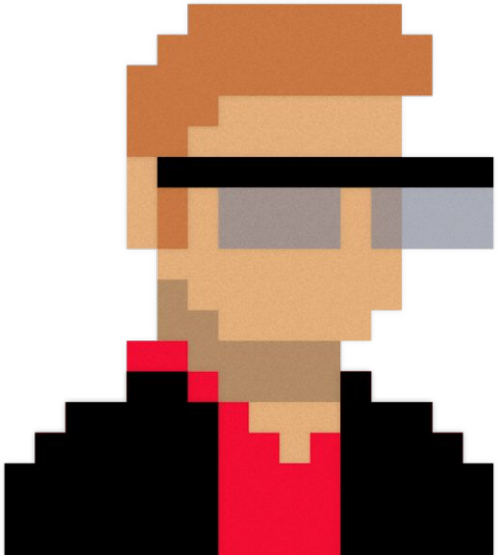
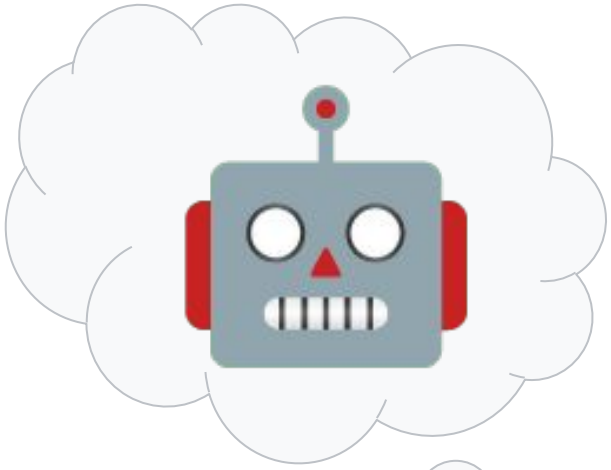
Jun 4, 2024

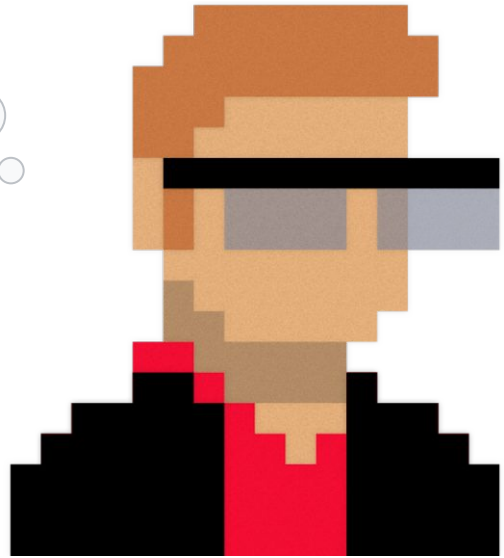
How to teach (and not to teach) STPA in Big Tech

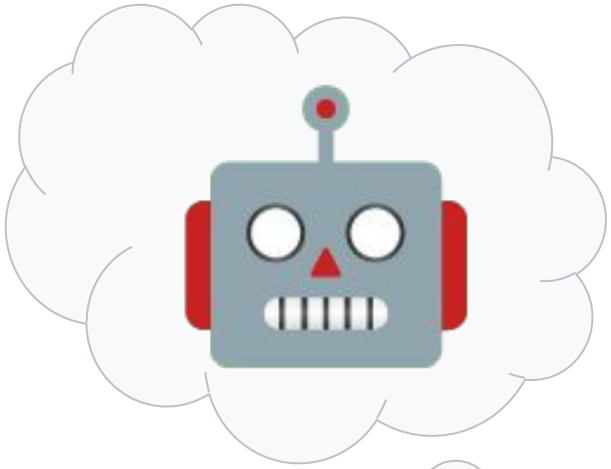
Garrett Holthaus

Google

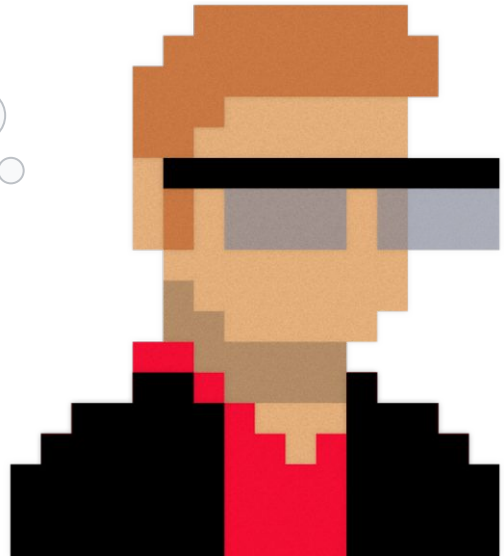












Jun 4, 2024



Google

- I would prefer to see more real examples from teams.
- Unfortunately, in order to be useful, I think we'll need…more depth in how to apply the technique. But you gotta start somewhere!




WE HEAR YOU!

- I've heard about STPA in past years, but this was the first time I saw it explained with concrete examples. The Google example at the end was also really helpful.

- [The presenters] did an excellent job in this session, it has been one of the best I have attended so far at Google.





Today's agenda

- Training history
- What we learned: Takeaways
- Our current approach
- Summary
- Questions

Training history

History of STPA Training at Google



Initial training:

Google asked Dr. Thomas for a class

2021 STPA Class

- 2 weeks
- ~40 Googlers
- STAMP background
- 4 steps of STPA
- Build control structure, get feedback

History of STPA Training at Google



2021

Initial training: Google asked Dr. Thomas for a class

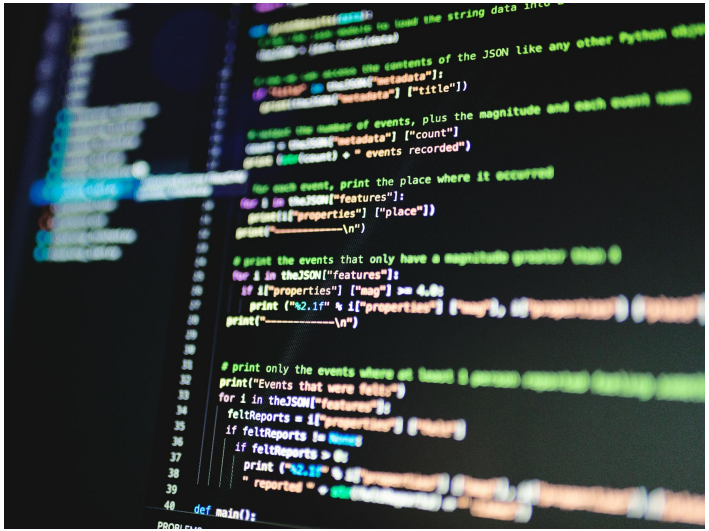
2022

First series: Control Structures 101/201

Challenge: Physical vs. Software examples

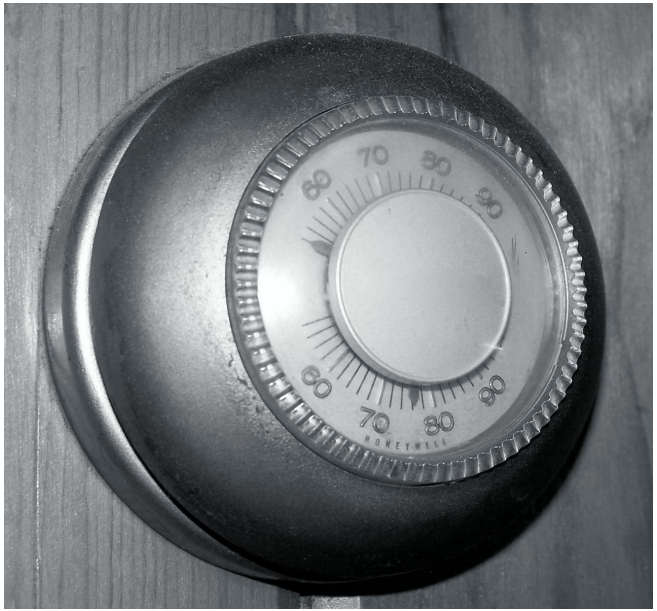


Common STPA examples

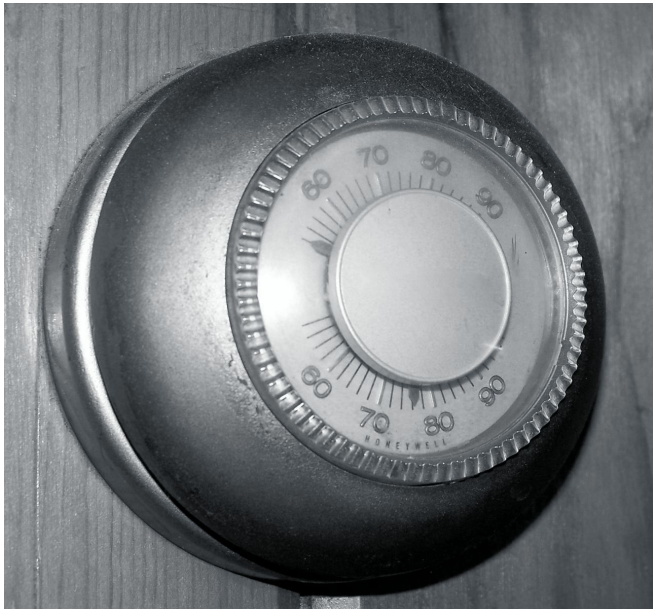


Software examples

Control Structures 101



Control Structures 101





Challenge: Software complexity

- Gigantic codebase
- Many different products/systems/teams
- Any example we pick requires extensive explanation

How to teach STPA at Google

Use physical examples to introduce concepts.

Build on the concepts with carefully-chosen software examples.



History of STPA Training at Google



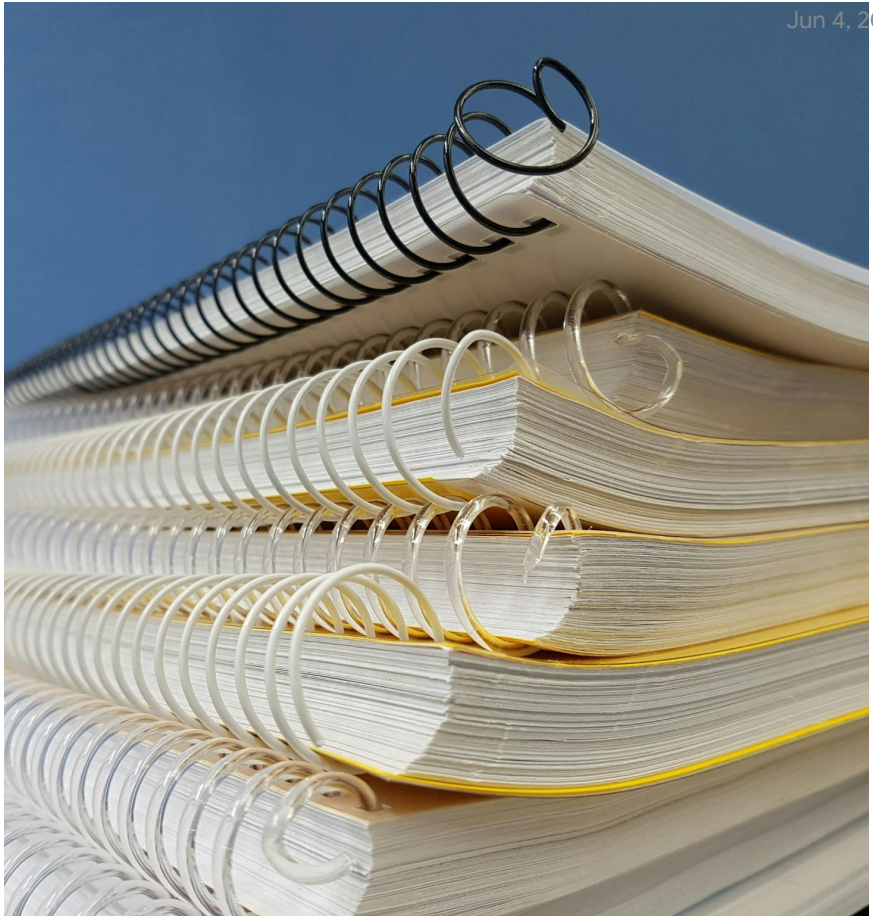
2021

Initial training: Google asked Dr. Thomas for a class

2022

First series: Control Structures 101/201

Challenge: Impractical to train everyone as an STPA expert



How to teach STPA at Google

Design training to give a high-level understanding of STPA.

Motivate attendees to run their own STPA, and set them up for success.



History of STPA Training at Google



2021

Initial training: Google asked Dr. Thomas for a class

2022

First series: Control Structures 101/201

Second series: STPA 101

2023

2024

STPA 101

Reliability vs.
Safety



STPA 101

Reliability vs. Safety



STPA Overview

1 2

3 4

STPA 101

Reliability vs. Safety

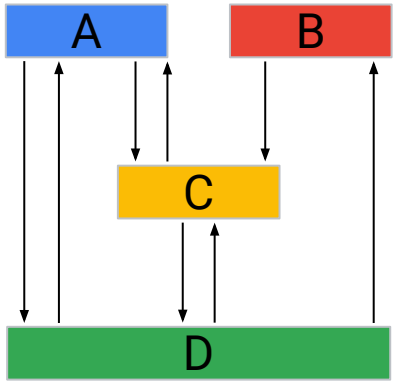


STPA Overview

1 2

3 4

Google System Example

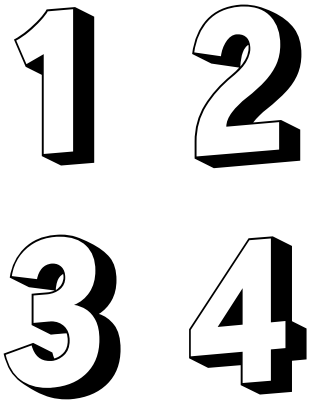


STPA 101

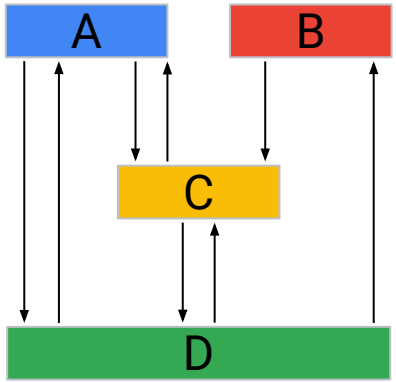
Reliability vs. Safety



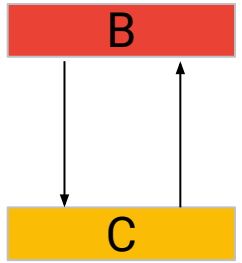
STPA Overview



Google System Example



Control Loop

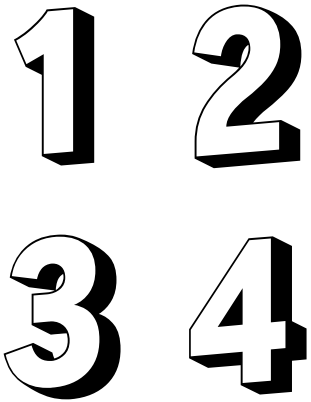


STPA 101

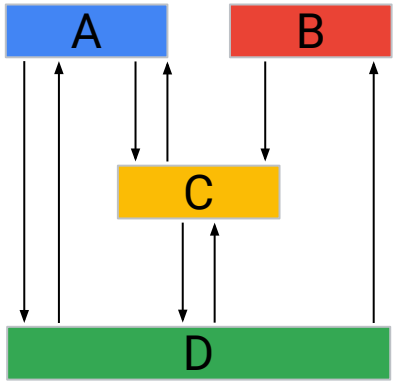
Reliability vs. Safety



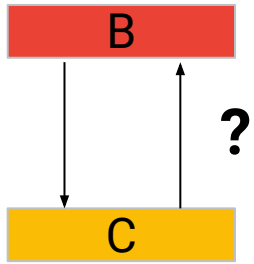
STPA Overview



Google System Example



Control Loop



STPA 101 Results

- Taught 6 sessions
- 100+ Googlers
- 77 survey responders, 95% favorable “worth my time”
- Increased awareness and interest in STPA

History of STPA Training at Google



2021

Initial training: Google asked Dr. Thomas for a class

2022

First series: Control Structures 101/201

Second series: STPA 101

2023

Second series cont: Losses and Hazards

2024

Your turn! Question:

- **In your opinion, what is difficult about getting people to take training?**



Challenge: People don’t have time for training



How to teach STPA at Google

Provide short tutorials to increase interest/motivation.

Provide longer, in-depth training for people who want to develop expertise.



History of STPA Training at Google



2021

Initial training: Google asked Dr. Thomas for a class

2022

First series: Control Structures 101/201

Second series: STPA 101

2023

Second series cont: Losses and Hazards

Third series: 1st short tutorial, Google example

2024

Google Services Hit by Outage



STPA Tutorial 1

- Primary goal: increase interest in STPA
- Use a recent, well-known outage to reduce cognitive load
- Less STAMP theory
- More on system model and explaining outages

Challenge: Finding STPA strengths that resonate with software developers



How to teach STPA at Google

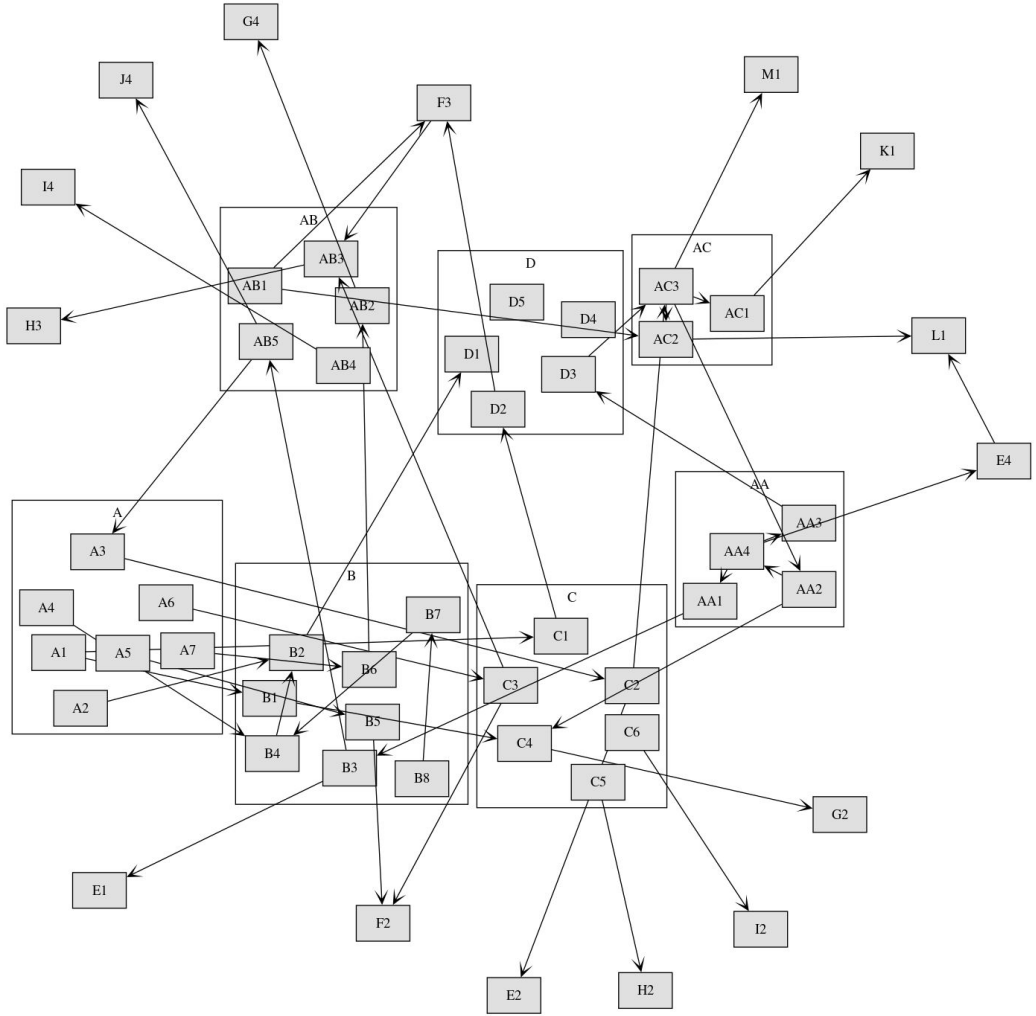
STPA enables you to analyze the feedback path



How to teach STPA at Google

STPA narrows the focus to a few hundred lines of code

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AC2
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C6
C4
C5
G2
E1
F2
I2
E2
H2

Google

History of STPA Training at Google



2021	2022	2023	2024
Initial training: Google asked Dr. Thomas for a class	**First series:** Control Structures 101/201 **Second series**: STPA 101	**Second series** cont: Losses and Hazards **Third series**: 1st short tutorial, Google example	**Third series**: 2nd short tutorial **Third series**: 2-day workshop with exercises

Stepped Approach

- Tutorial 1: 20 minutes
- Tutorial 2: 1 hour
- 2-day workshop

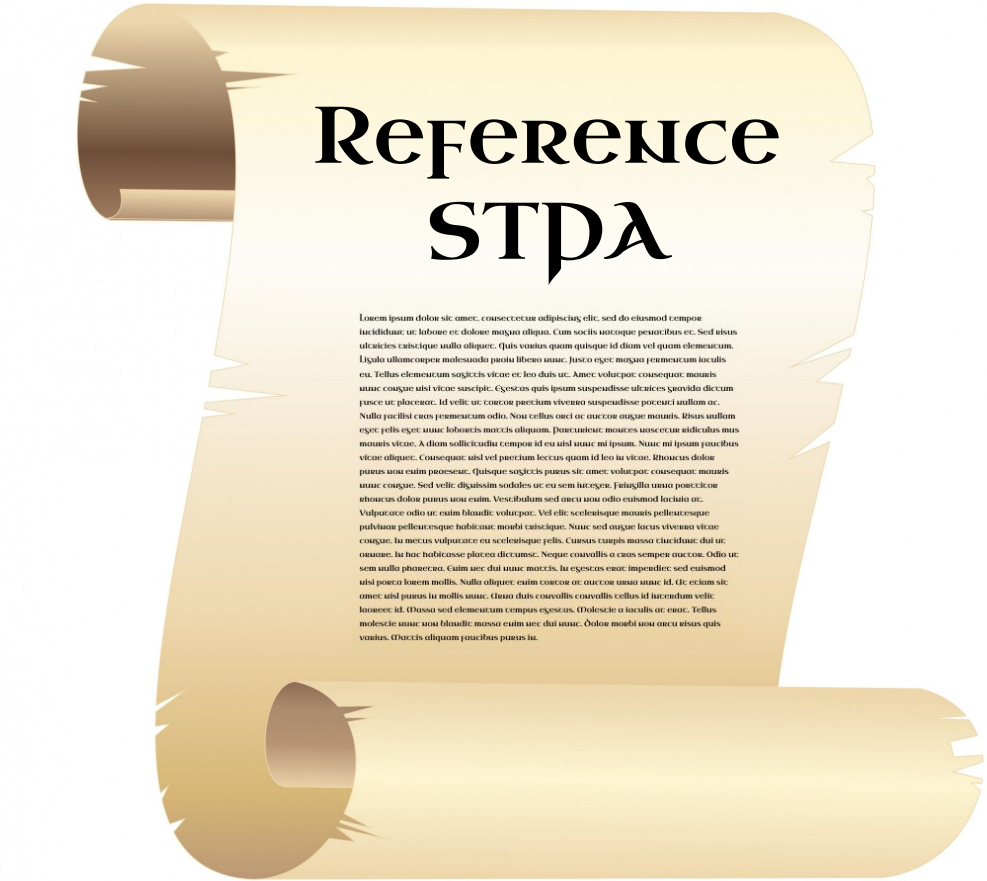


Stepped Approach

- Tutorial 1: 20 minutes
- Tutorial 2: 1 hour
- 2-day workshop

Self-selecting!




Reference
STPA
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Current approach

- 2 short tutorials to raise interest and awareness
- 2-day workshop for hands-on practice
- Reference STPA to help teams run their own analysis

Summary

- 2 short tutorials to raise interest and awareness
- 2-day workshop for hands-on practice
- Reference STPA to help teams run their own analysis



- We need carefully chosen, Google-specific examples.
- Use a stepped approach: high-level for most, in-depth for a few
- Show: STPA enables you to analyze the feedback path
- Show: STPA narrows the focus to a few hundred lines of code

Thank you!
Questions?

Jun 4, 2024

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