Requirements

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Slides are based on the Oreilly Head First slides

Requirements

We create software for a reason

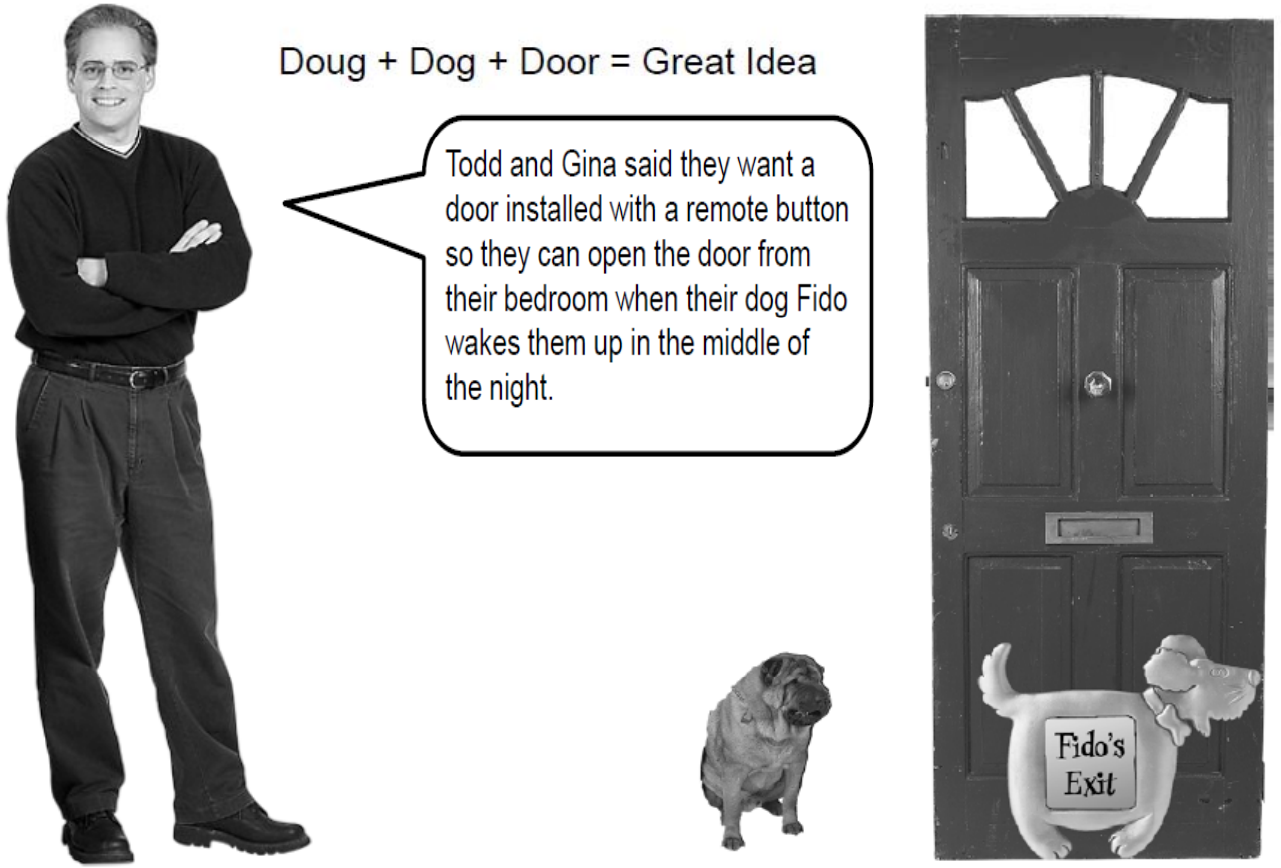
We create software for people

We need to know what the people want in the software we build

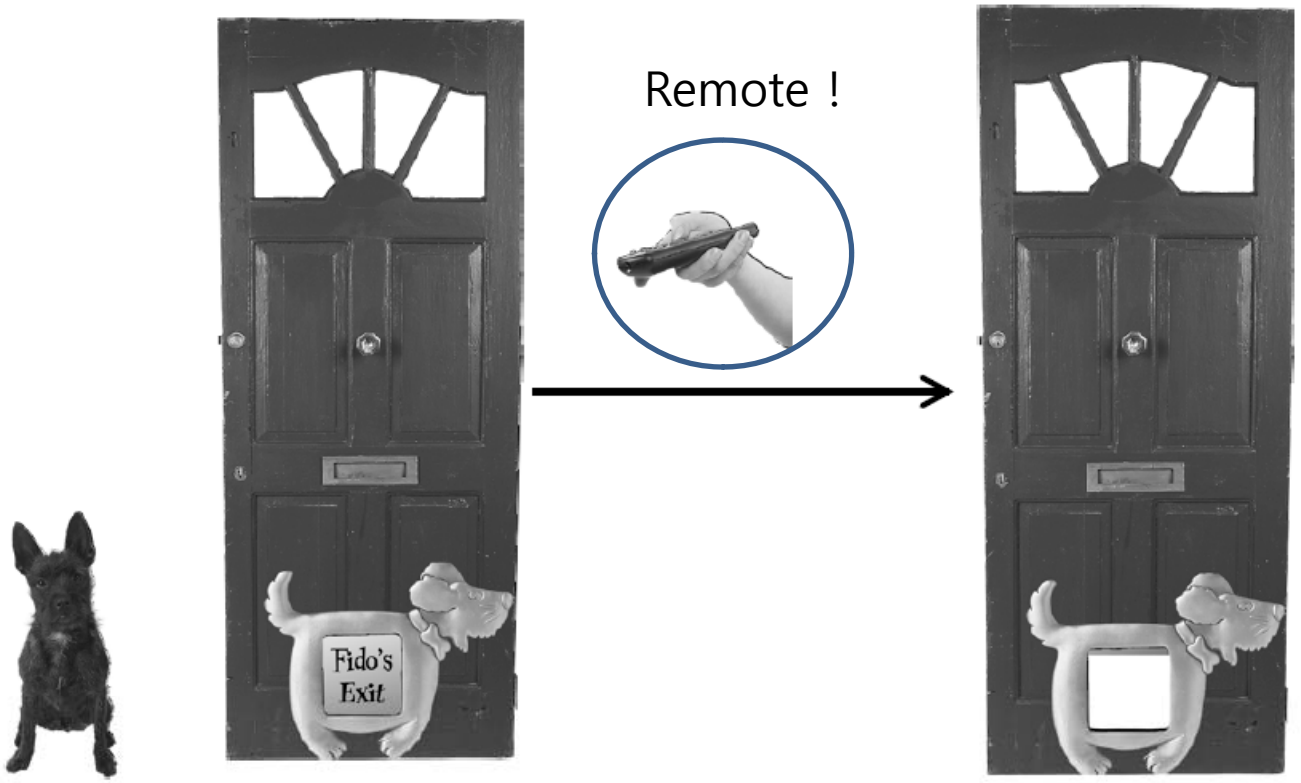
Who provides requirements?

- Stakeholders
  - Customer
  - End user
  - Development team members
  - Management
  - Technology providers

Example application of this chapter



The initial product



This is a piece of cake, right?
And you're getting paid for this!

Our requirements

Push the button on the remote and ***open*** the door

Push the button again to ***close*** the door

Is that all we need?
We need a design

Initial Design of the requirements

Focus on ***Responsibility!!***

DogDoor

Open
Close
Wait for signal from the remote

Remote

Tell the door to open or close
Recognize when the button is pushed

Initial Codes

```
public class DogDoor {

  private boolean open;

  public DogDoor() {
    this.open = false;
  }

  public void open() {
    System.out.println("The dog door opens.");
    open = true;
  }

  public void close() {
    System.out.println("The dog door closes.");
    open = false;
  }

  public boolean isOpen() {
    return open;
  }
}
```

DogDoor.java

```
public class Remote {

  private DogDoor door;

  public Remote(DogDoor door) {
    this.door = door;
  }

  public void pressButton() {
    System.out.println("Pressing the remote
control
                button...");
    if (door.isOpen()) {
      door.close();
    } else {
      door.open();
    }
  }
}
```

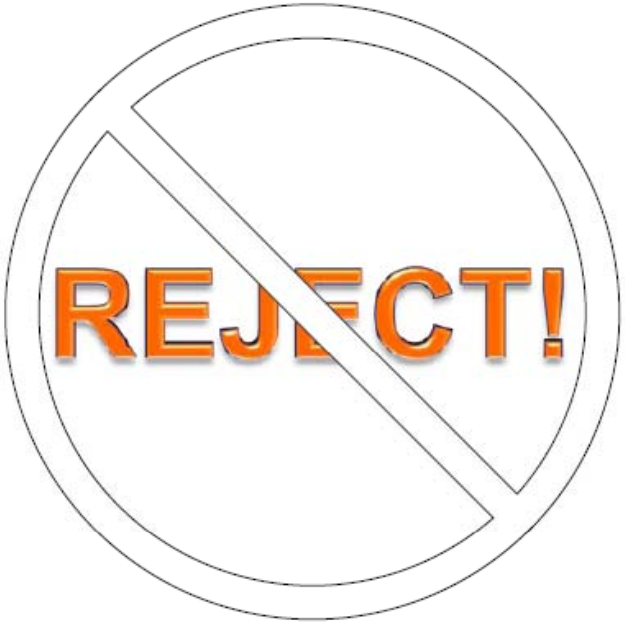
Remote.java

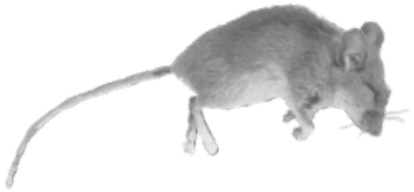
Are you sure it works?

- Test!!
- Are these good Tests?
  - Why?
  - Why not?

```
public class DogDoorSimulator {

  public static void main(String[] args) {
    DogDoor door = new DogDoor();
    Remote remote = new Remote(door);

    System.out.println("Fido barks to go outside...");
    remote.pressButton();

    System.out.println("\nFido has gone outside...");
    remote.pressButton();

    System.out.println("\nFido's all done...");
    remote.pressButton();

    System.out.println("\nFido's back inside...");
    remote.pressButton();
  }
}
```

The customer is the final judge

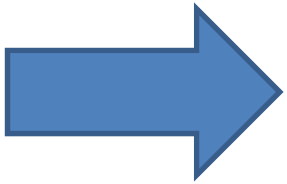




Let's back up a bit

- We did exactly what Doug told us to do
- We tested it
- The door worked as we programmed it
- The hardware works
- The software works

So, what did we do **wrong?**

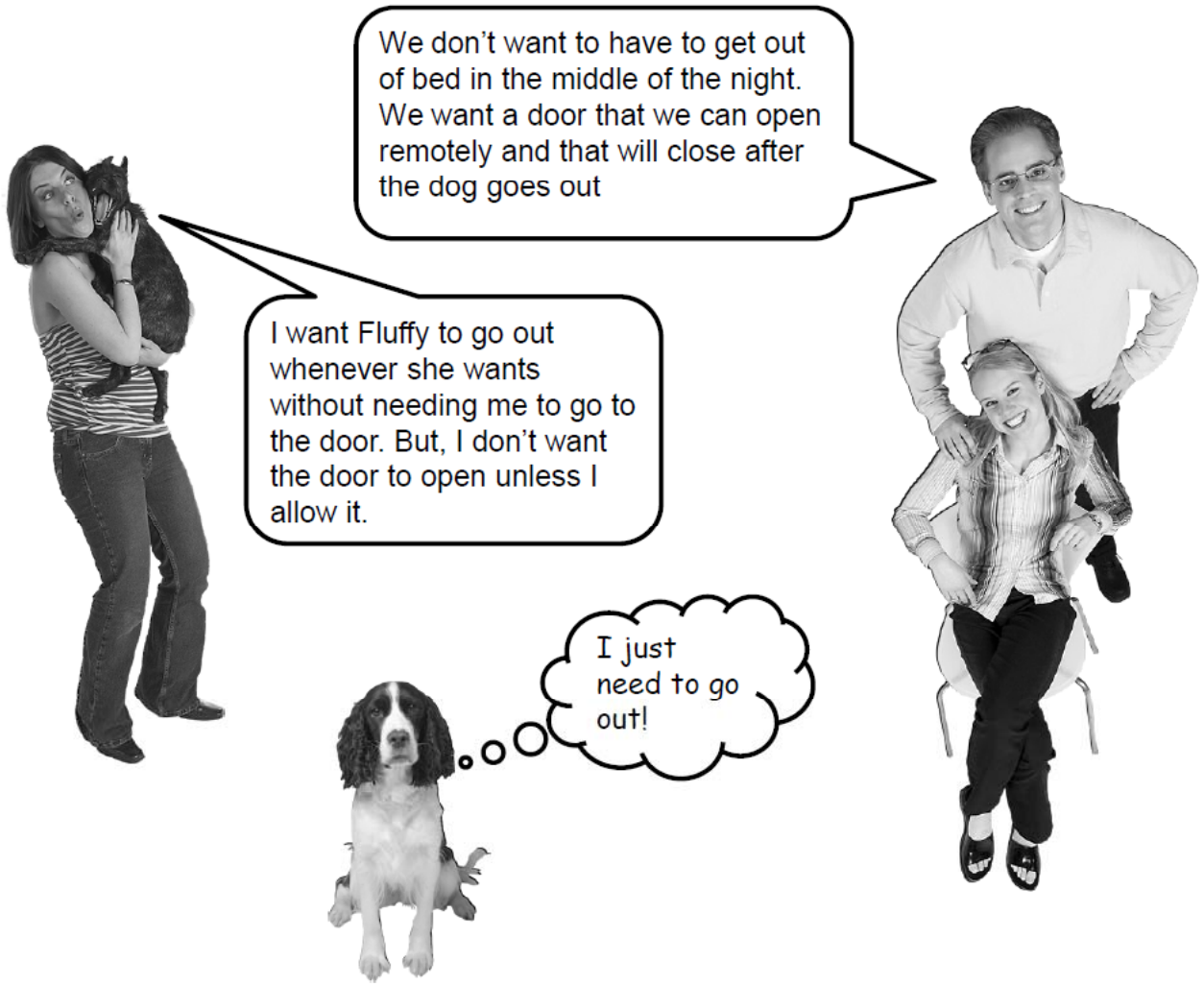


Did we meet the **requirement?**

meet requirement
= Define the problem ***well***

- Talk to the customer
- Talk to other stakeholders
- Ask questions
- Brainstorm
- Look at the problem from many points of view

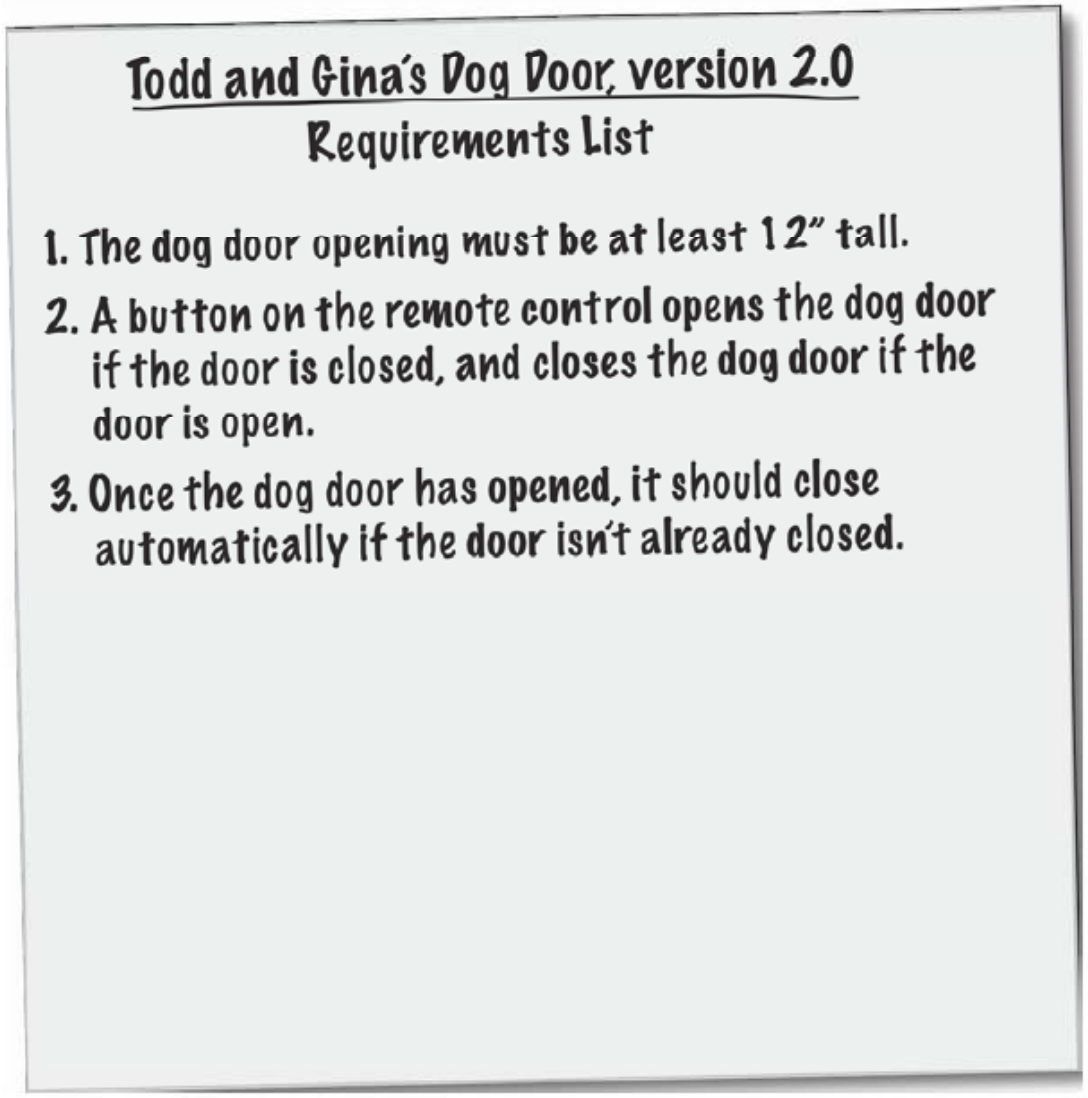
Possible other requirements



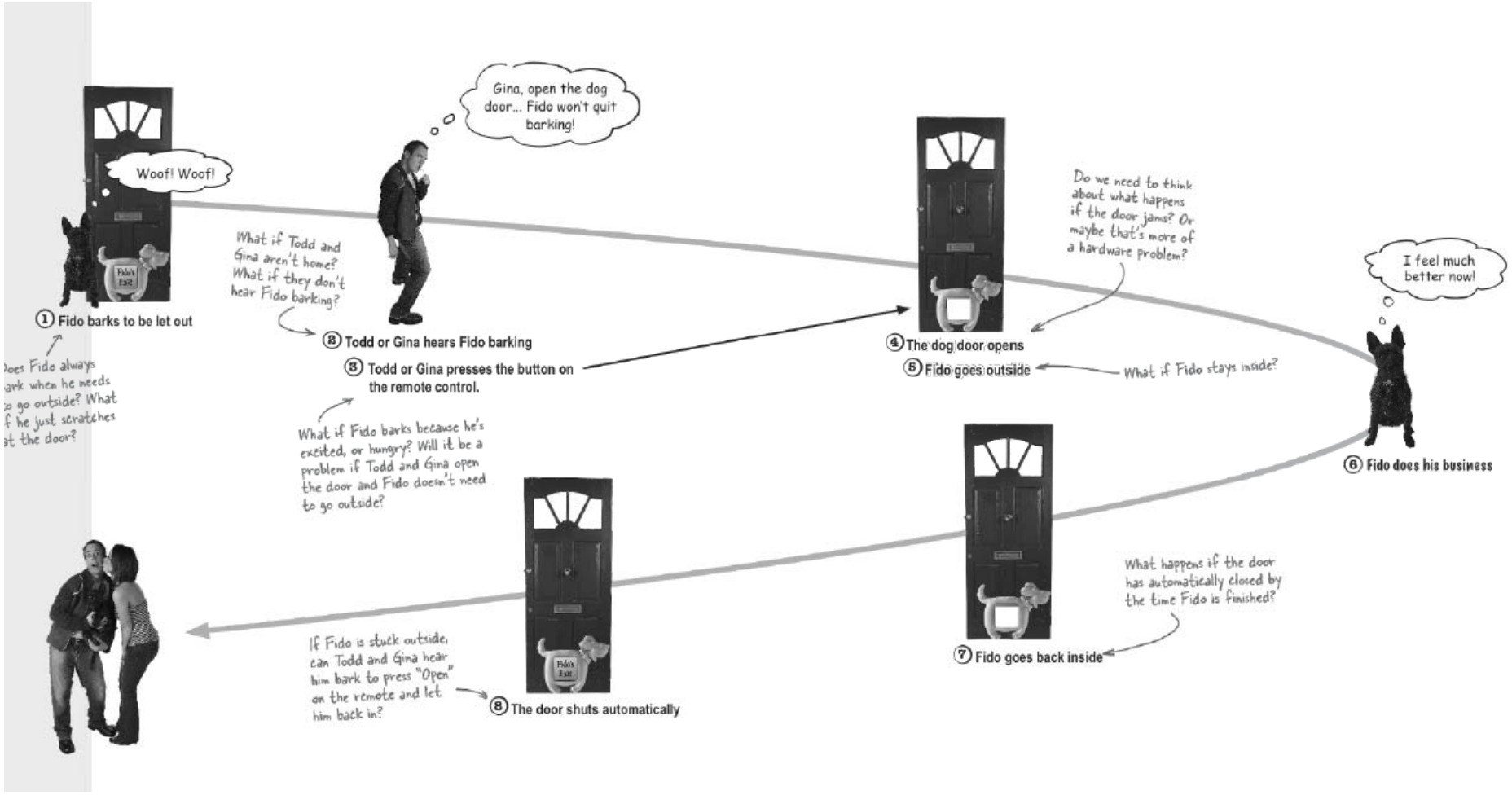
What we currently know

- Doug
  - We need a system soon
  - It has to be cost-effective
- Hardware engineers
  - The door has two signals
    - Get the current state (open or closed)
    - Change the door's state (open-to-closed or closed-to-open)
  - The remote sends a single signal (button pressed)
- Customers' stated requirements
  - Door should be able to be opened remotely
  - Door should close after dog goes out
- Customers' implies requirements
  - Door should not close while the dog going through it
  - Door should close automatically and not by remote

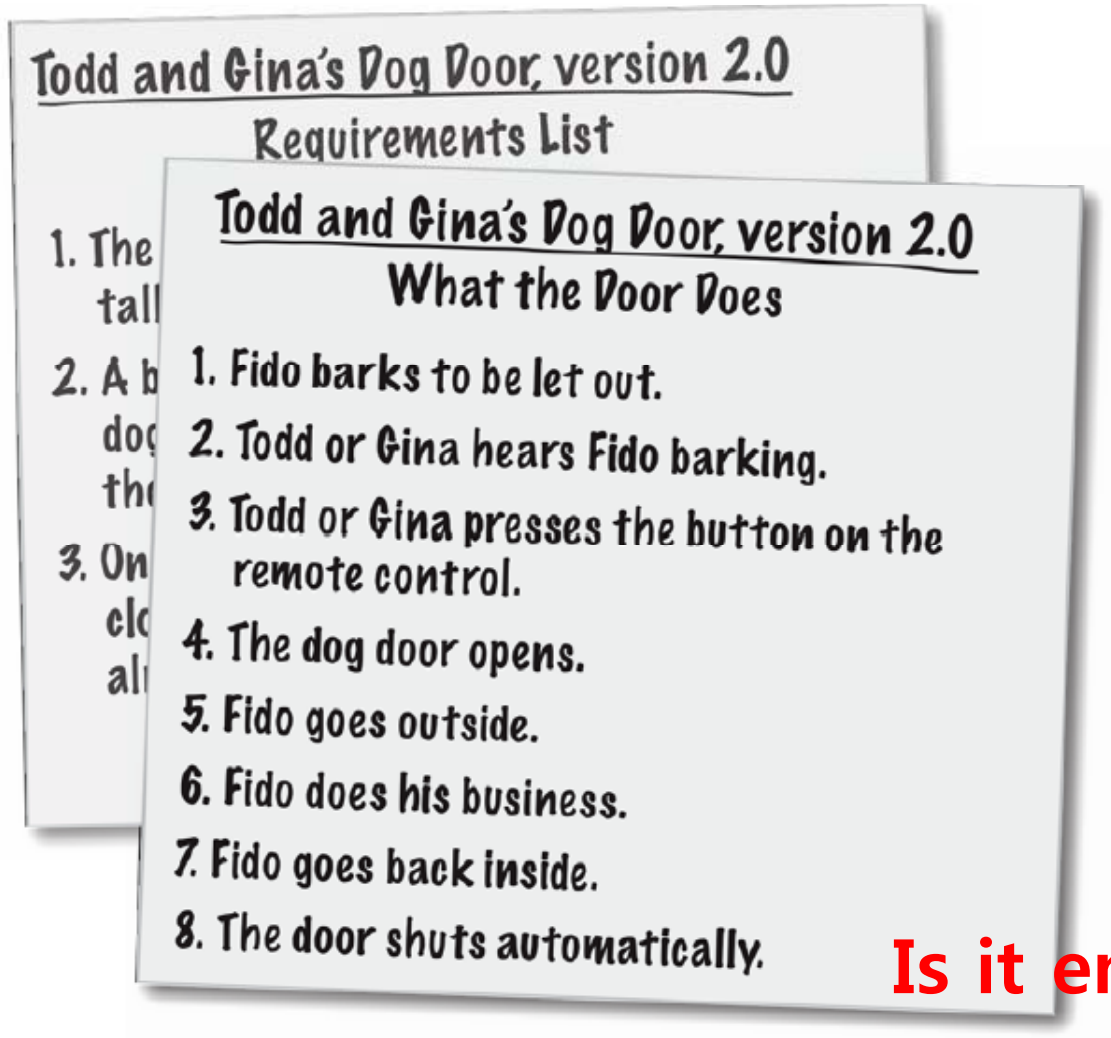
Requirements List



A Scenario of how the system works



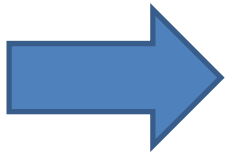
Generating a use case



Is it enough??

What if

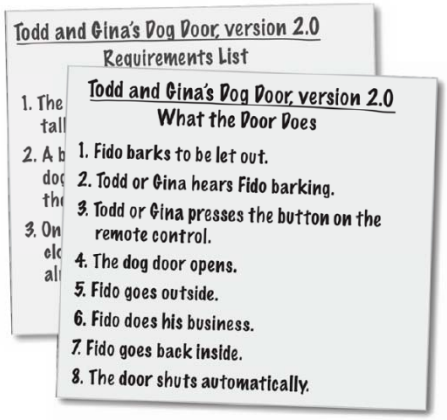
- A Dog does not go outside, but stay in
- A Dog does not come back inside
- The door starts to close when Fido is going out
- …



We should generate other use cases.

What is “Use case”

- A Complete sequence of steps that provides value to someone
- Something your system must do
- Initiated by an Actor
  - Actor : Someone or something not part of your system
    - Fido, Todd and Gina

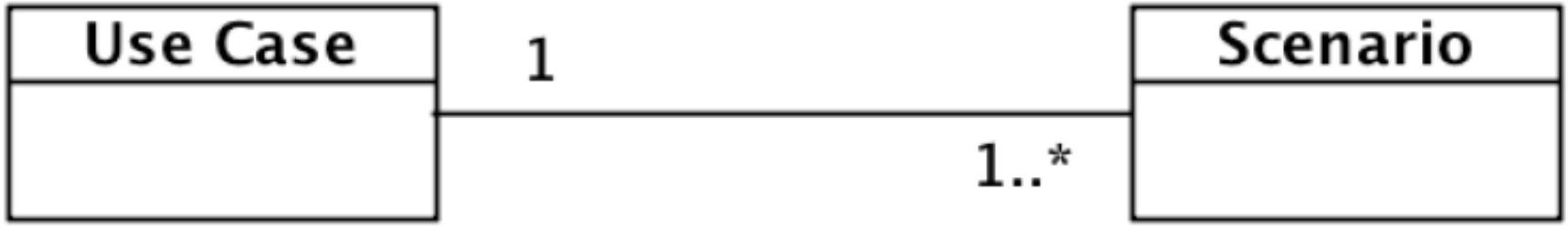


The essence of use cases

- Use cases definitely…
  - Provide value
  - Are complete
  - Are initiated by an actor
  - Describe a ***single goal*** of the system
- Use cases may…
  - Be described by UML diagrams with text
  - Be formally structured
  - Be described using a language with formal semantics
  - Be described by using software tools

Use case ≠ Scenario

- A scenario is one way to achieve the goal from a specific starting point
- A use case describes ***all ways*** to achieve the goal from a specific starting point



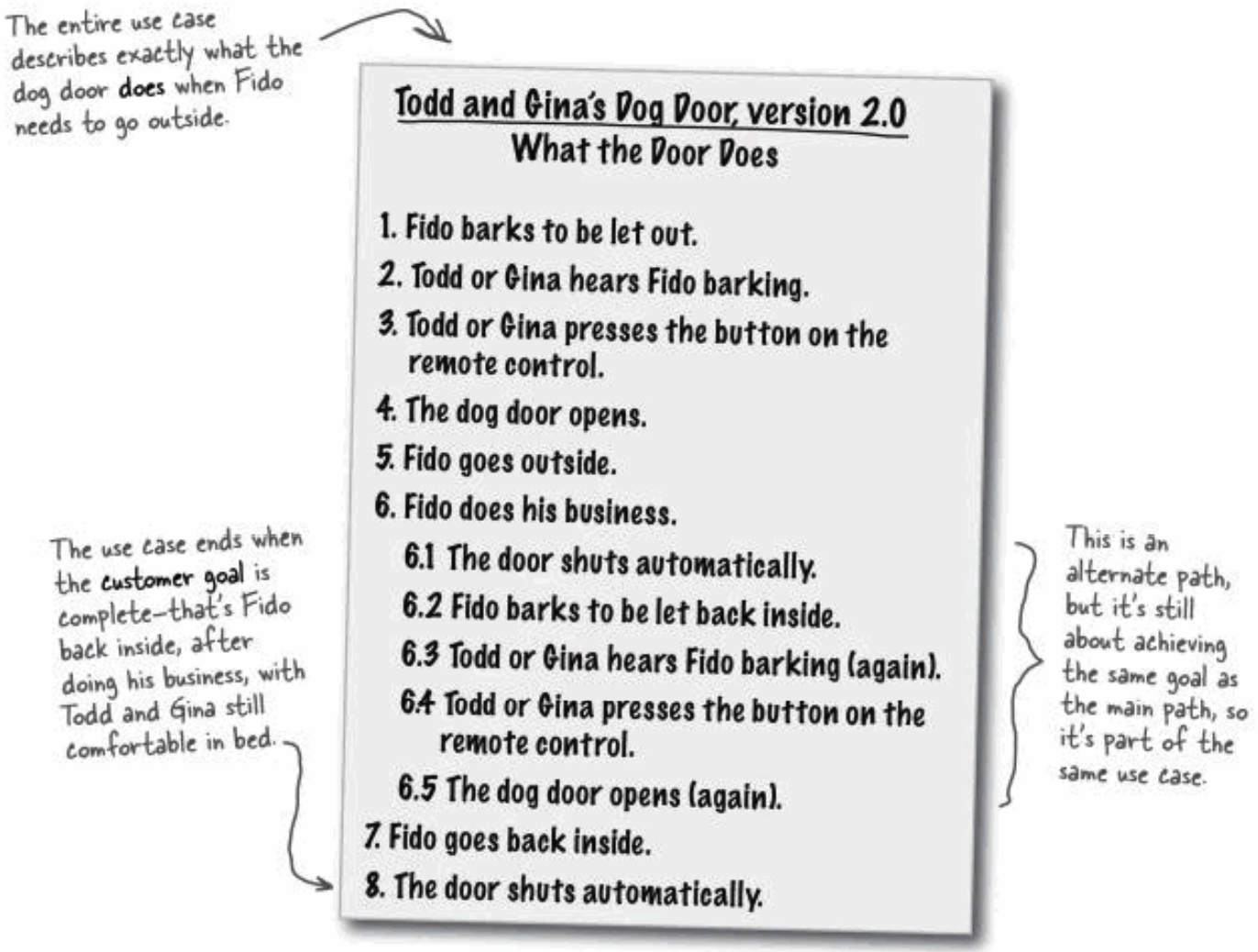
Parts of a use case

- Name
  - Usually verf-noun (e.g. enroll in course)
- Description
  - A paragraph or two describing the purpose and value (results)
- Actors (External Initiator)
  - Name the actor(s) involved
- Basic Flow (Start → Stop)
  - The most common or expected path through the use case
- Alternate Flows
  - Those paths or exceptions that can occur
- Preconditions
  - Things that must be true before the use case can begin
- Postconditions
  - Things that must be true when the use case ends successfully

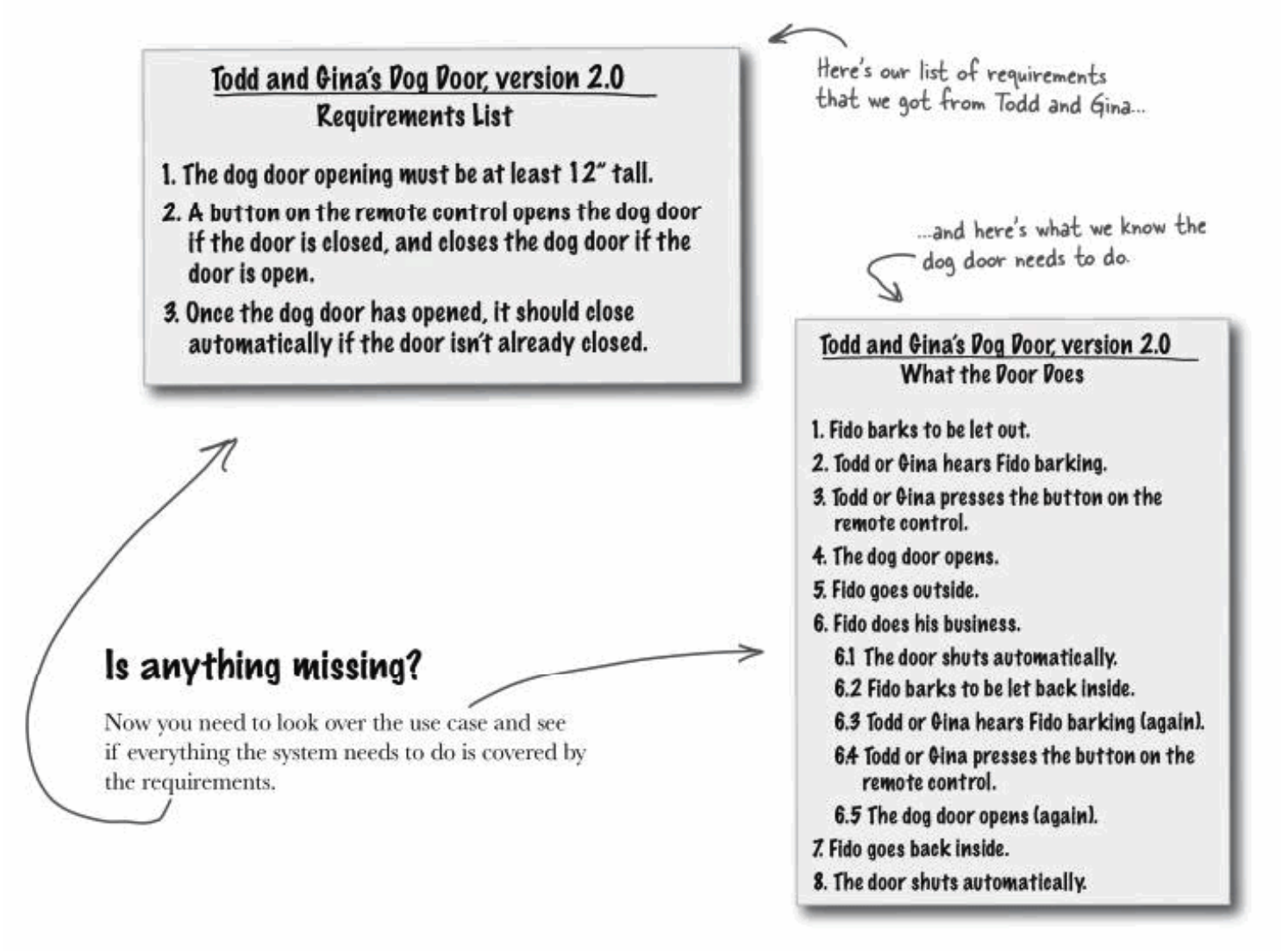
How formal do you need to be?

If it works, use it!

Let's upgrade the use case



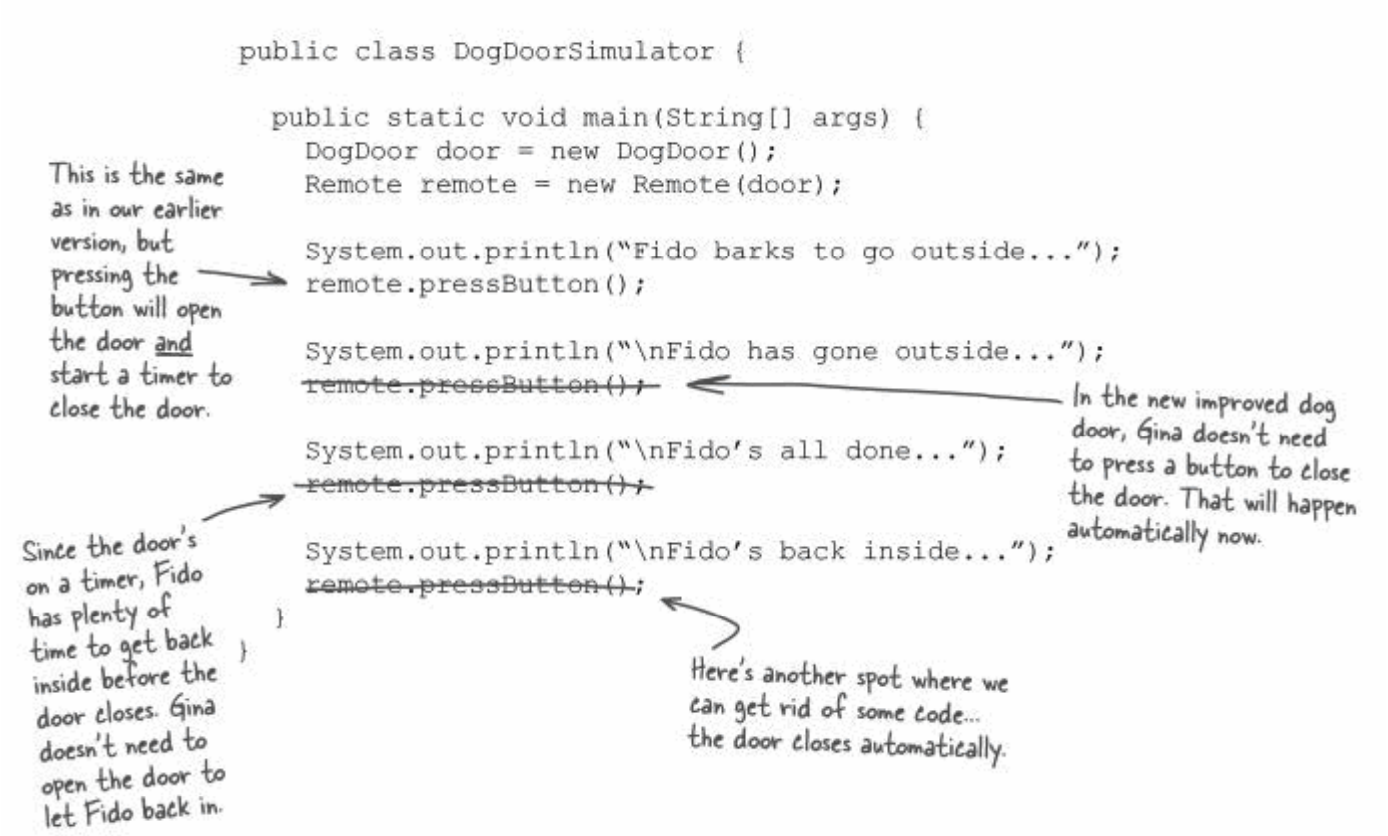
Check requirements against your use cases



New Codes

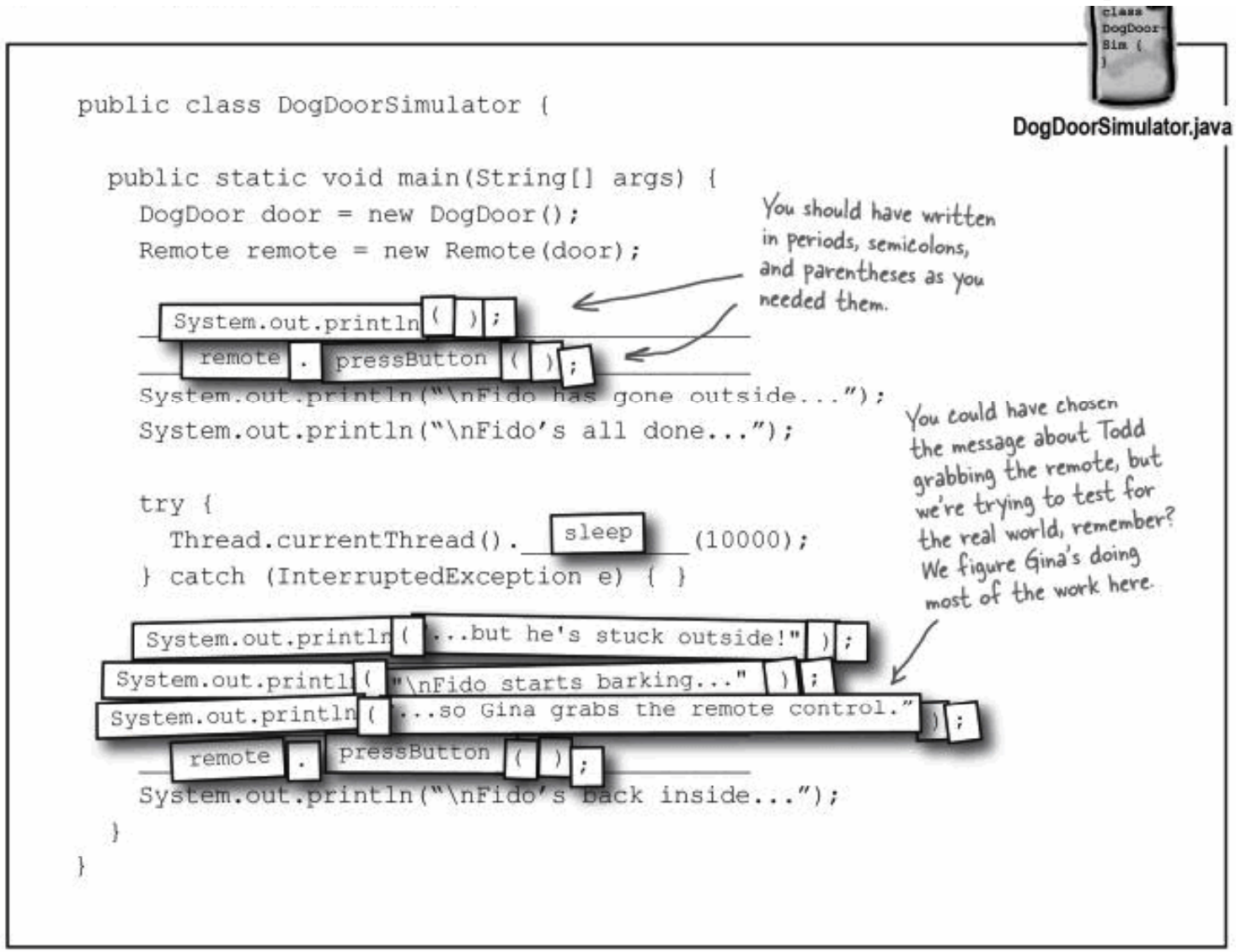
```
import java.util.Timer;
import java.util.TimerTask;

public class Remote {
  private DogDoor door;

  public Remote(DogDoor door) {
    this.door = door;
  }

  public void pressButton() {
    System.out.println("Pressing the remote control button...");
    if (door.isOpen()) {
      door.close();
    } else {
      door.open();

      final Timer timer = new Timer();
      timer.schedule(new TimerTask() {
        public void run() {
          door.close();
          timer.cancel();
        }
      }, 5000);
    }
  }
}
```

New test code



Door must be closed after 5 seconds.

Test code for the alternate path



Example 1

Kristen and Bitsie's Dog Door
Use Case

1. Kristen enters a code on a keypad.
2. The dog door and all the windows in the house lock.

Kristen and Bitsie's Dog Door
Requirements List

1. The keypad must accept a 4-digit code.
2. The keypad must be able to lock the dog door.

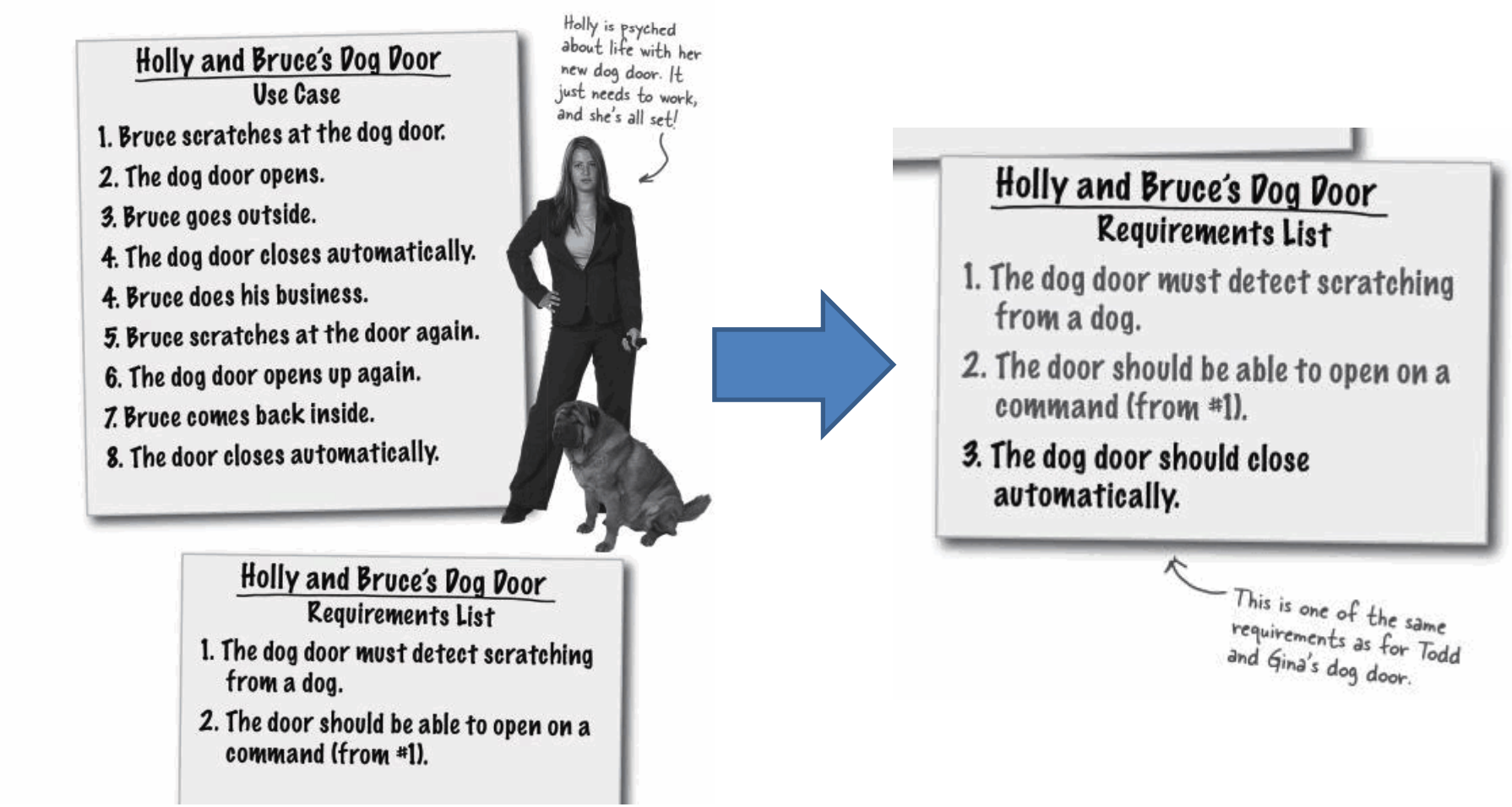
Here's the requirements list for Kristen's dog door. Is anything missing or incomplete based on the use case? If so, write in the extra requirements you think the door needs to handle.

Remember Kristen and Bitsie?

Kristen and Bitsie's Dog Door
Requirements List

1. The keypad must accept a 4-digit code.
2. The keypad must be able to lock the dog door and all the windows.
3. The keypad must be able to unlock the dog door and all the windows in the house.

Example 2

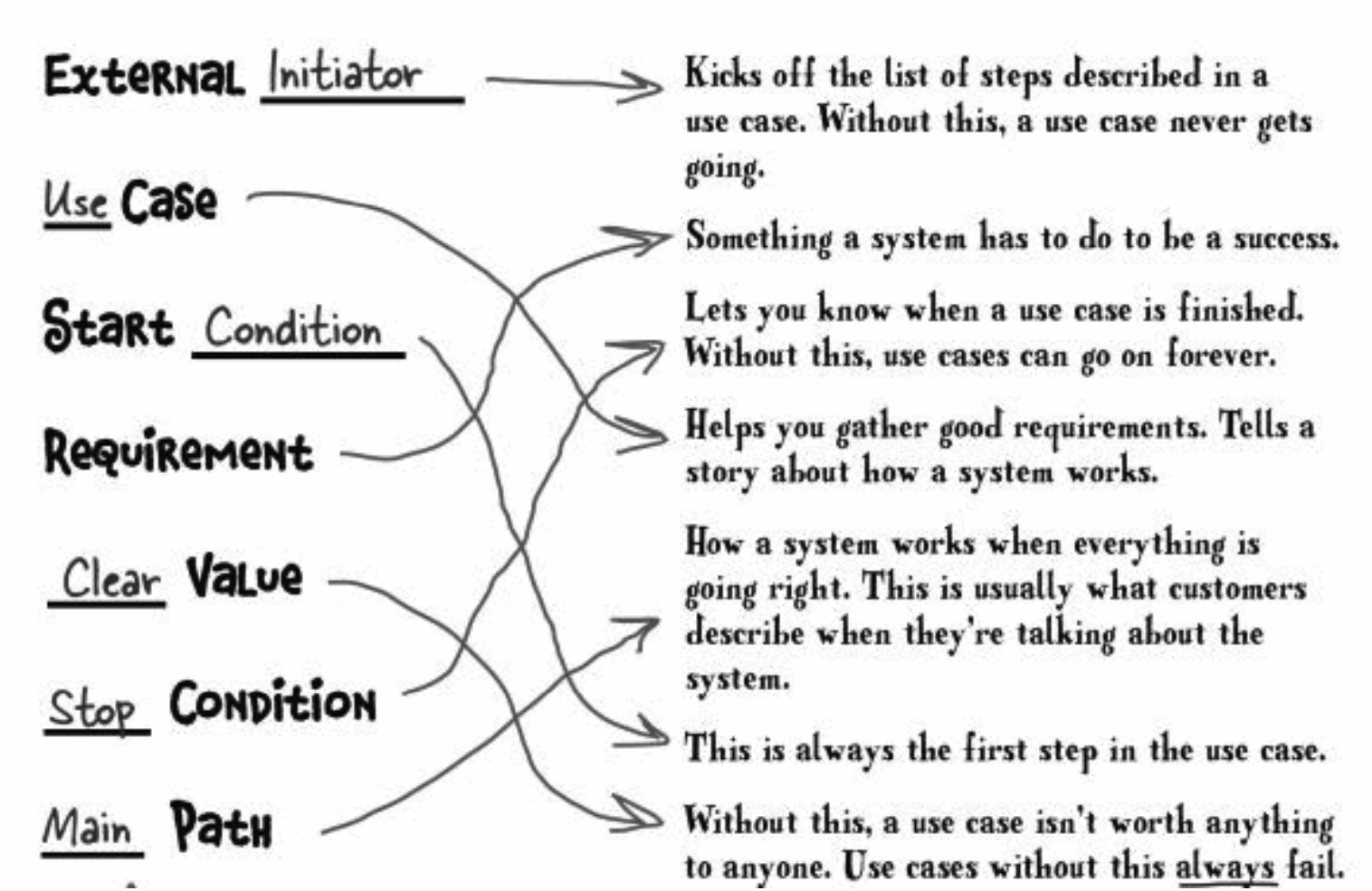

Holly and Bruce's Dog Door
Use Case
1. Bruce scratches at the dog door.
2. The dog door opens.
3. Bruce goes outside.
4. The dog door closes automatically.
4. Bruce does his business.
5. Bruce scratches at the door again.
6. The dog door opens up again.
7. Bruce comes back inside.
8. The door closes automatically.
Holly is psyched about life with her new dog door. It just needs to work, and she's all set!
Holly and Bruce's Dog Door
Requirements List
1. The dog door must detect scratching from a dog.
2. The door should be able to open on a command (from #1).
Holly and Bruce's Dog Door
Requirements List
1. The dog door must detect scratching from a dog.
2. The door should be able to open on a command (from #1).
3. The dog door should close automatically.
This is one of the same requirements as for Todd and Gina's dog door.

Example 3

John and Tex's Dog Door

1. (Somehow) the dog door opens.
2. Tex goes outside.
3. The dog door closes automatically.
4. Tex does his business.
   - 4.1 Tex gets muddy
   - 4.2 John cleans Tex up
5. John presses a button.
6. The dog door opens.
7. Tex comes back inside.
8. The door closes automatically.

Review


External Initiator
Use Case
Start Condition
Requirement
Clear Value
Stop Condition
Main Path
Kicks off the list of steps described in a use case. Without this, a use case never gets going.
Something a system has to do to be a success.
Lets you know when a use case is finished. Without this, use cases can go on forever.
Helps you gather good requirements. Tells a story about how a system works.
How a system works when everything is going right. This is usually what customers describe when they're talking about the system.
This is always the first step in the use case.
Without this, a use case isn't worth anything to anyone. Use cases without this always fail.

Bullet Points

- **Requirements** are things your system must do to work correctly.
- To make sure you have a good set of requirements, you should develop use cases for your system.
- **Use cases** detail exactly what your system should do.
- A use case has a **single goal**, but can have **multiple paths** to reach that goal
- A good use cases has a **starting and stopping condition and external initiator and clear value** to the user
- A use case is a simple a story about how your system works
- After your use cases are complete, you can refine and add to your requirements
- When things **go wrong**, your system must have **alternate paths** to reach the system's goal