

How Many Is Too Much? Exploring Costs of Coordination During Outages



Dr. Laura M.D. Maguire

Cognitive Systems Engineering Lab

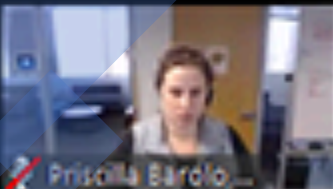
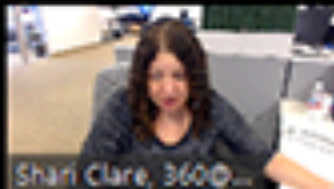
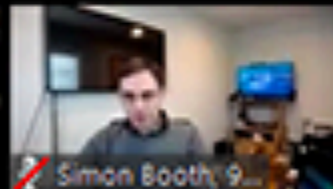




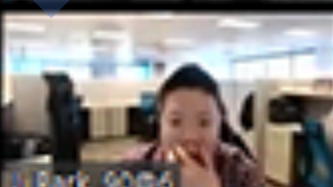
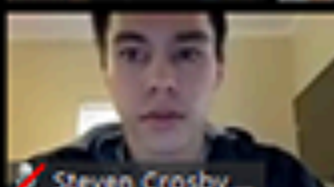
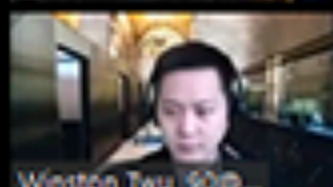
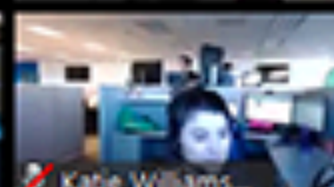
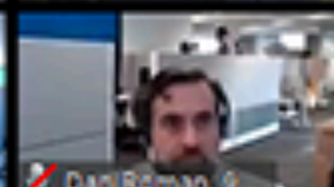

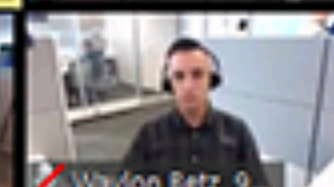
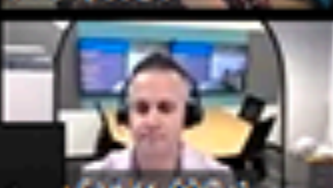
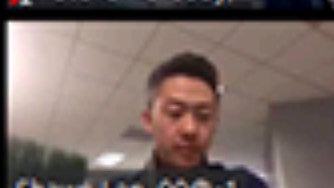
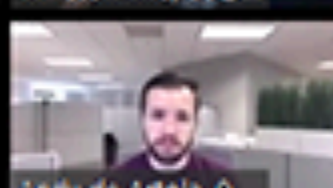
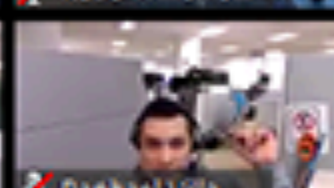
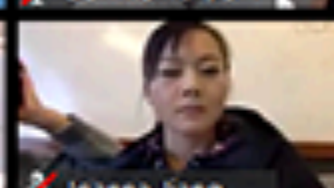

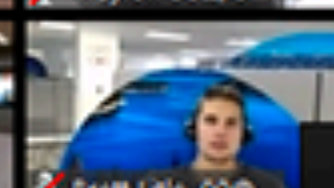
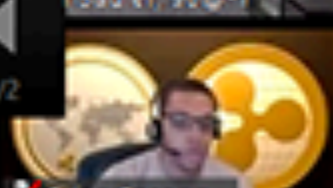
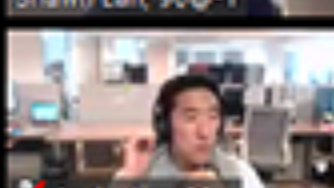
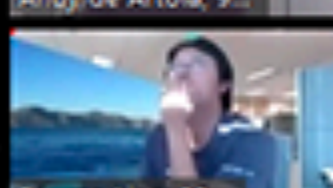
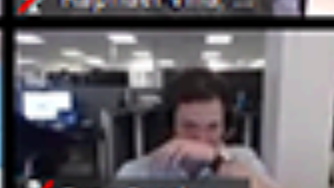
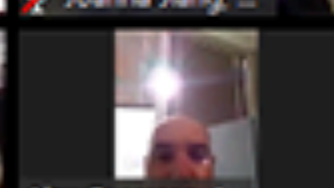

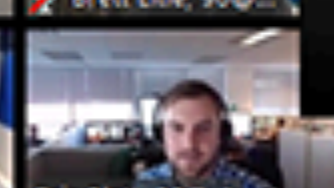
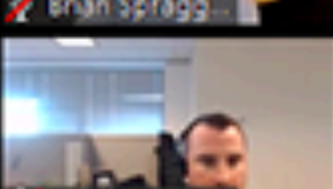
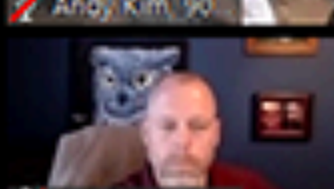
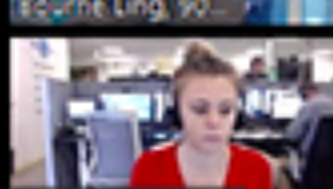
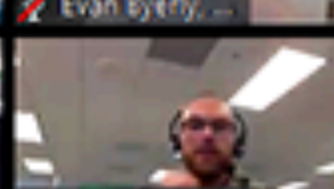
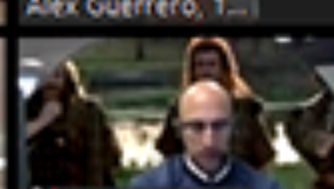
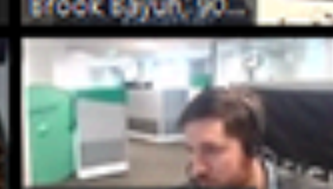
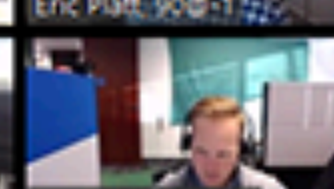
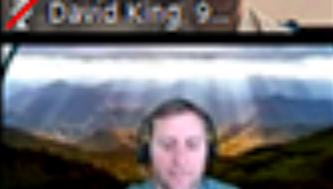
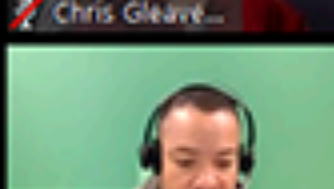
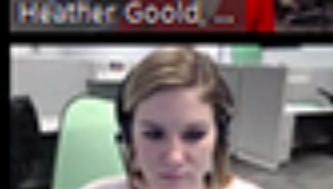
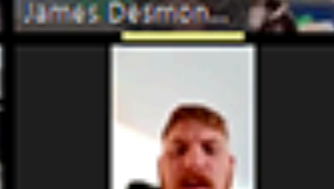

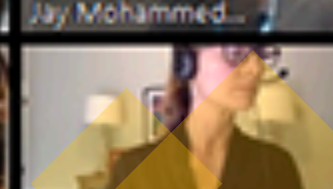
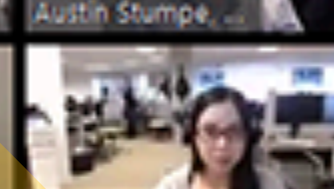
The Ohio State University

@LauraMDMaguire







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 J Park, 9006	 Steven Crosby, ...	 Winston Twu, 900...	 Katie Williams, ...	 Dan Roman, 9...	 Art Gilbreath, 9...	 Waylon Betz, 9...
 Sadler, 900-1	 Shawn Lan, 900-1	 Andy de Artola, 9...	 Raphael Villa, ...	 Joanna Jiang, ...	 Bernie Senzig, ...	 Brett Lile, 900...
 Brian Spragg, ...	 Andy Kim, 90...	 Bourne Ling, 90...	 Evan Byerly, ...	 Alex Guerrero, 1...	 Brook Bayuh, 90...	 Eric Platt, 900-1
 David King, 9...	 Chris Gleave, ...	 Heather Goold, ...	 James Desmon, ...	 George Guti, ...	 Jay Mohammed, ...	 Austin Stumpe, ...
 Jeffrey Faulkner, ...	 James Woolridge, ...	 Janelle Spar, ...	 Dustin DeMayo, ...	 John Mensik, 0...	 Katherine Sm, ...	 Katrina Tsai, 000



Turn on Original Sound

00:00:49

Speaker View

Priscilla Barolo

Shari Clare, 900...

Simon Booth, 9...

Jules Park, 9007

Alex Kim, 9005

Dan Ly, 9008

Nasim Moham...

Mark, 9006

Steven Crosby...

Winston Twu, 900...

Kate Williams...

Dan Roman, 9...

Art Gilbreath, 9...

Waylon Betz, 9...

Edgar, 9003

Shawn Lan, 900-1

Andy de Artola, 9...

Raphael Villa...

Joanna Jiang, ...

Bernie Sertig

Brett Lile, 900...

Brian Spragg

Andy Kim, 90...

Bourne Ling, 90...

Evan Byerly, ...

Alex Guerrero, 1...

Brook Bayuh, 90...

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Chris Gleave...

Heather Gould, ...

James Desmond...

George Gufi...

Jay Mohammed...

Austin Stumpe...

Jeffrey Faulkner

James Woolido...

Janelle Spac...

Dustin DeMayo...

John Marisk, 0...

Katherine Sm...

Katrina Tsai, 000

1/2

1/2

Learning From ...

Laura Maguire

Jump to...

All unread

Threads

Apps

Channels

admins

announcements

applied-resilience

cases

chaos-engineering

conferences

education

human-factors

incident-response

intros

invites

language

lfi-admin-retro

new-channels

operation_reog

#chaos-engineering

☆ | 👤 68 | ✨ 0 | ➕ Add a topic

Monday, February 10th

eric 3:15 PM

learning is not at all automated.

It occurs to me that this right here is why I think learning from incidents has been so hard to pitch to a software business. We think we can automate everything. Even teaching machines how to learn. That learning stuff is taking too long. Can't you automate that so you can get back to work?

nora 3:19 PM

Perhaps Unfortunately, part of the task as the chaos facilitator is to present the "design" phase as fun and challenging

Which involves some creativity on the facilitators part - otherwise, yes you will have trouble getting people to participate

matt 3:46 PM

learning can be a difficult thing to get support for. i was in a \$prior_gig where the CTO refused to cover an embarrassingly inexpensive local conference (so zero anything else, just the < \$50 pass, for maybe 10-20 people), that the company had previously covered until this person became CTO. he vociferously proclaimed "people are in charge of doing their own learning on their own time, not on the company dollar"

i imagine this attitude is more common than not

Fred Hebert 3:47 PM

when our local user group for developers started a few years ago, some local business owners were apparently afraid of letting their employees go (in their own time) for fear they'd get poached

7 replies

Last reply 13 days ago

nora 4:06 PM

Yep, this is why the LFI field needs some active focus on change management to take hold in orgs

It's difficult for us to unsee things, but ultimately others in our orgs aren't there yet - how do we get them there?

@LauraMDMaguire

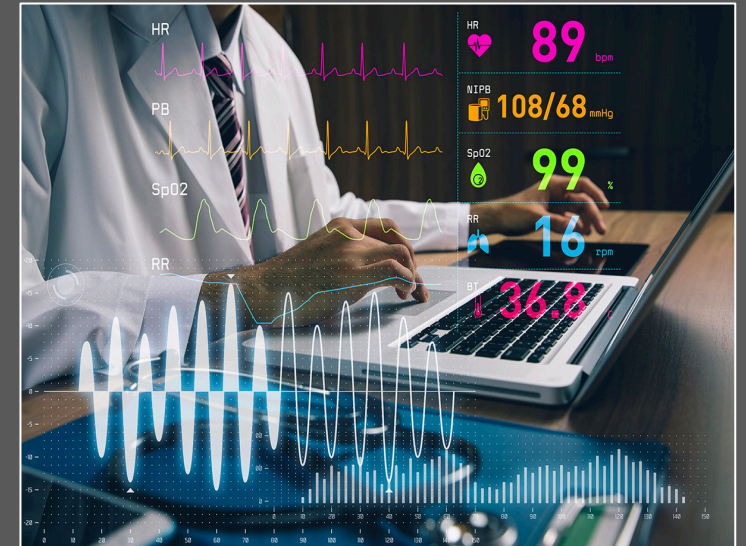


NASA



(c) AleksandarNakic

Software is increasingly managing critical societal functions



Overview

~~Changing nature of 'control rooms' & implications~~

Cognitive & Coordinative work

Coordination

4 interesting findings

Implications for your work

*Hint: You are probably going to want to rethink the need for an Incident Commander.
@LauraMDMaguire

Cognitive work



Perceiving



Reasoning



Attending



**Forming
an Action**

Cognitive work

Anticipating

Observing

Inferring

Reasoning

Recognizing change

Prioritizing

Planning

Troubleshooting

Diagnosing

Correcting

Modifying

Reacting



Perceiving



Reasoning



Attending



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Reacting



Perceiving



Reasoning



Attending



Forming
an Action

Coordinative work

Recruiting

Synchronizing

Grounding

Signaling

Updating

Taking Initiative

Delegating

Taking Direction

Reciprocity

Relaxing goals or
constraints

Cognitive costs of coordination – additional mental effort, load and delay required to participate in joint activity.



Wait... but then why coordinate?

- 24/7 ops
- Geographically distributed
- Dependencies
- Specialized functions
- Characterized by continuous change
- Complex, interactive systems
- Operating at speed & scale

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“Woods' Theorem: As the complexity of a system increases, the accuracy of any single agent's own model of that system decreases rapidly.”

*-Stella report
(stella.io)*

Which people are important...

Which people are important...

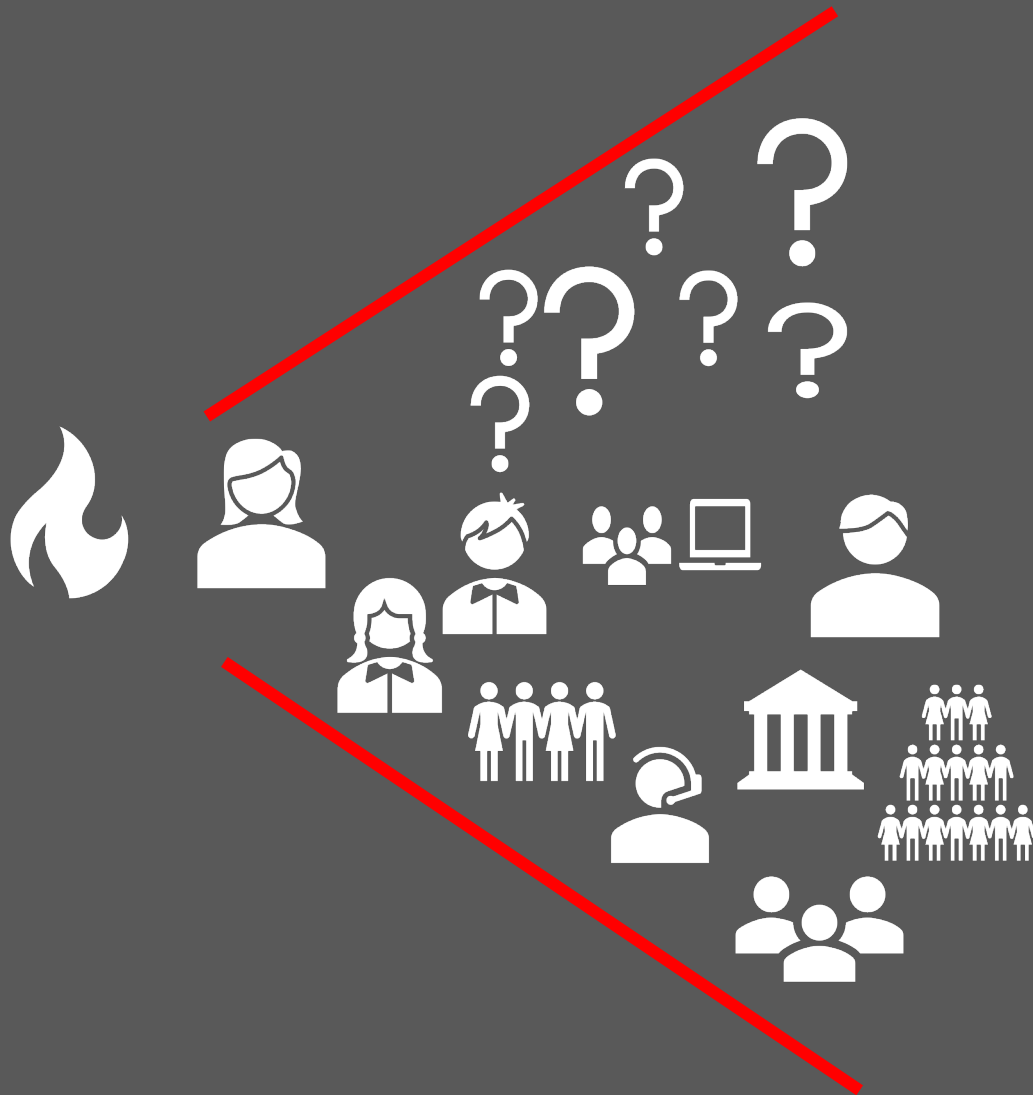
...in what collaborative interplay...

Which people are important...

...in what collaborative interplay...

...in what sequence?

The progression of an incident



Cognitive demands



Coordinative demands



The coordination paradox

- In complex adaptive systems, everyone's model is going to be partial and incomplete (Woods, 2017).

The coordination paradox

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- Therefore we need multiple, diverse perspectives to handle non-routine or exceptional events (Grayson, 2018, Watts-Perotti & Woods, 2001).

The coordination paradox

- In complex adaptive systems, everyone's model is going to be partial and incomplete (Woods 2017).
- Therefore we need multiple, diverse perspectives to handle non-routine or exceptional events (Grayson, 2018, Watts-Perotti & Woods, 2001).
- But there is additional cognitive load working with others (Klein et al, 2005; Maguire, 2019).

The coordination paradox

**How to reap the benefits of joint activity
without the costs of coordination becoming too
high?**

**What strategies do software engineers use to
control the costs of coordination?**

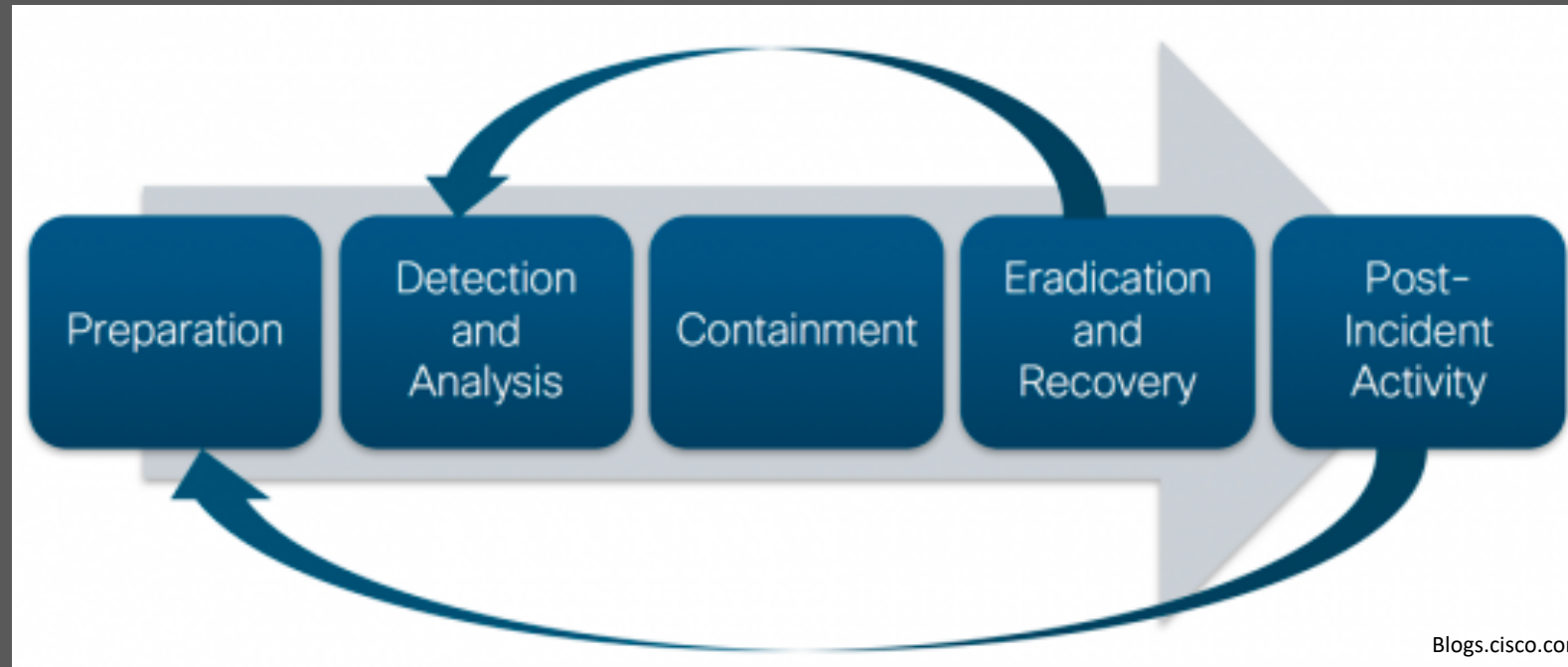
What did I find?

- 1) Incident response
- 2) Incident command
- 3) Adaptation was key
- 4) Tooling can increase CoC

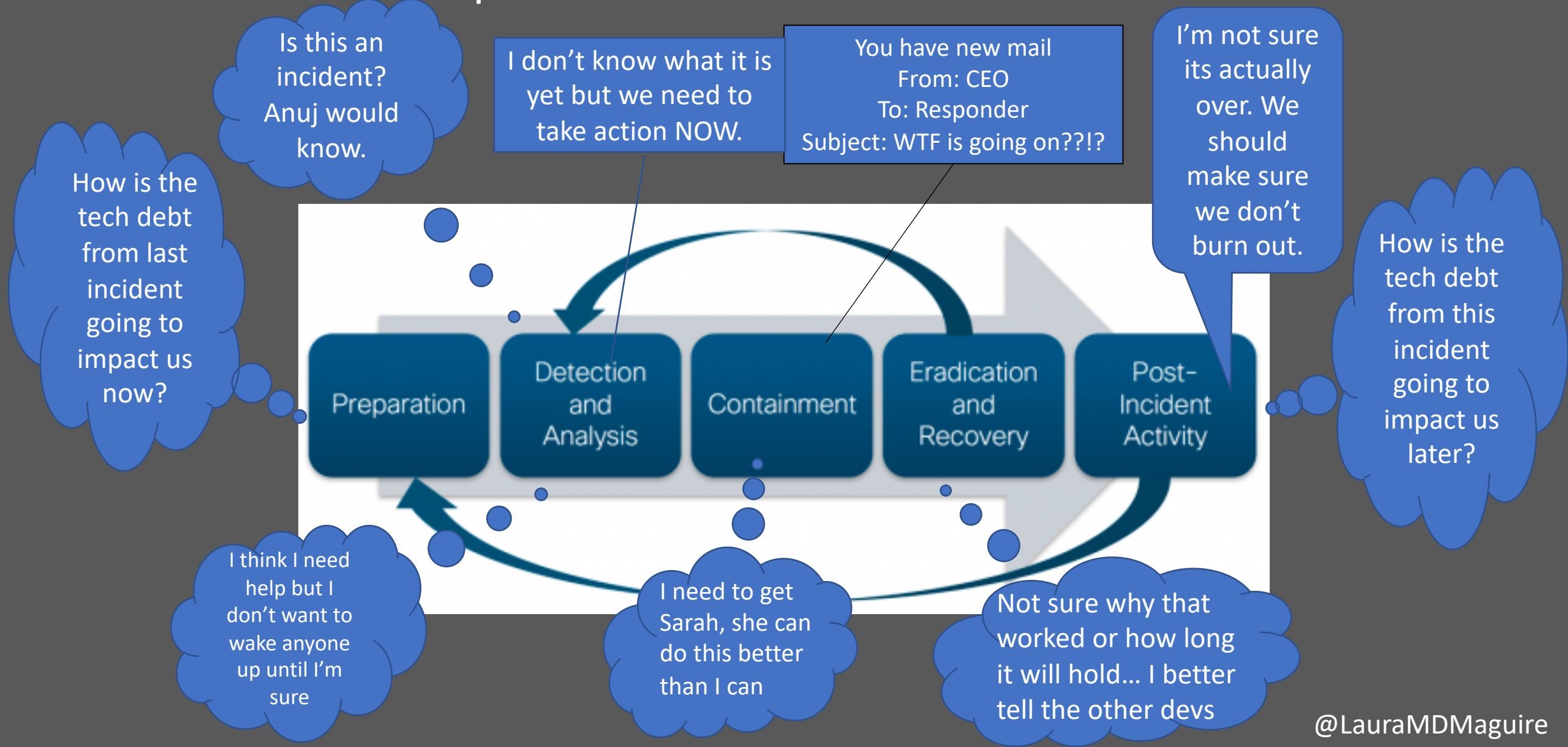
SNAFU Catchers Consortium Cycle 2



Incident Response – a model



Incident Response – the hidden stuff



Incident Response – the hidden stuff

Is this an incident?
Anuj would know.

I don't know what it is yet but we need to take action NOW.

You have new mail
From: CEO
To: Responder
Subject: WTF is going on??!?

I'm not sure its actually over. We should make sure we don't burn out.

How is the tech debt from this incident going to impact us now?

How is the tech debt from this incident going to impact us later?

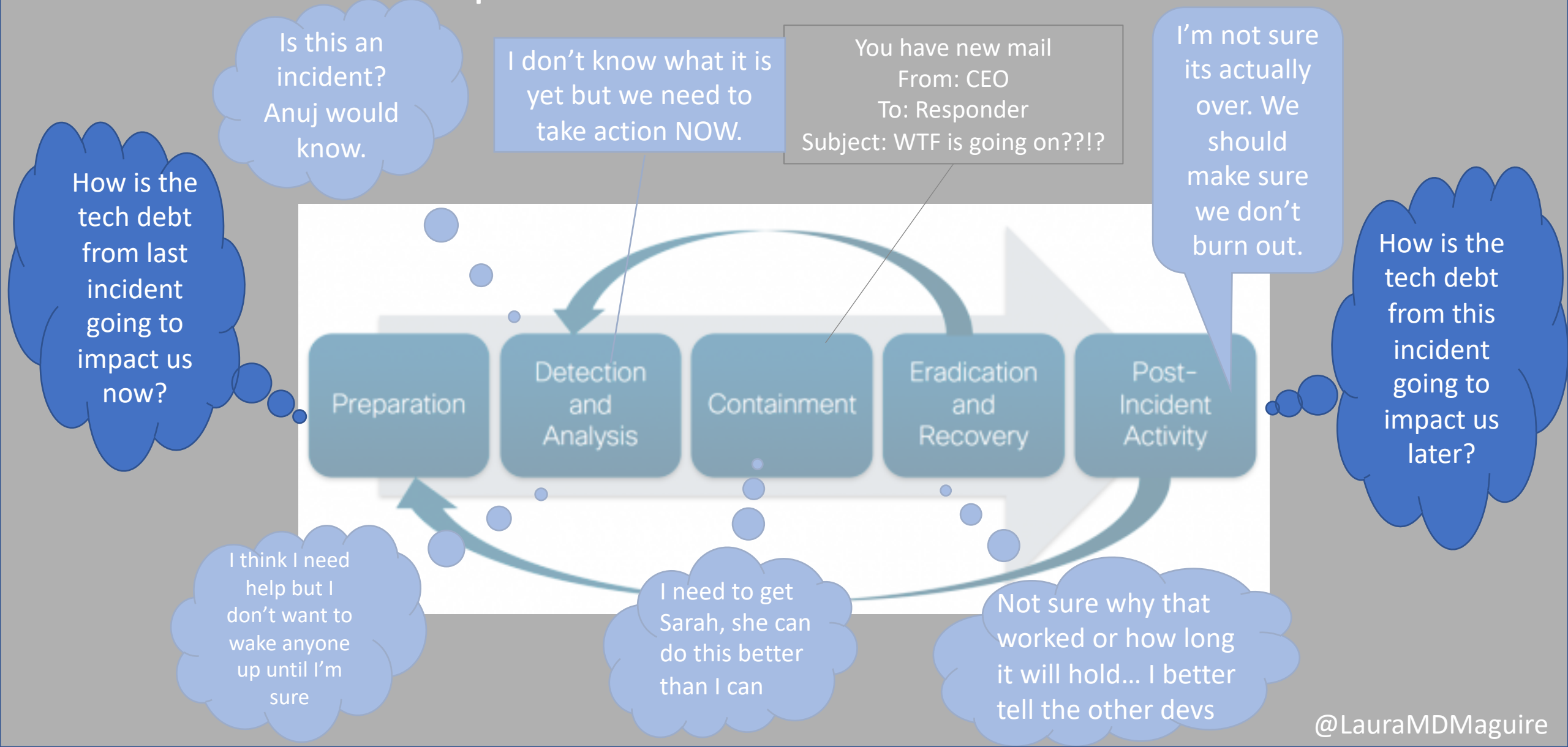
I think I need help but I don't want to wake anyone up until I'm sure

I need to get Sarah, she can do this better than I can

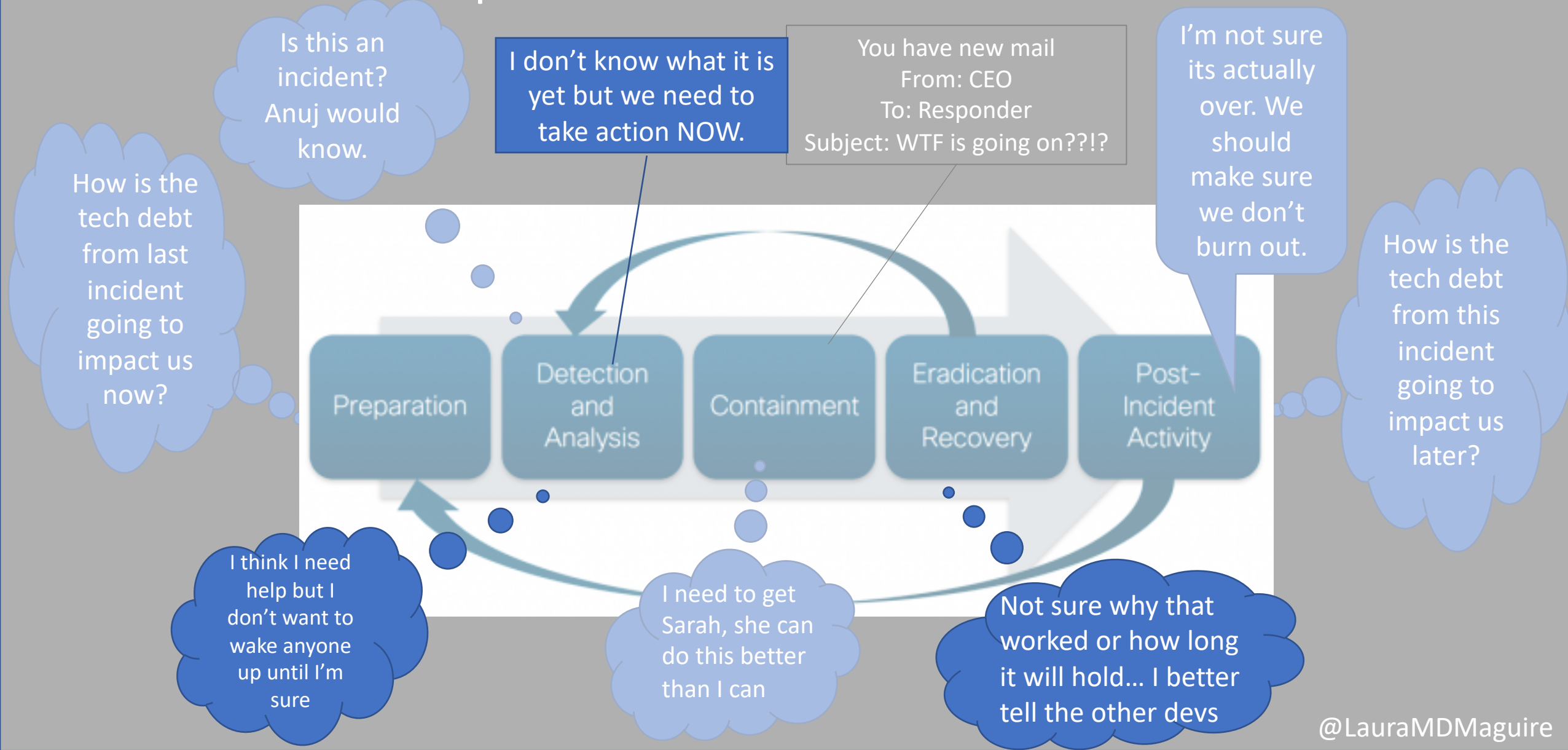
Not sure why that worked or how long it will hold... I better tell the other devs



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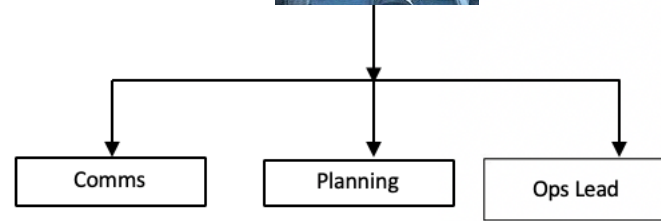


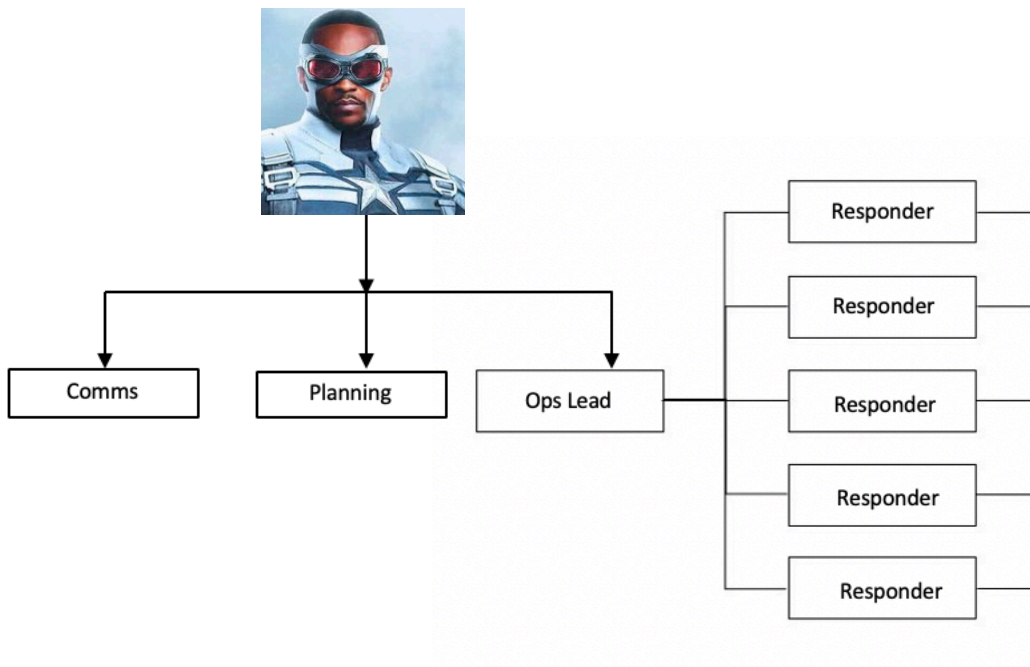
“The incident commander holds the high-level state about the incident. They structure the incident response task force, assigning responsibilities according to need and priority.

De facto, the commander holds all positions that they have not delegated.”

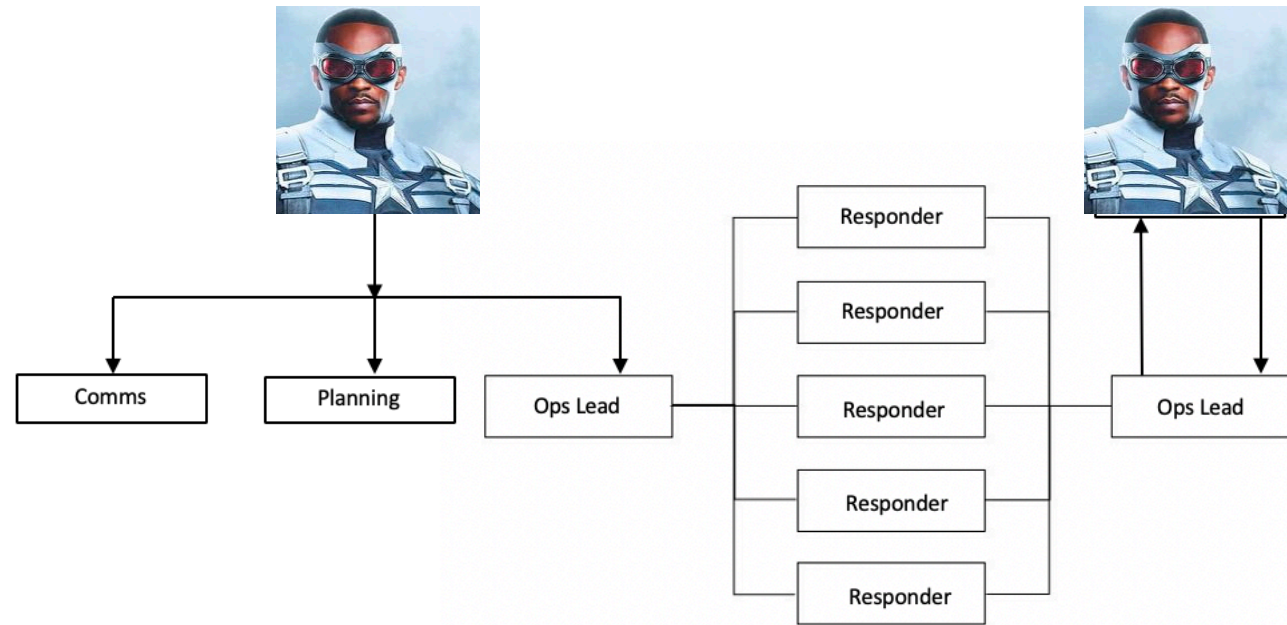
Beyer et al (2016)



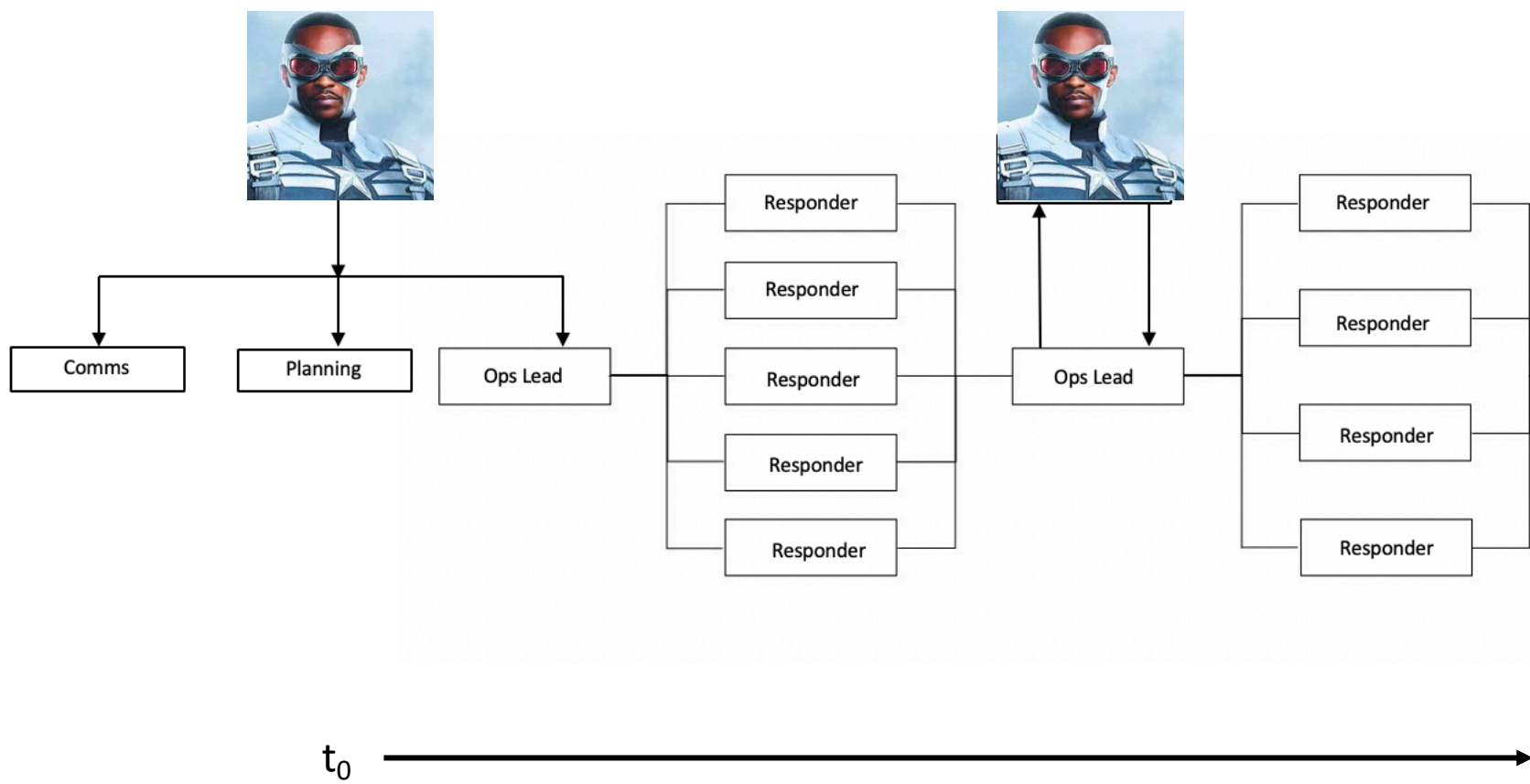


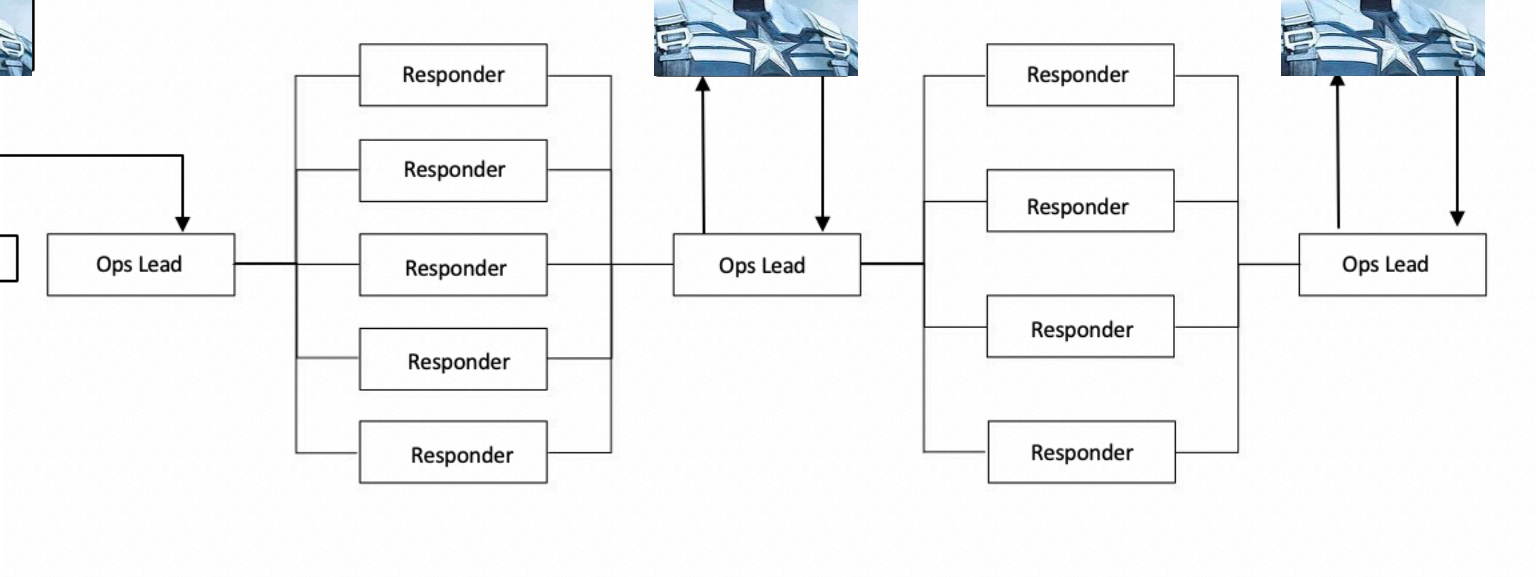


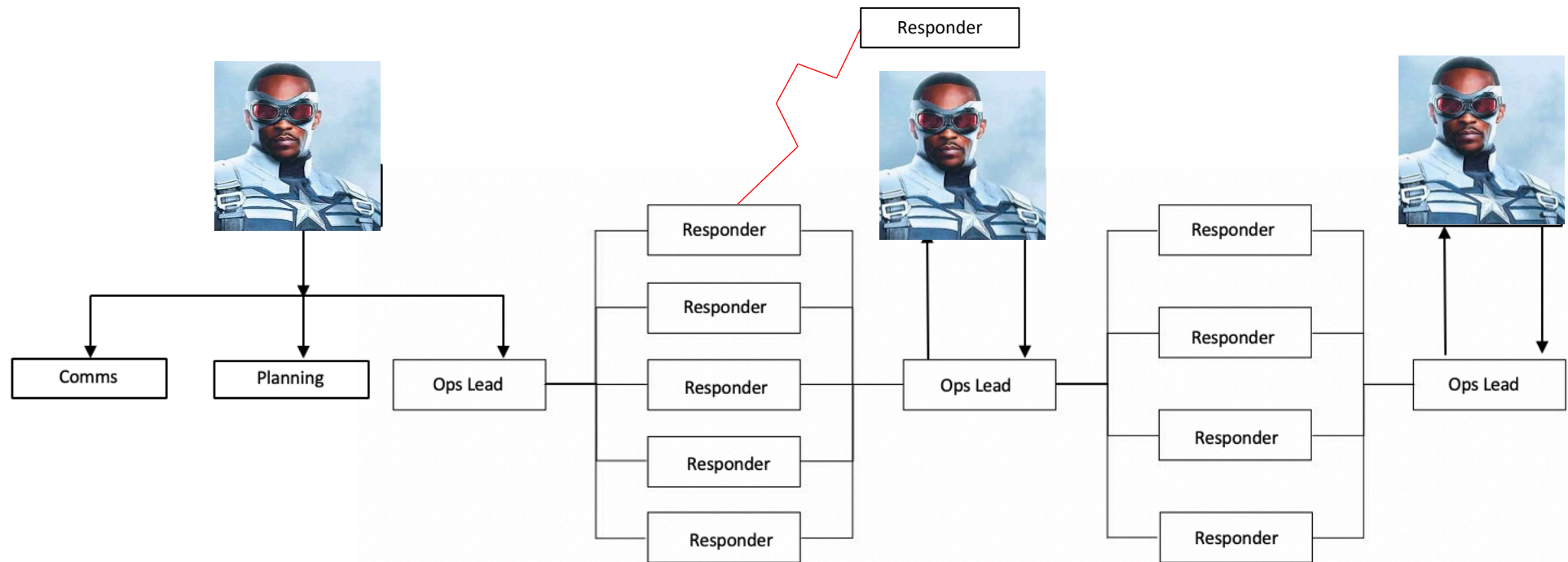
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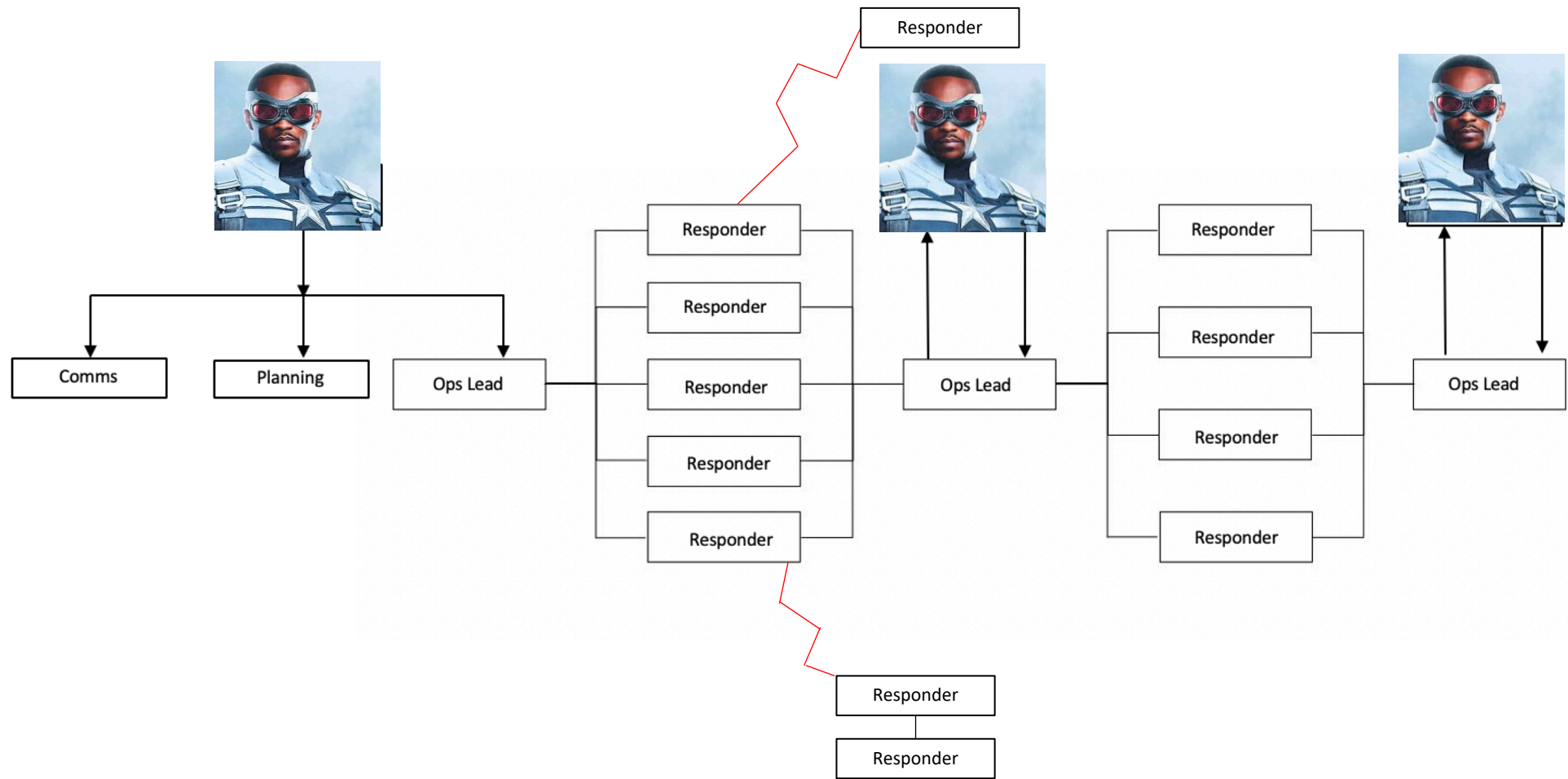


t_0 →











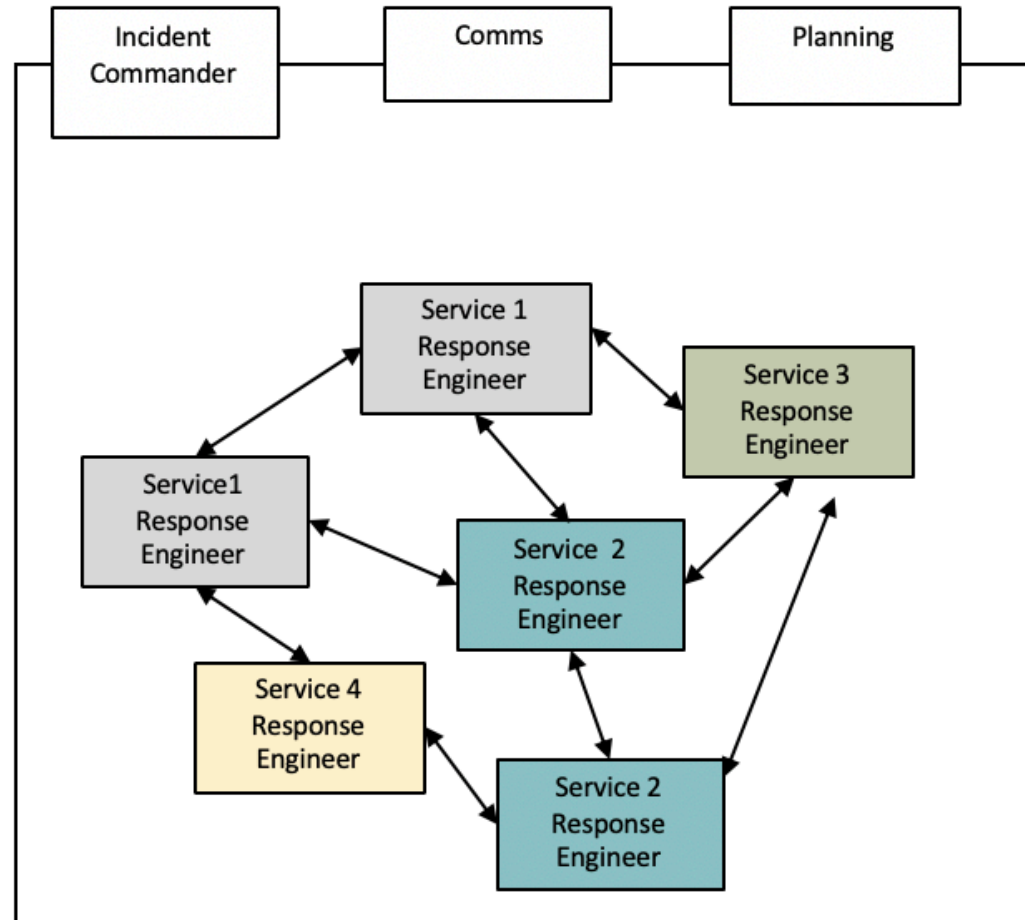




Adaptive Choreography.



Dynamically reconfiguring how coordination happens.



Taking Initiative

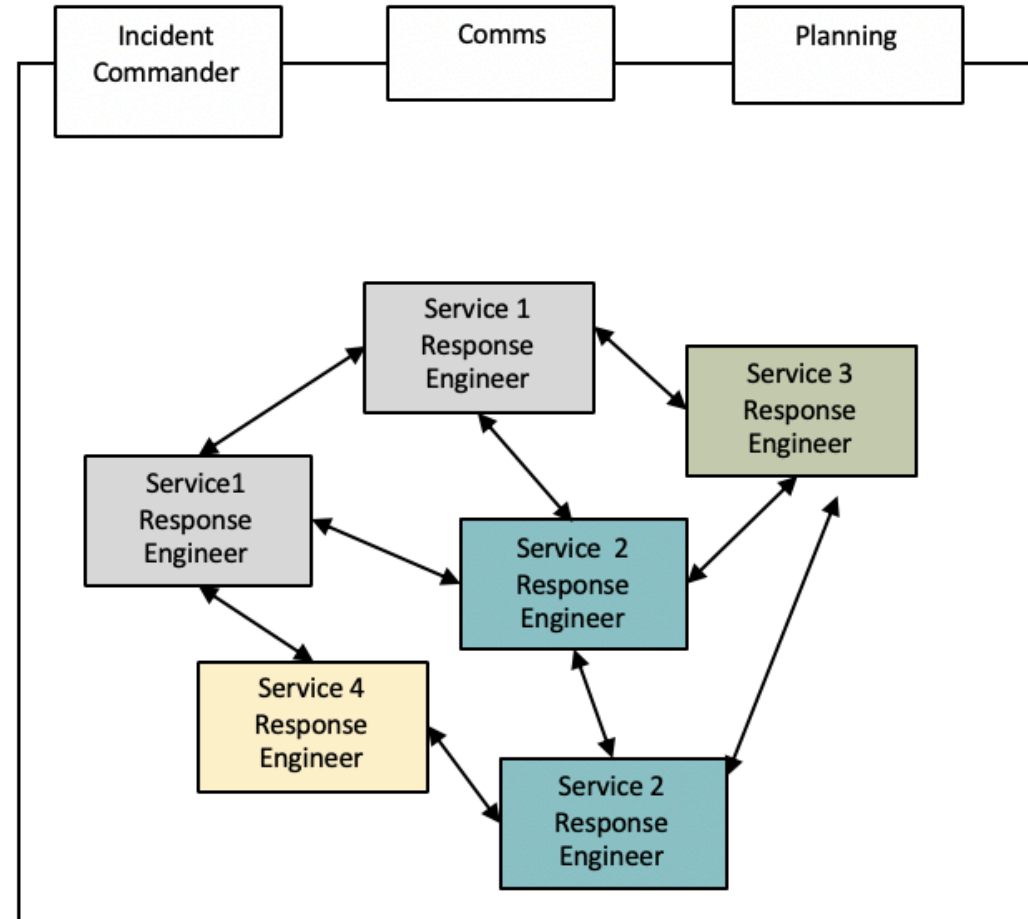
Updating

Sharing Info

Deciding

Anticipating

Adjusting



Taking Direction

Recruiting others

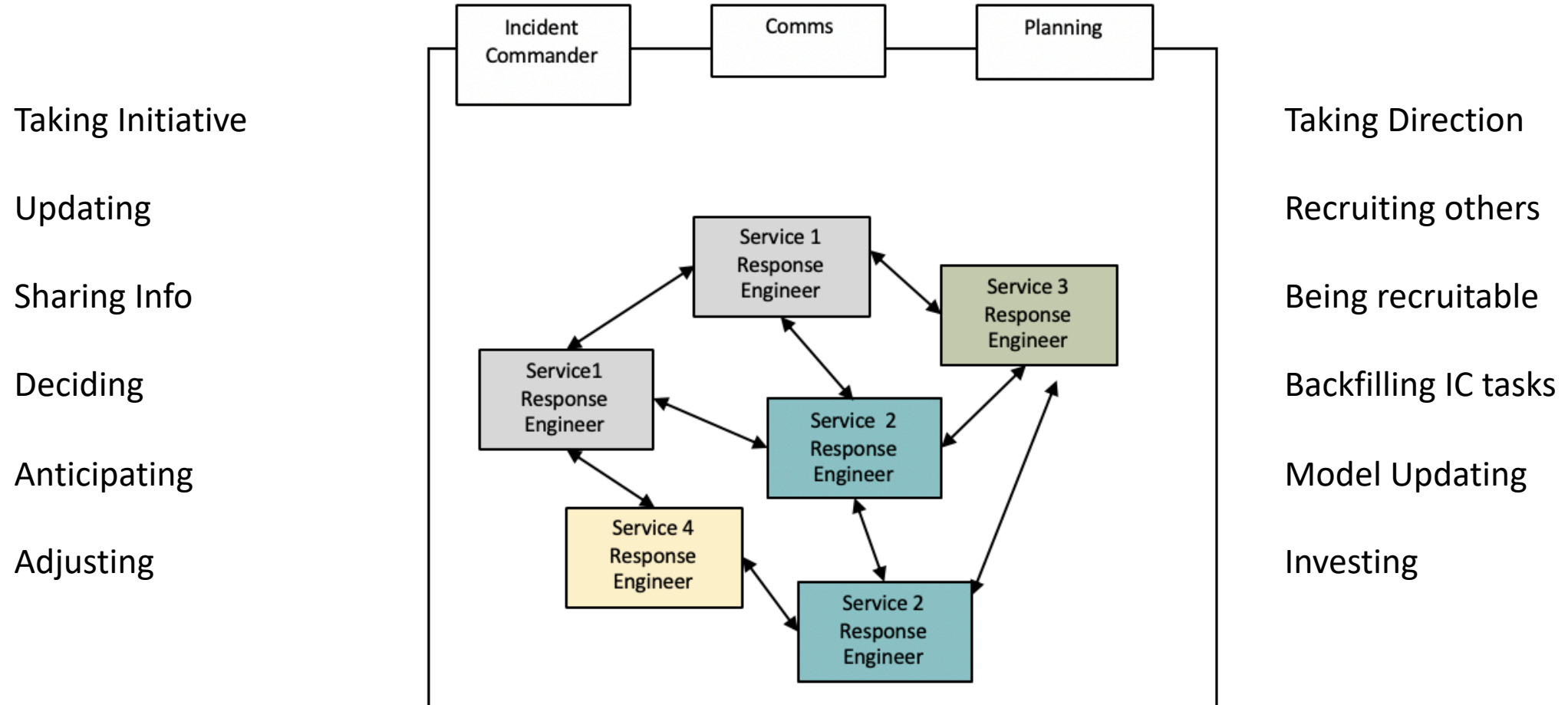
Being recruitable

Backfilling IC tasks

Model Updating

Investing

Adaptive Choreography.



Which people/**machines** are important...

...in what collaborative interplay...

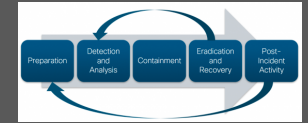
...in what sequence?

Costs of coordination with tooling

- Lag/delay
 - Reduced functionality
 - Glitches
 - Updating
 - Calibration
 - Difficulty with access
 - Limited observability
- Investments in:
 - Selecting
 - Testing
 - Piloting
 - Launching
 - Switching
 - Calibration
 - Re-calibrating
 - Working around limitations

What did I find?

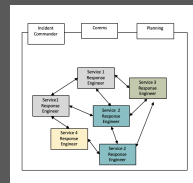
1) Incident response has technical and coordinative demands



2) Incident command should be A role, not THE role



3) Adaptation was key



4) Tooling can increase costs of coordination.



References

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- Watts-Perotti, J. and Woods, D. D. (2007). How Anomaly Response is Distributed Across Functionally Distinct Teams in Space Shuttle Mission Control.

Interested in chatting further? workshops@jeli.io

@LauraMDMaguire

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Dr. Laura M.D. Maguire

Cognitive Systems Engineer & Researcher

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