



COLLEGE *of*
CHARLESTON

Systems Engineering: Design and Development

ENGR 387

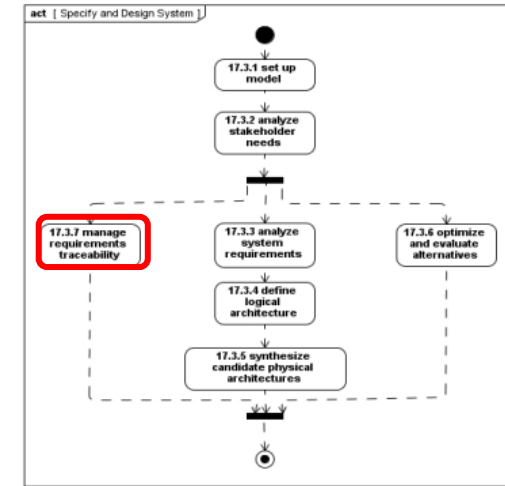
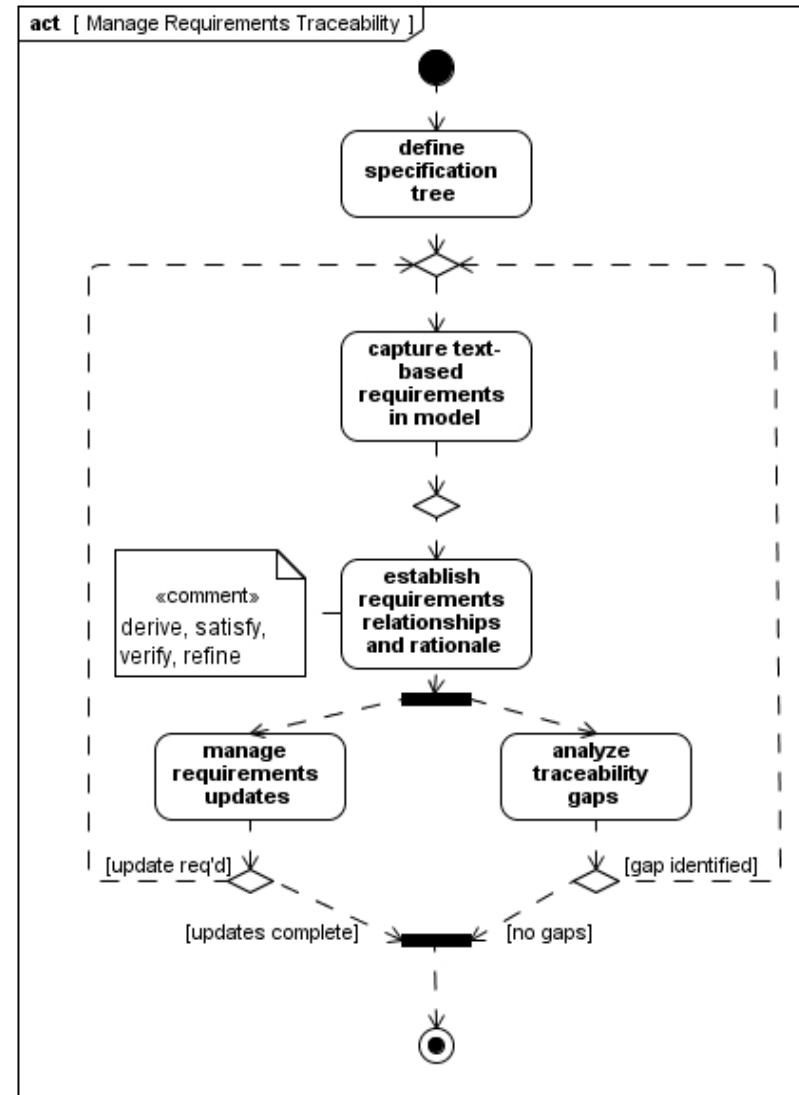


Agenda

- **An Introduction to the Manage Requirements Traceability activity in the OOSEM method**

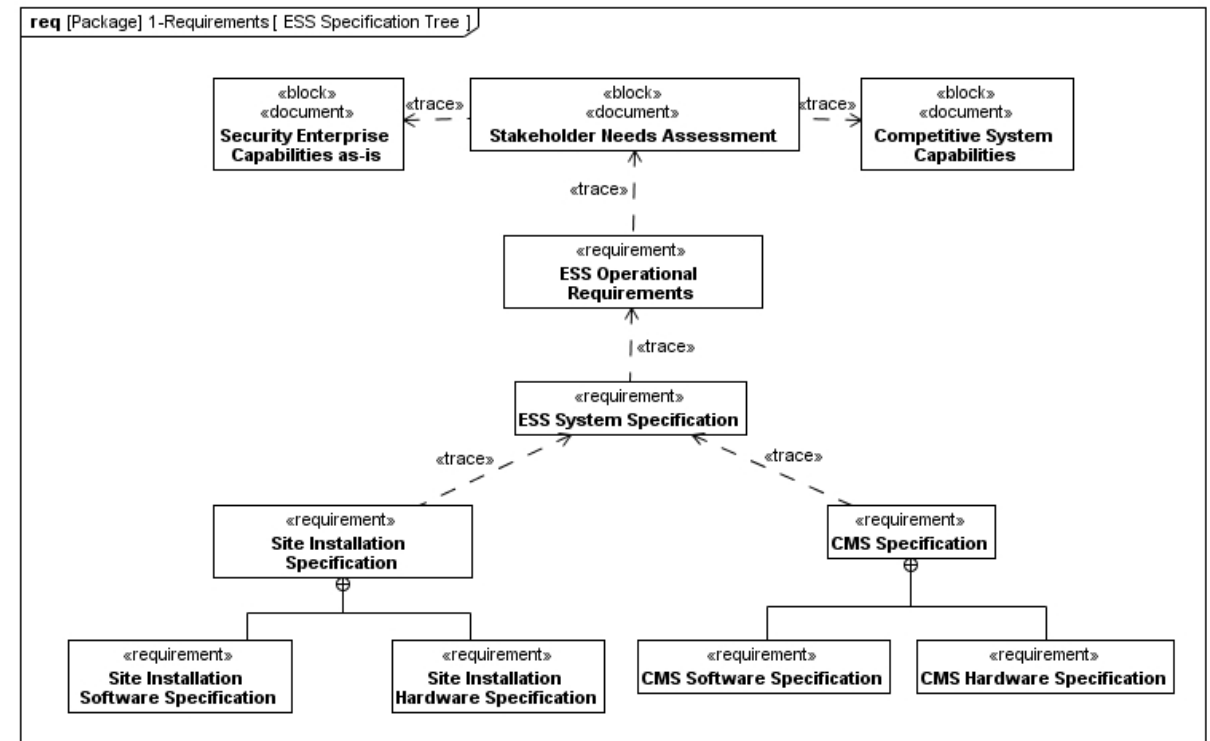
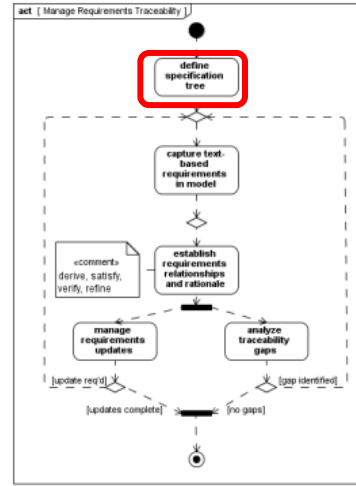
Manage Requirements Traceability

- Invoked throughout the process
 - Manage traceability from the mission-level requirements to the component requirements
- Steps include:
 - Defining the specification tree
 - Capturing text-based requirements in the model
 - Establishing relationships between the text-based requirements and the model elements
 - Generating the traceability reports
 - Managing requirements updates



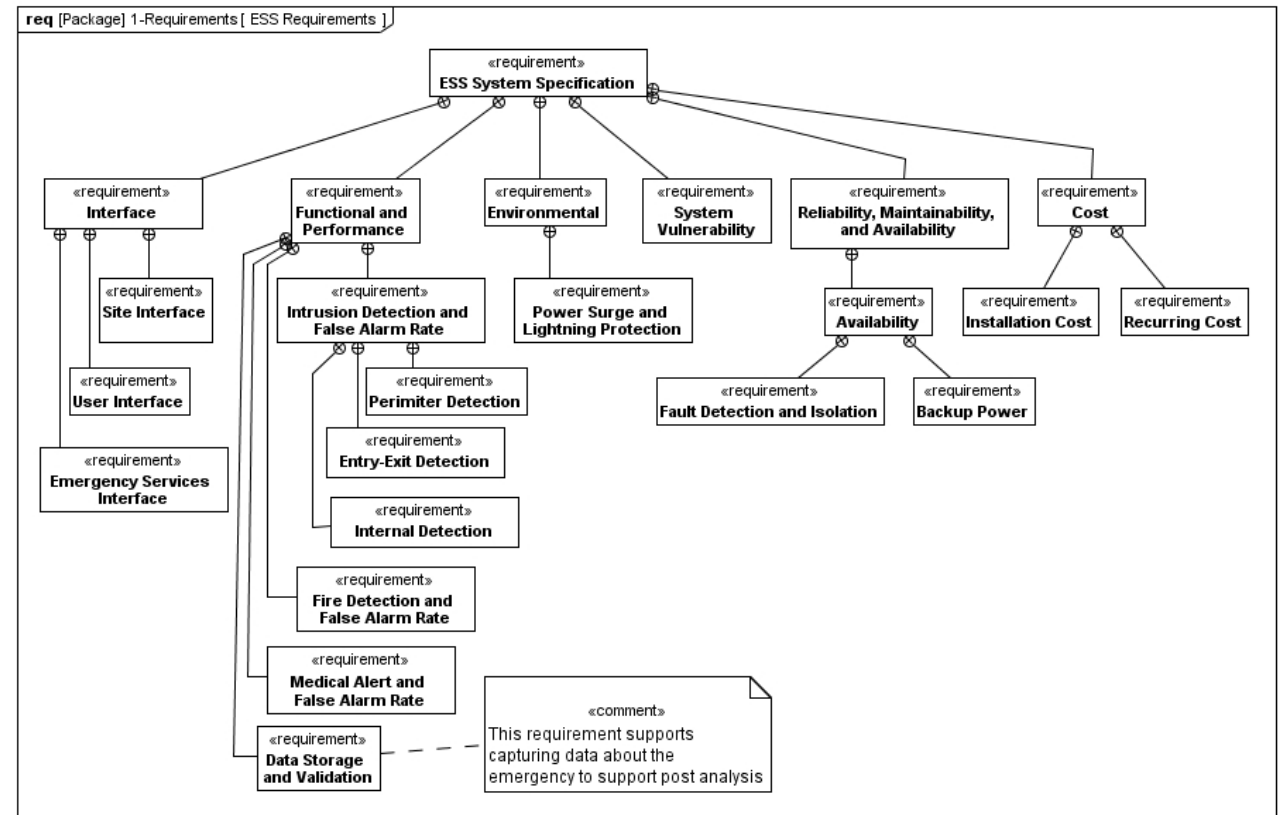
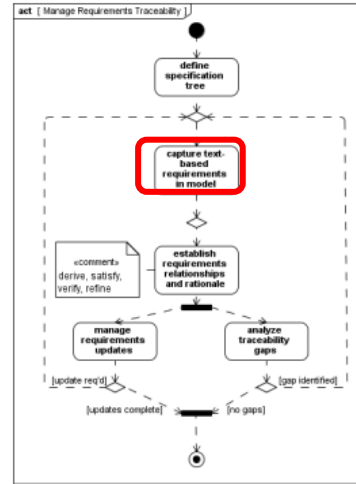
Define Specification Tree

- The specification tree shows the specifications at each level of the system hierarchy
- A requirement block is used to represent a container for all of the requirements contained in each text specification
- The trace relationship is used to show the traceability between the specification levels
 - For example, the ESS System Specification traces to the ESS Operational Requirements, which in turn trace to the Stakeholder Needs Assessment



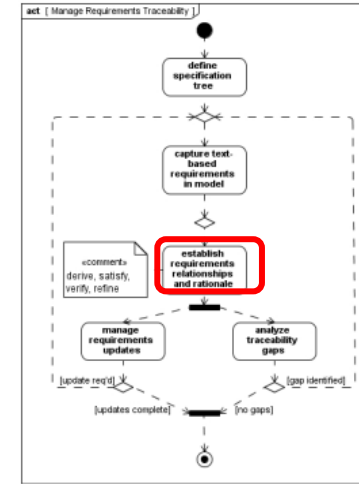
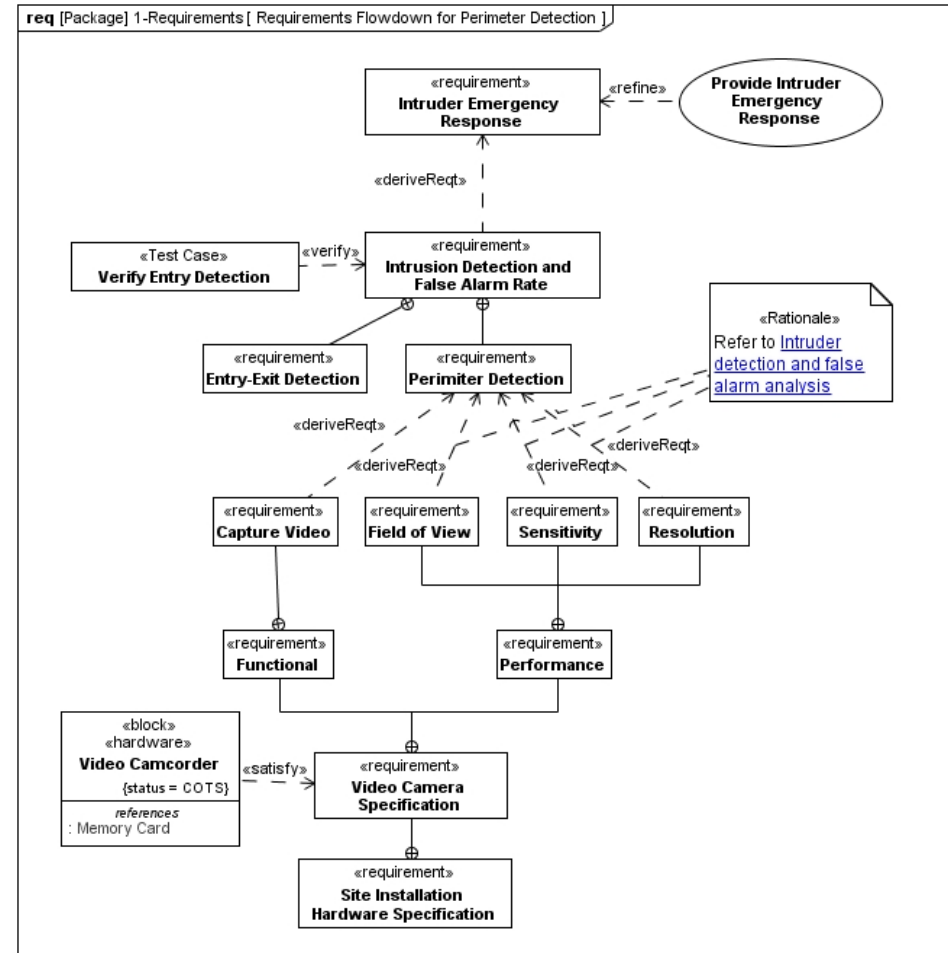
Capture Text-Based Requirements in Model

- A top level requirement for each specification is defined
- The requirements hierarchy in the specification is represented using containment (i.e. cross hairs)
- Each requirement in the model contains at least a name, id, and text, and can contain other attributes, such as: criticality, uncertainty, verification method



Establish Requirements Relationships and Rationale

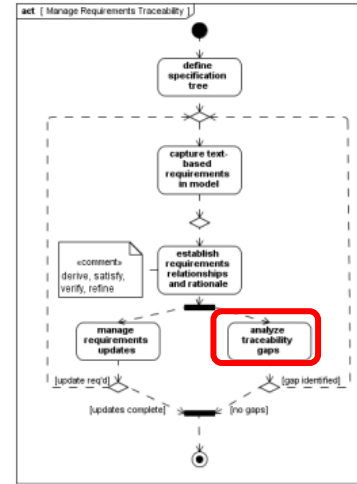
- Requirements traceability is maintained by establishing relationships between the text-based requirements in the model, and other model elements (including: other requirements, design elements, and test cases)
- Rationale for the relationships can be captured in the model as well
- SysML requirement relationships, such as: 'derive', 'refine', 'satisfy', and 'verify' are used to depict the relationships between the requirements and other model elements



Analyze Traceability Gaps

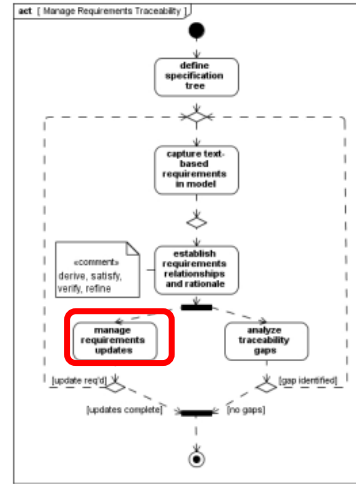
- Traceability reports can be generated from the model to analyze traceability gaps and assess how the system design satisfies the system requirements
- Viewpoints and their corresponding views can aid in requirements traceability analysis by providing a means to query the model for the model elements that satisfy a particular set of requirements
- The viewpoints represent different stakeholder perspectives and the view represents that portion of the model that addresses the stakeholder concerns

1-Requirements	14
2 ESS System Specification	14
2.2 System Vulnerability	
2.6 Interface	3
2.6.5 Emergency Services Interface	✓
2.6.7 Site Interface	✓
2.6.8 User Interface	✓
2.6.4 Wireless Activation and Deactivation (optional)	
2.6.8 User Interface	
2.6.8.2 Displays and Controls Interface	
2.6.8.1 Web Interface	
2.3 Reliability, Maintainability, and Availability	2
2.3.1 Availability	2
2.3.1.1 Backup Power	✓
2.3.1.2 Fault Detection and Isolation	✓
2.1 Environmental	1
2.1.1 Power Surge and Lightning Protection	✓
2.4 Cost	1
2.4.1 Installation Cost	✓
2.4.2 Recurring Cost	
2.5 Functional and Performance	7
2.5.4 Data Storage and Validation	✓
2.5.2 Fire Detection and False Alarm Rate	✓
2.5.1 Intrusion Detection and False Alarm Rate	✓
2.5.3 Medical Alert and False Alarm Rate	✓
2.5.1 Intrusion Detection and False Alarm Rate	3
2.5.1.2 Entry-Exit Detection	✓
2.5.1.3 Internal Detection	✓
2.5.1.1 Perimeter Detection	✓



Manage Requirements Updates

- The requirements management activity may result in proposed updates to existing requirements, and/or the generation of new requirements
- Models help to reveal ambiguous, inconsistent, and incomplete requirements
- Requirements management tools can be used in conjunction with a systems modeling tool to manage the requirements
- Integration between the tools is important to ensure that the requirements and their relationships are synchronized between the two tools



Questions



Summary

- Packages can be used to organize requirements and to reflect the various specification levels of the system hierarchy
- Trace relationships are used to show the traceability between various specification levels
- Text-based requirements are captured in the model by creating a SysML requirement for each text requirement, that includes a name, an id, and text
- Containment is used to represent the requirements hierarchy for each specification
- SysML requirement relationships, such as: 'derive', 'refine', 'satisfy', and 'verify' are used to depict the relationships between the requirements and other model elements
- Traceability reports can be generated from the model to analyze traceability gaps and assess how the system design satisfies the system requirements

References

Additional information can be obtained by reviewing:

SysML Distilled (Delligatti)

A Practical Guide to SysML (Friedenthal)

Section 16.3.6