Software Engineering I (02161)

Week 8

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DTU Compute
Technical University of Denmark

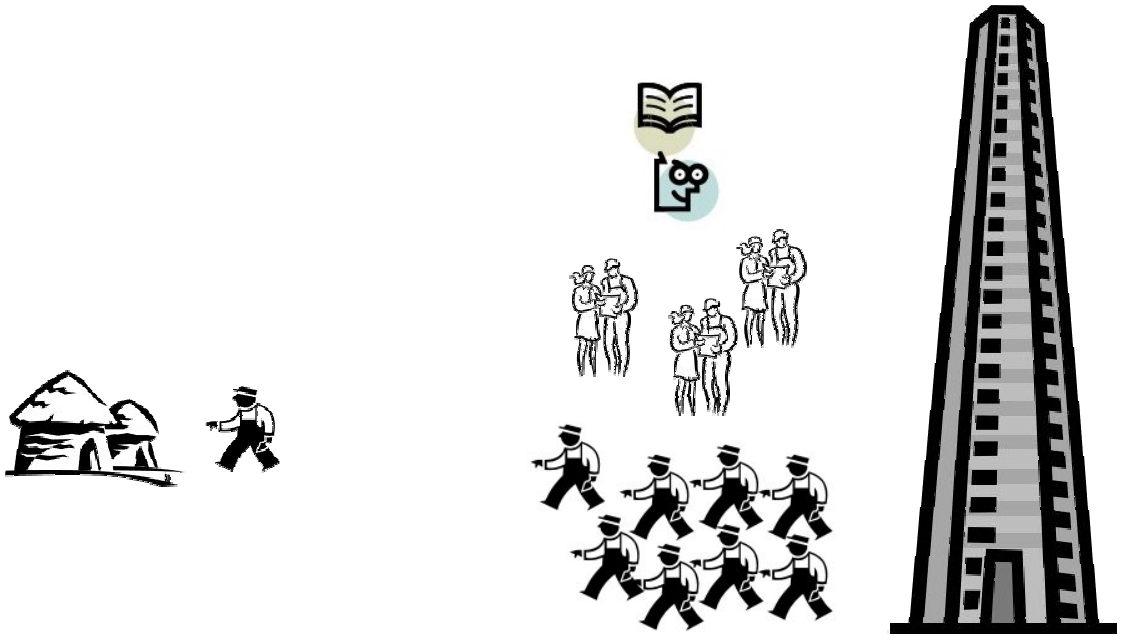
Spring 2015

Last Week

- State machines
- Layered Architecture: GUI
- Layered Architecture: Persistency Layer

Contents

Software Development Challenges



- Challenges of Software Development
  - On **time**
  - In **budget**
  - No **defects**
  - Customer **satisfaction**

Software Development Process

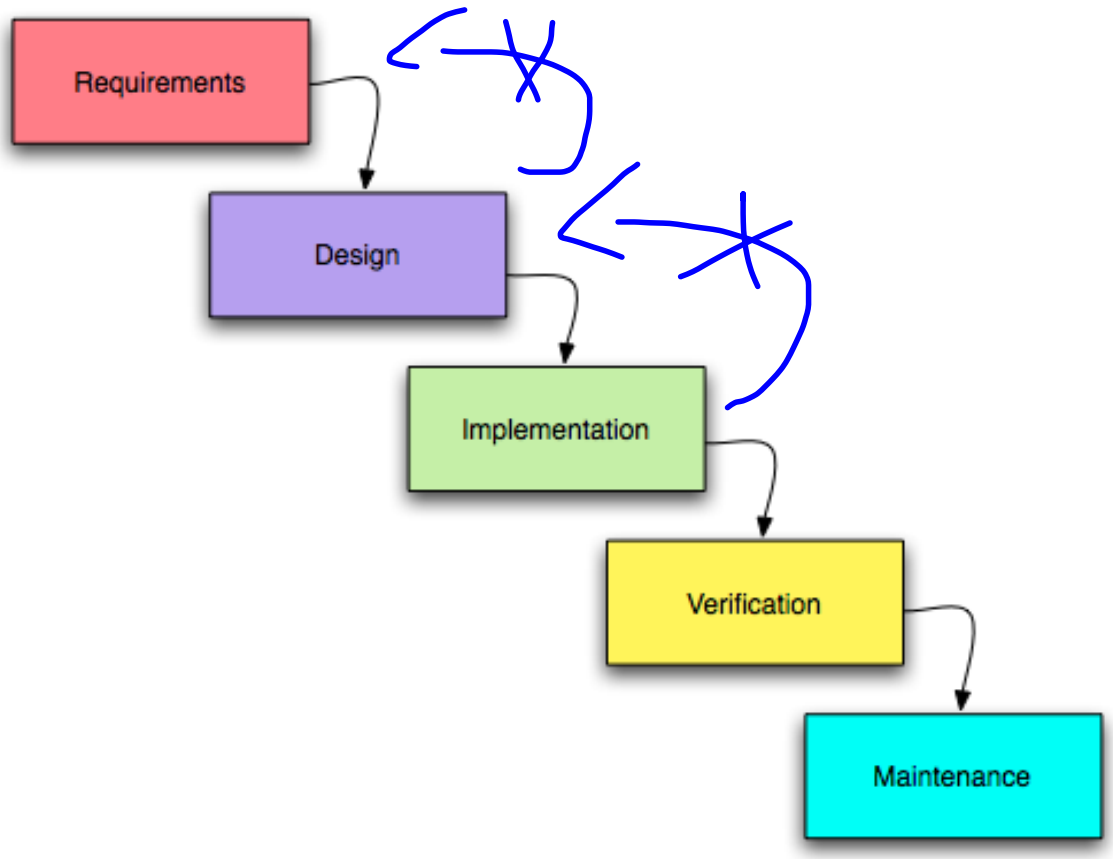
- Activities in Software Development
  - *Understand* and *document* what the customer wants: **Requirements Engineering**
  - *How* to build the software: **Design**
  - *Build* the software: **Implementation**
  - *Validate*: **Testing**, **Verification**, **Evaluation**

→ Set of techniques: Use cases, CRC cards, refactoring, test-driven development, ...

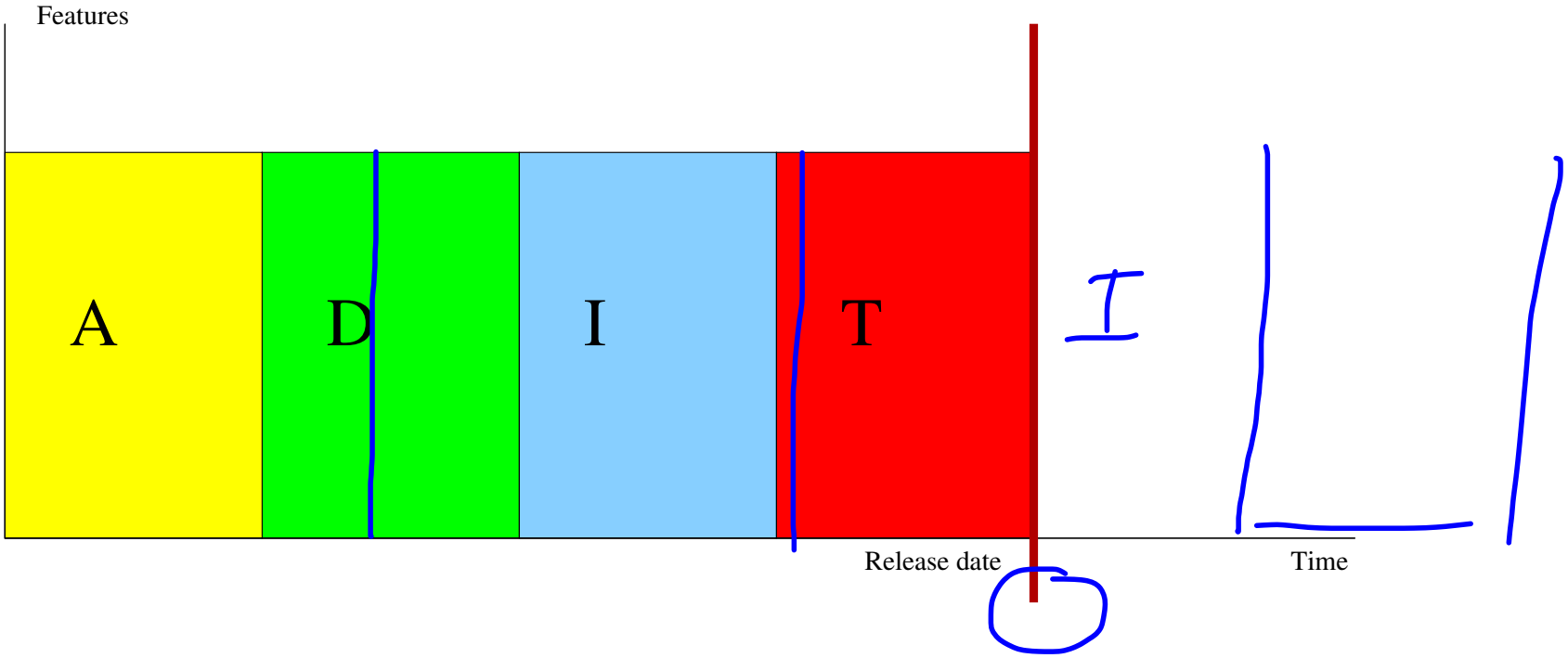
- How to apply the techniques:

→ Different **software development processes**: Waterfall, Iterative processes, agile, lean, ...

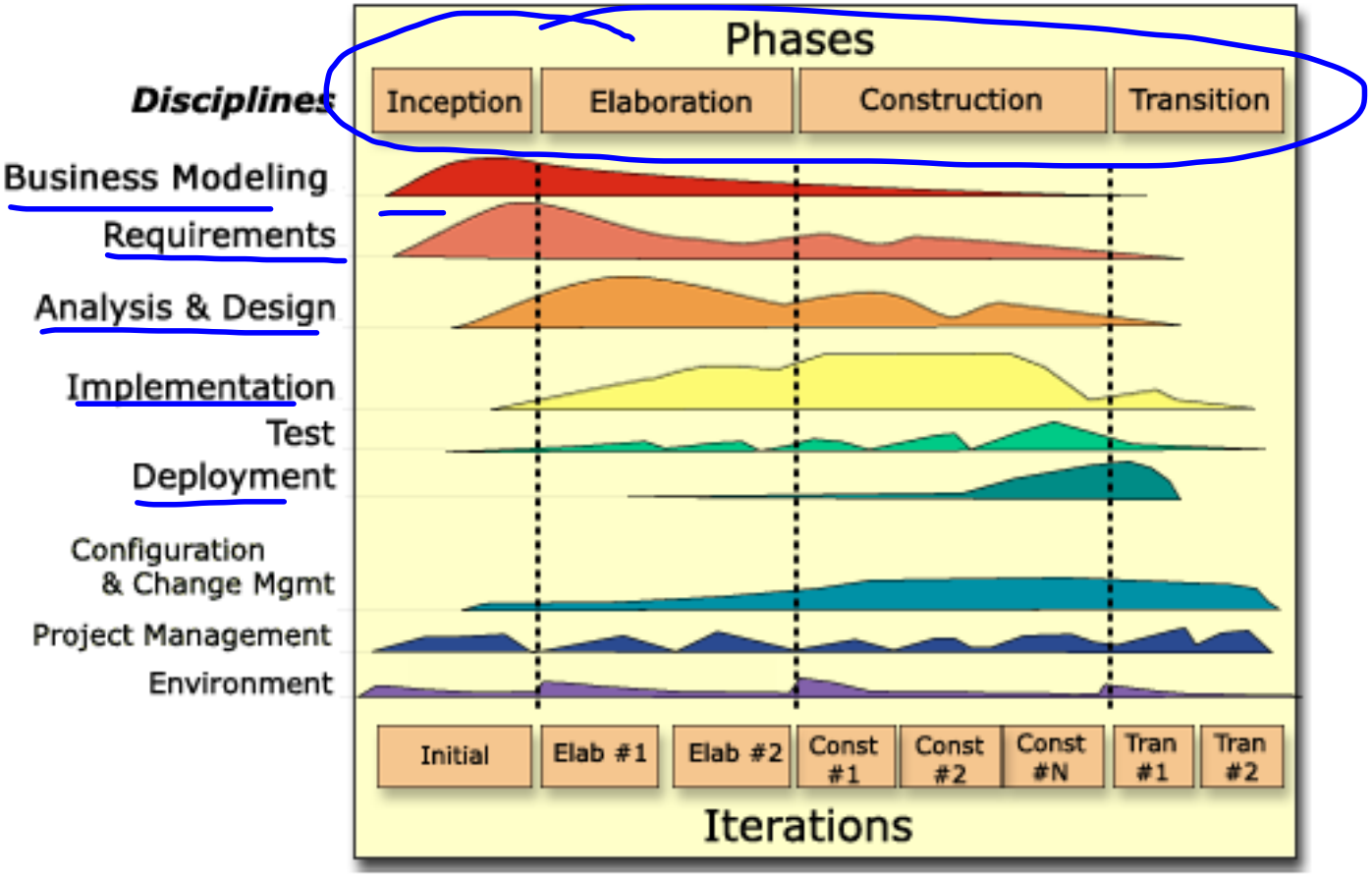
Waterfall process



Delays in waterfall processes



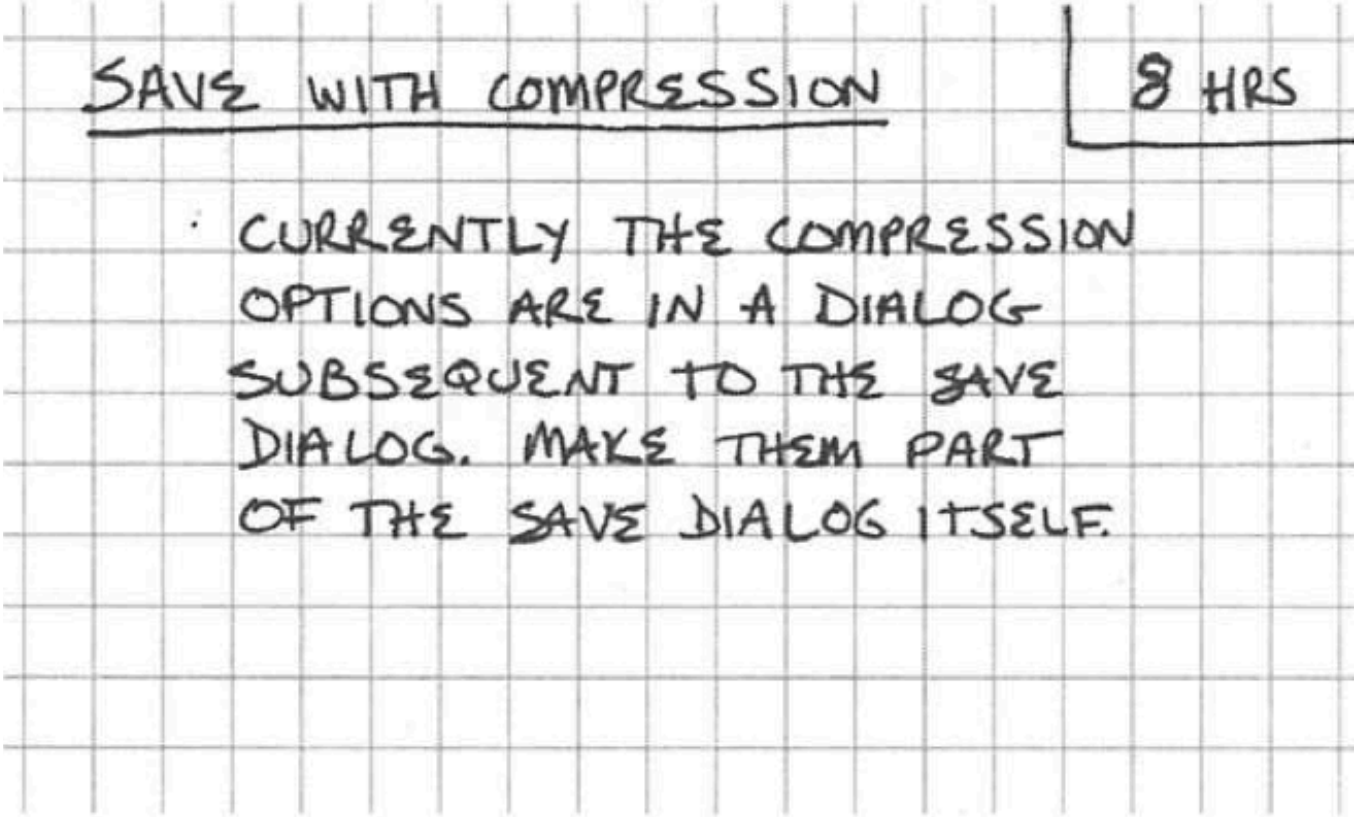
Iterative Processes: E.g. (Rational) Unified Process



Agile processes

- Agile software development methods
  - Extreme Programming
  - Scrum
  - Lean Software Development
  - (Kanban: often seen as a process, but is process improvement tool)
- Common characteristic
  - Short iterations:
    - Each iteration produces a software increment
    - = Small batch sizes
      Ideal batch size: one (single piece flow)
  - Driven by user stories/Backlog items/smallest marketable feature/...
  - Agile Manifesto `http://www.agilemanifesto.org`

Example of a User story card



Kent Beck, Extreme Programming 2nd ed.

- User story card: A contract between the customer and the devloper to talk about the user story

Manifesto for Agile Software Development

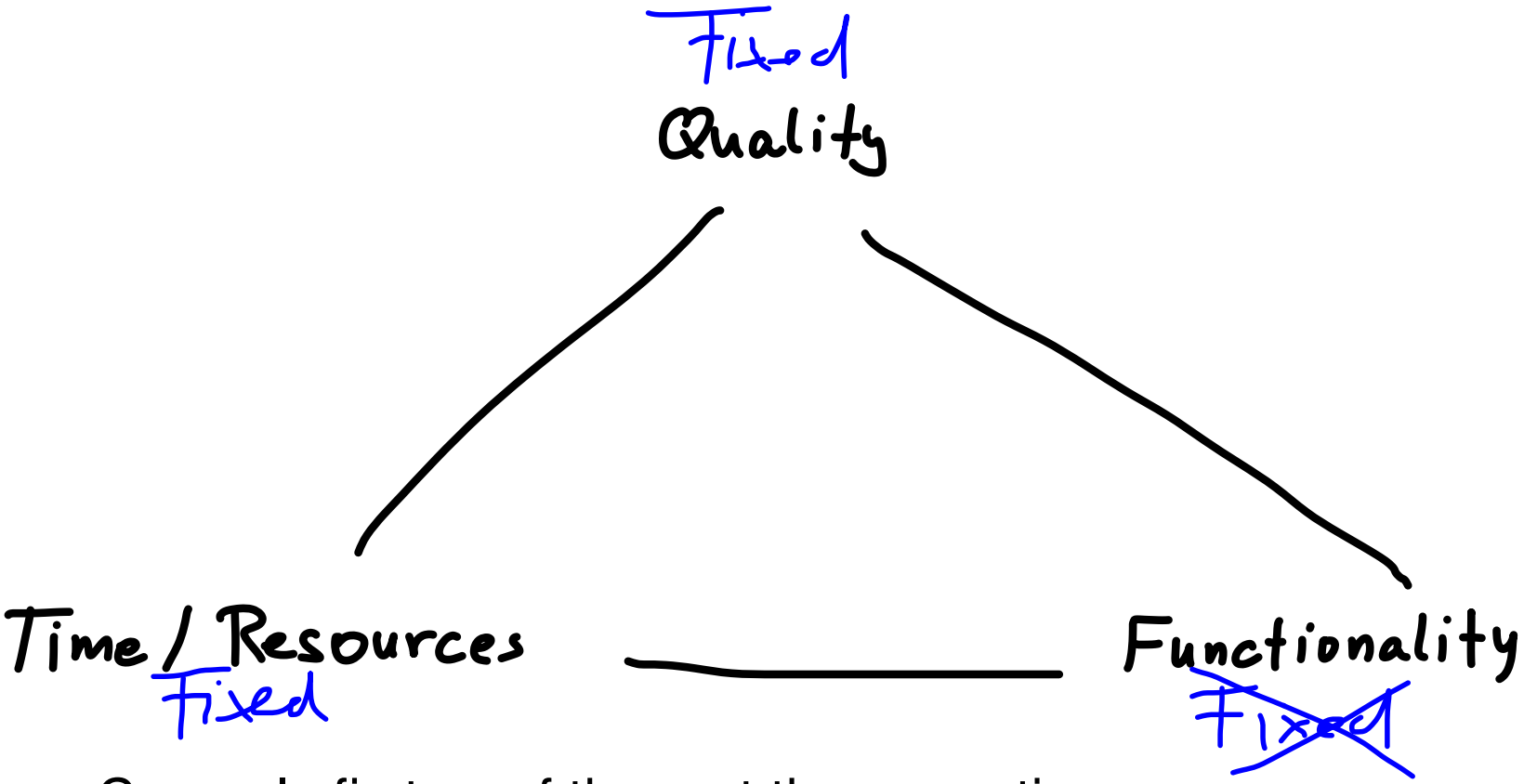
We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

- *Individuals and interactions over processes and tools*
- *Working software over comprehensive documentation*
- *Customer collaboration over contract negotiation*
- *Responding to change over following a plan*

That is, while there is value in the items on the right, we value the items on the left more.

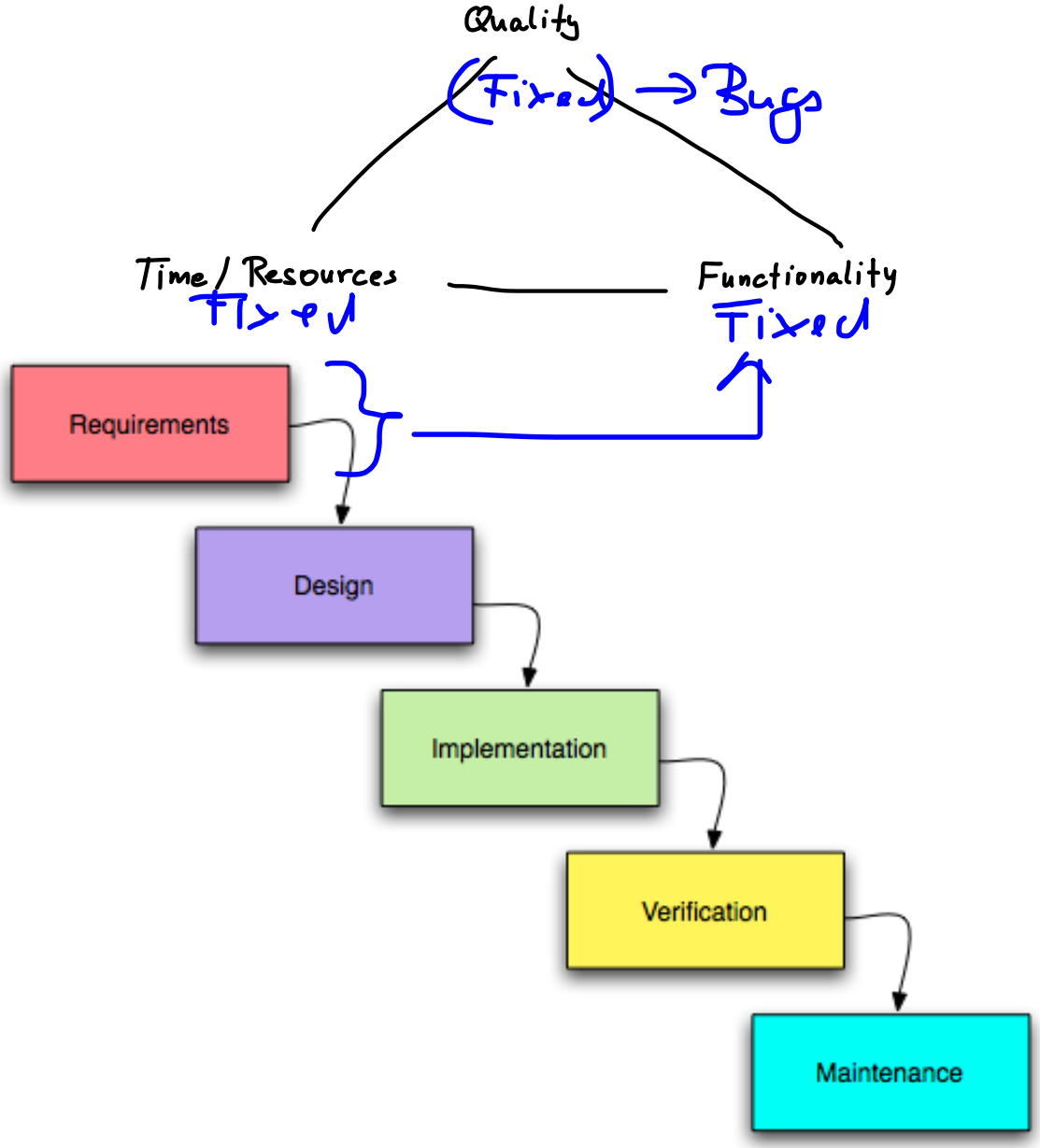
`http://www.agilemanifesto.org`

Resource Triangle

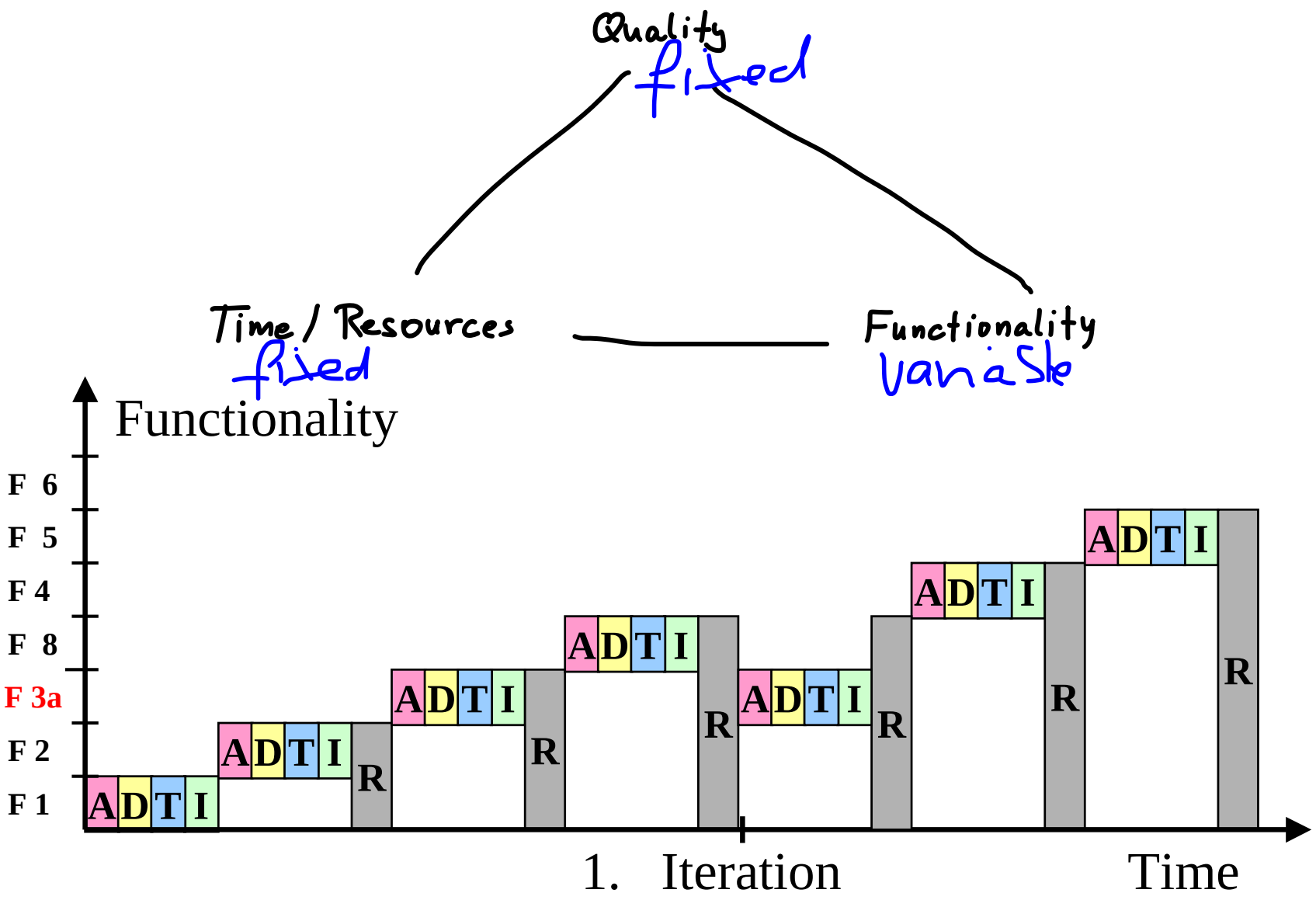


- Can only fix two of them at the same time

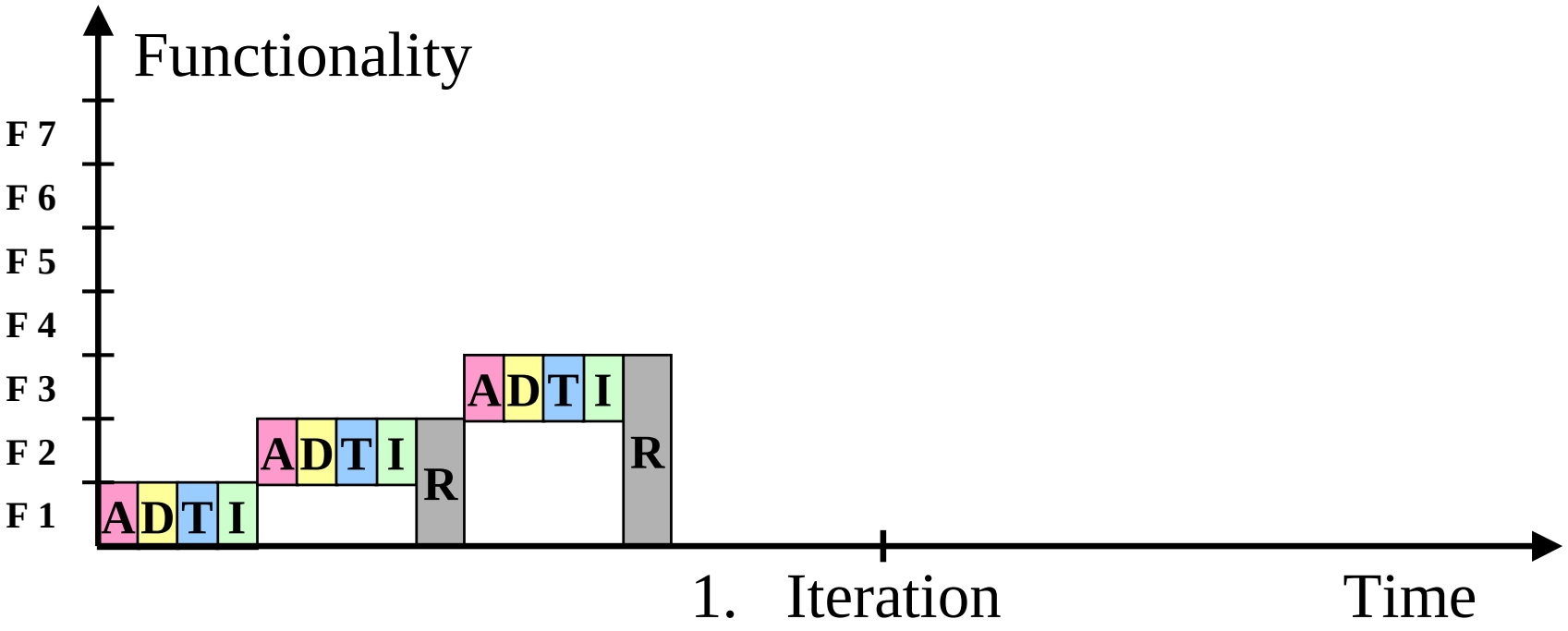
Resource Triangle: Waterfall



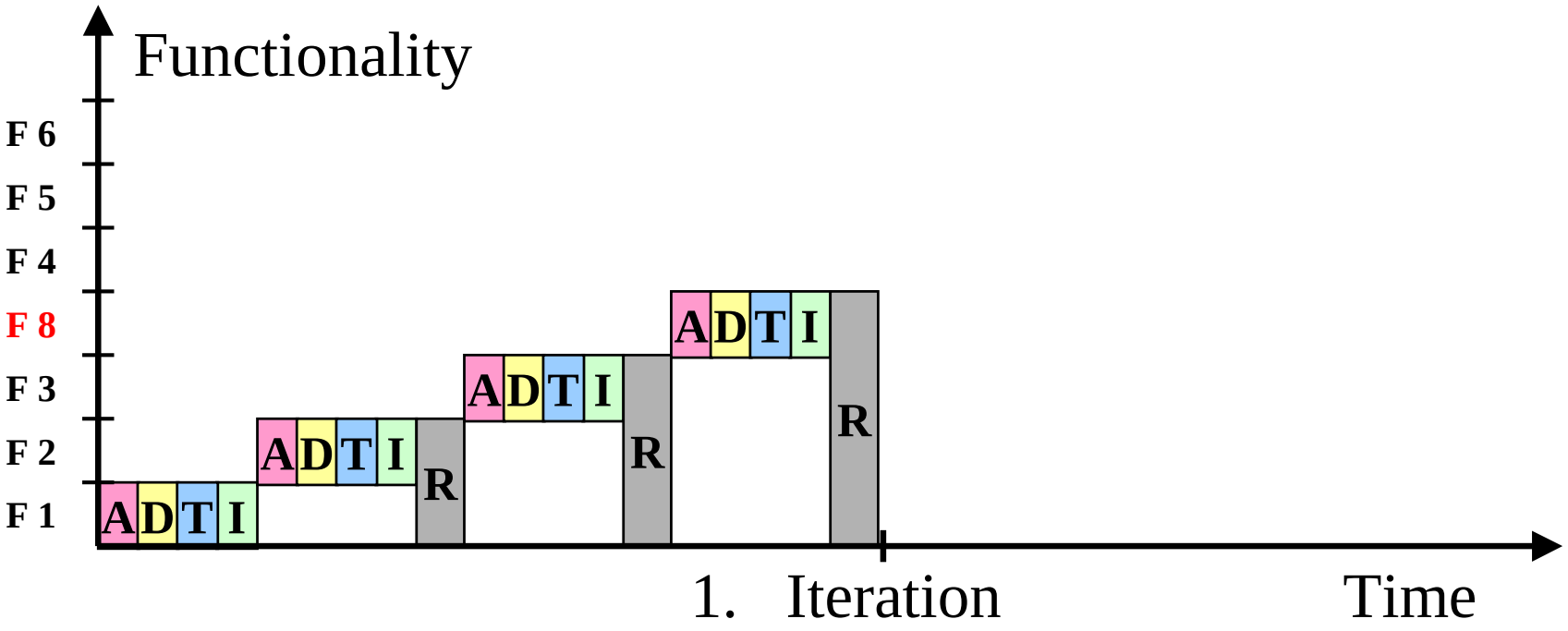
Resource Triangle: Agile



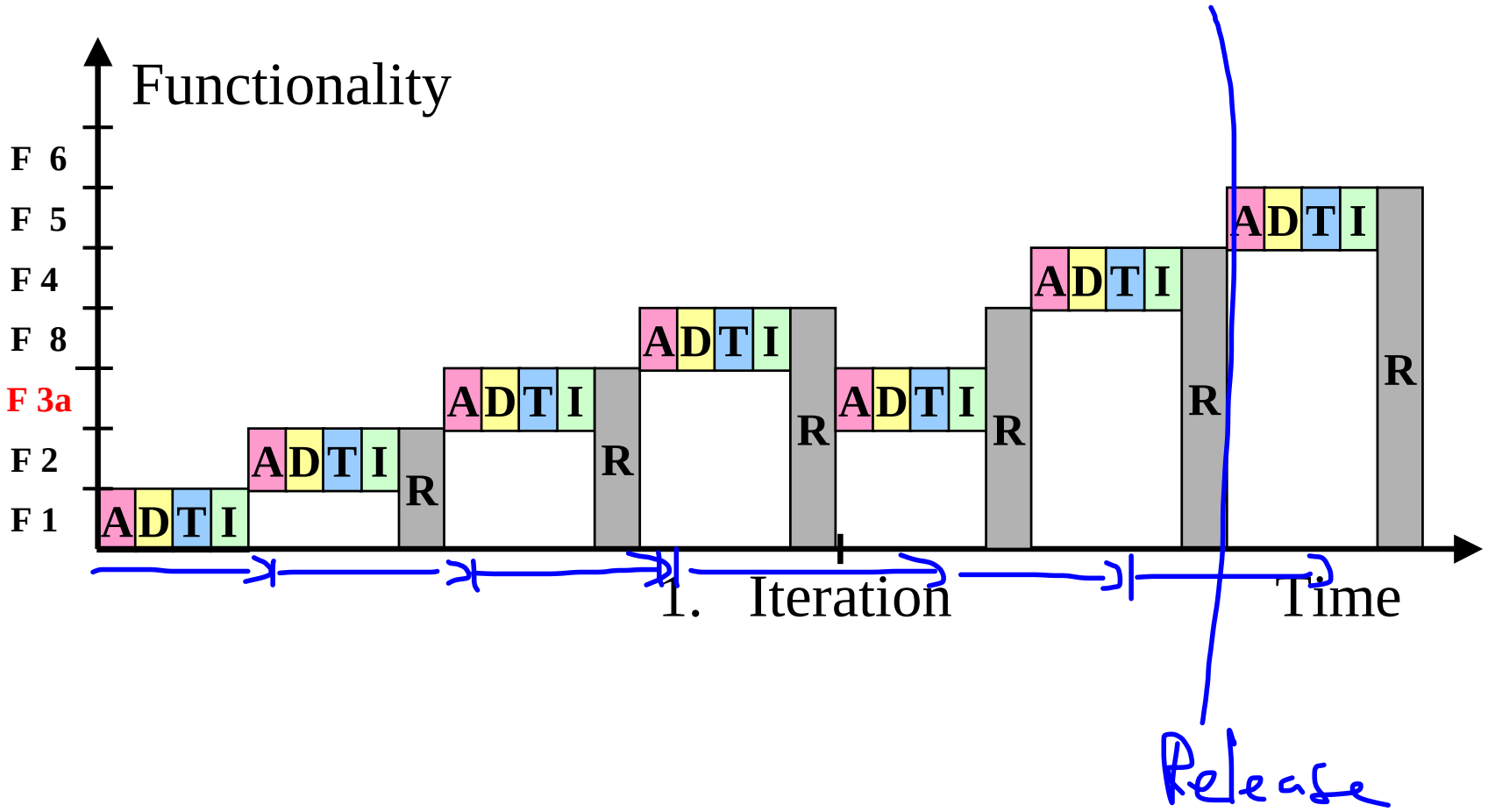
Agile processes and Lean Software Development



Agile processes and Lean Software Development



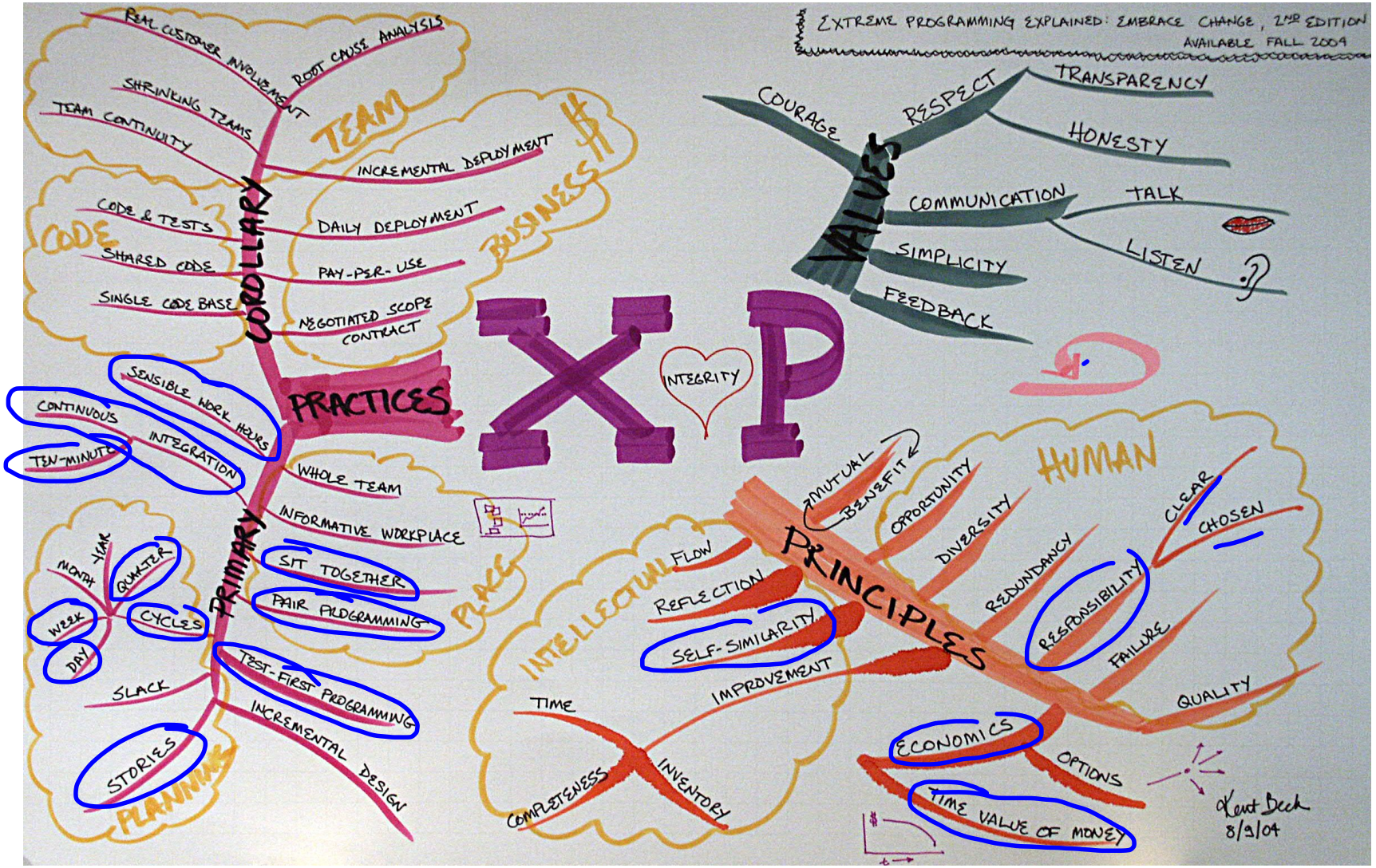
Agile processes and Lean Software Development



Agile Processes and Lean Software Development

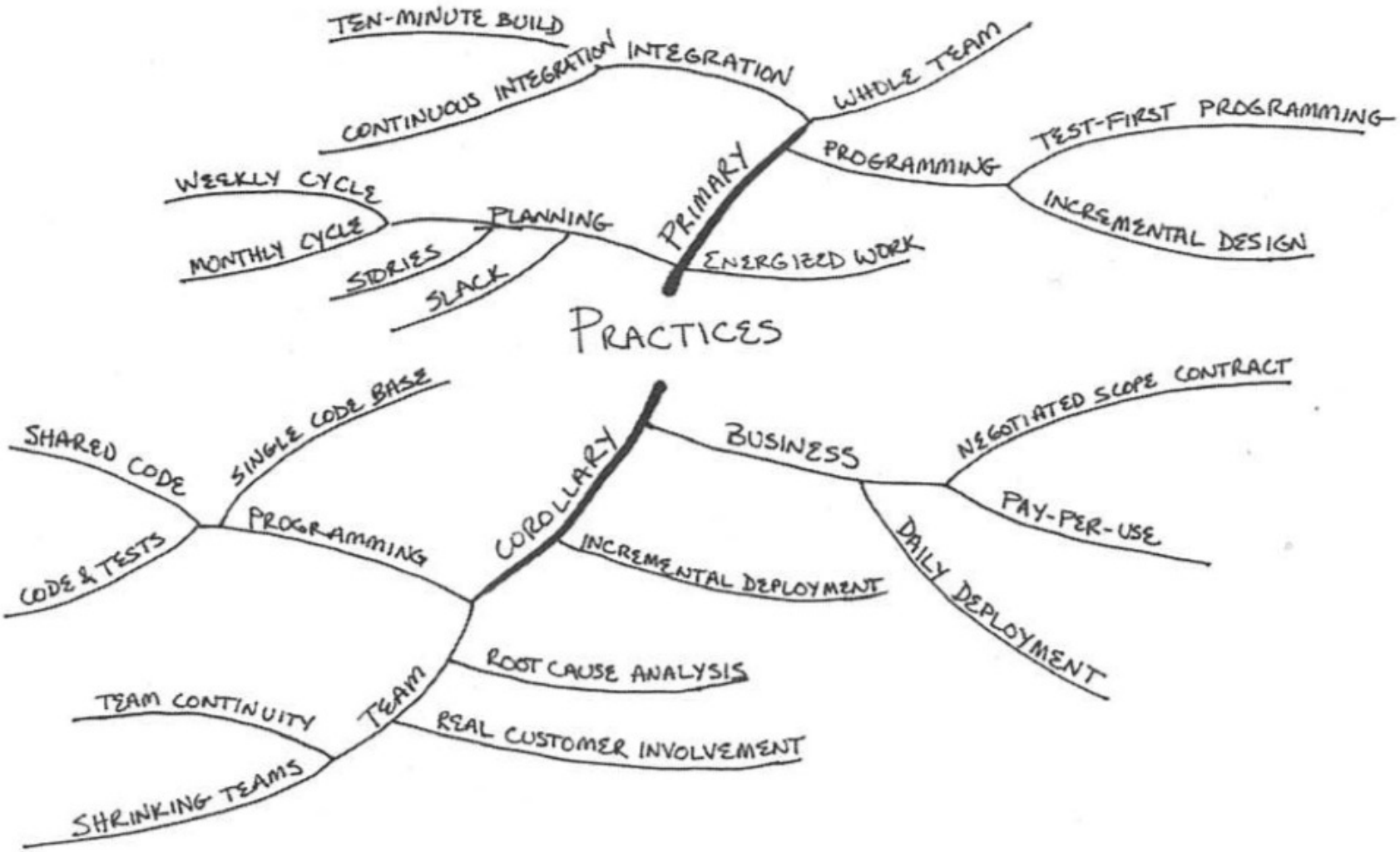
- Agile processes: eXtreme Programming (XP), Scrum, Feature Driven Development (FDD), *Lean Software Development*, (Kanban, Scrumban), . . .
- Common characteristics
  - Short iterations
  - Focus on *marketable features* (Lean/Kanban) / user stories (XP) / product backlog items (Scrum)
  - New, **extreme** practices
  - Applying **values** and **principles** from *Lean Production*

eXtreme Programming (XP)



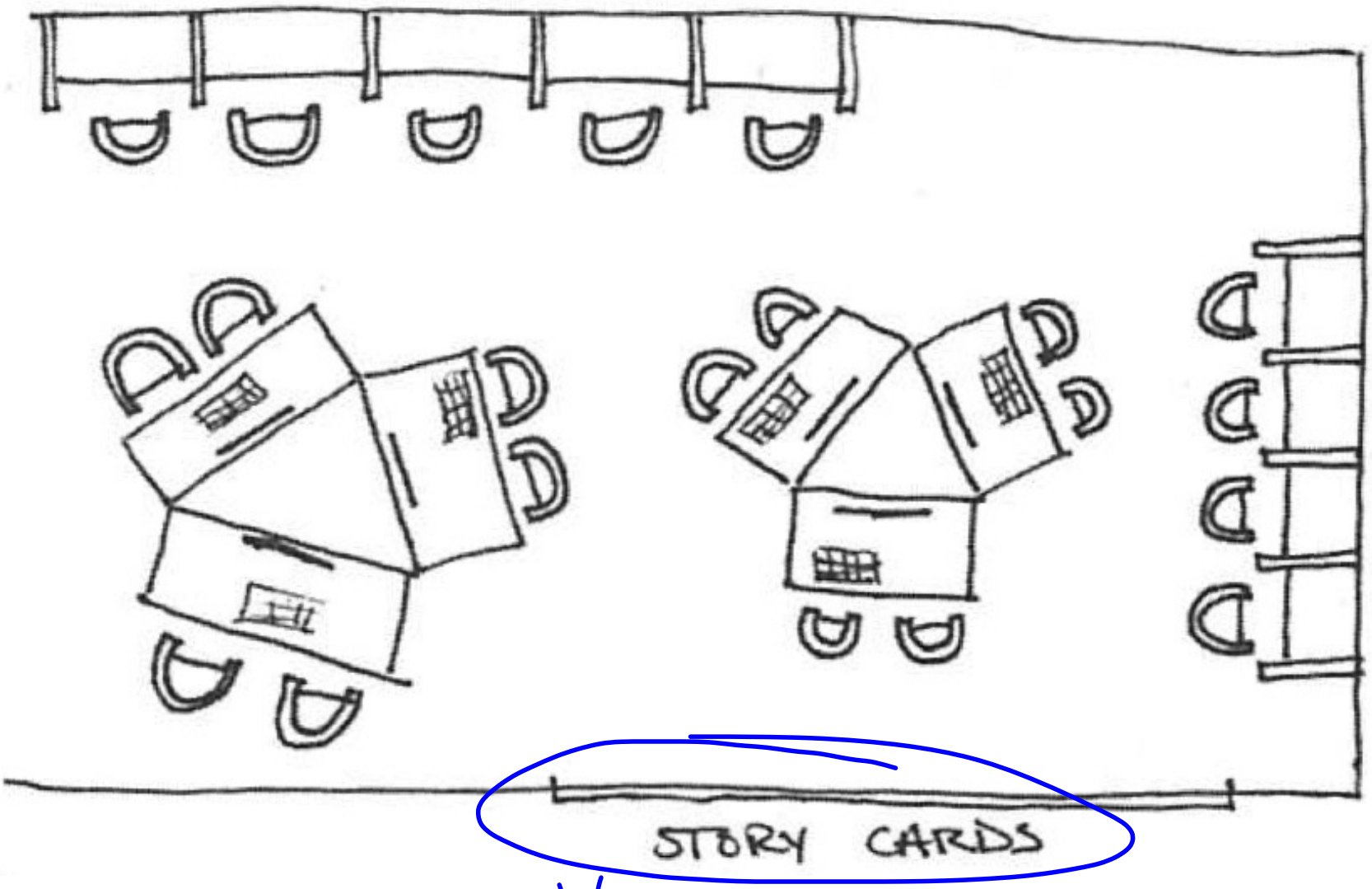
Kent Beck, Extreme Programming 2nd ed.

eXtreme Programming practices



Kent Beck, eXtreme Programming, 2nd edition

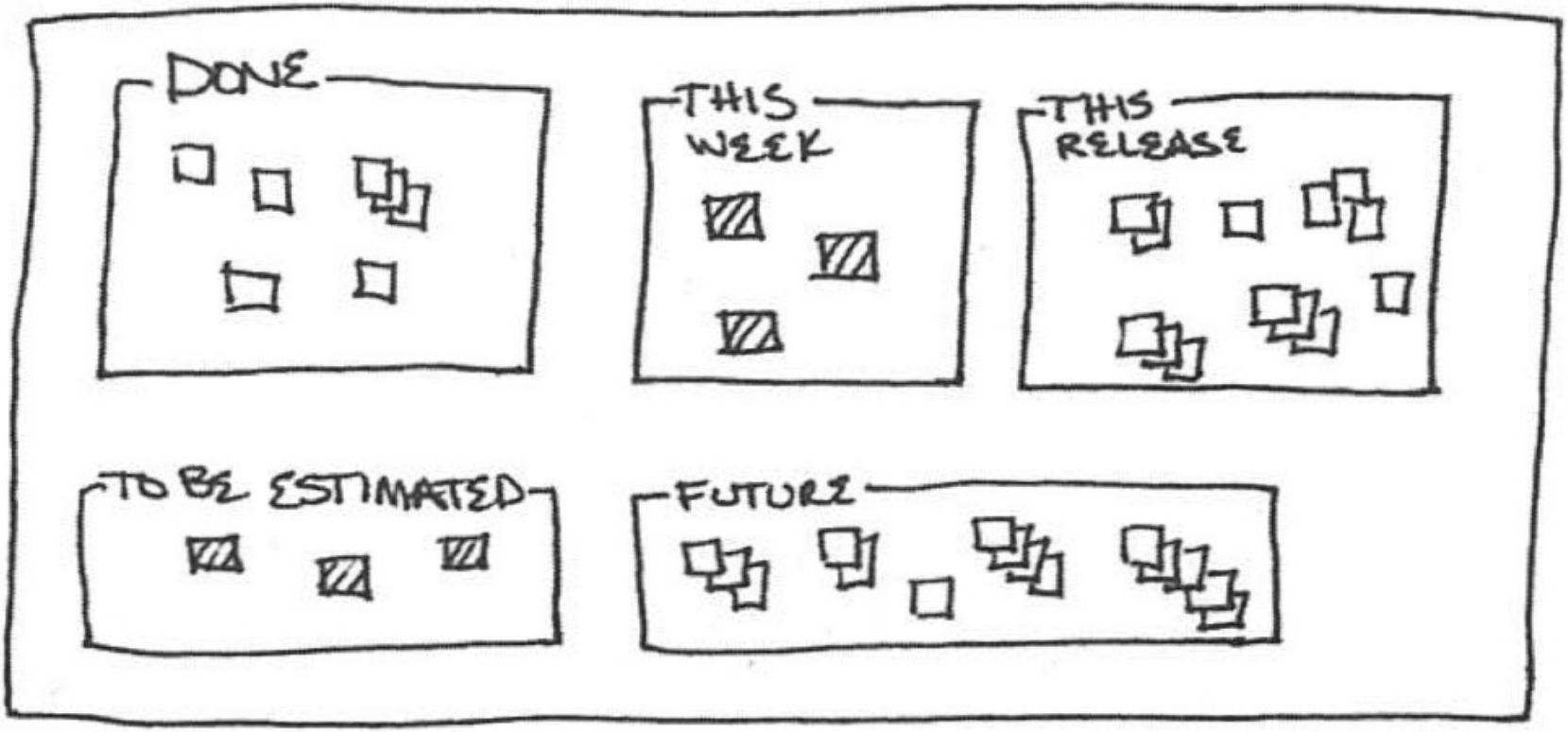
Sit-together



Visual Wall

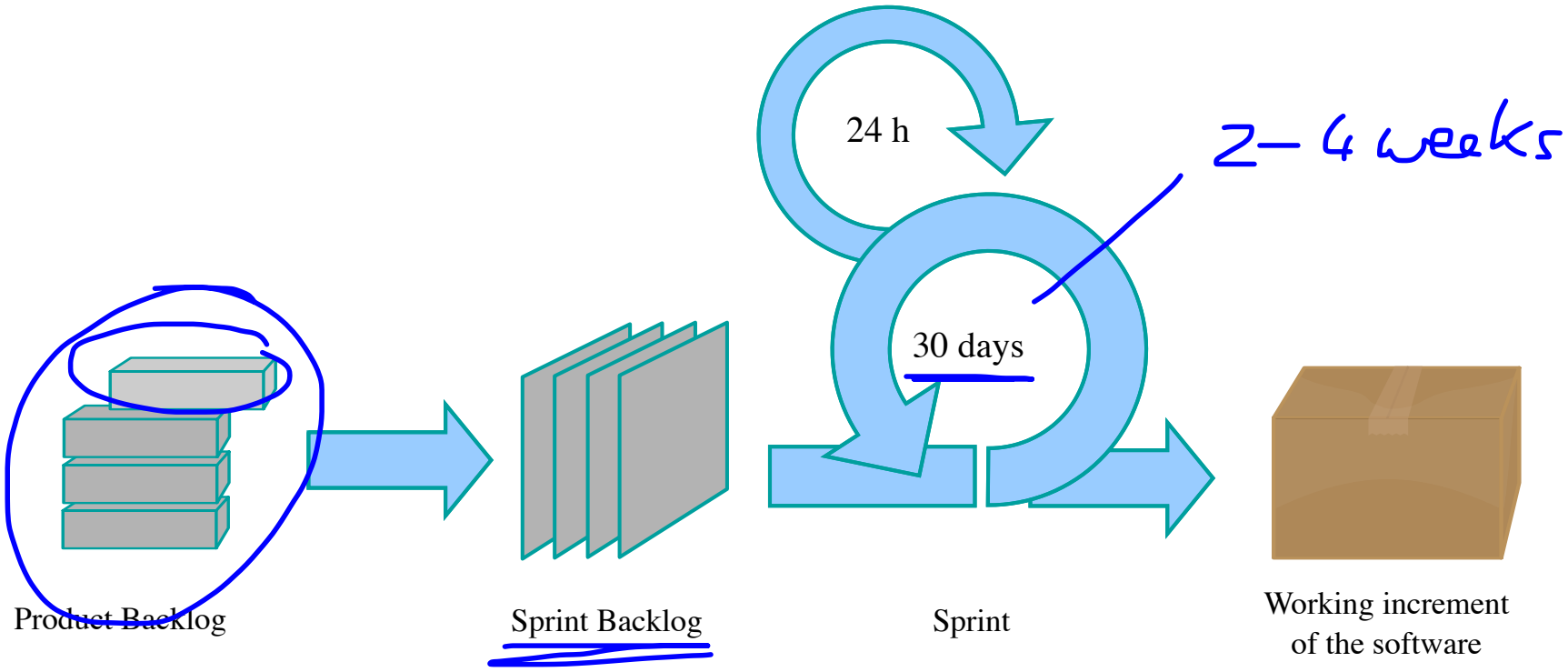
Kent Beck, Extreme Programming 2nd ed.

Visual wall



Kent Beck, Extreme Programming 2nd ed.

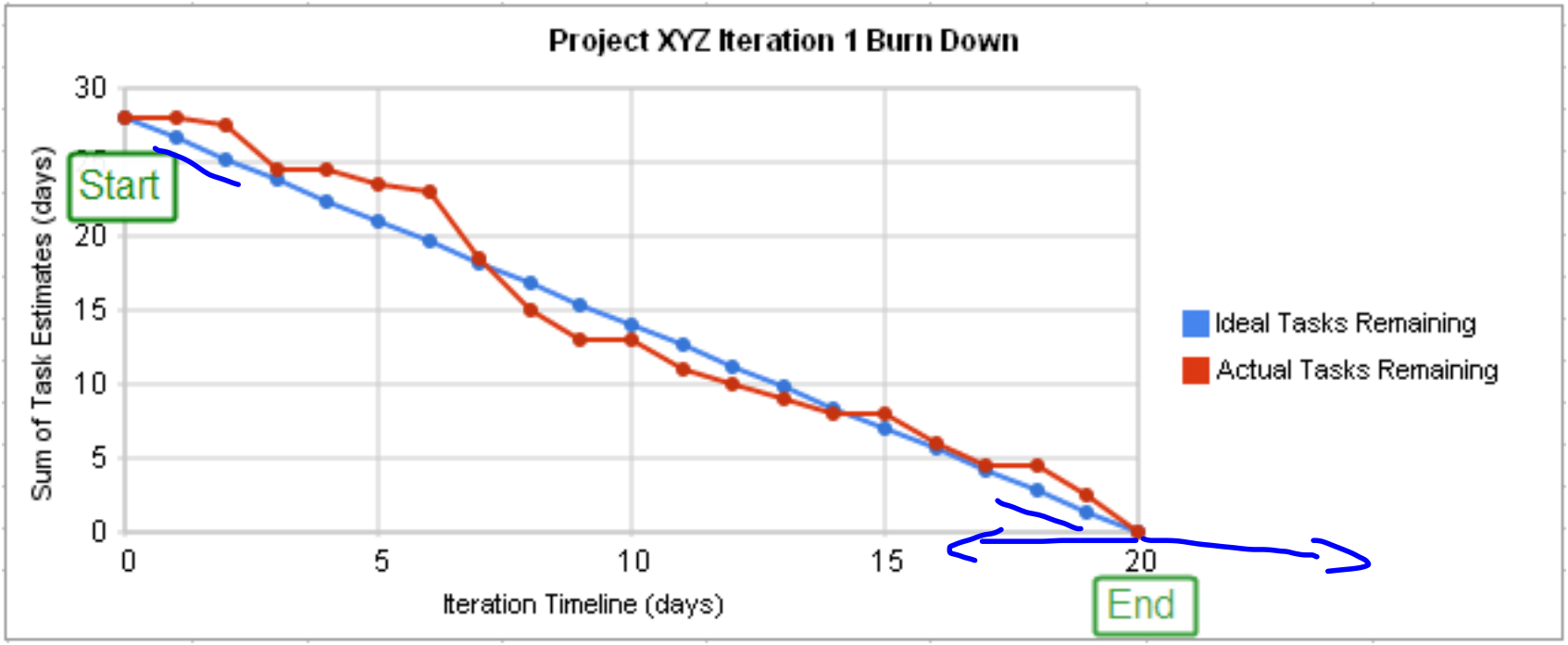
Scrum



Wikipedia

- Robert Martin (Uncle Bob) about "The Land that Scrum Forgot"
  `http://www.youtube.com/watch?v=hG4LH6P8Syk`
  → History about agile methods, the agile manifesto, and Scrum and its relationshop to XP

Burn Down Charts



Wikipedia

Lean Software Development

- Lean Production:
  - Reduce the amount of *waste*
  - Generate *flow*
- Waste: resources used with does not produce value for the customer
  - time needed to fix bugs
  - time to change the system because it does not fit the customers requirements
  - time waiting for approval
  - ...

Cycle time

Cycle time

Time it takes to go through the process one time

$$cycle\_time = \frac{number\_of\_features}{feature\_implemantion\_rate}$$

- Example: Waterfall
  - Batch size = number_of_features in an iteration
  - Software: 250 features, feature_implementation_rate = 5 features/week
  - cycle_time = 250 / 5 = 50 weeks
  - Overall time: 50 weeks

  → 1 cycle

Reducing the cycle time

- Reduce batch size: 1 feature in an iteration
- Software: 250 features, feature_implementation_rate = 5 features/week

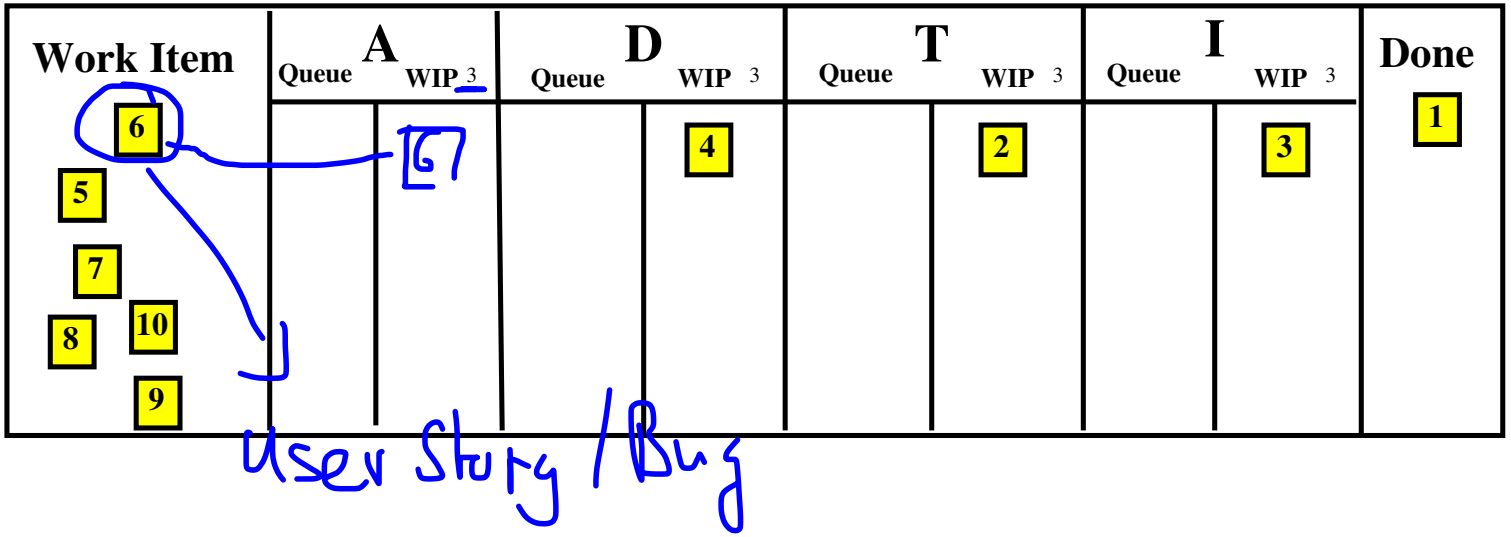
$$cycle\_time = \frac{number\_of\_features}{feature\_implemantion\_rate}$$

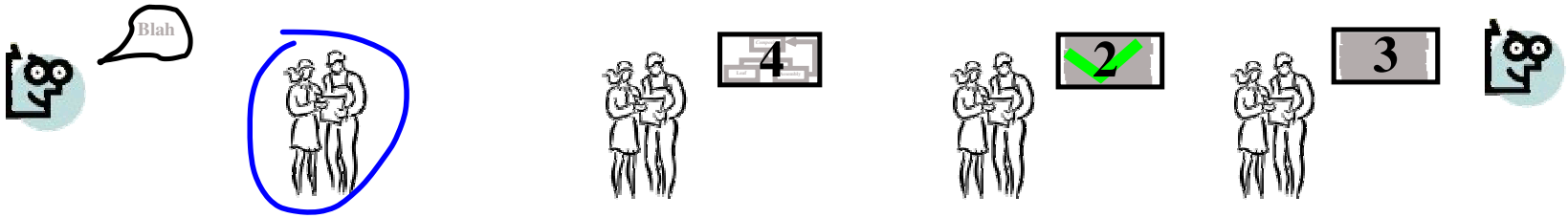
- Agile: cycle_time = 1 / 5 = 8 hours

→ 250 cycles

Generating flow using Pull and Kanban

WIP = Work in Progress Limit





Flow through Pull with Kanban

- Process controlling: local rules
- Load balancing: Kanban cards and *Work in Progress (WIP) limits*
- Integration in other processes: e.g. Scrum + Kanban = Scrumban

Figure from David Anderson `www.agilemanagement.net`

Online Tool

- `www.targetprocess.com`: Electronic Kanban board useful for your project

Week 8—13

Implementation process

1. Choose a set of user stories to implement
1. Select the user story with the highest priority
   a) Create the acceptance test for the story in JUnit
   b) Implment the user story test-driven, creating additional tests as necessary and **guided** by your design
      - → based on the classes, attributes, and methods of the model
      - → implement **only** the classes, attributes, and methods needed to implement the user story
      - → Criteria: 100% code coverage based on the tests you have

   c) → Refactor system = Design
3. Repeat step 2 with the user story with the next highest priority

Contents

What is version control

Version Control

- Stores and mangages versions of documents (e.g. .java files)
- Manages concurrent work on documents
- Manages different software release versions
- Various systems: Concurrent Versions System (CVS), Apache Subversion (SVN), Git, Team Foundation Server (TFS) ...

CVS

- Concurrent Versions System
- One central repository
- Command line tools, IDE support
- Files have a tree of versions: branching
- Release: File versions having same *tag*
- Versions: **diffs** (differences) to previous versions

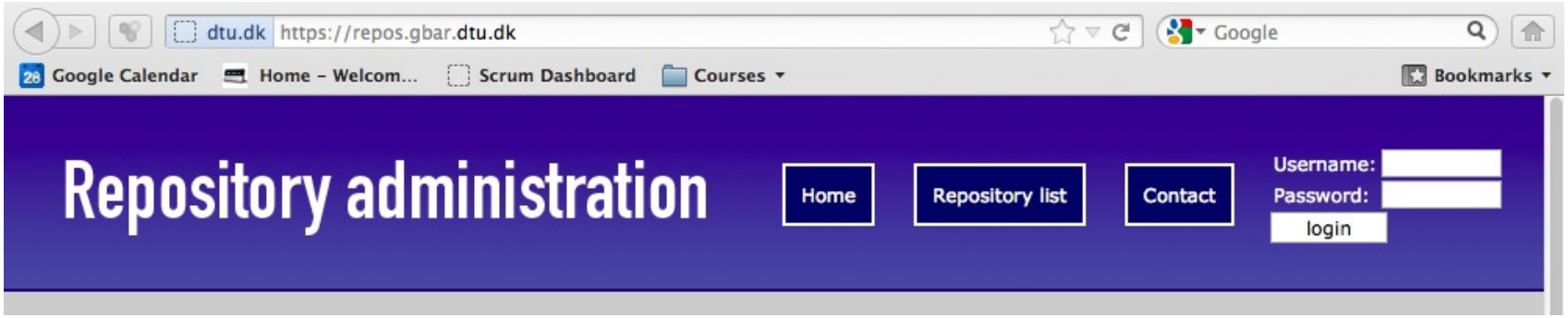
↳ diff command (Unix)

Use cases of CVS

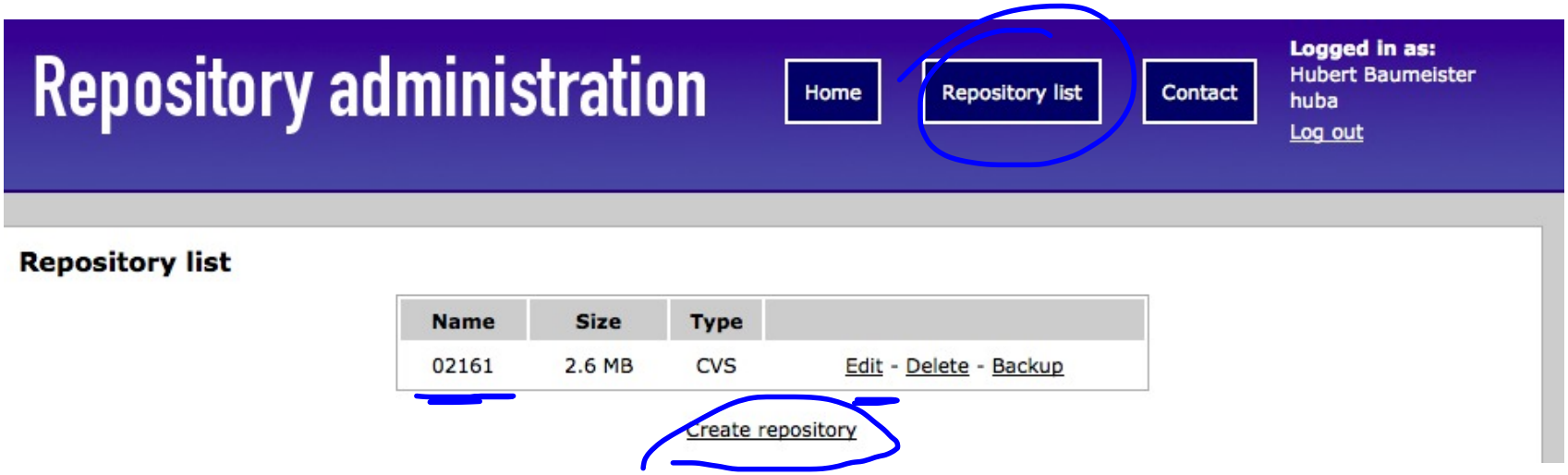
- Creating a repository
- Creating a project
- Checking out a project
- Updating a project
- Committing changes
- Tagging versions
- Branching versions
- Merging branches

Creating a repository

`http://repos.gbar.dtu.dk`



Creating a repository



Creating a repository

Field:	Value
Rename repository: Alphanumeric characters and underscore.	02161
Options	Anonymous read-only access (disabled): ☐
Checkout	:pserver:USERNAME@cvs.gbar.dtu.dk:/home/cvs/huba/02161 Please note that you need to add a user to the repository before you check it out!
Current users:	No users yet! [Add new user]
	Update Repository

Creating a repository

Edit repository

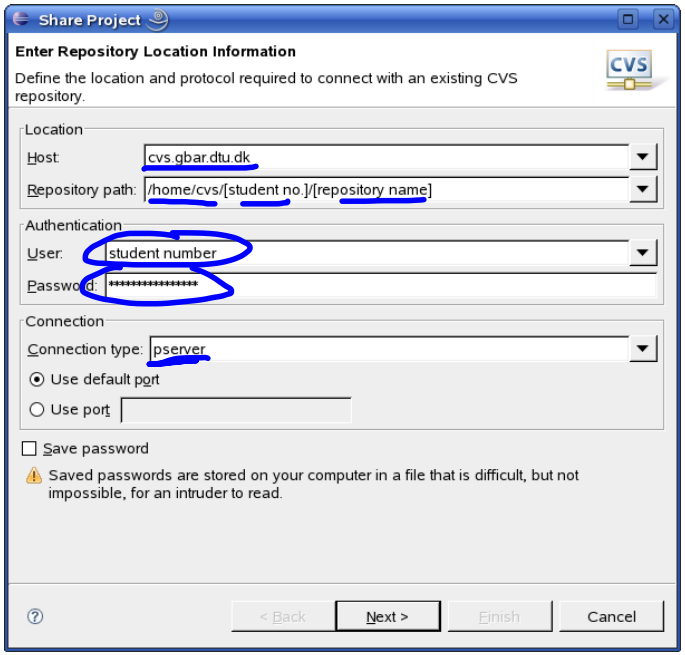
Field:	Value
User name:	
New password:	
Confirm new password:	
	Add user

Back

Create a project and *share* it

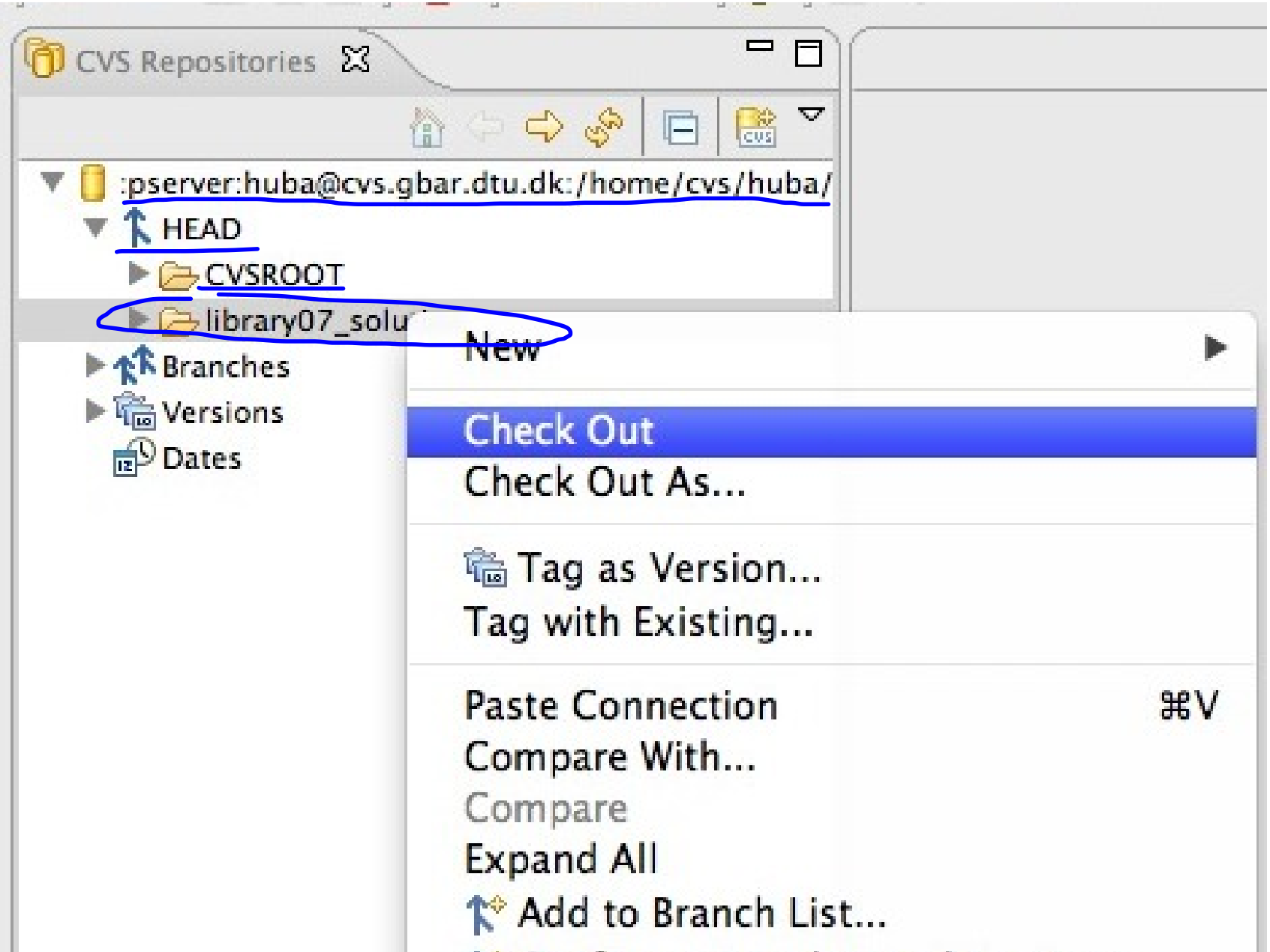
Eclipse

- Menu: Team→share project and `create a new repository location`

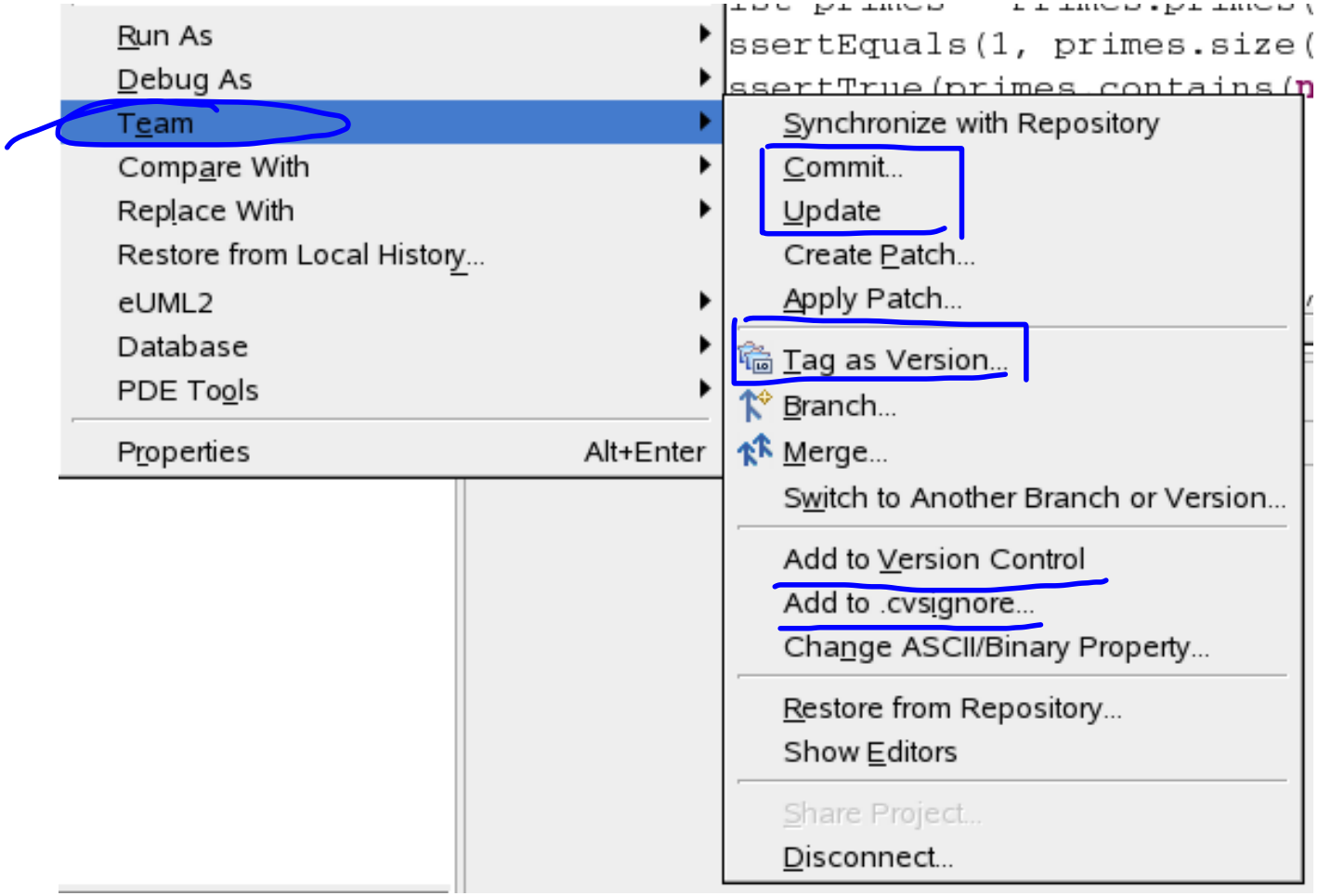


Checking out a project

- CVS Repository Exploring perspective



Package Explorer Team Menu Project



Steps in Developing a Program using CVS

1. Create Repository
2. Create a project and *share* the project
3. For all the programming tasks in an **iteration**
   - 3.1 Run tests; Update project; run tests; fix tests
   - 3.2 Work on the implementation so that all tests run
   - 3.3 Commit your changes
     - 3.3.1 *Update* the project; run tests
     - 3.3.2 *Fix* all compile time errors and all **broken** tests;
     - 3.3.3 *Commit* your changes
4. *Tag* you files for major **project milestones**

Important: Commit only if all tests pass

Others check out project

Committing changes

- Fails if someone else committed the file before
- If fail $\rightarrow$ update, merge, commit

Update a project

- Gets newest version of the file
- If conflicts
  - → *text* files are **merged**
  - → other files are **overwritten**
    - based on **lines**
    - successful merge
    - unsuccessful merge

Unsuccessful merge

- **Same** lines have been changed

```
    public Address() {
        // TODO Auto-generated constructor stub
    }
<<<<<<< Address.java
    public String getStrasse() {  // Local change
=======
    public String getGade() { // Committed change
>>>>>>> 1.2
        return street;
    }
```

Package Explorer Compare With Menu

Compare result: Compare with latest from HEAD

Address.java | Address.java

Java Structure Compare

- Compilation Unit
  - Address
    - getGade()
    - getStrasse()

Java Source Compare

Local File 1.2

```
    }

    public Address() {
        // TODO Auto-generated constructor stub
    }

    public String getStrasse() {  // Local change
        return street;
    }

    public int getPostnumber() {
        return postNumber;
    }
```

Remote File 1.2

```
    public Address() {
        // TODO Auto-generated constructor stub
    }

    public String getGade() { // Committed change
        return street;
    }

    public int getPostnumber() {
        return postNumber;
    }
```

Next Week

- Project planning (traditional and agile)
- Refactoring
- (Design Patterns)