INSTANA

Learning from the visible past to accelerate the observable future

What can chocolate cake teach us about Observability

What is Observability

Depends on who you ask ...

"If you are observable then **data** is available so I can **analyze** and **understand** you."

Paraphrase from **Observability vs. Monitoring,** https://www.instana.com/blog/observability-vs-monitoring/

And this needs to be done in **production** ...

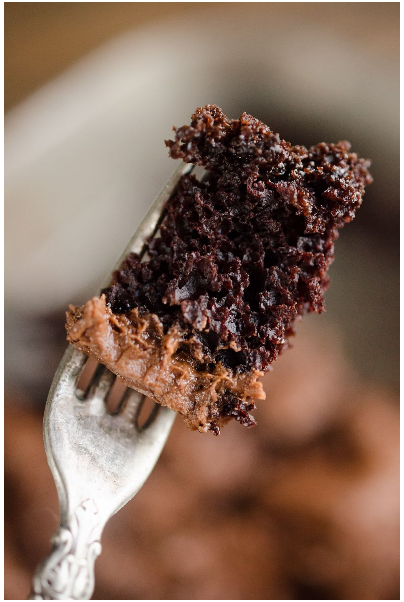
Challenging Trends

- **Production is the validation environment**
- **Increasing speed everywhere**: dev, build, deploy, troubleshoot, ..
- **Embrace complexity**: complex software manages more complex software
- **Just in time structure:** FaaS
- **Infrastructure is less visible**

Important Questions and Considerations

Why bake a chocolate cake?	What problems and challenges to tackle?
What are the best baking techniques?	Can we identify some best practices?
What can we learn from past cakes?	What can the past teach us about how to proceed?

A Taste of the Problem Space

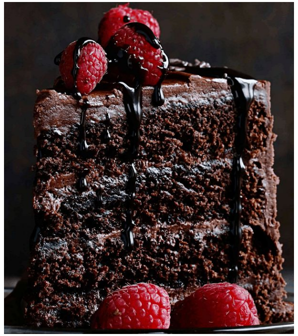


Who	What	Example Problem Statement
Business owners	User journeys (workflows, SLI/SLO)	What services are involved in this user journey?
Developers	Services (business logic, endpoints)	What business goals are impacted by these services? What h/w or infrastructure is impacting this service?
SRE / Operators	Infrastructure (h/w, schedulers, frameworks, libraries, virtualization)	If I retire this h/w, what services are impacted?

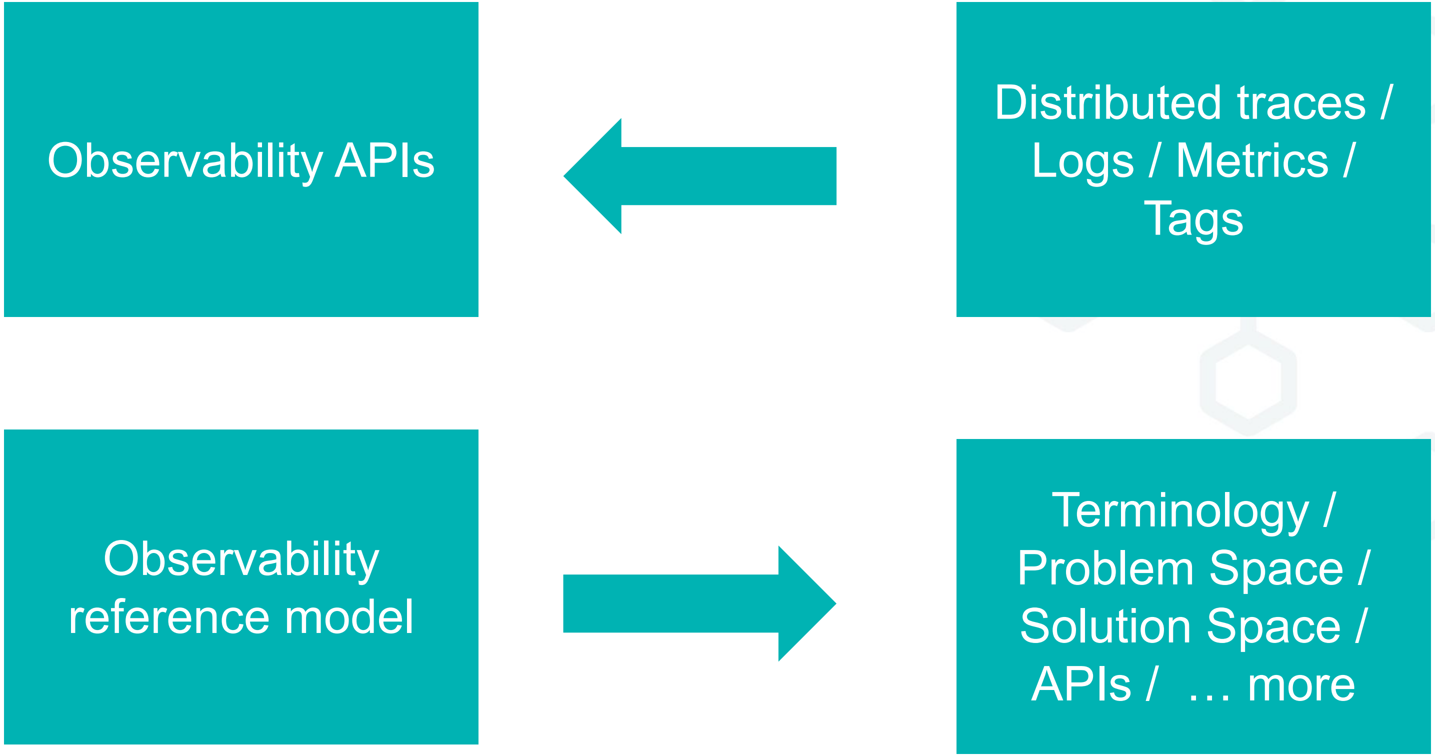
A Well Stocked Kitchen

Metrics	Production Ready	CI/CD Integration	Custom Dashboards	AI assistance
Logs	Code Profiling	User Monitoring	Trend analysis	Custom Metrics
Distributed Tracing	Alerts	Beacons	Time shifting	**more...**

Ingredients or Chocolate Cake First?



Ingredients or Observability First?



Observability APIs

Distributed traces / Logs / Metrics / Tags

Observability reference model

Terminology / Problem Space / Solution Space / APIs / … more

Why a Reference Model

- Promote understanding of the problem space and not specific solutions
- Technology agnostic
- Terminology, entities, and relationships
- Only clarify "things within an environment" or a problem space

- A **reference model** is an abstract framework or domain-specific ontology consisting of an interlinked set of clearly defined concepts … to encourage clear communication.
- it represents a complete set. Reference models are often illustrated as a set of concepts with some indication of the relationships between the concepts.

https://en.wikipedia.org/wiki/Reference_model

"Community"

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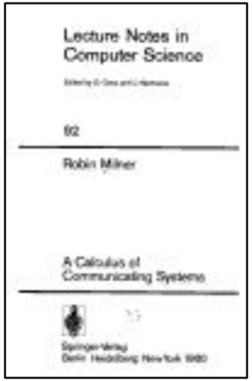
Past Reference Models

“CCS: Calculus of Communicating Systems”
Milner, 1980

Business user journeys, workflows



Lecture Notes in Computer Science

Edited by G. Goos and J. Hartmanis

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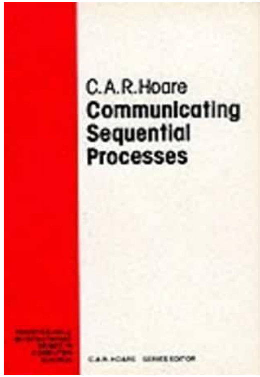
Robin Milner

A Calculus of Communicating Systems

Springer-Verlag
Berlin Heidelberg New York 1980

“Communicating Sequential Processes”
Hoare, 1986

Services, (business logic, endpoints)



C.A.R.Hoare
Communicating Sequential Processes

PRENTICE-HALL
INTERNATIONAL
SERIES IN
COMPUTER
SCIENCE

C.A.R. HOARE SERIES EDITOR

“Queueing Systems”
Kleinrock, 1975

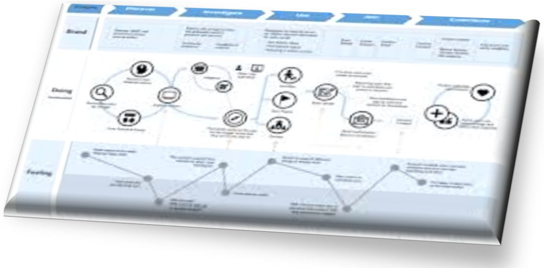
Infrastructure, schedulers

QUEUEING SYSTEMS
Volume 2: COMPUTER APPLICATIONS

Leonard Kleinrock

Three Dimensions (3D) of Observability

Business user journeys (workflows,SLI / SLO)



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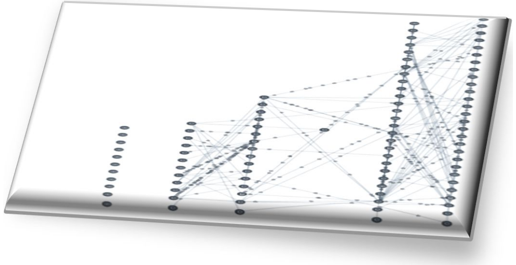
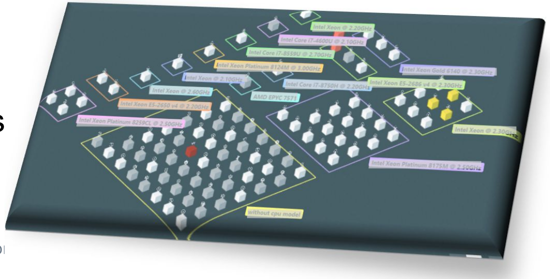


Infrastructure (h/w, schedulers frameworks, libraries)


Intel Xeon @ 2.20GHz
Intel Core i7-4600U @ 2.10GHz
Intel Core i7-8559U @ 2.70GHz
Intel Xeon Platinum 8124M @ 3.00GHz
Intel Xeon Gold 6140 @ 2.30GHz
Intel Xeon @ 2.10GHz
Intel Core i7-8750H @ 2.20GHz
Intel Xeon E5-2686 v4 @ 2.30GHz
Intel Xeon @ 2.60GHz
AMD EPYC 7571
Intel Xeon E5-2650 v4 @ 2.20GHz
Intel Xeon Platinum 8259CL @ 2.50GHz
Intel Xeon @ 2.30GHz
Intel Xeon Platinum 8175M @ 2.50GHz
without cpu model

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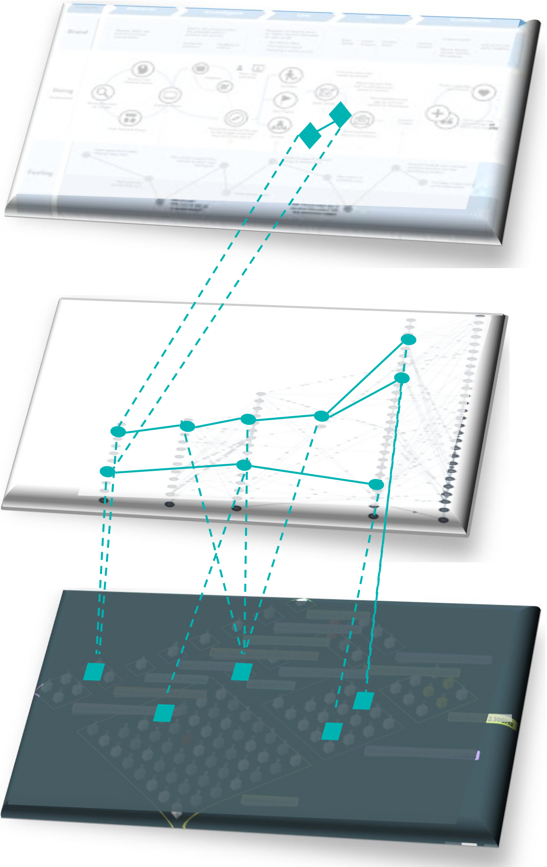

- What services are involved in this user journey?
- What h/w or infrastructure is impacting this service?

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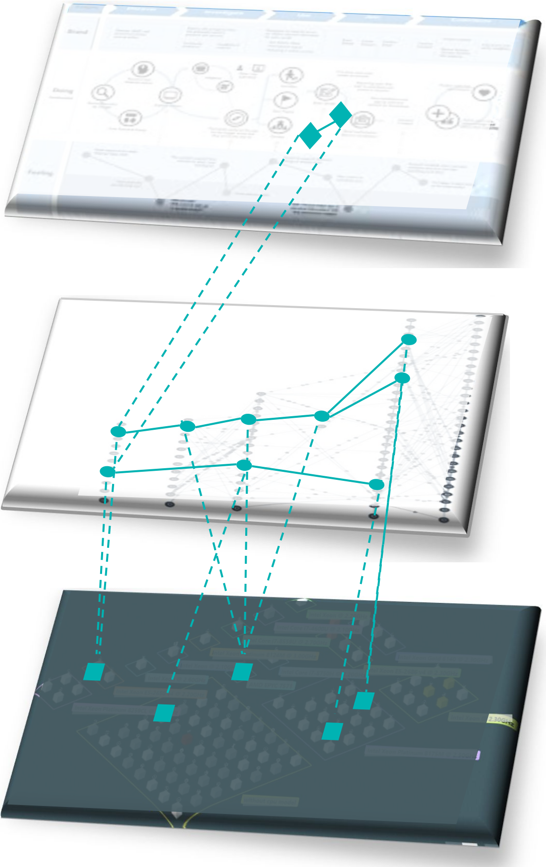
Three Dimensions (3D) of Observability



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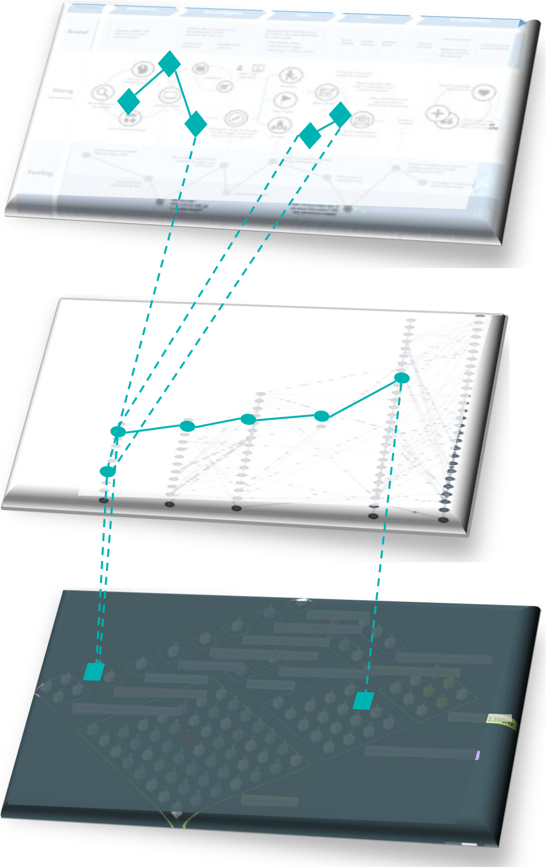

- What business goals are impacted by these services?
- If I retire this h/w what services are impacted?

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Three Dimensions (3D) of Observability

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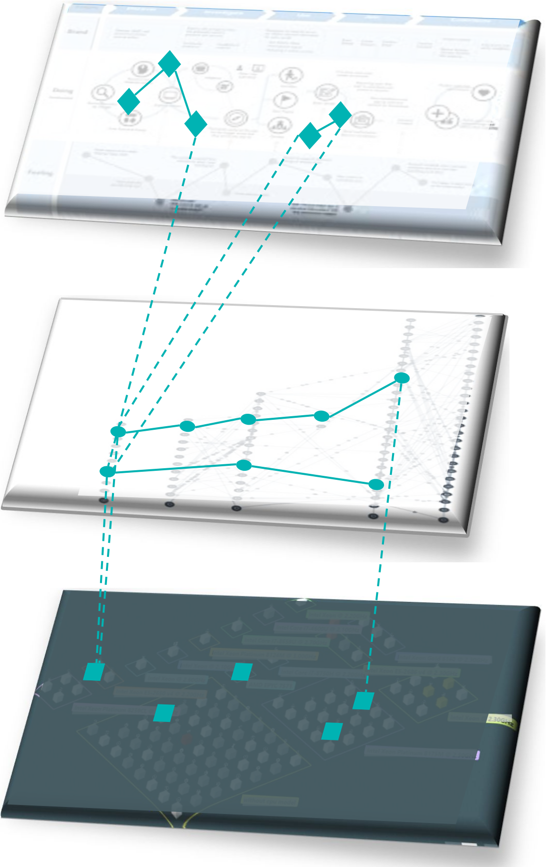

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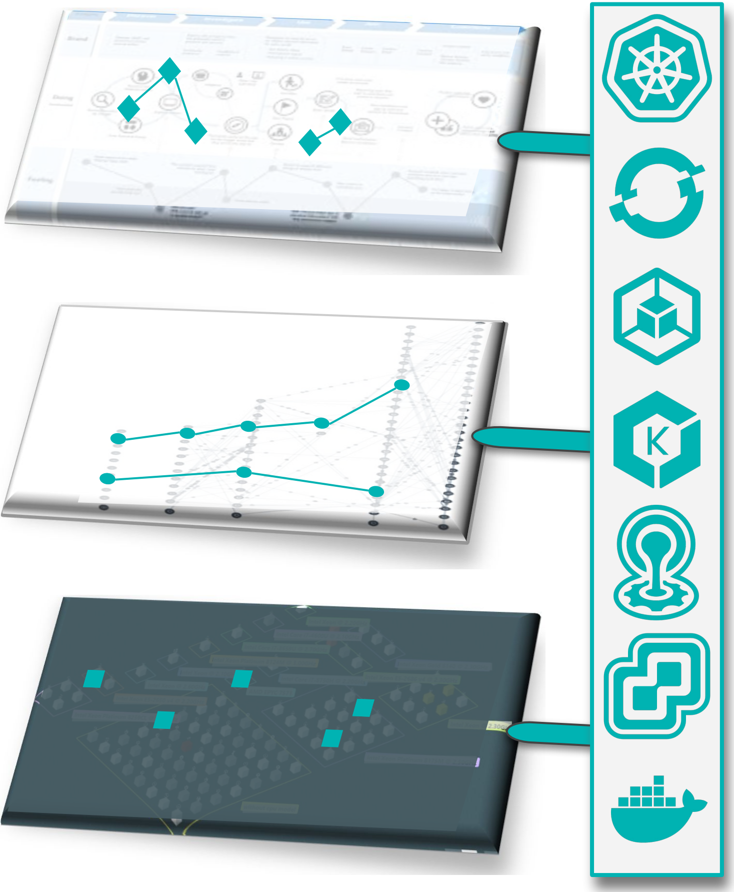
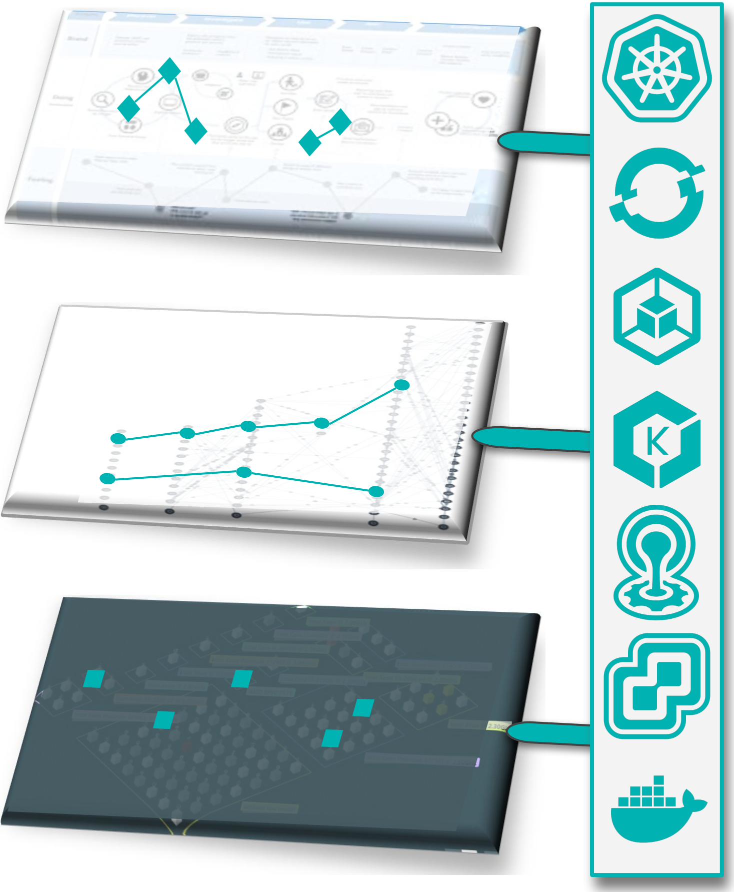


- What user journeys (business KPIs) have priority?

- How to map logical services to actual services?
- What number of of replicas?

- Where to place the replicas?

Three Dimensions (3D+1) of Observability



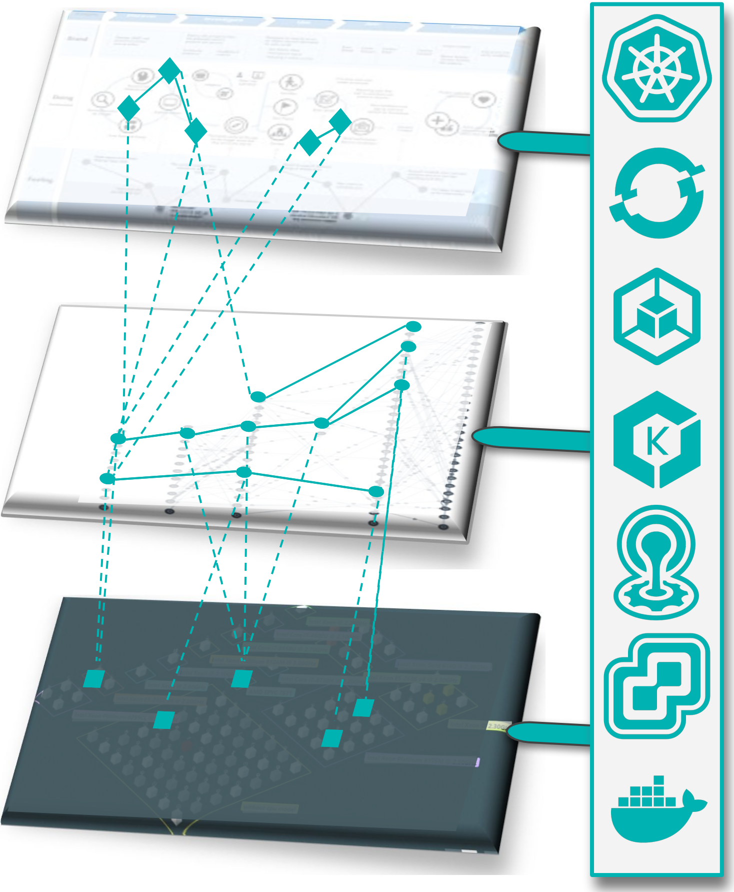
Business user journeys (workflows,SLI / SLO)

Services, (business logic, endpoints)

Infrastructure (h/w, schedulers frameworks, libraries)

Platform (global scheduler, orchestration)

One Possible Formalism



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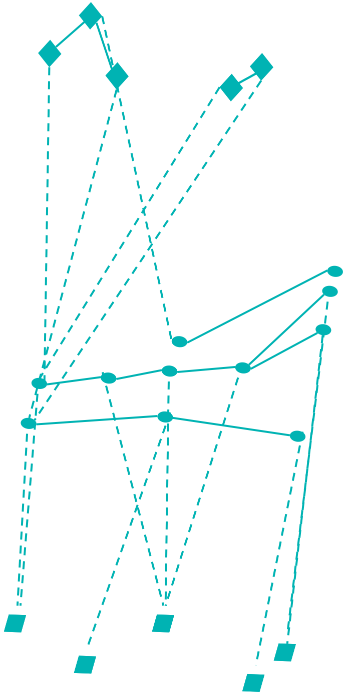


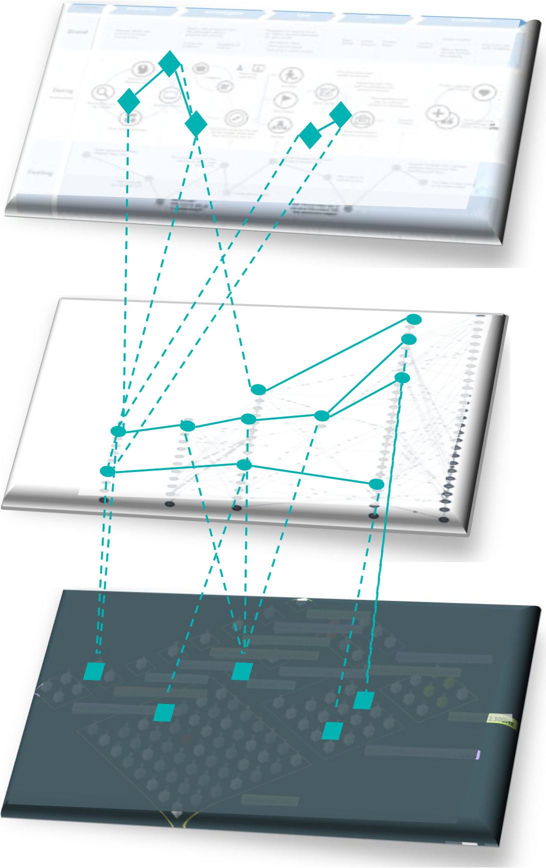
- An algorithmic attributed graph grammar
  - Nodes (objects) are typed with attributes (tag+value)
  - Edges (relationships) are typed and have meaning
  - Sub-graphs have semantics
  - Reason or simplify using graph rewrite rules
- Technology agnostic
  - Can be implemented in various ways: Graph DB, SQL, noSQL, etc.

The Root Cause Triage Recipe

Business user journeys (workflows,SLI / SLO)

Services, (business logic, endpoints)

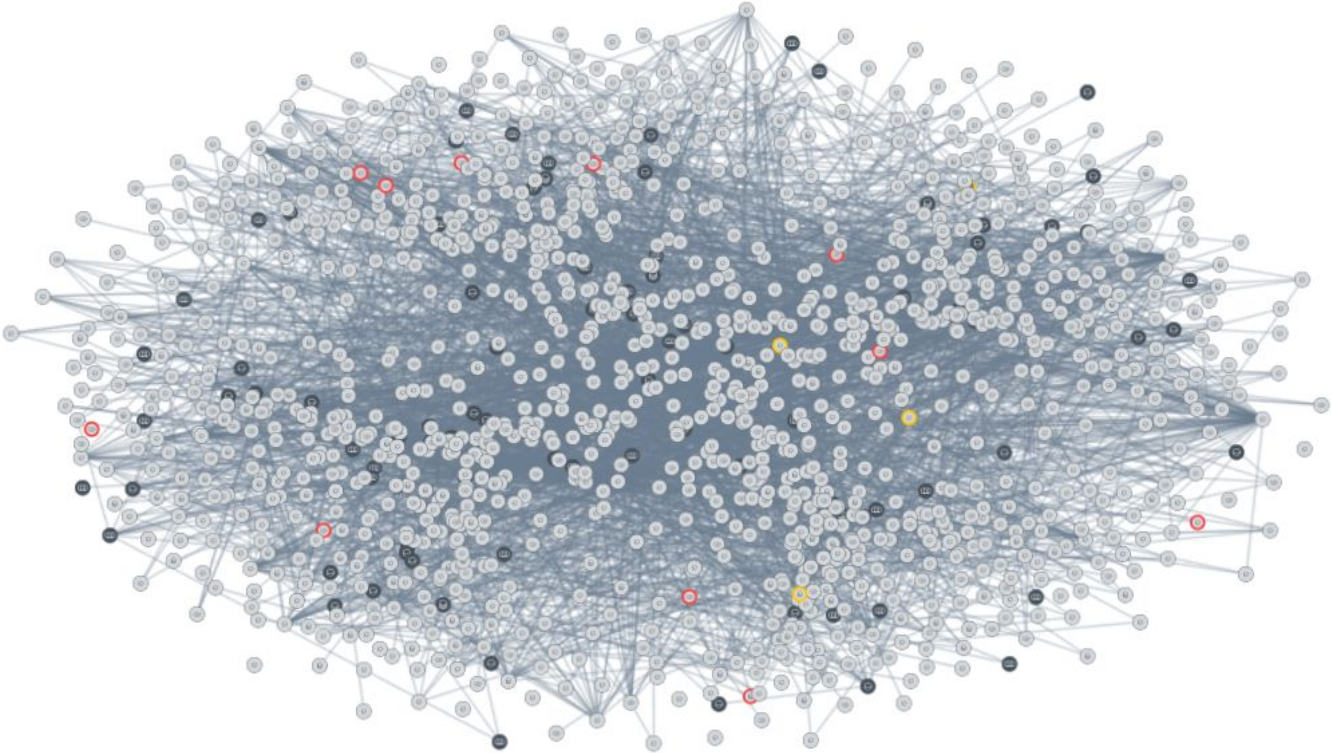
Infrastructure (h/w, schedulers frameworks, libraries)



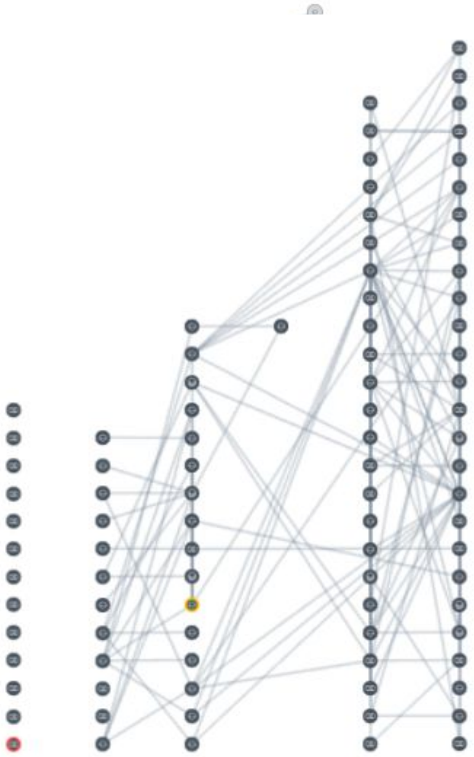
The root cause triage recipe:

1. Contrast when things were good
2. Compare with a healthy object of the same type
3. Examine the upstream or downstream objects
4. Check recent config changes
5. Review a similar issue in the past
6. Is it second order interference
7. Was a limit reached
8. Bug somewhere
9. At a dead end so go back several objects, goto 1
10. Move to a different dimension and goto 1

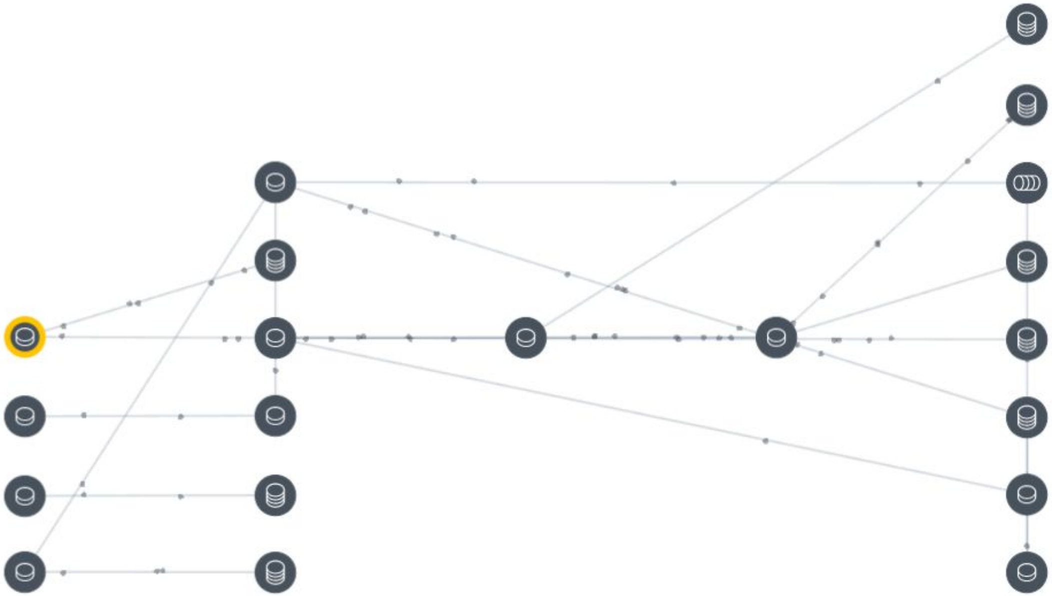
Slicing the Cake



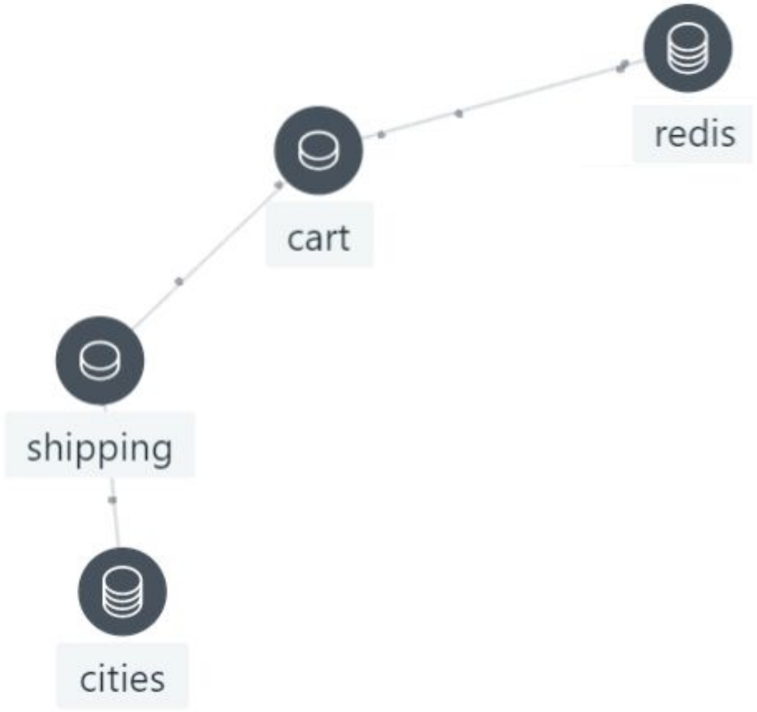
Is a Big Slice Too Much?



Smaller Slices - Easier to Manage



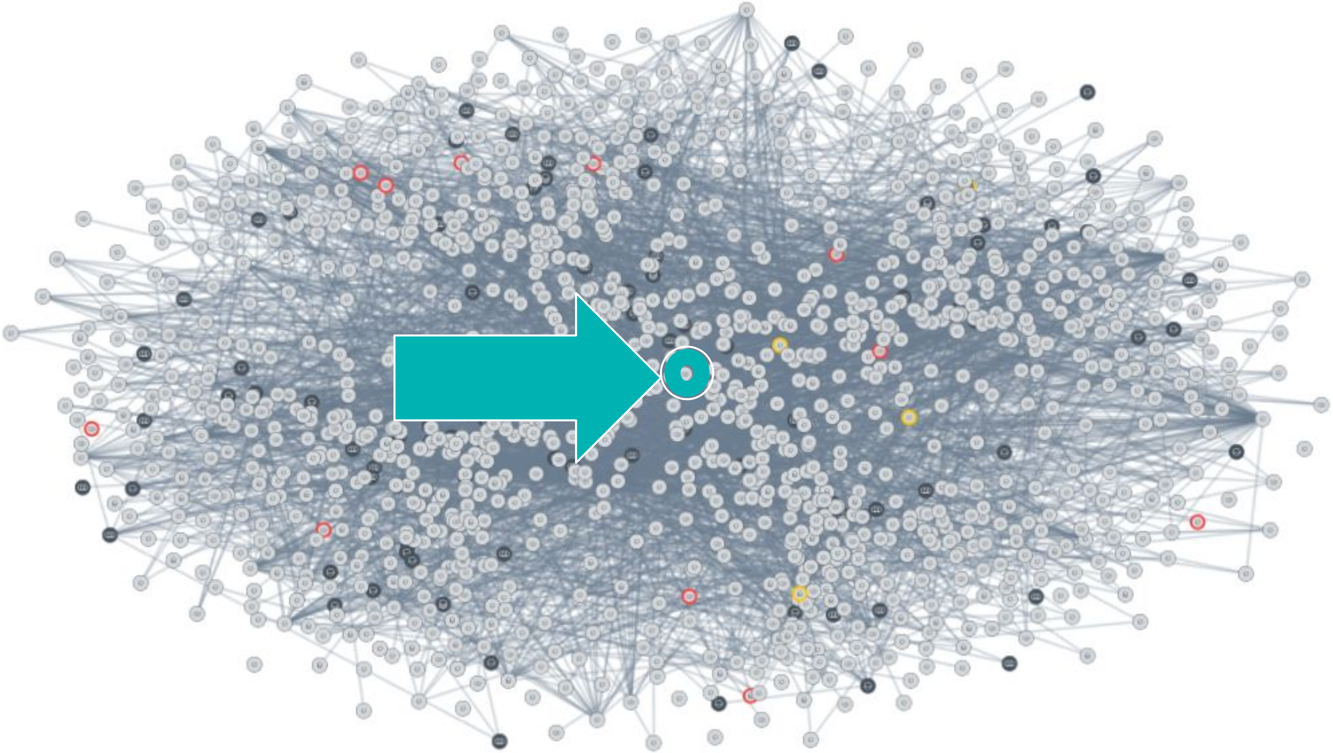
Custom Sized Slices for Everyone



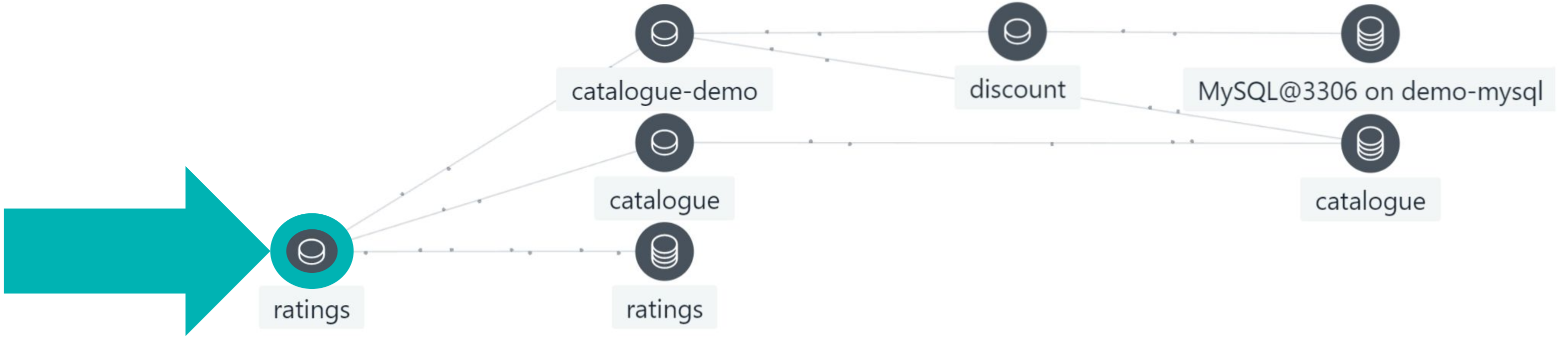
Many ways to slice it …

1. Grouping several services or endpoints
2. K8s namespace or …
3. Location: env, geo, cloud, or hosts
4. Protocol: HTTP, RPC, …
5. By technology: DB, MQ

Getting a Custom Slice



Getting a Custom Slice



Going from 1 Cake to 1,000 Cakes

Sampling is a way to scale

But sampling impacts the numerator or denominator of the error rate calculation

$$\frac{number\ of\ errors}{number\ of\ successes\ and\ errors}$$

So how to minimize sampling bias or bound the error or … for my needs?

Which sampling strategy to pick?

- No sampling
- Head-based sampling
- Tail-based sampling
- Stratified sampling
- Static sampling
- Dynamic sampling
- Key-based dynamic sampling
- Constant throughput
- Constant throughput per key
- Average sample rate
- Average sample rate with minimum per key
- …

Forming the Mold

- Does the observability community need a reference model to …
  - Define the problem space, terminology, objects, and relationships
  - Use a formalism that provides a semantics and eanbles interoperability
  - Incorporate challenges beyond the API (e.g., scoping, triage workflow, etc.)

- This activity compliments and informs the API development

- If you are interested in taking the next steps Contact me: curtis.hrischuk@instana.com

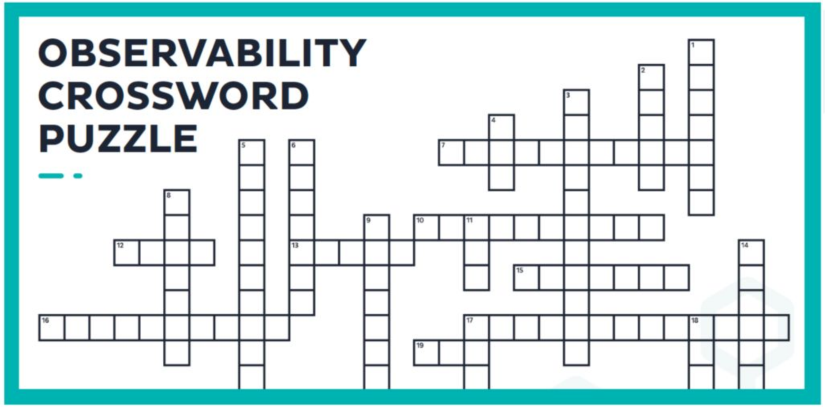
Q&A

Email me if you are interested in taking the next steps

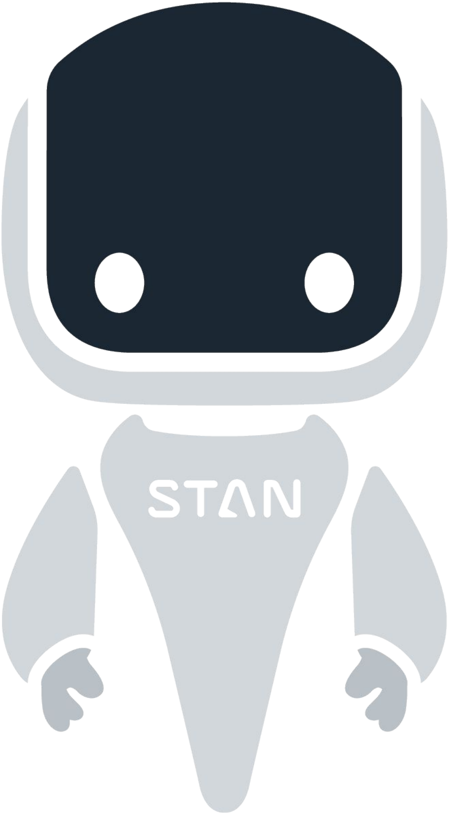
Curtis.Hrischuk@instana.com

Bonus: Test your observability knowledge by giving our crossword puzzle a try!

https://www.instana.com/crossword



Thank you



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