

# Architectural Views

*Software Architecture*

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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, 2018]*
- ISO/IEC/IEEE 42010:2011 *[iso, 2011]*

# C4 Model

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## Infrastructure – Deployment

- How system is *deployed* on computing platforms

## 4+1 Views

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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

# 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

*Reading...*

“Architectural Views” Notes<sup>1</sup> *[Thomas and Webb, 2023]*

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<sup>1</sup>Remember, 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>.