

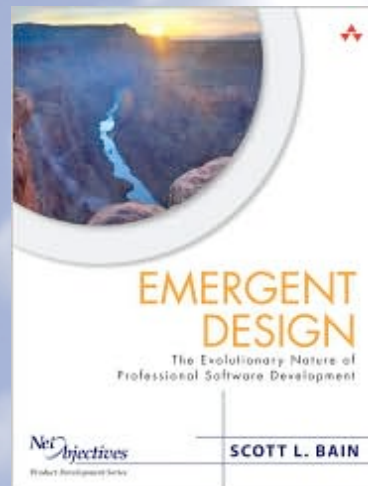
Net Objectives

info@netobjectives.com
www.netobjectives.com



Emergent Design

The Evolutionary Nature of
Professional Software
Development



Scott L. Bain
Net Objectives

Net Objectives: Who We Are



Vision Effective software development without suffering

Mission To assist companies in maximizing the business value returned from their efforts in software development and maintenance.

We do this by providing training, coaching, and consulting that directly assists and empowers our customers to create and sustain this ability

Services Training in sustainable product development
Assessments
Lean-Agile coaching and mentoring

Expertise Lean Software Development
Agile Methods (Scrum, XP, RUP)
Agile Analysis
Design Patterns
Test-Driven Development / Quality Assurance

Scott Bain



slbain
@netobjectives.com

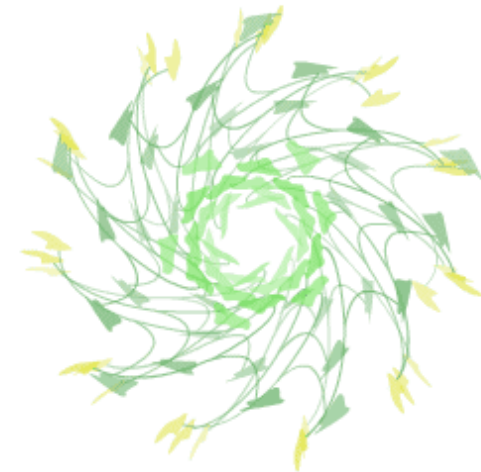
- Senior Consultant
- Certified Scrum Master
- Author, Emergent Design
- Instruction in Agile Development, Design Patterns, Test-Driven Development
- Consulting in quality coding and agile practices

*I have spent most of my professional life working for CBS television and radio.
I am an avid enthusiast of the American and Russian space programs of the 1960's and
an obsessive movie buff*

What Is Design?



- Risk mitigation
- Opportunity to reduce waste
- Documentation of intent
- The thought process behind the software
- Exists at multiple levels:
 - Architecture
 - “Design”
 - Code



When Do We Do Design?



- After Analysis?
- Before Implementation?
- Do we test our design?
- What if we get it wrong?
- What if we overdo it?
- How much design is enough design?

Analysis

Design

Implementation

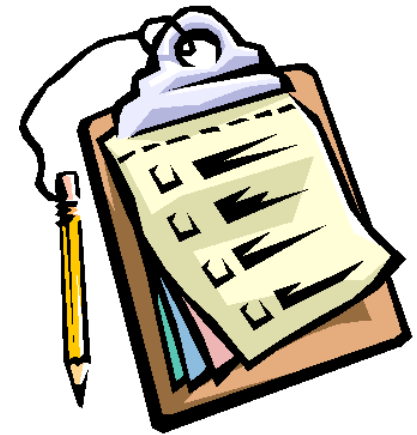
Testing

Release

Agenda



- The natural flow of software development
- The traditional view
- A more realistic view
- Qualities, Principles, and Practices
- Disciplines: Testing, Refactoring, and Patterns
- Emergent Design (an example)



The Nature of Software Development



“Let the water take you...”

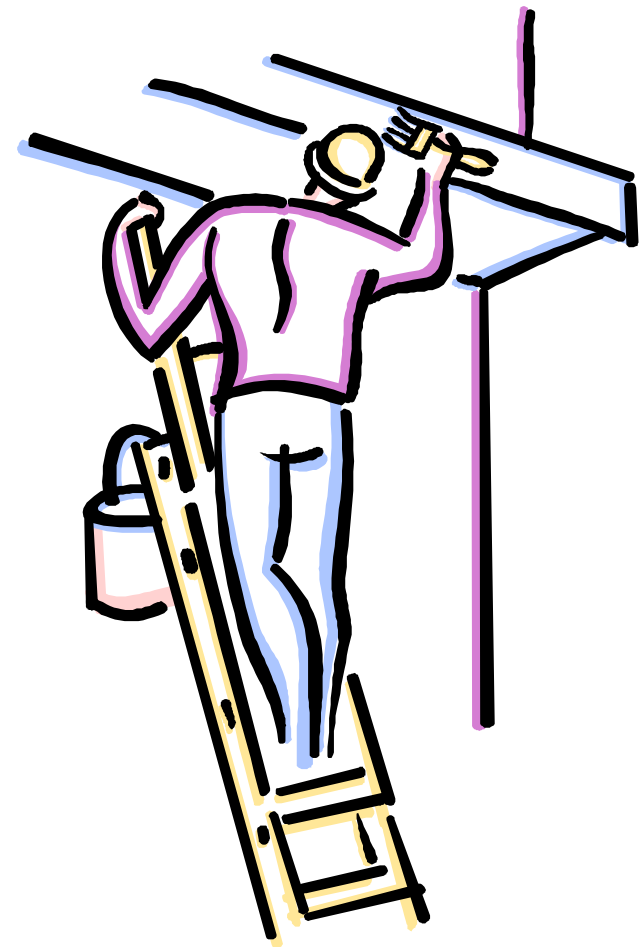


The water flows around the rocks, not through them.

The Traditional View



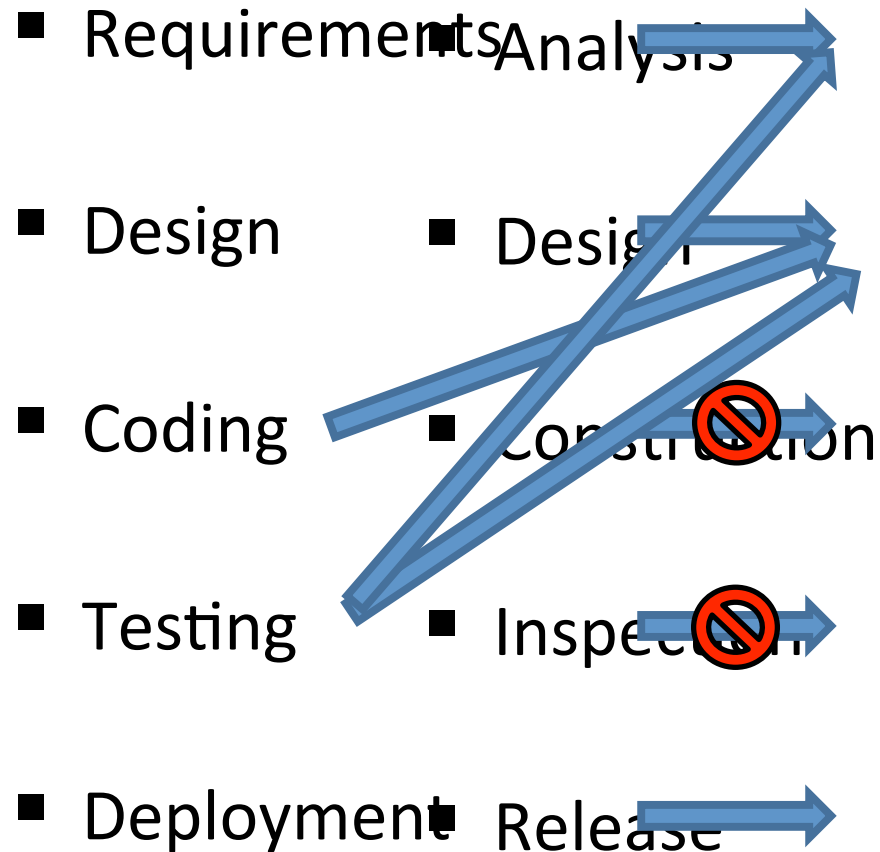
- Analogous to Civil Engineering
- Plan, do, review
- Based on:
 - Concrete Analysis
 - Hi-Fidelity Communication
 - Slow Pace of Change
 - Planning around “knowns”



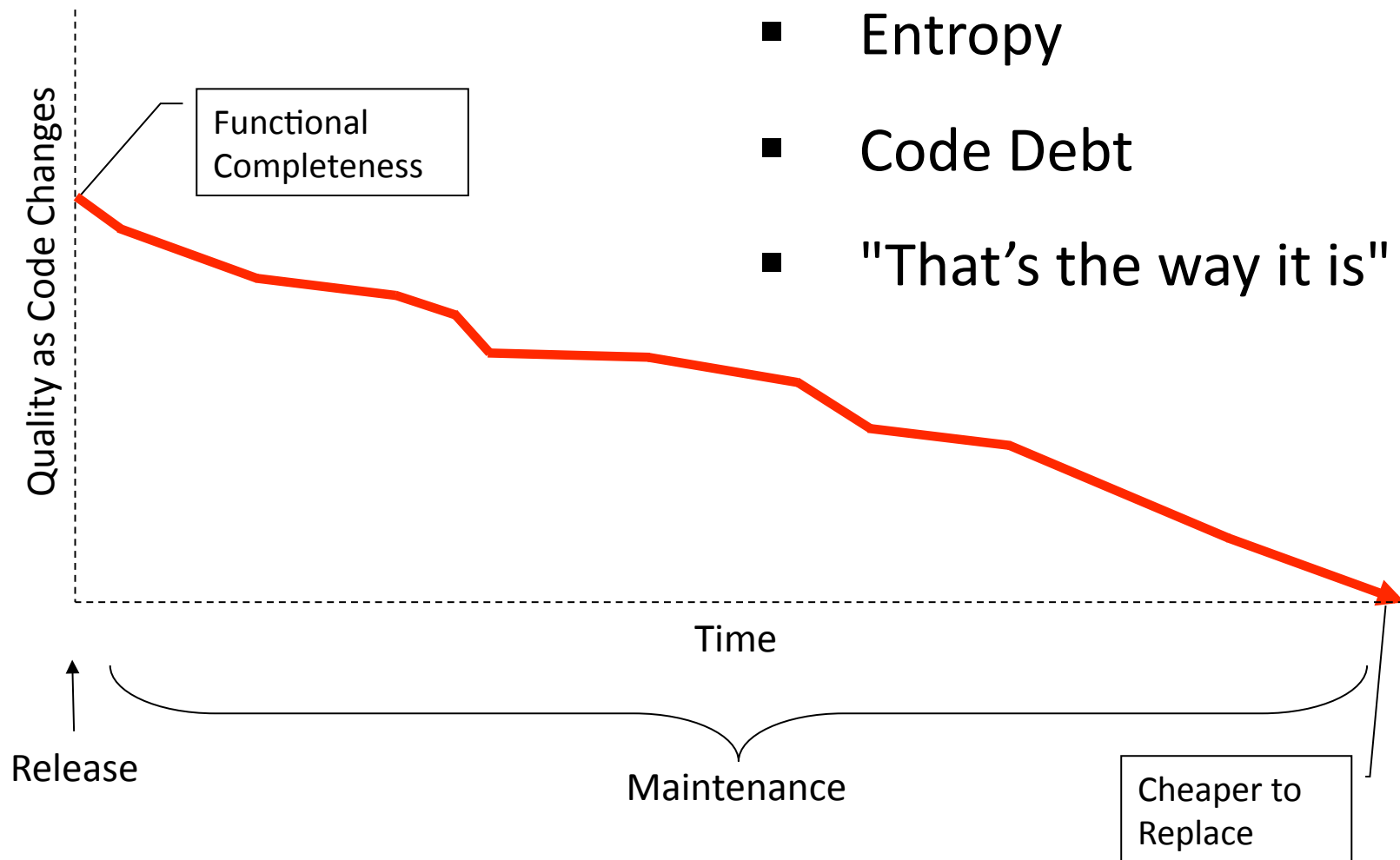
A Realistic Fit?



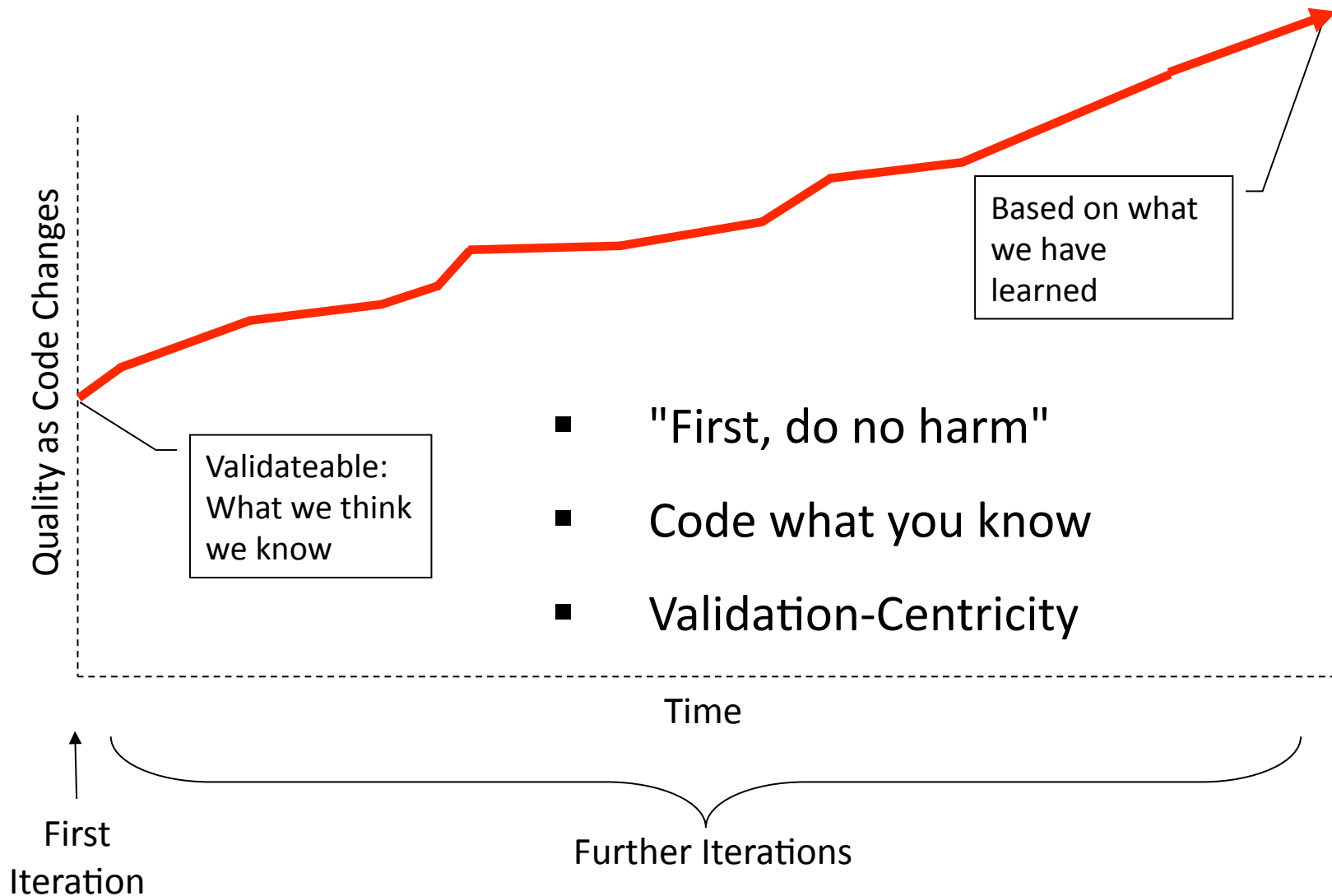
Software Development Engineering



"Inevitable" Decay



Rejecting Decay: Changing Change

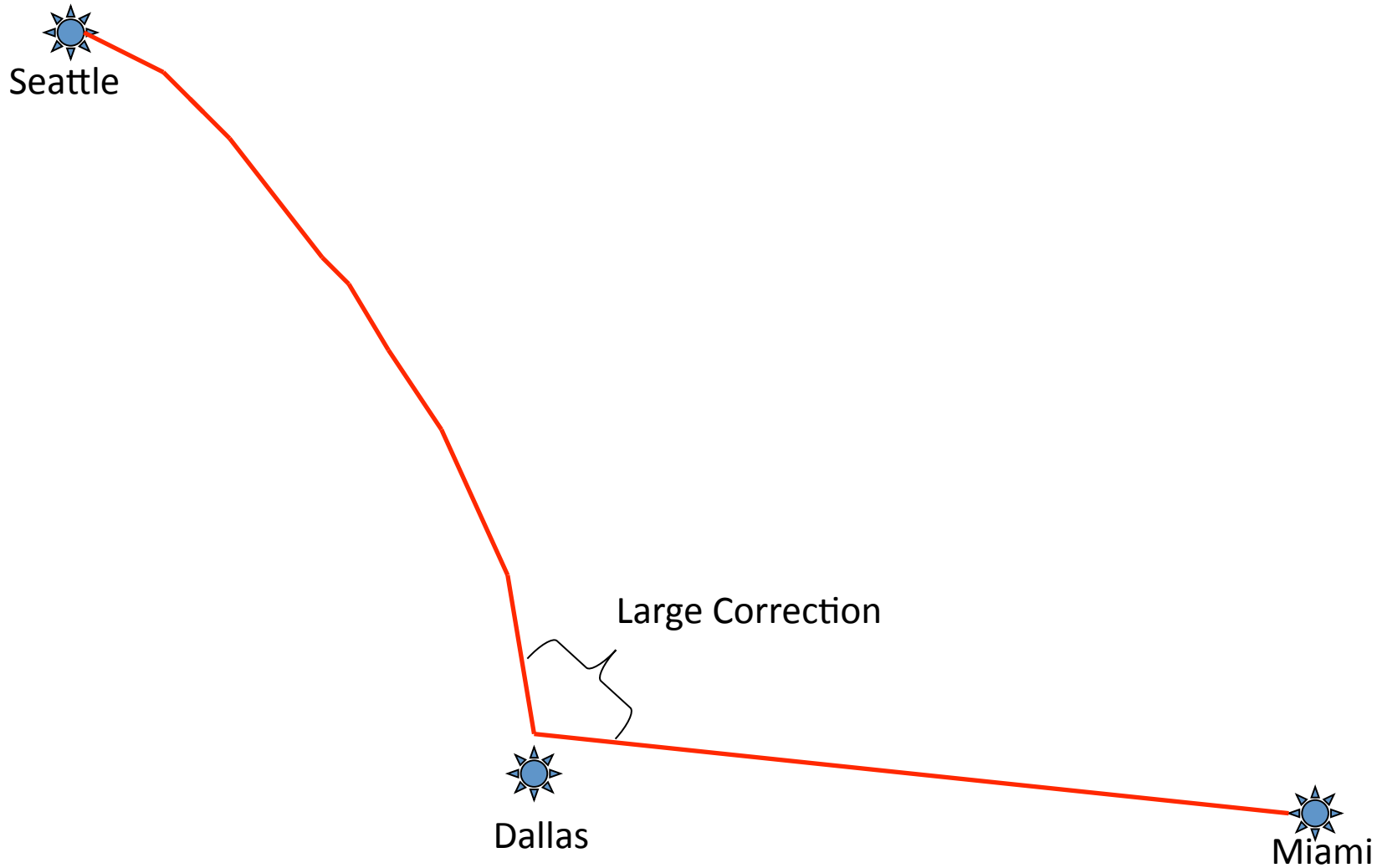


Changing Expectations, Changing Design

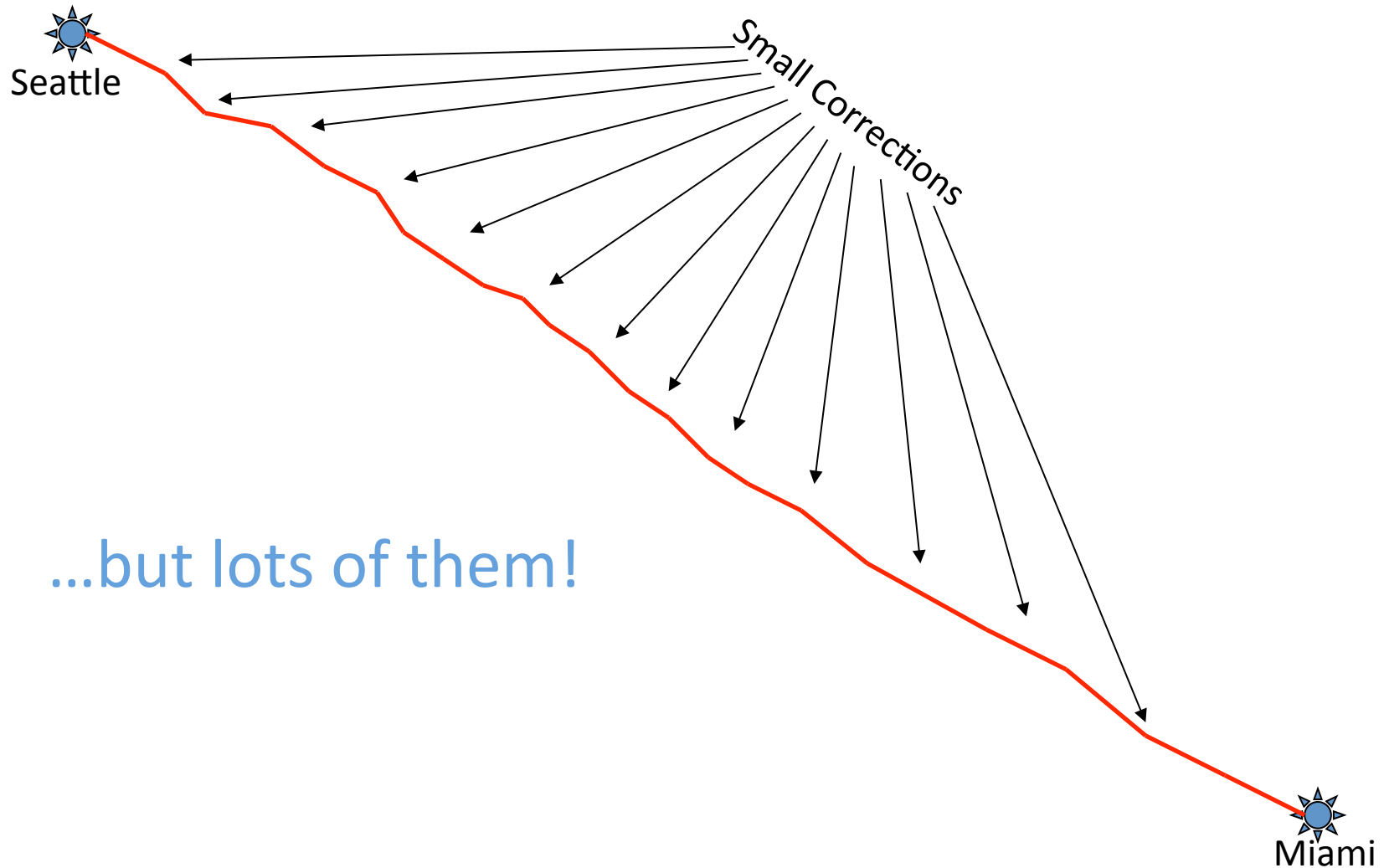


- Let's compare the “old way” of looking at design with this idea of emerging a design
- While we believe we're “letting the water take us”, we also want to respond to any vulnerabilities or potential waste in an agile process
- So, as an analogy...

Let's Fly to Miami: Plan, Do, Review



Let's Fly to Miami: Act, Validate, Adjust



What Is Changeable Design?



- A design is changeable if:
 - In changing it, you do not increase risk or waste
 - It can be changed economically (ROI)
 - It can be changed without decaying
- We are guided by the Open-Closed Principle, which is manifested by Patterns...

The Open-Closed Principle



- Based on the work of Bertrand Meyer, and ultimately a product of pre-OO thinking by Ivar Jacobsen
- Jacobsen: “All systems change during their life cycles. This must be borne in mind when developing systems expected to last longer than the first version”
- Meyer: “Software entities (classes, modules, functions, etc.) should be open for extension, but closed for modification”

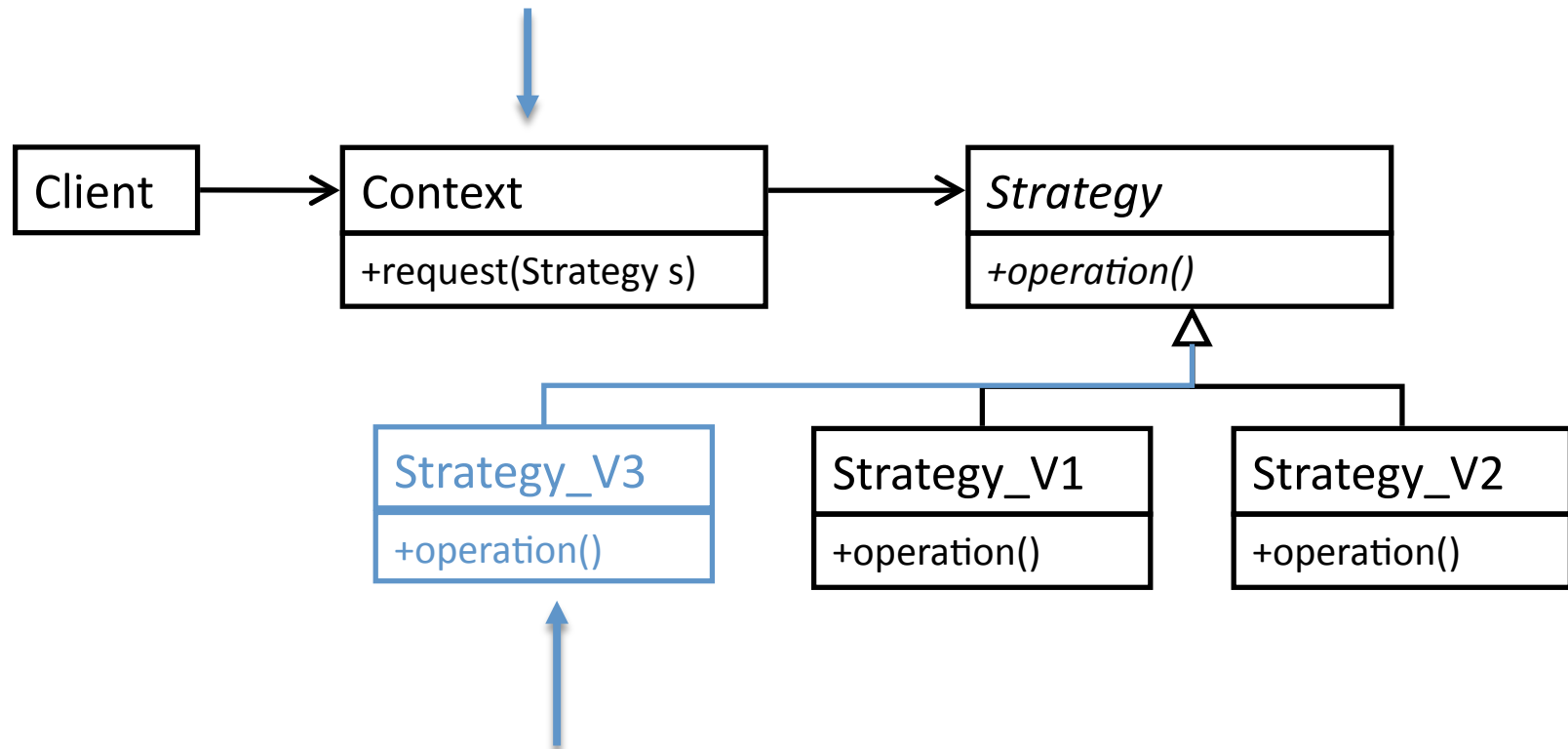


http://en.wikipedia.org/wiki/Open_Closed_Principle

Applied to Classes: The Strategy Pattern



Do not change the code in the context



New Requirement: *add a class*

The Kobayashi Maru



- From “Star Trek II: The Wrath Of Khan”
- The “un-winnable scenario”
- Kirk won anyway
- By cheating!



KOBAYASHI MARU	
CLASSIFICATION:	Class III Neutronic Fuel Carrier
REGISTRY:	Amber, Tau Ceti IV
MASTER:	Kojiro Vance
CREW:	81
PASSENGERS:	300
DEAD WEIGHT TONNAGE:	147,943 M.T.
CARGO CAPACITY:	97,000 M.T.
LENGTH:	237 m.
BEAM:	111 m.
HEIGHT:	70 m.
MAX CRUISE SPEED:	wf 3
MAX EMERGENCY SPEED:	wf 6

It's okay to cheat if it really helps you...

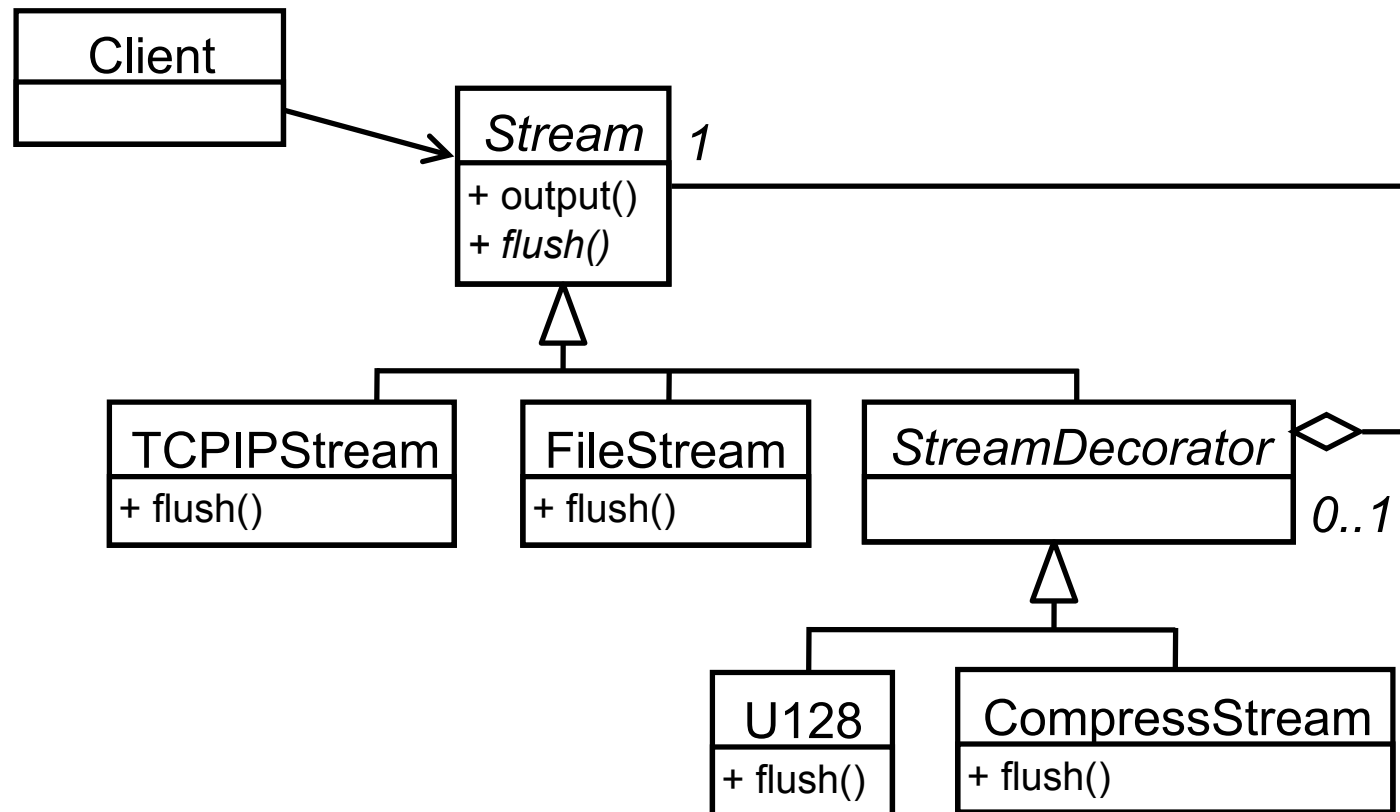
http://en.wikipedia.org/wiki/Kobayashi_Maru

Open Closed to Other Things: The Decorator Pattern



- The Decorator Pattern is about adding one, two, or many optional behaviors on top of an existing behavior
- For flexibility, we often accomplish this by placing the behaviors in a linked list (although this is not the pattern, only an example implementation)
- If you've done streaming IO in Java or .Net, you've already used a decorator

Decorator Pattern for Streaming IO

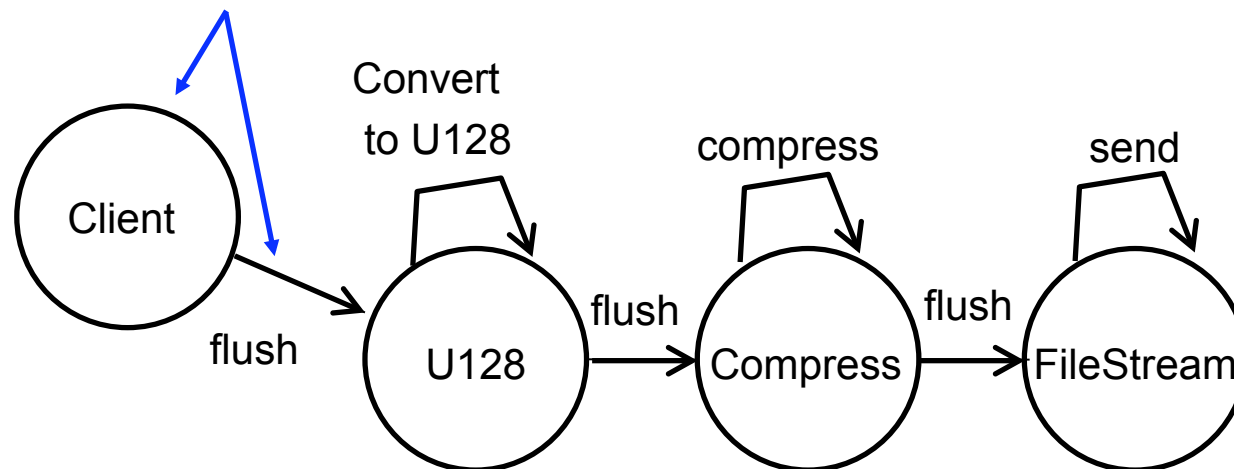


```
Stream myStream = new U128(
    new CompressStream(
        new FileStream(filename)));
```

Decorator's Structure and Behavior

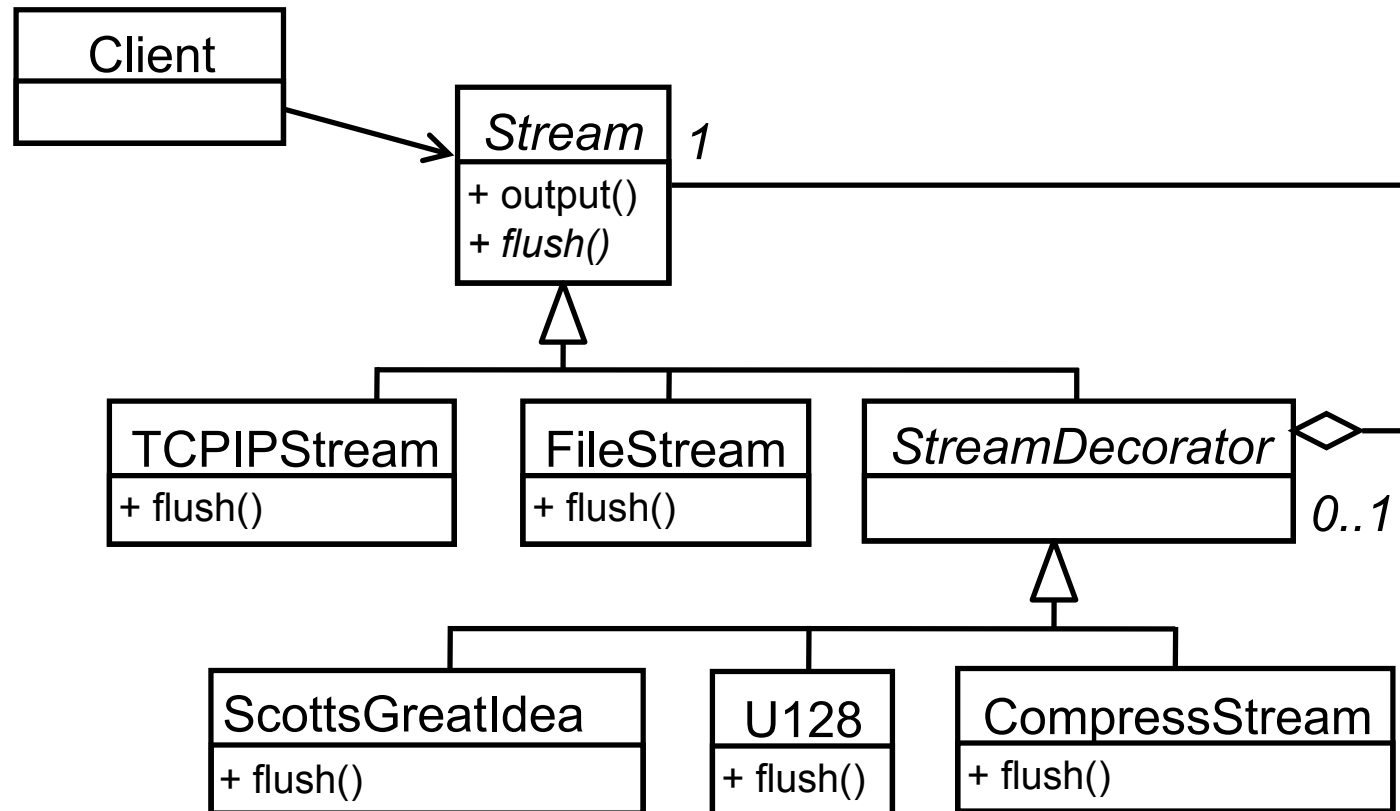


Single Behavior, sees only "Stream"



Case: Convert to Unicode, Compress, Flush

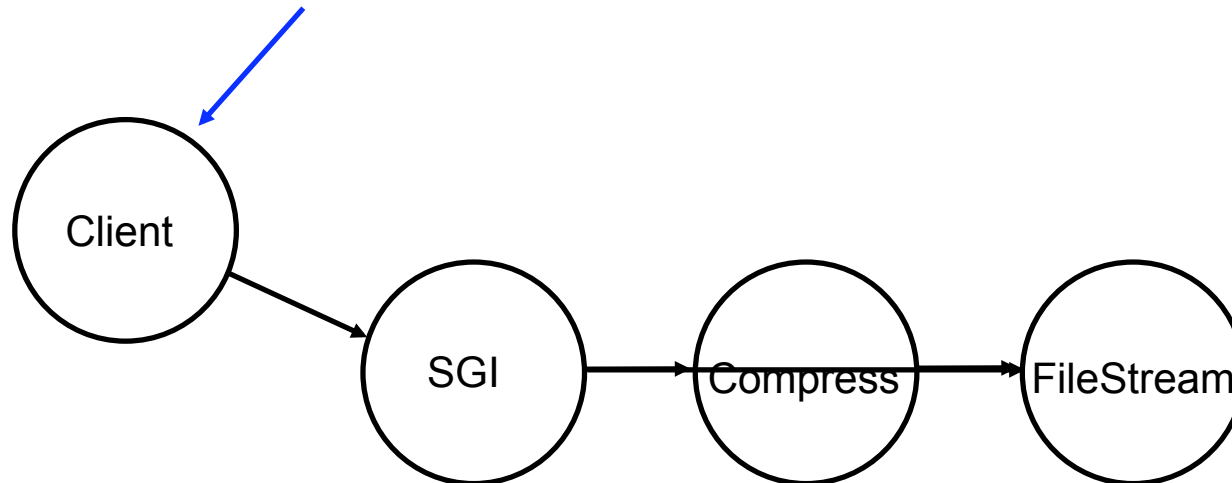
Open-Closed to a New Decorator



Open-Closed to More Things...



No change to the
Client's code...



Open-Closed is a “Principle”



- No matter how “Open-Closed” your system is, it could be moreso
- Sometimes it’s overkill, especially if you know you can add it later
- If we don’t go so far as to introduce it at the class or design level, we can still be guided by it...

What Is Changeable *Code*?



- Code can be open-closed too
- It has to do with:
 - Cohesion (each class or method is “single minded”)
 - Coupling (dependencies and side-effects are minimized)
 - Non-duplication (one rule in one place)
- ...and these ***qualities*** are manifested by Patterns too

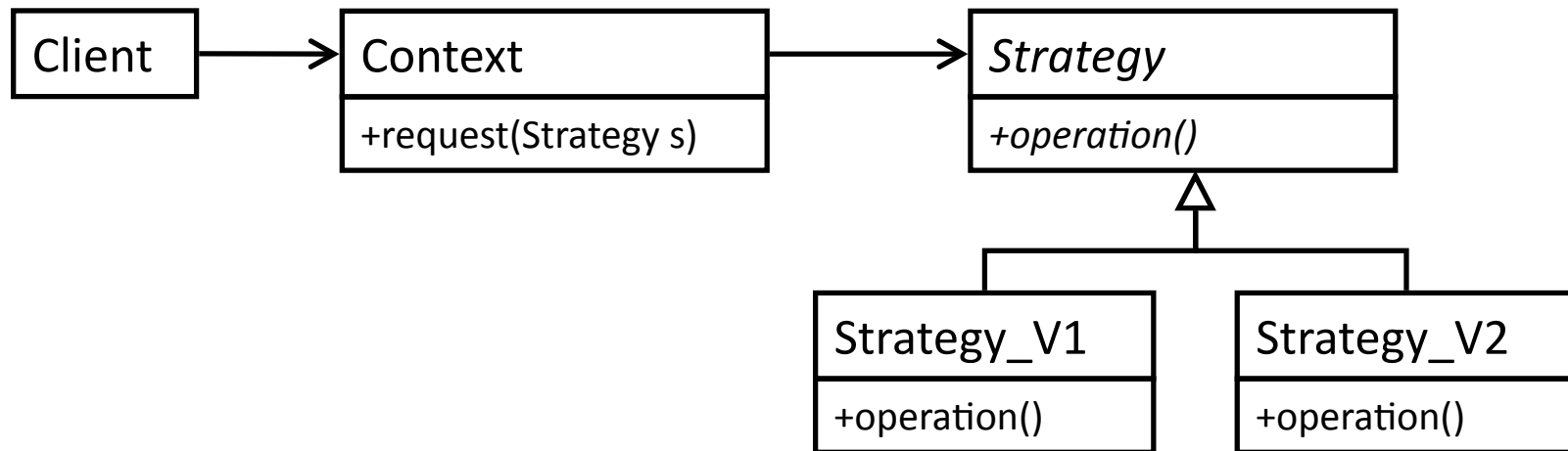
Patterns Also Promote Code Quality



Cohesive: Delegates an operation

Decoupled: No commitment to specific implementation

Any duplication pushed up here



Cohesive: Implementation is separate

Decoupled: Implementations have no side-effects

Principles and Practices



Principles:

- General wisdom about design
- Can be difficult to follow in some situations
- Are often compromised when we are high to follow
- Helps us to think about what we are doing
- Example: OCP



Practices:

- Are always different
- Are often different ways
- Are becoming standard things
- Help us to think about things
- Example: let's look at two...



Practice: Programming By Intention



```
class Transaction
{
    public Boolean commit(String command)
    {
        Boolean result = true;

        String[] tokens = tokenize(command);

        normalizeTokens(tokens);

        if(tokens.Length > getMaximumLength()) {
            result = processLargeTransaction(tokens);
        } else {
            result = processSmallTransaction(tokens);
        }
        return result;
    }
}
```

Practice: Encapsulate the Constructor



- A simple practice that promotes the separation of use from construction
- Is the topic of an entire seminar on its own
- I'll show it simply here...

Instead of This...



```
class Service {
    public String doOperation(int x) {
        //Whatever this does
        return rVal;
    }
}

class Client {
    Service myService;
    Client() {
        myService = new Service();
    }

    public void m() {
        // Other stuff
        myService.doOperation(10);
        //
    }
}
```

We Do This...*



```
class Service {
    private Service(){}
    public static Service getInstance() {
        return new Service();
    }
    public String doOperation(int x) {
        //Whatever this does
        return rVal;
    }
}

class Client {
    Service myService;
    Client() {
        myService = Service.getInstance();
    }

    public void m() {
        // Other stuff
        myService.doOperation(10);
        //
    }
}
```

****Based on a recommendation by Joshua Bloch in Effective Java***

So Later We Can Do This...



```
abstract class Service {

    public static Service getInstance() {
        if(whateverCondition()) {
            return new Service_V1();
        }else{
            return new Service_V2();
        }
    }
    public abstract String doOperation(int x);
}

class Service_V1 : Service {
    // impl1
}

class Service_V2 : Service {
    // impl1
}

//... with little or no change to the client(s)
```


Disciplines



- These are what we teach entire courses on
- Three we're sold on:
 - Pattern-Oriented Development, which we've touched on
 - Test-Driven Development
 - Refactoring (in two different senses of the word)

Testability and Quality

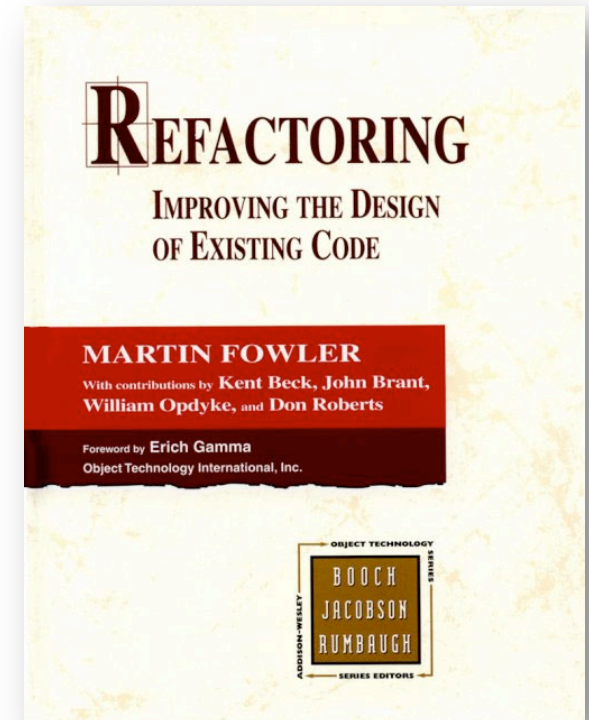


- One big virtue of Test-Driven Development /Design is that it drives the “testability” issue to the forefront in design
 - A class that is too tightly coupled will be hard to test, because all of its dependencies will have to be tested with it
 - A class that is weakly cohesive will be hard to test, because all possible combinations of its multiple responsibilities will have to be tested, due to lack of encapsulation
 - Redundancies in the system will produce redundancies in the test(s)

Refactoring



- “Improving the Design of Existing Code”
- Behavior-Preserving Change of code
 - Same outward effect as before
 - Same tests pass as before
 - Code Quality is Improved
- Often seen as “Developer Obsession” with code cleanliness, because it does not produce new business value



Refactoring: Improving the Design of Existing Code by Martin Fowler, Kent Beck, John Brant, William Opdyke, Don Roberts

Two Kinds of Refactoring



- Classic “Fowlerian” Refactoring:
 - Taking working code and making it better
 - Improving its clarity
 - Improving its design

- Refactoring to the Open Closed
 - Taking working code that was fine when written
 - But is not open-closed to adding a new requirement
 - Making it open closed (in a particular sense)
 - ...so you can enhance (add a feature) with less risk and less waste
 - Eliminating risk and waste are business values

(Fowler understands this too...)

Design as Evolution: Emergent Design



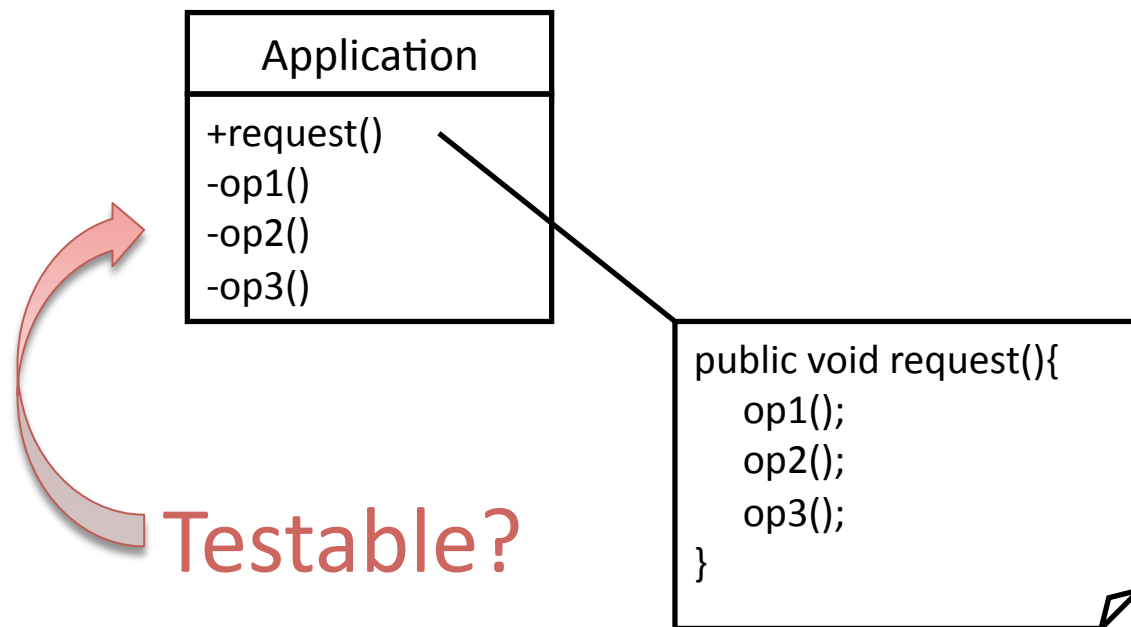
- Software is valuable relative to the world around us, and the needs it has...
- The world, and its needs, change
- For software to retain its value, it must change
- The pace of change is increasing
- Software must always be in a state of evolution

- Disciplines, Principles, and Practices make it possible...

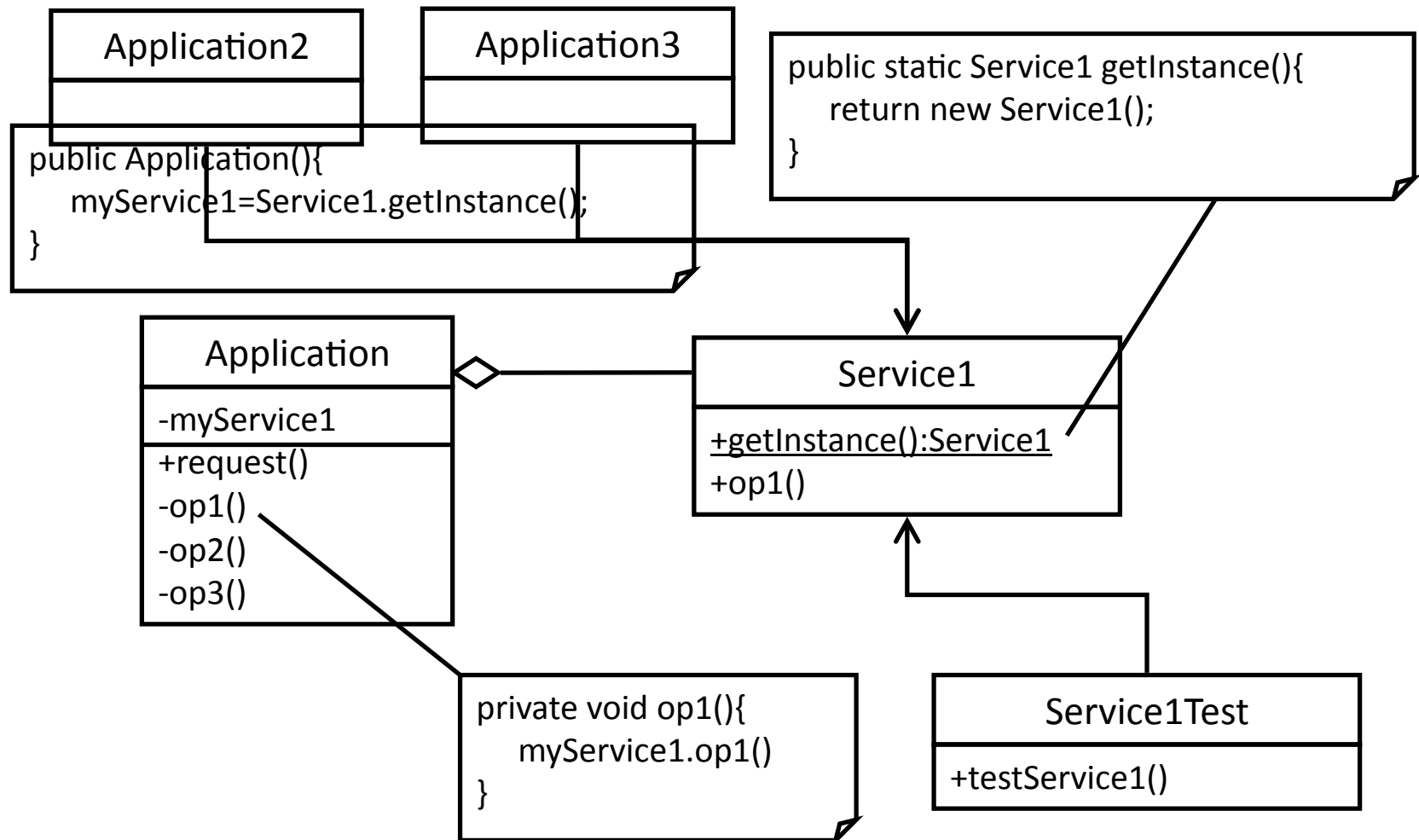
Practice: Programming By Intention



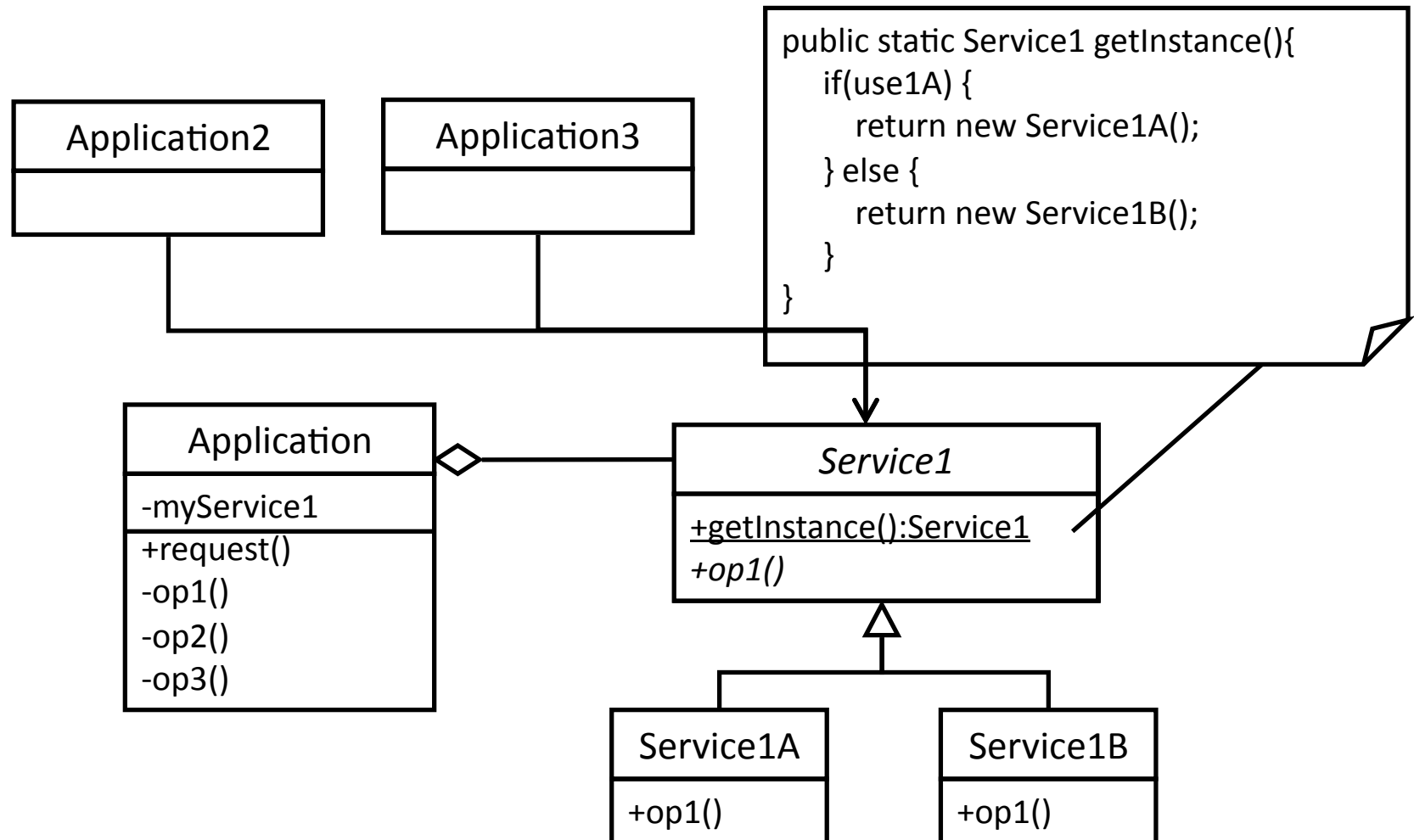
If we'd neglected to do this (or someone else neglected to do this) the refactor would be *extract method*.



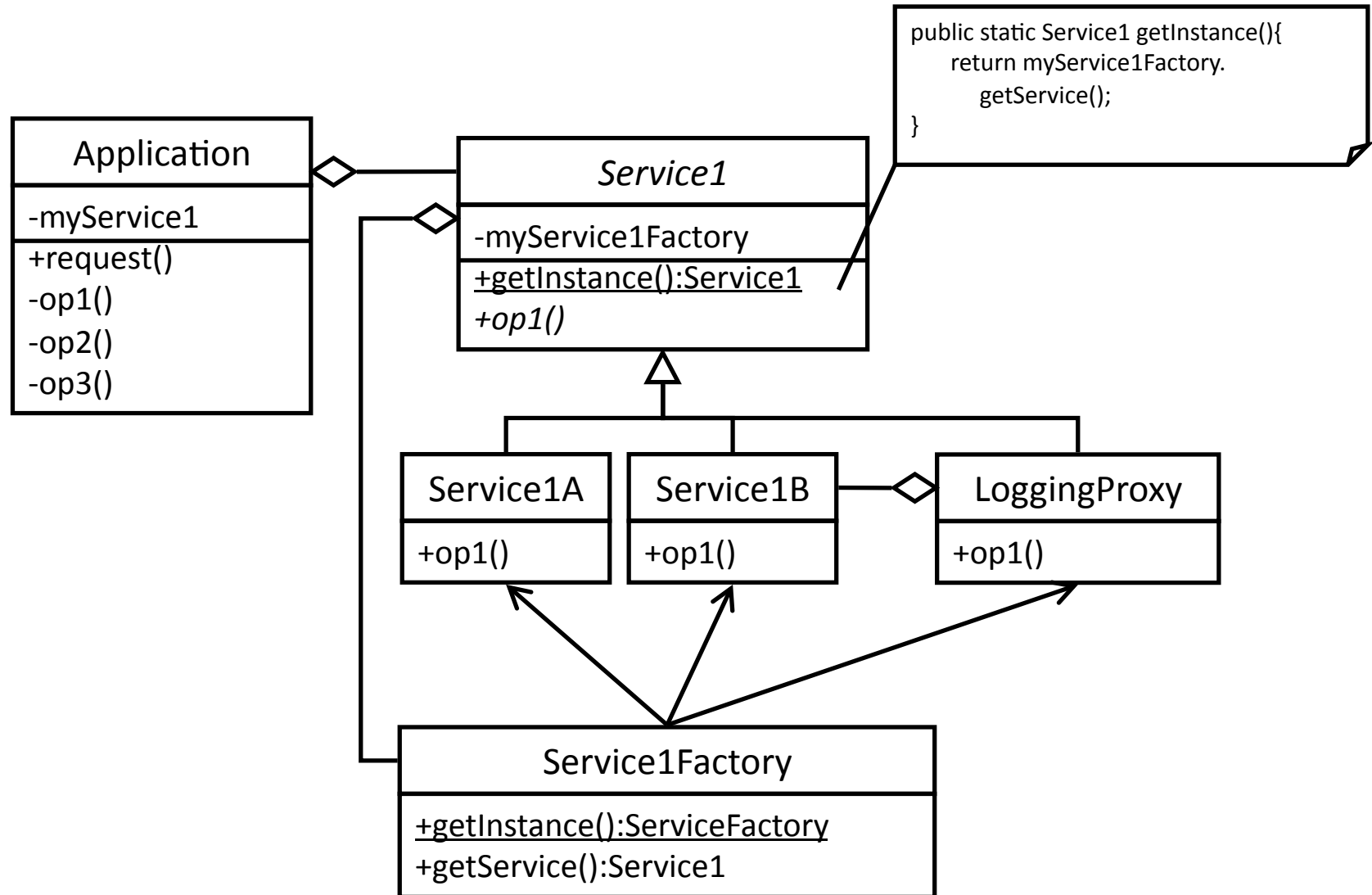
Testability: Refactor - Extract Class



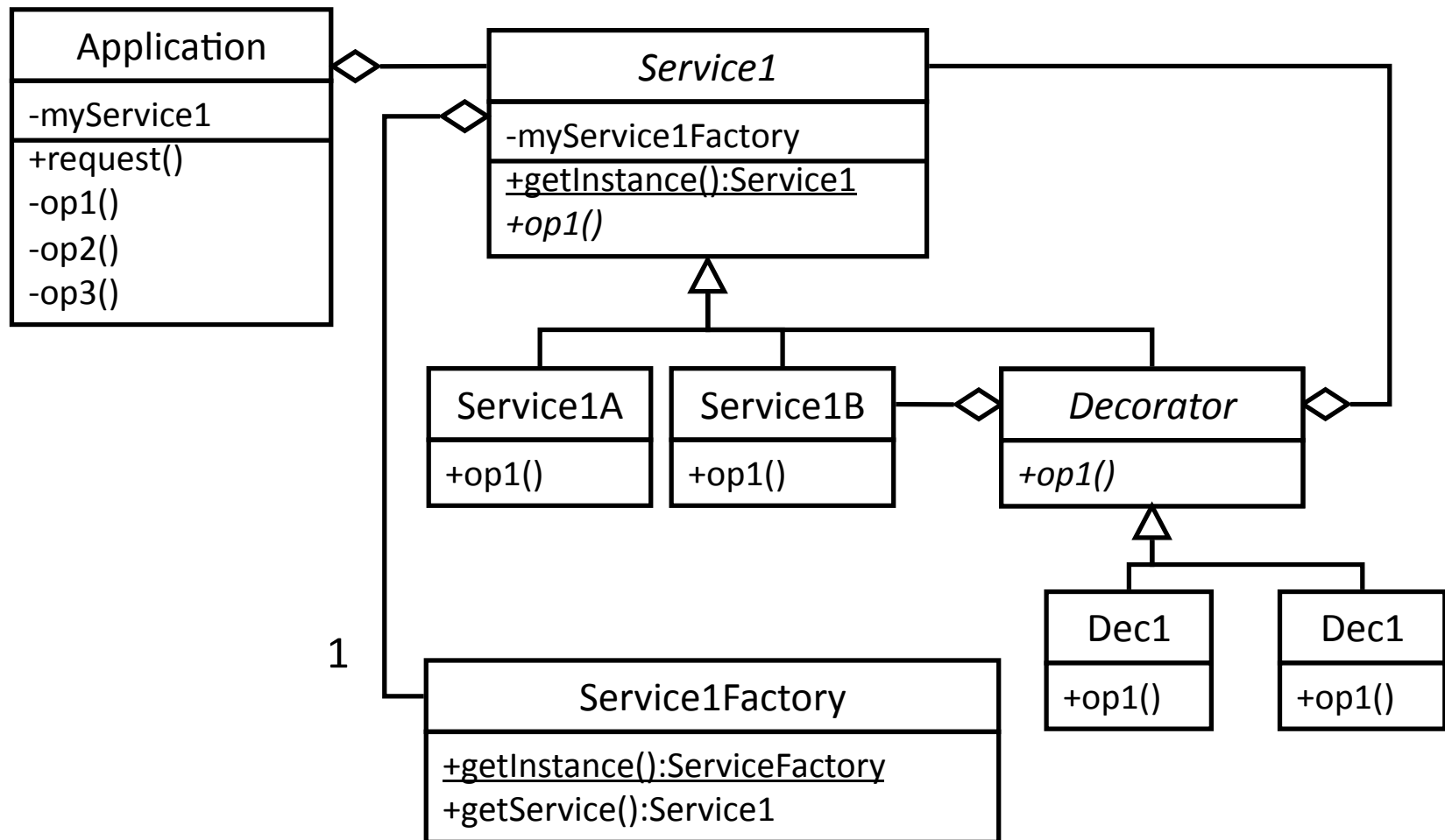
Open-Closed Principle: Refactor - Extract Interface



Patterns: Refactor – Introduce Proxy



Patterns: Refactor – Evolve Decorator



Remember Where We Started?



Application
+request() -op1() -op2() -op3()

Avoiding Over-Design



- Complexity When You Need it
 - But not before you need it
- Good practices reduce risk
- Risk is wasteful
- Over-Design is wasteful

- Emergent Design uses refactoring to reduce over-design and enable low-risk change
- Principles can guide us...
- Practices can protect us...
- Disciplines can empower us...
- You cannot stop thinking!

Resources for Further Investigation



- Design Patterns:
 - www.netobjectives.com/PatternRepository
- Testing, Refactoring, Qualities
 - www.netobjectives.com/resources

Pattern Repository



[article](#) [edit](#) [history](#) [unprotect](#) [delete](#) [move](#) [unwatch](#)

Main Page

Net Objectives

The Net Objectives Design Patterns Repository [\[edit\]](#)

This repository is sponsored by [Net Objectives](#), a Seattle-based organization dedicated to training, coaching, and consulting on software design, agile methodologies, test-driven development, lean software process, and scrum.

The site manager is [Scott Bain](#).

You are free to use this material for your edification and study. Please ask any questions or contribute your views on patterns at our Yahoo Lean Programming Group: <http://tech.groups.yahoo.com/group/leanprogramming/>

The authors of this repository lurk on that discussion group and will answer your questions, comments, suggestions and make changes to this repository as needed.

The "original seed" material for this repository was taken directly from appendix B of Scott Bain's book [Emergent Design: The Evolutionary Nature of Professional Software Development](#)

For other online resources provided by Net Objectives, please visit the [Net Objectives Main Site](#).

Site Information: [\[edit\]](#)

- Structure of the Pattern Pages
- Why Membership is Required (for editing only)
- Acknowledgements
- Contributors

Patterns: [\[edit\]](#)

- Listed Alphabetically
- Listed by Encapsulation
- Pattern Comparisons
- Pattern Evolutions
- Patterns Under Consideration
- Pattern Humor

Want to add a pattern? Here are complete instructions for creating a new page, and applying the pattern template to it:

- [New Pattern Template](#)

Qualities: [\[edit\]](#)

- Code Quality Matrix

Want to experiment with wiki editing in a safe area?

Net Objectives

navigation

- Repository Home
- Net Objectives Home
- Discussion Group
- Training
- News
- Recent changes
- Random page
- Help

patterns

- Abstract Factory
- Adapter
- Bridge
- Chain of Responsibility
- Command
- Composite
- Decorator
- Facade
- Mock Object
- Observer
- Proxy
- Singleton
- State
- Strategy
- Template Method
- Visitor

search

toolbox

- What links here
- Related changes
- Upload file
- Special pages
- Printable version
- Permanent link

Resources



Resources

Lean Software Development

Agile / Scrum

Design / Testing /
Programming Skills for Agile
Developers

Agile VSTS

Certification

Coaching

Tools

Webinars

Bibliography by Topic

Book: Design Patterns
Explained

Book: Emergent Design

Book: Prefactoring

Book: Lean-Agile Software
Development - Achieving
Enterprise Agility

Book: Essential Skills for the
Agile Developer

Blog: Net Objectives
Thoughts

Podcast: Lean-Agile Straight
Talk

Pattern Repository

User Groups

- Resources: www.netobjectives.com/resources
 - Ezines (regular online magazine)
 - Streamzines (PowerPoint with audio)
 - Articles and whitepapers
 - Pre/post course support Supporting materials
 - Quizzes
 - Recommended reading paths
- Blogs and podcasts: blogs.netobjectives.com
- Annotated Bibliography
- Additional Training
- Two User Groups
 - <http://tech.groups.yahoo.com/group/leanagilescrum>
 - <http://tech.groups.yahoo.com/group/leanprogramming>

Join our e-mail list to receive regular updates and information
about our resources and training of interest to you

Net Objectives Services



Training in Sustainable Product Development

Net Objectives offers the most comprehensive Lean-Agile training in the world. Our offerings include Lean, Agile Analysis, Scrum, Design Patterns, Test-Driven Development, Lean-Agile Testing and more.

Our approach is a blend of principles and practices to provide a complete team and/or enterprise wide training solution.

Certification Programs by Net Objectives

Net Objectives offers certification programs that provides a road-map of knowledge as well as resources to get there.

- Scrum Certification
- ScrumMaster Certification
- Product Owner Certification

Net Objectives is not affiliated with the Scrum Alliance.

Assessment Services

An effective way to embark on an enterprise level transition to Lean-Agile methods is to start with an assessment of where you are, where you want to go and options on how to get there that are right for you and your budget.

Lean-Agile Coaching

While training can provide a great jump start, coaching is often the most effective way of assisting a team in transitioning to a more effective software development process.

Our coaches work with your teams to provide guidance in both the direction your teams need to go and in how to get there.

Coaching provides the knowledge transfer while working on your own problem domain.

Net Objectives

Thank You!

**Please fill out your
evaluations!**

... and following is more to help you
plan your next steps

Help Us Spread the Word of Lean

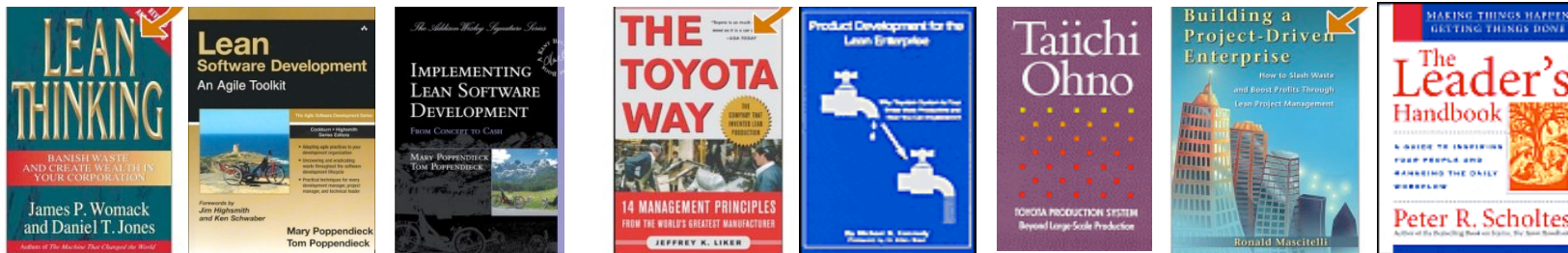


- Contact us if you want a free day of Lean Software Development at your site, shared with your community. Contact Alan Shalloway alshall@netobjectives.com

A Short List of Books - Lean Related



- Womack and Jones: *Lean-Thinking*
- Mary & Tom Poppendieck
 - *Lean Software Development*
 - *Implementing Lean Software Development: From Concept to Cash*
- Jeff Liker: *The Toyota Way*
- Michael Kennedy: *Product Development in the Lean Enterprise*
- Taiichi Ohno: *Toyota Production System*
- Ronald Mascitelli: *Building a Project-Driven Enterprise: How to Slash Waste and Boost Profits Through Lean Project Management*
- Peter Scholtes: *The Leader's Handbook: Making Things Happen, Getting Things Done*

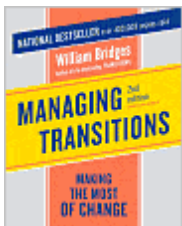


See <http://www.netobjectives.com/resources/bibliography> for a full bibliography

Other Relevant Books



- William Bridges: *Managing Transitions*
- Weick and Sutcliffe: *Managing the Unexpected: Assuring High Performance in an Age of Complexity*



See <http://www.netobjectives.com/resources/bibliography> for a full bibliography

A Short List of Books - Technical



- Mugridge & Cunningham: *Fit for Developing Software*
- Michael Feathers: *Working Effectively with Legacy Code*
- Shalloway & Trott: *Design Patterns Explained, A New Perspective on Object-Oriented Design*
- Bob Martin: *Agile Software Development: Principles, Patterns and Practices*
- Freeman, Freeman, Bates, Sierra: *Head First Design Patterns*
- Martin Fowler, *Refactoring: Improving the Design of Existing Code*
- Ken Pugh, *Prefactoring*
- Scott Bain, *Emergent Design: The Evolutionary Nature of Professional Software Development*



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Lean-Agile Coaching

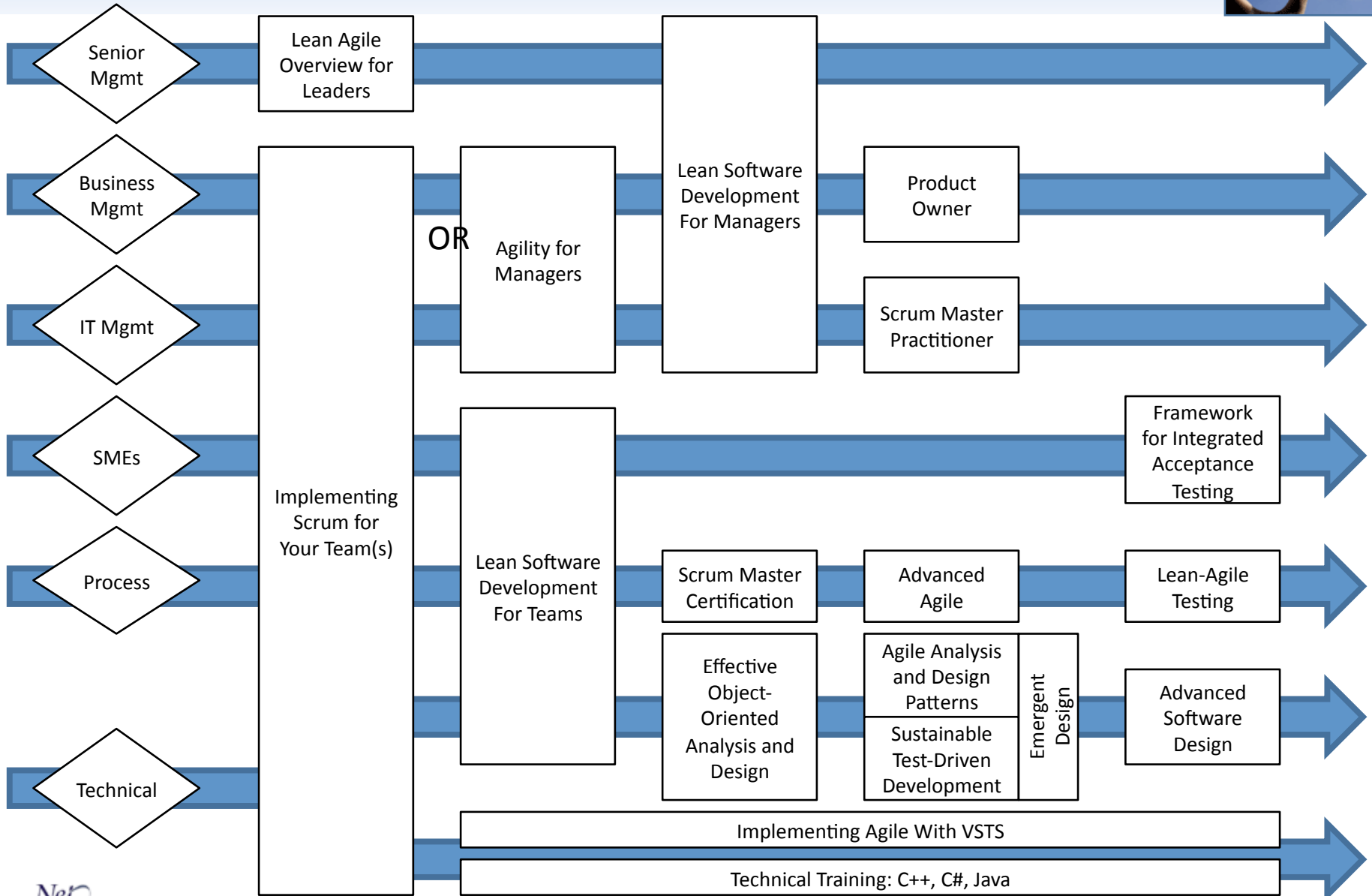
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Coaching provides the knowledge transfer while working on your own problem domain.

Achieving Enterprise and Team Agility

Best Practices Curriculum



Net Objectives Courses



■ Lean Software Development

- Lean Software Development for Management
- ★ Lean Software Development
- Lean-Agile Software Development
- Lean-Agile Testing Practices

■ Agile/Scrum

- ★ Implementing Scrum for Your Team
- ➡ Implementing Scrum for Multiple Teams
- ★ Scrum Master Certification by Net Objectives
- Agile Estimation and Analysis for Developers and Product Owners
- Product Owner Certification by Net Objectives
- Agile Life-Cycle Management with VersionOne

■ Agile Software Development

- ★ Design Patterns Explained
- ➡ Emergent Design: Effective Agile Software Development
- ➡ Design Patterns for Agile Developers
- ★ Sustainable Test-Driven Development
- ➡ TDD Database Boot Camp
- Advanced Software Design
- Effective Object-Oriented Analysis and Design



A Top 5 Course
A New Course

For more information, see: www.netobjectives.com/training



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www.netobjectives.com

Net Objectives Course Catalogue

Following is a list of all of the
courses we offer

Lean Software Development



1 day and 3 and 5 day courses

- Specific versions for management and for general teams
- Provides complete coverage of Lean Software Development from a management, process and QA point of view
- Covers the material in the Management course above as well as going into greater depth about how a software development team manages Lean-Agile projects
- Includes a future value stream mapping exercise, an overview of the Lean-Agile Process Management method and the new relationship QA has in the development team

For more information, see: www.netobjectives.com/training/lean-software-development

Lean-Agile Testing Practices



2 day course

- Lean-Agile methods promote the rapid delivery of value to the customer. One way they do this is to defer detailed definition and design of system features until the “last responsible moment.” This challenges the whole team to stay continuously synchronized within very short Iteration cycles. The team must be creative, smart, and efficient with their verification and validation testing activities.
- How Lean principles can add value to your organization and how they apply to Quality Assurance goals and activities.
- Learn Agile Testing Practices needed to quickly deliver the highest value to your customers
- Discover solutions to your Lean-Agile testing challenges
- Recognize Lean opportunities for change in your organization
- Respond and adapt to Agile development changes effecting your team
- Evaluate and implement Lean-Agile testing practices for your team across the whole release cycle
- Evaluate FitNesse as an automated acceptance testing tool solution for your team
- Recommend Agile Testing transitioning solutions

For more information, see: www.netobjectives.com/training/lean-agile-testing

Implementing Scrum for Your Team



2-3 day course

- This course is a team-centered offering that teaches a development team how to implement Scrum. It is a combination of interactive lecture with a significant amount of time spent on hands-on exercises.
- If at all possible, the entire team should attend the course together.
 - While only one or two team-members need to know how to play the role of the Scrum Master, all the members need to know what Scrum is and what is expected of them.
- This course teaches:
 - What Scrum is
 - How to manage Scrum projects
 - How to manage requirements in Scrum projects
 - How to use Planning Poker to do story estimation
 - The roles of a Scrum team
 - The role of the Scrum Master
 - The role of the Product Owner
 - The limitations of Scrum
 - How to Scale Scrum

For more information, see: www.netobjectives.com/training/agile-scrum

Implementing Scrum for Multiple Teams



3 day course

- We offer an extended 3-day version of our Scrum course which includes the core course but adds:
 - An advanced visual control for managing the work across teams
 - How teams need to integrate and work together to be effective
 - How to create an integration team that goes well beyond Scrum of Scrums
 - How to minimize technical dependencies between teams

For more information, see: www.netobjectives.com/training/agile-scrum

Scrum Master Certification

by Net Objectives



3 day course

- This course teaches how to be a successful Scrum Master. The Scrum Master course focuses on the role and responsibilities of the Agile project manager, the Scrum Master. Learn how to ensure your team is fully functional and productive and act as the facilitative team lead working closely with the Product Owner. You will learn how to make your development team, your project, and your organization Agile. Our course is different from other CSM classes in that it teaches the principles on which Scrum is based as well as all of the necessary Scrum practices. At course completion, you are eligible to get your Professional Scrum Master Certification from Net Objectives. Net Objectives is not affiliated with the Scrum Alliance.

For more information, see: www.netobjectives.com/training/certification

Agile Estimation and Analysis for Developers and Product Owners



2 day course

- This course blends several technologies in a breakthrough course that equips the entire team to uncover and manage the story definition/discovery process.
- It focuses on uncovering and managing customers' needs of the product being built and teaches how to discover the stories in an Agile manner.
- It goes beyond the process of merely pulling out stories as they are encountered, to illustrate how to organize stories so they can be more easily implemented in a consistent manner.
- Techniques on how to organize requirements to help insure consistent and complete information from your customers and/or subject matter experts (SMEs) are also presented

For more information, see: www.netobjectives.com/training/agile-scrum

Product Owner Certification

by Net Objectives



1 day course

- This course can be delivered as either a stand-alone follow up course to any of the Scrum courses that include analysis or it can be integrated into any of these courses adding one additional day of training to the original course. Product Owner training focuses on both the management of the stories on the product backlog and on how to lead a development team in discovering what the best product is for the customer(s). At course completion, you are eligible to get your Professional Product Owner Certification from Net Objectives. Net Objectives is not affiliated with the Scrum Alliance.

For more information, see: www.netobjectives.com/training/certification

Agile Life-Cycle Management with VersionOne



2 day course

- Provides the necessary understanding of how Agile projects are managed and how to use VersionOne's flagship product **V1: Agile Enterprise** to manage one's work.
- VersionOne's 100% web-based management platform incorporates a simple, intuitive framework for organizations introducing and scaling their agile development efforts.
- Using VersionOne, all project stakeholders - developers, testers, managers, product managers, customers, and software executives - work together to easily coordinate project plans, priorities, and progress.
- Deployable in minutes, VersionOne enables development teams to accelerate the rollout of today's leading agile methodologies across multiple projects, releases, teams, and locations. Configurable, methodology-specific templates for Scrum, Extreme Programming (XP), DSDM, and Agile UP accelerate internal deployment and can be customized for teams utilizing hybrid methodologies.



For more information, see: www.netobjectives.com/training/agile-scrum

Design Patterns Explained



2 day or 3 day course

- This course goes beyond merely teaching several design patterns. It also teaches the principles and strategies that make design patterns good. This enables students to use advanced design techniques in solving their problems whether design patterns are present or not.
- After teaching several patterns and the principles underneath them, the course goes further by showing how patterns can work together to create robust, flexible, maintainable designs.
- Design patterns are about using existing quality solutions to solve recurring problems. They are valuable to learn, because knowing them:
 - provides quality solutions that might not otherwise be thought of
 - gives a common set of terminology to be used amongst team members
 - improves the team-wide quality of design and code

For more information, see: www.netobjectives.com/courses/design-patterns-explained

Emergent Design: Effective Agile Software Development



5 day course

- This 5-day course focuses on teaching developers how to:
 - Minimize complexity
 - Maximize Flexibility and Scalability
- It does it with a combination of:
 - Code qualities
 - Handling Variations with Design Patterns
 - Test-Driven Development
 - Refactoring (legacy and agile techniques)
 - Emergent Design
- This course covers the material in both our Design Patterns for Agile Developers and our Test-Driven Development Courses.

Design Patterns for Agile Developers



3 day course

- This course teaches how work effectively in an agile environment.
 - Agile environments embrace change, and therefore require changeable systems.
 - This requires understanding how code quality, design patterns, refactoring, and object management with factories can make systems easier to change.
- Many design patterns are taught to illustrate how to handle variations without adding un-needed complexity.
 - We teach you how to remove the need for overdesign, creating confidence that you can add what you need when you need it.

For more information, see: www.netobjectives.com/courses/agile-analysis-design-patterns

Sustainable Test-Driven Development



3 day course

- The practice of Agile Software Development requires, among other things, a high degree of flexibility in the coding process. As we get feedback from clients, stakeholders, and end users, we want to be able to evolve our design and functionality to meet their needs and expectations.
- This implies an incremental process, with frequent (almost constant) change to the code we're working on. Each change is an opportunity to make the product more appropriate to the needs it is intended to address.
- Traditionally, changing working code is a stressful prospect, one which we have tended to shy away from. No matter how hard we try, we're almost always faced with making changes. Because of this, many developers have decided to embrace change as their primary working mode.
- However, the reasons we feared change in the first place have not disappeared. Therefore, we need new tools and techniques to ameliorate the problems that change creates.
- Refactoring, the discipline of changing code without harming it, is one such technique. Unit testing, which ensures that a given change has not caused an unforeseen ripple effect in the system, is another.

For more information, see: www.netobjectives.com/courses/test-driven-development

TDD Database Boot Camp



2-day course

- This course teaches testing disciplines which enable emergent design in a database. Hands-on lab exercises are provided. Comes with a license to a tool that help facilitate the process.
- Everything you know about Agile Software Development applies to databases. However, there are additional techniques required to make agility work when maintaining a database. This boot camp is intended to teach you those new techniques.
- This course teaches:
 - An overview of the motivations behind Agility, and TDD specifically
 - Fundamental differences between software and database development
 - How existing TDD techniques apply
 - Introduction of the new techniques required to complete the database TDD picture
 - Concept of “Transition Testing”
 - Developing databases in small increments
 - As a group, get testing framework up and running, install DataConstructor, review its features
 - Transition testing exercise
 - Setup of test databases with representative structure and data
 - Hands-on legacy database transition workshop

For more information, see: www.netobjectives.com/training/agile-scrum

Advanced Software Design



2 day course

- This course that continues the exploration of agile design and analysis techniques begun in the Design Patterns for Agile Developers course.
- We provide an in-depth examination of the critical forces that drive design decisions, and enable a more reliable cost-benefit analysis as part of this.
- We Present a detailed case study, and add additional patterns, including:
 - Visitor
 - Mediator
 - Composite
 - State
 - Observer
 - Command
- We also show how patterns often show up together in repeated ways (often termed “compound patterns”) due to the use of Rapid-Application Development tools and the desire to accommodate changing technology.

For more information, see: www.netobjectives.com/courses/advanced-software-design

Effective Object-Oriented Analysis and Design



5 day course

- Object Orientation was and is primarily about the needs of the developer. It came from the best practices of traditional, procedural code, and from all the clever things programmers tried to do in FORTRAN, C, RPG, etc... But where those older languages sometimes hindered object orientation, new OO languages promote and enable OO design, if used properly.
- However, learning the syntax and supporting library API's for an OO language like C++, Java, C#, or VB.NET is really just the first step toward making effective use of Object Orientation. Without a true understanding of the principles that comprise good OO design, and the real benefits they provide, the software produced with an OO language can be just as brittle, inflexible, and hard-to-maintain as ever.
- This course teaches developers and development teams how they can get the maximum benefit from working in an OO language and platform. Using this knowledge, they will produce code more efficiently, with fewer defects, in a more predictable period of time, and which is far easier to maintain.

Available in C++, Java, C#, or VB.NET

For more information, see: www.netobjectives.com/courses/object-oriented-analysis-design