



SG Tech Stack | StackOps

15 August 2024 | 9:00 AM to 1:00 PM

Today's Programme

1. Engineering Productivity Programme And System Resiliency
Hsiao Ming, Director, GovTech

2. Improving Observability With StackOps
Wee Meng Teo, Lead Product Manager, GovTech

3. Demo on Application Monitoring
Jie-Hong Lim, Principal Solution Architect, Public Sector, Elastic

4. How APEX Uses StackOps To Optimize Operations
Allen NG, Lead DevOps Engineer, GovTech
Faiz Muhammad, DevOps Specialist, GovTech

5. WOG Production Readiness with SRE Principles
Yuanlin Lian, Lead Site Reliability Engineer, NDI, GovTech

6. Demo on Observability Accelerator
Yi Sheng Yap, Lead DevOps Engineer, GovTech
Shan Mahanama, Senior DevOps Engineer, GovTech

7. Panel Discussion - the Future of Dev Teams

- Hsiao Ming, Director, GDS, GovTech
- Yuanlin Lian, Lead Site Reliability Engineer, NDI, GovTech
- Allen NG, Lead DevOps Engineer, GovTech
- Jie-Hong Lim, Principal Solution Architect, Public Sector, Elastic

8. Closing – Group Photo, Networking & Refreshments



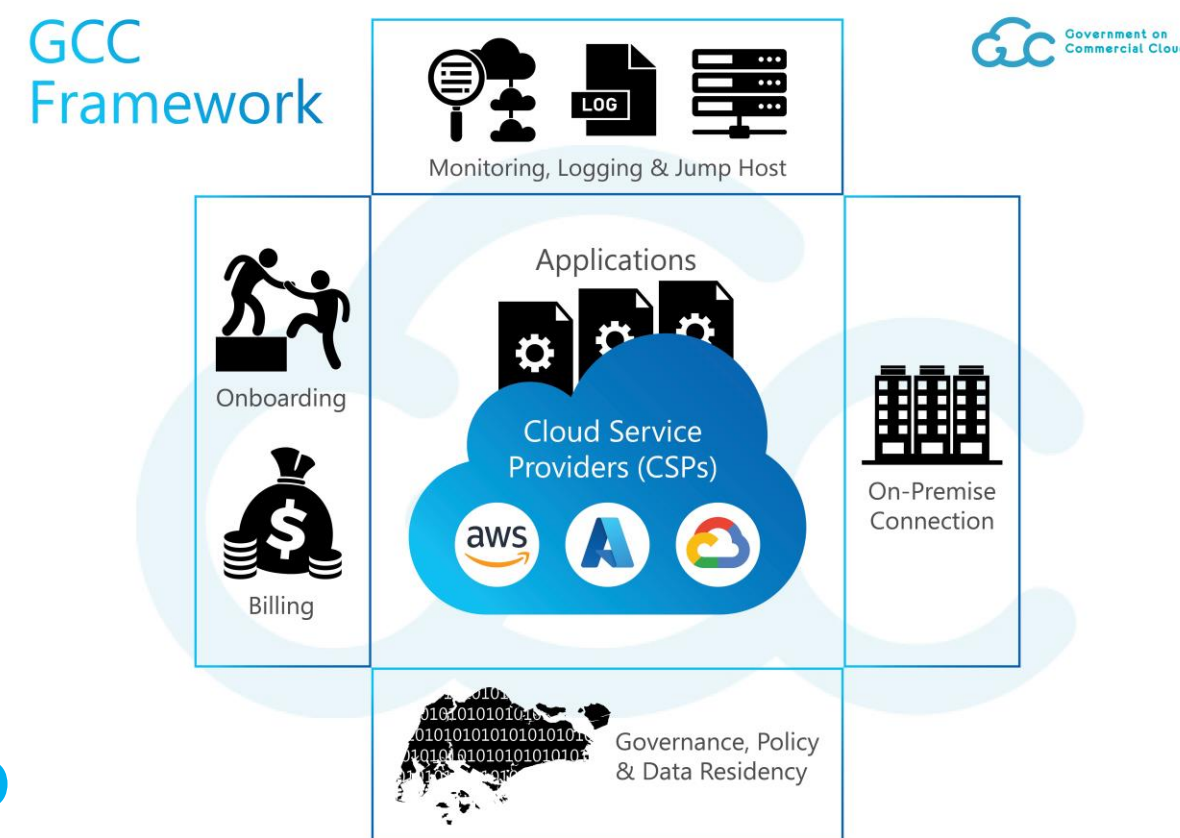
Employee Productivity Programme & System Resiliency

Chia Hsiao Ming
Director, GovTech



A bit about our group

- Who we were and who we are now
 - 'Applications Infrastructure' to 'Engineering Productivity' to 'Core Engineering Products'
- Our mission remains the same
 - Provide **products and platforms** to help engineering teams **go faster, do more with less, achieve better quality and be more secure and resilient**
 - In the form of **SGTS** and **GCC** products



Engineering Productivity Programme

- Introduced Q1 FY24, spanning 5 years
- 3 sub-programmes, with the following objectives
 - System Infrastructure Modernisation
 - Increase Developer Productivity
 - **Strengthen System Resiliency**



Strengthen System Resiliency

a.k.a System Resiliency and Monitoring sub-programme

- What's the problem?
 - State of WOG system **monitoring and observability** falls short in providing **comprehensive insight** into the health and performance of our systems.
 - Lack a **holistic view of our infrastructure, applications and services** which makes it **challenging to achieve rapid and informed response** to incidents and anomalies.
- What do we want to do about it?
 - To **increase system resiliency** through **faster and consistent detection** to enable agencies to **response and recover faster**.
- The goal
 - Achieve **SLA uptime of 99.5% (including planned downtime!)** for systems on StackOps and with significant public impact.
- Our system resiliency product – **StackOps!**
 - Based on **Elastic Cloud** with **additional value-added capabilities** provided by the StackOps team

Improving Observability with StackOps

Wee Meng Teo
Product Manager, StackOps



Why we monitor?

- Ensure that systems are functioning correctly
 - To meet committed Service Level Agreement
 - To detect incidents early for faster resolution
- For capacity planning
 - To budget resources in advance

Importantly, to ensure the apps that run on this infrastructure:

- Are up & running smoothly
- Do not have negative user experience

Challenges

- Silo monitoring
 - Network, Storage, Server, Serverless, etc
- Not able to correlate issue
 - No visibility on impacts to or from dependencies (horizontally & vertically)
- No idea on apps performance
 - Quality of the coding
 - Breakage/ performance degradation

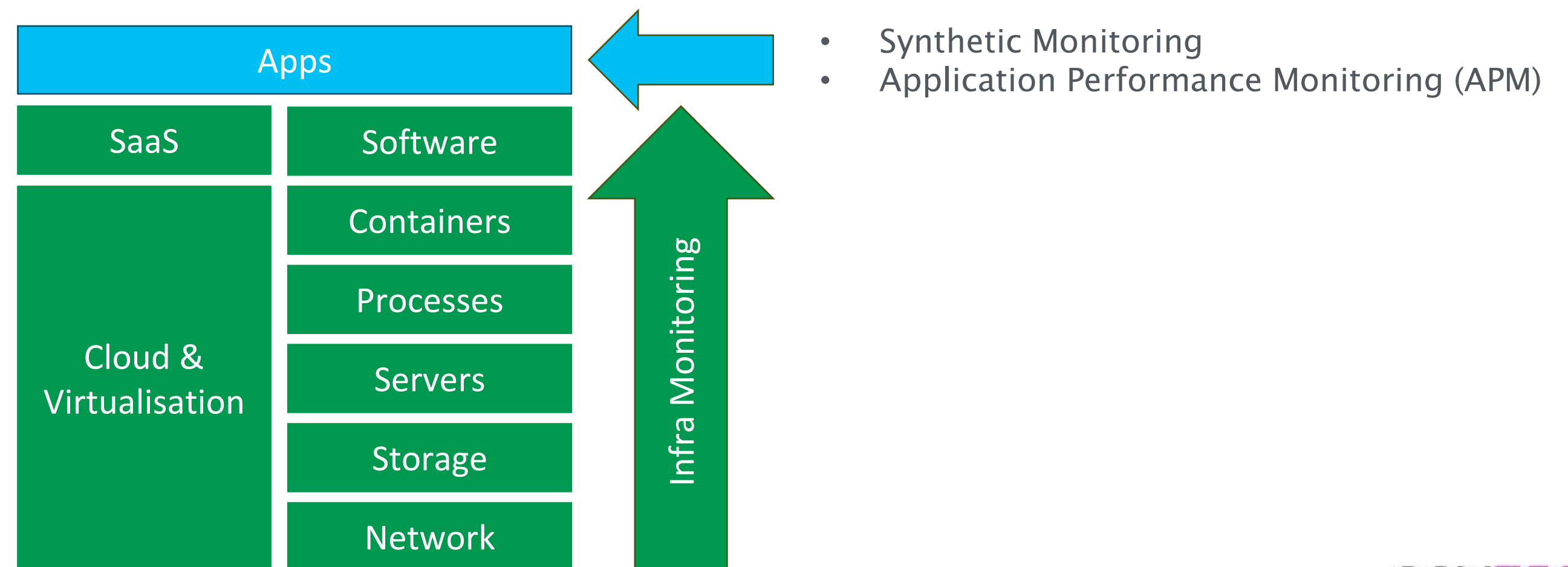
Improving Observability

Observability – gain insight into how a system behaves and operates, by observing its dependencies, interactions and external manifestations

- From metrics, logs/events, traces from telemetry data

Benefits:

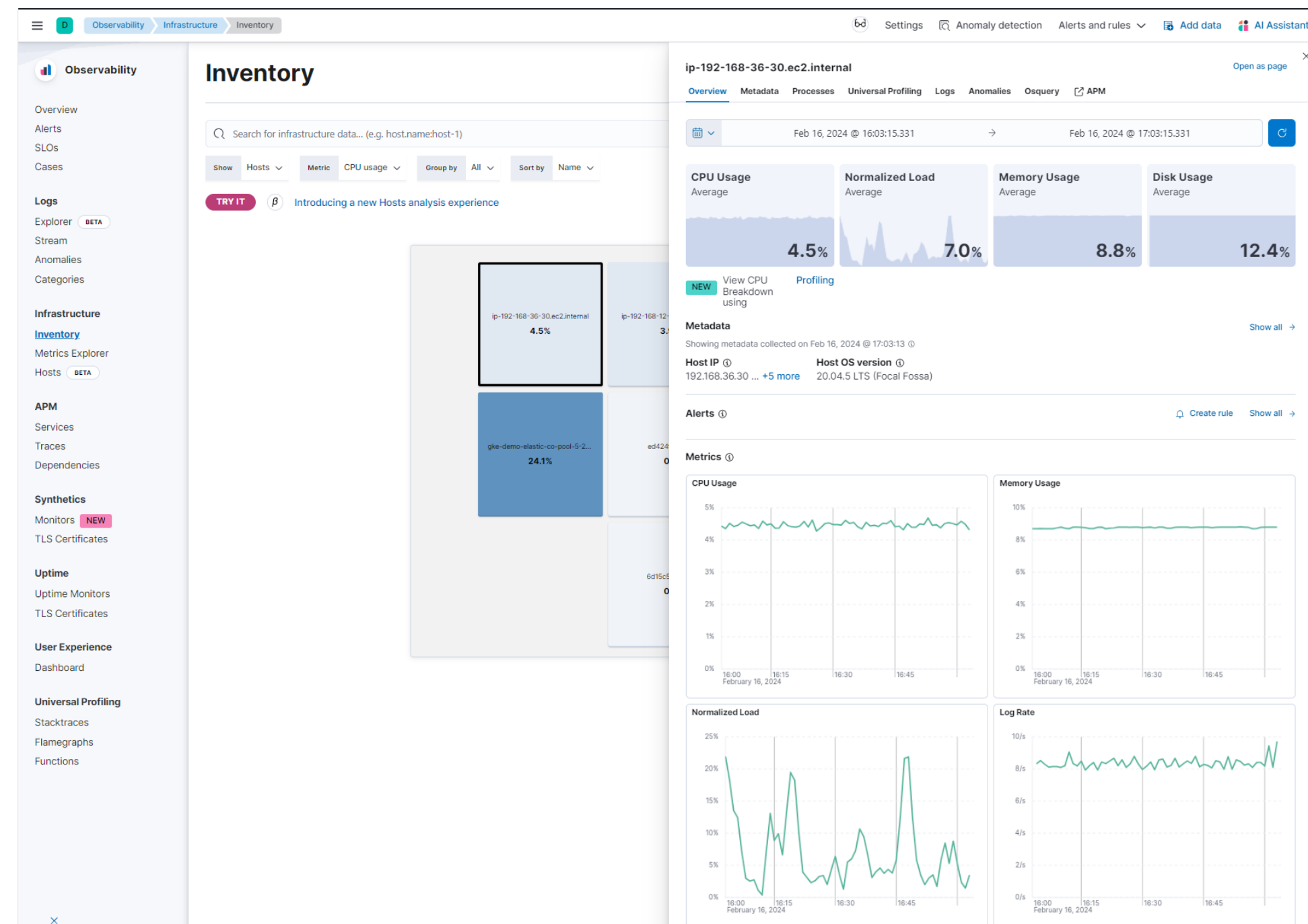
- Holistic view of complex networks & systems
- Easier to detect & resolve problems, prevent outages & troubleshoot issues
- Faster & safer on firmware, code updates



Infrastructure Monitoring

Monitor performance trends for each infrastructure component with logs, processes, application performance, anomalies and metadata in context

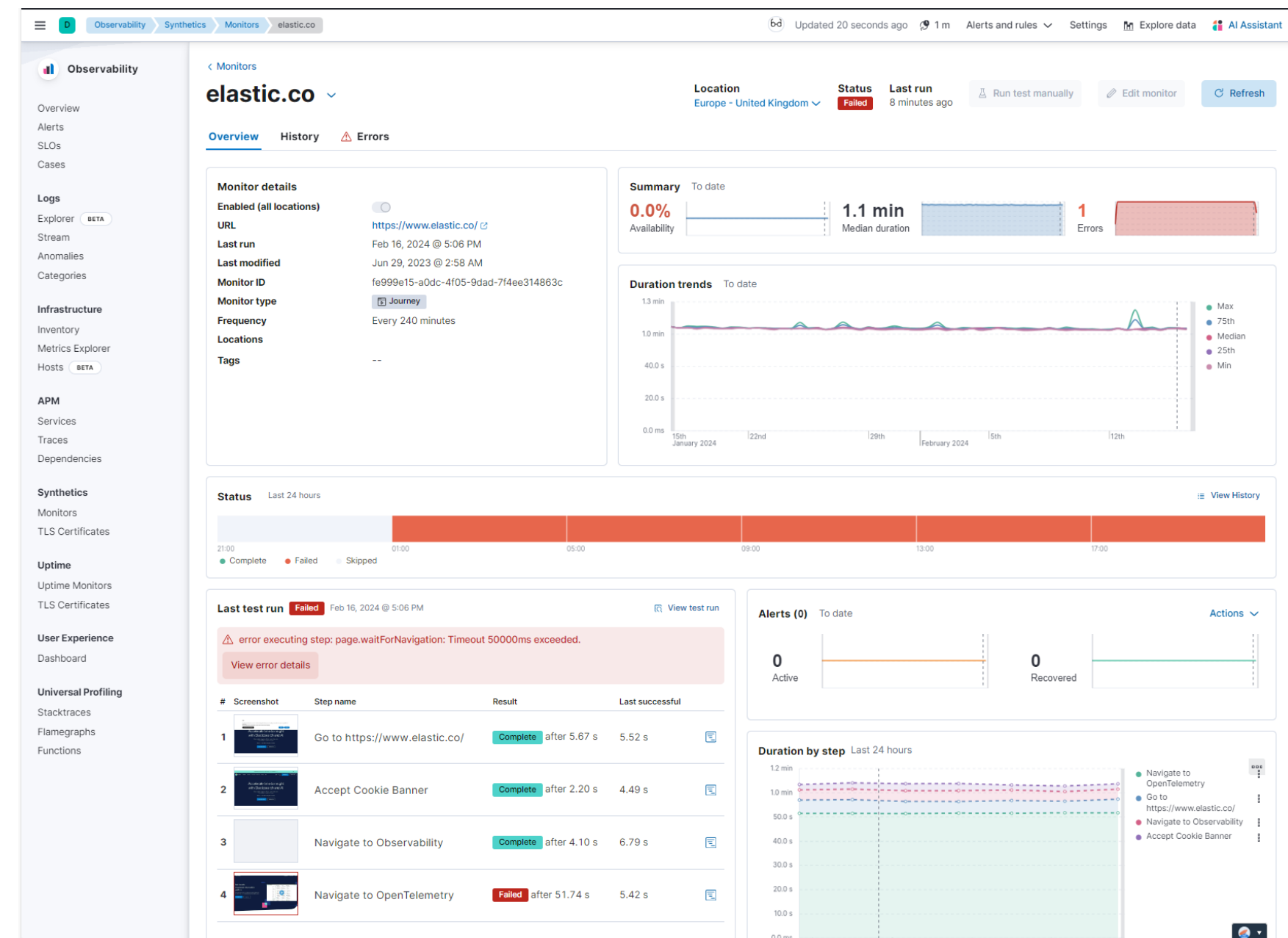
- Unified Elastic Agent with centralized management (Fleet) simplifies the collection and management of logs, metrics, and all other monitoring data.
- Out-of-the box machine learning & preconfigured dashboards



Synthetic Monitoring

Monitor website performance and availability from a customer perspective, actively detecting any issues that your users may encounter

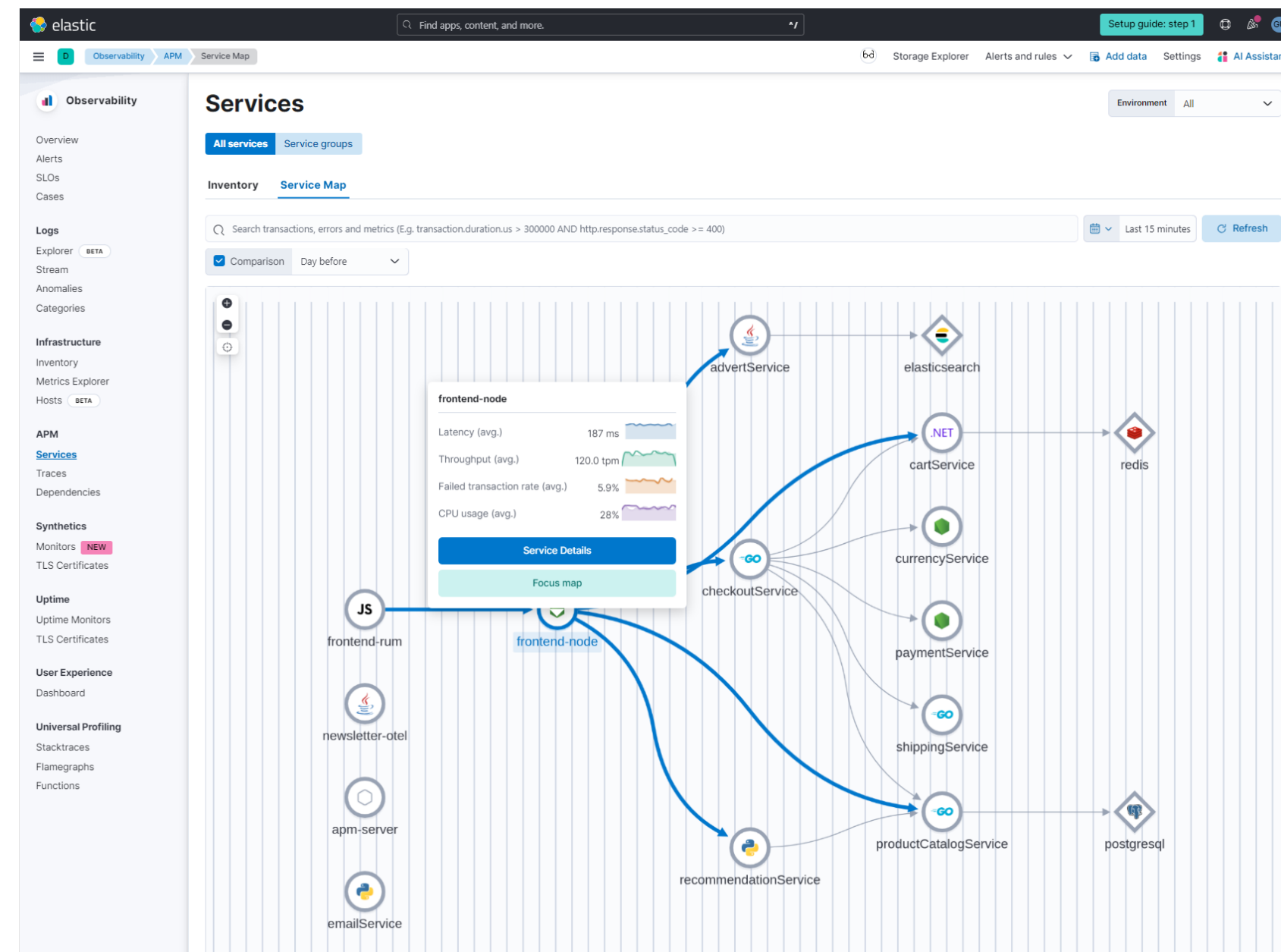
- Helps mitigate the 'watermelon effect'—where system health appears stable, but the user experience is unreliable
- Get complete visibility and actively detecting any issues that your users may encounter



Application Performance Monitoring

Monitors software services and applications in real time, enhancing visibility and insights into application performance and dependencies.

- Facilitates the focus from system health to application performance
- Quickly identify application problems with dependency mapping
- Support for OpenTelemetry protocol & open standard data sources



Demo – Application Monitoring

Jie-Hong Lim

Principal Solution Architect, Public Sector, Elastic



How APEX Uses StackOps to Optimize Operations

Allen NG

Lead DevOps Engineer, GovTech

Faiz Muhammad

DevOps Specialist, GovTech



SYNOPSIS



- A peek into dashboards and alerts we design for GovTech Operations Center (GTOC), our tenants and ourselves



Agenda

- APEX/Tenants/GTOC DASHBOARDS
 - APEX Business Metrics
 - Multi-tenancy (Self-service/Empowerment)
 - Reports about API consumption
 - Troubleshooting
 - GTOC Monitoring
- Demo
 - Our Dashboards

APEX Dashboards

Business Metrics



Business metrics



APEX uses StackOps to create business metrics based on adoption and usage.

This includes trending of:

- #projects
- #users
- #applications
- #registered APIs
- #API calls



Usage

No. of API requests (monthly) Jun 1, 2023 @ 00:00:00.000 to Sep 30, 2023 @ 23:59:59.999

@timestamp per	Internet Pass	Internet Fail	Total API (Interne	Intranet Pass	Intranet Fail	Total API (Intrane
2023-06-01	4,366,859	149,502	4,516,361	14,263,193	258,268	14,521,461
2023-07-01	20,858,273	372,834	21,231,107	63,139,923	879,032	64,018,955
2023-08-01	25,269,827	219,950	25,489,777	68,592,712	503,500	69,096,212
2023-09-01	22,196,977	269,922	22,466,899	61,195,432	429,651	61,625,083



How APEX Empowers Tenants Through Self- service

APEX Dashboards



Multi-tenancy (Self-service/Empowerment)

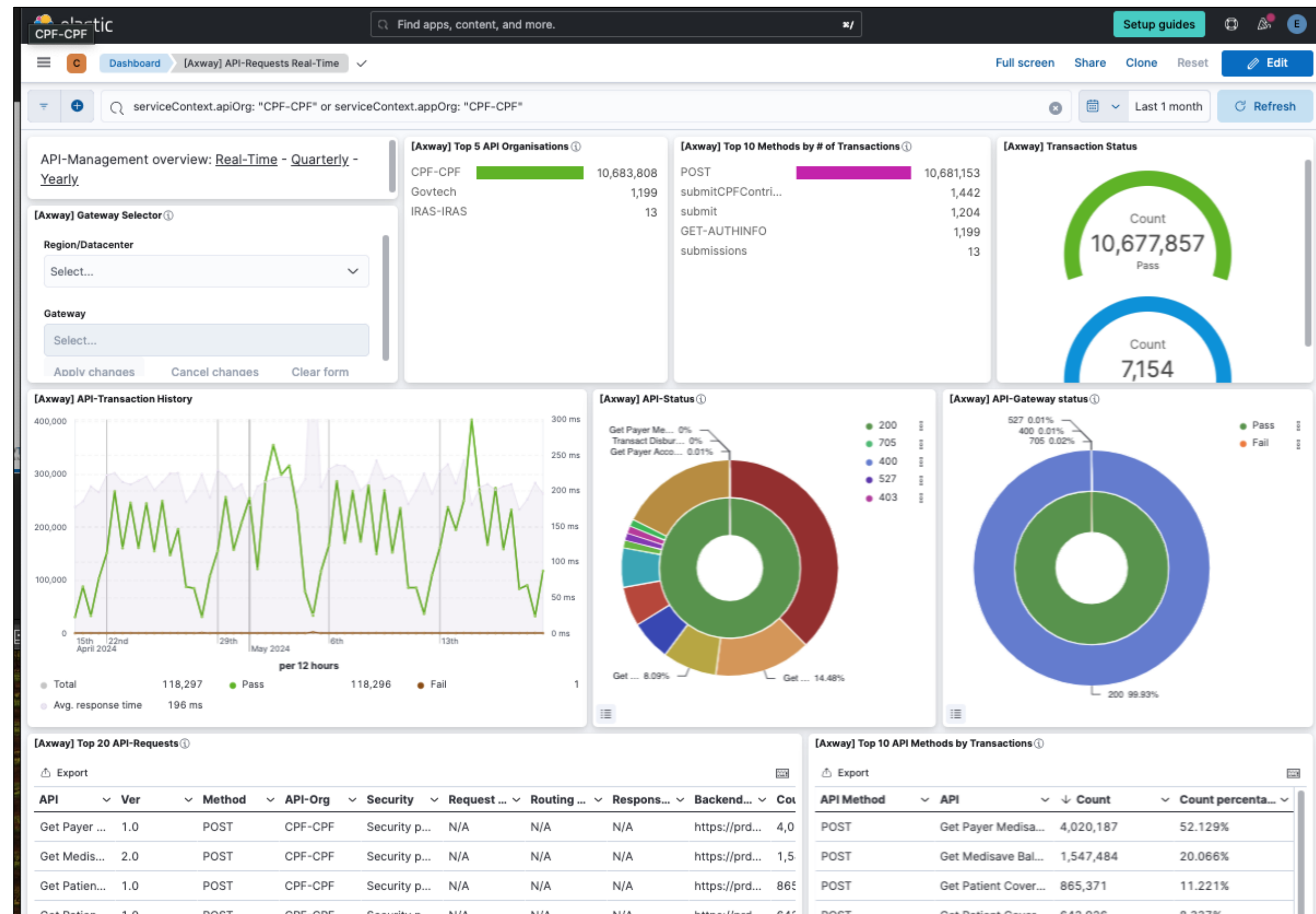
APEX tenants are empowered to use StackOps to:

- Generate utilization reports
- Monitor their API health
- Trace and troubleshoot individual API call

Dashboards			
Search...		Recently updated ▾	Tags ▾
		+ Create dashboard	
☐	Name, description, tags	Last updated ▾	Actions
☐	[APEX] API calls success Tenants	May 9, 2024	✎ ⓘ
☐	[Tenant] Traffic trace	March 1, 2024	✎ ⓘ
☐	[Axway] API-Requests Real-Time Monitor the status of your APIs. Status information, performance and appropriate filtering options. Information is almost real-time and with that, the time range is limited. apis axway real-time	December 27, 2023	✎ ⓘ
☐	[Axway] API-Requests Quarterly This dashboard provides a less granular but by default a long-term 90 days overview of daily API requests. Data appears with a delay of 3 hours. apis axway historical	April 10, 2023	✎ ⓘ
☐	[Axway] API-Requests Yearly This dashboard provides a less granular, but long-term 1-year overview of monthly API requests. Data appears with a delay of 3 hours. Depending on the available data, you can also extend the period to more than 1 year. apis axway historical	April 10, 2023	✎ ⓘ
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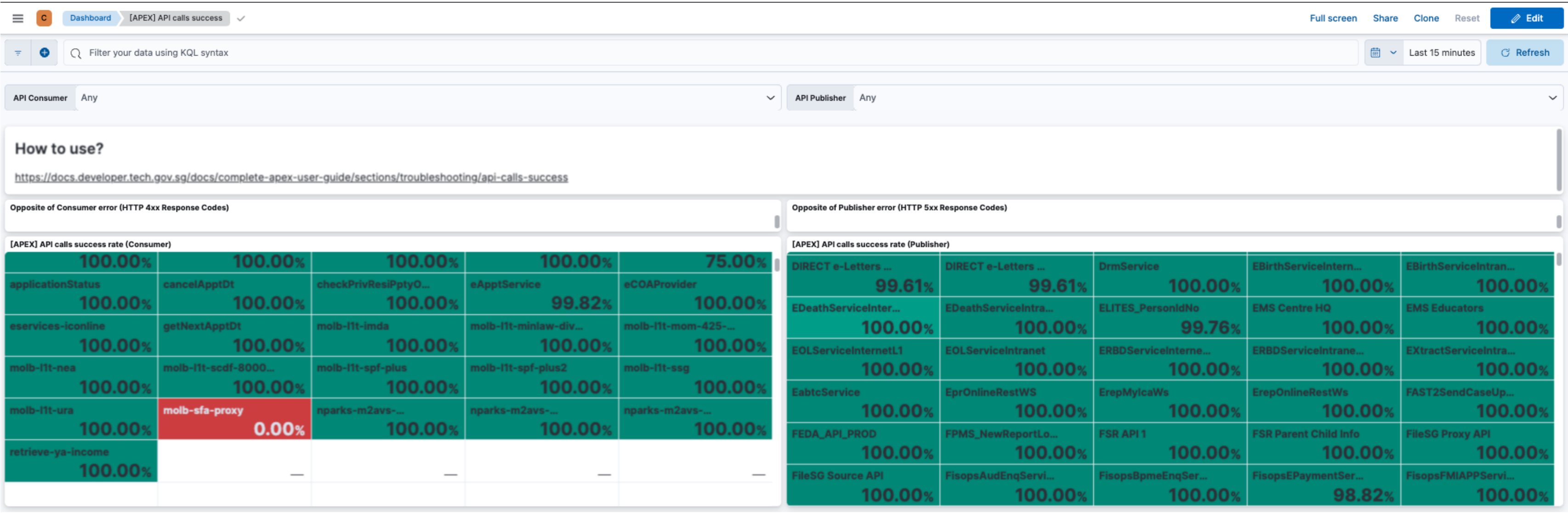
Multi-tenancy (Self-service/Empowerment)

Sample real-time utilization of a Tenant



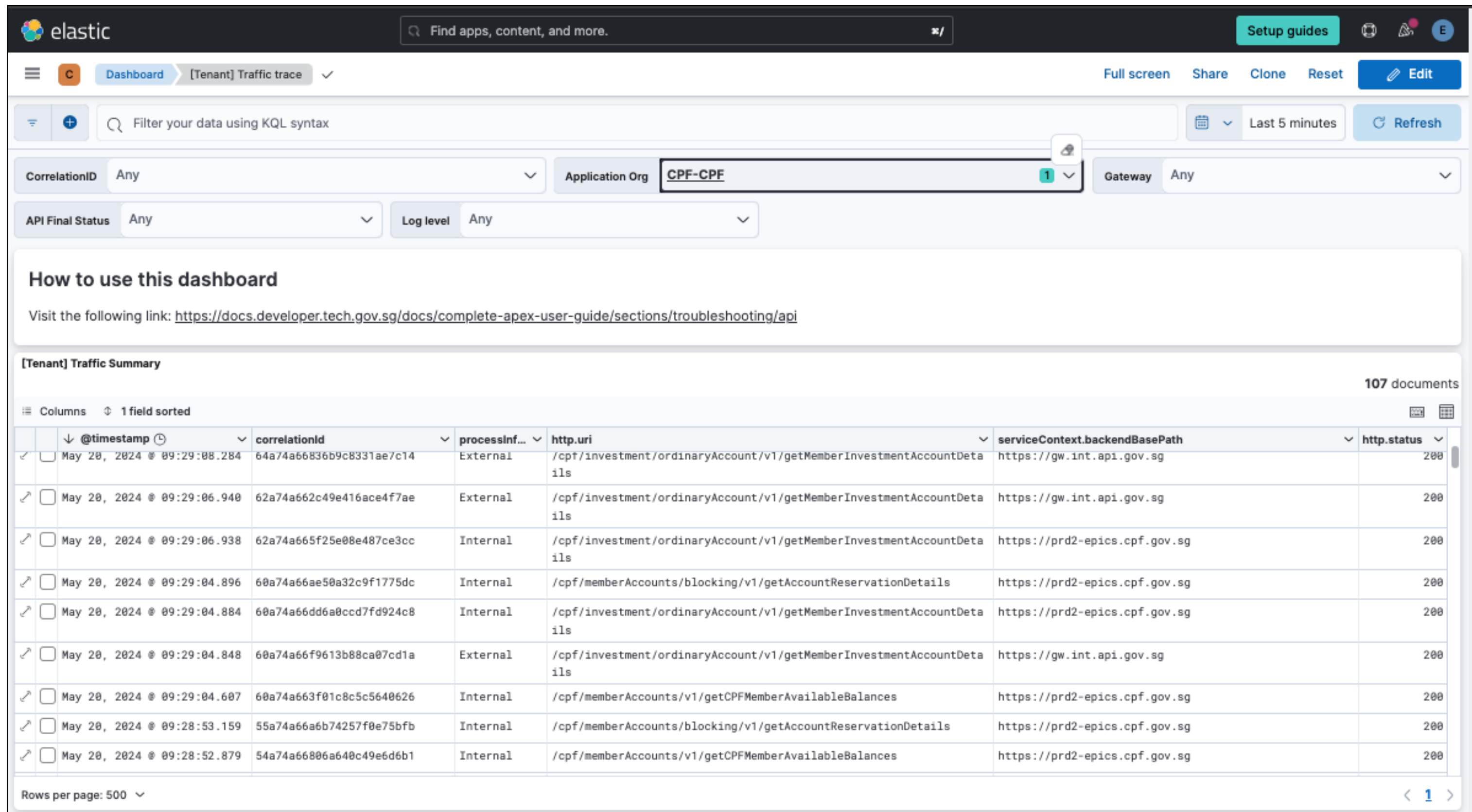
Multi-tenancy (Self-service/Empowerment)

API calls success rates



Multi-tenancy (Self-service/Empowerment)

API troubleshooting dashboard



The screenshot shows the Elastic API troubleshooting dashboard for the 'CPF-CPF' application. The dashboard includes a search bar, filters for CorrelationID, Application Org, Gateway, API Final Status, and Log level. It also has a 'How to use this dashboard' section with a link to the documentation. The main section is a table titled '[Tenant] Traffic Summary' showing 107 documents. The table columns are @timestamp, correlationId, processInfo, http.uri, serviceContext.backendBasePath, and http.status. The table displays 10 rows of traffic data.

	@timestamp	correlationId	processInfo	http.uri	serviceContext.backendBasePath	http.status
☐	May 20, 2024 @ 09:29:08.284	64a74a66836b9c8331ae7c14	External	/cpf/investment/ordinaryAccount/v1/getMemberInvestmentAccountDetails	https://gw.int.api.gov.sg	200
☐	May 20, 2024 @ 09:29:06.940	62a74a662c49e416ace4f7ae	External	/cpf/investment/ordinaryAccount/v1/getMemberInvestmentAccountDetails	https://gw.int.api.gov.sg	200
☐	May 20, 2024 @ 09:29:06.938	62a74a665f25e08e487ce3cc	Internal	/cpf/investment/ordinaryAccount/v1/getMemberInvestmentAccountDetails	https://prd2-epics.cpf.gov.sg	200
☐	May 20, 2024 @ 09:29:04.896	60a74a66ae50a32c9f1775dc	Internal	/cpf/memberAccounts/blocking/v1/getAccountReservationDetails	https://prd2-epics.cpf.gov.sg	200
☐	May 20, 2024 @ 09:29:04.884	60a74a66dd6a0ccd7fd924c8	Internal	/cpf/investment/ordinaryAccount/v1/getMemberInvestmentAccountDetails	https://prd2-epics.cpf.gov.sg	200
☐	May 20, 2024 @ 09:29:04.848	60a74a66f9613b88ca07cd1a	External	/cpf/investment/ordinaryAccount/v1/getMemberInvestmentAccountDetails	https://gw.int.api.gov.sg	200
☐	May 20, 2024 @ 09:29:04.607	60a74a663f01c8c5c5640626	Internal	/cpf/memberAccounts/v1/getCPFMemberAvailableBalances	https://prd2-epics.cpf.gov.sg	200
☐	May 20, 2024 @ 09:28:53.159	55a74a66a6b74257f0e75bfb	Internal	/cpf/memberAccounts/blocking/v1/getAccountReservationDetails	https://prd2-epics.cpf.gov.sg	200
☐	May 20, 2024 @ 09:28:52.879	54a74a66806a640c49e6d6b1	Internal	/cpf/memberAccounts/v1/getCPFMemberAvailableBalances	https://prd2-epics.cpf.gov.sg	200

Learn about our GTOC Dashboards/Alerting

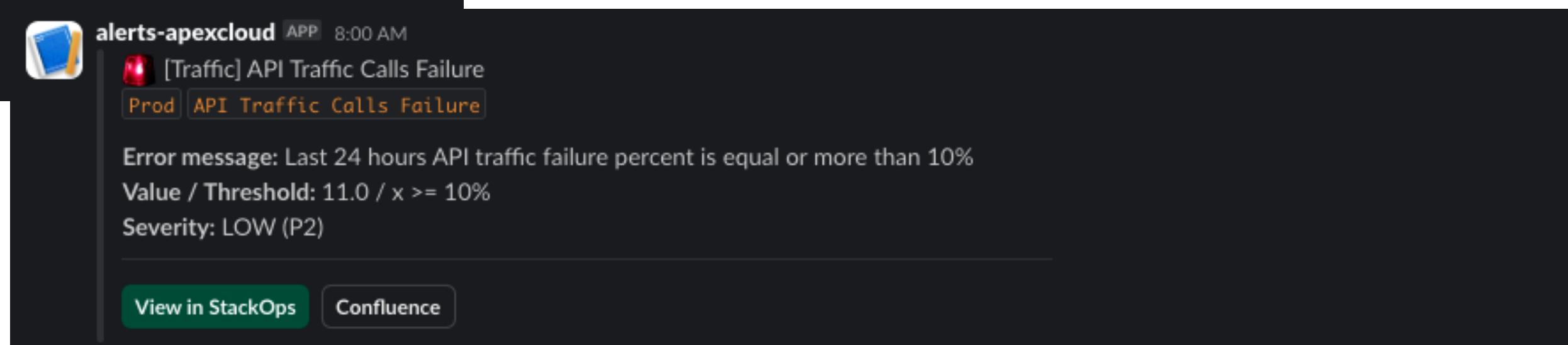
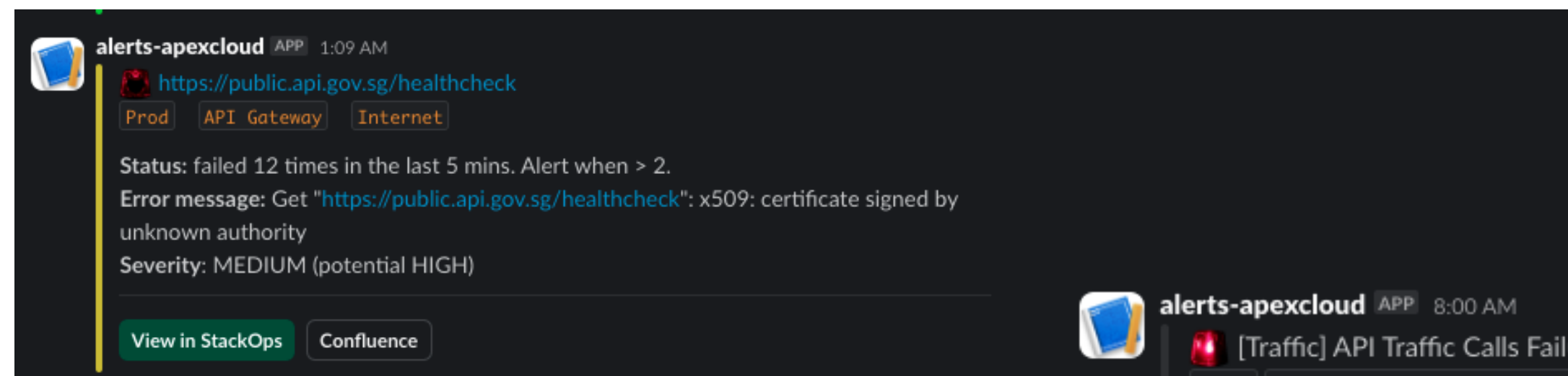
APEX Dashboards/Alerts



GTOC Monitoring/Alerting

APEX has alerts configured to slack which is monitored by Govtech Operations Centre (GTOC) 24x7.

- Links to GTOC dashboard and confluence documenting the actions GTOC should take are in the alerts as well.



GTOC Dashboards

APEX shares our monitoring and troubleshooting Dashboards to GTOC. Dashboards include:

- Quick assessment to gauge the overall API health in APEX
- Tech Ops Dashboard for a high-level overview of SLI against SLO/SLA, error rates, API latencies, number of traffic calls etc.



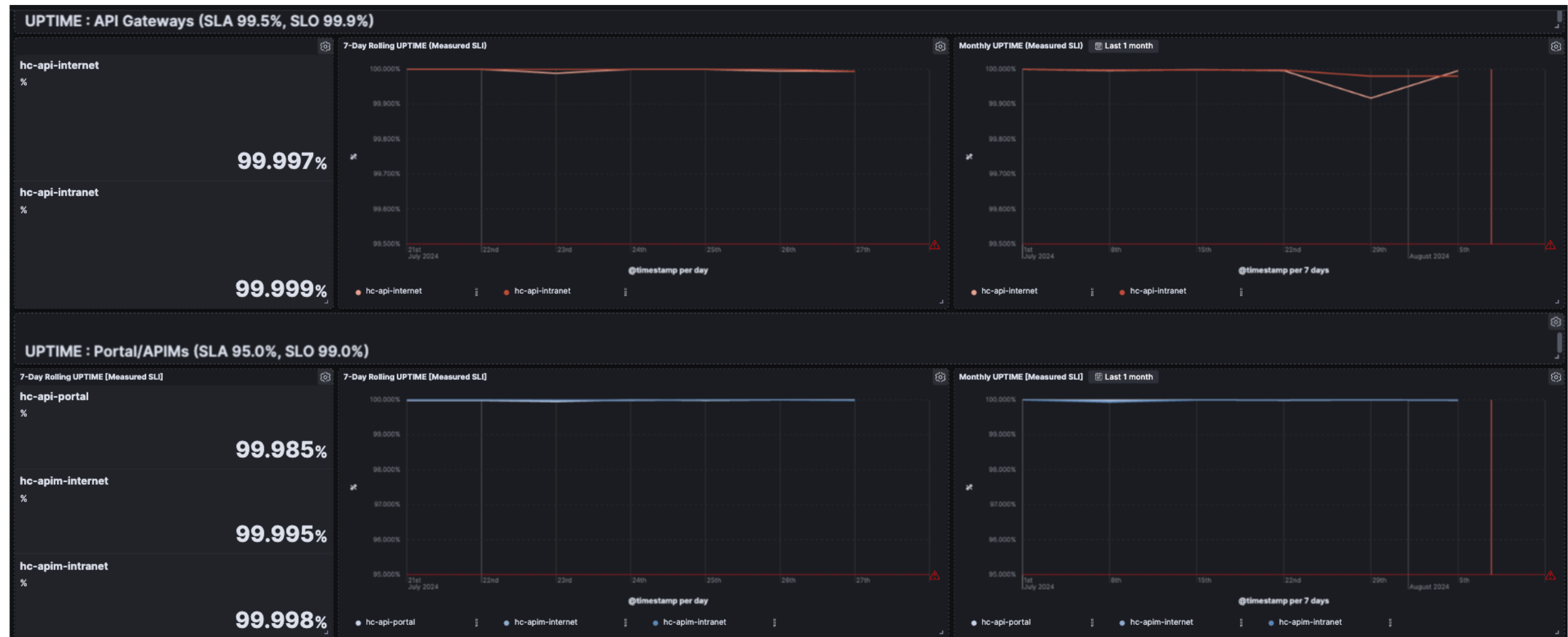
GTOC Dashboards

Quick assessment to check overall API status by the minute

@timestamp per minute	Total Calls	Successful Calls	Unsuccessful Calls	Error Rate (%)	2xx Successful Calls	4xx Error Calls	5xx Error Calls
15:59	3,221	3,020	201	6.24%	3,021	152	48
16:00	4,257	4,123	134	3.15%	4,123	108	26
16:01	4,826	4,635	191	3.96%	4,635	149	42
16:02	4,220	4,033	187	4.43%	4,033	143	44
16:03	4,668	4,514	154	3.30%	4,514	124	30
16:04	4,361	4,180	181	4.15%	4,181	151	29
16:05	3,833	3,660	173	4.51%	3,660	142	31
16:06	3,603	3,480	123	3.41%	3,481	94	28
16:07	3,585	3,460	125	3.49%	3,461	100	24
16:08	3,580	3,420	160	4.47%	3,420	137	23
16:09	3,395	3,235	160	4.71%	3,237	120	38
16:10	3,554	3,424	130	3.66%	3,426	93	35
16:11	3,800	3,657	143	3.76%	3,657	111	32
16:12	4,551	4,436	115	2.53%	4,437	86	28
16:13	1,419	1,379	40	2.82%	1,378	37	3
Sum: 59,113		Sum: 56,801	Sum: 2,312	Average: 3.93%	Sum: 1,817		Sum: 485

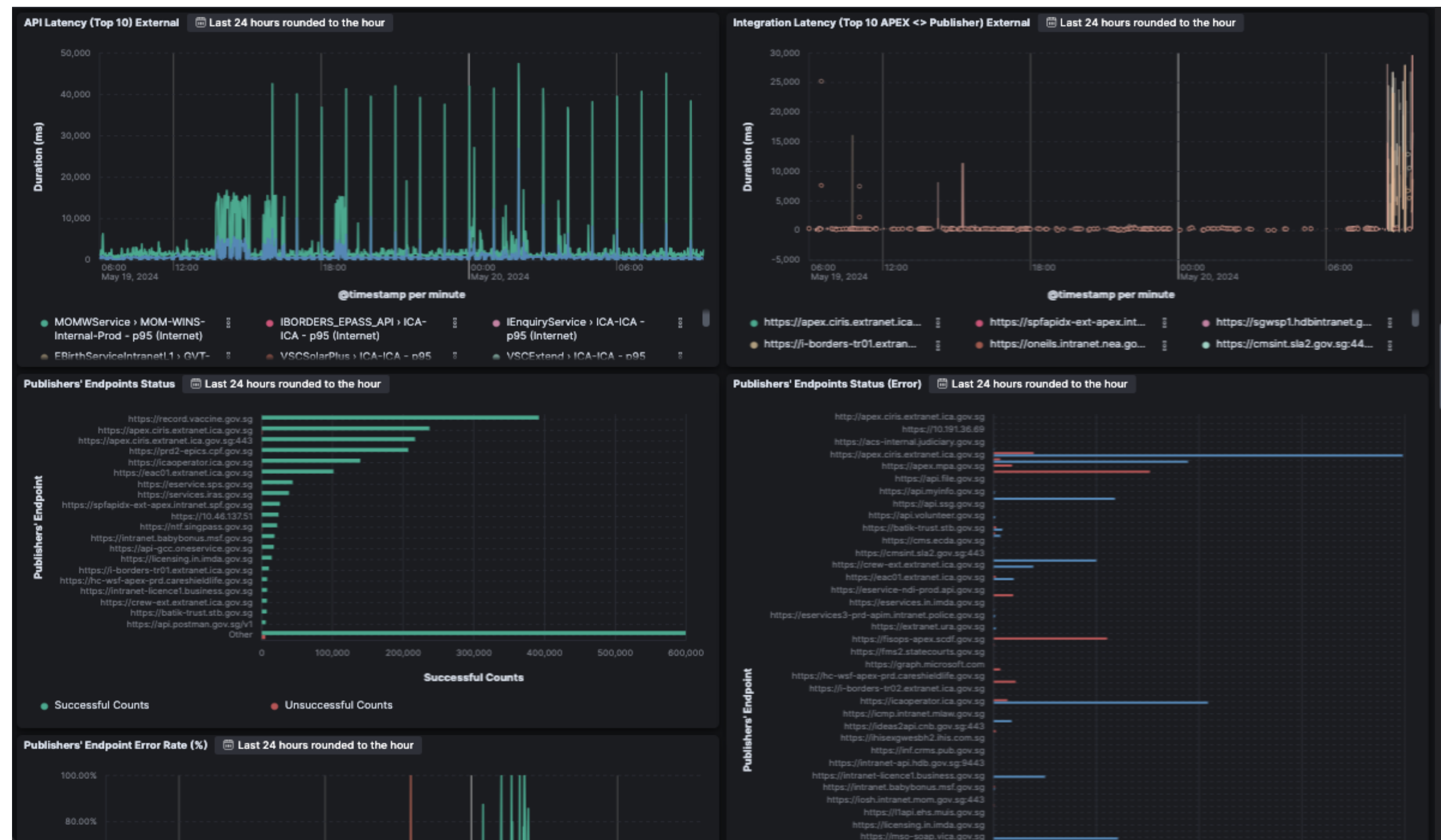
GTOC Dashboards

Service Level Indicator (SLI) of our critical vs non-critical components



GTOC Dashboards

Three of the four SRE golden signals (error rate, latency, traffic)



Building Reliable Systems in WOG

Yuanlin Lian, Lead Site Reliability
Engineer, NDI



Who am I?

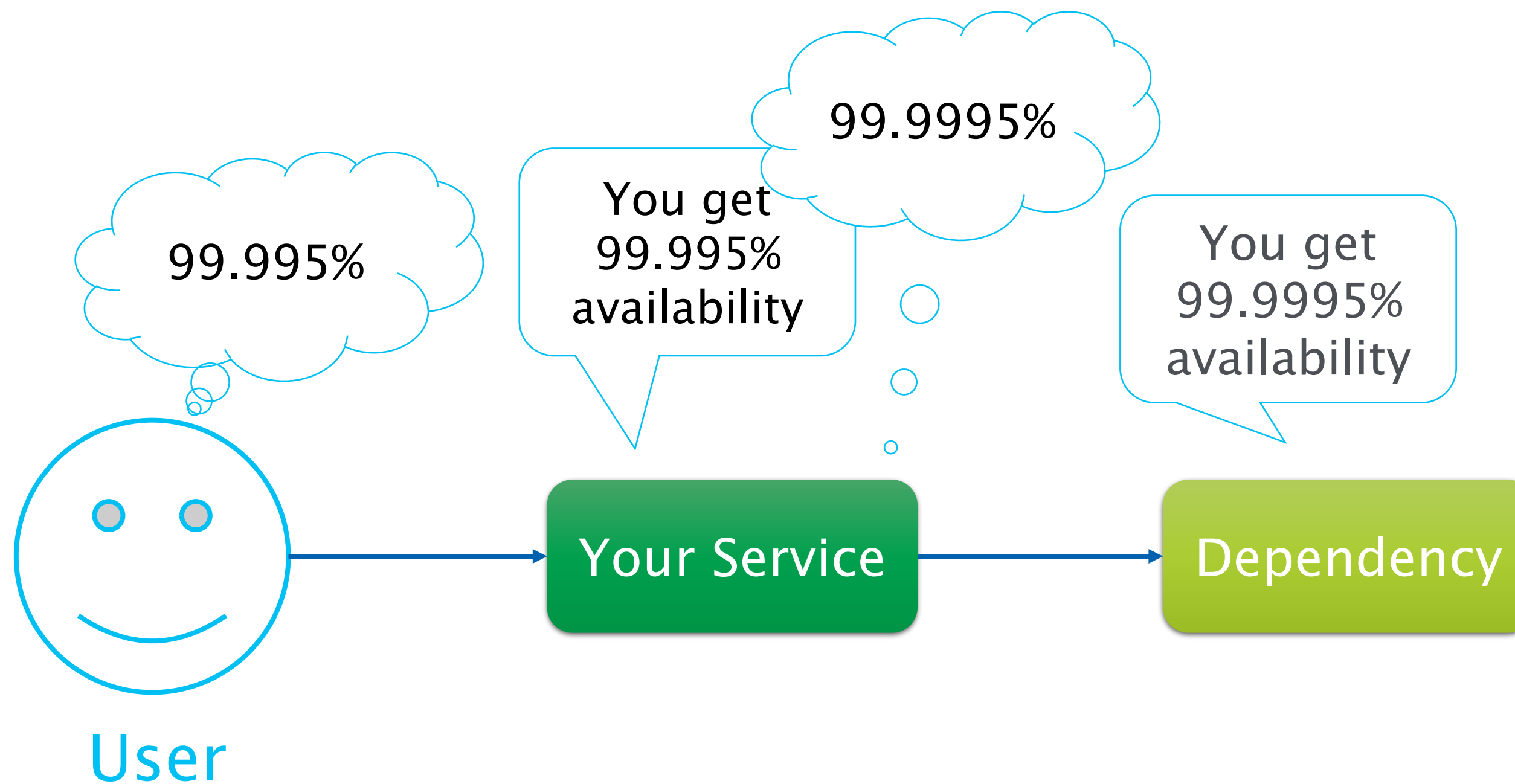
- Lead Site Reliability Engineer, NDI
- Worked briefly in DSAID as Lead DevOps Engineer
- 7 years as Google Site Reliability Engineer in California and Zurich
- Grab full-stack turned backend engineer



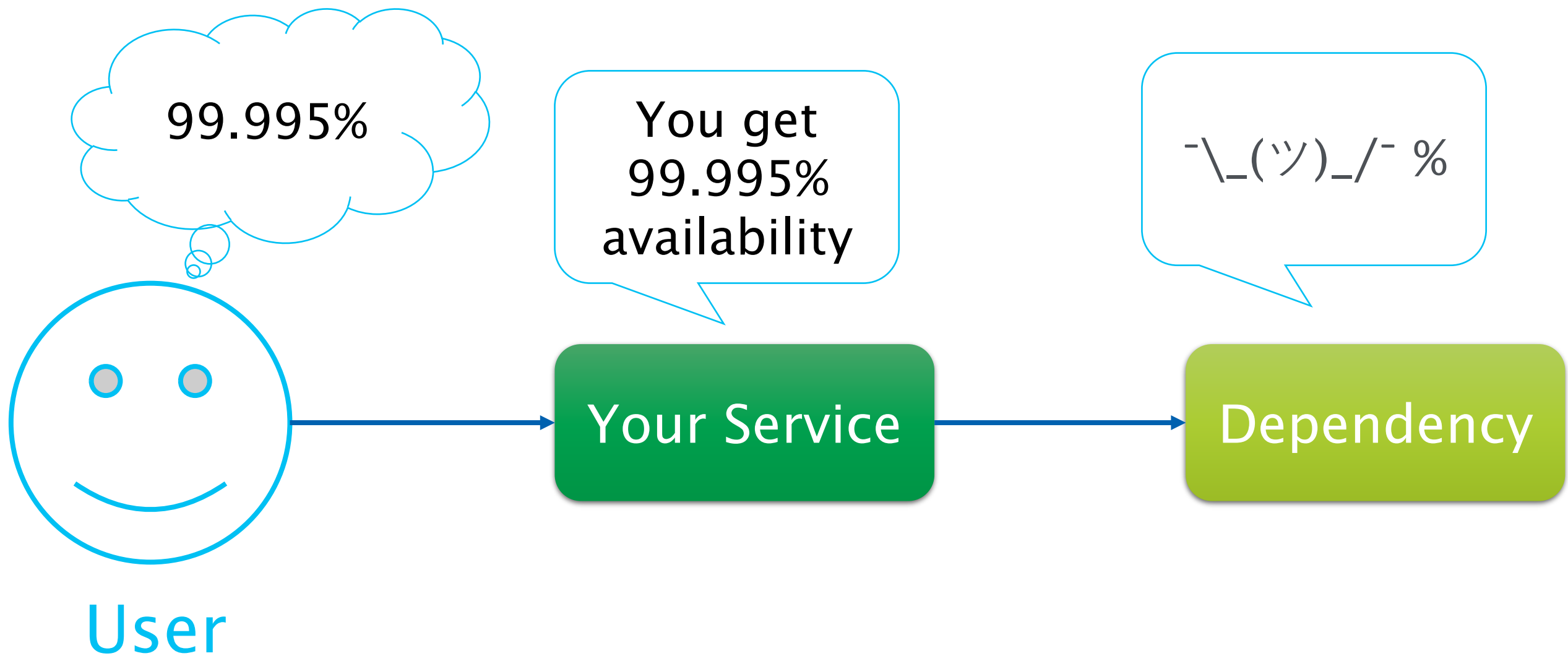
Agenda

- Building a Foundation of Trust
- Ownership of Reliability Guarantees
- Shared Ownership of Production Criticality
- Transparent About Outages
- Sublinear Scaling of Reliability Resources
- Core Principles of SRE

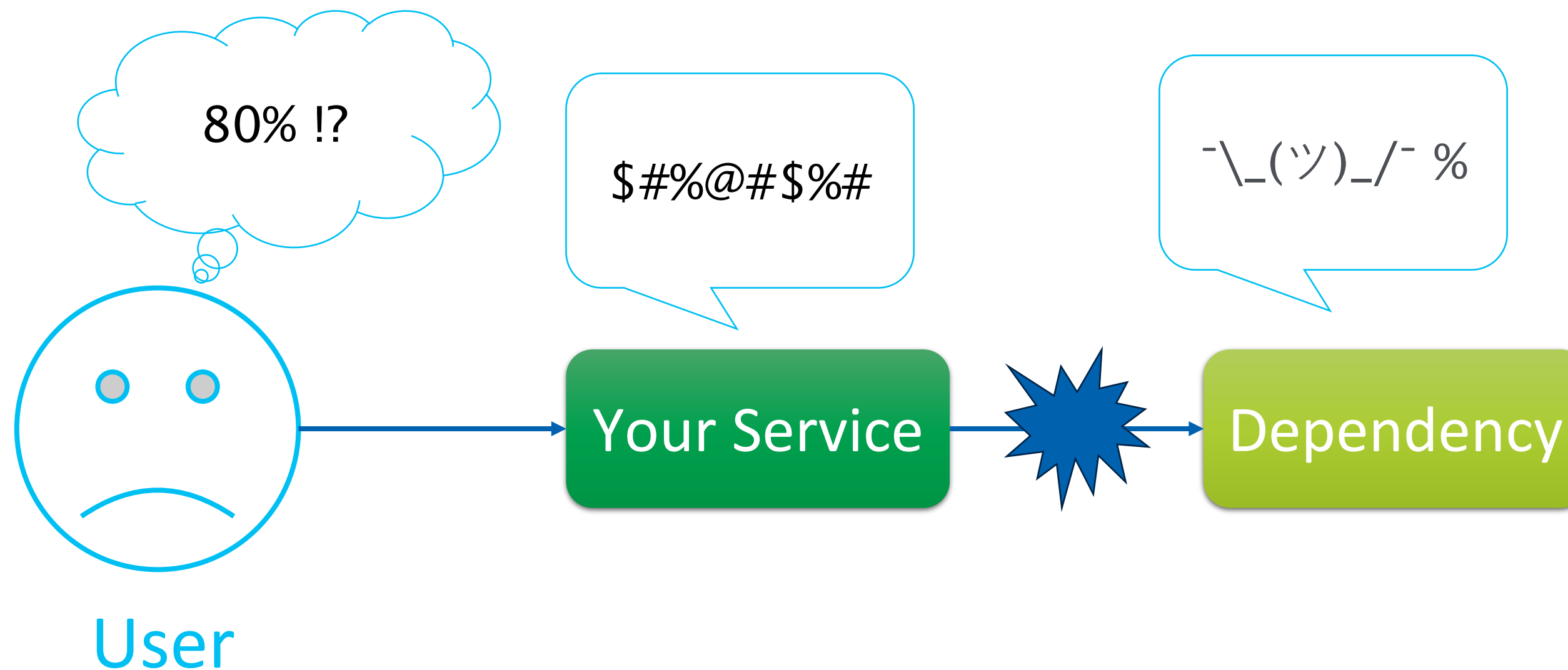
Building a Foundation of Trust



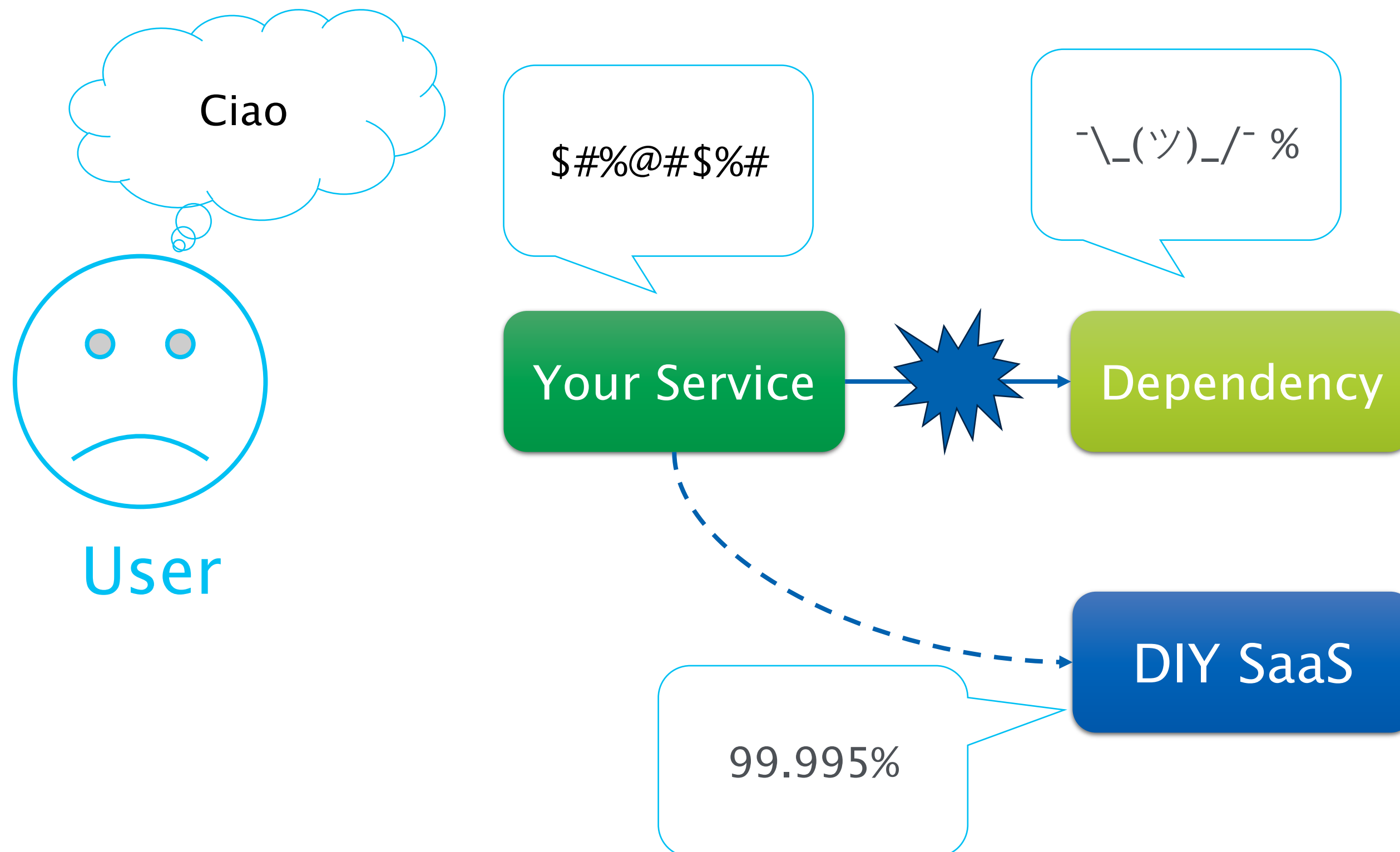
Building a Foundation of Trust?



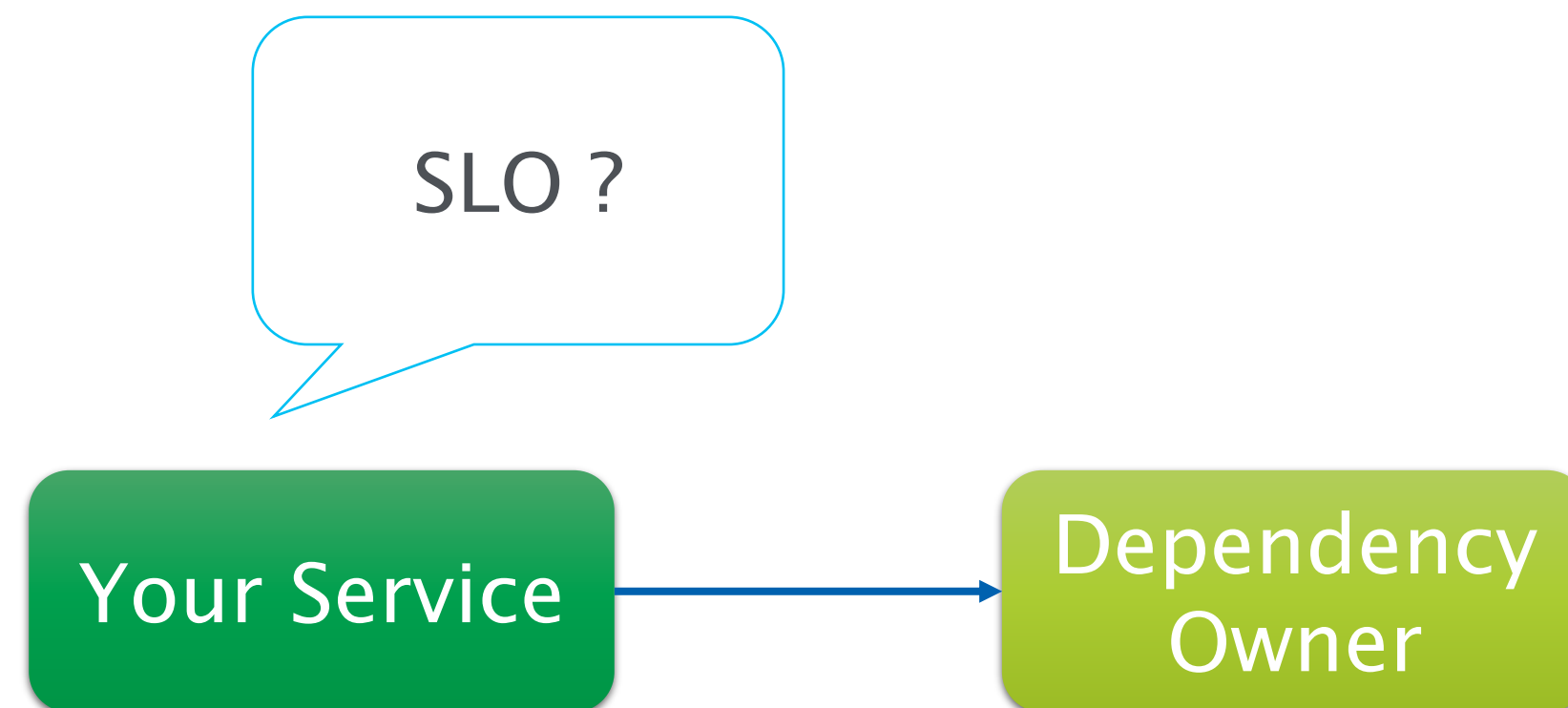
Destroying a Foundation of Trust



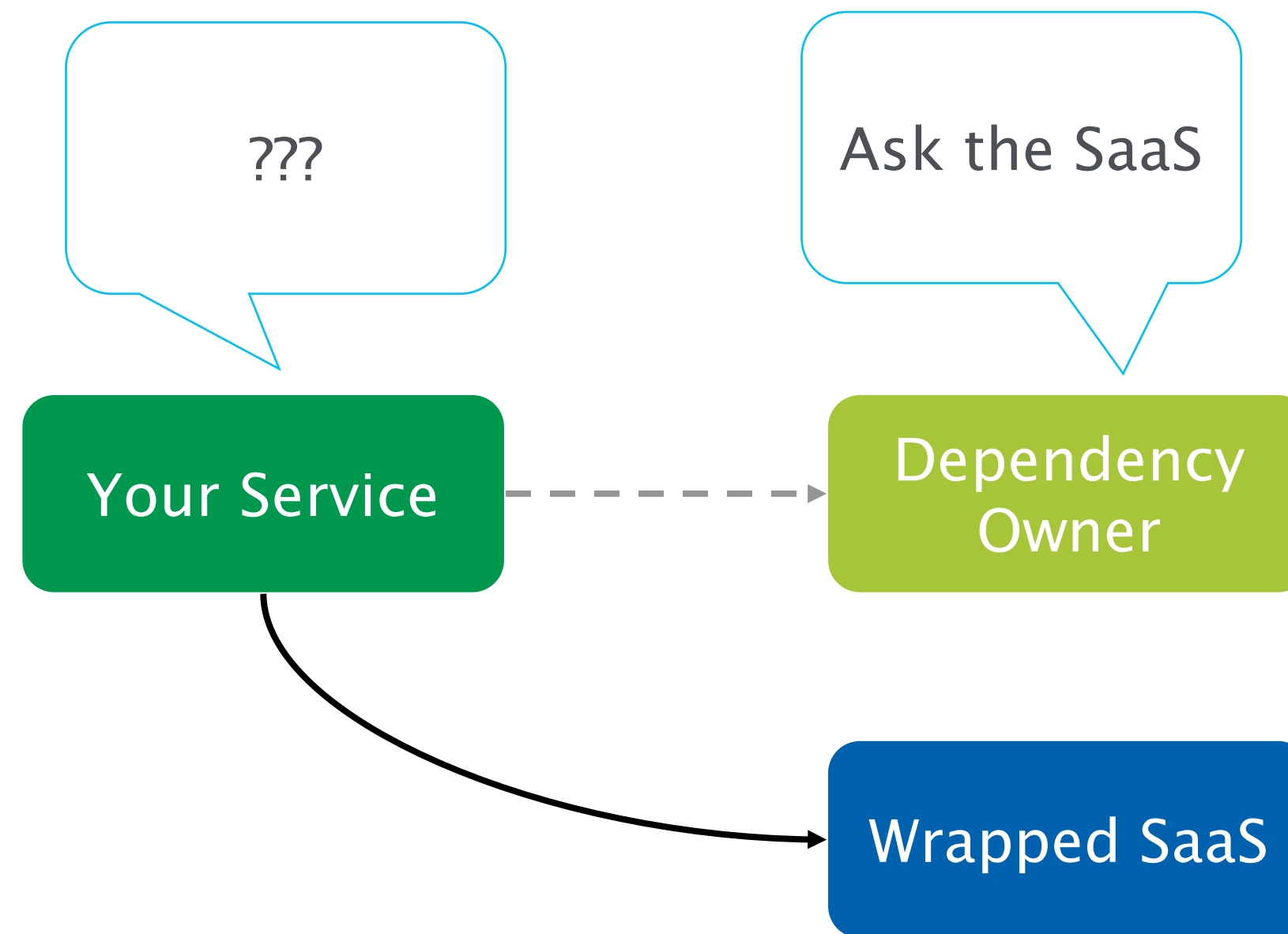
Destroying a Foundation of Trust



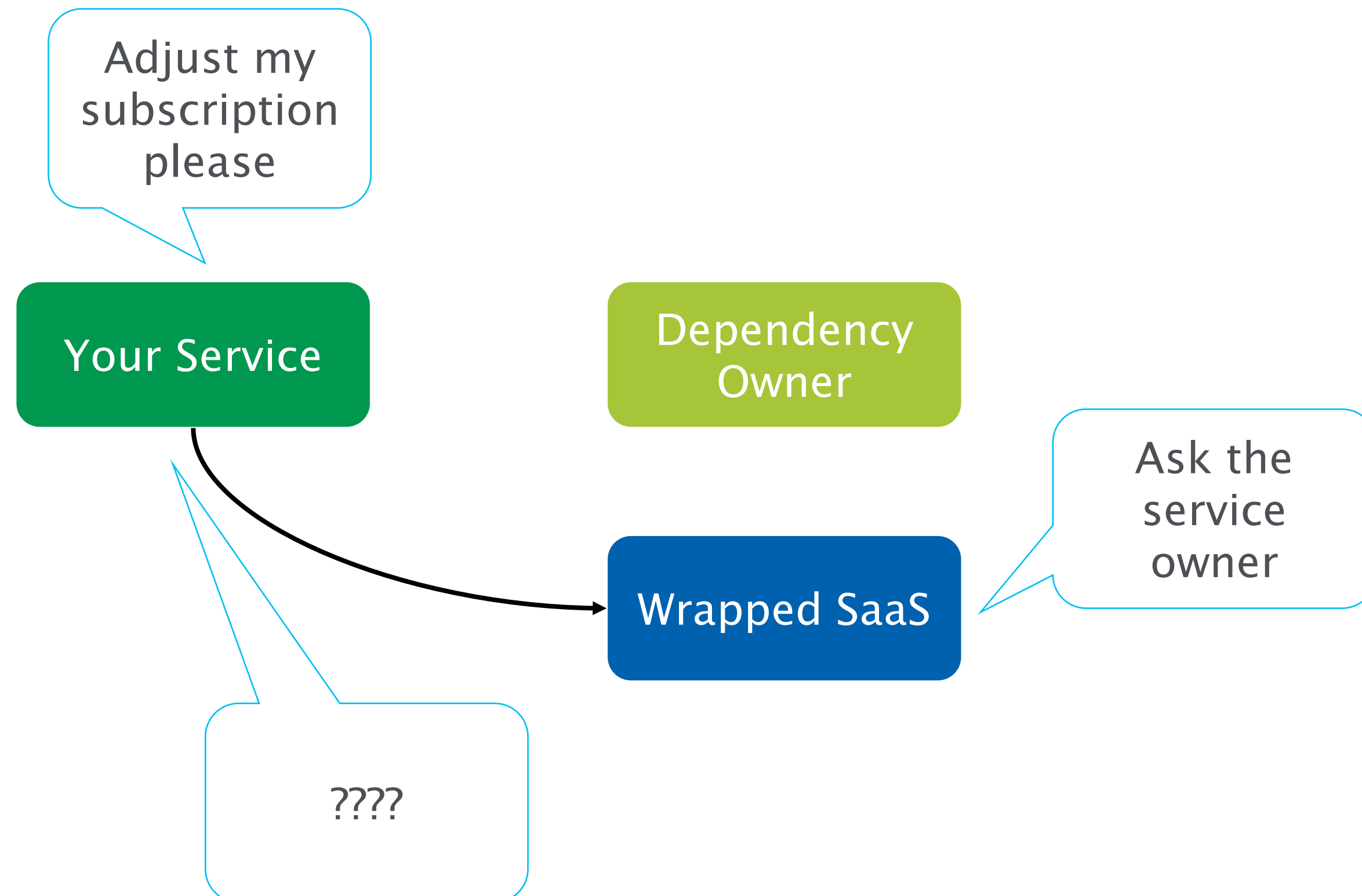
Ownership of Reliability Guarantees



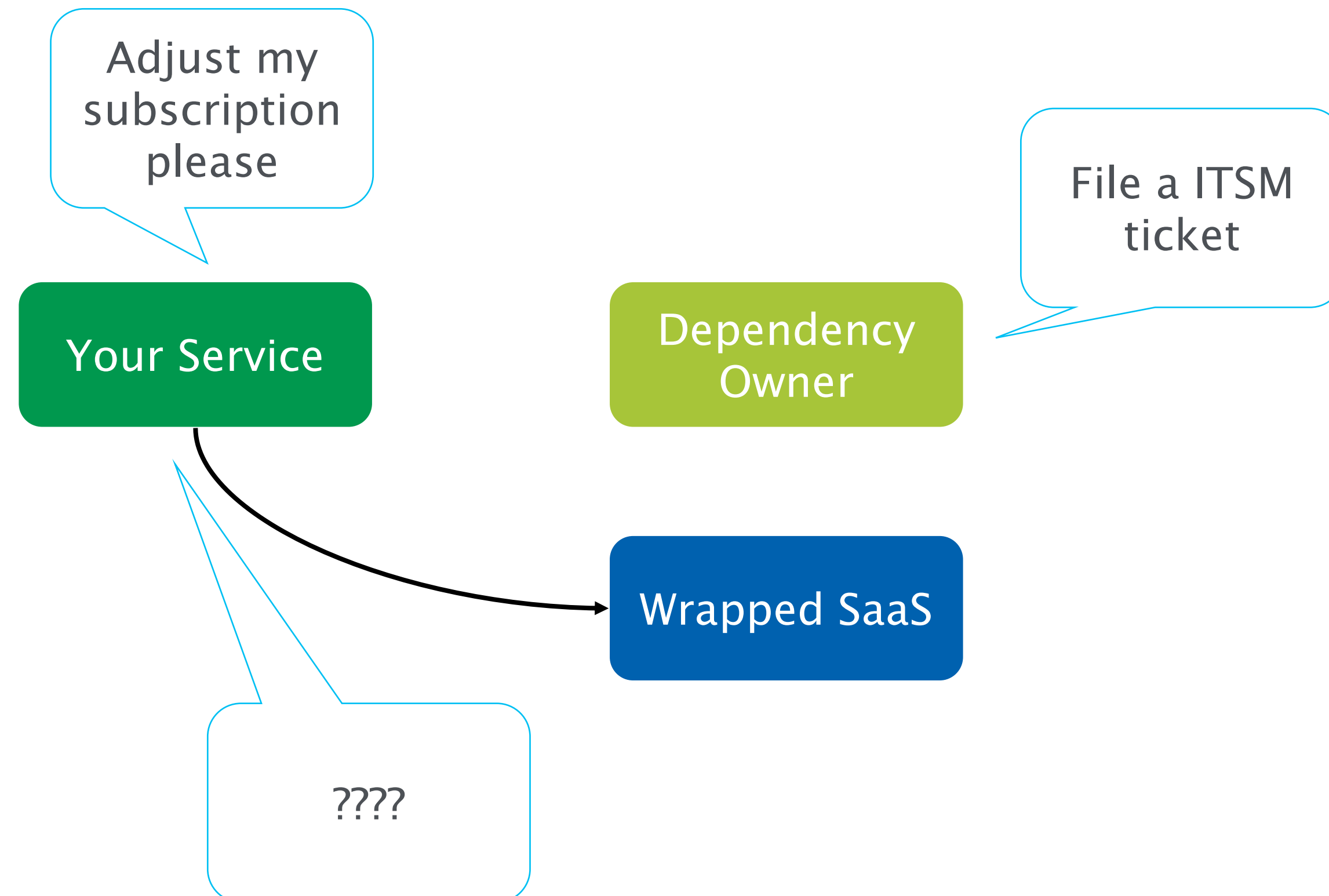
Ownership of Reliability Guarantees



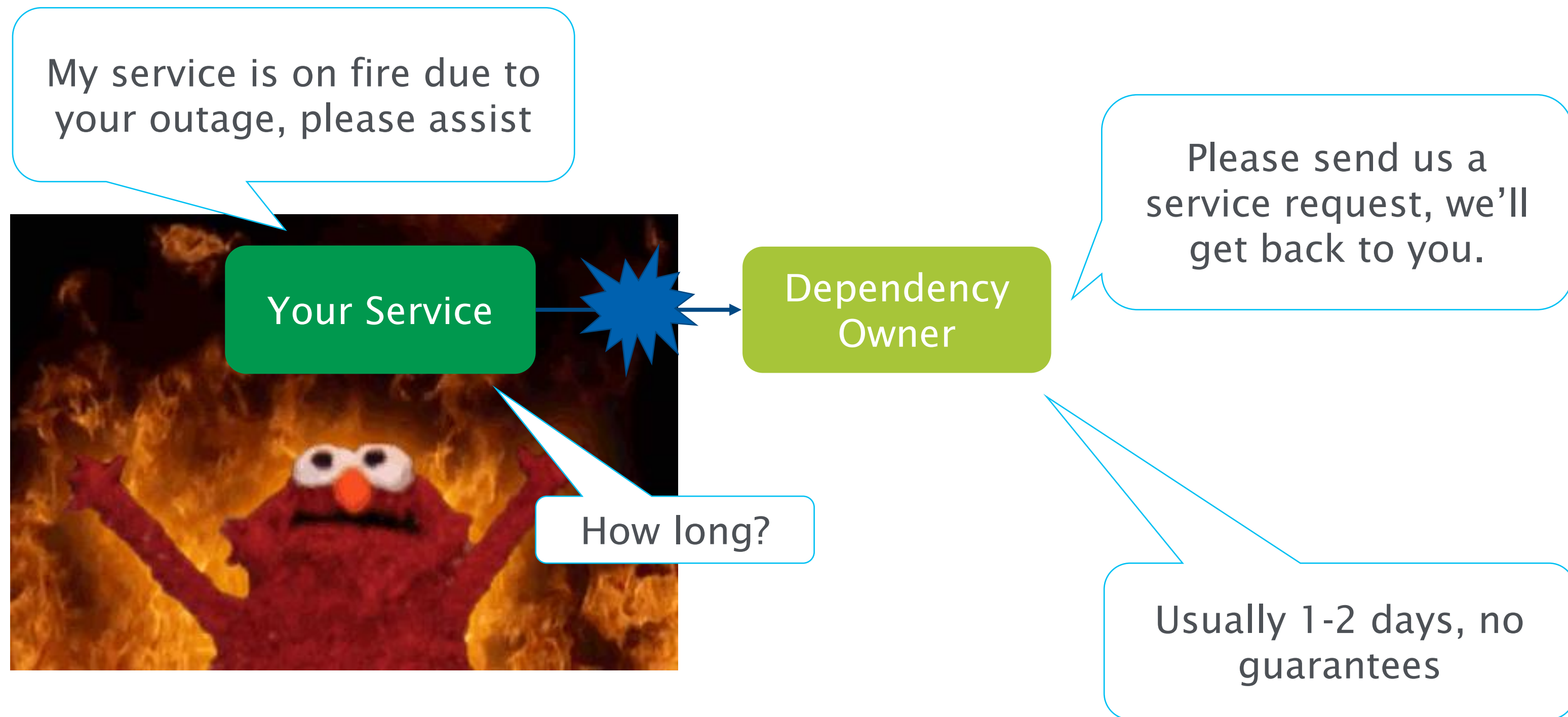
Ownership of Reliability Guarantees



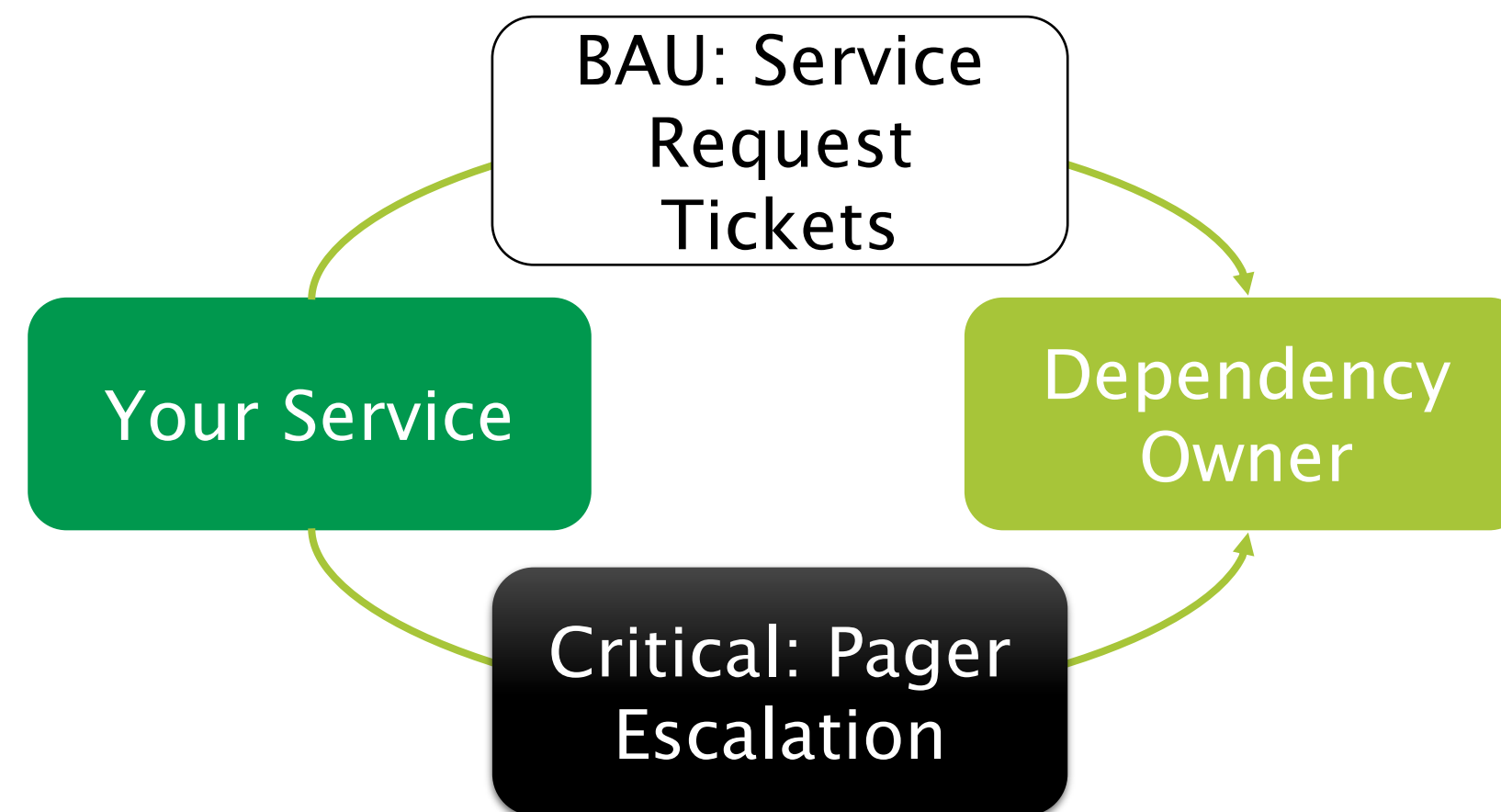
Ownership of Reliability Guarantees



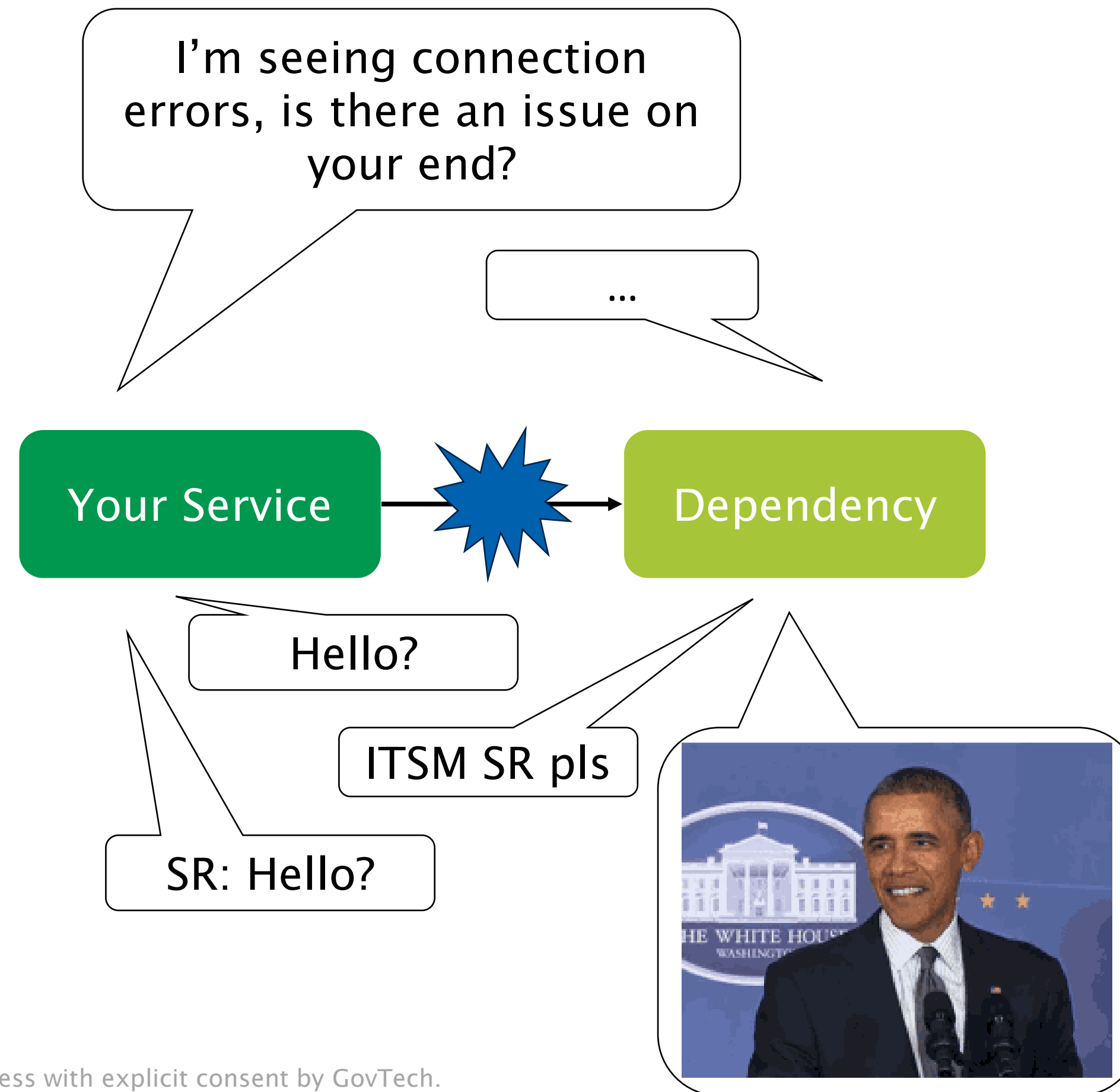
Shared Ownership of Production Criticality



Shared Ownership of Production Criticality

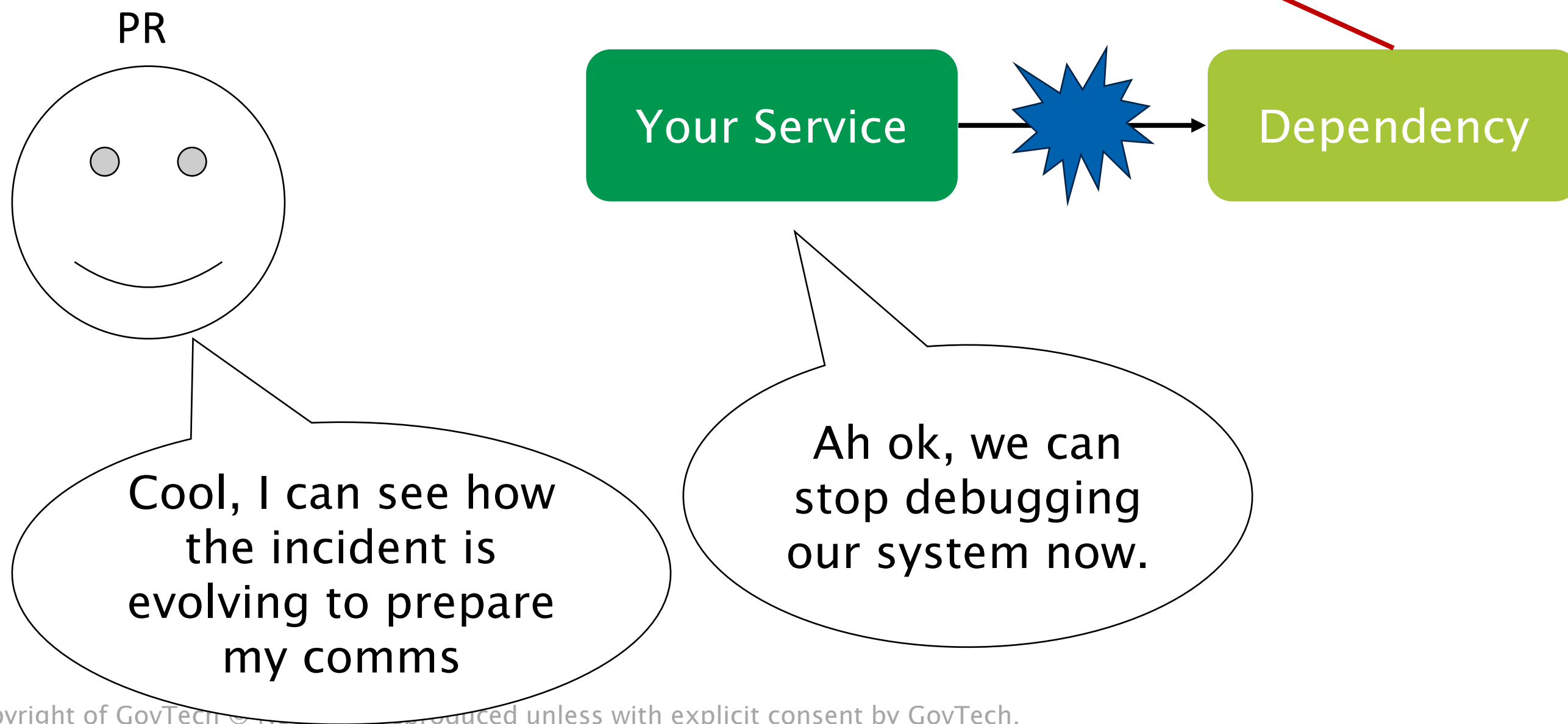


Transparency About Outages



Transparency About Outages

	Incident: Network Rollbacks Impact: 30% of GCC <-> GDC connections down since 08:55 Status: Ongoing User Course of Action: None POC: some_person@tech.gov.sg	
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Sublinear Scaling of Reliability Resources

- If we need one SRE to perform a manual integration test, how many more SREs do we need to do manual UATs, load testing, and synthetic testing?
- **None.** All of this should be **automated**. A good SRE or SRE-principled team should always get rid of unnecessary linear scaled processes.

Core Principles of Site Reliability Engineering



Risk Management

Service Level Objectives

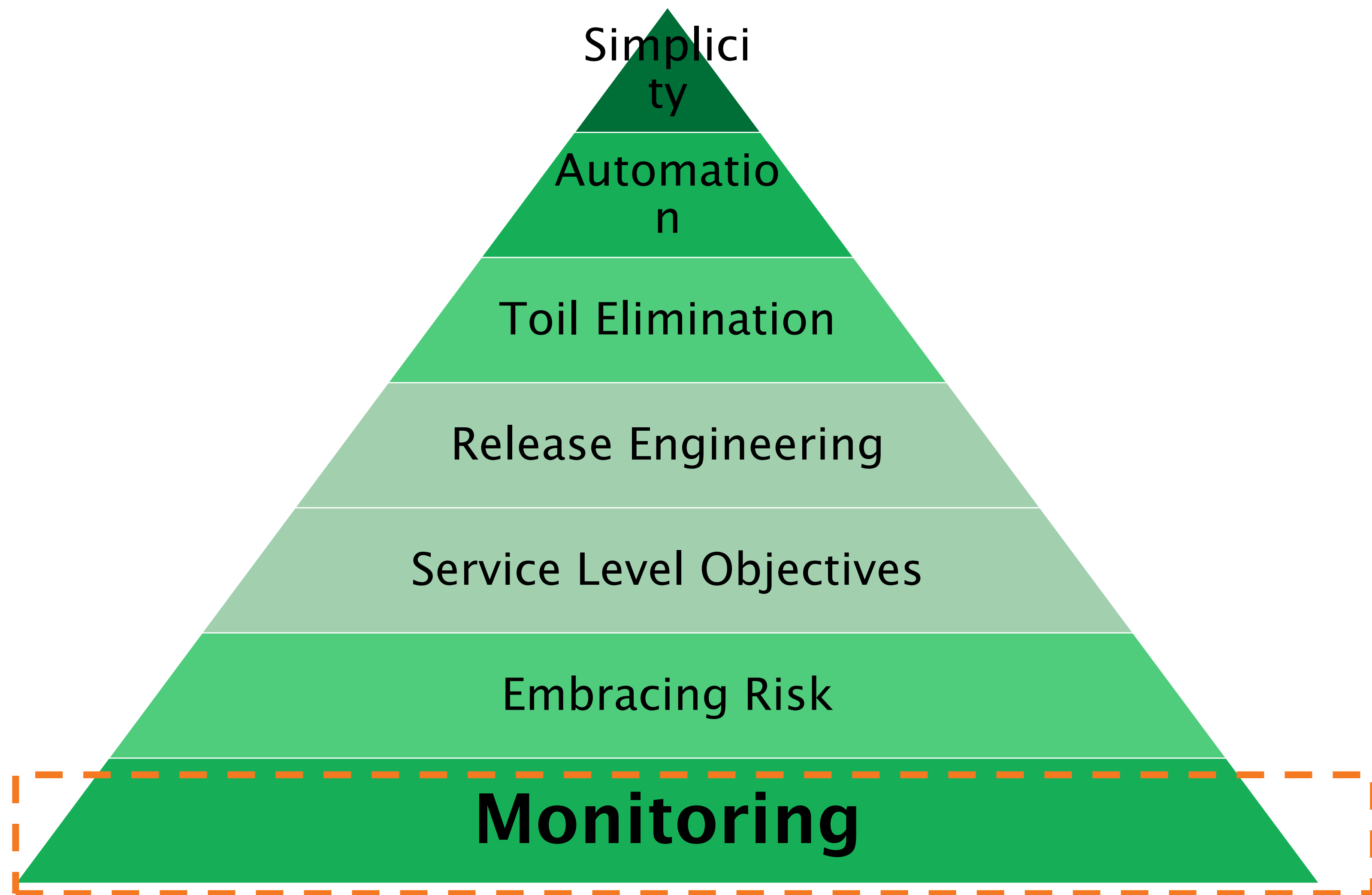
Eliminating toil

Monitoring

Release Engineering

Automation

Simplicity



Observability Accelerator

Yi Sheng Yap
Shan Mahanama



CONTENTS

Problem Statement

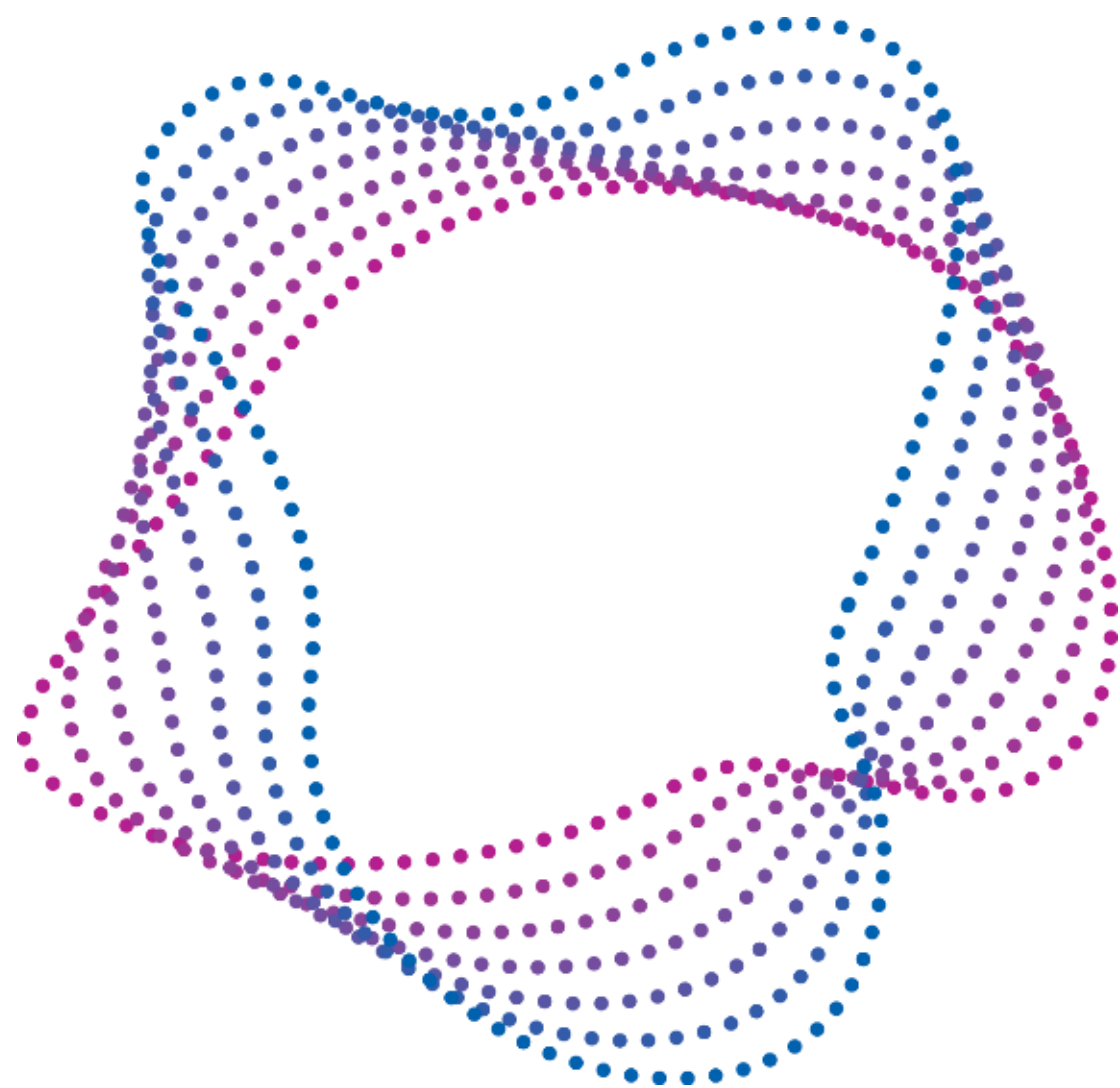
About Observability Accelerator

Before vs After

Demo

- Discover
- Suggest
- Automate
- Running as pipeline (Stretch)

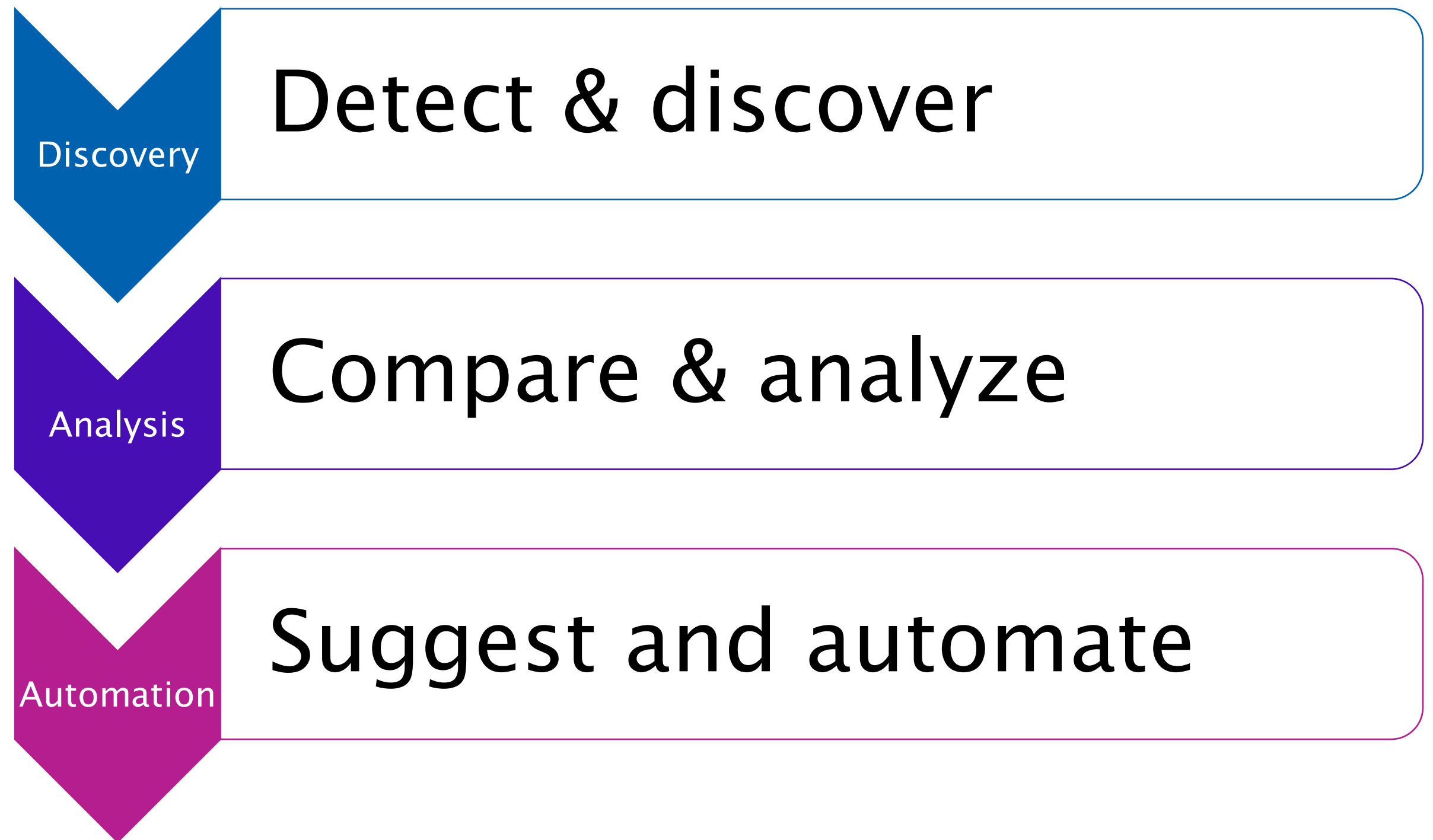
Problem Statement



Challenges in understanding state of observability maturity.

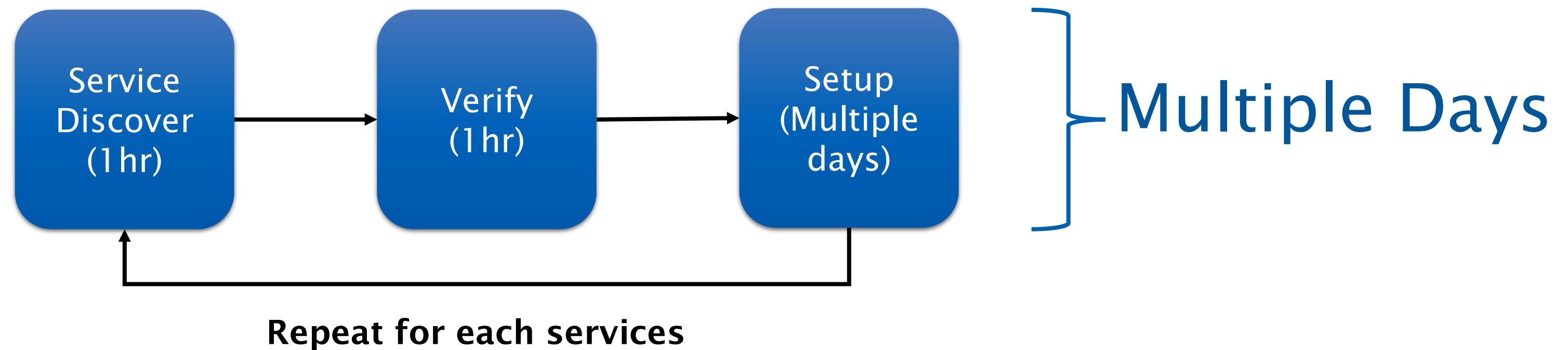
1. What do I have
2. Identifying gaps
3. How to implement

Observability Accelerator

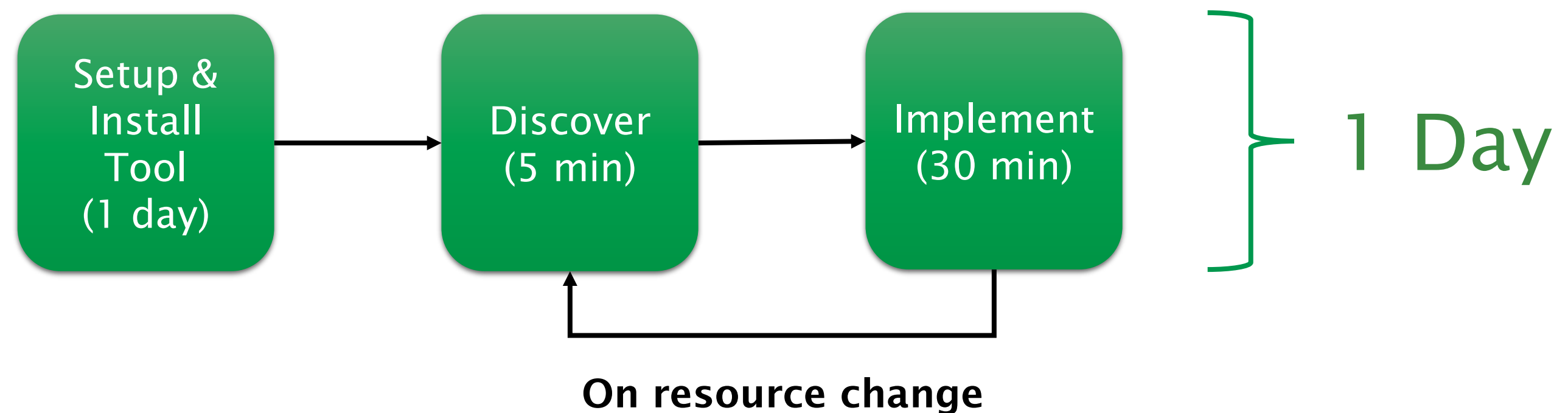


Differences (Estimated)

Before



After



StackOps Resources

- Join our tele community
- [Register for 102 workshop here!](#)
- Got a Query?
 - Write to teo_wee_meng@tech.gov.sg or gary_wong@tech.gov.sg
- [StackOps documentation](#)



Post-Event Feedback

Share your thoughts with us!

<https://go.gov.sg/sgts-meetup-survey>



<https://go.gov.sg/sgts-meetup-survey>

Thank you!

