

# LESSONS LEARNED FROM ENTERPRISE DEPLOYMENTS OF KAMAILIO

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# Agenda

*I'd like to discuss the following....*

1. Intro: Everything you didn't want to know about Fred in 1 -2 slides.
2. What is an Enterprise?
3. Some Lessons Learned
4. Questions / Comments



# Introduction

*Hi. I'm Fred.*

- VoIP Consultant > 20 years
- Based in Florida, USA
- Proud Papa
- Helped Yeni @ the bakery for 10 years
- LOVES Kamailio and Backpacks





“A camel is a horse  
designed by committee.”

See also: “Too many cooks spoil the broth.”

# What is an Enterprise?

# Enterprise

*What is an Enterprise?*

- Technically, can be any business.
- Generally accepted to mean...
  - **Large Scale**
  - Multiple Locations (often global)
  - High Volume
  - Highly Available





# Enterprise

## *Common Aspects*

- Prod, Stage, Test Environments
- Intricate, complicated documentation needed
- Meetings galore
- Generally detailed business requirements
- Multiple teams (server, network, security)
- Jira, Agile, Scrum, Confluence, etc.



# Lessons Learned



**Enterprise  
Network Engineers  
Hate UDP**



# Lesson Learned: UDP

*Network Engineers Hate UDP*

- Often, there are “rules” that ALL network traffic must be encrypted or over TLS
- On high traffic, can do IPSEC tunnels for encryption, and still send traffic as UDP
- If TLS is needed, there’s a dramatic reduction in performance (need more nodes).
- (For the RTP over TLS, see intro section of RFC 1889/3550)

“Why can’t RTP be TLS?”

—Senior Network Engineer



# -94%

“TLS can reduce performance by up to a **factor of 17**  
compared to the typical case of SIP-over-UDP”  
[https://www.cs.columbia.edu/~hgs/papers/Shen1008\\_TLS.pdf](https://www.cs.columbia.edu/~hgs/papers/Shen1008_TLS.pdf) (2010)



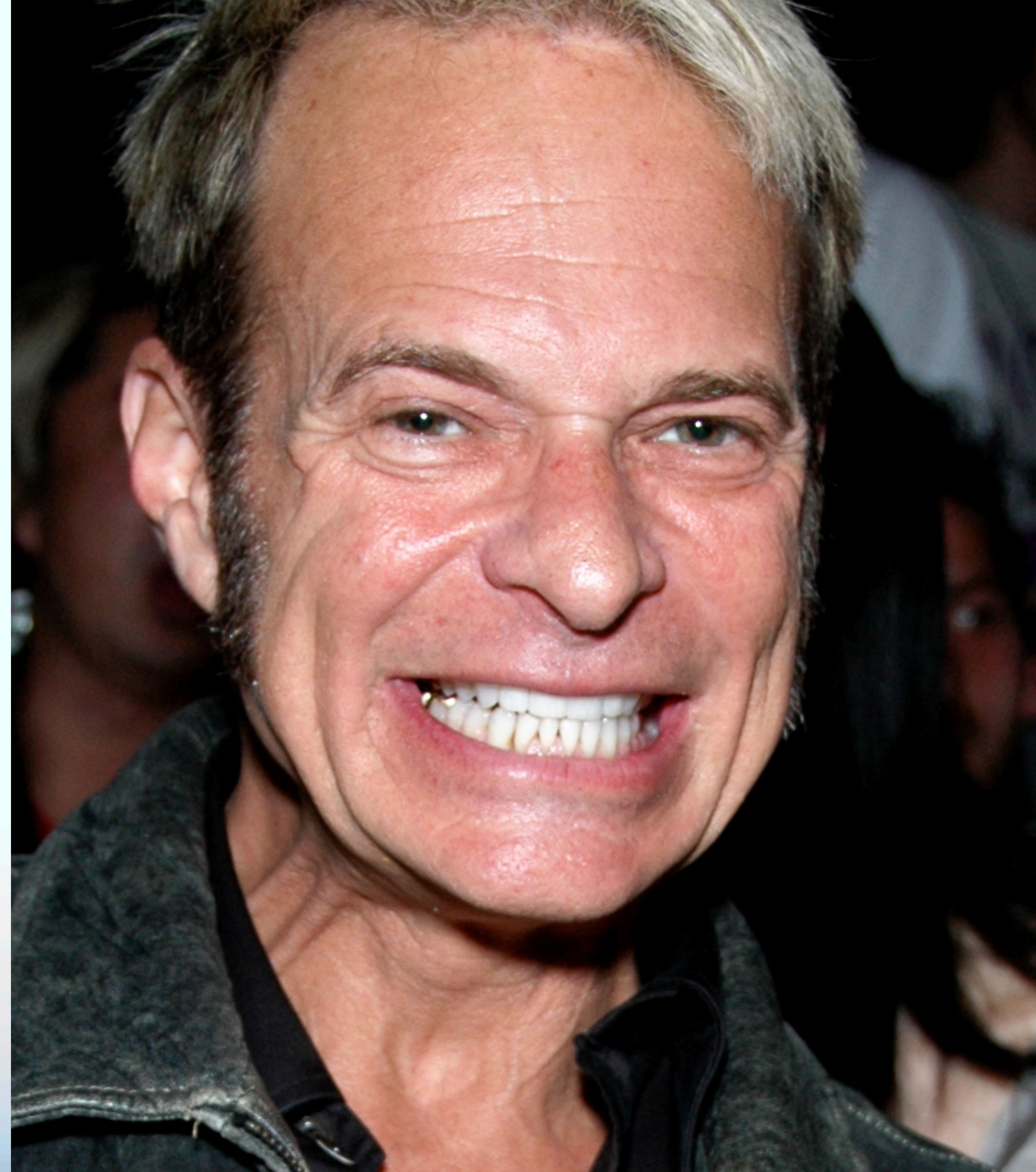
# **Lesson Learned: Documentation Required**



# Documentation

*...that will mostly be ignored*

- Enterprise work requires many stages of documentation.
- An example cycle could be...
  - A. Proposal
  - B. High Level Design
  - C. Low Level Design
- Checkbox Project Management
- David Lee Roth Brown M&Ms:  
[https://youtu.be/\\_IxqdAgNJck](https://youtu.be/_IxqdAgNJck)





# Brown\_MMS

## *Example Documentation*

### **1.1.1.2.32) DMQ\_USRLOC**

The module adds user location (usrloc) records replication between multiple servers via DMQmodule.

### **1.1.1.2.33) BROWN\_MMS**

Why did Van Halen have a clause in their contracts about Brown M&Ms? Much like this paragraph, it was there only to ensure that the entire contract was read. It's a very good story, especially when you listen to David Lee Roth explain it in his own words . Not sure who David Lee Roth or Van Halen is? Ask an older employee.

### **1.1.1.3) HTABLE Usage**

HTABLE will store routing information into Kamailio shared memory. Using HTABLE for routing decisions will result in an extremely fast, scalable solution.



**Lesson Learned:  
PPS is not considered**



# Lesson Learned: PPS

*Most Enterprise Network Designs do not consider VoIP PPS*

- If lucky, many Enterprise networks provide a dedicated VLAN for VoIP
  - Ideally, should be a separate network or VLAN
  - Many did not consider UDP usage or PPS from replication / RTP
- Enterprise user base can be well over 200k

I could tell you a  
joke about UDP...

**...but I'm not sure you'd get it.**

# 28

Min average registrations per sec for 100k endpoints



# 105,000

PPS for 1,000 ulaw/opus/etc RTP/RTCP channels





# Lesson Learned: PPS

*You need to predict the future*

- "What volume do we need to handle in 5 years?"
- Reduce PPS where possible
- Design accordingly
- Build a foundation for the future
- Look at year over year growth in the past to help predict the future



“Those who cannot  
remember the past are  
condemned to repeat it.”

—George Santayana (1905)

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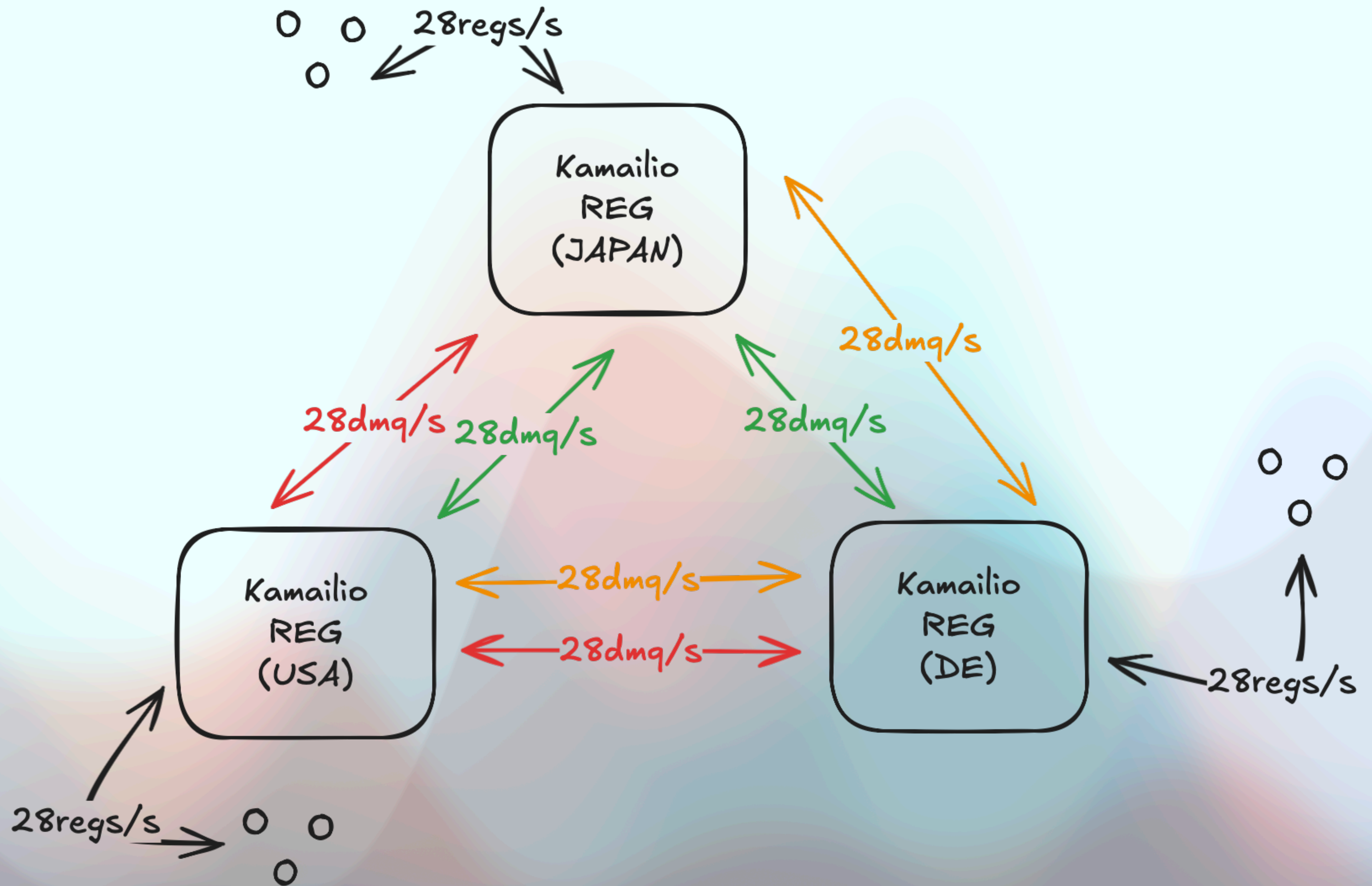


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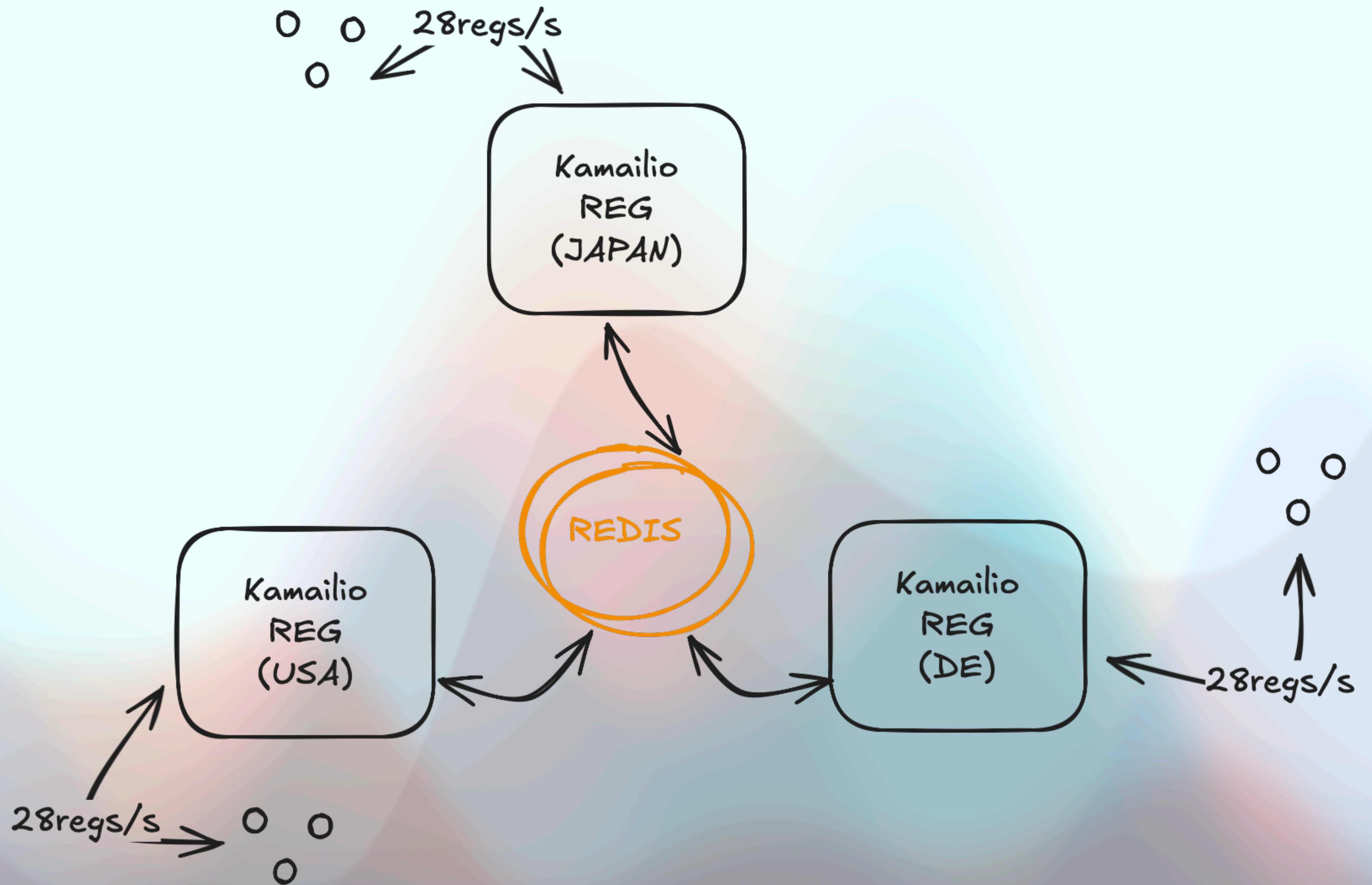
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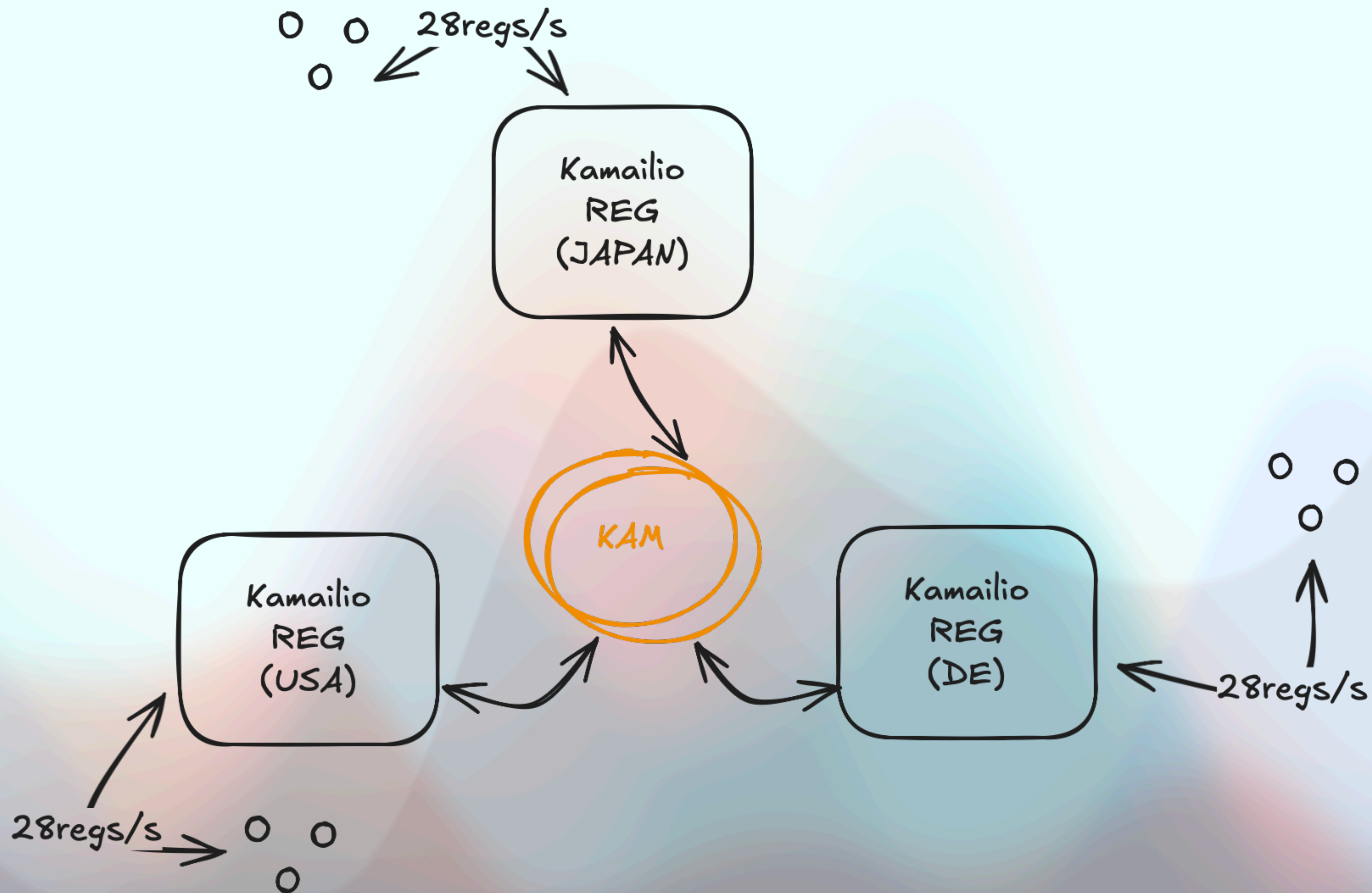
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**Lesson Learned:  
Systems Are Over Subscribed**

# Lesson Learned: Systems

*Oversubscribed/Overutilized/etc*

- The benefits of visualization end when you don't get what you need
- "Everything is fine with the host"
- Kamailio is layer 7
- If you can't explain delays, try to reproduce on a different platform
- When Raspberry Pi's outperform, it's a strong argument
- sipp / sipexer





# Lesson Learned: Security

# Lessons Learned: Security

*ALG is not for me*

- SIP ALG can impact call set-up, SDP (altering addresses, etc).
- ALG is redundant for systems (like Kamailio) that can handle NAT
- Firewall identification of RTP will impact traffic at volume (must have RTP handler not susceptible to RTP bleed, etc)
- Most Security/Network engineers do not understand impact of delay in RTC





**Questions? Comments?**

# Thank You

<https://fred.tel>



- Got **APIBAN**?
- [LOD.com](https://lod.com)
- Slides: <https://pgpx.io/kw2025>