Emerging Technologies

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Topics

Languages

Go – Getting Started

Build tools

Web Application Architectures

Languages

Popular programming languages

JavaScript	"high-level, dynamic, untyped, and interpreted"
SQL	"special-purpose programming language"
Java	"general-purpose, concurrent, class-based, object-oriented"
C#	"multi-paradigm programming language"
PHP	" server-side scripting"
Python	"high-level, general-purpose, interpreted, dynamic"
C++	"general-purpose, imperative, object-oriented and generic"
C	"general-purpose, imperative"
Others	Node.js, AngularJS, Ruby, Objective-C (in order).

http://stackoverflow.com/research/developer-survey-2016

Kinds of programming languages

Interpreted Software interprets the language at runtime.

Compiled Software translates the language into machine code, which is then run.

Systems Designed with operating system, device drivers development in mnid.

Applications Designed with user applications development in mind.

High-level Abstration from the nitty-gritty computer details.

Imperative Statements change the program state.

New languages

Go 2009 at Google.

Rust 2010 at Mozilla.

Swift 2014 at Apple.

Hack 2014 at Facebook, variant of PHP.

Scala 2004 at EPFL (Martin Odersky).

Julia 2012 at MIT.

Dart 2011 at Google.

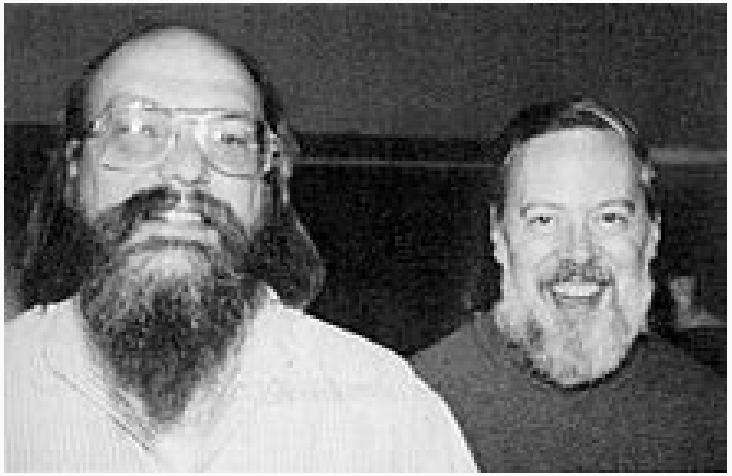
Styles in languages

I'm always delighted by the light touch and stillness of early programming languages. Not much text; a lot gets done. Old programs read like quiet conversations between a well-spoken research worker and a well studied mechanical colleague, not as a debate with a compiler. Who'd have guessed sophistication bought such noise?

— Dick Gabriel

web.stanford.edu/class/ee380/Abstracts/100428-pike-stanford.pdf

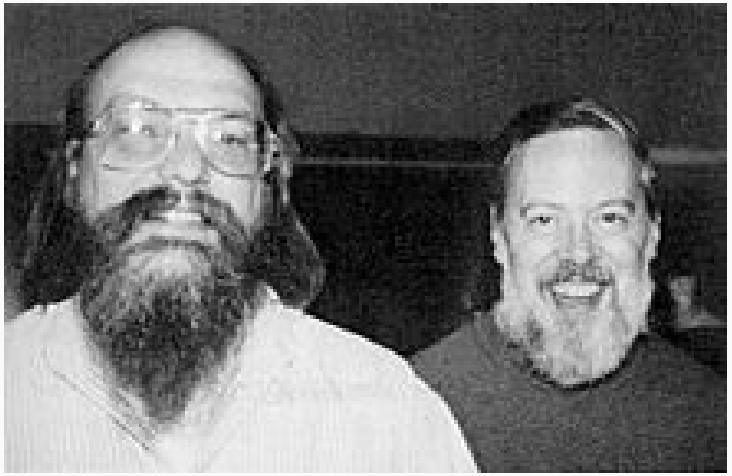
People: Dennis Ritchie



Dennis Ritchie 1941-2011 (right)

- Helped Ken Thompson (left in above photo) to create UNIX.
- Created C, wrote book with Brian Kernighan.

People: Ken Thompson



Ken Thompson (left)

- Created UNIX.
- One of the creators of Go.

People: Brian Kernighan

- Wrote *The C Programming Language* with Dennis Ritchie.
- Coined `Hello, world!`.
- Wrote *The Go Programming Language* (with Alan Donovan).

People: Bjarne Stroustrup

- Created C++.
- Former head of Large-scale Programming Research at Bell Labs.

Places: Bell Labs

- Pretty much set up by Alexander Graham Bell.
- Eight Nobel prizes, two Turing awards.
- Owned by Alcatel-Lucent, who were bought by Nokia.

Go – Getting Started

Go features

Concurrency is builtin with light-weight goroutines, channels.

Fast compiling is a goal.

Packages are easily managed and dependencies are quickly resolved.

Type inference is available (sometimes).

C-like in syntax.

Tools like go fmt and godoc are builtin.

Garbage collection is builtin.

Hello, World!

```
package main

import "fmt"

func main() {
  fmt.Println("Hello, world!")
}
```

gobyexample.com/hello-world

go build

go build is the Go compiler.

go build hello.go created an executable called hello (or hello.exe on windows).

Dependencies are automatically built.

go run is an alternative that also runs the program after.

Building is fast in Go.

golang.org/cmd/go/

Functions

```
package main

import "fmt"

func add(x int, y int) int {
  return x + y
}

func main() {
  fmt.Println(add(42, 13))
}
```

tour.golang.org/basics/4

for loops

```
package main

import "fmt"

func main() {
  sum := 0
  for i := 0; i < 10; i++ {
    sum += i
  }
  fmt.Println(sum)
}
```

tour.golang.org/flowcontrol/1

if and else

```
func pow(x, n, lim float64) float64 {
  if v := math.Pow(x, n); v < lim {
    return v
  } else {
    fmt.Printf("%g >= %g\n", v, lim)
  }
  // can't use v here, though
  return lim
}
```

tour.golang.org/flowcontrol/7

Goroutines

```
func say(s string) {
  for i := 0; i < 5; i++ {
    time.Sleep(100 * time.Millisecond)
    fmt.Println(s)
  }
}

func main() {
  go say("world")
  say("hello")
}
```

tour.golang.org/concurrency/1

Build tools

go help

```
> go help [command]
```

---

go help prints out help for the go command

Optionally you can provide another command line argument to to get help about a specific command.

golang.org/cmd/go

GOPATH

```
> export GOPATH=/Users/john/go
```

GOPATH is a variable that must be set properly to use go packages.

It's a list of directories to look for packages in.

Directories listed must have `src`, `pkg` and `bin` subdirectories.

Colons are used to separate the directories listed in GOPATH (but semicolons on Winodws).

golang.org/cmd/go

go fmt

```
> go fmt [-n] [-x] [packages]
```

---

go fmt formats go code in a standard way.

gofmt does the same, but reads and writes to and from stdin and stdout.

Tabs are used to clean up the code, with one tab equal to 8 spaces.

Writing code can be done in developers own style, then reformatted.

Reading code is a bit easier, as there's a standard.

Diffs are cleaner.

golang.org/cmd/go

go get

```
> go get ... [-u] [build flags] [packages]
```

---

go get downloads packages and installs them into the first entry in GOPATH.

Dependencies are taken care of.

Source code is put into the src subdirectory.

Object files are put into the pkg directory.

Any exectuables are put in bin.

golang.org/cmd/go

Web Application Architectures

What is a web application?

Web applications are web pages that are interactive, thanks to JavaScript.

JavaScript is used to capture user events, and typically responds to them by firing off HTTP Requests in the background and changing the displayed resource based on the HTTP Response.

Resources are typically generated on the fly by a web server, which usually interacts with a database.

LAMP is an older architecture stack that follows this pattern.

MEAN is a more modern stack.

Considerations

Discoverable Identifiable as applications, findable by search engines.

Linkable Easily shareable via URLs, without requiring complex installation.

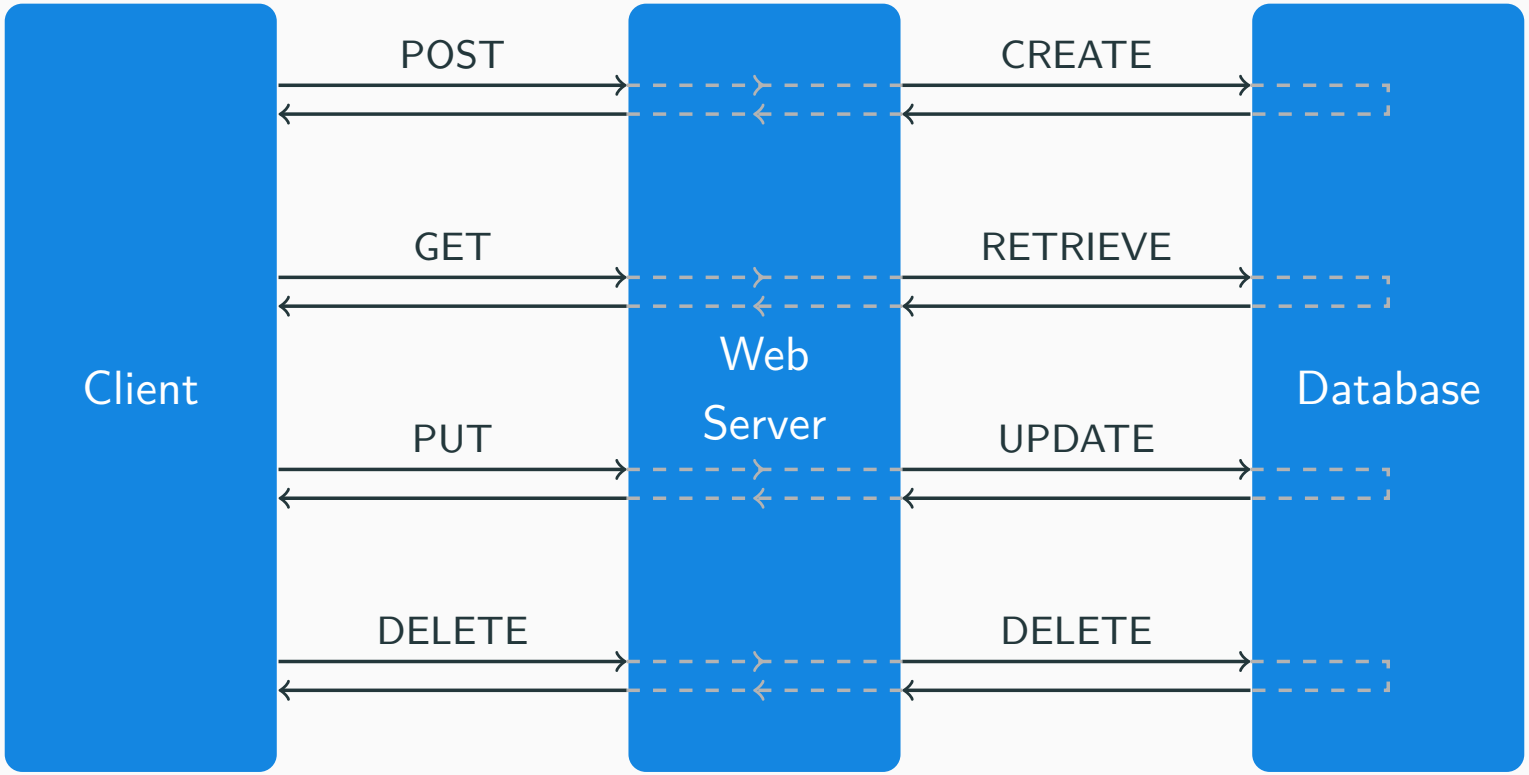
Progressive Works for every user, regardless of browser choice.

Responsive Fits any form factor: desktop, mobile, tablet, or whatever comes next.

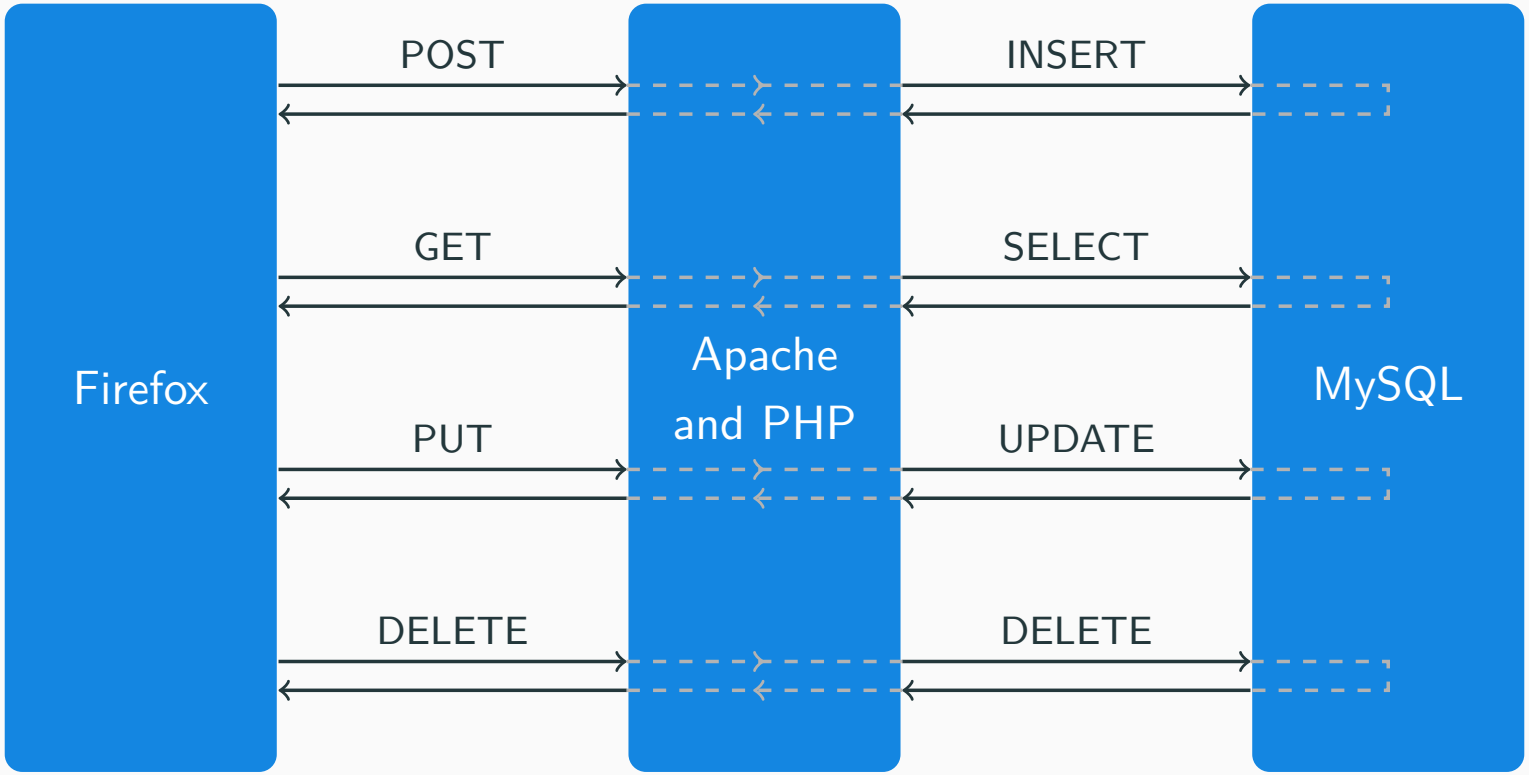
Network Works offline or on low quality networks.

developer.mozilla.org/en-US/Apps/Progressive

HTTP and CRUD



AMP


Firefox
POST
GET
PUT
DELETE
Apache
and PHP
INSERT
SELECT
UPDATE
DELETE
MySQL