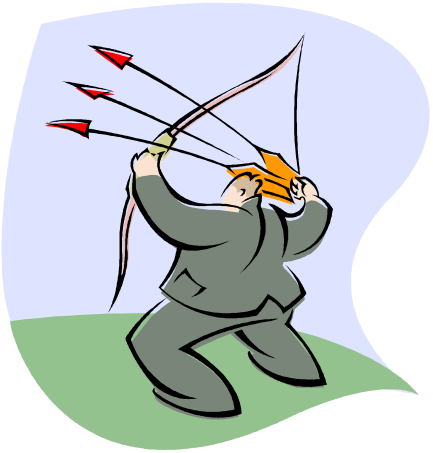
Software Engineering
Tools and Practices

Course Outcomes – why you are taking this class

- Become familiar with the **practices** used by Software Engineers for creating software applications
- Become familiar with the various modern **tools** used by Software Engineers for creating applications

- So that you can get a job and work in a team

What are Software *practices?*

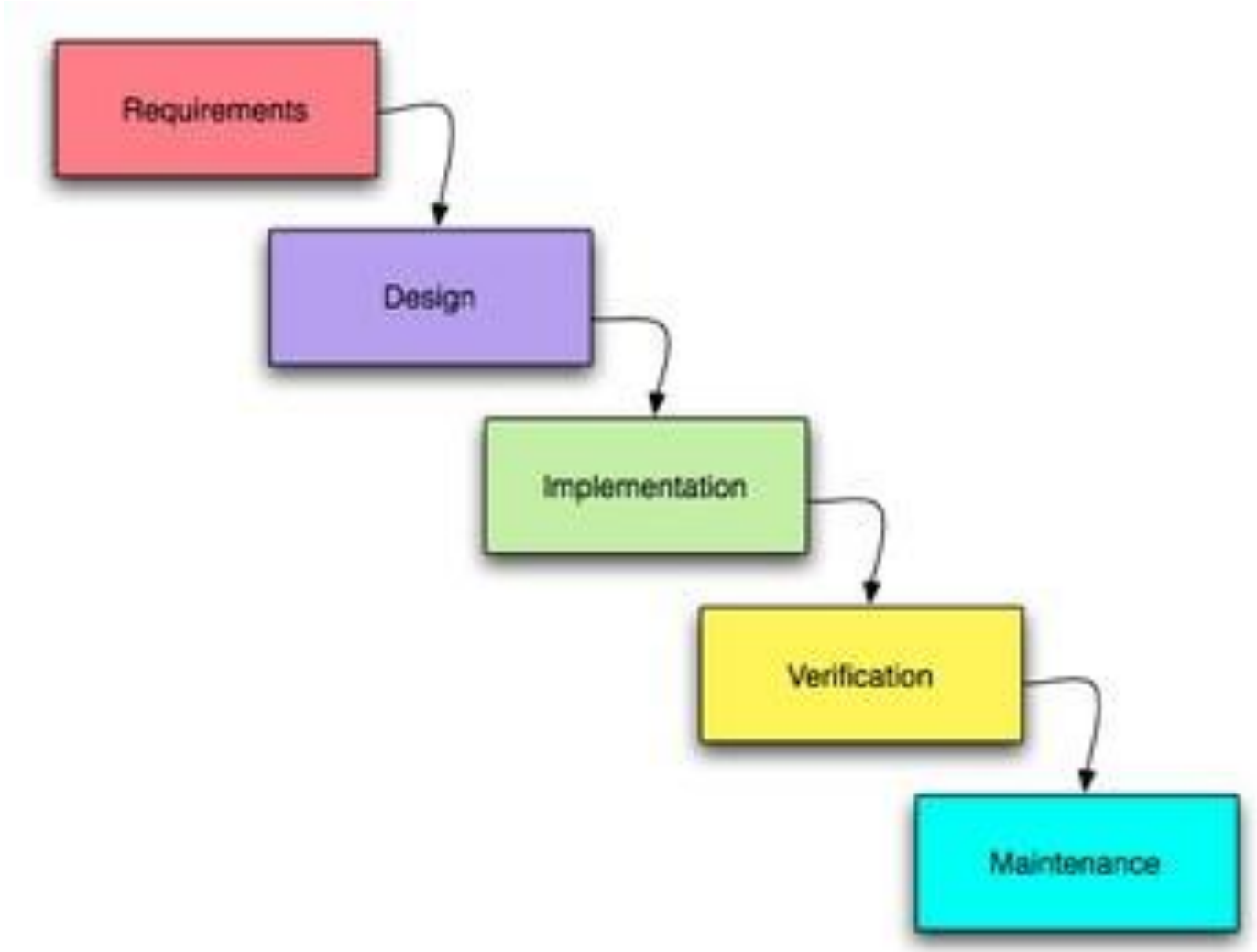


A software *process* defines the steps you take develop (good) software

- A software *process* typically defines **phases** (or stages) and steps you take within each phase to develop (good) software

- What phases can you think of?

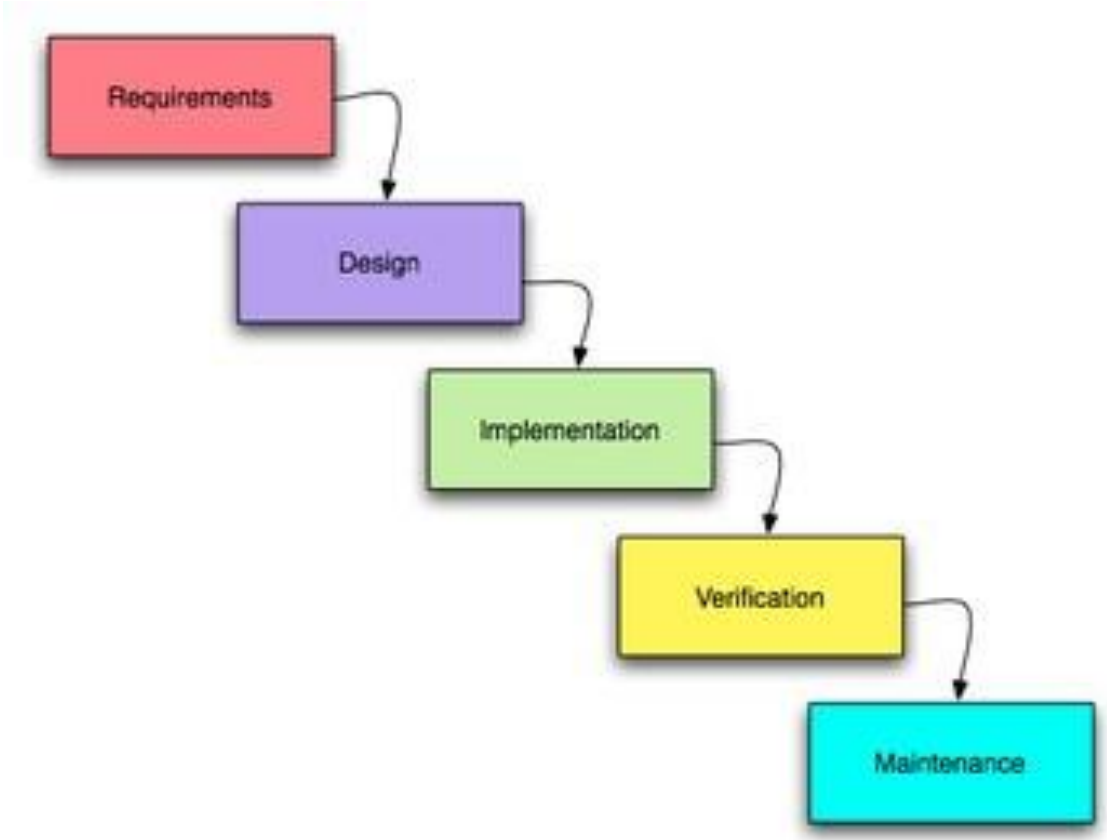
A Software Life Cycle

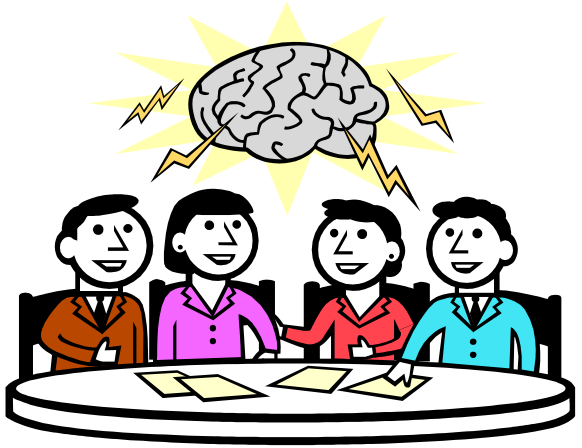


Software *practices* are specific things you do as part of the software development *process*

- That is, **practices** are activities that implement the **process**

Software development *practices* that might take place in each phase below





What are Software *tools?*

Introduction

- Software Engineering Methods are intended to make software engineering more systematic .
- Software development environment are the computer based tools that are intended to assist the software life cycle processes.
- Tools are often designed to support particular software engineering methods.

Software Engineering Tools and Methods

- Software Engineering tools represent
- a set of management and technical tools to support software development

- usually integrated in a coherent framework
- Methods usually provide a notation and vocabulary, procedures for performing
- identifiable tasks, and guidelines for checking both the process and the product.

Software Engineering Tools

- Some particular Software Engineering tools
  - Software Design Tools
  - Software Construction Tools
  - Software Requirement Tools
  - Software Testing Tools
  - Software Maintenance Tools
  - Software Configuration Management Tools

- Software Engineering Management Tools
- Software Engineering Process Tools
- Software Quality Tools
- Infrastructure Support Tools
- Miscellaneous Tools Issues

Software Requirements Tools

- These Tools are classified into two categories
  1. Requirements modeling tools 2. Requirement traceability tools
  - Requirements modeling tools
  - These tools are used for analyzing, specifying, and validating software requirements

- Requirement traceability tools
  - Since they are also relevant in other life cycle processes, they are presented separately from the requirements modeling tools.

Software Design Tools

- Creating Software Designs
- Checking Software Designs.

Software Construction Tools

- These tools are concerned with
- Production of the program representation
- Translation of the program representation
- These tools are
- Program Editors
- Creation and Modification Of Programs
- Compiler and Code generators
- Non Interactive translators of source code
- Interpreters
- Provide Software execution through emulation
- Debugger
- Support Construction Process

Software Testing Tools

These tools are categorized as

- Test generators
- assist in the development of test cases.
- Test execution frameworks
- enable the execution of test cases in a controlled environment where the behavior of the object under test is observed.
- Test evaluation tools
- assessment of the results of test execution,
- helping to determine whether or not the observed behavior conforms to the expected behavior .
- Test management tools
- Managing software testing process.

- Performance analysis tools
- measuring and analyzing software performances

Software Maintenance Tools

These tools are categorized as

- Comprehension tools
- assist in the human comprehension of programs. Ex: Animators
- Reengineering tools
- examination and alteration of the subject software to reconstitute it in a new form
- Reverse engineering tools
- Assist the process by working backwards from an existing product

Software Configuration Management Tools

These tools are categorized as

- Tracking
  - used in connection with the problem-tracking issues associated with a particular software product
  - Version management
  - involved in the management of multiple versions of a product
  - Release tools
  - used to manage the tasks of software release and build

Software Engineering Management Tools

These are categorized as

- Project Planning and Tracking
- used in software project effort measurement and cost estimation, as well as project scheduling
- Risk Management
- used in identifying, estimating, and monitoring risks.
- Measurement
- assist in performing the activities related to the software measurement program

Software Engineering Process Tools

These are categories as

- Process modeling tools
- These tools are used to model and investigate software engineering processes.
- Process management tools
- provide support for software engineering management.
- Process-centered software engineering environments
- incorporate information on the software life cycle processes and guide and monitor the user according to the defined process.
- Integrated CASE environments
- Integrated computer-aided software engineering tools or environments covering multiple phases of the software engineering life cycle belong

Software Quality Tools

These are categories as

- Review and Audit tools
- used to support reviews and audits
- Static Analysis tools
- used to analyze software artifacts, such as syntactic and semantic analyzers, as well as data, control flow, and dependency analyzers

Miscellaneous Tool Issues

This are categories as

- Tool Integration Techniques
- Used to make individual tools cooperate
- Integration techniques are applied
- Meta-tools
- Meta-tools generate other tools; compiler-compilers are the classic example.
- Tool Evaluation

- Evolve new tool

Software Engineering Methods

- Methods usually provide a notation and vocabulary, procedures for performing identifiable tasks, and guidelines for checking both the process and the product
- These are categorized as
- Heuristic methods
- dealing with informal approaches.
- Formal methods
- dealing with mathematically based approaches.
- Prototyping methods

- dealing with software engineering approaches based on various forms of prototyping

Heuristic Methods

- These are categories as
  - ➢ Structured methods
    - ✓ The system is built from a functional viewpoint, starting with a high-level view and progressively refining this into a more detailed design.
  - ➢ Data-oriented methods
    - ✓ the starting points are the data structures that a program manipulates rather than the function it performs
  - ➢ Object-oriented methods
    - ✓ The system is viewed as a collection of objects rather than functions
  - ➢ Domain-specific methods
    - ✓ includes specialized methods for developing systems which involve real-time, safety, or security aspects

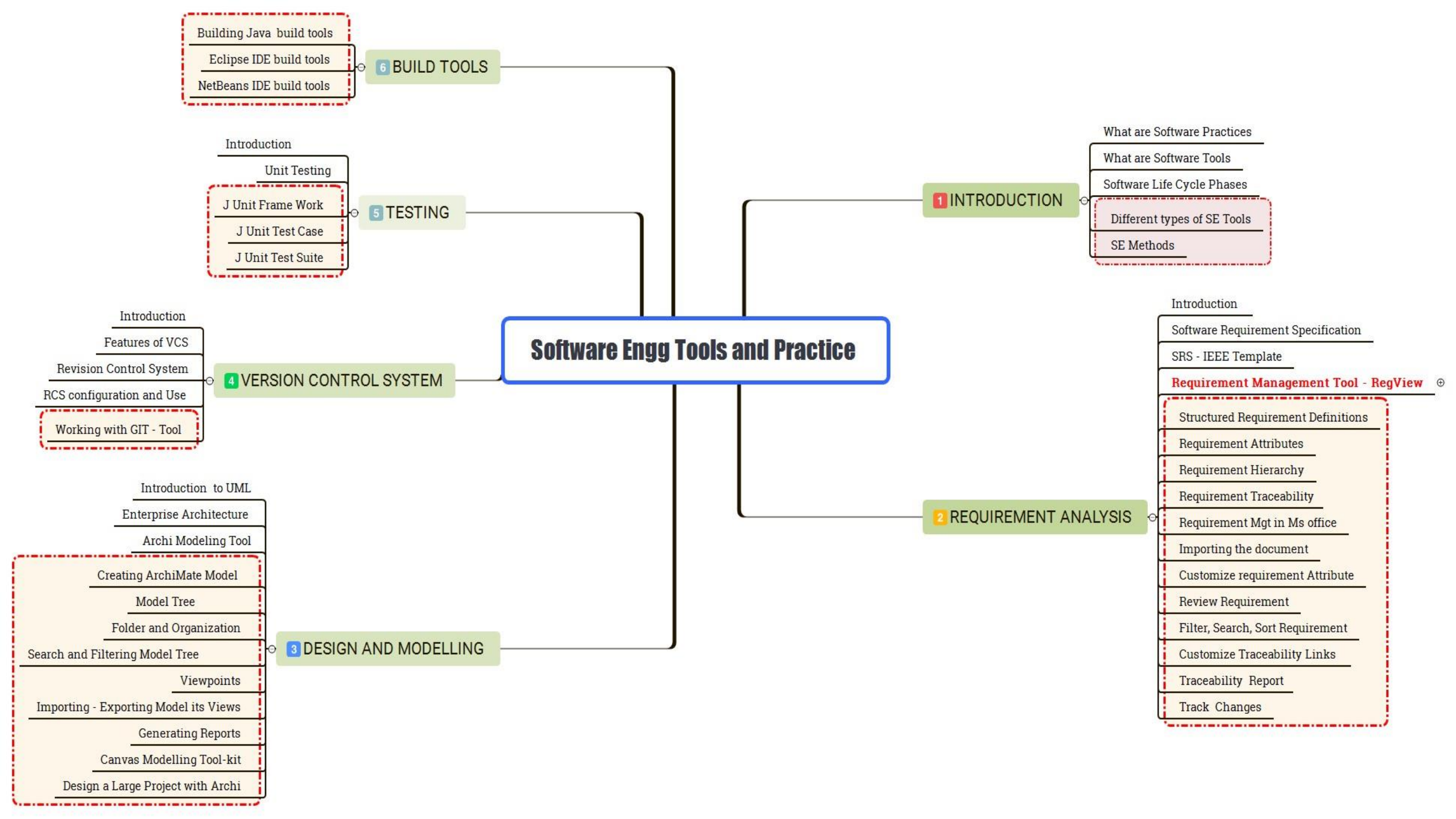
Formal Methods

These are categorized as

- Specification languages and notations
- This topic concerns the specification notation or language used. Specification languages can be classified as model-oriented, property-oriented, or behavior-oriented
- Refinement
- This topic deals with how the method refines (or transforms) the specification into a form which is closer to the desired final form of an executable program.
- Verification/Proving properties:
- This topic covers the verification properties that are specific to the formal approach, including both theorem proving and model checking

Prototyping Methods

- These are categorized as
- Prototyping styles
- The prototyping styles topic identifies the various approaches: throwaway, evolutionary, and executable specification
- Prototyping targets
- Examples of the targets of a prototyping method may be requirements, architectural design, or the user interface
- Prototyping evaluation techniques
- This topic covers the ways in which the results of a prototype exercise are used.s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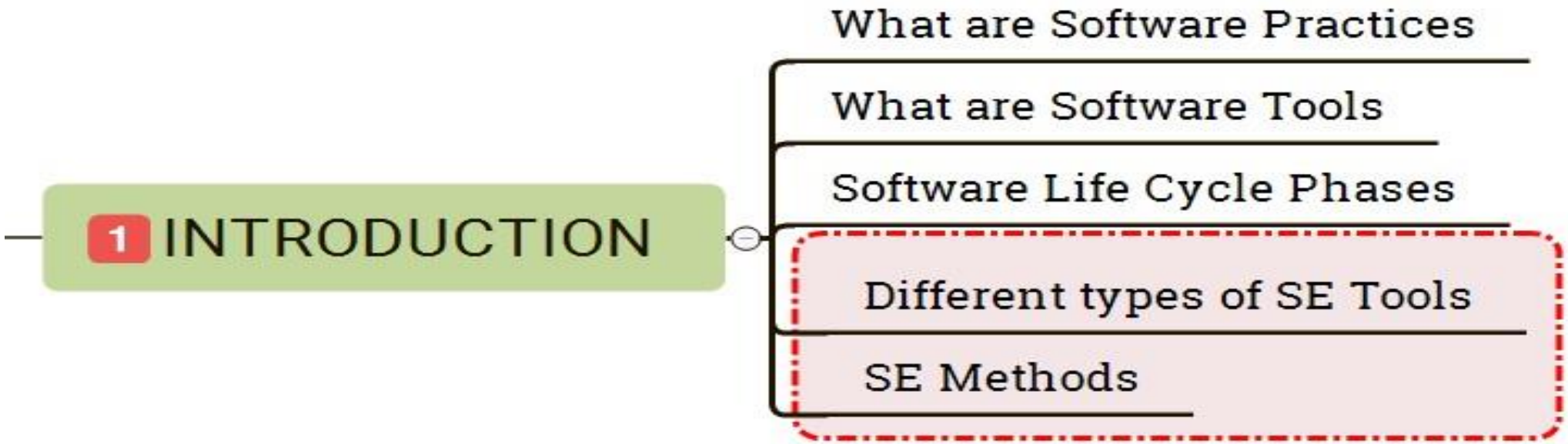
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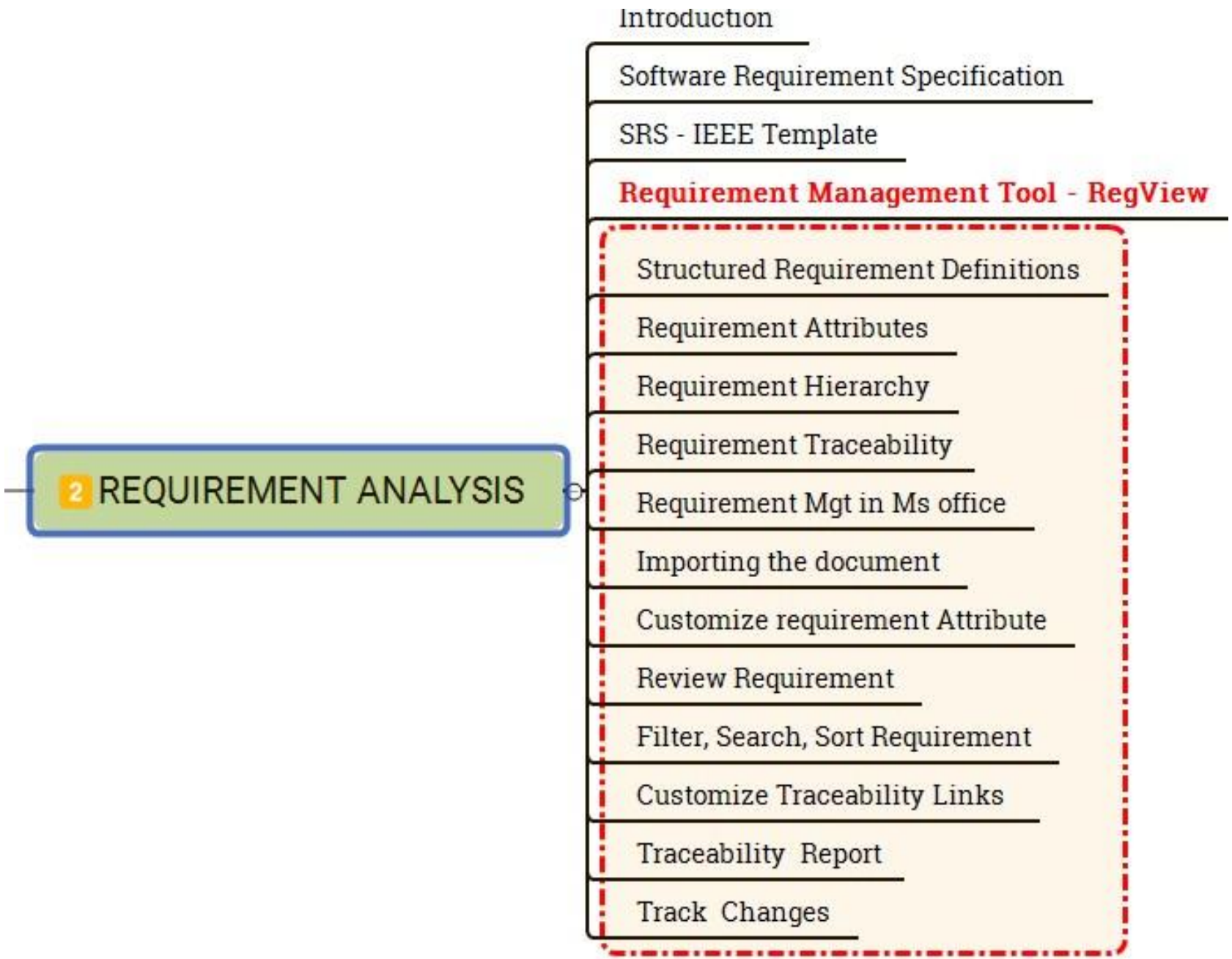
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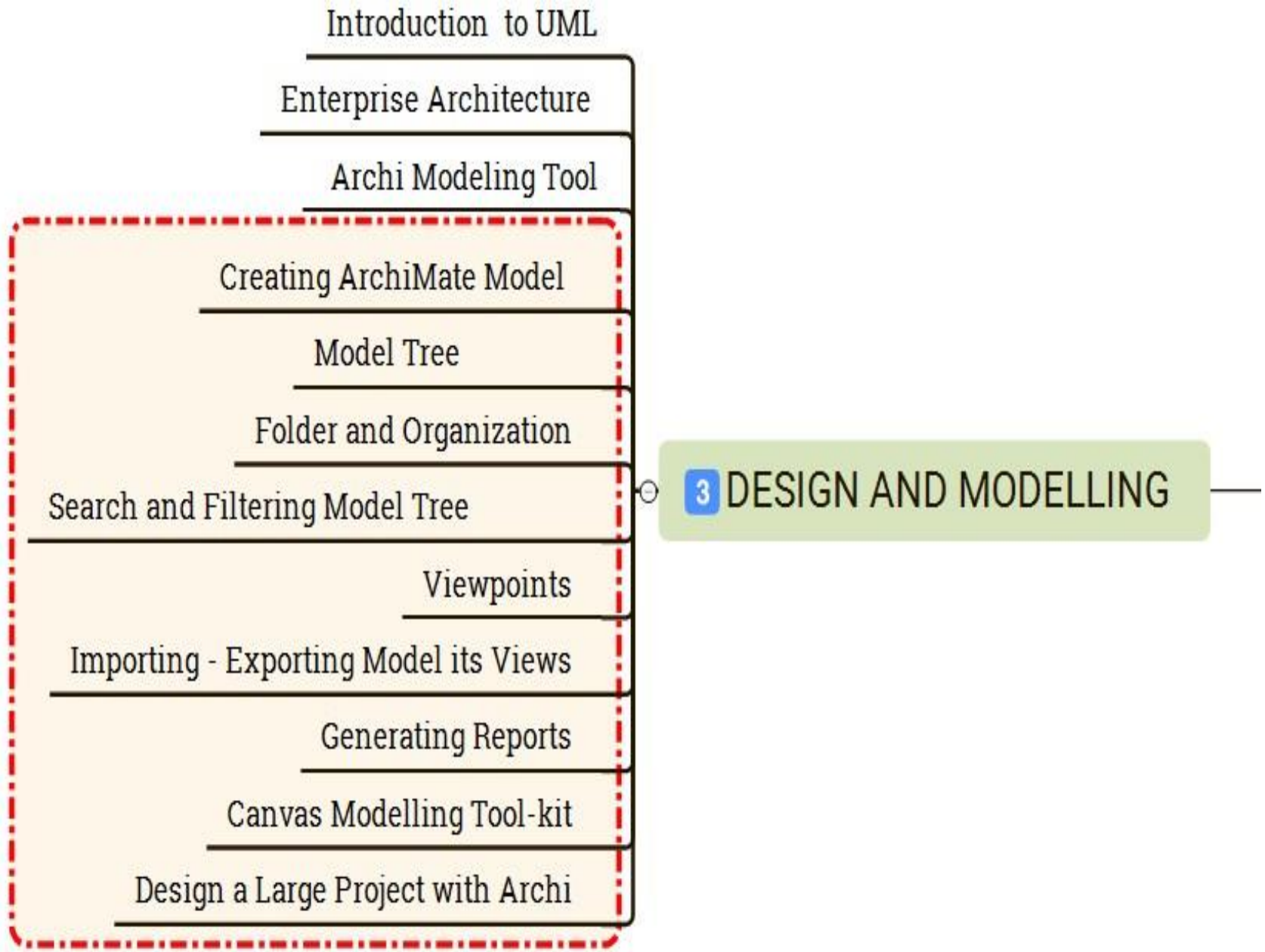
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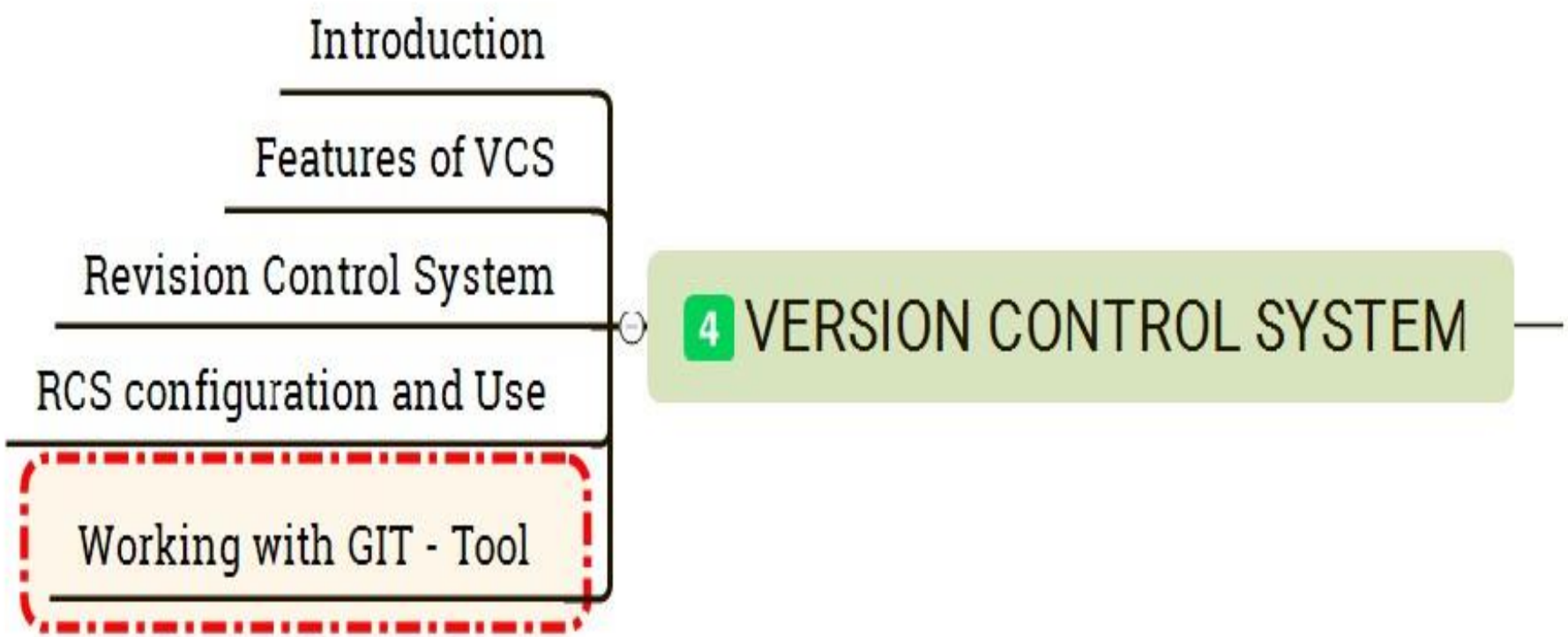
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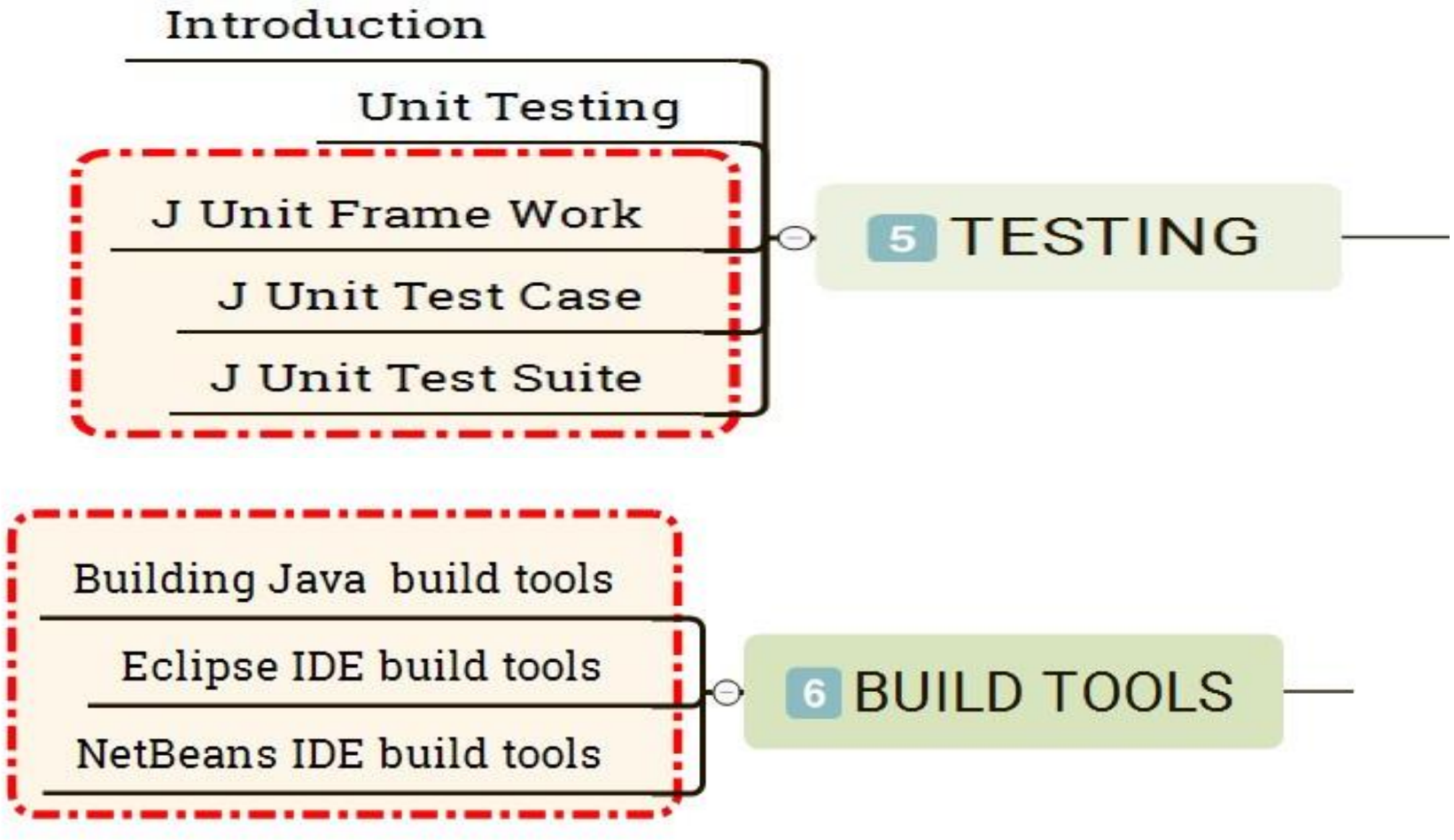
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