# PROCESS MODELING

ITACS 5203, Unit 5

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**Introduction**

System Development Methodologies – Structured Techniques

Structured System Process Requirements
- Process Modeling
  - Data Flow Diagraming
  - Decision Modeling

Vulnerability Mapping
- The Misuse Case
- Diagraming Sensitive Dataflows
- Data Diagraming and the Trust Boundary

## LEARNING OBJECTIVES

Understand the logical modeling of processes by studying examples of Data Flow Diagrams (DFD).

Be able to draw DFDs following specific rules and guidelines that lead to accurate and well-structured process models.

Use DFDs as a tool to support analysis of information systems.

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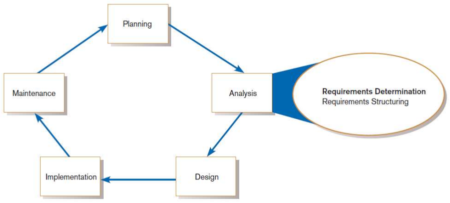
## PERFORMING REQUIREMENTS DETERMINATION



Systems development life cycle with analysis phase highlighted

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## REQUIREMENTS PROCESS MODELING

Graphically represent the processes that capture, manipulate, store, and distribute data

- Between a system and its environment
- Among the system's components

Examples of process modeling diagrams

- Data flow diagrams
- Use case diagrams
- Activity and business process modeling ("swim lane") diagrams
- Sequence diagrams

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## SECURITY REQUIREMENTS

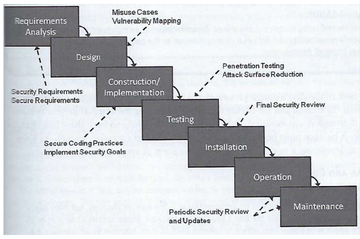
The earlier security is considered, the more likely it is to be implemented well

Baseline of security considerations are:

- Confidentiality
- Integrity
- Availability

Security requirements may also include:

- Data privacy
- Strict authentication and access control
- Uptime and reliability
- Failing safely
- Nonrepudiation



Richardson, T. and Thies, C. (2013) Secure Software Design

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## SECURE REQUIREMENTS VERSUS SECURITY REQUIREMENTS

***Secure requirements*** are standard requirements that have security built into them to determine the necessary constraints to protect the system as a whole

- Facilitate security across the entire system
- Systematic

***Security requirements*** are separate entities that support an overall security objective

- Often contributed by security personnel and specialists
- Assert what is needed within the system to support overall business security objectives
- Emphasize security in particular places

Richardson, T. and Thies, C. (2013) Secure Software Design

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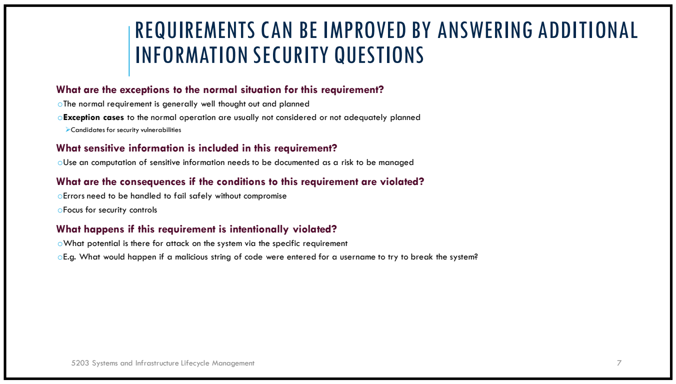


## REQUIREMENTS CAN BE IMPROVED BY ANSWERING ADDITIONAL INFORMATION SECURITY QUESTIONS

**What are the exceptions to the normal situation for this requirement?**

- The normal requirement is generally well thought out and planned
- **Exception cases** to the normal operation are usually not considered or not adequately planned
  - Candidates for security vulnerabilities

**What sensitive information is included in this requirement?**

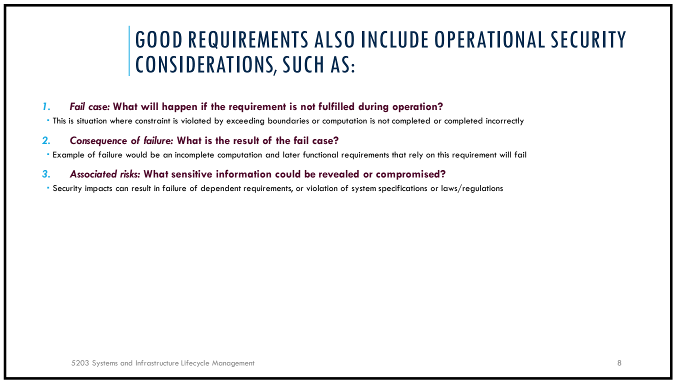
- Use an computation of sensitive information needs to be documented as a risk to be managed

**What are the consequences if the conditions to this requirement are violated?**

- Errors need to be handled to fail safely without compromise
- Focus for security controls

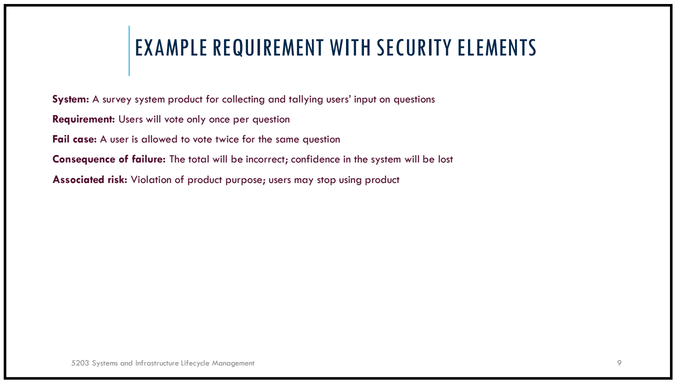
**What happens if this requirement is intentionally violated?**

- What potential is there for attack on the system via the specific requirement
- E.g. What would happen if a malicious string of code were entered for a username to try to break the system?



## GOOD REQUIREMENTS ALSO INCLUDE OPERATIONAL SECURITY CONSIDERATIONS, SUCH AS:

1. ***Fail case:* What will happen if the requirement is not fulfilled during operation?**
   - This is situation where constraint is violated by exceeding boundaries or computation is not completed or completed incorrectly
2. ***Consequence of failure:* What is the result of the fail case?**
   - Example of failure would be an incomplete computation and later functional requirements that rely on this requirement will fail
3. ***Associated risks:* What sensitive information could be revealed or compromised?**
   - Security impacts can result in failure of dependent requirements, or violation of system specifications or laws/regulations



## EXAMPLE REQUIREMENT WITH SECURITY ELEMENTS

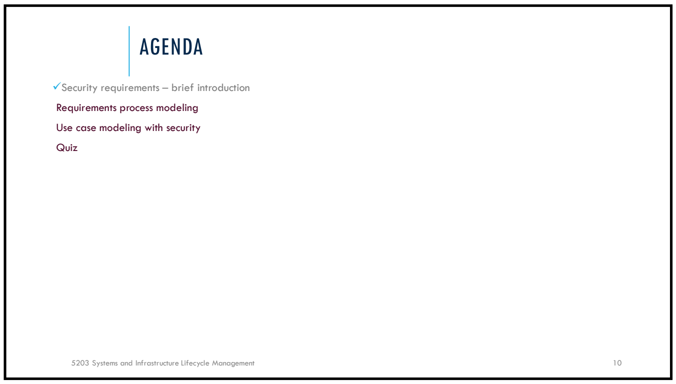
**System:** A survey system product for collecting and tallying users' input on questions

**Requirement:** Users will vote only once per question

**Fail case:** A user is allowed to vote twice for the same question

**Consequence of failure:** The total will be incorrect; confidence in the system will be lost

**Associated risk:** Violation of product purpose; users may stop using product



## AGENDA

- ✓Security requirements – brief introduction
- Requirements process modeling
- Use case modeling with security
- Quiz

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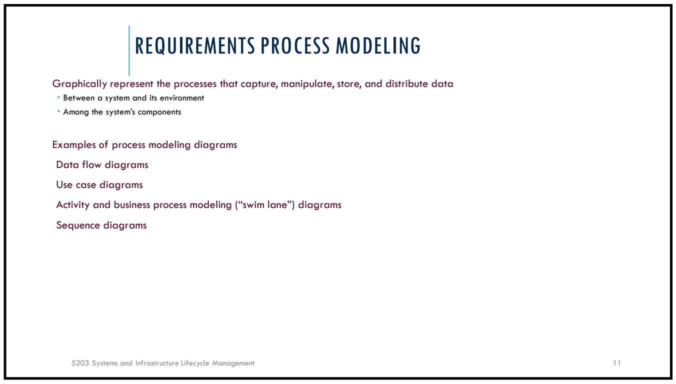

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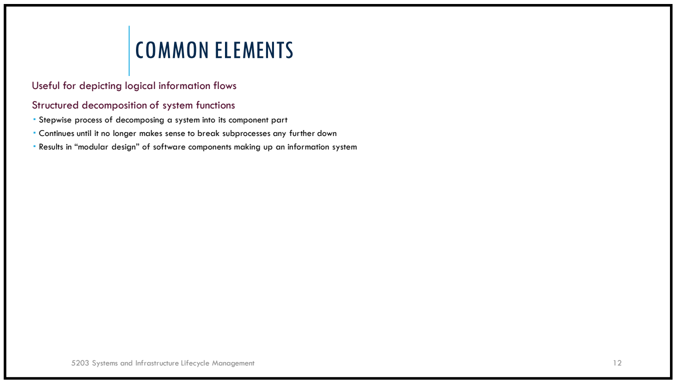

## COMMON ELEMENTS

Useful for depicting logical information flows

Structured decomposition of system functions

- Stepwise process of decomposing a system into its component part
- Continues until it no longer makes sense to break subprocesses any further down
- Results in "modular design" of software components making up an information system

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## COMMON ELEMENTS

Useful for depicting logical information flows

- Structured decomposition of system functions
- Stepwise process of decomposing a system into its component part
- Continues until it no longer makes sense to break subprocesses any further down
- Results in "modular design" of software components making up an information system
- Context diagram = Overview of an information system, showing:
  - System boundaries
  - External entities
  - Information flows between the entities and the systems
- Level-0 diagram = Represents systems' major processes, data flows, and data stores
- Level-n diagram = Result of n nested decompositions from a process on a Level-0 diagram

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## DATA FLOW DIAGRAMS

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- System boundaries
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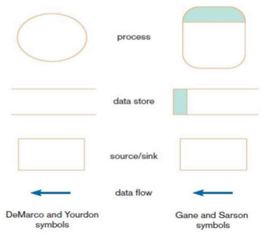
## DATA FLOW DIAGRAMS – BASIC ELEMENTS



- Process: work or actions performed on data (inside the system)
- Data store: data at rest (inside the system)
- Source/sink: external entity that is the origin or destination of data (outside the system)
- Data flow: arrows depicting movement of data

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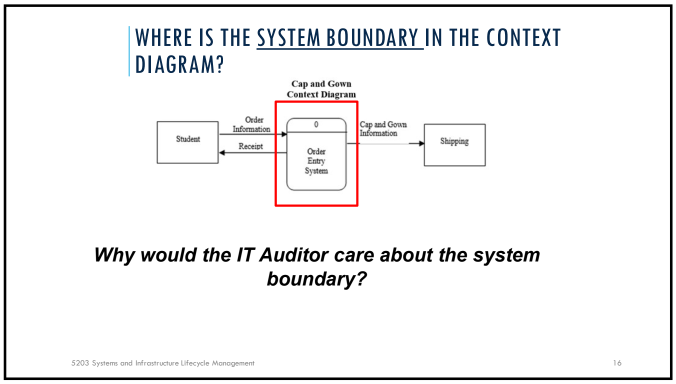
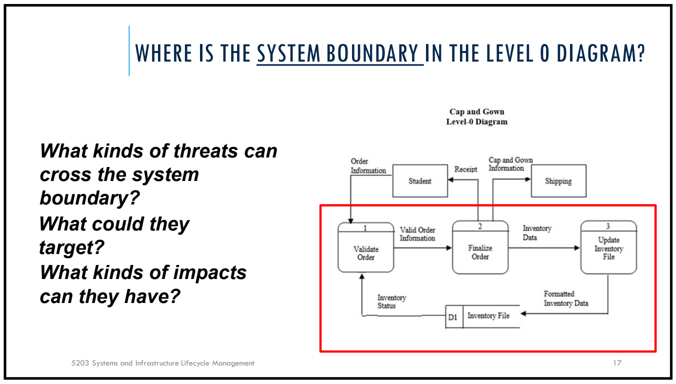


## WHERE IS THE SYSTEM BOUNDARY IN THE CONTEXT DIAGRAM?

Cap and Gown
Context Diagram

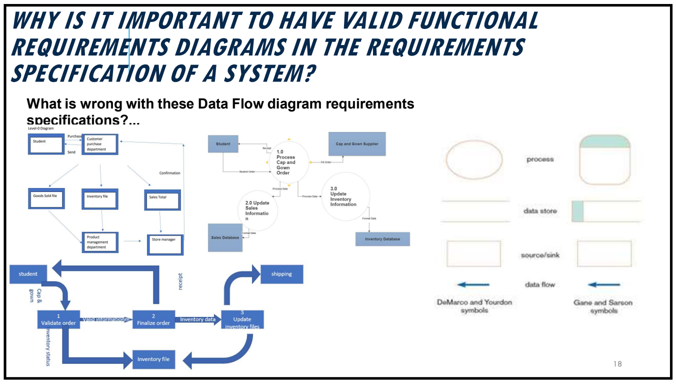
***Why would the IT Auditor care about the system boundary?***



## WHERE IS THE SYSTEM BOUNDARY IN THE LEVEL 0 DIAGRAM?

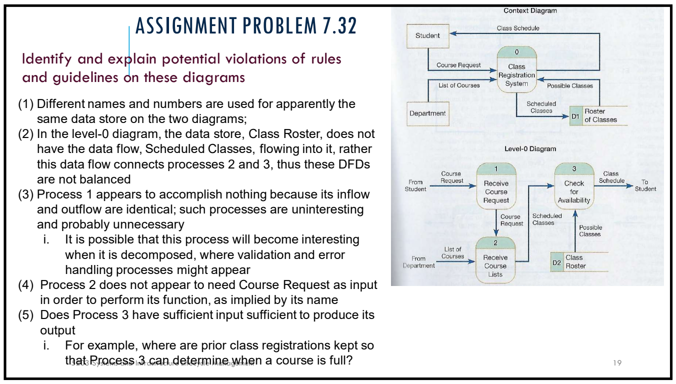
***What kinds of threats can cross the system boundary?***
***What could they target?***
***What kinds of impacts can they have?***

Cap and Gown
Level-0 Diagram



## *WHY IS IT IMPORTANT TO HAVE VALID FUNCTIONAL REQUIREMENTS DIAGRAMS IN THE REQUIREMENTS SPECIFICATION OF A SYSTEM?*

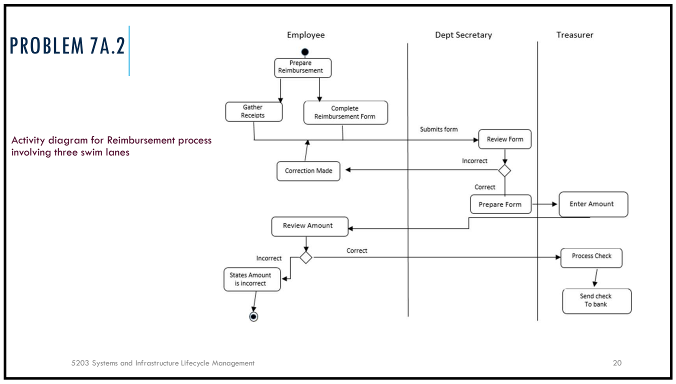
**What is wrong with these Data Flow diagram requirements specifications?...**



## ASSIGNMENT PROBLEM 7.32

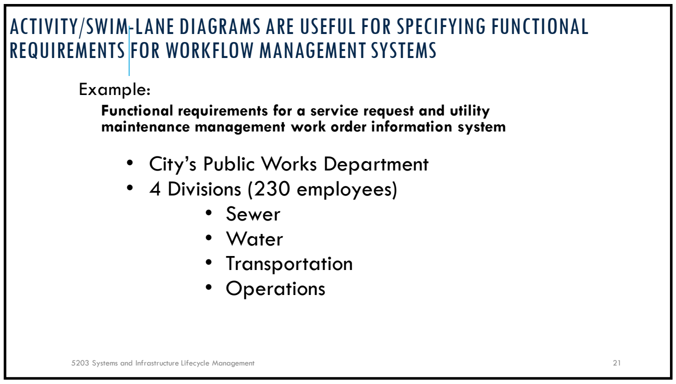
Identify and explain potential violations of rules and guidelines on these diagrams

(1) Different names and numbers are used for apparently the same data store on the two diagrams;
(2) In the level-0 diagram, the data store, Class Roster, does not have the data flow, Scheduled Classes, flowing into it, rather this data flow connects processes 2 and 3, thus these DFDs are not balanced
(3) Process 1 appears to accomplish nothing because its inflow and outflow are identical; such processes are uninteresting and probably unnecessary
   i. It is possible that this process will become interesting when it is decomposed, where validation and error handling processes might appear
(4) Process 2 does not appear to need Course Request as input in order to perform its function, as implied by its name
(5) Does Process 3 have sufficient input sufficient to produce its output
   i. For example, where are prior class registrations kept so that Process 3 can determine when a course is full?



## PROBLEM 7A.2

Activity diagram for Reimbursement process involving three swim lanes

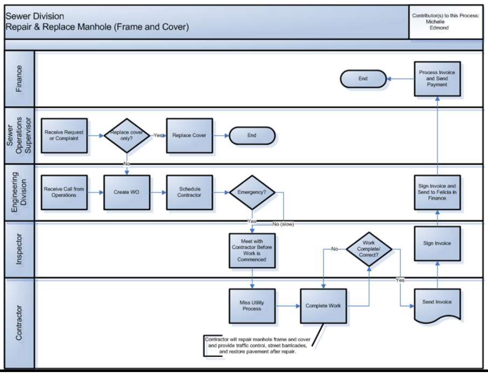


## ACTIVITY/SWIM-LANE DIAGRAMS ARE USEFUL FOR SPECIFYING FUNCTIONAL REQUIREMENTS FOR WORKFLOW MANAGEMENT SYSTEMS

Example:

**Functional requirements for a service request and utility maintenance management work order information system**

- City's Public Works Department
- 4 Divisions (230 employees)
  - Sewer
  - Water
  - Transportation
  - Operations


Sewer Division
Repair & Replace Manhole (Frame and Cover)
Contributor(s) to this Process:
Michelle
Edmond
Finance
Sewer Operations Supervisor
Engineering Division
Inspector
Contractor
End
Process Invoice and Send Payment
Receive Request or Complaint
Replace cover only?
Yes
Replace Cover
End
No
Receive Call from Operations
Create WO
Schedule Contractor
Emergency?
Sign Invoice and Send to Felicia in Finance
Yes
No (slow)
Meet with Contractor Before Work is Commenced
Work Complete/ Correct?
No
Yes
Sign Invoice
Miss Utility Process
Complete Work
Send Invoice
Contractor will repair manhole frame and cover and provide traffic control, street barricades, and restore pavement after repair.

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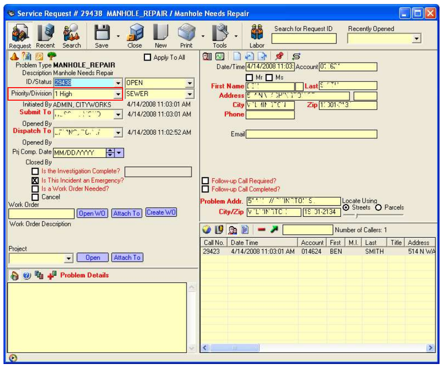

Service Request # 29438 MANHOLE_REPAIR / Manhole Needs Repair

Search for Request ID

Recently Opened

□ Apply To All

Problem Type **MANHOLE_REPAIR**

Description Manhole Needs Repair

ID/Status 29438 OPEN

Priority/Division 1 High SEWER

Initiated By ADMIN, CITYWORKS 4/14/2008 11:03:01 AM

**Submit To** [redacted] 4/14/2008 11:03:01 AM

Opened By

**Dispatch To** [redacted] 4/14/2008 11:02:52 AM

Opened By

Prj Comp. Date MM/DD/YYYY

Closed By

□ Is the Investigation Complete?

☒ Is This Incident an Emergency?

□ Is a Work Order Needed?

□ Cancel

Work Order

Work Order Description

Project

**Problem Details**

Date/Time 4/14/2008 11:03 Account [redacted]

□ Mr □ Ms

**First Name** [redacted] **Last** [redacted]

**Address** [redacted]

**City** [redacted] **Zip** [redacted]

**Phone**

Email

□ Follow-up Call Required?

□ Follow-up Call Completed?

**Problem Addr.** [redacted] Locate Using ⊙ Streets ○ Parcels

**City/Zip** [redacted]

Number of Callers: 1

| Call No. | Date Time | Account | First | M.I. | Last | Title | Address |
|---|---|---|---|---|---|---|---|
| 29423 | 4/14/2008 11:03:01 AM | 014624 | BEN | | SMITH | | 514 N WA |

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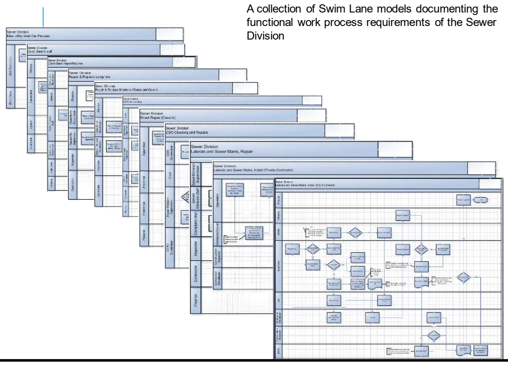

A collection of Swim Lane models documenting the functional work process requirements of the Sewer Division

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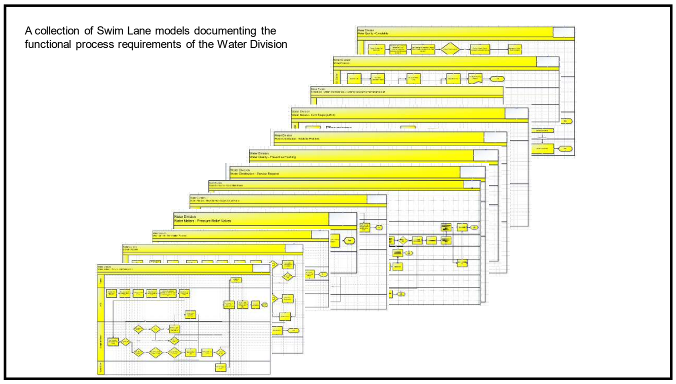
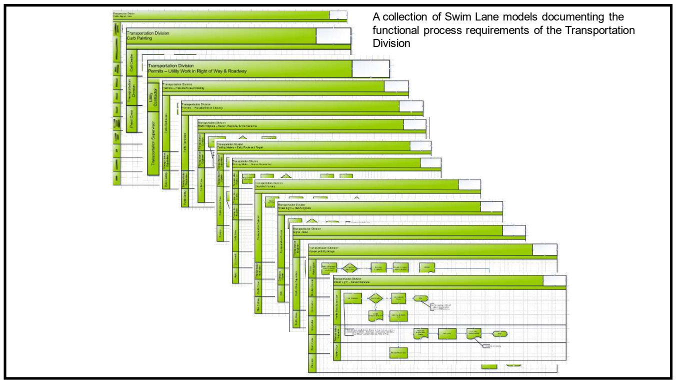


A collection of Swim Lane models documenting the functional process requirements of the Water Division

25



A collection of Swim Lane models documenting the functional process requirements of the Transportation Division

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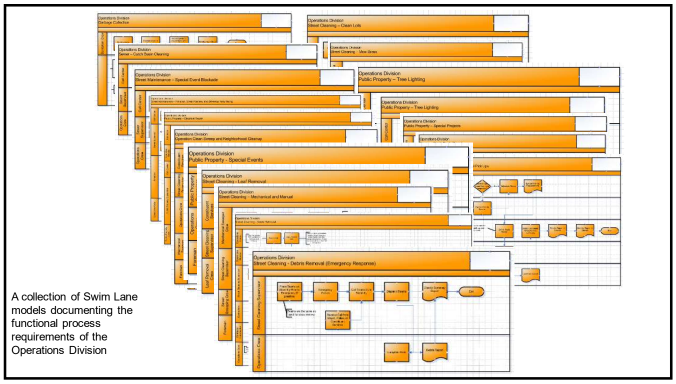

A collection of Swim Lane models documenting the functional process requirements of the Operations Division

Operations Division
Garbage Collection
Operations Division
Street Cleaning – Clean Lots
Operations Division
Sewer – Catch Basin Cleaning
Operations Division
Street Maintenance – Special Event Blockade
Operations Division
Public Property – Tree Lighting
Operations Division
Public Property – Special Projects
Operations Division
Operation Clean Sweep and Neighborhood Cleanup
Operations Division
Public Property - Special Events
Operations Division
Street Cleaning – Leaf Removal
Operations Division
Street Cleaning – Mechanical and Manual
Operations Division
Street Cleaning - Debris Removal (Emergency Response)

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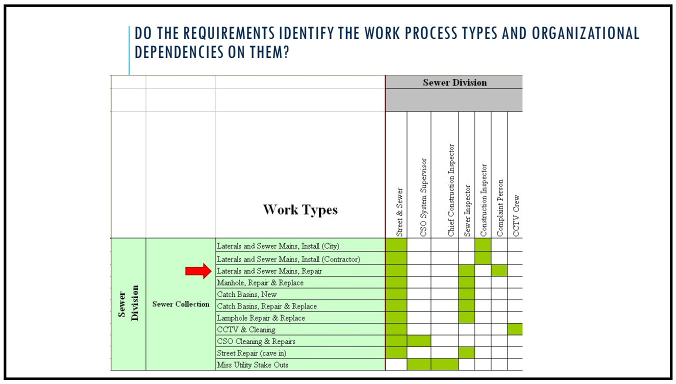

## DO THE REQUIREMENTS IDENTIFY THE WORK PROCESS TYPES AND ORGANIZATIONAL DEPENDENCIES ON THEM?

| | | | Sewer Division | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Work Types | Street & Sewer | CSO System Supervisor | Chief Construction Inspector | Sewer Inspector | Construction Inspector | Complaint Person | CCTV Crew |
| Sewer Division | Sewer Collection | Laterals and Sewer Mains, Install (City) | 🟩 |  |  |  | 🟩 |  |  |
| | | Laterals and Sewer Mains, Install (Contractor) | 🟩 |  |  |  | 🟩 |  |  |
| | ➡ | Laterals and Sewer Mains, Repair | 🟩 |  |  | 🟩 |  | 🟩 |  |
| | | Manhole, Repair & Replace | 🟩 |  |  | 🟩 |  |  |  |
| | | Catch Basins, New | 🟩 |  |  | 🟩 |  |  |  |
| | | Catch Basins, Repair & Replace | 🟩 |  |  | 🟩 |  |  |  |
| | | Lamphole Repair & Replace | 🟩 |  |  | 🟩 |  |  |  |
| | | CCTV & Cleaning | 🟩 |  |  |  |  |  | 🟩 |
| | | CSO Cleaning & Repairs | 🟩 | 🟩 |  |  |  |  |  |
| | | Street Repair (cave in) | 🟩 |  |  | 🟩 |  |  |  |
| | | Miss Utility Stake Outs |  | 🟩 | 🟩 |  |  |  |  |

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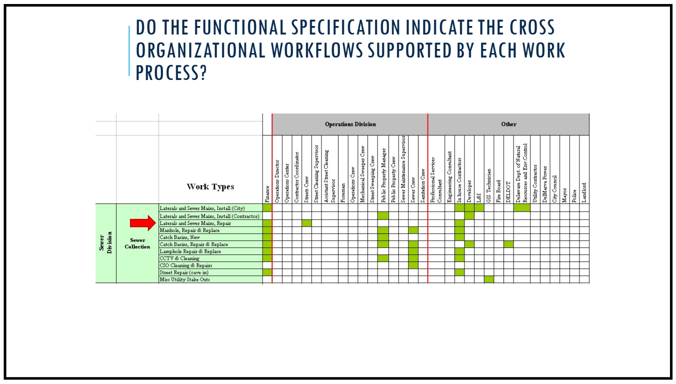

## DO THE FUNCTIONAL SPECIFICATION INDICATE THE CROSS ORGANIZATIONAL WORKFLOWS SUPPORTED BY EACH WORK PROCESS?

| | | | | Operations Division | | | | | | | | | | | | | | | Other | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Work Types | Finance | Operations Director | Operations Center | Contractor Coordinator | Streets Crew | Street Cleaning Supervisor | Assistant Street Cleaning Supervisor | Foreman | Operations Crew | Mechanical Sweeper Crew | Street Sweeping Crew | Public Property Manager | Public Property Crew | Sewer Maintenance Supervisor | Sewer Crew | Sanitation Crew | Professional Services Consultant | Engineering Consultant | In house Contractors | Developer | L&I | GIS Technician | Fire Board | DELDOT | Delaware Dept. of Natural Resources and Env.Control | Utility Contractor | DelMarva Power | City Council | Mayor | Police | Landlord |
| Sewer Division | Sewer Collection | Laterals and Sewer Mains, Install (City) | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 | 🟩 | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |
| | | Laterals and Sewer Mains, Install (Contractor) |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |
| | ➡ | Laterals and Sewer Mains, Repair | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Manhole, Repair & Replace | 🟩 |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Catch Basins, New | 🟩 |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Catch Basins, Repair & Replace | 🟩 |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |  |  |  | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |  |
| | | Lamphole Repair & Replace | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | CCTV & Cleaning | 🟩 |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | CSO Cleaning & Repairs |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Street Repair (cave in) | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Miss Utility Stake Outs |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |

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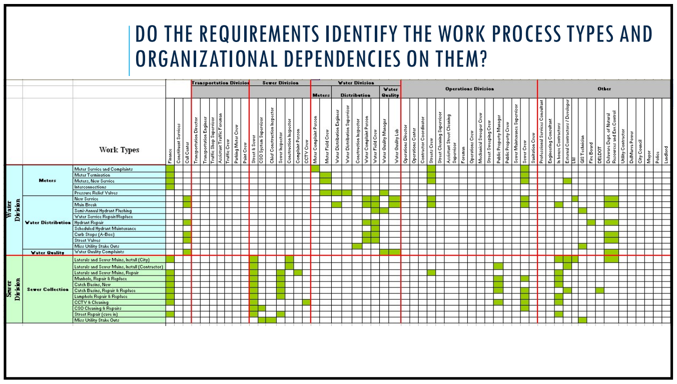

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| | | | | | | Transportation Divisio | | | | | | | Sewer Division | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Work Types | Finance | Constituent Services | Call Center | Transportation Director | Transportation Engineer | Traffic Shop Supervisor | Assistant Traffic Foreman | Traffic Crew | Parking Meter Crew | Paint Crew | Street & Sewer | CSO System Supervisor | Chief Construction Inspector | Sewer Inspector | Construction Inspector | Complaint Person | CCTV Crew |
| Water Division | Meters | Meter Service and Complaints | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Meter Termination | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Meters, New Service | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Interconnections | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Pressure Relief Valves |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | Water Distribution | New Service |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Main Break |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Semi-Annual Hydrant Flushing |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Water Service Repair/Replace |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Hydrant Repair |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Scheduled Hydrant Maintenance |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Curb Stops (A-Box) |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Street Valves |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Miss Utility Stake Outs |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | Water Quality | Water Quality Complaints |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sewer Division | Sewer Collection | Laterals and Sewer Mains, Install (City) | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  | 🟩 |  |  |
| | | Laterals and Sewer Mains, Install (Contractor) |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  | 🟩 |  |  |
| | | Laterals and Sewer Mains, Repair | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  | 🟩 |  |
| | | Manhole, Repair & Replace | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |  |  |
| | | Catch Basins, New | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |  |  |
| | | Catch Basins, Repair & Replace | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |  |  |
| | | Lamphole Repair & Replace | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |  |  |
| | | CCTV & Cleaning | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  | 🟩 |
| | | CSO Cleaning & Repairs |  |  |  |  |  |  |  |  |  |  | 🟩 | 🟩 |  |  |  |  |  |
| | | Street Repair (cave in) | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |  |  |
| | | Miss Utility Stake Outs |  |  |  |  |  |  |  |  |  |  |  | 🟩 | 🟩 |  |  |  |  |

| | | | Water Division | | | | | | | | | Operations Division | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Meters | | Distribution | | | | | Water Quality | | | | | | | | | | | | | | | | |
| | | Work Types | Meter Complaint Person | Meter Field Crew | Water Distribution Engineer | Water Distribution Supervisor | Construction Inspector | Water Complaint Person | Water Field Crew | Water Quality Manager | Water Quality Lab | Operations Director | Operations Center | Contractor Coordinator | Streets Crew | Street Cleaning Supervisor | Assistant Street Cleaning Supervisor | Foreman | Operations Crew | Mechanical Sweeper Crew | Street Sweeping Crew | Public Property Manager | Public Property Crew | Sewer Maintenance Supervisor | Sewer Crew | Sanitation Crew |
| Water Division | Meters | Meter Service and Complaints | 🟩 |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |
| | | Meter Termination |  | 🟩 |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |
| | | Meters, New Service |  | 🟩 |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |
| | | Interconnections |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Pressure Relief Valves |  | 🟩 | 🟩 | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | Water Distribution | New Service |  |  |  |  |  | 🟩 | 🟩 |  | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |
| | | Main Break |  |  | 🟩 |  |  | 🟩 | 🟩 |  | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  | 🟩 |  |
| | | Semi-Annual Hydrant Flushing |  |  |  |  |  |  | 🟩 | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Water Service Repair/Replace |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Hydrant Repair |  |  |  |  |  | 🟩 | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Scheduled Hydrant Maintenance |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Curb Stops (A-Box) |  |  |  |  |  | 🟩 | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Street Valves |  |  |  |  |  | 🟩 | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Miss Utility Stake Outs |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | Water Quality | Water Quality Complaints |  |  |  |  |  |  |  | 🟩 | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Sewer Division | Sewer Collection | Laterals and Sewer Mains, Install (City) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Laterals and Sewer Mains, Install (Contractor) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |
| | | Laterals and Sewer Mains, Repair |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |
| | | Manhole, Repair & Replace |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |
| | | Catch Basins, New |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |
| | | Catch Basins, Repair & Replace |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |
| | | Lamphole Repair & Replace |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |
| | | CCTV & Cleaning |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |  | 🟩 |  |
| | | CSO Cleaning & Repairs |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 🟩 |  |
| | | Street Repair (cave in) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Miss Utility Stake Outs |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

| | | | Other | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Work Types | Professional Services Consultant | Engineering Consultant | In house Contractors | External Contractors / Developer | L&I | GIS Technician | Fire Board | DELDOT | Delaware Dept. of Natural Resources and Env.Control | Utility Contractor | DelMarva Power | City Council | Mayor | Police | Landlord |
| Water Division | Meters | Meter Service and Complaints |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Meter Termination |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Meters, New Service |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |
| | | Interconnections |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Pressure Relief Valves |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | Water Distribution | New Service |  |  |  |  | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |
| | | Main Break |  |  | 🟩 |  |  |  |  |  | 🟩 |  |  |  |  |  |  |
| | | Semi-Annual Hydrant Flushing |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |
| | | Water Service Repair/Replace |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Hydrant Repair |  |  |  |  |  |  | 🟩 |  | 🟩 |  |  |  |  |  |  |
| | | Scheduled Hydrant Maintenance |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Curb Stops (A-Box) |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |
| | | Street Valves |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |
| | | Miss Utility Stake Outs |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |
| | Water Quality | Water Quality Complaints |  |  |  |  |  |  |  |  | 🟩 |  |  |  |  |  |  |
| Sewer Division | Sewer Collection | Laterals and Sewer Mains, Install (City) |  |  | 🟩 | 🟩 | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |
| | | Laterals and Sewer Mains, Install (Contractor) |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |
| | | Laterals and Sewer Mains, Repair |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Manhole, Repair & Replace |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Catch Basins, New |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Catch Basins, Repair & Replace |  |  |  | 🟩 |  |  |  | 🟩 |  |  |  |  |  |  |  |
| | | Lamphole Repair & Replace |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | CCTV & Cleaning |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | CSO Cleaning & Repairs |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Street Repair (cave in) |  |  | 🟩 |  |  |  |  |  |  |  |  |  |  |  |  |
| | | Miss Utility Stake Outs |  |  |  |  |  | 🟩 |  |  |  |  |  |  |  |  |  |

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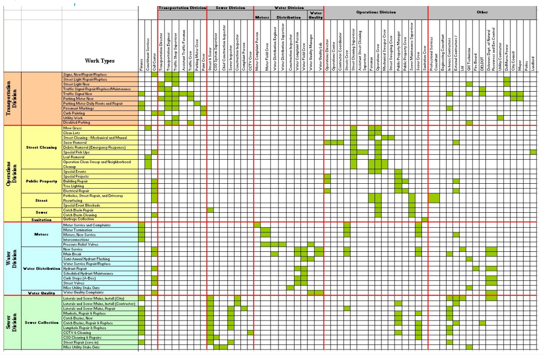
## DO THE REQUIREMENTS IDENTIFY THE WORK PROCESS TYPES AND ORGANIZATIONAL DEPENDENCIES ON THEM?



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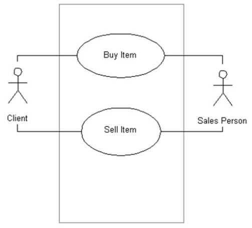
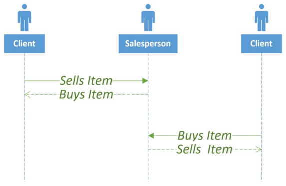
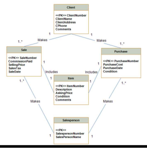
## PROBLEM 7C.9



Use Case Diagram

This is a Sequence Diagram





This is not a Sequence Diagram, …it is a UML object class diagram

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## MODELING FUNCTIONAL LOGIC WITH DECISION TABLES

Functional Requirements

| Role | Facility | Default Facility | Thematic Map at Startup | LifeCycle Status Checked at Startup | Available Thematic Maps | Map Select | Attribute Select | Building Search | Electric Network Query | Sewer Flow Trace | Stormwater Flow Trace | Water Valve Isolation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ADMIN | All | Home facility | Utilities | Existing | All | X | X | X | X | X | X | X |
| Generic-USER | Home facility | Home facility | Utilities | Existing | All | X | X | X | X | X | X | X |
| ELECTRICAL-USER | Home facility | Home facility | Electrical Facilities | Existing | Electrical Only | X | X | X | X | | | |
| STRUCTURAL-USER | Home facility | Home facility | Structural Facilities | Existing | Structural Only | X | X | X | | | X | |
| MECHANICAL-USER | Home facility | Home facility | Mechanical Facilities | Existing | Mechanical Only | X | X | X | | X | | X |
| MARKOUT-USER | Home facility | Home facility | Utility Mark-Out Facilities | Existing and NIS | Utility Mark-Out | X | X | X | | | | |

Example requirements specification for of role-based user access to system functionality

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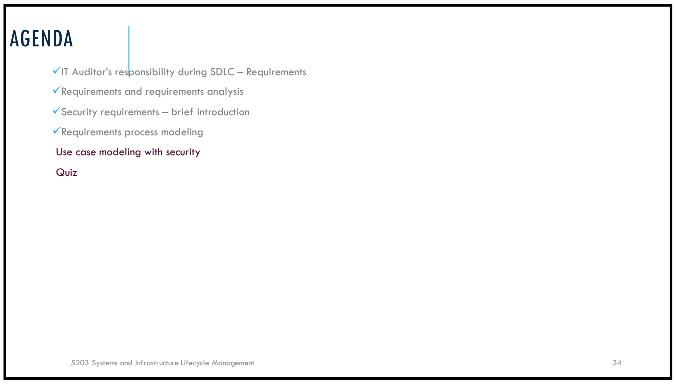
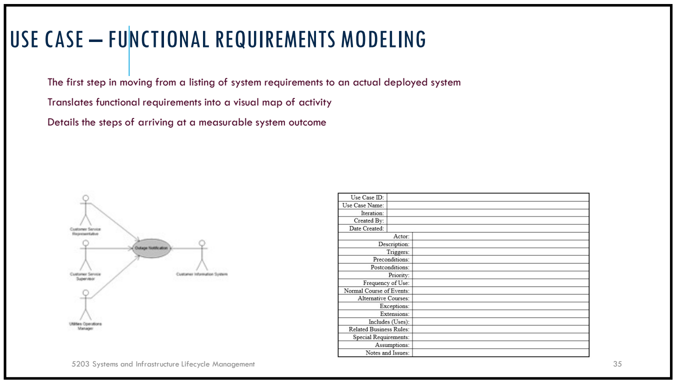


## AGENDA

- ✓IT Auditor's responsibility during SDLC – Requirements
- ✓Requirements and requirements analysis
- ✓Security requirements – brief introduction
- ✓Requirements process modeling
- Use case modeling with security
- Quiz



## USE CASE – FUNCTIONAL REQUIREMENTS MODELING

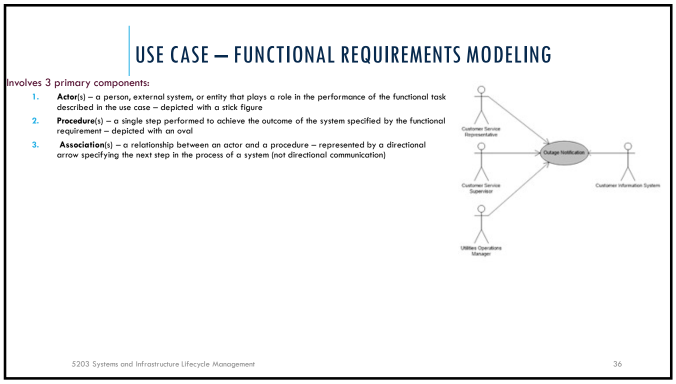
The first step in moving from a listing of system requirements to an actual deployed system

Translates functional requirements into a visual map of activity

Details the steps of arriving at a measurable system outcome

Customer Service Representative
Customer Service Supervisor
Utilities Operations Manager
Outage Notification
Customer Information System

| | |
|---|---|
| Use Case ID: | |
| Use Case Name: | |
| Iteration: | |
| Created By: | |
| Date Created: | |
| Actor: | |
| Description: | |
| Triggers: | |
| Preconditions: | |
| Postconditions: | |
| Priority: | |
| Frequency of Use: | |
| Normal Course of Events: | |
| Alternative Courses: | |
| Exceptions: | |
| Extensions: | |
| Includes (Uses): | |
| Related Business Rules: | |
| Special Requirements: | |
| Assumptions: | |
| Notes and Issues: | |

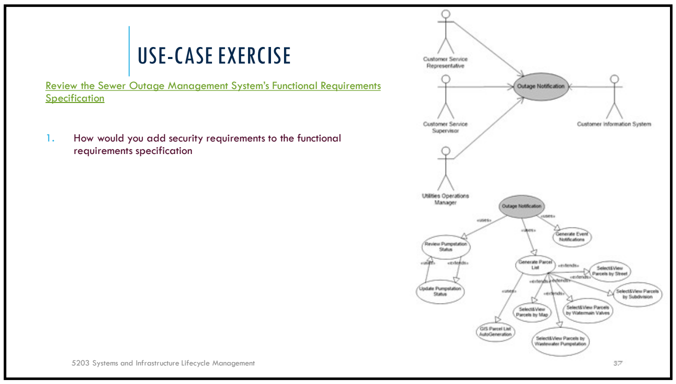


## USE CASE – FUNCTIONAL REQUIREMENTS MODELING

Involves 3 primary components:

1. **Actor**(s) – a person, external system, or entity that plays a role in the performance of the functional task described in the use case – depicted with a stick figure
2. **Procedure**(s) – a single step performed to achieve the outcome of the system specified by the functional requirement – depicted with an oval
3. **Association**(s) – a relationship between an actor and a procedure – represented by a directional arrow specifying the next step in the process of a system (not directional communication)

Customer Service Representative
Customer Service Supervisor
Utilities Operations Manager
Outage Notification
Customer Information System



## USE-CASE EXERCISE

Review the Sewer Outage Management System's Functional Requirements Specification

1. How would you add security requirements to the functional requirements specification

Customer Service Representative
Customer Service Supervisor
Utilities Operations Manager
Outage Notification
Customer Information System
Outage Notification
«uses»
«uses»
«uses»
Generate Event Notifications
Review Pumpstation Status
«uses»
«extends»
Update Pumpstation Status
Generate Parcel List
«extends»
Select&View Parcels by Street
«extends»
Select&View Parcels by Subdivision
«extends»
«extends»
«extends»
«uses»
Select&View Parcels by Map
Select&View Parcels by Watermain Valves
GIS Parcel List AutoGeneration
Select&View Parcels by Wastewater Pumpstation

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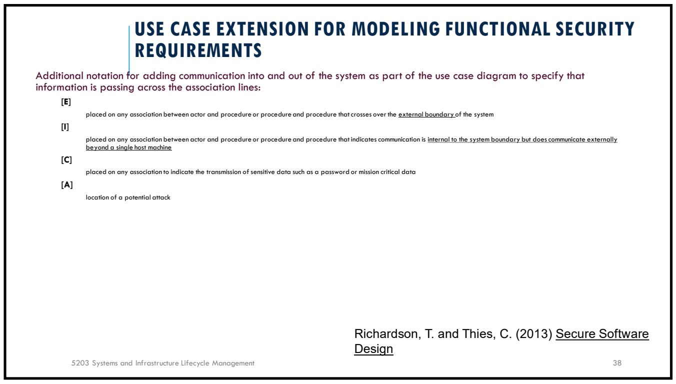

## USE CASE EXTENSION FOR MODELING FUNCTIONAL SECURITY REQUIREMENTS

Additional notation for adding communication into and out of the system as part of the use case diagram to specify that information is passing across the association lines:

**[E]**

placed on any association between actor and procedure or procedure and procedure that crosses over the external boundary of the system

**[I]**

placed on any association between actor and procedure or procedure and procedure that indicates communication is internal to the system boundary but does communicate externally beyond a single host machine

**[C]**

placed on any association to indicate the transmission of sensitive data such as a password or mission critical data

**[A]**

location of a potential attack

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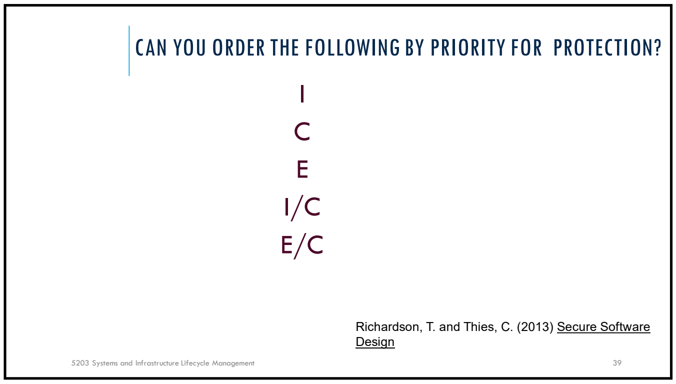

## CAN YOU ORDER THE FOLLOWING BY PRIORITY FOR PROTECTION?

I

C

E

I/C

E/C

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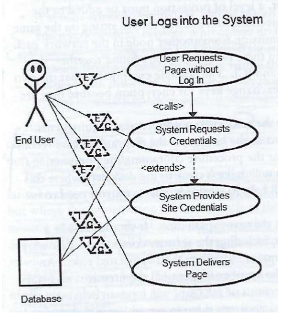
## CAN YOU DESCRIBE WHAT IS GOING HERE?

*An example use case with notations for communication and transfer of sensitive information across system boundaries*


User Logs into the System
User Requests Page without Log In
<calls>
System Requests Credentials
<extends>
System Provides Site Credentials
System Delivers Page
End User
Database
E
E C

Richardson, T. and Thies, C. (2013) Secure Software Design

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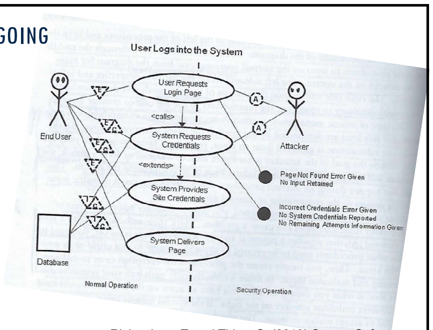
## CAN YOU DESCRIBE WHAT IS GOING HERE?

*An example of the Misuse Management Method identifying possible attack points for each activity, and the fail case exist state for each*


User Logs into the System
User Requests Login Page
<calls>
System Requests Credentials
<extends>
System Provides Site Credentials
System Delivers Page
End User
Database
Attacker
A
E
E C
Page Not Found Error Given
No Input Retained
Incorrect Credentials Error Given
No System Credentials Reported
No Remaining Attempts Information Given
Normal Operation
Security Operation

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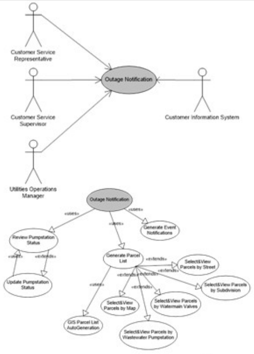
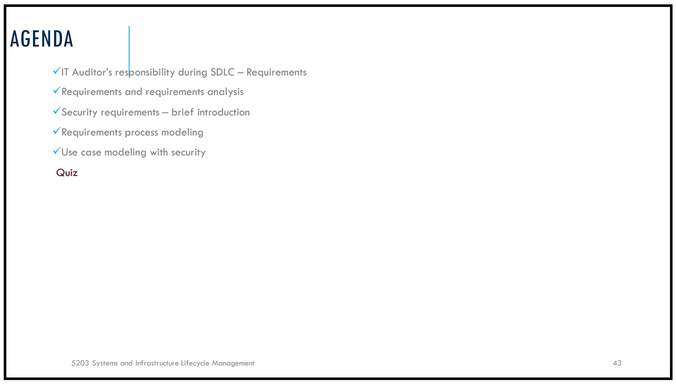
## USE-CASE EXERCISE

Review the Sewer Outage Management System's Functional Requirements Specification

1. How would you add security requirements to the functional requirements specification
2. Add security requirements to 1 use case


Customer Service Representative
Customer Service Supervisor
Utilities Operations Manager
Customer Information System
Outage Notification
«uses»
«extends»
Review Pumpstation Status
Update Pumpstation Status
Generate Event Notifications
Generate Parcel List
Select&View Parcels by Street
Select&View Parcels by Subdivision
Select&View Parcels by Map
Select&View Parcels by Watermain Valves
Select&View Parcels by Wastewater Pumpstation
GIS Parcel List AutoGeneration

42



## AGENDA

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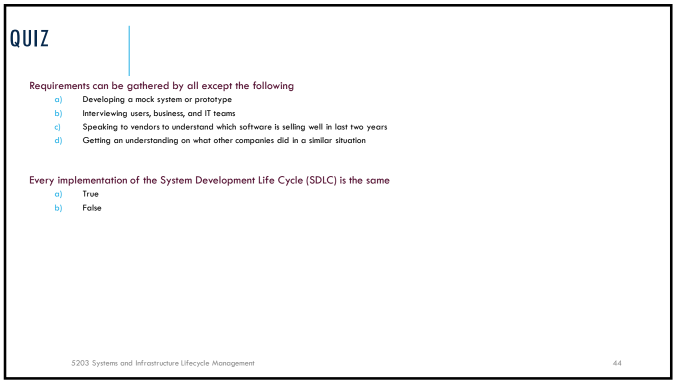

## QUIZ

Requirements can be gathered by all except the following

a) Developing a mock system or prototype
b) Interviewing users, business, and IT teams
c) Speaking to vendors to understand which software is selling well in last two years
d) Getting an understanding on what other companies did in a similar situation

Every implementation of the System Development Life Cycle (SDLC) is the same

a) True
b) False

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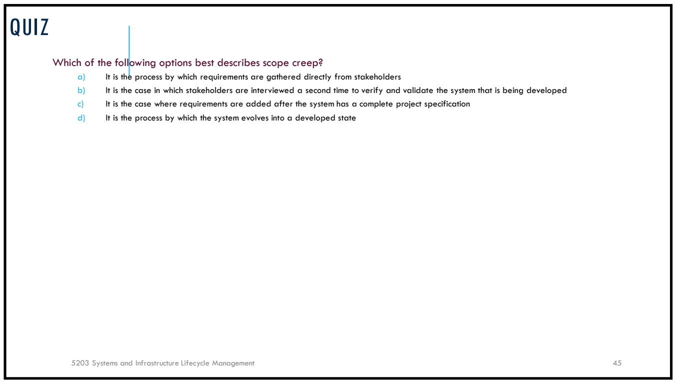

## QUIZ

Which of the following options best describes scope creep?

a) It is the process by which requirements are gathered directly from stakeholders
b) It is the case in which stakeholders are interviewed a second time to verify and validate the system that is being developed
c) It is the case where requirements are added after the system has a complete project specification
d) It is the process by which the system evolves into a developed state

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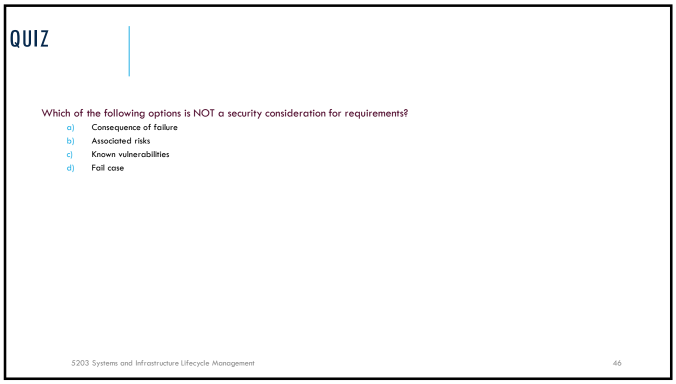

## QUIZ

Which of the following options is NOT a security consideration for requirements?

a) Consequence of failure
b) Associated risks
c) Known vulnerabilities
d) Fail case

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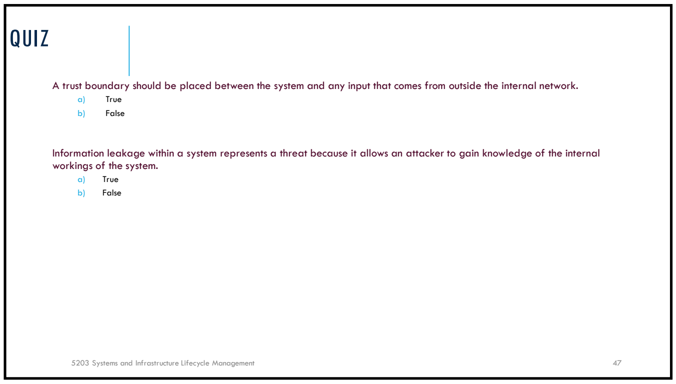

## QUIZ

A trust boundary should be placed between the system and any input that comes from outside the internal network.

a) True
b) False

Information leakage within a system represents a threat because it allows an attacker to gain knowledge of the internal workings of the system.

a) True
b) False

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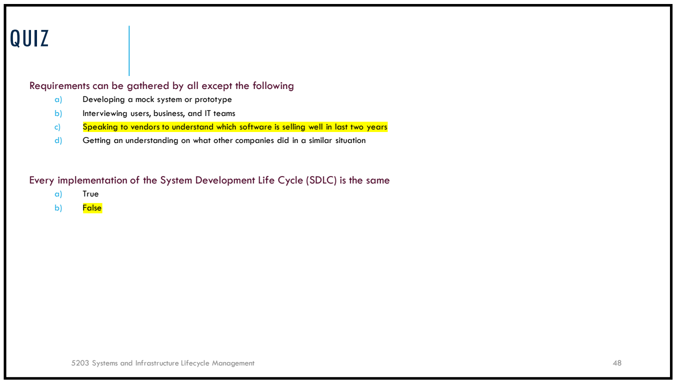

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c) Speaking to vendors to understand which software is selling well in last two years
d) Getting an understanding on what other companies did in a similar situation

Every implementation of the System Development Life Cycle (SDLC) is the same

a) True
b) False

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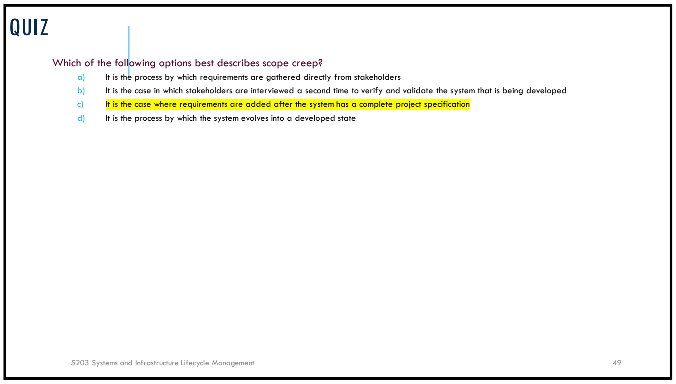

## QUIZ

Which of the following options best describes scope creep?

a) It is the process by which requirements are gathered directly from stakeholders
b) It is the case in which stakeholders are interviewed a second time to verify and validate the system that is being developed
c) It is the case where requirements are added after the system has a complete project specification
d) It is the process by which the system evolves into a developed state

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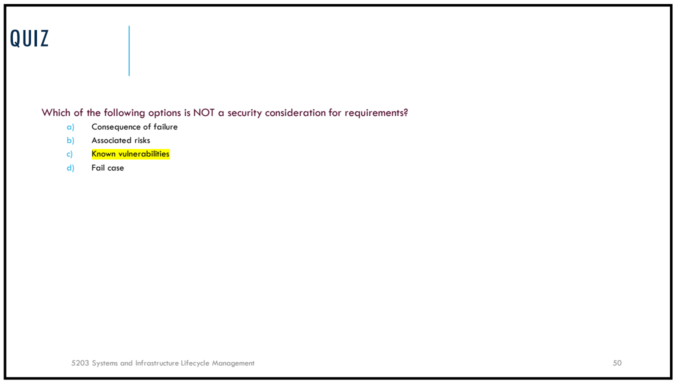

## QUIZ

Which of the following options is NOT a security consideration for requirements?

a) Consequence of failure
b) Associated risks
c) Known vulnerabilities
d) Fail case

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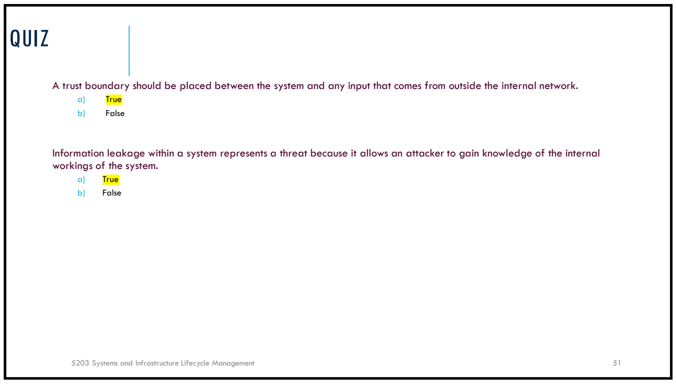

## QUIZ

A trust boundary should be placed between the system and any input that comes from outside the internal network.

a) True
b) False

Information leakage within a system represents a threat because it allows an attacker to gain knowledge of the internal workings of the system.

a) True
b) False

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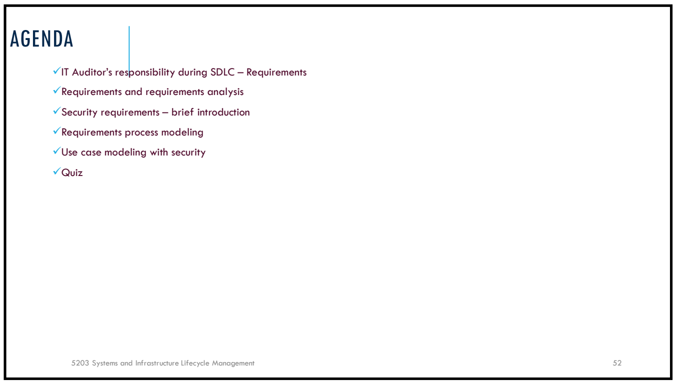

## AGENDA

- ✓ IT Auditor's responsibility during SDLC – Requirements
- ✓ Requirements and requirements analysis
- ✓ Security requirements – brief introduction
- ✓ Requirements process modeling
- ✓ Use case modeling with security
- ✓ Quiz

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