Requirements Engineering

(Summer 2022)

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https://github.com/nanniu/RE-Summer2022

Today's Menu

Tuesday (July 12)
"req.s" & "why"

Spell your FULL NAME in Zoom

Wednesday (July 13):
RE & Meaning of Req.s
ASN1 Release

Thursday (July 14):
Req.s Elicitation
ASN2 Release
ASN1 Q&A

Yesterday's take-aways

- What're requirements?
  - Stakeholders' needs & desires
- Why're requirements important?
  - Because doing requirements right saves money

Today's take-aways

→What's requirements engineering (RE)?

→What's the meaning of requirements?

→What's ASN1 about?

Req.s Eng. =? Eng. Req.s

→If "requirements" are "stakeholders' needs & desires", what does "engineering requirements" mean?

→If you're a requirements engineer (requirements analyst, business analyst, …), what do you do to make a living?

Class Participation #1

→Zoom poll: please select the most proper ***verb*** requirements in your mind

- For example, if the subject matter is "software", then to engineer software can refer to
  - *develop* software
  - *test* software
  - *install* software
  - *configure* software
  - *maintain* software
  - …
- Here, our subject matter is "requirements"

RE is a set of activities

- *eliciting* requirements,
- *modelling* and *analysing* requirements,
- *communicating* requirements,
- *agreeing* requirements, and
- *evolving* requirements.

↳aimed at communicating and adjusting requirements

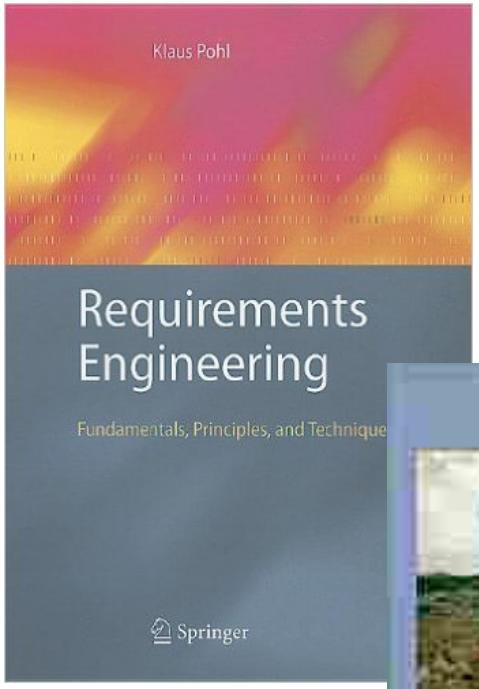
↳"RE-Roadmap.pdf" uploaded to "Readings"

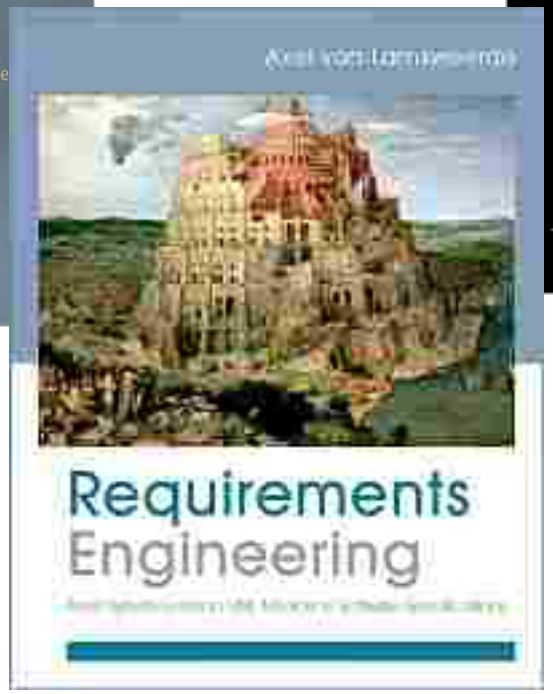
About Textbook

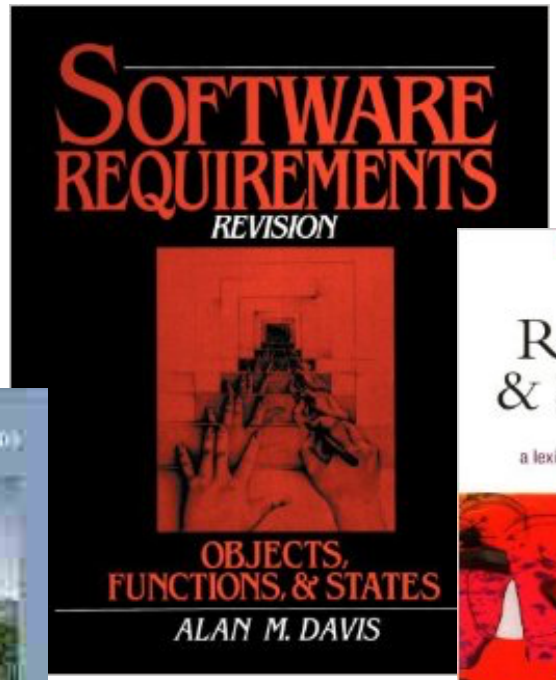
No one textbook covers the field well ➔ No required textbook for this course

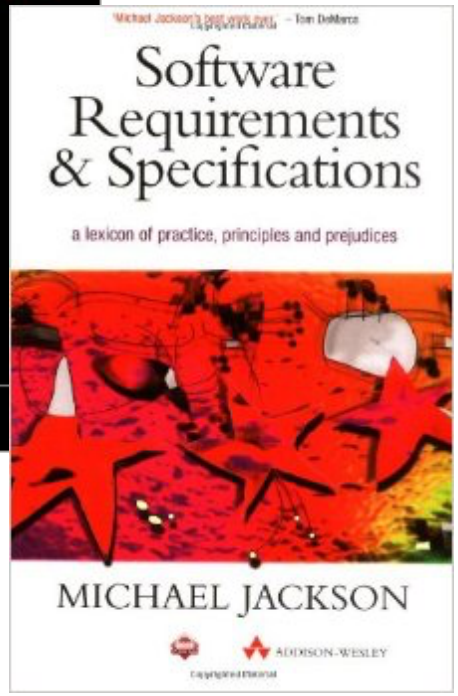
- Background readings will be made available on the course website
- Some fun RE papers will be mentioned later in the course

Just because we don't use a textbook…









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Research Literature

Conferences

- IEEE International Symposium on Requirements Engineering
  - RE'93 - Jan 1993, San Diego, USA
  - RE'95 - Mar 1995, York, UK.
  - …
  - RE'01 - Aug 2001, Toronto, Canada
- IEEE International Conference on Requirements Engineering
  - ICRE'94 - Apr 1994. Colorado Springs, USA.
  - ICRE'96 - Apr 1996. Colorado Springs, USA.
  - …
  - ICRE'00 - Jun 2000, Schaumburg, USA
- In 2002, ICRE and RE merged...
- IEEE International Requirements Engineering Conferences
  - RE'02 - Sept 2002, Essen, Germany
  - RE'03 - Sept 2003, Monterey Bay, USA
  - RE'04 - Sept 2004, Kyoto, Japan
  - RE'05 - Sept 2005, Paris, France
  - …
  - RE'18 – Aug 2018, Banff, Canada
  - RE'19 – Sept 2019, Jeju Island, Korea
  - RE'20 – Aug-Sept 2020, Zurich, Switzerland
  - RE'21 – Sept 2021, South Bend, USA

Journals

- Requirements Engineering Journal
  - published quarterly by Springer
- IEEE Transactions on Software Engineering
  - (published bi-monthly)
- ACM Transactions on Software Engineering and Methodology
  - (published quarterly)
- Various other SE journals:
  - IEEE Software
  - Automated Software Engineering
  - Journal of Systems and Software
  - Information and Software Technology

Workshops

- REFSQ - Int. Working Conference on Requirements Engineering: Foundations of Software Quality
- RE Tracks @ ACMSAC (ACM Symposium on Applied Computing), QUATIC (Int'l Conf. on the Quality of Info. and Comm.s Tech), …

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- IEEE Transacti… Engine…
- …Software Engineering
- …nal of Systems and Software
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RE portal link
http://requirements-engineering.org
on course website

Today's take-aways

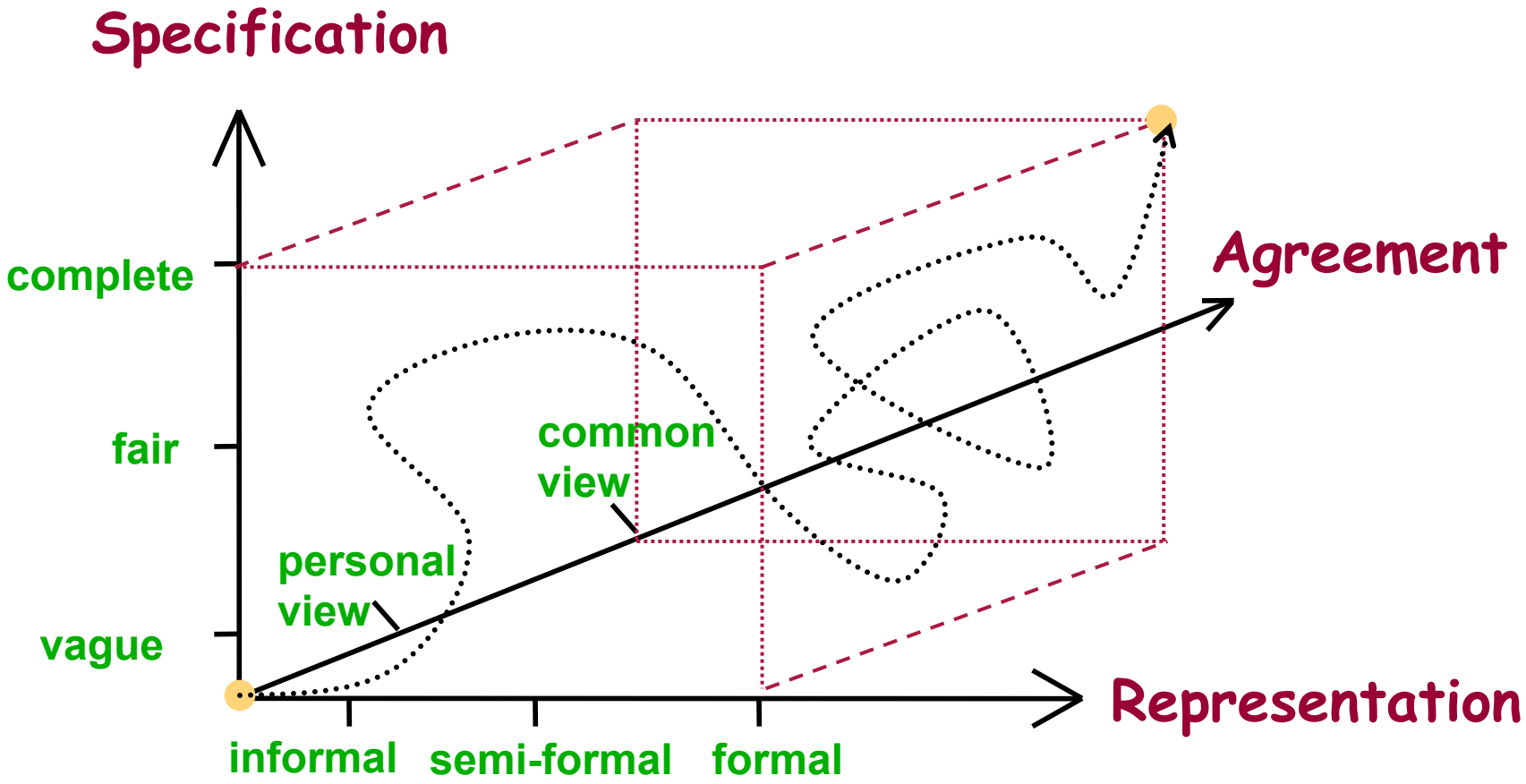
→ What's requirements engineering (RE)?

- A set of activities (elicitation, modeling, prioritization, realization, evolution, etc.) aimed at communicating and adjusting requirements

→ What's the meaning of requirements?

→ What's ASN1 about?

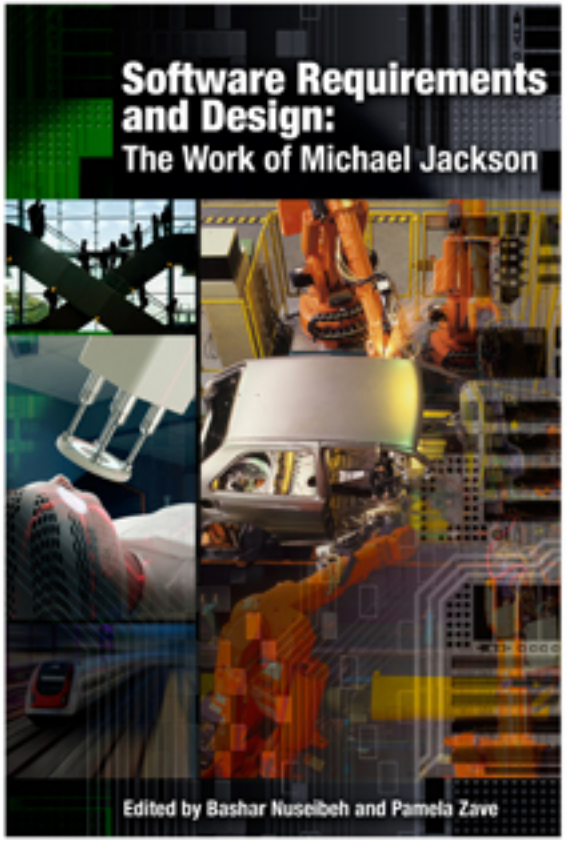
A "Requirements Lifecycle"



The Meaning of Requirements

Software Requirements and Design: A Tribute to Michael Jackson

ICSE 2009 VANCOUVER



Michael Jackson (not the singer)

$$\mathcal{E}, S \vdash R$$

The *req.s* concerned in Jackson's paper

- The computer must not weigh more than 0.25 Kg.
- The system must be completed by 1st January 1998.
- The programs must be written in Ada.
- The system specification must be formally accepted by the steering committee.
- The operator interface must be easy to learn.
- The system must produce a monthly report of outstanding debts.
- If passenger in the lift presses the *open-doors* button while the lift is stationary at a floor, the doors should begin to open within 0.5 secs.

→Functional requirements

↳Real-time response

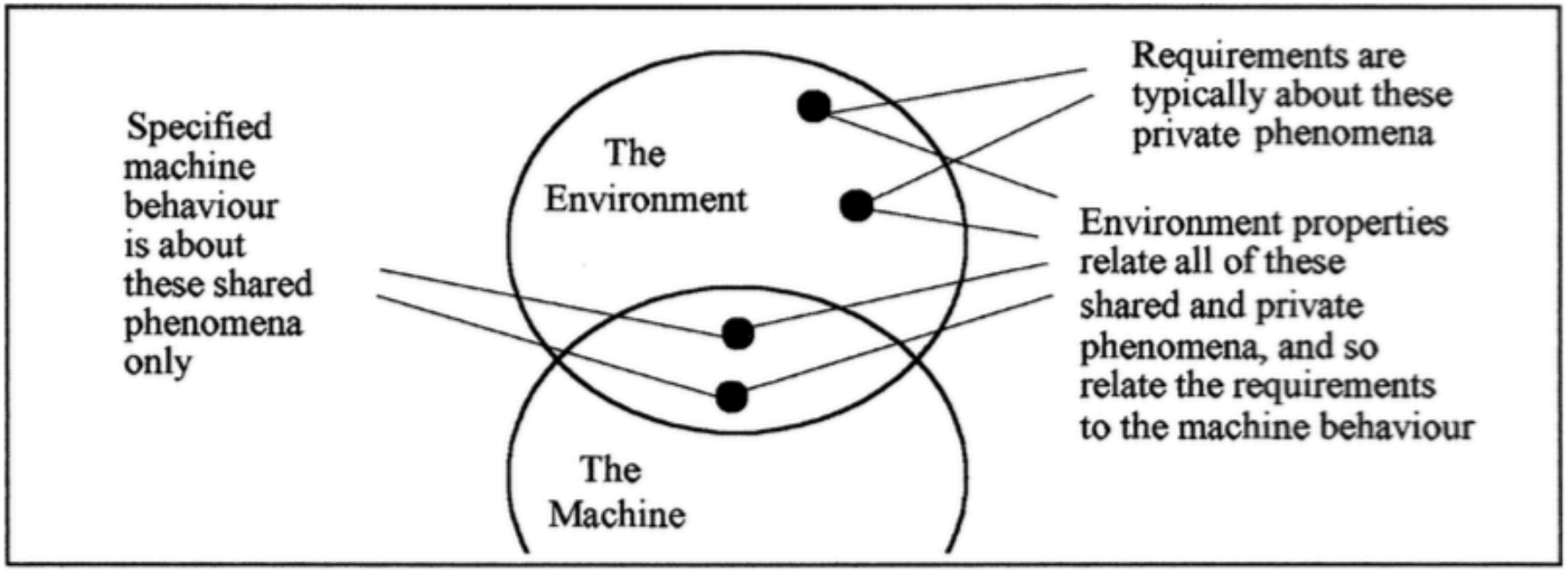
↳Those properties (of operational safety that) can be *precisely* stated in terms of system behavior

Requirements are in environment

- Environment = the part of the world
  - into which the machine will be installed
  - with which the machine will interact
  - in which the effects of the machine will be observed and evaluated
- Machine = software-to-be
  - with which programmers do programming
  - sth. that we transform a general-purpose computer into in order to satisfy stakeholder needs & desires

We want to do programing/transformation without further environment knowledge. ← What RE is for.

Understanding R, Ɛ, S



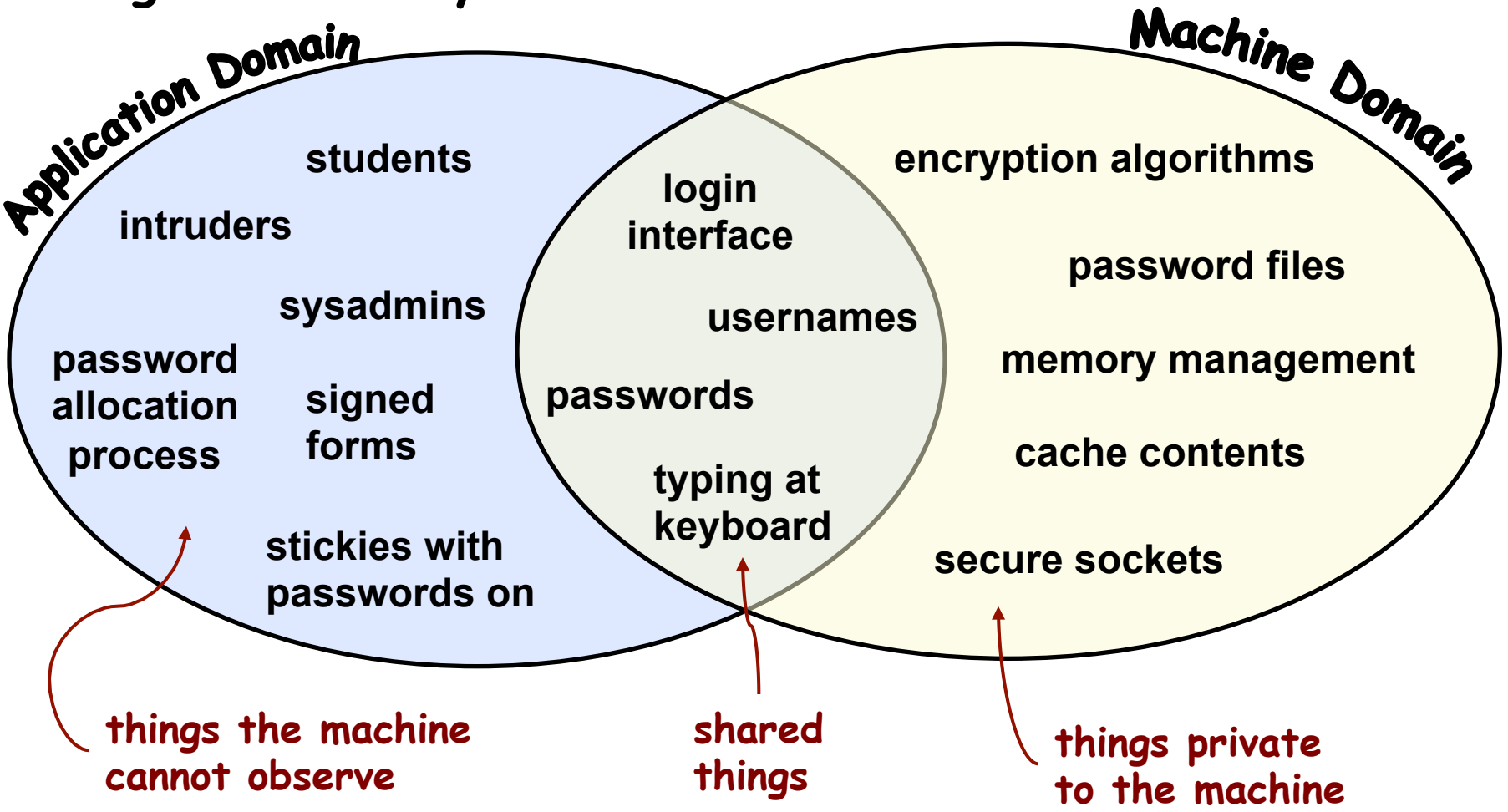
R: requirements (optative/desired)

Ɛ: environmental assertions (indicative/given)

S: specifications (optative/desired)

Software is a science of description

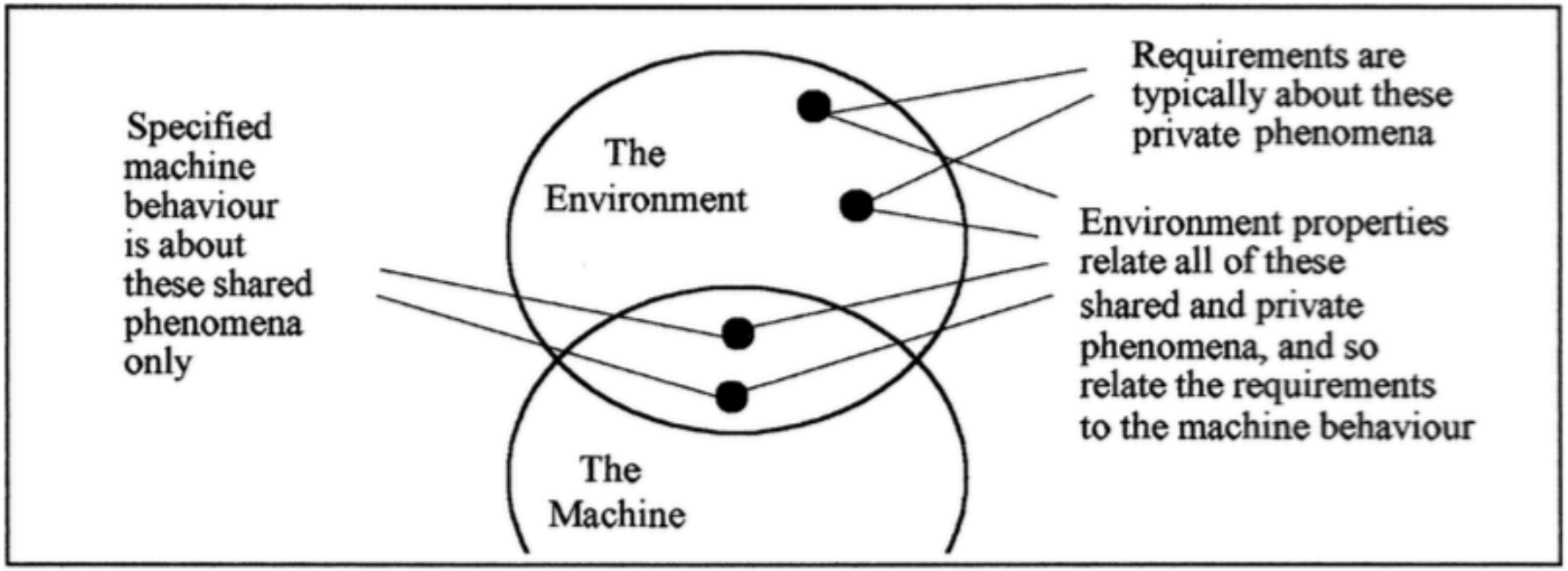
→ E.g. "allow only authorized access to lab machines"



To be more specific

- Requirement R:
  - "The lab machine shall be accessible by only authorized personnel"
- Domain Properties E:
  - Authorized personnel have usernames
  - Authorized personnel have passwords
  - Passwords are never shared with non-authorized personnel
- Specification S:
  - Access to the lab machine shall be granted only after the user types an authorized "username, password" pair
- S + E entail R

Req.s = Stakeholders' needs & desires



A library system allows its member to renew books.

An auto-pilot helps the pilot to fly the plane safely & efficiently.

An elevator controller provides safe & convenient transport from floor to floor in a tall building.

Req.s are *OUTSIDE* the machine

A library system allows its member to renew books.

An auto-pilot helps the pilot to fly the plane safely & efficiently.

An elevator controller provides safe & convenient transport from floor to floor in a tall building.

If the software-intensive system fails, *where* are the complaints?

"The true subject matter of the software development is not the computation performed inside the computer, but the desired behavior that these computations evoke and control in the world outside."

In-Class Exercise

→ Type in the chat to everyone or to me

→ Instantiate R, Ɛ, S for the elevator system such that your instantiated R, Ɛ, S satisfy "Ɛ,S |- R".

Requirements

→R: "attend a class at a different floor"

→Requirement is in the OPTATIVE mood, expressing a wish

→Requirement can (and SHOULD) be stated entirely without reference to the machine

- Private phenomena of the environment
- Requirements are located in the environment

→The GOAL (needs & desires) of stakeholders

Environmental Assertions

→ R: "attend a class at a different floor"

→ E is in the INDICATIVE mood, expressing what is claimed to be a known truth

→ Instances of E: knowing …

- "different floor of the SAME building"
- "LOCATION of the elevator inside the building"
- "DIRECTION ('up' or 'down') to go"
- …

Finally: "Ɛ,S |- R"

→ R: "attend a class at a different floor"

→ Ɛ: …, "press the right button", …

→ S: "button ➔ sensor ➔ controller ➔ move"

→ Specification

- Optative
- Shared phenomena of environment and machine
- A nexus of constraints and causal chains

Today's take-aways

- What's requirements engineering (RE)?
  - A set of activities (elicitation, modeling, prioritization, realization, evolution, etc.) aimed at communicating and adjusting requirements
- What's the meaning of requirements?
  - E, S |- R
- What's ASN1 about?
  - Practice E, S |- R

ASN1: Meaning of Requirements

- What?
  - You're provided with three S's in the web conferencing domain
    - S1: Adjust camera brightness
    - S2: Optimize your voice
    - S3: Attendance and registration reports
  - The full description of each S is shown in later slide.
  - These S's are best understood as the (to be) implemented features of a machine (e.g., Zoom or Webex).

ASN1: Notes

→Now that S is given (in English)

- Come up with "R" and "E" for each "S"
- Express "R" and "E" in English
  - Expressing "R" *without* referring to the machine
  - Making sure "E" is *relevant*; note that "E" can be a *set* of environment assertions
  - Optionally, justifying your "E" (the set of indicative properties) helps to establish a nexus of constraints and causal chains

Suppose S: "Polling"

- Answer 1
  - R: "An instructor wants to break the ice and also introduce a class participation mechanism"
  - E: "polling questions are intuitive", "latest version of software is installed", "participation will be credited" …
- Answer 2
  - R: "A presenter wants the audience to decide which topic to continue among multiple topic options"
  - E: "non-participation won't hurt the decision", "only single choice is permitted", …
- You need to provide *only one* E, S |- R tuple for each given S

ASN1: When & how to submit?

→ Before 11:59pm on Friday (July 15)

→ Email your ASN1 solution in one PDF file to summercourse_re@163.com before the deadline

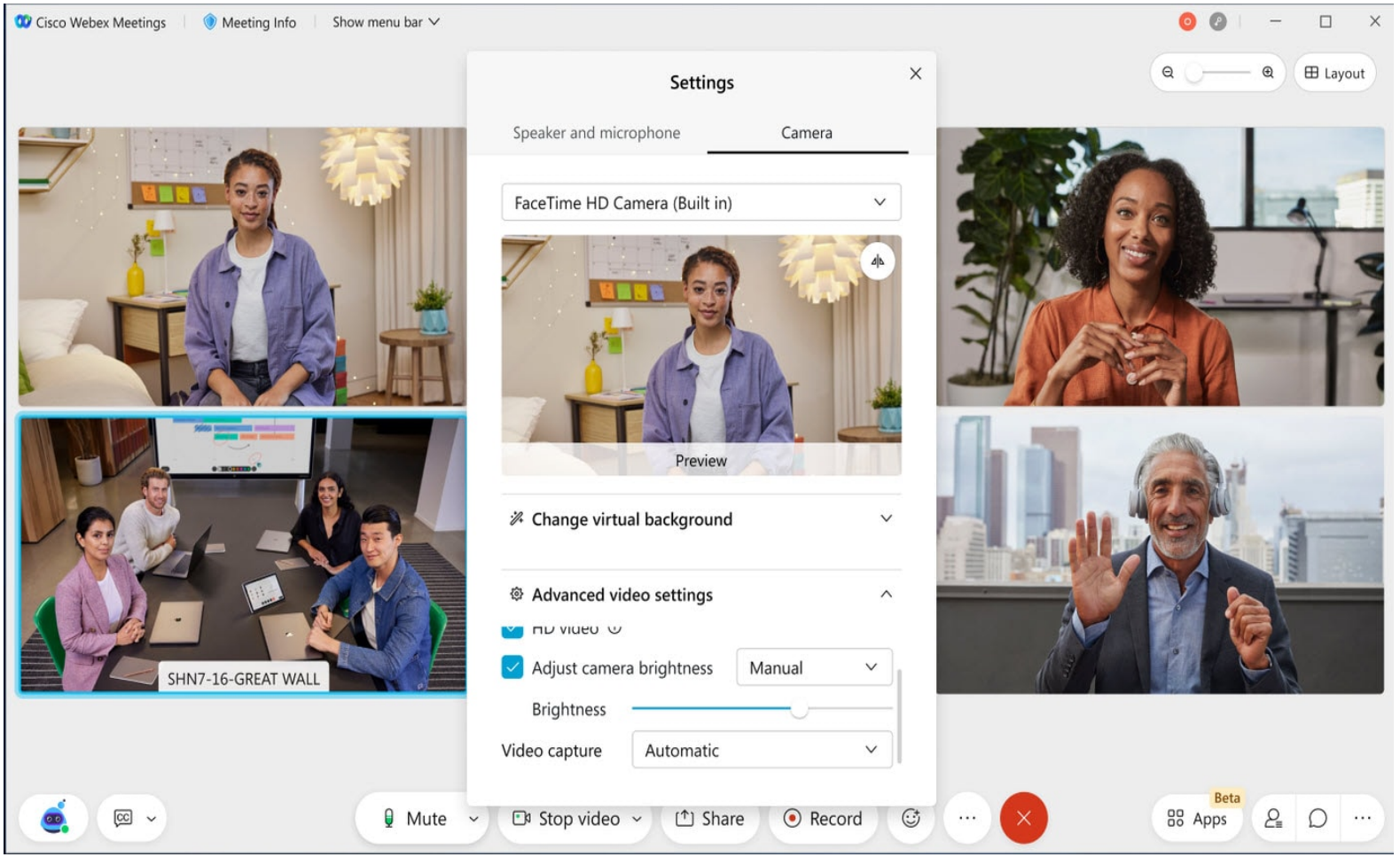
- Subject and attachment of your email: Assignment_No_Name
  - e.g., Assignment_1_Jinzhi_Shan (as the email subject) and Assignment_1_Jinzhi_Shan.pdf (as the email attachment)

S1: Adjust camera brightness

Under the camera settings, there's a new option to adjust the camera brightness. Enable this feature by checking the box to automatically adjust the camera brightness. This can help with low light or other challenging lighting environments. You can also select Manual in the drop-down menu to enable this feature. This enables a slider control, allowing you to manually adjust the camera brightness level to the desired level.

 Source: https://help.webex.com/en-us/article/xcwws1/What's-new-for-the-latest-channel-of-Webex-Meetings

S1: Adjust camera brightness (Cont'd)



 Source: https://help.webex.com/en-us/article/xcwws1/What's-new-for-the-latest-channel-of-Webex-Meetings

S2: Optimize your voice

You can filter out background voices and noises that would normally be picked up by your mic from your voice to create a better and more engaging experience during your meetings and events.

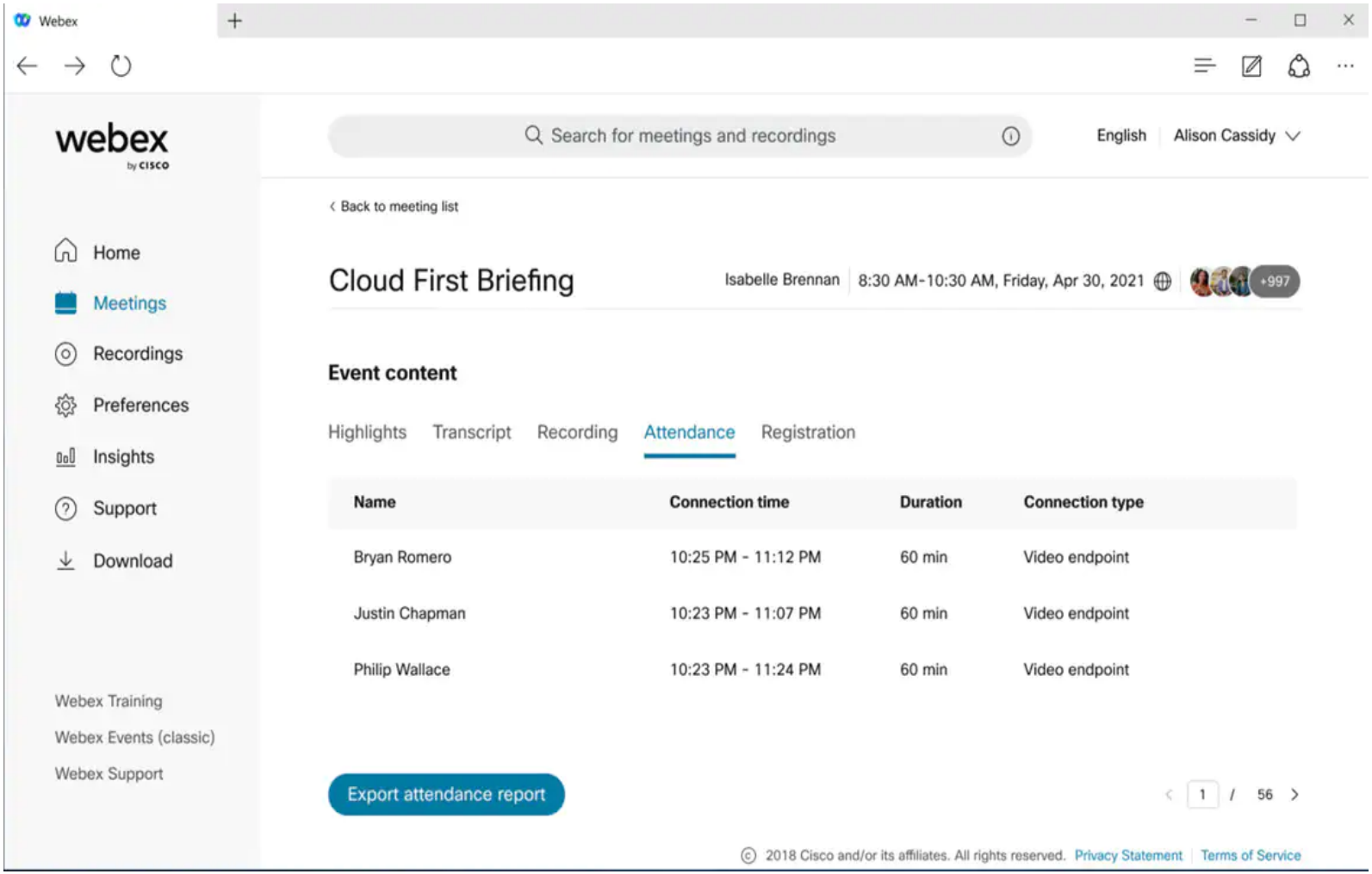
 Source: https://help.webex.com/en-us/article/xcwws1/What's-new-for-the-latest-channel-of-Webex-Meetings

S3: Attendance and registration reports

As a host you have access to meetings and events attendance and registration reports in one place to better understand a meeting or event's turnout. In the Registration report view, you can look up someone's registration. You can choose to view individual registration by clicking on the registrant's name and export reports to a CSV formatted file that is available for both reports.

 Source: https://help.webex.com/en-us/article/xcwws1/What's-new-for-the-latest-channel-of-Webex-Meetings

S3: Attendance and registration reports (Cont'd)



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