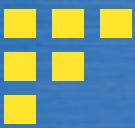


# Chapter 6

# System Engineering

**Software Engineering: A Practitioner's Approach, 6th edition**  
*by Roger S. Pressman*



# System Engineering

---

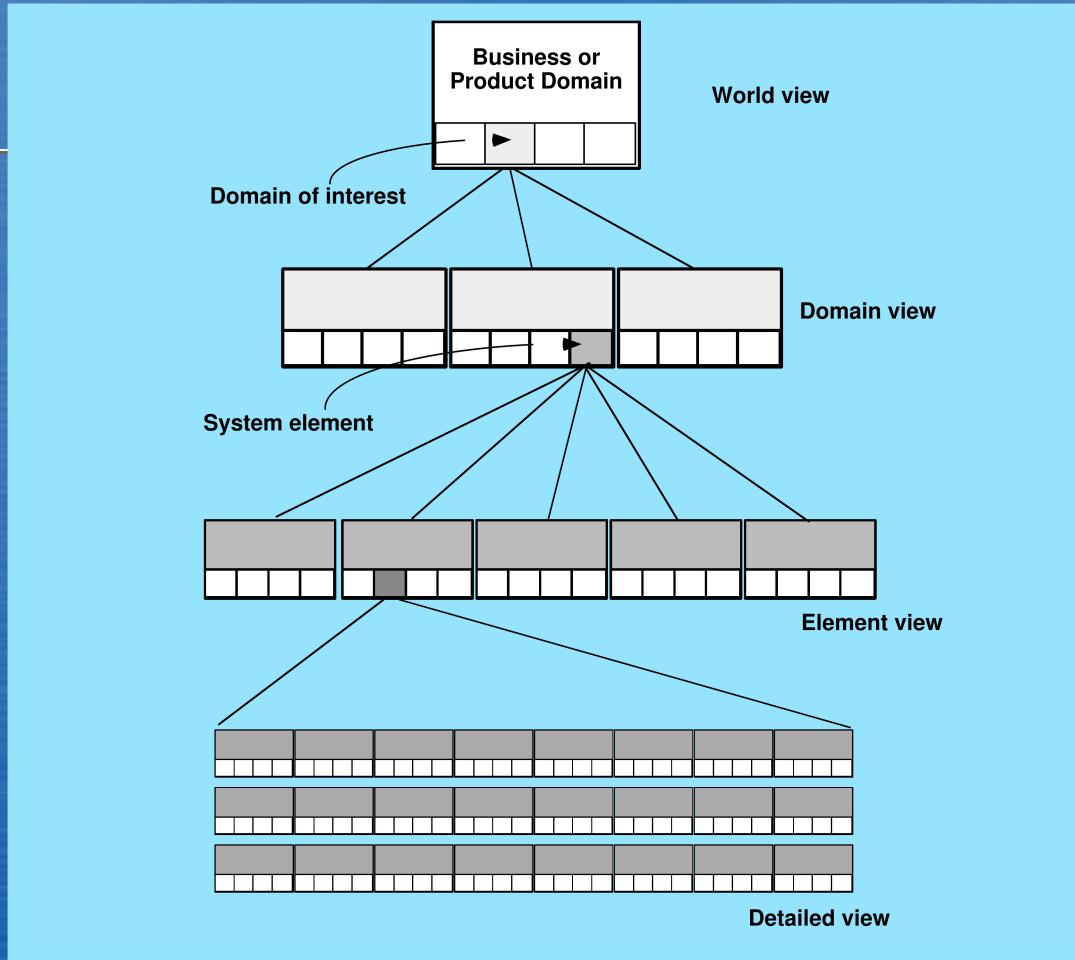
## § Elements of a computer-based system

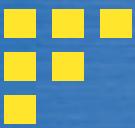
- Software
- Hardware
- People
- Database
- Documentation
- Procedures

## § Systems

- A hierarchy of macro-elements

# The Hierarchy





# System Modeling

- 
- § define the processes that serve the needs of the view under consideration.
  - § represent the behavior of the processes and the assumptions on which the behavior is based.
  - § explicitly define both exogenous and endogenous input to the model.
    - exogenous inputs link one constituent of a given view with other constituents at the same level or other levels; endogenous input links individual components of a constituent at a particular view.
  - § represent all linkages (including output) that will enable the engineer to better understand the view.



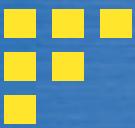
# Business Process Engineering

---

uses an integrated set of procedures, methods, and tools to identify how information systems can best meet the strategic goals of an enterprise focuses first on the enterprise and then on the business area

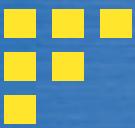
creates enterprise models, data models and process models

creates a framework for better information management distribution, and control



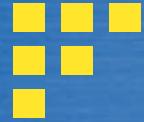
# System Architectures

- 
- § Three different architectures must be analyzed and designed within the context of business objectives and goals:
    - § data architecture
    - § applications architecture
    - § technology infrastructure
  - § *data architecture* provides a framework for the information needs of a business or business function
  - § *application architecture* encompasses those elements of a system that transform objects within the data architecture for some business purpose
  - § *technology infrastructure* provides the foundation for the data and application architectures



# The BPE Hierarchy

- § Information strategy planning (ISP)
  - strategic goals defined
  - success factors/business rules identified
  - enterprise model created
- § Business area analysis (BAA)
  - processes/services modeled
  - interrelationships of processes and data
- § Application Engineering
  - a.k.a ... software engineering
  - modeling applications/procedures that address (BAA) and constraints of ISP
- Construction and delivery
  - using CASE and 4GTs, testing



# Information Strategy Planning

## § Management issues

define strategic business  
goals/objectives

isolate critical success factors

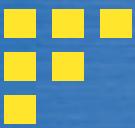
conduct analysis of technology impact  
perform analysis of strategic systems

## § Technical issues

create a top-level data model

cluster by business/organizational area

refine model and clustering



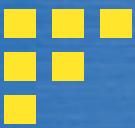
# Defining Objectives and Goals

- § **Objective**—general statement of direction
- § **Goal**—defines measurable objective: “reduce manufactured cost of our product”

## Subgoals:

- decrease reject rate by 20% in first 6 months
- gain 10% price concessions from suppliers
- re-engineer 30% of components for ease of manufacture during first year

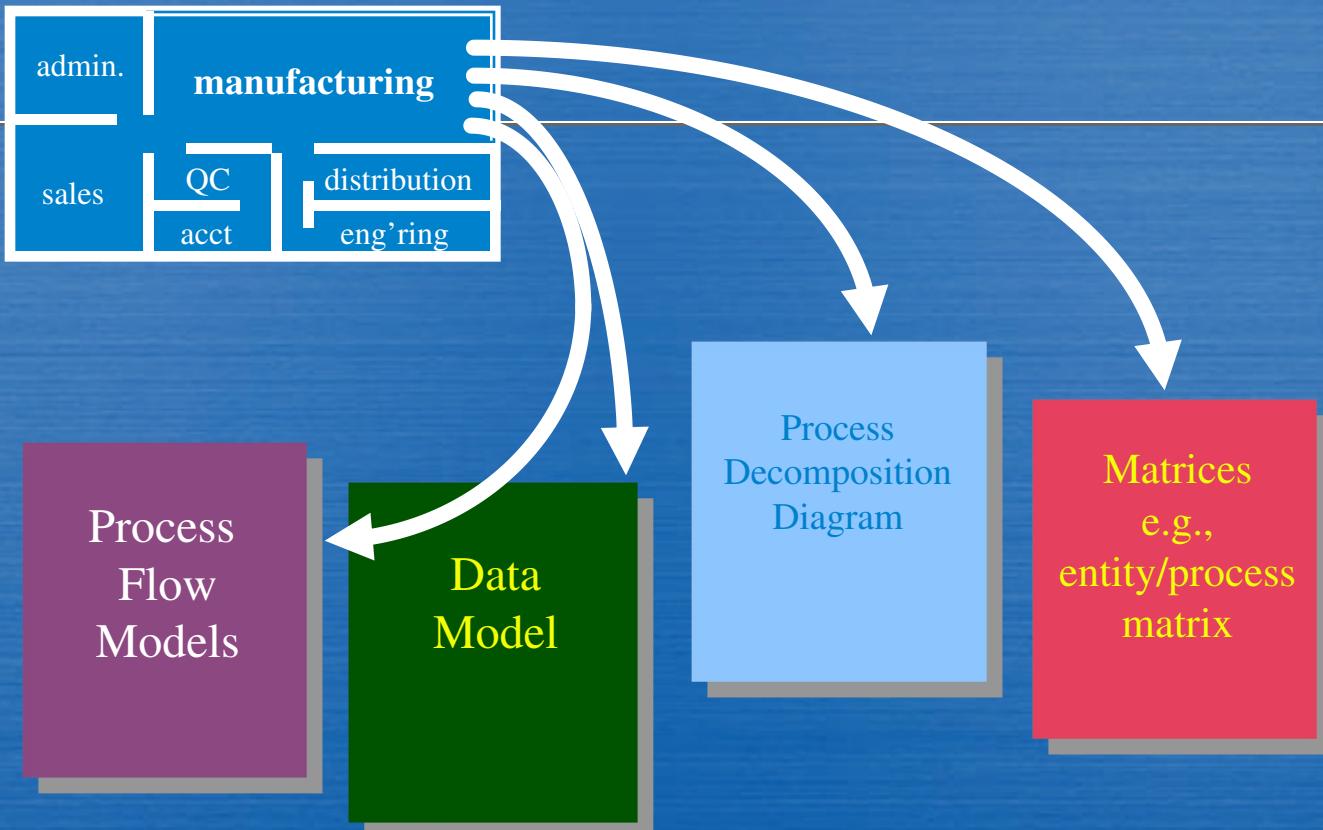
- § Objectives tend to be strategic while goals tend to be tactical



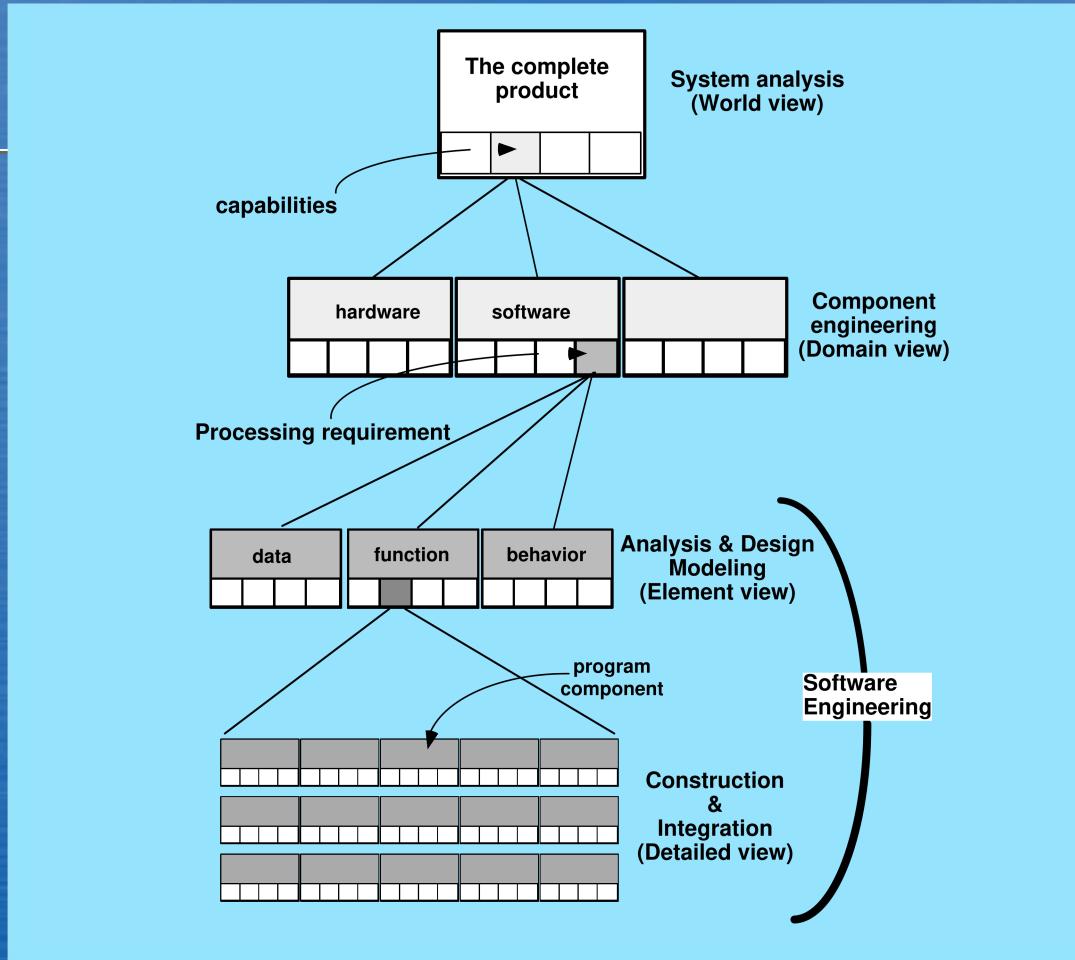
# Business Area Analysis

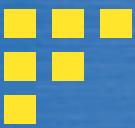
- § define “naturally cohesive groupings of business functions and data” (Martin)
- § perform many of the same activities as ISP, but narrow scope to individual business area
- § identify existing (old) information systems / determine compatibility with new ISP model
  - define systems that are problematic
  - defining systems that are incompatible with new information model
  - begin to establish re-engineering priorities

# The BAA Process

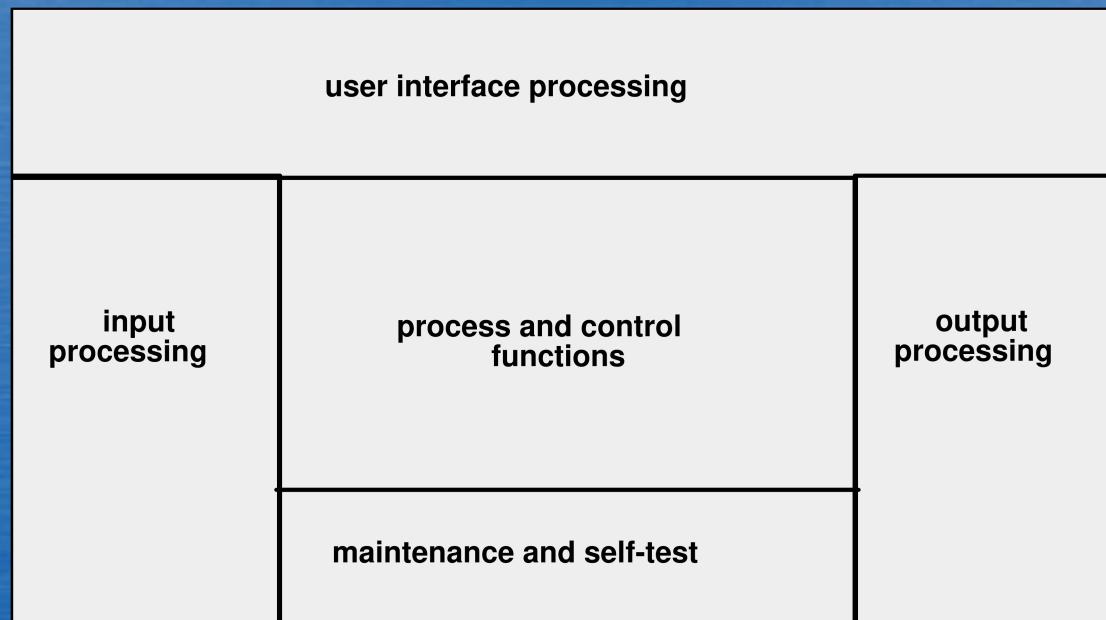


# Product Engineering

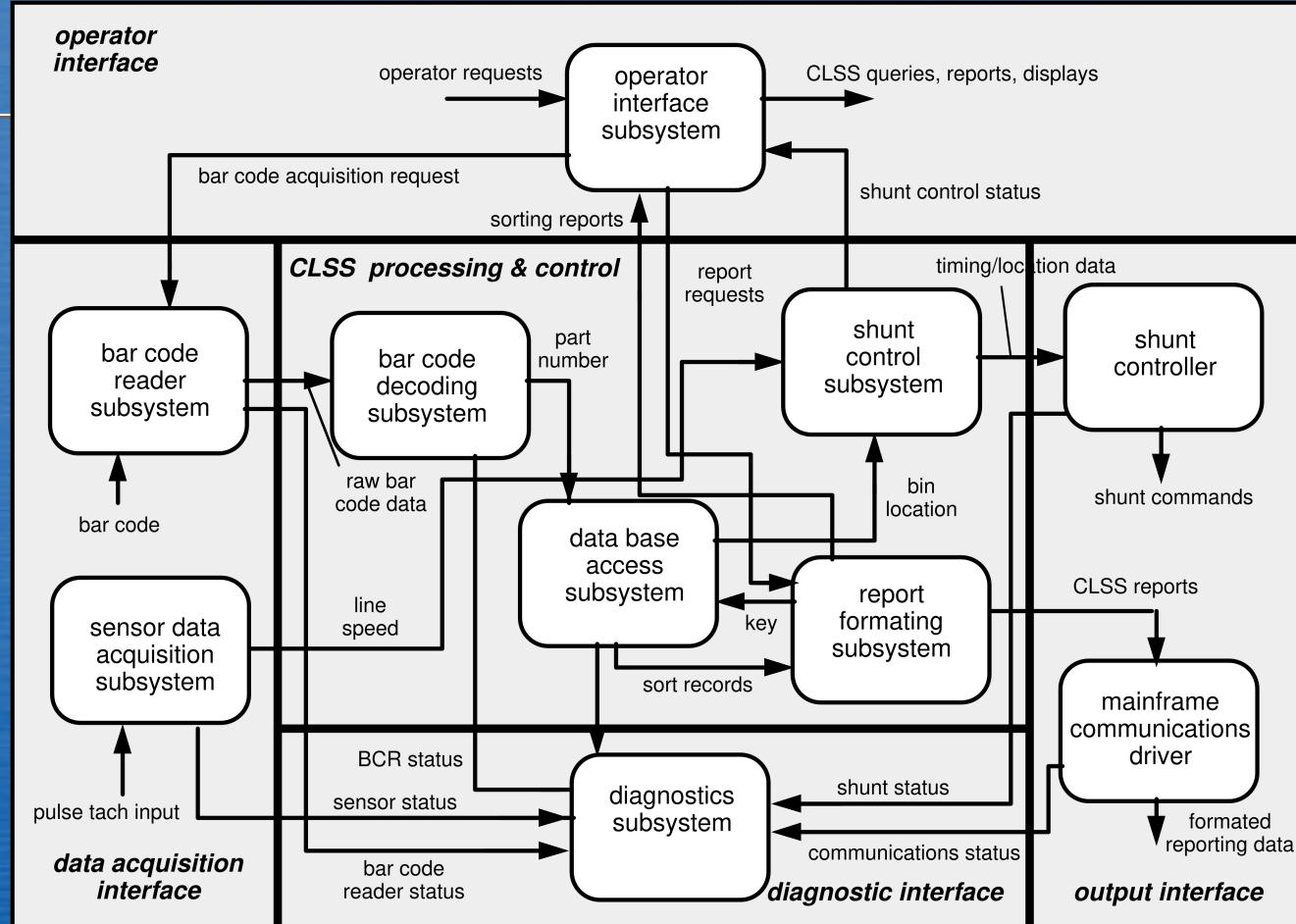


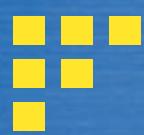


# Product Architecture Template



# Architecture Flow Diagram





# System Modeling with UML

## § Deployment diagrams

- Each 3-D box depicts a hardware element that is part of the physical architecture of the system

## § Activity diagrams

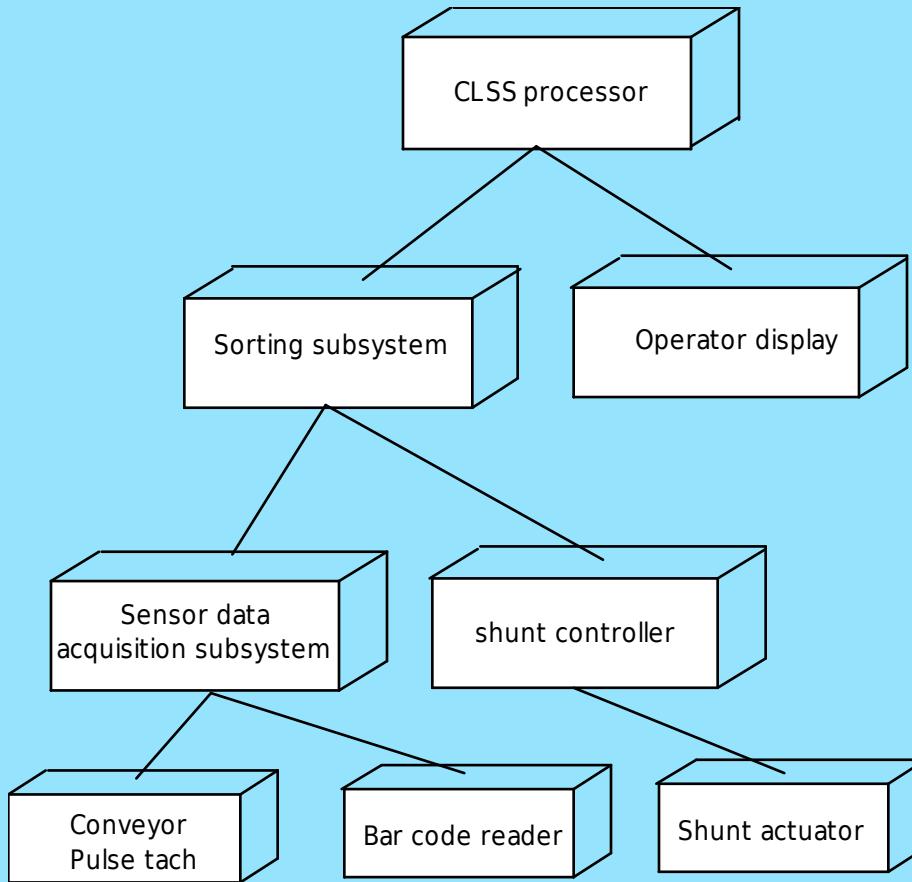
- Represent procedural aspects of a system element

## § Class diagrams

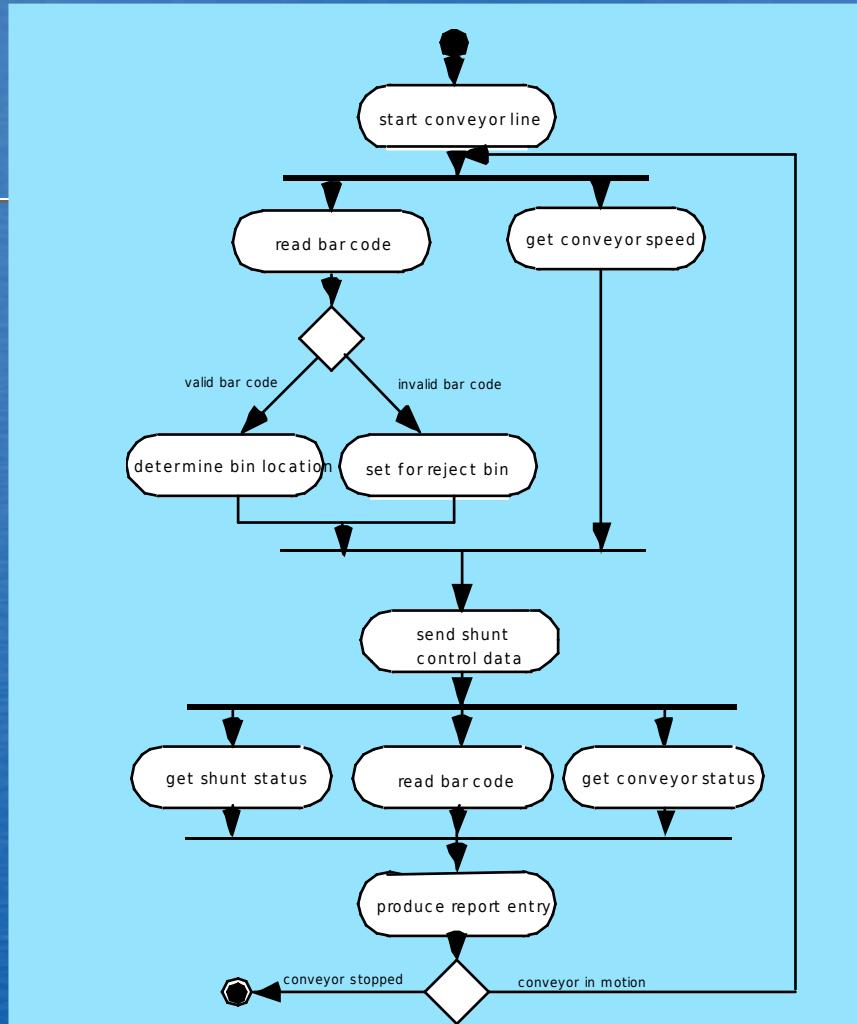
- Represent system level elements in terms of the data that describe the element and the operations that manipulate the data

*These and other UML models will be discussed later*

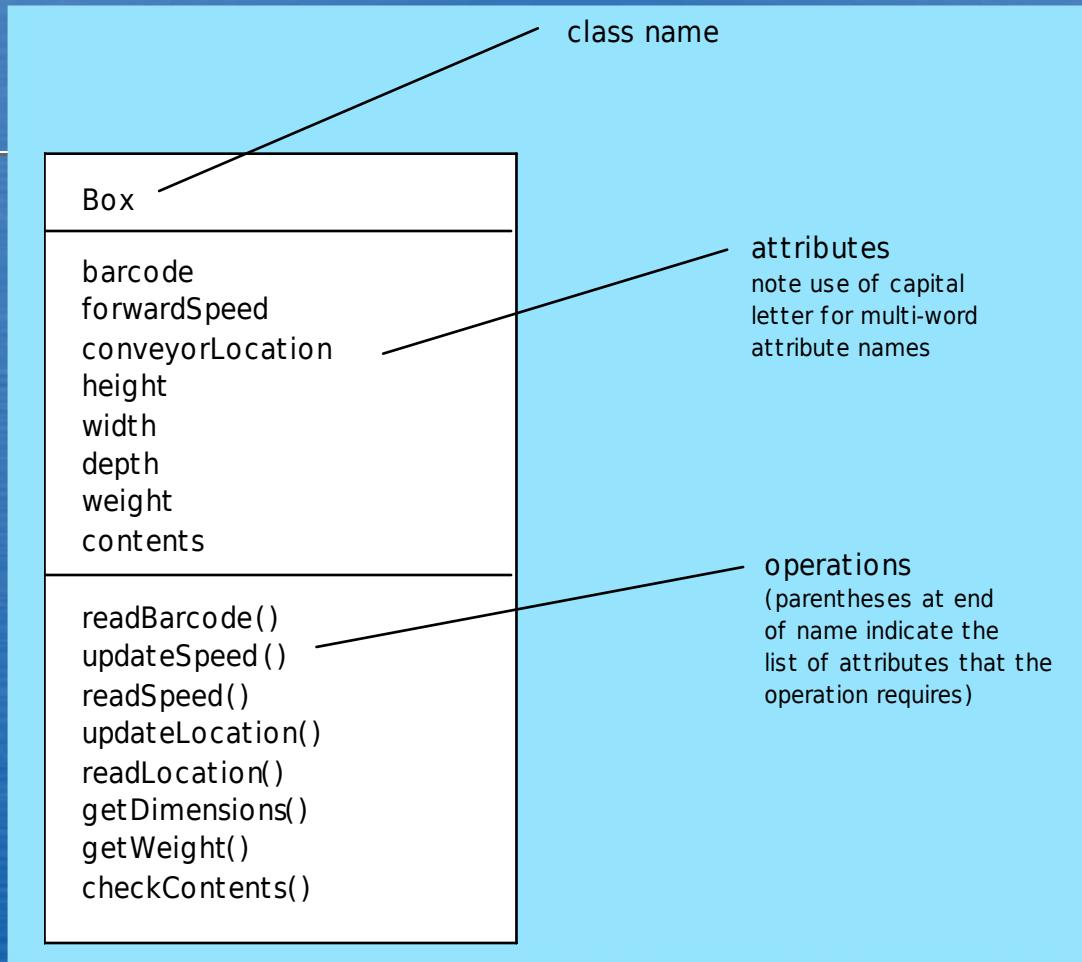
# Deployment Diagram

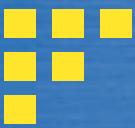


# Activity Diagram



# Class Diagram





# System Engineering

- § A system view of a product encompasses more than just the software.
- § Elements of a computer-based system:
  - Software
  - Hardware
  - People
  - Database
  - Documentation
  - Procedures
  - Other computer-based systems