

Architectural Views

Software Architecture

Richard Thomas

March 3, 2025

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?

Question

How do you describe a complex architecture, without making it too difficult to understand?

Answer

Architectural Views

- Only consider one aspect at a time.

Architectural Views

- C4 Model *[Brown, 2023]*
 - context, structure, behaviour, infrastructure

Architectural Views

- C4 Model *[Brown, 2023]*
 - context, structure, behaviour, infrastructure
- 4+1 Views *[Kruchten, 1995]*
 - logical, process, development, physical, scenario

Architectural Views

- C4 Model *[Brown, 2023]*
 - context, structure, behaviour, infrastructure
- 4+1 Views *[Kruchten, 1995]*
 - logical, process, development, physical, scenario
- Software Architecture in Practice *[Bass et al., 2021]*
 - module, component-and-connector, allocation

Architectural Views

- C4 Model *[Brown, 2023]*
 - context, structure, behaviour, infrastructure
- 4+1 Views *[Kruchten, 1995]*
 - logical, process, development, physical, scenario
- Software Architecture in Practice *[Bass et al., 2021]*
 - module, component-and-connector, allocation
- NATO Architecture Framework *[Team, 2020]*
 - concepts, service, logical, physical resource, architecture foundation

Architectural Views

- C4 Model *[Brown, 2023]*
 - context, structure, behaviour, infrastructure
- 4+1 Views *[Kruchten, 1995]*
 - logical, process, development, physical, scenario
- Software Architecture in Practice *[Bass et al., 2021]*
 - module, component-and-connector, allocation
- NATO Architecture Framework *[Team, 2020]*
 - concepts, service, logical, physical resource, architecture foundation
- The Open Group Architecture Framework (TOGAF)
[Forum, 2018]
- ISO/IEC/IEEE 42010:2011 *[iso, 2011]*

C4 Model

Context

- How software system fits into broader *environment*

C4 Model

Context

- How software system fits into broader *environment*

Structure – Containers, Components, Code

- *Levels* of detail

C4 Model

Context

- How software system fits into broader *environment*

Structure – Containers, Components, Code

- *Levels* of detail

Behaviour – Dynamic

- How elements *interact* to deliver features

C4 Model

Context

- How software system fits into broader *environment*

Structure – Containers, Components, Code

- *Levels* of detail

Behaviour – Dynamic

- How elements *interact* to deliver features

Infrastructure – Deployment

- How system is *deployed* on computing platforms

4+1 Views

Logical – *Structure* of how the software is implemented

- components/classes, relationships, interactions

4+1 Views

Logical – *Structure* of how the software is implemented

- components/classes, relationships, interactions

Process – *Dynamic* behaviour

- concurrency & distribution, fault tolerance, process control,

...

4+1 Views

Logical – *Structure* of how the software is implemented

- components/classes, relationships, interactions

Process – *Dynamic* behaviour

- concurrency & distribution, fault tolerance, process control,

...

Development – *Organisation* of the software in the development environment

4+1 Views

Logical – *Structure* of how the software is implemented

- 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, ...

4+1 Views

Logical – *Structure* of how the software is implemented

- 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, ...

Scenario – *Demonstrate* functionality delivered by architecture

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

Diagrams & Notation

- A *good* diagram is worth a thousand words
 - A thousand diagrams is just confusing

Diagrams & Notation

- A *good* diagram is worth a thousand words
 - A thousand diagrams is just confusing
- C4 – informal, simple structure *[Brown, 2023]*
- UML – formal, well-defined language *[uml, 2017]*
- You probably don't want to know about alternatives

Reading...

“Architectural Views” Notes¹ *[Thomas and Webb, 2023]*

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

References

[iso, 2011] (2011).

ISO/IEC/IEEE 42010:2011.

ISO.

[uml, 2017] (2017).

Unified Modeling Language.

OMG, 2.5.1 edition.

<https://www.uml.org/>.

[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, 2018] Forum, T. O. G. A. (2018).
The Open Group Architecture Framework Standard.
The Open Group, 9.2 edition.
<https://pubs.opengroup.org/architecture/togaf9-doc/arch/index.html>.
- [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>.