WHISPERS IN CHAOS

J. PAUL REED

RELEASE ENGINEERING APPROACHES

QCON SF, 2018

“CHAOS?!”

“CHAOS?!”
(INCIDENTS)

HOW DO YOU KNOW AN INCIDENT IS OCCURRING?

MONITORING!

MONITORING!

(Not a trick question.)

HOW DO YOU KNOW WHAT TO DO WHEN AN INCIDENT IS OCCURRING?

J. PAUL REED

- @JPAULREED ON
- @SHIPSHOWPODCAST ALUMN
- 15+ YEARS IN BUILD/RELEASE ENGINEERING
- NOW, A DEVOPS CONSULTANT™
- MASTERS OF SCIENCE ~~CANDIDATE~~ IN HUMAN FACTORS AND SYSTEMS SAFETY

HOW DO YOU KNOW WHAT TO DO WHEN AN INCIDENT IS OCCURRING?

Two Brain Systems

“System One”

- “Automatic” / Quick
- Little to no effort
- No sense of voluntary control

Two Brain Systems

“System One”

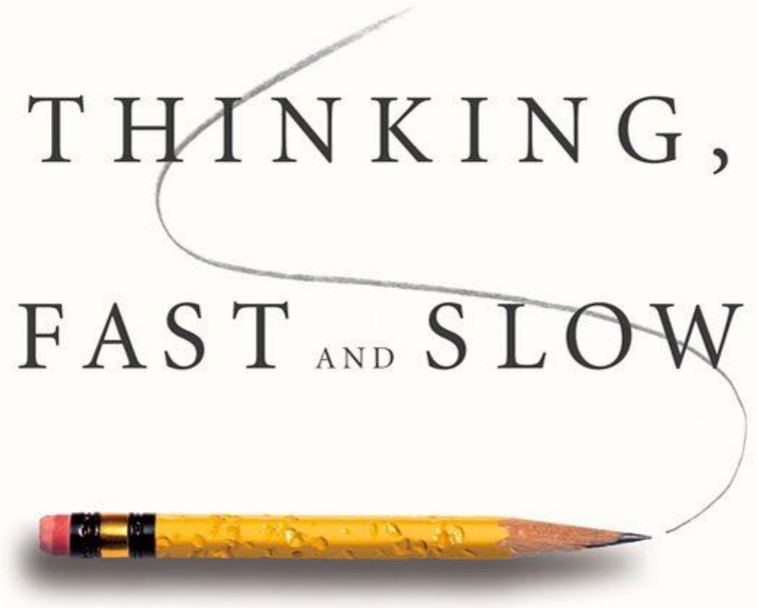
- “Automatic” / Quick
- Little to no effort
- No sense of voluntary control

“System Two”

- “Effortful”
- Complex computations
- “Associated with the subjective experience of agency, choice, and concentration”

THE *NEW YORK TIMES* BESTSELLER

THINKING, FAST AND SLOW



DANIEL KAHNEMAN

WINNER OF THE NOBEL PRIZE IN ECONOMICS

"[A] masterpiece . . . This is one of the greatest and most engaging collections of insights into the human mind I have read." —WILLIAM EASTERLY, *Financial Times*

Two Problem Types

“System One”

- Orient to the source of a sudden sound
- Complete: “bread and…”
- 2 + 2 = ?
- Find a strong move in chess (*but only* if you’re a chess master!)

Two Problem Types

“System One”

- Orient to the source of a sudden sound
- Complete: “bread and…”
- 2 + 2 = ?
- Find a strong move in chess (*but only* if you’re a chess master!)

“System Two”

- Focus on a particular voice in a crowded room
- Count the occurrence of the letter ‘a’ on this slide
- Fill out a tax form
- Check the validity of a complex logical argument

Velocity
Web Performance
and Operations
CONFERENCE
© Pinar Ozger

TRADE-OFFS UNDER PRESSURE: HEURISTICS AND OBSERVATIONS OF TEAMS RESOLVING INTERNET SERVICE OUTAGES

John Allspaw

LUND UNIVERSITY
SWEDEN

Date of submission: 2015-09-07

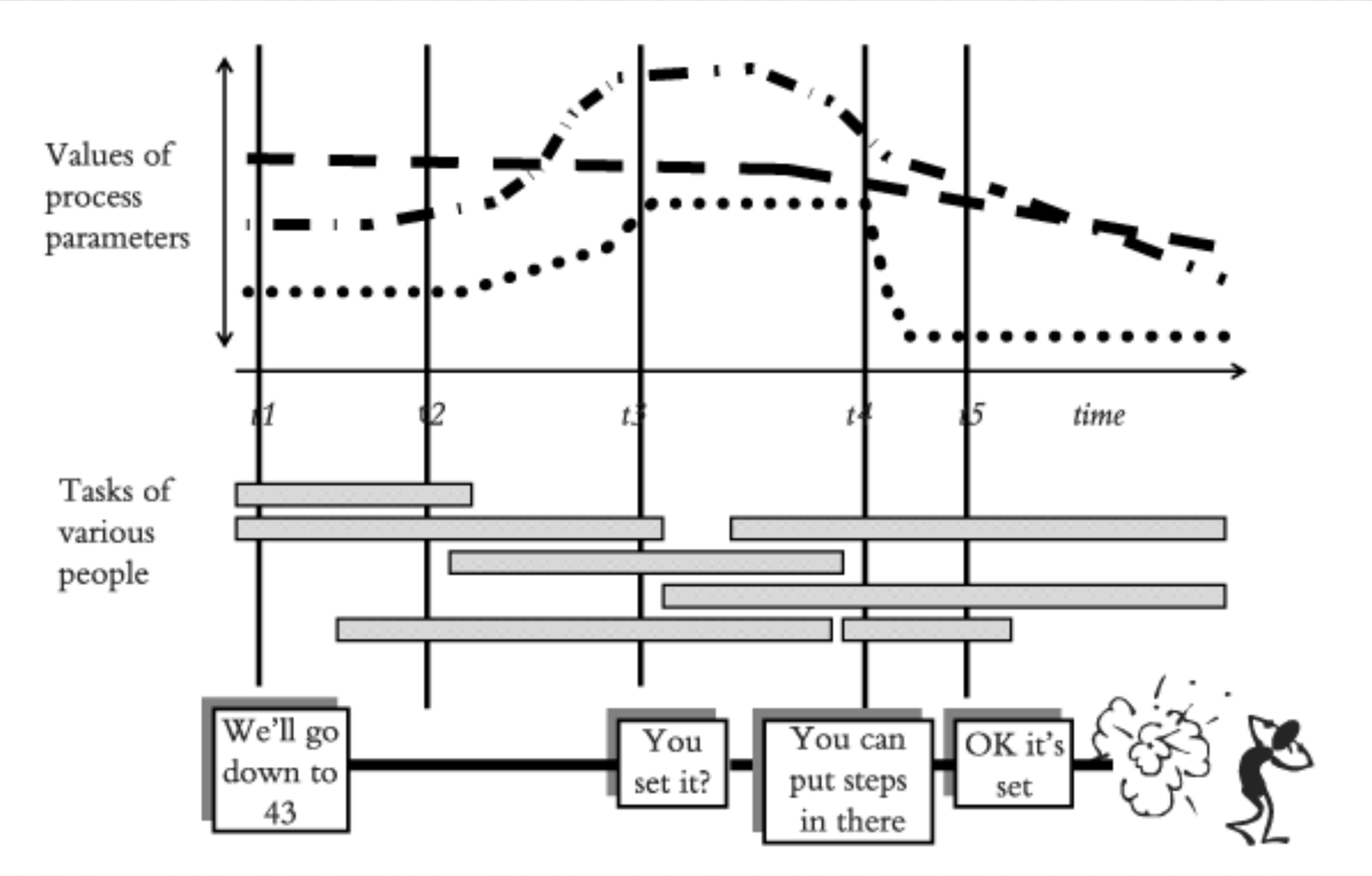
@jpaulreed

#QConSF

“THE INCIDENT”

On December 4th, 2014, during the busy holiday shopping season, it was reported at 1:06 PM EST that the personalized homepage for logged-in users was experiencing loading issues.

“Timelines, yadda, yadda”



The Field Guide to Understanding Human Error
Dr. Sidney Dekker

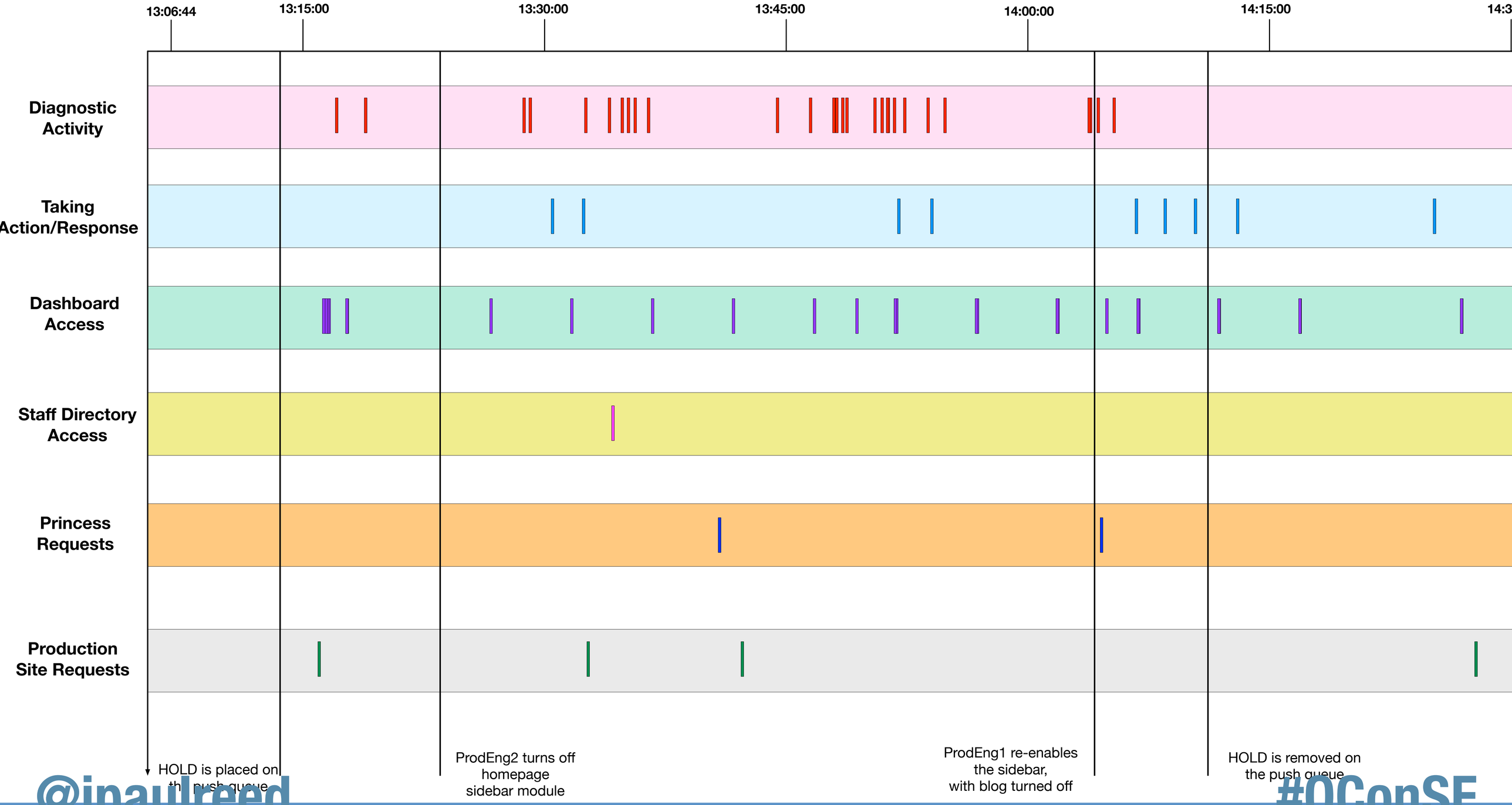
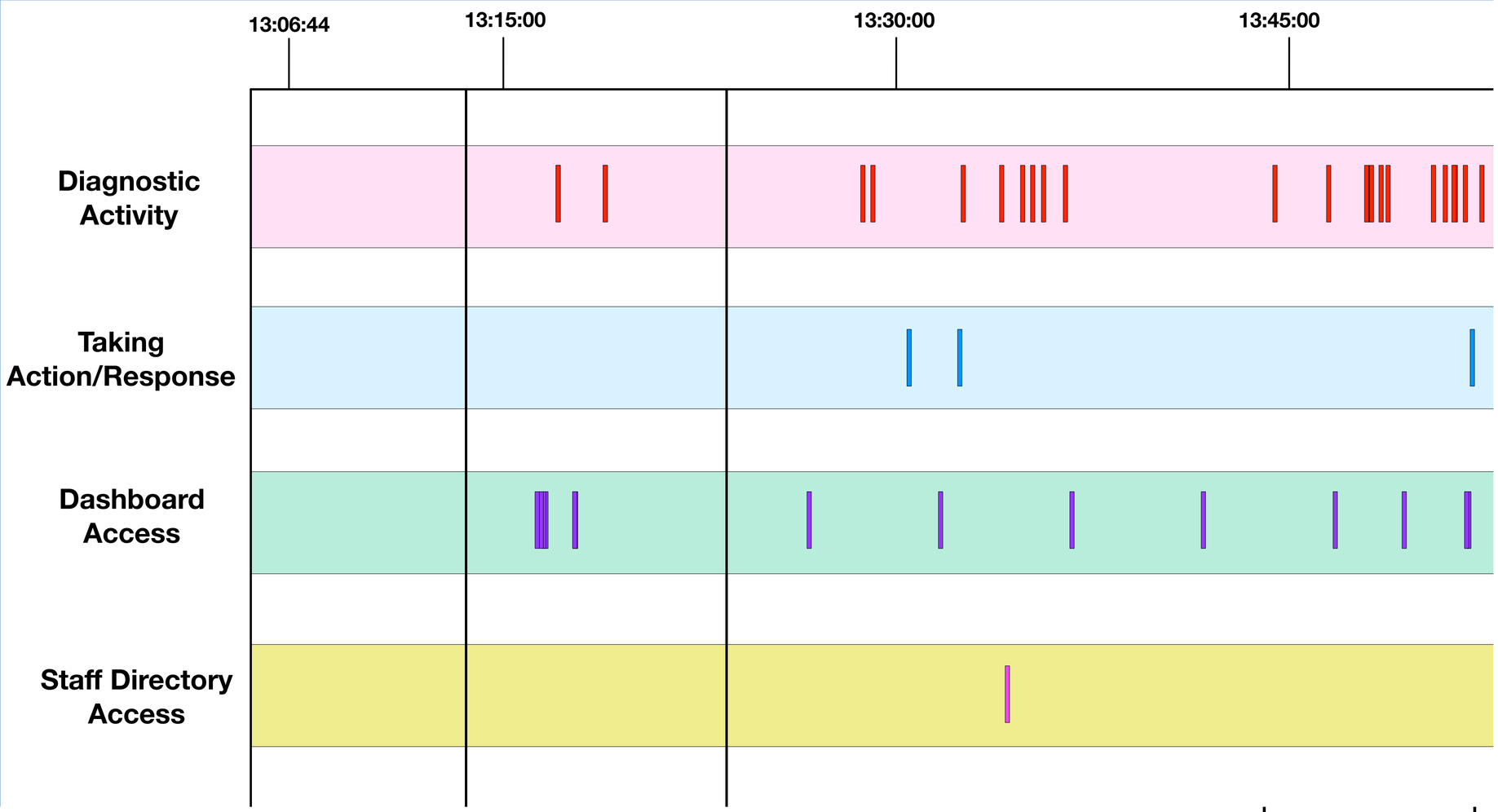
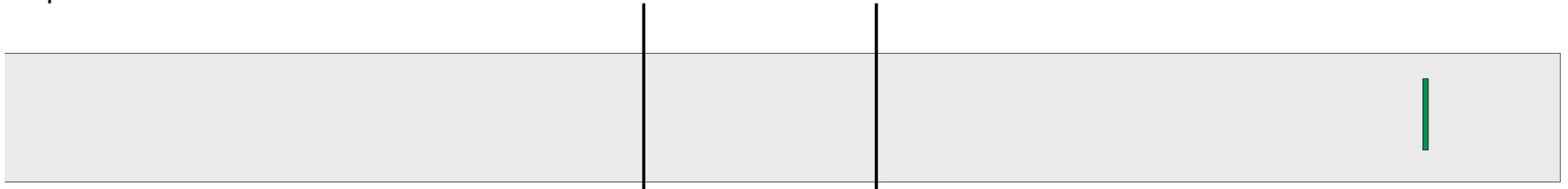


Figure 19 - Infrastructure Engineer 1 timeline





ProdEng1 re-enables the sidebar, with blog turned off

HOLD is removed on the push queue

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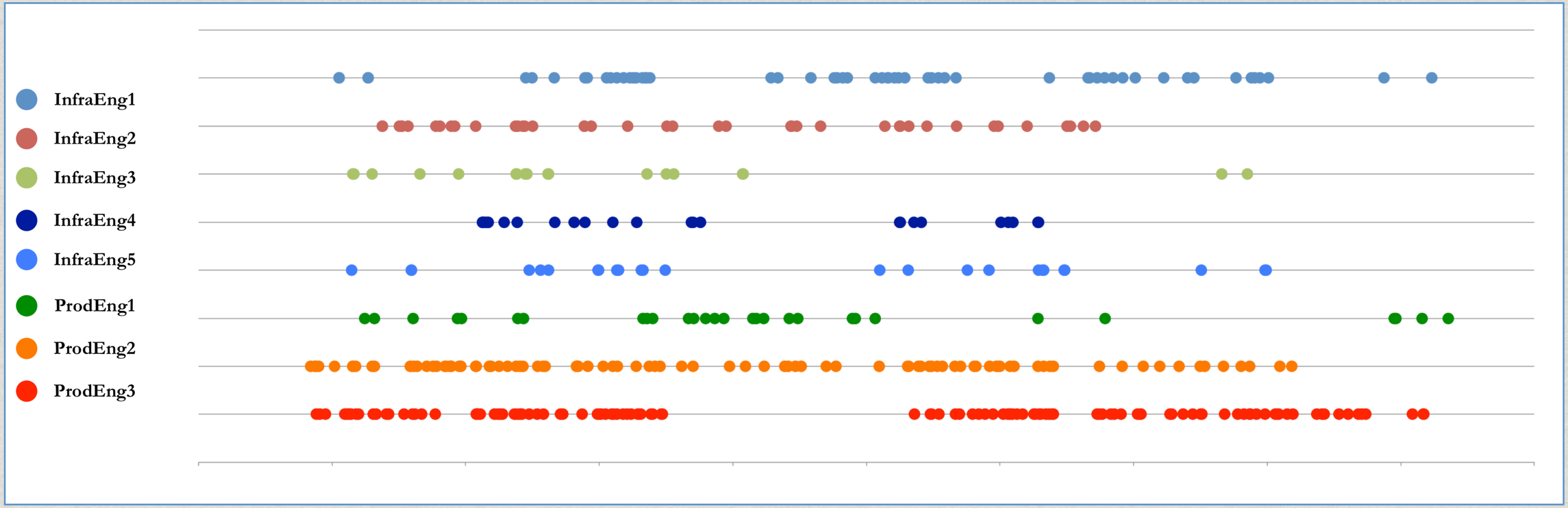
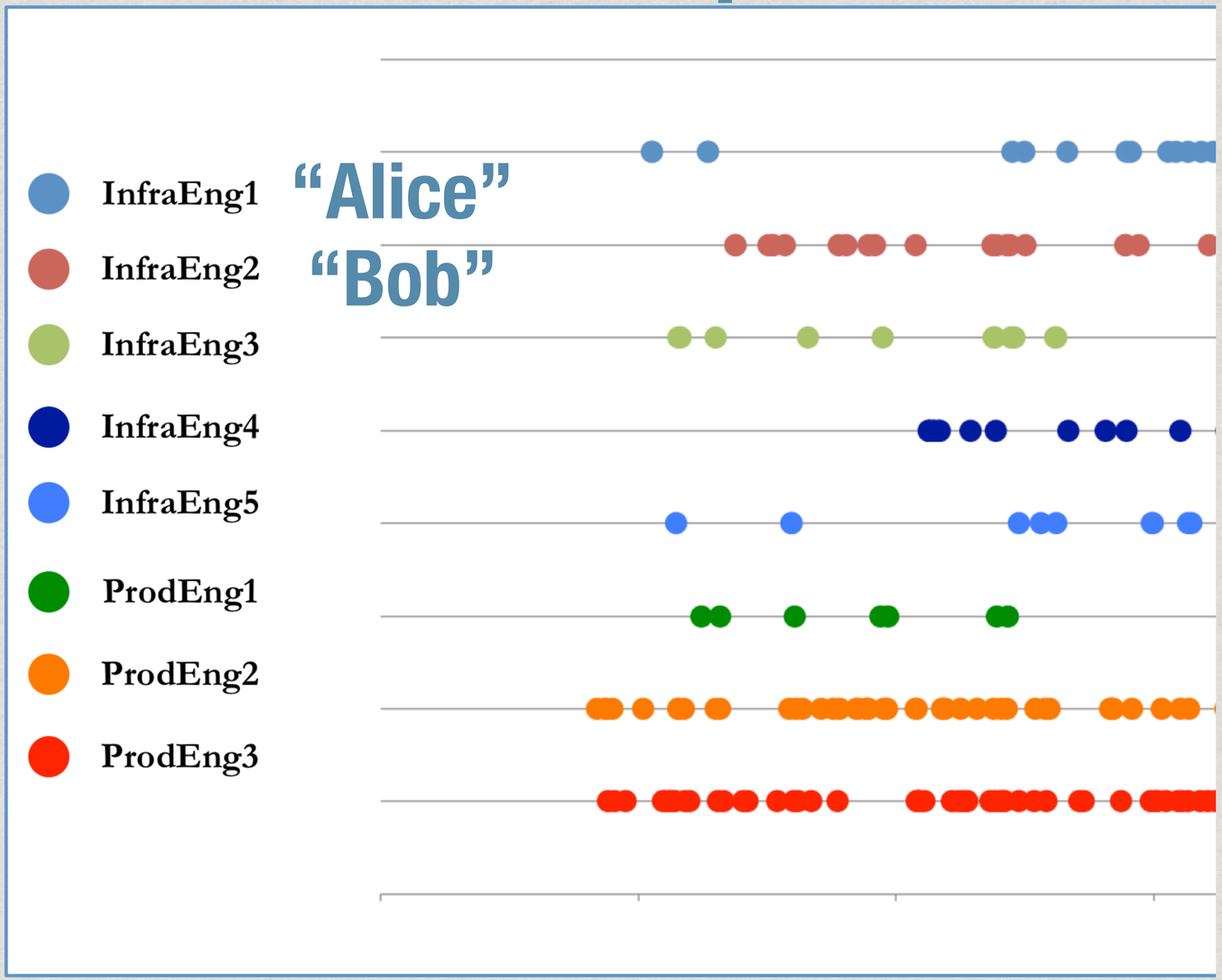
Software: A Team Sport



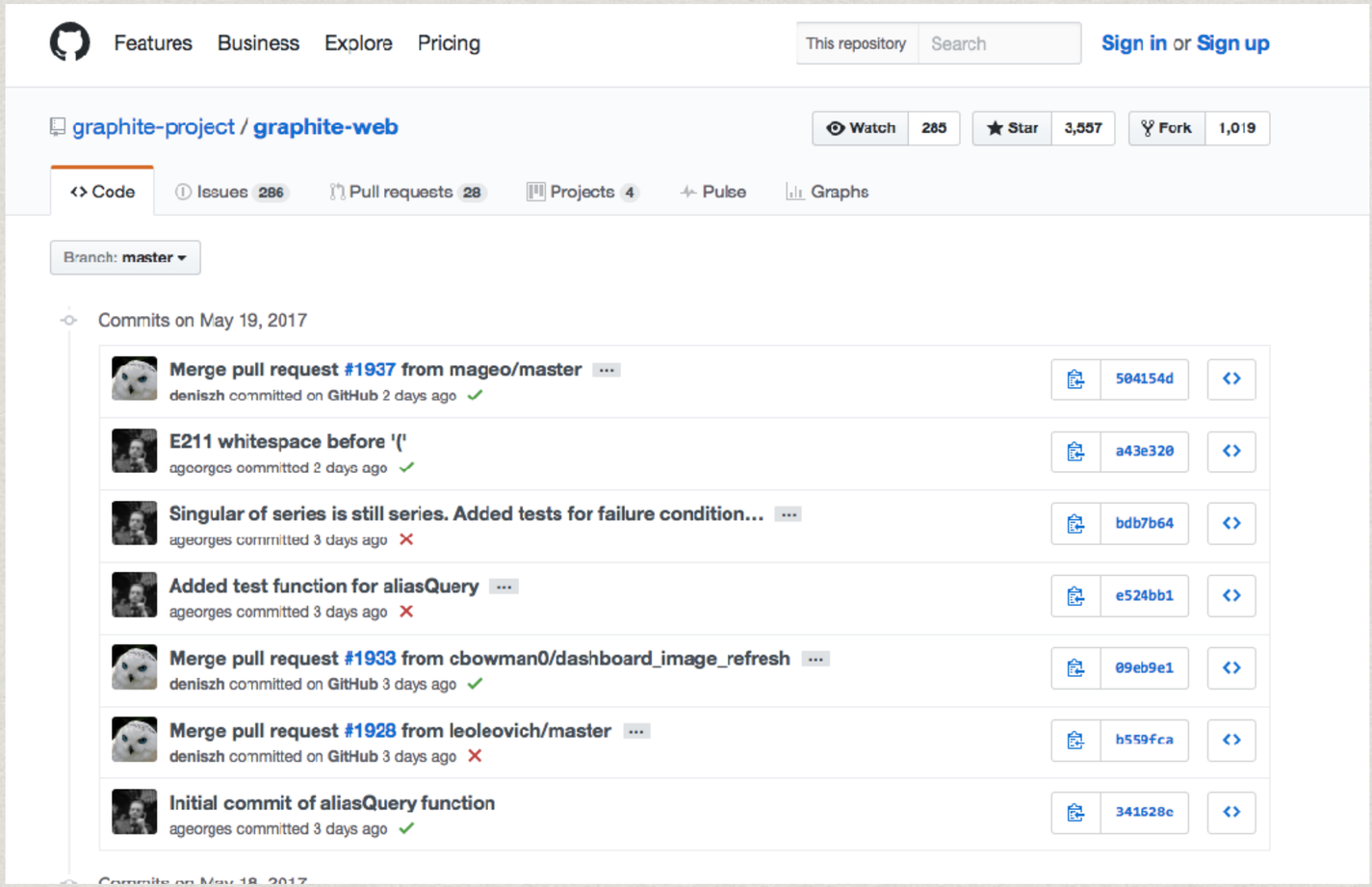
Combined IRC utterances

Software: A Team Sport



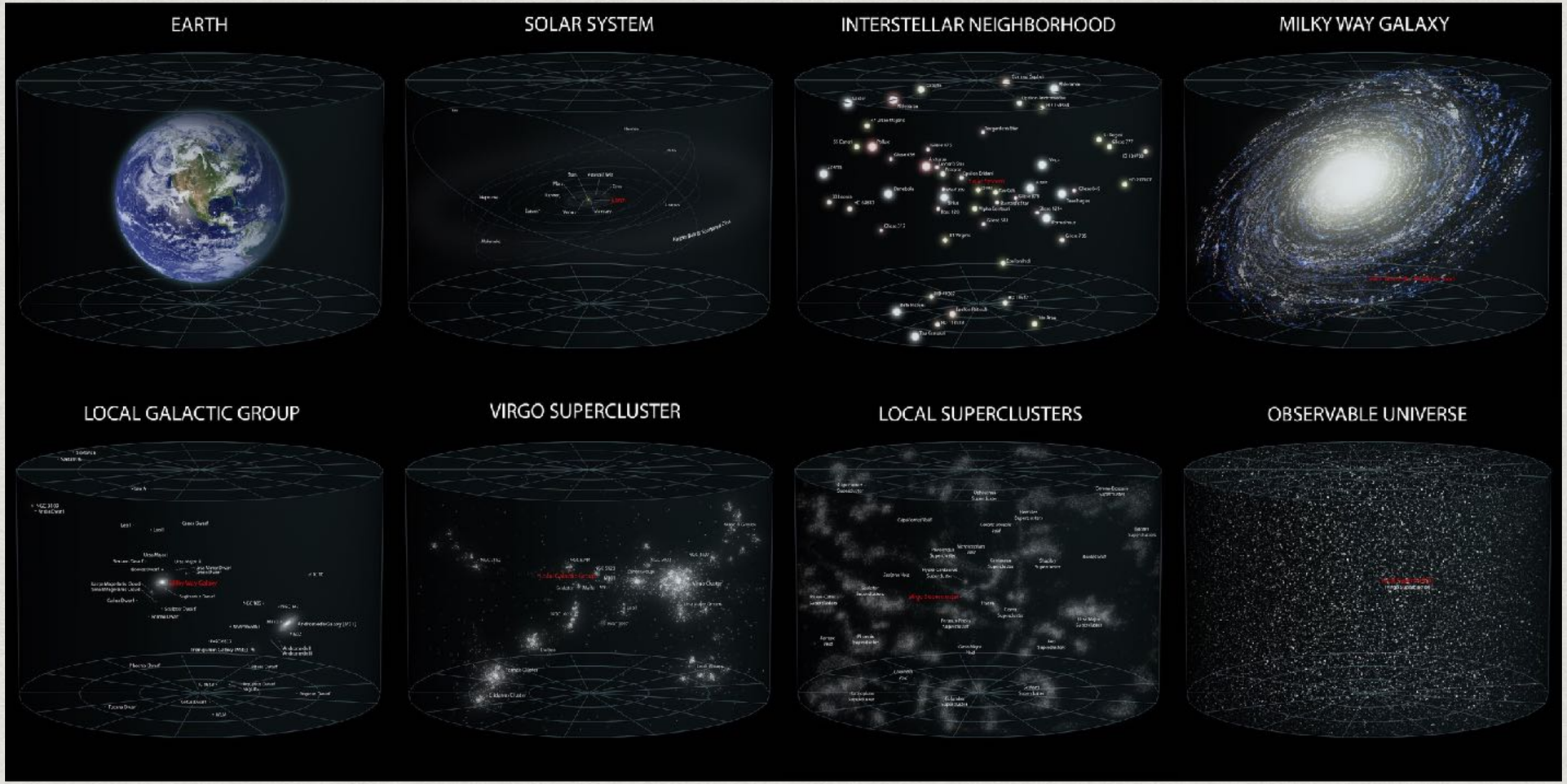
ALLSPAW IDENTIFIED THREE “MONITORS” (HEURISTICS) ENGINEERS USE TO WORK INCIDENTS

Heuristic #1: Change



"What has changed since the system was in a known-good state?"

Heuristic #2: “Go Wide”



Widen the search to any potential contributors imagined

Heuristic #3: Convergent Searching

Confirm/disqualify diagnoses by matching signals/symptoms

Heuristic #3: Convergent Searching

Confirm / Disqualify…

- A specific and past diagnosis
- A general and *recent* diagnosis

…that comes to mind by matching signals or symptoms that appear similar

Heuristic #3: Convergent Searching

Confirm / Disqualify…

- A ***really*** painful incident-memory
- An incident still in your “L1 cache”

…that comes to mind by matching signals or symptoms that appear similar

“THE INCIDENT”

The page load time increase was caused by:

- CDN cache misses…
- Due to an HTTP 400 status in an API…
- From a “closed store”…
- Referenced by a blog post in the sidebar

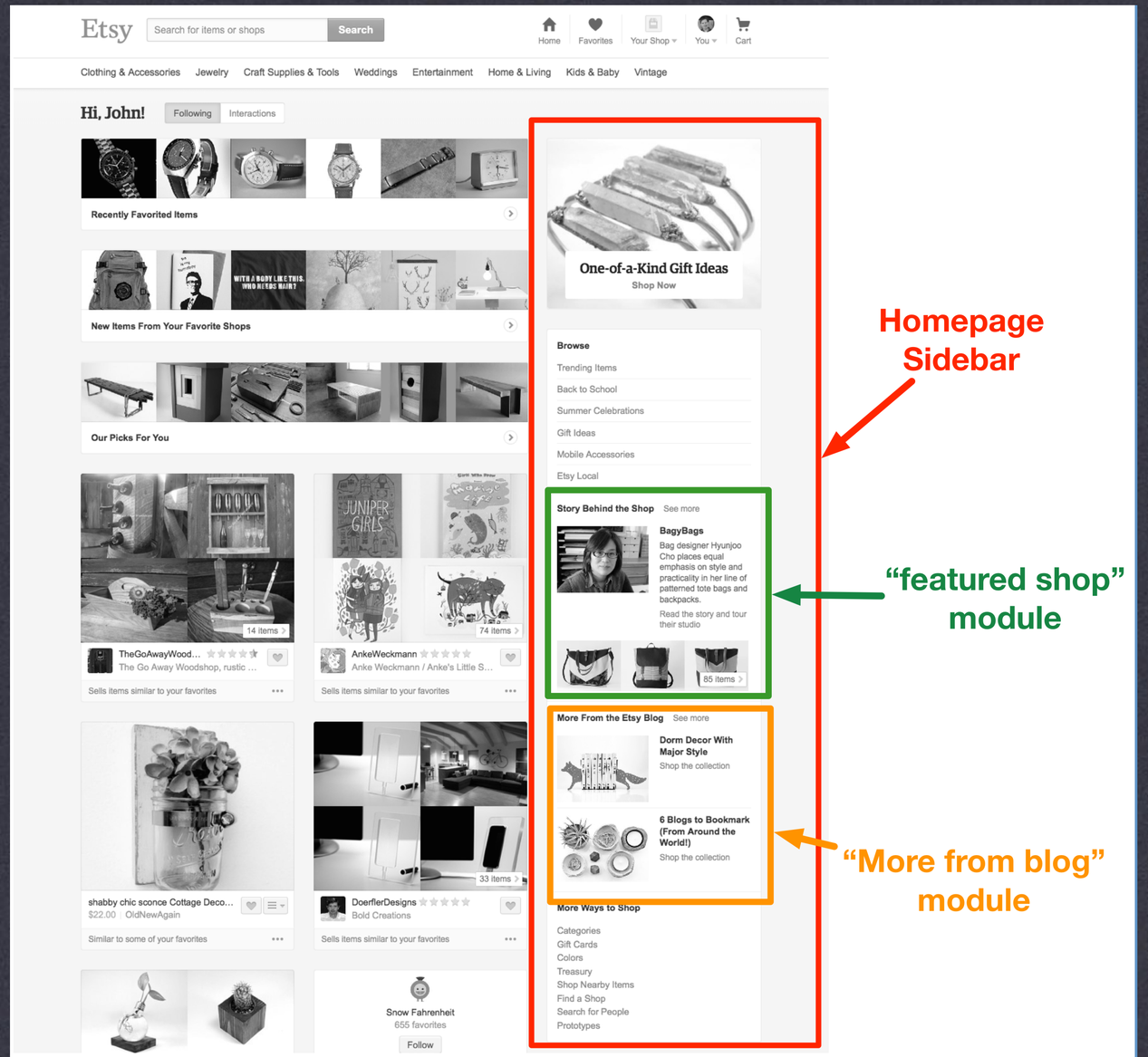
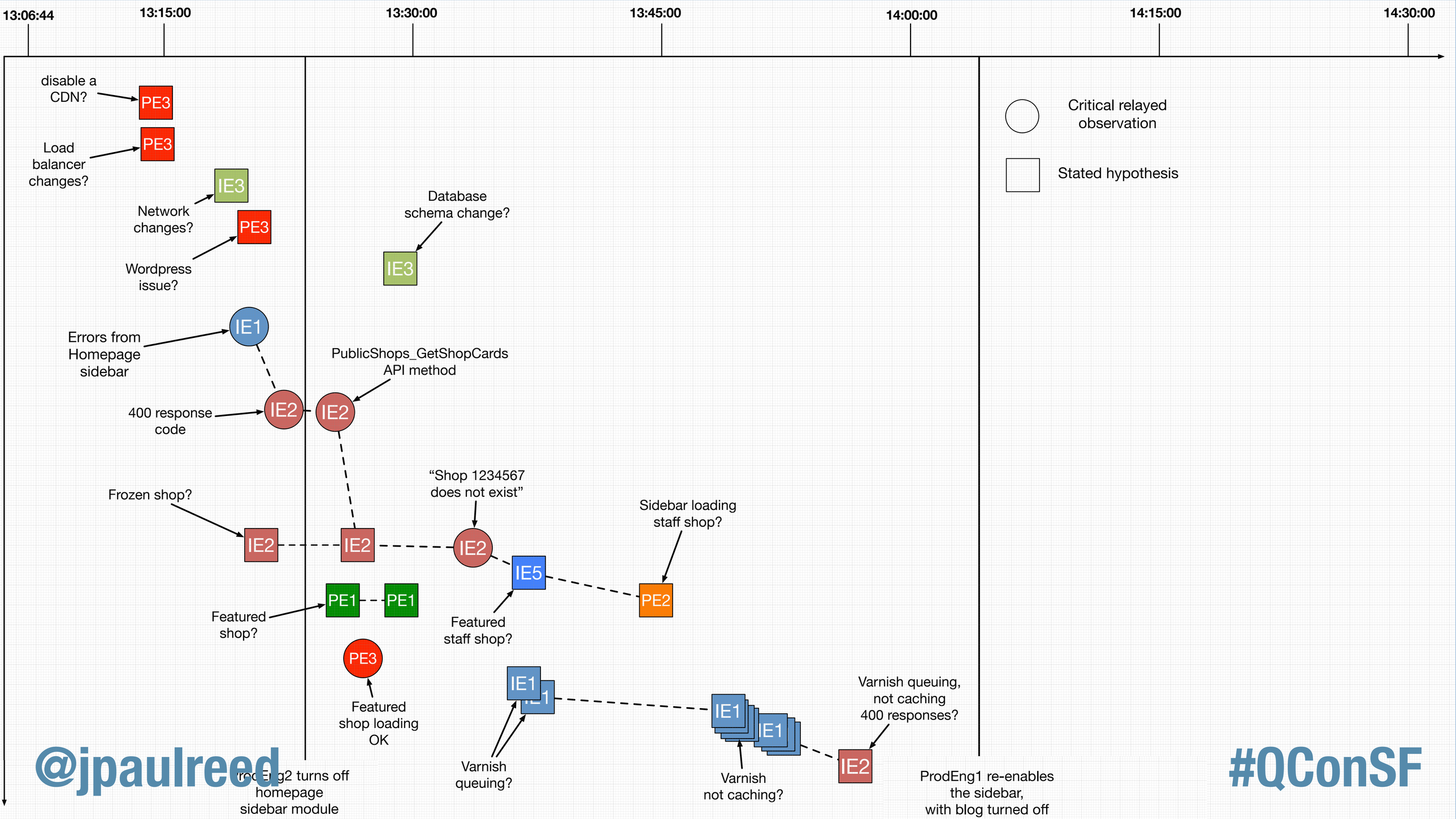
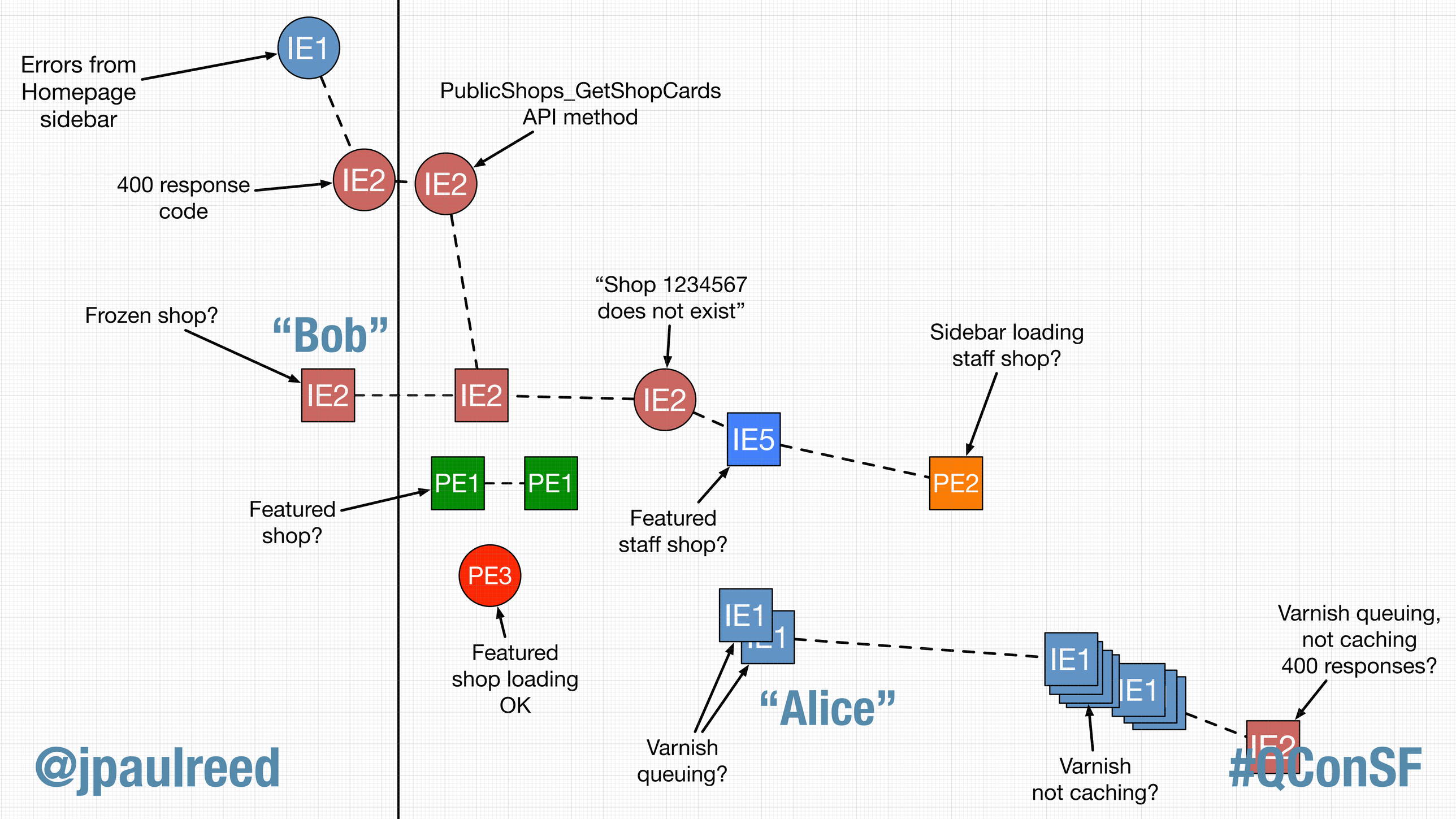


Figure 5 - Signed-in homepage with sidebar components


13:06:44
13:15:00
13:30:00
13:45:00
14:00:00
14:15:00
14:30:00
disable a CDN?
PE3
Load balancer changes?
PE3
IE3
Network changes?
PE3
Wordpress issue?
Database schema change?
IE3
Errors from Homepage sidebar
IE1
PublicShops_GetShopCards API method
400 response code
IE2
IE2
Frozen shop?
IE2
IE2
“Shop 1234567 does not exist”
IE2
Sidebar loading staff shop?
IE5
PE2
Featured shop?
PE1
PE1
Featured staff shop?
PE3
Featured shop loading OK
IE1
IE1
IE1
IE1
Varnish queuing?
Varnish not caching?
Varnish queuing, not caching 400 responses?
IE2
Critical relayed observation
Stated hypothesis
ProdEng2 turns off homepage sidebar module
ProdEng1 re-enables the sidebar, with blog turned off
@jpaulreed
#QConSF


IE1
Errors from Homepage sidebar
PublicShops_GetShopCards API method
400 response code
IE2
IE2
Frozen shop?
"Bob"
"Shop 1234567 does not exist"
Sidebar loading staff shop?
IE2
IE2
IE2
IE5
PE1
PE1
PE2
Featured shop?
Featured staff shop?
PE3
Featured shop loading OK
IE1
IE1
IE1
IE1
Varnish queuing, not caching 400 responses?
"Alice"
Varnish queuing?
Varnish not caching?
IE2
@jpaulreed
#QConSF

Bonus Heuristic: Testing the Fix

Bonus Heuristic: Testing the Fix

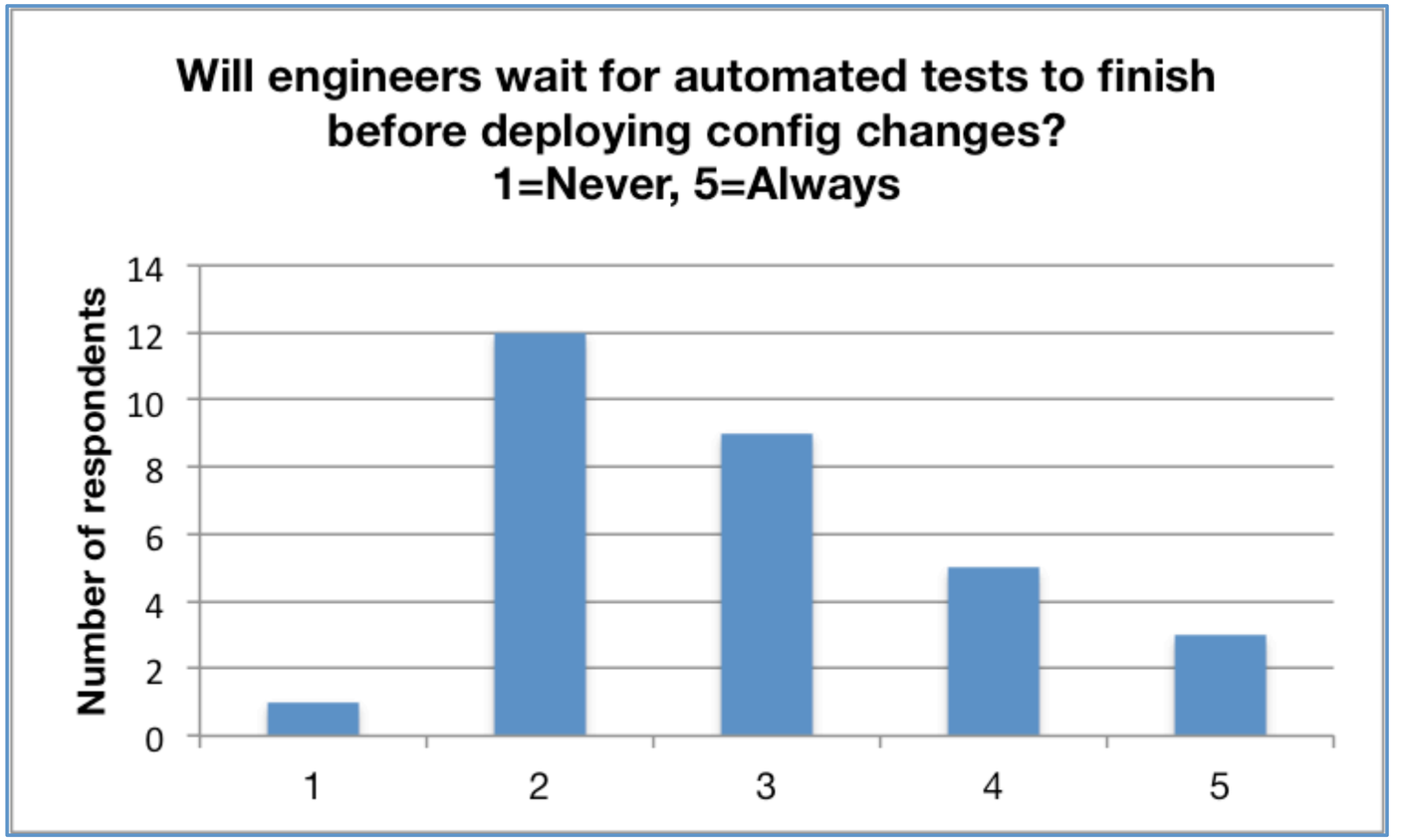


Figure 18 - Survey results: waiting for automated tests to finish

Bonus Heuristic: Testing the Fix

YOLO, Every Day, Twice on Sundays?

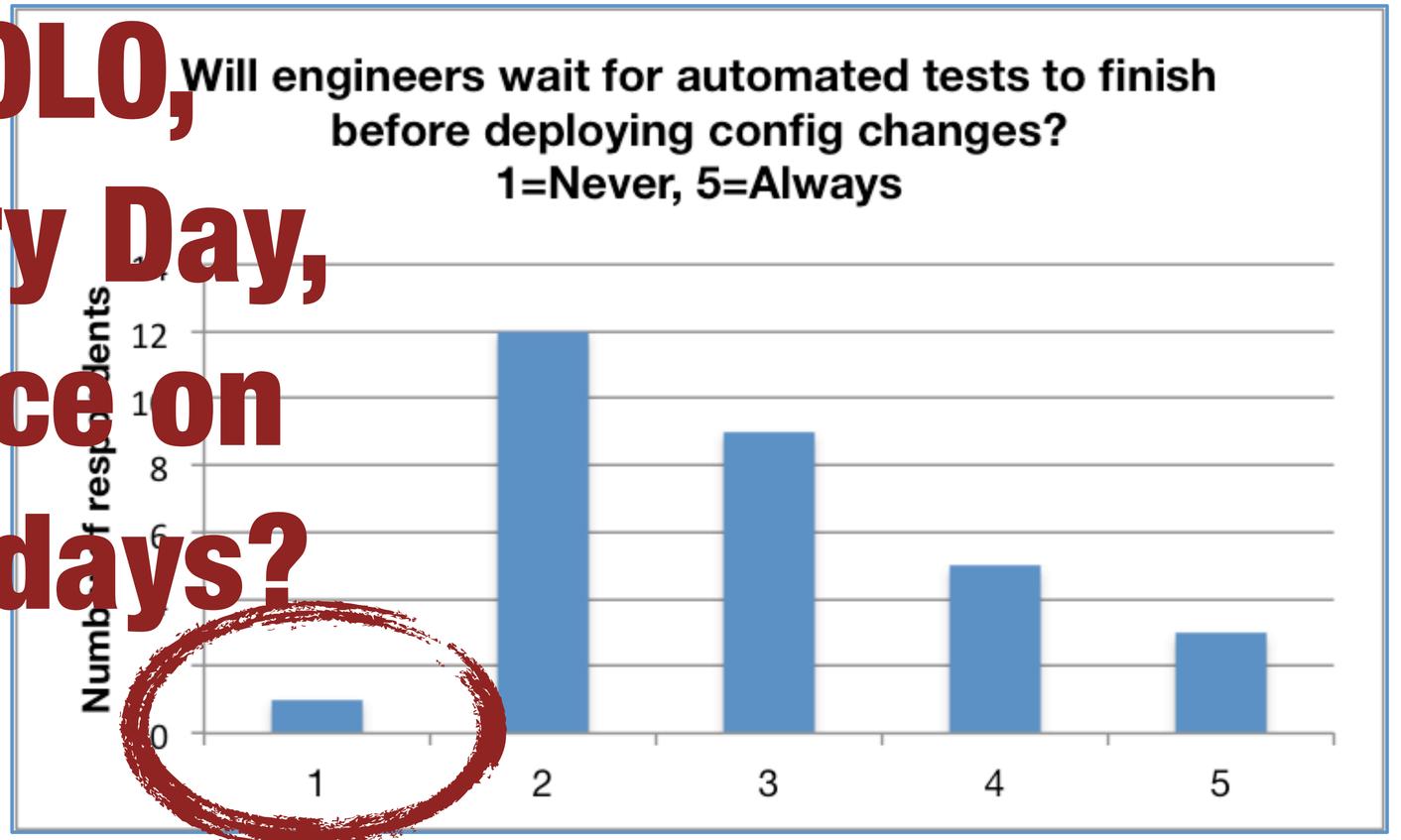


Figure 18 - Survey results: waiting for automated tests to finish

HOW DO YOU GET BETTER AT DETECTING AN INCIDENT IS OCCURRING?

MONITOR THINGS BETTER!

MONITOR THINGS BETTER!

(Still not a trick question.)

HOW DO YOU GET BETTER AT KNOWING WHAT TO DO WHEN AN INCIDENT IS OCCURRING?

Elements of “Expertise”

- Experts use their knowledge base to
  - Recognize **typicality**
  - Make **fine discriminations**
  - Use **mental simulation**
- Knowledge base also used to apply **higher level rules**

“Seeing the Invisible”

With experience, a person gains the ability to visualize how a situation developed and how to imagine how it’s going to turn out.

Experts can see what is not there.

Seeing the Invisible: Perceptual-Cognitive Aspects of Expertise
Klein & Hoffman

BUILDING EXPERTISE: THE 10,000 HOUR RULE

Outliers

The Story of Success

Malcom
Gladwell

#1 bestselling author of *The Tipping Point* and *Blink*

“Yeah, but Malcolm Gladwell…”

Psychological Review
1993, Vol. 100, No. 3, 363–406

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The Role of Deliberate Practice in the Acquisition of Expert Performance

K. Anders Ericsson, Ralf Th. Krampe, and Clemens Tesch-Römer

The theoretical framework presented in this article explains expert performance as the end result of individuals' prolonged efforts to improve performance while negotiating motivational and external constraints. In most domains of expertise, individuals begin in their childhood a regimen of effortful activities (deliberate practice) designed to optimize improvement. Individual differences, even among elite performers, are closely related to assessed amounts of deliberate practice. Many characteristics once believed to reflect innate talent are actually the result of intense practice extended for a minimum of 10 years. Analysis of expert performance provides unique evidence on the potential and limits of extreme environmental adaptation and learning.

“Yeah, but Malcolm Gladwell…”

Why expert performance is special and cannot be extrapolated from studies of performance in the general population: A response to criticisms ☆

K. Anders Ericsson

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Deliberate practice
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Innate talent
IQ

ABSTRACT

Many misunderstandings about the expert-performance approach can be attributed to its unique methodology and theoretical concepts. This approach was established with case studies of the acquisition of expert memory with detailed experimental analysis of the mediating mechanisms. In contrast the traditional individual difference approach starts with the assumption of underlying general latent factors of cognitive ability and personality that correlate with performance across levels of acquired skill. My review rejects the assumption that data on large samples of beginners can be extrapolated to samples of elite and expert performers. Once we can agree on the criteria for reproducible objective expert performance and acceptable methodologies for collecting valid data. I believe that scientists will recognize the need for expert-performance approach to the study of expert performance, especially at the very highest levels of achievement.

Expert Performance

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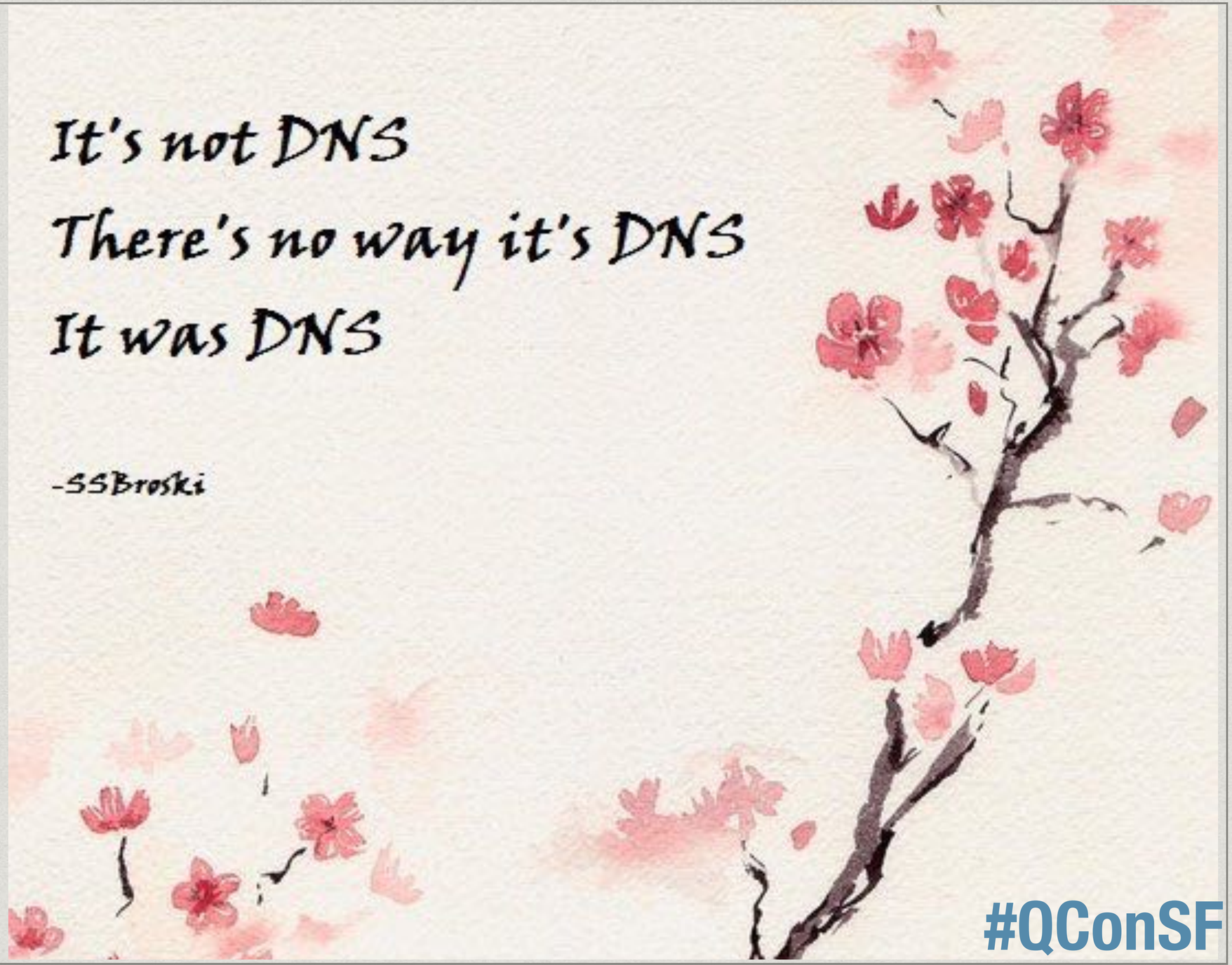
exoSphere 3D
2027:02.8
ALT
2660
AIR
SPEED
KNOTS
New York Departure
CAPT Sullenberger
F/O Skiles
@jpaulreed
#QConSF

Expertise in Other Crafts

- Immediately starting the Auxiliary Power Unit (APU)
- Taking control of the aircraft from his co-pilot
- *Not* attempting to land at La Guardia Airport

Expertise in Ops: A Haiku



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Transforming Experience into Expertise

- **Personal Experiences**: “the opportunity to be continually challenged”
- **Directed Experiences**: Receiving tutoring *so as to be able to tutor*
- **Manufactured Experiences**: training / simulation
- **Vicarious Experiences**: painful / memorable events we craft into stories we tell others

Transforming Experience into Expertise

- **Personal Experiences**: “On-call”
- **Directed Experiences**: Training / Code Review / Pair Programming / Wikis+Runbooks
- **Manufactured Experiences**: Chaos Engineering / Game Days
- **Vicarious Experiences**: “I remember this one incident… where it was DNS.”

BUILDING EXPERTISE: EXPLORING DISCRETIONARY SPACES

@jpaulreed

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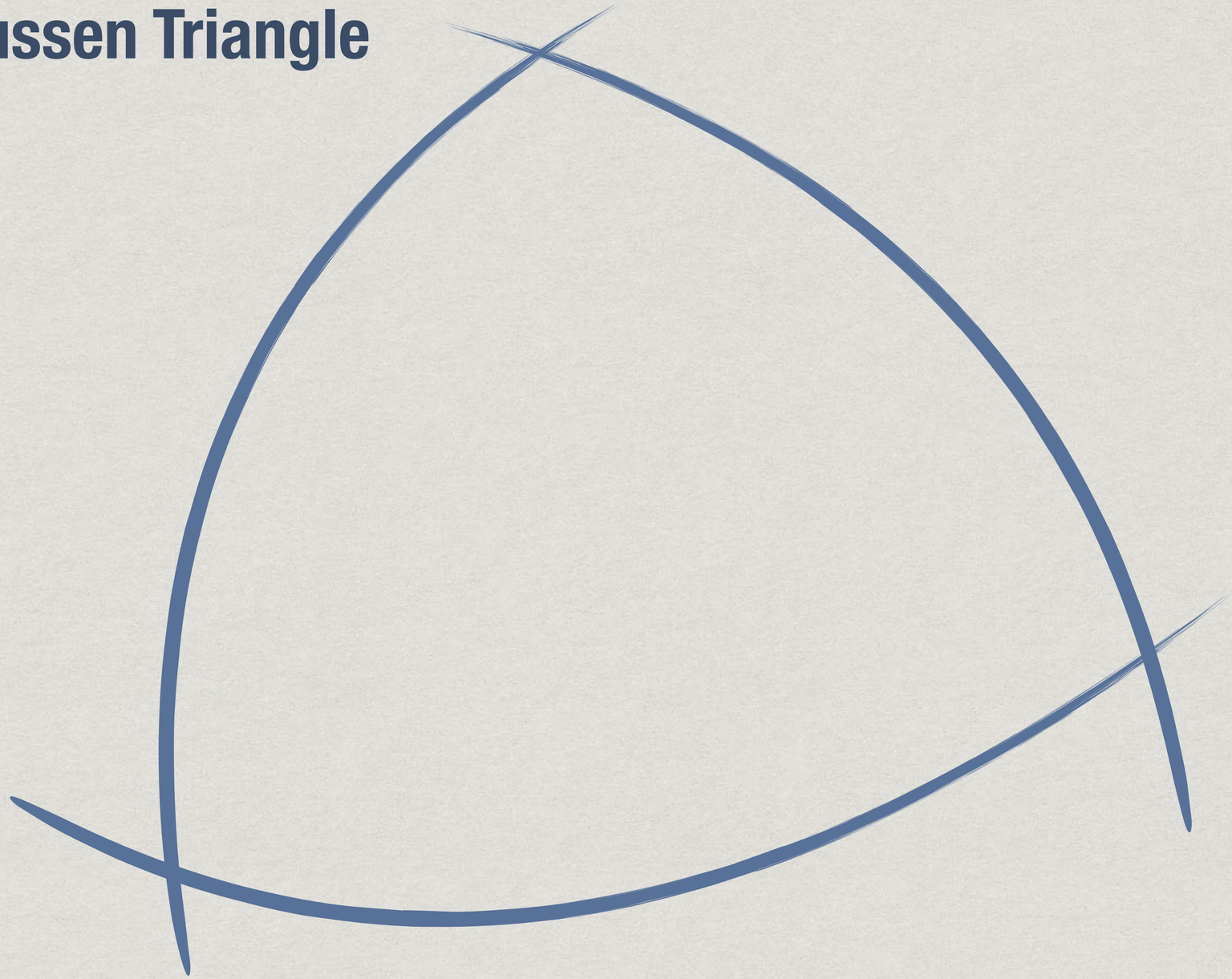
The Rasmussen Triangle



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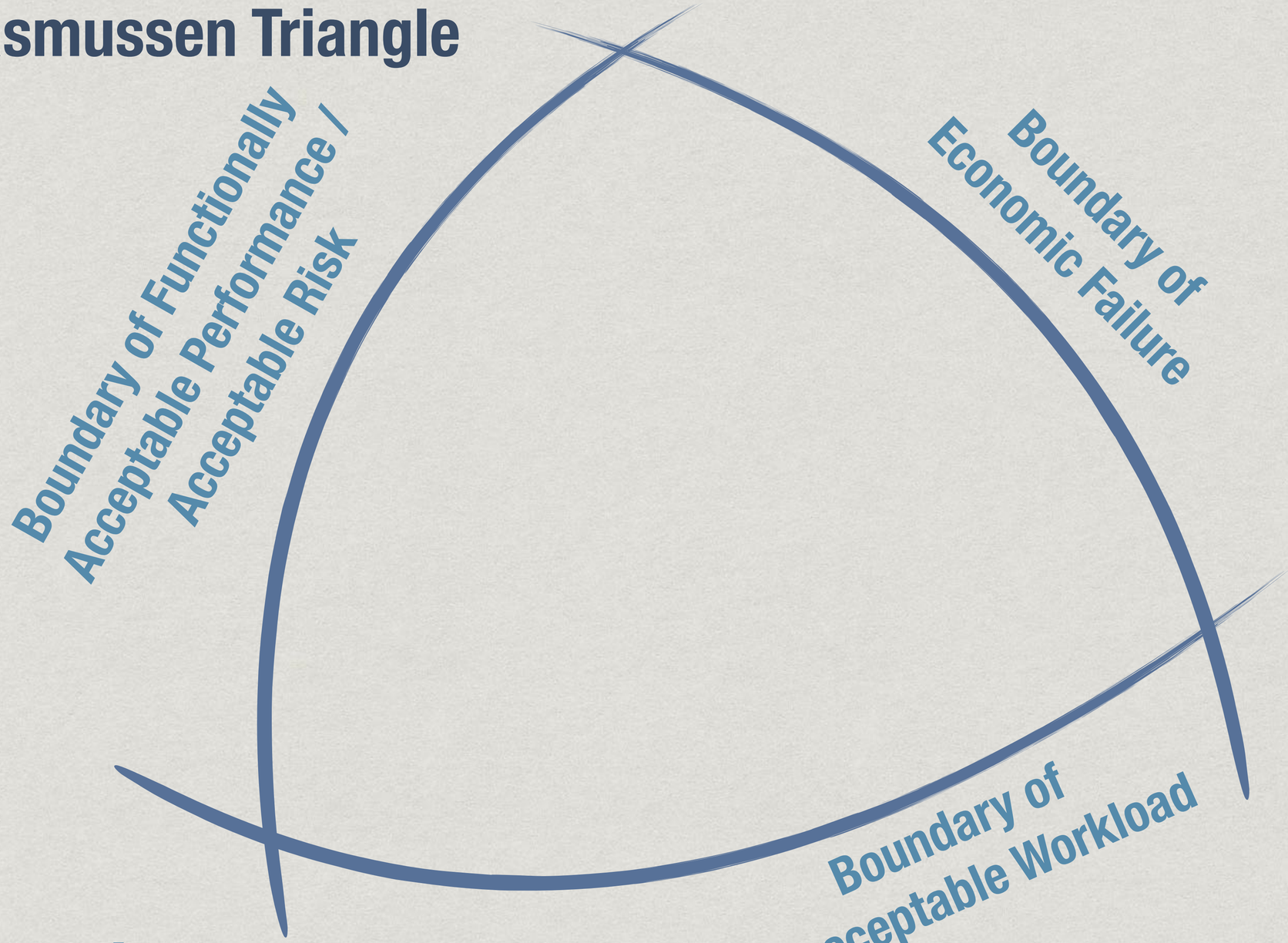

The Rasmussen Triangle

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"Cheaper, Better, Faster"

The Rasmussen Triangle

"Cheaper, Better, Faster"

Maximum Work for the Least Effort

The Rasmussen Triangle

"Cheaper, Better, Faster"

Maximum Work for the Least Effort

The Rasmussen Triangle

"Cheaper, Better, Faster"

Maximum Work for the Least Effort

The "Discretionary Space"

The Rasmussen Triangle

"Cheaper, Better, Faster"

The "Discretionary Space"

Maximum Work for the Least Effort

Maslow's SRE Hierarchy

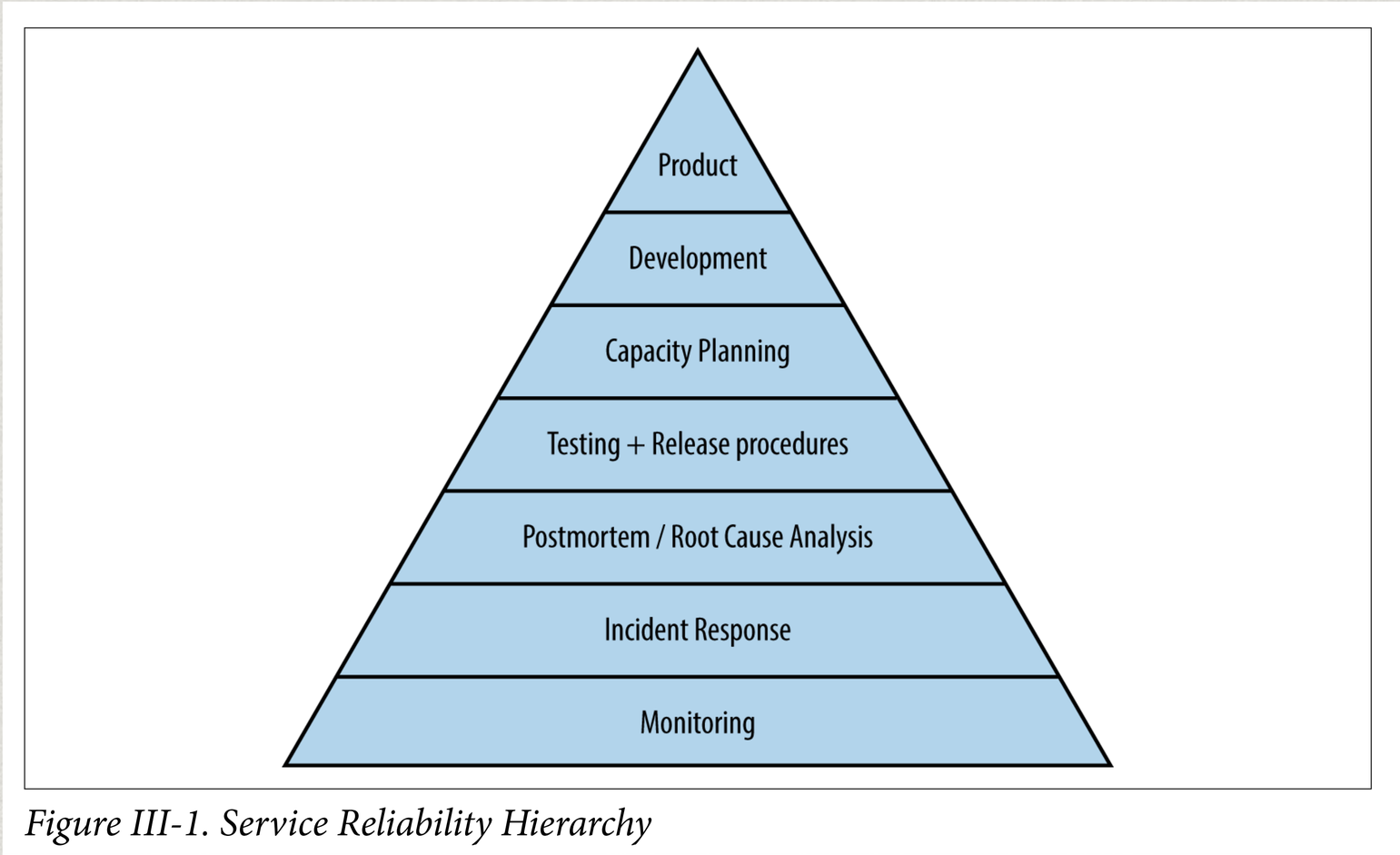


Figure III-1. Service Reliability Hierarchy

Maslow's SRE Hierarchy

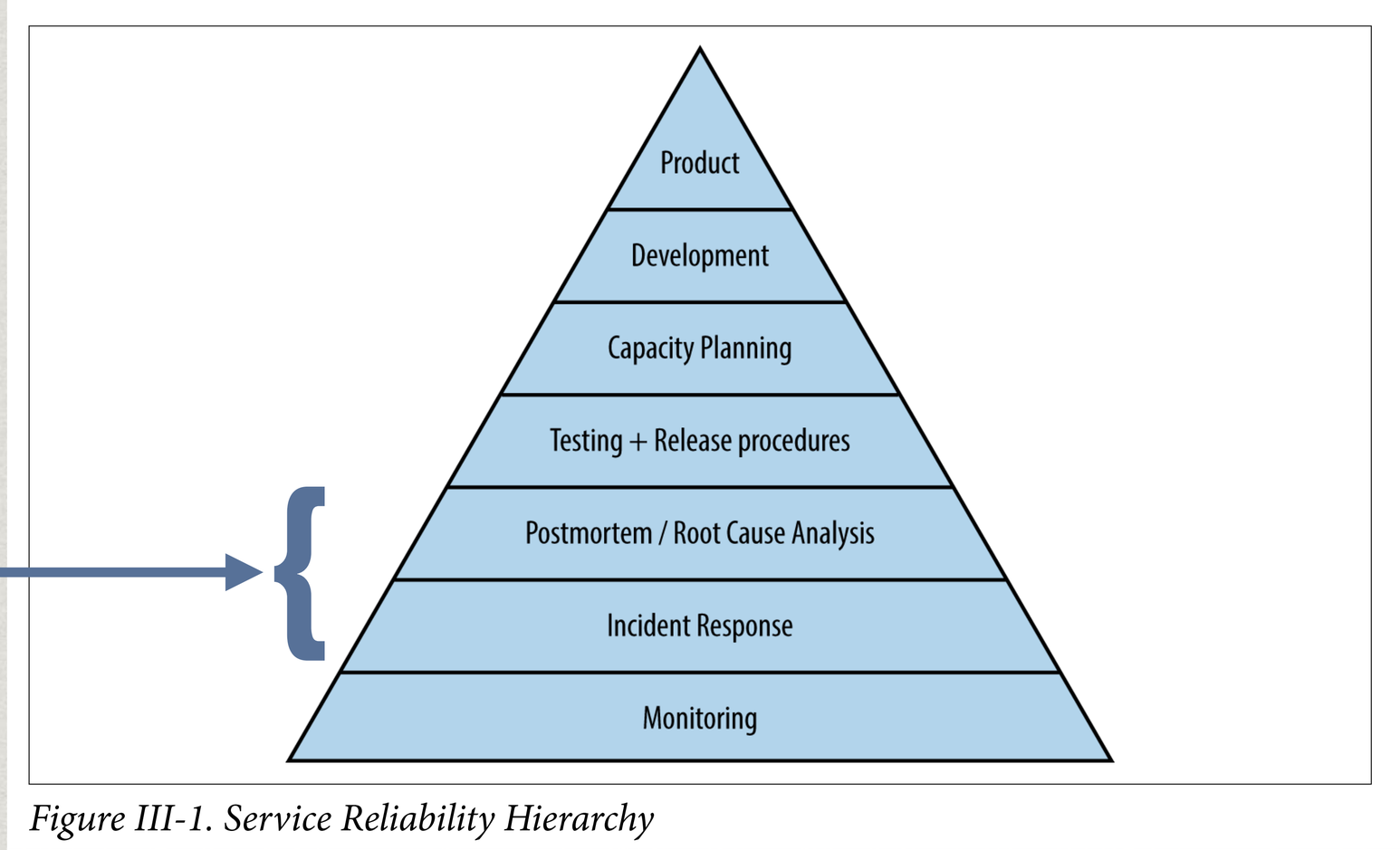
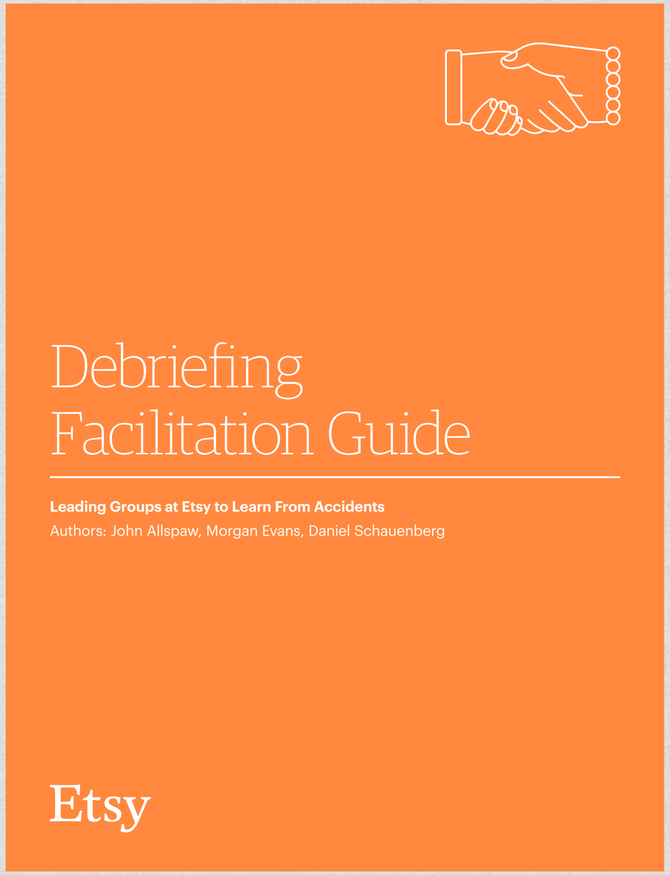


Figure III-1. Service Reliability Hierarchy

Just Two Questions

- Did at least one person learn one thing that ***will affect how they work*** in the future?
- Did at least half of the attendees say they would ***attend another debrief*** in the future?



IN OTHER WORDS: IT'S NOT ABOUT REMEDIATION ITEMS

HOW DO YOU GET BETTER AT KNOWING WHAT TO DO WHEN AN INCIDENT IS OCCURRING?

CREATE SPACE & EXPERIENCES TO FACILITATE
THE CULTIVATION OF
OURSELVES AND OUR TEAMS SO AS
TO IMPROVE OUR COLLECTIVE HEURISTICS AT
DETECTING WEAK SIGNALS AND AMBIGUITY
IN THE COMPLEX SOCIO-TECHNICAL SYSTEMS
WE OPERATE AND IN WHICH WE EXIST

PRACTICE MAKES… BETTER

EXPERTISE TAKES TIME.
AND SPACE.

CREATE THAT
TIME AND SPACE.

AMID THE CHAOS, IT'S JUST US OUT HERE

AMID THE CHAOS, IT'S JUST US OUT HERE

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BE GOOD TO EACH OTHER ON OUR JOURNEY TO EXPERTISE

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Maps, Context, and Tribal Knowledge: On the Structure of Post-Incident Analysis Artifacts and Their Role in Learning in Software Development and Operations Organizations

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