The Simplicity Workout

Giovanni Asproni
Kevlin Henney
Peter Sommerlad

Agenda

- Simplicity admiration
  - What is simplicity?
  - What makes software "beautifully simple"?
  - Higher valuation of simple code
  - Continue work on Simplicity Manifesto
- Simplifying workout
  - Practice simplifying and learn simplification

What Is Simplicity?

simplicity *noun*

- the quality or condition of being simple.
- a thing that is simple.

simple *adjective*

- presenting little or no difficulty.
- easily done or understood.
- plain and uncomplicated in form, nature, or design.

Shorter and Concise Oxford English Dictionaries

What Makes Software Simple?

Economy
Usability
Utility
Fitness for purpose
Comprehensibility
Consistency
Unsurprising
Unification
Symmetry

Context
Familiarity
Abstraction
Compression
Explicitness
Implicitness
Emergence
Doing more with less
...

Simply Algorithmic

- Many of the most effective and enduring algorithms are surprisingly simple
  - Tony Hoare's Quicksort is a classic example of a divide-and-conquer strategy
  - Google's MapReduce scales simple functional primitives, *map* and *reduce*, into the large
  - The STL offers a simple and powerful approach to separating and combining algorithms and data structures

grep-lite

```
int grep(char *regexp, FILE *f, char *name)
{
    int n, nmatch;
    char buf[BUFSIZ];

    nmatch = 0;
    while (fgets(buf, sizeof buf, f) != NULL) {
        n = strlen(buf);
        if (n > 0 && buf[n-1] == '\n')
            buf[n-1] = '\0';
        if (match(regexp, buf)) {
            nmatch++;
            if (name != NULL)
                printf("%s:", name);
            printf("%s\n", buf);
        }
    }
    return nmatch;
}
```

```
int matchhere(char *regexp, char *text)
{
    if (regexp[0] == '\0')
        return 1;
    if (regexp[1] == '*')
        return matchstar(regexp[0], regexp+2, text);
    if (regexp[0] == '$' && regexp[1] == '\0')
        return *text == '\0';
    if (*text!='\0' && (regexp[0]=='.' || regexp[0]==*text))
        return matchhere(regexp+1, text+1);
    return 0;
}

int match(char *regexp, char *text)
{
    if (regexp[0] == '^')
        return matchhere(regexp+1, text);
    do {
        if (matchhere(regexp, text))
            return 1;
    } while (*text++ != '\0');
    return 0;
}

int matchstar(int c, char *regexp, char *text)
{
    do {
        if (matchhere(regexp, text))
            return 1;
    } while (*text != '\0' && (*text++ == c || c == '.'));
    return 0;
}
```

Brian W Kernighan and Rob Pike, *The Practice of Programming*
http://cm.bell-labs.com/cm/cs/tpop/grep.c

Google's *MapReduce*

```
main() {
    dictionary wordCount;
    for each document d {
        for each word w in d {
            wordCount[w]++;
        }
    }
}
```

Sequential word counter

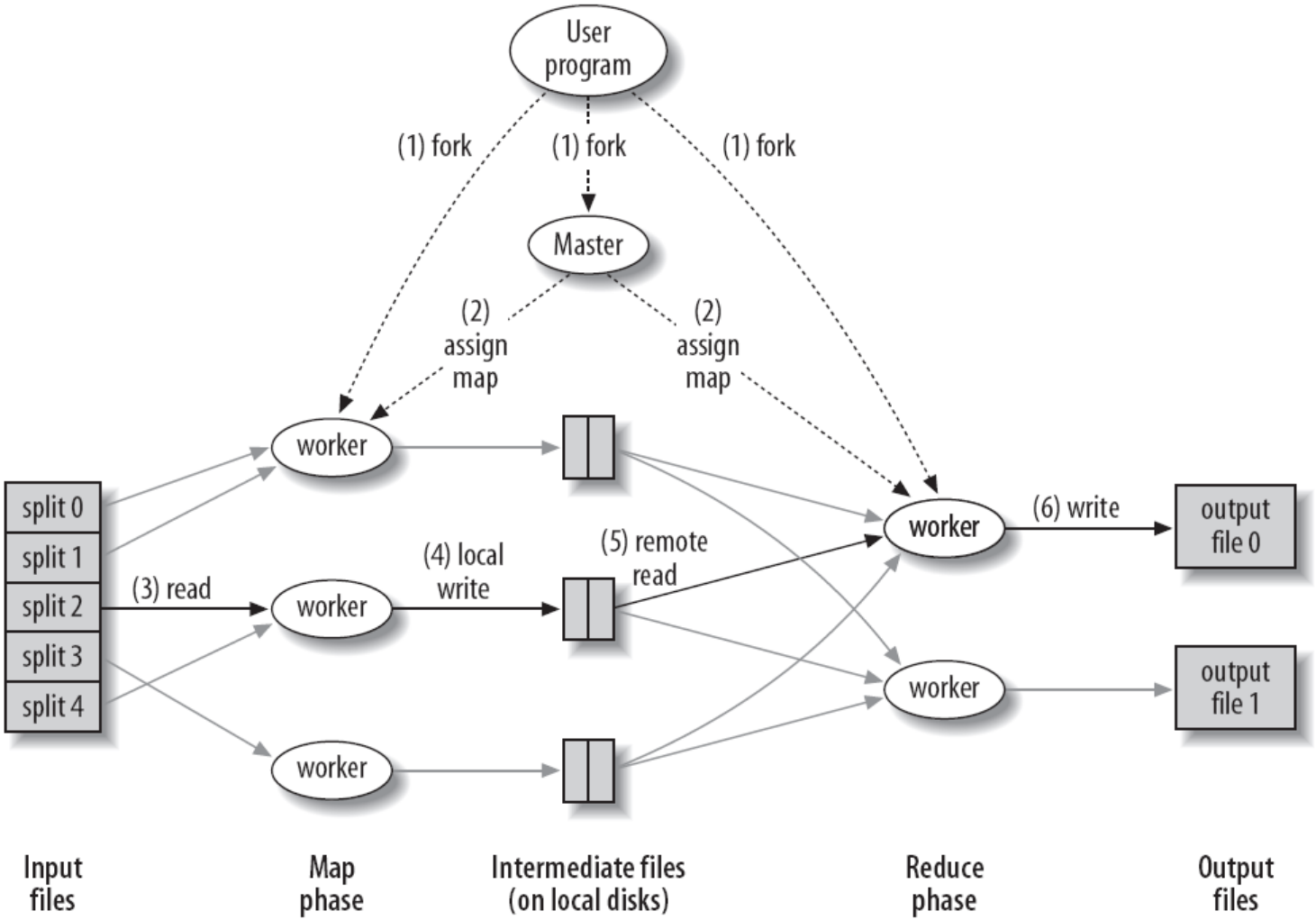
```
Map(document) {
    for each word w in document {
        EmitIntermediate(w, 1);
    }
}
Reduce(word, listOfValues) {
    count = 0;
    for each v in listOfValues {
        count += v;
    }
    Emit(word, count);
}
main() {
    Driver(Map, Reduce);
}
```

MapReduce'd word counter

```
EmitIntermediate(key, value) {
    ...
}
Emit(key, value) {
    ...
}
Driver(mapFunction, reduceFunction) {
    ...
}
```

Essence of MapReduce framework

MapReduce Architecture



Not-So-Fearsome Engines

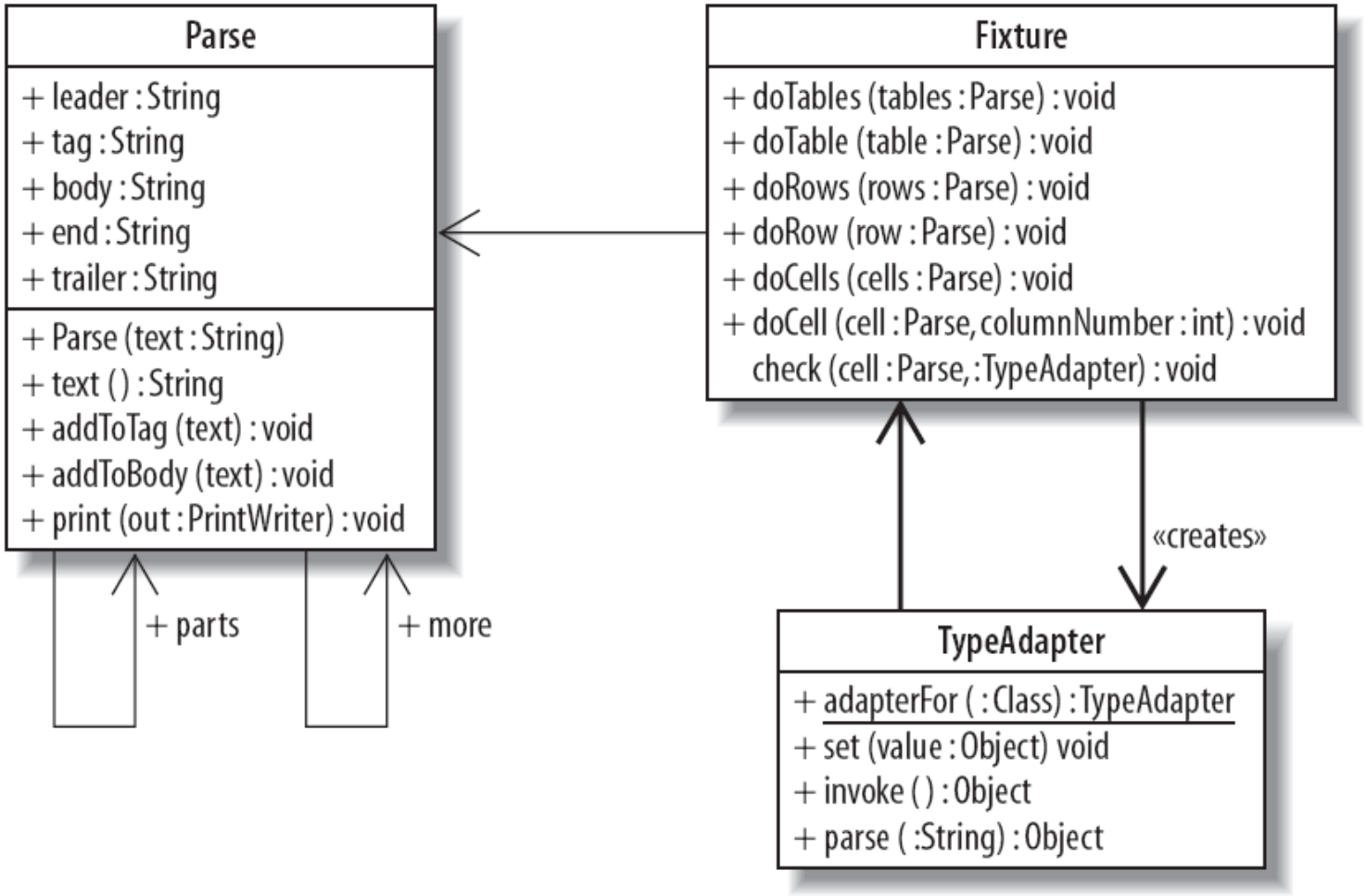
- There is a simple heart to many powerful frameworks, platforms and environments
  - The original Unix kernel was small and expressive
  - Some testing frameworks, such as JUnit and FIT, have a simple micro-architecture
  - Languages with a unified programming model, such as LISP and Smalltalk, tend to have a small and regular interpretive core

Scheme's *eval*

```
(define (eval exp env)
  (cond ((self-evaluating? exp) exp)
        ((variable? exp) (lookup-variable-value exp env))
        ((quoted? exp) (text-of-quotation exp))
        ((assignment? exp) (eval-assignment exp env))
        ((definition? exp) (eval-definition exp env))
        ((if? exp) (eval-if exp env))
        ((lambda? exp)
         (make-procedure (lambda-parameters exp)
                         (lambda-body exp)
                         env))
        ((begin? exp)
         (eval-sequence (begin-actions exp) env))
        ((cond? exp) (eval (cond->if exp) env))
        ((application? exp)
         (apply (eval (operator exp) env)
                (list-of-values (operands exp) env)))
        (else
         (error "Unknown expression type -- EVAL" exp))))
```

Harold Abelson, Gerald Jay Sussman and Julie Sussman,
The Structure and Interpretation of Computer Programs
http://academic.evergreen.edu/curricular/fofc00/eval.html

Anatomy of FIT



Heart of FIT

```
static String tags[] = {"table", "tr", "td"};
public Parse (String text) throws ParseException {
     this (text, tags, 0, 0);
}
public Parse (String text, String tags[]) throws ParseException {
     this (text, tags, 0, 0);
}
public Parse (String text, String tags[], int level, int offset)
     throws ParseException {
     String lc = text.toLowerCase( );
     int startTag = lc.indexOf("<"+tags[level]);
     int endTag = lc.indexOf(">", startTag) + 1;
     int startEnd = lc.indexOf("</"+tags[level], endTag);
     int endEnd = lc.indexOf(">", startEnd) + 1;
     int startMore = lc.indexOf("<"+tags[level], endEnd);
     if (startTag<0 || endTag<0 || startEnd<0 || endEnd<0) {
            throw new ParseException ("Can't find tag: "+tags[level], offset);
     }
     leader = text.substring(0,startTag);
     tag = text.substring(startTag, endTag);
     body = text.substring(endTag, startEnd);
     end = text.substring(startEnd,endEnd);
     trailer = text.substring(endEnd);
     if (level+1 < tags.length) {
            parts = new Parse (body, tags, level+1, offset+endTag);
            body = null;
     }
     if (startMore>=0) {
            more = new Parse (trailer, tags, level, offset+endEnd); trailer = null;
     }
}
```

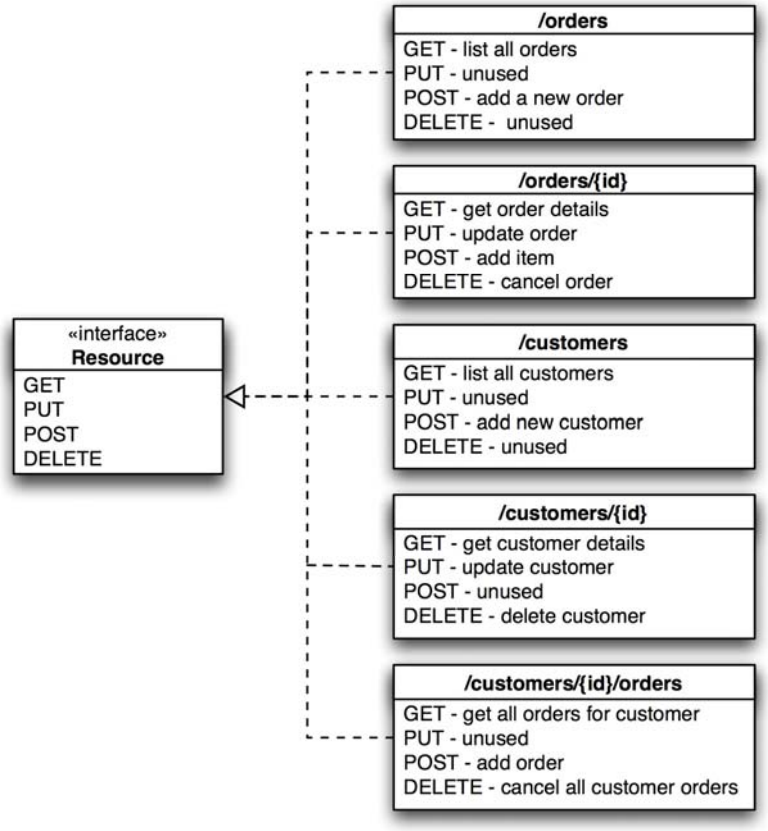
Small and Regular Interfaces

- Simple protocols can be very flexible and highly composable, as well as easy to use
  - The Unix file (and general) I/O model and API
  - The Linda model of concurrent and distributed communication is based on few primitives
  - The RESTful (REpresentational State Transfer) approach to distributed architecture
  - The pipes and filters architecture common to Unix shells

RESTful Architecture

Key REST Principles

- Give every 'thing' an ID, e.g., a URI
- Link things together, i.e., the network is the program
- Use standard methods, e.g., HTTP verbs
- Resources with multiple representations, e.g., HTTP content negotiation
- Communicate statelessly, i.e., state is held as a resource or on the client



Stefan Tilkov, "A Brief Introduction to REST"
http://www.infoq.com/articles/rest-introduction

A Simple Web UI

Writing Simple Code

- Correct, simple, fast (in that order)
  - TDD + refactoring + optimisation
- Decremental development
  - Determine what is needed of the solution (i.e., understand the problem), and...
  - Omit needless code
- Openness
  - Another pair of eyes

Writing Simple Code

What is the operating concept here? How else can we put that concept into action?

Edward De Bono, Simplicity

Quicksort in Erlang

```
qsort([]) -> [];
qsort([Pivot|T]) -> qsort([X || X <- T, X < Pivot])
                    ++ [Pivot] ++
                    qsort([X || X <- T, X >= Pivot]).
```

Joe Armstrong, *Programming Erlang*

Quicksort in Erlang

```
qsort2([]) -> [];
qsort2([H | T]) -> {Less, Equal, Greater} = part(H, T, {[], [H], []}),
                   qsort2(Less)
                   ++ Equal ++
                   qsort2(Greater).
```

```
part(_, [], {L, E, G}) -> {L, E, G};
part(X, [H | T], {L, E, G}) -> if
                                 H < X -> part(X, T, {[H | L], E, G});
                                 H > X -> part(X, T, {L, E, [H | G]});
                                 true -> part(X, T, {L, [H | E], G})
                               end.
```

http://en.literateprograms.org/Quicksort_(Erlang)

Refactoring Workout

- Work in teams
- Look at the examples given
  - Try to understand what they do
- Refactor them to make them simpler
  - Determine what steps, both in code and outside the code, that you would take
  - Document these steps

http://wiki.hsr.ch/SimpleCode/

Wrapping Up