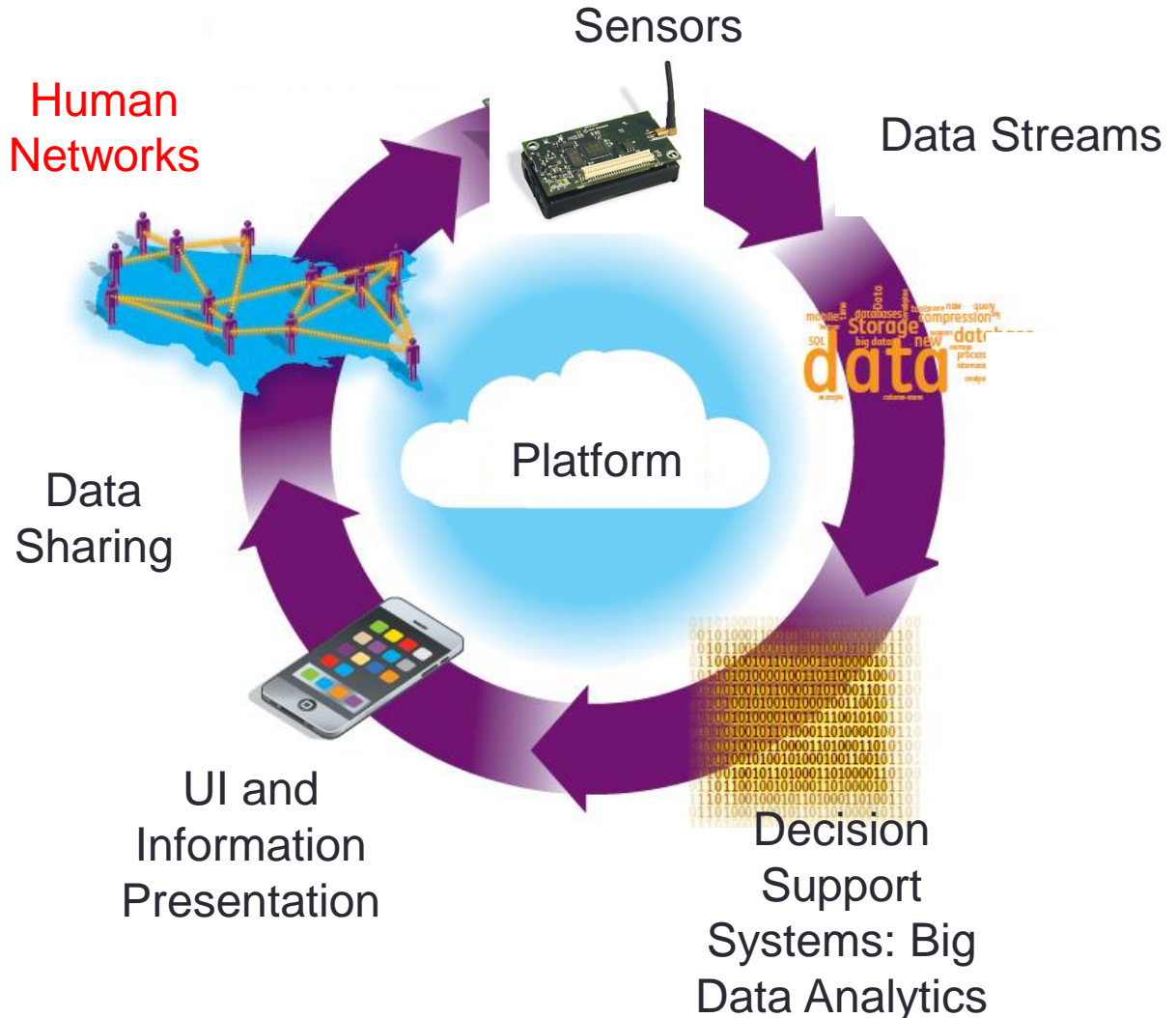
Smart and Connected Community - Challenges

- Security
- Privacy
- Correctness



Smart and Connected Community - Challenges

- Coordinated incentivization of certain decisions and measuring their effect is a challenge
 - It is not always economic in nature
- Providing information without coordination can cause issues.



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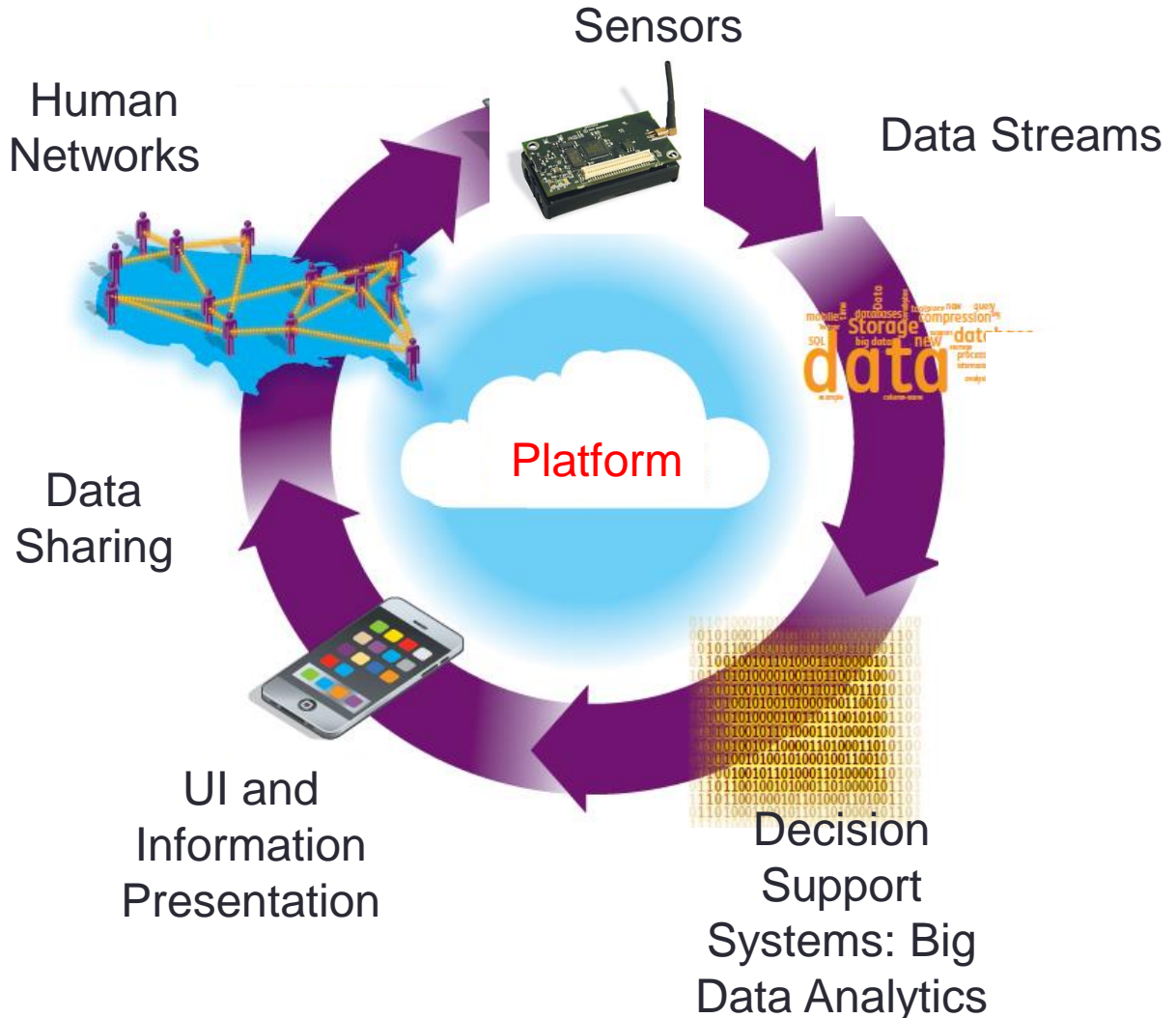


"Both Atlanta Mayor Kasim Reed and Georgia Gov. Nathan Deal put much of the blame on the fact that everyone -- government, businesses and schools -- all tried to go home at the same time, clogging highways for hours."

Source: cnn.com (What other cities can learn from Atlanta's ice debacle)

Smart and Connected Community - Challenges

- The platform Challenge
 - Interoperability
 - Resilience
 - Extensibility



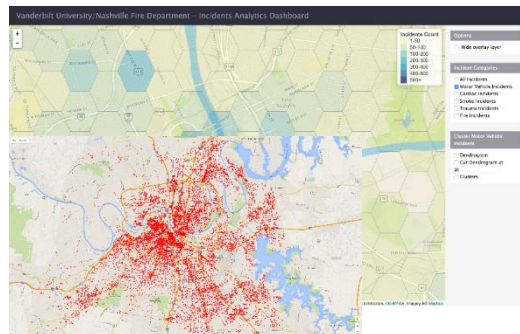


So who are we and what do we do

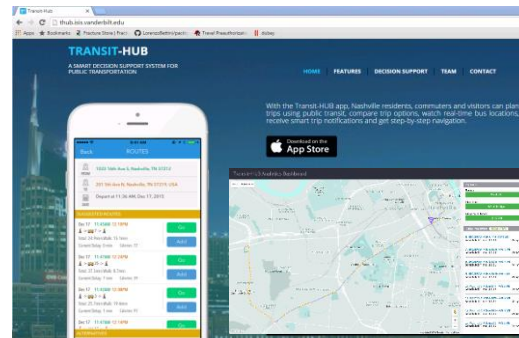
VISOR – Vanderbilt Initiative for Smart Cities Operations and Research

Computational Architectures and Data Driven Approaches to support Smart City Operations

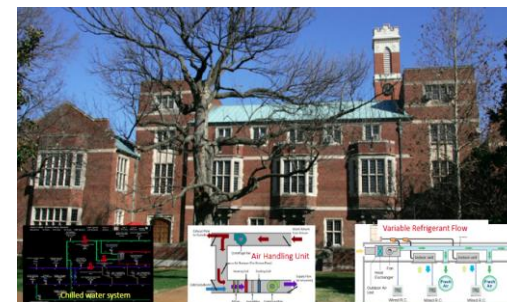
- ViA Award, Fall 2016-
 - Includes faculty and students from Engineering and Computer Science, Arts and Science, and Peabody
- What we do?
 - Bring convergence of social science, education, computer science, mathematics and engineering to address problems facing the fast growing city of Nashville using Data Analytics, Mobile Devices, and Smart Applications
- Why we do it?
 - Advance understanding of our cities and communities, esp. Nashville, to improve their functioning and quality of life within them bringing together research in computing, engineering, information and physical sciences, social, and learning sciences
 - Address the needs and perspectives of disparate communities across Nashville



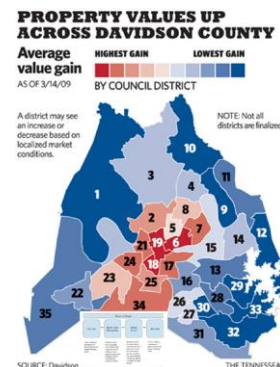
Incident Analysis and Forecast for Optimal Resource Allocation



Multimodal Transportation Simulation, Analysis and Optimization



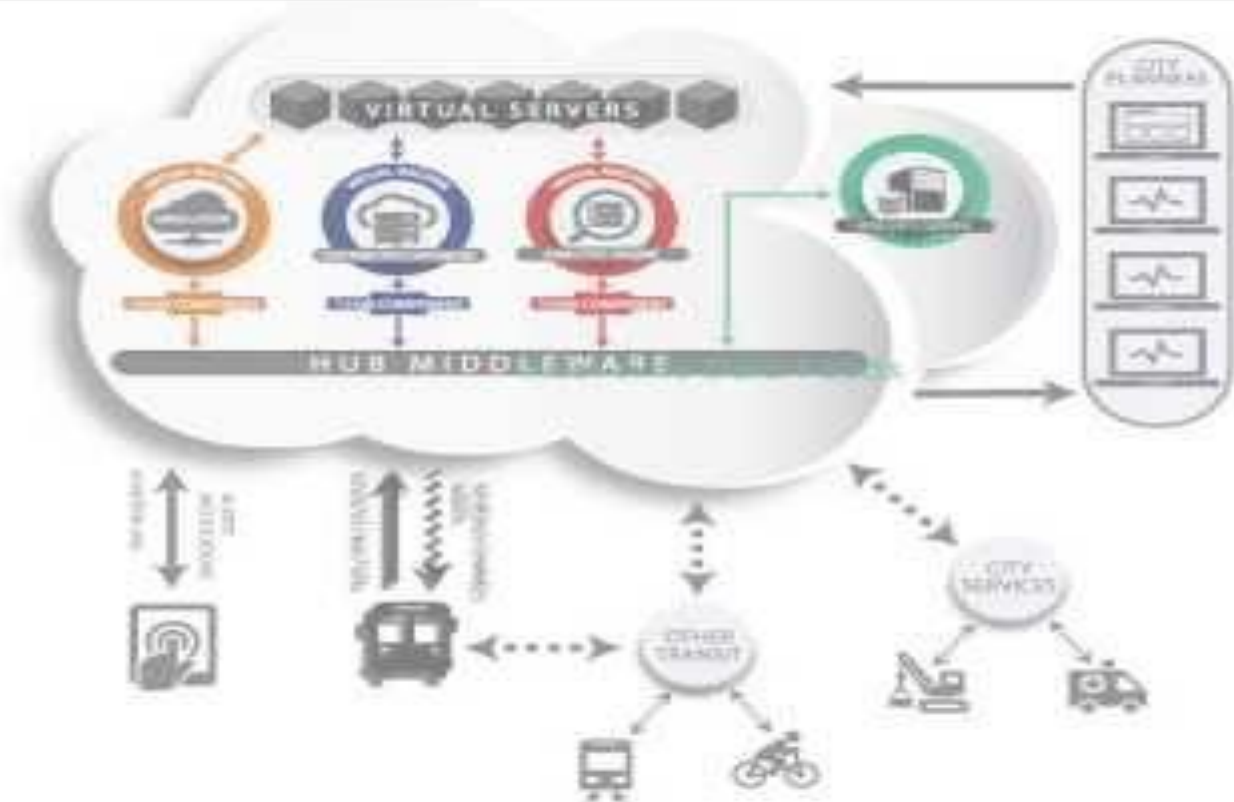
Building Monitoring and Control Smart Buildings



Gentrification Study Housing + Transportation

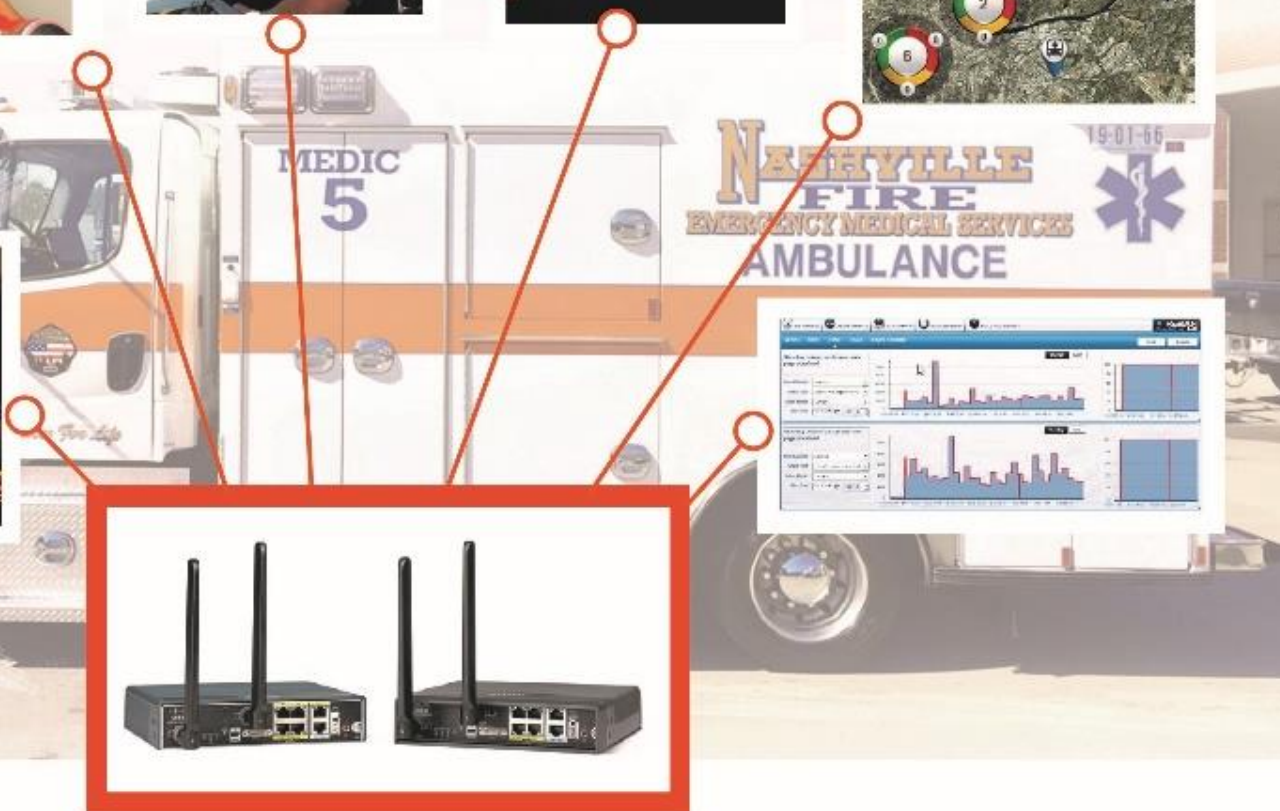


Transit Hub





Smart Emergency Response





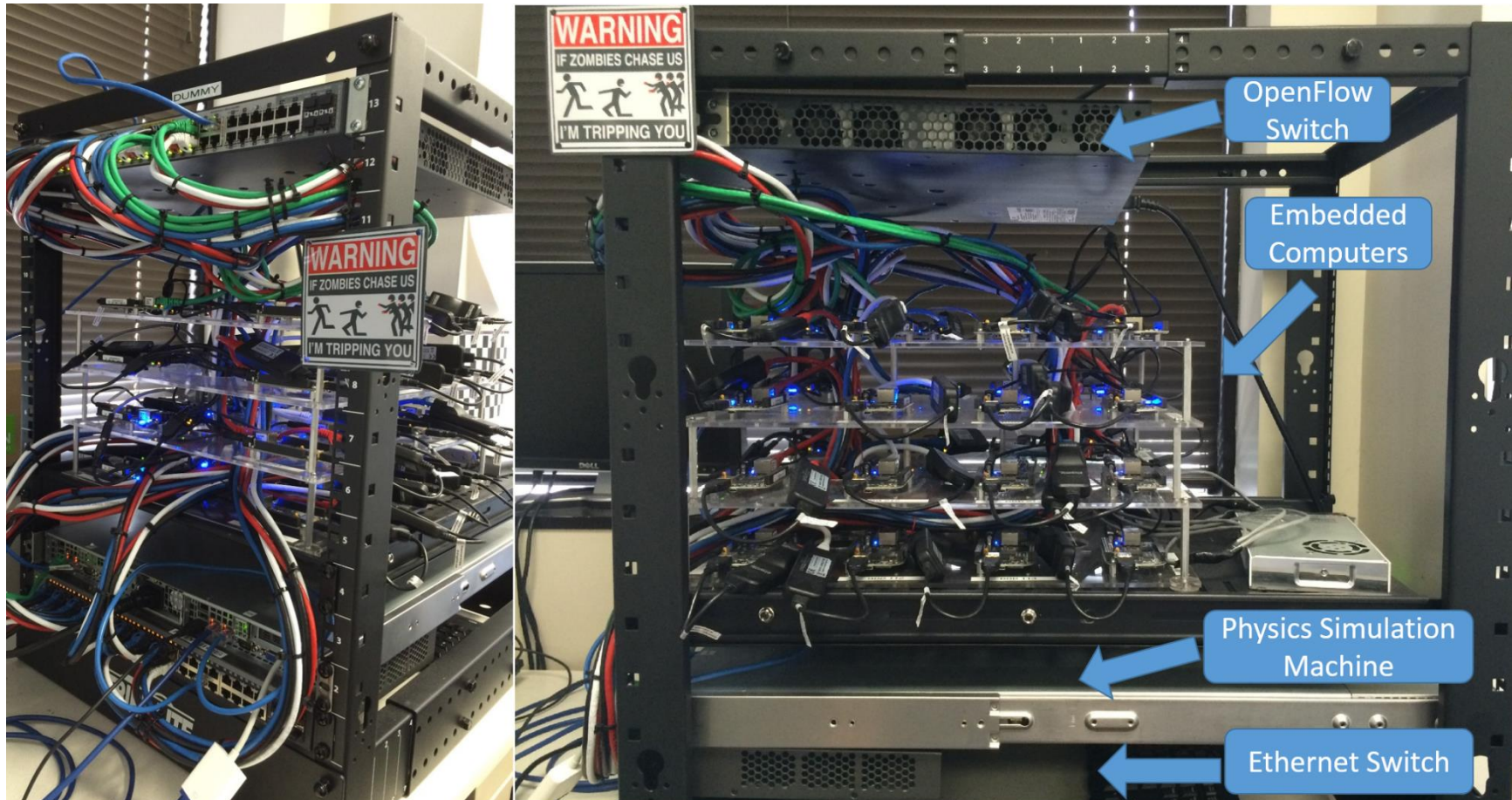
Incident Analytics Visualization



SIMULATION AND ANALYSIS PLATFORMS

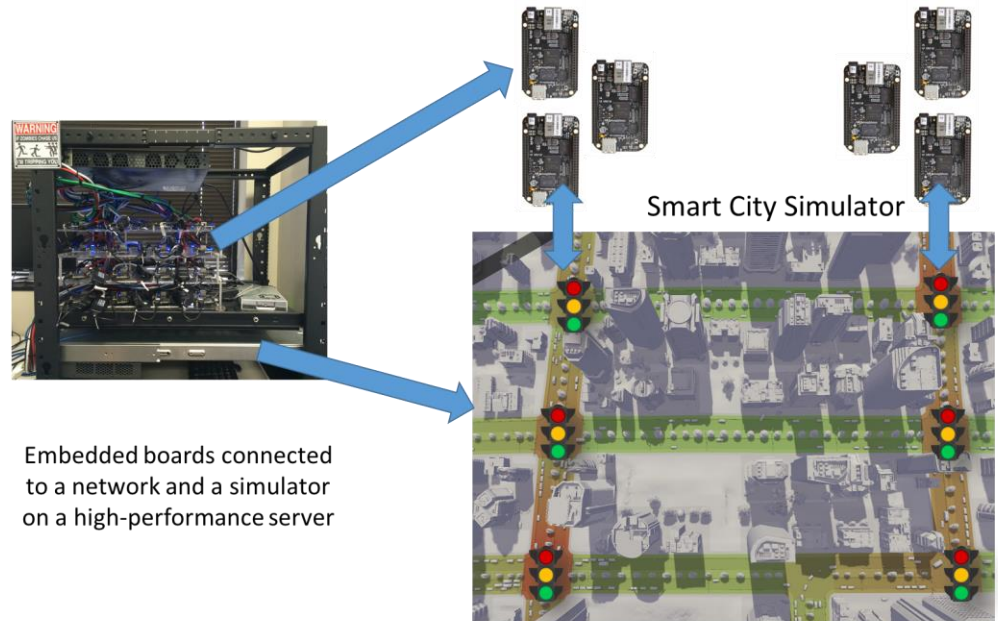


Simulation Platform



Example

- Control of multiple smart intersections which communicate with each other





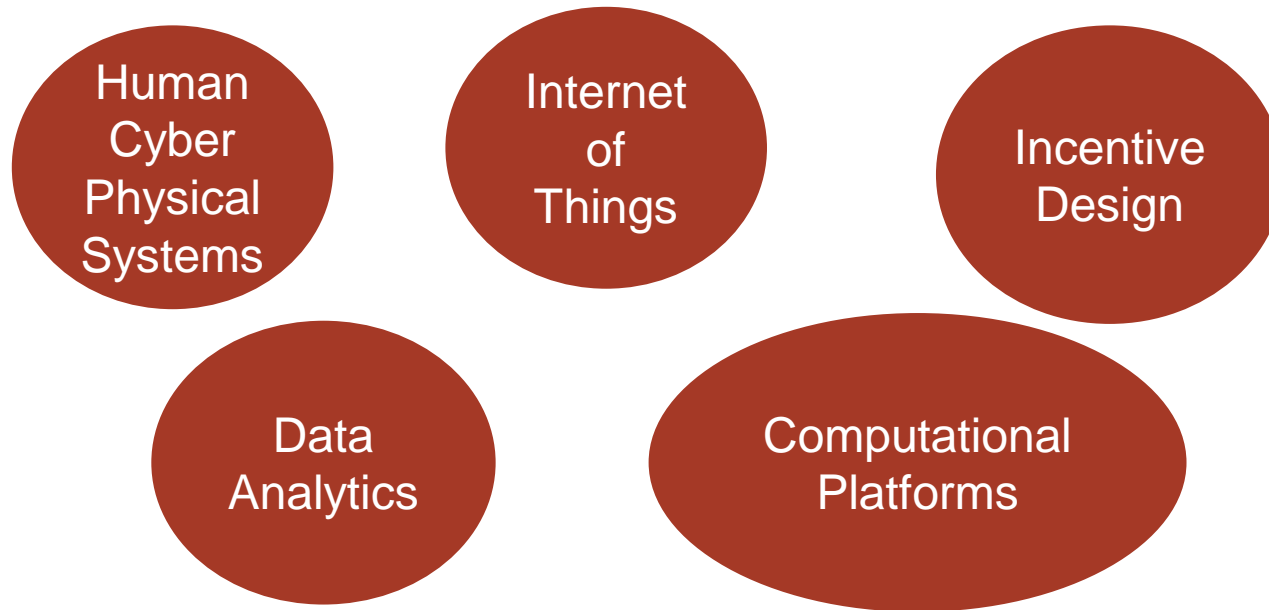
Video





Summary: VISOR Project(s)

- Areas of Research



Information technology is a key infrastructure across domains
Focus currently is on Nashville Metro and surrounding areas