Use Cases:

The Good, The Bad, and The Ugly

(and what you can do about it)

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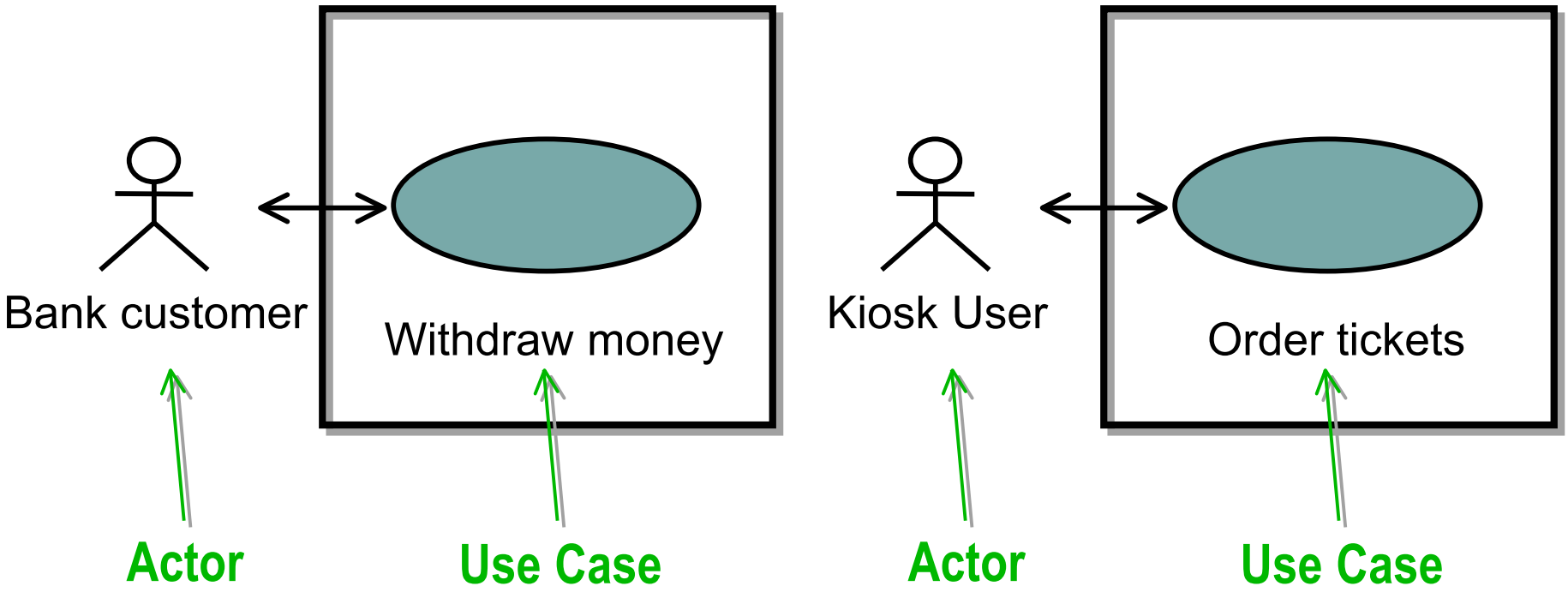
Presentation Outline

- Use cases are good
  - Quantum leap in software requirements specification (in principle)
- Use cases are bad
  - Difficult, time-consuming, and error-prone (in practice)
- Use cases can get ugly
  - Use case mistakes, misuse, and even “abuse cases”
- What you can do about it
  - Review “Top Ten” lists (practical advice)
  - Consider *Goals*, *Scenarios*, *Episodes*, *Concerns*, and *Aspects* (research work in progress)

Use Cases: The Good

Use cases are a simple and powerful way to define requirements for software behavior



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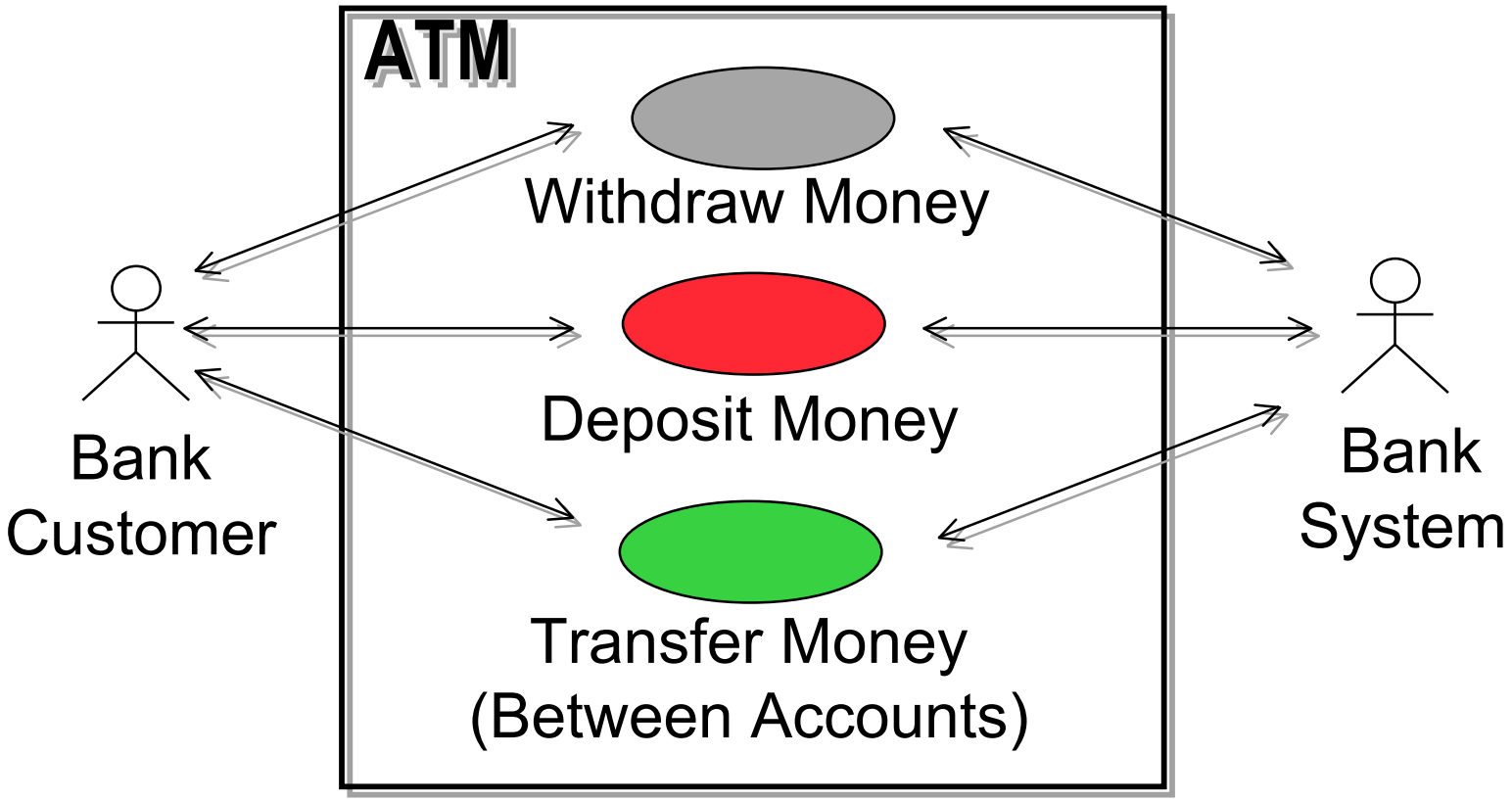
The Use-Case Model

- A **use-case model** illustrates
  - » The system's intended functions (use cases)
  - » Its surroundings (actors)
  - » Relationships between use cases and actors (use case diagram)
- The same use-case model used in requirements
  - » Is used in analysis, design, and test
  - » Serves as a unifying thread throughout system development

The most important role of a use-case model is to communicate the system's functionality and behavior to the customer or end user

A Simple ATM Use Case Model



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Use Case Details

- A use case is a textual or graphical description of
  - Major functions the system will perform for its actors
  - *Goals* the system achieves for its actors along the way
- A use case description should contain
  - Use case name
  - Basic course or path of action
  - Alternative paths and error/exception conditions
- *Scenarios*
  - Describe typical uses of the system as narrative
  - Correspond to a single path or flow through a use case
  - A use case is an abstraction or container of a set of related *scenarios*

Use Cases: The Bad and The Ugly

- If you don't fully understand the ins and outs of use cases
  - It is easy to misuse them or turn them into "abuse cases"
- Ellen Gottesdiener
  - "*Top Ten Ways Project Teams Misuse Use Cases – and How to Correct Them*." The Rational Edge, June 2002 (Part I), July 2002 (Part II).
- Martin Fowler
  - "*Use and Abuse Cases*." Distributed Computing, April 1998.
- Doug Rosenberg
  - "*Top Ten Use Case Mistakes*." Software Development, February 2001.
- Susan Lilly
  - "*How to Avoid Use Case Pitfalls*." Software Development, January 2000.
- Kulak and Guiney
  - "*Use Cases: Requirements in Context*." Second Edition, Addison-Wesley 2003.

Ten Misguided Guidelines (Gottesdiener)

- Don’t bother with any other requirements representations
  - Use cases are the only requirements model you’ll need!
- Stump readers about the *goal* of your use case
  - Name use cases obtusely using vague verbs such as do or process
- Be ambiguous about the scope of your use cases
  - There will be scope creep anyway, so you can refactor your use cases later
- Include nonfunctional requirements and UI details in your use-case text
- Use lots of extends and includes in your initial use-case diagrams
  - This allows you to decompose use cases into itty bitty units of work

Ten Misguided Guidelines (Cont'd)

- Don't be concerned with defining business rules
  - you'll probably remember some of them when you design and code
- Don't involve subject matter experts in creating, reviewing, or verifying use cases
  - They'll only raise questions!
- If you involve users at all in use case definition, just "do it"
  - Why bother to prepare for meetings with the users?
- Write your first and only use case draft in excruciating detail
  - Why bother iterating with end users when they don't even know what they want
- Don't validate or verify your use cases
  - That will only cause you to make revisions and do more rework!

Top Use Case Mistakes (Rosenberg)

- **Don't write functional requirements instead of usage scenario text**
  - Requirements are generally stated in terms of what the system shall do
  - Usage scenarios are user actions and corresponding system responses
- **Don't describe attributes and methods rather than usage**
  - Don't include too many presentation details
  - Don't detail data-entry fields on user screen
- **Don't write the use cases too tersely**
  - Must describe user actions and system responses in detail
  - Err on the side of too much detail in user documentation
- **Don't completely ignore the user interface**
  - Discuss features that allow the user to tell the system to "do something"
- **Don't avoid explicit names for boundary objects**
  - Name boundary objects explicitly in the use case text

Top Use Case Mistakes (Cont'd)

- **Don't write in a passive or not the user's voice**
  - Should be written from the user's perspective
  - Present-tense verb phrases in active voice
- **Don't ignore system behavior**
  - Include what the system does in response to user actions
    - » Creates new objects
    - » Validates user input
    - » Generates error messages
- **Don't omit text for alternative courses of action**
  - Basic course of action easier to identify and write
  - But alternate courses are critical for correctness and completeness; robustness
- **Don't focus on things outside the use case**
  - Such as how you get there or what happens afterwards
  - Watch out for "long form" use case templates!
- **Don't spend a month deciding whether to use includes or extends**

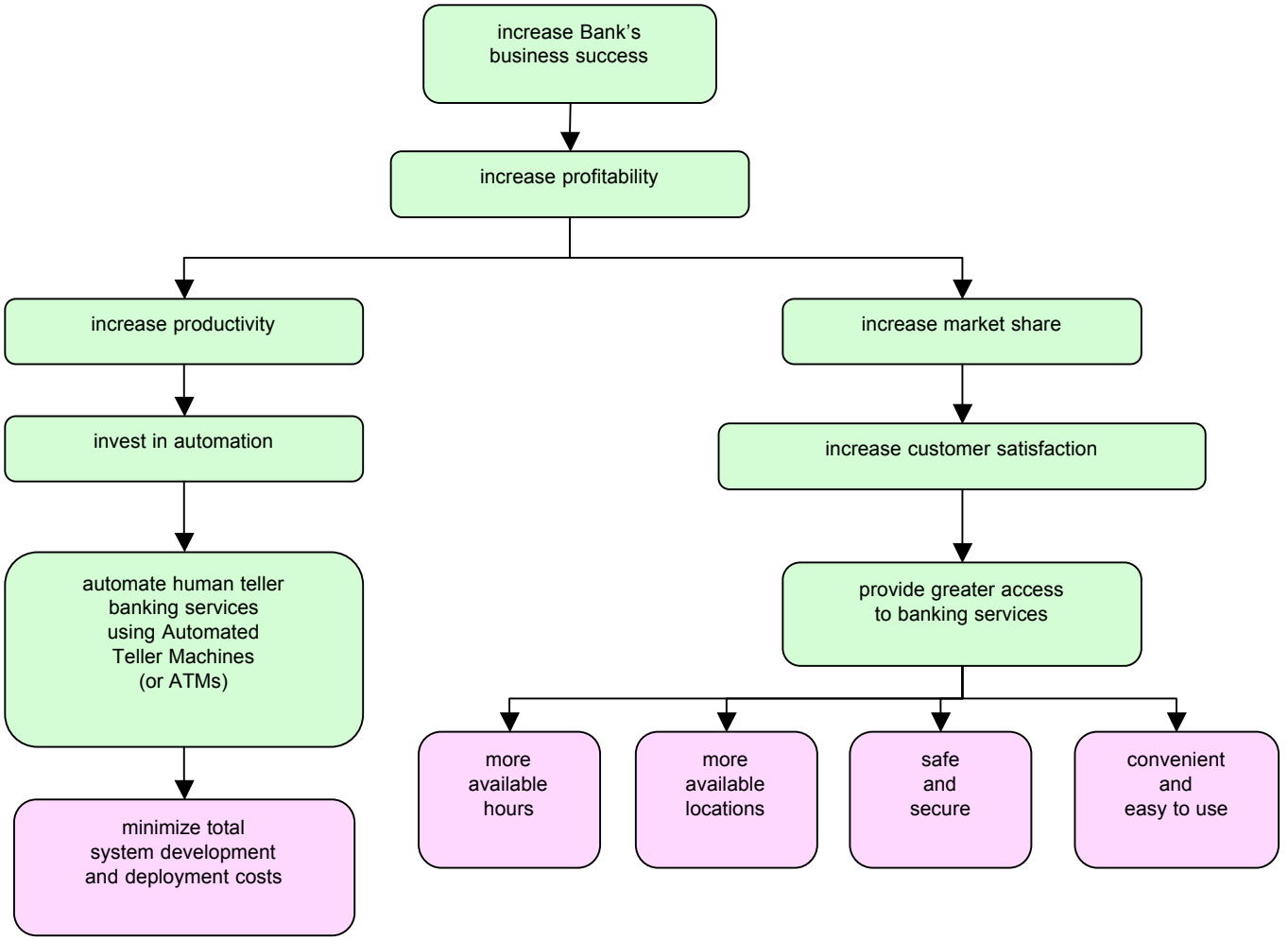
What Can Be Done About It?

- Question everything, even the basic definitions of relationships between
  - Use cases to *Goals* (1:1?)
  - Use cases to *Scenarios* (1:m?)
  - *Goals* to *Scenarios*?
  - All of the above to design and implementation???

Use Cases and Goals

- Use cases correspond to *goals*
  - A *goal* is a "desired state of affairs" (Schank/Wilensky)
- *Goals* have nontrivial structure and relationships
  - At least hierarchical but could be more complex
  - **We need better understanding and analysis of *goals***
- ATM example
  - High-level stakeholder *goals*
    - » Increase the bank's business success
    - » Increase market share
    - » Provide greater access to banking services
  - Low-level *goals*
    - » Terminate a user's session
    - » Authenticate a user's ATM card and PIN
    - » Withdraw $200 cash from user's account

(Partial) Requirements Goal Graph



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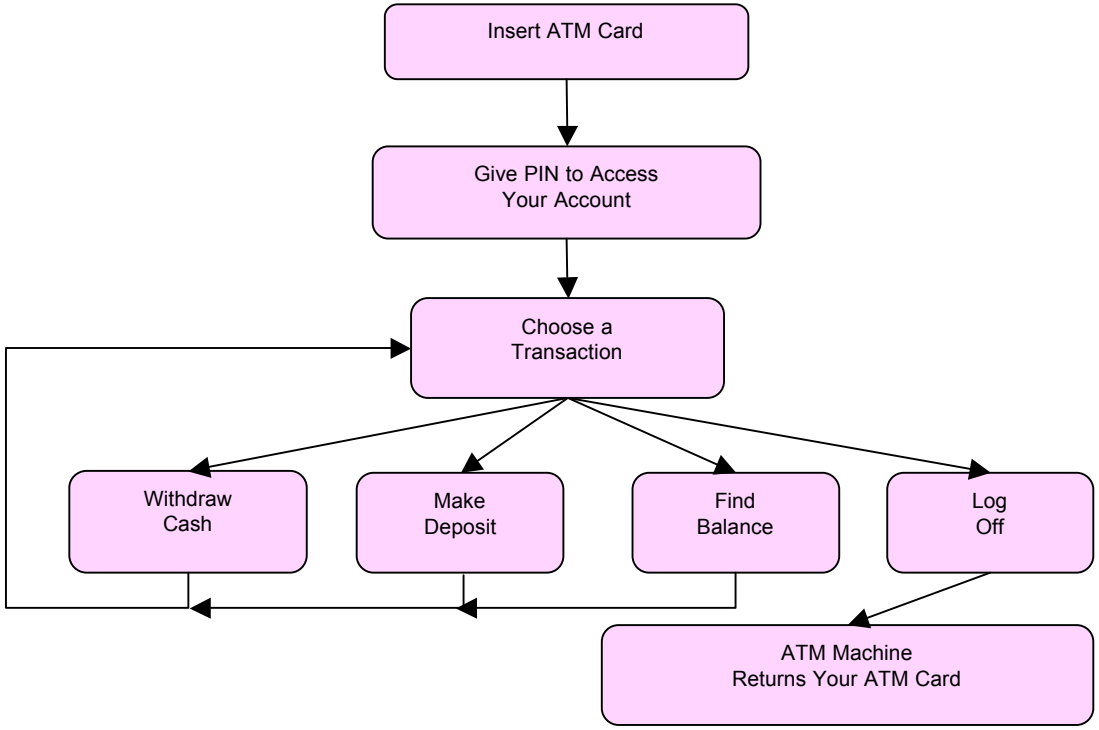
Use Cases and Scenarios

- Use cases contain a family of related *scenarios*
  - Within a single use case, *scenarios* may have nontrivial structure
  - Across use cases, *scenarios* are often referred to, reused, or linked in nontrivial ways
  - Often, containment becomes confinement!
- *Scenarios*
  - A sequence of events that corresponds to a purposeful use of a system
  - "Purposeful uses" are characterized by associated *goals*
- *Episodes*
  - Subsequences of events contained within a surrounding *scenario*
  - Correspond to the pursuit of *subgoals*
  - Example *episodes*: Login, Logout, Authenticate

Goals and Scenarios

- Software requirements
  - Involve many goals at many different levels of abstraction/detail
    - » "provide" goals
    - » "prevent" goals
- Goals and Scenarios
  - A high-level "provide" goal typically corresponds to a single usage scenario
  - A low-level "provide" or "prevent" goal typically corresponds to a single plan of action or "episode"
  - Therefore, a usage scenario consists of multiple episodes addressing multiple goals!

A Family of ATM Scenarios



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A Family of ATM Scenarios (Cont'd)

1. "Login Episode"
2. The **ATM** presents, in **English**, a **choice of transactions** the **customer** may perform.
3. Iteration *:
    1. Alternatives:
        1. Alternative:
            1. The **customer** selects **"Withdraw cash".**
            2. **"Withdraw Cash Episode"**
        2. Alternative**:**
            1. The **customer** selects **"Make deposit".**
            2. **"Deposit Funds Episode"**
        3. Alternative:
            Guard: Customer has more than one account.
                1. The **customer** selects **"Transfer funds".**
                2. **"Transfer Funds Episode"**
            4. Alternative:
                1. The **customer** selects **"Balance".**
                2. **"Balance Episode"**
        2. **ATM** presents, in French, a choice of transactions the **customer** may perform.
        4. **The customer selects "Done".**
        5. **The ATM ejects the ATM card and beeps until the customer withdraw it.**
        6. **The customer withdraws the card.**

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A Sample Login Episode

- 1. The **customer** inserts an **ATM card** into an **ATM**.
- 2. The **ATM** presents a **choice of languages**.
- 3. The **customer** selects **English**.
- 4. The **ATM** prompts for a **PIN**.
- 5. The **customer** enters the **PIN for his/her ATM card**.

A Sample Withdraw Cash Episode

- 1. The customer selects **"Withdraw cash".**
- **2. The ATM presents the accounts from which the customer can withdraw.**
- **3. The customer selects "Checking".**
- **4. The ATM prompts for an amount to withdraw.**
- **5. The customer enters $200.**
- **6. The ATM dispenses the requested amount of cash.**
- **7. The ATM prints a receipt.**
- **8. The ATM presents a choice of transactions the customer may perform.**

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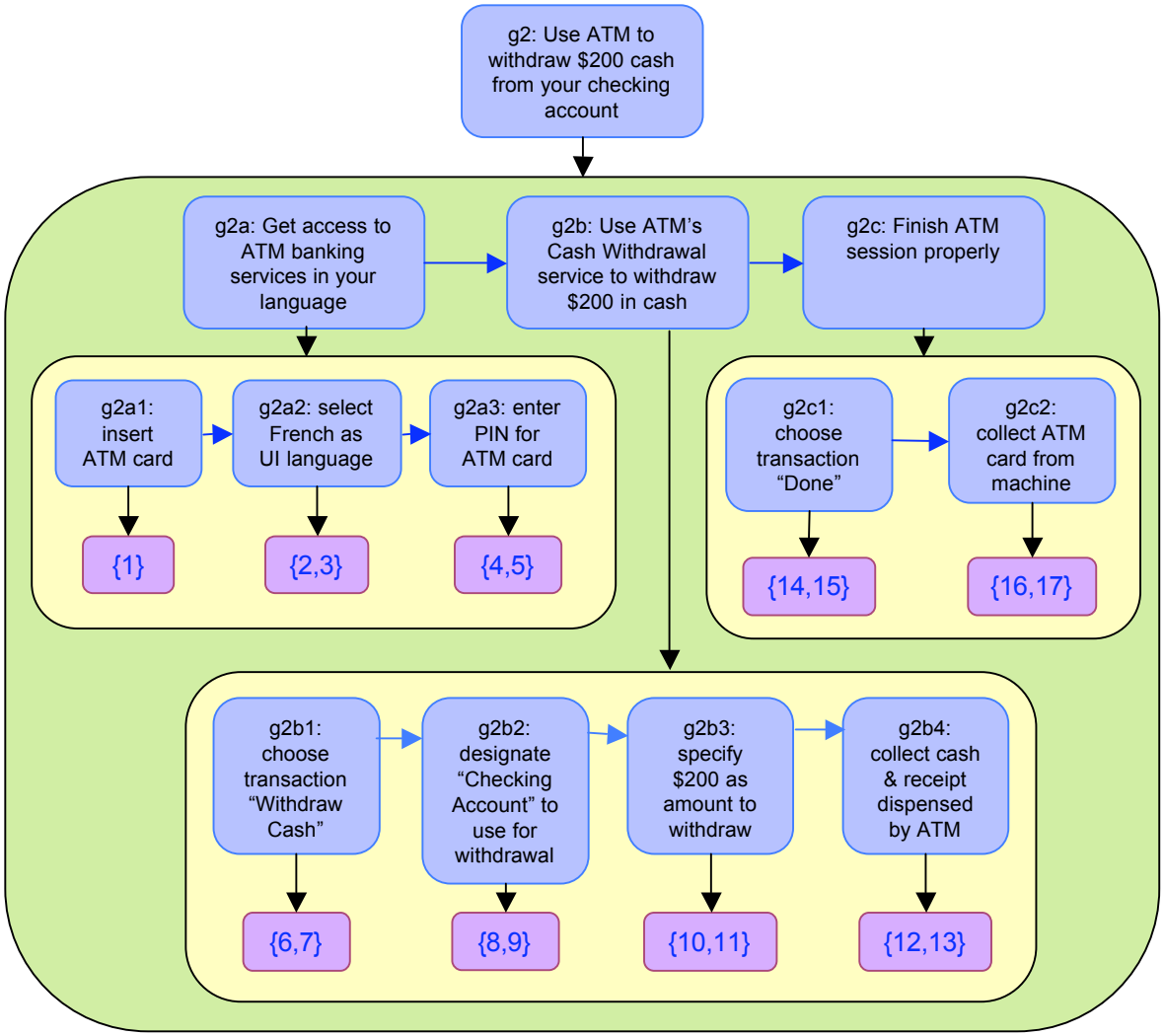
Example of Scenario Goal Analysis:



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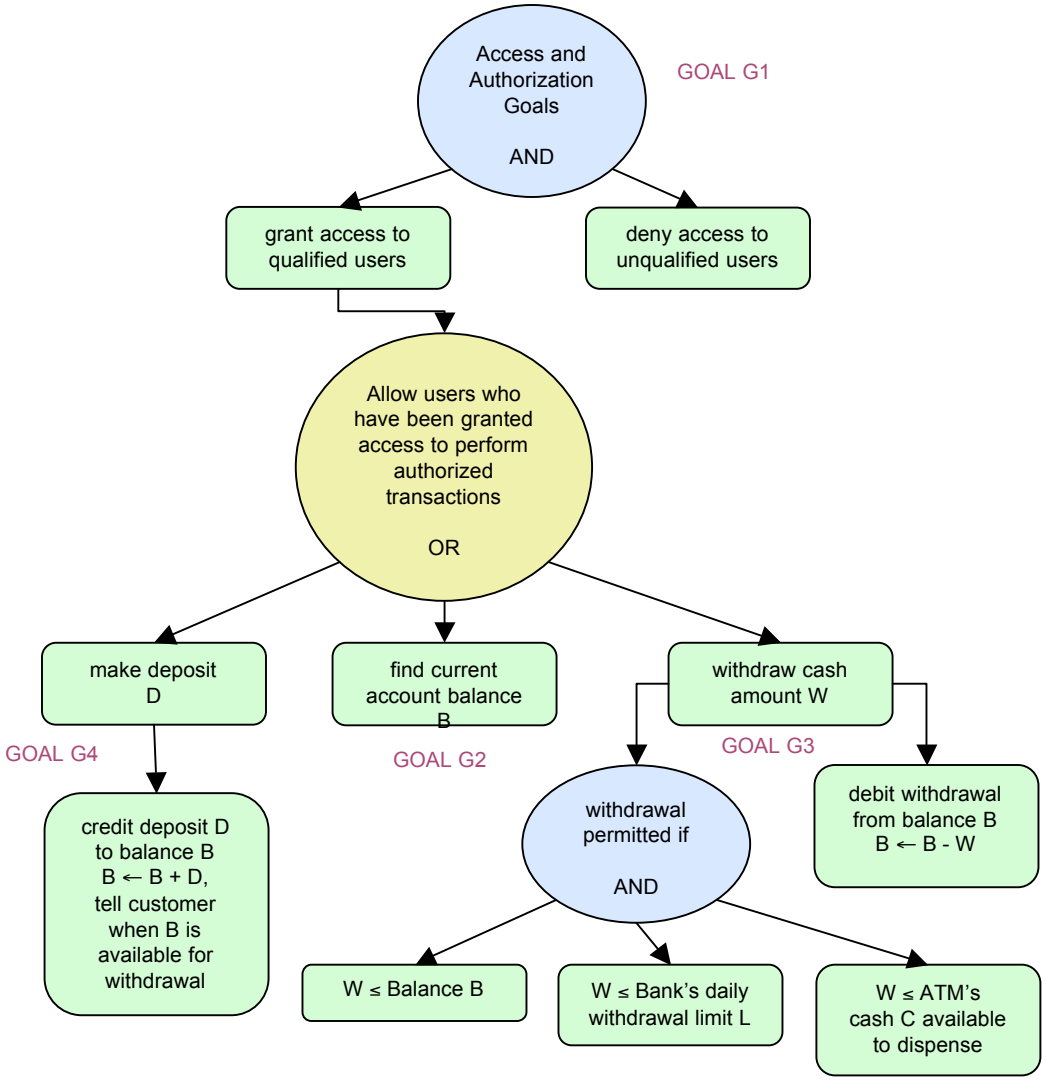
ATM AND/OR Goal Analysis



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Concerns and Aspects

- Goals correspond to concerns
  - "provide" concerns
    - » Withdraw money, Deposit money, Transfer money
  - "prevent" concerns
- Aspects correspond to cross-cutting concerns
  - Typically "prevent" concerns
    - » User access/authentication, data integrity, transaction integrity
- A requirements-level usage-scenario
  - Will be written as a collection of episodes
  - Will be designed to address multiple concerns
  - Will be implemented using "regular" code + aspects for the cross cutting concerns

Use Cases and Aspects

- According to Jacobson,
  - All use cases are extensions to the "null system"
- He sees a relationship between use cases and aspects, such that
  - aspects ≈ extensions
  - join points ≈ extension points
- AOP allows us to
  - Separate use case extensions all the way down to code
  - Compose back extensions before execution
- Thus, AOP supports extensions
  - Ivar Jacobson, "Use cases and aspects – Working together."

Summary and Recommendations

- Be aware of "top ten" lists of use case mistakes, misuse, and "abuse cases"
  - Beware each article has a different list!☺
  - Beware articles provide different, sometimes conflicting advice!☺
- Consider goals and scenarios
  - When writing use cases or instead of writing them
  - Perform goal analysis and goal decomposition
  - Perform scenario analysis and scenario composition (from episodes)
  - Design and implement using concerns and aspects (for cross-cutting concerns)