Architectural Views

Software Architecture

Richard Thomas

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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.

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- The Open Group Architecture Framework (TOGAF) [Forum, 2022]
- ISO/IEC/IEEE 42010:2011 [iso, 2022]

Diagrams & Notation

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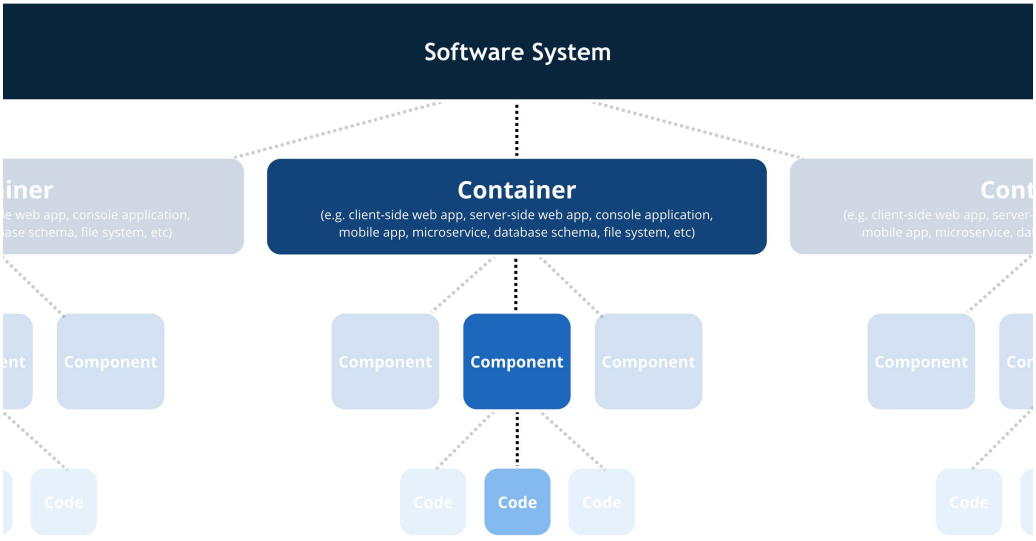
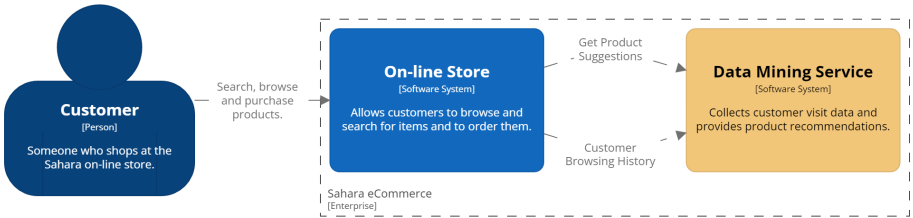
- C4 – informal, simple structure *[Brown, 2023]*
- UML – formal, well-defined language *[uml, 2017]*
- You probably don't want to know about alternatives

C4 Model: Levels

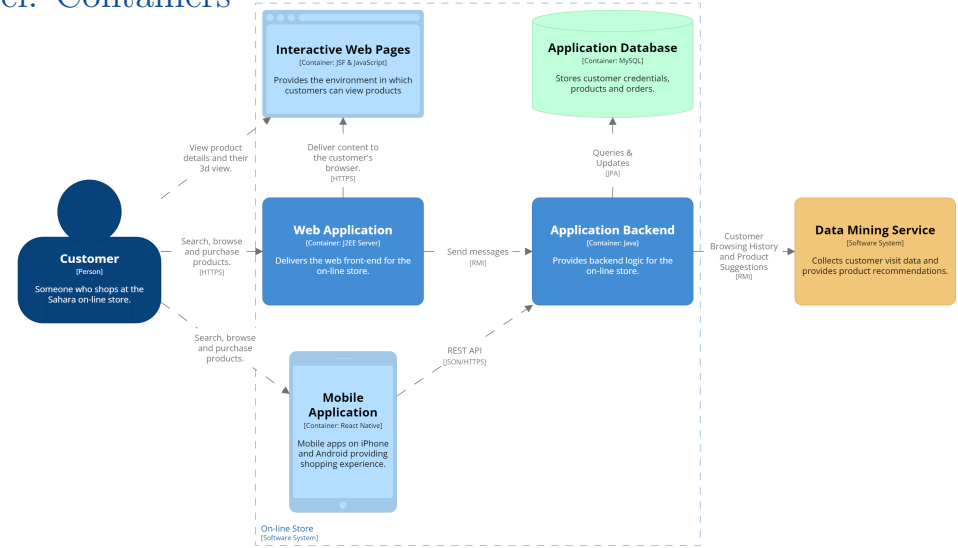


C4 Model: Context



How software system fits into broader *environment*

C4 Model: Containers



Structure of the software system

C4 Model

Context

- How software system fits into broader *environment*

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Structure – Containers, Components, Code

- *Levels* of detail

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Infrastructure – Deployment

- How system is *deployed* on computing platforms

4+1 Views

Logical – *Structure* of how the software is implemented

- components/classes, relationships, interactions

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Scenario – *Demonstrate* functionality delivered by architecture

- use case details
  - *drive* functional design of architecture
  - *validate* design of architecture
  - *illustrate* purpose of architecture

Reading...

"Architectural Views" Notes[1] *[Thomas and Webb, 2023]*

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

References

[uml, 2017] (2017).
Unified Modeling Language.
OMG, 2.5.1 edition.
https://www.uml.org/.

[iso, 2022] (2022).
Software, Systems and Enterprise – Architecture Description (ISO/IEC/IEEE 42010:2022).
International Organization for Standardization.

[Bass et al., 2021] Bass, L., Clements, P., and Kazman, R. (2021).
Software Architecture in Practice.
Addison-Wesley, 4th edition.

[Brown, 2023] Brown, S. (2023).
The C4 Model for Visualising Software Architecture.
Leanpub.
https://leanpub.com/visualising-software-architecture.

[Forum, 2022] Forum, T. O. G. A. (2022).
The Open Group Architecture Framework Standard – Architecture Development Method.
The Open Group, 10 edition.
https://pubs.opengroup.org/togaf-standard/.

[Kruchten, 1995] Kruchten, P. (1995).
Architectural blueprints — the '4+1' view model of software architecture.
IEEE Software, 12(6):42–50.
https://www.cs.ubc.ca/~gregor/teaching/papers/4+1view-architecture.pdf.

[Team, 2020] Team, A. C. (2020).
NATO Architecture Framework.
NATO, 4th edition.

[Thomas and Webb, 2023] Thomas, R. and Webb, B. (2023).
Architectural views.
`https://csse6400.uqcloud.net/handouts/views.pdf`.