



Towards a Digital Twin Framework for Adaptive Last Mile City Logistics



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 861598



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Agenda

Conceptual Digital Twin

Business Process

Technical architecture



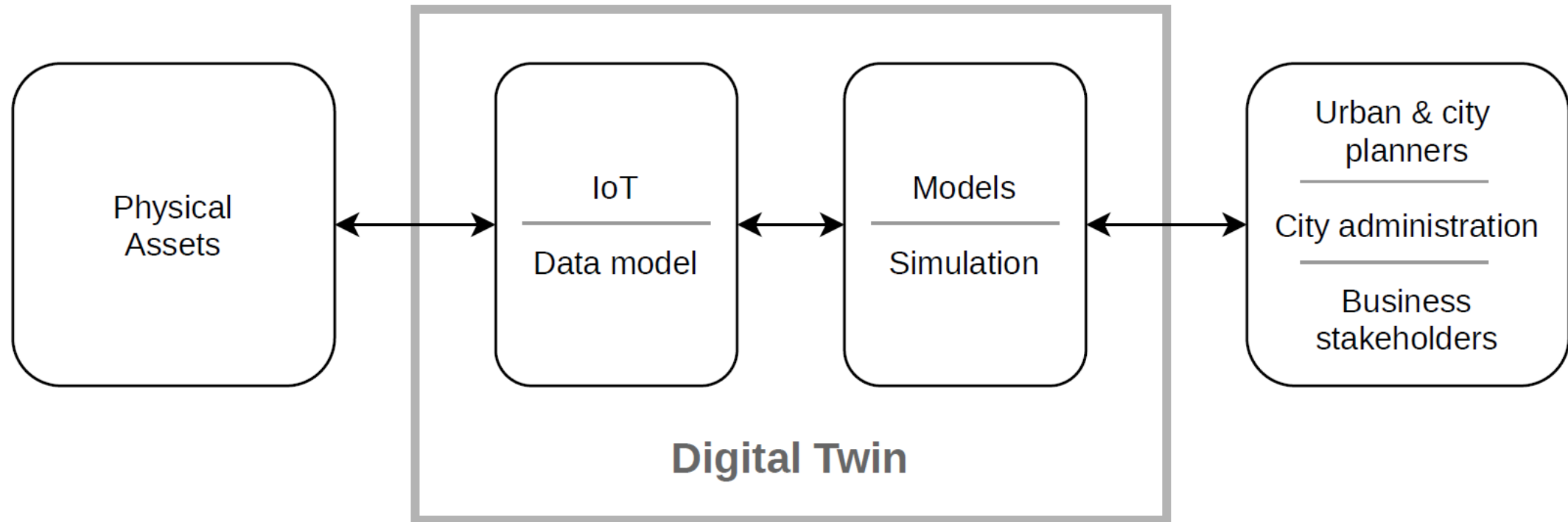
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Conceptual Digital Twin



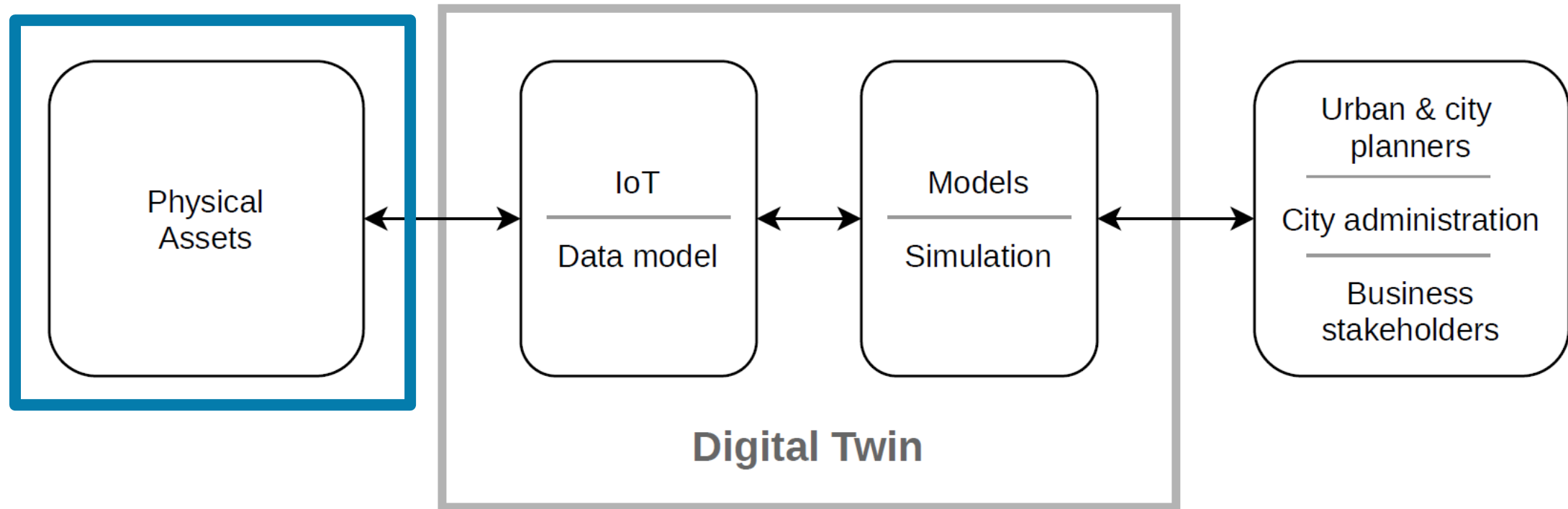
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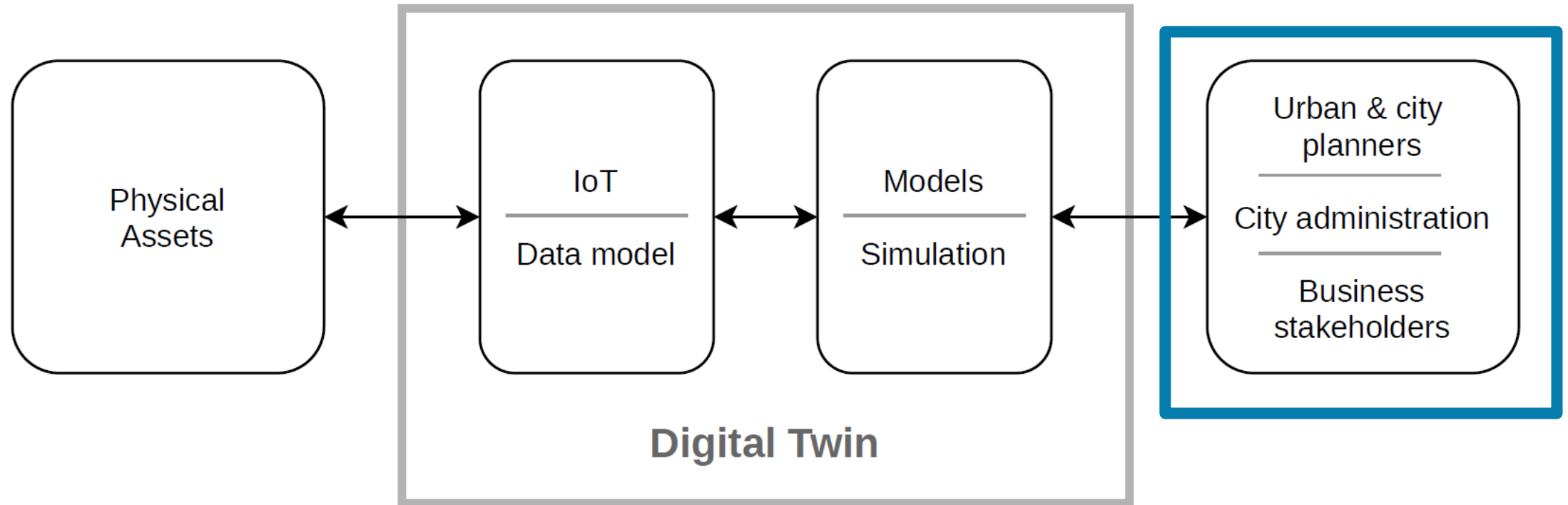
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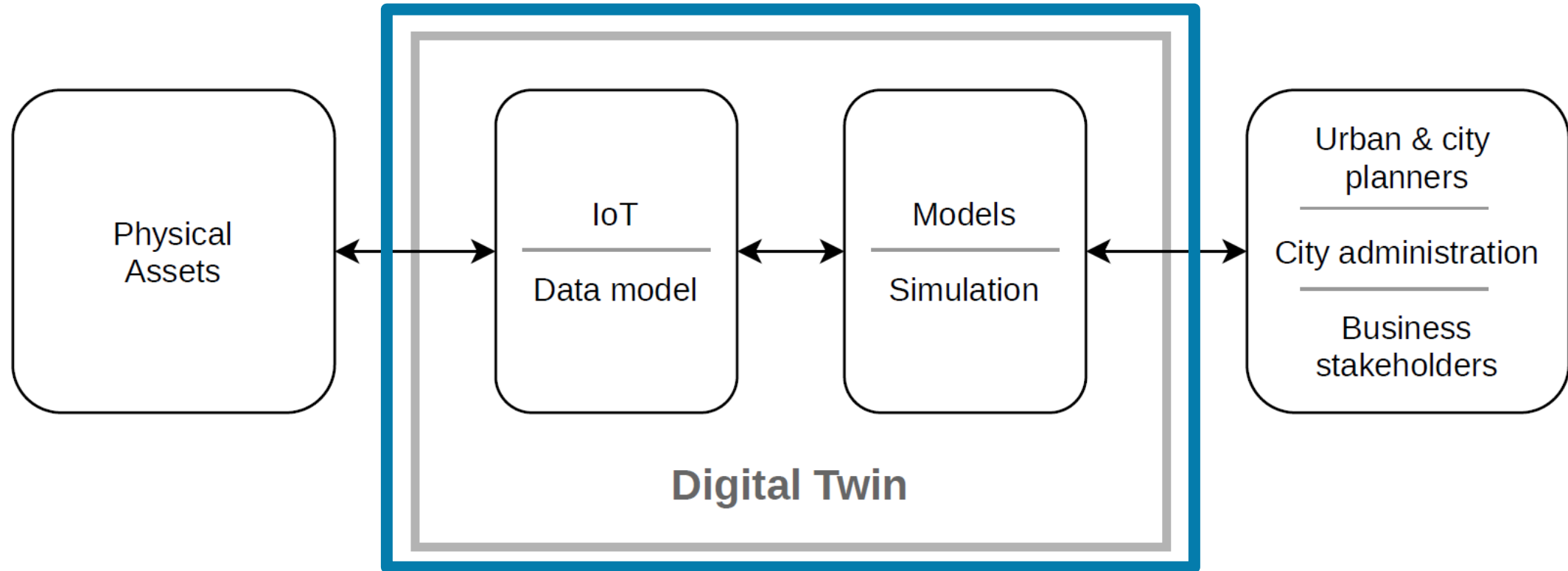
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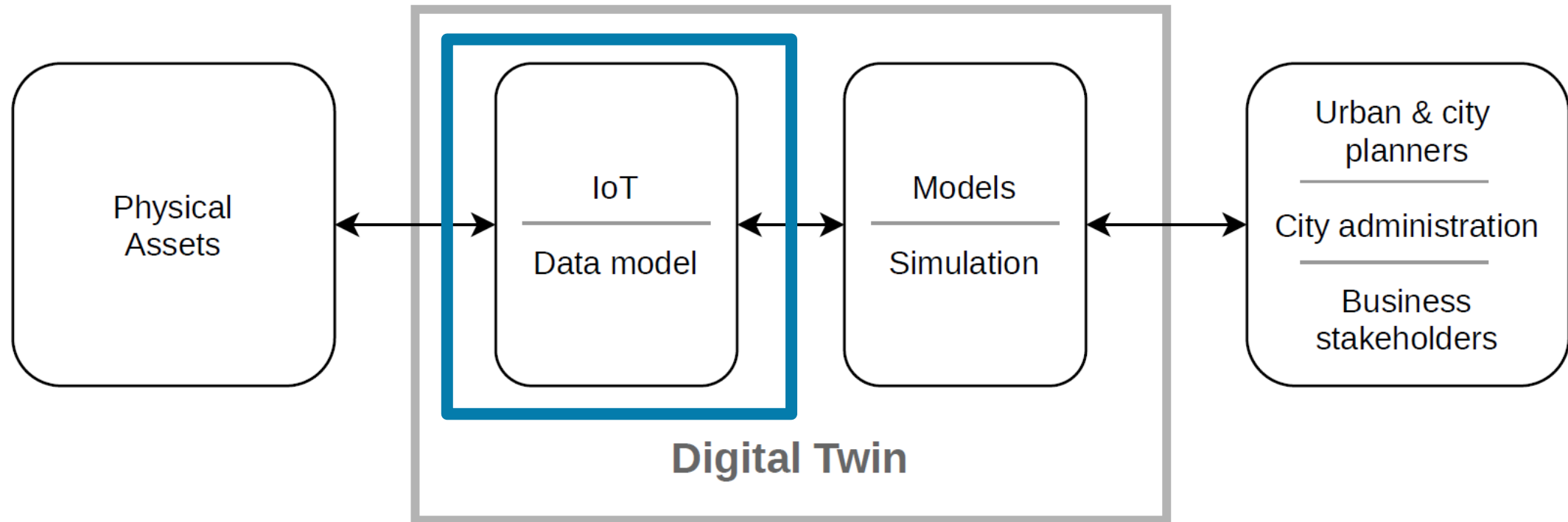
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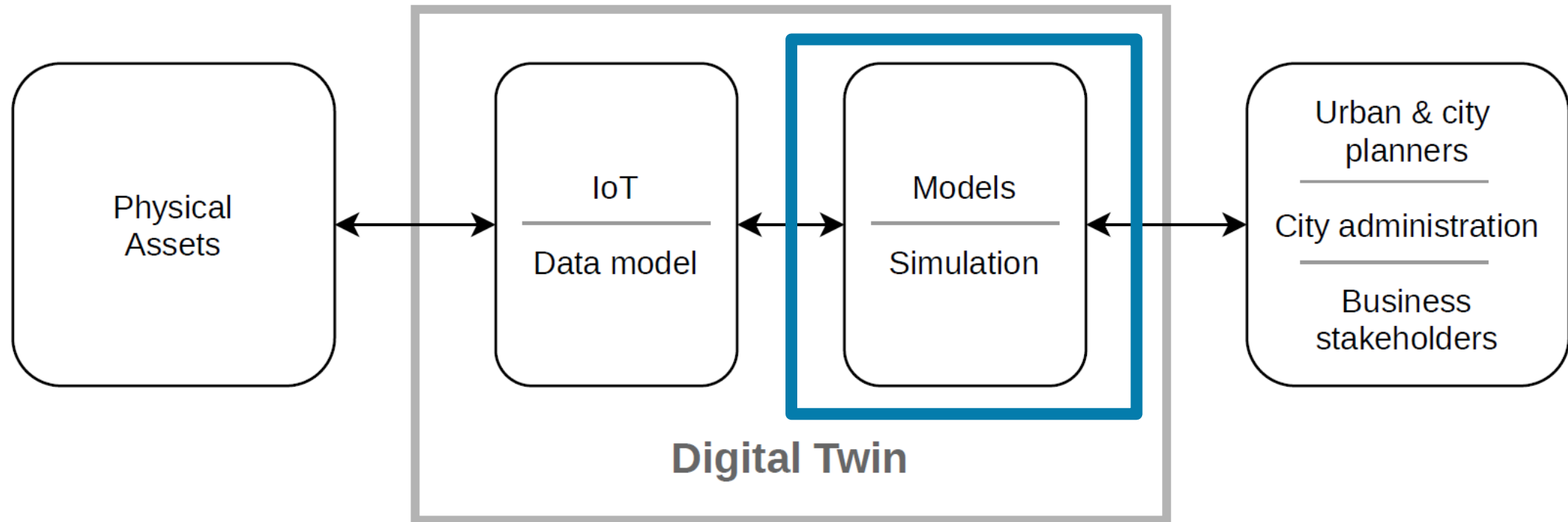
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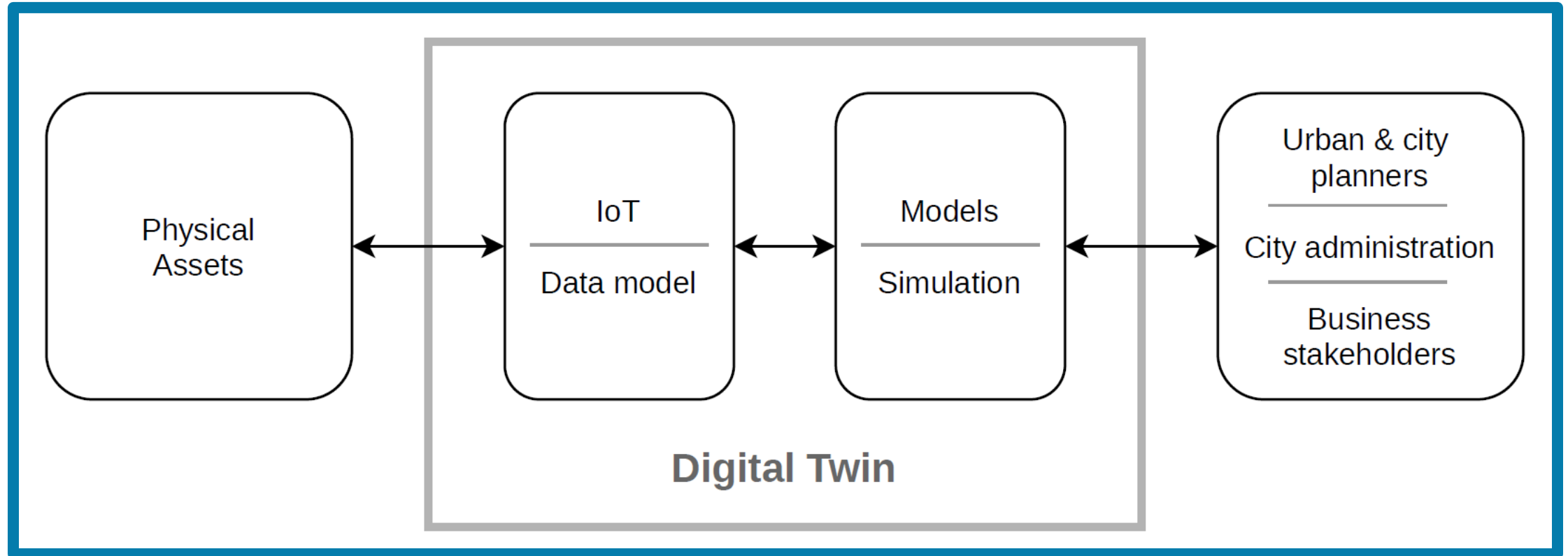
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Building blocks

- Business process:
 - What do stakeholders want to do with the Digital Twin?
 - Which questions should it be able to answer?
 - How do stakeholders want to interact with the digital twin?
- Technical architecture:
 - What components do we need to respond to the stakeholder needs?
 - How do we need to connect the individual components?
- Technical implementation
 - What concrete technologies can we reuse to fulfill the tasks defined in the architecture?
 - Which new components need to be developed?



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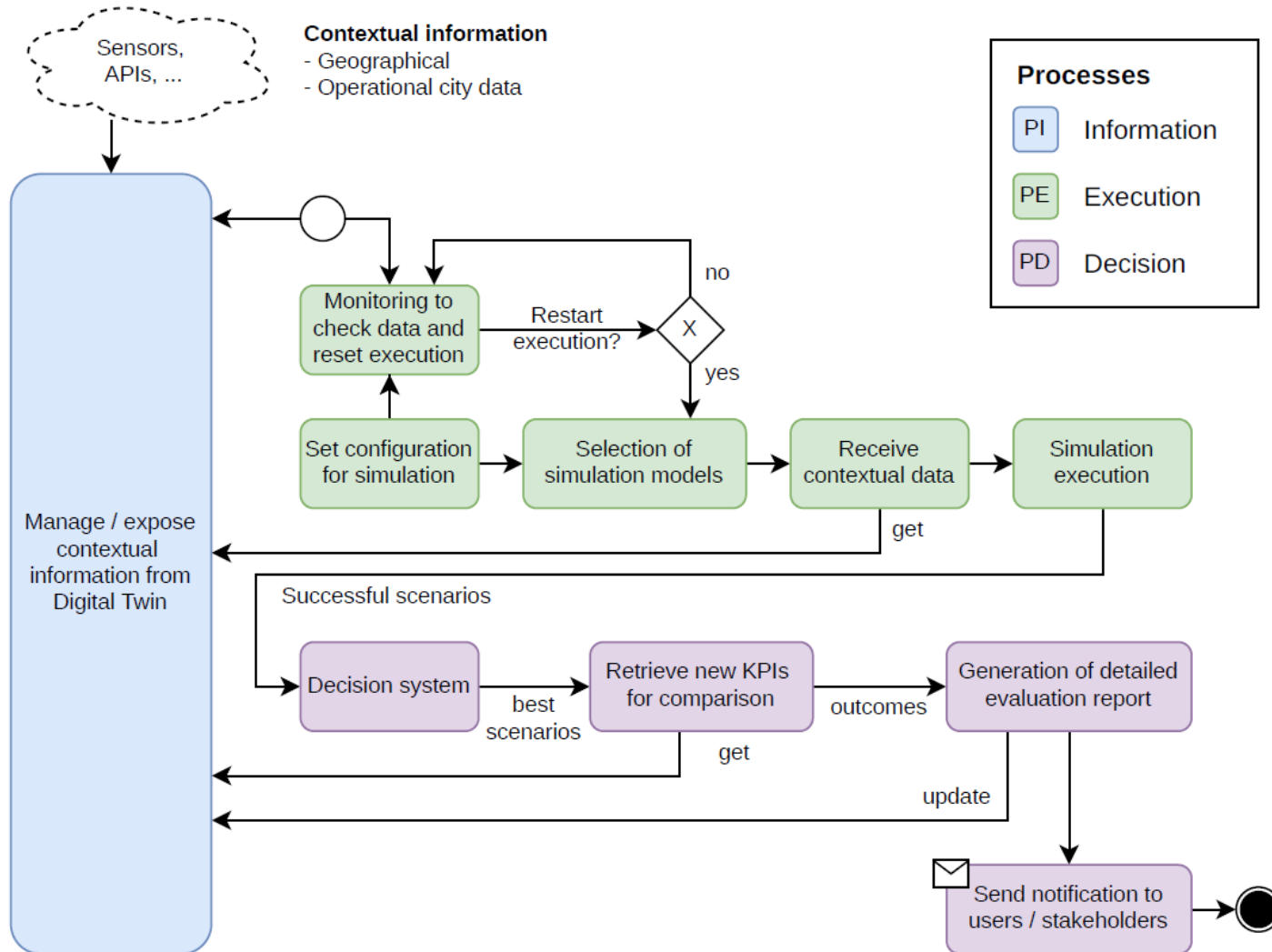


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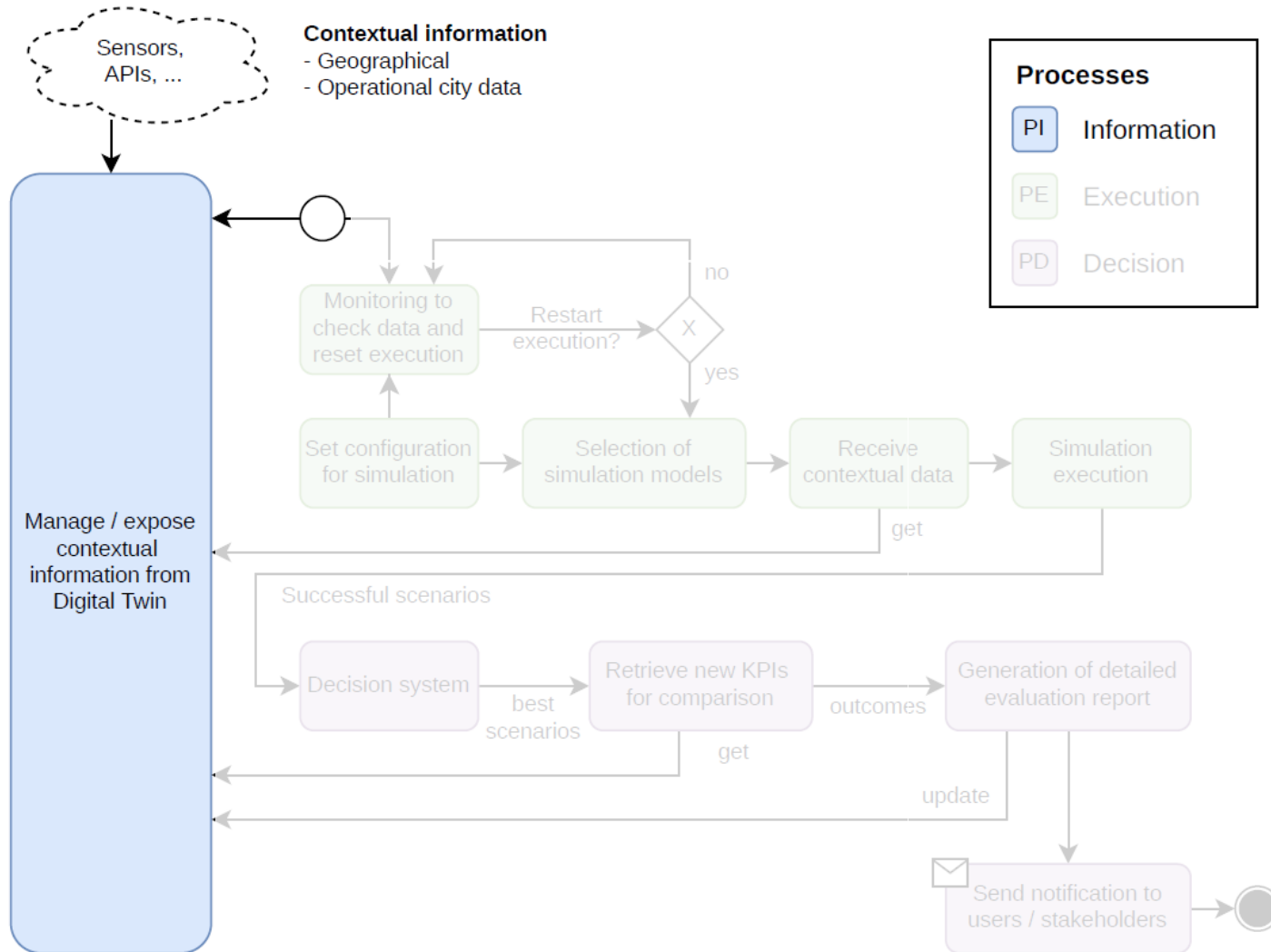
Business process

- Based on an analysis of business cases of the LEAD stakeholders
- Generic representation of the required business logic
- Three individual processes with different tasks



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Information

- Manage contextual data
- Manage and detect changes in inputs from the physical twin
- Send instructions to the physical twin

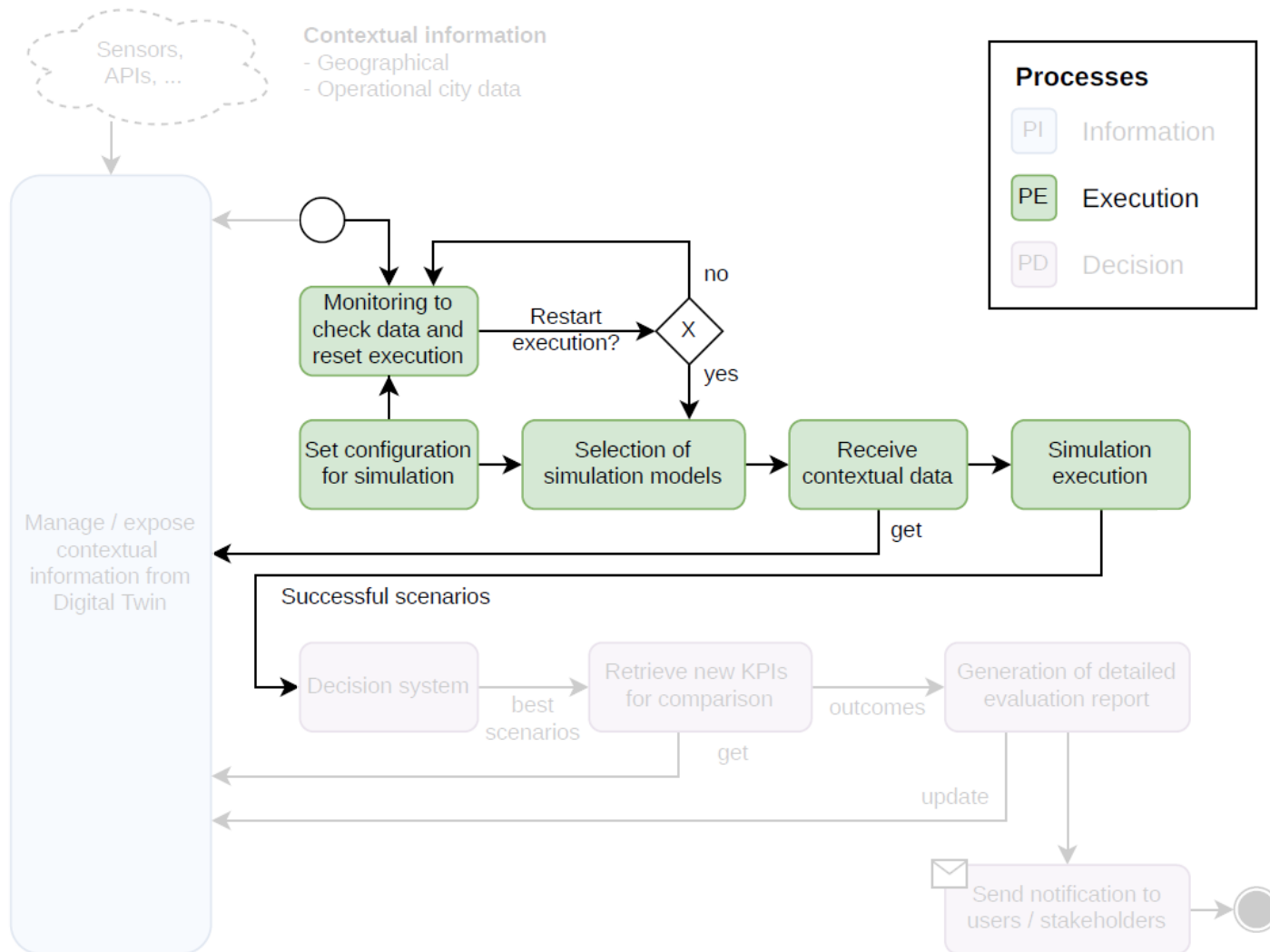


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Execution

- Set up modeling chain (sequence of models)
- Set up inputs to the modeling chain from the physical twin
- Execute models that need to be updated

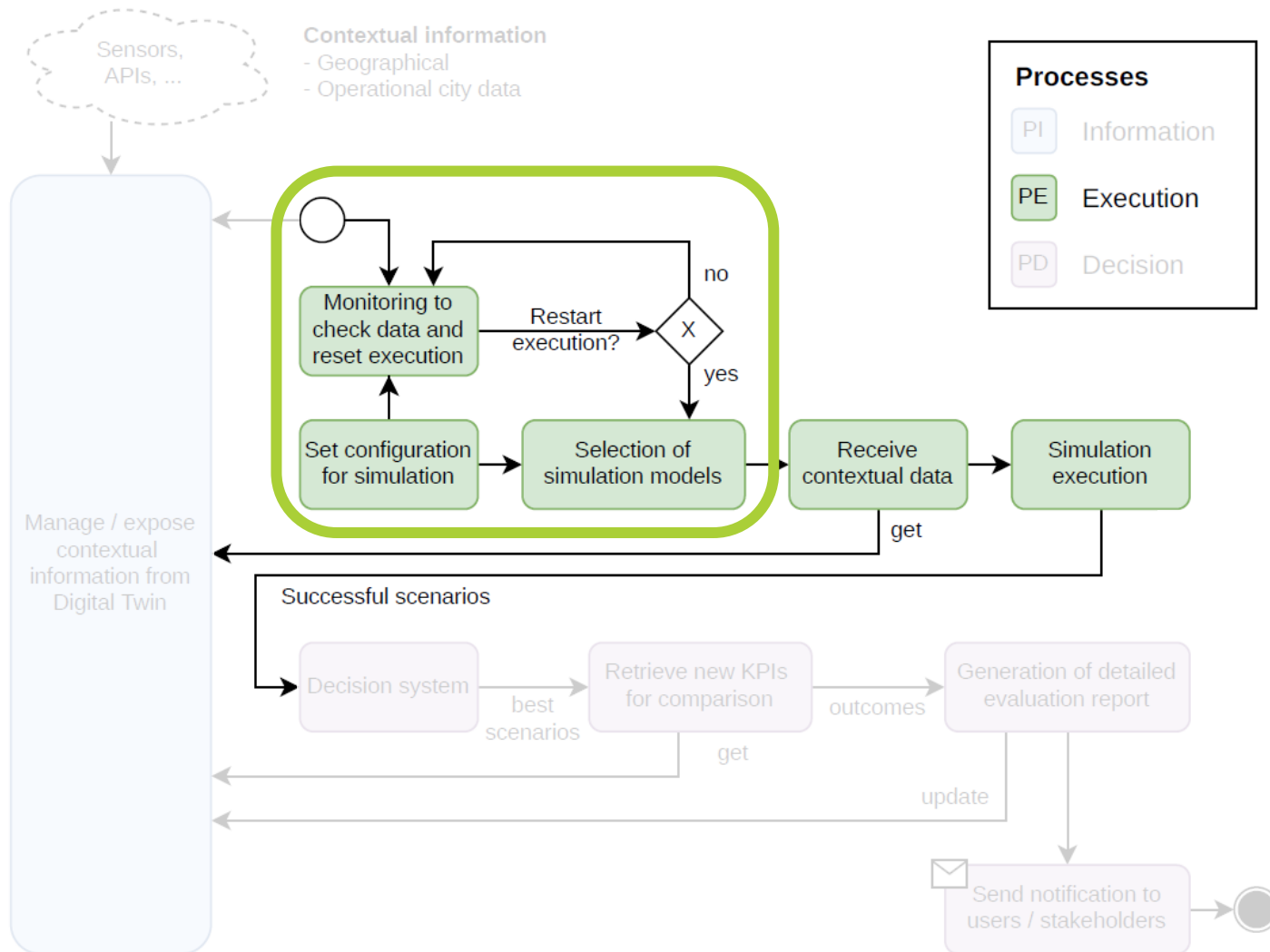


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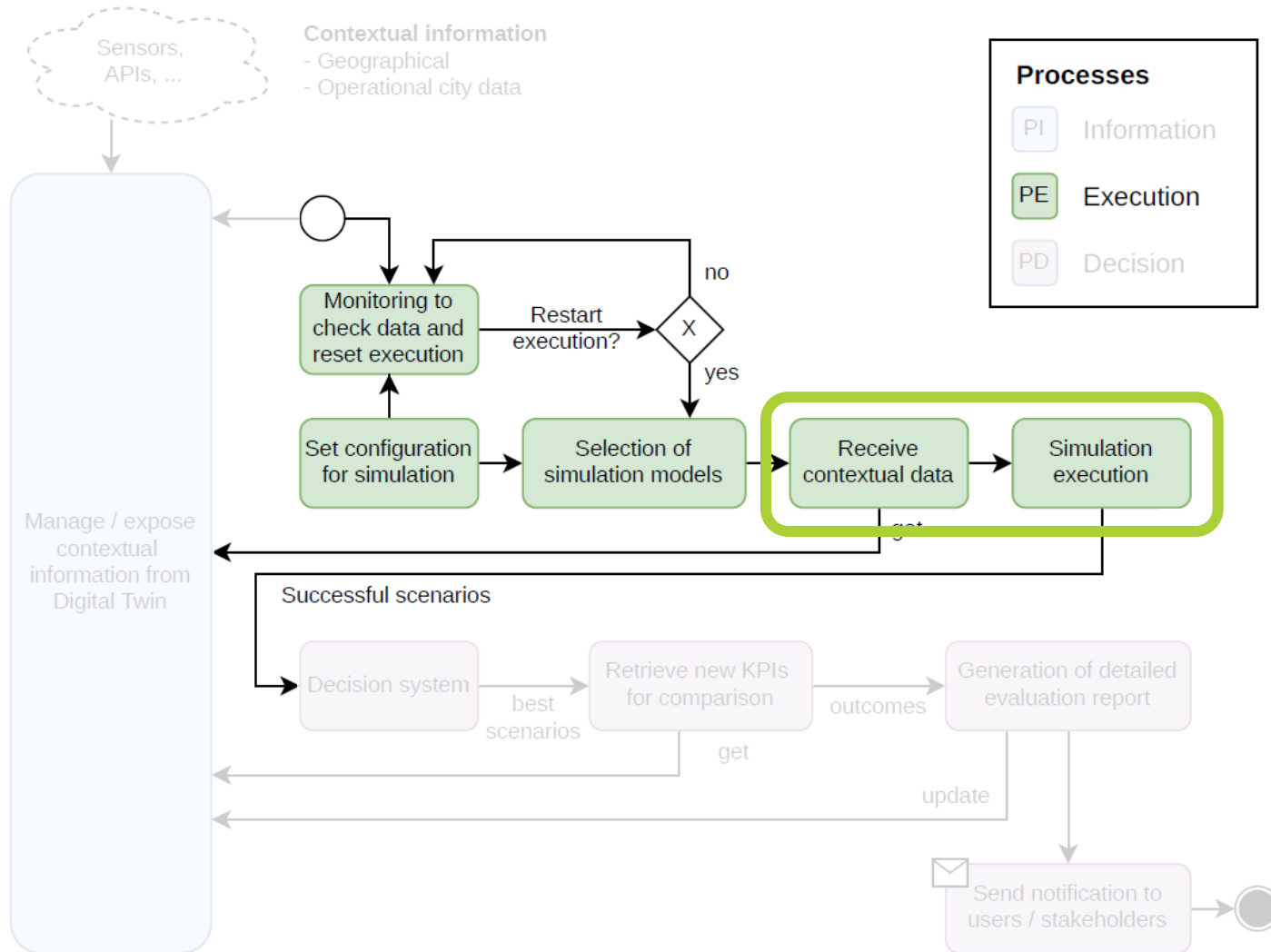
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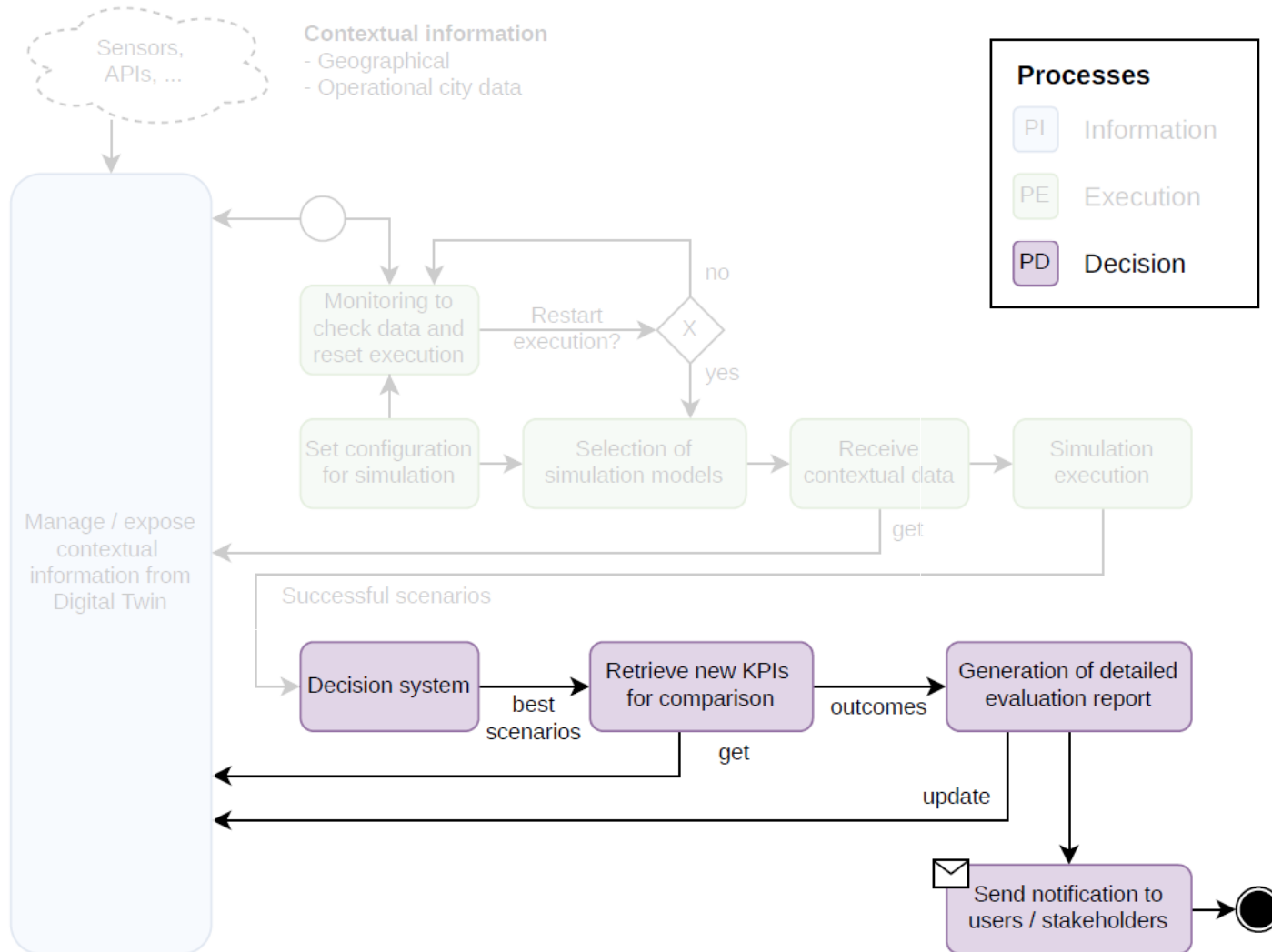


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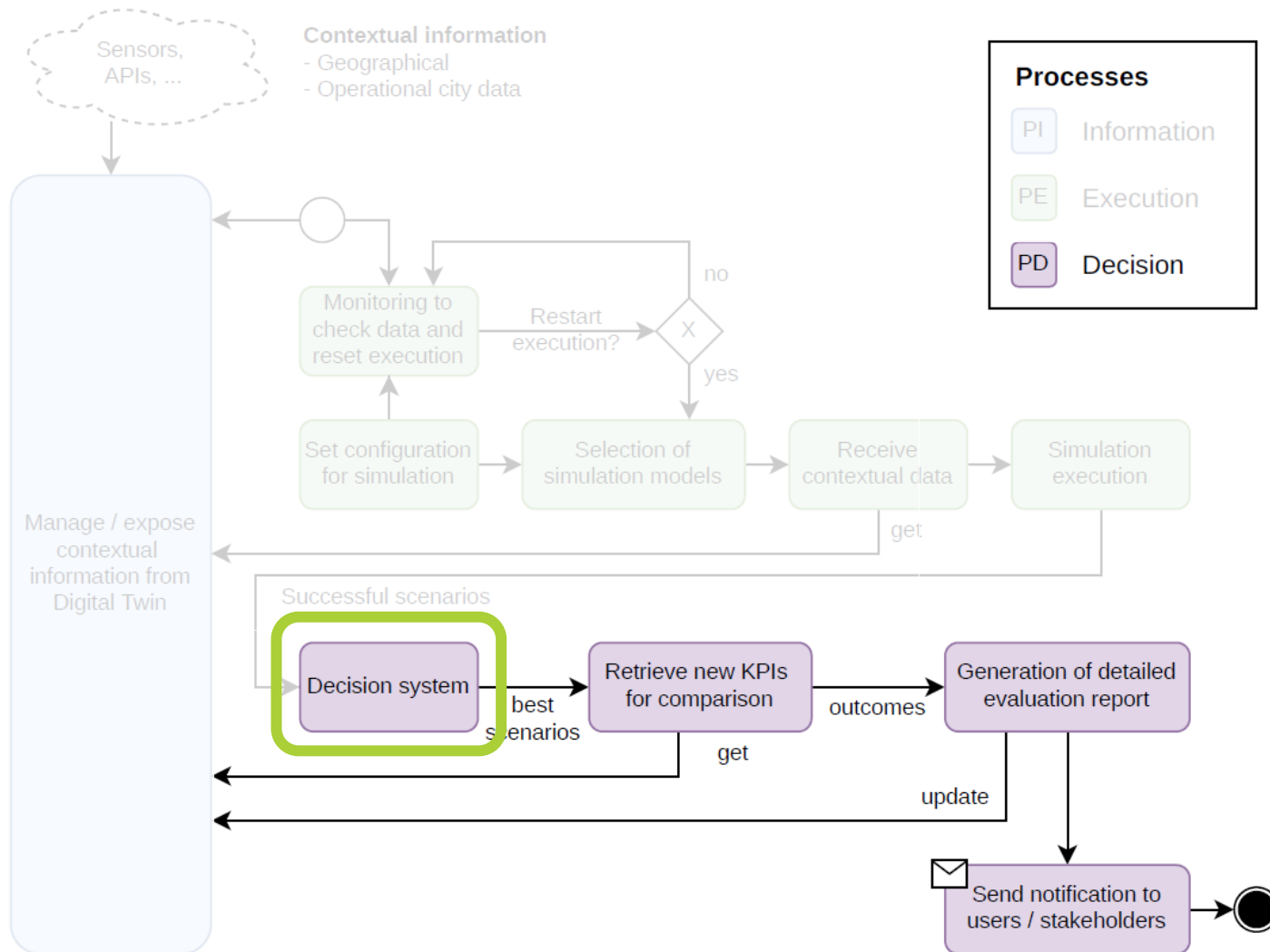
Decision

- Select scenarios to be evaluated and find the best outcomes
- Compare potential system outcomes to the current system state
- Inform stakeholders
- Forward instructions to the physical world



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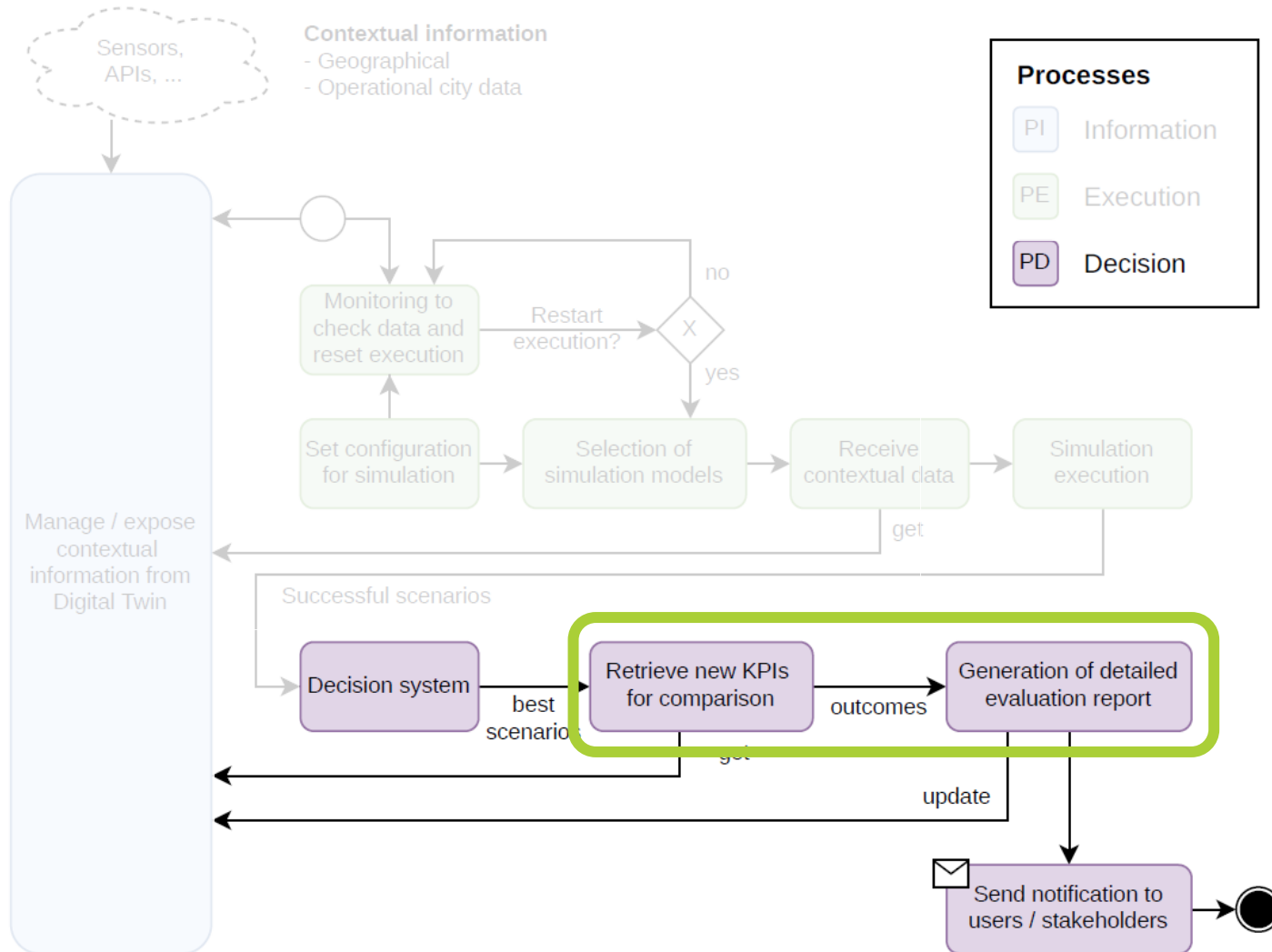
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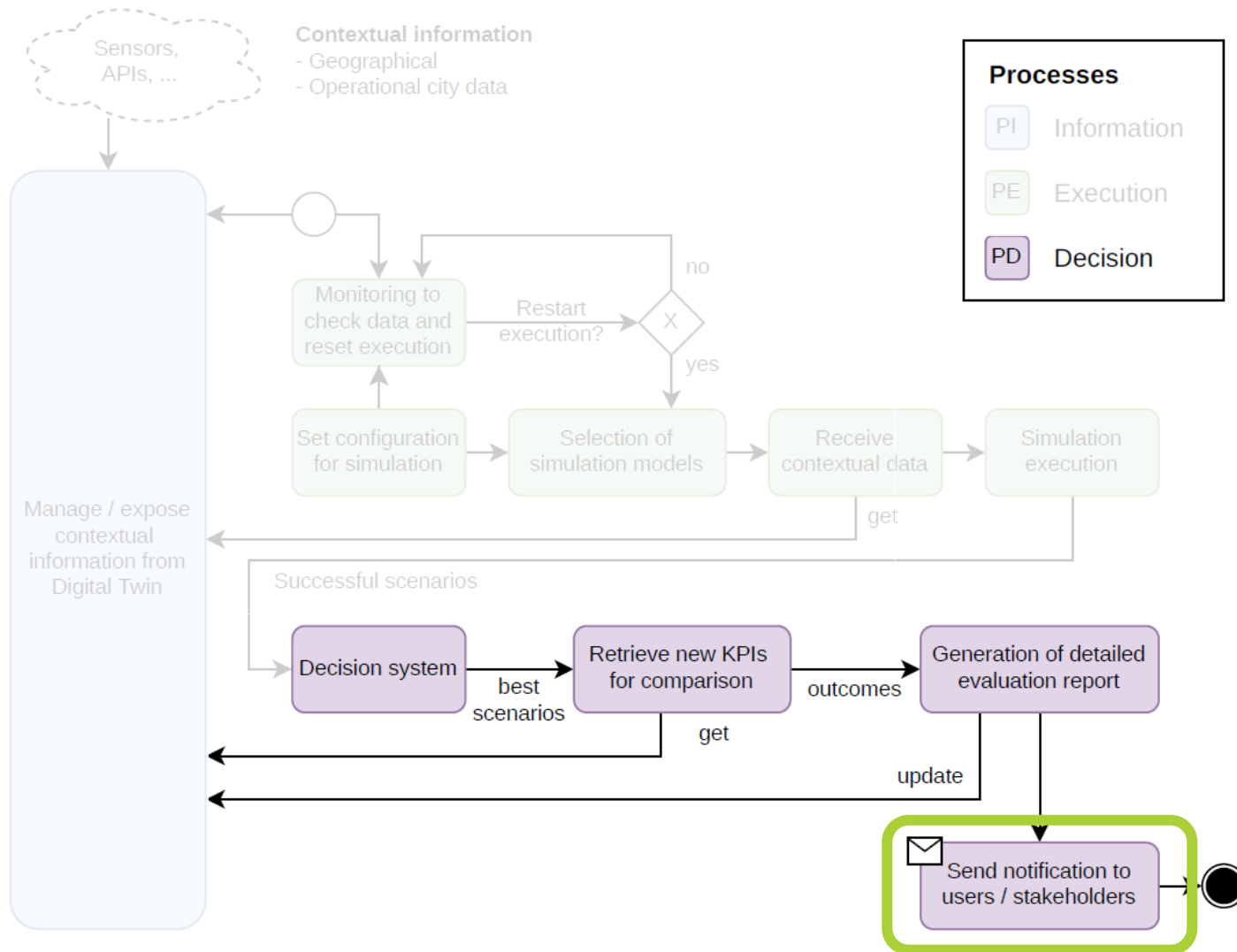
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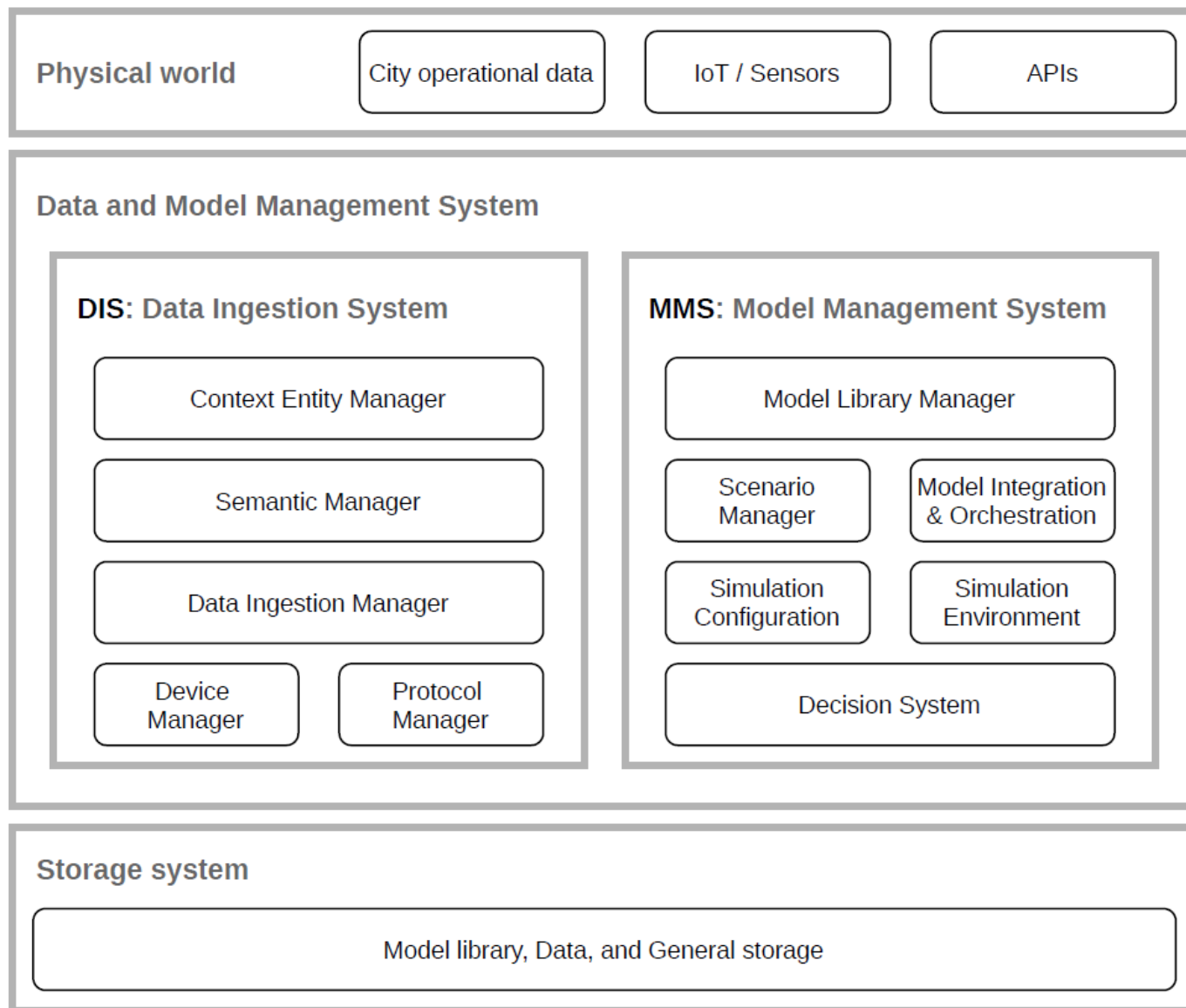
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Technical architecture

- Technical entities that make up the system
- Three layers
- Two complex components
 - Data Ingestion System
 - Model Management System

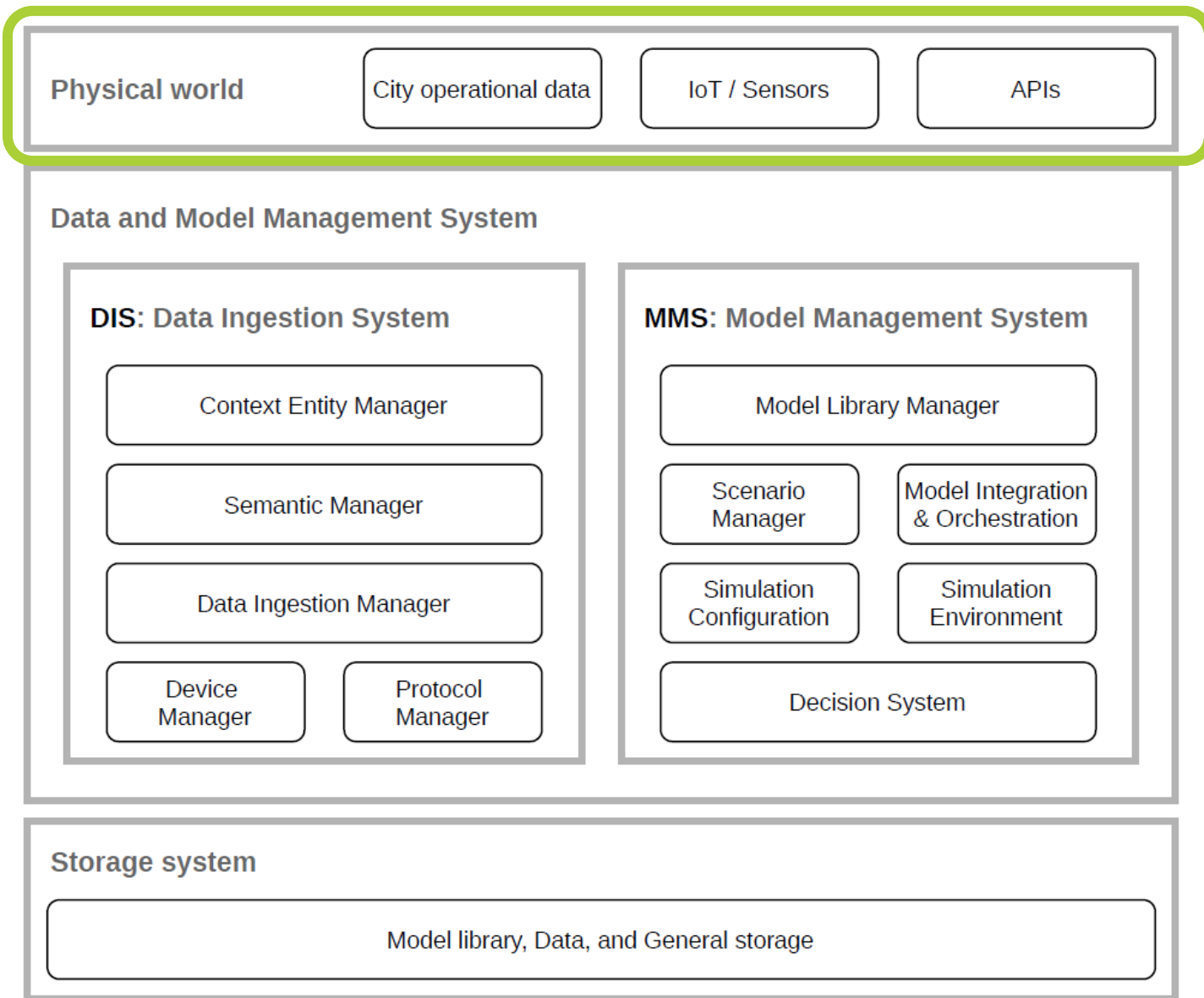


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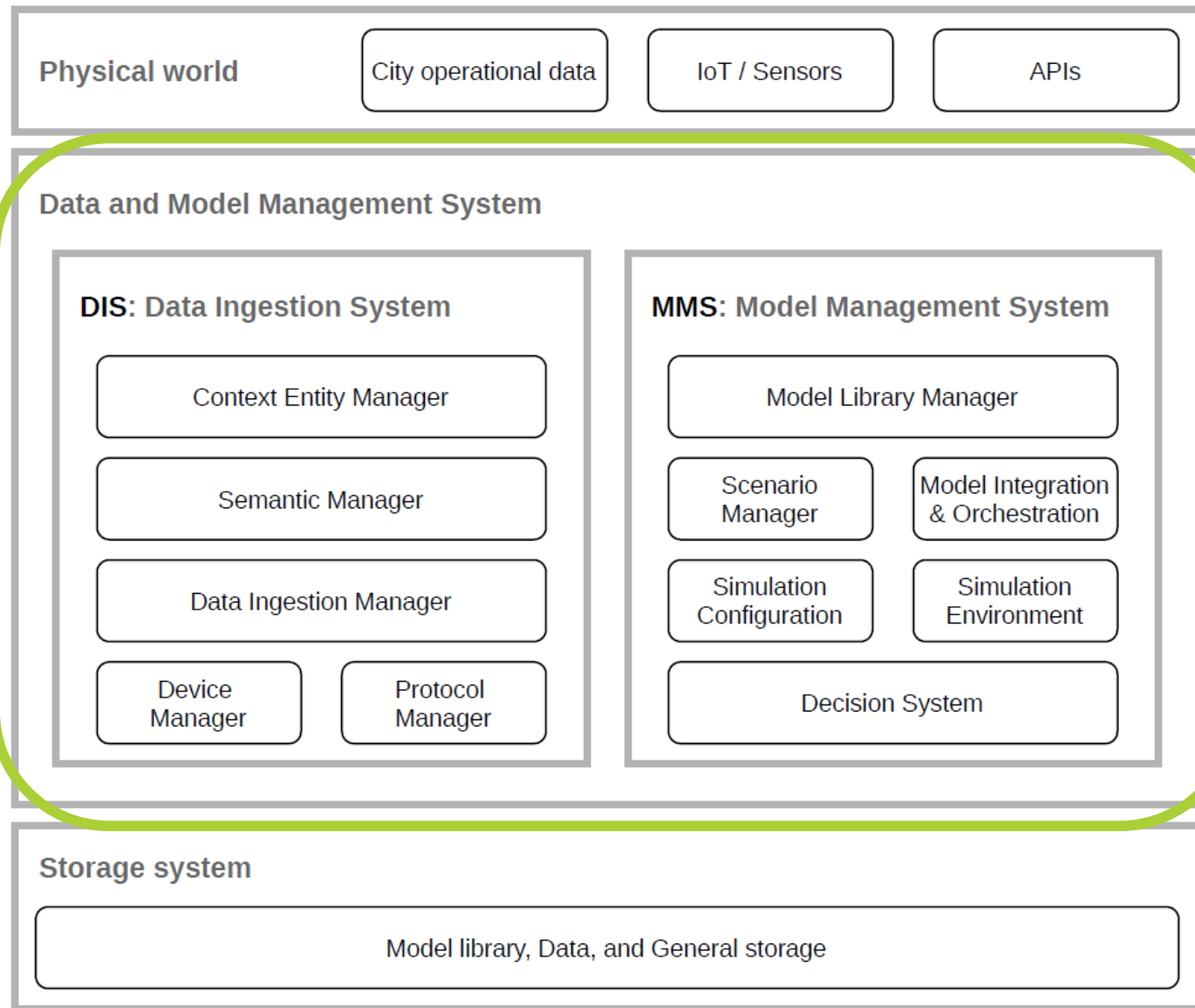


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DMMS

- Manage models
- Manage data
- Maintain interactions

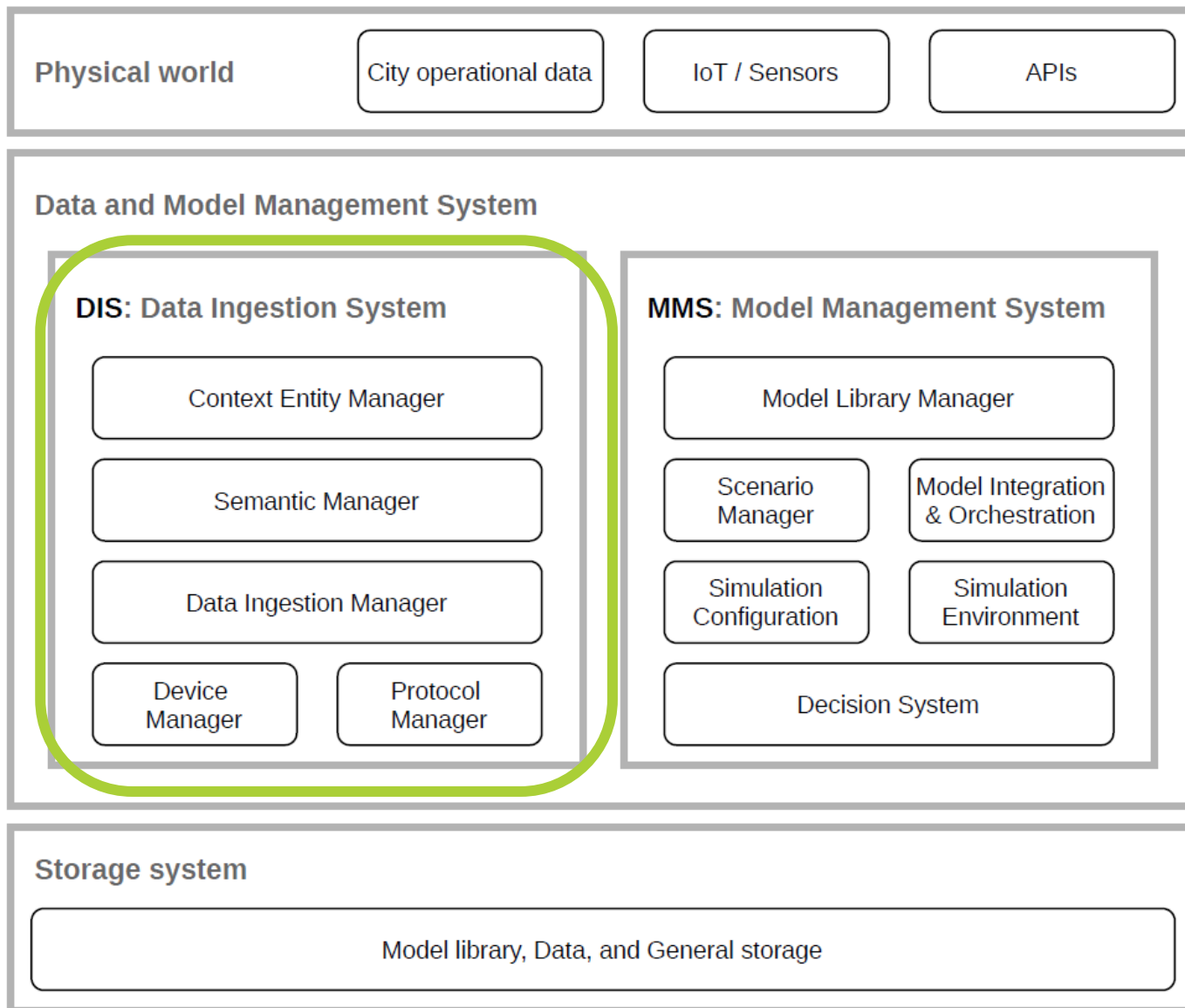


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DIS

- Large variety of devices and protocol for data ingestion
- Semantic representation of data in an abstract way
- Context Entity Manager poses interface to the MMS

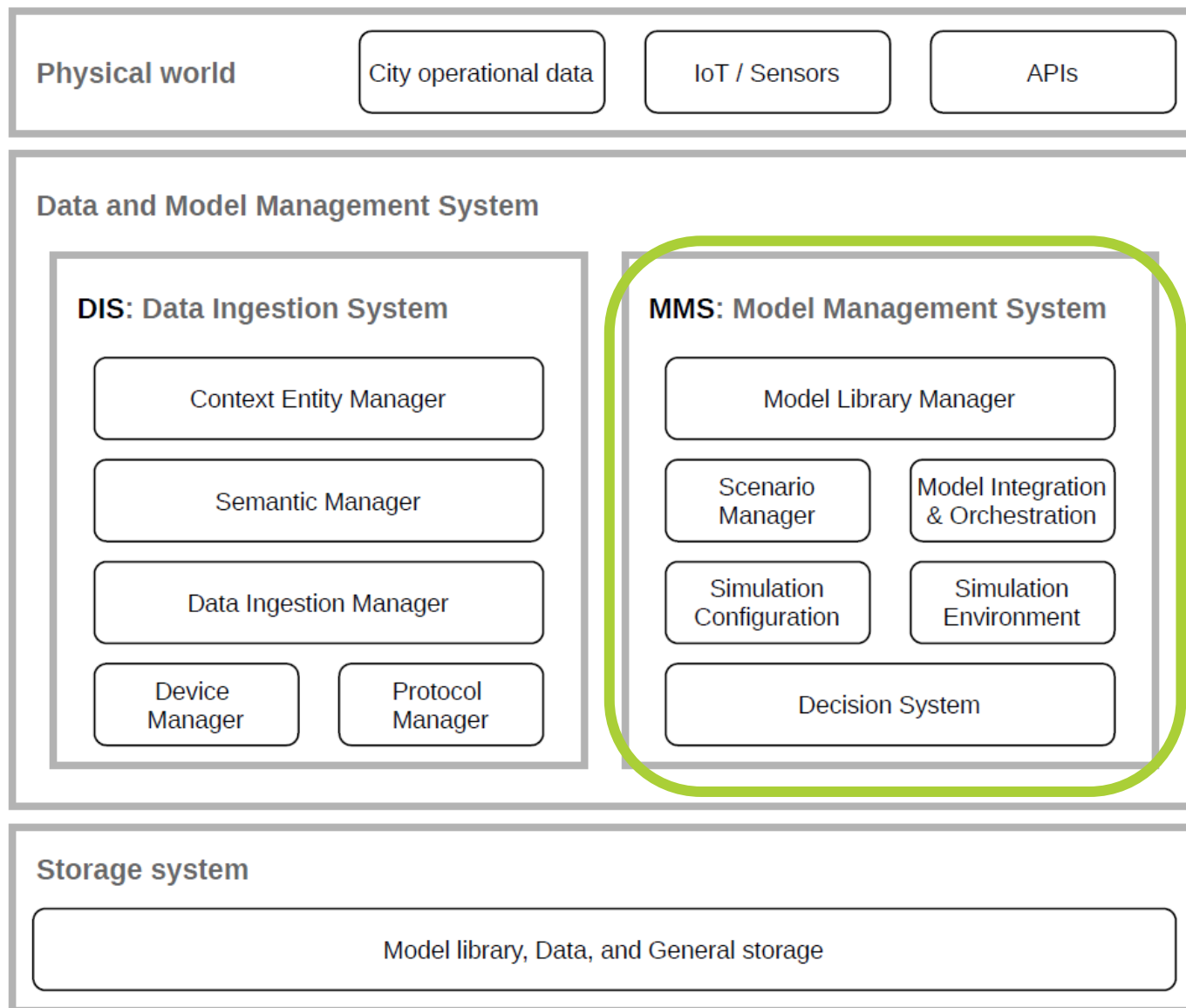


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MMS

- Maintain a library of executable models and information on how to configure them
- Manage connections between models and transformation of data
- Manage scenarios with alternative configurations
- Provide an execution environment
- Evaluate outcomes and perform decisions

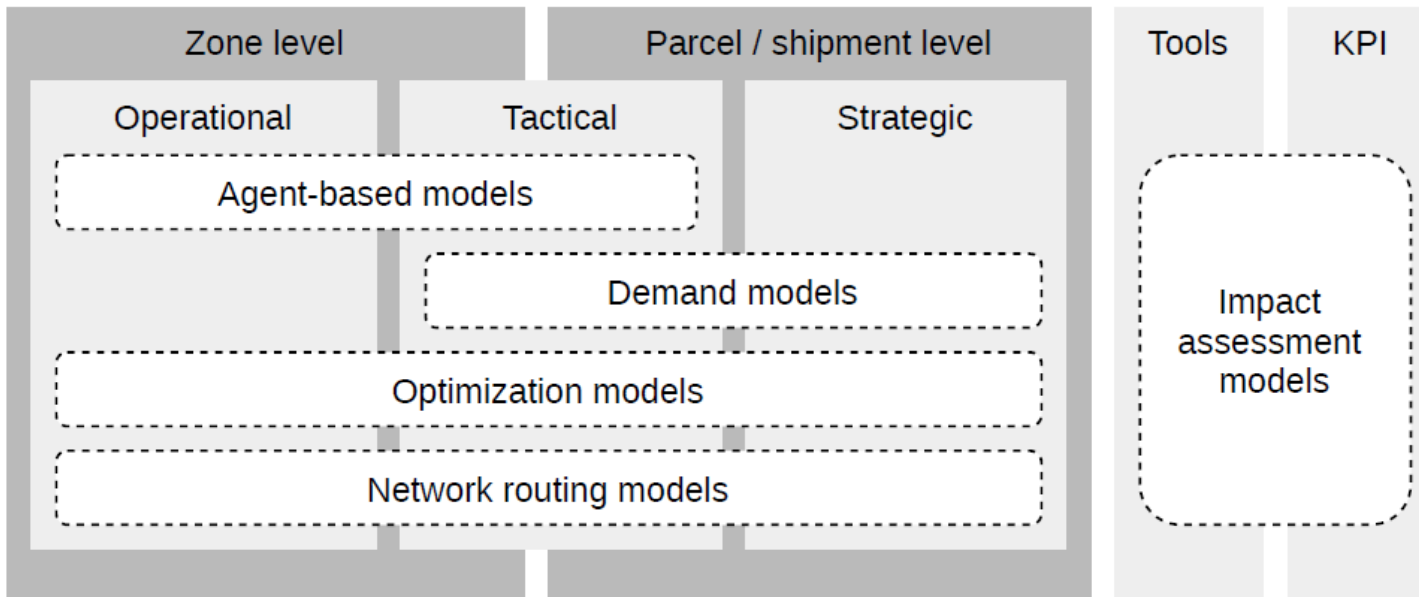


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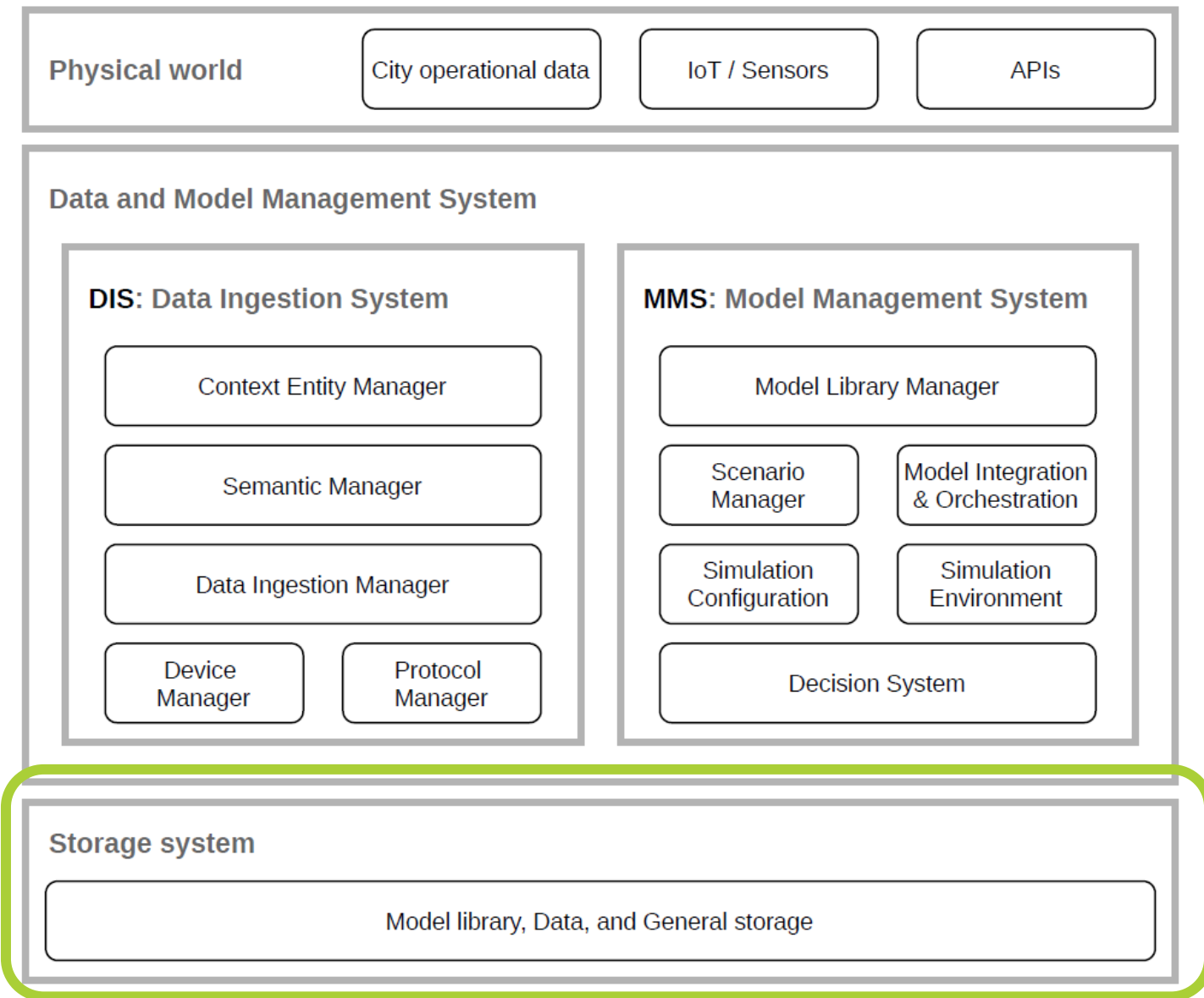


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Storage

- Incoming data
- Preliminary modeling results
- Final analyses



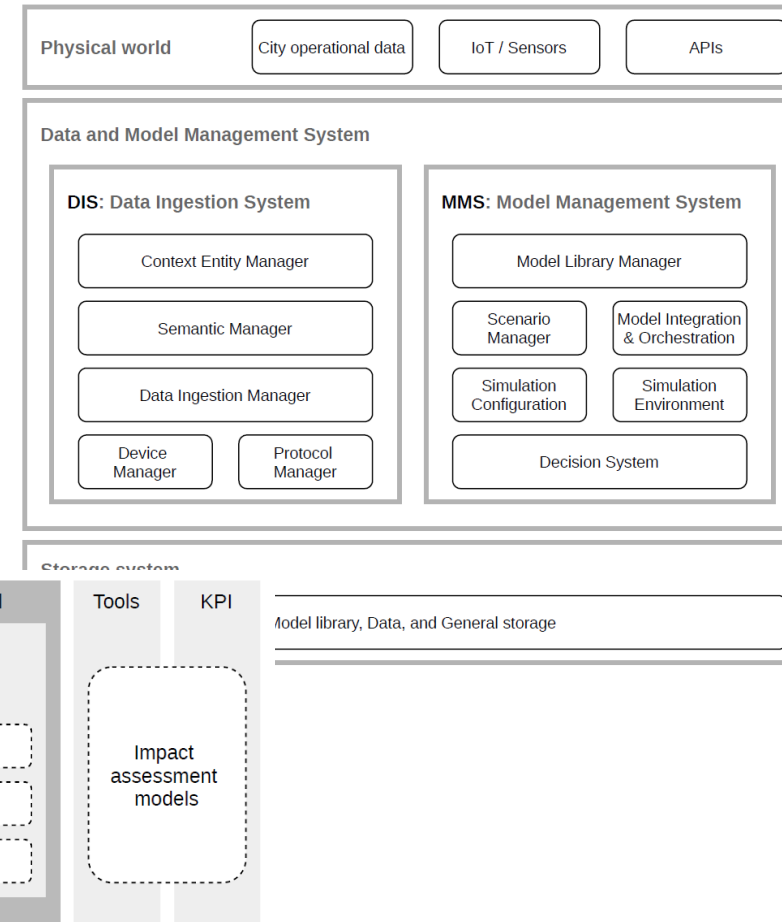
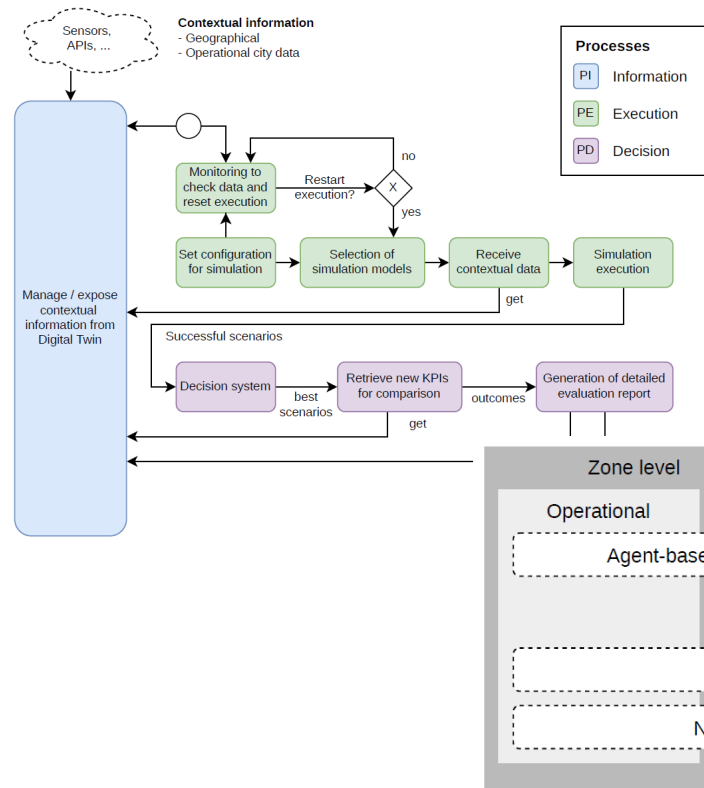
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Conclusion



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