Object-Oriented Systems Engineering Method (OOSEM)

Define Logical Architecture

Sanford Friedenthal
safriedenthal@gmail.com

OOSEM Topics

- OOSEM Overview
- Method
  - Setup Model
  - Analyze Stakeholder Needs
  - Analyze System Requirements
  - Define Logical Architecture
  - Synthesize Candidate Physical Architectures
  - Optimize and Evaluate Alternatives
  - Manage Requirements Traceability
  - Integrate and Verify System
- Summary

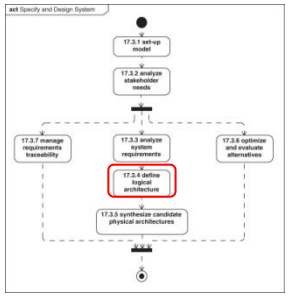
Module Objectives

- After completion of this module, student should understand
  - The motivation for developing a logical design
  - The primary modeling artifacts from Define Logical Architecture
  - The distinction between a logical and physical component
  - An approach to decomposing the system into logical components
  - How to realize a system function in the logical design
  - How an ibd is used to capture the interconnection among the logical components

Logical Architecture Motivation

- Partitions system design functionality and properties into logical components
  - Provides a shared understanding of what the system is and what it can do
- Provides an intermediate and stable abstraction layer between the requirements and the physical design
  - Supports trade studies of alternative physical architectures
  - Mitigates impact of change in requirements
  - Mitigates impact of change in physical design/technology
  - Supports design evolution
  - Can serve as a reference architecture for a product family

Define Logical Architecture



- Decompose the system into logical components
- Define how the logical components interact to realize the system black box behavior
- Define the interconnection between the logical components
- Specify the logical components

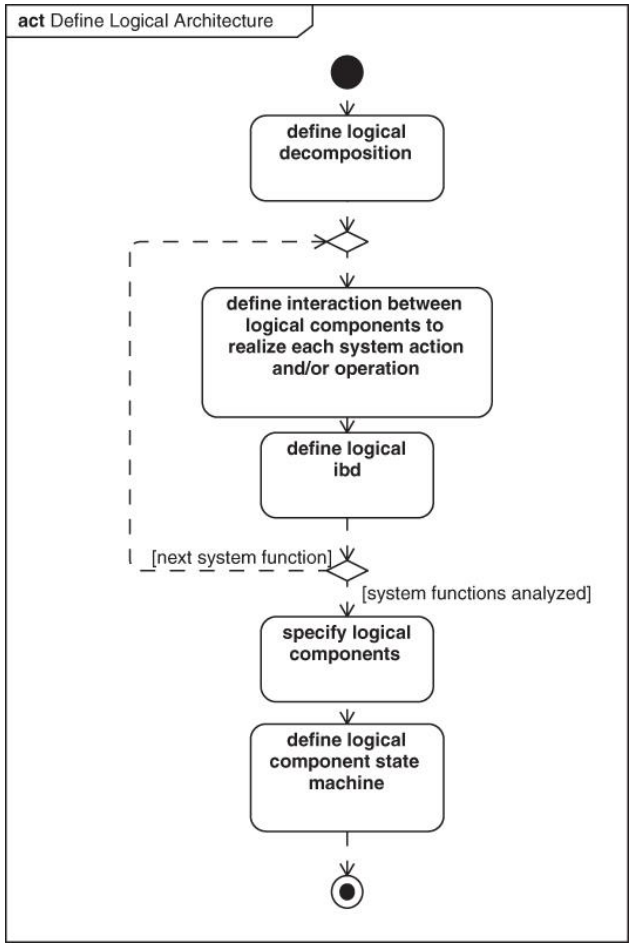
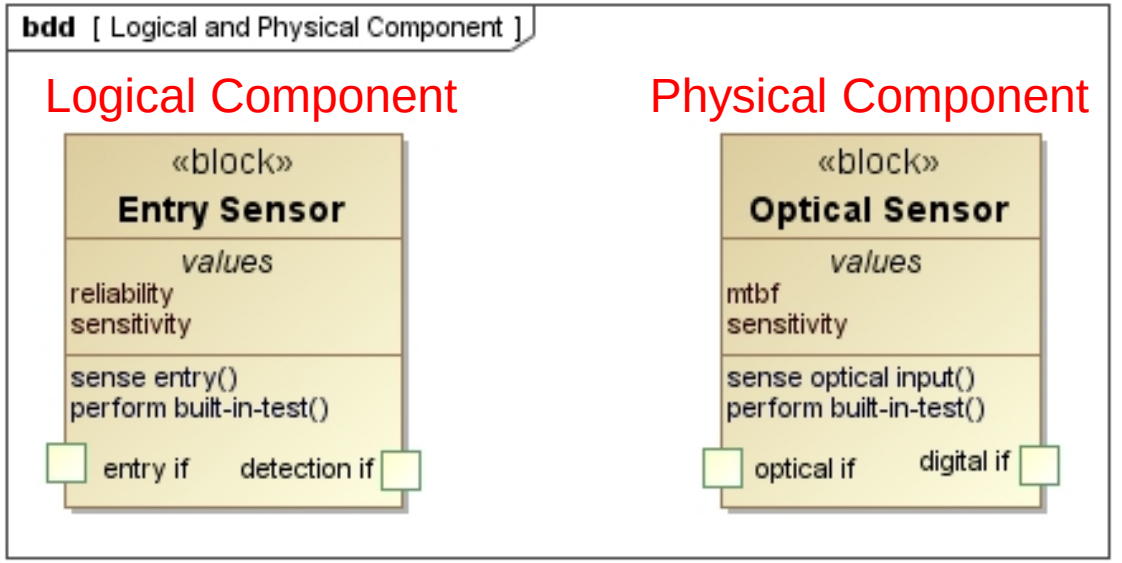


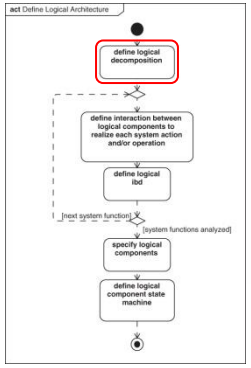
Figure 17.22

Logical vs. Physical Components

- Logical component is an abstraction of a physical component
  - Technology/implementation independent
  - Performs functions
  - Has properties
  - Has logical interfaces

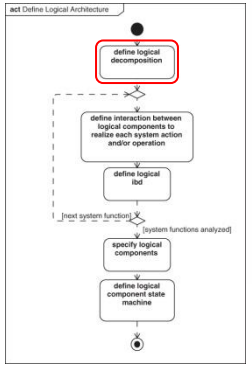


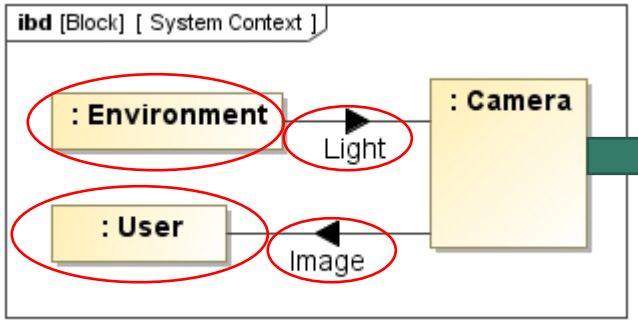
Define Logical Decomposition



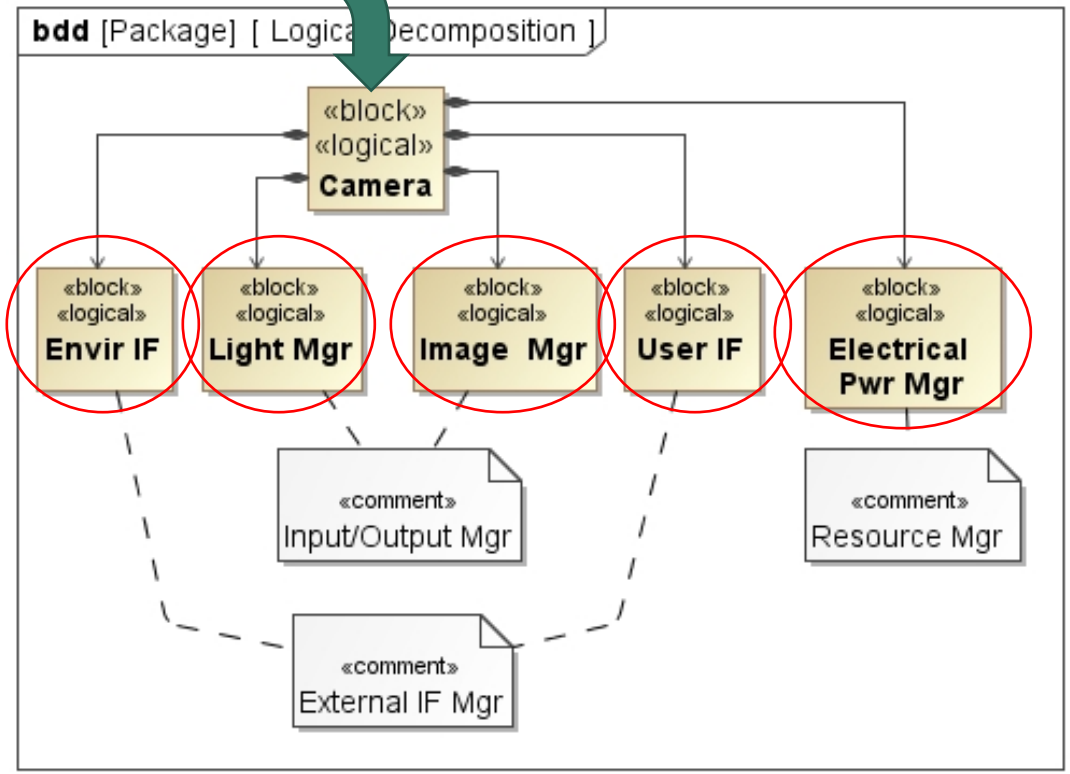
- ESS Logical is subclass of the ESS system block
  - Inherits the black box specification features
  - Is decomposed into logical components
- ESS Logical decomposition approach
  - Identify a logical component to interface/connect to each external system, user, or environment
  - Identify a logical component to provide the functionality to manage each item flow
  - Identify a logical component to manage each internal resource (e.g., fault management, electrical/mechanical interconnection)
- Logical decomposition provides a systematic method to identify the components to respond to external environment

Define Logical Decomposition Camera Example

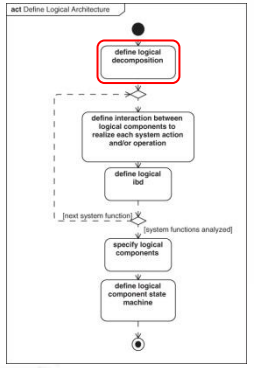


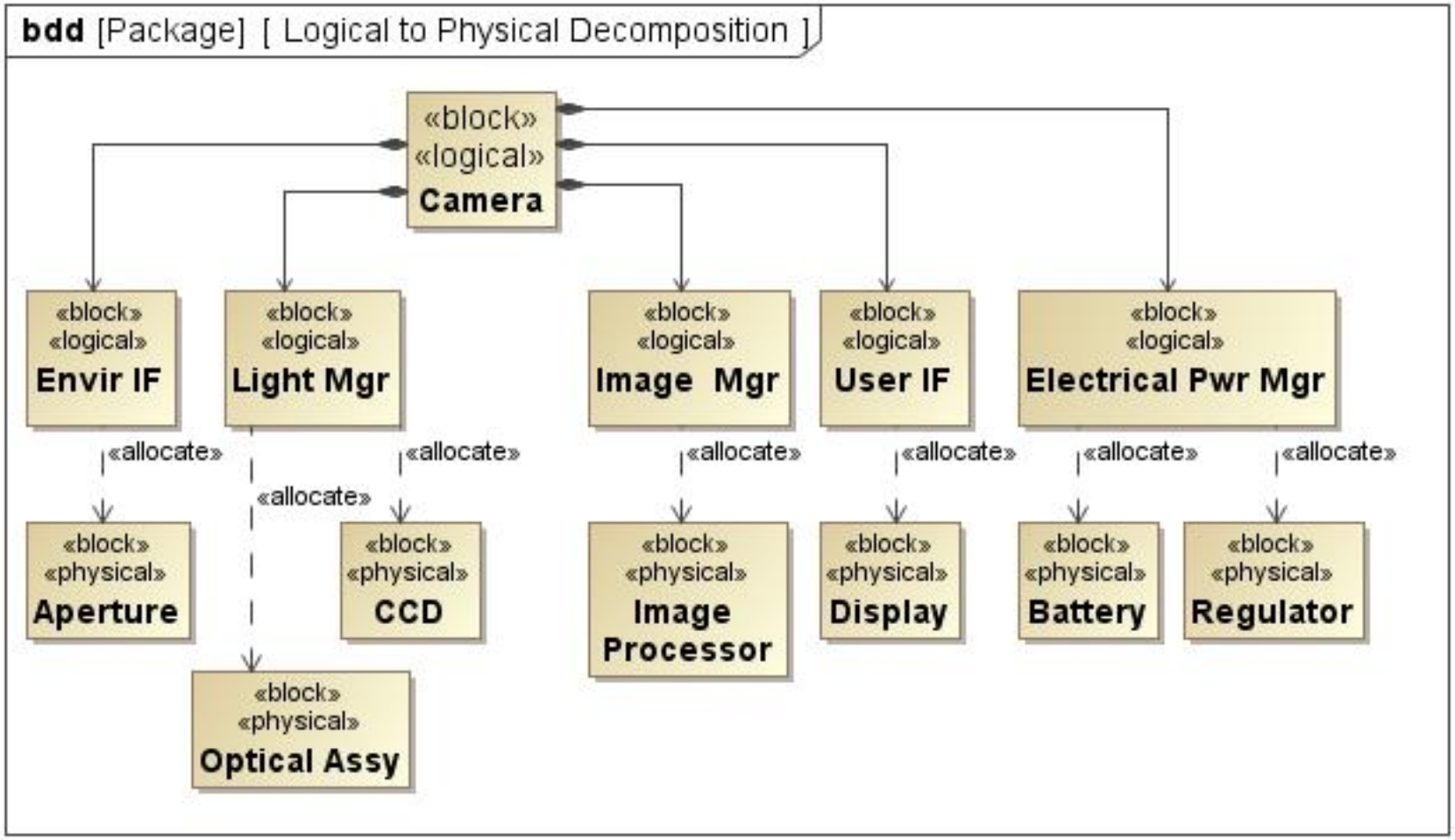


What are the logical components?



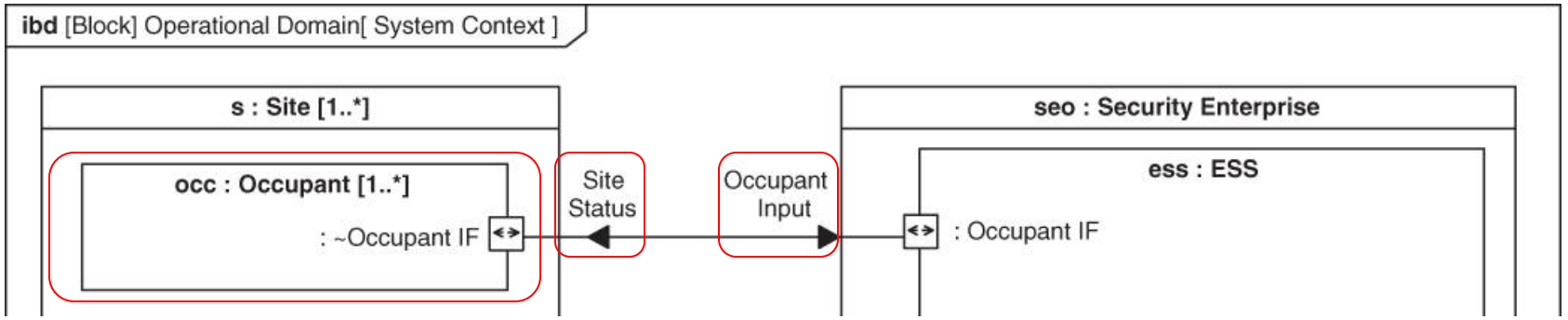
Allocating Logical to Physical Components - Camera Example



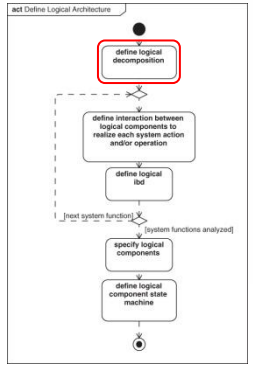


ESS Logical Decomposition

- Example of ESS item flows and external interface from System Context that drives logical decomposition



ESS Logical Decomposition (cont.)



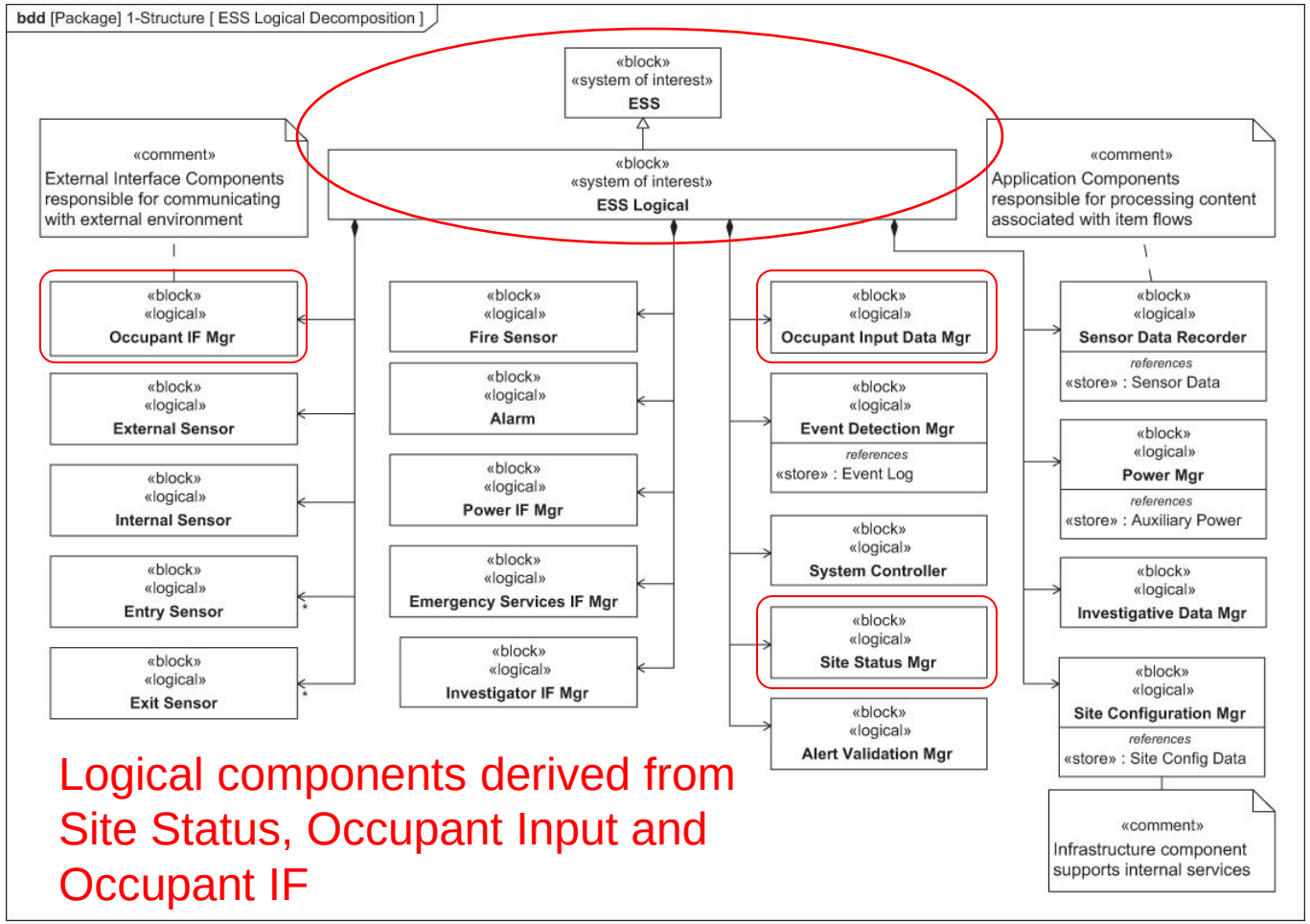
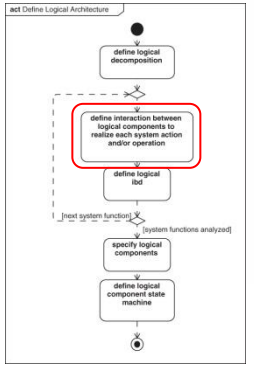


Figure 17.21

Define Interaction between Logical Components



- Define an activity diagram that shows how the logical components realize each system black box function

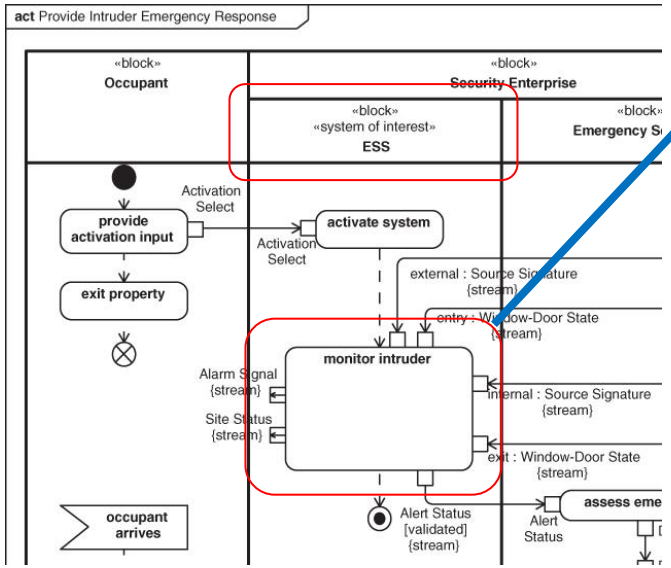


Figure 17.14

Identify patterns that apply to multiple activity diagrams (e.g., sense, control, act)

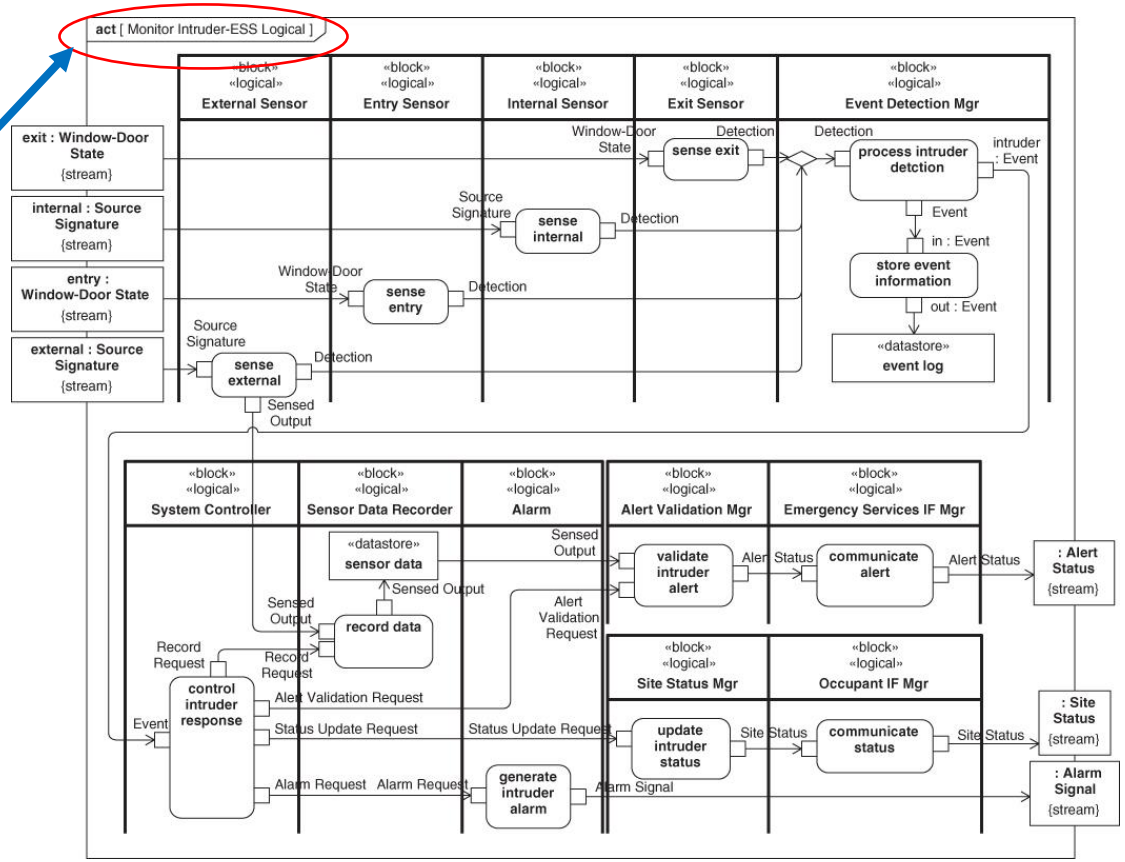
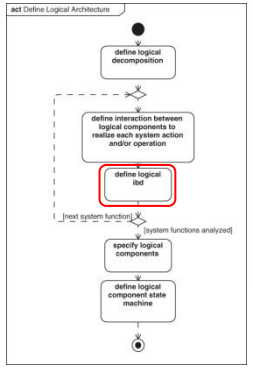


Figure 17.22

Define System Logical Internal Block Diagram



- Interconnection of logical components support interactions specified by the activity diagrams

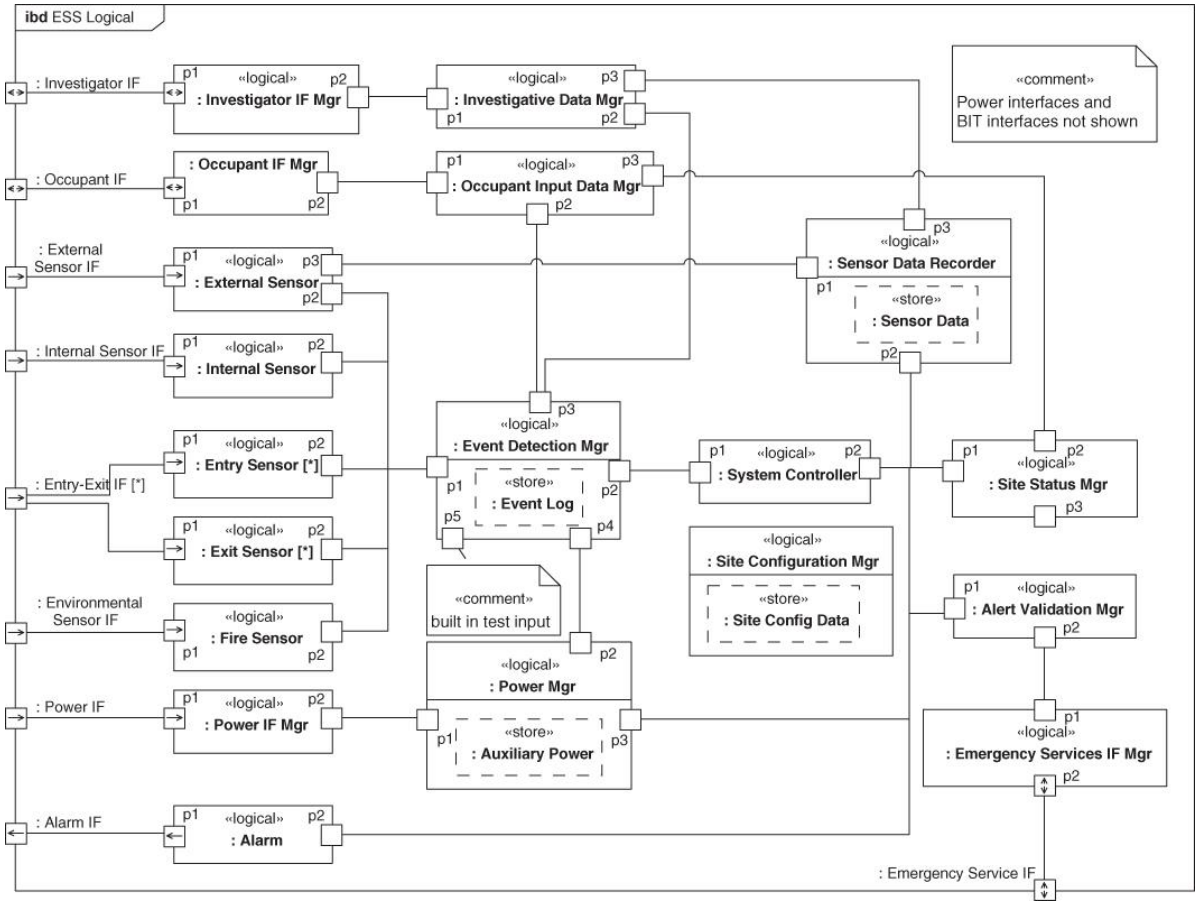
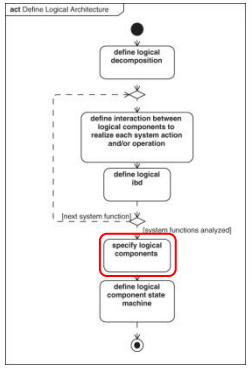


Figure 17.23

Specify Logical Components



- The logical components are specified similar to the system black-box specification
  - Actions from logical component swim lane are the required component functions
  - Ports on the components represent the required interfaces
  - Performance, physical, and quality characteristics are captured as value properties
  - Items that must be stored are captured as store properties

Summary

- The Logical Architecture is an abstraction level that aids in managing change, supports architecture trade-offs, and improved system understanding
- The system black box is decomposed into logical components
  - The logical decomposition approach provides a systematic method for identifying the components needed to manage the systems inputs and outputs and connect to the external environment
- Each black box system function is realized through the interaction among the logical components
- The logical ibd shows the interconnection among the logical components