Software Engineering

The Software Process(Spiral&CMMI)

Slides for cse470 video lecture series produced by:

A.M.Esfar-E-Alam

Afrina Khatun

Dr.Muhammad Zavid Parvez

Spiral Model

- Rarely Used but an important model
- Its a model that works for projects with unlimited budget, time and projects that has huge risk factors.
- Example, making a heavy lift system for space shuttle and international space station.
- Another example can be about a company name Galaxy inc.

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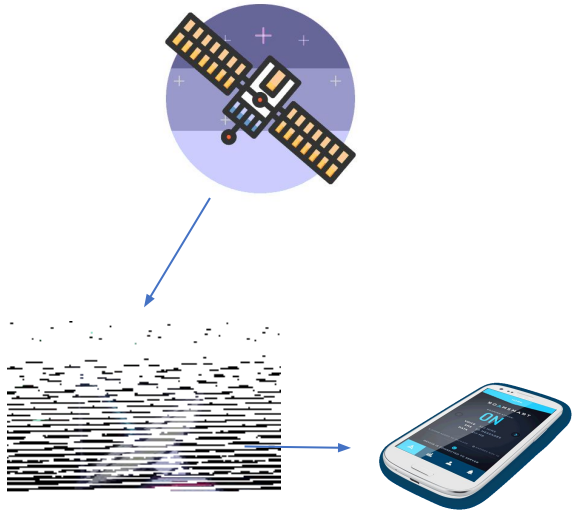
- They wanted to send 6 dozons satellite in space and build a satellite based celluler system.
- So that remote places like even in Antarctica where you don’t have any BTS(mobile tower) you can still be able to communicate using your cell.
- You are never out of network.

As you can see for this project:

- Risk were enormous
- Needs a huge budget
- No published materials or experienced worker
- Risks will be coming and identified once the project kicks off
- Several million codes had to be written and you don’t even have Stackoverflow…



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Spiral Model Formal Definition

- The **spiral model** is a **risk-driven** process model generator for software projects. Based on the unique risk patterns of a given project, the spiral model guides a team to adopt elements of one or more process models, such as incremental, waterfall, or evolutionary prototyping.
- This model was first described by **Barry Boehm** in his 1986 paper "A Spiral Model of Software Development and Enhancement".

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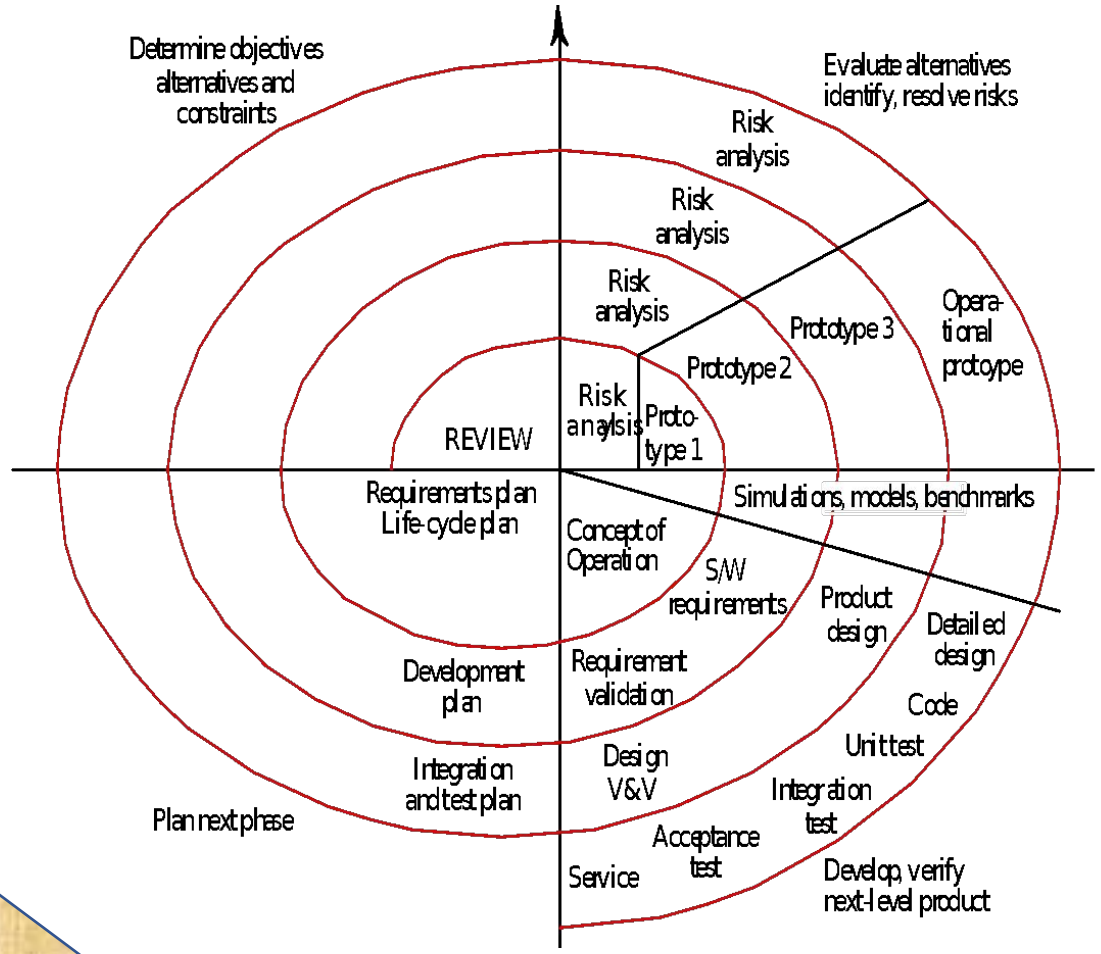
Spiral model Figure



- Here is the image depicting spiral model.
- As you can see spiral loops showing phase by phase development.
- You can see we are doing risk analysis in every phase, planning and keep building prototype until we reach our goal.

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Spiral model sectors

- Objective setting
  - Specific objectives for the phase are identified
- Risk assessment and reduction
  - Risks are assessed and activities put in place to reduce key risks
- Development and validation
  - A development model for the system is chosen which can be any of the generic models
- Planning
  - The project is reviewed and next phase of the spiral is planned

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Spiral model usage

- Spiral model has been very influential in helping people to think about iteration in software processes and introducing the risk-driven approach to development. In practice, however as mentioned, the model is rarely used as published for practical software development.

- So if you are a project manager or lead developer when would you suggest spiral model? It is if you have:
  - Long term project commitment and budget
  - Users and developers unsure of the needs
  - Requirements are complex
  - New product line
  - Significant changes are expected(research and explanation)

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CMMI

- The Capability Maturity Model Integration (CMMI) is a process and behavioral model that helps organizations streamline process improvement and encourage productive, efficient behaviors that decrease risks in software, product and service development.
- It is developed by CMU
- This process is mostly a requirement if you want to get a contract for software development in US govt organization.
- In this model work is divided in such a way so that you have different maturity level of a system you are building.
- It divided in 5 maturity level and you need to improve the system until you reach level 5

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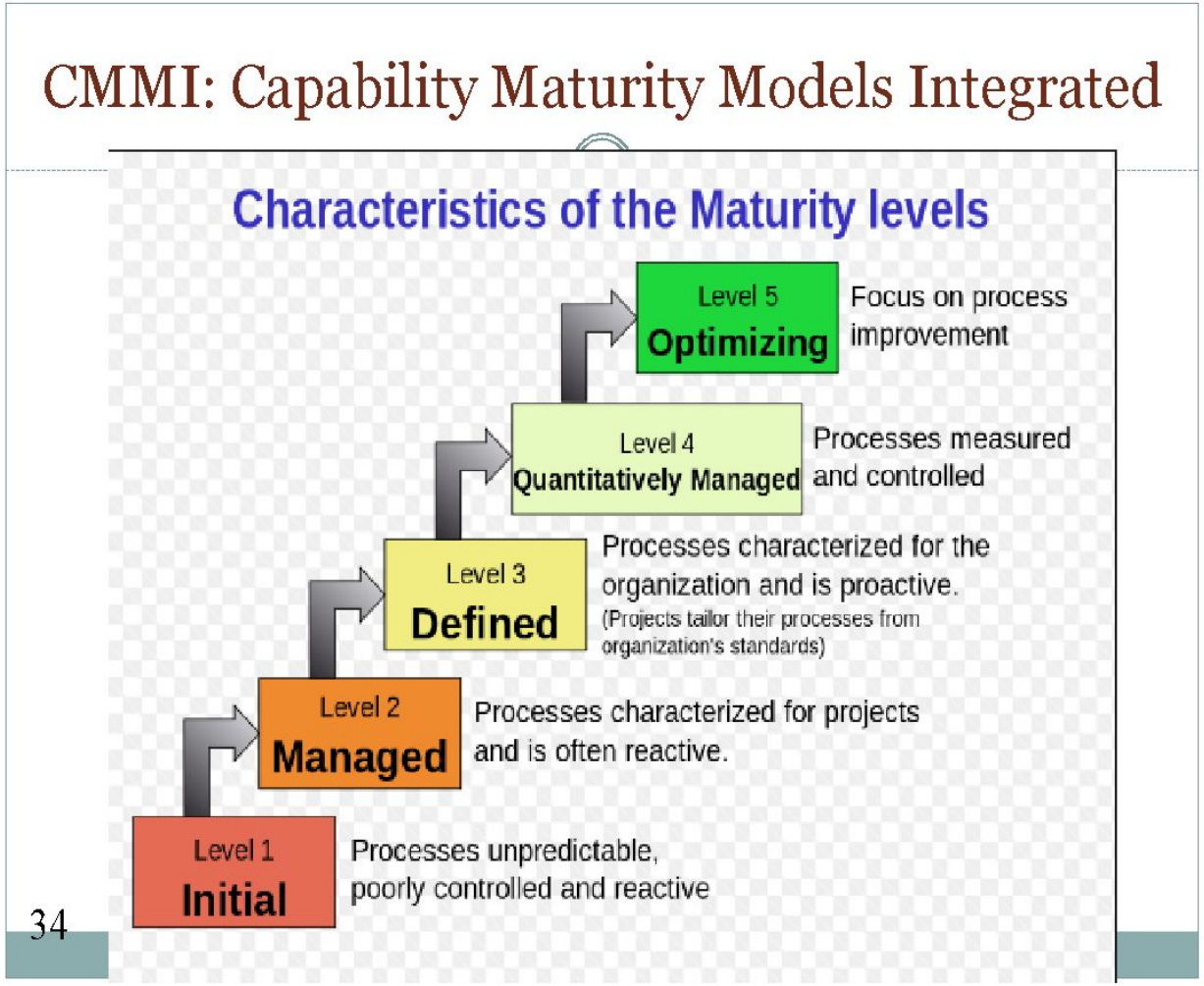

- Once you reach level 5 that does not mean the end of your system.
- It means now the system is full proof, it just need regular maintenance nothing else.

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Level	Focus	Process Area	
5 Optimizing	Continuous Process Improvement	•Organizational Performance Management	•Causal Analysis & Resolution
4 Quantitatively Managed	Quantitative Management	•Organizational Process Performance	•Quantitative Project Management
3 Defined	Process Standardization	•Requirements Development •Technical Solutions •Product Integration •Verification •Validation •Organizational Process Focus	•Organizational Process Definition •Organizational Training •Integrated Project Management Risk Management •Decision Analysis & Resolution
2 Managed	Basic Project Management	•Requirements Management •Project Planning •Project Monitoring & Control •Supplier Agreement Management	•Measurement & Analysis •Process & Product Quality Assurance •Configuration Management
1 Initial			

- Pause and go through this chart that will give you detailed Idea of what happens in each maturity levels

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