L09 Architecture

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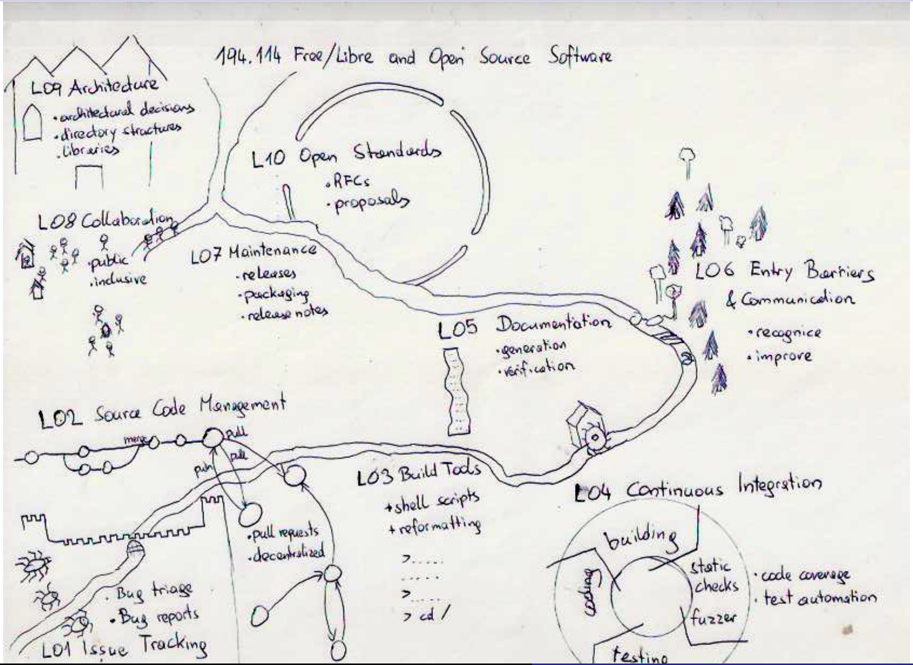
Directory Structure

1. Directory Structure
2. Software Architecture
3. Architectural Decisions
4. Meeting
   - Preview

Learning Outcomes

After successful completion of L09 Architecture students will be able to

- reproduce chosen FLOSS software architectures.


194.114 Free/Libre and Open Source Software
L09 Architecture
·architectural decisions
·directory structures
·libraries
L10 Open Standards
·RFCs
·proposals
L08 Collaboration
·public
·inclusive
L07 Maintenance
·releases
·packaging
·release notes
L06 Entry Barriers & Communication
·recognice
·improve
L05 Documentation
·generation
·verification
L02 Source Code Management
merge
pull
pull
push
·pull requests
·decentralized
L03 Build Tools
+shell scripts
+reformatting
>.....
.....
>.....
> cd /
L04 Continuous Integration
building
static checks
fuzzer
testing
coding
·code coverage
·test automation
·Bug triage
·Bug reports
L01 Issue Tracking

Overviewability

- complementary to traceability
  (i.e. trace from requirements/documentation/issues to affected code and back)
- measurement how long a newcomer needs to find her/his way
- answers: “Where to add new functionality?”
- in FLOSS directory structure in repository essential (= physical view)

Grouping of Files

- by programming language
- by topics (tests, src, doc)
- by modules/plugins

Metadata of Files and Directories

- README.md
- file name endings
- LICENSES and `.license`
- `scripts` vs. `src` (executable bits)

Cleanup

- top-level
- main folders
- file names
- automatic formatting (encodings and line endings)
- reduce dependencies between folders

But also stop worrying if needed by convention.

Logical Views

- Documentation Generators (“Files” in Doxygen is physical view)
- Building Block View (may be identical to physical)
- Runtime View
- Deployment View

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Software Architecture

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Software Architecture

- architecture is a high-level description of the overall system
- use ready-made patterns and templates for architecture
- e.g., `http://arc42.org/`

Arc42

1. Introduction and Goals
2. Constraints
3. Context and Scope
4. Solution Strategy
5. Building Block View
6. Runtime View
7. Deployment View
8. Crosscutting Concepts
9. Architectural Decisions [1]
10. Quality Requirements
11. Risks and Technical Debt
12. Glossary

Example

Crosscutting concept “configuration settings”:

- are stored in configuration files
- in data structure KeySet
- modified by configuration management tool using KeySet

more about it in course “configuration management”

Roles

In FLOSS usually nobody is project manager
→ but everyone is software architect

Goals

The most important tasks of software architects are

- to pursue the right goals
- to have good documentation (e.g. with arc42)
- to keep everything as simple as possible
- to communicate the architecture
- maintain community and quality

Refactoring

- build what community needs at the moment
- change according to current needs
- avoid over-engineering, refactor to KISS

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Architectural Decisions

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Architectural Decisions

- describe decisions that lead to the architecture
- decisions are high-level configuration
- patterns/templates are useful [1], e.g.:

Template

1. problem
2. constraints
3. assumptions
4. considered alternatives
5. decision
6. rationale
7. implications
8. related
9. notes

Example: API Design

- future-proof
- hard to use it wrong vs. easy to use
- consistent concepts, e.g. for resources
- minimal vs. comfort

Example: Libraries vs. Daemons

- both foster reuse of code
- daemon better if there is dynamic state
- but: daemon creates a single point of failure (KISS)

Dangers

> *Insanity in individuals is something rare – but in groups, parties, nations, and epochs, it is the rule. – Friedrich Nietzsche*

In groups you get confronted with the whole spectrum of psychology:

- Groupthink (conformity)
- Group polarization

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Meeting

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L10 Open Standards

[1] Neil B Harrison, Paris Avgeriou, and Uwe Zdun. Using patterns to capture architectural decisions. *Software, IEEE*, 24(4):38–45, 2007. ISSN 0740-7459. doi: 10.1109/MS.2007.124.