Continuous Modernization

Maintaining Long-Lived Federal Systems

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Long-Lived Federal IT Systems

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Federal IT systems include critical enterprise functions:

- System of record
- Implementation of mandate
- Accomplishing the mission

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- System of record
- Implementation of mandate
- Accomplishing the mission

These frequently evolve over time, but rarely go away.

Long-Lived Federal IT Systems

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Federal systems serve uniquely long-lived missions.

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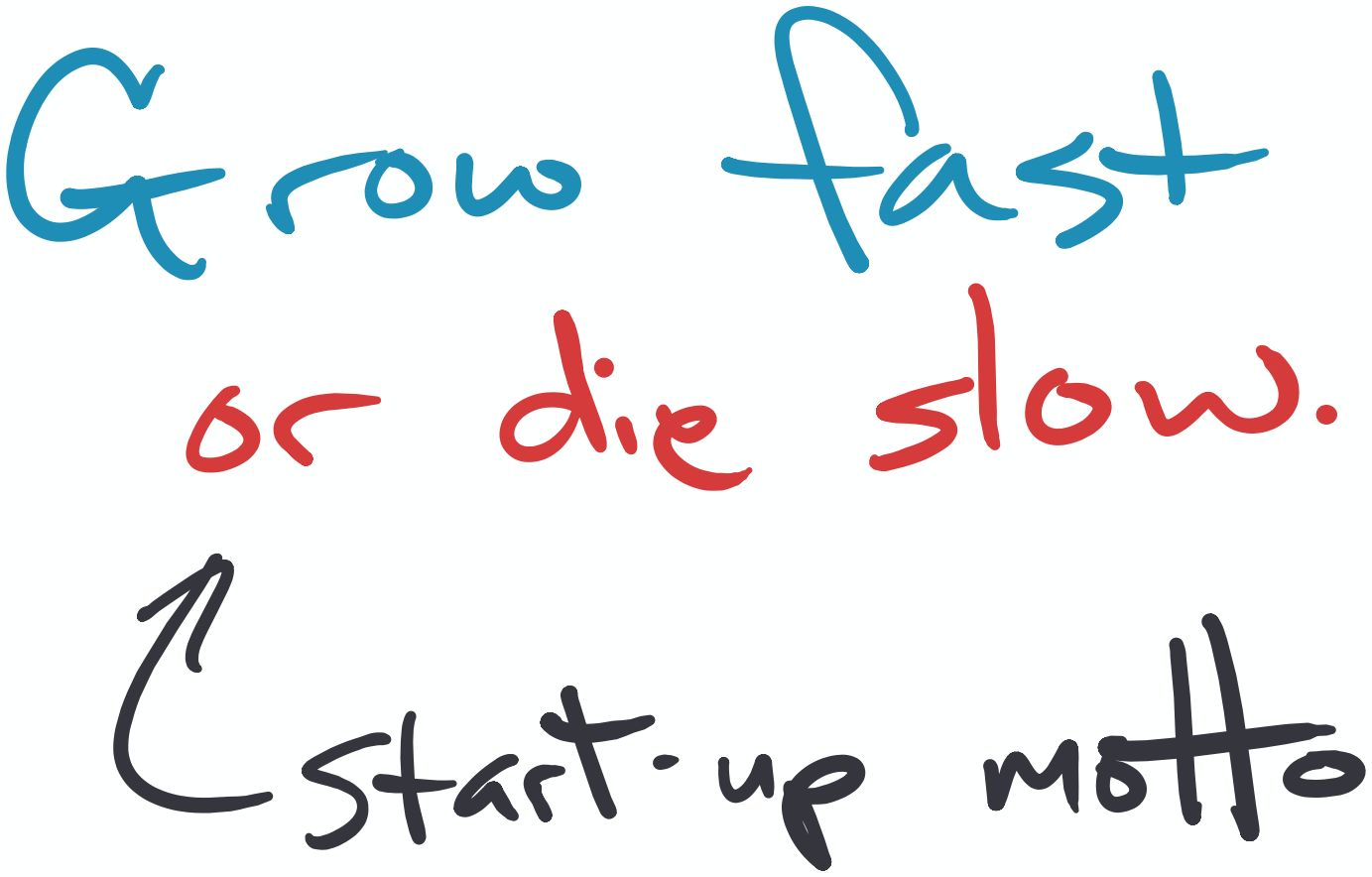
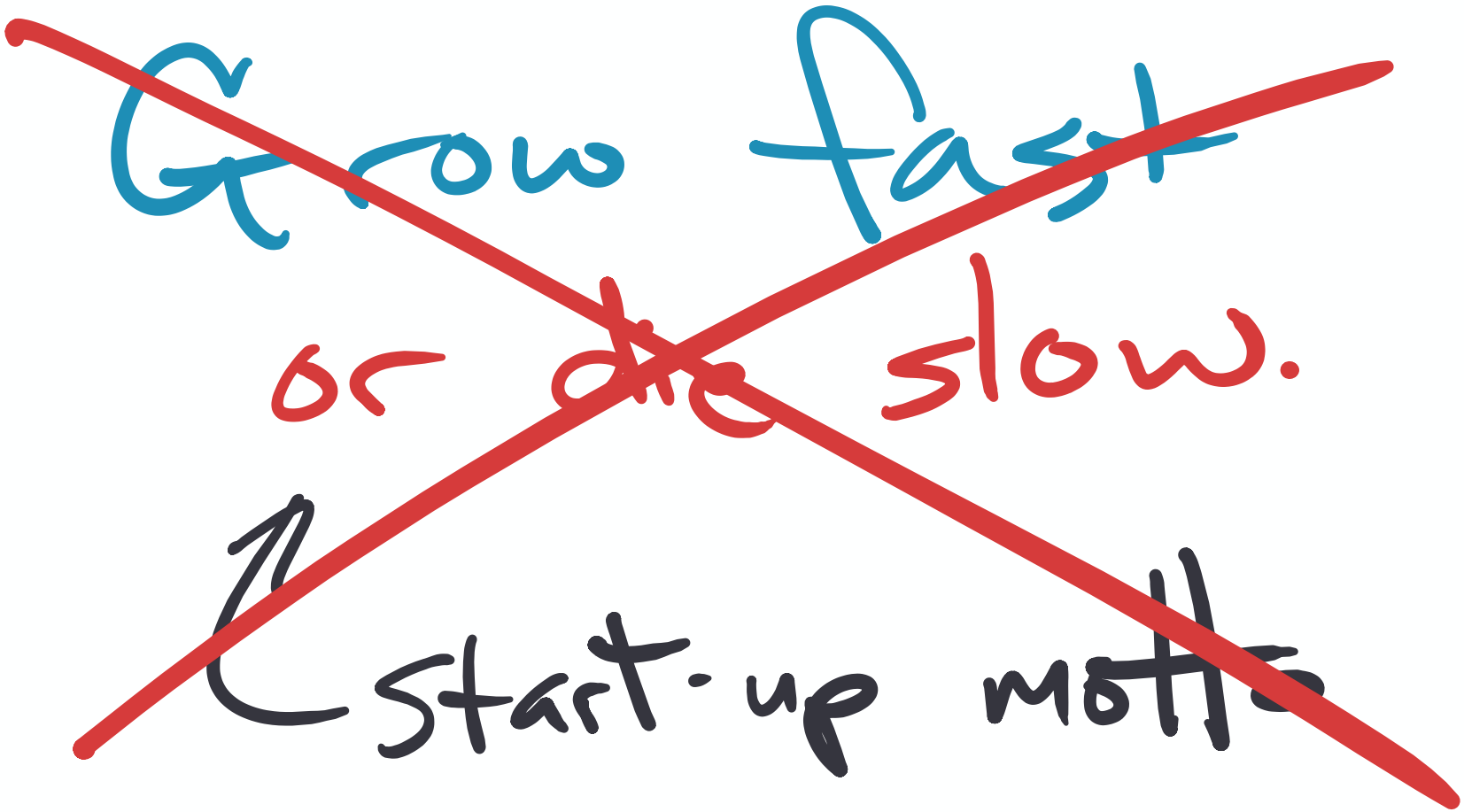
Short-term thinking often leads to **risks** and **waste** that have long-term consequences.

Long-Lived Federal IT Systems



Long-Lived Federal IT Systems



Long-Lived Federal IT Systems

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Goals for critical enterprise functions:

Long-Lived Federal IT Systems

Goals for critical enterprise functions:

- Cost-effective

Long-Lived Federal IT Systems

Goals for critical enterprise functions:

- Cost-effective
- Dependable

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Goals for critical enterprise functions:

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- Extensible

Long-Lived Federal IT Systems

Reality

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Long-Lived Federal IT Systems

Reality

~~Goals~~ for critical enterprise functions:

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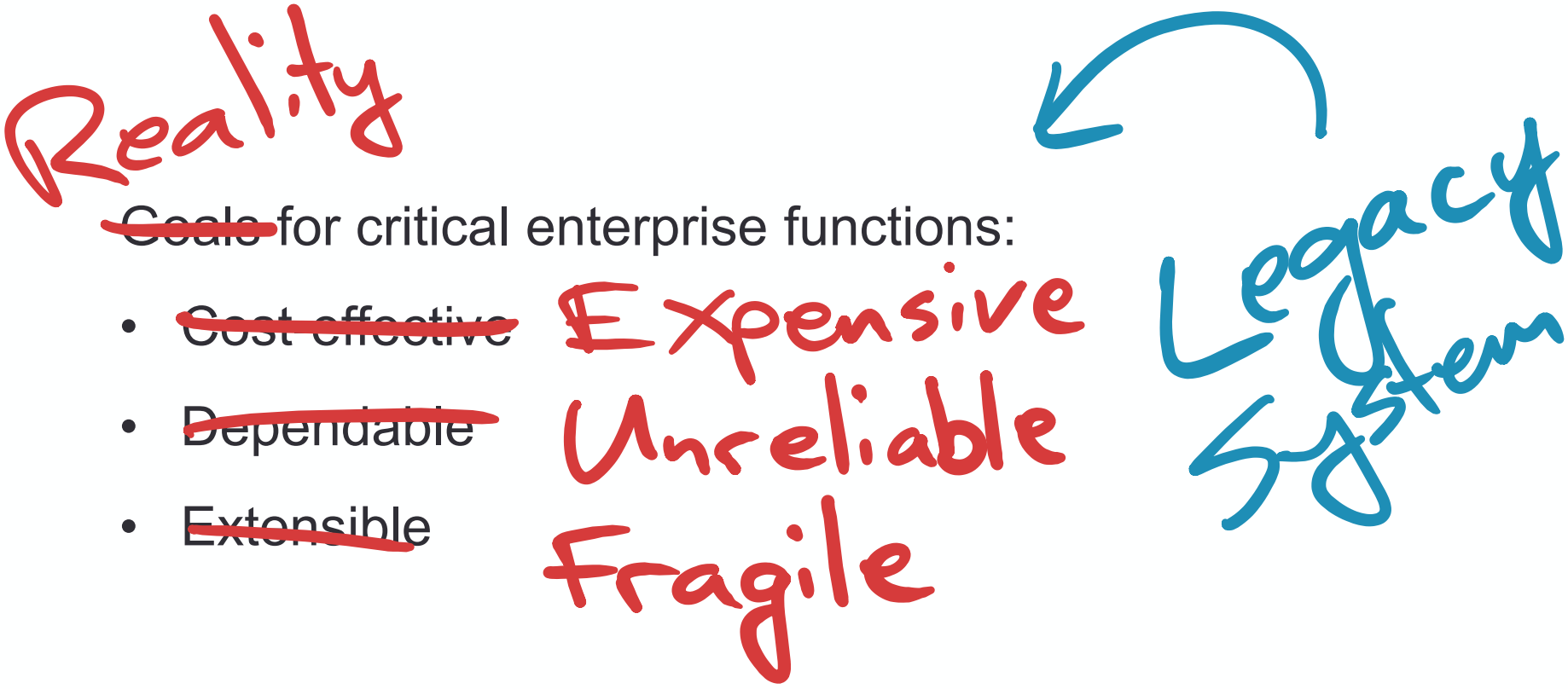
Long-Lived Federal IT Systems

Reality

~~Goals~~ for critical enterprise functions:

- ~~Cost-effective~~ Expensive
- ~~Dependable~~ Unreliable
- ~~Extensible~~ Fragile

Long-Lived Federal IT Systems



Long-Lived Federal IT Systems

What makes legacy systems so expensive, unreliable, and fragile?

Long-Lived Federal IT Systems

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Technical Debt

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Technical debt is a metaphor for the shortcuts, onerous designs, and outdated technology that make modifying the system difficult and risky.

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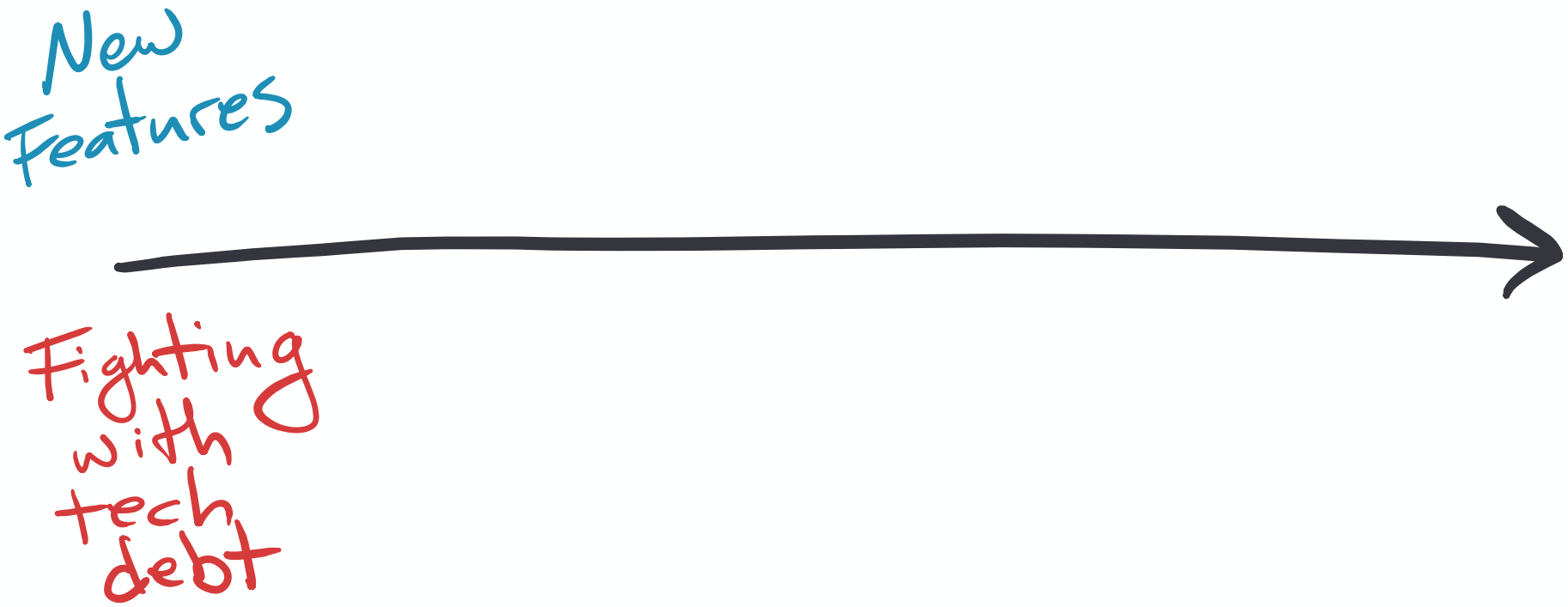
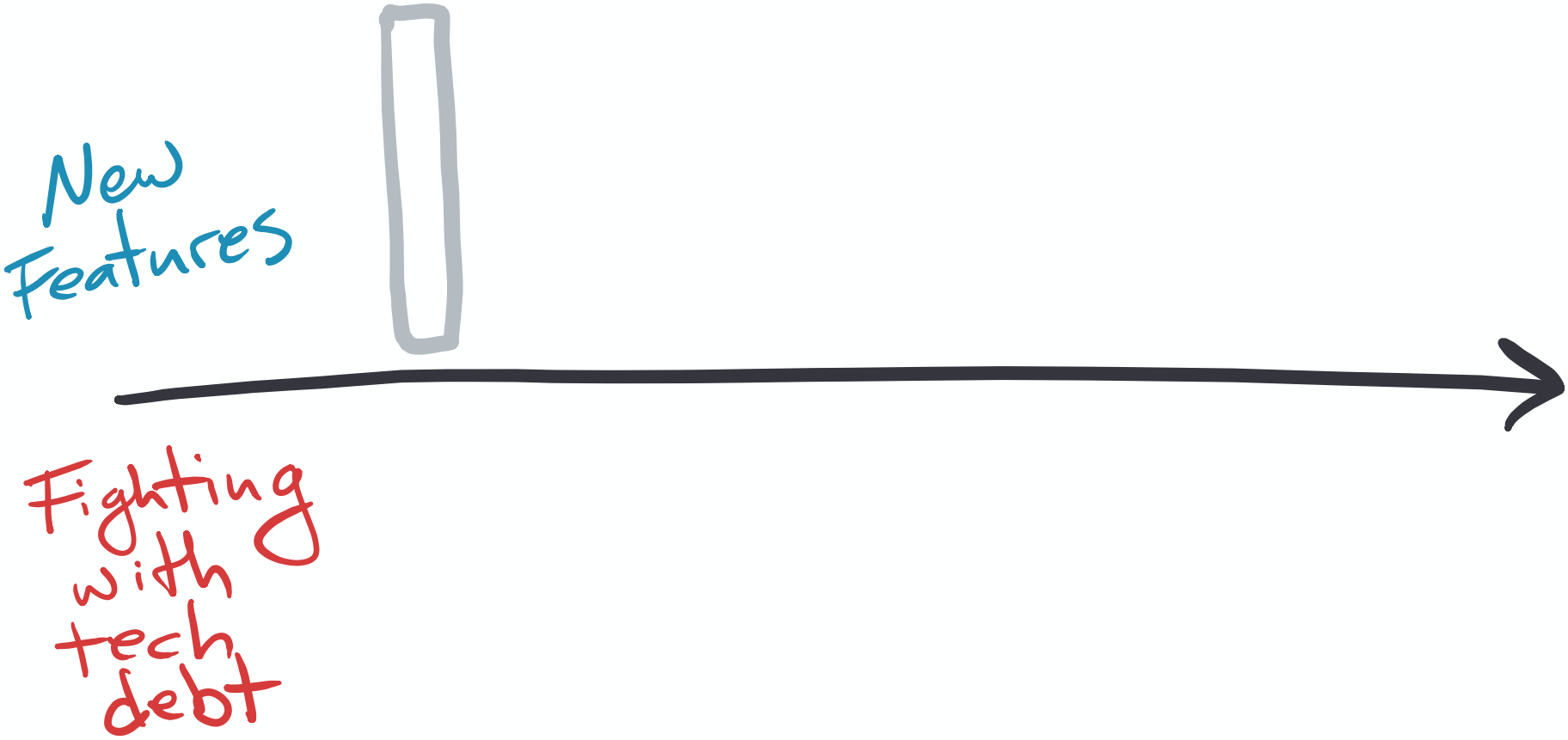
Like *financial debt* it compounds and accumulates over time and has ongoing costs until it is paid off.

Technical Debt



Technical Debt



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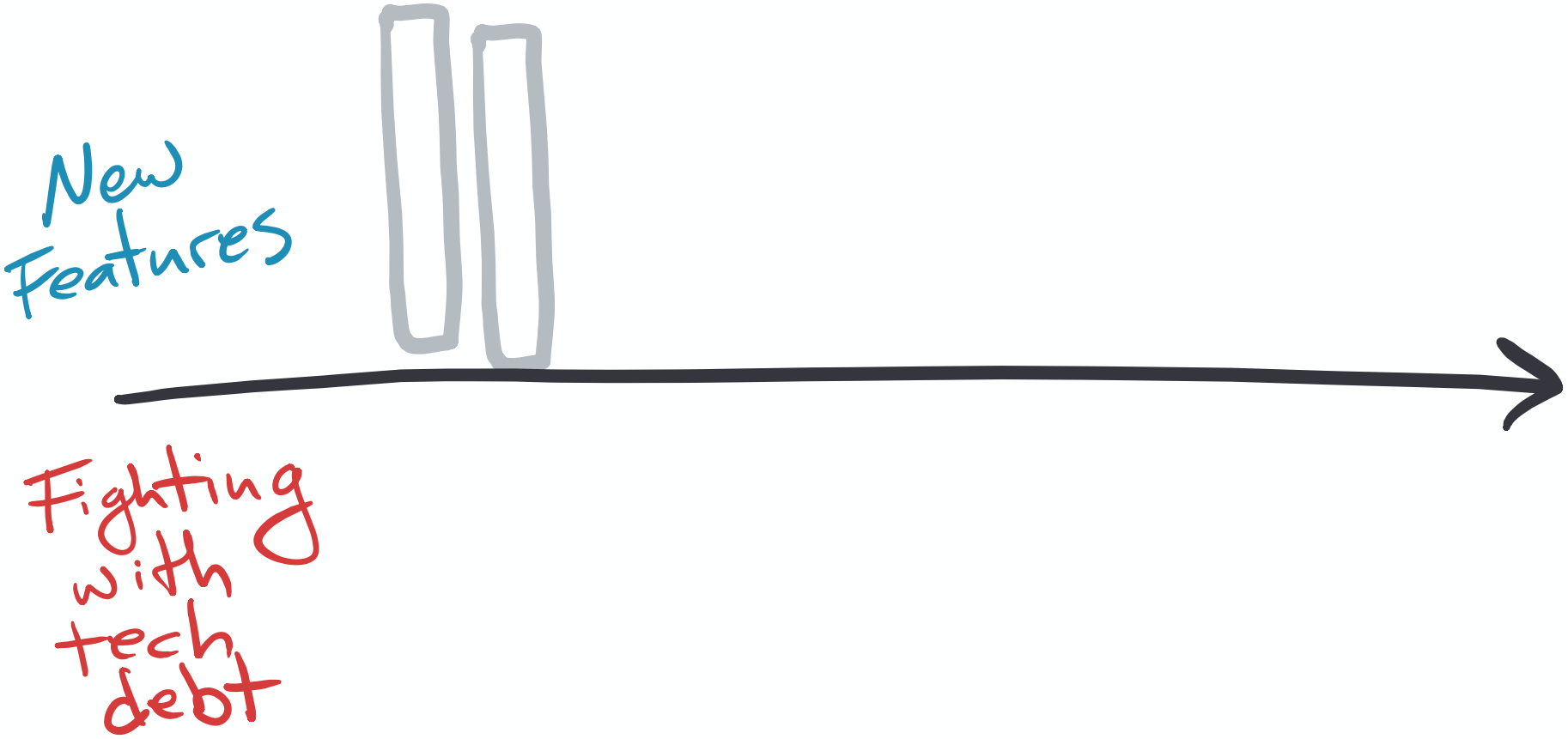

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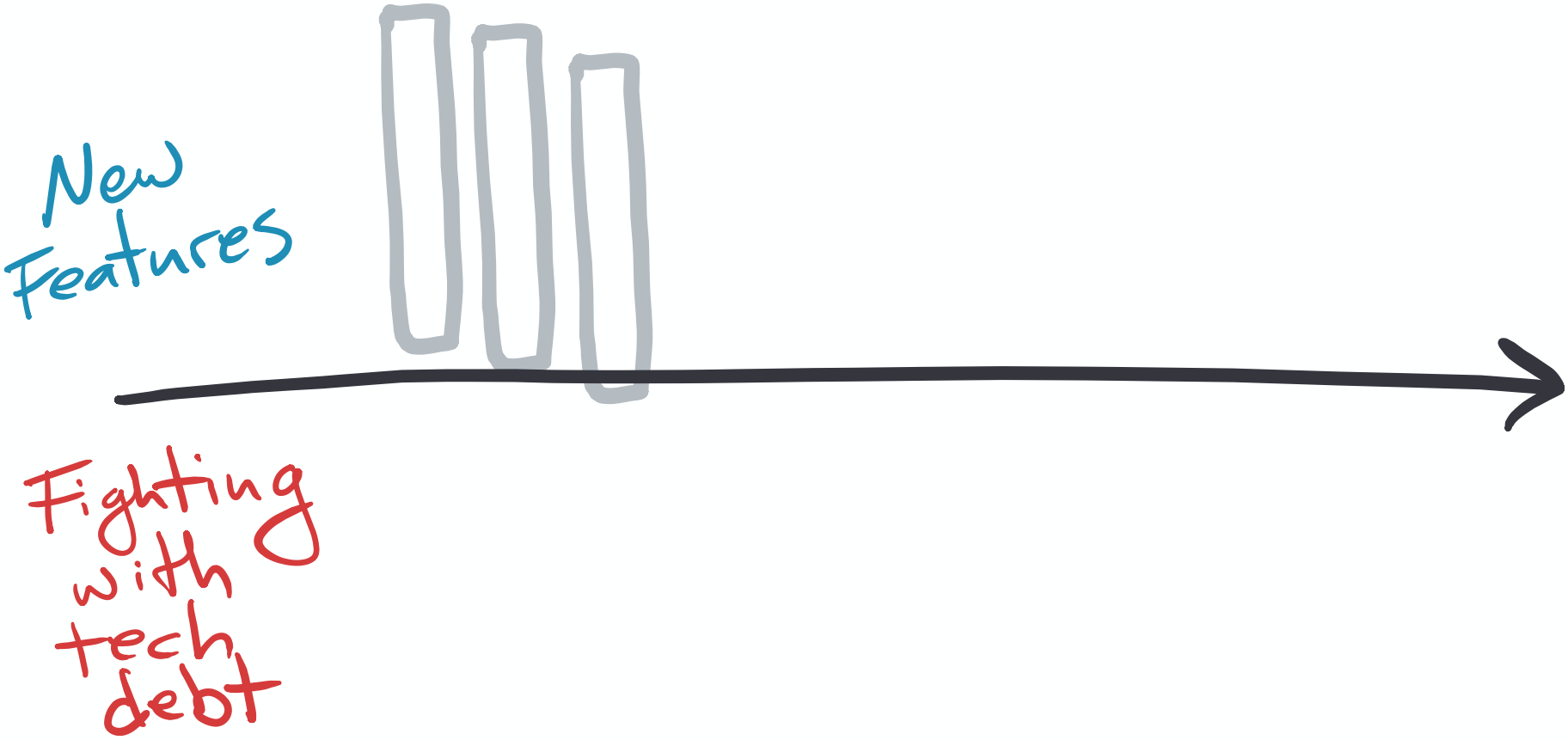

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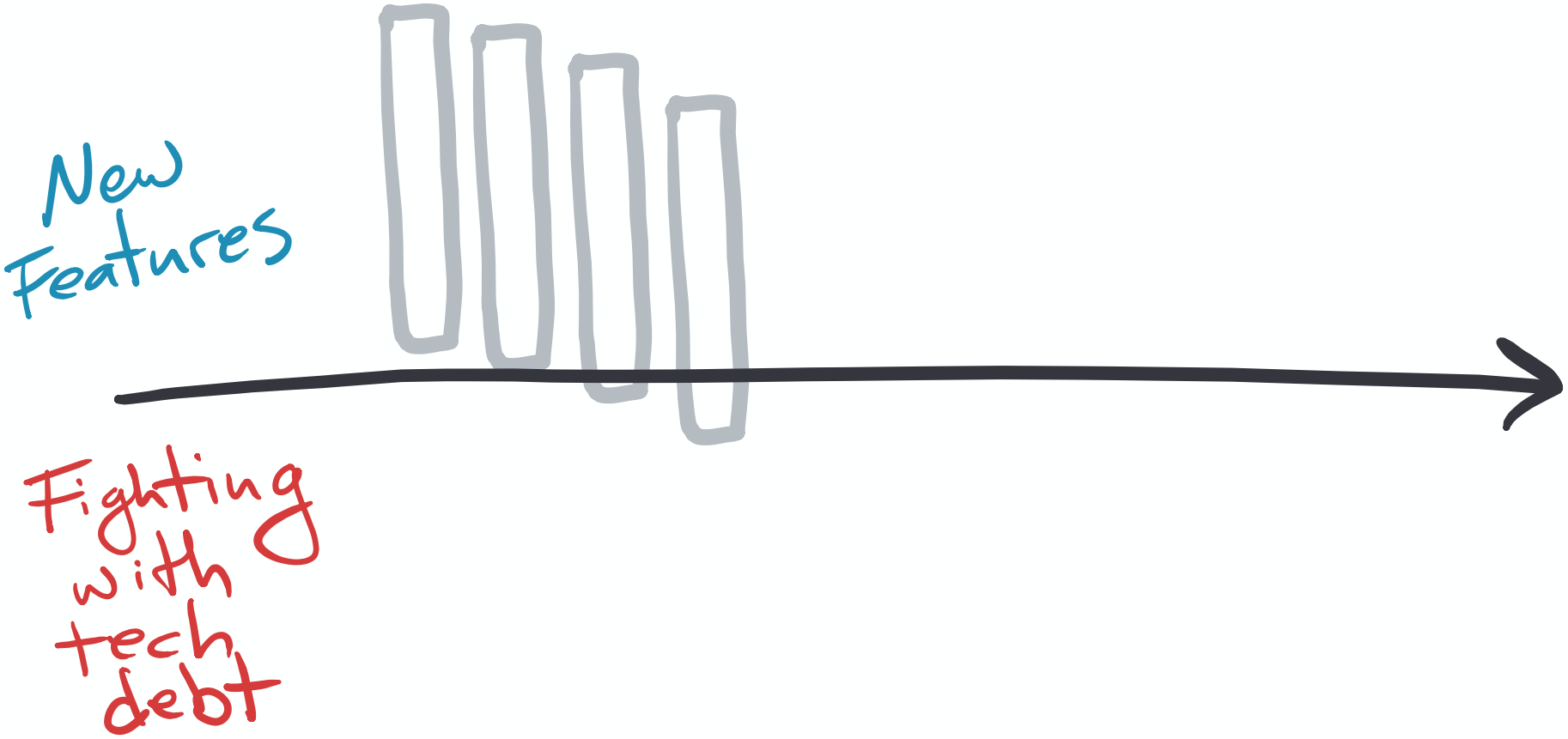

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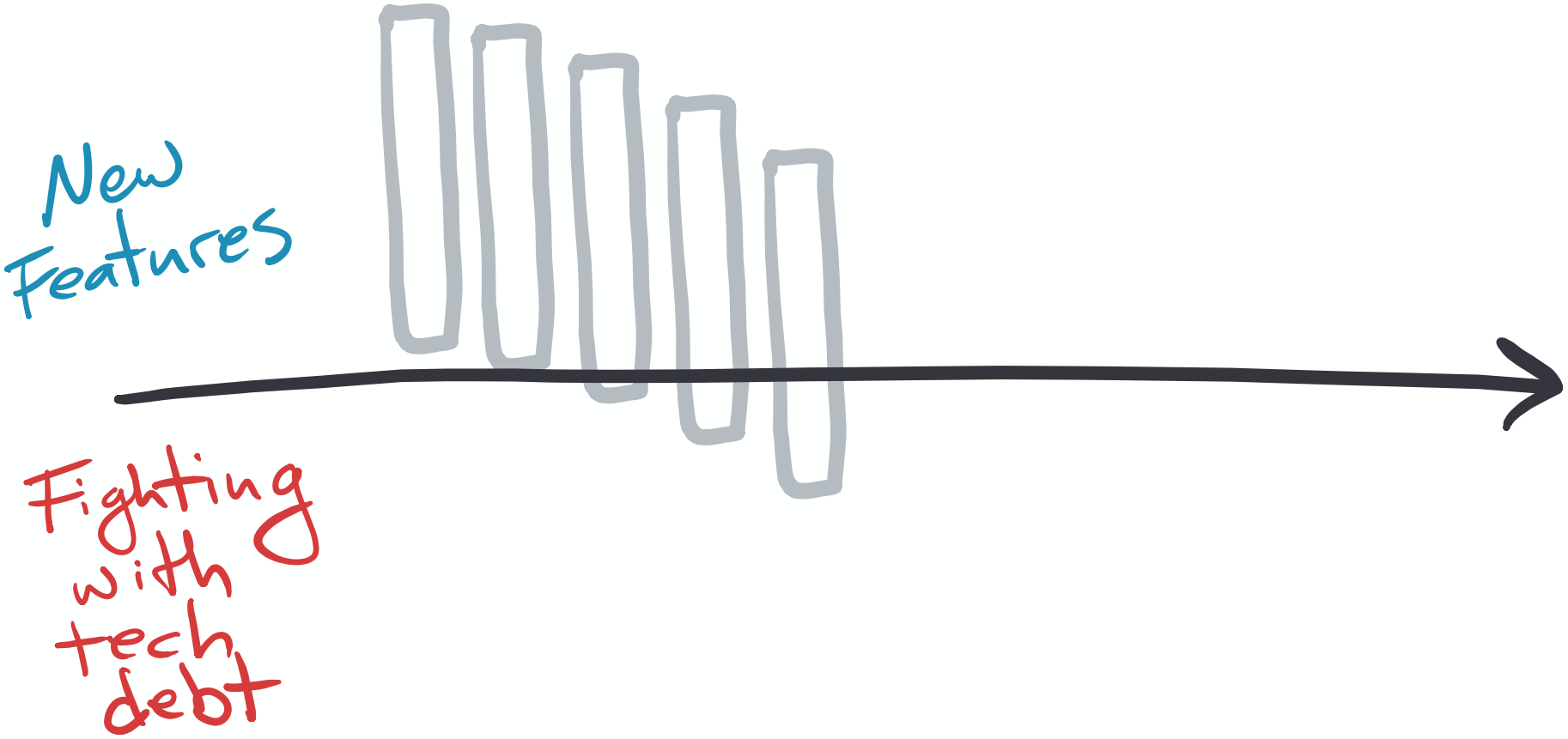

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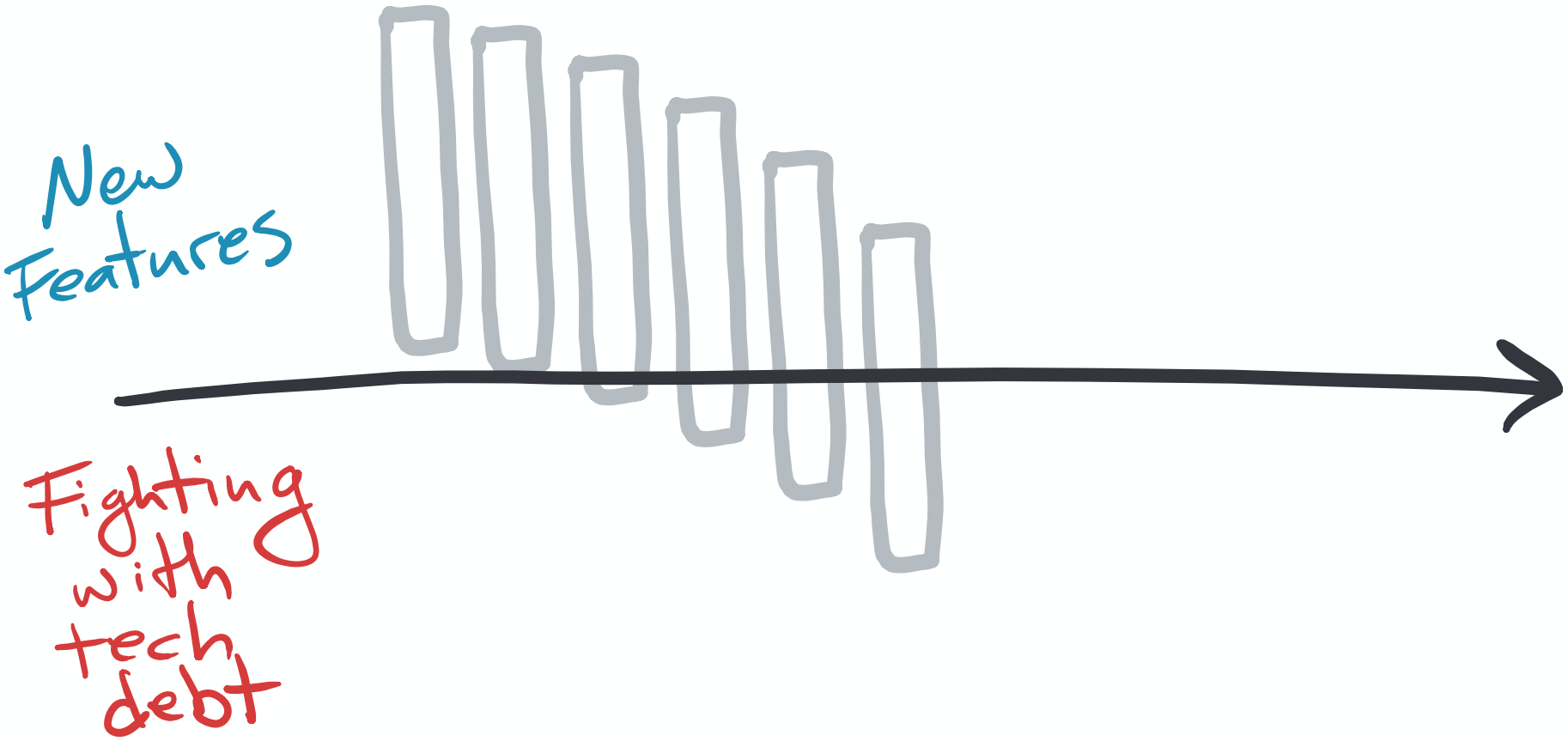

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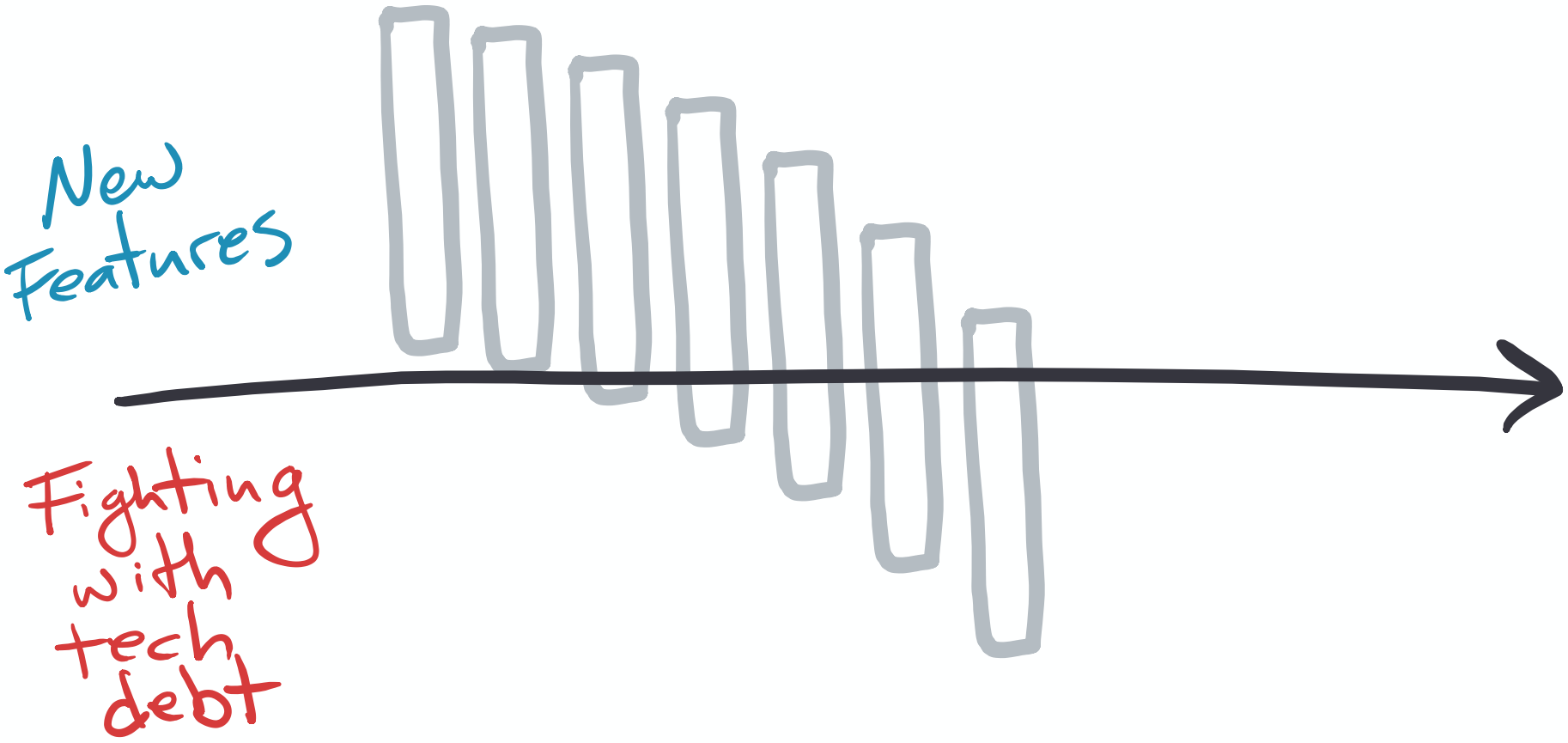

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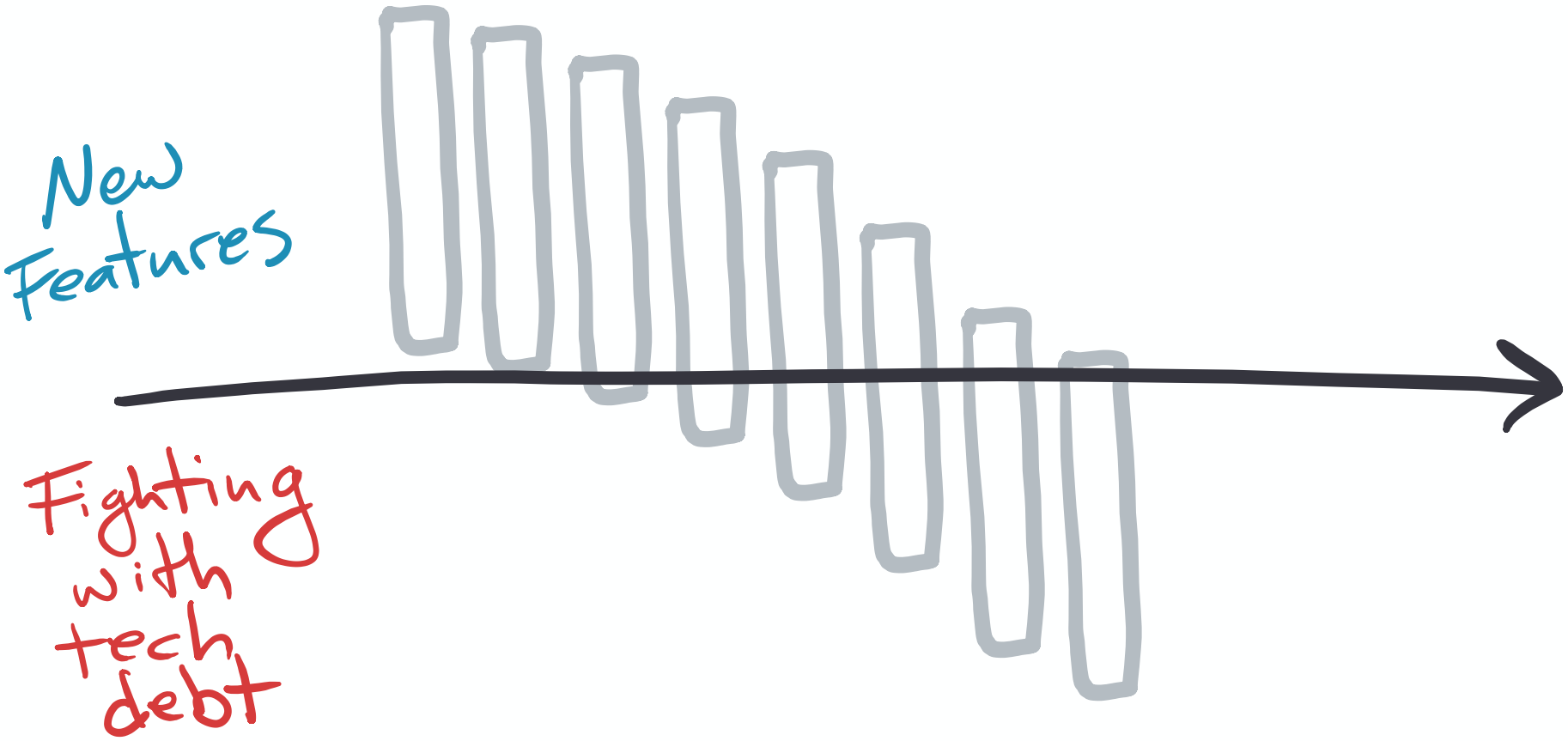

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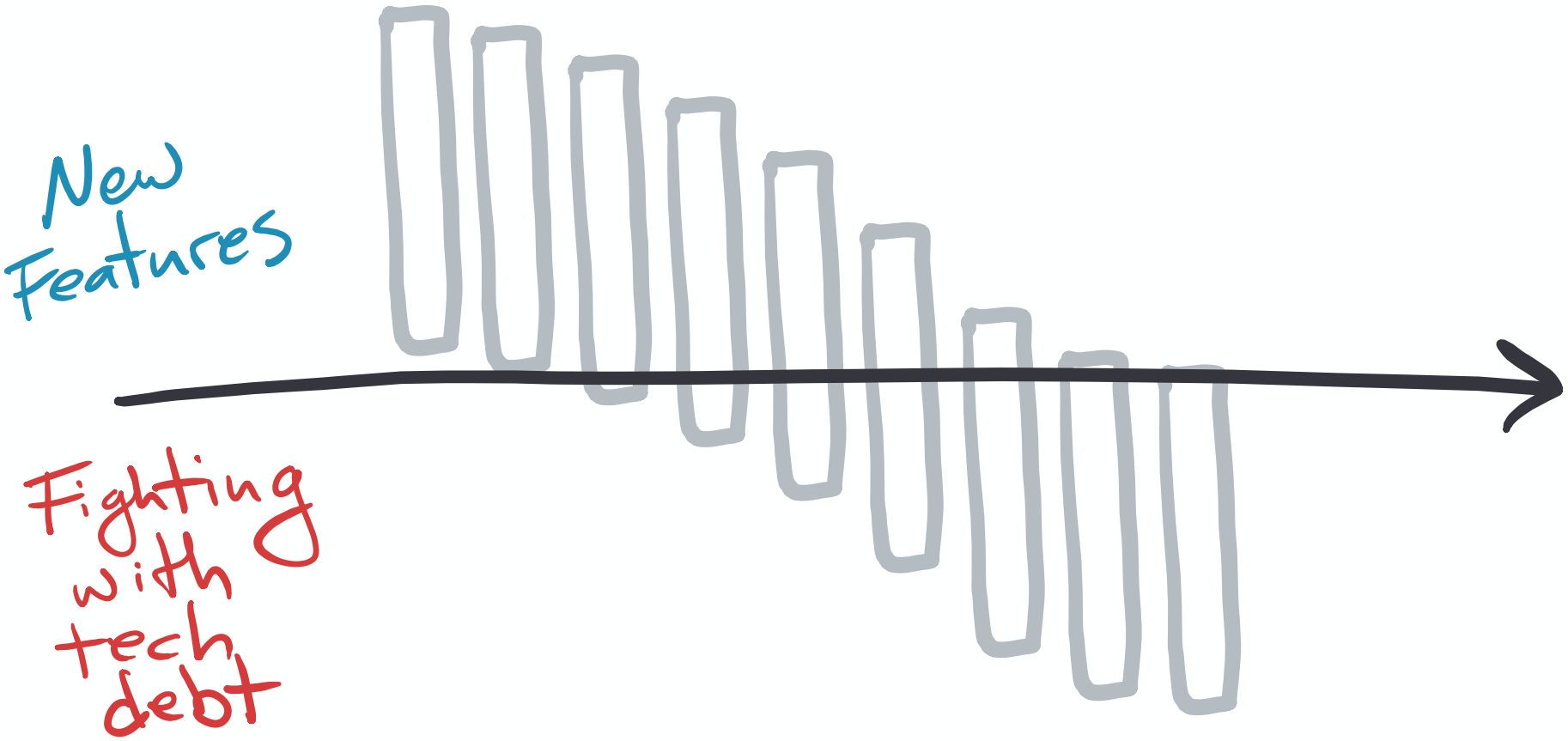

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It is *compounding risk*.

Legacy Modernization

Legacy System → **Modernization** → **Modern System**

Legacy Modernization

Legacy System

The bad old system full of technical debt.

Modernization

Modern System

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Modernization

Modern System

The replacement that will make all of our dreams come true.

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Modernization

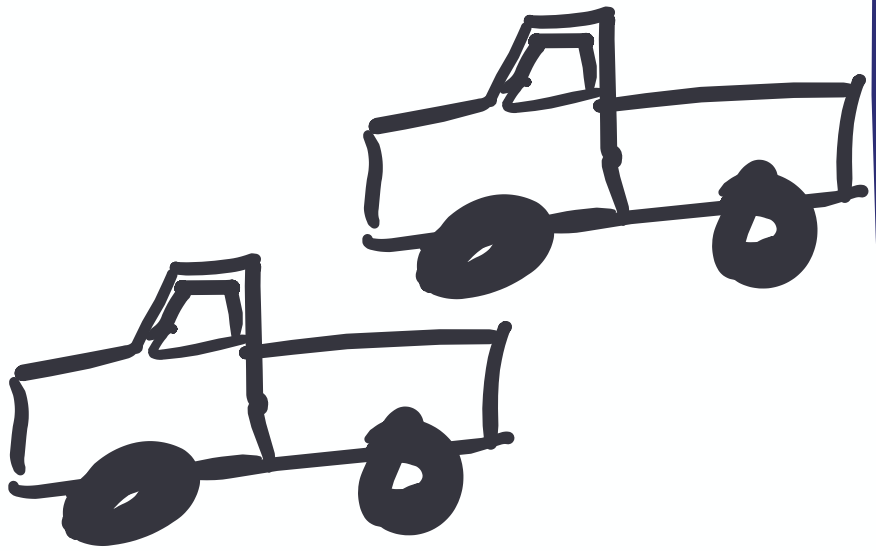
Modern System

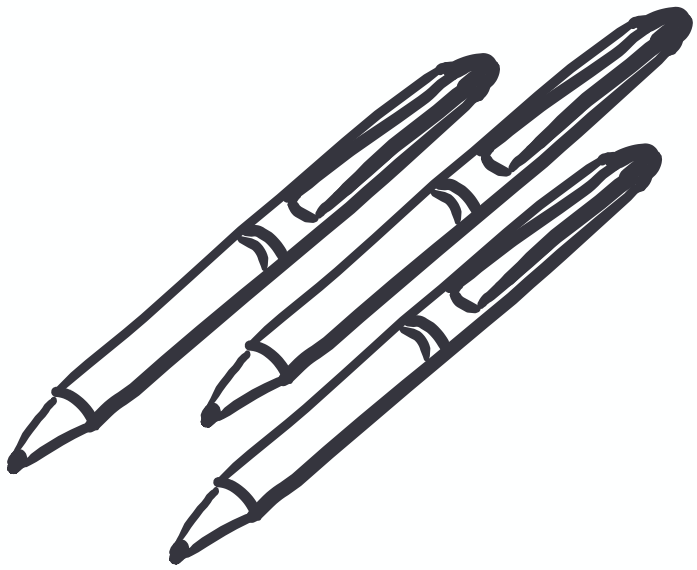
The replacement that will make all of our dreams come true.

Legacy Modernization

“Product” is a problematic metaphor

Trucks, pens, laptops, and code?





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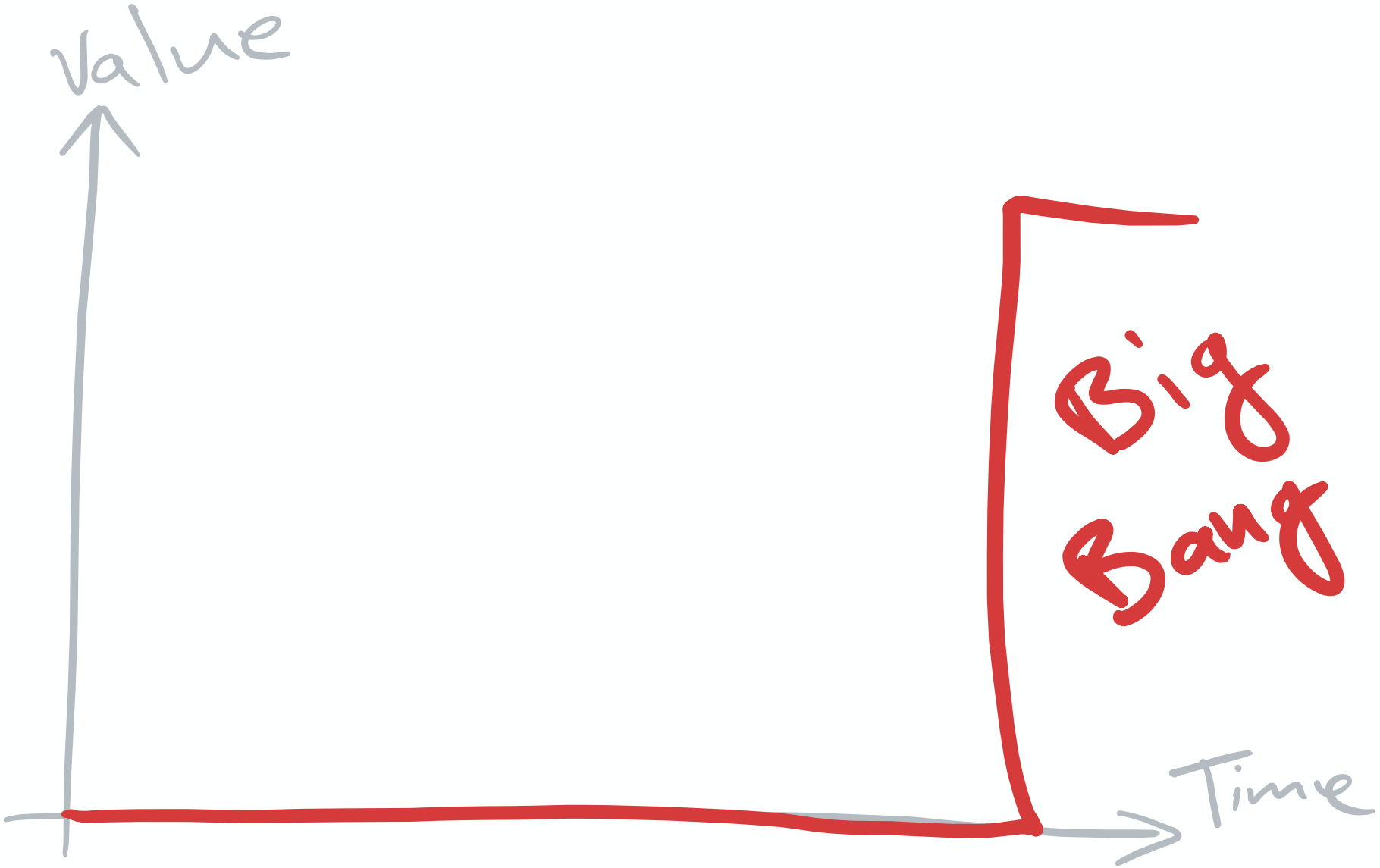
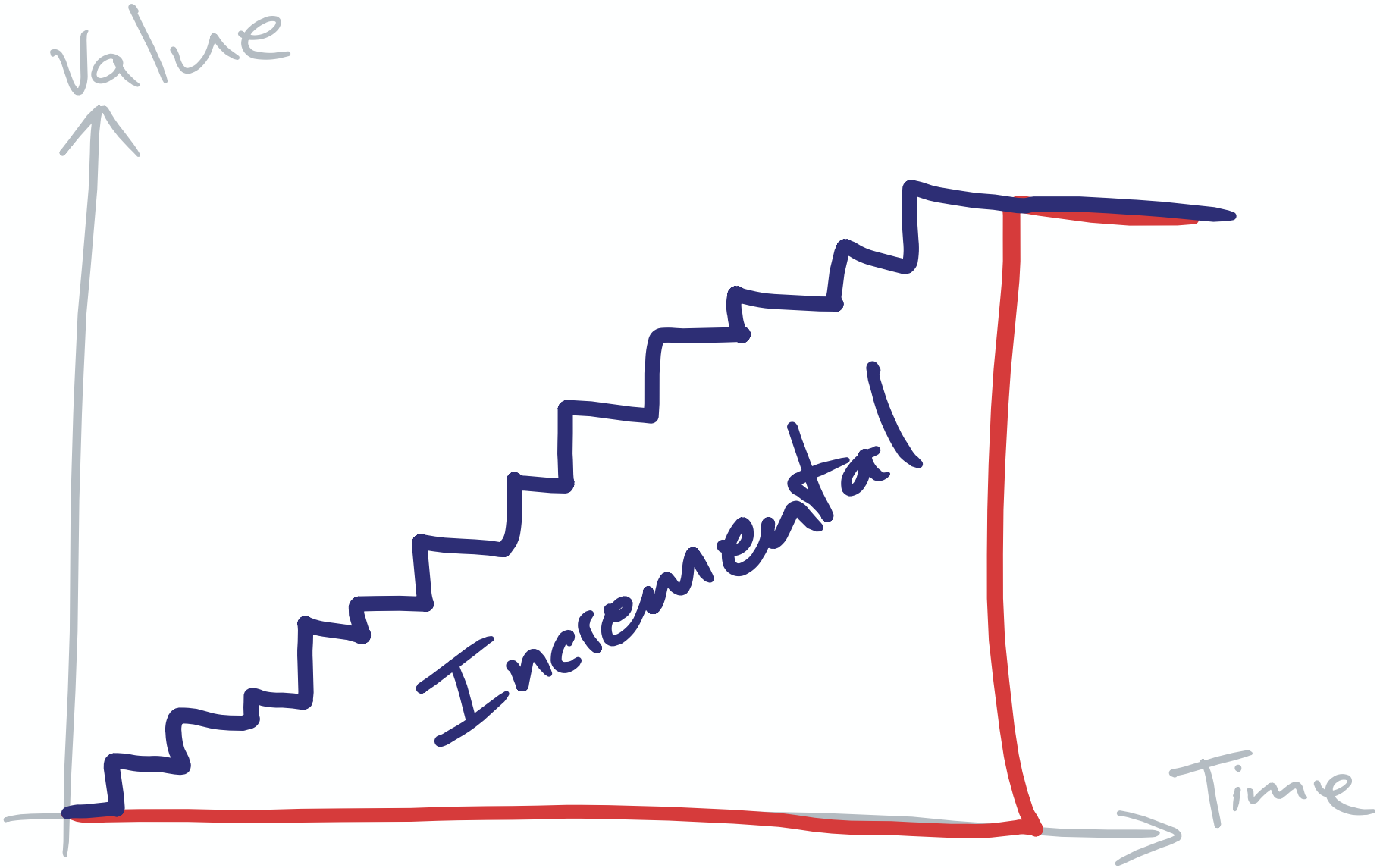
( {$PSItem.SideIndicator
-eq "<="} {
Copy-Item -Path
$PSItem.InputObject
```

The Promise of Agile Delivery


Value
Time


Value
Big Bang
Time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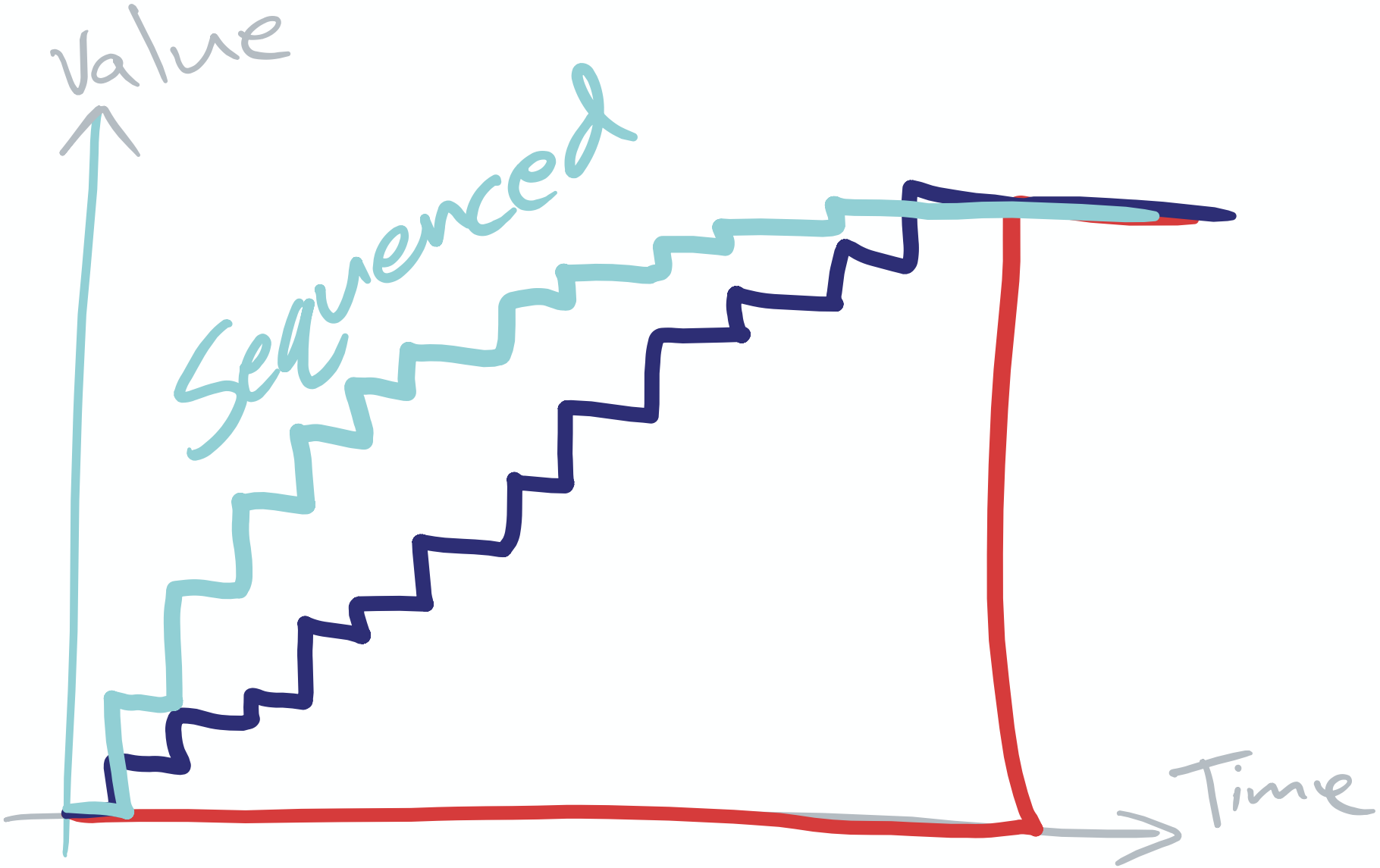
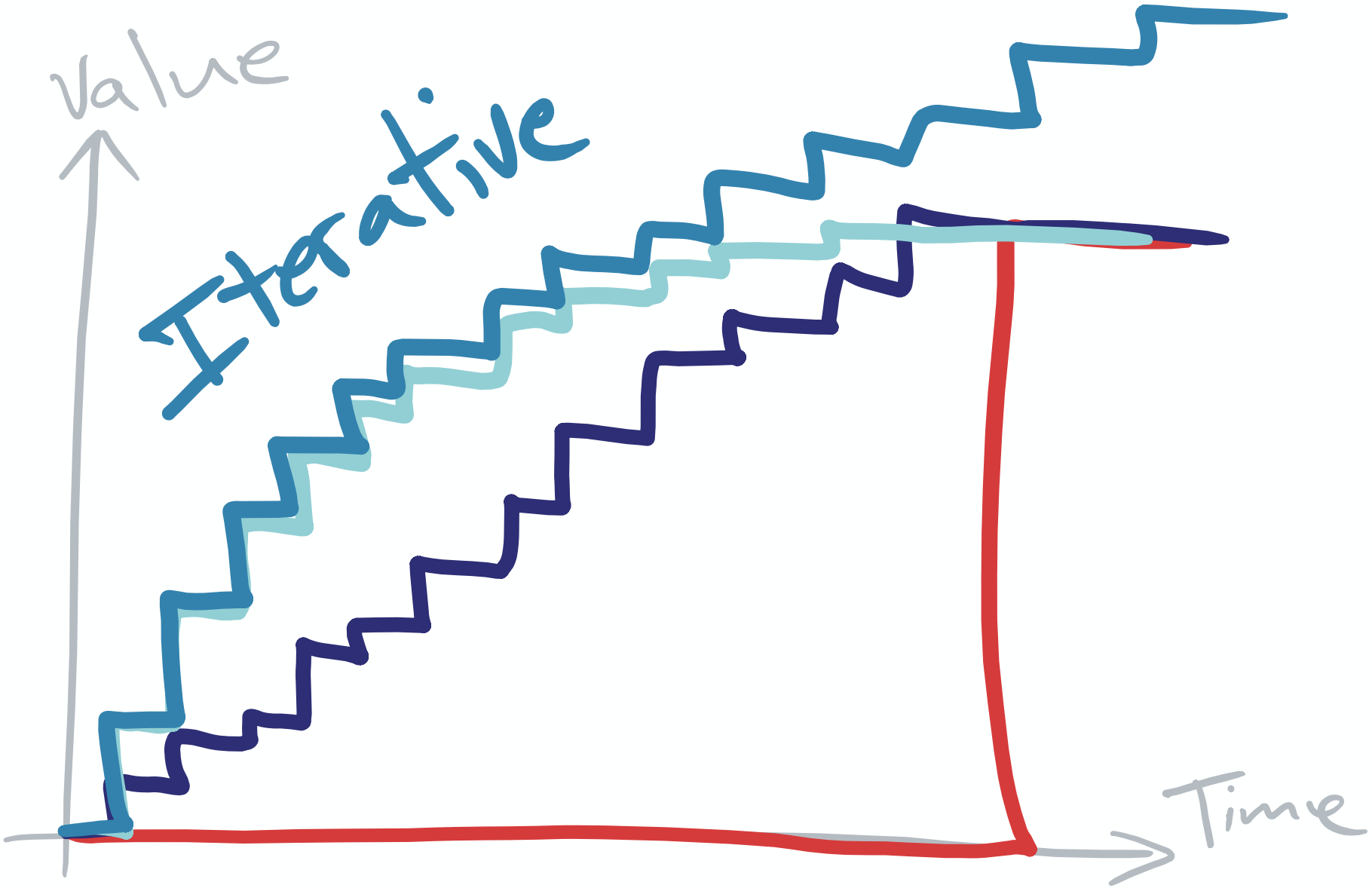
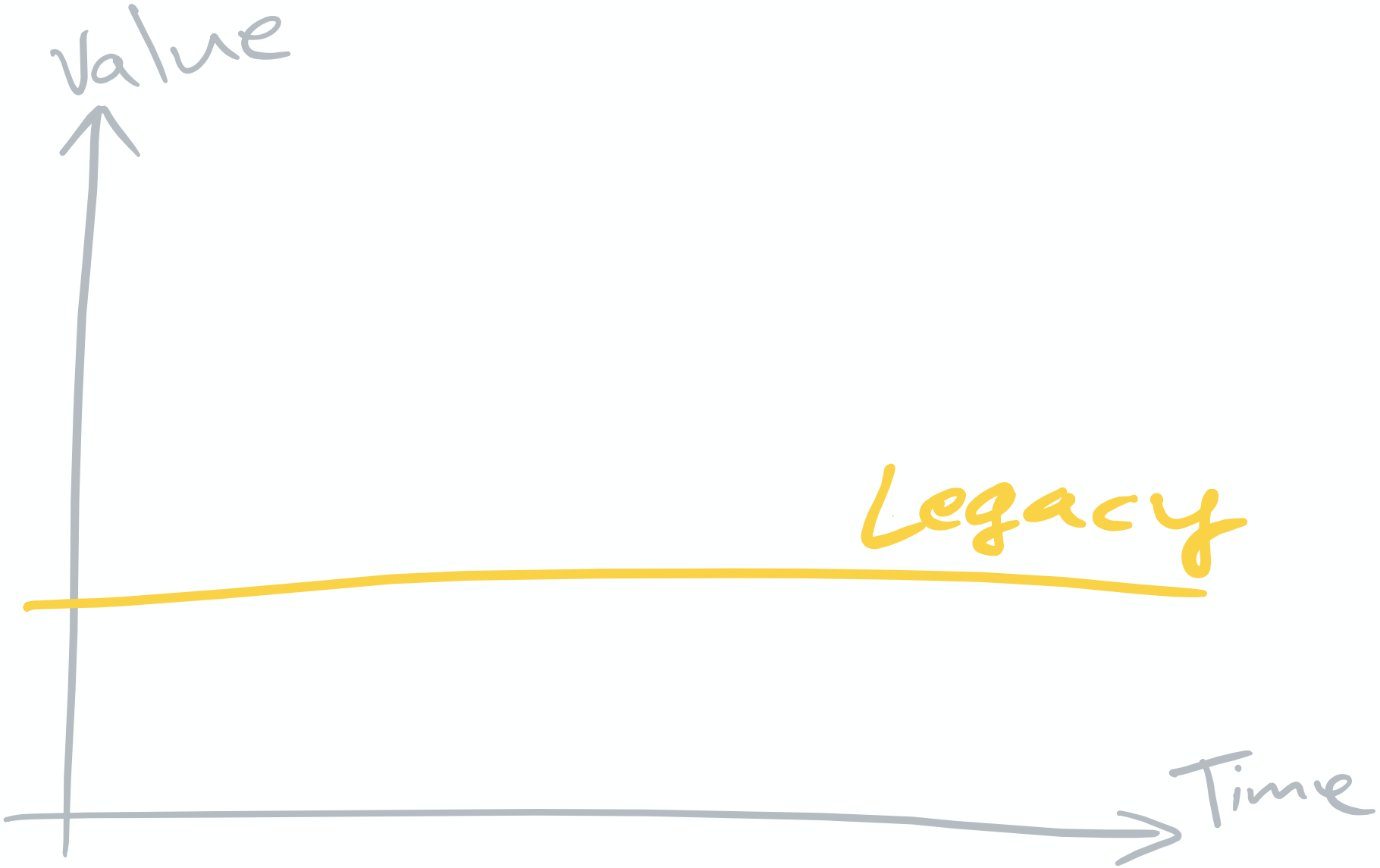
Incremental
Time

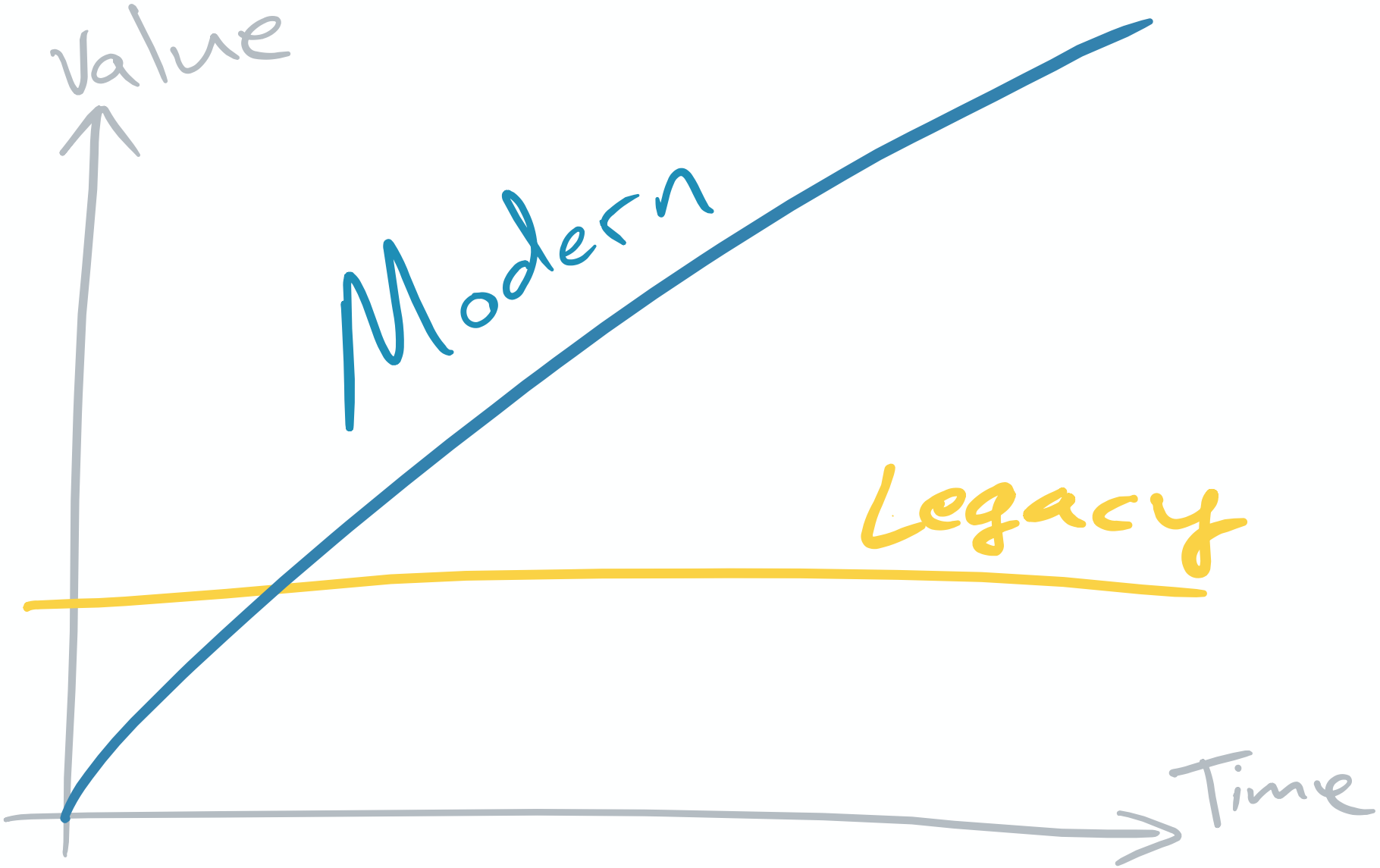

Value
Sequenced
Time

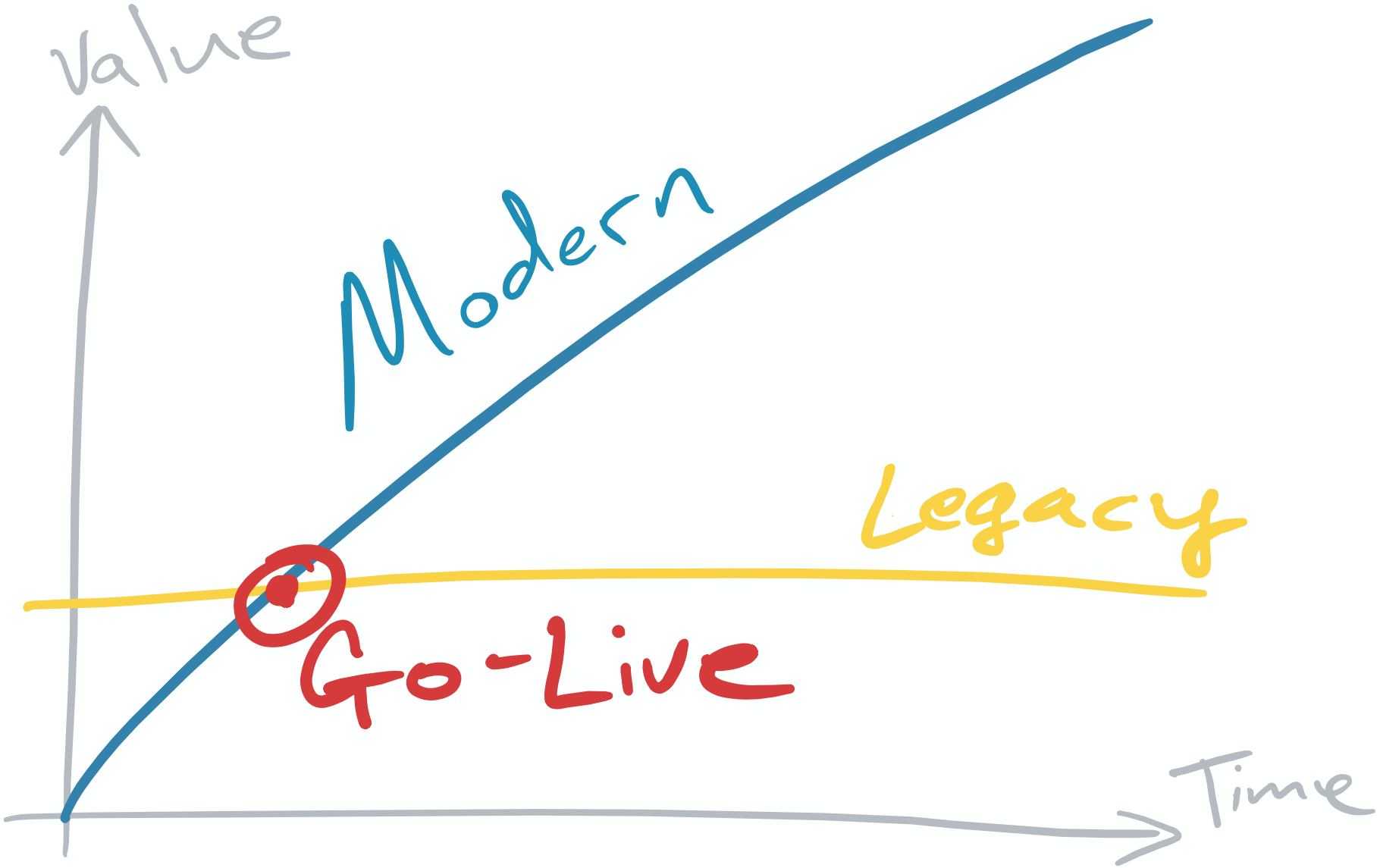

Value
Iterative
Time

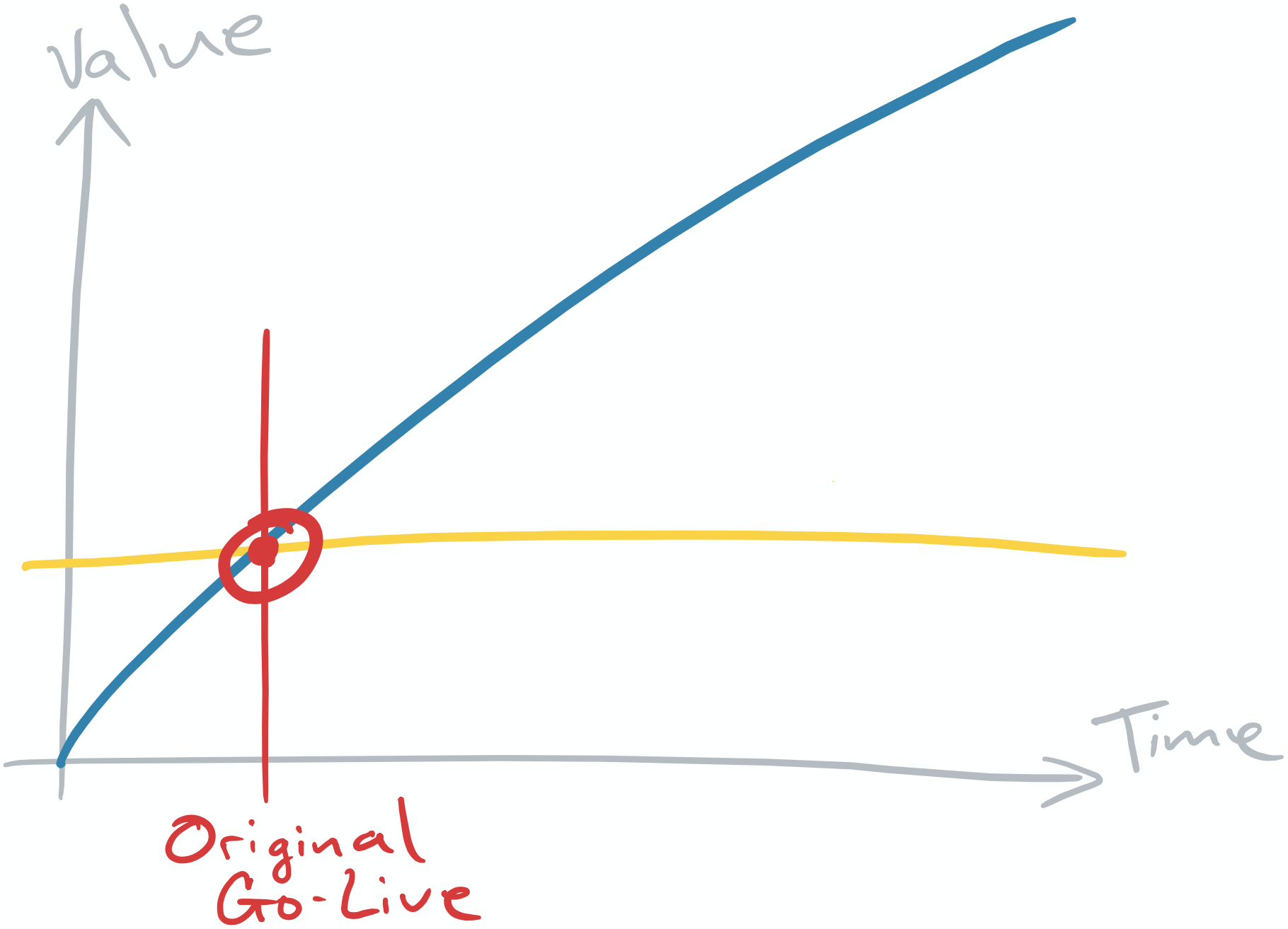
The Problem of Modernization

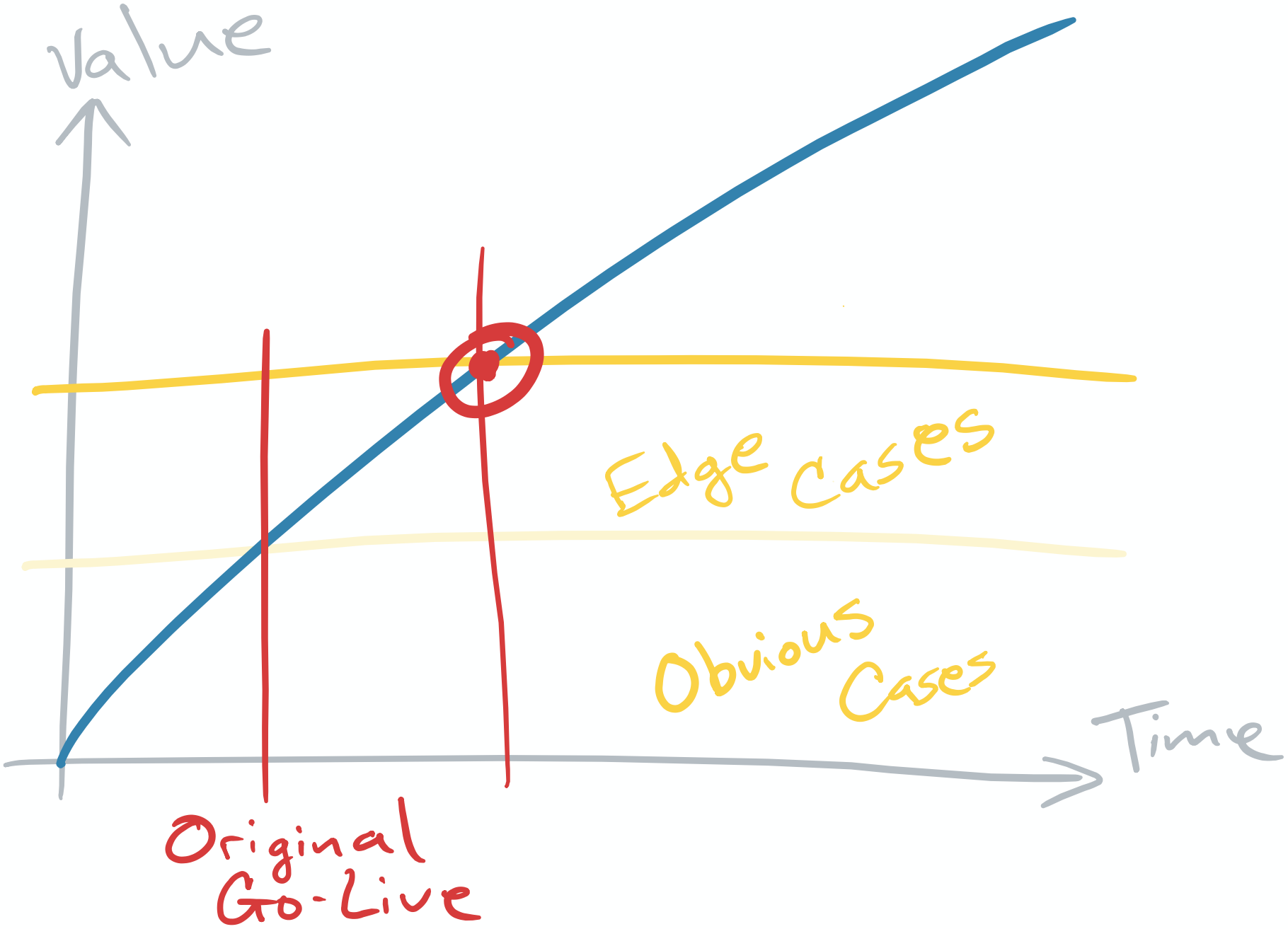

Value
Time

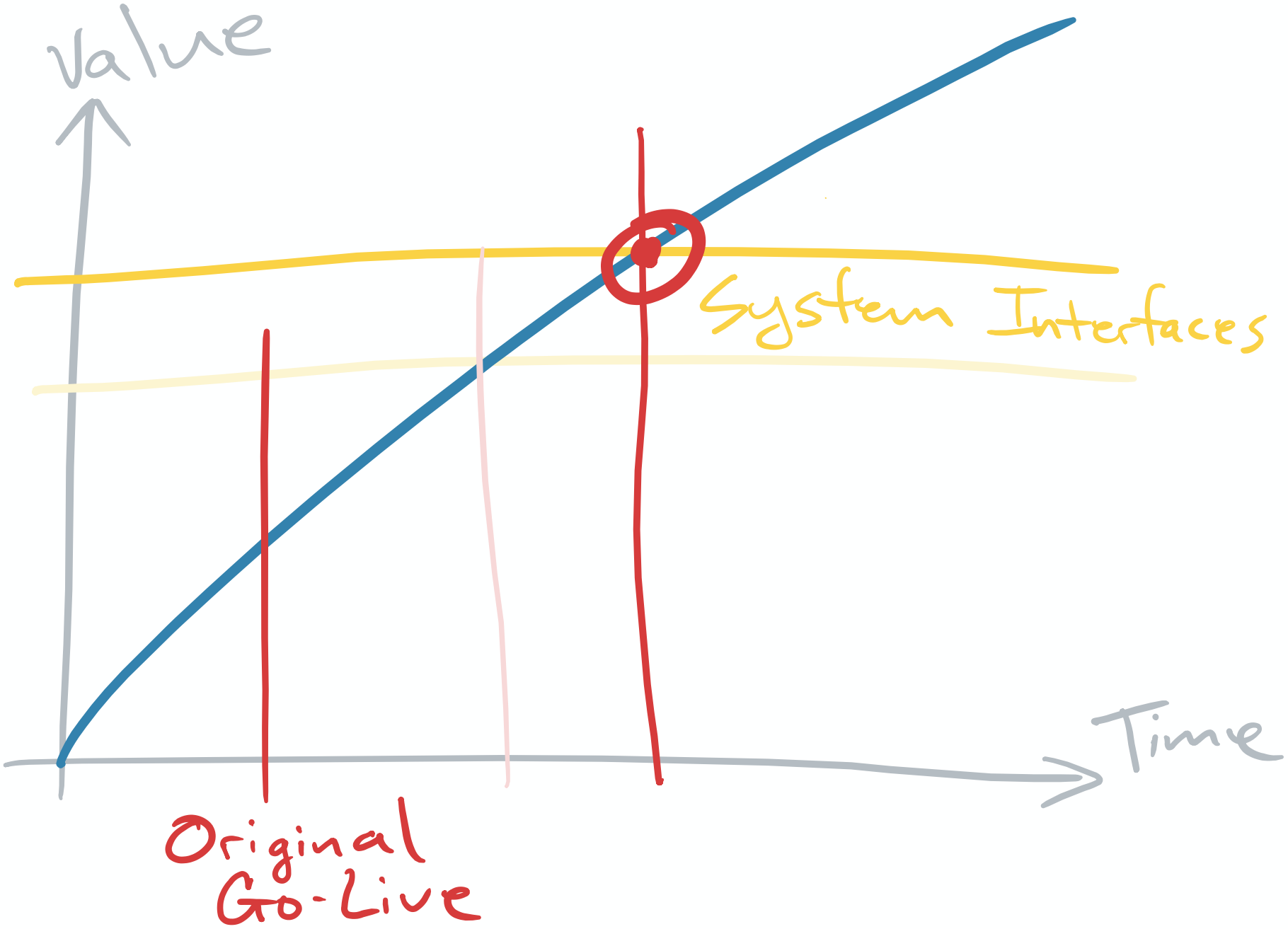

Value
Legacy
Time

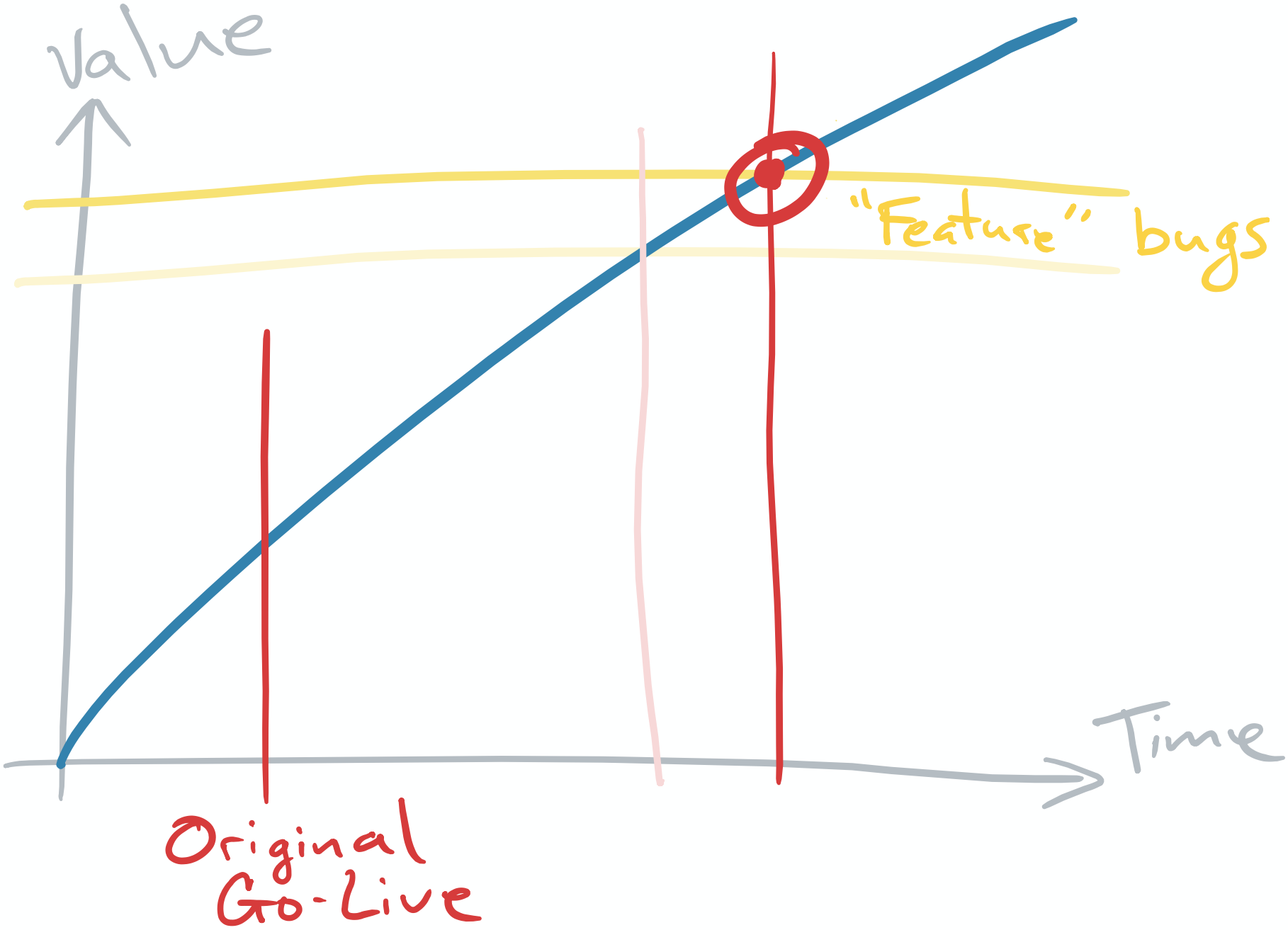

Value
Modern
Legacy
Time

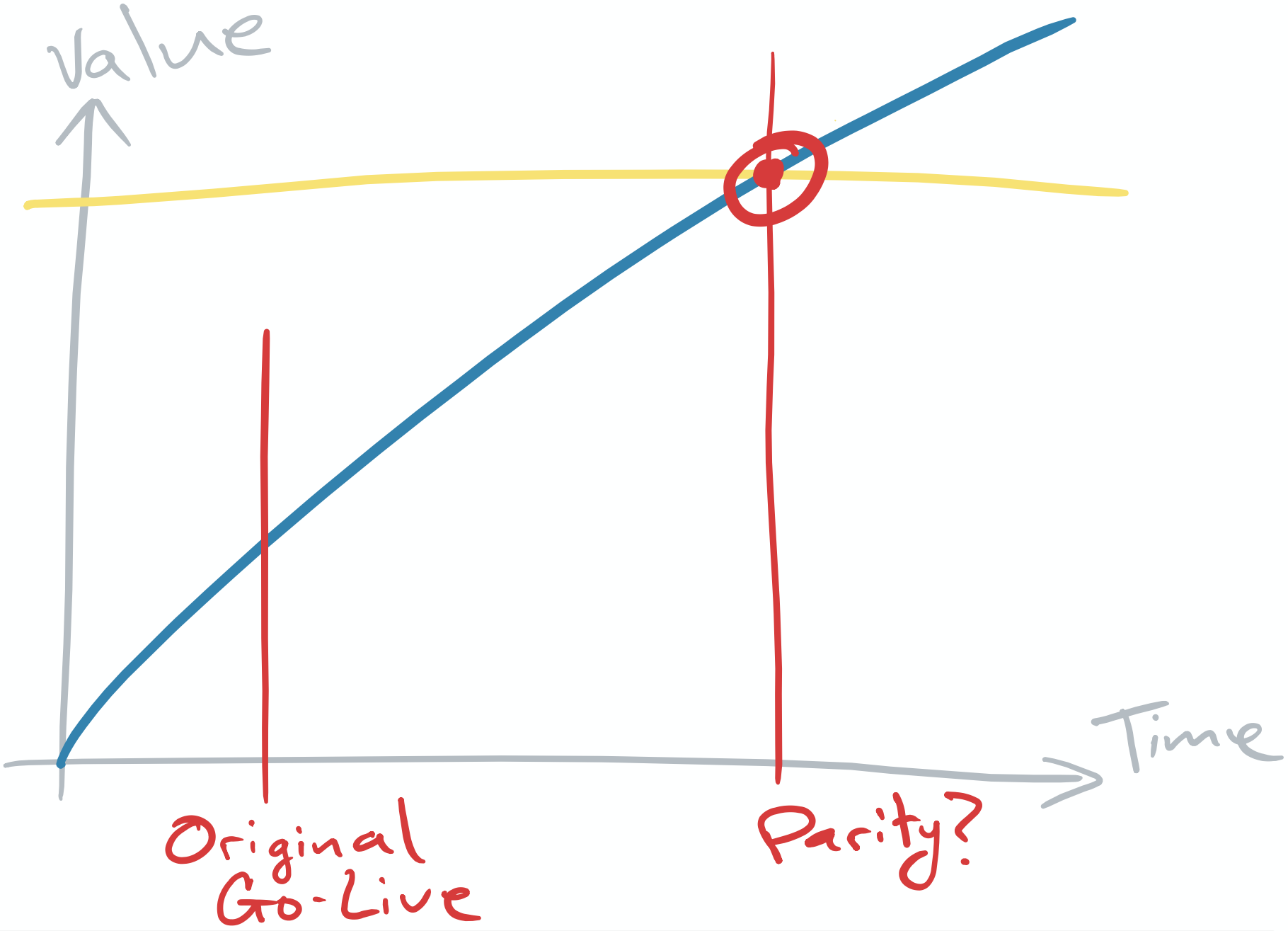

Value
Modern
Legacy
Go-Live
Time

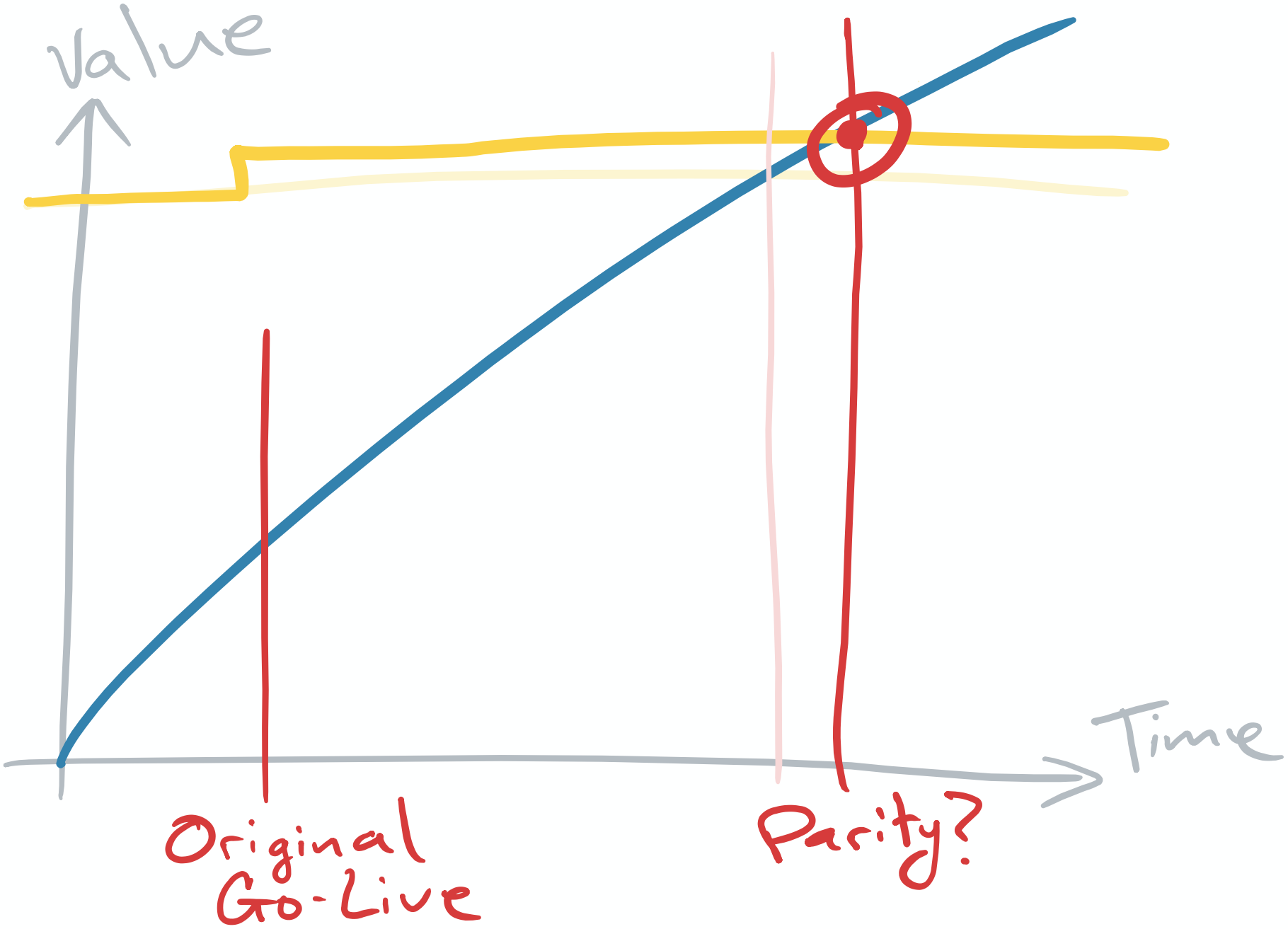

Value
Time
Original
Go-Live

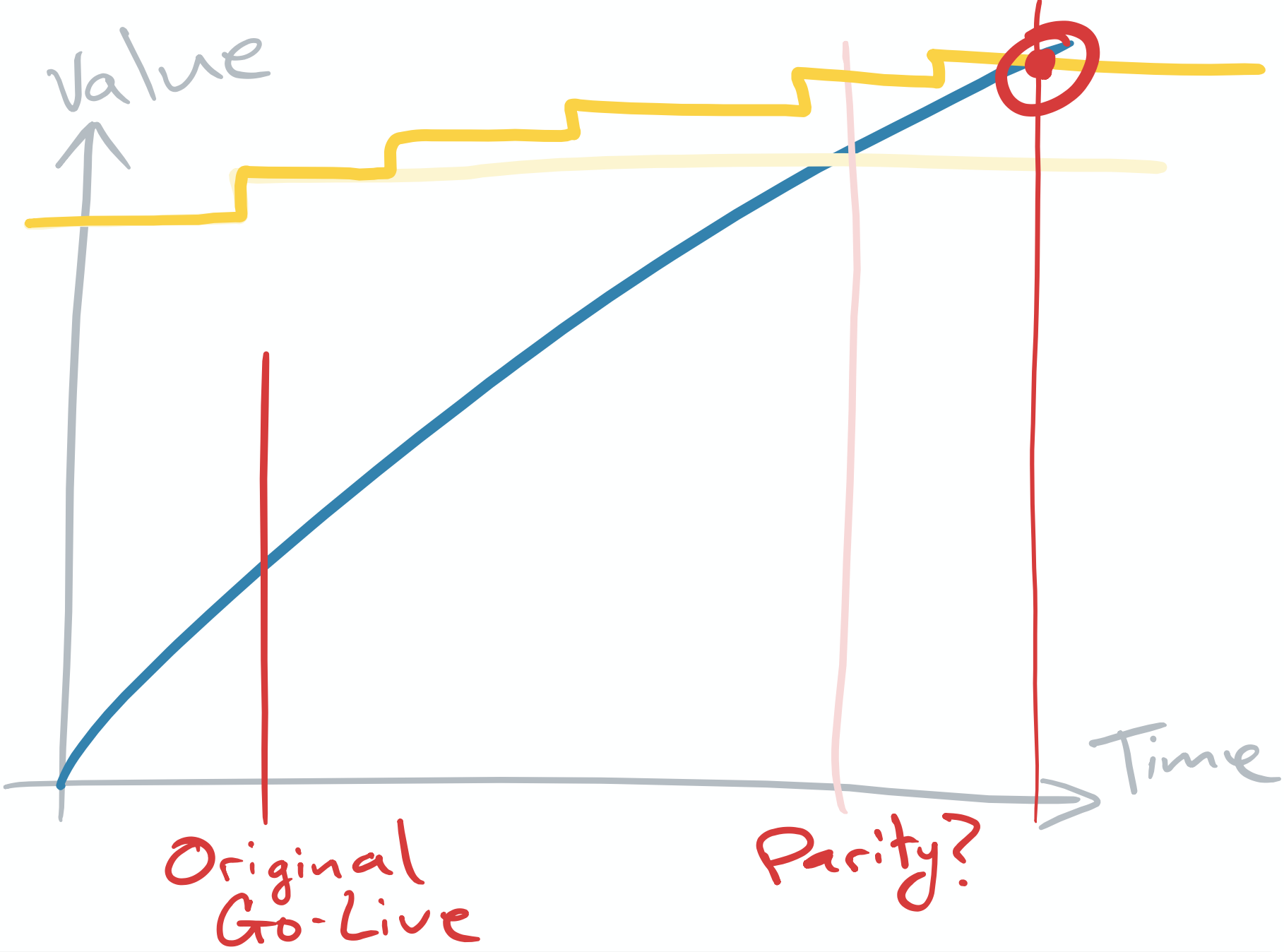

Value
Edge cases
Obvious Cases
Time
Original Go-Live

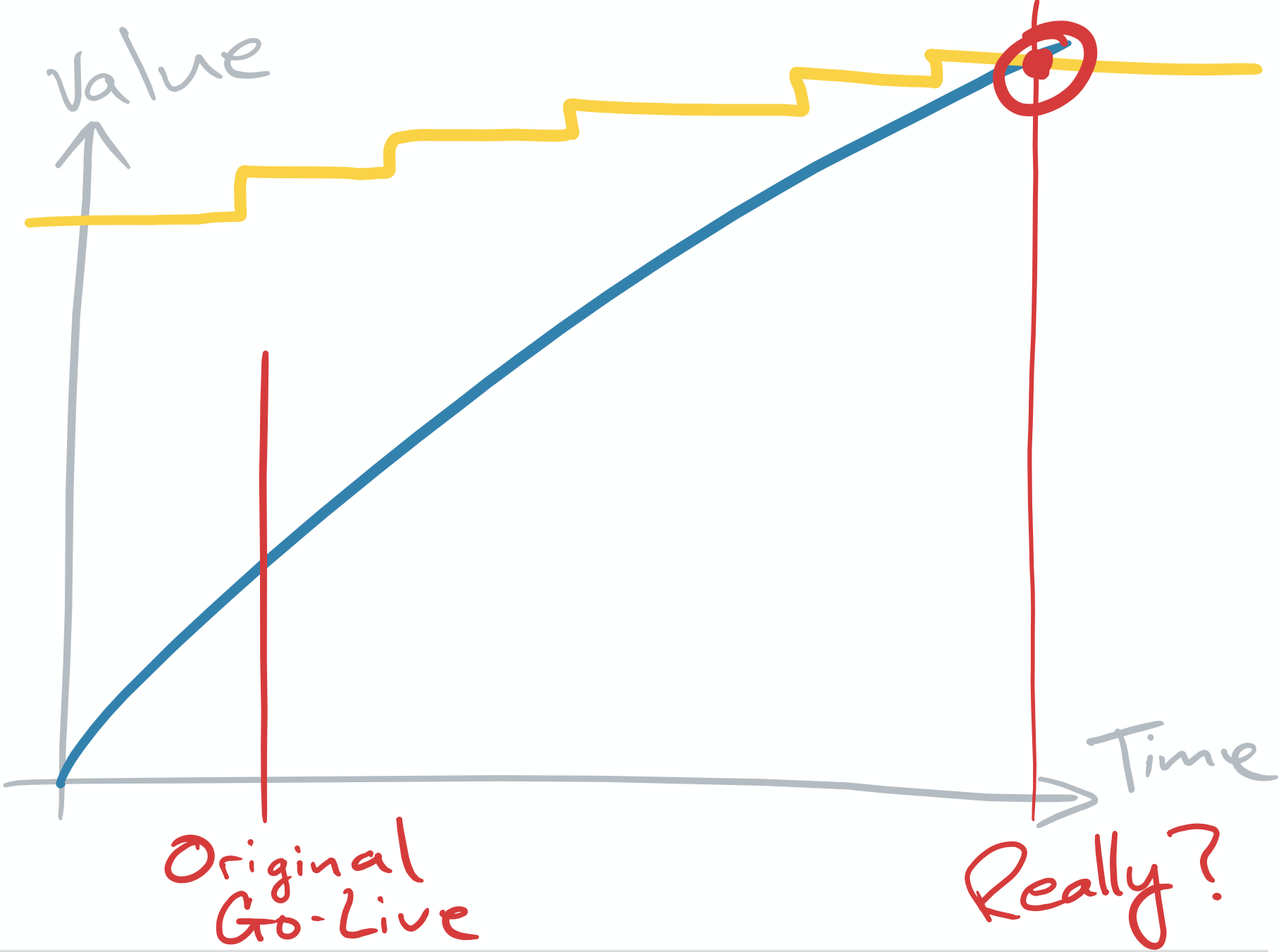

Value
System Interfaces
Time
Original
Go-Live

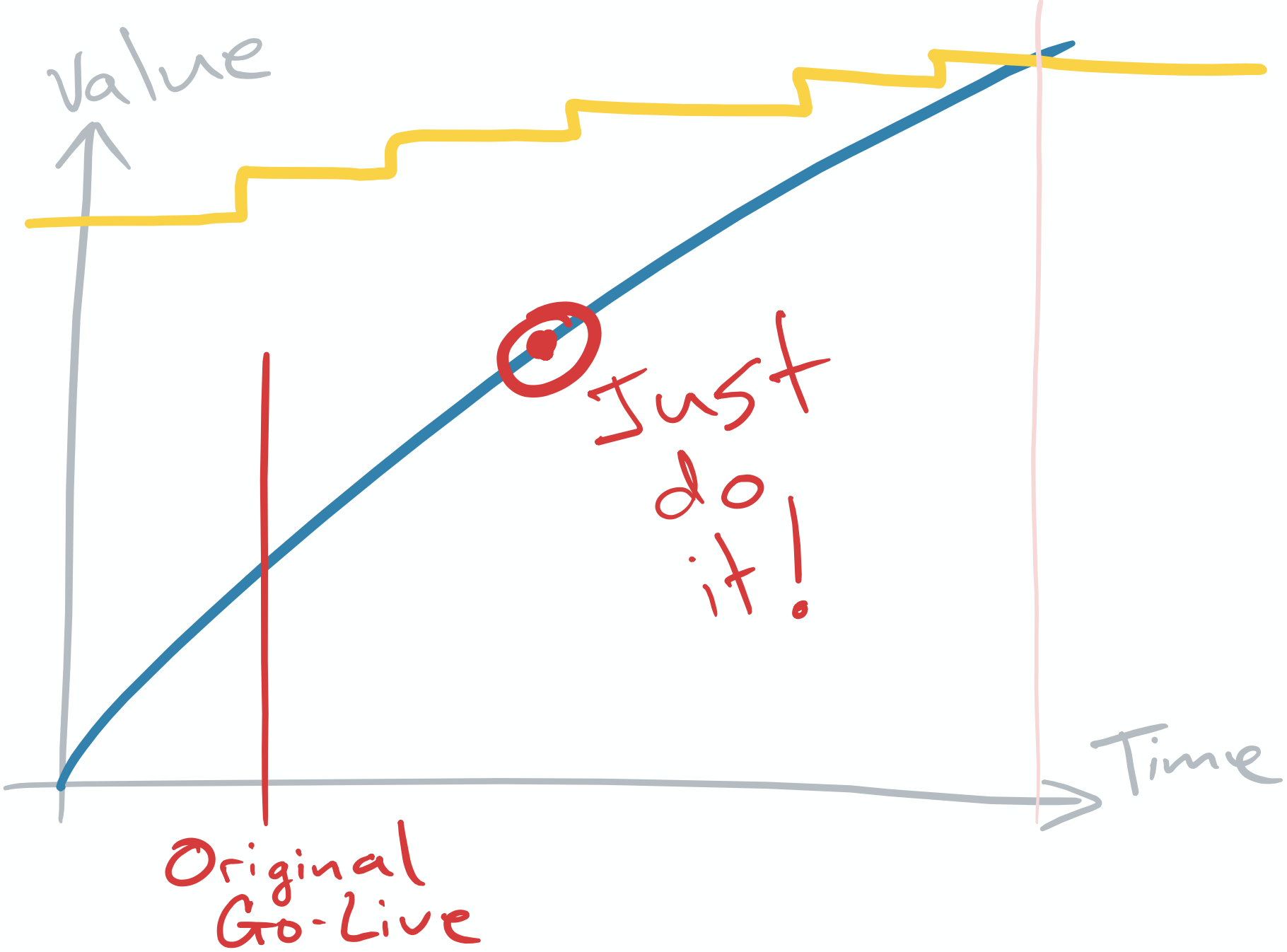

Value
"Feature" bugs
Time
Original
Go-Live

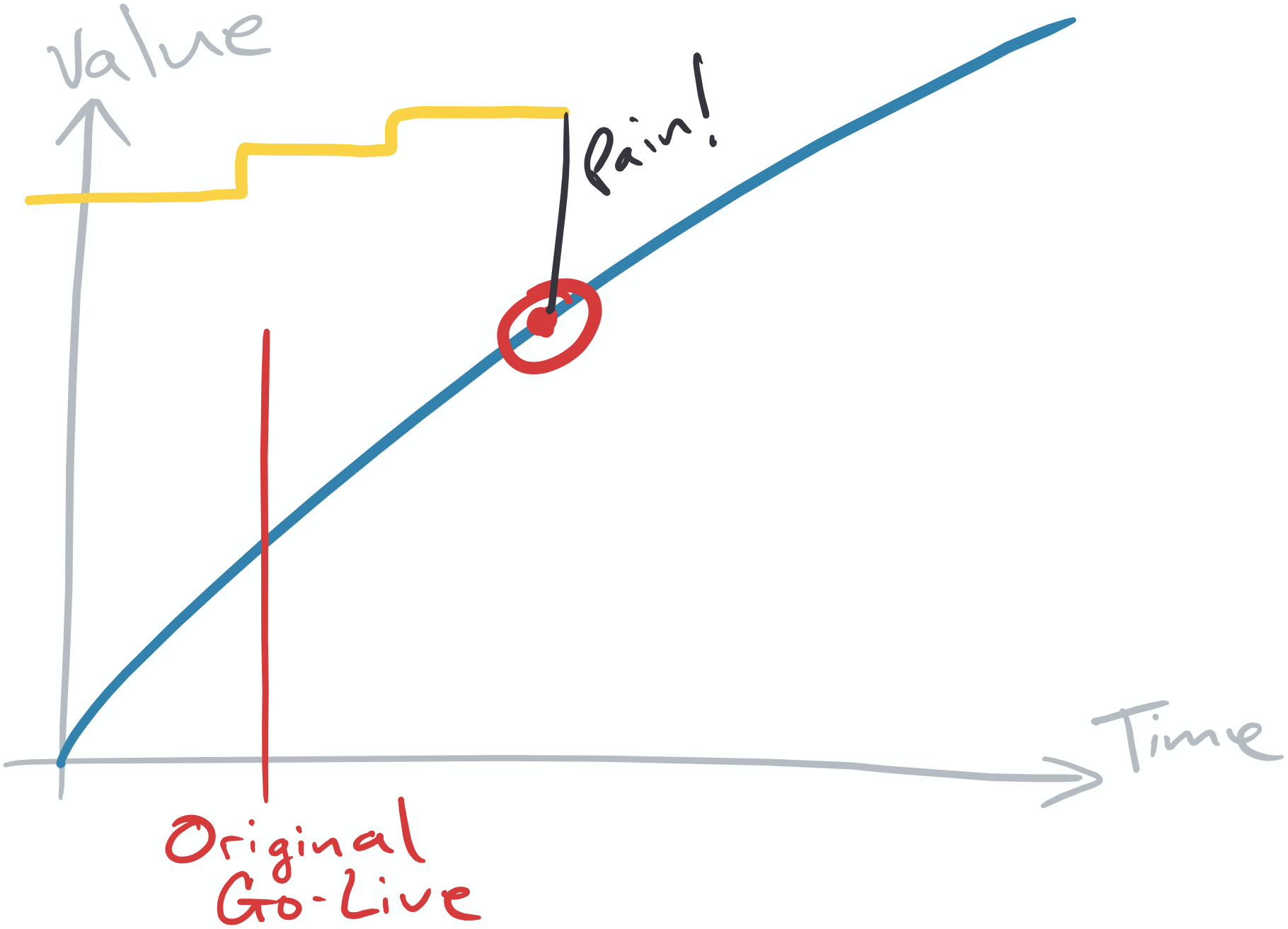

Value
Time
Original Go-Live
Parity?

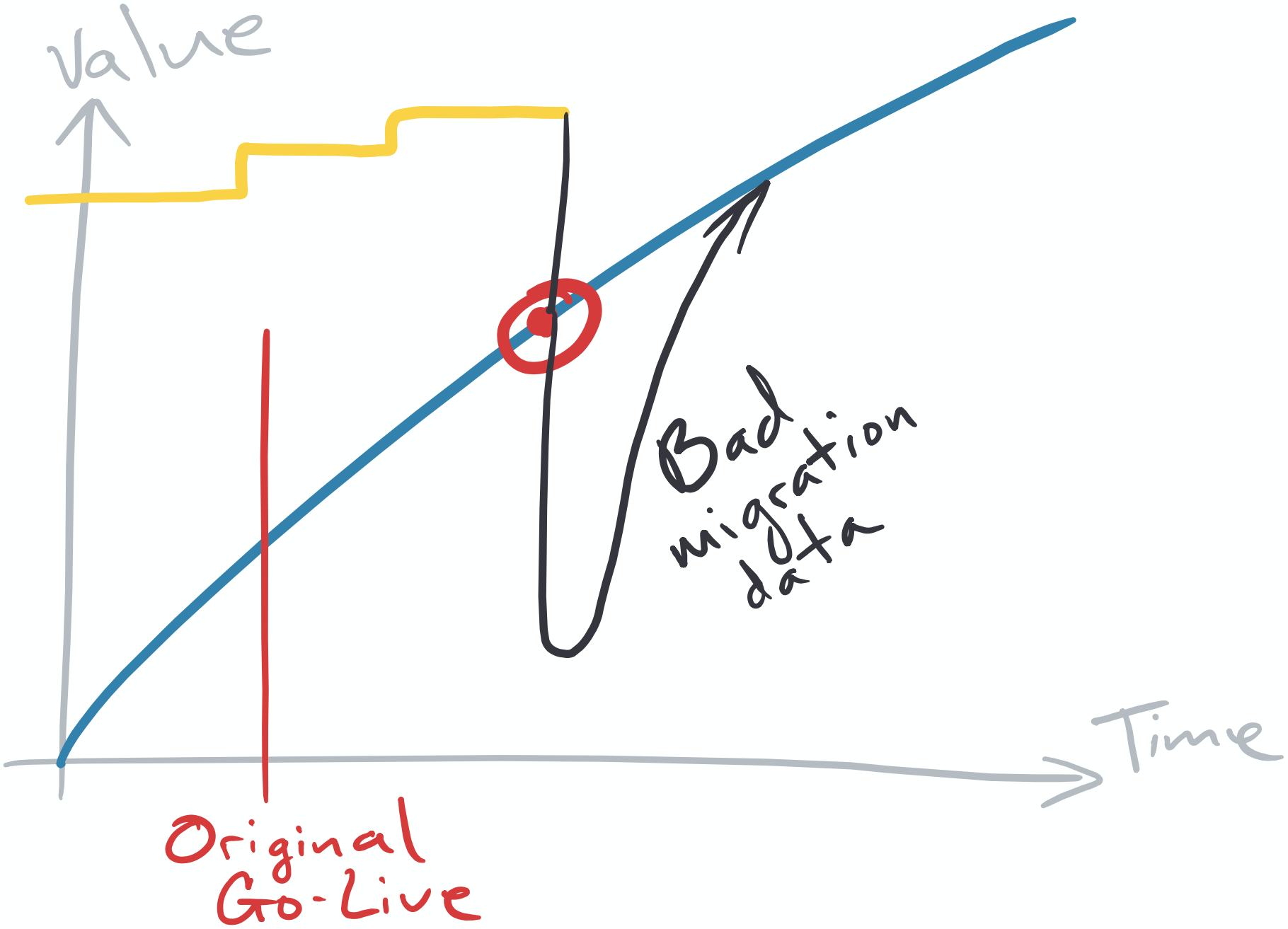

Value
Time
Original Go-Live
Parity?


Value
Time
Original Go-Live
Parity?

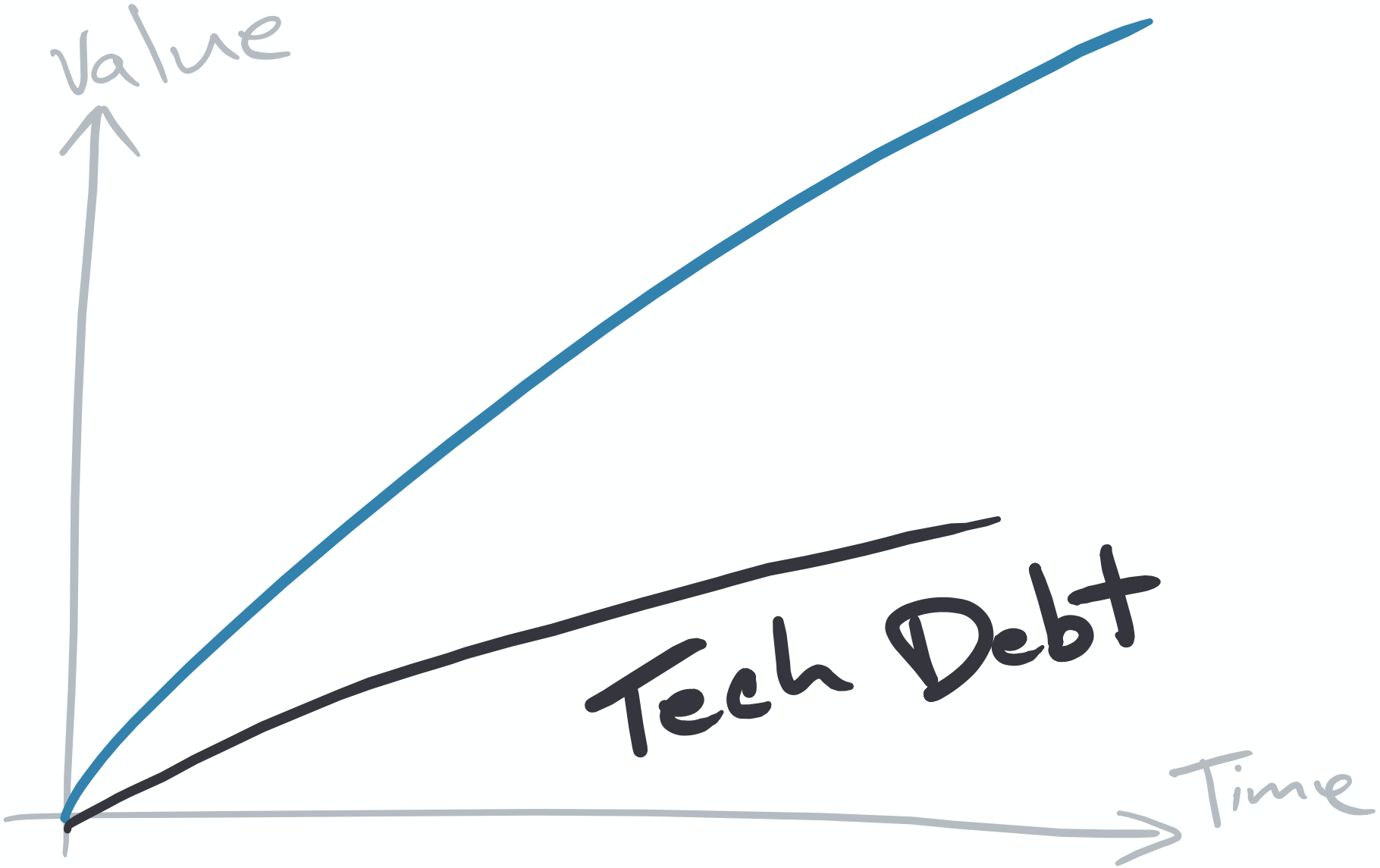

Value
Time
Original Go-Live
Really?

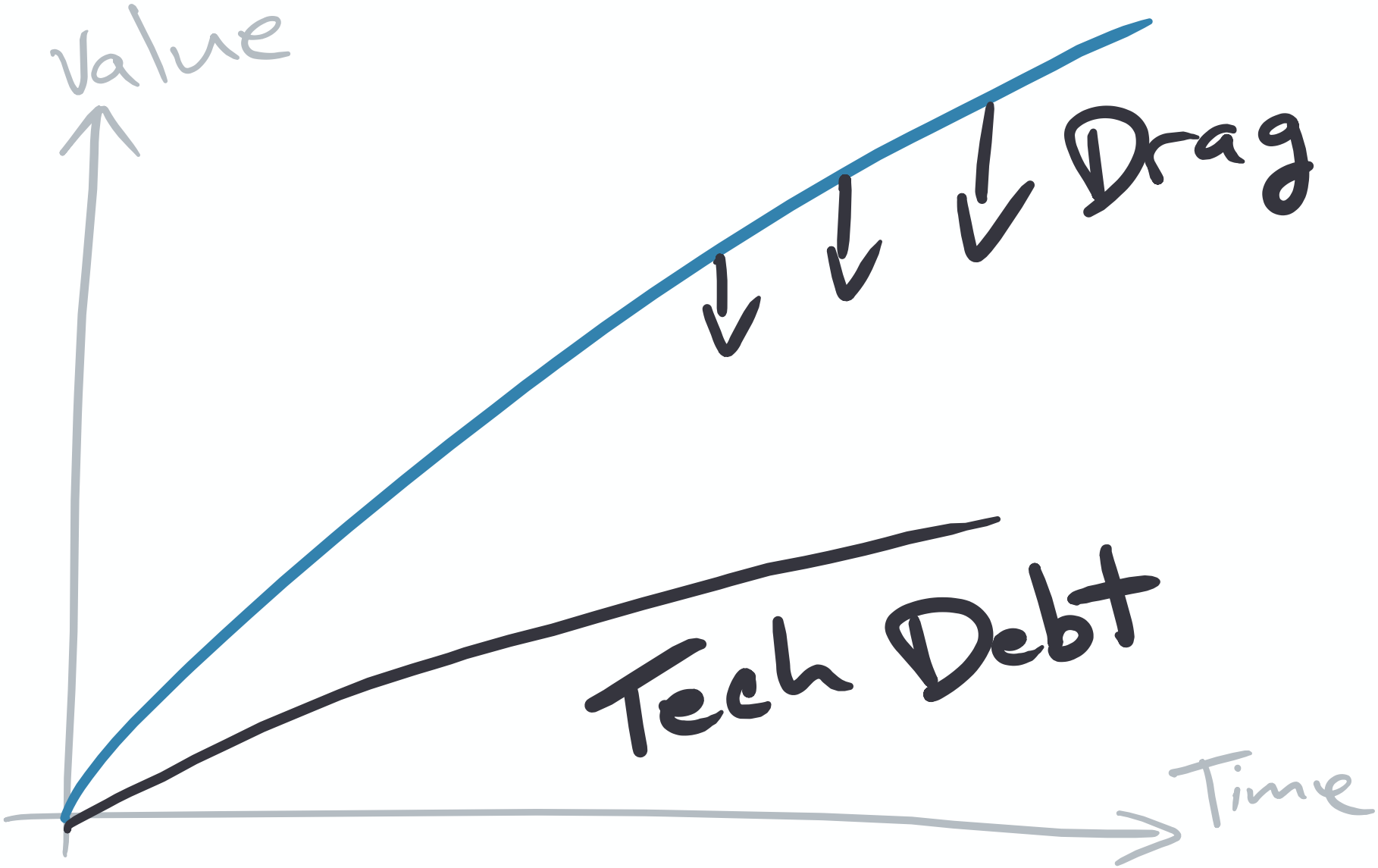

Value
Just do it!
Time
Original Go-Live

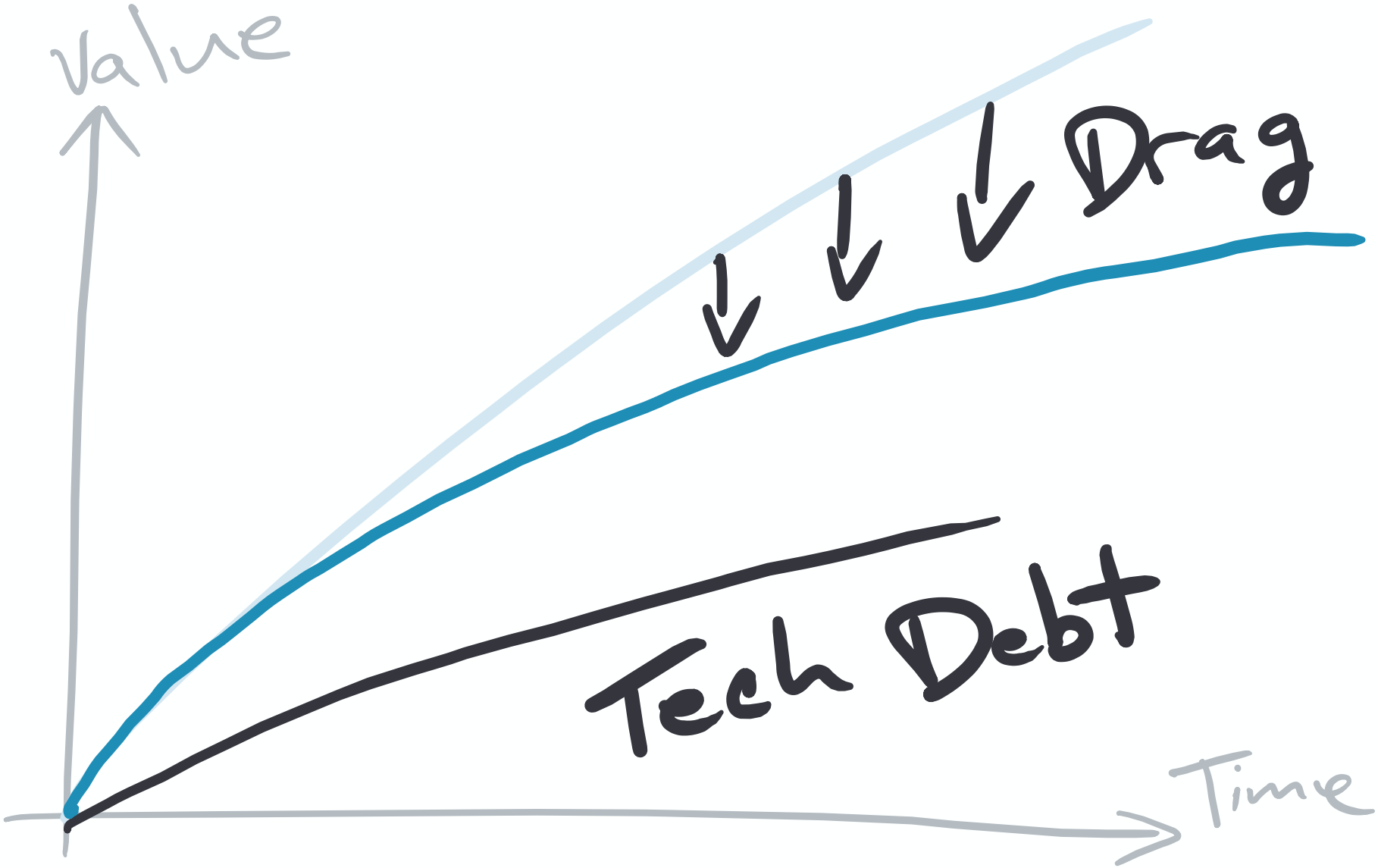

Value
Pain!
Time
Original
Go-Live

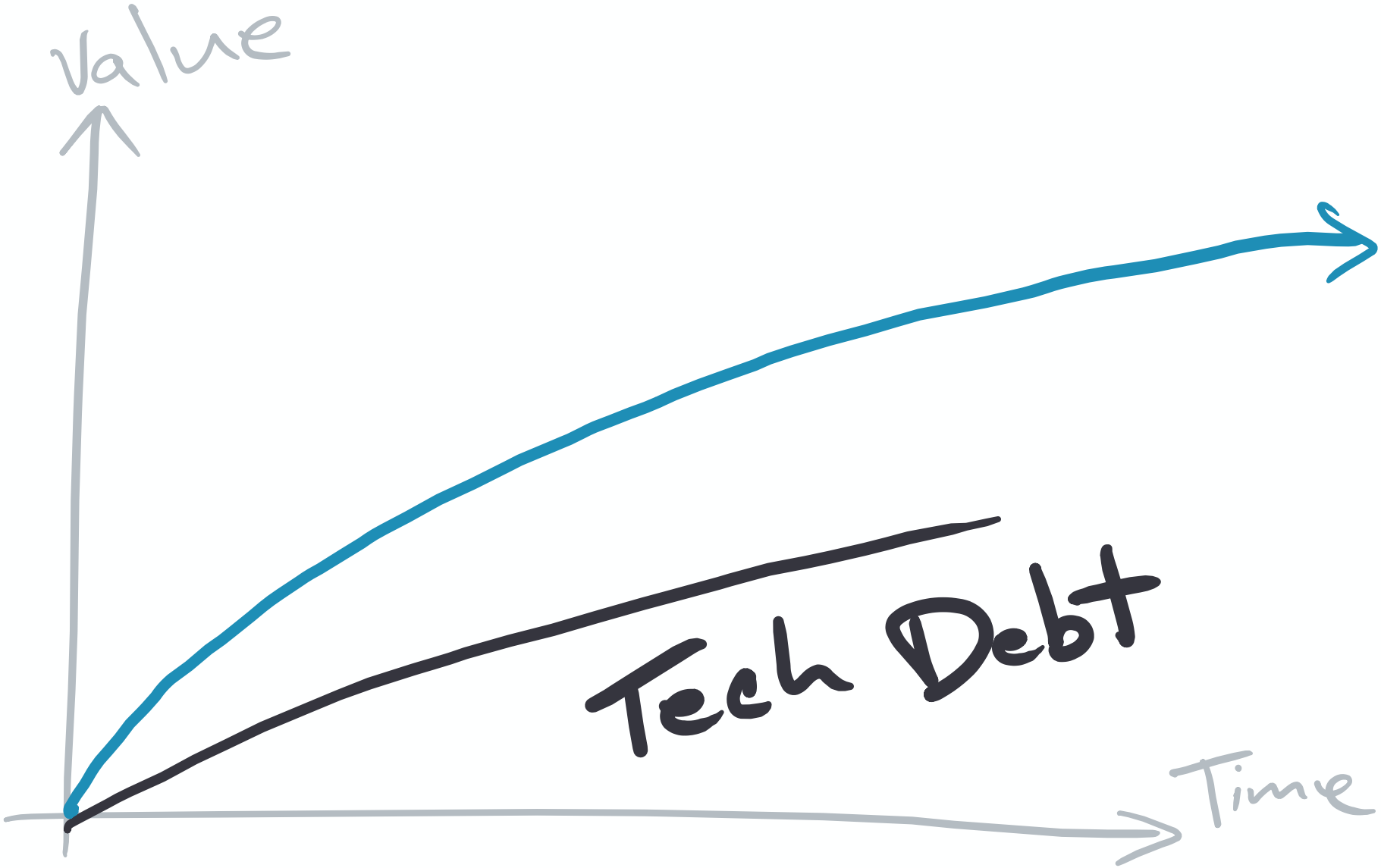

Value
Bad migration data
Time
Original Go-Live

Dirty Secret: The modernization was “rushed”


Value
Tech Debt
Time


Value
Drag
Tech Debt
Time


Value
Drag
Tech Debt
Time

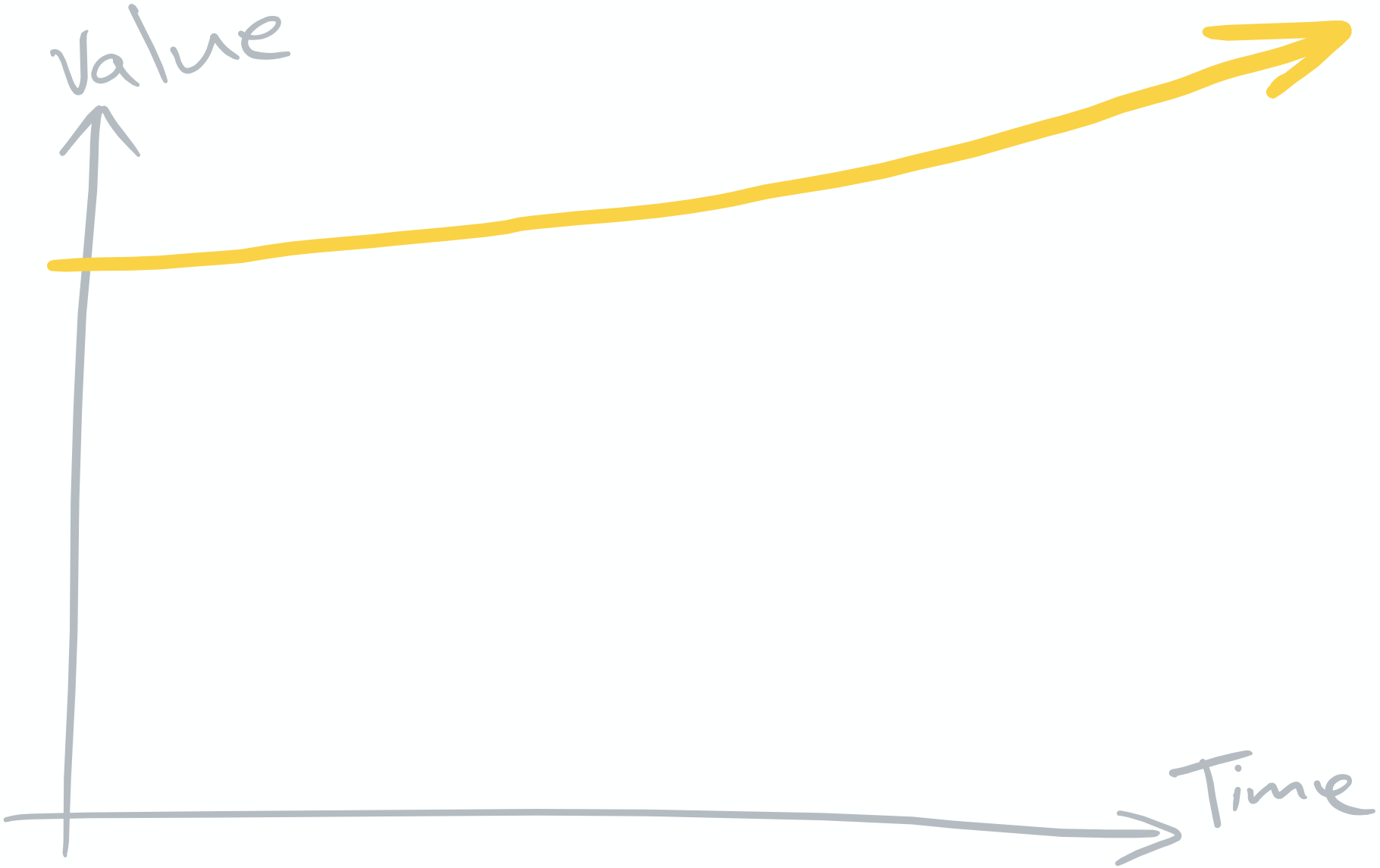

Value
Tech Debt
Time

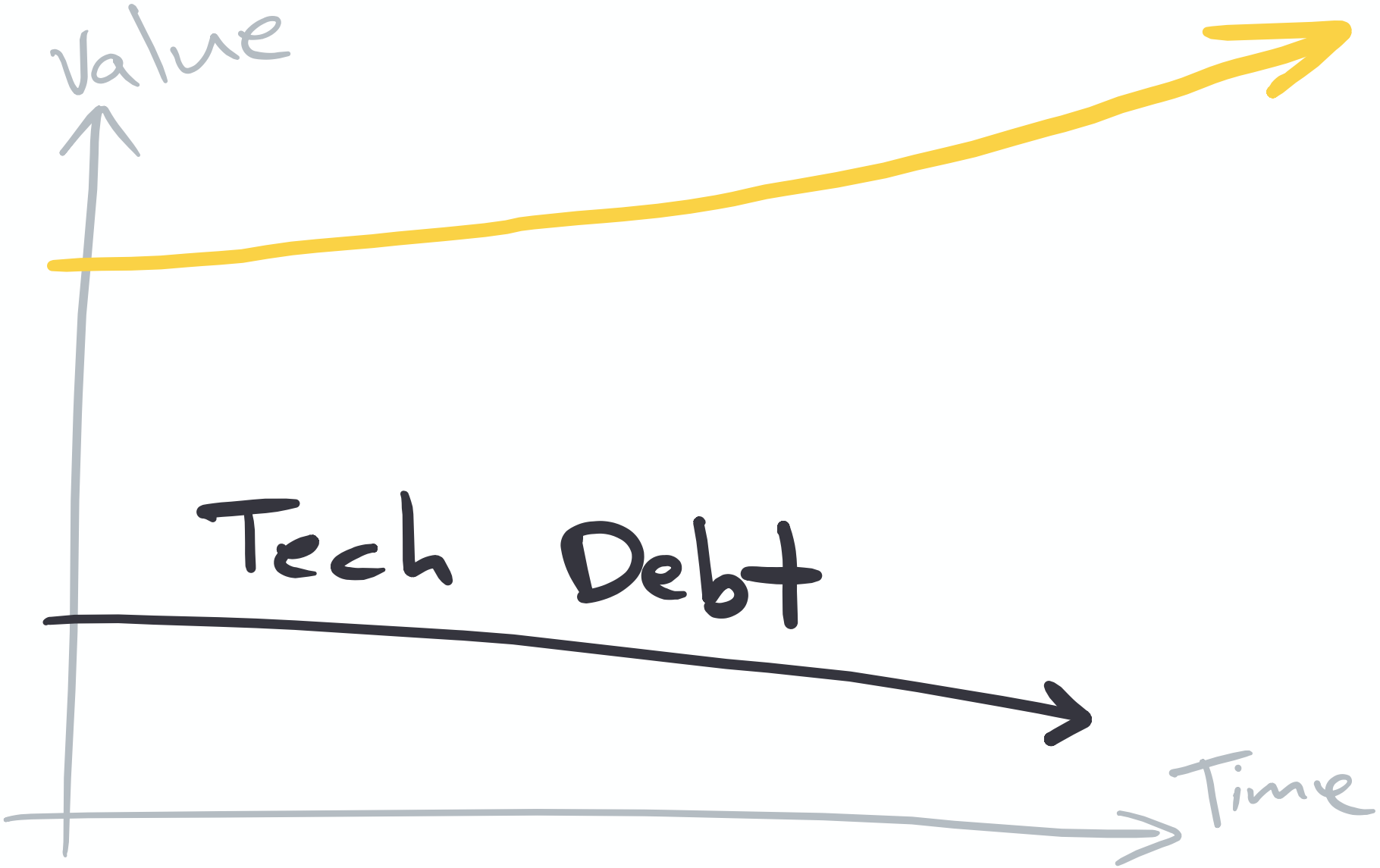
Every Legacy System was once “Modern”

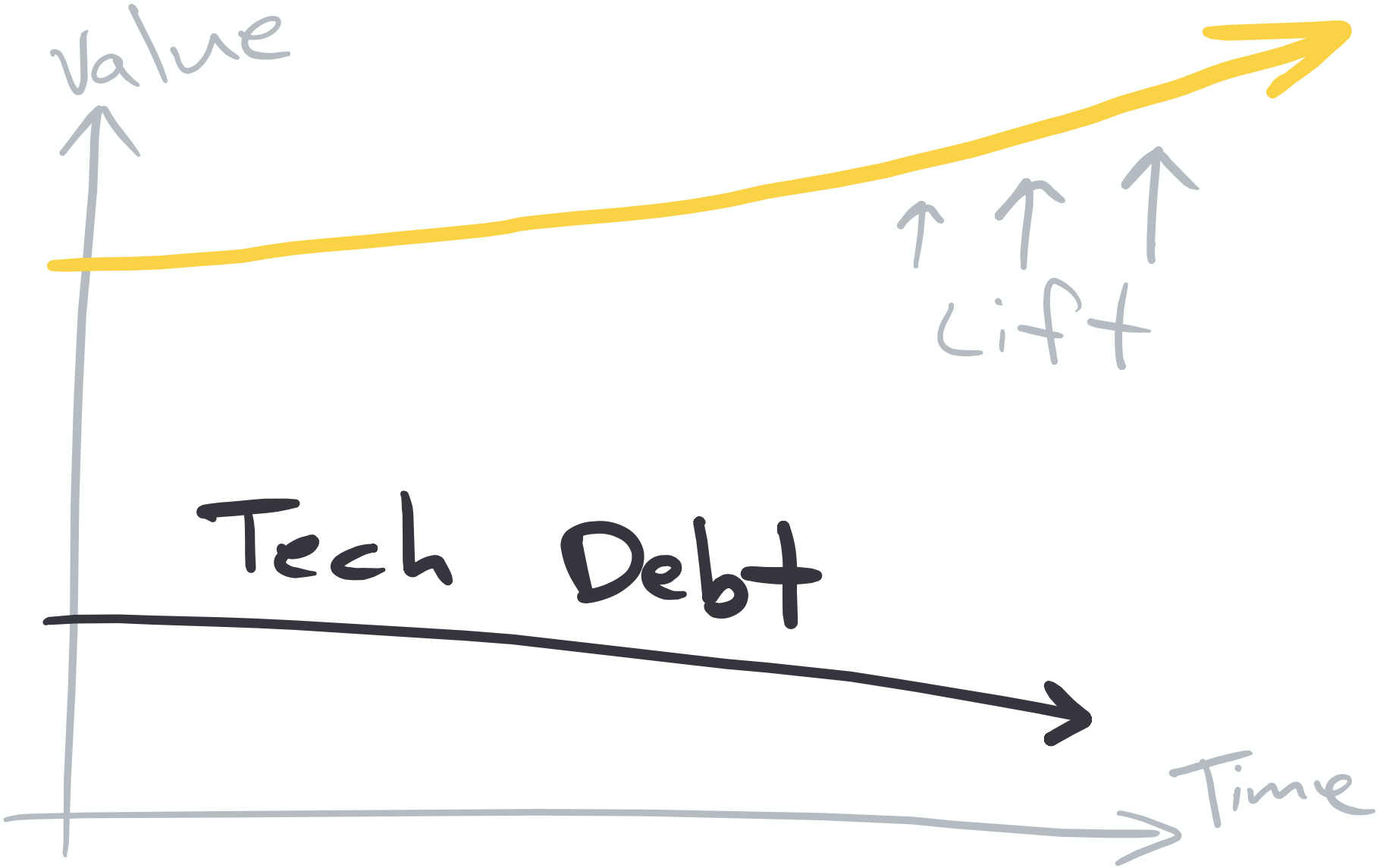
Congratulations!

We just built another legacy system.

Instead: Maintain and Renovate


Value
Time

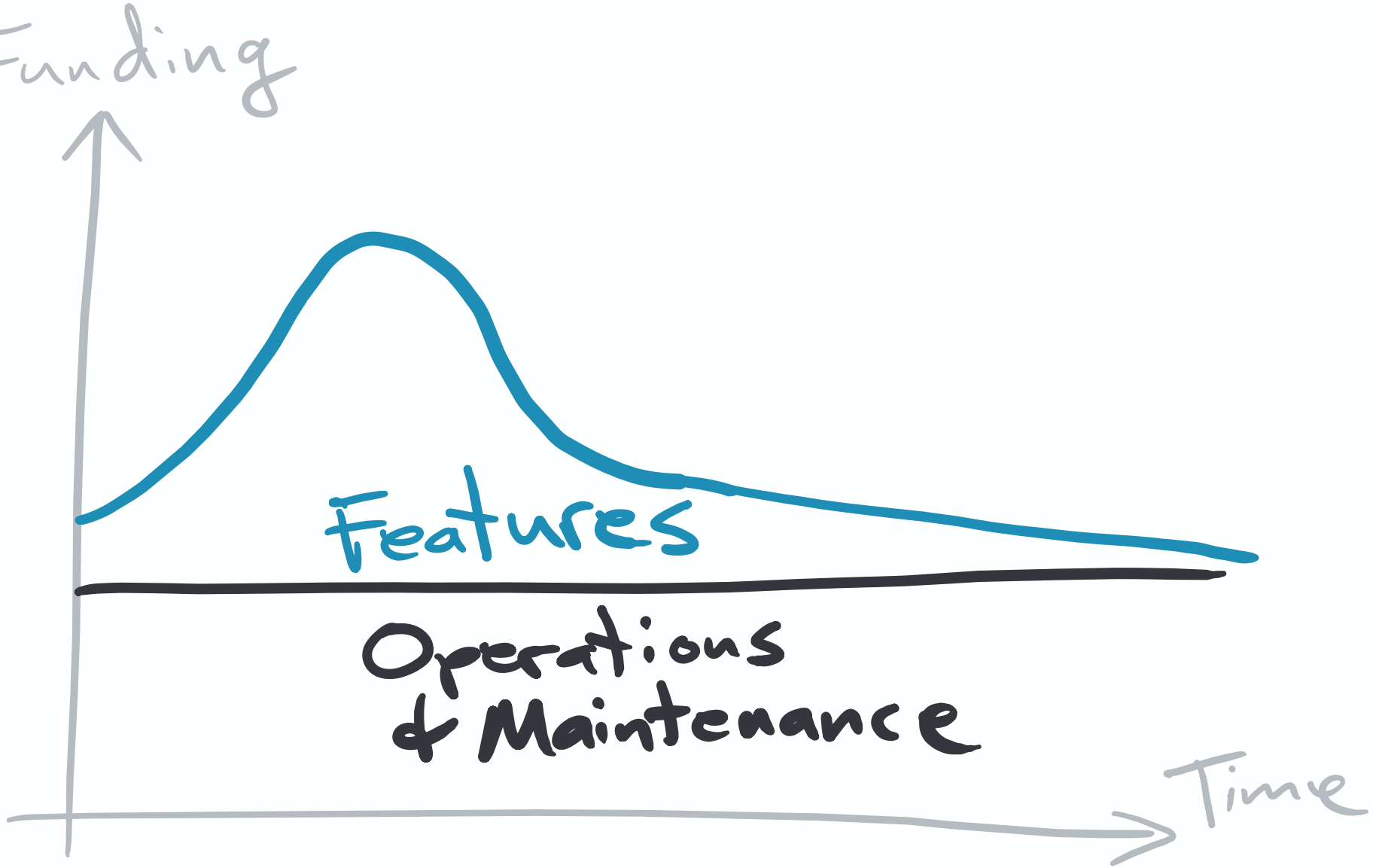

Value
Tech Debt
Time

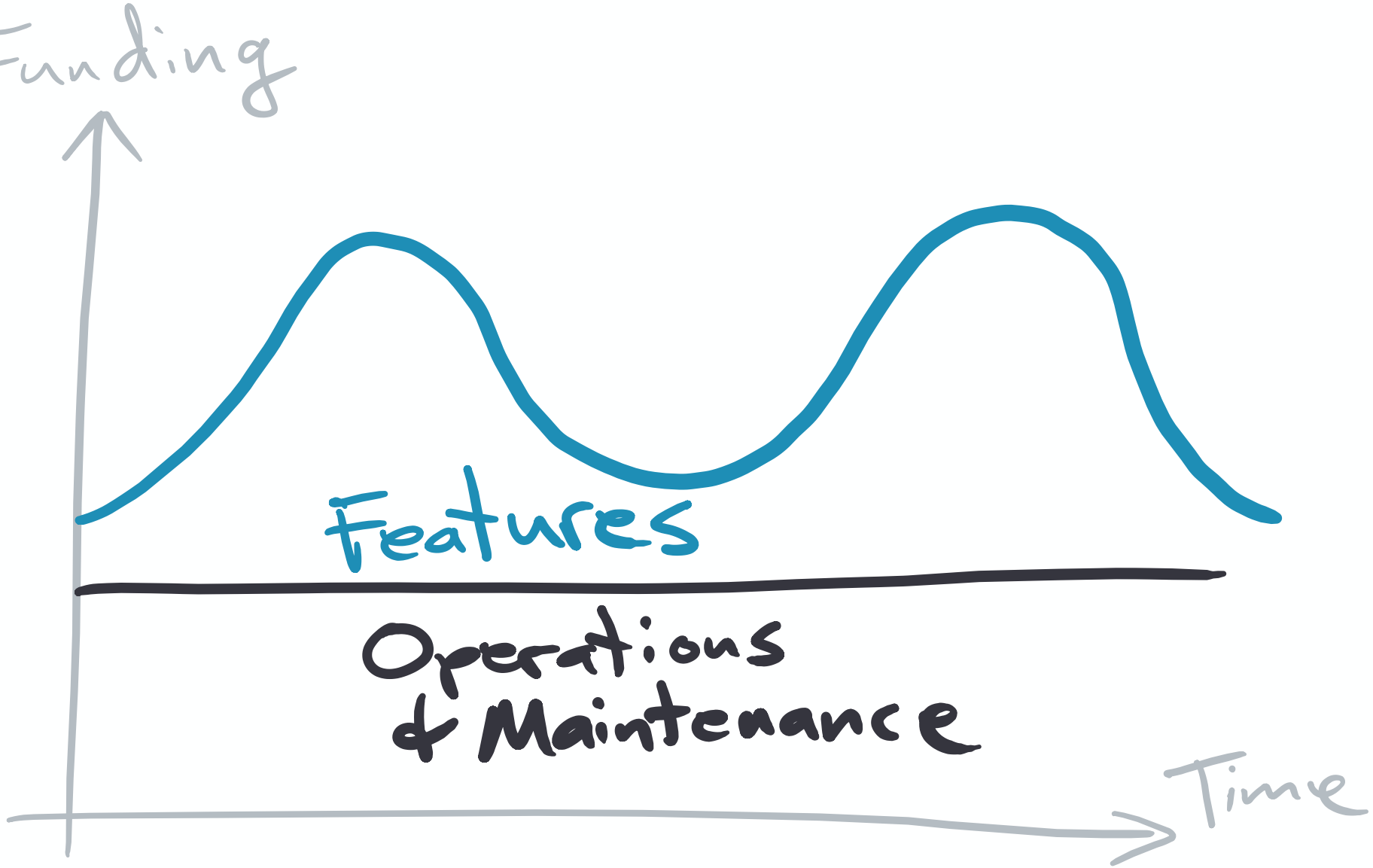

Value
Lift
Tech Debt
Time


Funding
Time

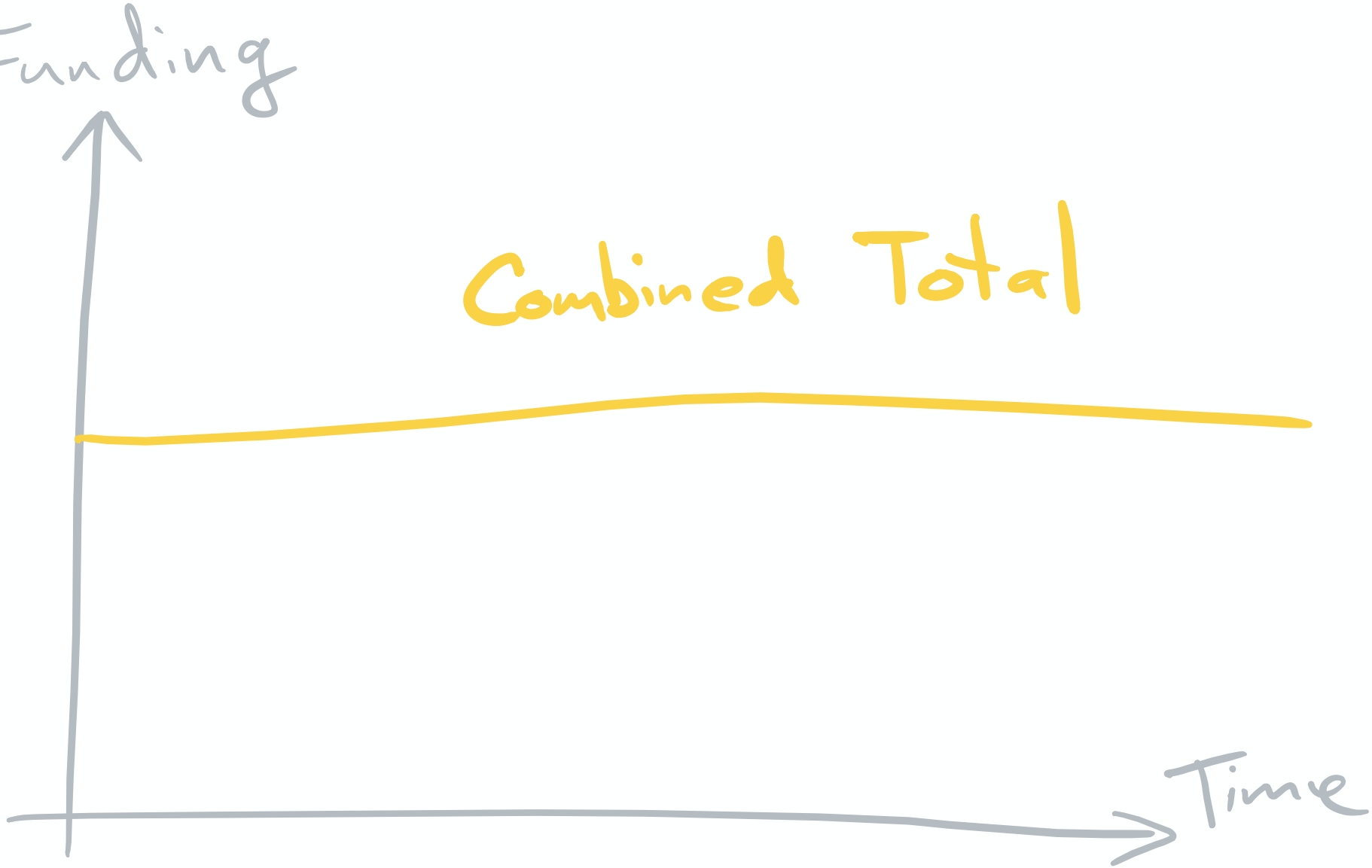

Funding
Time

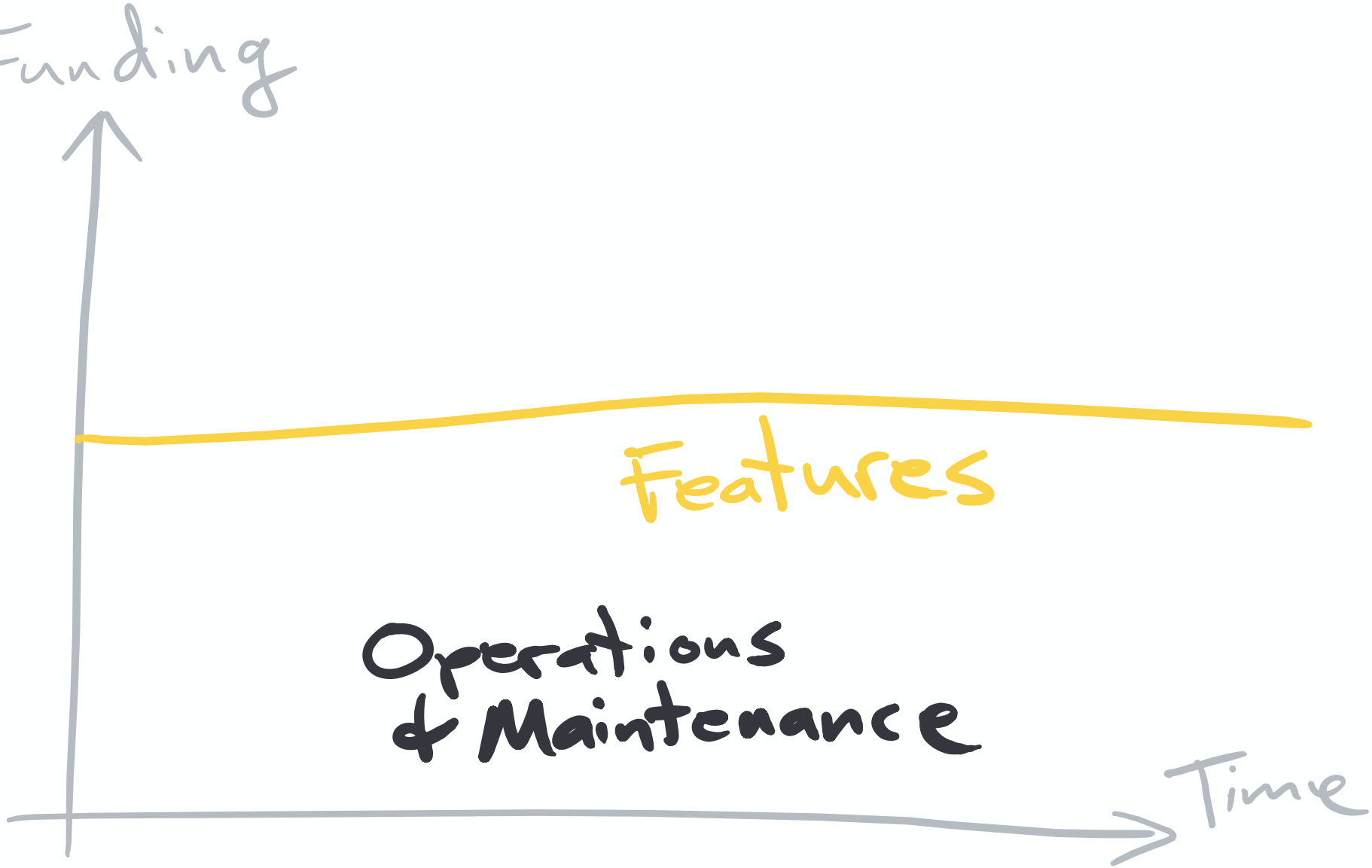

Funding
Operations
& Maintenance
Time

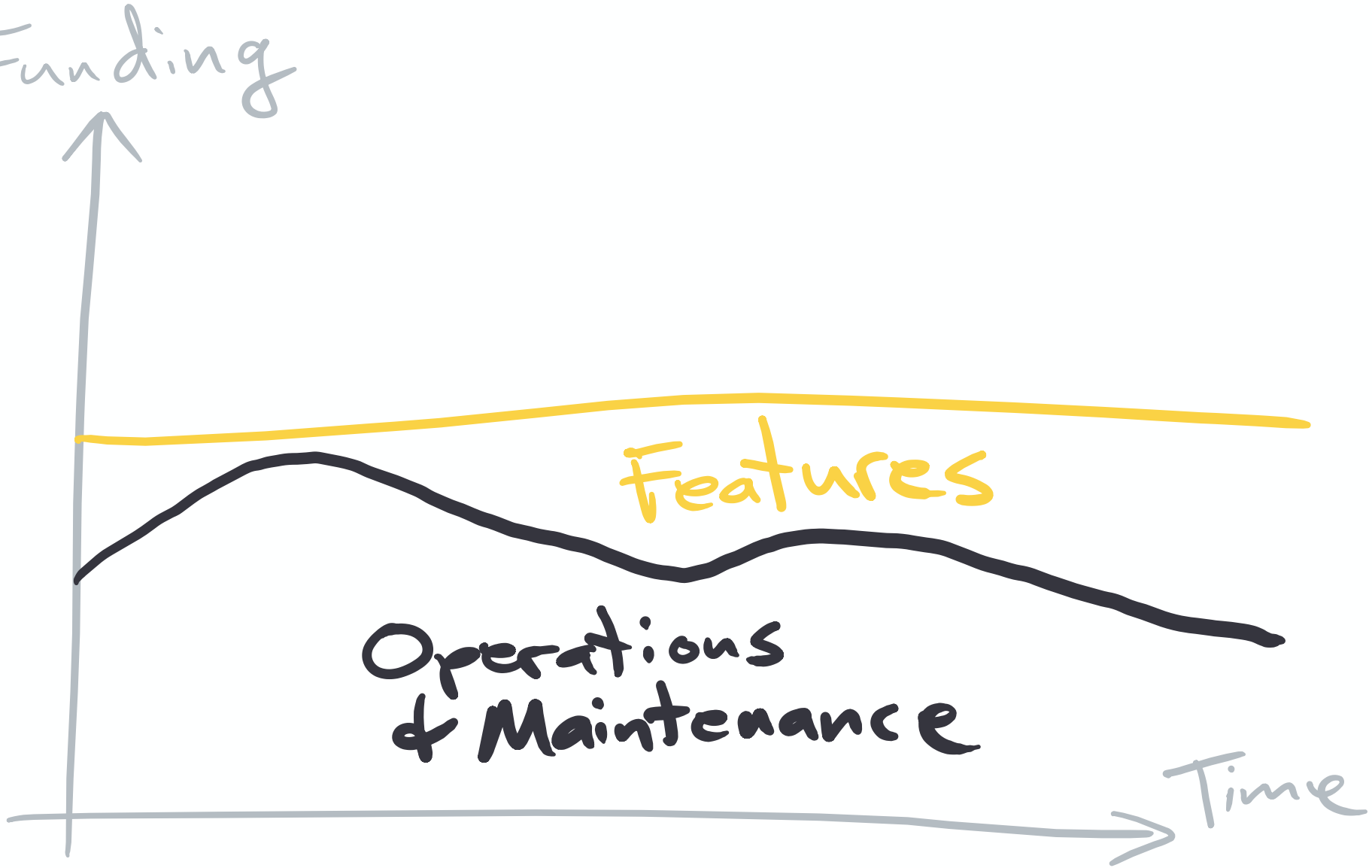

Funding
Features
Operations
& Maintenance
Time


Funding
Features
Operations
& Maintenance
Time


Funding
Time


Funding
Combined Total
Time


Funding
Features
Operations
& Maintenance
Time


Funding
Features
Operations
& Maintenance
Time

Another Metaphor: Your Home

Does it really need to be demolished?

The “Home” Metaphor

The “Home” Metaphor

- Long-term investment
- In daily use
- Needs maintenance
- Renovate as needed
- Make it safe to renovate with girders, braces, shoring, & jacks

The “Home” Metaphor

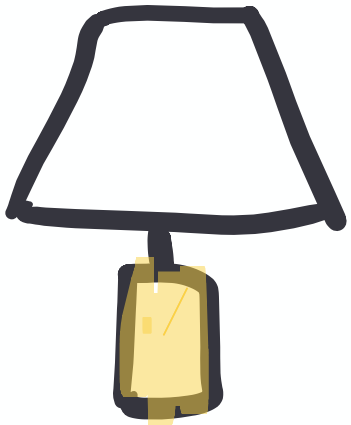
It is one thing to build a new house, but to build a new house in the same exact spot?

The “Home” Metaphor

The “Home” Metaphor

Live On-Site

This is critical to the enterprise. Moving out for a year is a costly and risky option.



The “Home” Metaphor

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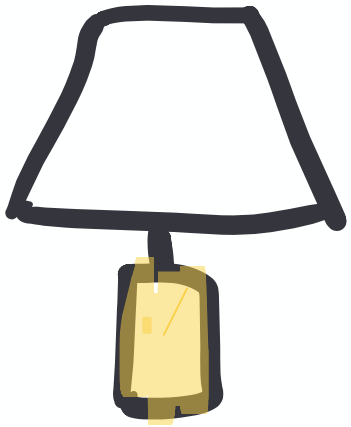
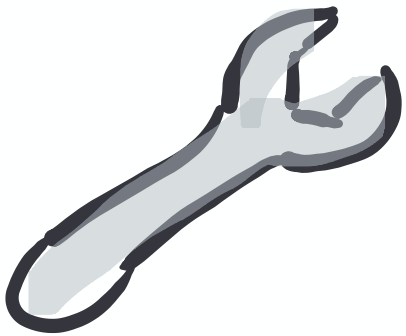


Maintain

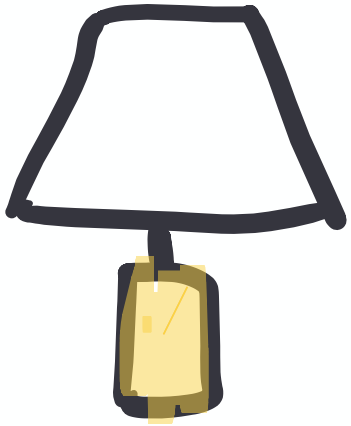
Prevention over cure. Don’t save money now at the risk of catastrophe later.



The “Home” Metaphor

Live On-Site

This is critical to the enterprise. Moving out for a year is a costly and risky option.



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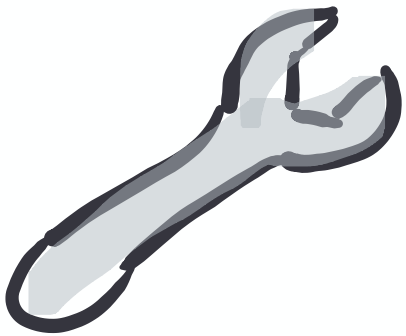

Renovate

Drastic changes may include remodeling, additions, and major retrofitting.

The “Home” Metaphor

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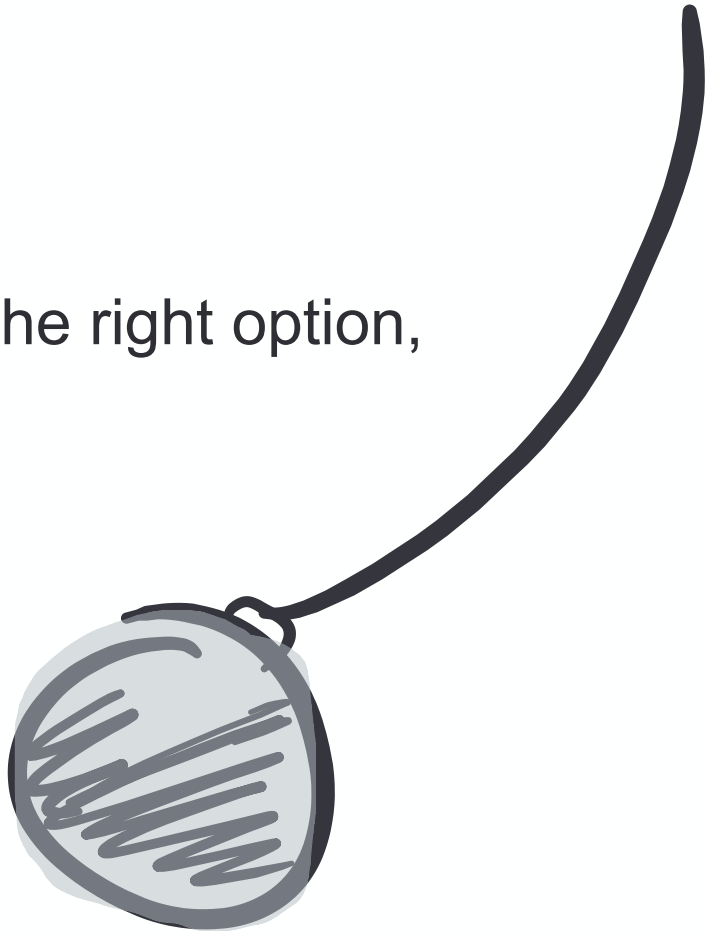
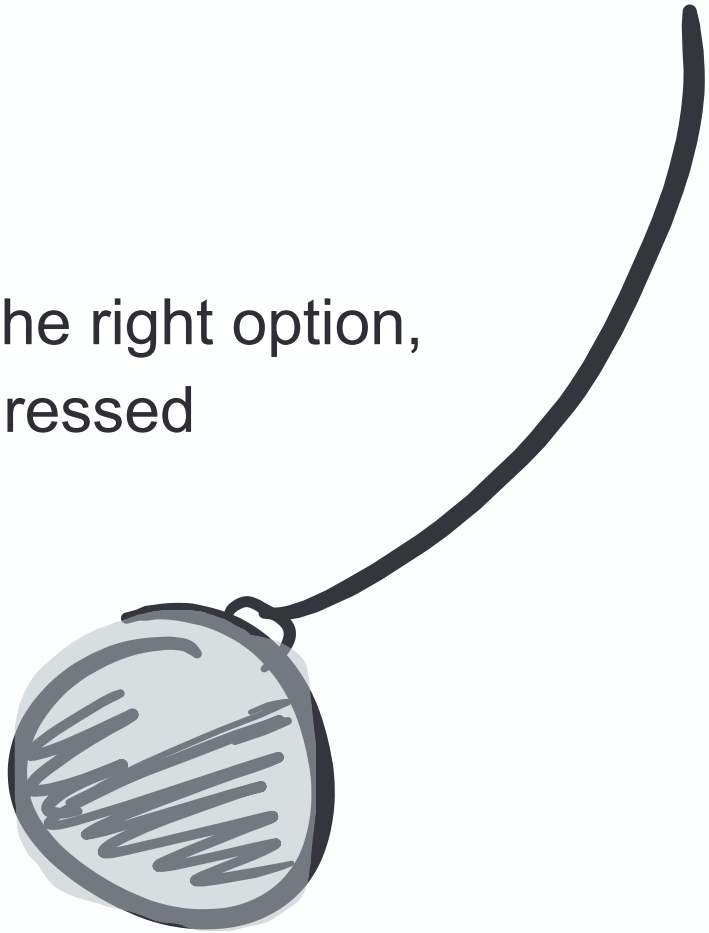
Demolition and rebuilding may be the right option,



The “Home” Metaphor

Demolition and rebuilding may be the right option, although usually because of unaddressed deterioration.



How to maintain and renovate

Maintain & Renovate

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Treat long-lived Federal IT systems like homes.

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Avoid demolition and rebuilding.

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- Tightly-coupled components
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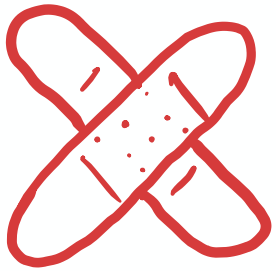
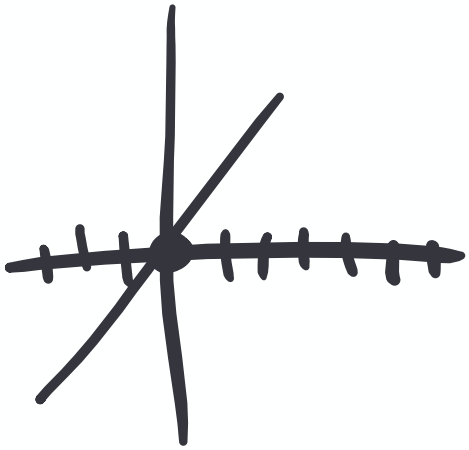
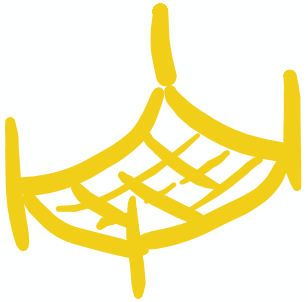


Stop the bleeding

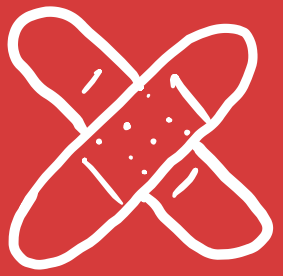


Create time and space



Ensure safety

Stop the Bleeding



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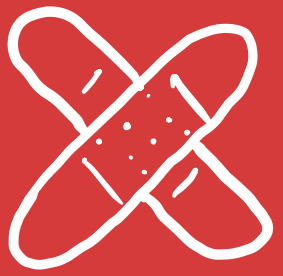

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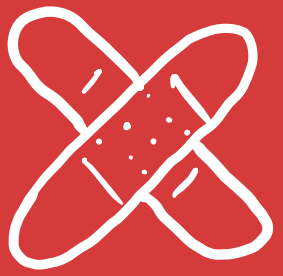

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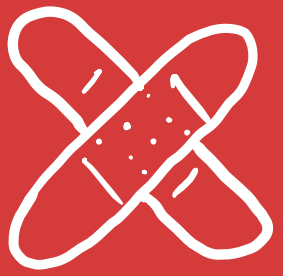

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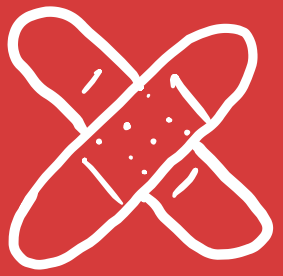

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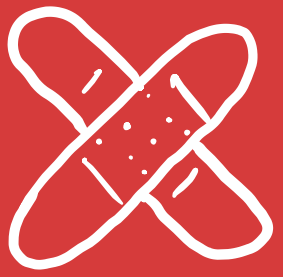
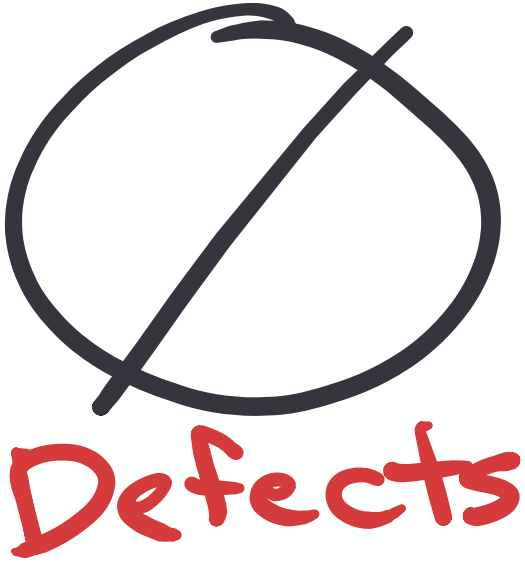


Zero Defects:
fix all known defects before adding functionality.



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- Paying down technical debt, including major re-writes, should be supported, rewarded, and celebrated.
- Educate stakeholders about the effort: these systems are long-term investments.

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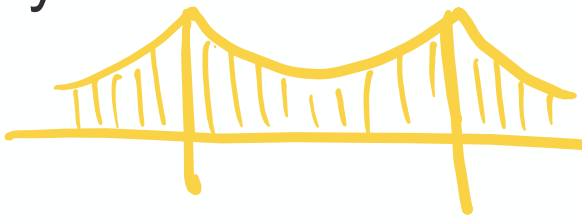
- Imagine if bridge infrastructure was only measured by number of miles added!



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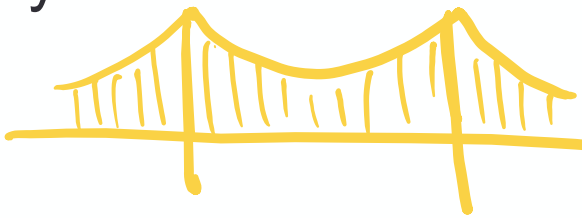

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- If you target a metric, you will likely improve it, although at some cost elsewhere.
- I want to drive on bridges where the key metric is on-time inspection and maintenance.

Create Time and Space

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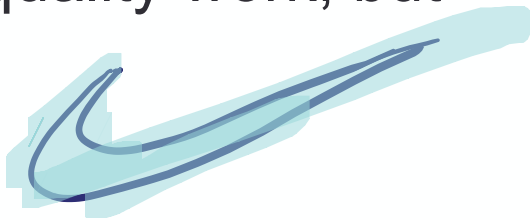
- Just do it.



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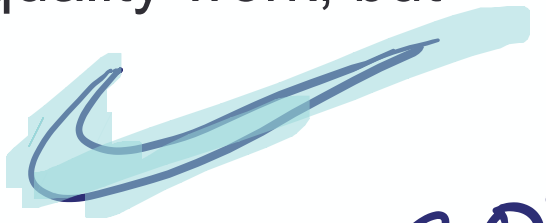

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- Set aside time & capacity for maintenance.

20%

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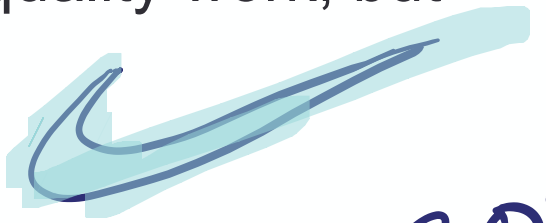

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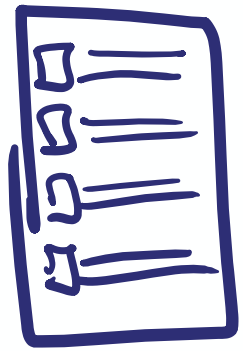
- Track maintenance and refactors the same as PBIs/User Stories/etc.



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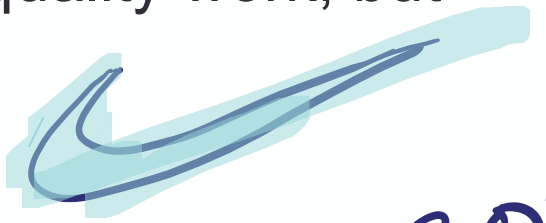

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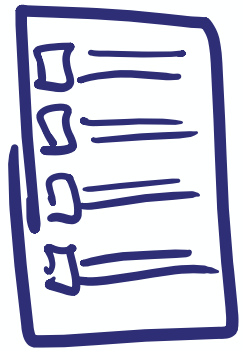

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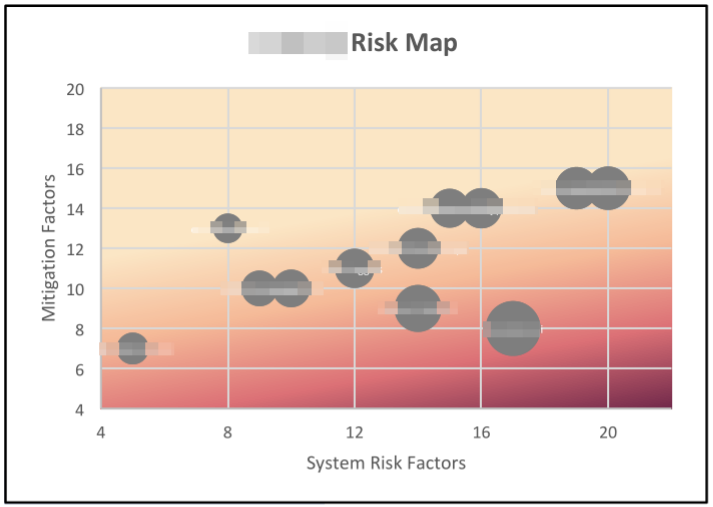

Maximum Risk Score:	
10.6	
1 week ago	10.6
5 weeks ago	10.6
Report Date:	10/14/18

Microservice	Risk Score	Mitigation	Testing	Monitoring	Logging	Alerting
	10.6	25%	2	2	1	3
	7.8	31%	3	3	2	1
	6.7	69%	4	4	4	3
	6.3	69%	4	4	4	3
	5.8	50%	3	3	3	3
	5.7	63%	4	3	4	3
	5.5	44%	3	3	2	3
	5.4	63%	4	3	4	3
	5.0	38%	2	3	2	3
	4.5	38%	1	3	3	3
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	3.1	56%	4	3	3	3

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- Testing, especially automated testing, is huge.
- Blue/green deployments & shadowing (running new code in parallel with the old) can be even more effective.

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Automated Tests!

Automated tests pay off over time and make future changes safer.

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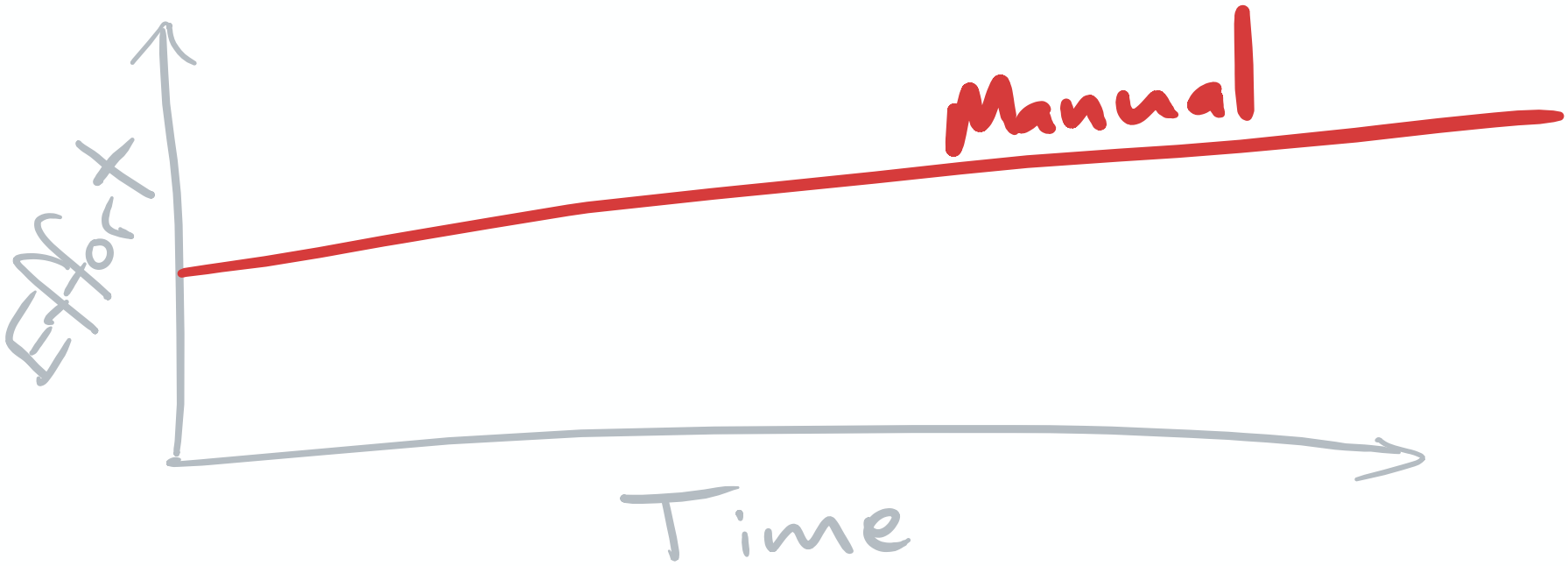

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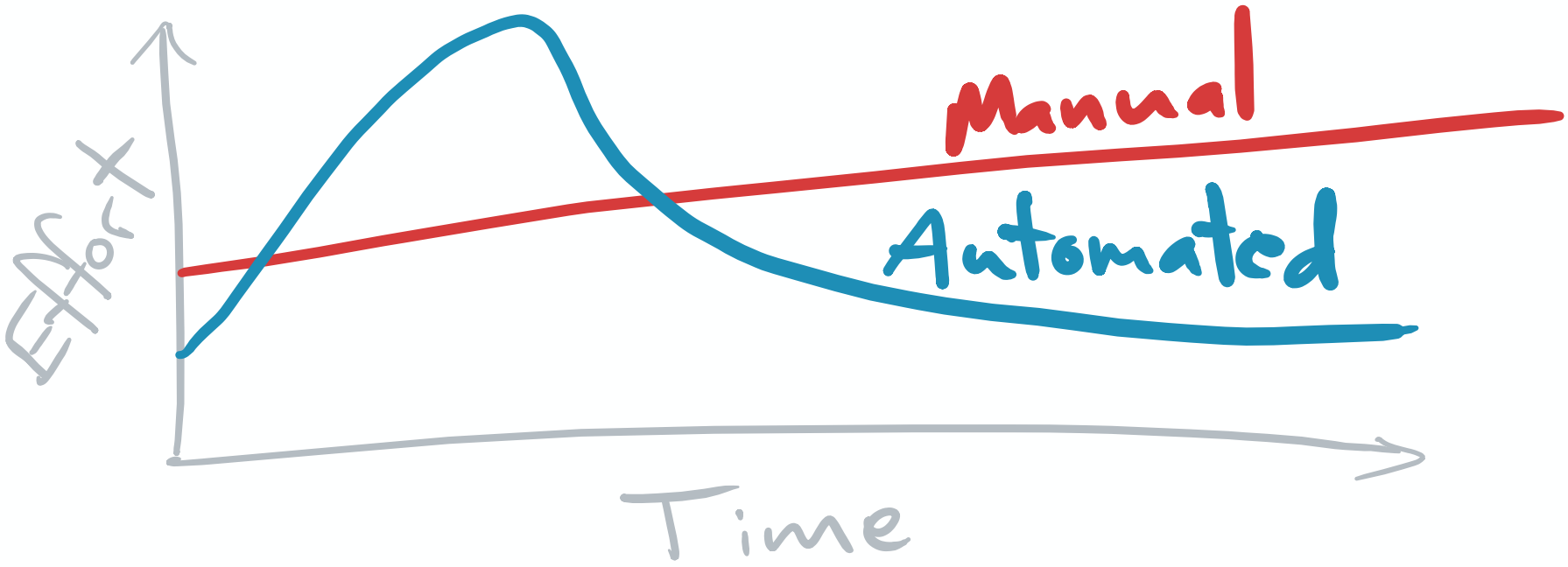

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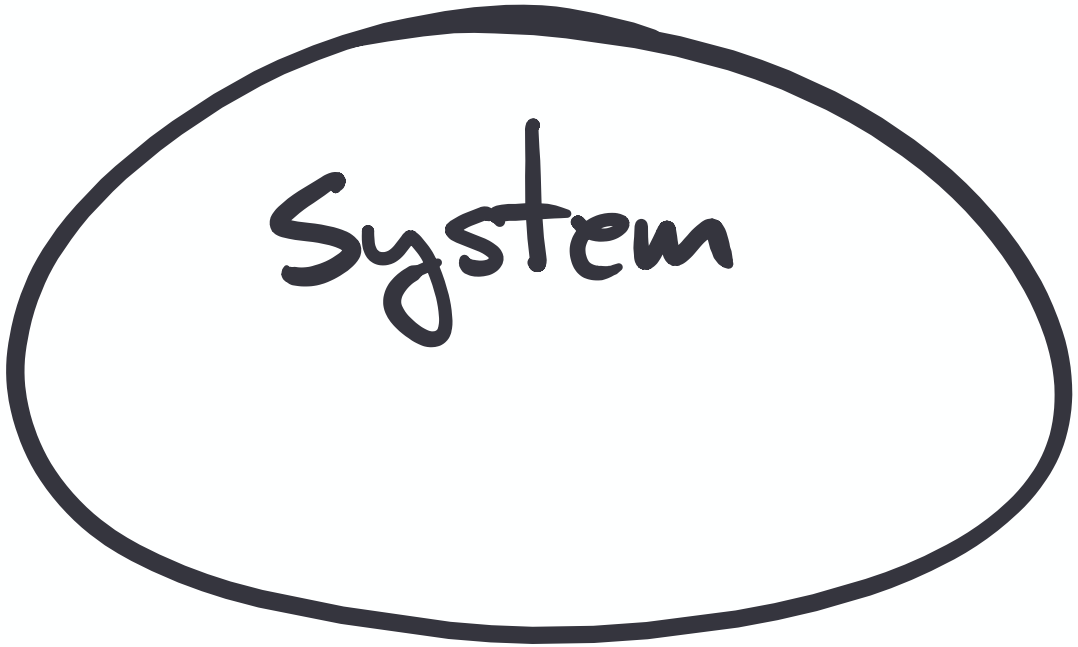

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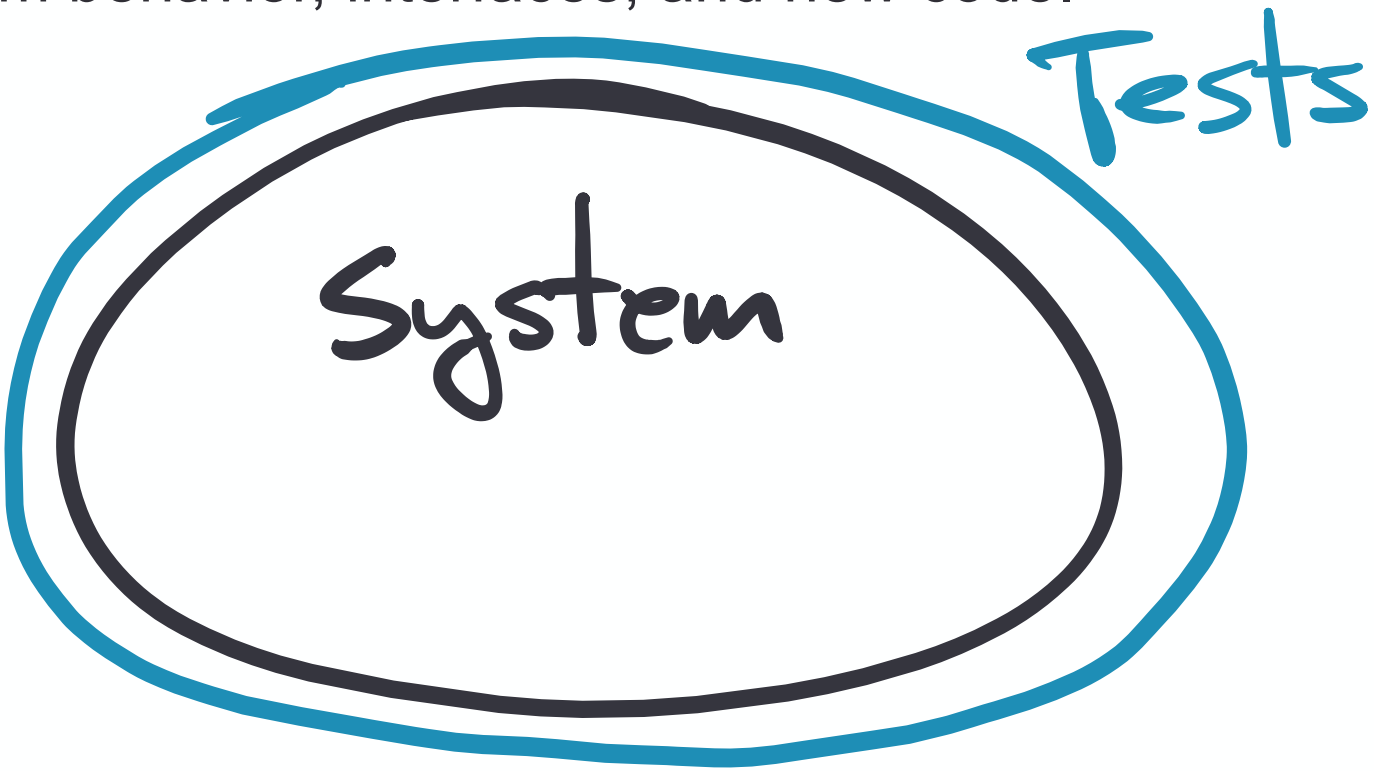

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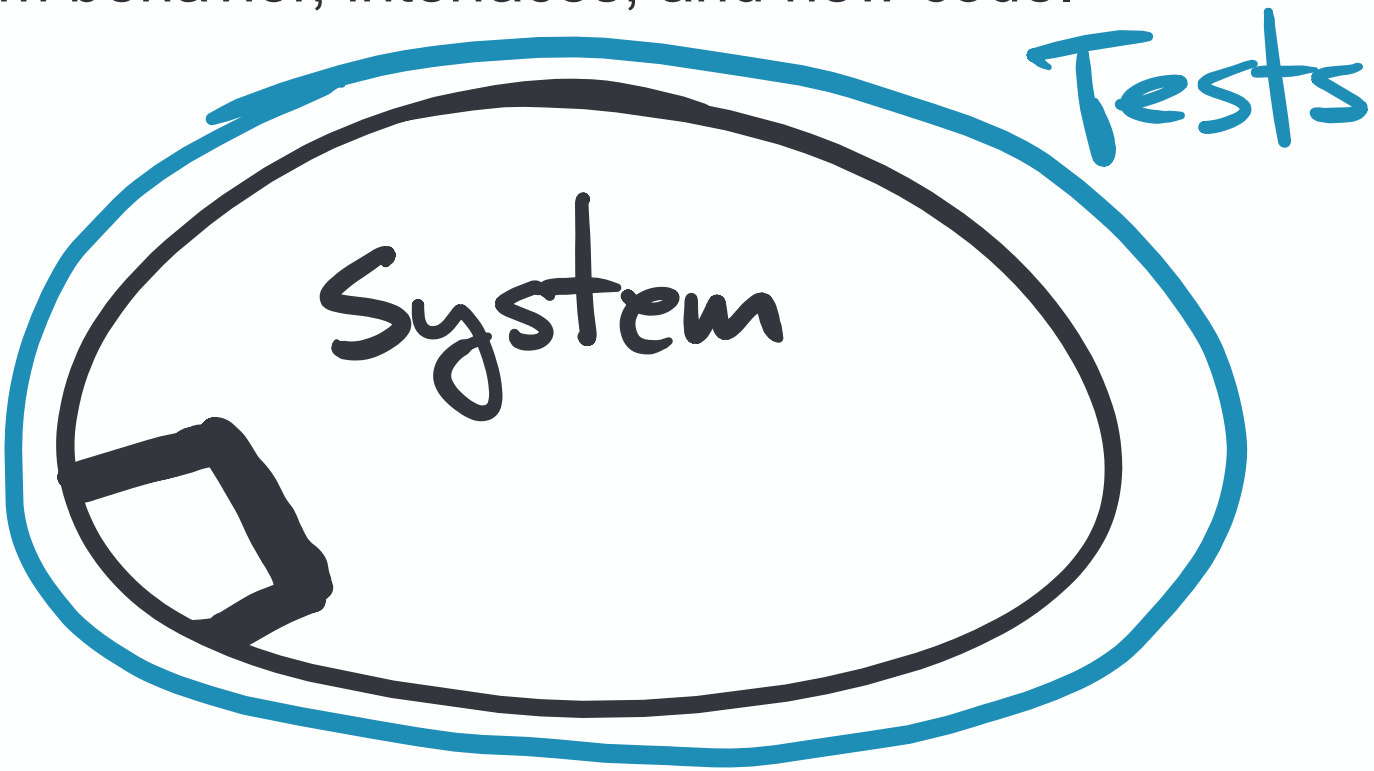

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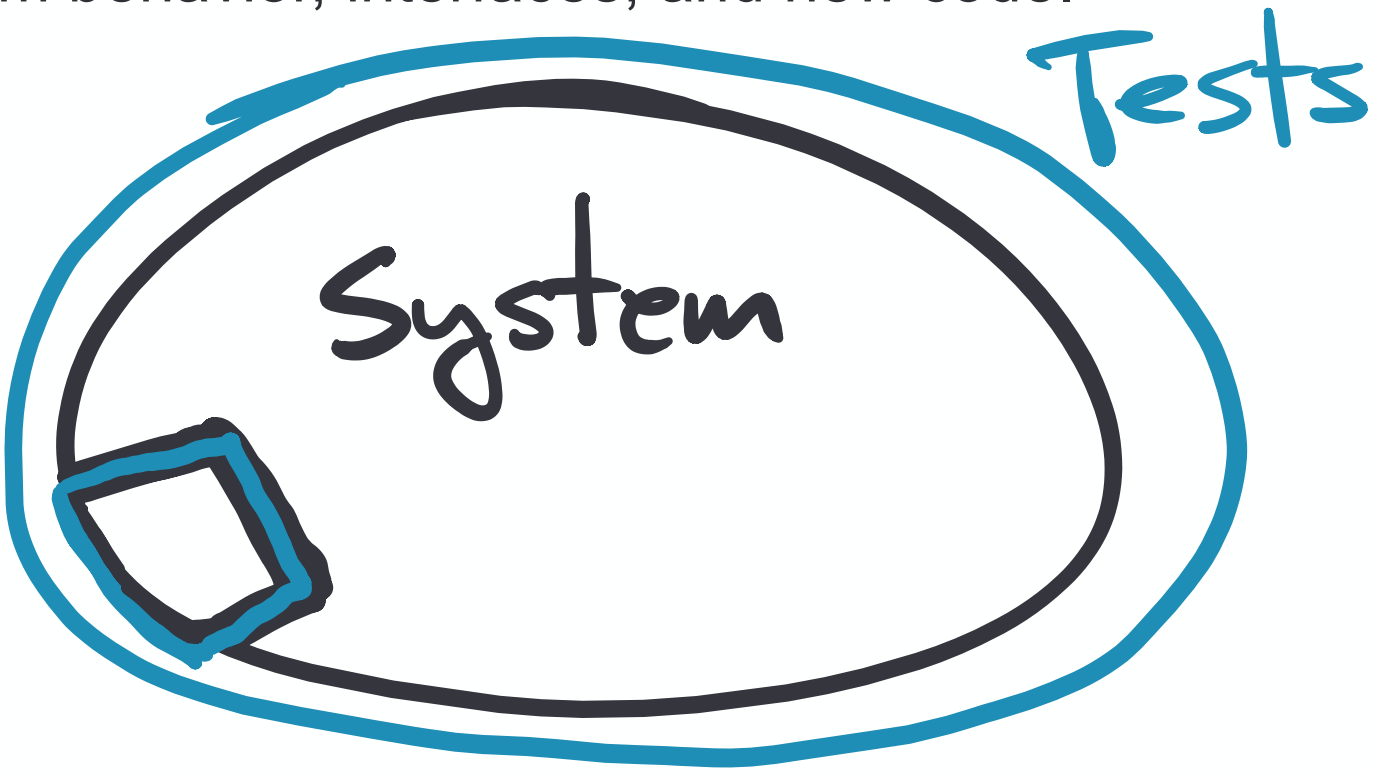

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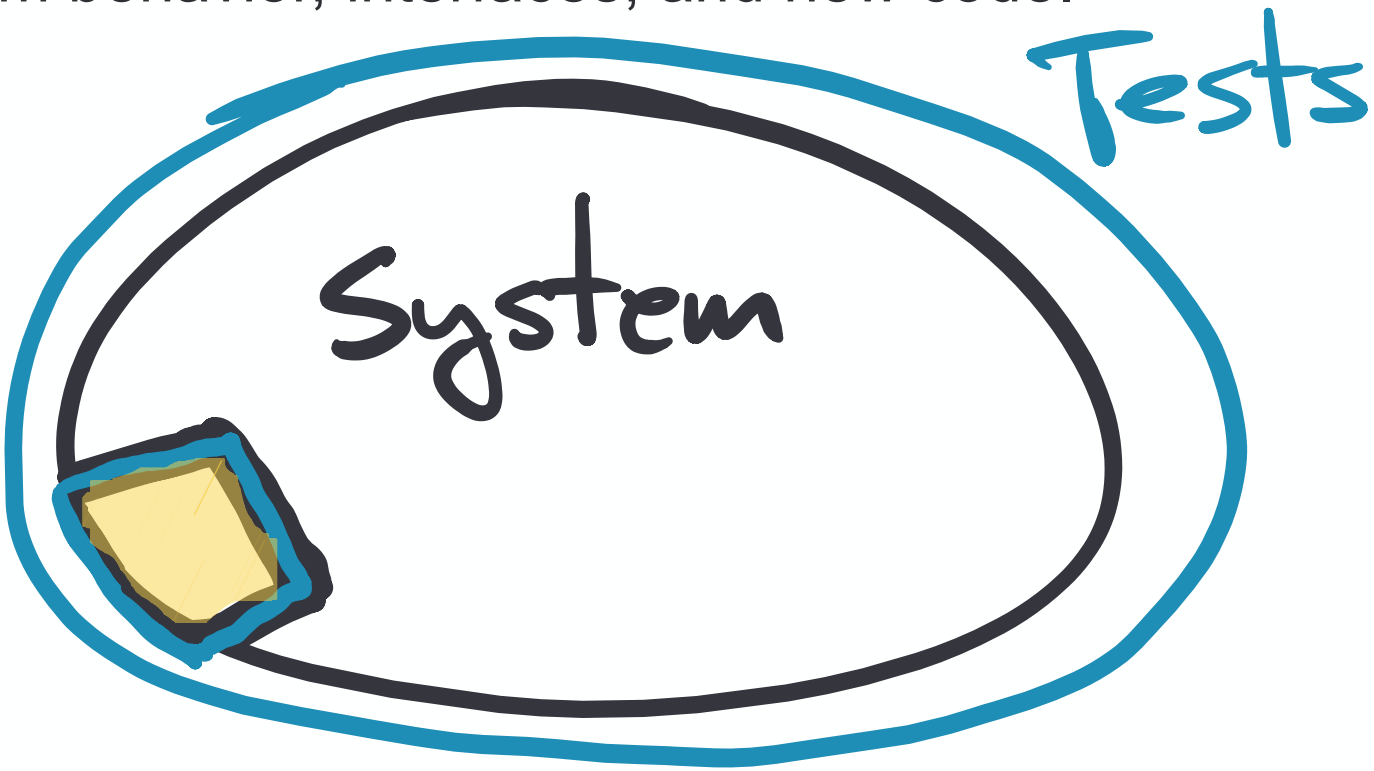

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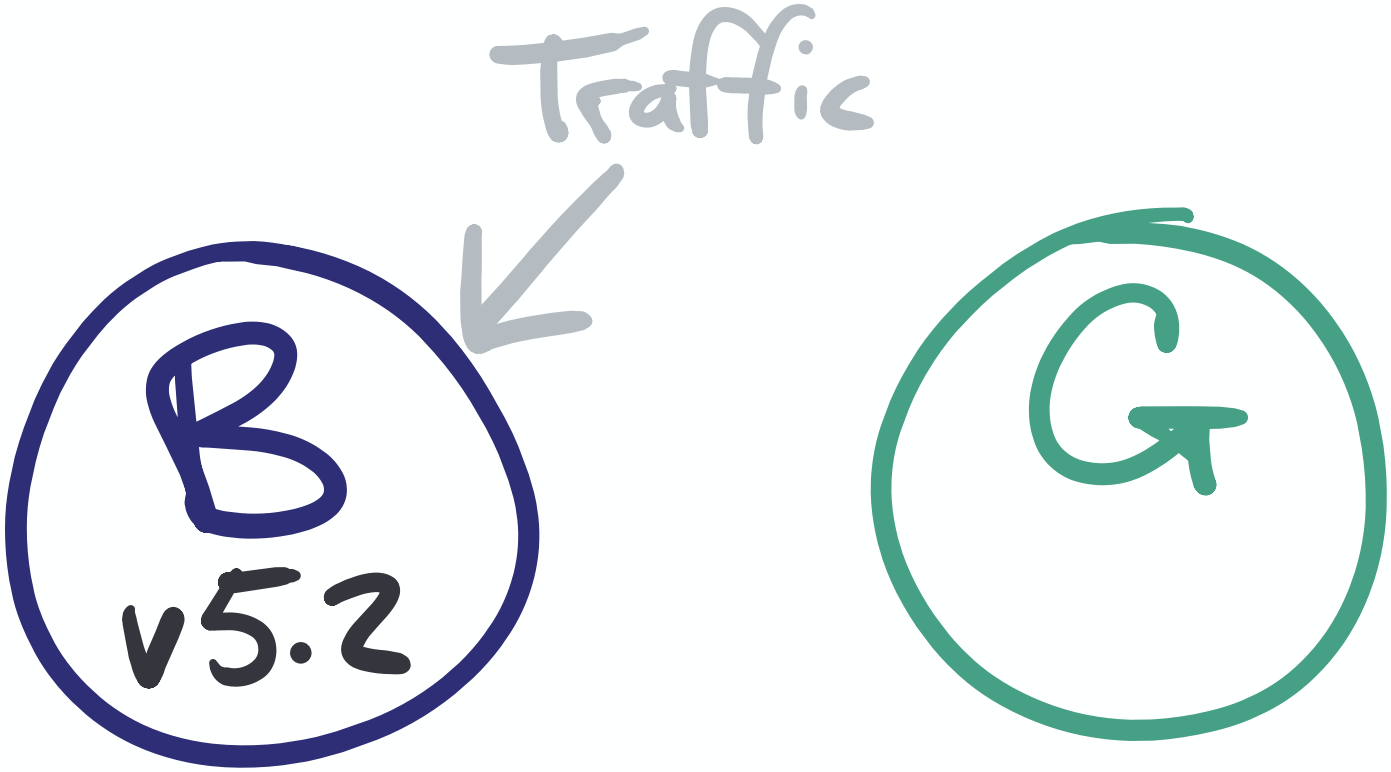

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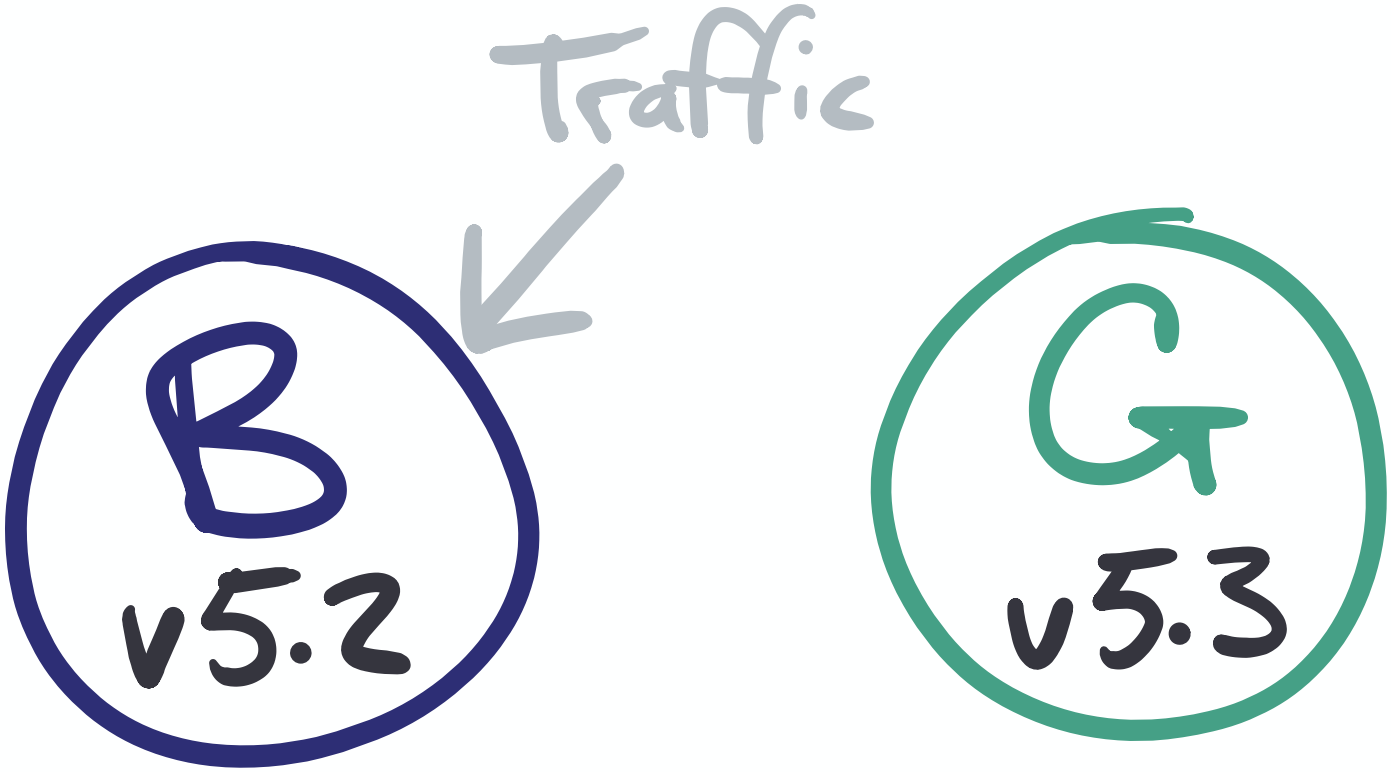

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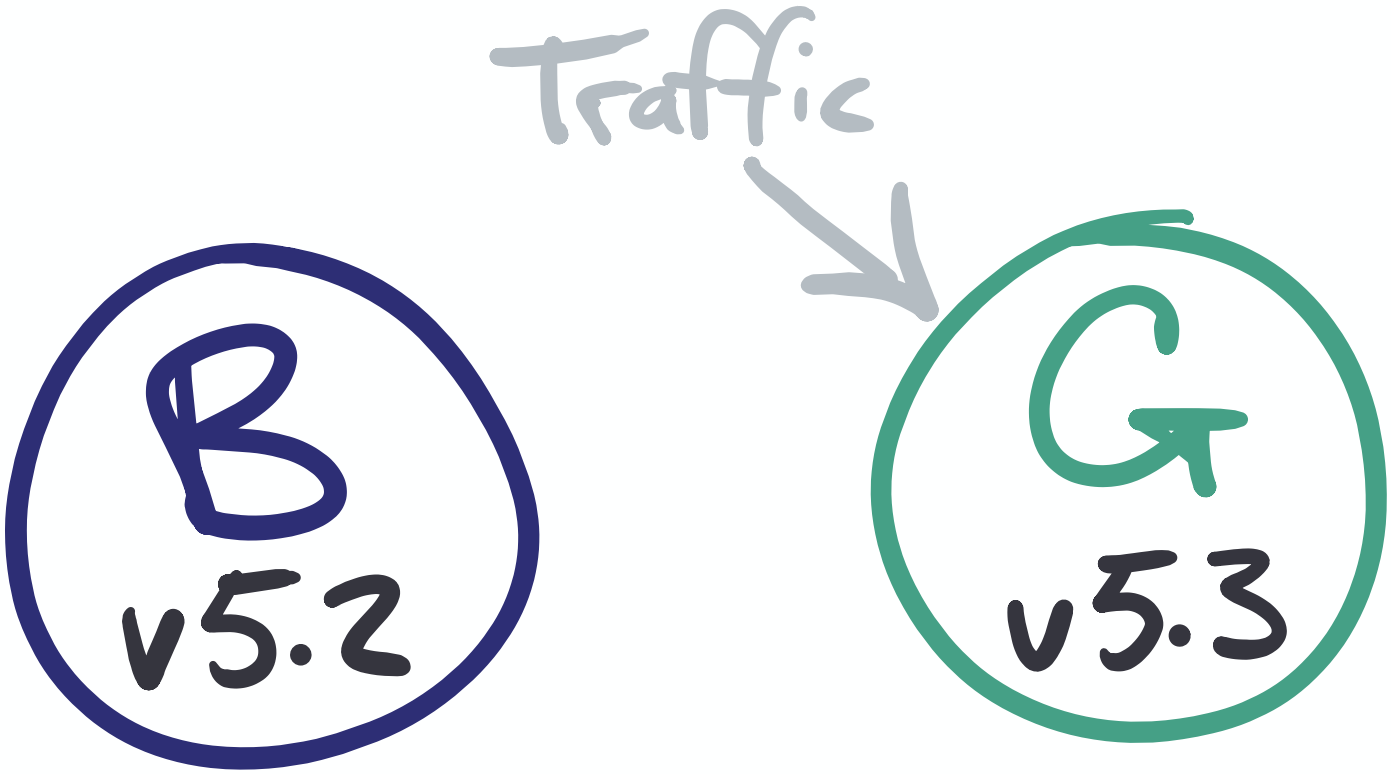

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Shadowing (Transform & Eliminate)

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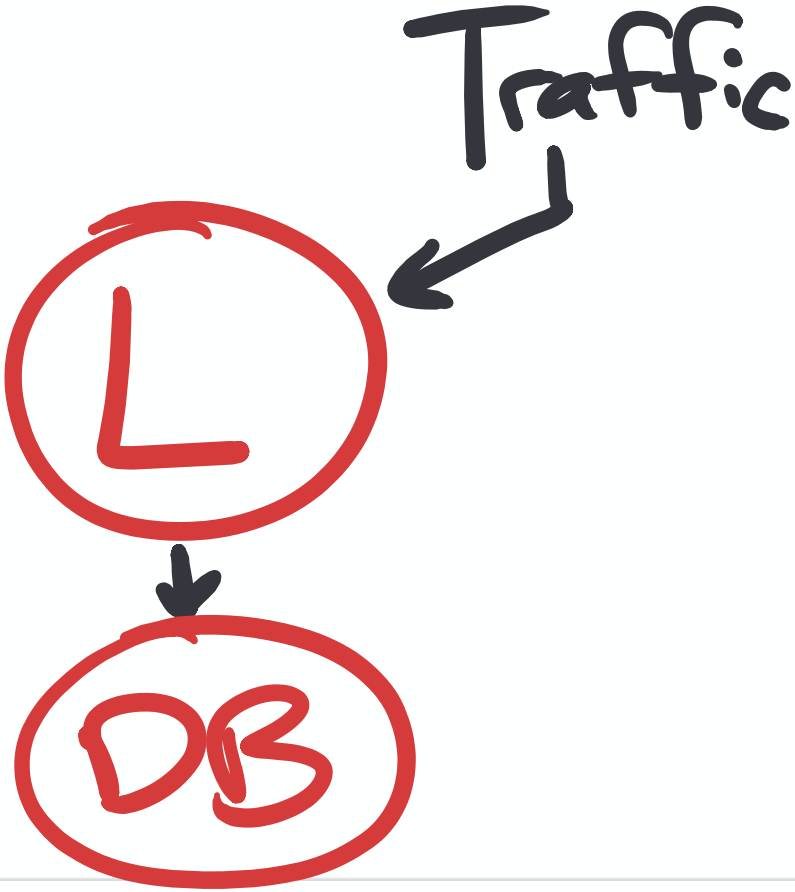

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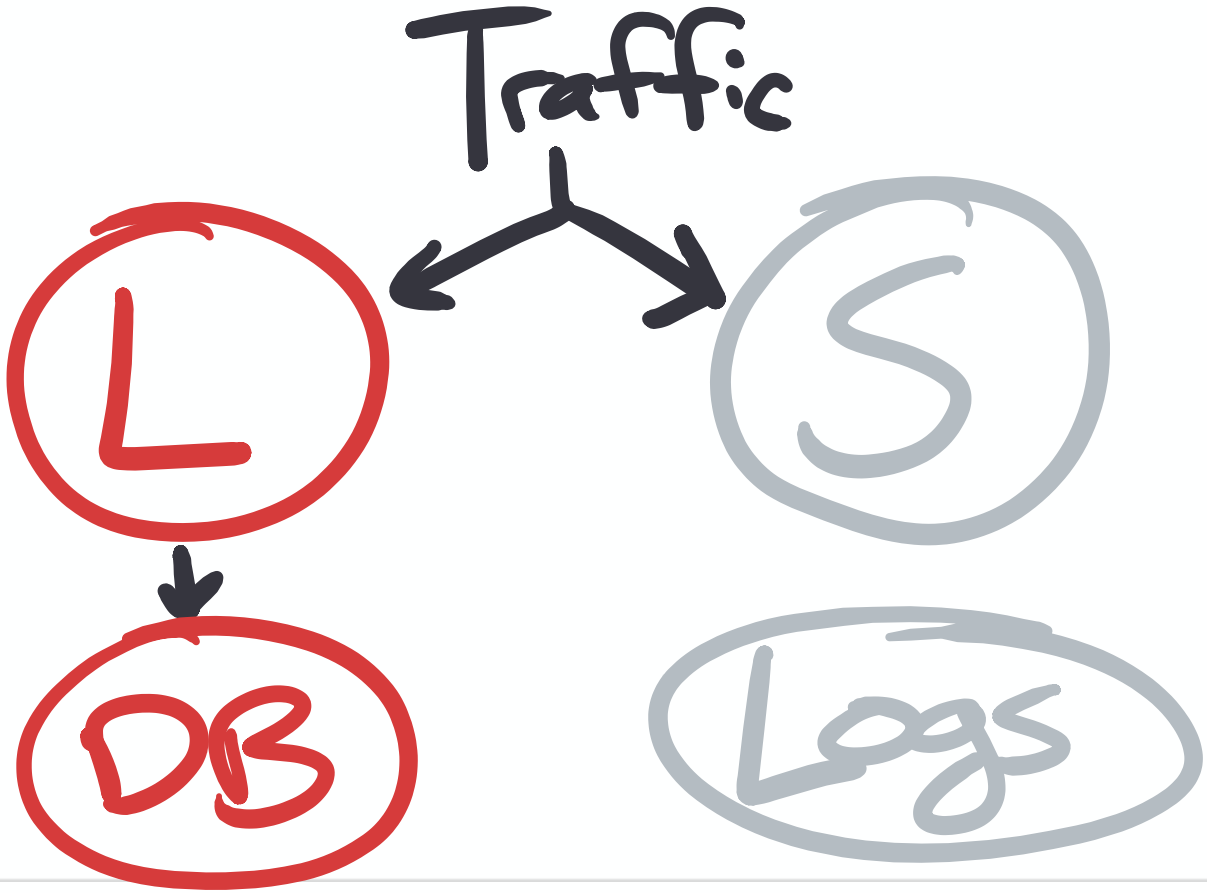

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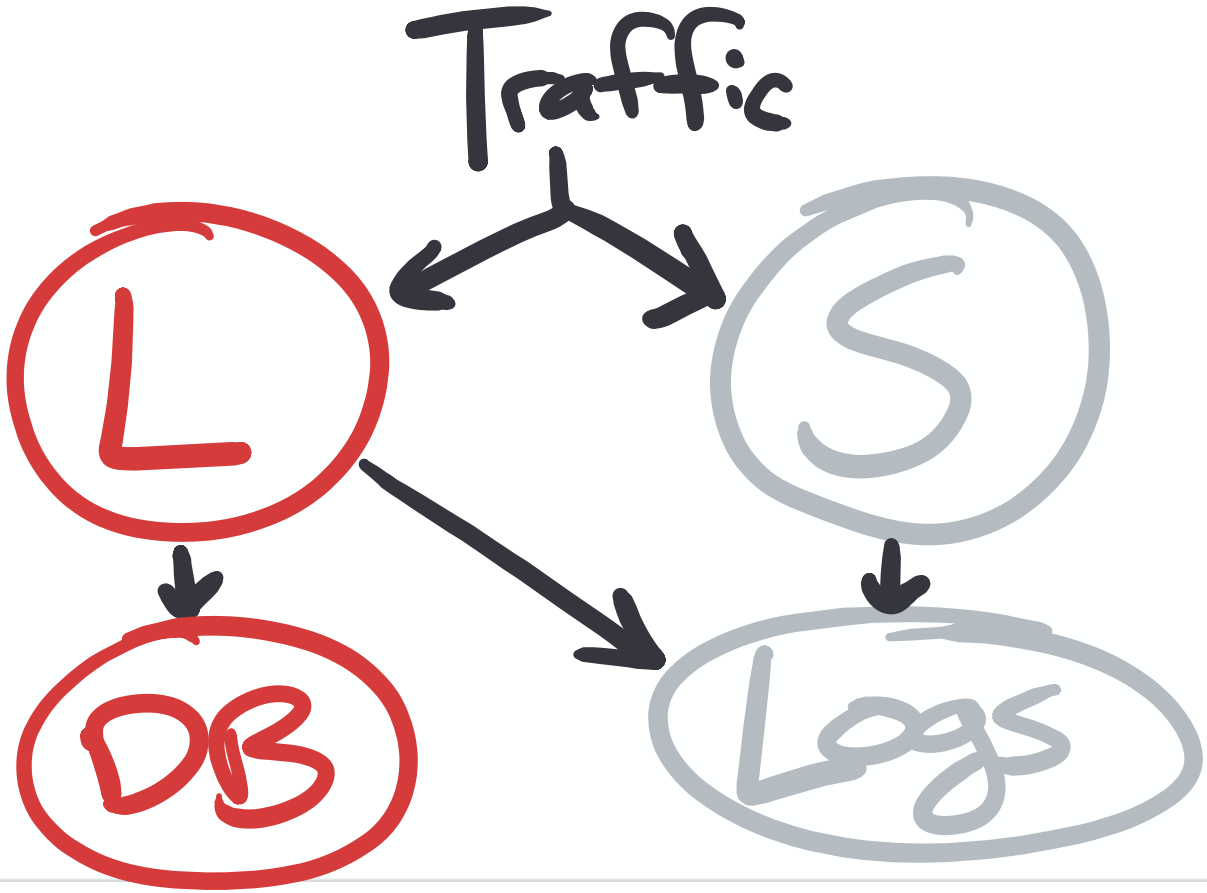

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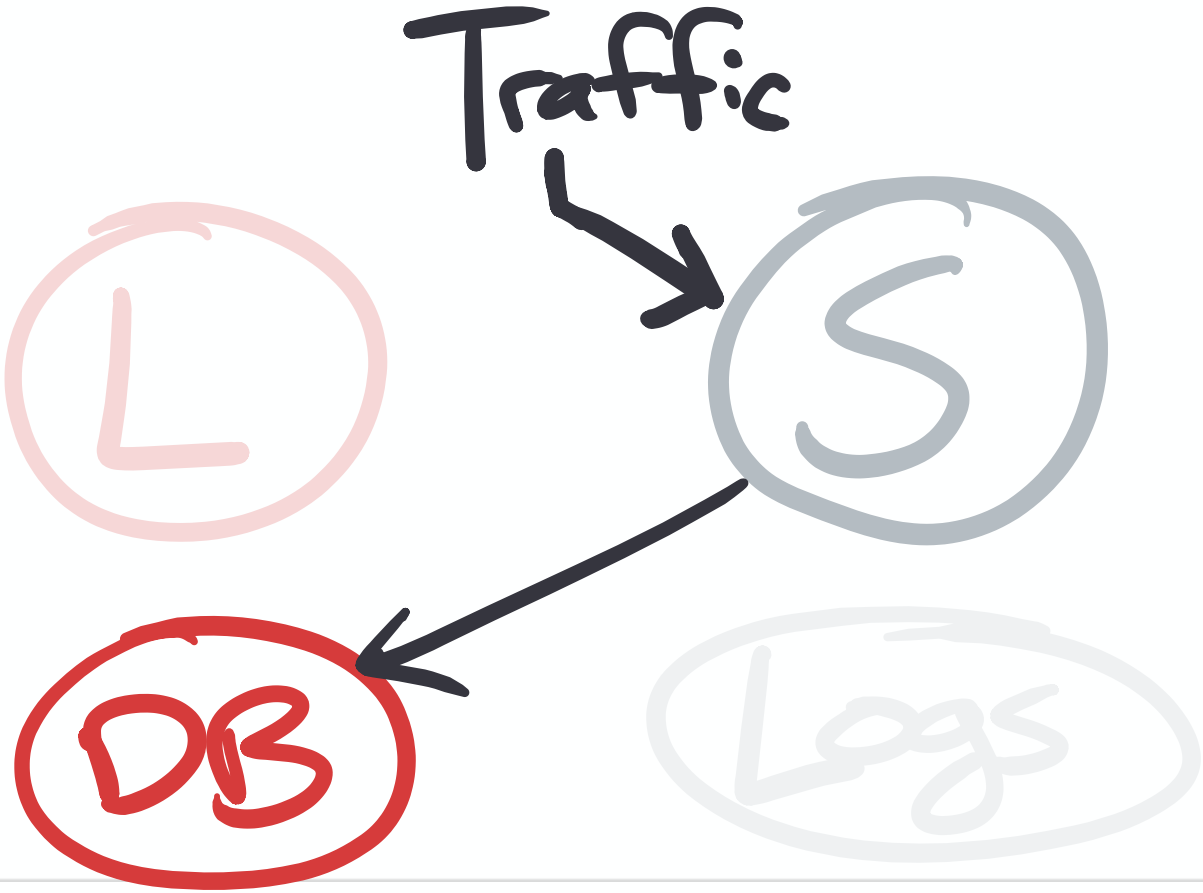

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Further reading:

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- The “strangler vine” pattern

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Never Stop Modernizing!

DO IT CONTINUOUSLY

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