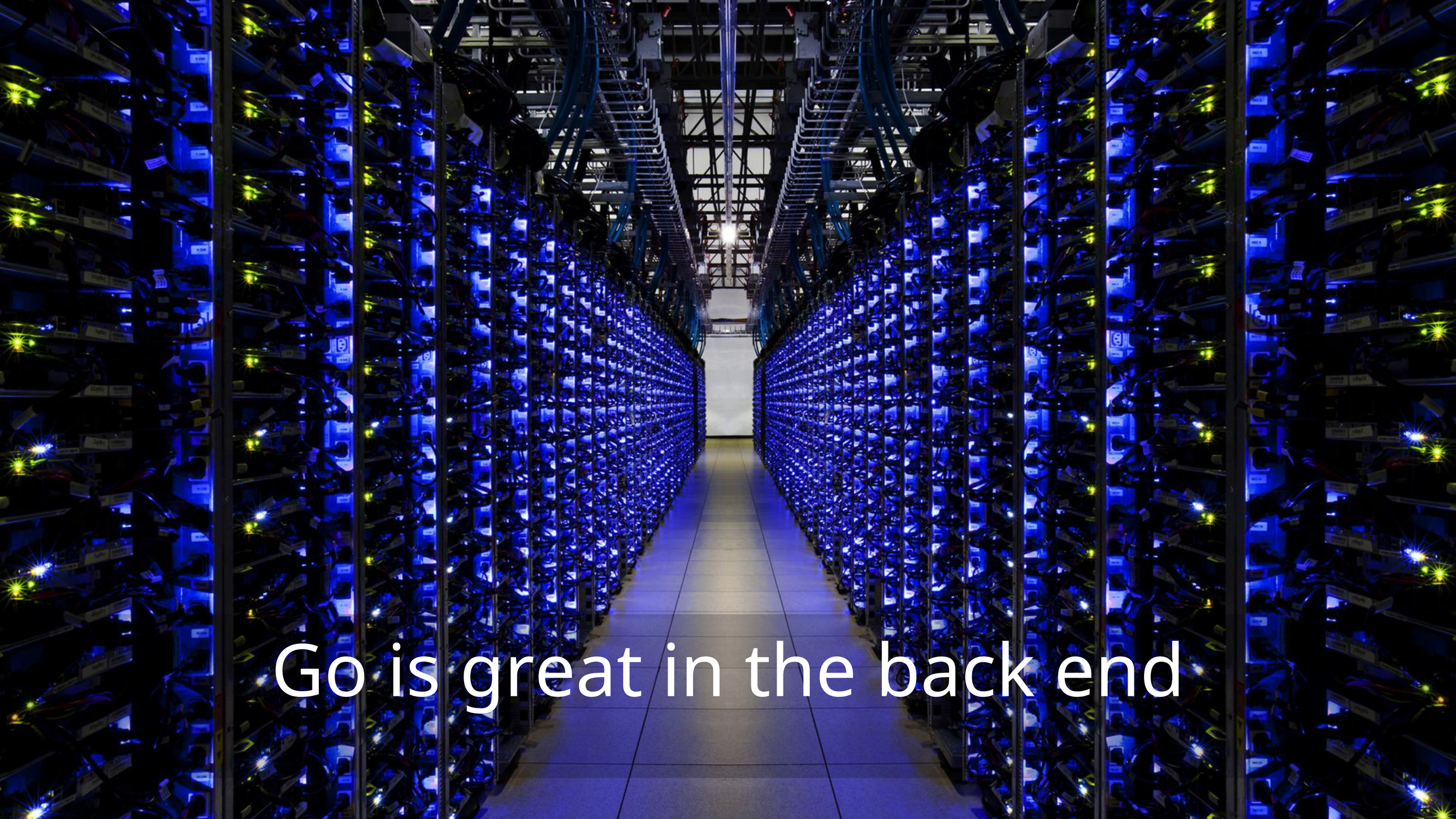
Go
For Information Displays

Anthony Starks
@ajstarks


Go is great in the back end


But sometimes it's about the picture

Information Displays

Libraries and Tools

Lots of pictures

Why Go?

Edward Tufte

Display data for precise, effective, quick analysis, Small multiples, optimizing the data-ink ratio, Visual and beautiful evidence.

Nigel Holmes

Designing for the context: The data visualizer asks: “What’s the data?”, the infographics designer: “What’s the Story?”

An interesting arrangement of text and graphics designed to convey a message

I hate pushing pixels

programs are so much
better at it

Photo by deborahschillbach

Fatih Arslan
@fatih

Following

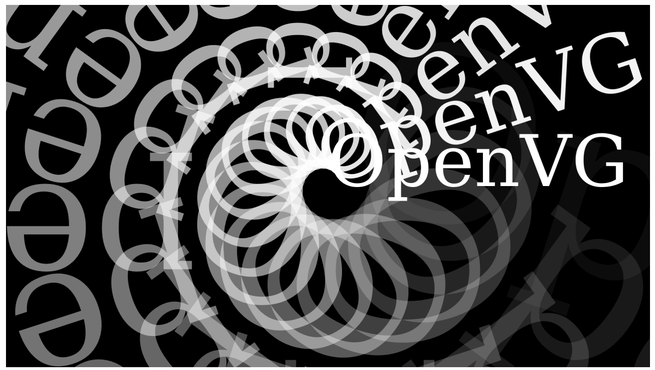
If you don't learn your tool in and out, the tool will block you during the progress. Don't let the tool disrupt you. If there is too much disruption, it's time to switch to a new tool. If there is no such tool, it's time to write your own.

4:43 AM - 12 Apr 2018

SVGo


```
go get github.com/ajstarks/svgo/...
```

OpenVG

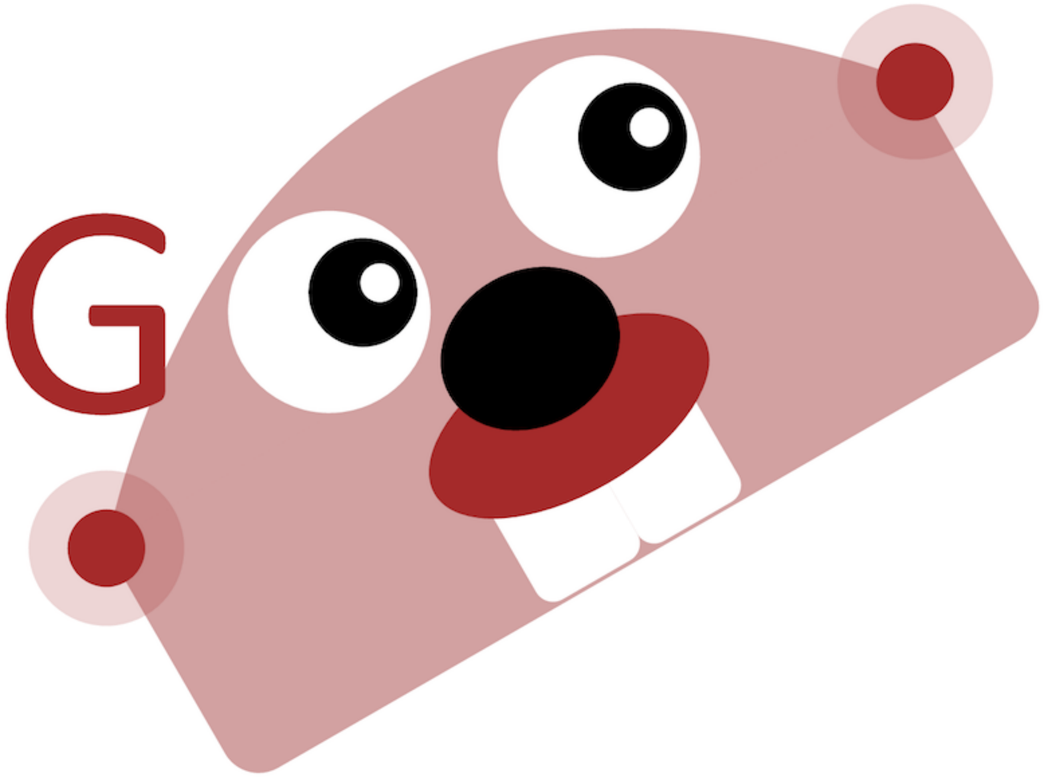


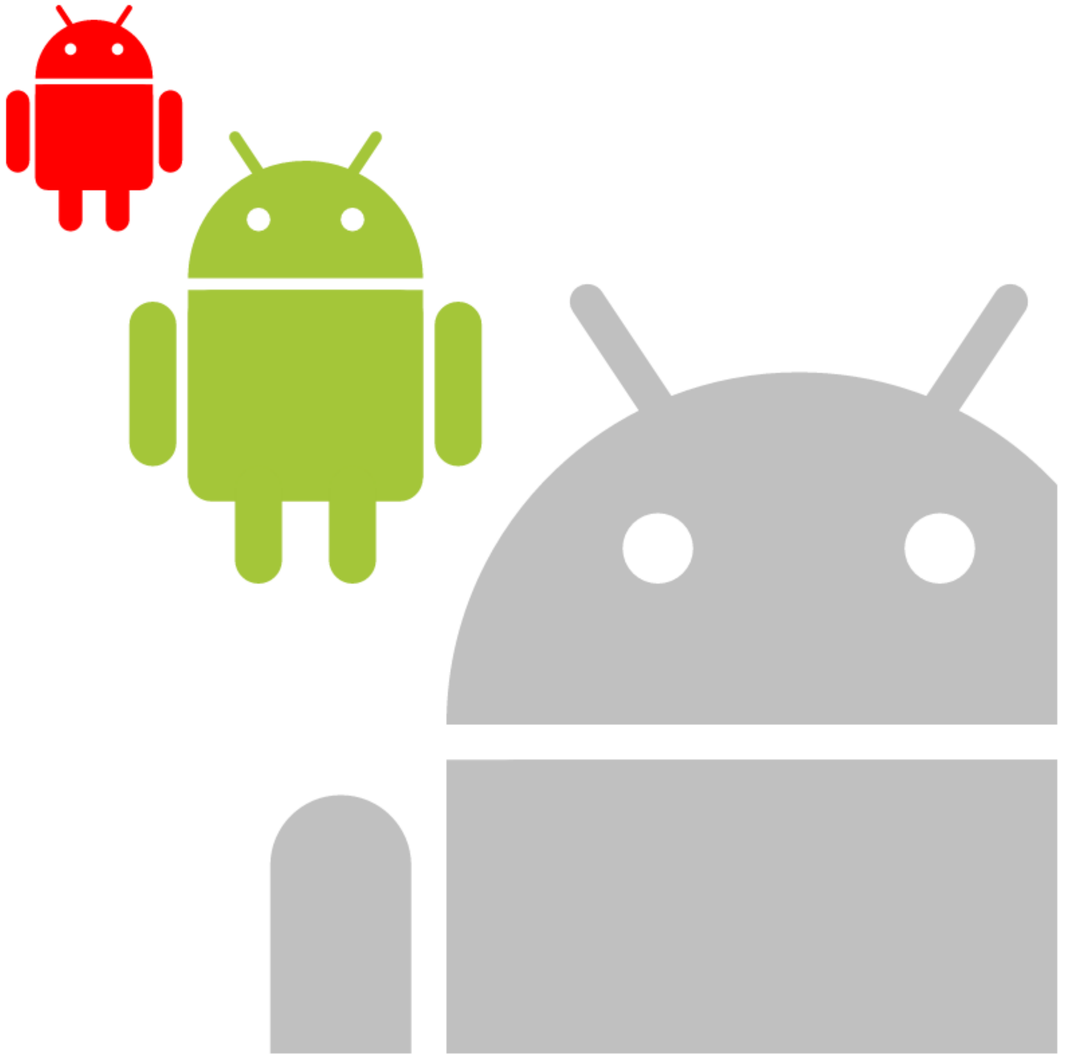

```
go get github.com/ajstarks/openvg
```

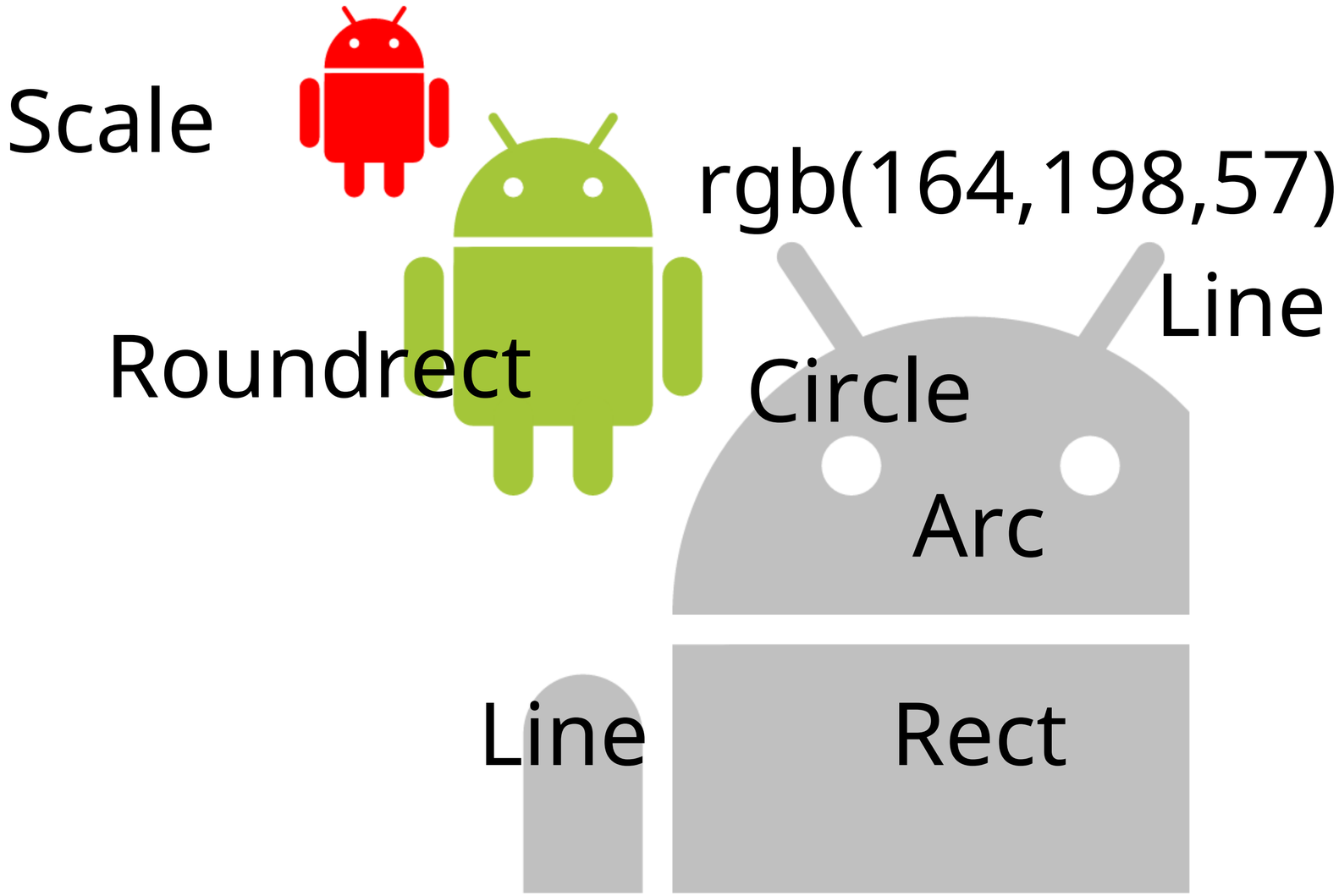
Deck

```
go get github.com/ajstarks/deck/
go get github.com/ajstarks/deck/generate
go get github.com/ajstarks/deck/cmd/pdfdeck/
go get github.com/ajstarks/deck/cmd/dchart/
```

SVG






Scale
rgb(164,198,57)
Roundrect
Line
Circle
Arc
Line
Rect

Element Arguments

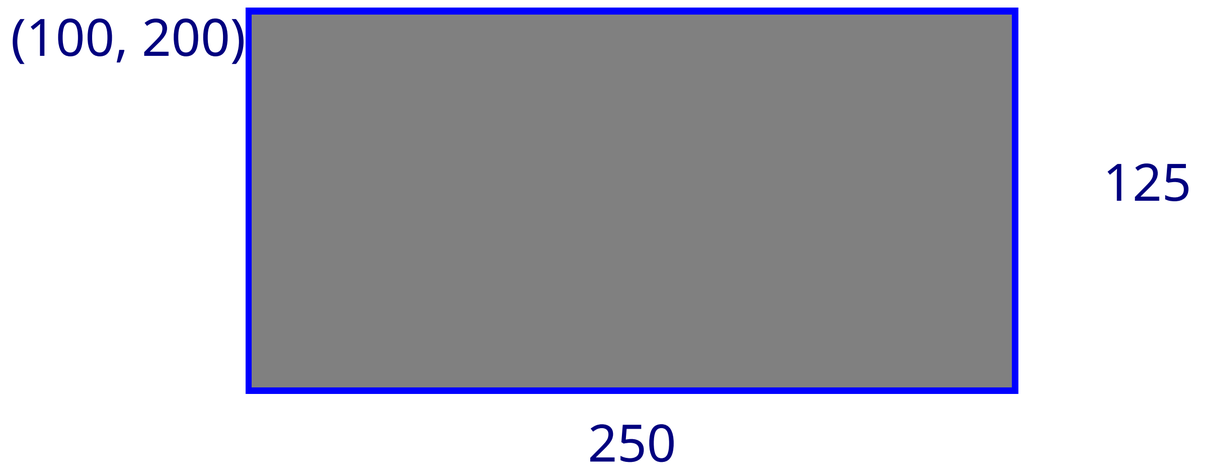
Rect (100,200,250,125)

```
<rect x="100" y="200" width="250" height="125"/>
```

Element Arguments CSS Style

```
Rect (100,200,250,125,
      "fill:gray;stroke:blue")
```

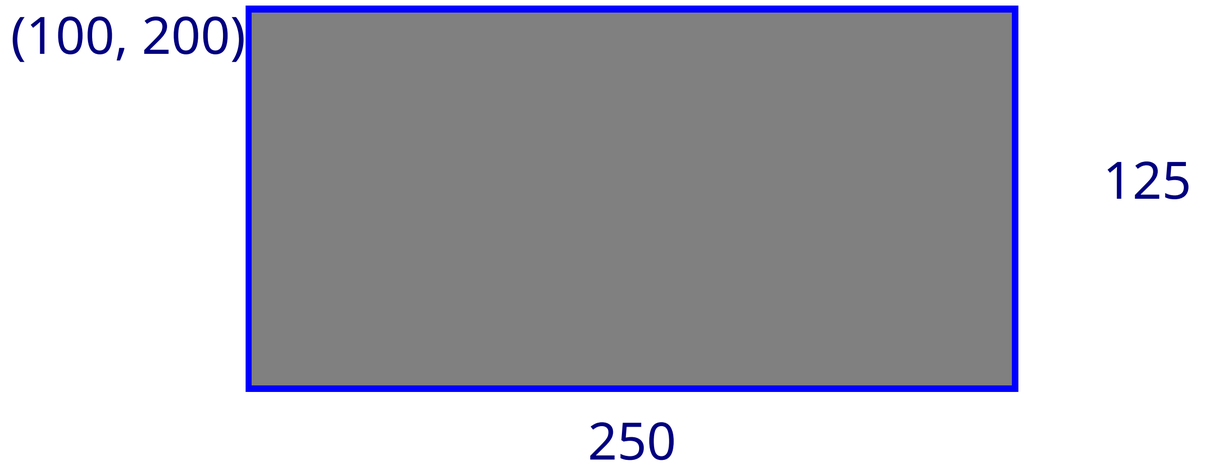
```
<rect x="100" y="200" width="250" height="125"
      style="fill:gray;stroke:blue"/>
```



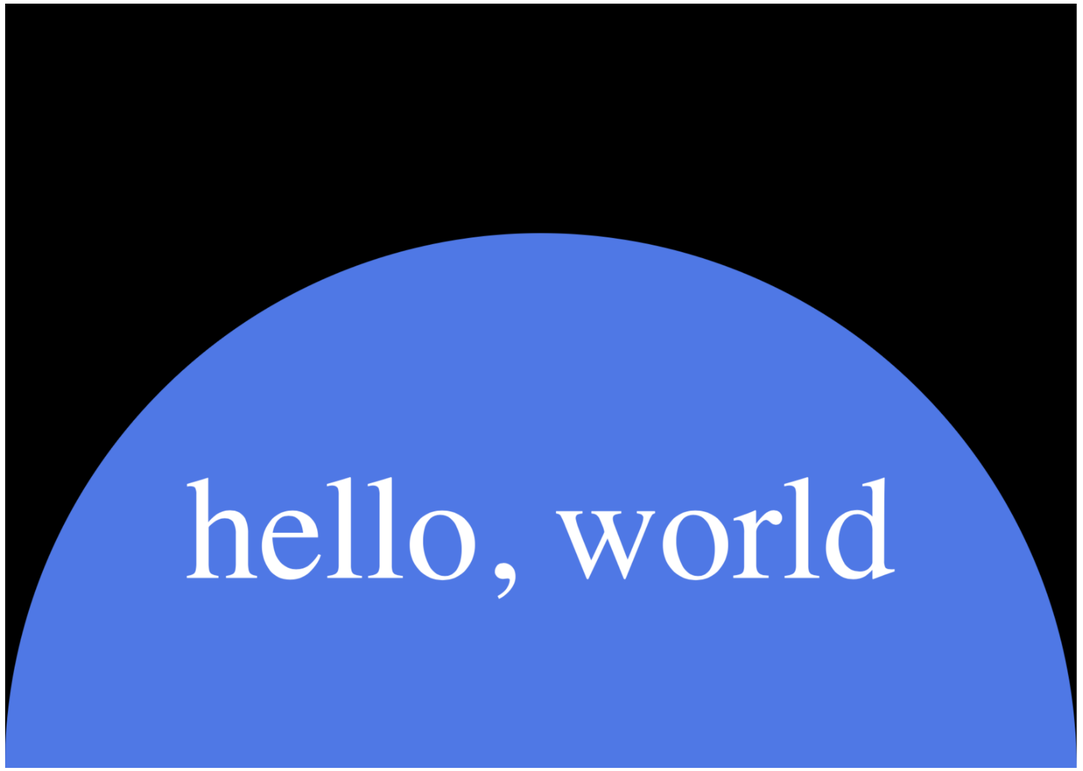
Element Arguments Attributes

```
Rect (100,200,250,125,
    `id="box"`, `fill="gray"`, `stroke="blue"`)
```

```
<rect x="100" y="200" width="250" height="125"
     id="box" fill="gray" stroke="blue"/>
```

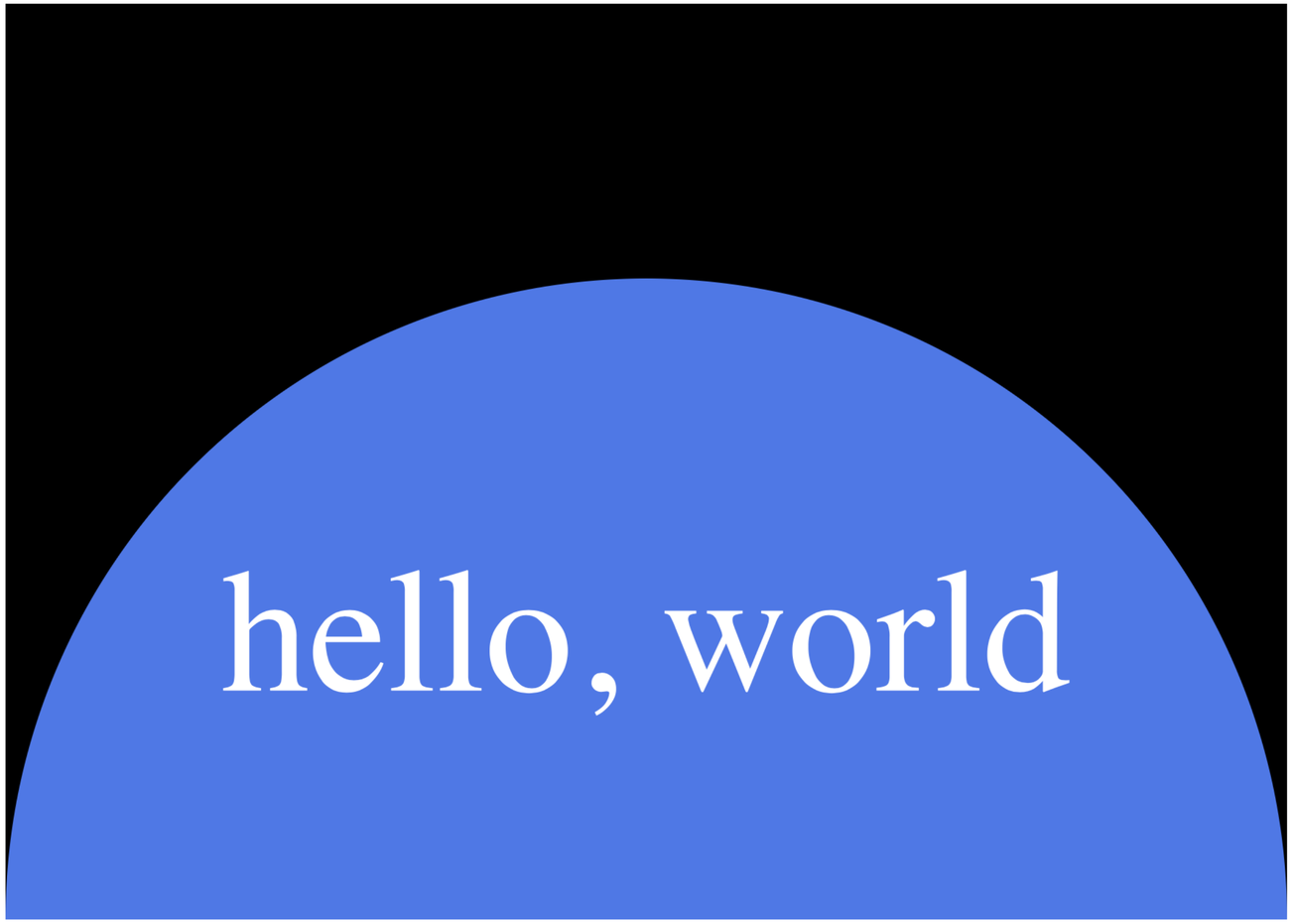


```
package main

import (
    "github.com/ajstarks/svgo"
    "os"
)

func main() {
    canvas := svg.New(os.Stdout)
    width := 700
    height := 500
    style := "font-size:72pt;fill:white;text-anchor:middle"

    canvas.Start(width, height)
    canvas.Rect(0, 0, width, height)
    canvas.Circle(width/2, height, width/2, "fill:rgb(77, 117, 232)")
    canvas.Text(width/2, height*3/4, "hello, world", style)
    canvas.End()
}
```



localhost:1999/hwsvg.go

```
package main

import (
	"github.com/ajstarks/svgo"
	"os"
)

func main() {
	canvas := svg.New(os.Stdout)
	width := 700
	height := 500
	style := "font-size:72pt;fill:white;text-anchor:middle"

	canvas.Start(width, height)
	canvas.Rect(0, 0, width, height)
	canvas.Circle(width/2, height, width/2, "fill:rgb(77, 117, 232)")
	canvas.Text(width/2, height*3/4, "hello, world", style)
	canvas.End()
}
```



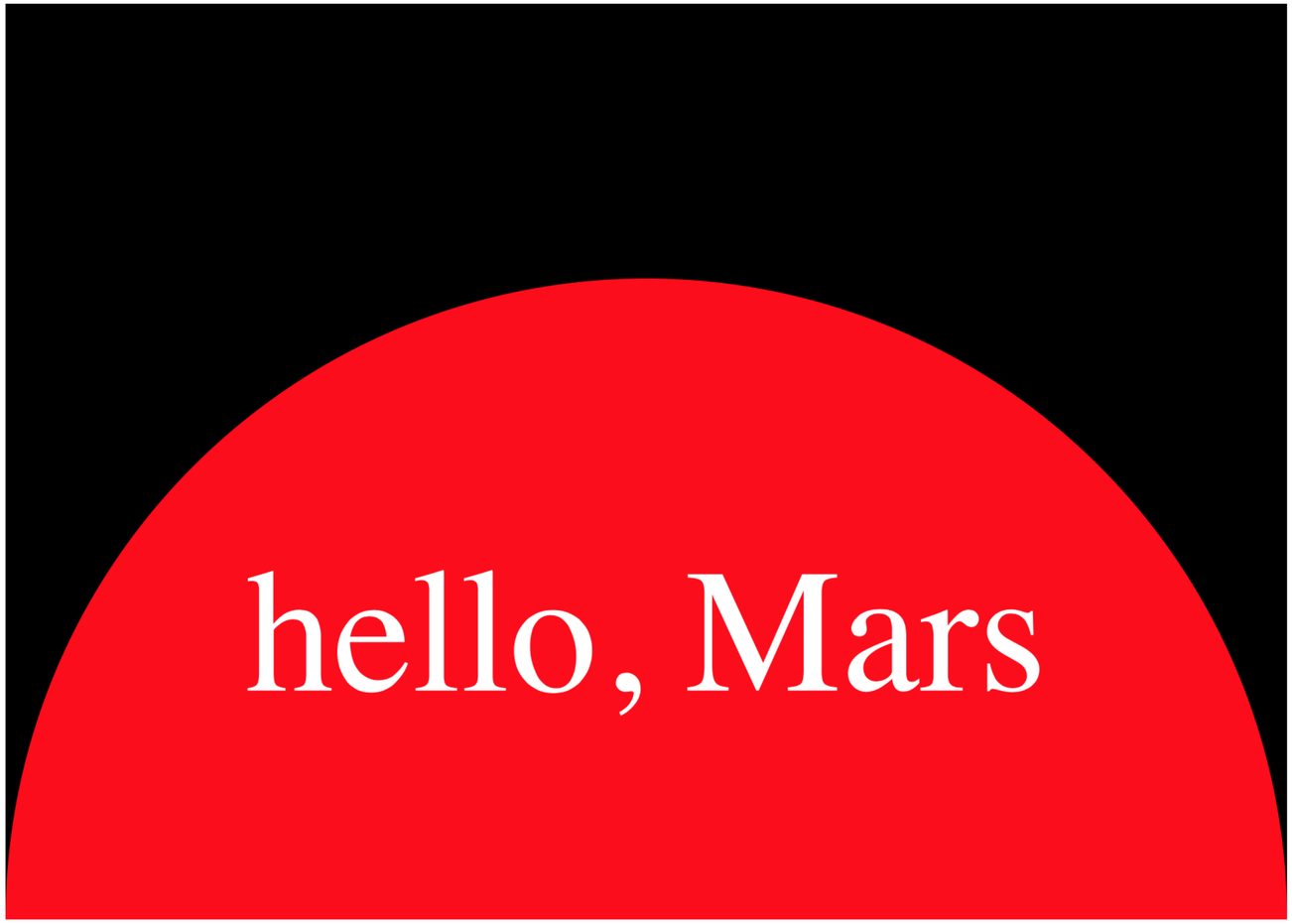
(Shift-Enter to compile and run.) ☐ *Compile and run after each keystroke*

svgplay

localhost:1999/hwsvg.go

```
package main

import (
	"github.com/ajstarks/svgo"
	"os"
)

func main() {
	canvas := svg.New(os.Stdout)
	width := 700
	height := 500
	style := "font-size:72pt;fill:white;text-anchor:middle"

	canvas.Start(width, height)
	canvas.Rect(0, 0, width, height)
	canvas.Circle(width/2, height, width/2, "fill:rgb(255,0,0)")
	canvas.Text(width/2, height*3/4, "hello, Mars", style)
	canvas.End()
}
```

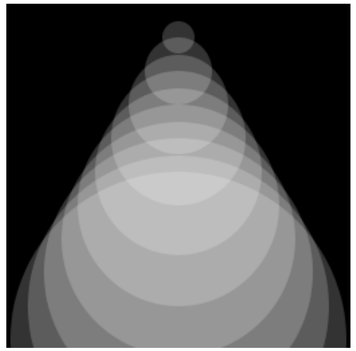
(Shift-Enter to compile and run.) *Compile and run after each keystroke*



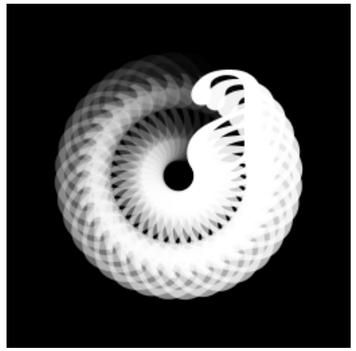
svgplay

https://ajstarks.org:1958/{thing}/

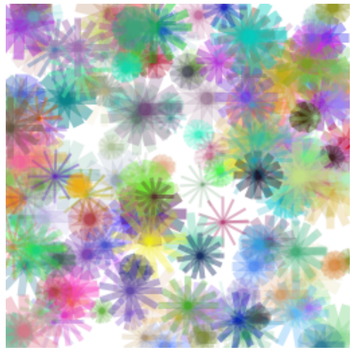
clock



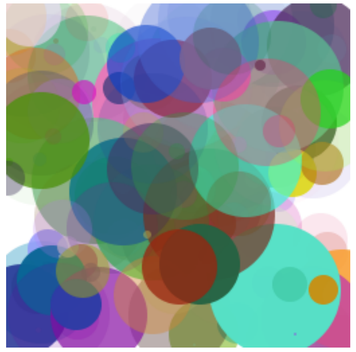
funnel



rotext

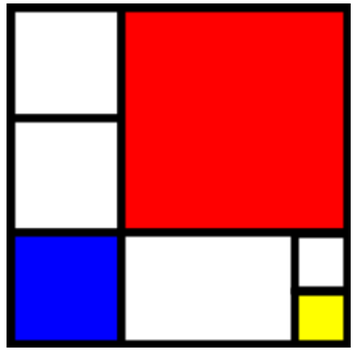


flower

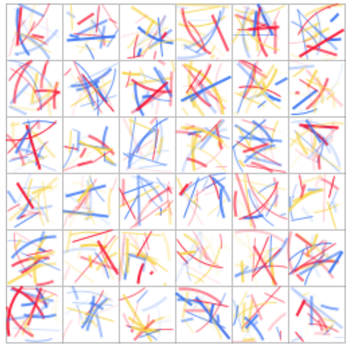


rshape

cube



mondrian

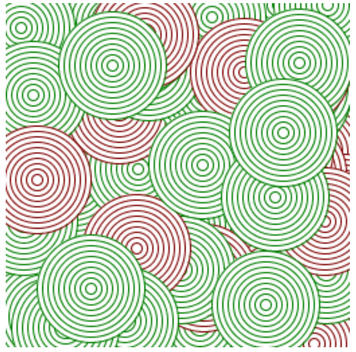


lewitt

face

pacman

tux

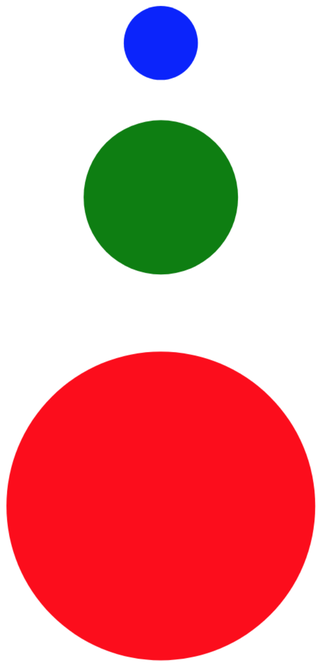


concentric

Data

```
<thing top="100" left="100" sep="100">
    <item width="50"  height="50"  name="Little" color="blue">This is small</item>
    <item width="75"  height="100" name="Med"    color="green">This is medium</item>
    <item width="100" height="200" name="Big"    color="red">This is large</item>
</thing>
```

Picture

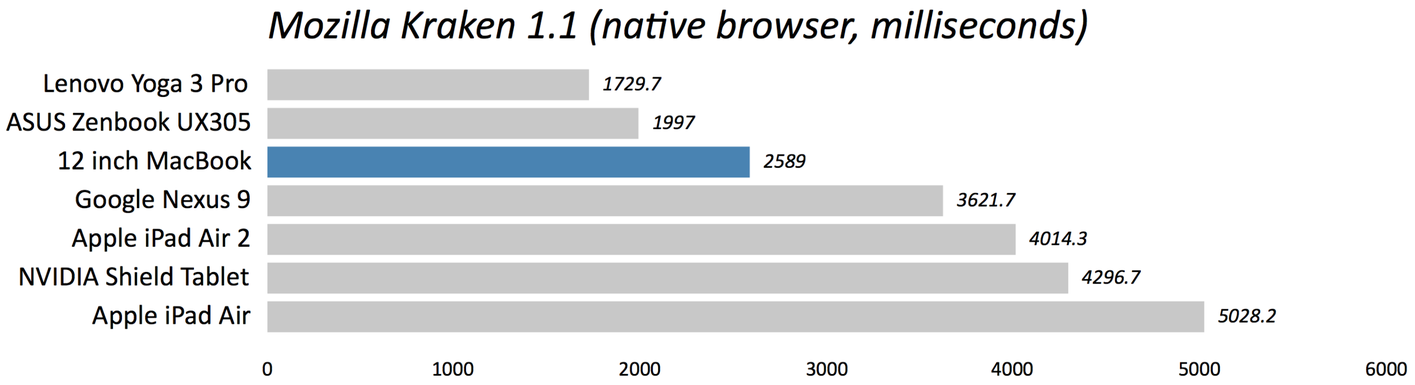


Little:This is small/blue

Med:This is medium/green

Big:This is large/red

```
<barchart title="2015 MacBook Benchmarks">
    <note>Source: AnandTech, April 14, 2015</note>
    <bdata scale="0,6000,1000"
        title="Mozilla Kraken 1.1 (native browser, milliseconds)">
       <bitem value="1729.7" name="Lenovo Yoga 3 Pro"/>
       <bitem value="1997.0" name="ASUS Zenbook UX305"/>
       <bitem color="steelblue" value="2589.0" name="12 inch MacBook"/>
       <bitem value="3621.7" name="Google Nexus 9"/>
       <bitem value="4014.3" name="Apple iPad Air 2"/>
       <bitem value="4296.7" name="NVIDIA Shield Tablet"/>
       <bitem value="5028.2" name="Apple iPad Air"/>
    </bdata>
</barchart>
```

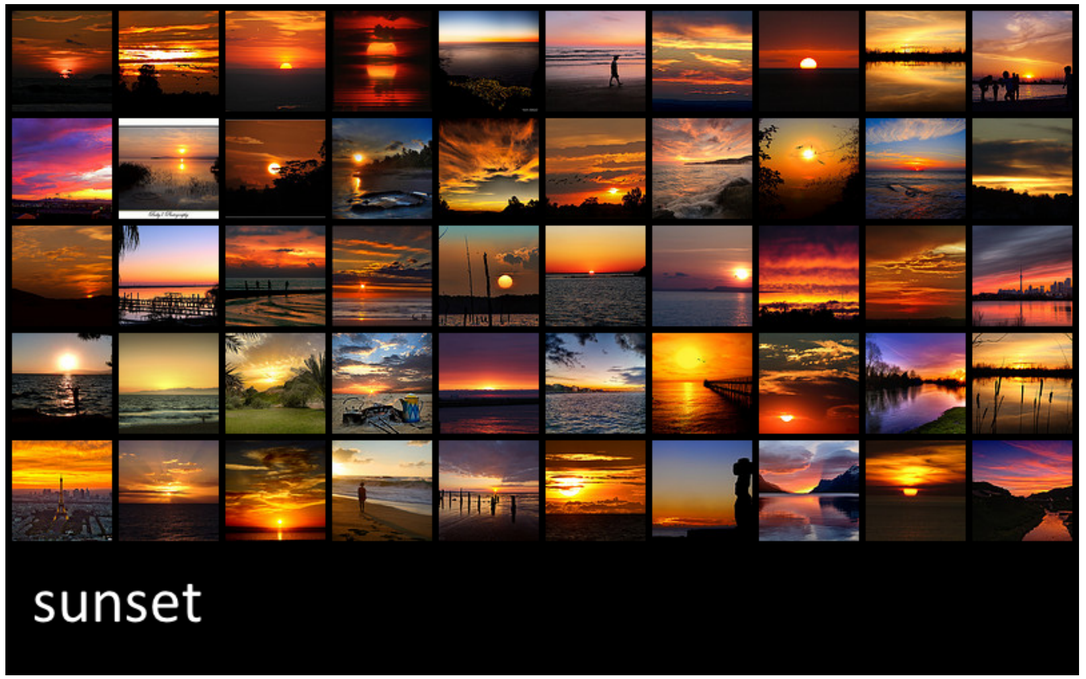


2015 MacBook Benchmarks

Source: AnandTech, April 14, 2015

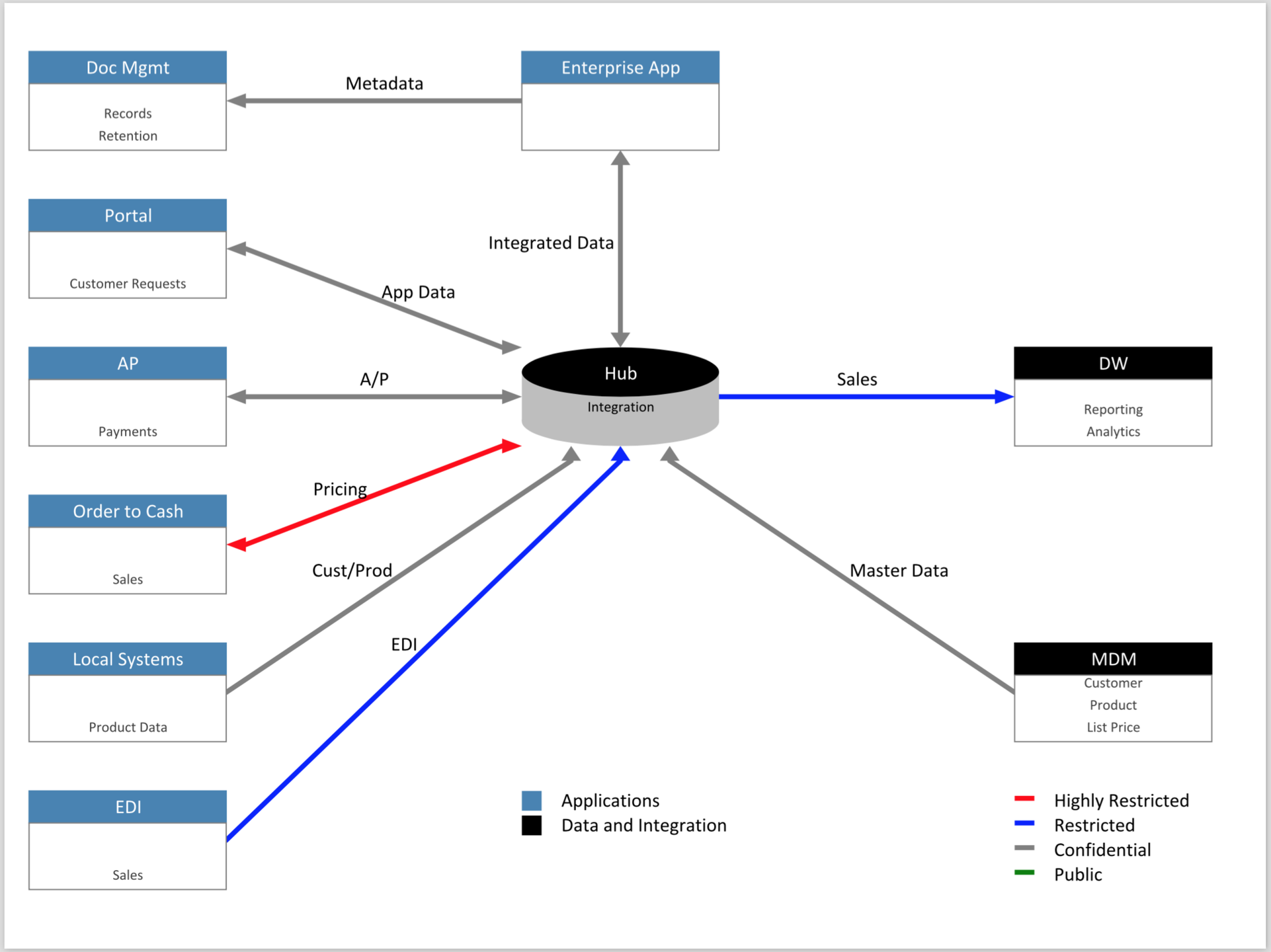
f50 sunset

https://api.flickr.com/services/rest/
?method=flickr.photos.search
&api_key=...
&text=sunset
&per_page=50
&sort=interestingness-desc



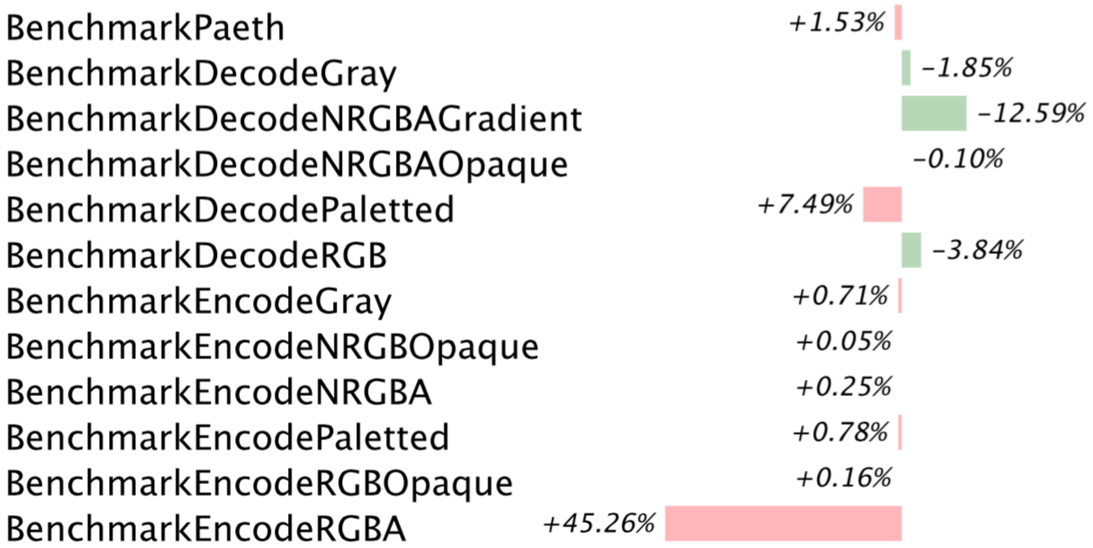

```
<?xml version="1.0" encoding="utf-8" ?>
<rsp stat="ok">
   <photos page="1" pages="105615" perpage="50" total="5280747">
      <photo id="4671838925" ... secret="b070f3363e" server="4068" farm="5 ... />
      <photo id="3590142202" ... secret="c46752e4d8" server="2441" farm="3" .../>
      ...
 </photos>
</rsp>
```

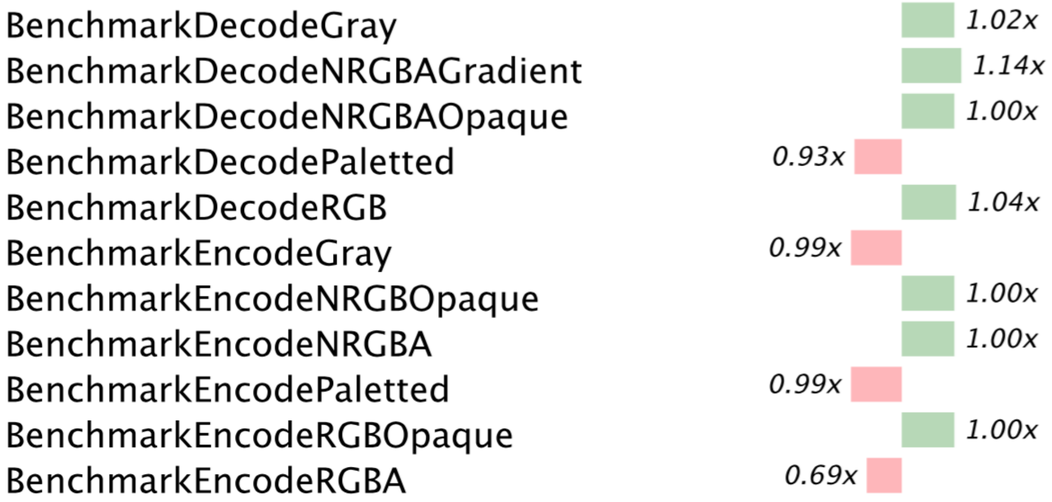
SVGo Clients

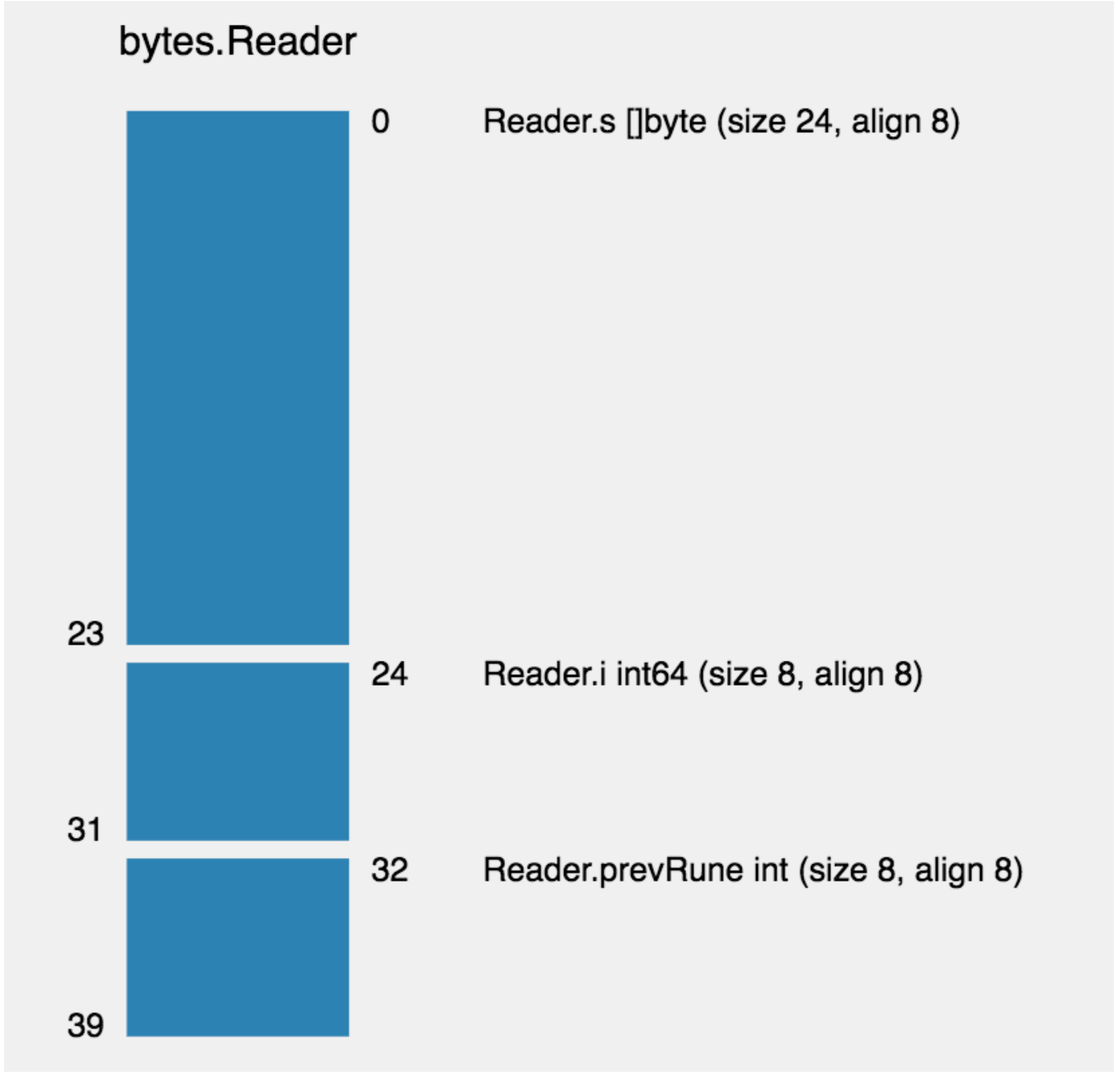

Doc Mgmt
Records
Retention
Metadata
Enterprise App
Portal
Customer Requests
App Data
Integrated Data
AP
Payments
A/P
Hub
Integration
Sales
DW
Reporting
Analytics
Pricing
Order to Cash
Sales
Cust/Prod
Master Data
Local Systems
Product Data
EDI
MDM
Customer
Product
List Price
EDI
Sales
Applications
Data and Integration
Highly Restricted
Restricted
Confidential
Public

benchpng.txt

image/png package: Go 1.3 vs Go 1.4

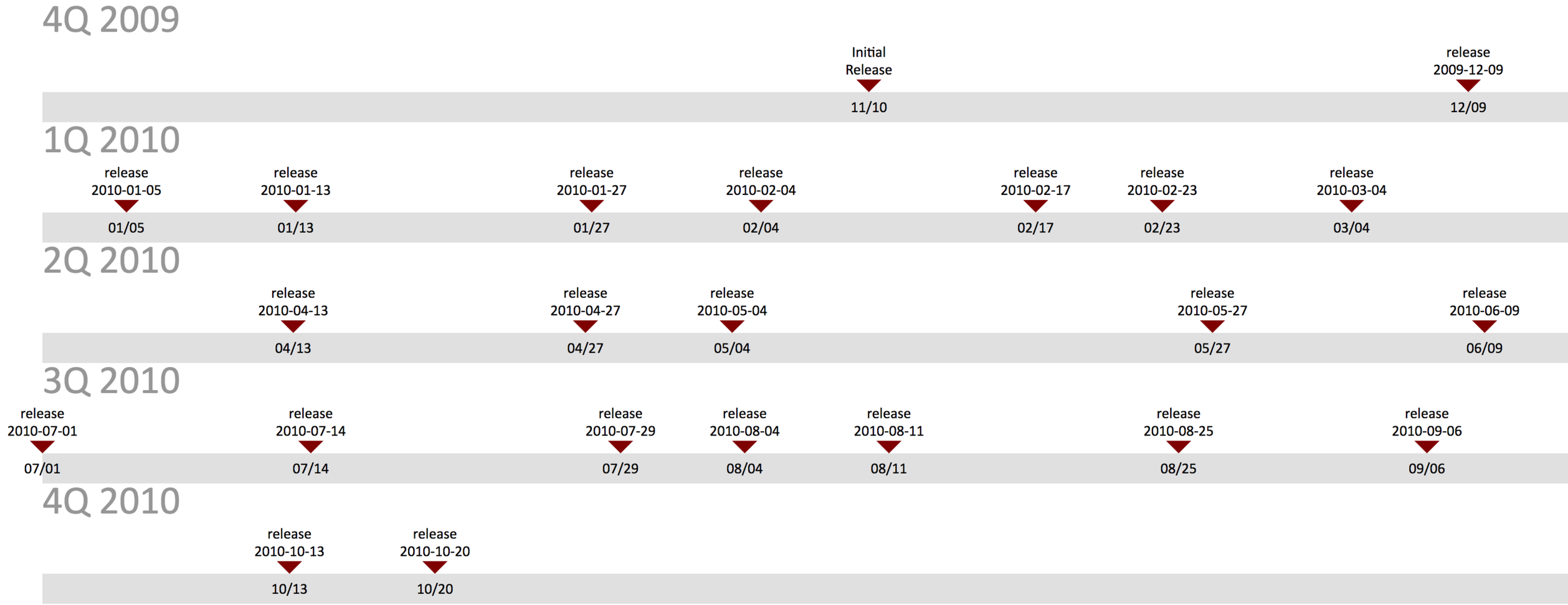


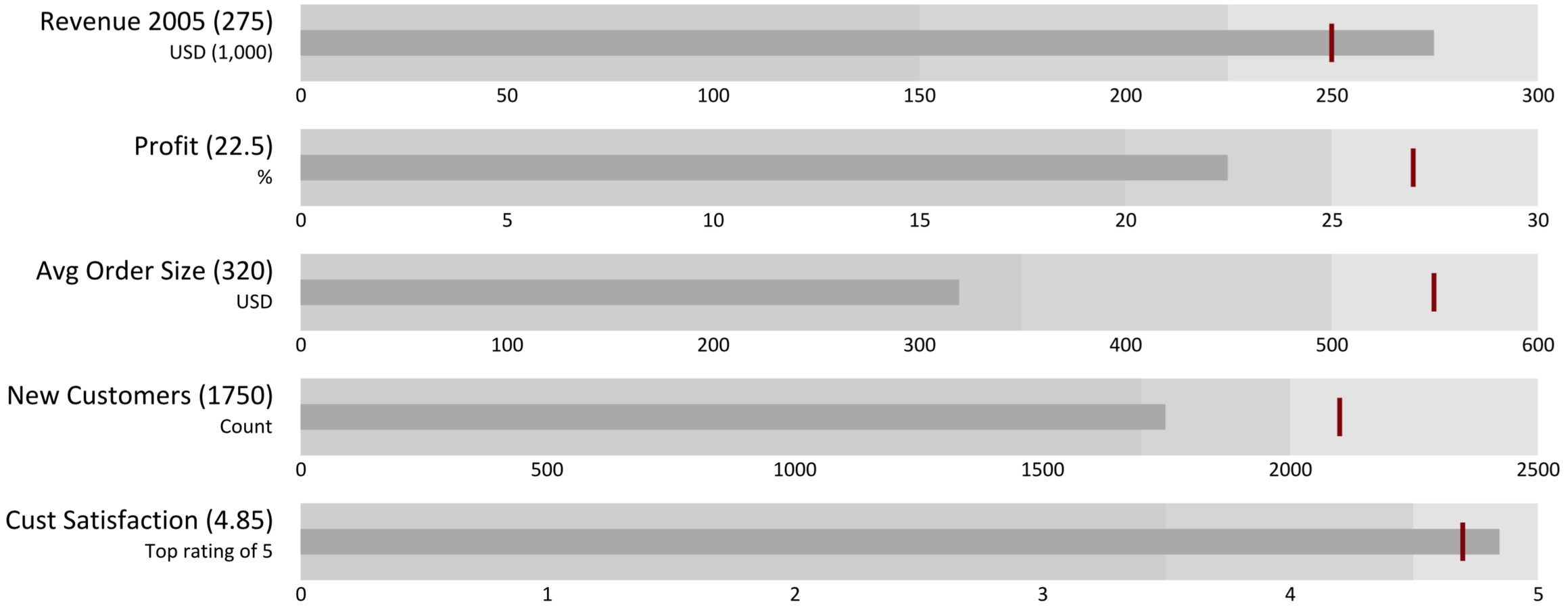





```
structlayout -json bytes Reader | structlayout-svg -t "bytes.Reader" > reader.svg
```

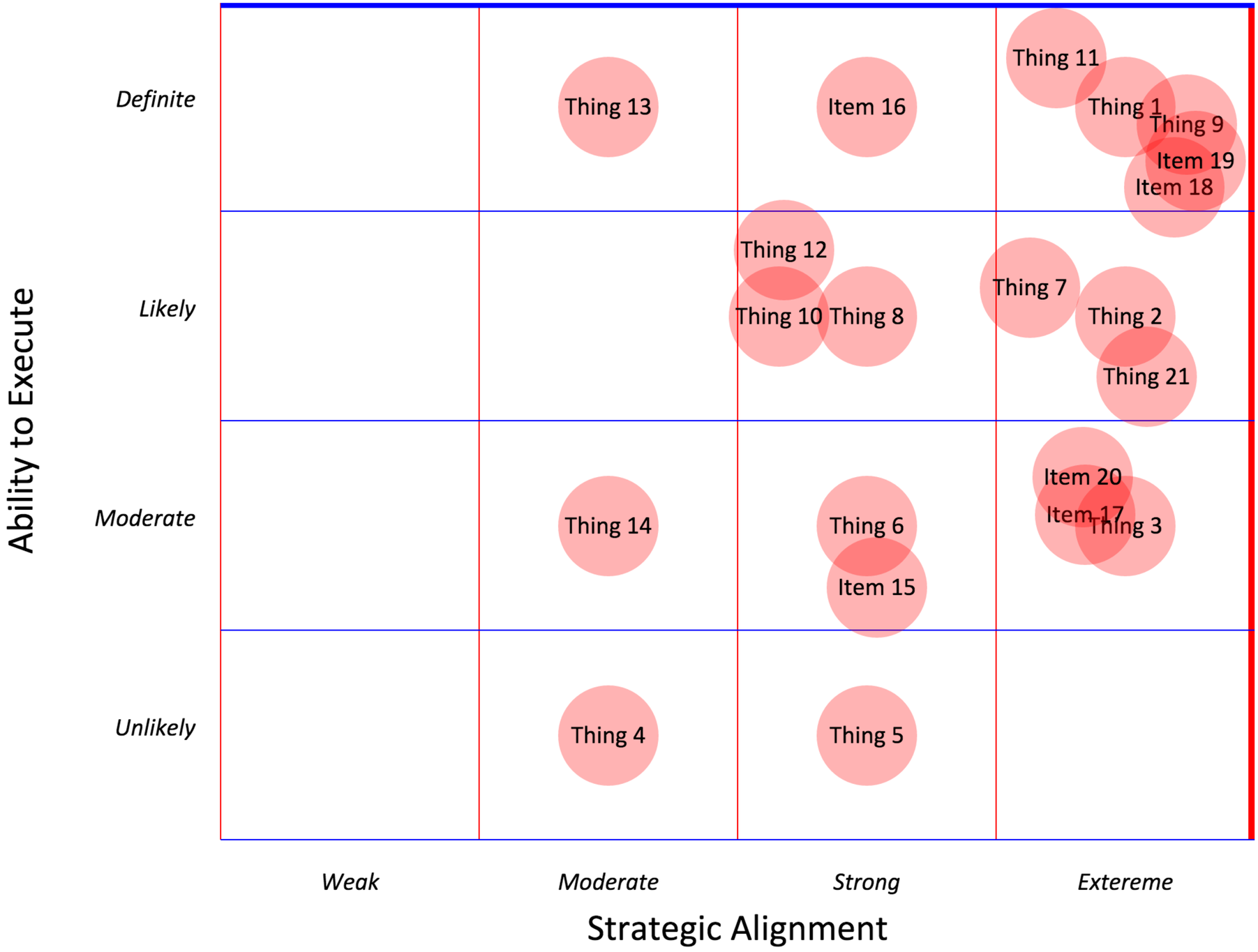
Go Programming Language Release History



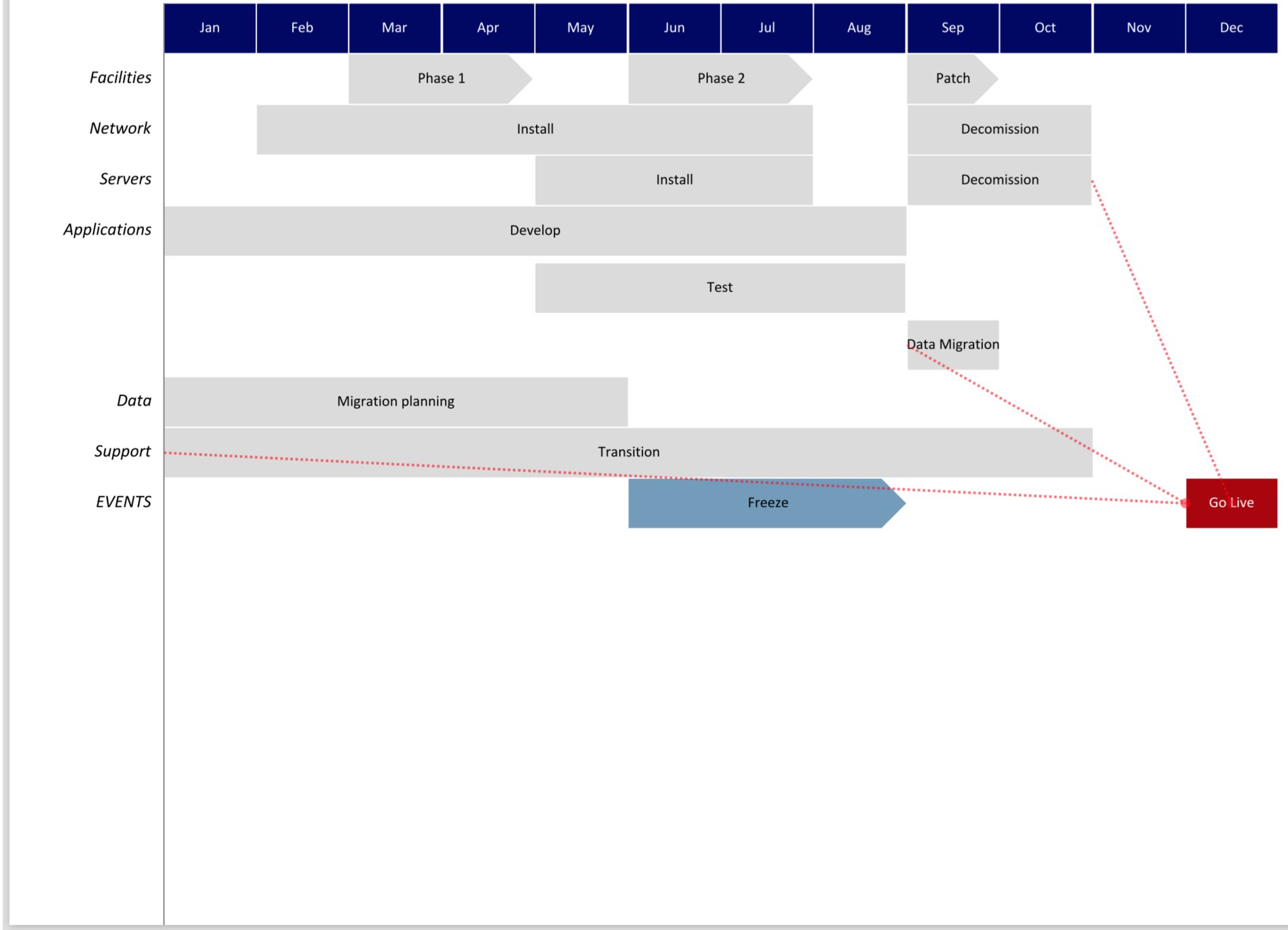


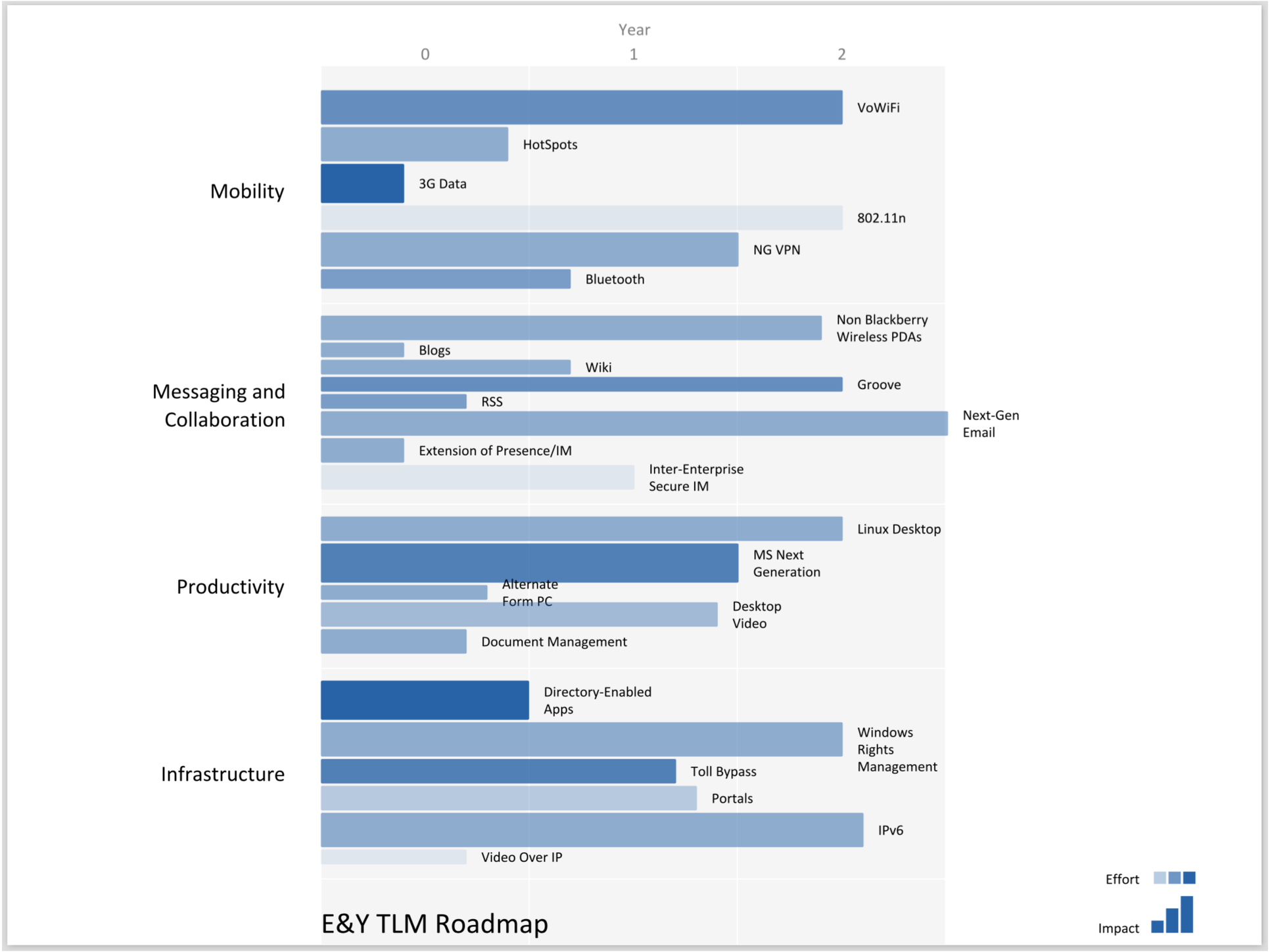
Sample Bullet Graph

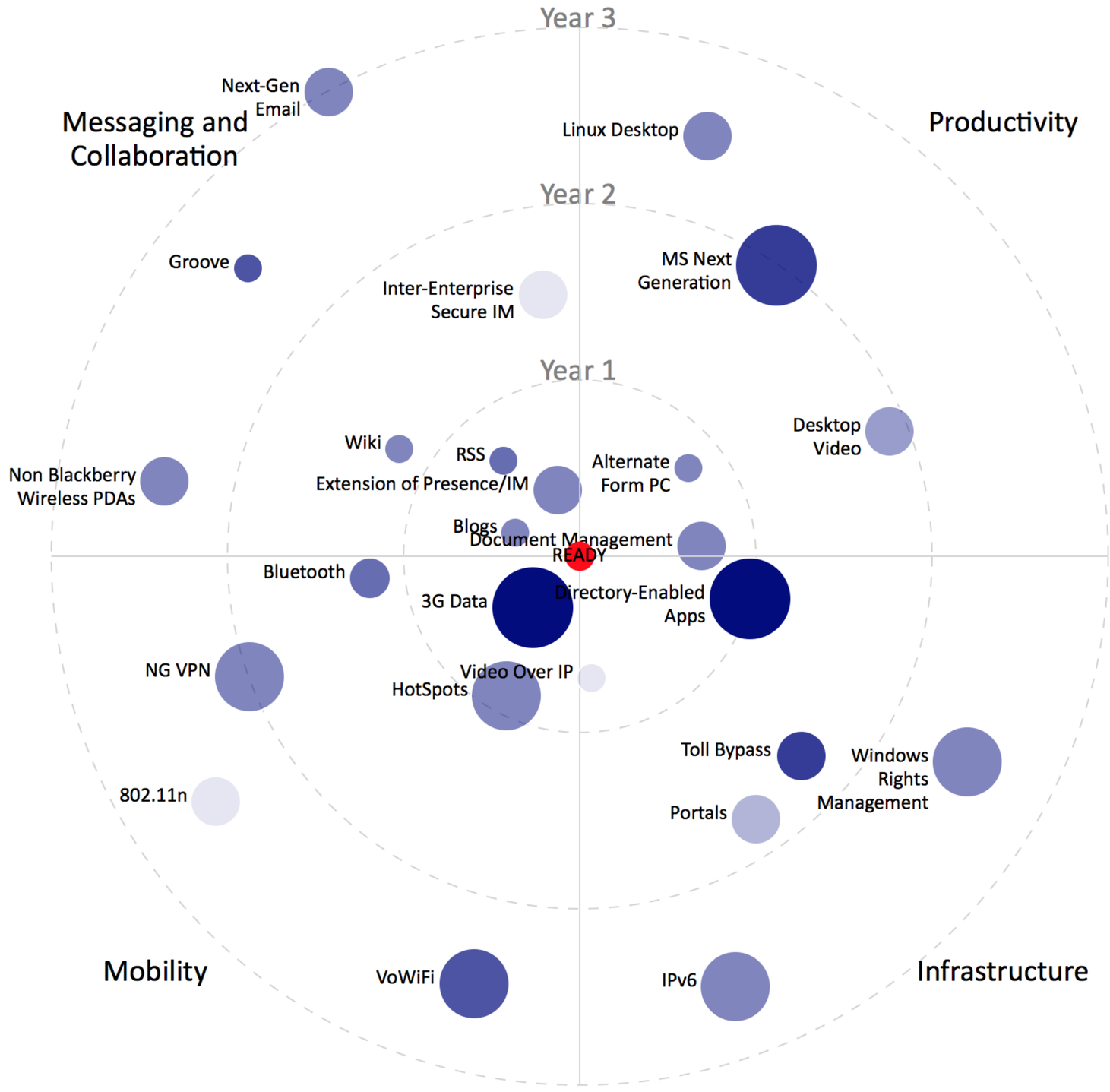
The bullet graph features a single, primary measure (for example, current year-to-date revenue) compares that measure to one or more other measures to enrich its meaning, for example, compared to a target), and displays it in the context of qualitative ranges of performance, such as poor, satisfactory, and good.


Ability to Execute
Definite
Likely
Moderate
Unlikely
Thing 13
Item 16
Thing 11
Thing 1
Thing 9
Item 19
Item 18
Thing 12
Thing 10
Thing 8
Thing 7
Thing 2
Thing 21
Thing 14
Thing 6
Item 15
Item 20
Item 17
Thing 3
Thing 4
Thing 5
Weak
Moderate
Strong
Extereme
Strategic Alignment

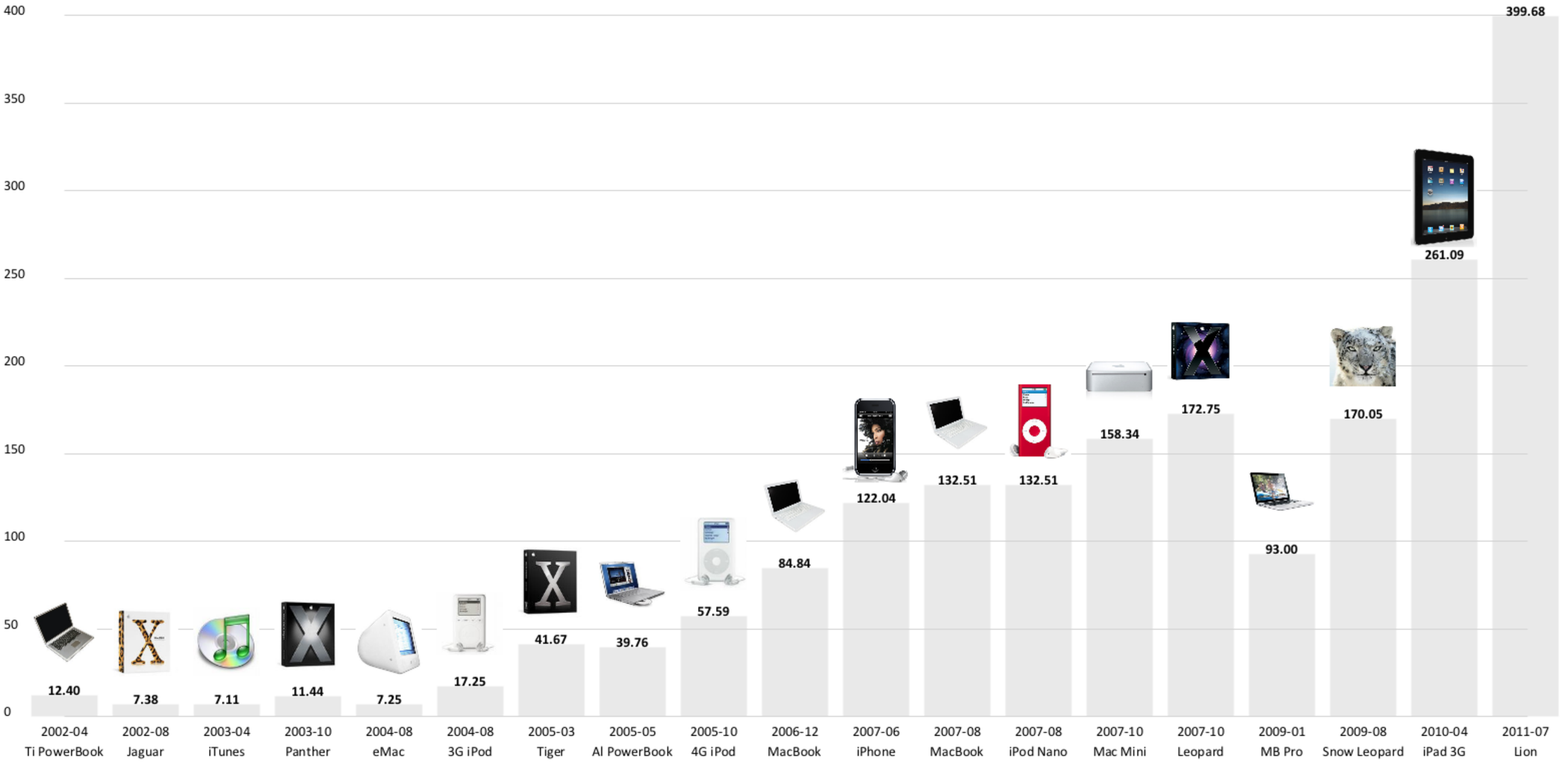
PLANNING TO PLAN



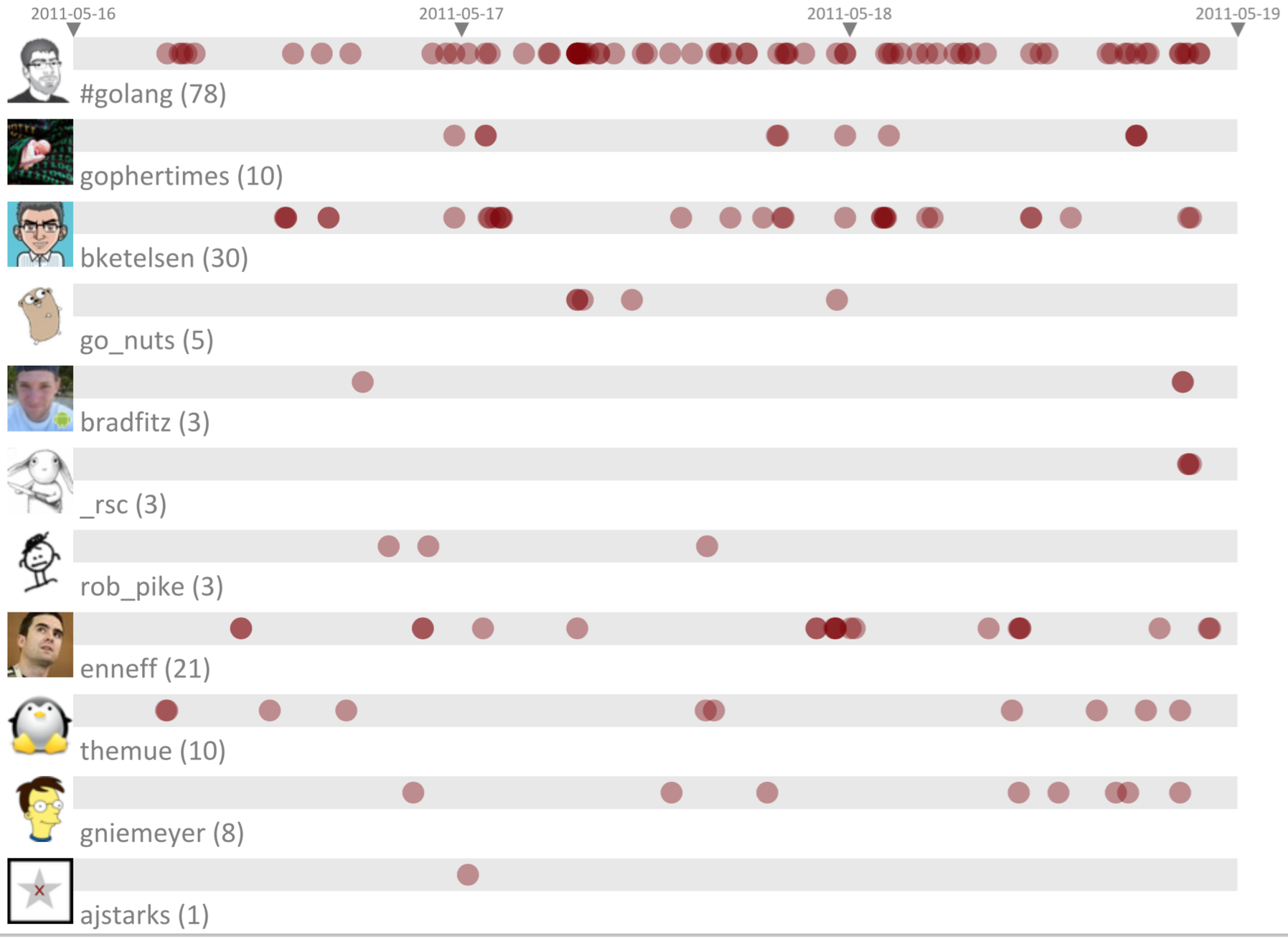

Year
0
1
2
Mobility
VoWiFi
HotSpots
3G Data
802.11n
NG VPN
Bluetooth
Messaging and Collaboration
Non Blackberry Wireless PDAs
Blogs
Wiki
Groove
RSS
Next-Gen Email
Extension of Presence/IM
Inter-Enterprise Secure IM
Productivity
Linux Desktop
MS Next Generation
Alternate Form PC
Desktop Video
Document Management
Infrastructure
Directory-Enabled Apps
Windows Rights Management
Toll Bypass
Portals
IPv6
Video Over IP
E&Y TLM Roadmap
Effort
Impact


Year 3
Year 2
Year 1
Messaging and Collaboration
Productivity
Mobility
Infrastructure
Next-Gen Email
Linux Desktop
Groove
Inter-Enterprise Secure IM
MS Next Generation
Desktop Video
Wiki
RSS
Alternate Form PC
Non Blackberry Wireless PDAs
Extension of Presence/IM
Blogs
Document Management
READY
Bluetooth
3G Data
Directory-Enabled Apps
NG VPN
Video Over IP
HotSpots
Toll Bypass
Windows Rights Management
802.11n
Portals
VoWiFi
IPv6

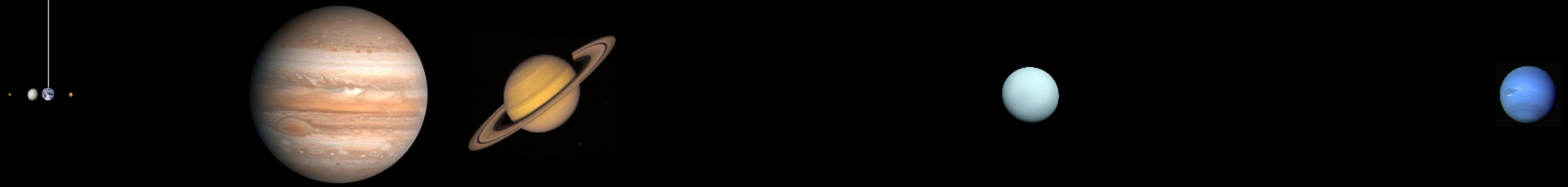
Apple Purchases and Stock Price



Twitter Update Frequency



You are here

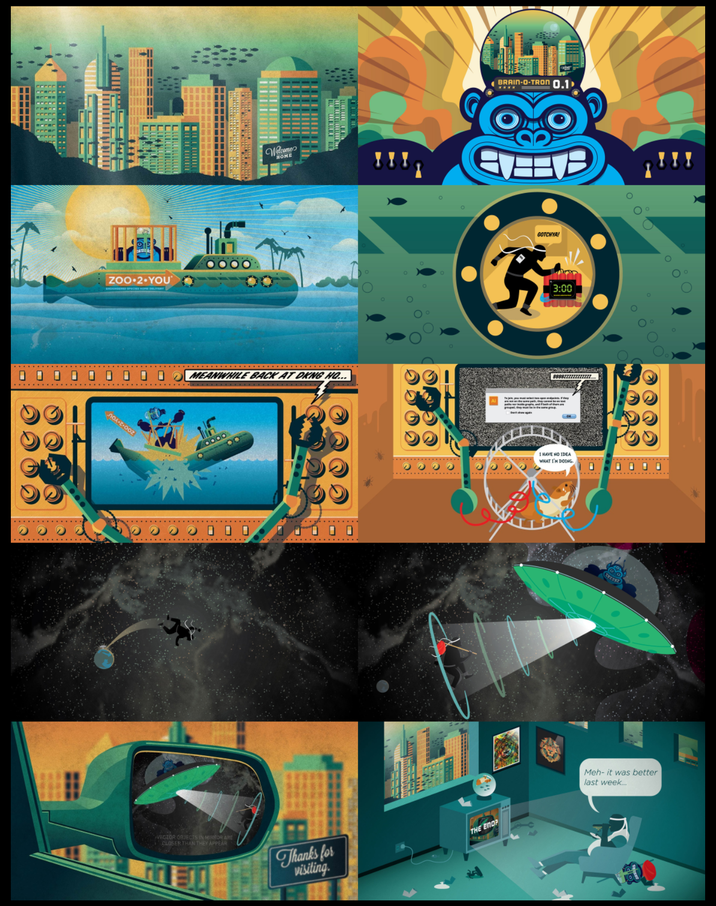


JONES
MONTIEL

- LAYER TENNIS SEASON 4 WEEK 6 MATCH COMMENTARY BY MIKE MONTEIRO -

DKNG
DDL

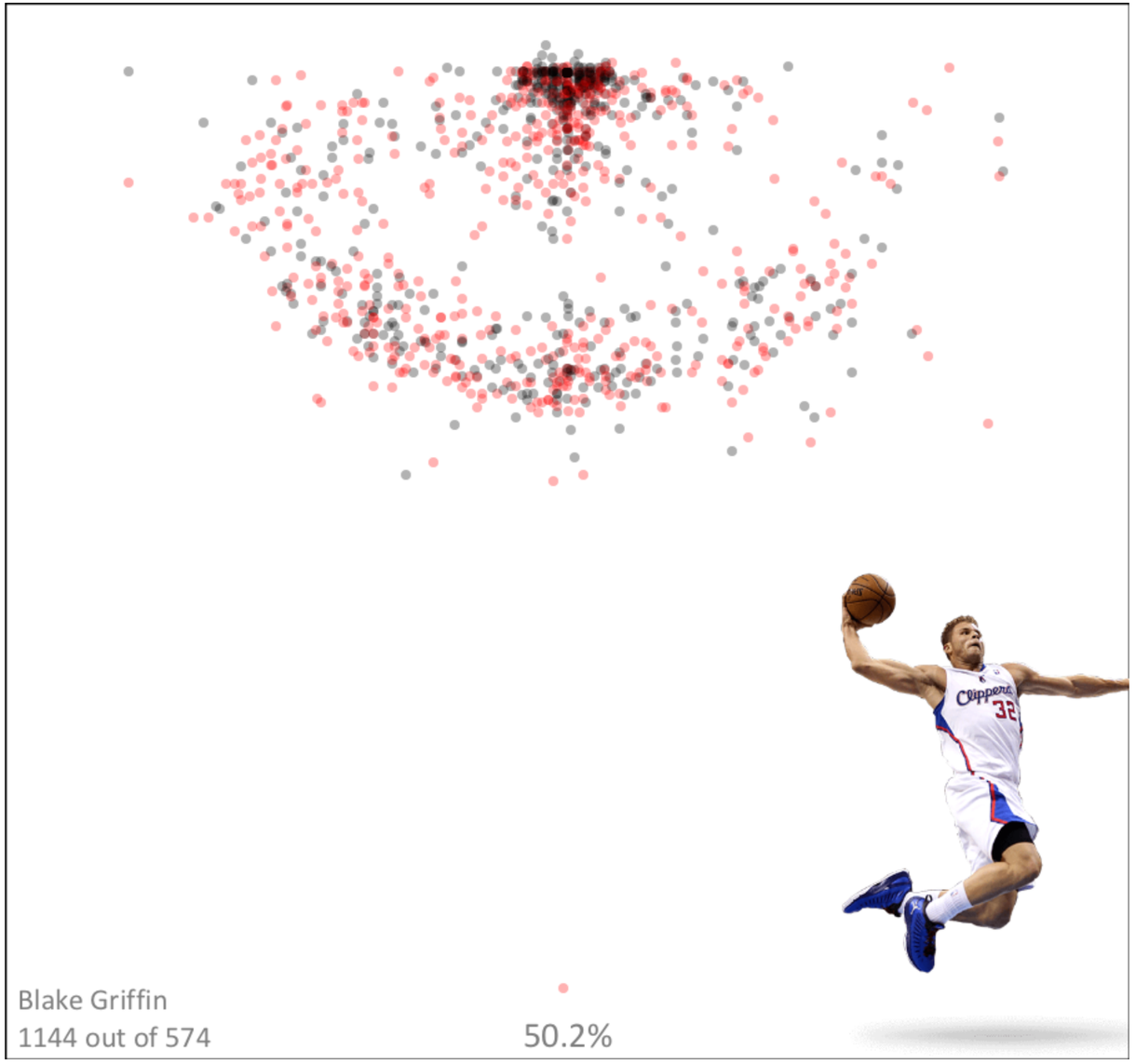
- LAYER TENNIS SEASON 4 WEEK 7 MATCH COMMENTARY BY JOHN GRUBER -

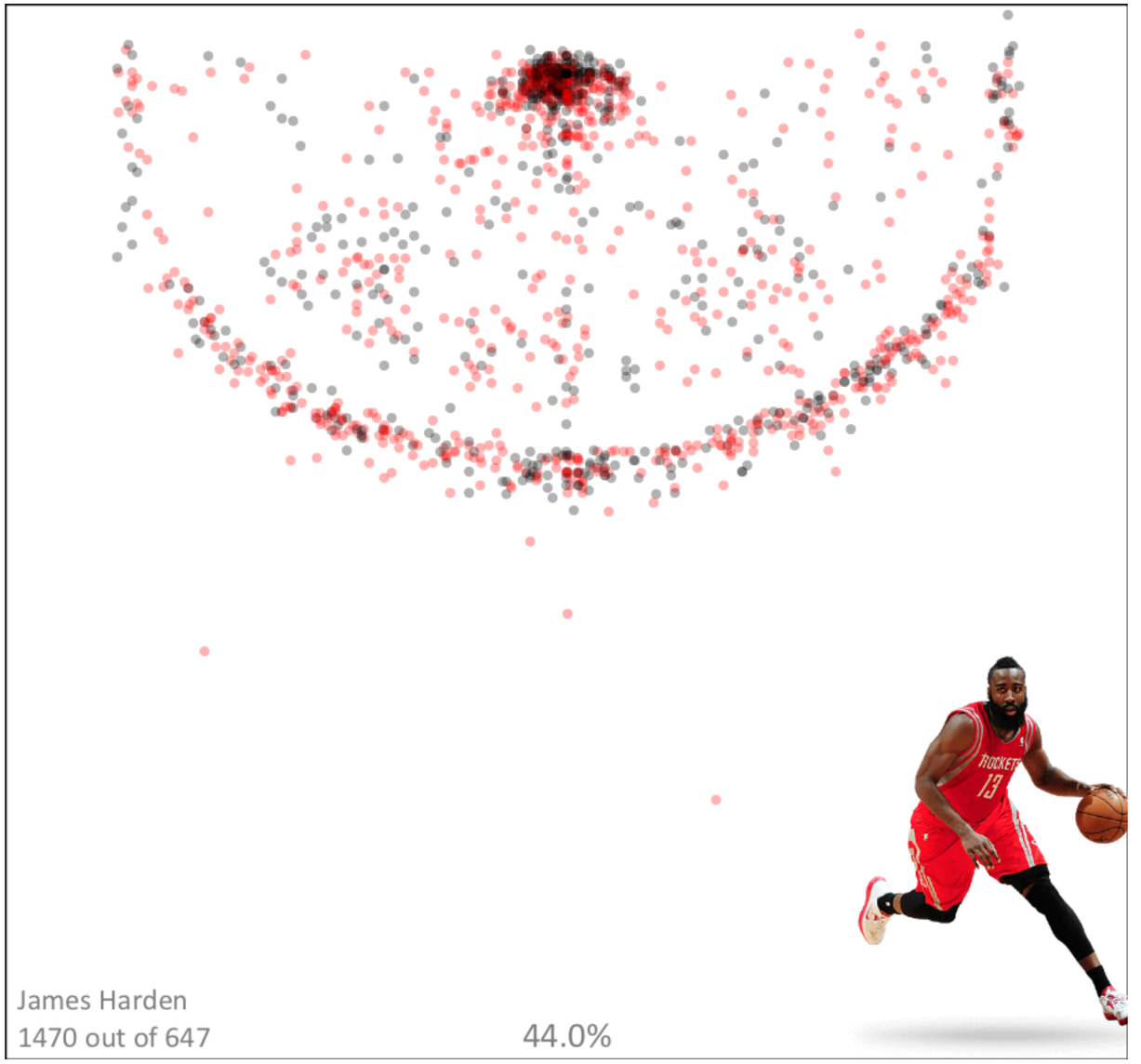


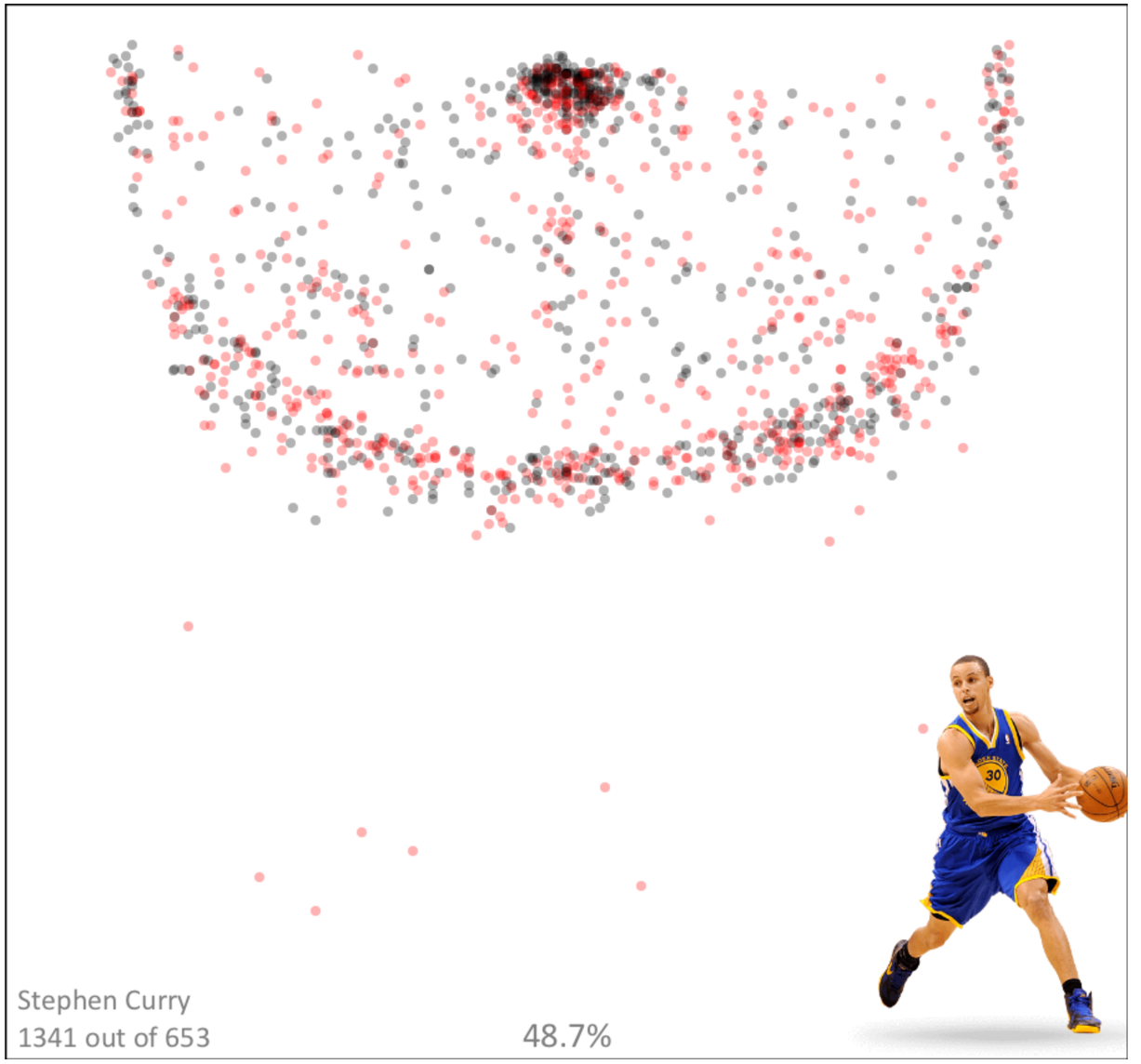
ANDERSON
DKNG

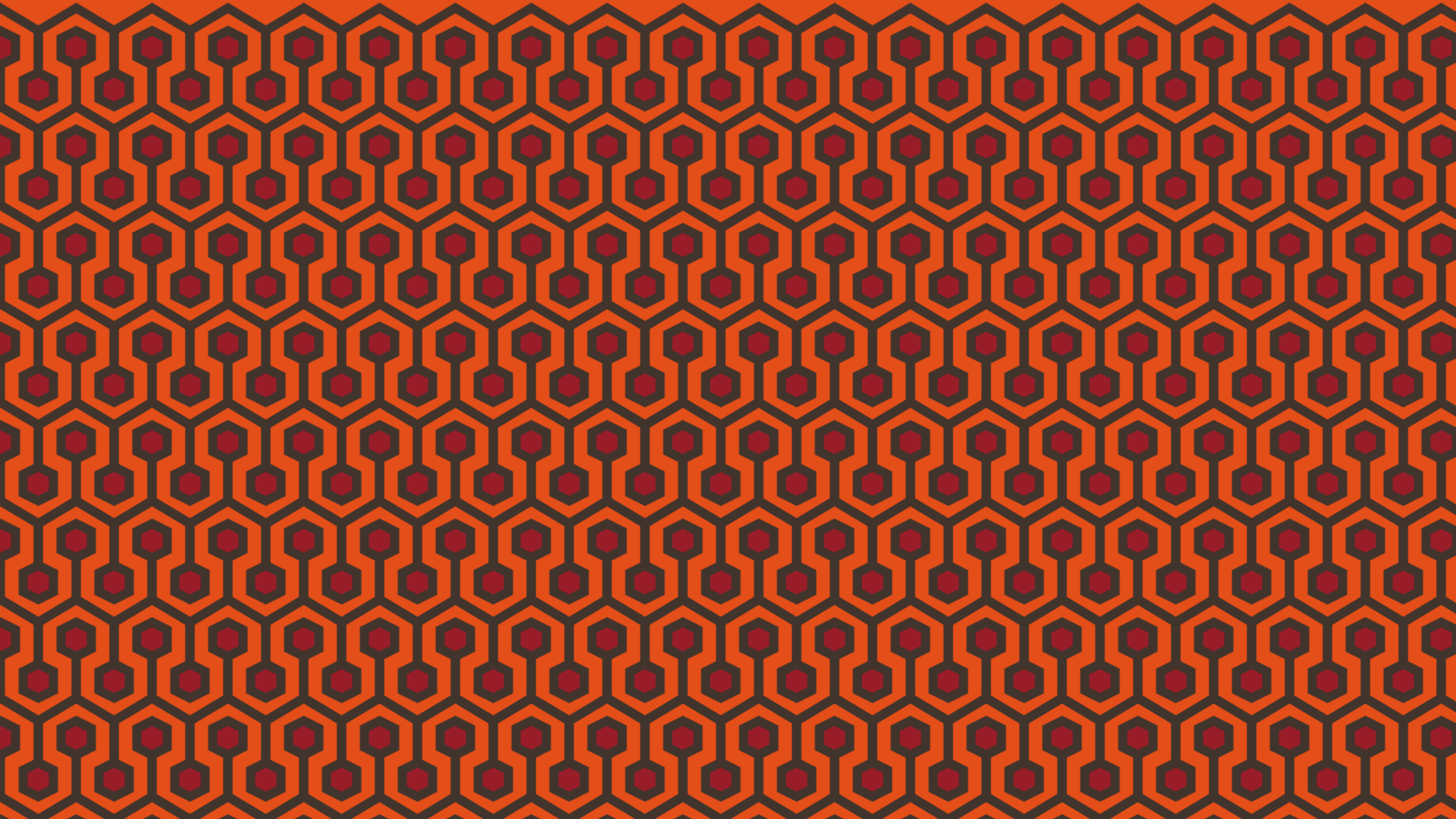
- LAYER TENNIS SEASON 4 PLAYOFF QUARTERFINAL COMMENTARY BY BRYAN BEDELL -


CONTINO CASSARO
PUTNAM STOCKS
WHITE TAYLOR
HALL WARREN
STRAWBERRYLUNA DOUBLENAUT
JONES MONTIEL
DKNG DDL
SHAWNA X STEVENS
TAYLOR JONES
PUTNAM RAJKUMAR
REYES WHITE
ANDERSON DKNG
TAYLOR WHITE
RAJKUMAR ANDERSON
ANDERSON WHITE
A FIGHT TO THE DEATH!
THE BATTLE OF LONG ISLAND
DIVIDE AND CONQUER
DIVIDE AND CONQUER?
JON CONTINO SOMEHOW TURNS INTO AN EAGLE!!
CUT OFFS
2022: A SPACE ODDITY
LANDING... 5 4 3 2 1
The Great British Autumn
Autumn HARVEST
OR
THEY MAY EAT YOUR PENGUIN
WHAT THE PUCK?
DECK THE HALL THIS CHRISTMAS EVE
HALLO ON A SEC AREN'T WE GETTING A BIT HASTEVE?! IT'S ONLY OCTOBER
SORRY AM I THE ONLY ONE WITH A TIME MACHINE?
WE SAY ABOUT THEY SAY A
REGULAR
SUPER SIZE ME!
VISIT THE "GREAT" WHITE NORTH
THE GREAT WHITE NORTH
CANADIANS HAVE BIGGER BALLS
"OUR BEER IS BETTER" QUOTE GOES HERE.
EVERYONE KNOWS THAT'S NOT TRUE
bronze
bro hoe
whamf
PENGUIN BURGER
It wasn't me
She won't be missed for long.
CASSANDRA THUNDER
07:30
OINK
OOPS!
SNOOZE
200M
LET'S GO CRAZY


Blake Griffin
1144 out of 574
50.2%

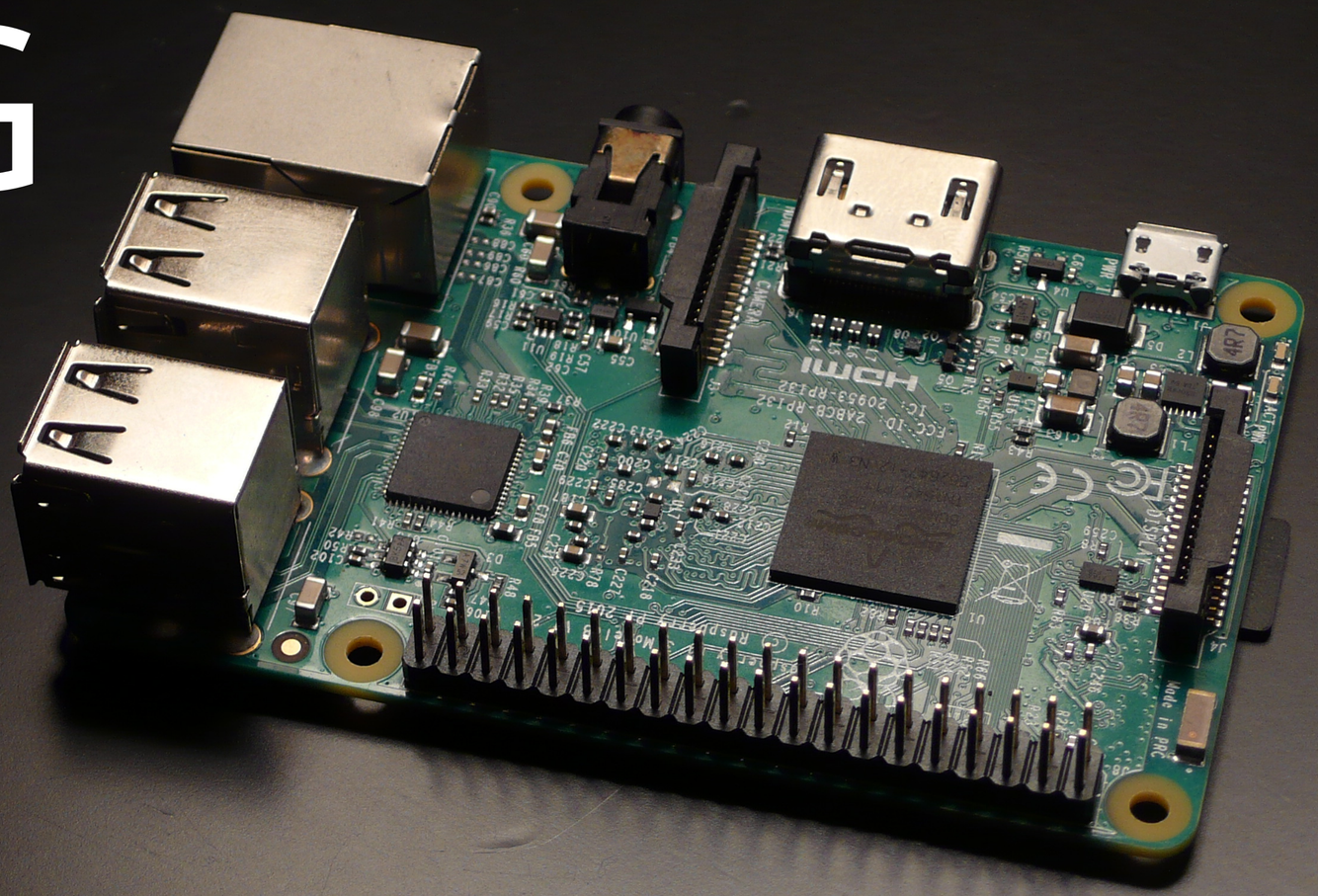

James Harden
1470 out of 647
44.0%


Stephen Curry
1341 out of 653
48.7%



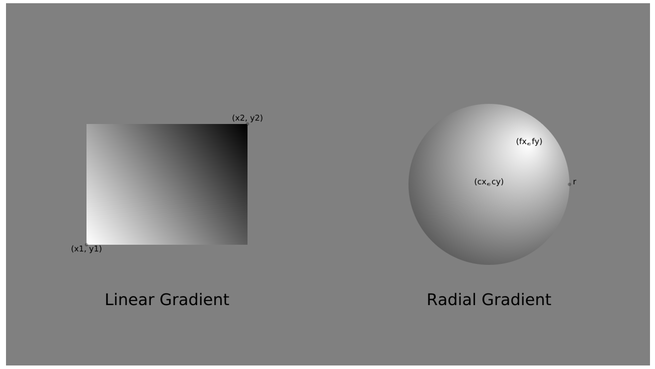
```
canvas.Def()
canvas.Gid("unit")
canvas.Polyline(xl, yl, "fill:none")
canvas.Polygon(xp, yp)
canvas.Gend()

canvas.Gid("runit")
canvas.TranslateRotate(150, 180, 180)
canvas.Use(0, 0, "#unit")
canvas.Gend()
canvas.Gend()
canvas.DefEnd()

for y := 0; < height; y += 130 {
    for x := 100; x < width; x+=100 {
        canvas.Use(x, y, "#unit")
        canvas.Use(x, y, "#runit")
    }
}
```

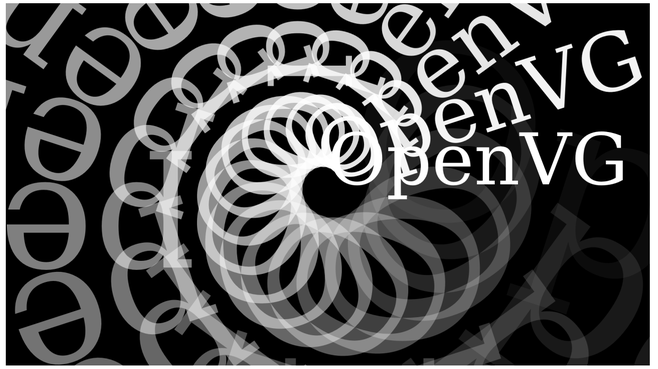
OpenVG

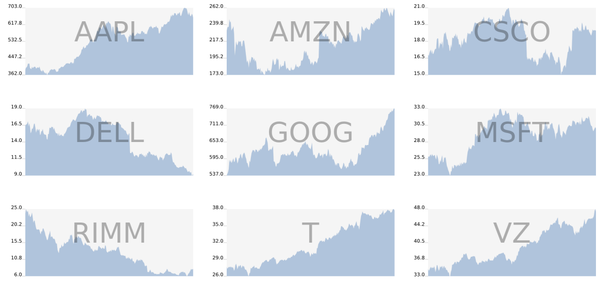


- Circle
- Ellipse
- Rectangle
- Rounded Rectangle
- Line
- Polyline
- Polygon
- Arc
- Quadratic Bezier
- Cubic Bezier
- Image

OpenVG on the Raspberry Pi



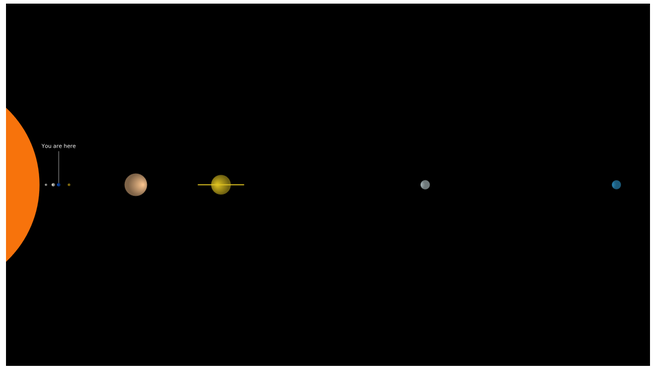




Why I use Go

Anthony Starks

@ajstarks
ajstarks@gmail.com




```
package main
import "fmt"

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

This is the traditional hello, world program.
It's six lines long, and imports the fmt package,
leading some to be suprised at the size of the resulting binary.

```
package main

import (
    "bufio"
    "github.com/ajstarks/openvg"
    "os"
)

func main() {
    width, height := openvg.Init()

    w2 := openvg.VGfloat(width / 2)
    h2 := openvg.VGfloat(height / 2)
    w := openvg.VGfloat(width)

    openvg.Start(width, height)                  // Start the picture
    openvg.BackgroundColor("black")              // Black background
    openvg.FillRGB(44, 100, 232, 1)              // Big blue marble
    openvg.Circle(w2, 0, w)                      // The "world"
    openvg.FillColor("white")                    // White text
    openvg.TextMid(w2, h2, "hello, world", "serif", width/10) // Greetings
    openvg.End()                                 // End the picture
    bufio.NewReader(os.Stdin).ReadBytes('\n') // Pause until [RETURN]
    openvg.Finish()                              // Graphics cleanup
}
```

OpenVG Functions

Circle	(x, y, r VGfloat)
Ellipse	(x, y, w, h VGfloat)
Rect	(x, y, w, h VGfloat)
Roundrect	(x, y, w, h, rw, rh VGfloat)
Line	(x1, y1, x2, y2 VGfloat)
Polyline	(x, y []VGfloat)
Polygon	(x, y []VGfloat)
Arc	(x, y, w, h, sa, aext VGfloat)
Qbezier	(sx, sy, cx, cy, ex, ey VGfloat)
Cbezier	(sx, sy, cx, cy, px, py, ex, ey VGfloat)
Image	(x, y VGfloat, w, h int, s string)
Text	(x, y VGfloat, s, font string, size int)
TextMid	(x, y VGfloat, s, font string, size int)
TextEnd	(x, y VGfloat, s, font string, size int)

Partly Cloudy

40°

(feels like 33°)

Tuesday April 17

7:20 pm

Missouri's Governor Was Already in Trouble. A New Felony Claim Adds to That.

U.S. Seeks to Send American ISIS Suspect to Another Country's Custody

Sessions Tries to Put New Pressure on Drug Companies in Opioid Crisis

A Southwest Airlines Engine Explodes, Killing a Passenger

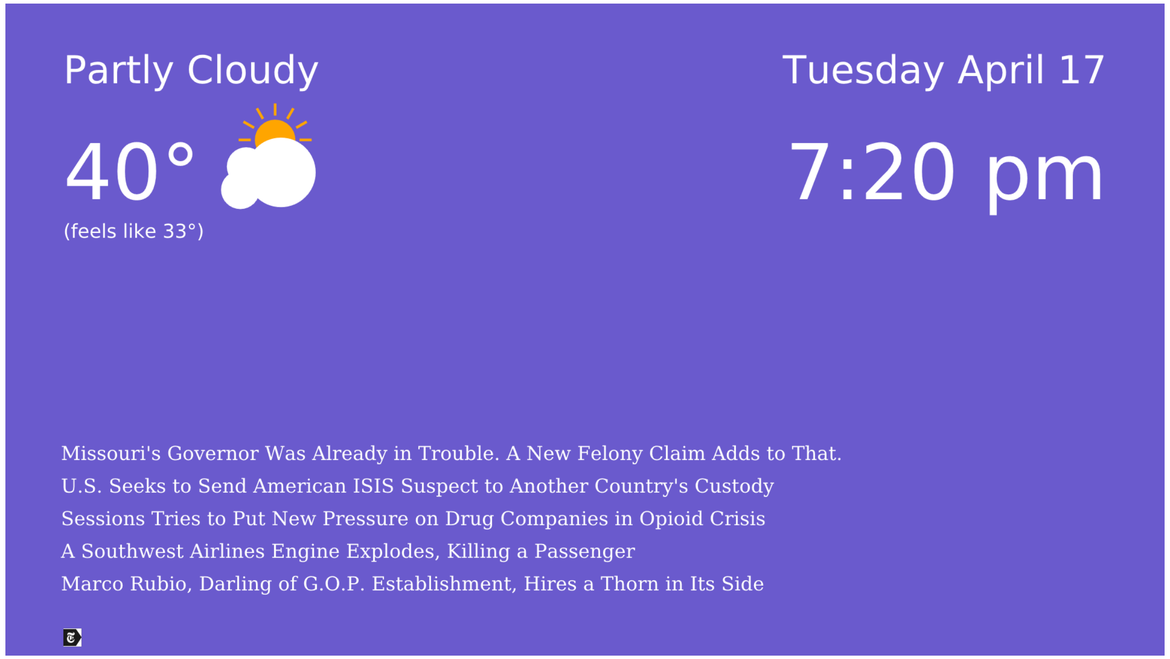
Marco Rubio, Darling of G.O.P. Establishment, Hires a Thorn in Its Side


Mostly Cloudy
47°
(feels like 45°)
Sunday March 13
3:03 am
Farhad and Mike Discuss the Apple Case and a Go-Playing Computer Program
Getting the Weather Report From Windows
The Government Answers Apple in the iPhone Case
Apple and U.S. Bitterly Turn Up Volume in iPhone Privacy Fight
F.C.C. Proposes Privacy Rules for Internet Providers
MECHANICAL DRAWING

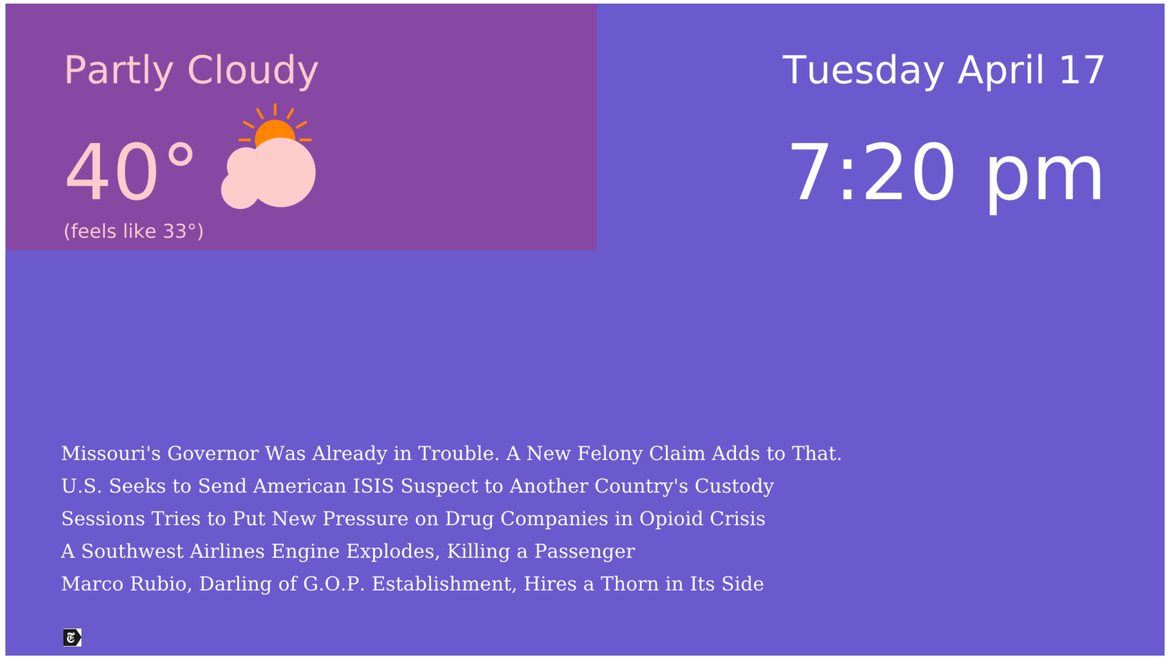

Mostly Cloudy
Tuesday February 23
36°
9:41 pm
(feels like 29°)
29% Chance of precipitation
Justice Alito Addresses Prospect of an 8-Member Court
Michigan: State Senate Approves Aid to Help Flint Residents Pay Water Bills
Told to 'Take the Gloves Off,' John Kasich Says the Race Is Out of His Hands
Utah: Polygamist Sect Leaders Are Arrested on Fraud Charges
North Carolina: State Lawmakers Target Restroom Anti-Bias Law in Charlotte


Clear
66°
Friday April 14
5:55 pm
White House to Keep Its Visitor Logs Secret
Georgia Officers are Fired After Kicking Man at Traffic Stop
Does a Uniform Keep Officers in Line? The Baltimore Chief Thinks So
Wisconsin Man Who Mailed Manifesto to Trump Is Captured After 10-Day Manhunt
California Today: GoPros, Audiobooks and Other Perks of the Library
LG

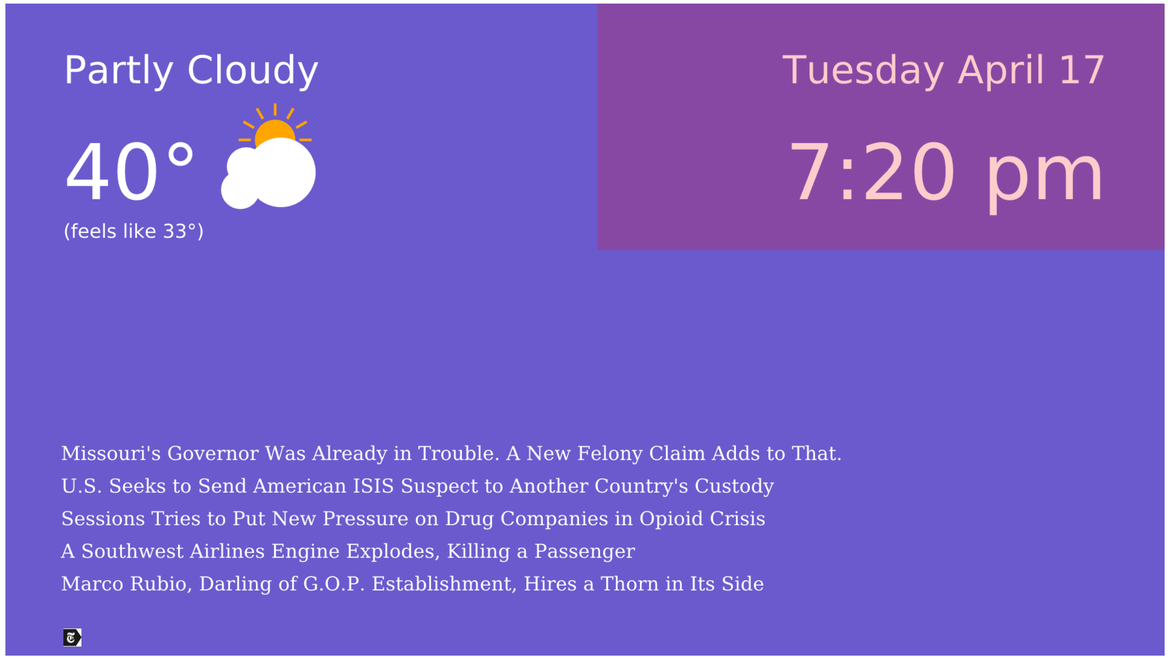
```
func main() {

    //...

    dateticker := time.NewTicker(1 * time.Minute)
    weatherticker := time.NewTicker(5 * time.Minute)
    headticker := time.NewTicker(10 * time.Minute)
    sigint := make(chan os.Signal, 1)
    signal.Notify(sigint, os.Interrupt)

    for {
        select {
        case <-weatherticker.C:
            canvas.weather(*location)
        case <-dateticker.C:
            canvas.clock(*smartcolor)
        case <-headticker.C:
            canvas.headlines(*section, *thumb)
        case <-sigint:
            openvg.Finish()
            os.Exit(0)
        }
    }
}
```



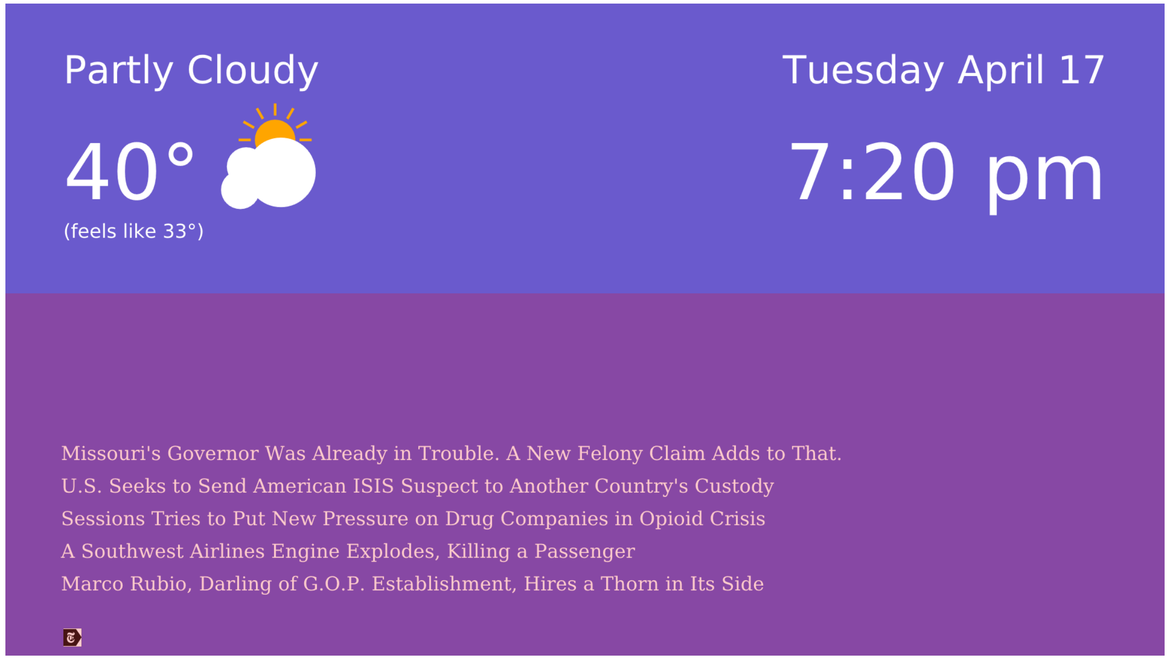
```
func main() {

    //...

    dateticker := time.NewTicker(1 * time.Minute)
    weatherticker := time.NewTicker(5 * time.Minute)
    headticker := time.NewTicker(10 * time.Minute)
    sigint := make(chan os.Signal, 1)
    signal.Notify(sigint, os.Interrupt)

    for {
        select {
        case <-weatherticker.C:
            canvas.weather(*location)
        case <-dateticker.C:
            canvas.clock(*smartcolor)
        case <-headticker.C:
            canvas.headlines(*section, *thumb)
        case <-sigint:
            openvg.Finish()
            os.Exit(0)
        }
    }
}
```



```
func main() {

    //...

    dateticker := time.NewTicker(1 * time.Minute)
    weatherticker := time.NewTicker(5 * time.Minute)
    headticker := time.NewTicker(10 * time.Minute)
    sigint := make(chan os.Signal, 1)
    signal.Notify(sigint, os.Interrupt)

    for {
        select {
        case <-weatherticker.C:
            canvas.weather(*location)
        case <-dateticker.C:
            canvas.clock(*smartcolor)
        case <-headticker.C:
            canvas.headlines(*section, *thumb)
        case <-sigint:
            openvg.Finish()
            os.Exit(0)
        }
    }
}
```



```
func main() {

    //...

    dateticker := time.NewTicker(1 * time.Minute)
    weatherticker := time.NewTicker(5 * time.Minute)
    headticker := time.NewTicker(10 * time.Minute)
    sigint := make(chan os.Signal, 1)
    signal.Notify(sigint, os.Interrupt)

    for {
        select {
        case <-weatherticker.C:
            canvas.weather(*location)
        case <-dateticker.C:
            canvas.clock(*smartcolor)
        case <-headticker.C:
            canvas.headlines(*section, *thumb)
        case <-sigint:
            openvg.Finish()
            os.Exit(0)
        }
    }
}
```



Deck

a Go package for presentations

Start the deck

Set the canvas size

Begin a slide

Draw some text

Place an image

Make a bullet list

End the list

Draw a line

Draw a rectangle

Draw an ellipse

Draw an arc

Draw a quadratic bezier

Draw a polygon

End the slide

End of the deck

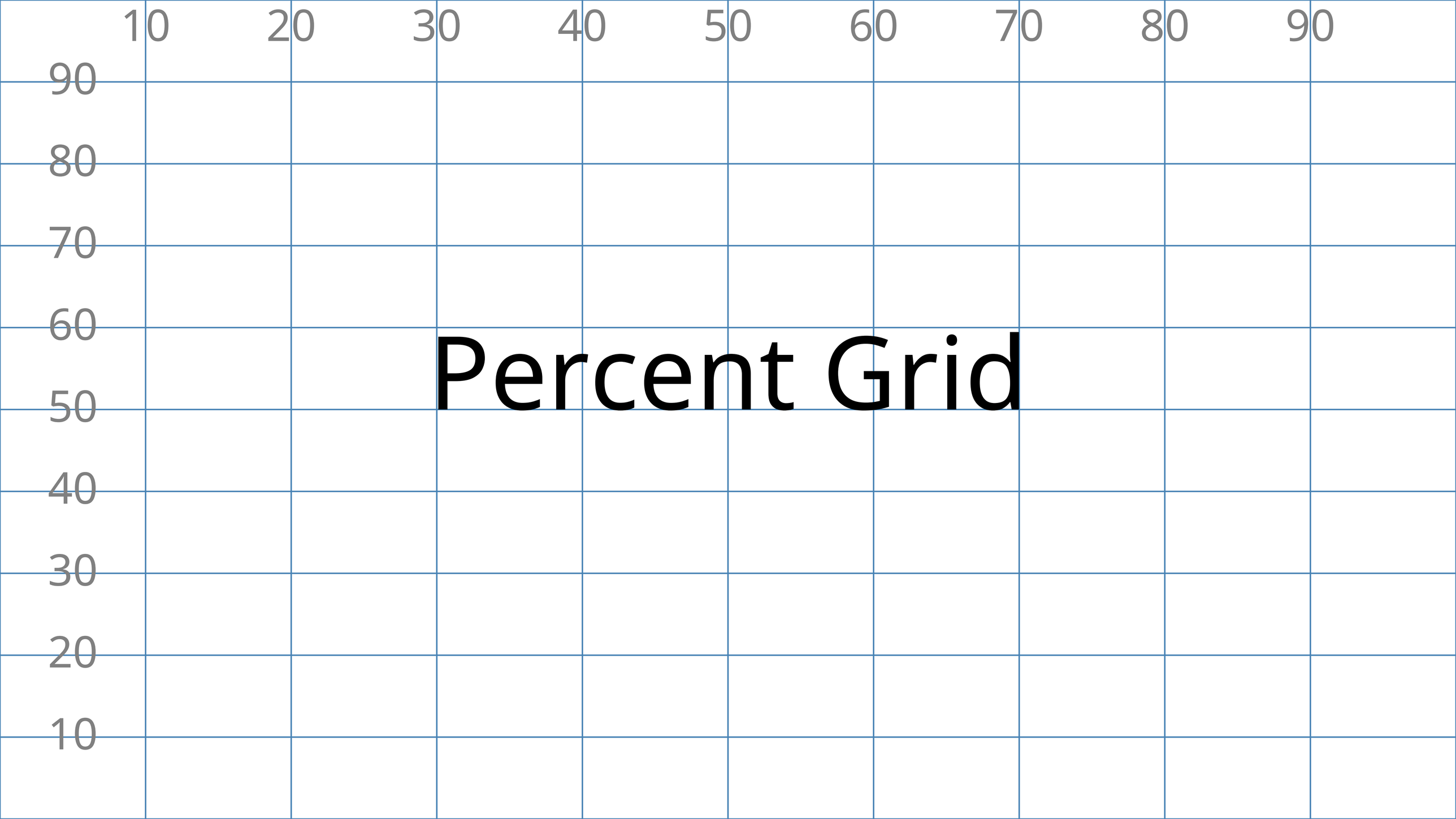
```
<deck>
    <canvas width="1200" height="900"/>
    <slide bg="white" fg="black">
    <text xp="50" yp="90" sp="5" font="" color="" opacity="" align="c">Deck elements</text>
    <image name="follow.jpg" caption="Dreams" xp="70" yp="60" width="640" height="480" scale=""/>
        <list xp="10" yp="70" sp="3" color="" opacity="" type="bullet">
        <li>text, list, image</li>
        <li>line, rect, ellipse</li>
        <li>arc, curve, polygon</li>
    </list>
    <line     xp1="20" yp1="10" xp2="30" yp2="10" sp="" color="" opacity=""/>
    <rect     xp="35" yp="10" wp="4" hp="3" color="rgb(127,0,0)" opacity=""/>
    <ellipse  xp="45" yp="10" wp="4" hp="3" color="rgb(0,127,0)" opacity=""/>
    <arc      xp="55" yp="10" wp="4" hp="3" a1="0" a2="180" color="rgb(0,0,127)" opacity=""/>
    <curve    xp1="60" yp1="10" xp2="75" yp2="20" xp3="70" yp3="10" color="" opacity=""/>
    <polygon  xc="75 75 80" yc="8 12 10" color="rgb(0,0,127)" opacity=""/>
</slide>
</deck>
```

Anatomy of a Deck

Deck elements

- text, list, image
- line, rect, ellipse
- arc, curve, polygon

Dreams


10 20 30 40 50 60 70 80 90
90 80 70 60 50 40 30 20 10
Percent Grid

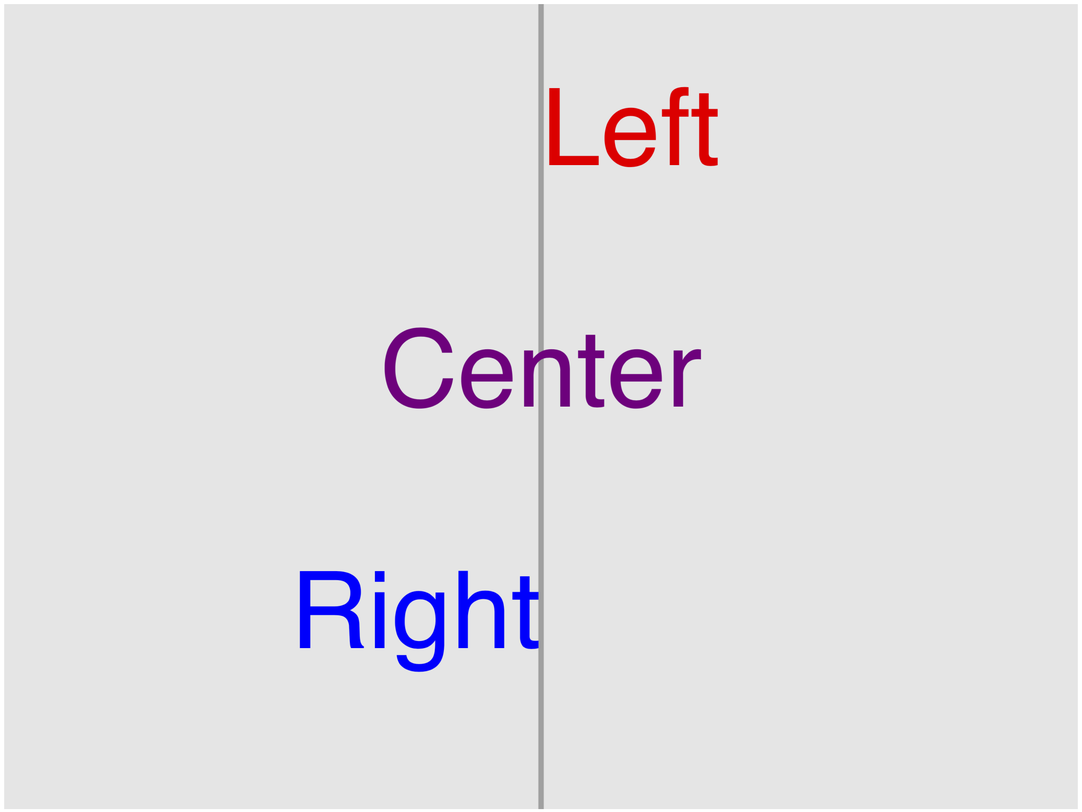
10%, 50%

50%, 50%

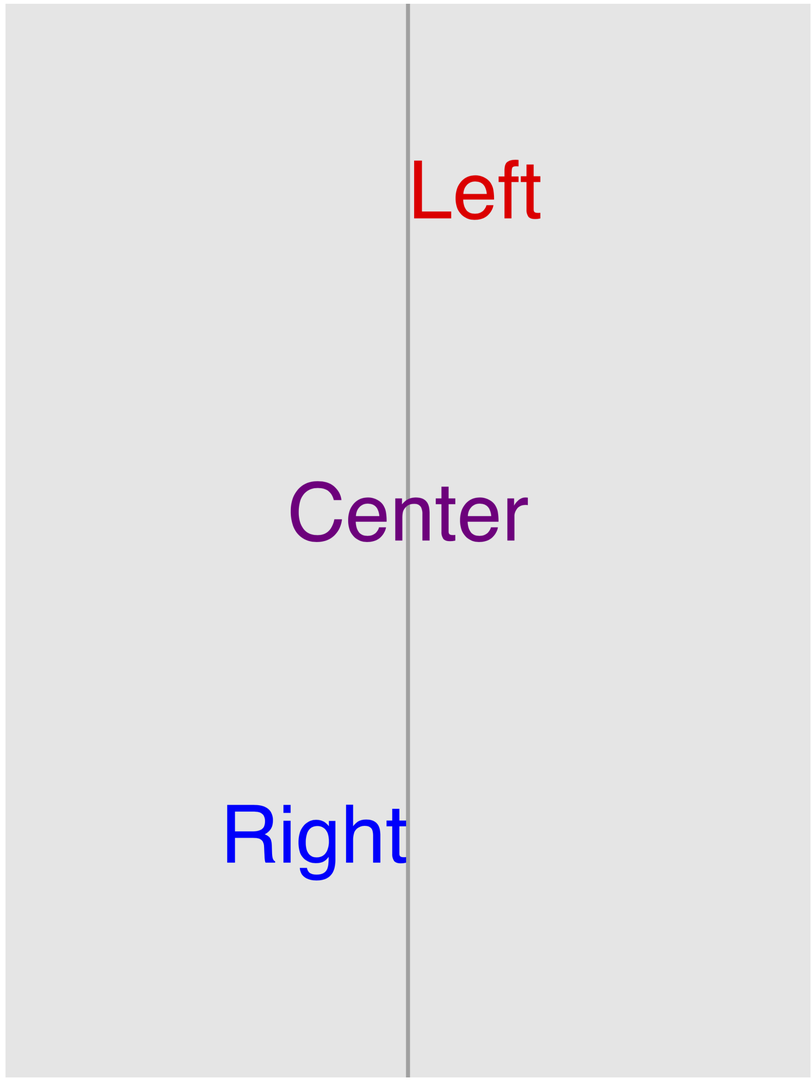
90%, 50%

Hello

Percentage-based layout

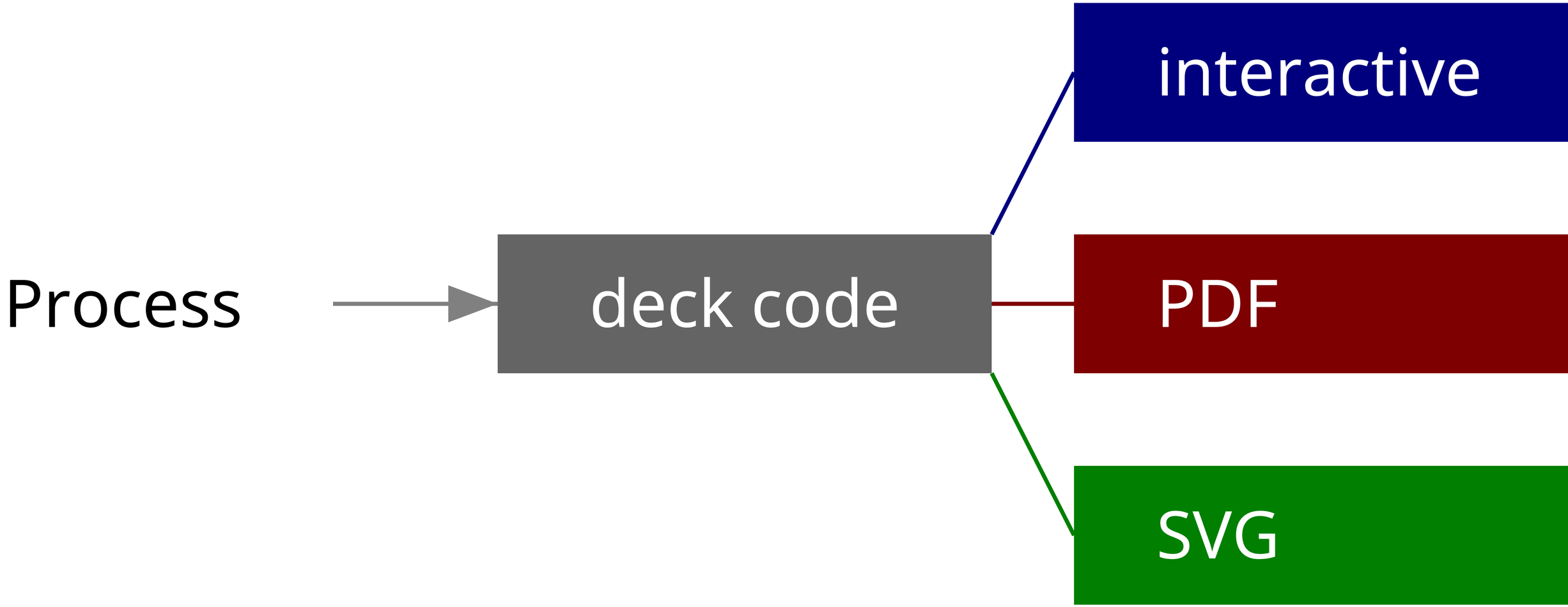


Landscape



Portrait

Scaling the canvas


Process
deck code
interactive
PDF
SVG

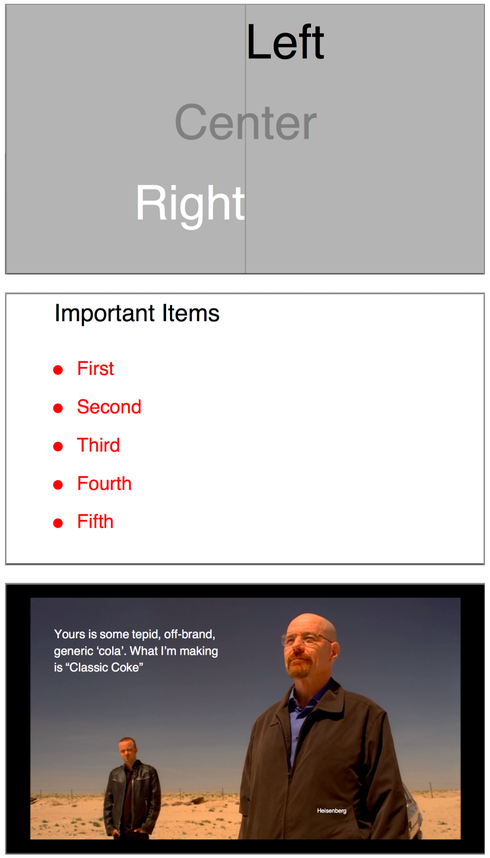
deck/generate text and list functions

Text	(x, y float64, s, font string, size float64, color string, op ...float64)
TextBlock	(x, y float64, s, font string, size, margin float64, color string, op ...float64)
TextMid	(x, y float64, s, font string, size float64, color string, op ...float64)
TextEnd	(x, y float64, s, font string, size float64, color string, op ...float64)
Code	(x, y float64, s string, size, margin float64, color string, op ...float64)
List	(x, y, size float64, items []string, ltype, font, color string)

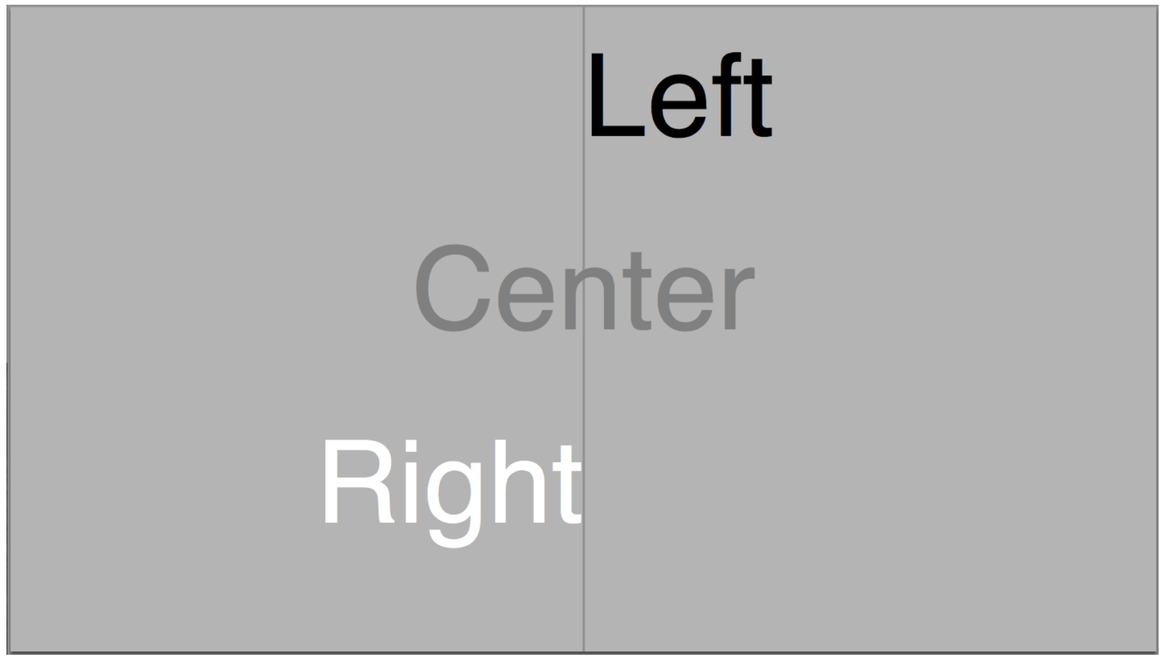
deck/generate graphic functions

Image	(x, y float64, w, h int, name string)
Arc	(x, y, w, h, size, a1, a2 float64, color string, op ...float64)
Circle	(x, y, w float64, color string, op ...float64)
Ellipse	(x, y, w, h float64, color string, op ...float64)
Square	(x, y, w float64, color string, op ...float64)
Rect	(x, y, w, h float64, color string, op ...float64)
Curve	(x1, y1, x2, y2, x3, y3, size float64, color string, op ...float64)
Line	(x1, y1, x2, y2, size float64, color string, op ...float64)
Polygon	(x, y []float64, color string, op ...float64)

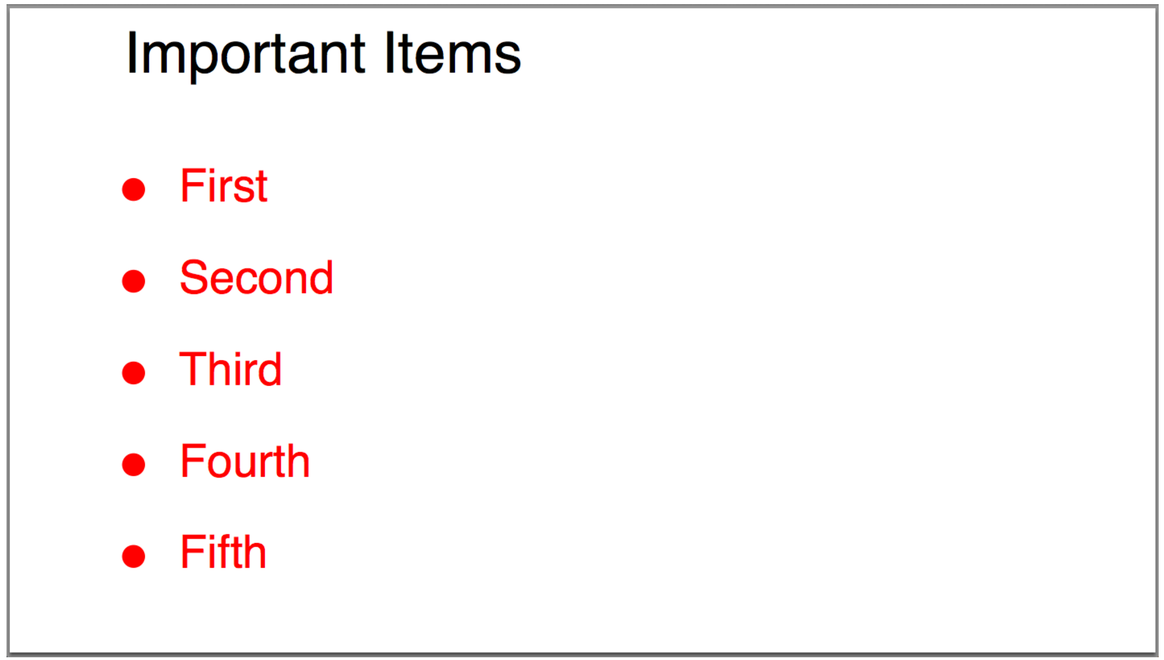
```
func main() {
    deck := generate.NewSlides(os.Stdout, 1600, 900) // 16x9 deck to stdout
    deck.StartDeck()                                 // start the deck

    deck.StartSlide("rgb(180,180,180)")
    // ...
    deck.EndSlide()

    deck.StartSlide()
    // ...
    deck.EndSlide()

    deck.StartSlide("black", "white")
    // ...
    deck.EndSlide()

    deck.EndDeck()                                   // end the deck
}
```



```
// Text alignment
deck.StartSlide("rgb(180,180,180)")
deck.Text(50, 80, "Left", "sans", 10, "black")
deck.TextMid(50, 50, "Center", "sans", 10, "gray")
deck.TextEnd(50, 20, "Right", "sans", 10, "white")
deck.Line(50, 100, 50, 0, 0.2, "black", 20)
deck.EndSlide()
```



```
// List
items := []string{"First", "Second", "Third", "Fourth", "Fifth"}
deck.StartSlide()
deck.Text(10, 90, "Important Items", "sans", 5, "")
deck.List(10, 70, 4, items, "bullet", "sans", "red")
deck.EndSlide()
```



```
// Picture with text annotation
quote := "Yours is some tepid, off-brand, generic ‘cola’. " +
         "What I’m making is “Classic Coke”"
person := "Heisenberg"
deck.StartSlide("black", "white")
deck.Image(50, 50, 1440, 900, "classic-coke.png")
deck.TextBlock(10, 80, quote, "sans", 2.5, 30, "")
deck.Text(65, 15, person, "sans", 1.2, "")
deck.EndSlide()
```

A View of User Experience:
Designing for People

Anthony Starks / ajstarks@gmail.com / @ajstarks

Design

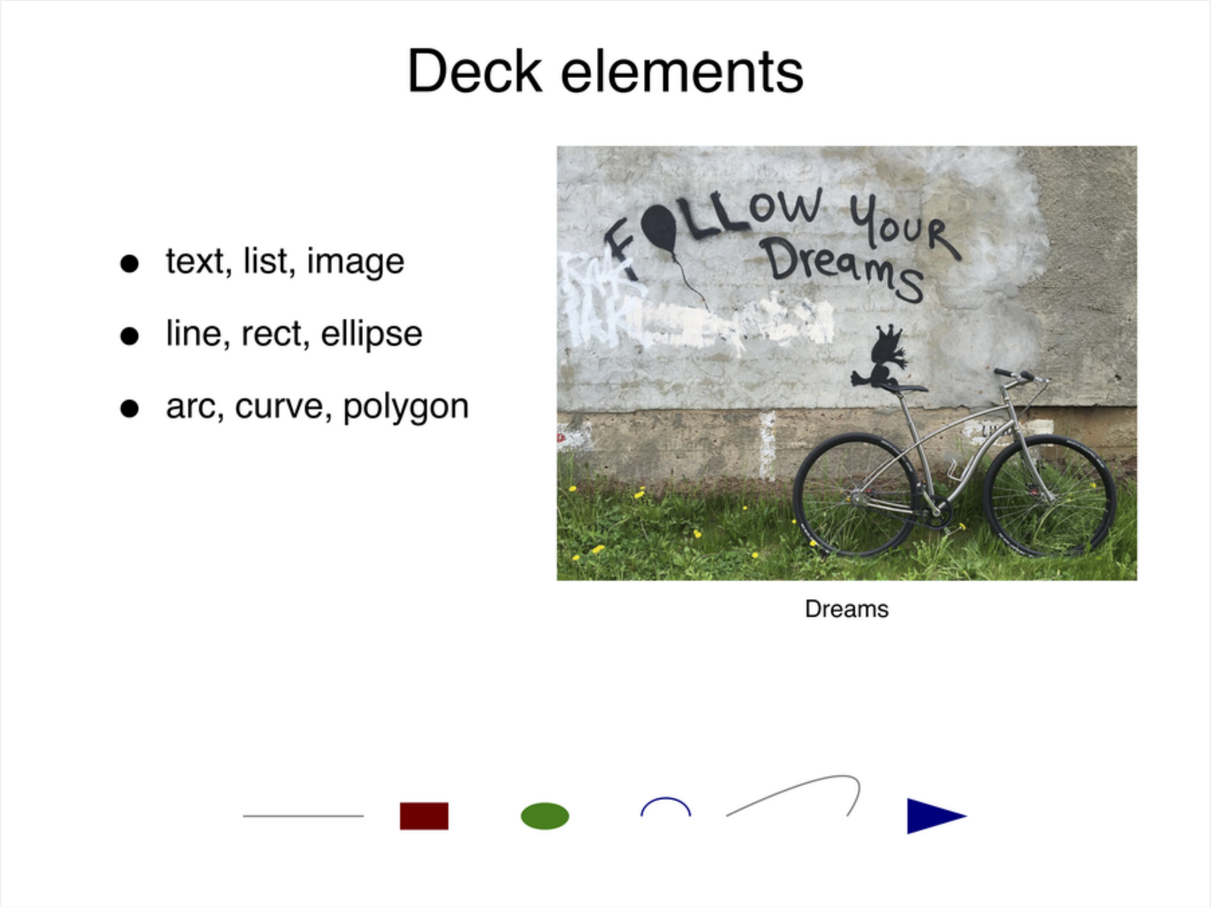
What works good is better than what looks good, because what works good lasts.

Ray Eames

```
# Designing for People
title    A View of User Experience: Designing for People    Anthony Starks / ajstarks@gmail.com / @ajstarks
section    Design    gray    white
caption    eames.png    Ray Eames    What works good is better than what looks good, because what works good last
```

```
capgen slides.txt | pdfdeck ... > slides.pdf
```

```
#!/bin/sh
. $HOME/Library/deckfuncs.sh

deck begin
    canvas 1200 900
    slide begin white black
        ctext "Deck elements" 50 90 5
        cimage follow.jpg "Dreams" 70 60 640 480

        blist 10 70 3
            li text, list, image
            li line, rect, ellipse
            li arc, curve, polygon
        elist

        line    20 10 30 10
        rect    35 10 4 3        "rgb(127,0,0)"
        ellipse 45 10 4 3        "rgb(0,127,0)"
        arc     55 10 4 3 0 180  "rgb(0,0,127)"
        curve   60 10 75 20 70 10
        polygon "75 75 80" "8 12 10" "rgb(0,0,127)"
    slide end
deck end
```



Deck Web API

```
sex -dir [start dir] -listen [address:port] -maxupload [bytes]
```

GET	/	List the API
GET	/deck/	List the content on the server
GET	/deck/?filter=[type]	List content filtered by deck, image, video
POST	/deck/content.xml?cmd=1s	Play a deck with the specified duration
POST	/deck/content.xml?cmd=stop	Stop playing a deck
POST	/deck/content.xml?slide=[num]	Play deck starting at a slide number
DELETE	/deck/content.xml	Remove content
POST	/upload/ Deck:content.xml	Upload content
POST	/table/ Deck:content.txt	Generate a table from a tab-separated list
POST	/table/?textsize=[size]	Specify the text size of the table
POST	/media/ Media:content.mov	Play the specified video


René Magritte
The False Mirror
LG

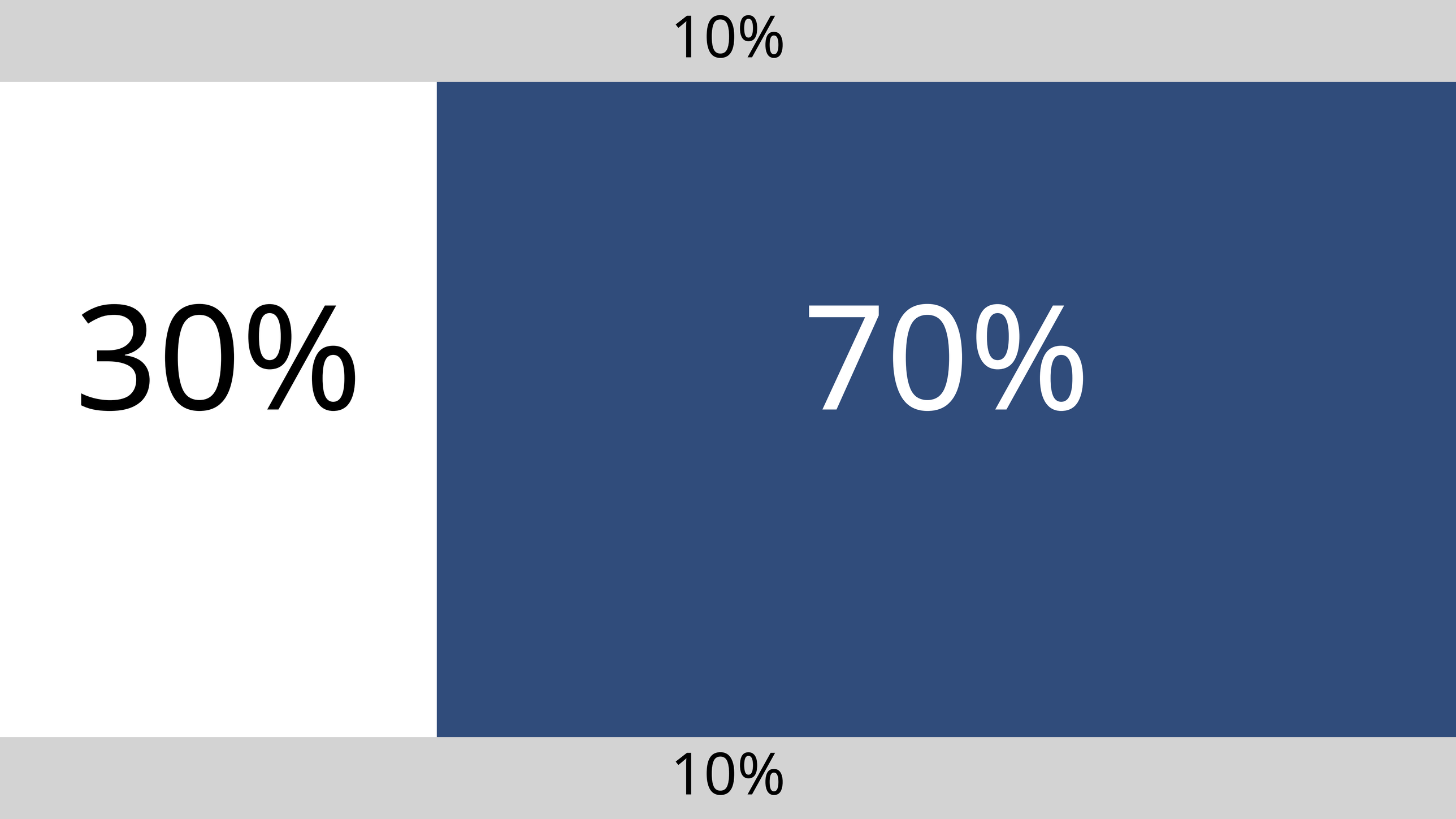
Design Examples

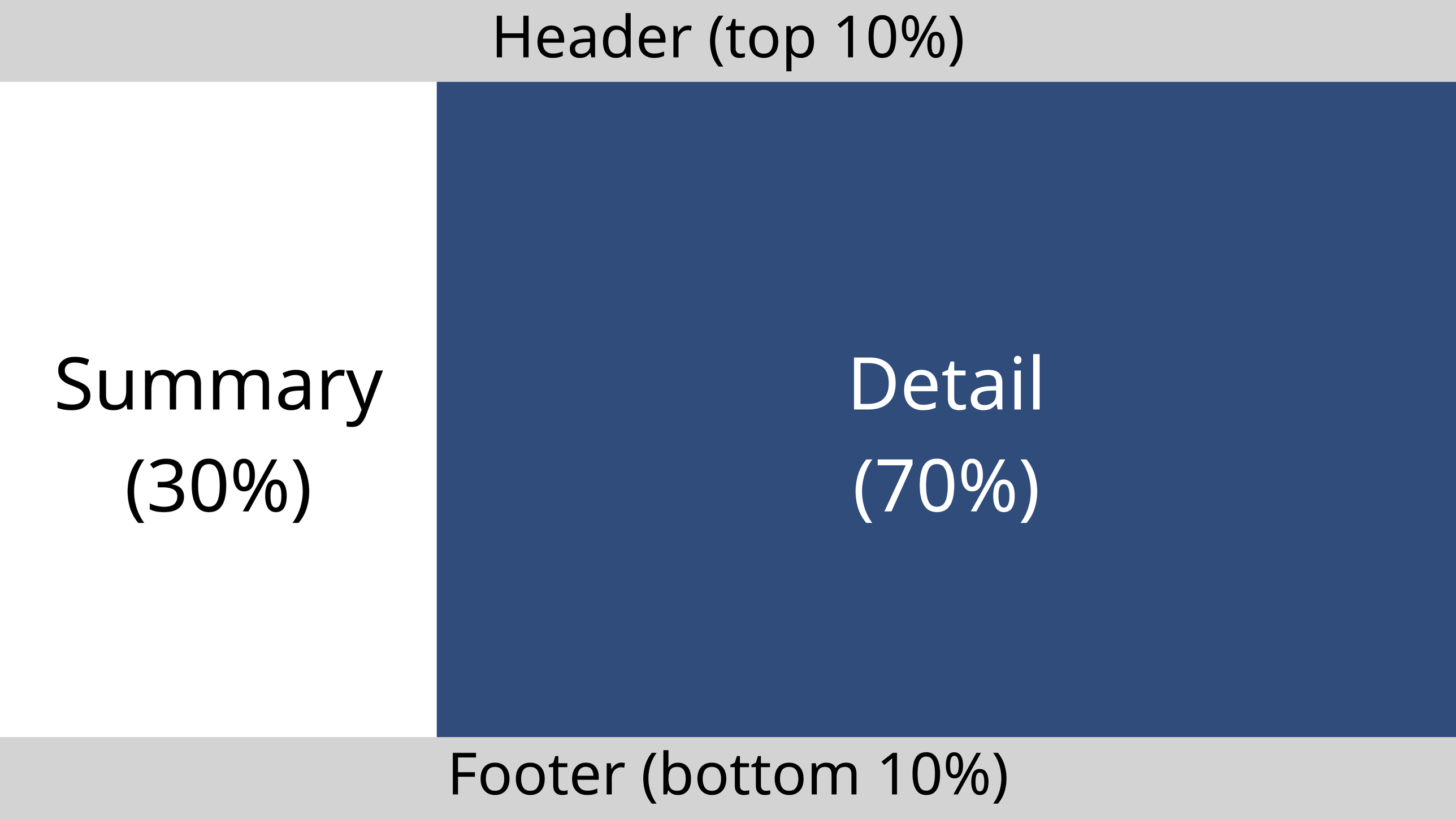
Top

Left

Right

Bottom


10%
30%
70%
10%


Header (top 10%)
Summary
(30%)
Detail
(70%)
Footer (bottom 10%)

My Story

Section

One

Two

Three

Four

Five

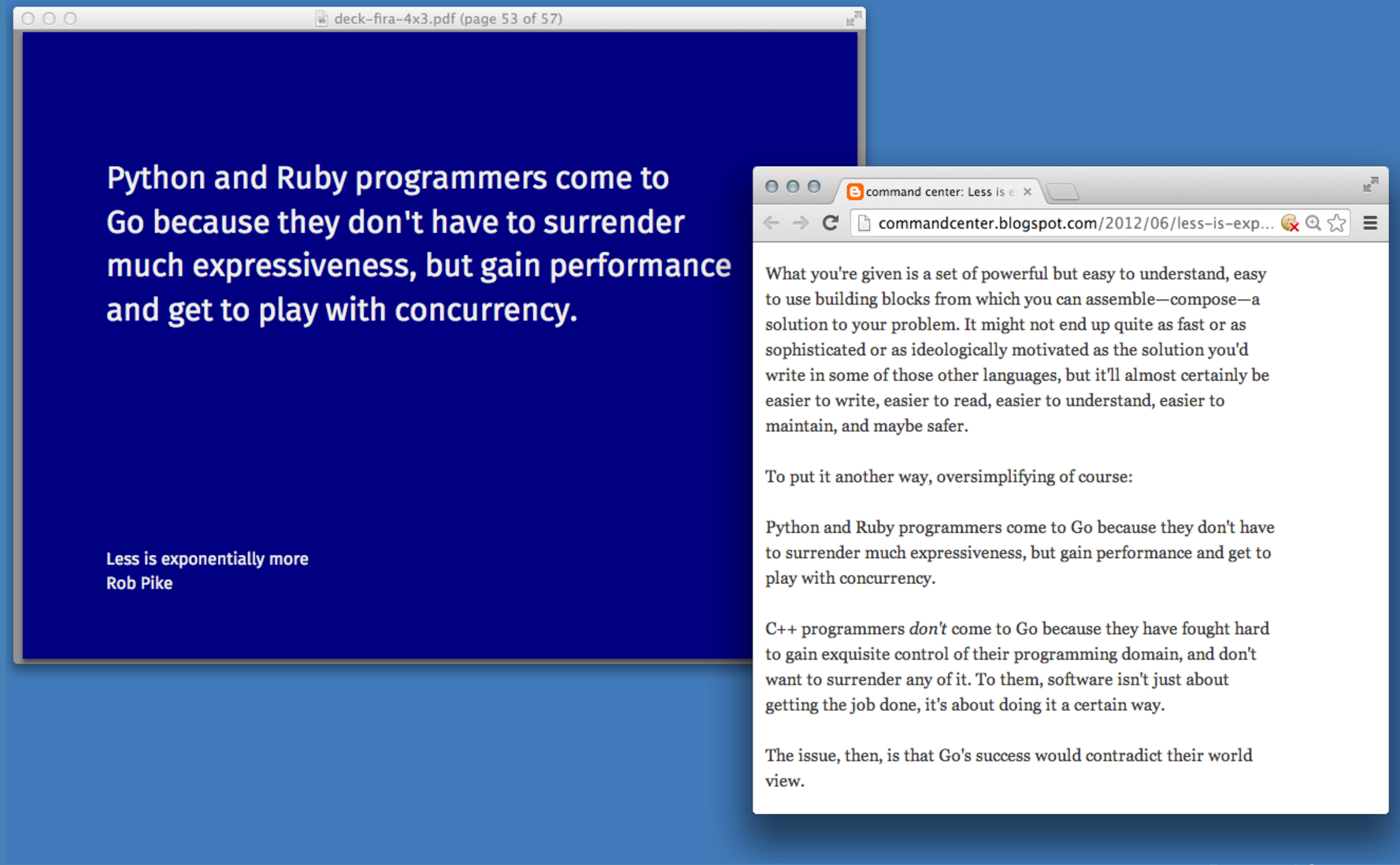
Six

A. Person, April 2017

Document Links

Add web and mailto links with the link attribute of the text element.

Once rendered as a PDF, clicking on the link opens the default browser or email client.



BOS

SFO

Virgin America 351

Gate B38

8:35am

On Time

JFK

IND

US Airways 1207

Gate C31C

5:35pm

Delayed

Flight Information

Los Angeles (LAX) New York/Newark (EWR)

Distance Traveled
1,958 mi
3,151 km

Distance to Destination
596 mi
798 km

Time to Destination 1:20
Estimated time of arrival 12:14 am
Local time of arrival 12:14 am

Ground speed
547 mph
382 kph

Headwind
50 mph
80 kph

Outside Temperature
-30° F
-34.4 C

Current Altitude
25,000 ft
7620 m

AAPL	179.98	3.04	(1.72%)
AMZN	1578.89	27.03	(1.74%)
FB	185.23	2.89	(1.58%)
GOOGL	1160.84	31.46	(2.79%)
MSFT	96.54	2.11	(2.23%)

2018-03-10 13:08:31

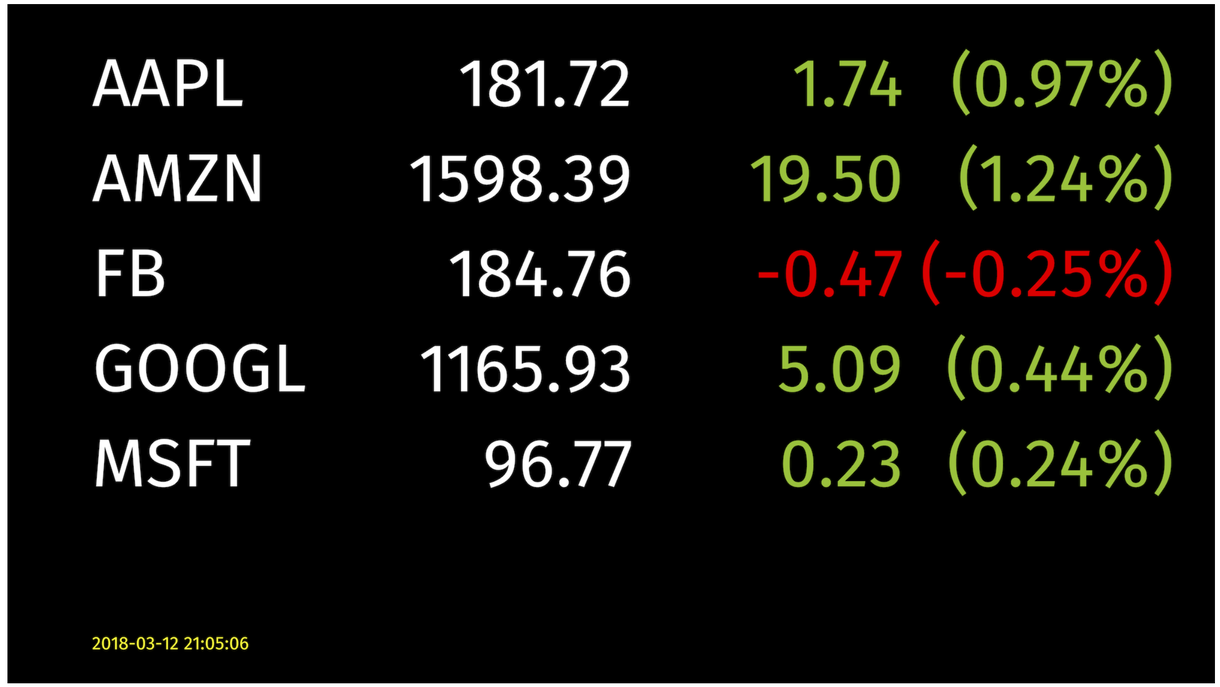
AAPL	181.72	1.74	(0.97%)
AMZN	1598.39	19.50	(1.24%)
FB	184.76	-0.47	(-0.25%)
GOOGL	1165.93	5.09	(0.44%)
MSFT	96.77	0.23	(0.24%)

2018-03-12 21:05:06

AAPL	175.30	-2.72 (-1.53%)
AMZN	1544.93	-26.75 (-1.70%)
FB	172.56	-12.53 (-6.77%)
GOOGL	1100.07	-34.35 (-3.03%)
MSFT	92.89	-1.71 (-1.81%)

2018-03-20 17:42:56

```
func stockslide(deck *generate.Deck, symbols []string) {
    x := left
    y := top

    rintr := (top-bottom)/float64(len(symbols))
    size := rintr/2.5
    cintr := size*4

    var color string
    for _, s := range symbols {
        stock, err := stockapi(s)
        if err != nil || stock.Symbol == "" {
            continue
        }
        if stock.Change < 0 {
            color = negcolor
        } else {
            color = poscolor
        }
        deck.Text(x, y, stock.Symbol, "sans", size, "")
        x += cintr * 2
        deck.TextEnd(x, y, fmt.Sprintf("%.2f", stock.Price), "sans", size, "")
        x += cintr
        deck.TextEnd(x, y, fmt.Sprintf("%.2f", stock.Change), "sans", size, color)
        x += cintr
        deck.TextEnd(x, y, fmt.Sprintf("(%.2f%%)", stock.PctChange), "sans", size, color)
        x = left
        y -= rintr
    }
    deck.Text(footx, footy, time.Now().Format("2006-01-02 15:04:05"), "sans", 1.5, "yellow")
}
```



So, the next time you're about to make a subclass, think hard and ask yourself

what would Go do

Andrew Mackenzie-Ross

go

build	compile packages and dependencies
clean	remove object files
doc	show documentation for package or symbol
env	print Go environment information
fix	run go tool fix on packages
fmt	run gofmt on package sources
generate	generate Go files by processing source
get	download and install packages and dependencies
install	compile and install packages and dependencies
list	list packages
run	compile and run Go program
test	test packages
tool	run specified go tool
version	print Go version
vet	run go tool vet on packages

Go Proverbs


Don’t communicate by sharing memory, share memory by communicating.


Concurrency is not parallelism.


Channels orchestrate; mutexes serialize.


The bigger the interface, the weaker the abstraction.


Make the zero value useful.


interface{} says nothing.


Gofmt’s style is no one’s favorite, yet gofmt is everyone’s favorite.


A little copying is better than a little dependency.


Syscall must always be guarded with build tags.


Cgo must always be guarded with build tags.


Cgo is not Go.

With the unsafe package there are no guarantees.


Clear is better than clever.


Reflection is never clear.


Errors are values.


Don’t just check errors, handle them gracefully.


Design the architecture, name the components, document the details.


Documentation is for users.


Don’t panic.

Don’t communicate
by sharing memory,
share memory by
communicating.

The bigger the interface,
the weaker the abstraction.

Make the zero value useful.

Chapter V

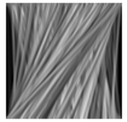
Advice from a Caterpillar

THE Caterpillar and Alice looked at each other for some time in silence: at last the Caterpillar took the hookah out of its mouth, and addressed her in a languid, sleepy voice. “Who are you?” said the Caterpillar. This was not an encouraging opening for a conversation. Alice replied, rather shyly, “I—I hardly know, sir, just at present—at least I know who I was when I got up this morning, but I think I must have been changed several times times since then.”

SVGo Examples

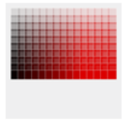
hello.go

colorhash.go


rl.go

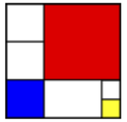

concentric.go

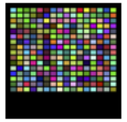

concentric2.go

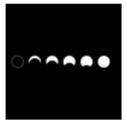

cgrid.go


diag.go


shining.go


mondrian.go


richter.go


eclipse.go


pacman.go


pyramid.go


cloud.go


color-clouds.go


creepy.go


d4h.go


sunearth.go

conception.go


conception2.go


randbox.go


randspot.go

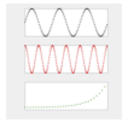

cube.go


schotter.go


randarc.go


recurse.go

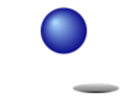

clock.go


plotfunc.go


therm.go

pattern.go

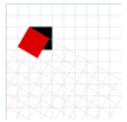

marker.go


gradient.go

fontrange.go


uni.go


lorem.go


rotate.go


rotext.go


skewabc.go


gear.go


star.go

starx.go

swoosh.go

textpath.go

imfade.go

fe.go

artist.go

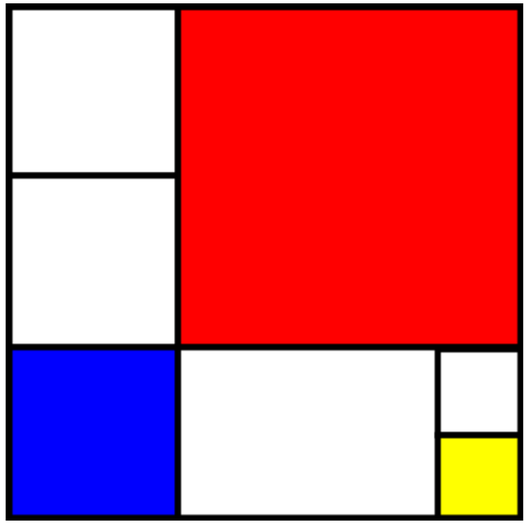
go.go

codepicdeck

```
package main

import (
    "fmt"
    "github.com/ajstarks/svgo"
    "os"
)

func main() {
    xp := []int{50, 70, 70, 50, 30, 30}
    yp := []int{40, 50, 75, 85, 75, 50}
    xl := []int{0, 0, 50, 100, 100}
    yl := []int{100, 40, 10, 40, 100}
    bgcolor := "rgb(227,78,25)"
    bkcolor := "rgb(153,29,40)"
    stcolor := "rgb(65,52,44)"
    stwidth := 12
    stylefmt := "stroke:%s;stroke-width:%d;fill:%s"
    canvas := svg.New(os.Stdout)
    width, height := 500, 500
    canvas.Start(width, height)
    canvas.Def()
    canvas.Gid("unit")
    canvas.Polyline(xl, yl, "fill:none")
    canvas.Polygon(xp, yp)
    canvas.Gend()
    canvas.Gid("runit")
    canvas.TranslateRotate(150, 180, 180)
    canvas.Use(0, 0, "#unit")
    canvas.Gend()
    canvas.Gend()
    canvas.DefEnd()
    canvas.Rect(0, 0, width, height, "fill:"+bgcolor)
    canvas.Gstyle(fmt.Sprintf(stylefmt, stcolor, stwidth, bkcolor))
    for y := 0; y < height; y += 130 {
        for x := -50; x < width; x += 100 {
            canvas.Use(x, y, "#unit")
            canvas.Use(x, y, "#runit")
        }
    }
    canvas.Gend()
    canvas.End()
}
```

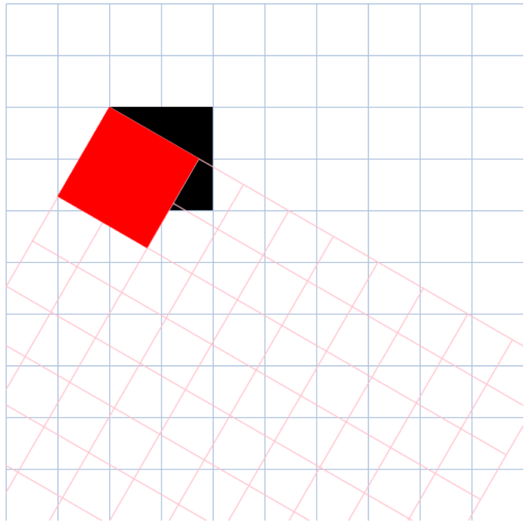
shining.go [8]

```
package main

import (
    "os"

    "github.com/ajstarks/svgo"
)

var (
    canvas = svg.New(os.Stdout)
    width  = 500
    height = 500
)

// Piet Mondrian - Composition in Red, Blue, and Yellow
func main() {
    w3 := width / 3
    w6 := w3 / 2
    w23 := w3 * 2
    canvas.Start(width, height)
    canvas.Gstyle("stroke:black;stroke-width:6")
    canvas.Rect(0, 0, w3, w3, "fill:white")
    canvas.Rect(0, w3, w3, w3, "fill:white")
    canvas.Rect(0, w23, w3, w3, "fill:blue")
    canvas.Rect(w3, 0, w23, w23, "fill:red")
    canvas.Rect(w3, w23, w23, w3, "fill:white")
    canvas.Rect(width-w6, height-w3, w3-w6, w6, "fill:white")
    canvas.Rect(width-w6, height-w6, w3-w6, w6, "fill:yellow")
    canvas.Gend()
    canvas.Rect(0, 0, width, height, "fill:none;stroke:black;stroke-width:12")
    canvas.End()
}
```



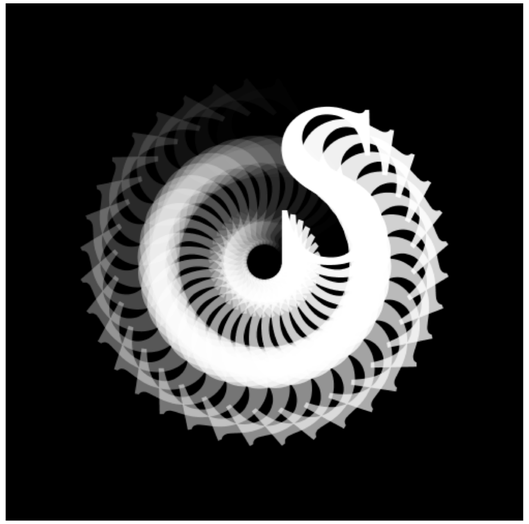
mondrian.go [9]

```
package main

import (
    "os"

    "github.com/ajstarks/svgo"
)

var (
    canvas = svg.New(os.Stdout)
    width  = 500
    height = 500
)

func tro() {
    canvas.Rect(100, 100, 100, 100)
    canvas.TranslateRotate(100, 100, 30)
    canvas.Grid(0, 0, width, height, 50, "stroke:pink")
    canvas.Rect(0, 0, 100, 100, "fill:red")
    canvas.Gend()
}

func main() {
    canvas.Start(width, height)
    canvas.Grid(0, 0, width, height, 50, "stroke:lightsteelblue")
    tro()
    canvas.End()
}
```



rotate.go [36]

```
package main

import (
    "os"

    "github.com/ajstarks/svgo"
)

var (
    canvas = svg.New(os.Stdout)
    width  = 500
    height = 500
)

func main() {
    a := 1.0
    ai := 0.03
    ti := 10.0

    canvas.Start(width, height)
    canvas.Rect(0, 0, width, height)
    canvas.Gstyle("font-family:serif;font-size:244pt")
    for t := 0.0; t <= 360.0; t += ti {
        canvas.TranslateRotate(width/2, height/2, t)
        canvas.Text(0, 0, "s", canvas.RGBA(255, 255, 255, a))
        canvas.Gend()
        a -= ai
    }
    canvas.Gend()
    canvas.End()
}
```



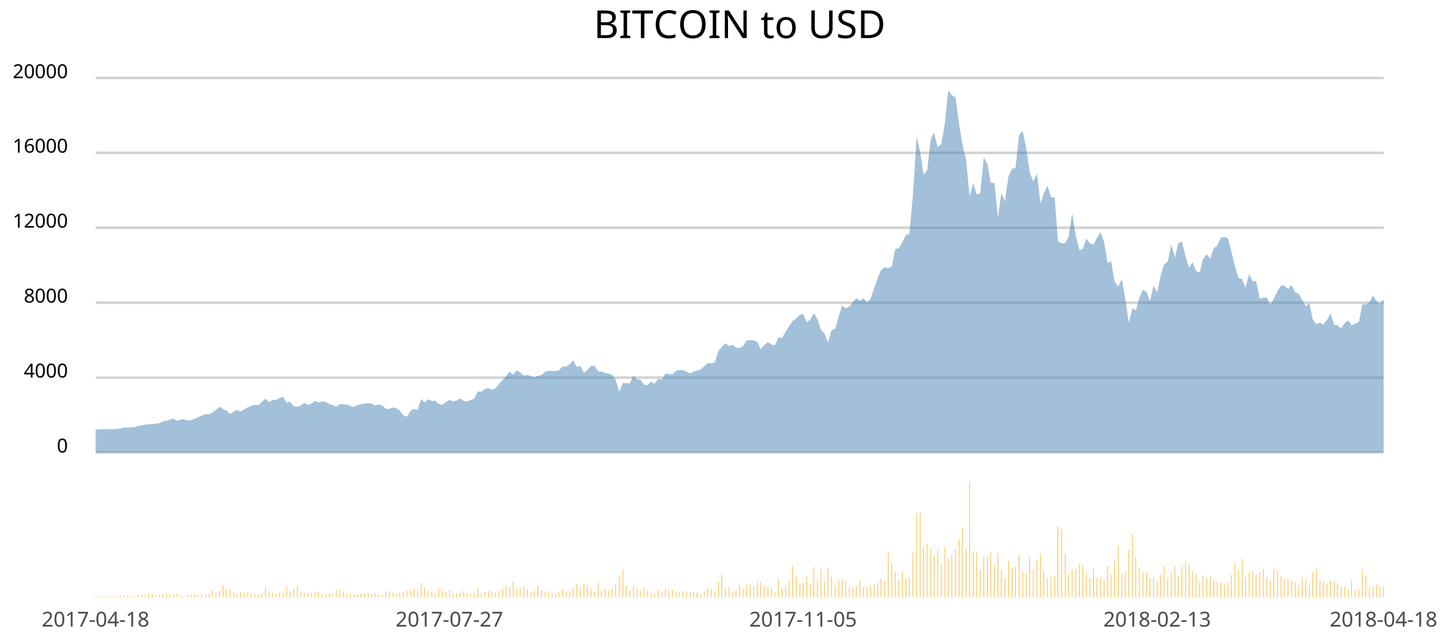
rotext.go [37]

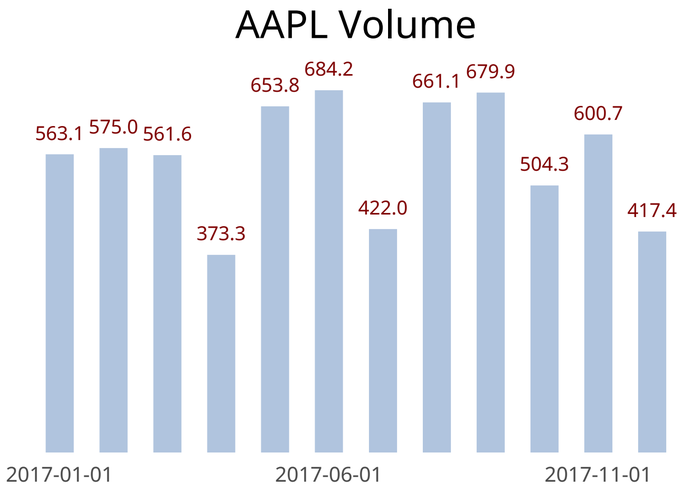
The new masters of our universe are people who are essentially only half-educated.

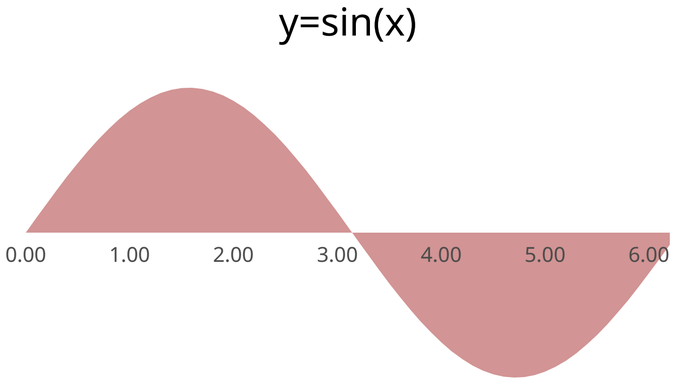
They have had no exposure to the humanities or the social sciences, the academic disciplines that aim to provide some understanding of how society works, of history and of the roles that beliefs, philosophies, laws, norms, religion and customs play in the evolution of human culture

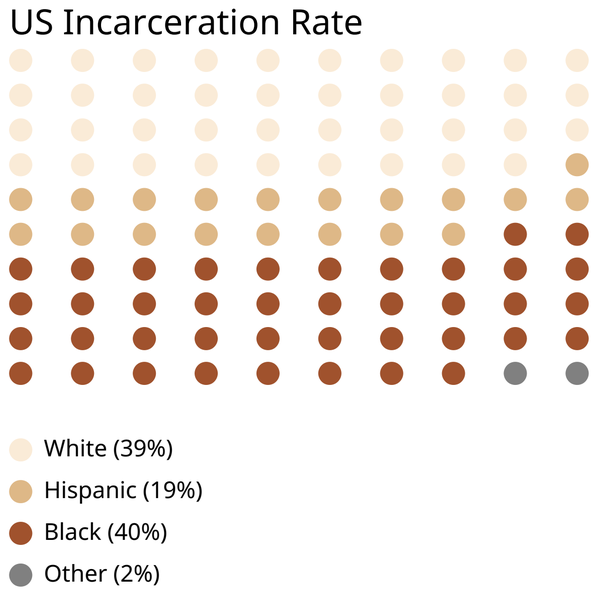
John Naughton, The Guardian, 19 November, 2017

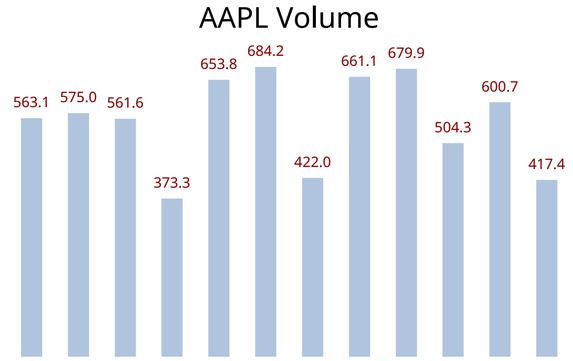
dchart: charts for deck



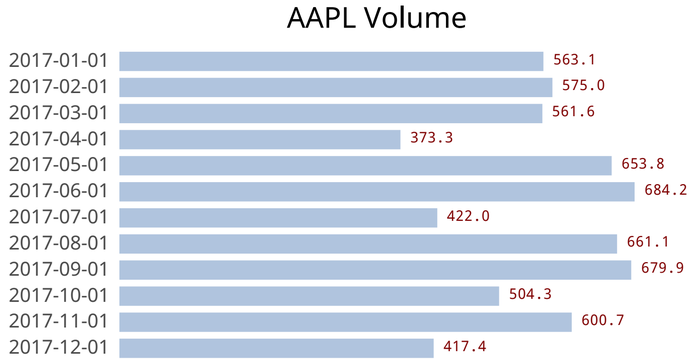






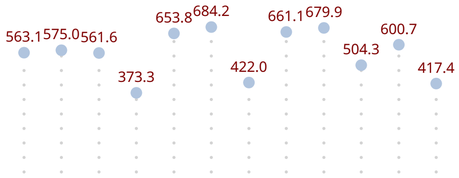


bar



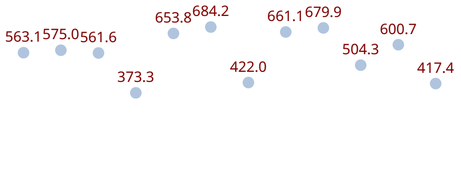
hbar

wbar

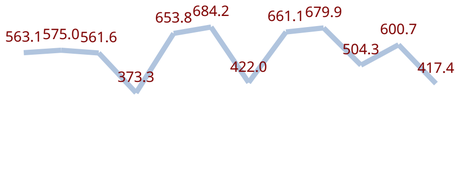


dot

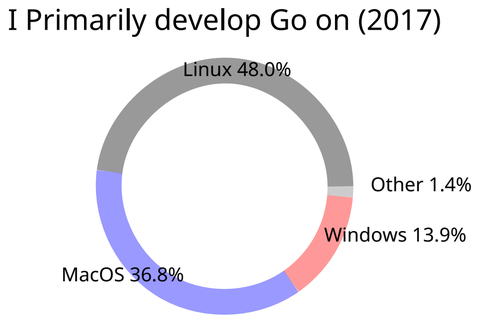
vol



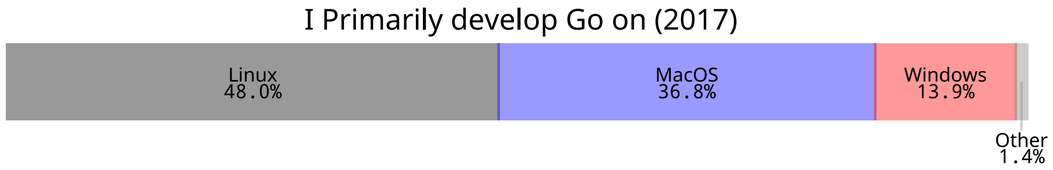
scatter



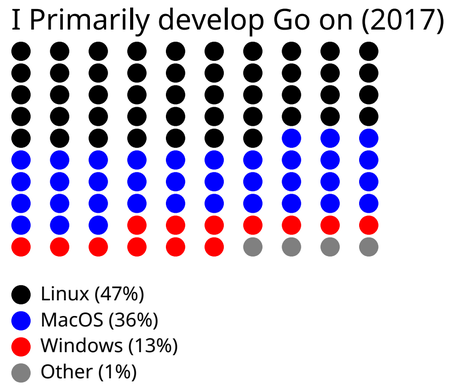
line



donut



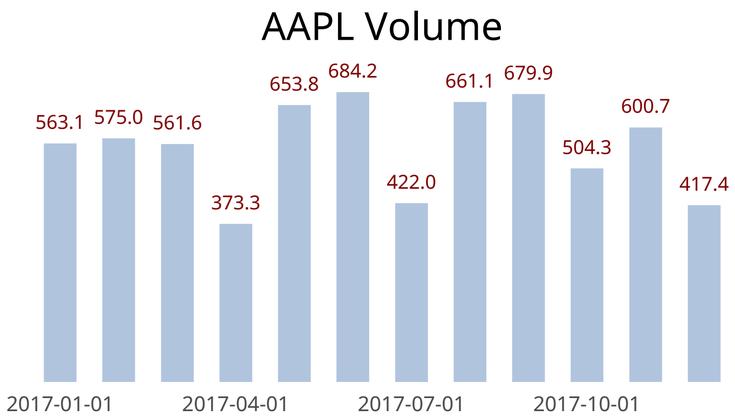
pmap



pgrid

```
# AAPL Volume
2017-01-01    563.122
2017-02-01    574.969
2017-03-01    561.628
2017-04-01    373.304
2017-05-01    653.755
2017-06-01    684.178
2017-07-01    421.992
2017-08-01    661.069
2017-09-01    679.879
2017-10-01    504.291
2017-11-01    600.663
2017-12-01    417.354
```

```
<deck>
    <slide>
        <text ...>AAPL Volume</text>
        <line ... color="lightsteelblue"/>
        <text ... color="rgb(127,0,0)">563.1</text>
        <text ... color="rgb(75,75,75)">2017-01-01</text>
    </slide>
</deck>
```



data | dchart | pdf

Chart Types

`-bar`	bar chart (default true)
`-wbar`	word bar chart (default false)
`-hbar`	horizontal bar chart (default false)
`-scatter`	scatter chart (default false)
`-dot`	dot plot (default false)
`-line`	line chart (default false)
`-vol`	volume plot (default false)
`-pgrid`	proportional grid (default false)
`-pmap`	proportional map (default false)
`-donut`	donut chart (default false)

Chart Elements

`-grid`	show gridlines on the y axis (default false)
`-val`	show values (default true)
`-valpos`	value position (t=top, b=bottom, m=middle) (default "t")
`-yaxis`	show a y axis (default true)
`-yrange`	specify the y axis labels (min,max,step)
`-fulldeck`	generate full deck markup (default true)
`-title`	show the title (default true)
`-chartitle`	specify the title (overiding title in the data)
`-xlabel`	x axis label interval (default 1, 0 to supress all labels)
`-xlast`	show the last x label
`-hline`	horizontal line at value with label

Position and Scaling

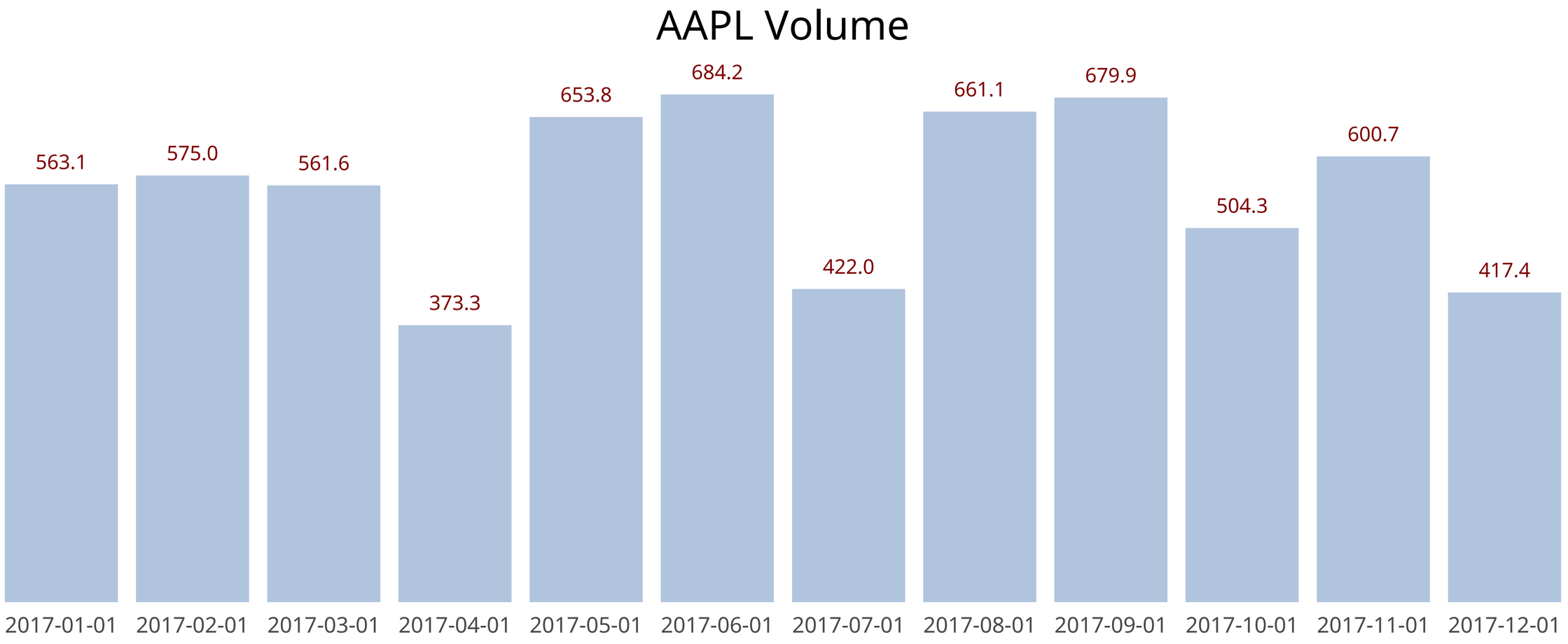
`-top`	top of the plot (default 80)
`-bottom`	bottom of the plot (default 30)
`-left`	left margin (default 20)
`-right`	right margin (default 80)
`-min`	set the minimum value
`-max`	set the maximum value
`-dmin`	data minimum (default false, min=0)

CSV

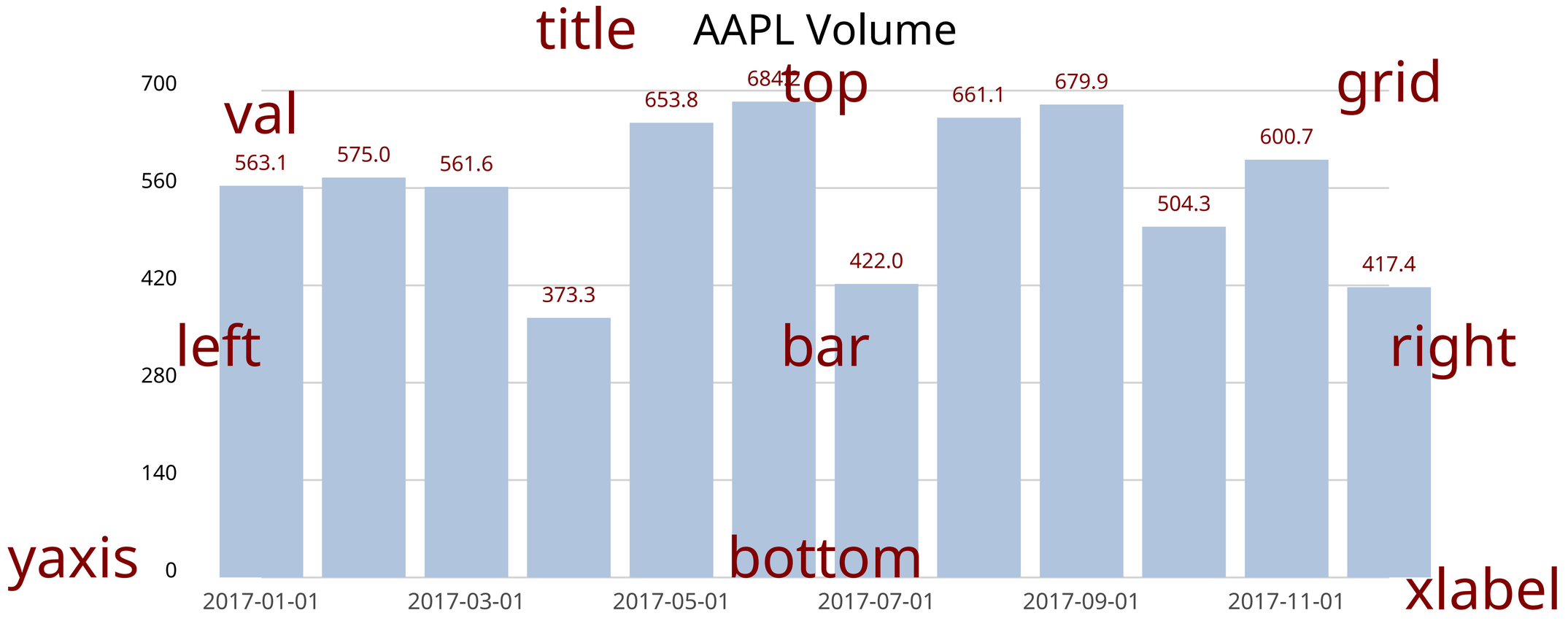
`-csv`	read CSV files (default false)
`-csvcol`	specify the columns to use for label,value

Measures and Attributes

`-barwidth`	barwidth (default computed from data size)
`-ls`	linespacing (default 2.4)
`-textsize`	text size (default 1.5)
`-color`	data color (default "lightsteelblue")
`-vcolor`	value color (default "rgb(127,0,0)")
`-datafmt`	data format for values (default "%.1f")
`-psize`	diameter of the donut (default 30)
`-pwidth`	width of the donut or proportional map (default 3)



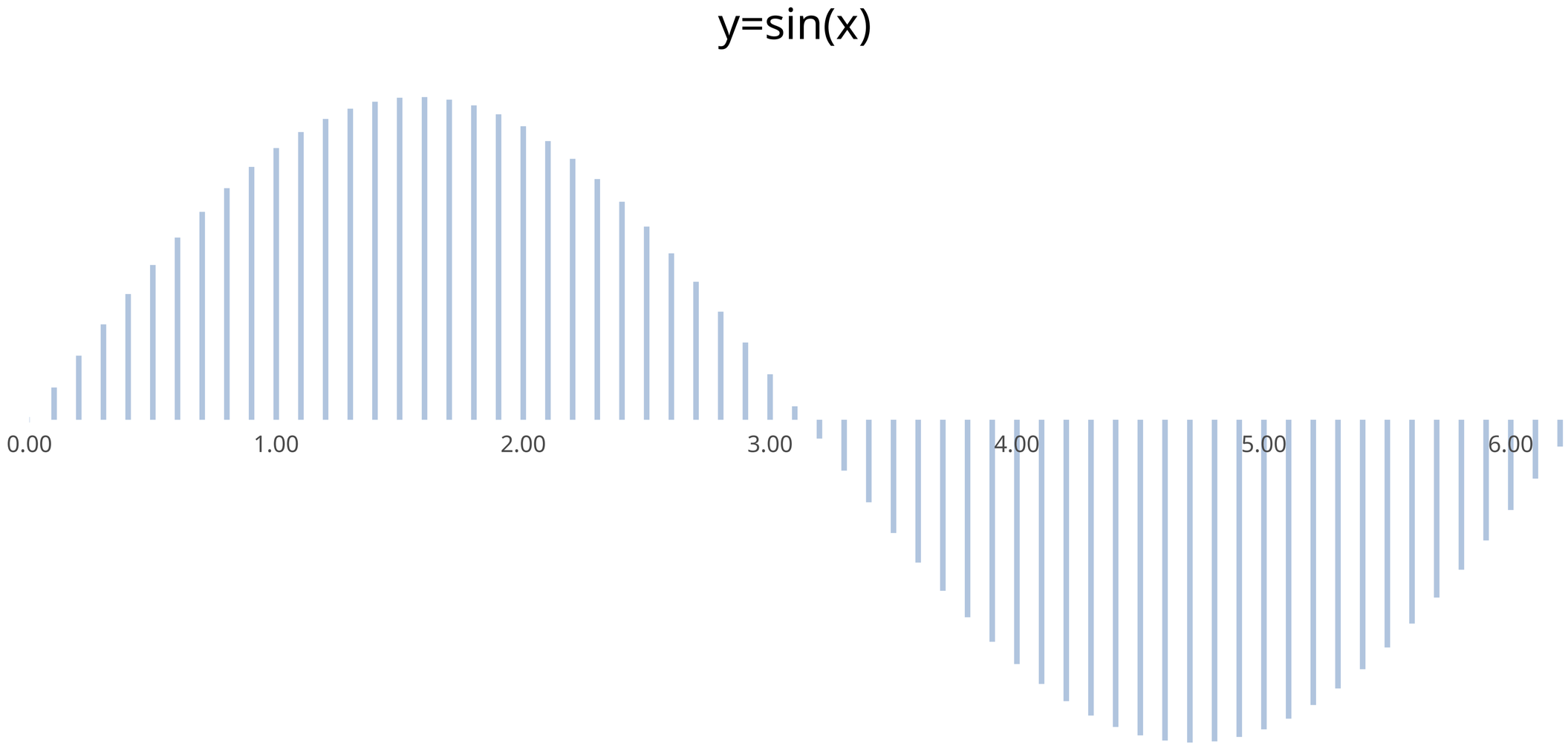

```
dchart AAPL.d
```



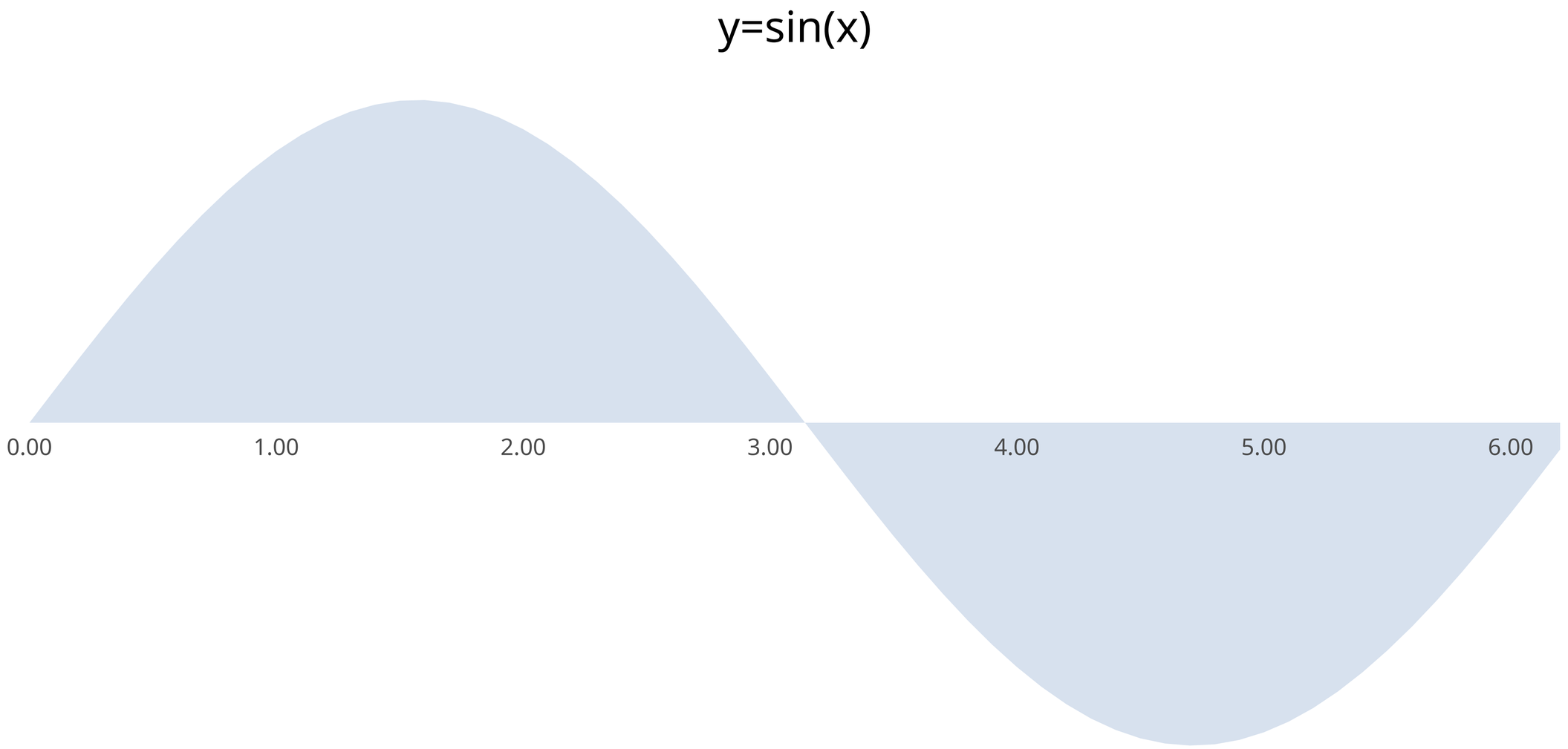

```
dchart -left=20 -right=80 -top=75 -yaxis -xlabel=2 -grid AAPL.d
```

```go
package main

import (
    "fmt"
    "math"
)

func main() {
    fmt.Println("# y=sin(x)")
    for x := 0.0; x < math.Pi*2; x += 0.1 {
        fmt.Printf("%.2f\t%.4f\n", x, math.Sin(x))
    }
}
```

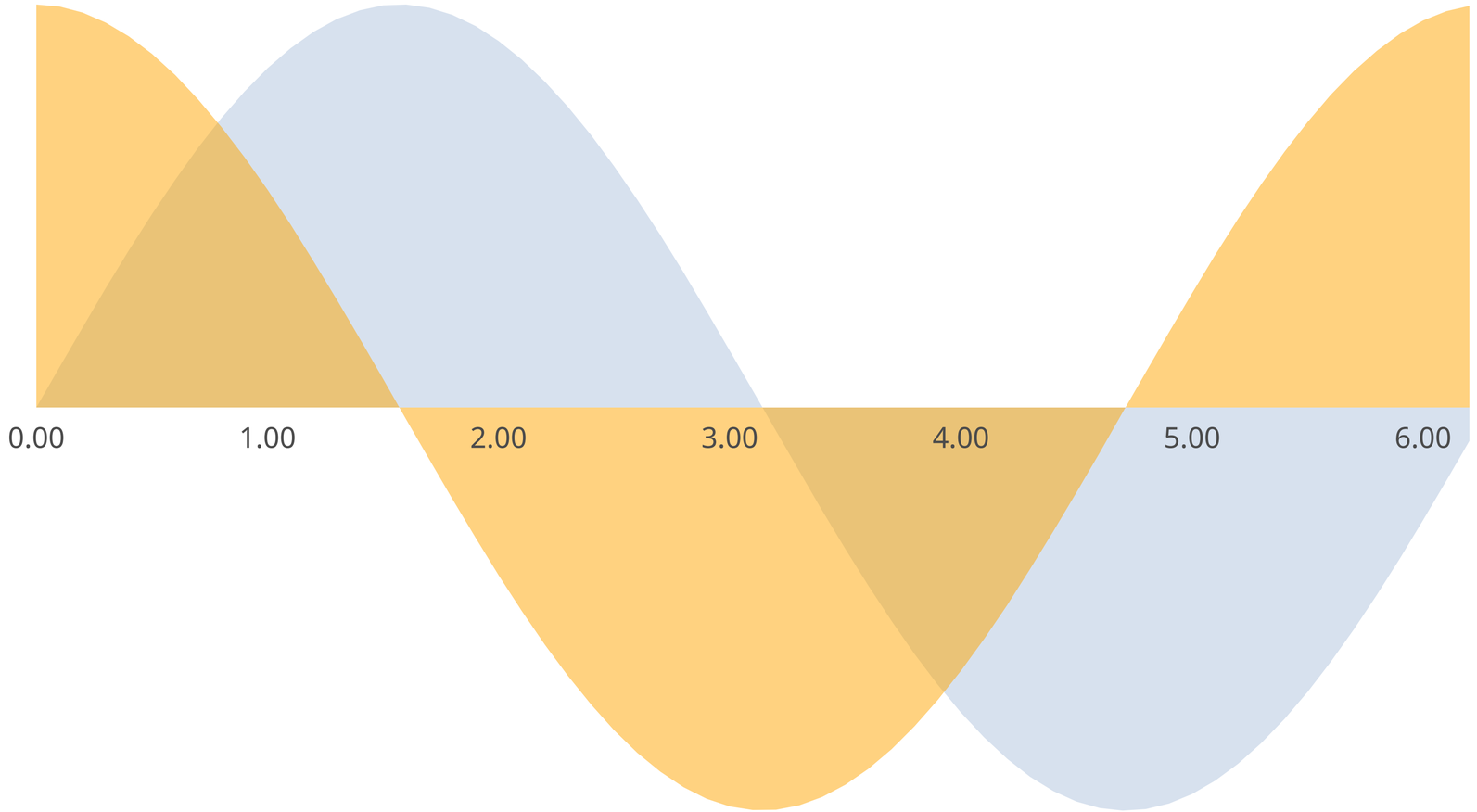
```
# y=sin(x)
0.00    0.0000
0.10    0.0998
0.20    0.1987
0.30    0.2955
0.40    0.3894
0.50    0.4794
0.60    0.5646
0.70    0.6442
0.80    0.7174
...
5.80    -0.4646
5.90    -0.3739
6.00    -0.2794
6.10    -0.1822
6.20    -0.0831
```




```
sine | dchart -val=f -bottom=50 -xlabel=10
```



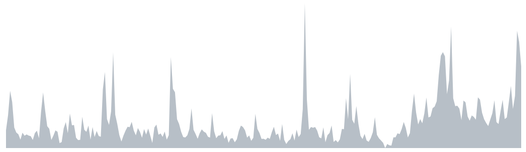
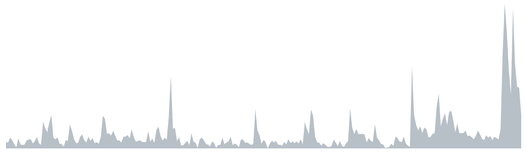
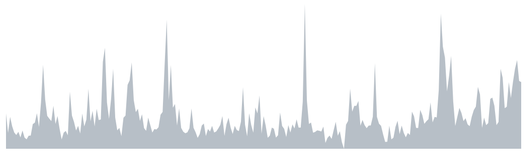
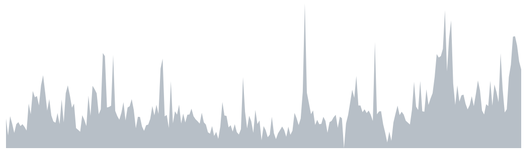

```
sine | dchart -val=f -bottom=50 -xlabel=10 -bar=f -line -vol
```




```
#!/bin/sh
mopts="-fulldeck=f -bar=f -vol -top=90 -bottom 60 -left=20 -right=80 -val=f -title=f"
mfunc -f sine   | dchart $mopts -xlabel=10
mfunc -f cosine | dchart $mopts -xlabel=0 -color=orange
```

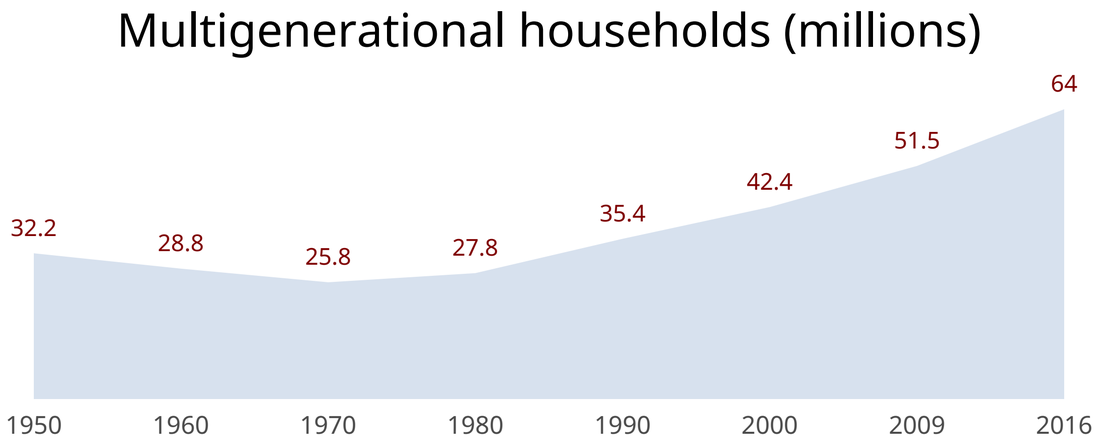
Tech Stock Performance

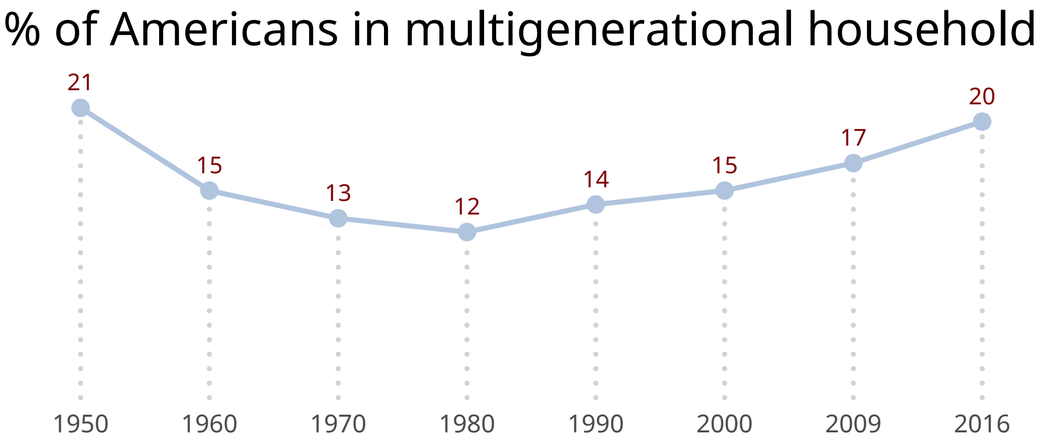
Apr 3 2017-Apr 2 2018

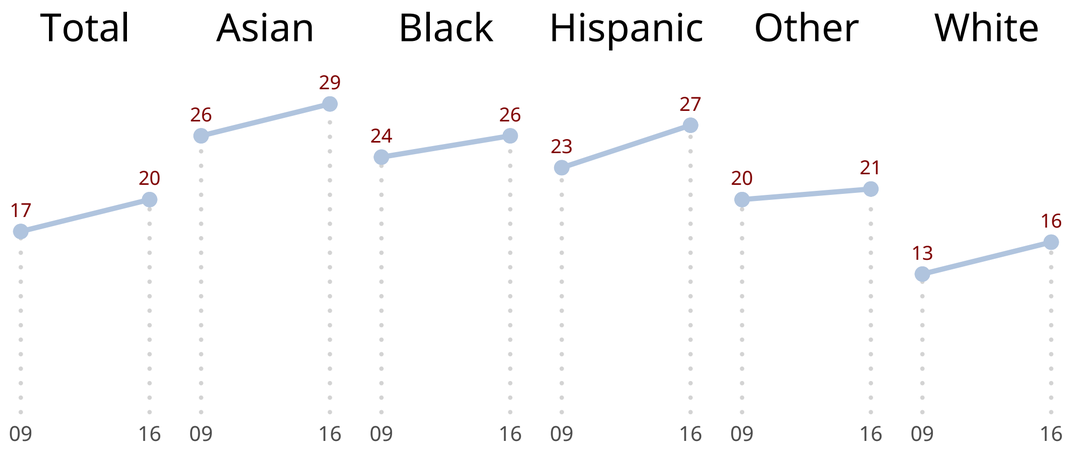
		Closing Price	Volume
Apple	AAPL		
Amazon.com	AMZN		
Facebook	FB		
Alphabet	GOOG		
Microsoft	MSFT		

A record 64 million Americans live in multigenerational households

The number and share of Americans living in multi-generational family households have continued to rise, despite improvements in the U.S. economy since the Great Recession. In 2016, a record 64 million people, or 20% of the U.S. population, lived with multiple generations under one roof, according to a new Pew Research Center analysis of census data.







What is it about Go?

fmt

func

io.Writer
io.Reader

net/http

encoding/xml
encoding/json
encoding/csv

cgo

The Community

From: Russ Cox
Subject: Re: [go-nuts] Visualizing Random Number Generators...
Date: March 5, 2010 1:14:44 EST
To: ajstarks <ajstarks@gmail.com>

---

are you going to share the library
or just tease us with pictures? ;-)

Thompson wanted to create a comfortable computing environment constructed according to his own design, using whatever means were available.

Dennis M. Ritchie, “The Development of the C Language”

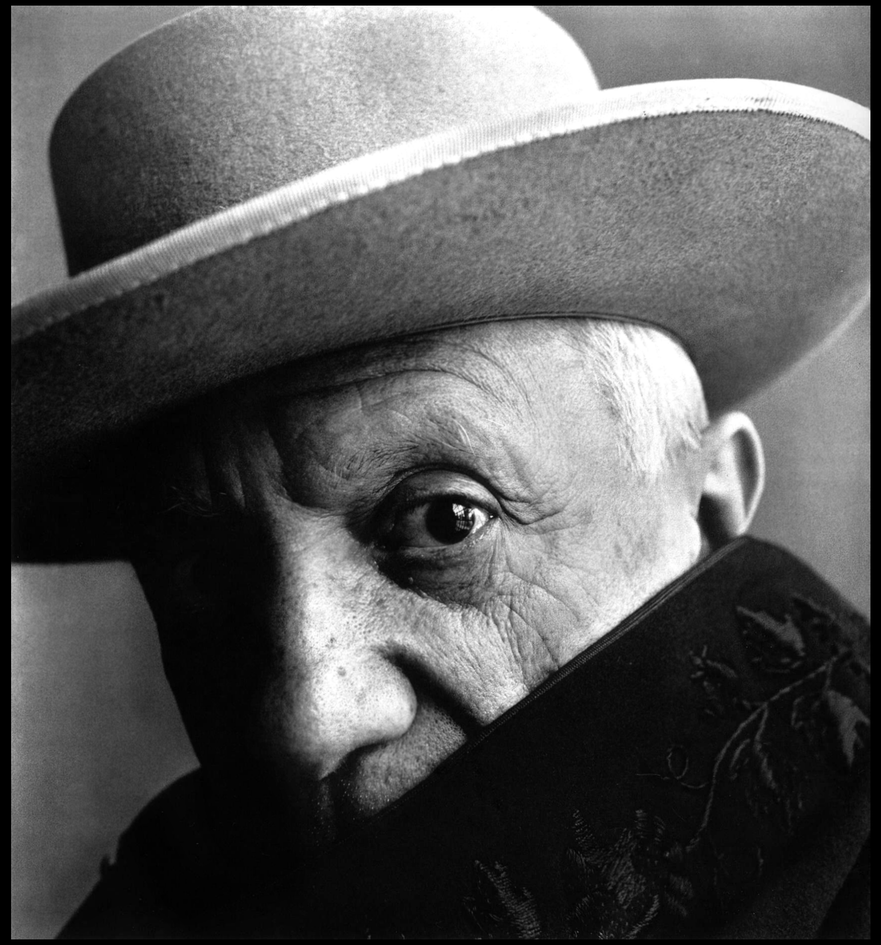
Go is not the product of a Whiggish development process. We were just trying to get something that worked for us.

Rob Pike, “Origin of Go’s interface design”, golang-nuts

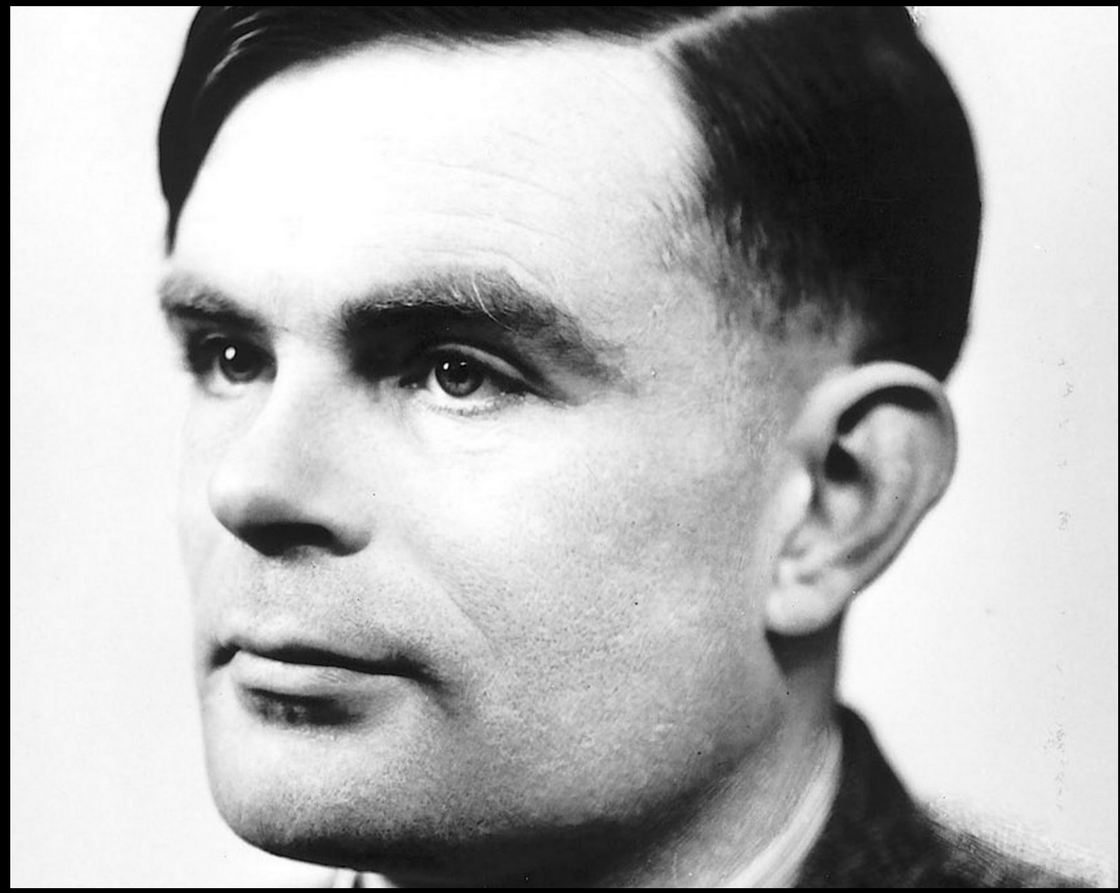
Making Tools

Fun

Reducing the distance from the idea to the picture



Picasso



Turing

Thank you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speakerdeck.com/ajstarks


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