COMP 3111
SOFTWARE ENGINEERING

LECTURE 9
SYSTEM REQUIREMENTS CAPTURE
USE-CASE MODELING EXERCISE

EXERCISE: CITYGAS USE-CASE MODEL

Citygas is designing a new billing system. For business customers, meter readers read the meter monthly. For residential customers, some require a meter reader to read the meter monthly, while others enter their meter reading directly into the system over the telephone. The meter readers enter the meter readings into handheld devices that upload the meter reading wirelessly to the billing system.

The meter readings are used to prepare a bill that is sent to the customer. Payments can be made by cheque or by autopay. For a cheque payment, a clerk records the payments in the system and then the payment is deposited in the bank. For autopay payments, the banks send a daily electronic statement of payments received to the billing system.

Special meter readings are required when a customer sells a building or a flat and turns over possession to the new owner. These have to be calculated and billed separately to reflect a bill for part of a month. A special reading is also provided when a meter is repaired or replaced. A separate bill is not prepared in these cases.

The accounting department is provided with a daily summary of payments received and a weekly list of bills unpaid for ninety days. The accounting department tries to collect unpaid bills. If they are not successful, they cut off service and send the billing department a notice to terminate the account.

EXERCISE: CITYGAS USE-CASE MODEL (CONT'd)

From the Citygas requirements statement:

a) **identify all actors and their required functionality.**

b) **group the functionality into use cases and show the uses cases and their related actors in a use-case context diagram.**

EXERCISE: CITYGAS USE-CASE MODEL ANALYSIS

We first analyze the system's functional requirements and then present the use-case model. For the purposes of producing the use-case model, we are only interested in those functional requirements that provide something of value for some actor.

Citygas is designing a new billing system.

functionality: None.

For business customers, meter readers read the meter monthly.

functionality: None.

For residential customers, some require a meter reader to read the meter monthly, while others enter their meter reading directly into the system over the telephone.

functionality: Customer: *enter meter reading*

EXERCISE: CITYGAS USE-CASE MODEL ANALYSIS

The meter readers enter the meter readings into handheld devices that upload the meter reading wirelessly to the billing system.

functionality: Meter reader: *enter meter reading*

Remarks: The handheld device is not an actor! It is merely an input device, like a cashier terminal. The meter reader still needs to do the input of the data; the handheld device cannot input the meter reading without the actor!

The meter readings are used to prepare a bill that is sent to the customer.

functionality: Customer: *receive bill*

Remarks: The customer is the actor that receives the output from the system (i.e., the bill).

Payments can be made by cheque or by autopay.

functionality: None.

For a cheque payment, a clerk records the payments in the system and then the payment is deposited in the bank.

functionality: Clerk: *record payment*

EXERCISE: CITYGAS USE-CASE MODEL ANALYSIS

For autopay payments, the banks send a daily electronic statement of payments received to the billing system.

functionality: Bank: *provide payment information*

Special meter readings are required when a customer sells a building or a flat and turns over possession to the new owner.

functionality: No new functionality as the method of collecting meter readings is the same as for regular readings.

These have to be calculated and billed separately to reflect a bill for part of a month.

functionality: No new functionality as the bill processing functionality is the same as for regular bills.

A special reading is also provided when a meter is repaired or replaced.

functionality: No new functionality as the method of collecting meter readings is the same as for regular readings.

EXERCISE: CITYGAS USE-CASE MODEL ANALYSIS

A separate bill is not prepared in these cases.

functionality: No new functionality in this statement.

The accounting department is provided with a daily summary of payments received and a weekly list of bills unpaid for ninety days.

functionality: Accounting Department: *receive payment report*

Remarks: The Accounting Department is the actor that receives the output from the system (i.e., the payment report).

The accounting department tries to collect unpaid bills.

functionality: None.

If they are not successful, they cut off service and request the billing system to terminate the account.

functionality: Accounting Department: *request account termination*

EXERCISE: CITYGAS USE-CASE MODEL ANALYSIS

Actors

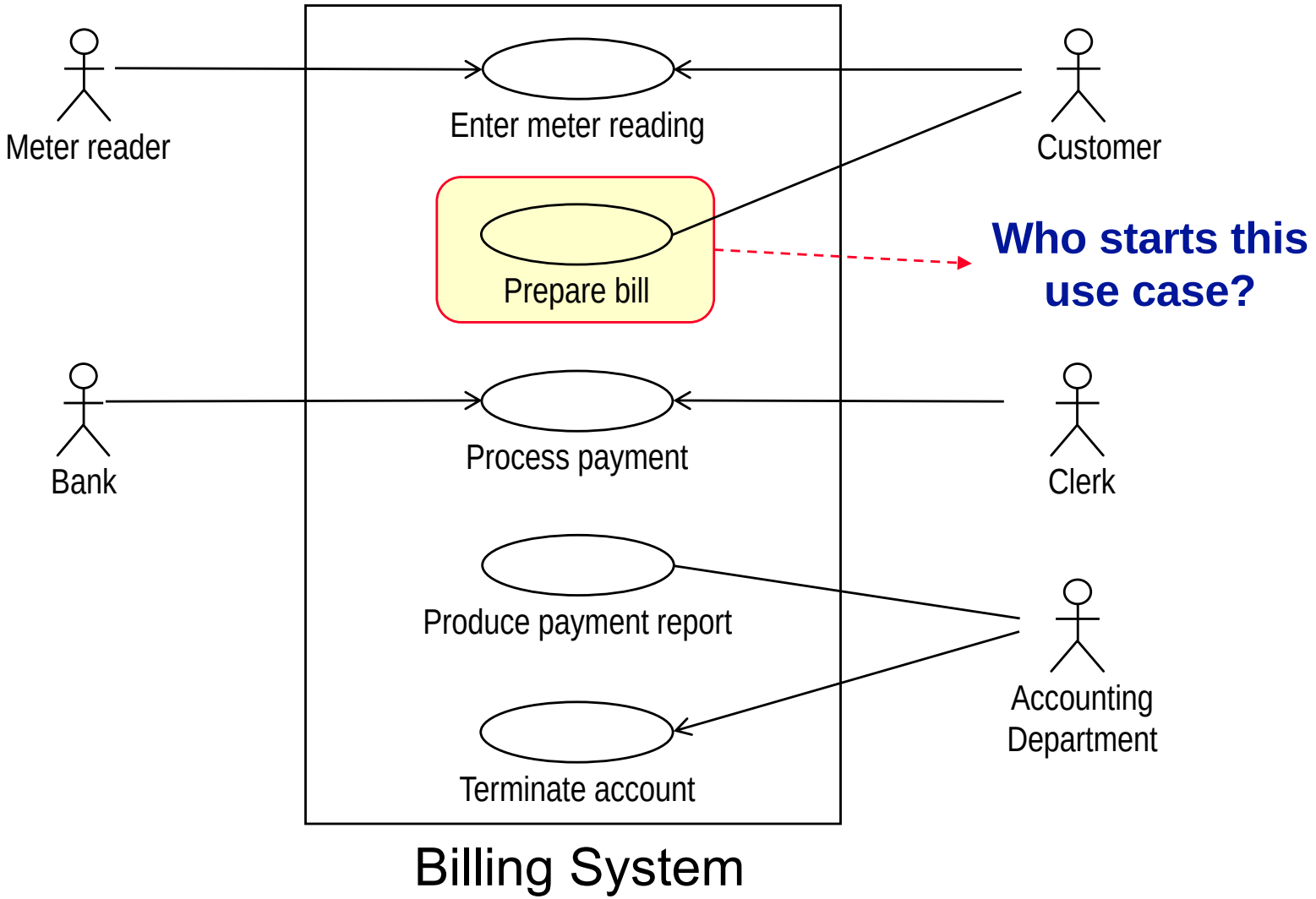
Meter reader	A meter reader is an employee of Citygas. A meter reader uses the billing system to enter gas meter readings.
Clerk	A clerk is an employee of Citygas. A clerk uses the billing system to record a customer's payment.
Customer	A customer is a person who purchases gas from Citygas. A customer uses the billing system to enter gas meter readings and receives bills from the billing system for the gas used.
Bank	A bank is a financial entity with which Citygas has made arrangements to receive payment for gas bills. The bank provides payment information to the billing system.
Accounting Department	The Accounting Department is a department within Citygas. The Accounting Department receives payment reports from the billing system and requests the billing system to terminate accounts.

EXERCISE: CITYGAS USE-CASE MODEL
FUNCTIONALITY ANALYSIS AND GROUPING

Initial Grouping

Meter reader: *enter meter reading* Customer: *enter meter reading*	Enter meter reading
Customer: *receive bill*	Prepare bill
Clerk: *record payment* Bank: *provide payment information*	Process payment
Accounting Department: *receive payment report*	Produce payment report
Accounting Department: *request account termination*	Terminate account

EXERCISE: CITYGAS INITIAL USE-CASE DIAGRAM



EXERCISE: CITYGAS USE-CASE MODEL
FUNCTIONALITY ANALYSIS AND GROUPING

Revised Grouping

Meter reader: *enter meter reading*

Customer: *enter meter reading*

Customer: *receive bill*

→ Bill customer

Clerk: *record payment*

Bank: *provide payment information*

→ Process payment

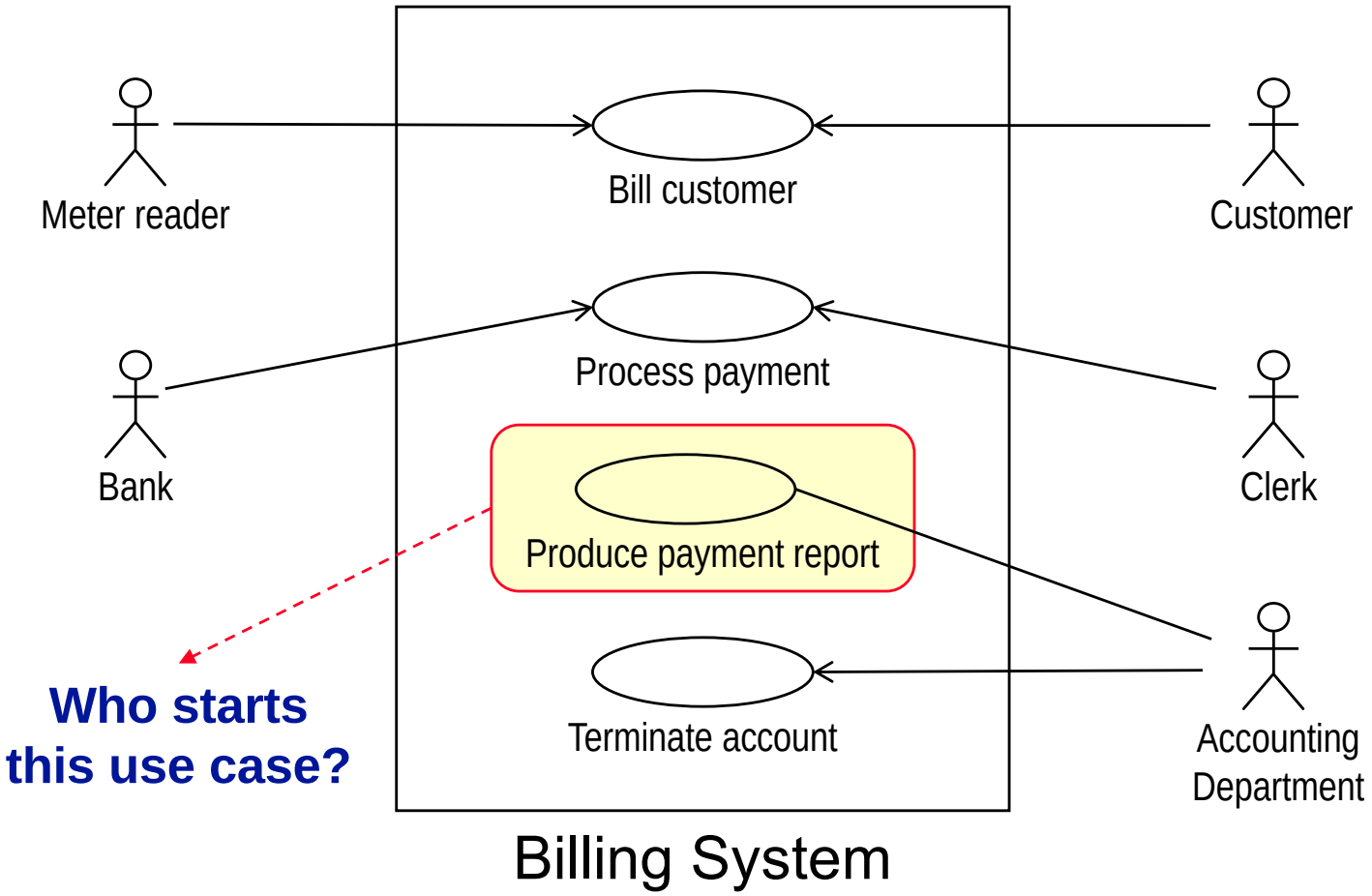
Accounting Department: *receive payment report*

→ Produce payment report

Accounting Department: *request account termination*

→ Terminate account

EXERCISE: CITYGAS REVISED USE-CASE DIAGRAM



EXERCISE: CITYGAS USE-CASE MODEL
FUNCTIONALITY ANALYSIS AND GROUPING

Final Grouping

Meter reader: *enter meter reading*

Customer: *enter meter reading*

Customer: *receive bill*

→ Bill customer

Clerk: *record payment*

Bank: *provide payment information*

Accounting Department: *receive payment report*

→ Process payment

Accounting Department: *request account termination*

→ Terminate account

EXERCISE: CITYGAS FINAL USE-CASE DIAGRAM