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1770

# Systems *Engineering: Design and Development*

ENGR 387

Agenda

- **An Introduction to the Analyze Stakeholder Needs activity in the OOSEM method**

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Analyze Stakeholder Needs

- Characterizes the as-is system
  - Limitations
  - Potential improvements

- Specifies mission requirements for the to-be system using:
  - 'to-be' model of the domain
  - Enterprise use cases
  - Measures of effectiveness (MOE)

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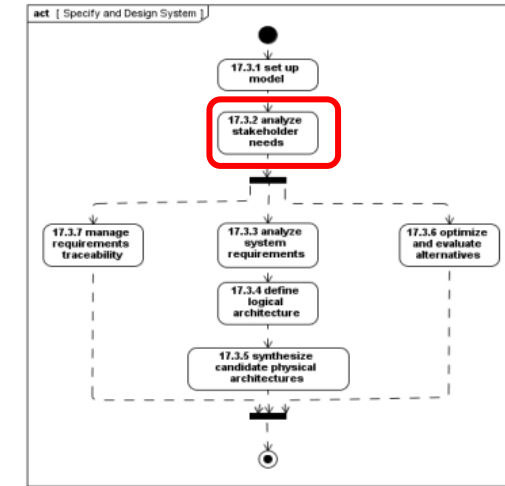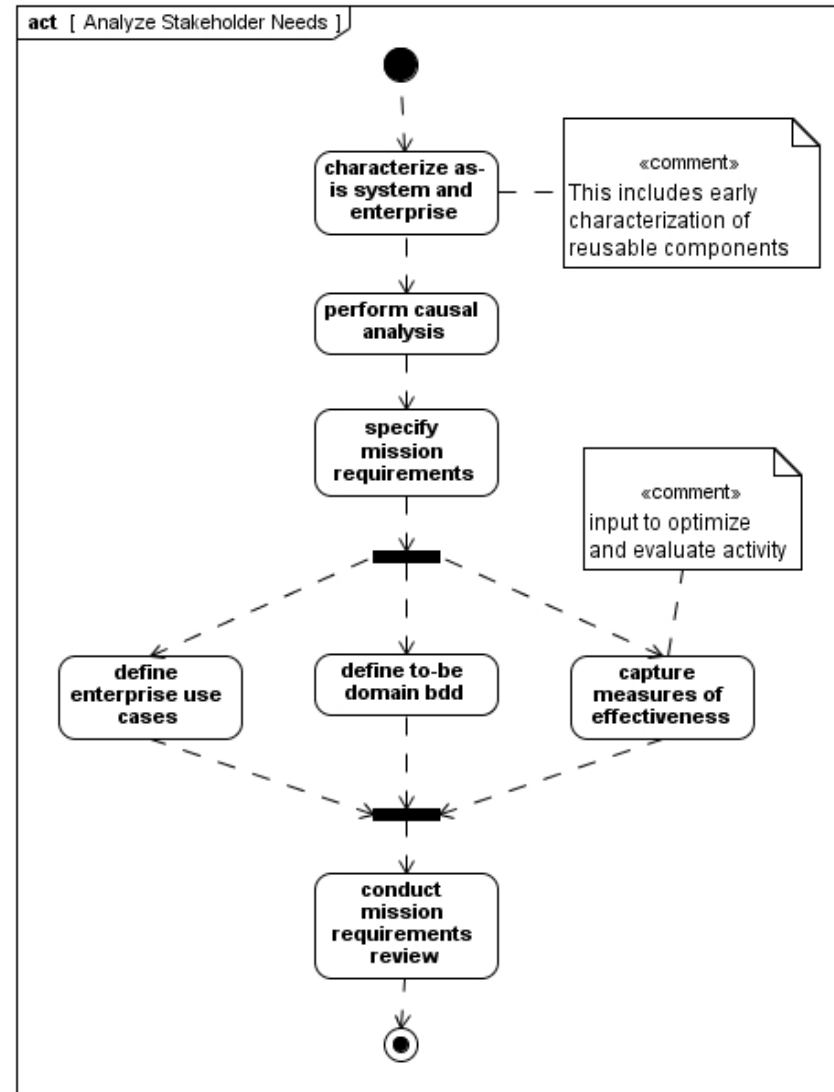
Characterize As-is System and Enterprise

- Model the current system only to the extent of understanding its limitations and areas of potential improvement

- The 'as-is' system domain is depicted in a BDD, which shows the relationship between the 'system-of-interest', and any external systems or users of the system (i.e. context diagram)

- An alternative depiction of the 'as-is' domain can show the system using icons
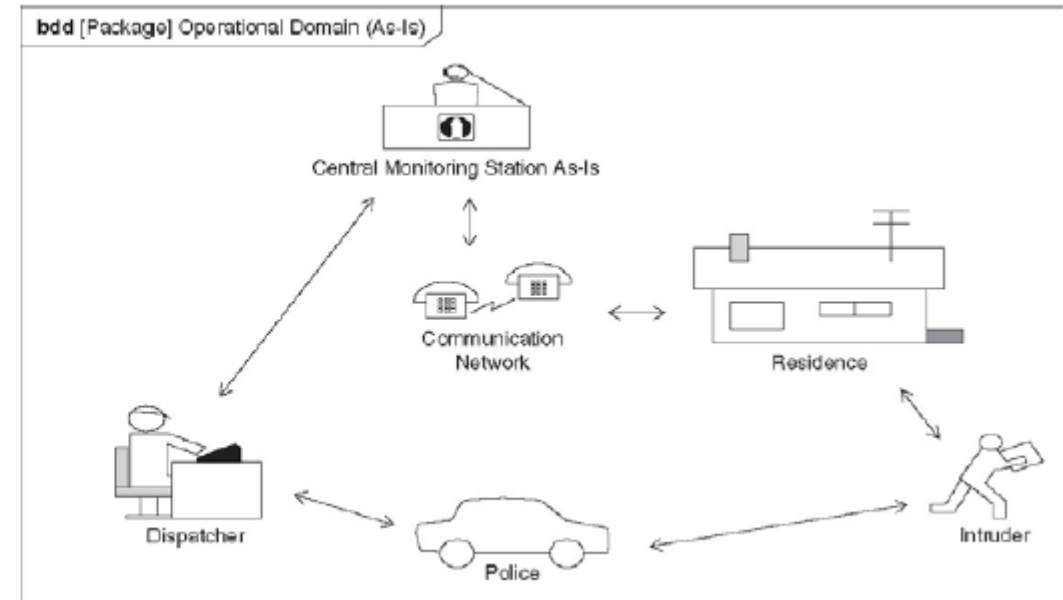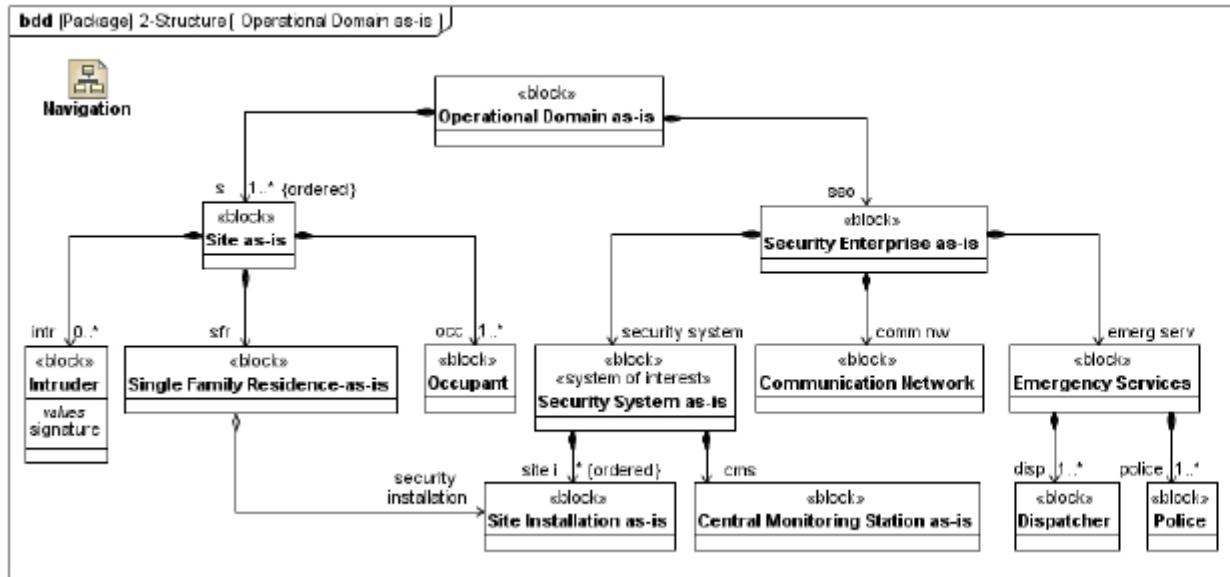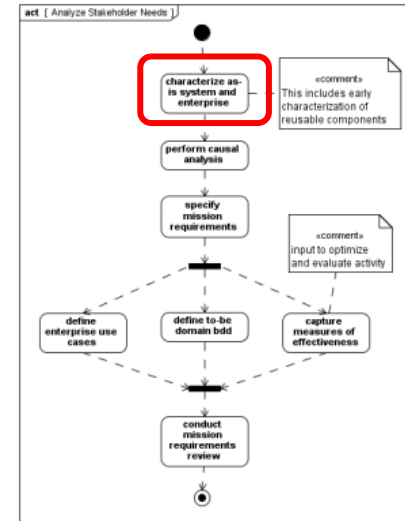
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Perform Causal Analysis

- Determines the limitations and potential improvement areas of the current system

- Fishbone diagram (not a SysML diagram) is used to depict cause-effect relationships

- The root represents a MOE

- Nodes represent dependent properties that impact the MOEs
  - Example: inadequate 'Response Time' negatively impacts 'Security Effectiveness' which in turn impacts 'Customer Satisfaction', which leads to a 'Lack of Sales'

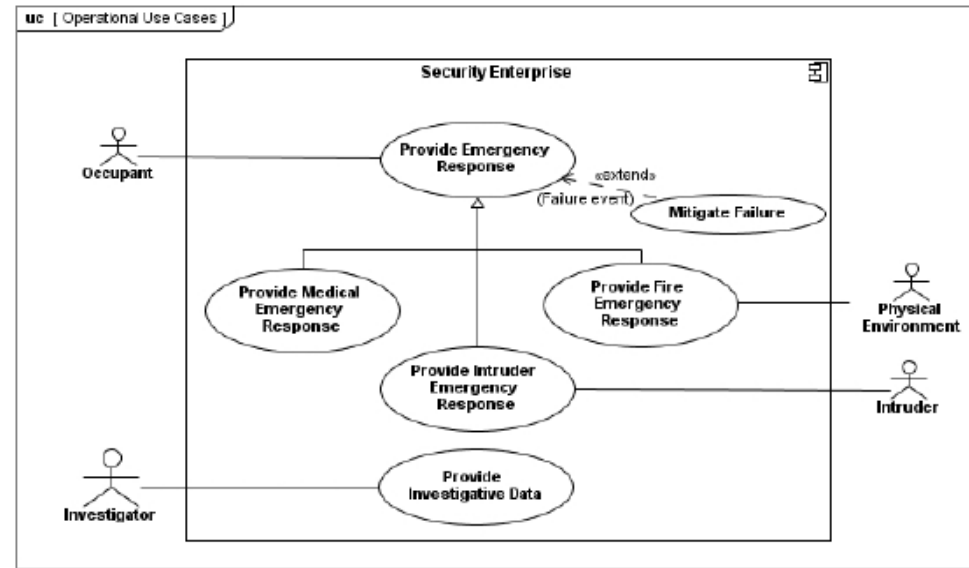© 2011 Elsevier, Inc.: A Practical Guide to SysML
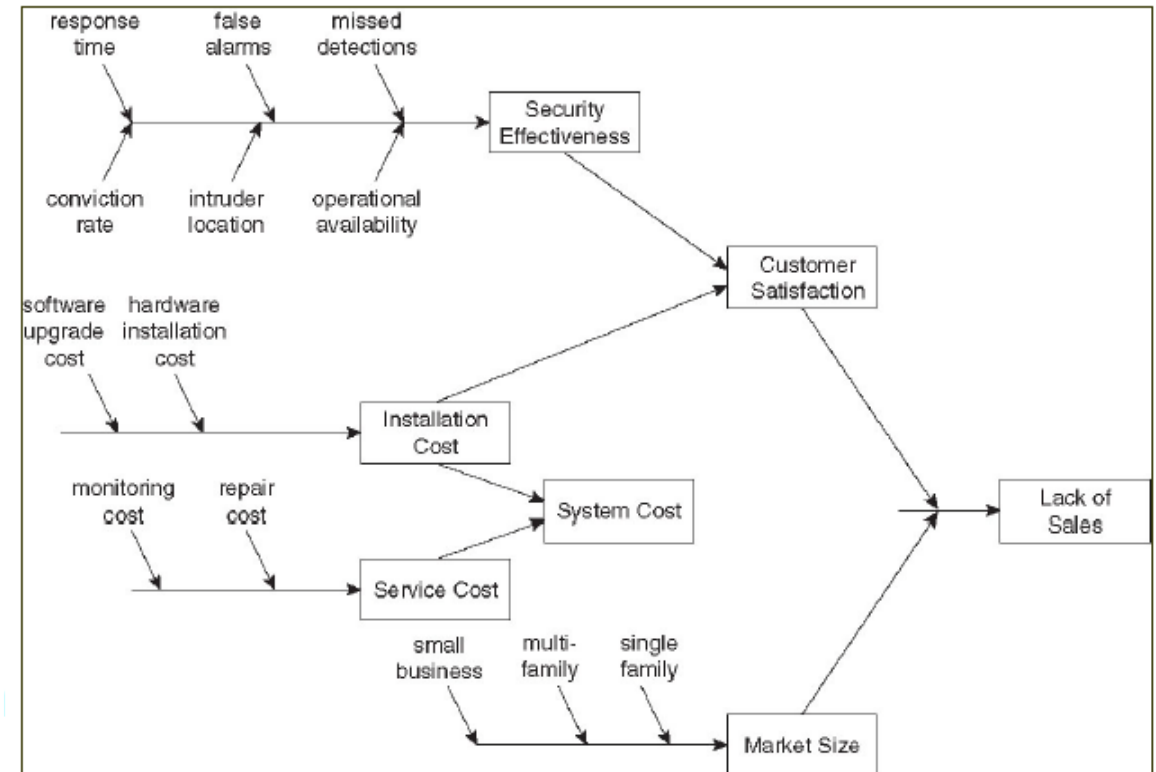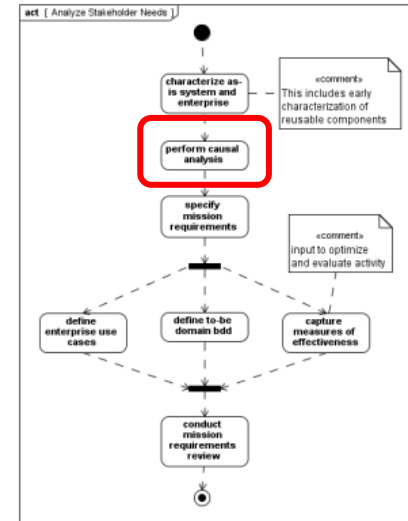
Specify Mission Requirements

- The causal analysis leads to a prioritized set of mission requirements to address the limitations of the 'as-is' domain

- The mission requirements can be captured on a Requirements diagram

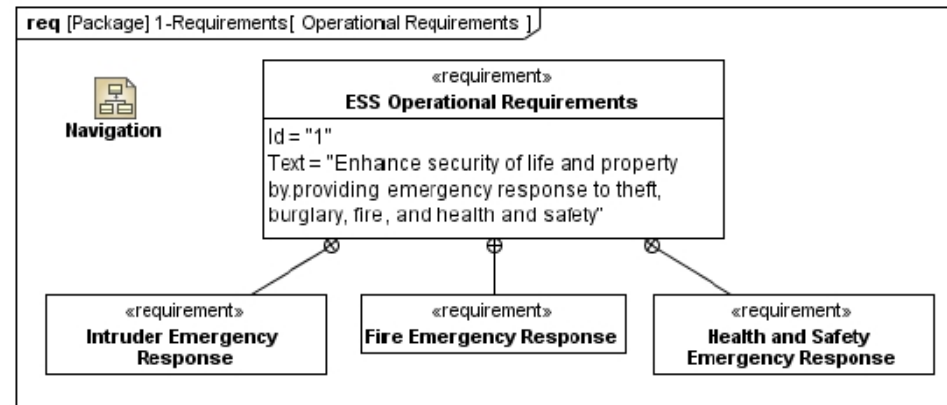© 2011 Elsevier, Inc.: A Practical Guide to SysML
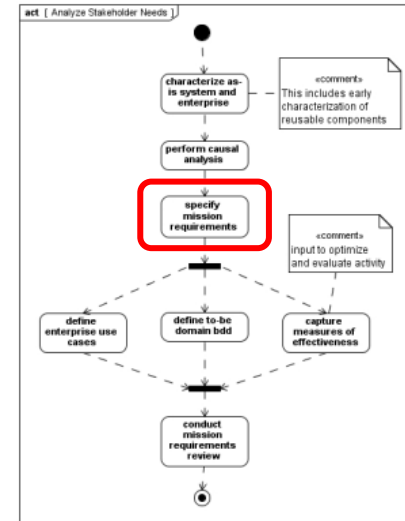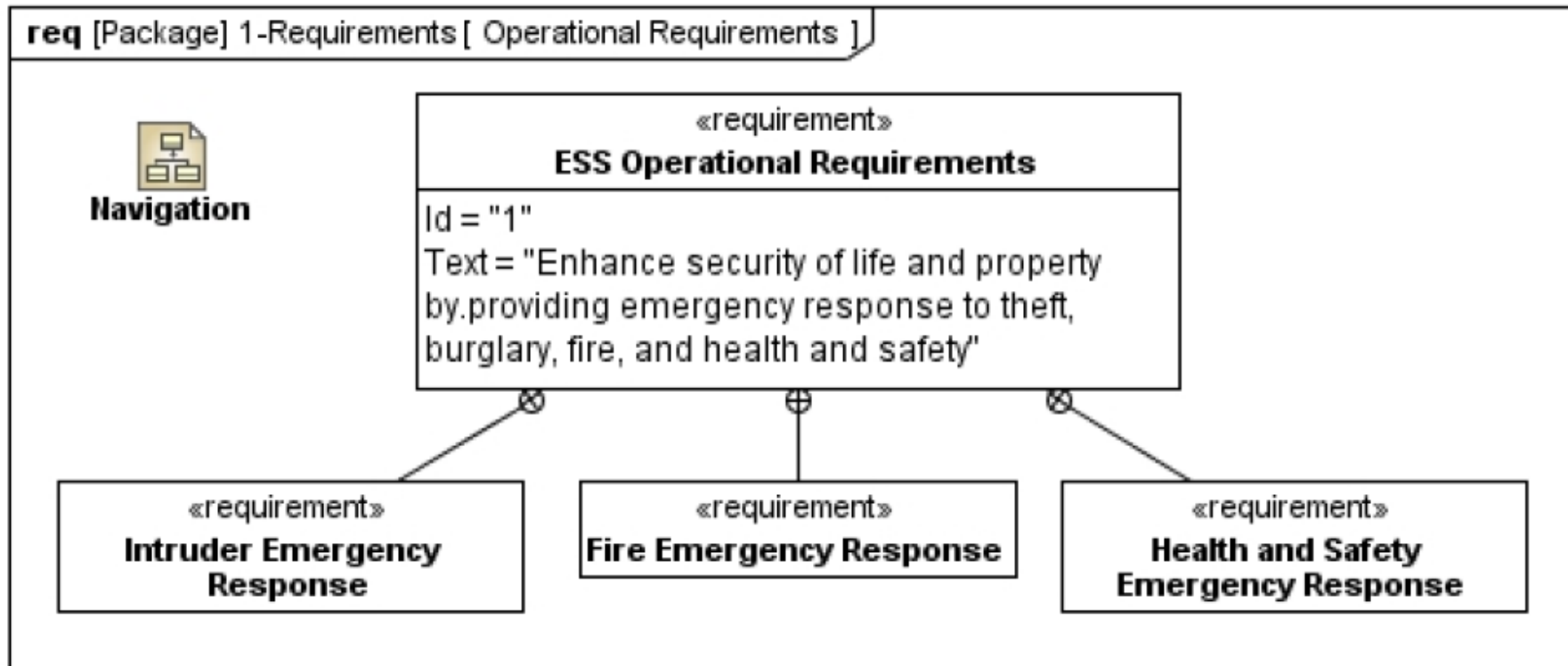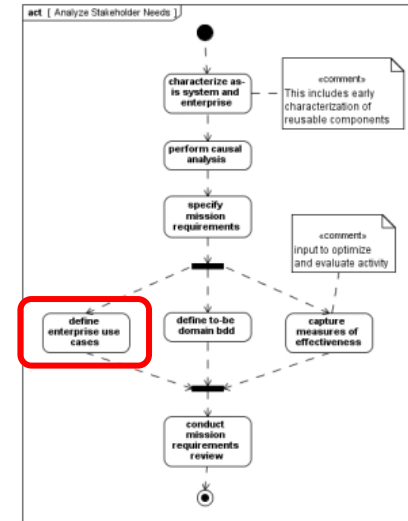
Specify Mission Requirements

- Use Cases for the overall enterprise are defined on a Use Case diagram
  - The subject of the Use Case diagram is the enterprise
  - The actors use the enterprise to achieve the mission objectives (i.e. use cases)

- The use cases correspond to the mission level requirements identified on the requirements diagram

- The use cases will be elaborated and used to help specify the system black-box requirements (next section)

uc [Operational Use Cases]

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req [Package] 1-Requirements[Operational Requirements]

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Capture Measures of Effectiveness

- MOEs reflect mission level performance requirements and are derived from the causal analysis

- MOEs can be captured in a parametric diagram that shows the relationship between a high-level MOE (operational cost effectiveness), in terms of lower-level MOEs (availability, emergency response time, operational cost, and probability of intruder conviction)

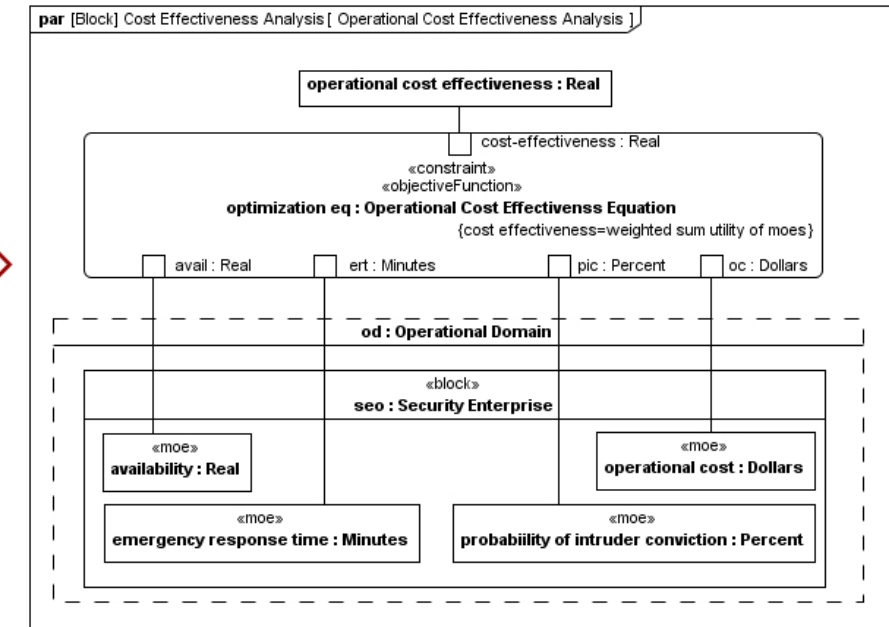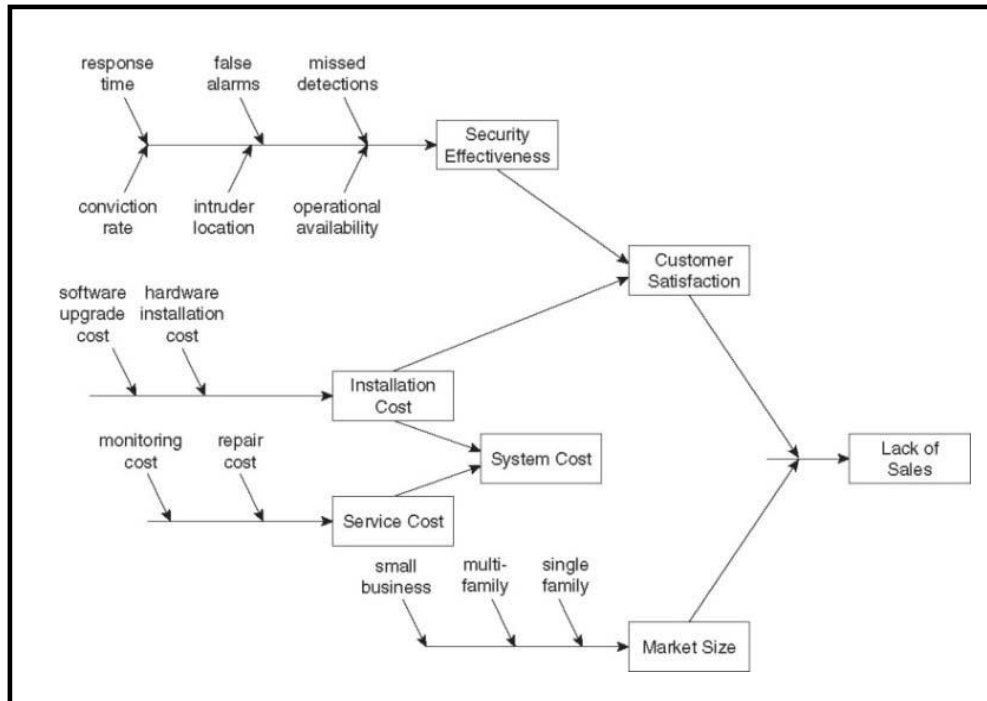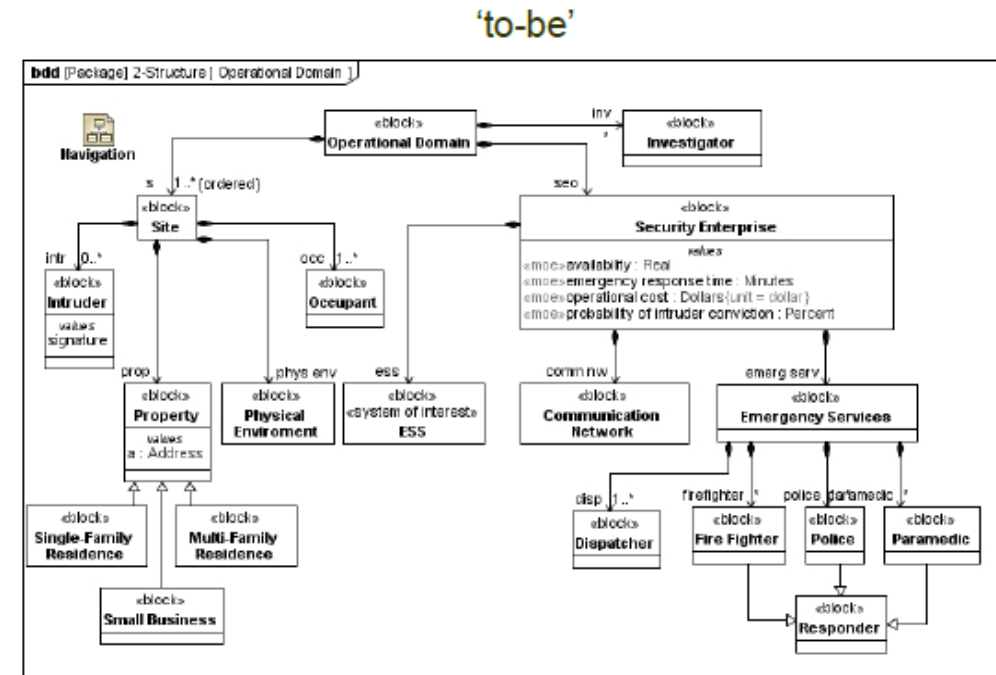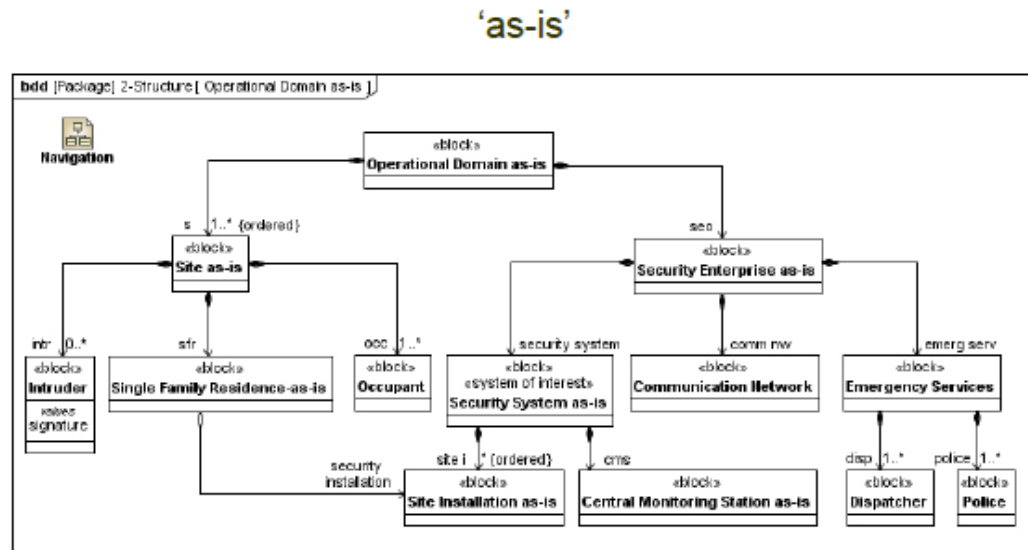- As the model is elaborated, MOEs can be related to critical system parameters

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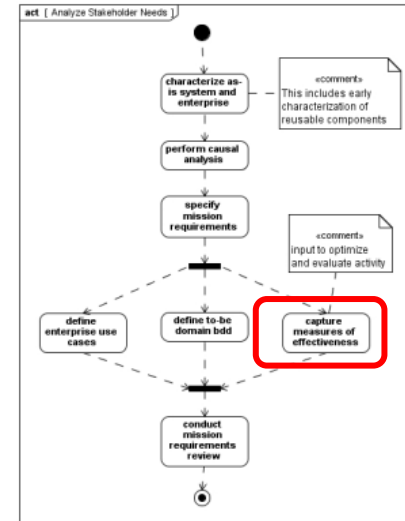
Define To-Be Domain Model

- Based on the stakeholder needs and causal analysis, a 'to-be' domain model is depicted in a BDD

- This diagram shows the differences between the 'as-is' model and the 'to-be' model (in order to meet the new requirements), for example:
  - Emergency Services now includes Firefighters and Paramedics
  - Small business and multi-family residences have been added
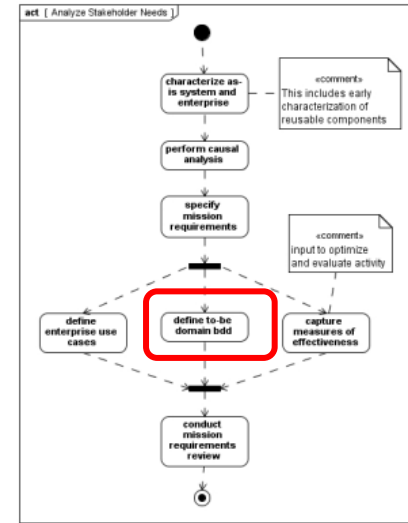

'as-is'

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'to-be'

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Questions

Summary

- As-is analysis is used to understand the problem
    - Limitations and root cause

- To-be analysis is used to understand the objectives
    - Mission requirements
        - Measures of effectiveness
        - To-be Domain model
        - Enterprise use cases

References

Additional information can be obtained by reviewing:

SysML Distilled (Delligatti)

Chapter 2: Block Definition Diagrams

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