Requirements and Specifications (Part 1/2)

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Requirements and Specifications (Part 1)

Today's agenda:

- **Reading Quiz**
- What are specifications, and why do we care?
- In-class exercise

Reading quiz: Reqs and Specs (1)

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Q2: **TRUE** or **FALSE**: In the author’s opinion, the number one mistake made by many companies is “having the manager of the programmers writing the specs and designing the product.”

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Announcements:

- all IP1 submissions should be graded (let me know if yours wasn't)
- team formation survey out (link here or on CampusWire)
- IP2 autograder is open (many students struggled on IP1 because they waited until the last minute)

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[with thanks to Michael D. Ernst for the GroupThink Specification Exercise]

Specifications tell you what to do (but not how to do it)

- **A perfect implementation is no good if it solves the wrong problem**
- **It’s difficult to create a specification that is**
  - complete
  - consistent
  - precise
  - concise

[with thanks to Michael D. Ernst for the GroupThink Specification Exercise]

Bundestag Sound System, 1992

- **No sound from speakers in new building**
  - system requirement: no feedback
  - new all-glass room

- **"This glass does not absorb the sound. The computers, detecting feedback, turn down the volume. A steady state is only achieved when the microphones are turned off."**

Dr. Debora Weber-Wulff

[with thanks to Michael D. Ernst for the GroupThink Specification Exercise]

Ariane 5 launch vehicle, 1996

- **Went off course during launch**
  - Ariane 4 guidance software reused in Ariane 5
  - Ariane 5 accelerated much faster
  - velocity variable overflowed, computer crashed

- **"The failure of the Ariane 501 was caused by the complete loss of guidance and attitude information... due to specification and design errors in the software."**

  ESA Inquiry Board

Mars Polar Lander, 1999

- **Crashed while landing on Mars**
  - sensor transient when legs deployed
  - software thought vehicle had landed
  - engine shut down during descent

- **"There was no software requirement to clear spurious signals prior to using the sensor information to determine that landing had occurred."**

Mars program independent assessment team

Specifications matter

- **A specification:**
  - connects customer and engineer
  - ensures parts of implementation work together
  - defines correctness of implementation
- **Therefore everyone must understand specs**
  - Designers, implementers, testers, managers, marketing, technical support, ... users!
- **Good specifications are essential**

[with thanks to Michael D. Ernst for the GroupThink Specification Exercise]

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Groupthink Specification Exercise

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Groupthink game

- **As a group, specify behavior of a desktop telephone**
- **Individually, answer questions about its behavior**
- **Goal: all group members give same answer**
  - No defaults based on the game (e.g., "always A")
- **The winning group receives a prize**

[with thanks to Michael D. Ernst for the GroupThink Specification Exercise]

Desktop telephone

Handset (speaker and microphone)

Keypad

```
talk
redial
ansmachine
end
```

24-character display

Answering machine

Phone jack

[with thanks to Michael D. Ernst for the GroupThink Specification Exercise]

Requirements

Display indicates current functionality

- caller ID
- number being called
- "Answering machine�much"
- "Ready"

Answering machine picks up after 2 rings

You decide other aspects of system behavior

[with thanks to Michael D. Ernst for the GroupThink Specification Exercise]

Definitions

Lineidle: phone is on-hook (“hung up”)

- sent from phone to phoneline

Lineactive: phone is off-hook (“picked up”)

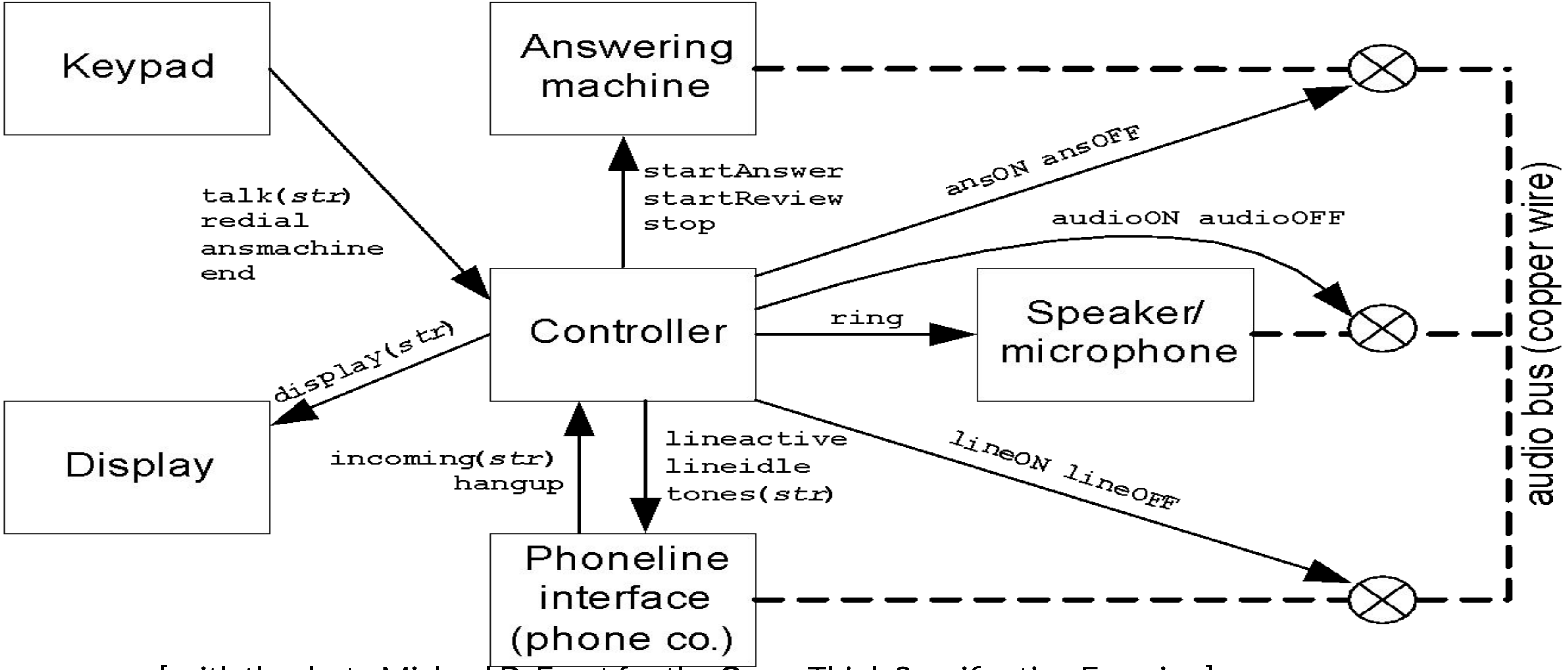
- sent from phone to phoneline

Ring signal: causes phone to ring once

- sent from phoneline to phone

[with thanks to Michael D. Ernst for the GroupThink Specification Exercise]

System architecture



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Sample question

The user is connected to an outside party. The outside party hangs up. What state is the phoneline in?

A. Lineactive (the user hears dialtone)

B. Lineidle (the user does not hear dialtone)

[with thanks to Michael D. Ernst for the GroupThink Specification Exercise]

Question 0