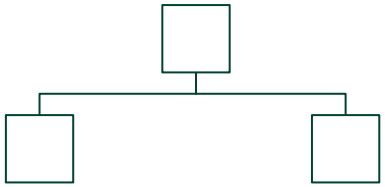
Complex Systems: Microservices and Humans

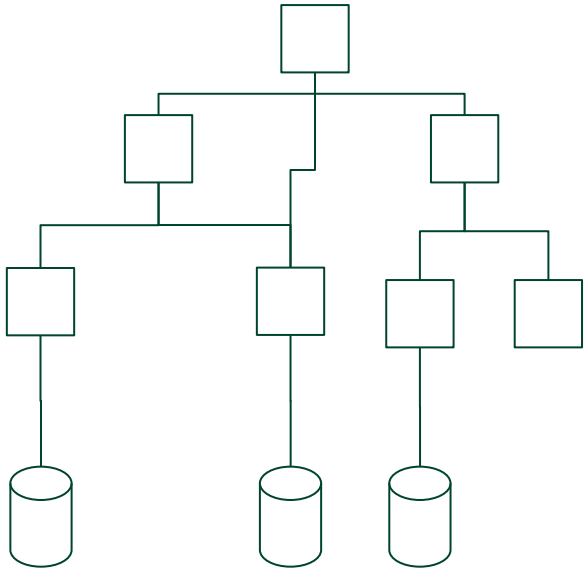
Katharina Probst, Engineering Director, Google

What do **polar bears** have to do with microservices?

Microservices Architectures Behave Similarly



Microservices Architectures Behave Similarly



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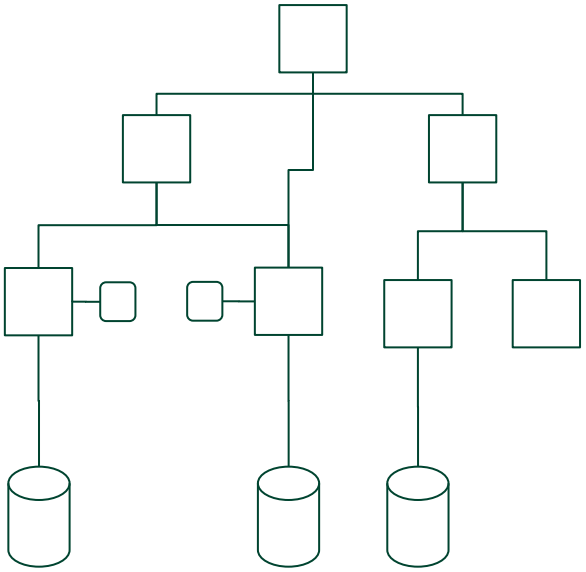

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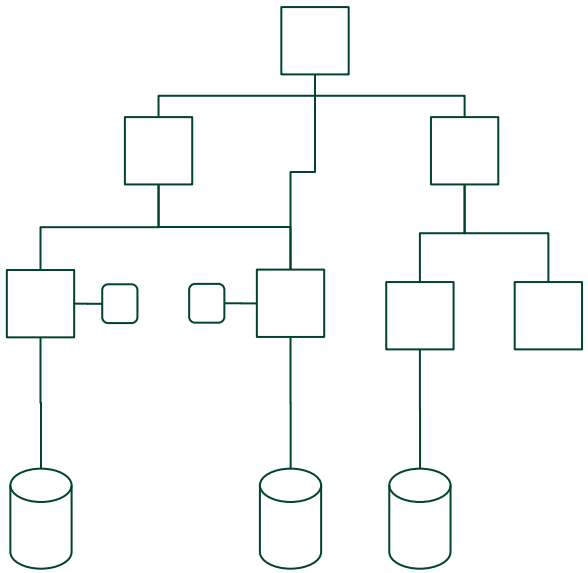
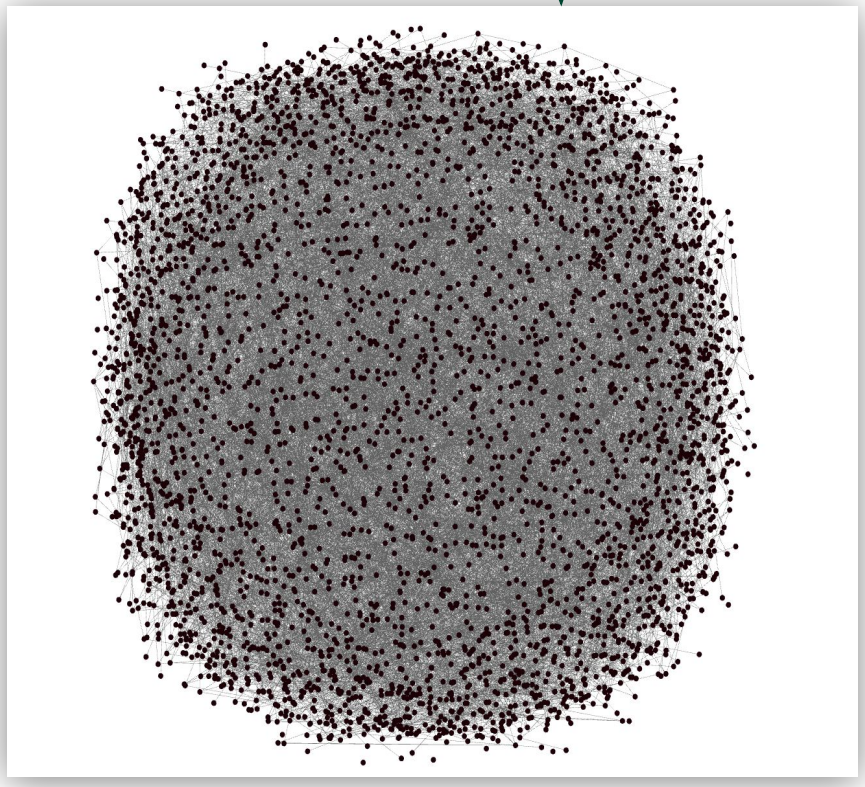
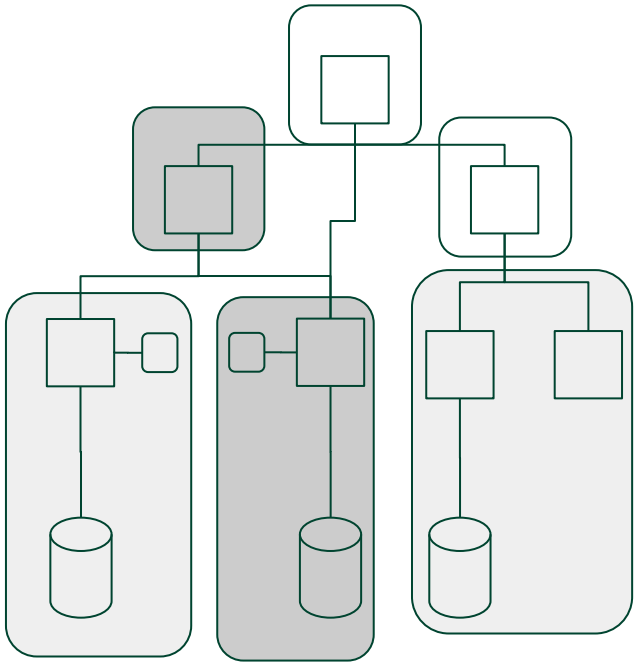


Theory

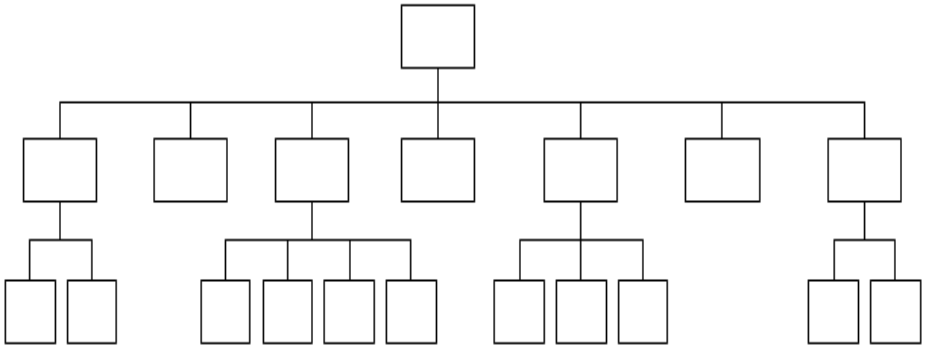
Reality



Microservices Architectures Behave Similarly



OUR HUMAN SYSTEMS ARE JUST AS COMPLEX AS OUR DISTRIBUTED SYSTEMS



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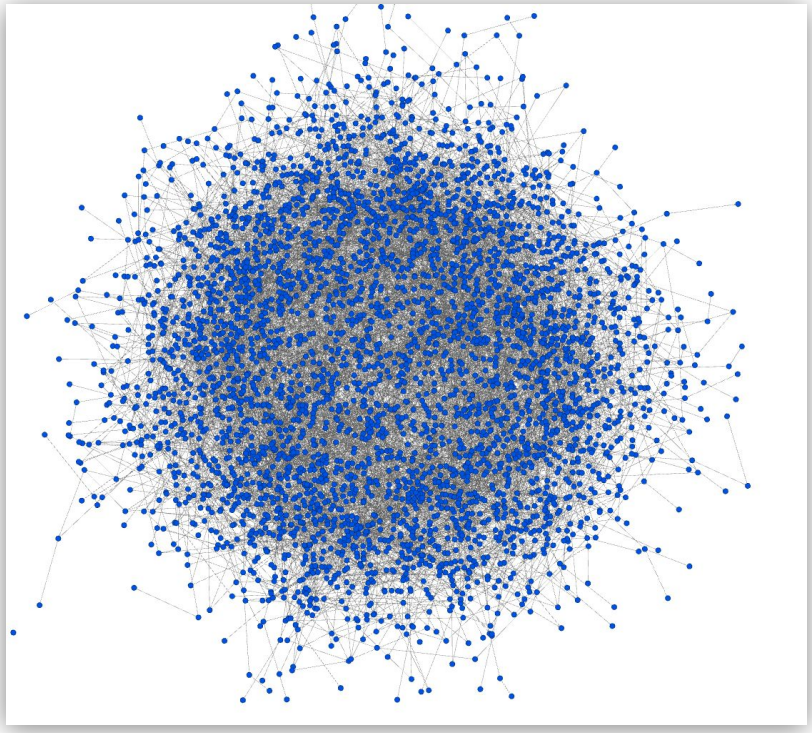
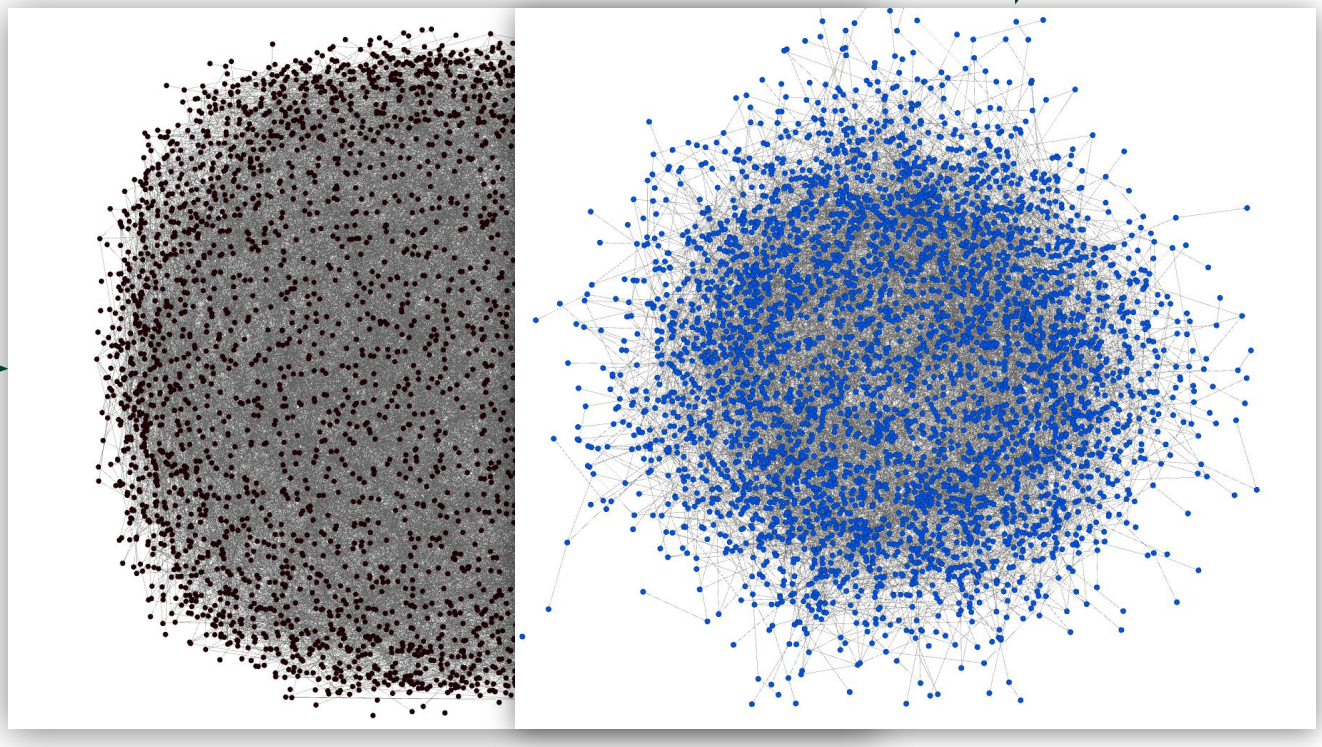


TWO LEVELS OF COMPLEX SYSTEMS

Human system
“overlay”

Microservices
system



UNDERESTIMATE AT YOUR OWN PERIL

SYSTEMS DECLINE SLOWLY, THEN FAST

Microservices system

Example:
Running out of memory

SYSTEMS DECLINE SLOWLY, THEN FAST

Microservices system

Example:
Running out of memory

Human system

Example:
Skyrocketing attrition

MICROSERVICES SYSTEMS

Configuration / Setup

- K8s
- Service meshes
- Architecture best practices

Changes

- CI/CD
- GitOps
- Testing
- Slow rollouts

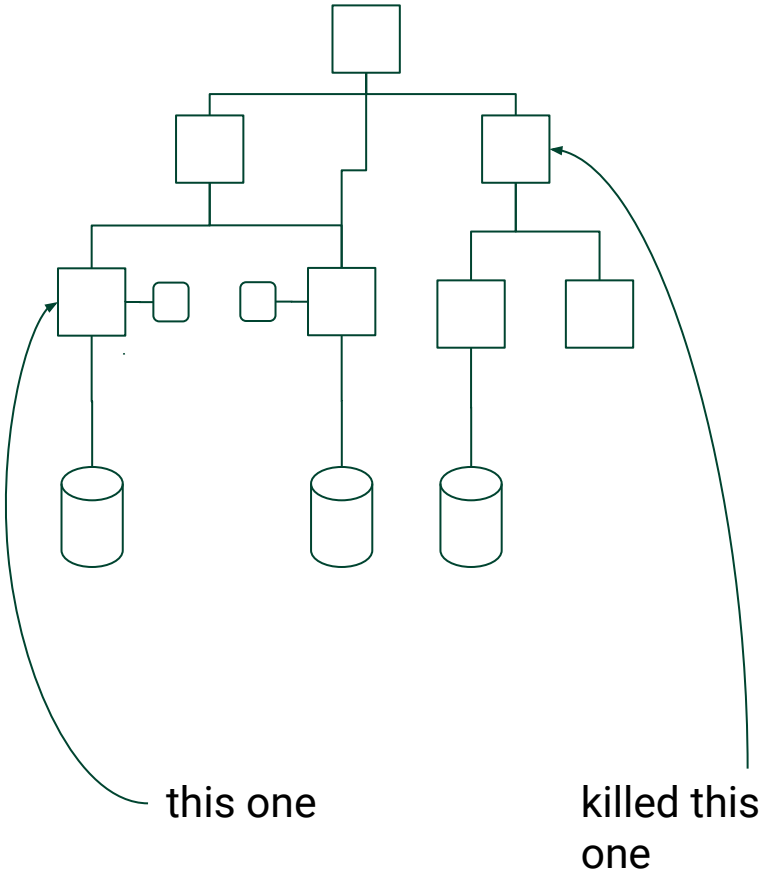
Day 2 operations

- Load testing
- Chaos testing
- AI Ops
- Monitoring

MICROSERVICES SYSTEMS

Outages are inevitable,
but usually surprising

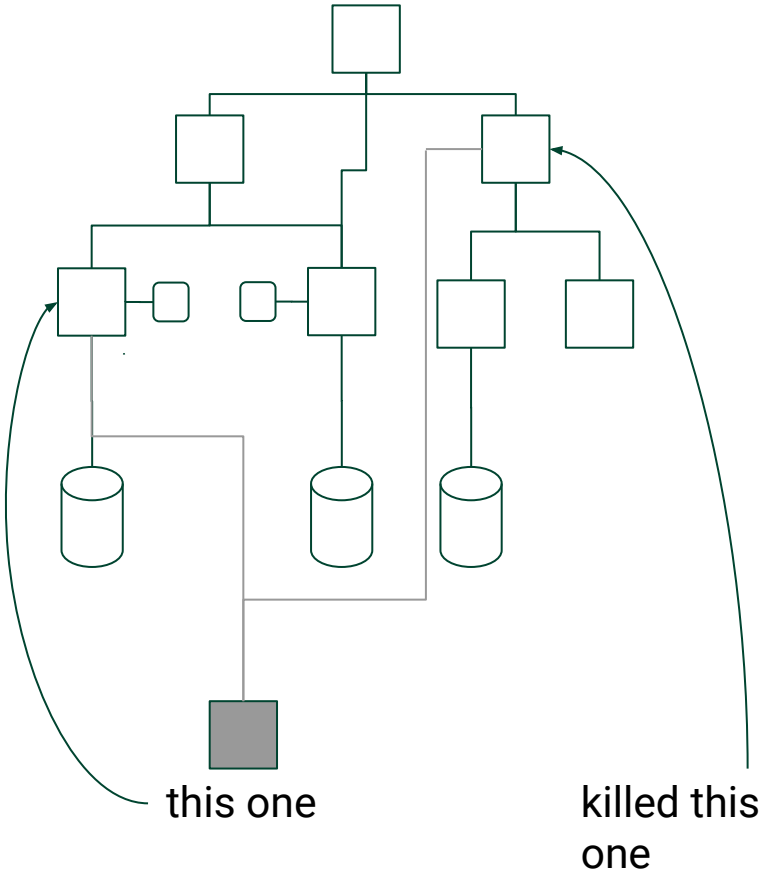
- Change to a part of
  the system far away



MICROSERVICES SYSTEMS

Outages are inevitable,
but usually surprising

- Change to a part of the system far away
- Hidden dependency?



MICROSERVICES SYSTEMS

Outages are inevitable,
but usually surprising

- Change to a part of the system far away
- Hidden dependency?
- Days/Months after code is rolled out

HUMAN SYSTEMS

Configuration / Setup

- Job ladders
- DEI
- Culture
- Motivation

Changes

- Promos
- Onboarding
- Attrition
- Org changes

Day 2 operations

- External forces (e.g., COVID!)
- Positive culture changes

THE REALITY OF INCIDENTS

- A rollercoaster of emotions

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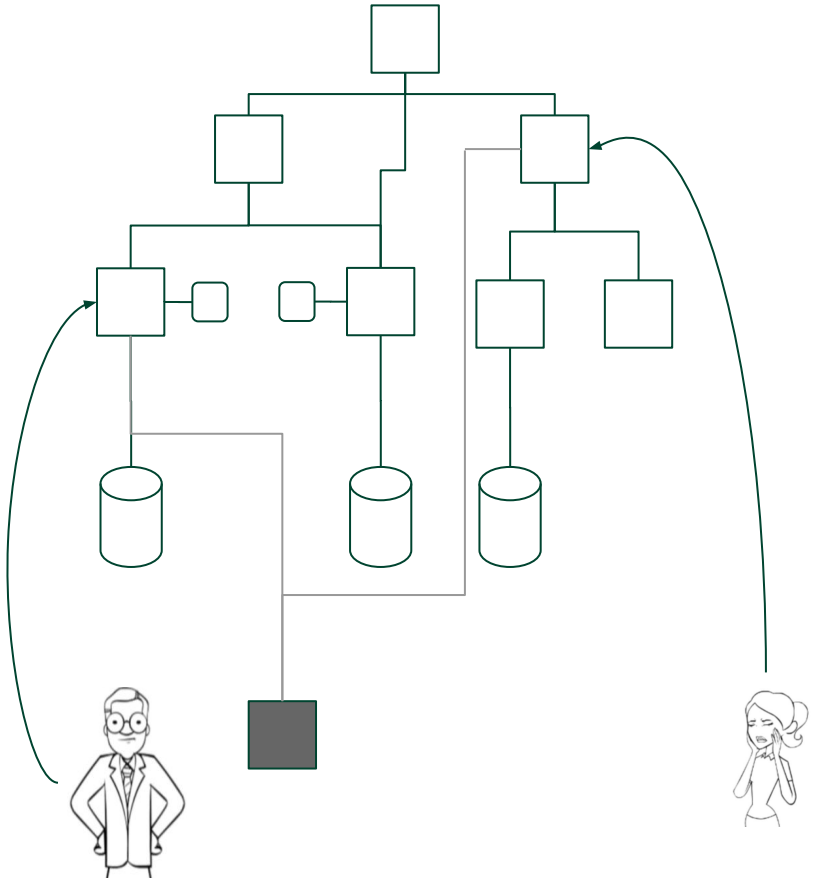
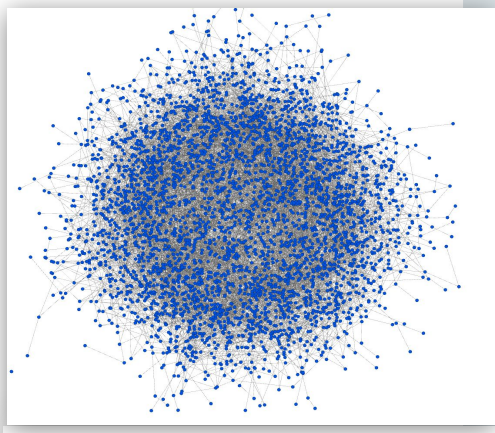
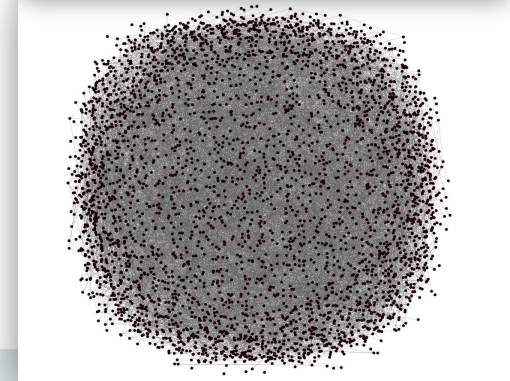
- A rollercoaster of emotions
- Often require experts from all over



THE REALITY OF INCIDENTS

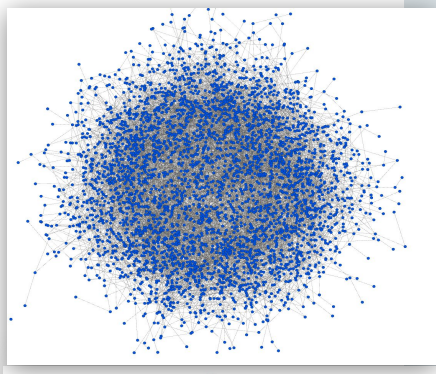
- Complex interaction between two complex systems
- Often no single root cause but contributing factors

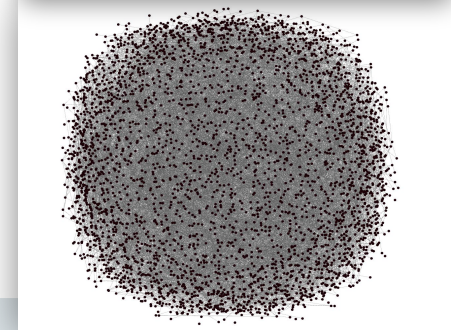




SOME PRIOR ART

- Human Factors
  - Interactions between human error and environment (e.g., J. Rasmussen: *Cognitive Systems Engineering*)
- Behavioral Economics
  - Small changes in environment can lead to behavior change (e.g., Thaler, Sunstein: *Nudge*)
  - Incentives (e.g., Ariely: *Predictably Irrational*)
- Motivation
  - Autonomy, Mastery, Purpose (e.g., Pink: *Drive*)





These are only examples!

NOW WHAT?
MICROSERVICES SYSTEMS

- Kubernetes
- Service meshes / sidecar proxies
- GitOps
- AI Ops
- Chaos testing
- etc.

Great tools, but be clear about your goal.

Continuously work to improve system and insights.

NOW WHAT?
HUMAN SYSTEMS

- Game days
- Education forums
- Design reviews
- Oncall training
- etc.

Good, but not enough.

Continuously work to improve organizational health.

"We can not solve our problems with the same level of thinking that created them."

Albert Einstein

Thanks!

Any questions?

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