# Benefits & Limitations of Patterns & Frameworks: Part 1

Douglas C. Schmidt
d.schmidt@vanderbilt.edu
www.dre.vanderbilt.edu/~schmidt

Professor of Computer Science

Institute for Software Integrated Systems

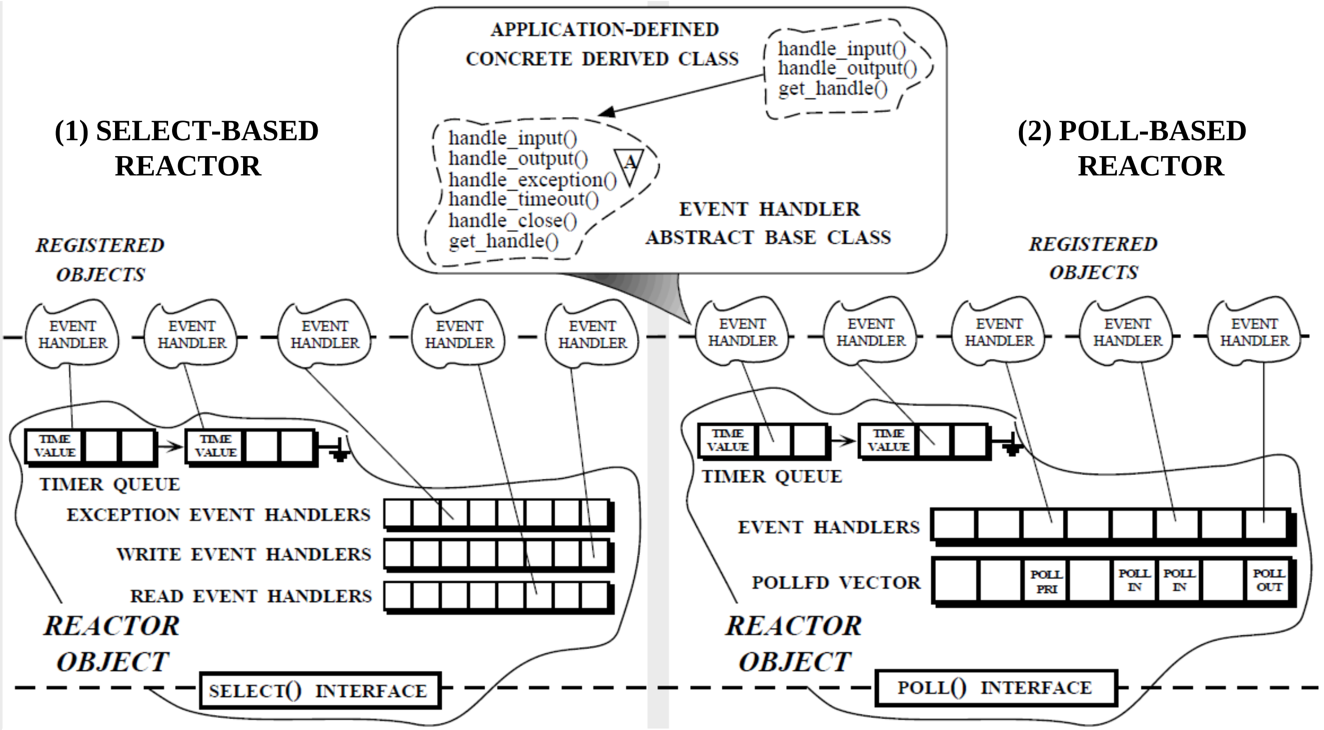
Vanderbilt University
Nashville, Tennessee, USA

# Topics Covered in this Part of the Module

- Summarize the benefits & limitations of patterns

# Benefits of Patterns

- Capture & abstract recurring software roles & relationships to facilitate systematic reuse of successful designs



See www.dre.vanderbilt.edu/~schmidt/PDF/Reactor2-93.pdf for more info

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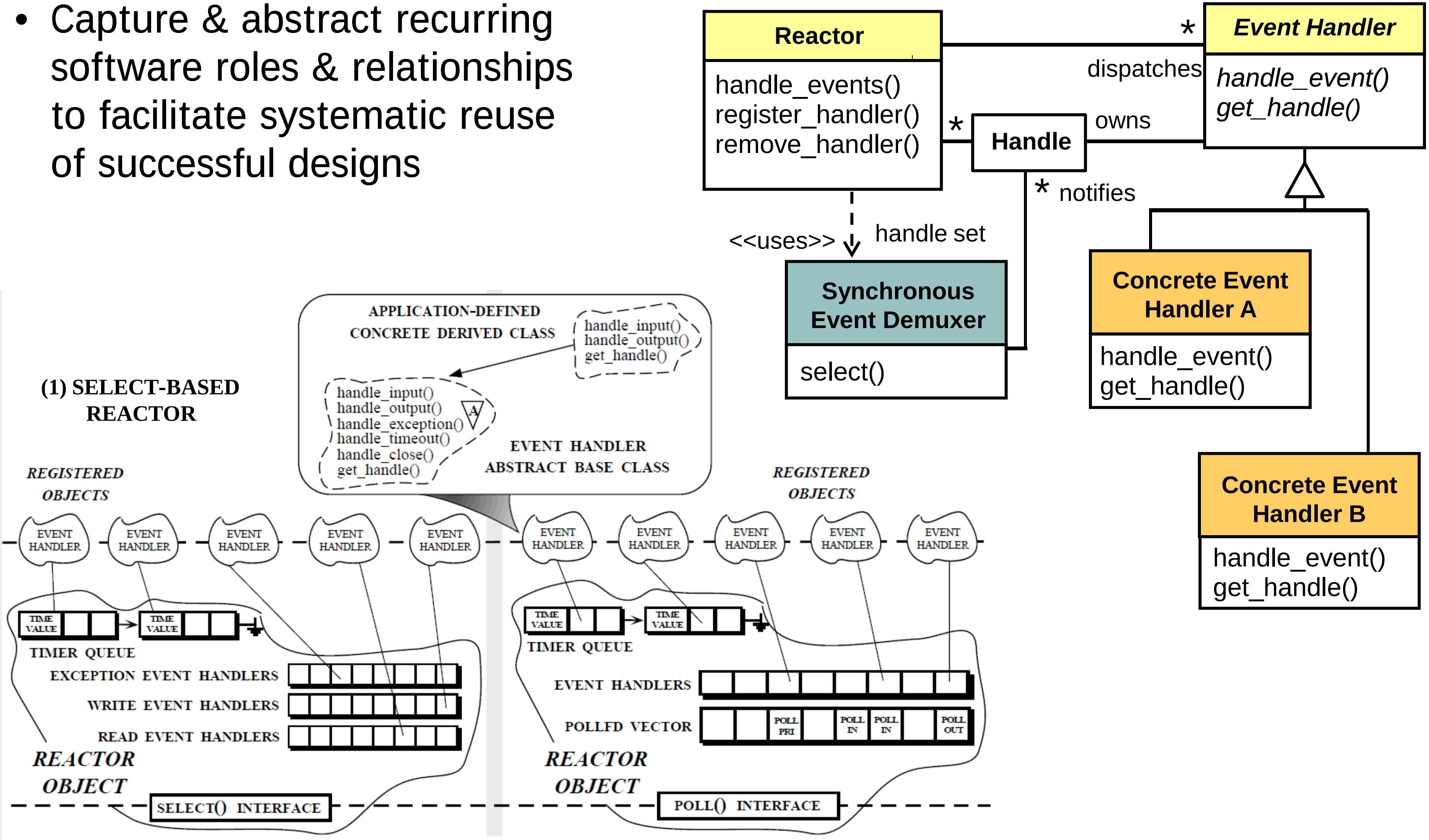

See www.dre.vanderbilt.edu/~schmidt/PDF/Reactor.pdf for more info

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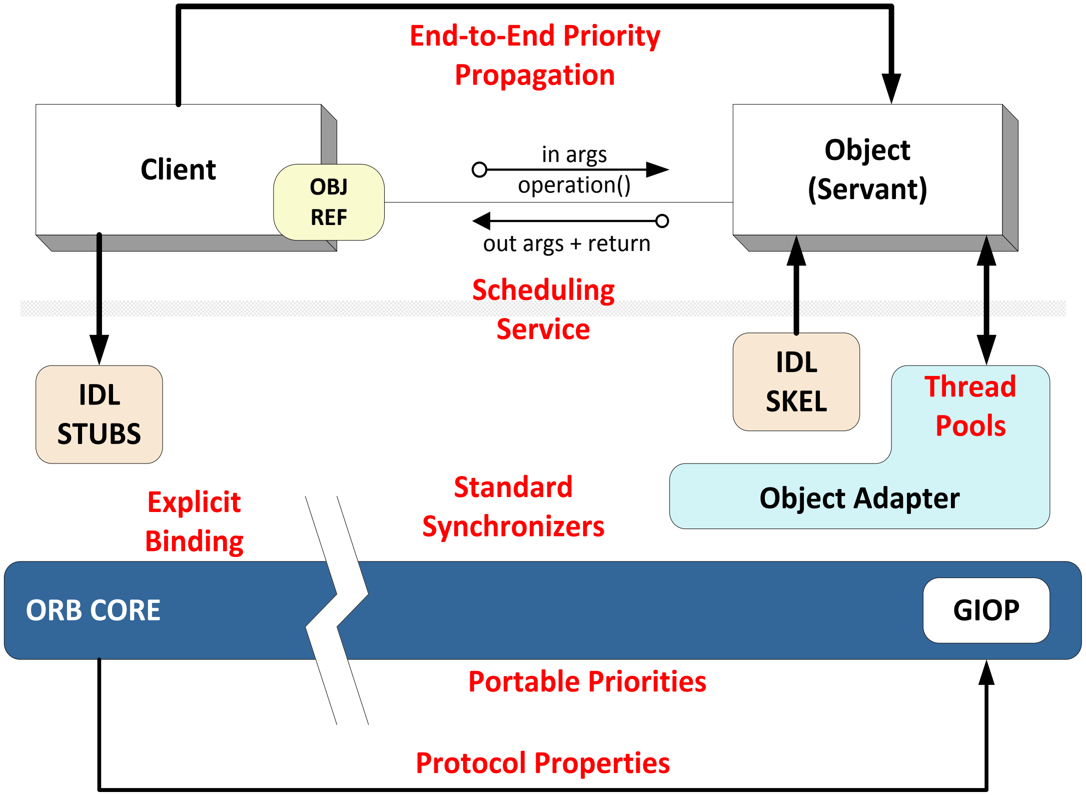
- Record engineering tradeoffs & design alternatives to enhance development & sustainment



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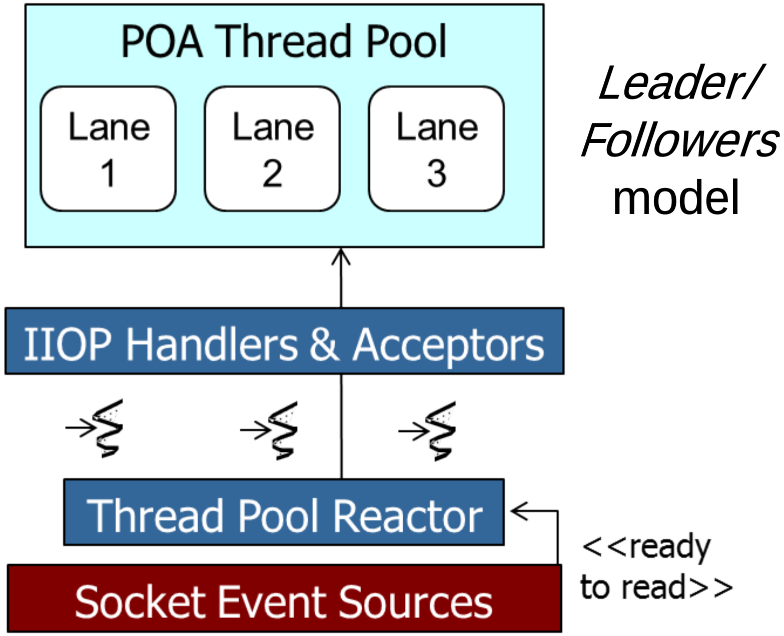
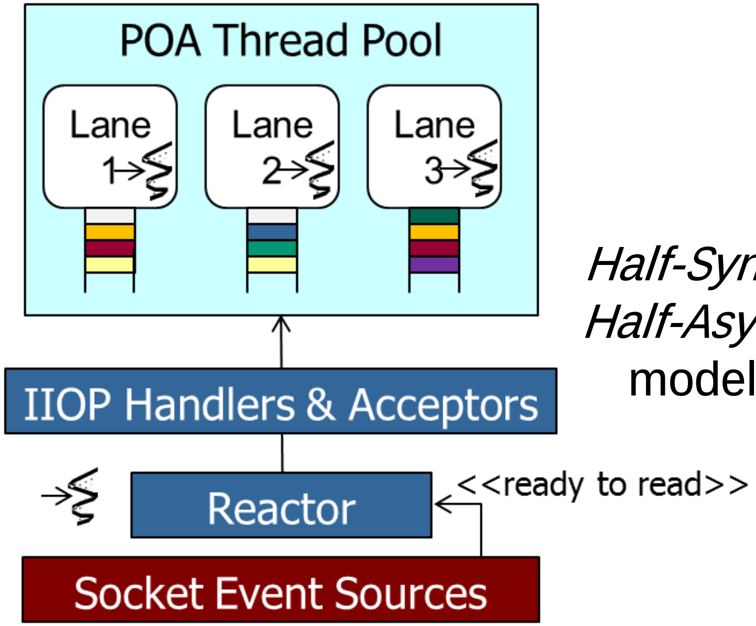


*Leader/ Followers* model



*Half-Sync/ Half-Async* model

| Tradeoff Analysis | Leader/ Followers | Half-Sync/ Half-Async |
|---|---|---|
| Features | Poor | Good |
| Scalability | Poor | Good |
| Efficiency | Good | Poor |
| Optimizations | Good | Poor |
| Priority inversion | Good | Poor |

See www.dre.vanderbilt.edu/~schmidt/PDF/OM-01.pdf for more info

# Benefits of Patterns

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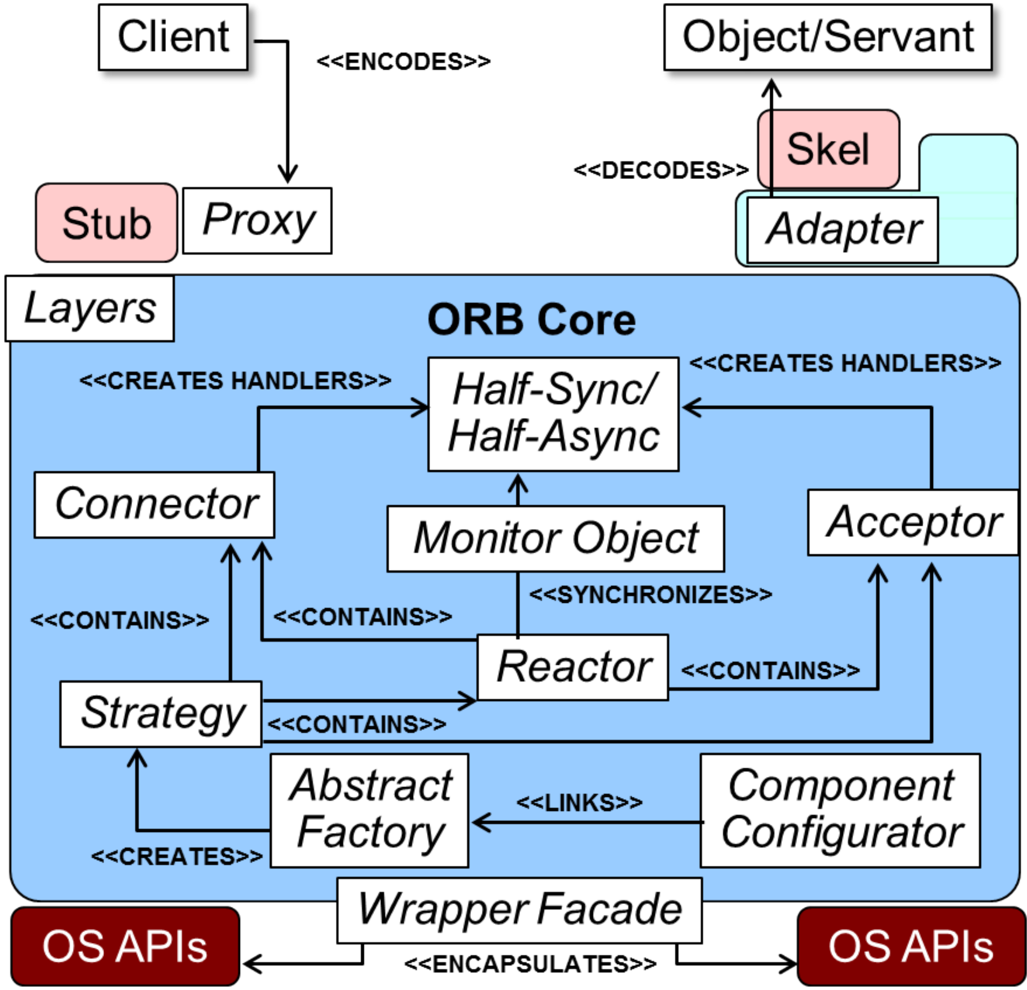
- Enable a shared design vocabulary that enhances understanding, (re)engineering effort, & team communication



See www.dre.vanderbilt.edu/~schmidt/corba-research-design.html for more

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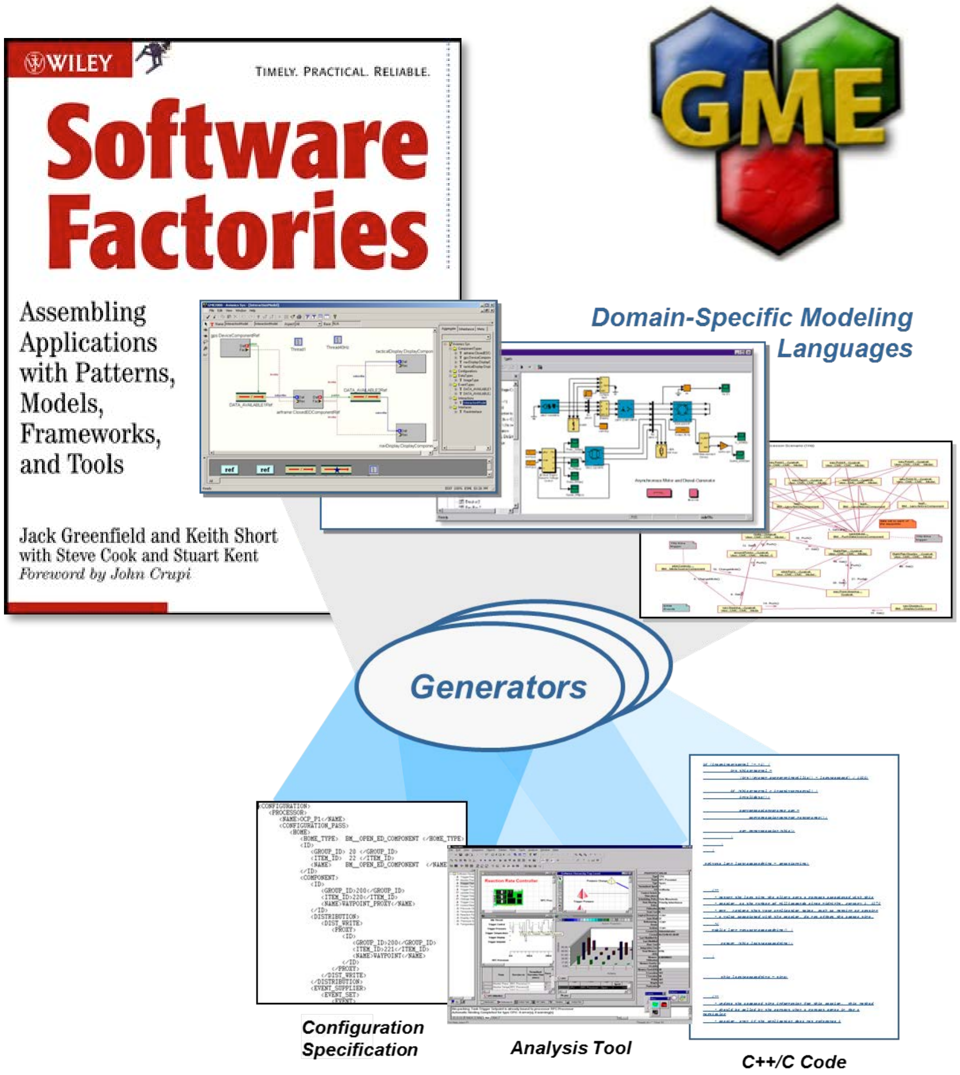
- Provide a basis for automation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Assembling Applications with Patterns, Models, Frameworks, and Tools
Jack Greenfield and Keith Short
with Steve Cook and Stuart Kent
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GME
Domain-Specific Modeling Languages
Generators
Configuration Specification
Analysis Tool
C++/C Code

See www.dre.vanderbilt.edu/~schmidt/GEI.pdf for more info

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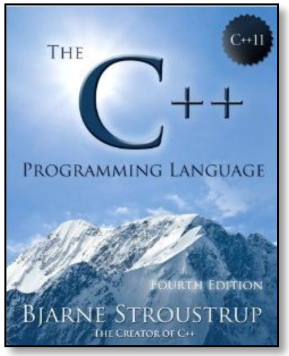
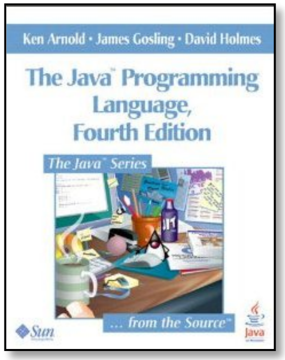
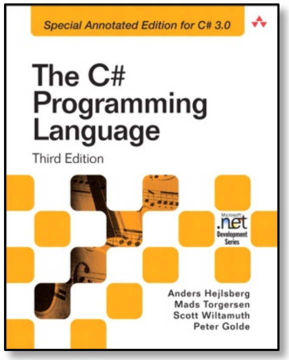
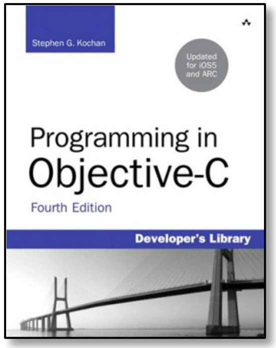
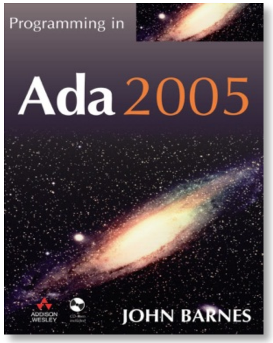
- Provide a basis for automation
- Transcend language-centric biases

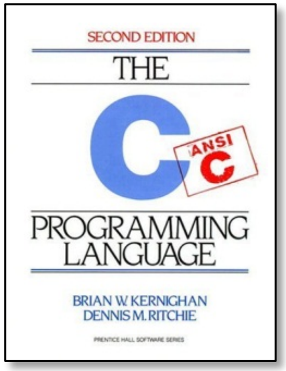



Ken Arnold · James Gosling · David Holmes
The Java Programming Language, Fourth Edition
The Java Series
... from the Source
Sun
Java









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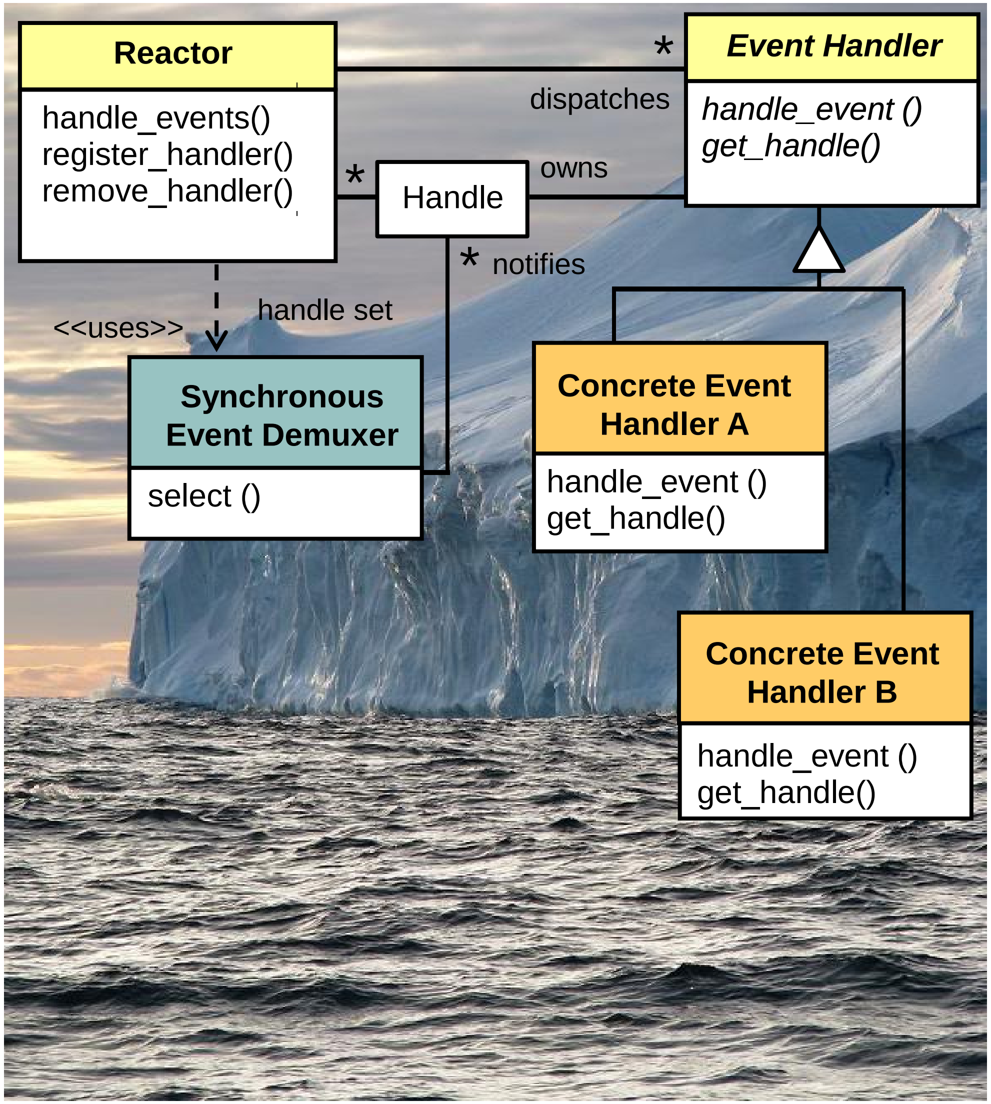
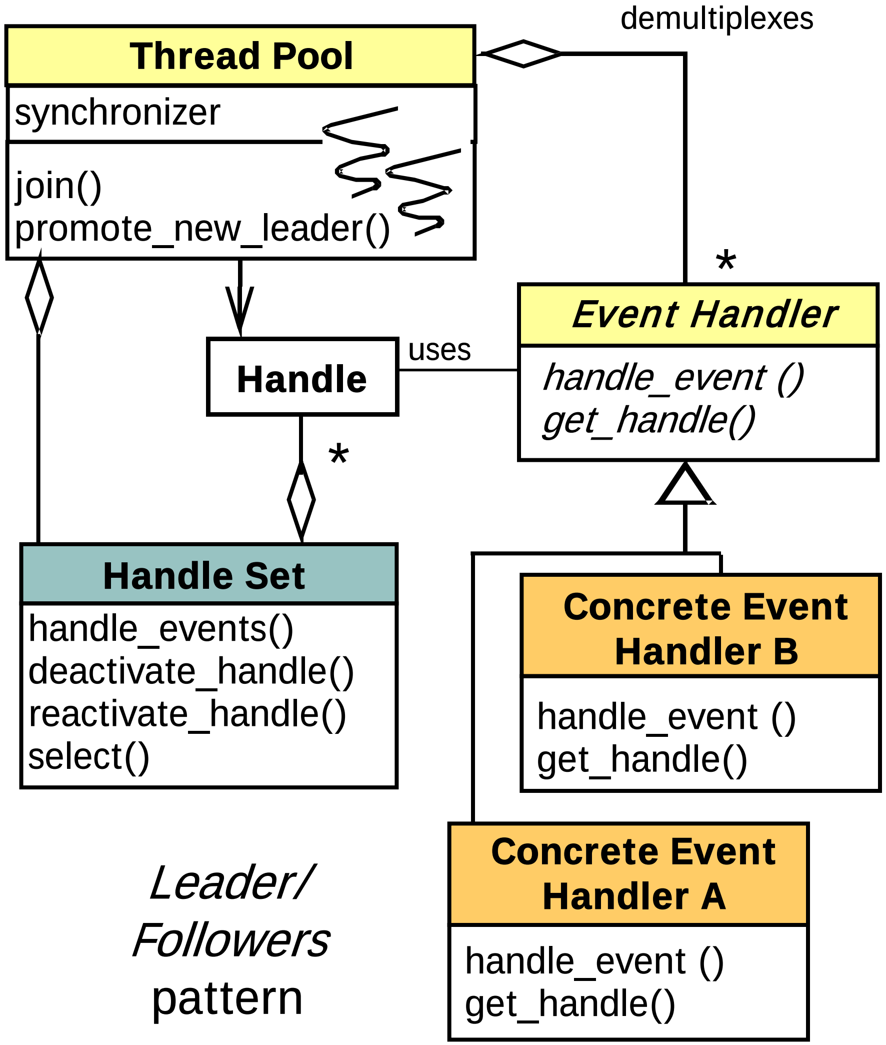
- Provide a basis for automation
- Transcend language-centric biases
- Abstract away from non-essential implementation details
  - e.g., during the design phase



# Limitations of Patterns

- Significant tedious & error-prone human effort may be needed to implement patterns manually



*Leader/ Followers* pattern

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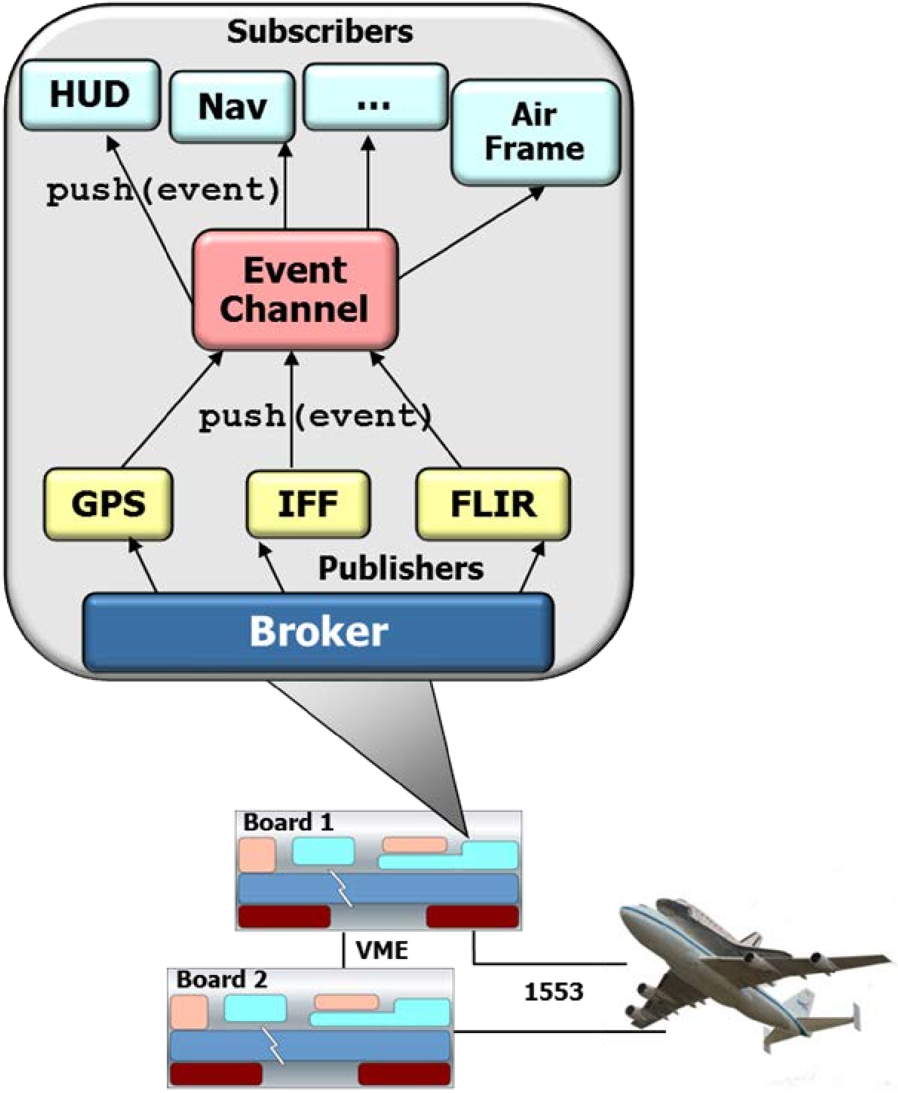

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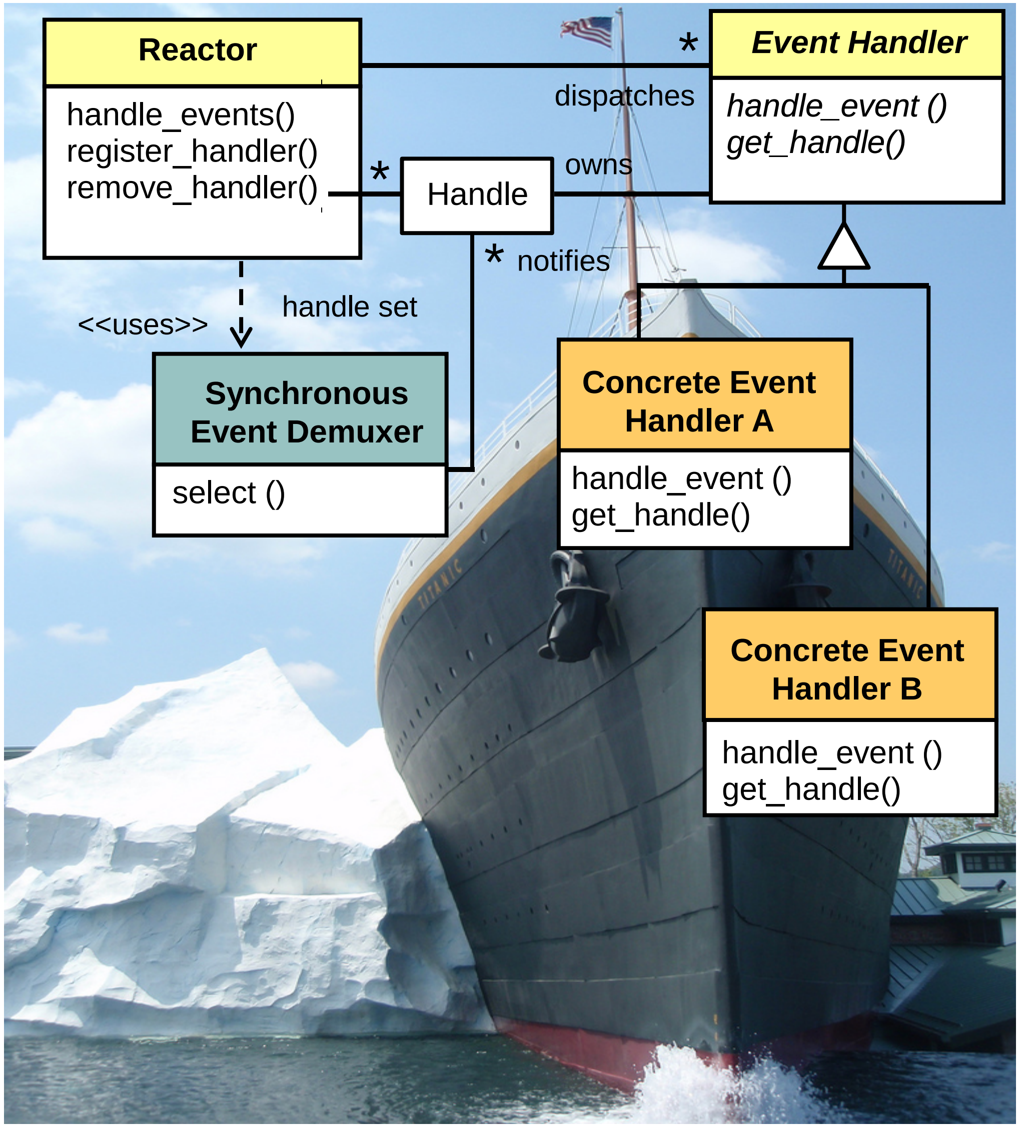
- Limited knowledge of patterns can constrain design options

Design Patterns
Elements of Reusable Object-Oriented Software
Erich Gamma
Richard Helm
Ralph Johnson
John Vlissides
Foreword by Grady Booch
ADDISON-WESLEY PROFESSIONAL COMPUTING SERIES

# Limitations of Patterns

- Significant tedious & error-prone human effort may be needed to implement patterns manually
- Shared design vocabulary can be deceptively simple
- Limited knowledge of patterns can constrain design options
- Essential implementation & optimization details may be neglected
  - e.g., edge-triggered vs. level-triggered event demuxers



See en.wikipedia.org/wiki/Epoll for more info on epoll()

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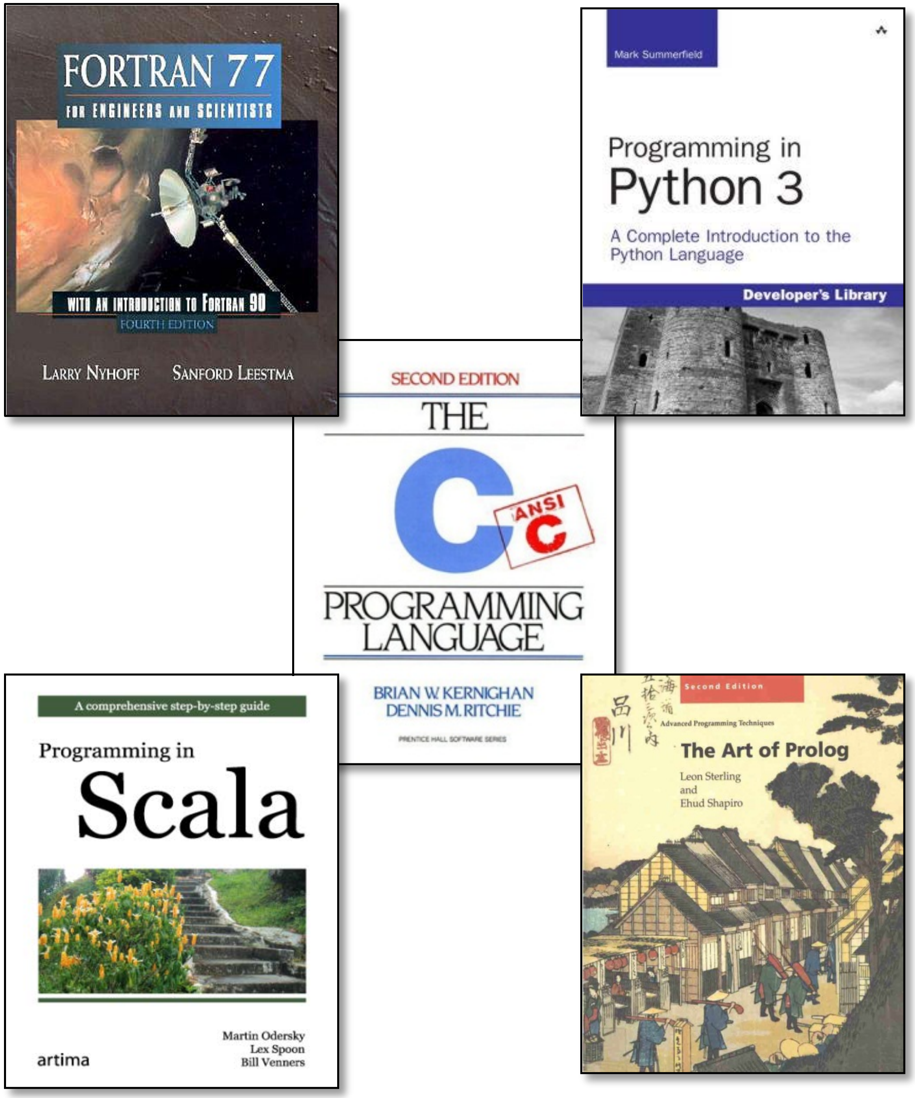
- Not all patterns are applicable to non-object-oriented languages
  - Nor are they always applicable in the same way



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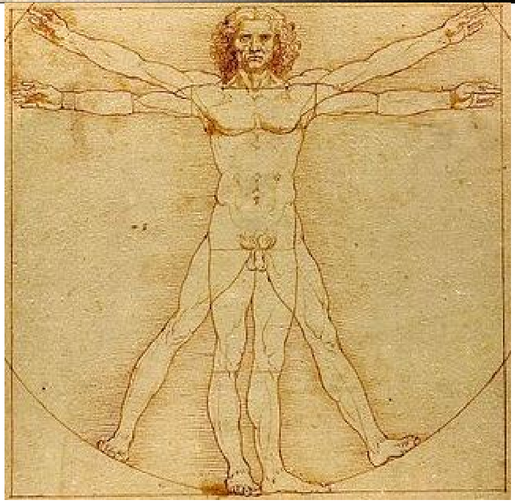

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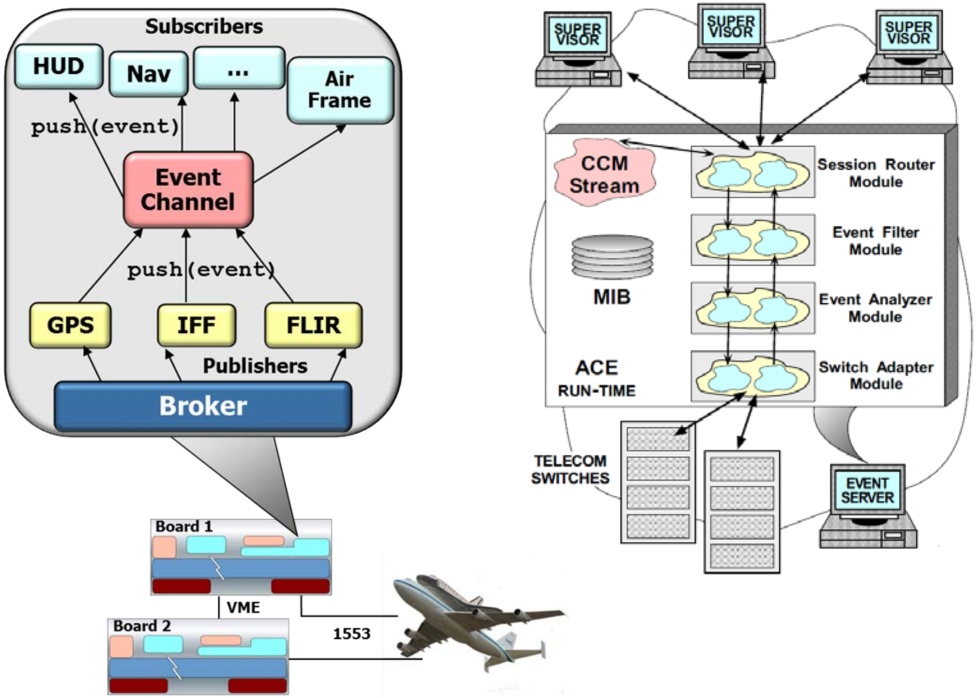
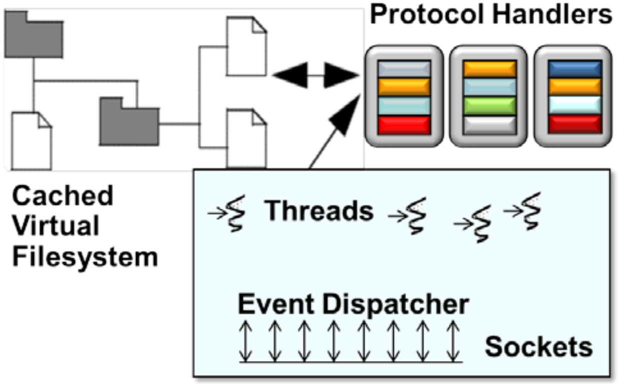
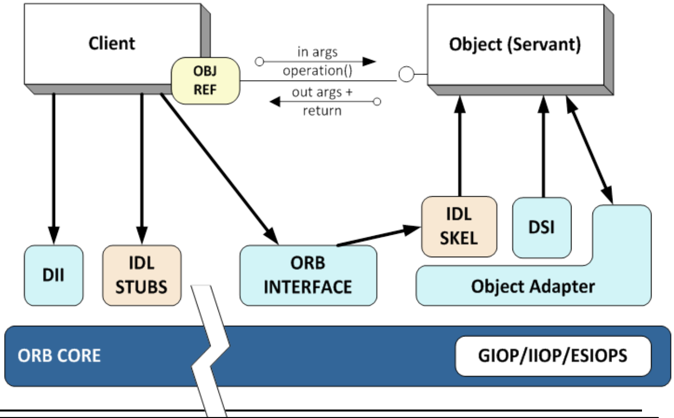
- Good patterns arise by generalizing from practical experience







See www.dre.vanderbilt.edu/~schmidt/patterns-experience.html for more info

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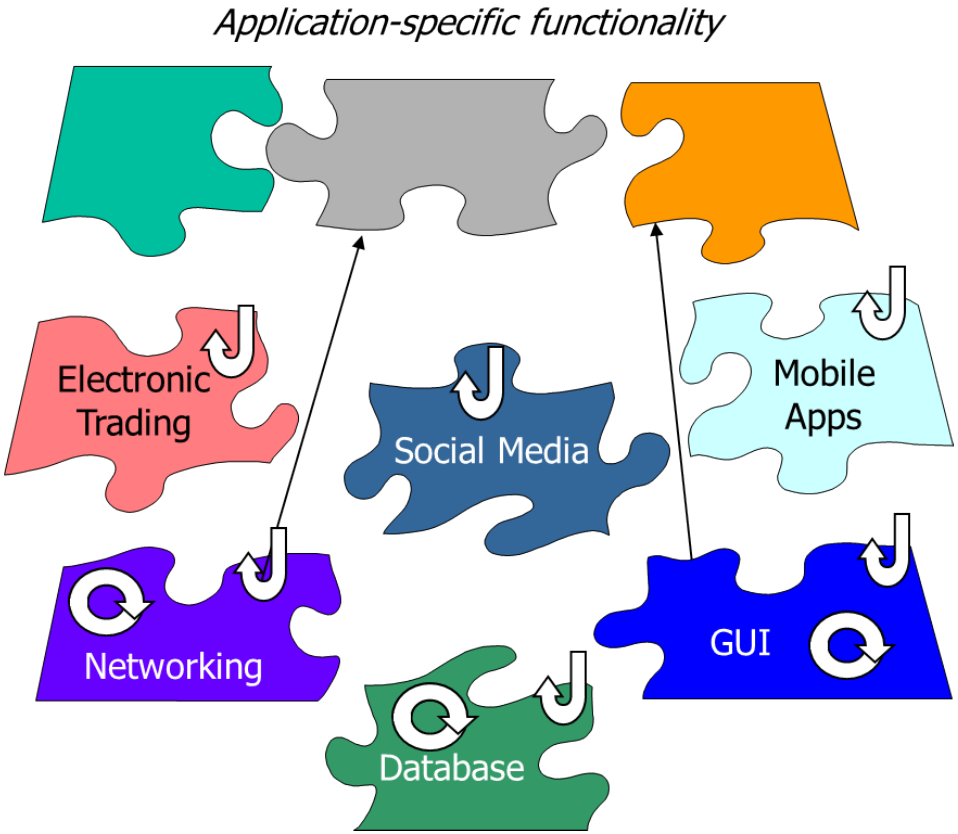
- Addressing key limitations of patterns requires more than just *design* reuse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Mobile Apps
Networking
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Database