CSSE6400

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Interesting Software is Complex

Many aspects to the design of its architecture.

Architectural Design

Managing technical complexity.

Question

How do you describe a complex architecture,

without making it too difficult to understand?

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Answer

Architectural Views

Only consider one aspect at a time.

- 4+1 Views [1]
 - logical, process, development, physical, scenario

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- The Open Group Architecture Framework (TOGAF) [5]
- ISO/IEC/IEEE 42010:2011 [6]

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 - components/classes, relationships, interactions
- Process Dynamic behaviour.
 - concurrency & distribution, fault tolerance, process control, ...
- Development Organisation of the software in the development environment.
 - Physical Map executable software containers to hardware.
 - address non-functional requirements
 - availability, reliability, scalability, throughput, ...

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- Development Organisation of the software in the development environment.
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 - address non-functional requirements
 - availability, reliability, scalability, throughput, ...
- Scenario Demonstrate functionality delivered by architecture.
 - use case details
 - drive functional design of architecture
 - validate design of architecture
 - illustrate purpose of architecture

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- UML formal, well-defined language [7]
- C4 informal, simple structure [8]
- You probably don't want to know about alternatives.

Reading...

"Architectural Views" Notes¹ [9]

¹Remember, I said you had to read the notes.

References

[1] Philippe Kruchten.

Architectural blueprints — the '4+1' view model of software architecture. *IEEE Software*, 12(6):42–50, 1995.

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//www.cs.ubc.ca/~gregor/teaching/papers/4+1view-architecture.pdf.

[2] Len Bass, Paul Clements, and Rick Kazman. Software Architecture in Practice.

Addison-Wesley, 4th edition, August 2021.

[3] Nick Rozanski and Eóin Woods. Software Systems Architecture: Working With Stakeholders Using Viewpoints and Perspectives.

Addison-Wesley, 2nd edition, 2012.

[4] Architecture Capability Team.

NATO Architecture Framework.

NATO, 4th edition, September 2020.

[5] The Open Group Architecture Forum.

The Open Group Architecture Framework Standard.

The Open Group, 9.2 edition, 2018.

https://pubs.opengroup.org/architecture/togaf9-doc/arch/index.html.

- [6] ISO/IEC/IEEE 42010:2011.
- [7] Unified Modeling Language.

OMG, 2.5.1 edition, December 2017.

https://www.uml.org/.

[8] Simon Brown.

Software Architecture for Developers - Volume 2.

Leanpub, January 2022.

https://leanpub.com/visualising-software-architecture.

[9] Richard Thomas and Brae Webb.

Architectural views.

March 2022.

https://csse6400.uqcloud.net/handouts/views.pdf.