

Introduction to the course of Software Architecture

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Simple case study

Three vendors have been asked to submit bids for work that tracks student credentials...

All vendors supply demonstration systems that:

- Seem to meet the requirements
- Are all within similar cost estimates.
- All other things being equal ... Who do you pick ?

You ask them to come in and describe their architecture so as to get a better understanding of the long term costs to maintain and adapt the system to your planned expansions.

The vendors

The We Know Better. Com → TheWKB.com

- An medium to large experienced company that has developed a wide range of similar products over several years for a variety of customers.

The Minority Owned Business. Com → TheMob.com

- A small company that has developed a similar product and is looking to expand their business

The Wet Behind the Ears. Com → TheWBTE.com

- A grad students run venture that is looking to capture the contract in order to acquire start up funding.

The Proposed Architectures

TheWKB.com

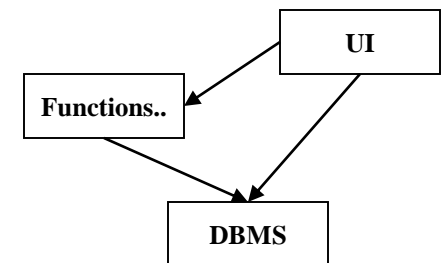
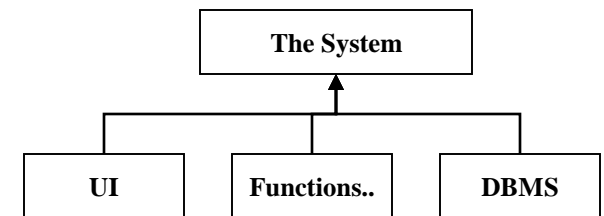
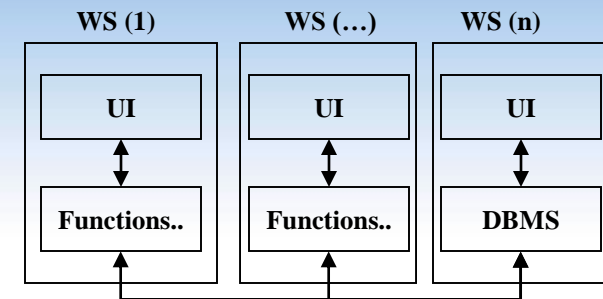
- depicts what they call an architecture by showing the allocation of functional pieces to hardware.

TheMob.com

- depicts what they call an architecture by showing a functional block diagram.

TheWBTE.com

- depict what they call an architecture by showing a logical view of the functional elements and their interconnection dependencies.

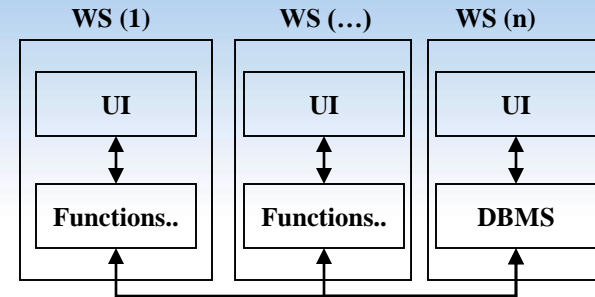


These depictions and others have been used to describe architectures – So who is correct ? What's missing ?

So how do you even start to evaluate and compare the architectures against each other ?

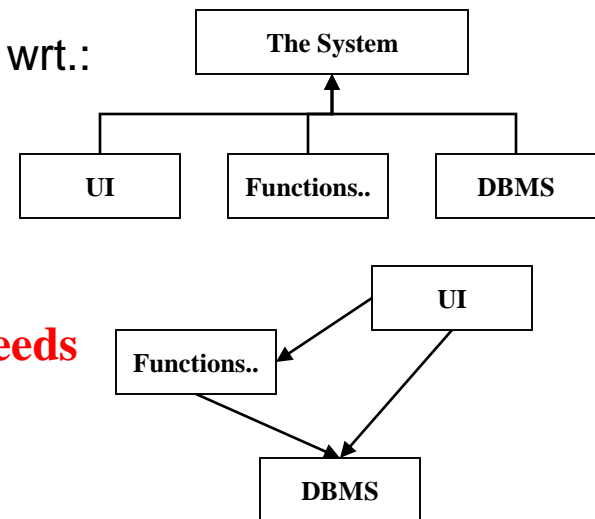
How to determine (measure) which one is better at capturing:

- Functional relationships ?
 - Data Flow ?
 - Control Flow ?
 - Event Handling ?
 - Fault-Tolerance ?
- Do the boxes and lines have the same meaning both internal to an architecture and across competing architectures ?**



How to measure which one is better at addressing the issues wrt.:

- Homogenous vs. Heterogeneous systems?
 - Expandability ?
 - Interoperability ?
 - Maintainability ?
 - Upgradeability ?
 - Responsiveness ?
 - ... etc..
- Who do you give the contract to?**
It should be obvious then that there needs to be a better (more formal) way of describing and evaluating an architecture !



Industry concerns

Industry - We need to be able to:

- Construct the Best Architecture to meet the requirements
- Evaluate Competing Product Architectures
- Share methods, techniques, patterns, idioms for structuring complex systems
- Exploit commonalities in specific domains to provide a reusable framework for product families.
- Educate ourselves on technique and formal methods

So what is meant by “Software Architecture”?

What are the issues that SW Architecture must address?

Overview of this course

What is software architecture?

How do you use software architectures in practice?

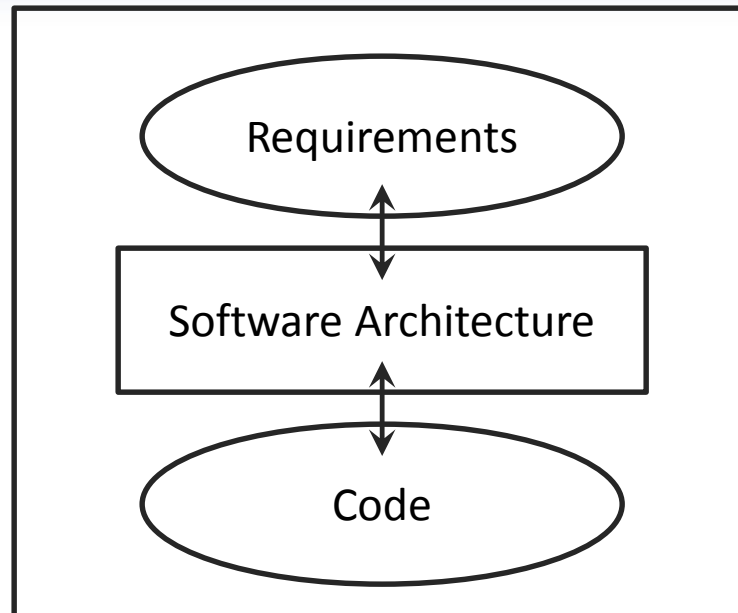
What value does software architecture provide?



Overview of this course

The role of SA in software development

- Bridging requirements and implementation



Overview of this course

The role of SA in software development

- *Understanding* of large SW system
- *Reuse* of SW components, framework...
- *Construction* of SW
- *Evolution* of SW
- *Analysis*
- *Management* of projects

Overview of this course

Software architectures can

- provide flexibility and adaptability in changing markets
- help reduce maintenance costs and amortize development costs
- assist in workforce organization and with project oversight and control
- establish a common corporate vocabulary
- shorten learning time
- ...

Overview of this course

After attending this course, students will have a better understanding of

- ✓ *what is a software architecture*
- ✓ *why a software architecture is important*
- ✓ *the relationships between system qualities and software architectures*
- ✓ *software architectural patterns and tactics, and their relationship to system qualities*
- ✓ *attribute-driven design*
- ✓ *software architecture documentation*
- ✓ *software architecture evaluation*

Roadmap of the course

What is Software Architecture?

Designing Software Architecture

- Requirements: quality attributes or qualities
- How to achieve requirements: tactics
- How do tactics lead to architectural styles
- Case studies on architectural styles, observed the achieved qualities
- The ADD method

Documenting software architecture

Evaluating an architecture

Course staff and web page

Lecturer:

- Ying Shen, Rm. 408R, Jishi Building,
- yingshen@tongji.edu.cn

Office hour:

- Mon. ~ Fri.: 9:00am – 11:00am, 3:00pm – 5:00pm

Course web page:

- <http://sse.tongji.edu.cn/yingshen/course/SA2015Spring/SA.htm>

Expectations

Read assigned readings

Attend lectures and participate in discussions

Bring your ideas and concerns to class

Work effectively in a group setting

Learn how to use the tools and understand your project
very well

Hand in your deliverables on time

**NO LATE
DELIVERABLES!!**

Course evaluation

Working in group:

1. Project (90 marks)
 - Assignment (40 marks)
 - Report (40 marks)
 - Presentation (10 marks)
2. Participation (10 marks)

Academic integrity and cheating

Cheating, plagiarism and other forms of academic fraud are taken very seriously by the University, the Faculty, and the teaching staff.

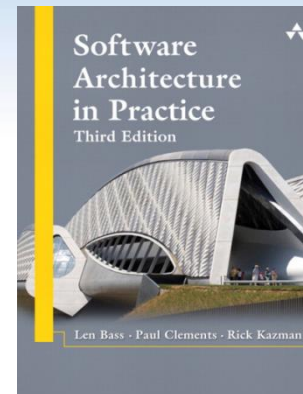
Examples:

- Submitting the work of another person as your original work.
- Incorporating others work in your work and not attributing it.

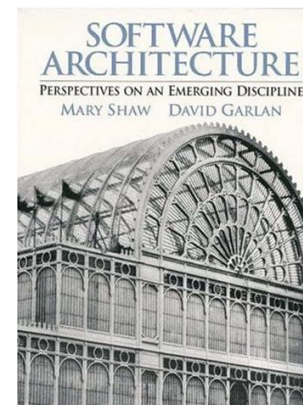
References

Main References:

Software Architecture in Practice
3rd Edition



Software Architecture:
Perspectives on an Emerging Discipline



Working in groups and choosing a group

Group Size : 2

Understand the work habits and goals of your group members:

- Night person
- Start early
- Laid back
- Morning person
- Start at last minute
- Perfectionist

Identify members with good English and communication skills

Asking questions

Ask me (email, office hours)

Ask in class

Discuss with your classmates or group members