The Red Pill of Resilience

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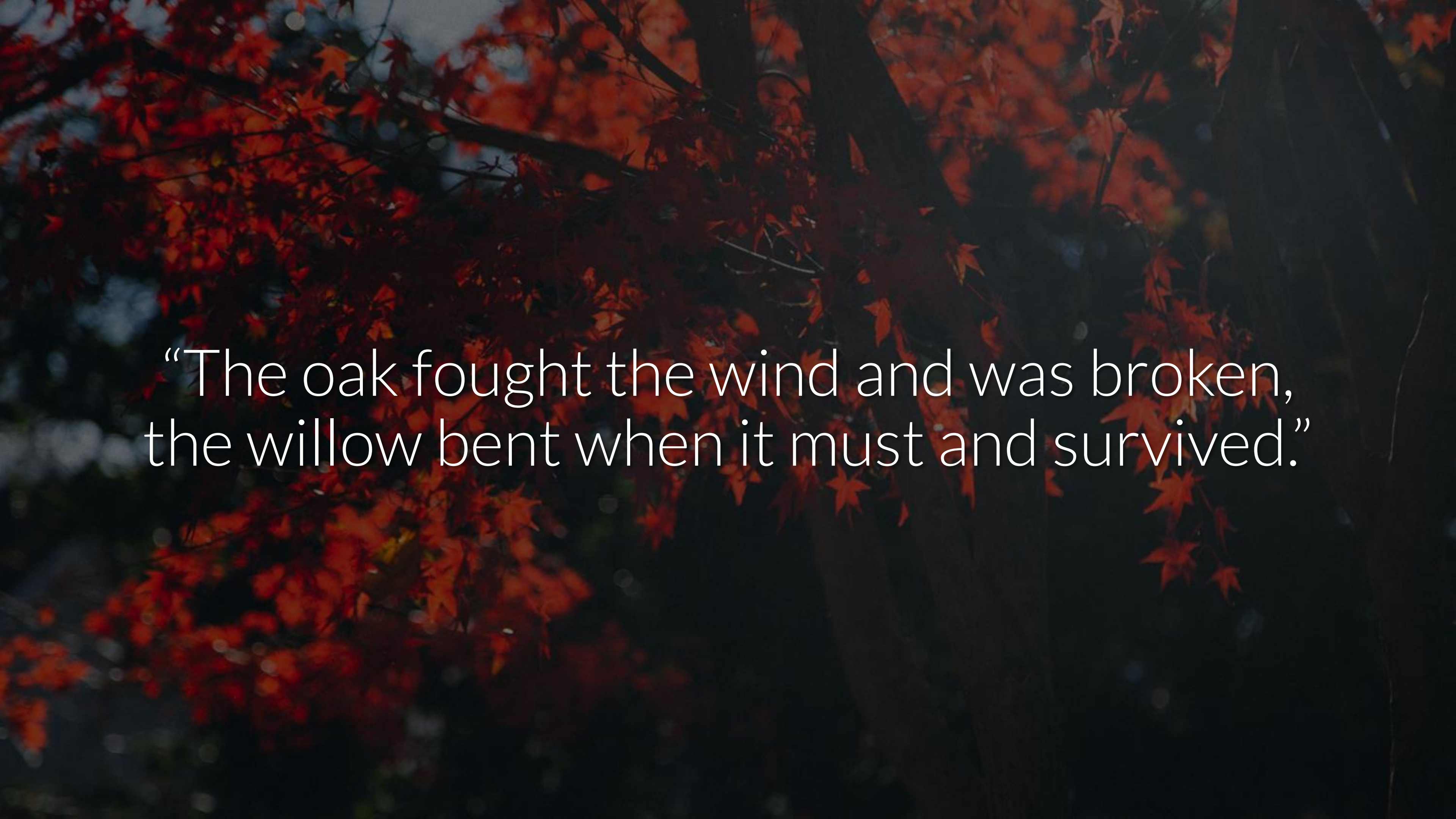
COUNTERMEASURE 2017

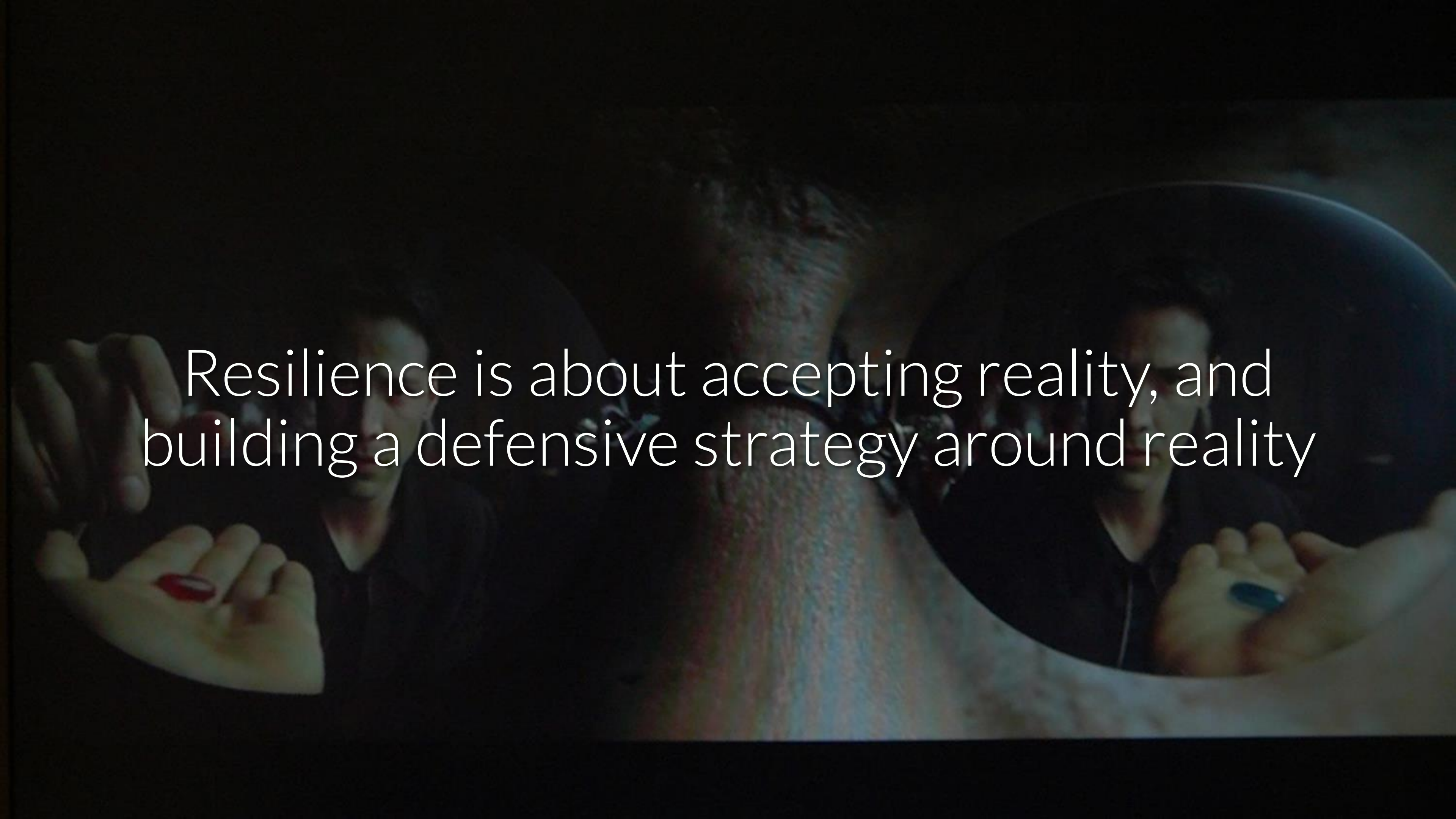
Hi, I’m Kelly

SecurityScorecard



“The oak fought the wind and was broken,
the willow bent when it must and survived.”

“The more you sweat in peace, the less you bleed in war.”



Resilience is about accepting reality, and building a defensive strategy around reality

Stages of Grief in InfoSec

Etymology of Resilience

The Resilience Triad:

- Robustness
- Adaptability
- Transformability

Stages of Grief

InfoSec is grieving that companies will never be invulnerable to attack

Denial – clinging to a false reality

“We aren’t really at risk”

Anger – frustration that denial can’t go on

“It’s your fault that I need security”

Bargaining – hope that the cause is avoidable

“Maybe we can stop attacks from happening”

Depression – despair over the reality

“We’re going to be hacked, why bother?”

Acceptance – embracing inevitability

"Attacks will happen, but I can be prepared"

Lack of acceptance feeds solution fragmentation, FUD, and snake oil

Security nihilism isn’t the answer.

Resilience is.

Etymology of Resilience

1858: Engineering – strength & ductility

20th Century: Psychology, ecology, social sciences, climate change, disaster recovery

Resilience in Complex Systems

Non-linear activity in the aggregate

Intertwined components, unpredictability

Infosec is a complex system.

Defenders, attackers, users, governments, software vendors, service providers, …

Ecological resilience

Continually adapt; high degree of instability

Chestnut trees in eastern North America’s forests were wiped out by chestnut blight

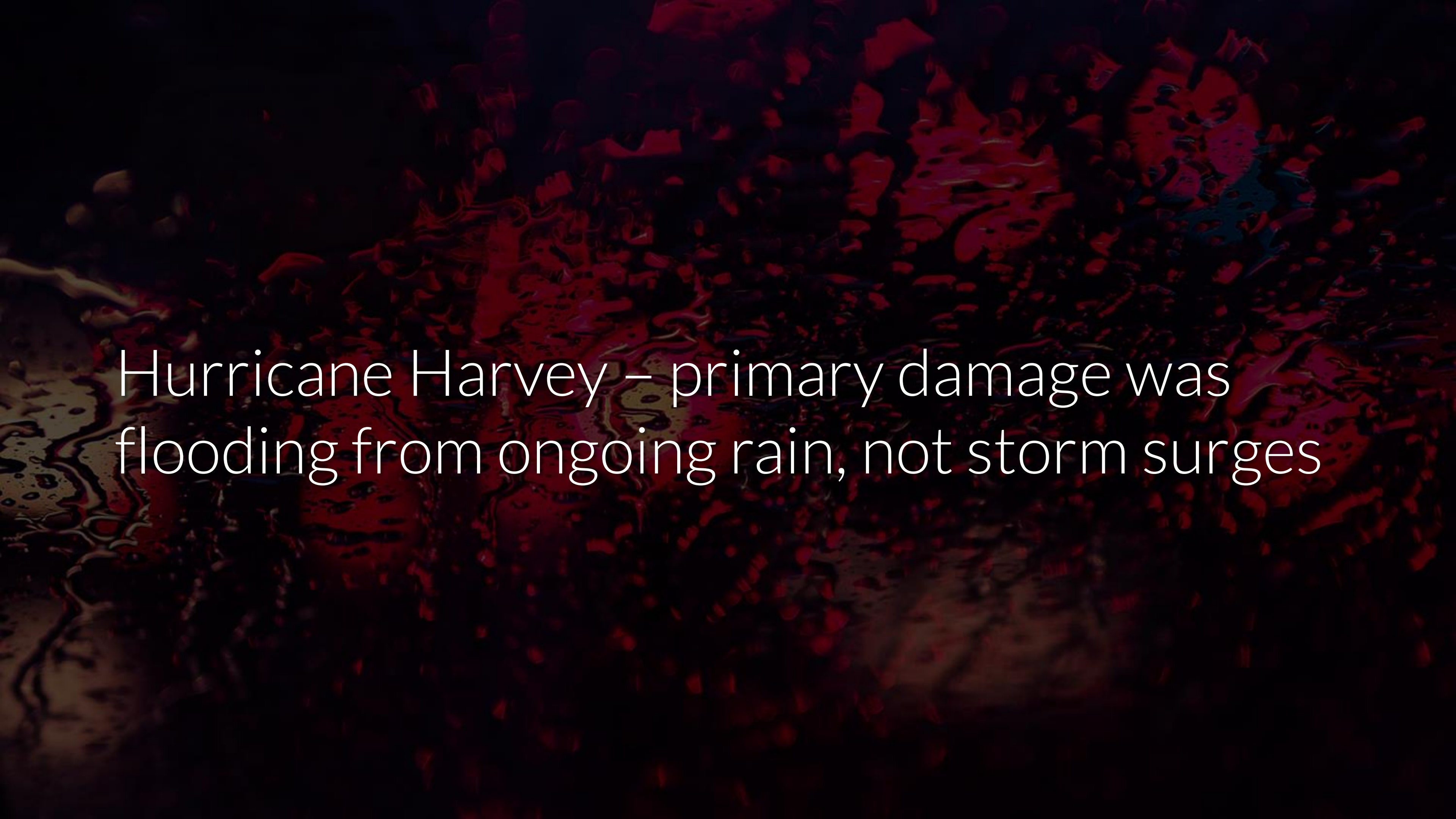
Oak and hickory trees grew in their stead

Evolutionary resilience assumes socio-ecological systems are co-evolutionary

Communities can diversify agricultural landscapes and production systems

Three central characteristics of resilience:

Robustness, Adaptability, Transformability

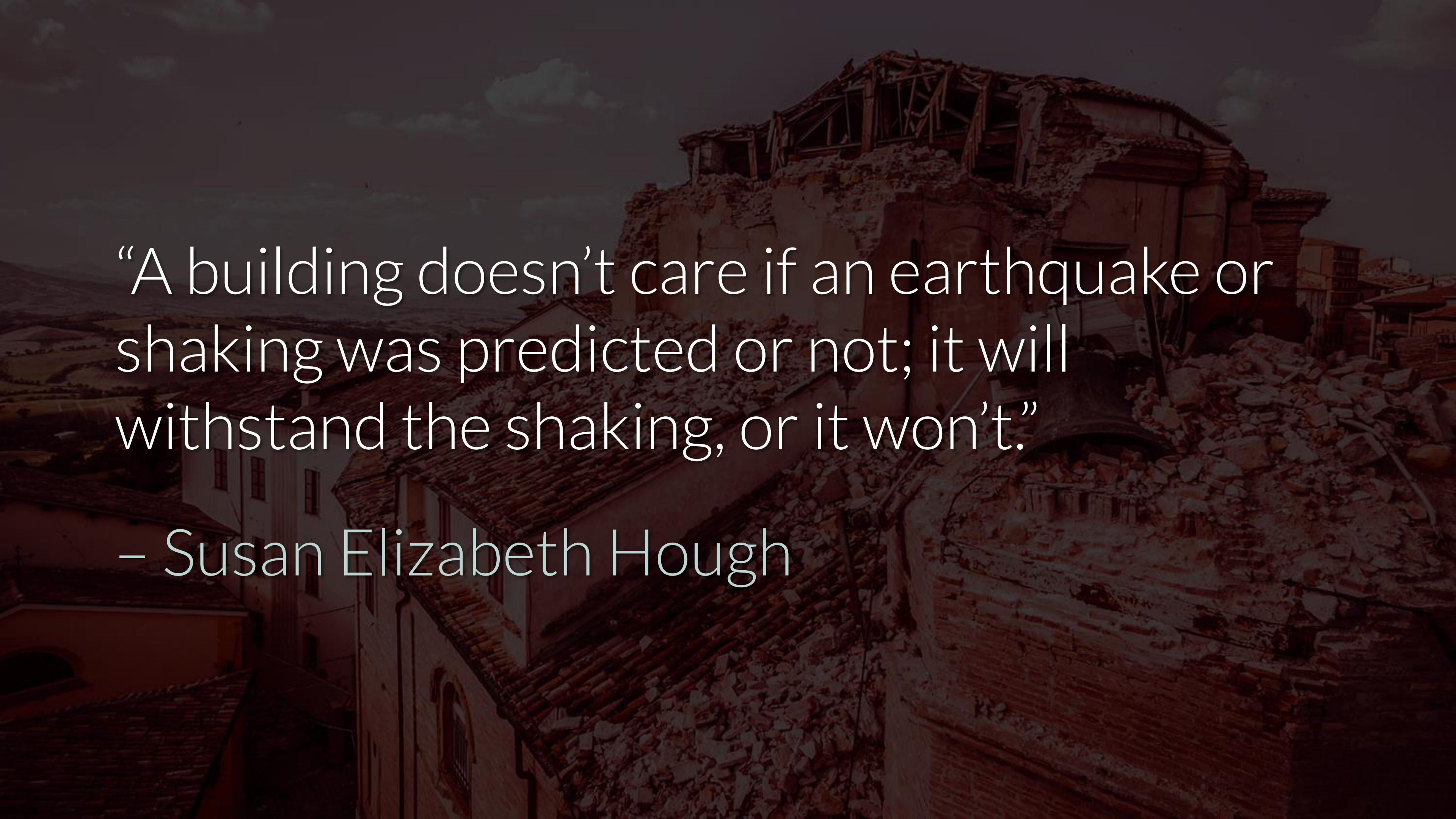


Hurricane Harvey – primary damage was flooding from ongoing rain, not storm surges

Resilience is about the journey, not the destination

Accept the risk will exist

Reduce potential damage & restructure around the risk



> "A building doesn't care if an earthquake or shaking was predicted or not; it will withstand the shaking, or it won't."
>
> – Susan Elizabeth Hough

Survival rests on embracing the unknown and accepting that change is inevitable

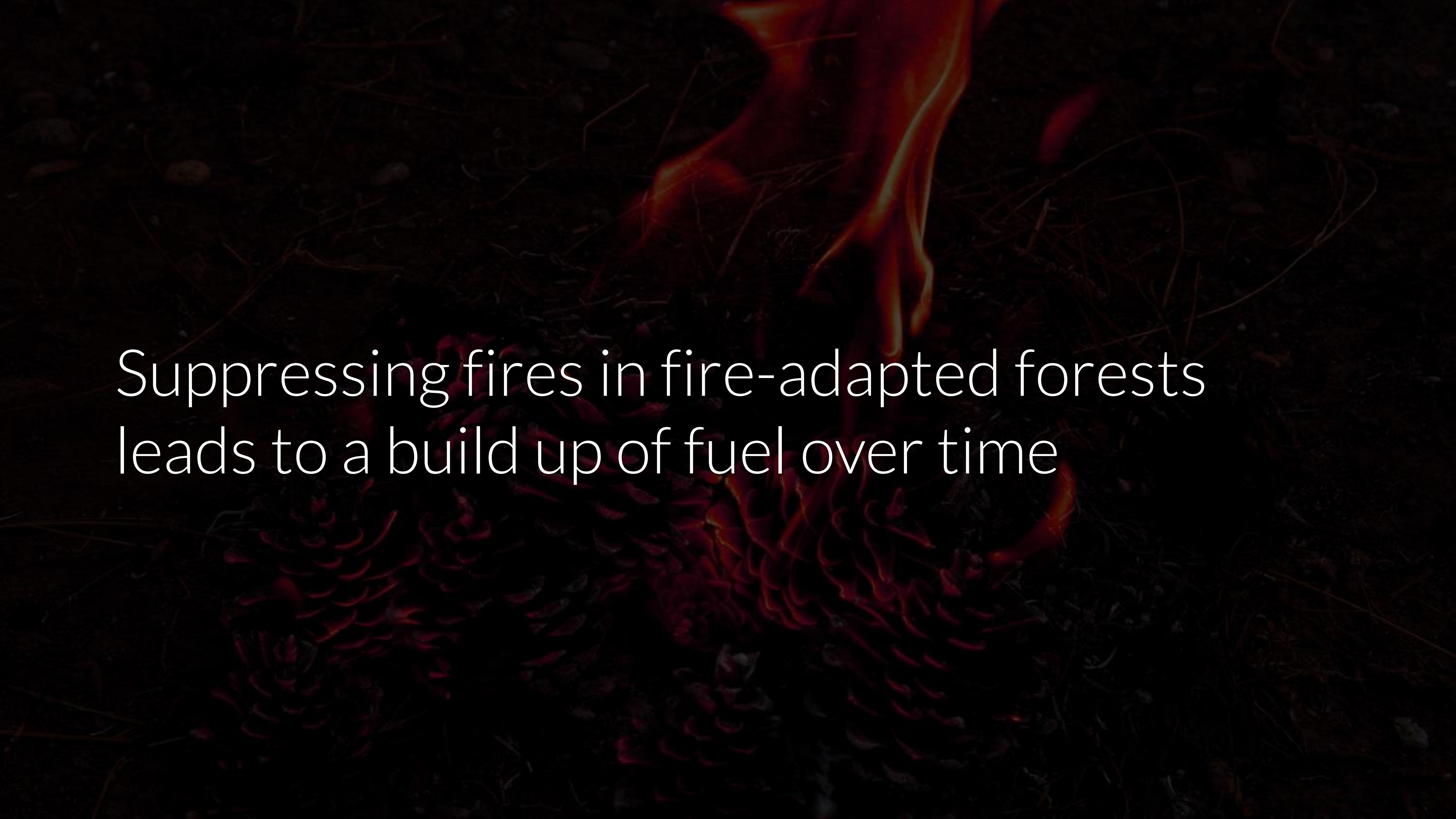
Robustness

Robustness: withstanding and resisting

a.k.a. “engineering resilience”

Safe development paradox: stability allows risk to accumulate, compromising resilience

Focus on just engineering resilience leads to a maladaptive feedback loop



Suppressing fires in fire-adapted forests leads to a build up of fuel over time

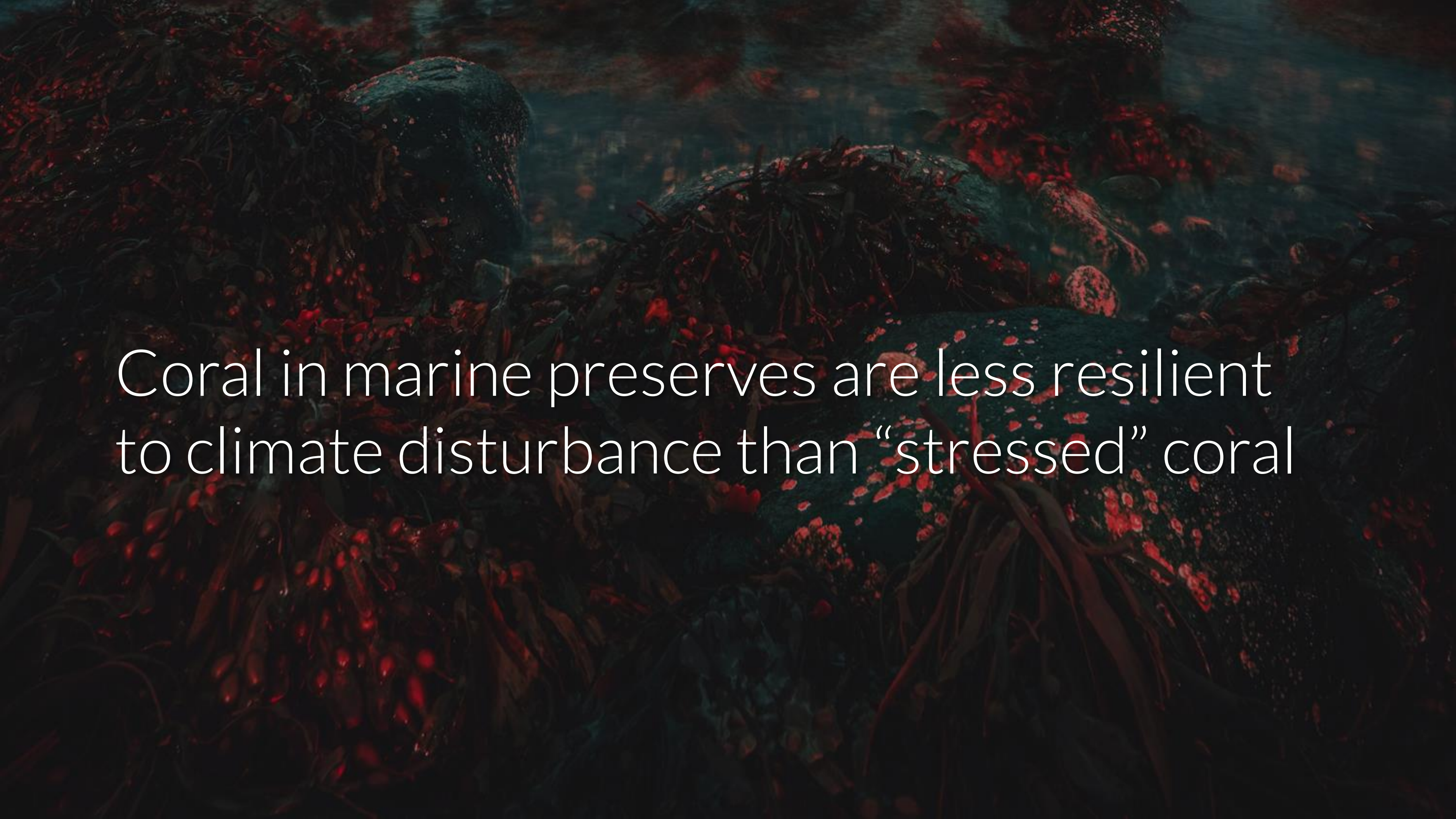
Patching & retroactive hardening of vuln-prone systems accumulates risk

Levees support further human development in at-risk floodplains

“Don’t treat the symptoms of bad planning with structures”

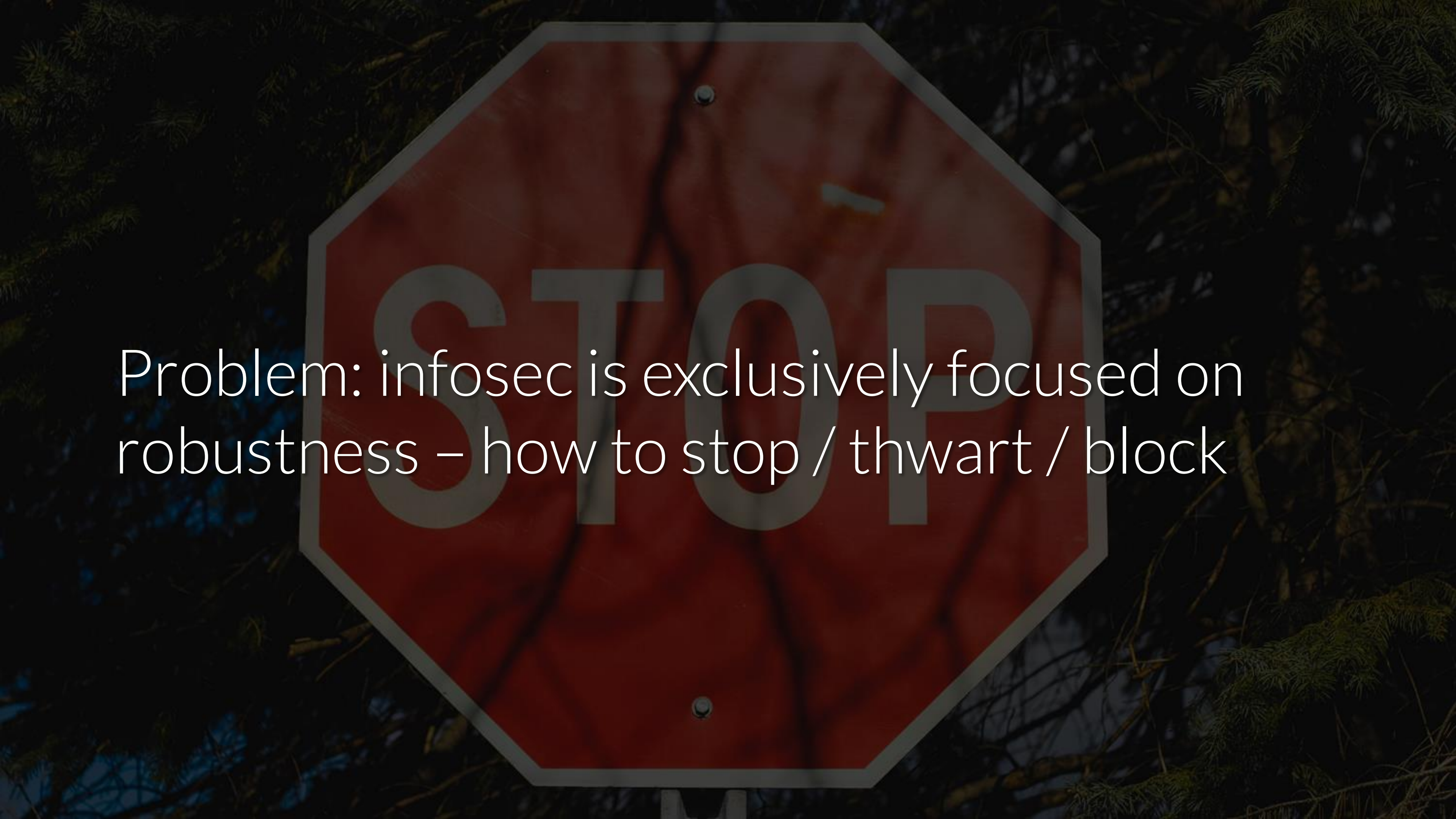
Technical controls shouldn’t allow exemption from cyber insurance requirements

Artificially creating a stable environment makes the system less adaptive to disruption



Coral in marine preserves are less resilient to climate disturbance than “stressed” coral

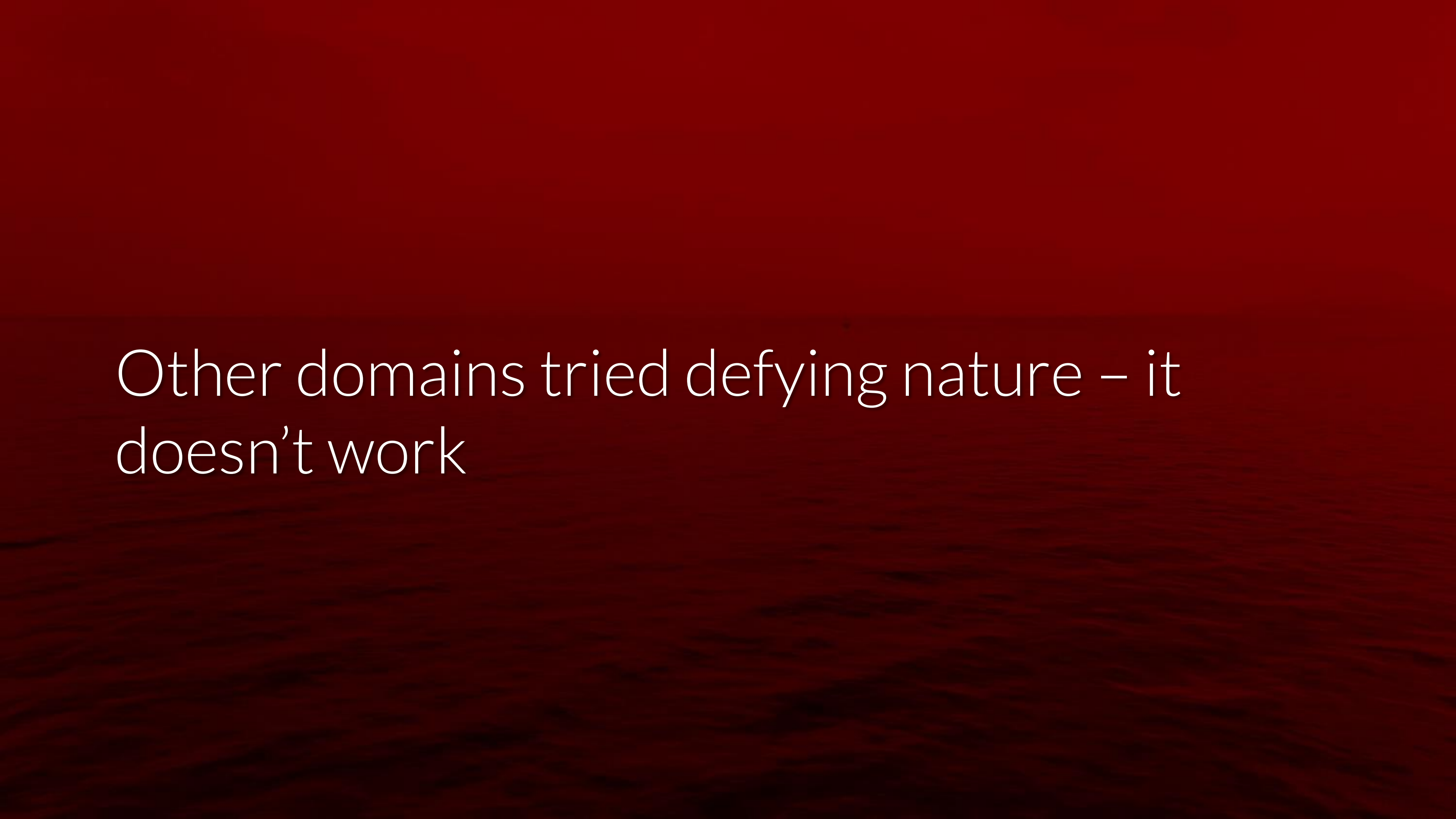
Design & test internal systems with the same threat model as externally-exposed ones



Problem: infosec is exclusively focused on robustness – how to stop / thwart / block

Infosec’s current goal is to return to “business as usual” post-breach.

There is no such thing.



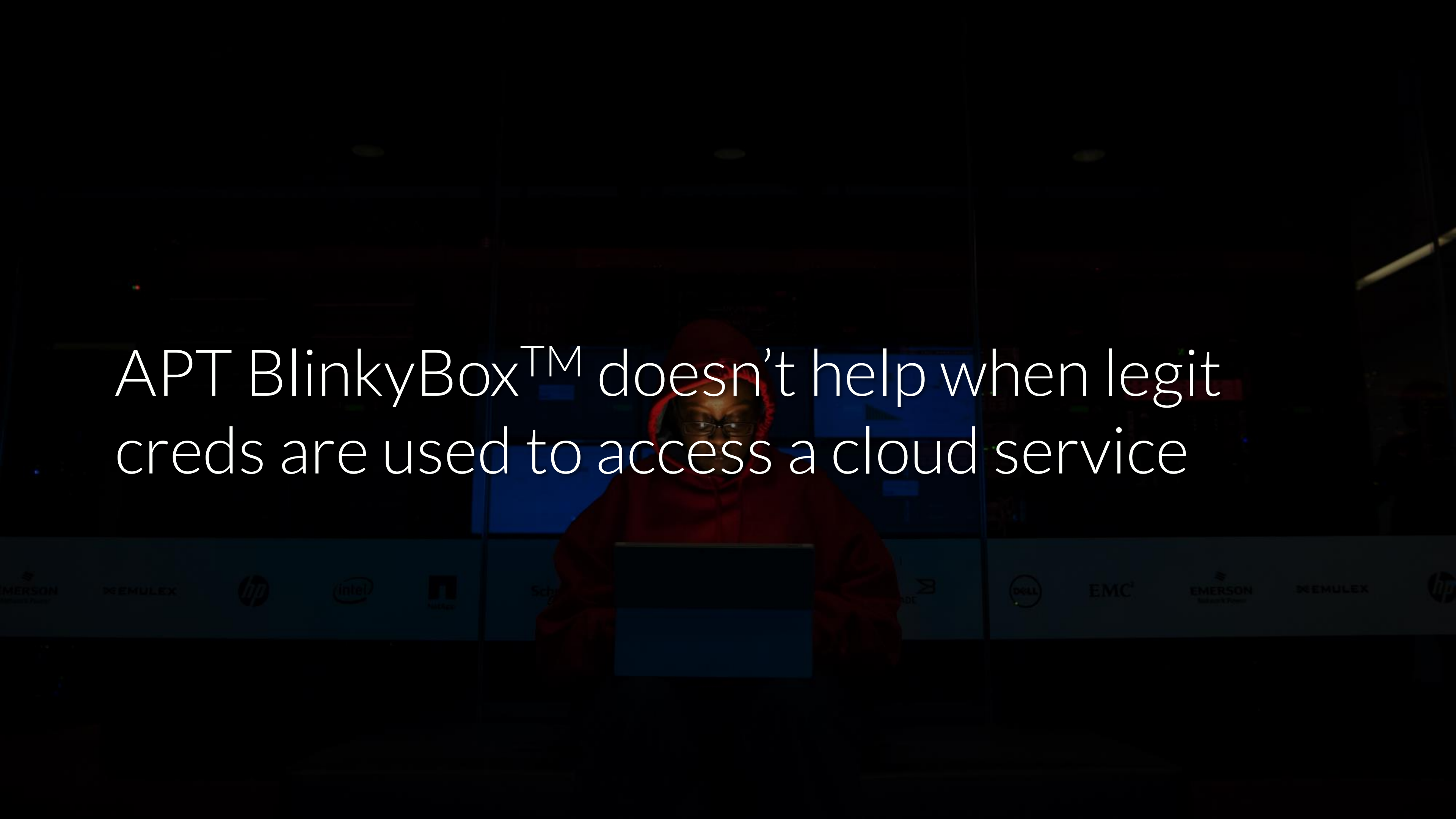
Other domains tried defying nature – it doesn’t work

Your systems must survive even if users click on phishing links and download pdf.zip.exe’s

Robustness is effective when you have diverse and layered controls

NYC’s excess heat guidelines: backup hybrid-power generators, heat-tolerant systems, window shades, high-performance glazing

Diversity helps provide redundancy in uncertain conditions



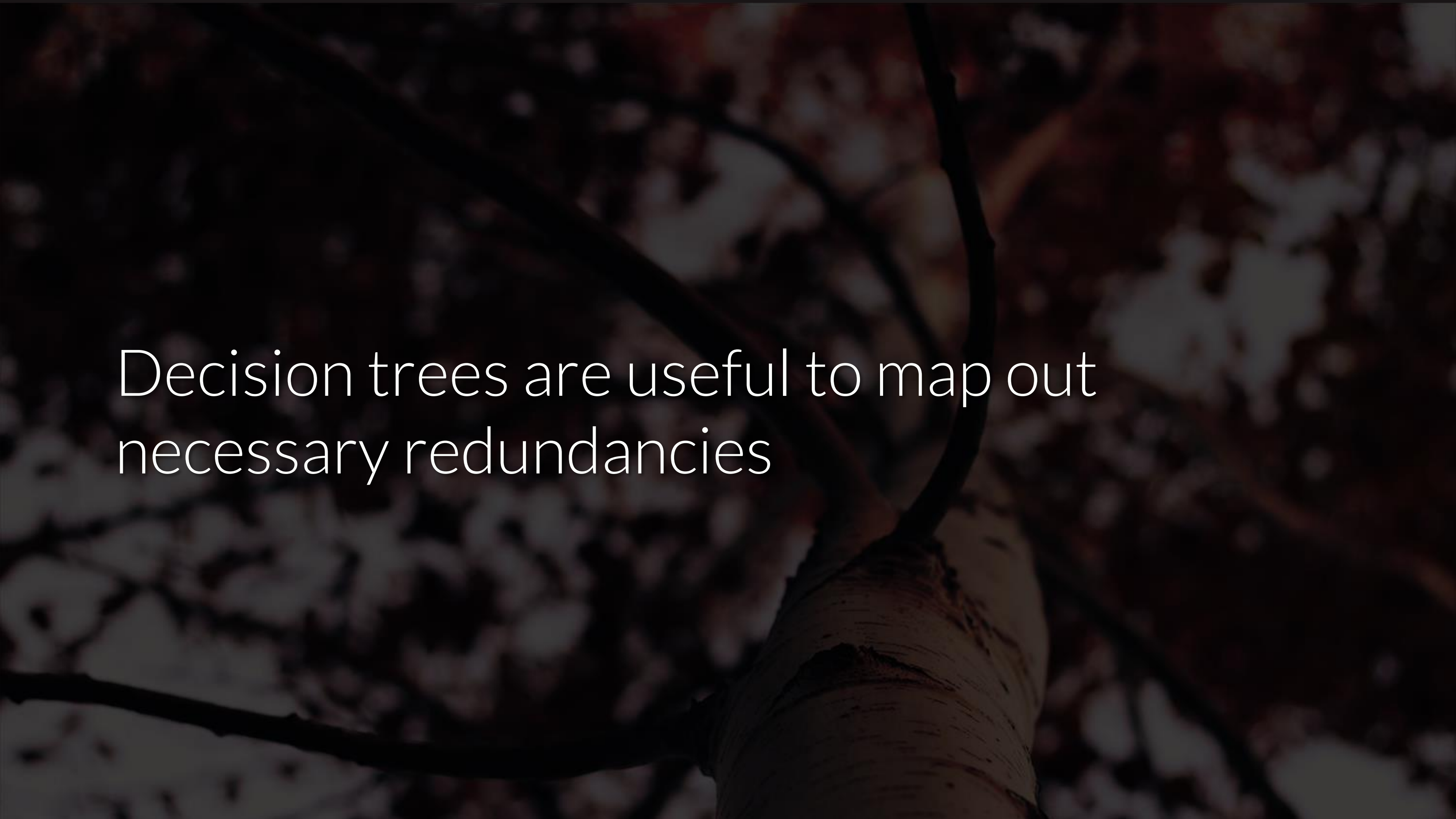
APT BlinkyBox^{TM} doesn’t help when legit creds are used to access a cloud service

Don’t ignore correlated risk.

Fragmentation can inject a healthy level of instability to foster resilience.

Pitfall of efficiency: more limited space in which your operations can survive

Up for debate: manageability via uniformity vs. minimized impact via diversity?



Decision trees are useful to map out necessary redundancies

Raising attacker cost is the bridge from robustness to adaptability

"Attackers will take the least cost path through an attack graph from their start node to their goal node."

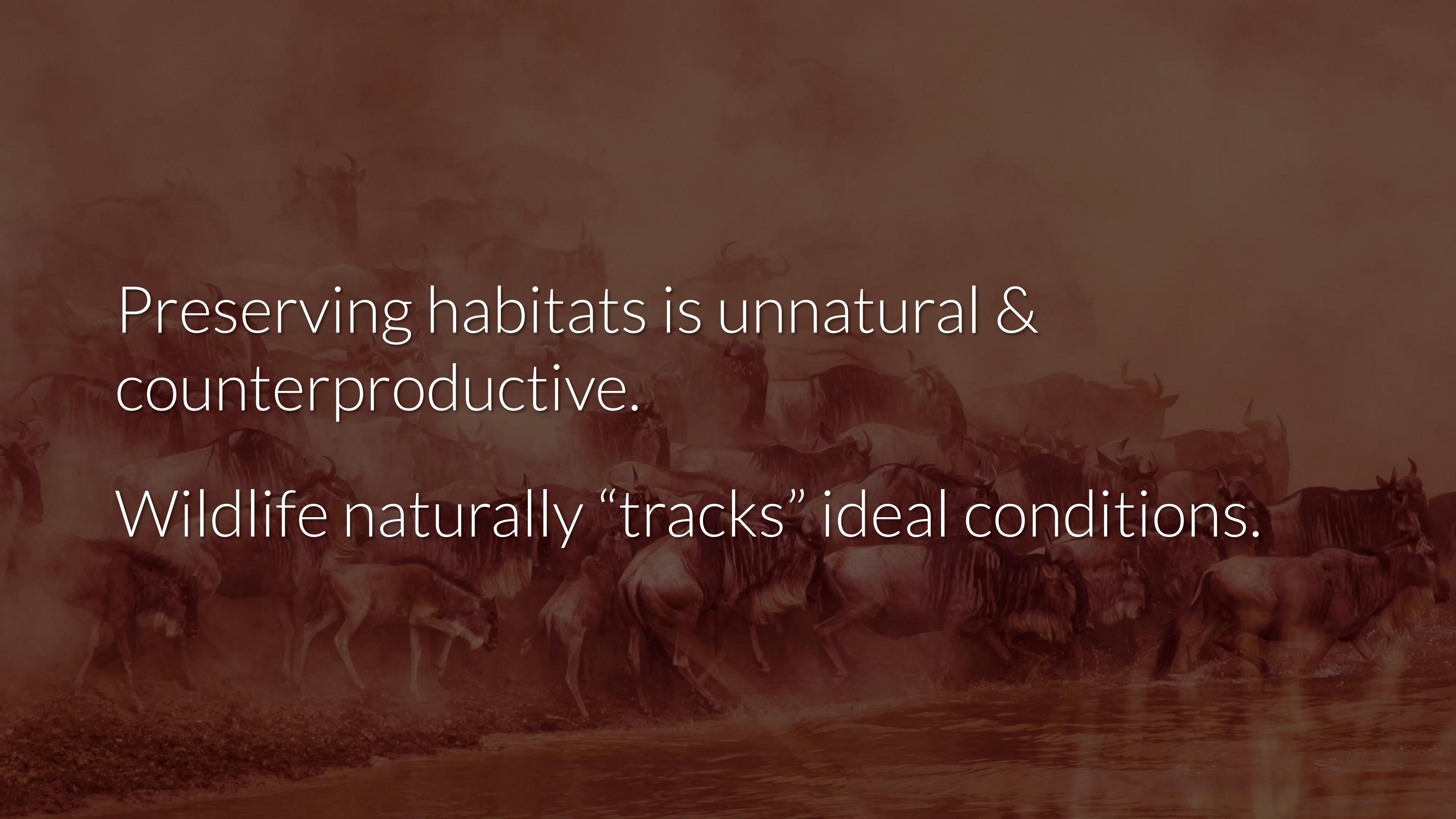
– Dino Dai Zovi

Adaptability

Adaptability: reduce costs and damage incurred, while keeping your options open

Intergov’t Panel on Climate Change (IPCC):

Incremental change creates a false sense of security – goal is managed transformation



Preserving habitats is unnatural & counterproductive.

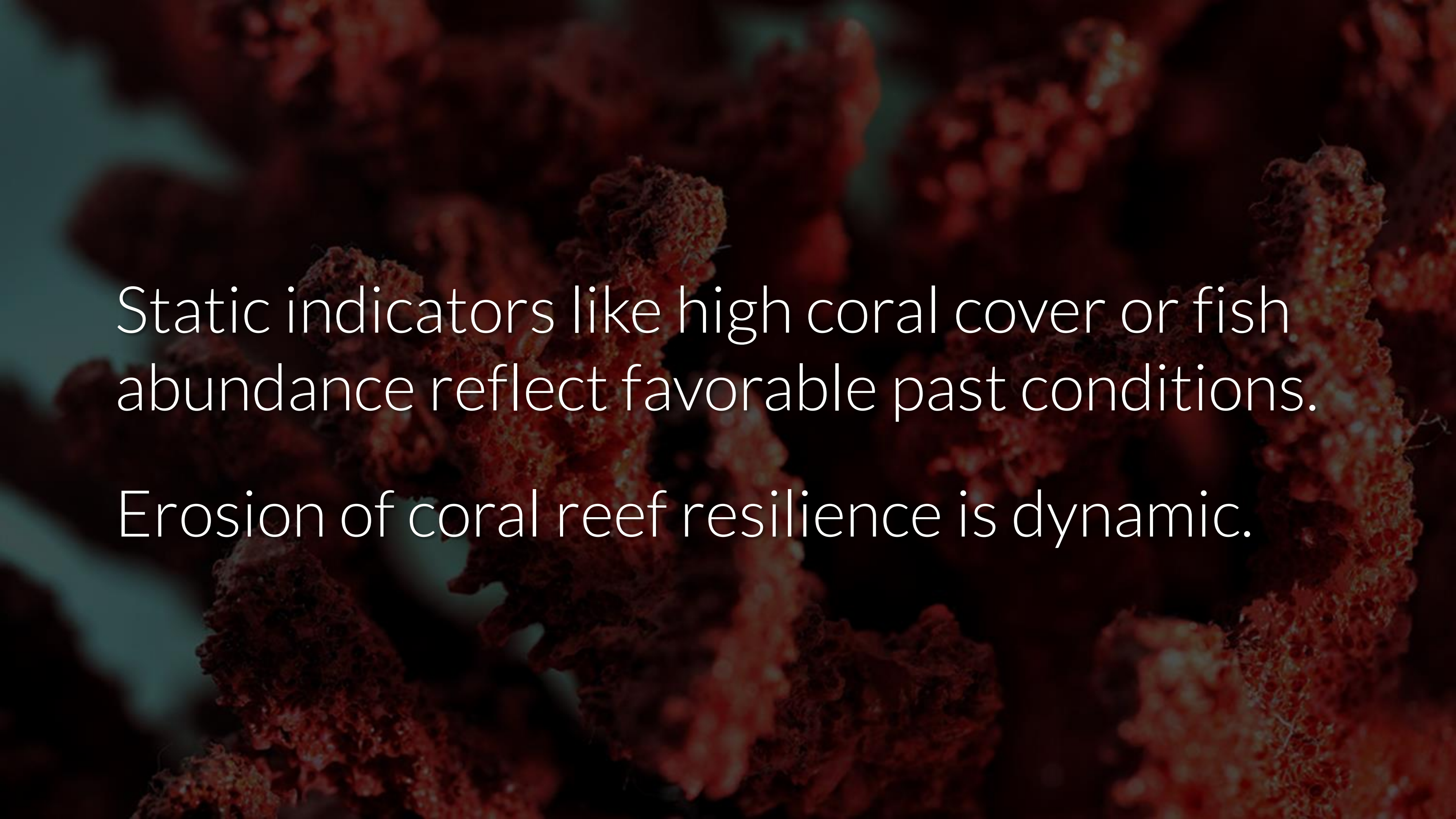
Wildlife naturally “tracks” ideal conditions.

Legacy systems are like preserved habitats.

We need to be able to migrate to better conditions.

Example: patching inline PHP code

Instead: single class for DB queries



Static indicators like high coral cover or fish abundance reflect favorable past conditions.

Erosion of coral reef resilience is dynamic.

Ensure your threat models aren’t based on favorable past conditions

Survival strategy: comingle warm-adapted species with cold-adapted cohorts

Apps built with legacy systems and libs will not survive in an increasingly open API world

Uncertainty and surprise must be baked into your approach

Test adaptability to attacker methods with attack simulation or auto playbook testing

Chaos Monkey

Randomly kills instances to test their ability to withstand failure.

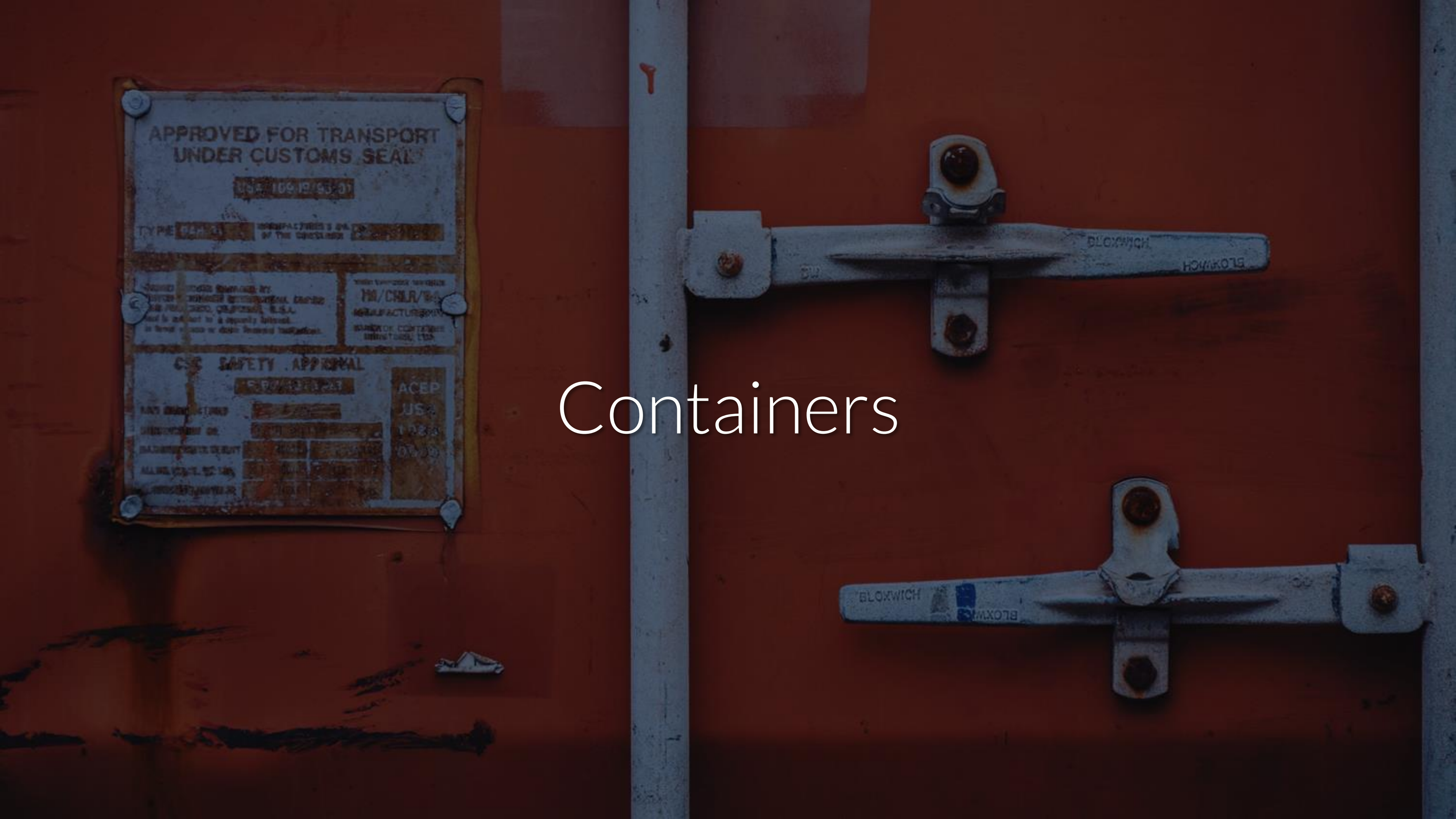
It also makes persistence really hard.

Design your security architecture for survival even if individual controls fail

Rethinking security architecture is hard.

The industry offers too much complexity.

Containers


APPROVED FOR TRANSPORT
UNDER CUSTOMS SEAL
CSC SAFETY APPROVAL
ACEP
USA
BLOXWICH
BLOXWICH

Containers promote adaptability and support transformability

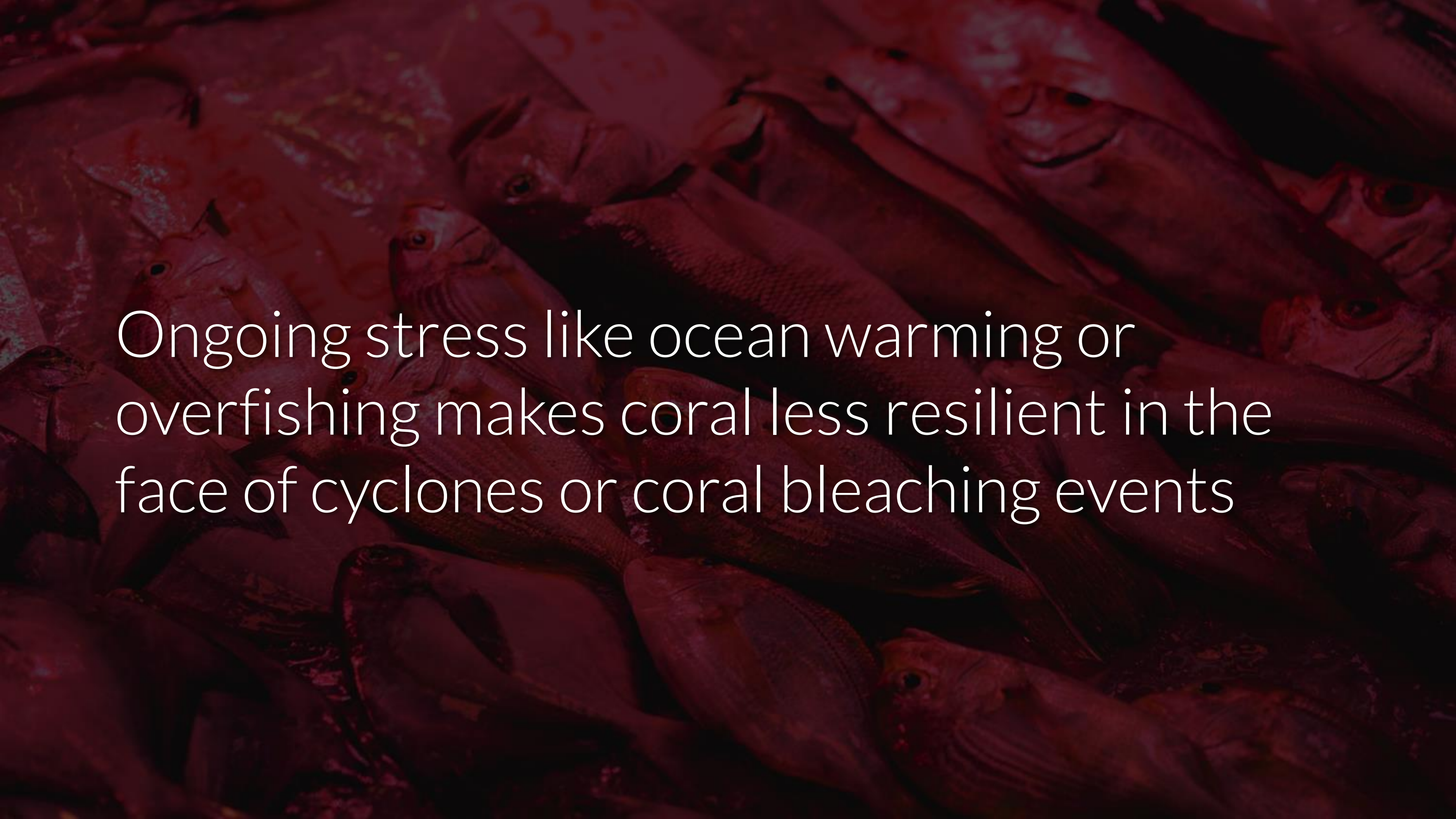
@jessfraz | blog.jessfraz.com/post/talks

Containers = “isolated, resource-controlled, and portable runtime environments”

Easier to determine root cause

Easier to transport to better infrastructure

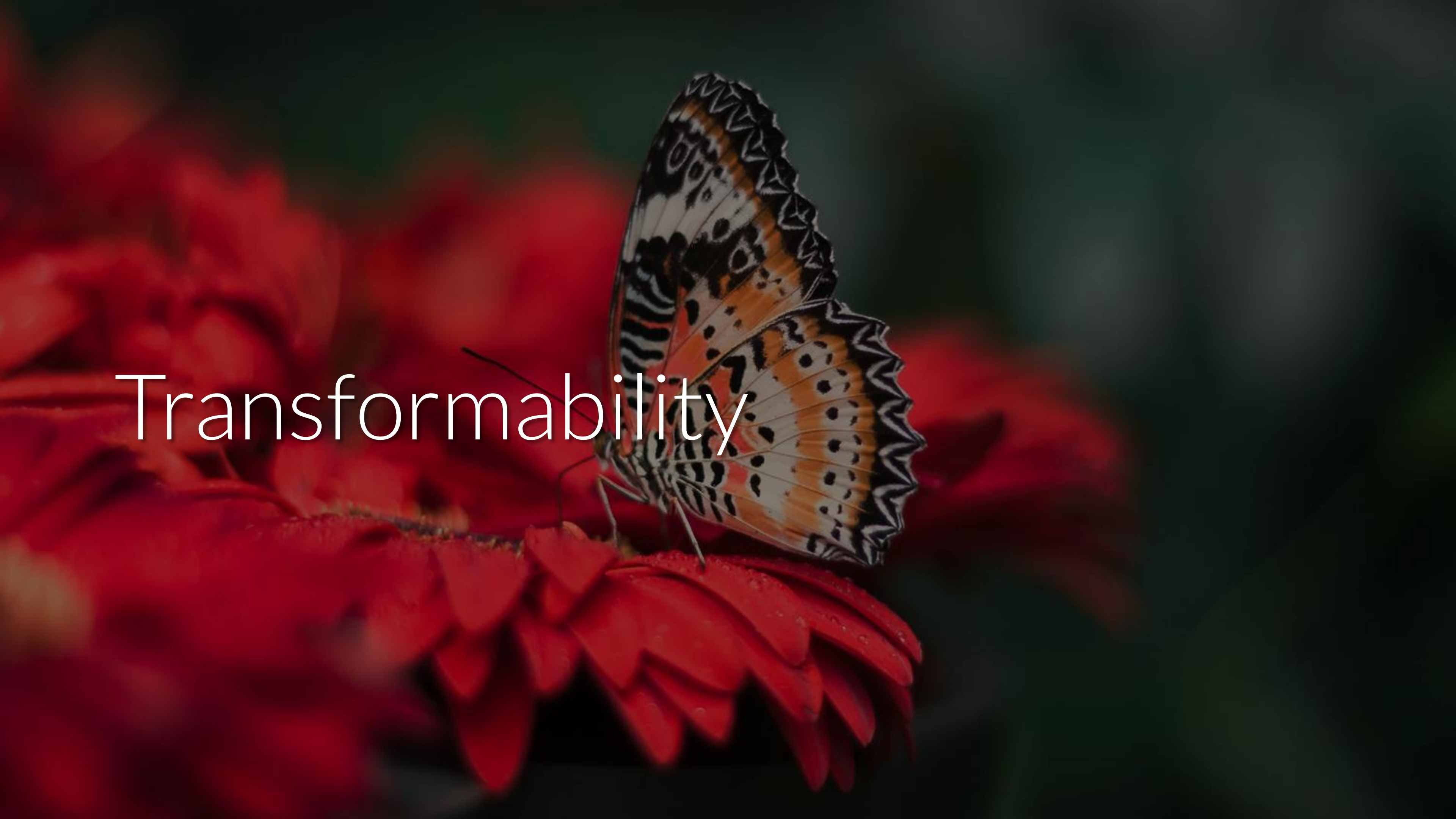
Easier to kill the infection & stop spread



Ongoing stress like ocean warming or overfishing makes coral less resilient in the face of cyclones or coral bleaching events

Complexity will erode your resilience in the face of new vulns or data breaches

Transformability



Transformability = challenge existing assumptions & reorganize your system

Prior example: inline code makes it difficult to reorganize your system vs. a single class

In disaster recovery policy, ideal is to change location & remove urbanization

2011: 6.3mms earthquake hit Christchurch

Cost to rebuild of $40bn+

NZ designated a “red zone” where land is too vulnerable & where rebuilding is uneconomic

Identify the red zones within your IT systems

Choose your own infosec redzone criteria:

Publicly exposed, legacy systems, critical data, privileged access, overly verbose, single point of failure, difficult to update, …

Example: API consuming critical data should be in “red zone” whether it has vulns or not

Identify assets that fall under your red zone criteria & migrate them to a safer system

Example: Planned decommission of levees to assist migration

Prohibits becoming a permanent “fix”

Continually consider how you can prepare in advance for migration

Complex systems require collaborative planning across stakeholders

Open sharing of protections in place, what risk remains, uncertainties in the approach

Partner with engineering – they benefit from flexibility and transformability as well

Your role is to manage state transitions.

Consider how a resilience approach fits into engineering workflows.

2FAC @ Facebook: integrated 2FA into dev workflows without creating friction

“You can actually implement security controls that affect every single thing people are doing and still make them love it in the process”

Find someone with whom to collaborate & how security can fit into their workflows

Ensure your org is learning from prior experiences – foster a security culture

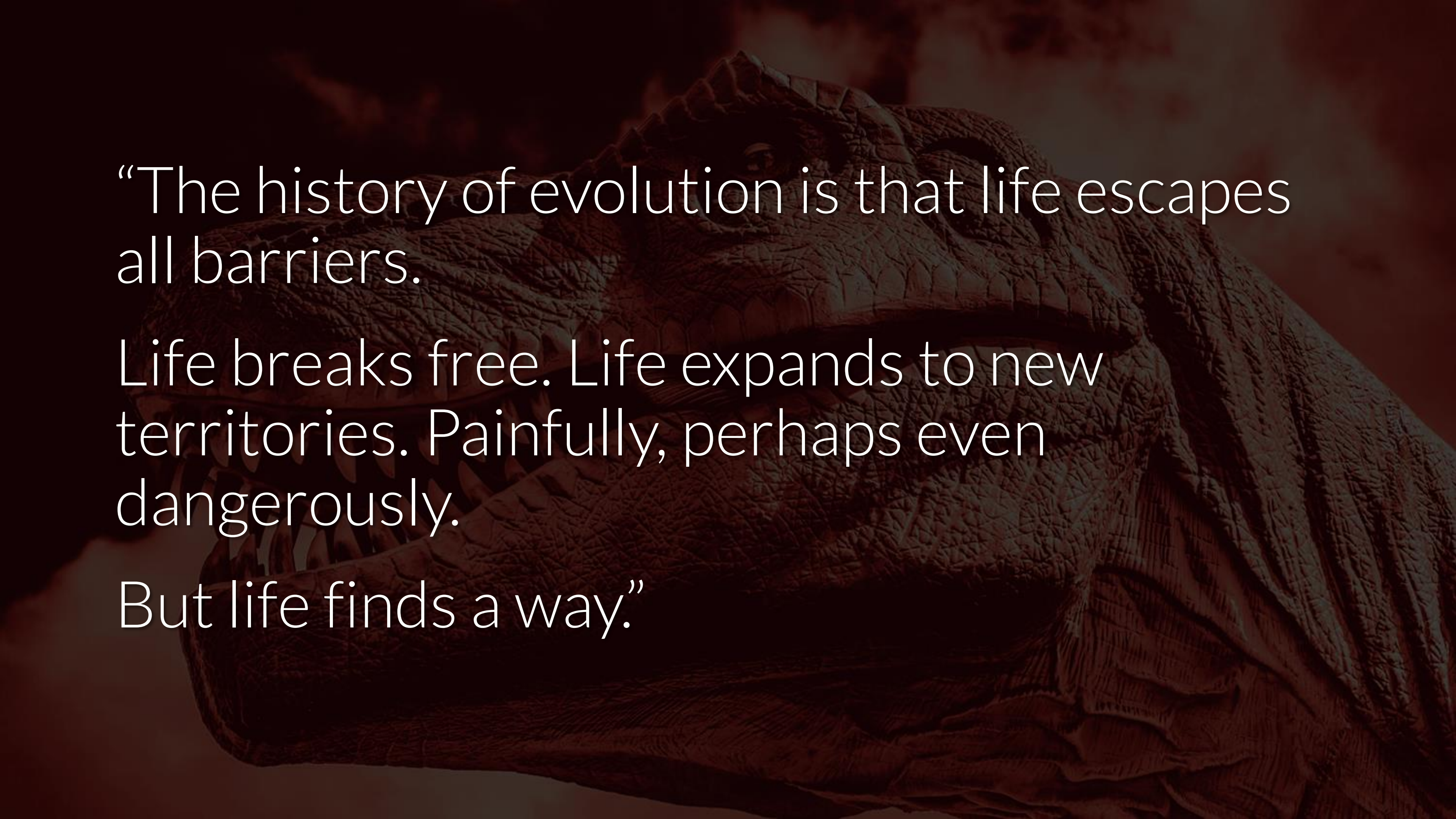
Conclusion

Infosec resilience means a flexible system that can absorb an attack and reorganize around the threat.

Robustness is optimized through diversity of controls

Adaptability minimizes the impact of an attack and keeps your options open

Transformability demands you challenge assumptions & reorganize around reality



“The history of evolution is that life escapes all barriers.

Life breaks free. Life expands to new territories. Painfully, perhaps even dangerously.

But life finds a way.”

Attacks will evolve. We can evolve, too.

Let’s strive for acceptance of our grief, and architect effective and realistic defense

The blue pill relegates us to the role of a firefighting cat who’s drunk on snake oil

Instead of accepting snake oil, take the red pill of resilience instead

“Good enough is good enough. Good enough always beats perfect.”

– Dan Geer

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Suggested Reading

- Engineering resilience versus ecological resilience
- Resilience and disaster risk reduction: an etymological journey
- A strategy-based framework for assessing the flood resilience of cities – A Hamburg case study
- Vulnerability, Resilience, and the Collapse of Society
- Are some forms of resilience more sustainable than others?
- Flood Resilience: a Co-Evolutionary Approach
- The oak or the reed: how resilience theories are translated into disaster management policies
- Rethinking Ecosystem Resilience in the Face of Climate Change
- Building evolutionary resilience for conserving biodiversity under climate change
- Complexity and Planning: Systems, Assemblages and Simulations
- “Windows Containers” by Microsoft
- “The Netflix Simian Army” by Netflix