Mechanical Sympathy

Martin Thompson - @mjpt777

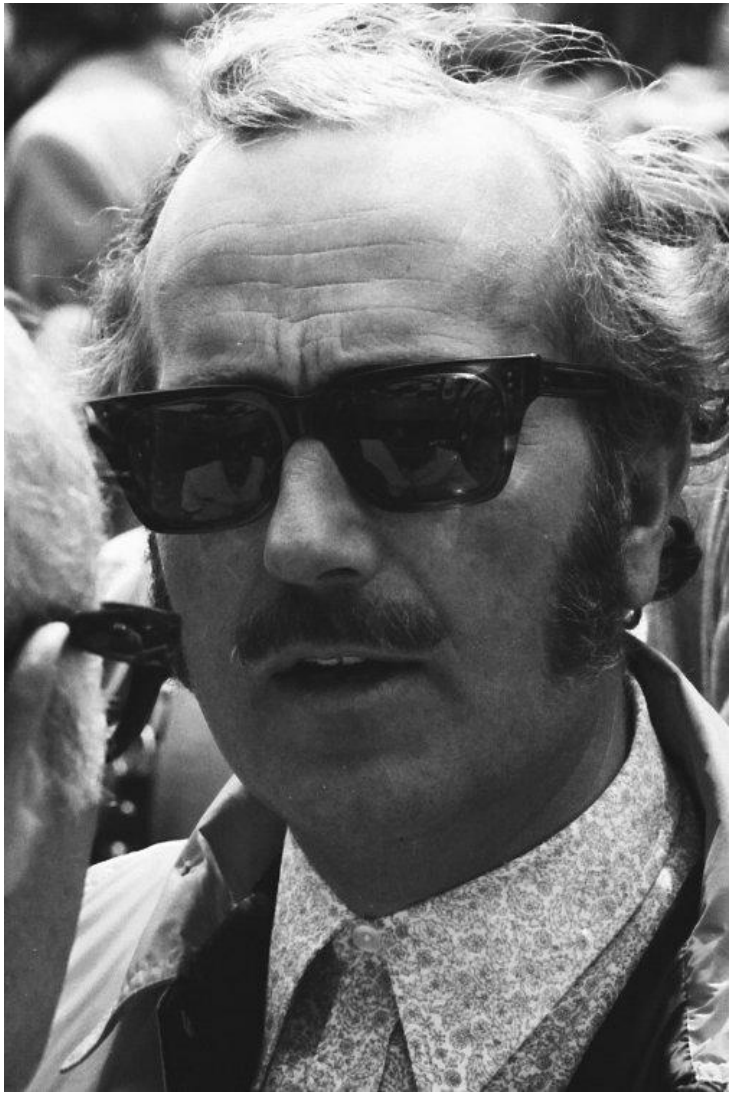
Sir Jackie Stewart
– 3 times World F1 Champion

The “Flying Scot”

“Mechanical Sympathy”?

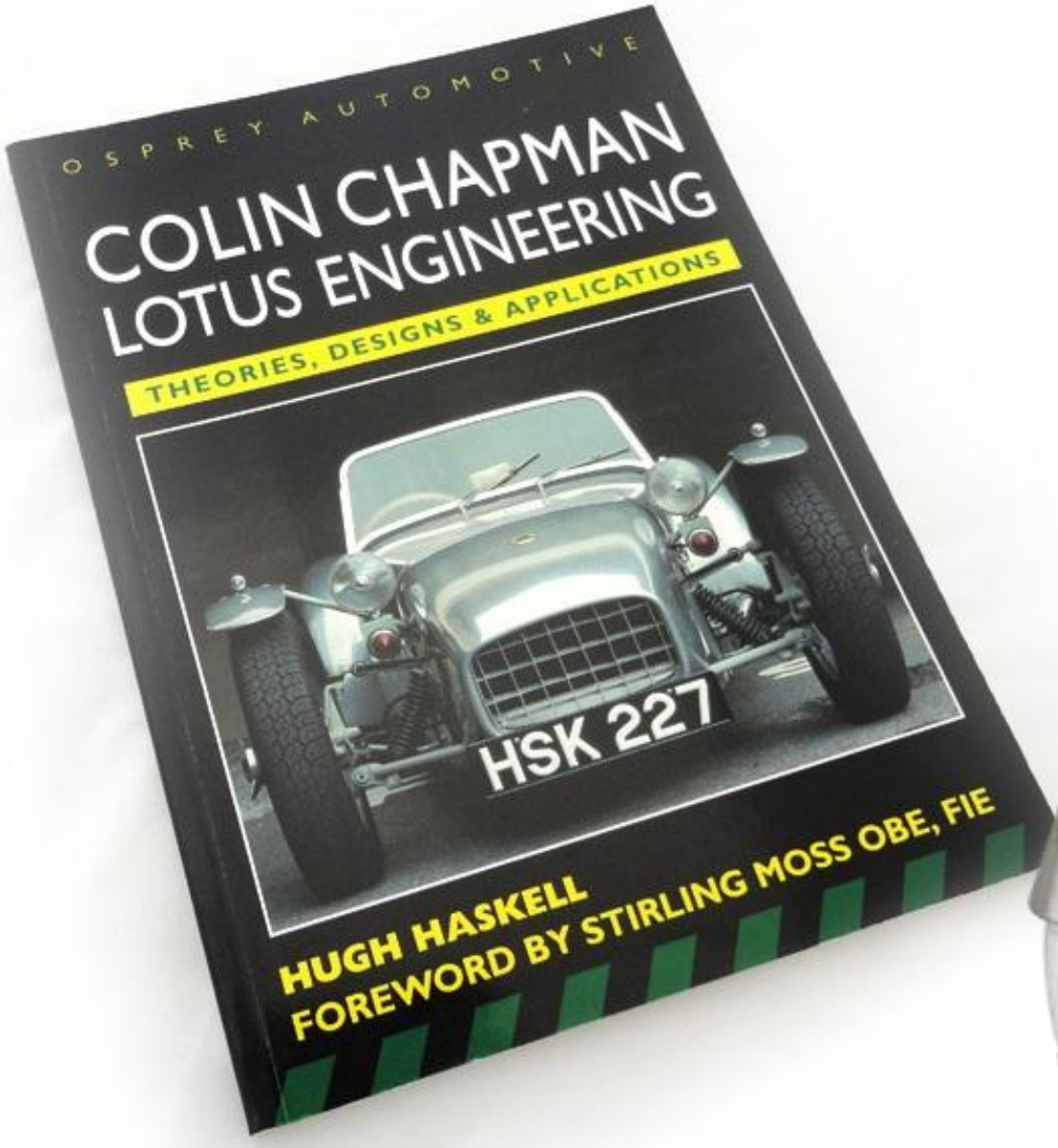
Man and machine working together in harmony

What does a “hardware guy” look like?



Colin Chapman

Lotus Founder
UCL Structural Eng
Pilot and Driver
Aerodynamics


OSPREY AUTOMOTIVE
COLIN CHAPMAN
LOTUS ENGINEERING
THEORIES, DESIGNS & APPLICATIONS
HSK 227
HUGH HASKELL
FOREWORD BY STIRLING MOSS OBE, FIE

?


GP
GENII
© Reuters

“I can think of no other field of human endeavour that allows the levels of inefficiency that we accept as normal in software.”

- Dave Farley (Continuous Delivery)

Mechanical Sympathy

1. Distilling a Model
2. Understand the Safety Features
3. Importance of Testing
4. Let Data drive Decisions
5. Mechanical Sympathy in Action

1.
Distilling the Model

A **model** is a **representation** of the domain in a given **context**.

Map != Territory

Model != Domain

Software != Real World

How do I create a Model?

Distil the essence of what **represents** the domain

What makes a really fast car?


FREE
WITH MAX FLAVER
EVERY MONTH
IT WAS A
FIESTA

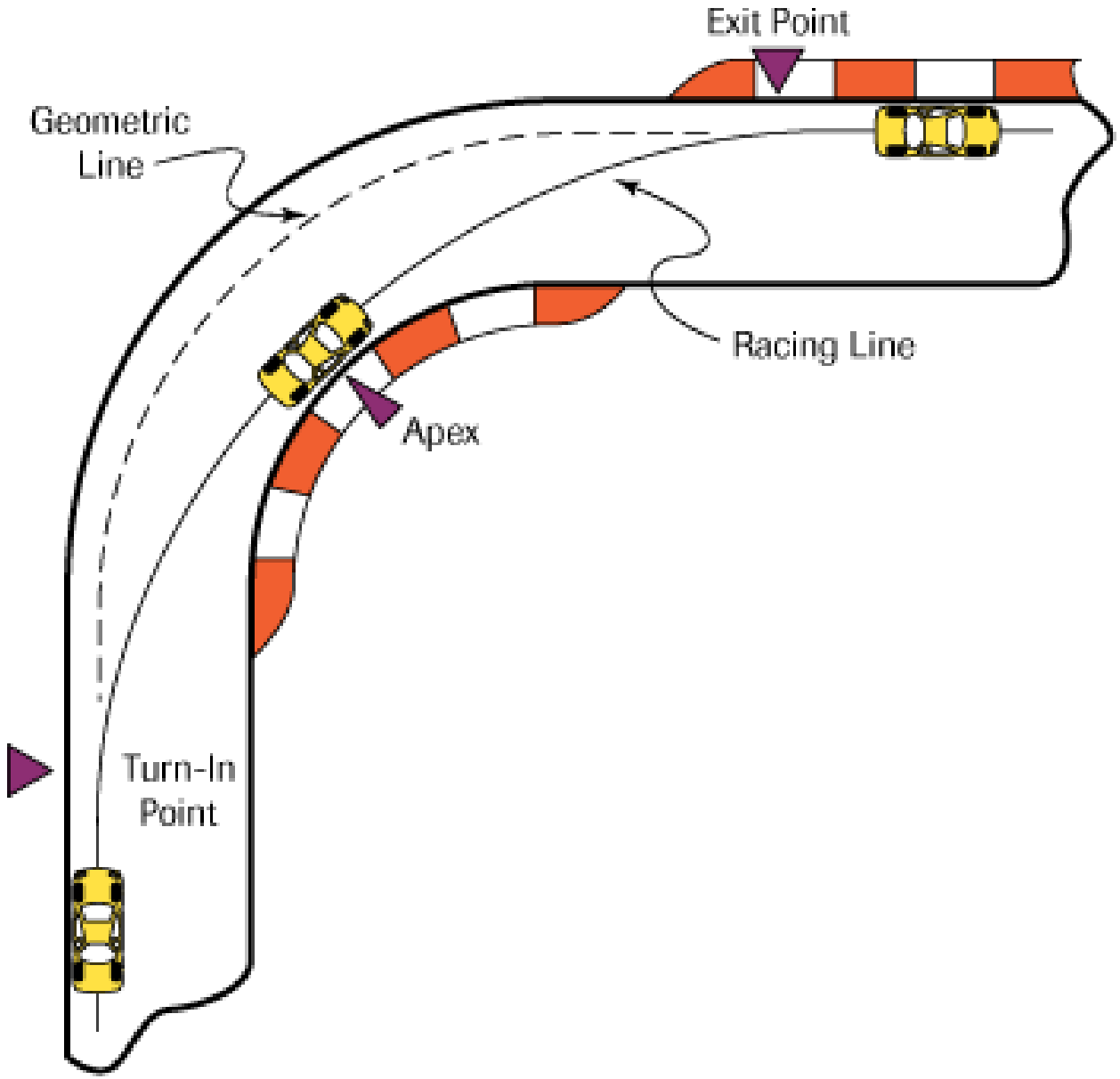
How do I create a Model?

Apply a Scientific Mindset

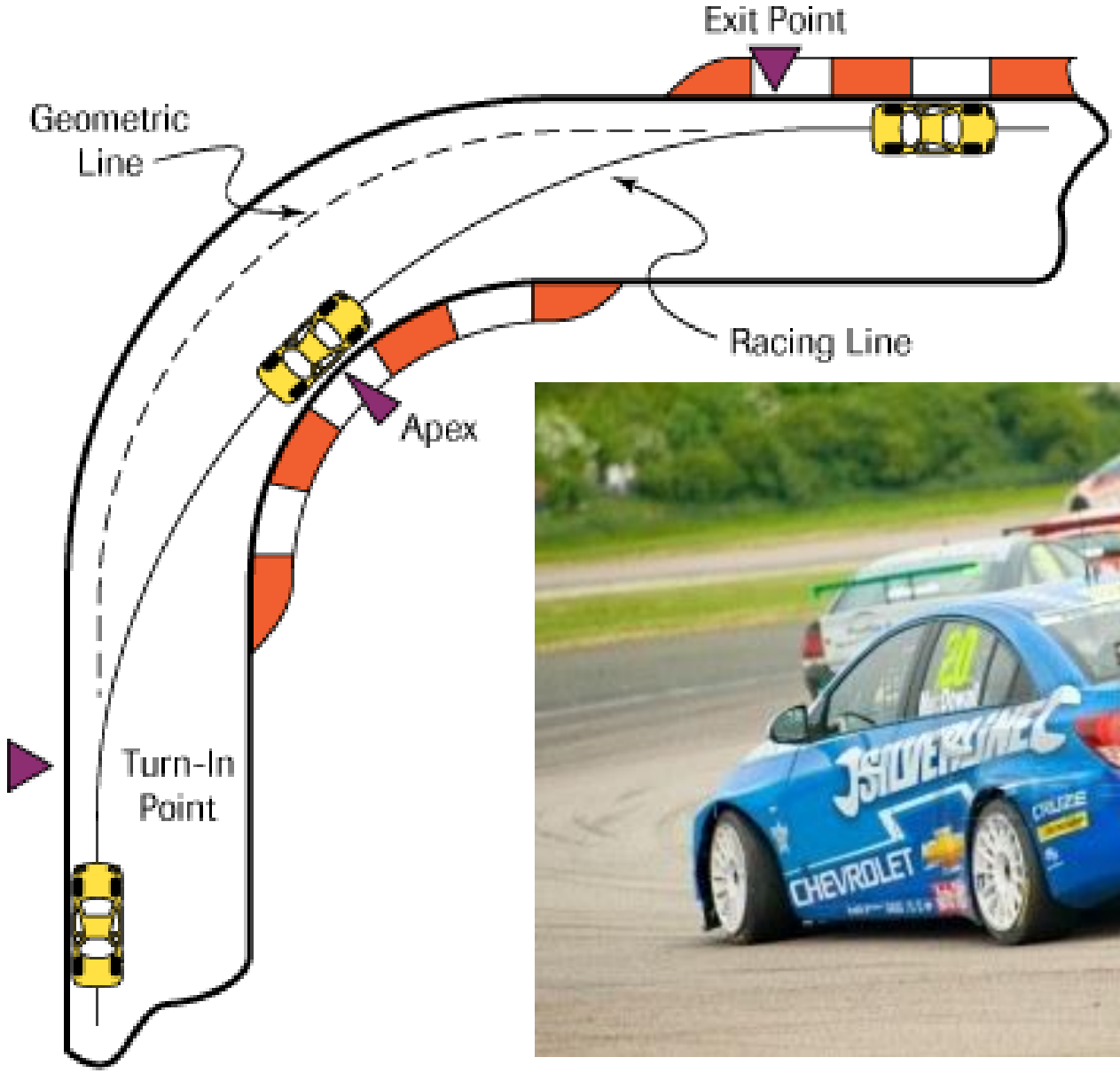
1. Draw on **Experience**
2. Do your **Research**
3. Learn by **Experimenting**

Let’s distil models of what needs represented for two domains

Physics Model of taking a corner



Physics Model of taking a corner



Model of Disk Write

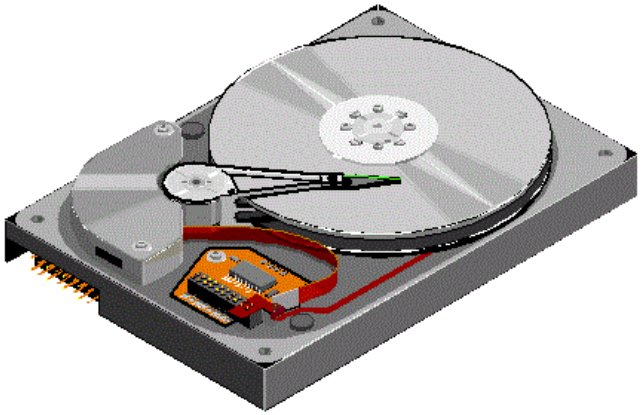
<< My Program >>

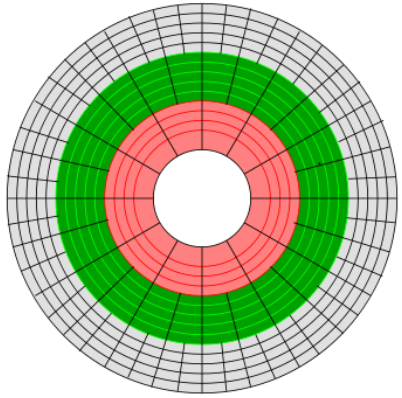
Byte Buffer

write() << syscall >>

User Space

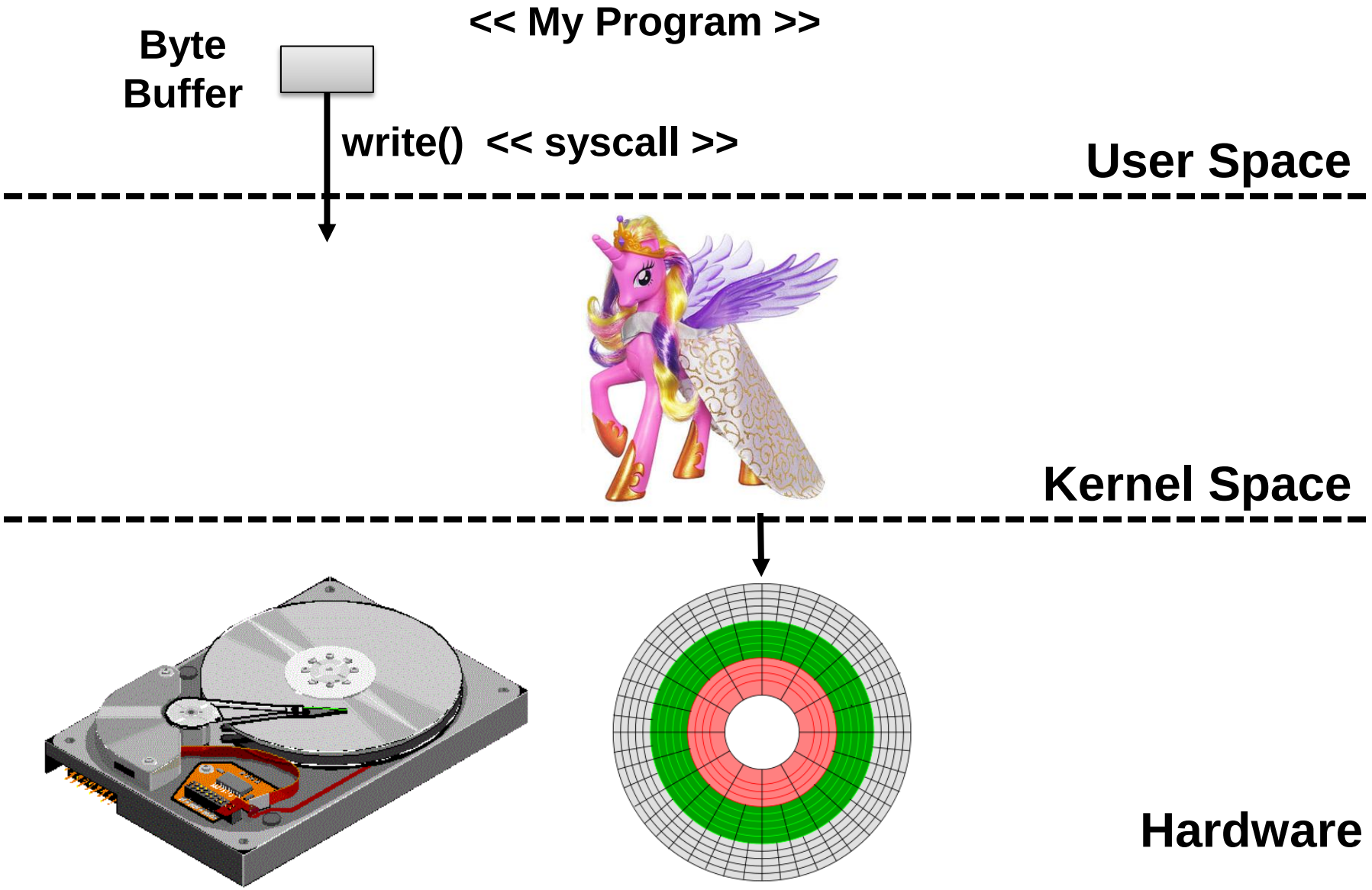
Kernel Space



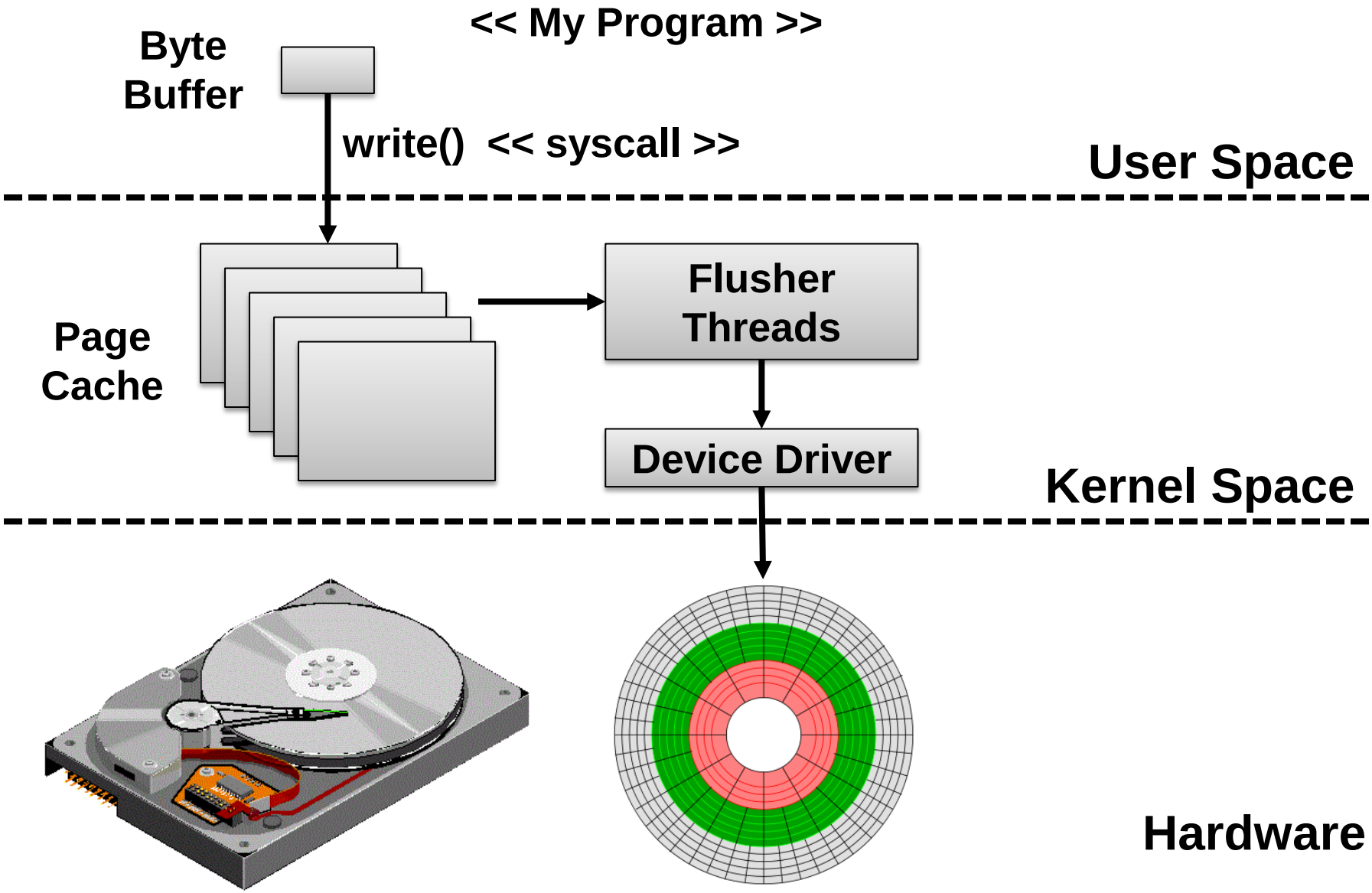


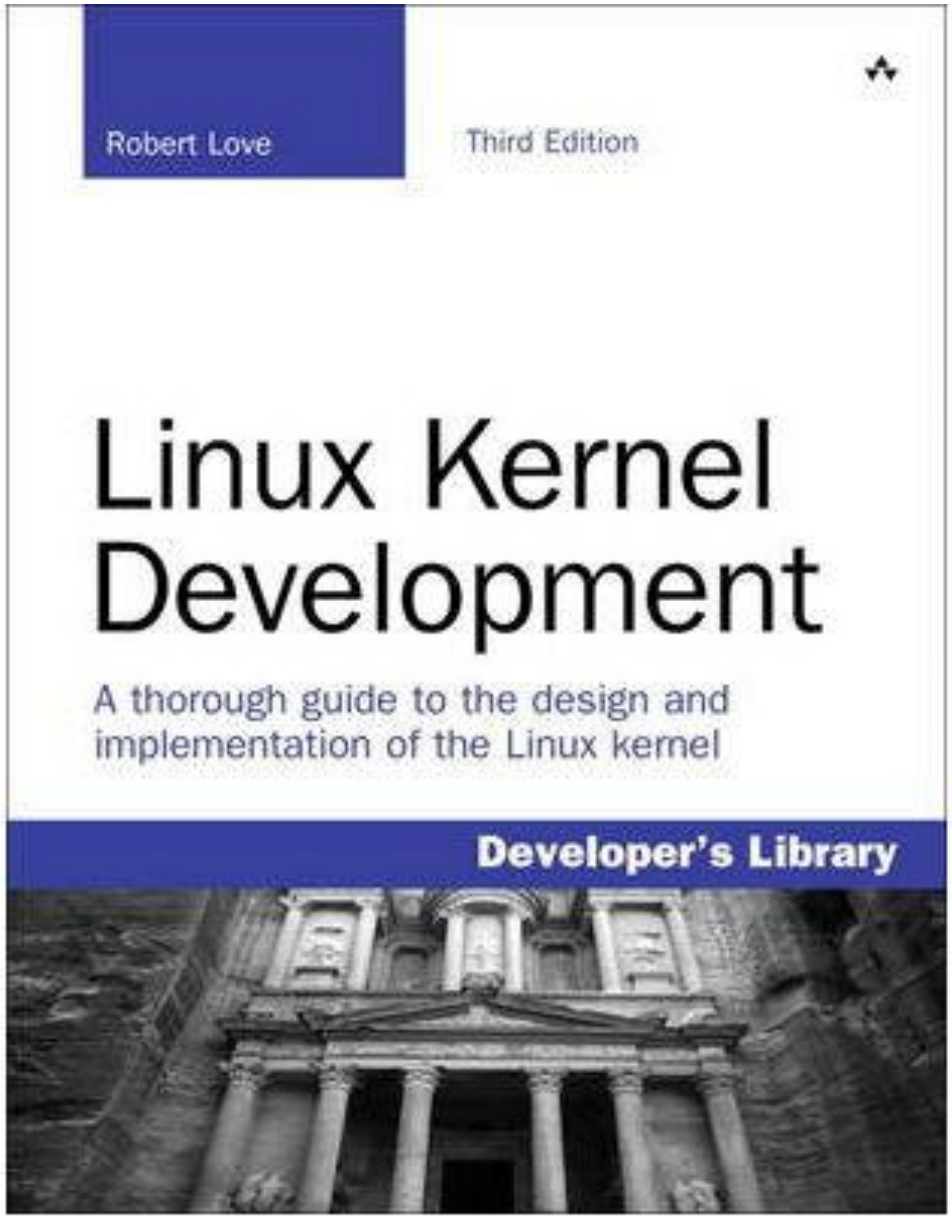
Hardware

Model of Disk Write



Model of Disk Write




Robert Love
Third Edition
Linux Kernel Development
A thorough guide to the design and implementation of the Linux kernel
Developer's Library

Do what is required

and nothing more...

remember Colin Chapman...

...for that is an elegant

and pure model

2.
Understand the Safety Features

Spa
Belgium
1966

Close Friends Lost

Jim Clark

François Cevert

“We are killing ourselves at a rate of one per month.

After 5 years in this sport you have a two out of three chance of being killed.”

- Jackie Stewart (1973)

Crash Barriers

Fireproof Suits

Emergency Services

Seat Belts

Full-Face Helmets

Electric Kill Switches

Removable Steering Wheels

The **safety features** in our platforms are some the most **interesting**

Bounds Checking

Forward Error Correction

RAID

Circuit Breakers

Replication

Congestion Control

Error/Exception Handling

Automatic Memory Management

Understanding the

safety features

will greatly improve your

understanding of the model

3.
The Importance of Testing

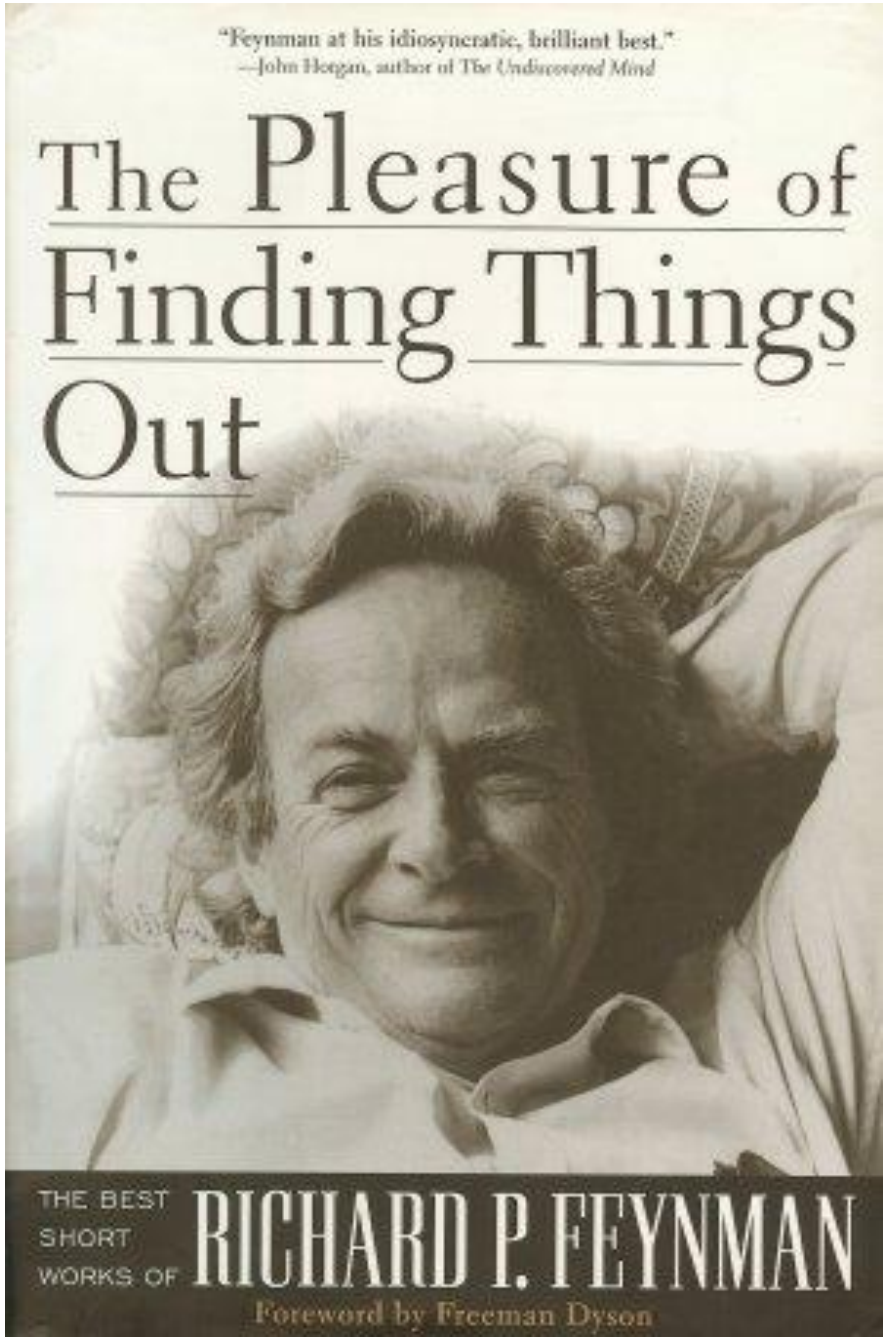
What happens when you don’t do enough

testing?


Mobil
15


Knight
Knight
Knight
Knight

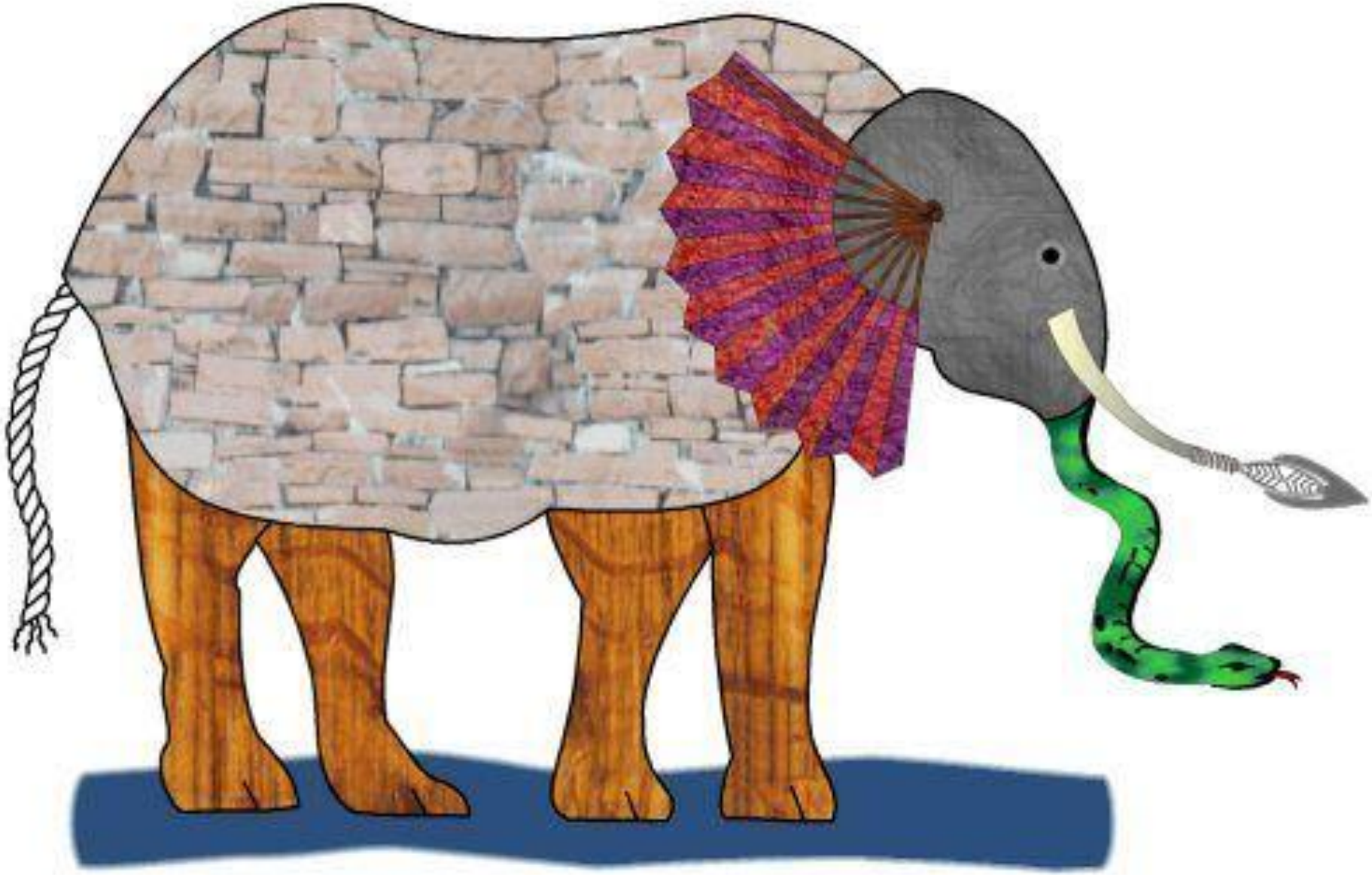
How can you have confidence in an untested model?


"Feynman at his idiosyncratic, brilliant best."
—John Horgan, author of The Undiscovered Mind
The Pleasure of Finding Things Out
THE BEST SHORT WORKS OF
RICHARD P. FEYNMAN
Foreword by Freeman Dyson

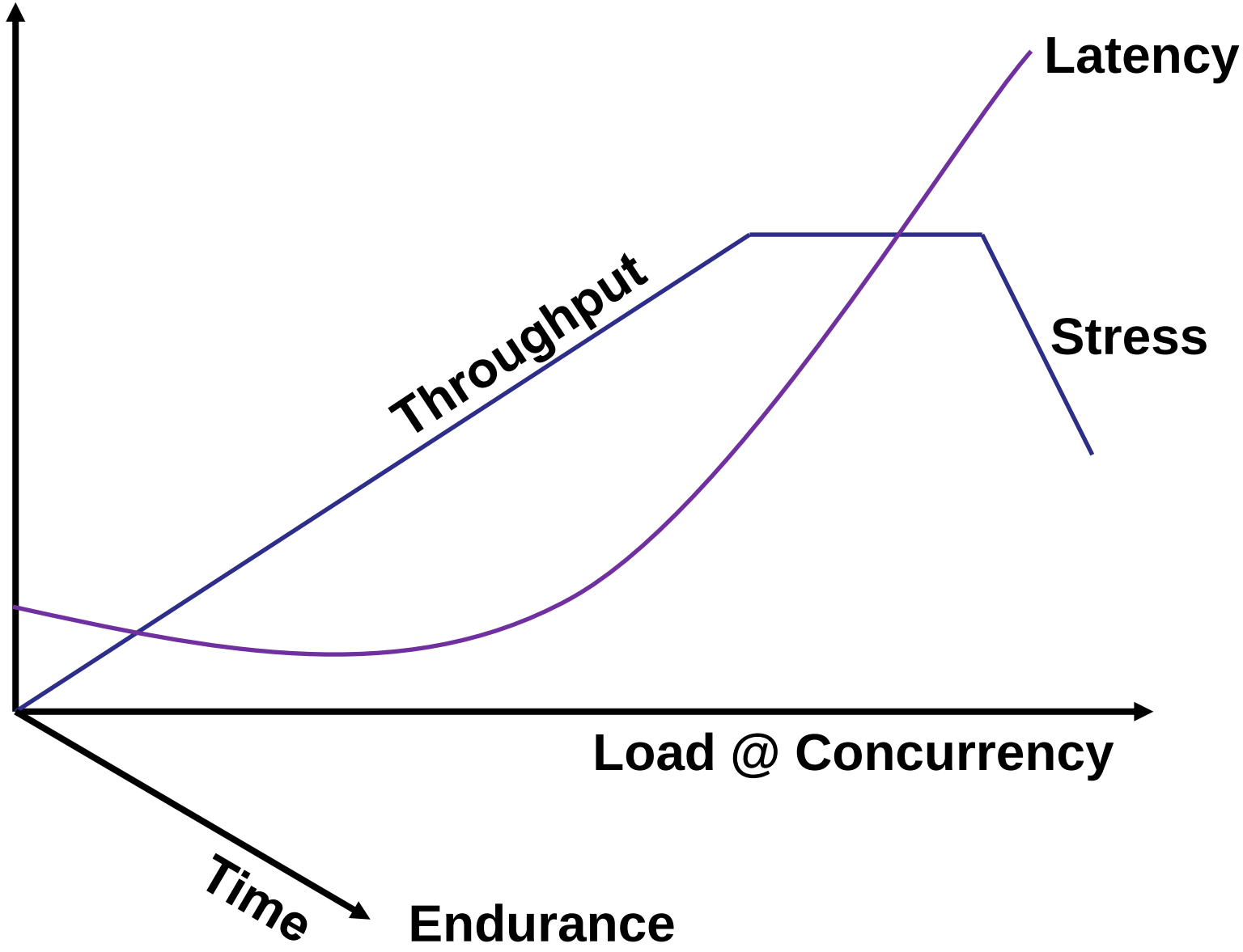
Testing is about gaining

experimental evidence

to prove the model



Performance Testing



4.
Let Data drive Decisions


Marlboro
Marlboro
Marlboro
Marlboro
OMP
motorsport.com


INFINITI
RedBull
RACING
Pepe Jeans
LONDON
RedBull
TOTAL
FLATTRON

Apply telemetry and perform real-time monitoring on the data

Requires efficient **collection**, centralised **aggregation**, **analysis**, and **alerting**

Application Level Events

Gauges

Counters

Ratios

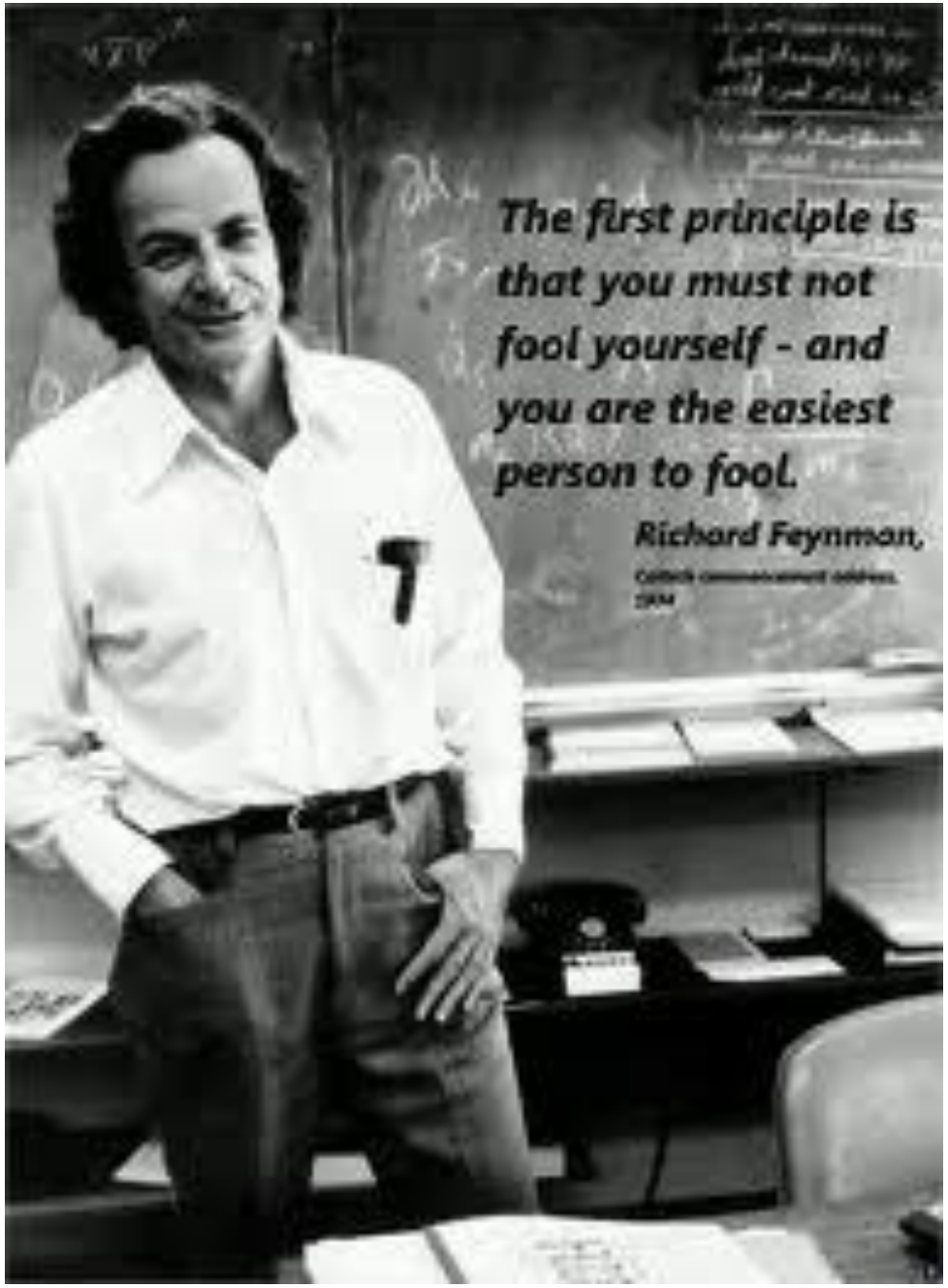
Histograms

Meters

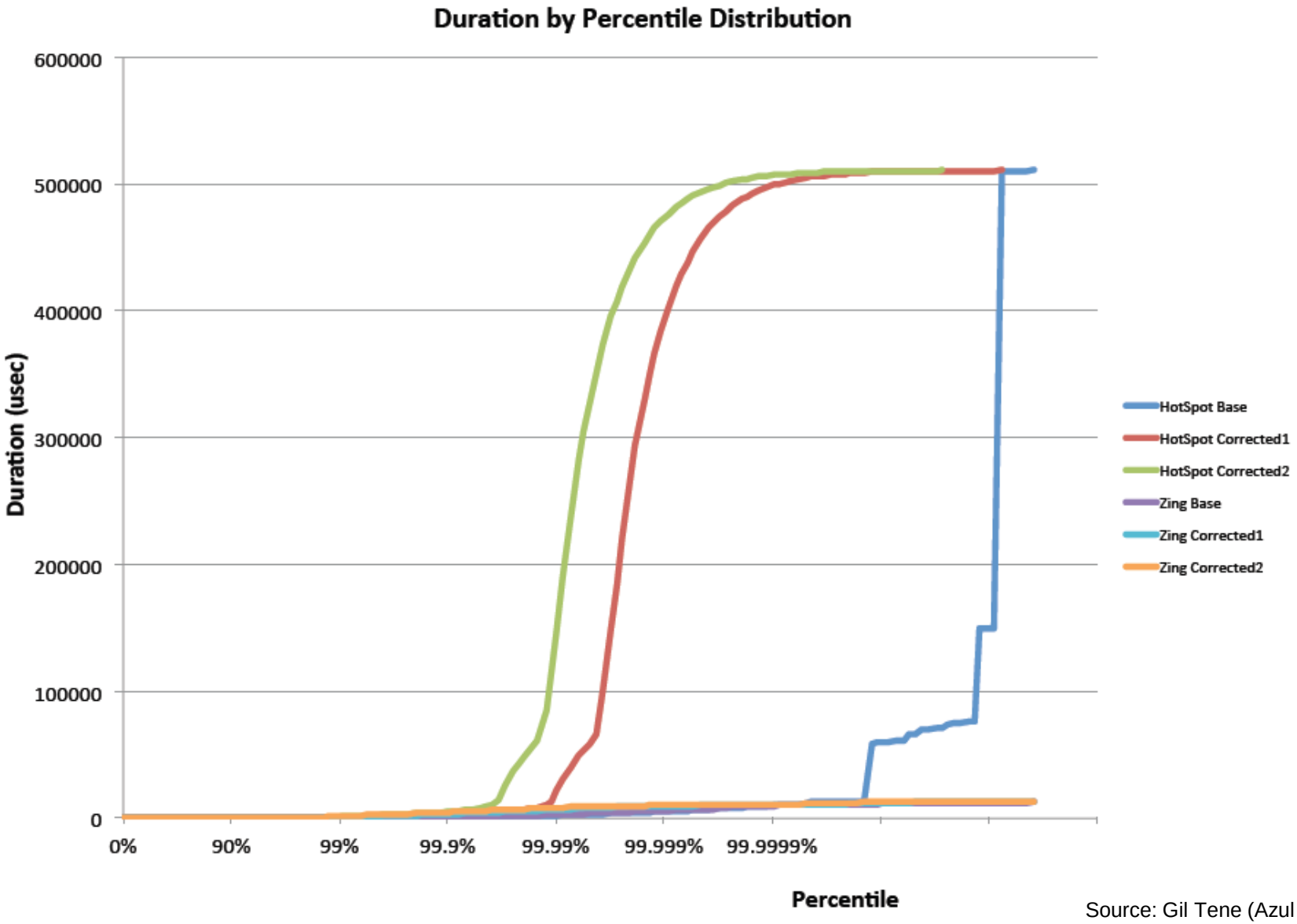
Timers

Full Stack Instrumentation

Telemetry not only informs the **design** it also allows for the **tuning** of a system in production


The first principle is that you must not fool yourself - and you are the easiest person to fool.
Richard Feynman,

Coordinated Omission



Source: Gil Tene (Azul Systems)

5.
Mechanical Sympathy in Action

It is all about **experience**

and **understanding**

executed with **finesse**

What are the highlights
we need to consider
when putting this into action?

Do you have appropriate

leadership and

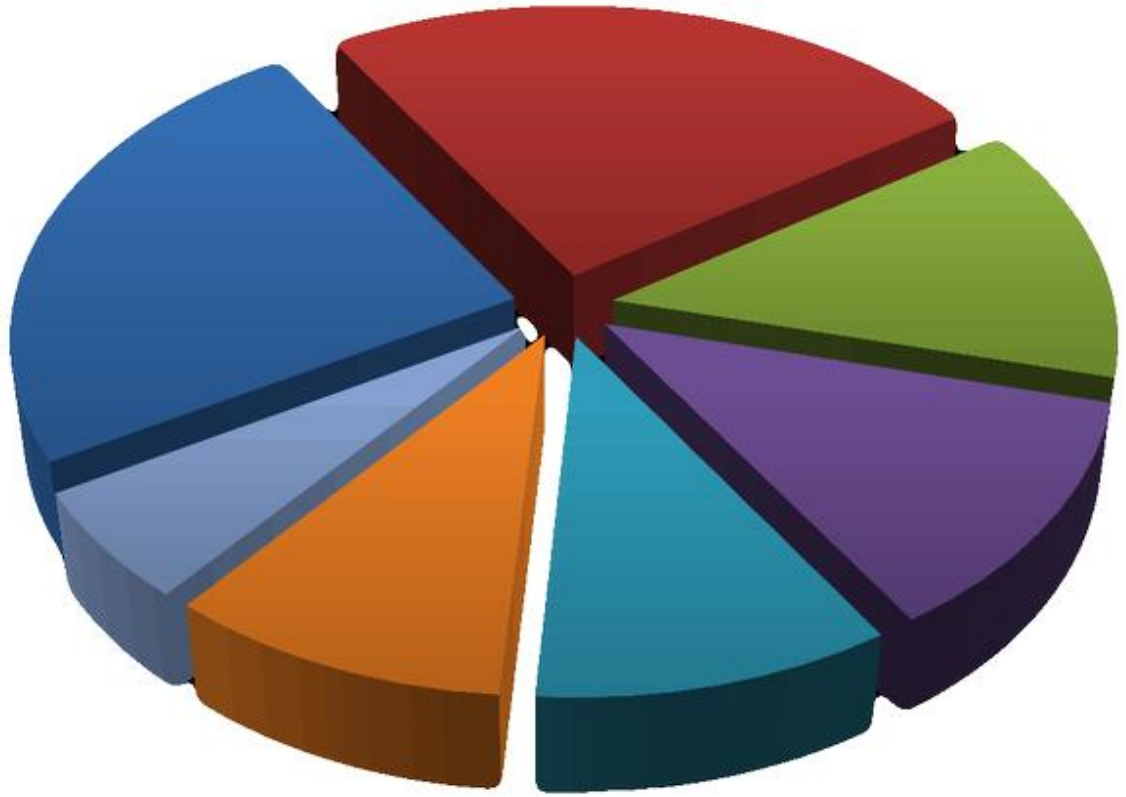
management in place?


FOST
SAN
200

You have finite resources

do you use them wisely?

Transaction Budget



Know where the limits are

and plan to stay inside them


acer
Santander

React appropriately to spikes in **load**...

...apply **batching** to amortise costs and **back-off** strategies to prevent failure

There is a **beauty** to doing it well

and it will look **effortless**

Questions?

Blog: http://mechanical-sympathy.blogspot.com/

Twitter: @mjpt777

"Winning is not enough. --
I'd have pushed harder on safety.
I'd have carried it to the next dimension."

- Sir Jackie Stewart