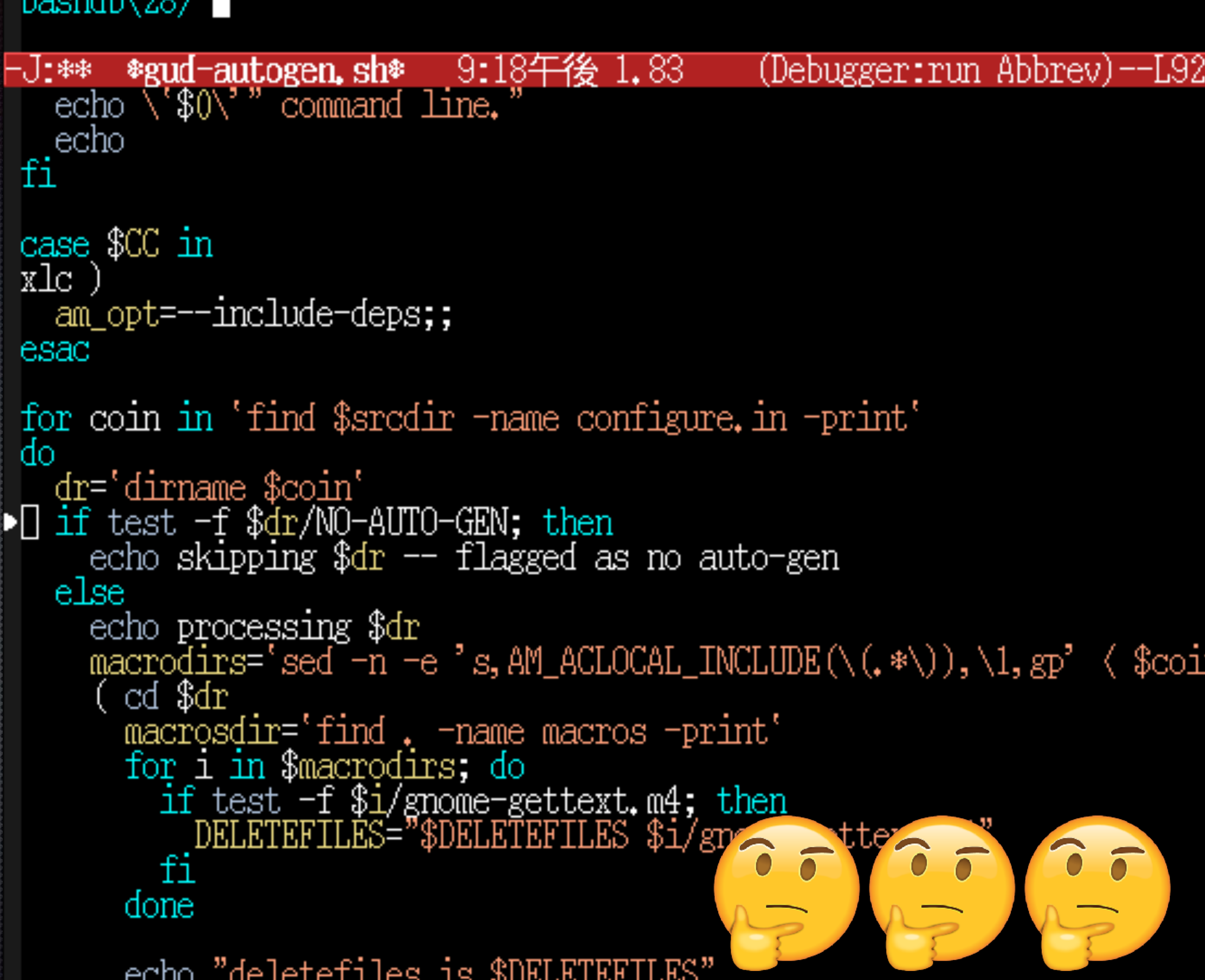
When /bin/sh *Strikes Back:* Revisiting "Automate All The Things"

J. Paul Reed

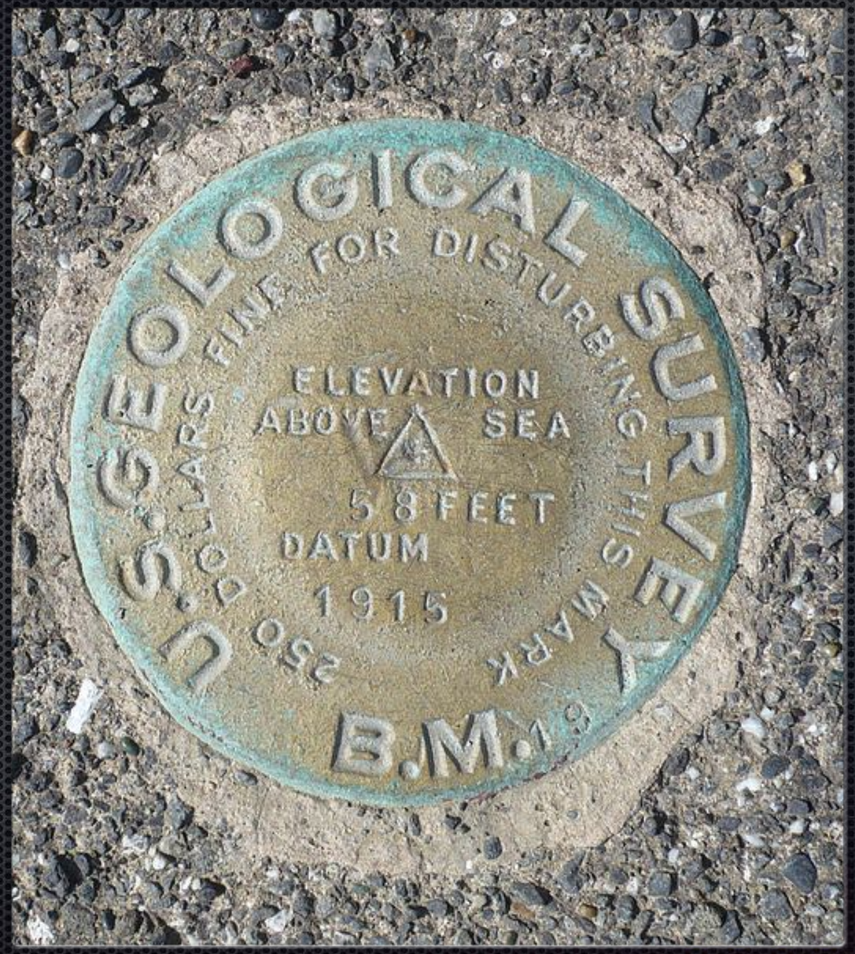
NETFLIX

SRE CON Americas

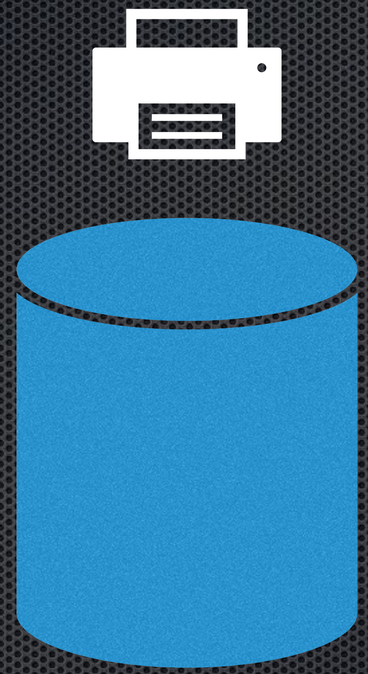
December, 2020



A Quick Survey

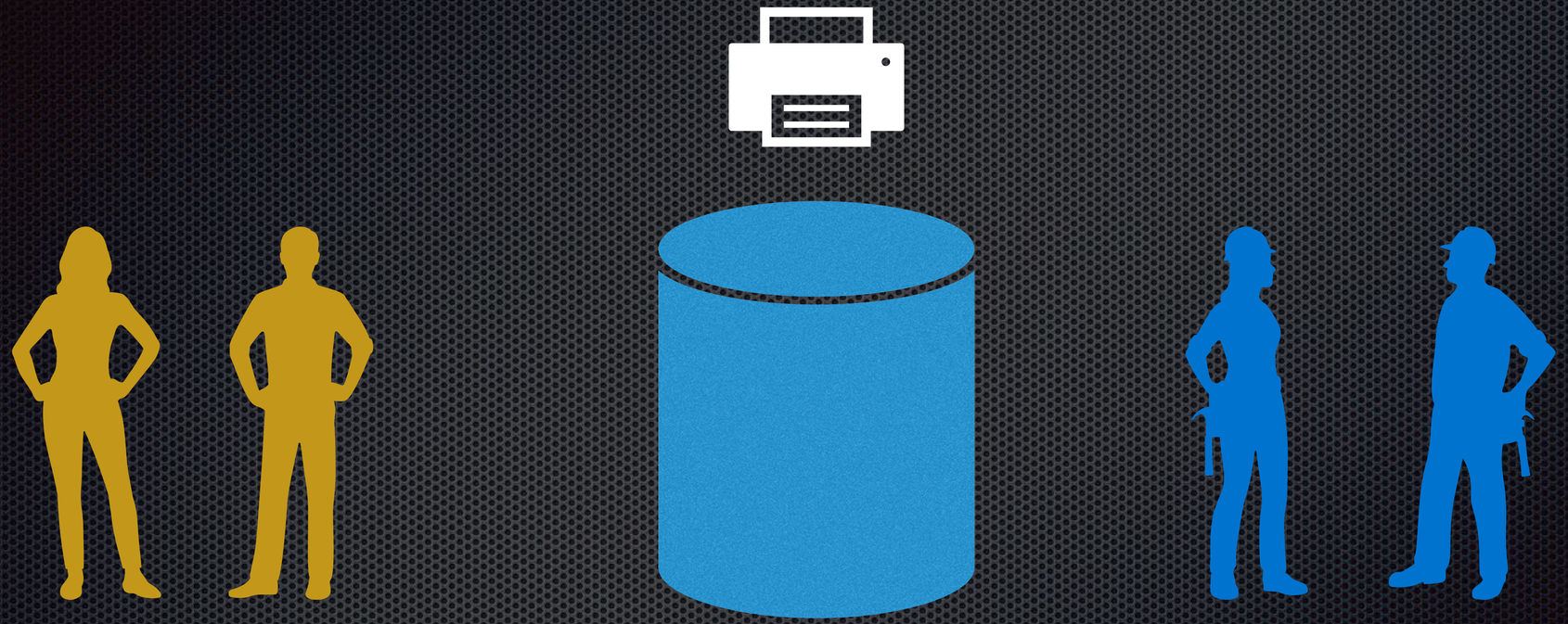


Does Any of This Sound Familiar?



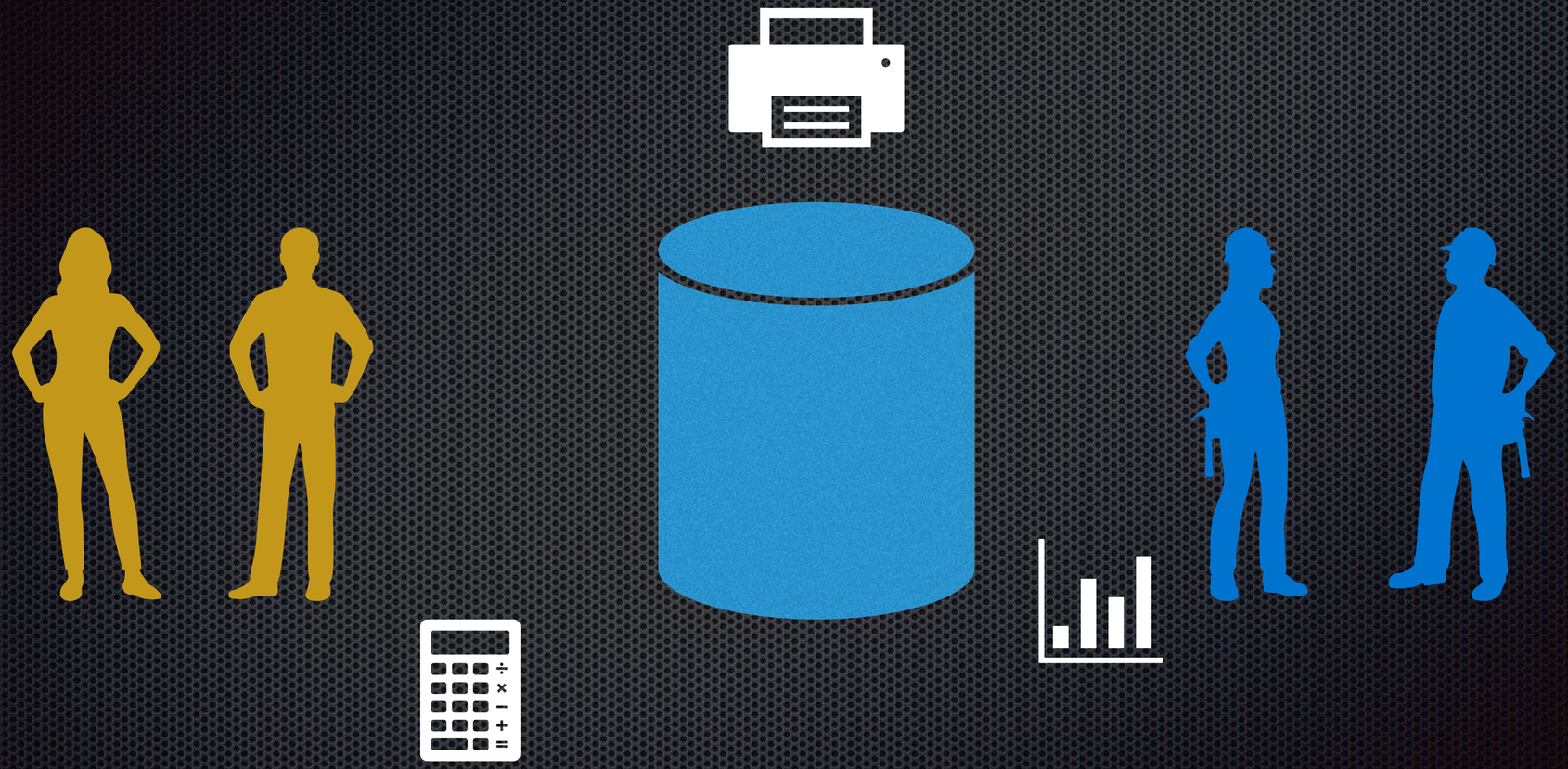
Invoice System

Does Any of This Sound Familiar?



Invoice System

Does Any of This Sound Familiar?



Invoice+Reporting System

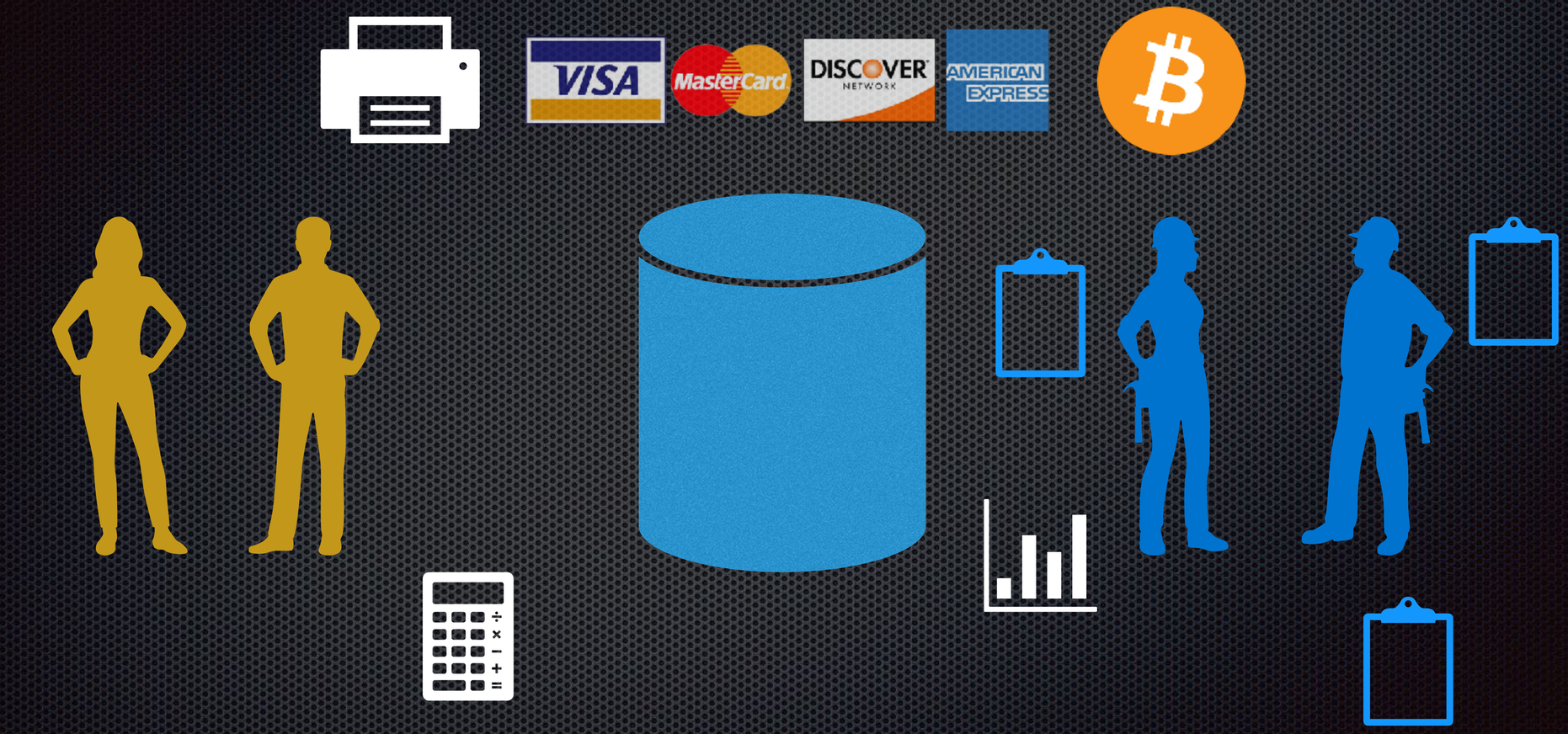
Does Any of This Sound Familiar?

Invoice+Reporting+Payment System

Does Any of This Sound Familiar?

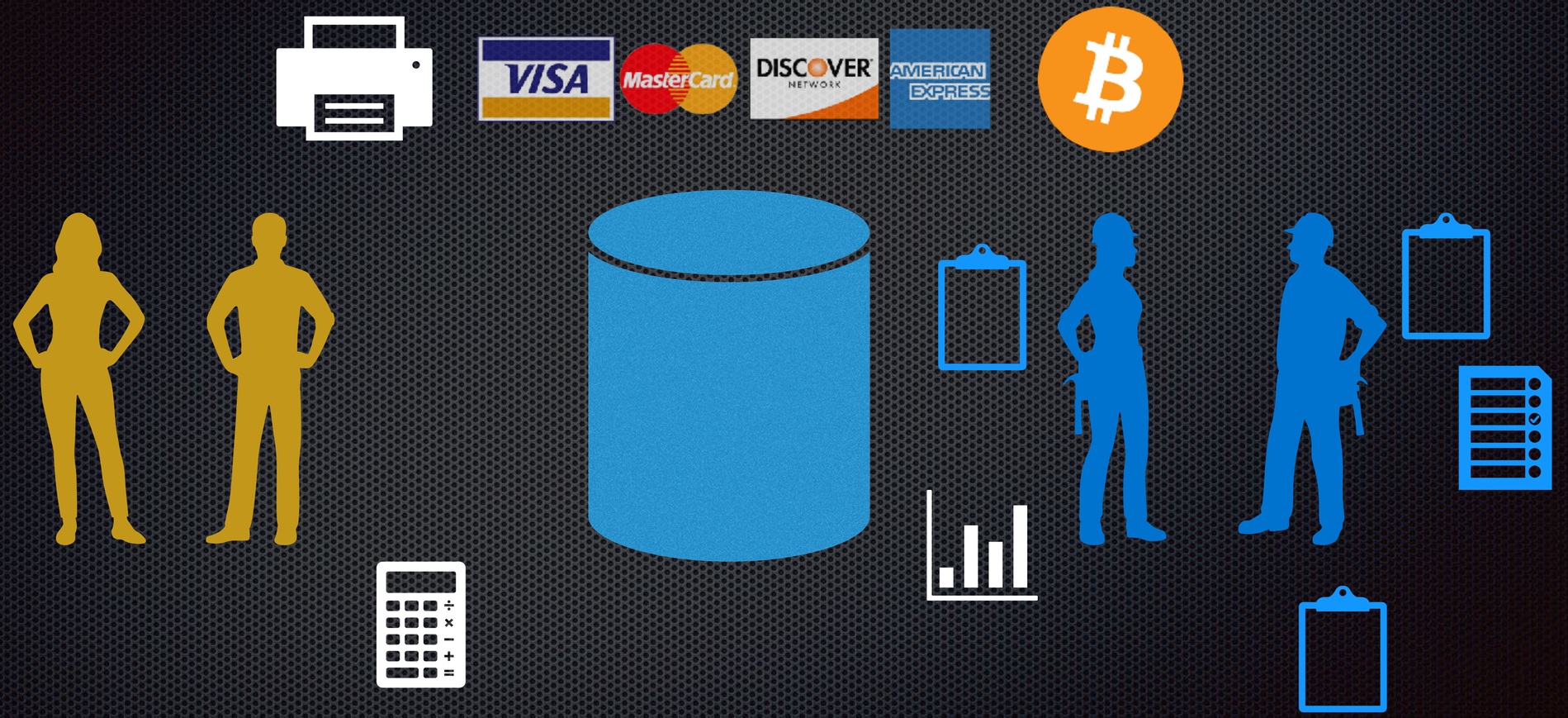
Invoice+Reporting+Payment System

Does Any of This Sound Familiar?



Automated Invoice+Reporting+Payment System

Does Any of This Sound Familiar?



“Automated” Invoice+Reporting+Payment System

Does Any of This Sound Familiar?

"Automated" & Monitored Invoice+Reporting+Payment System

Does Any of This Sound Familiar?

"Automated" & Monitored Invoice+Reporting+Payment System

Does Any of This Sound Familiar?

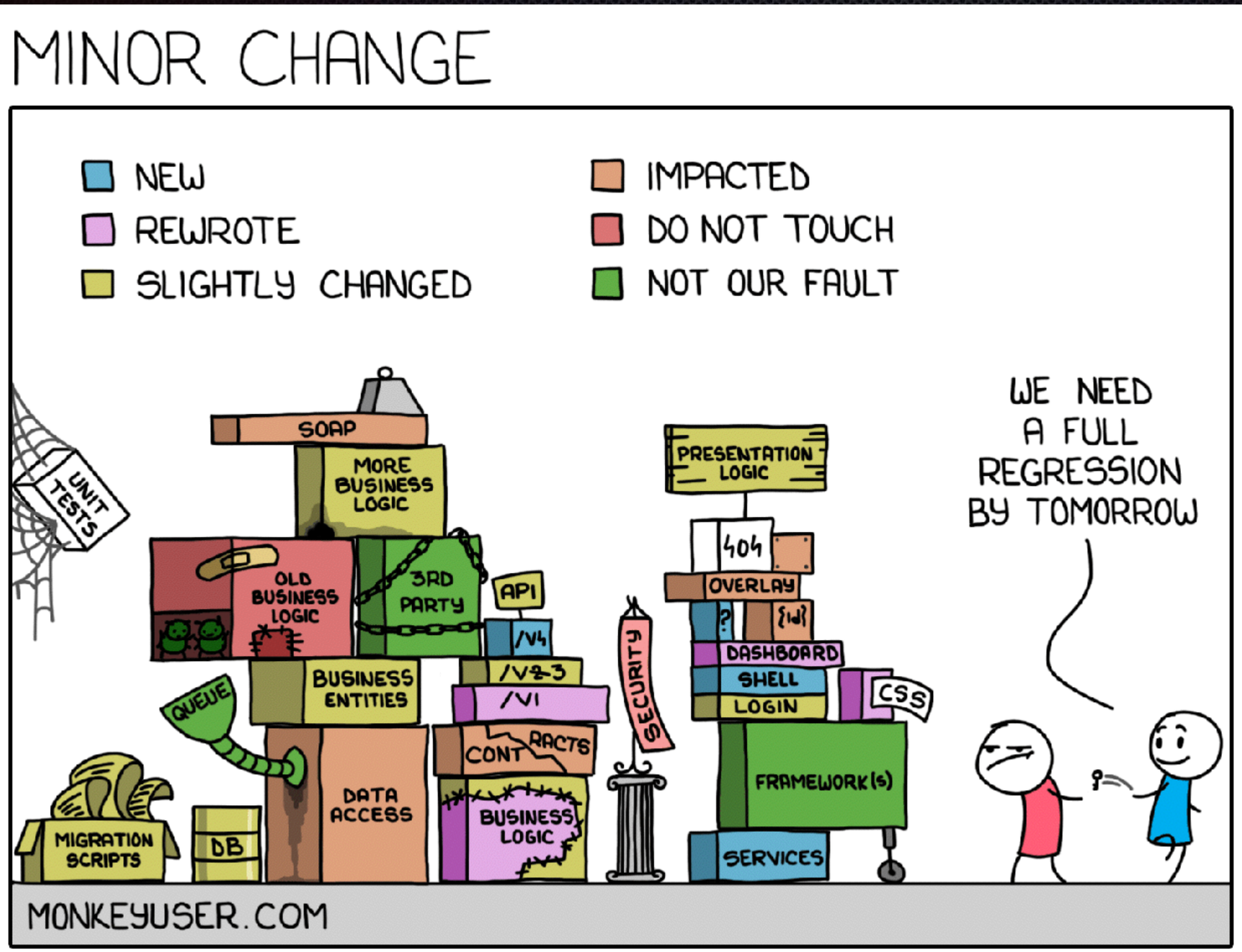
"Automated" & Monitored Invoice+Reporting+Payment System

Does Any of This Sound Familiar?

"Automated" & Monitored Invoice+Reporting+Payment System

Does Any of This Sound Familiar?

"Automated" & Monitored Invoice+Reporting+Payment System


MINOR CHANGE
NEW
REWROTE
SLIGHTLY CHANGED
IMPACTED
DO NOT TOUCH
NOT OUR FAULT
UNIT TESTS
SOAP
MORE BUSINESS LOGIC
OLD BUSINESS LOGIC
3RD PARTY
API
/V4
/V2-3
/V1
BUSINESS ENTITIES
QUEUE
CONTRACTS
DATA ACCESS
BUSINESS LOGIC
MIGRATION SCRIPTS
DB
SECURITY
PRESENTATION LOGIC
404
OVERLAY
?
{|d}
DASHBOARD
SHELL
LOGIN
CSS
FRAMEWORK(S)
SERVICES
WE NEED A FULL REGRESSION BY TOMORROW
MONKEYUSER.COM

ASIA PACIFIC

The New York Times

GIVE THE TIMES

Between Two Boeing Crashes, Days of Silence and Mistrust

A Long “Drift Into Failure”

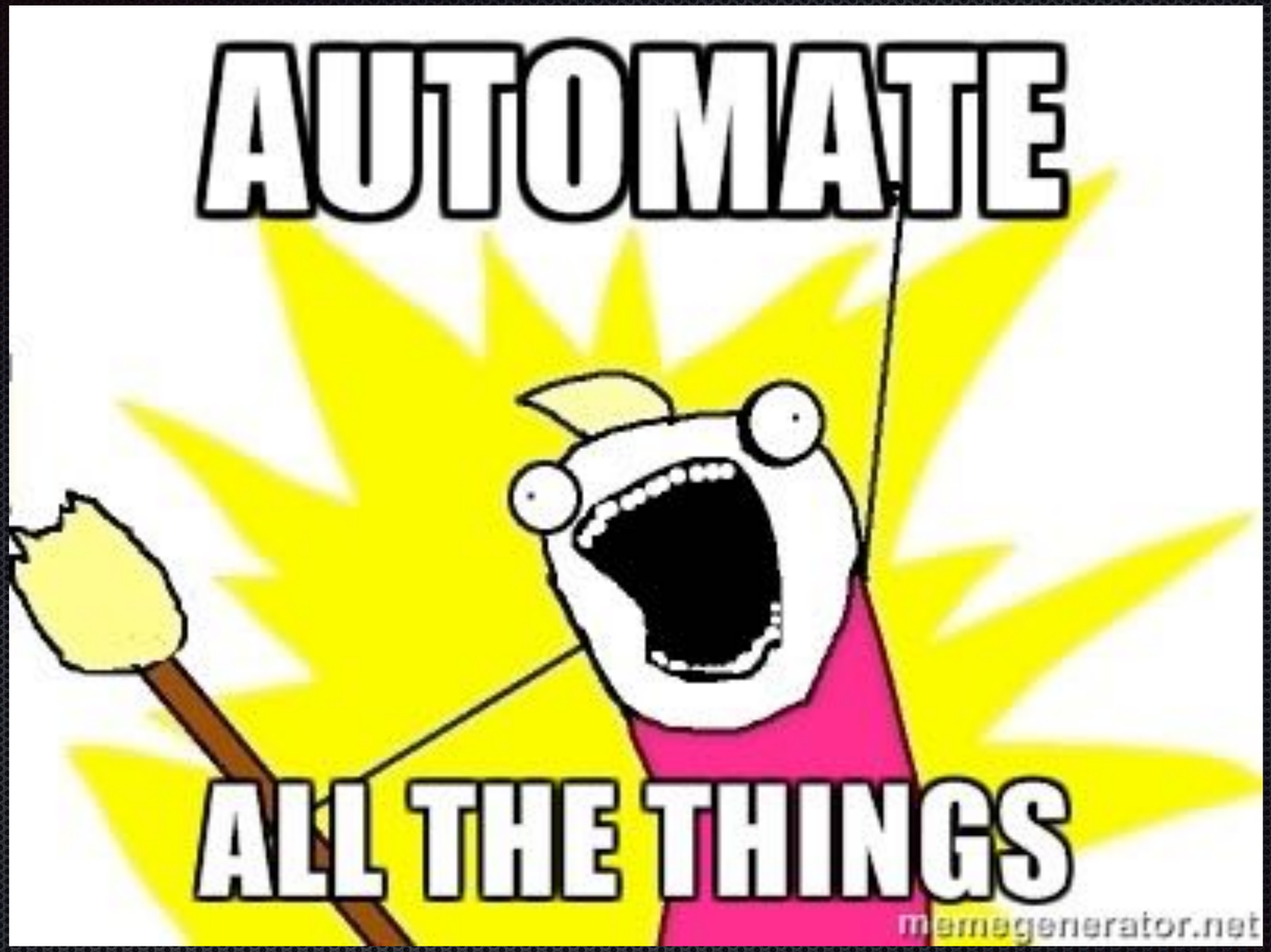
- Long running system, with legacy requirements
- *Eras* of modification
- Addition of supplemental features to address changes and maintain system *abstractions*
- Disprate, disconnected requirements gathering
- Siloed testing and validation
- Early, weak stress signals missed or ignored

$1,187,675

www.jpaulreed.com/737max-and-us

J. Paul Reed

- @jpaulreed on
- Alumn of The Ship Show
- 20+ Years in Build/Release Engineering
- Now, **C**ritical **O**perations & **R**eliability **E**ngineering team at NETFLIX
- Master of Science in Human Factors & System Safety



“We’re *doing DevOps*, OK?!”

“Universal” “Automation”

INSTALL.SH

```
#!/bin/bash

pip install "$1" &
easy_install "$1" &
brew install "$1" &
npm install "$1" &
yum install "$1" & dnf install "$1" &
docker run "$1" &
pkg install "$1" &
apt-get install "$1" &
sudo apt-get install "$1" &
steamcmd +app_update "$1" validate &
git clone https://github.com/"$1"/"$1" &
cd "$1";./configure;make;make install &
curl "$1" | bash &
```

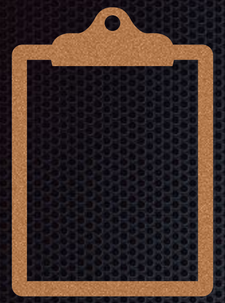
Courtesy XKCD

A “Simple” Question?

What is “Automation?”

A “Simple” Question?

What is “Automation?”



“Script”

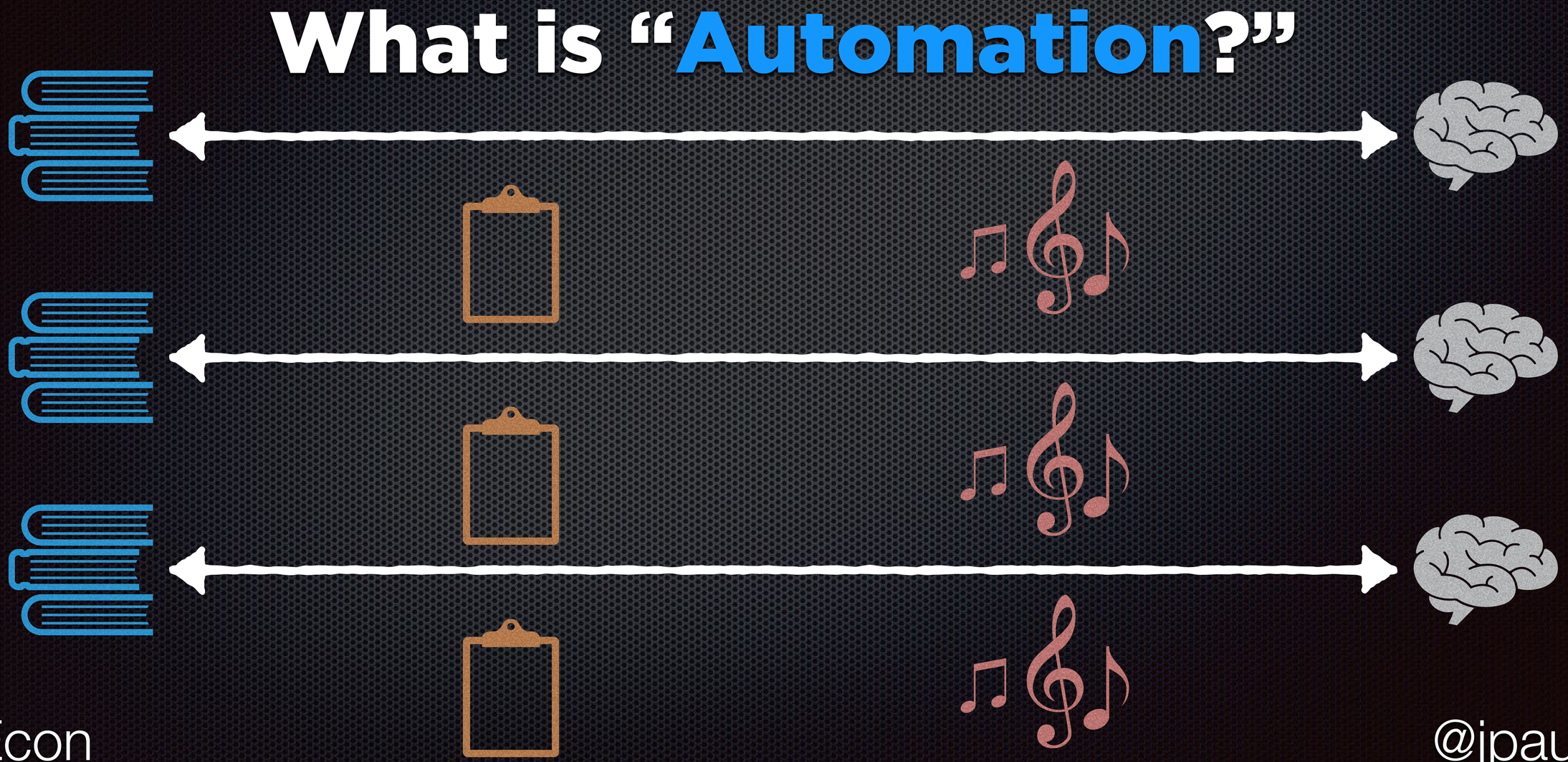
“Orchestration”

“ML/AI”

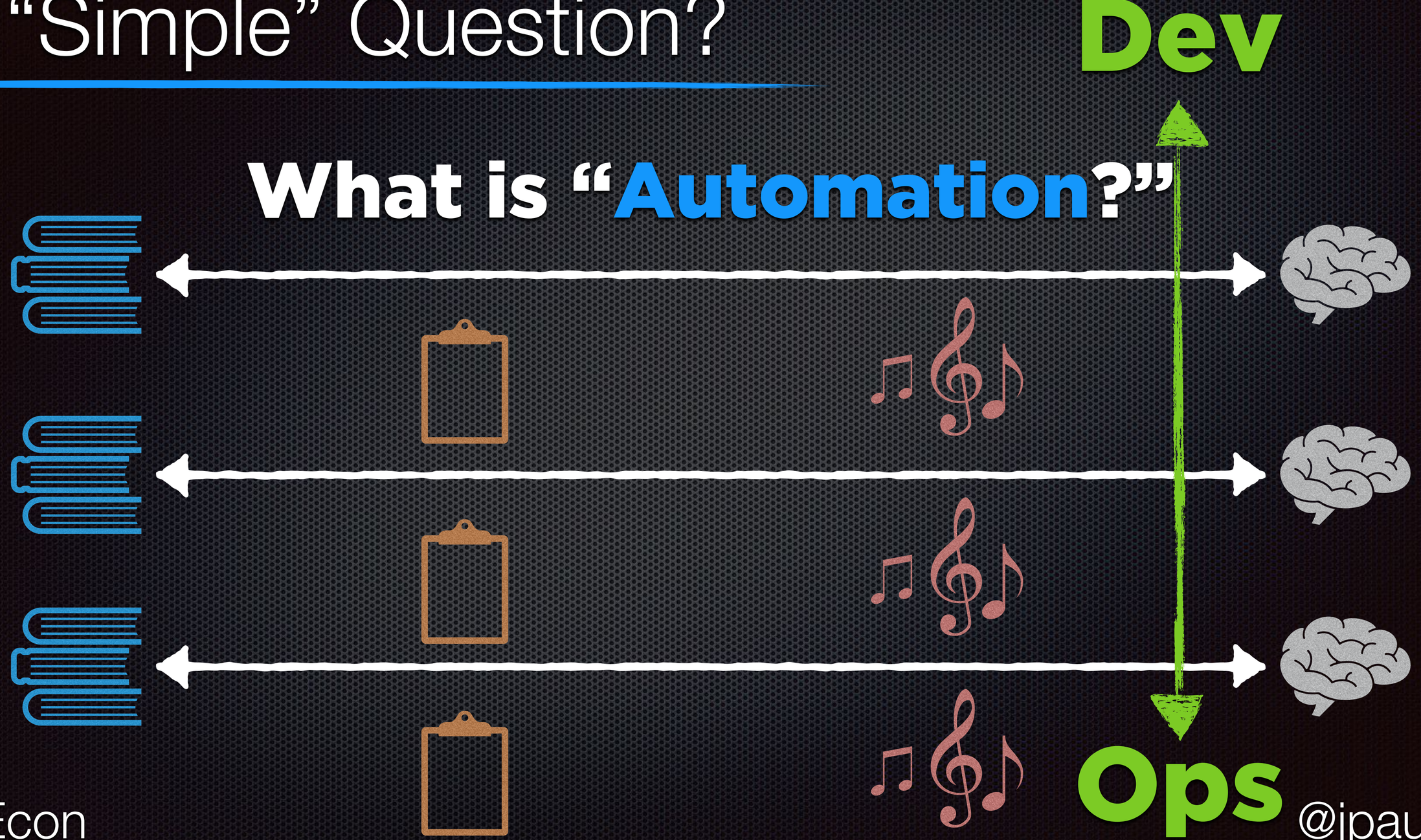
A “Simple” Question?

What is “Automation?”

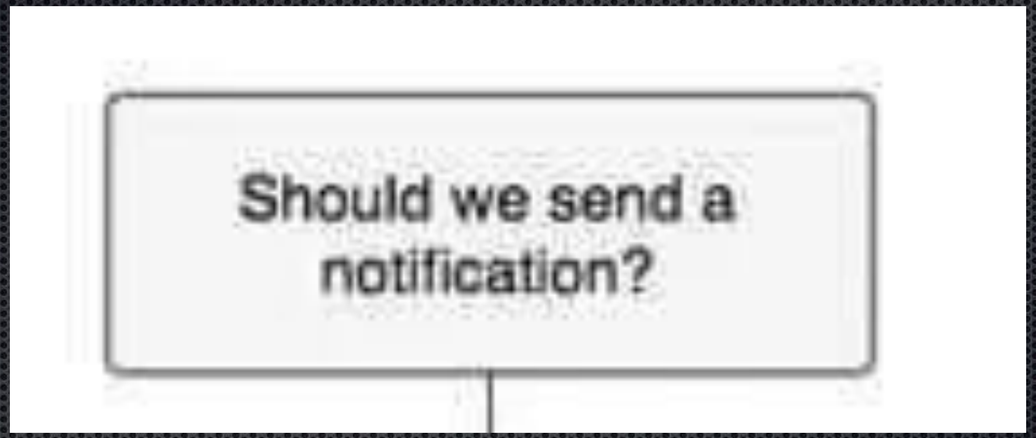
A “Simple” Question?



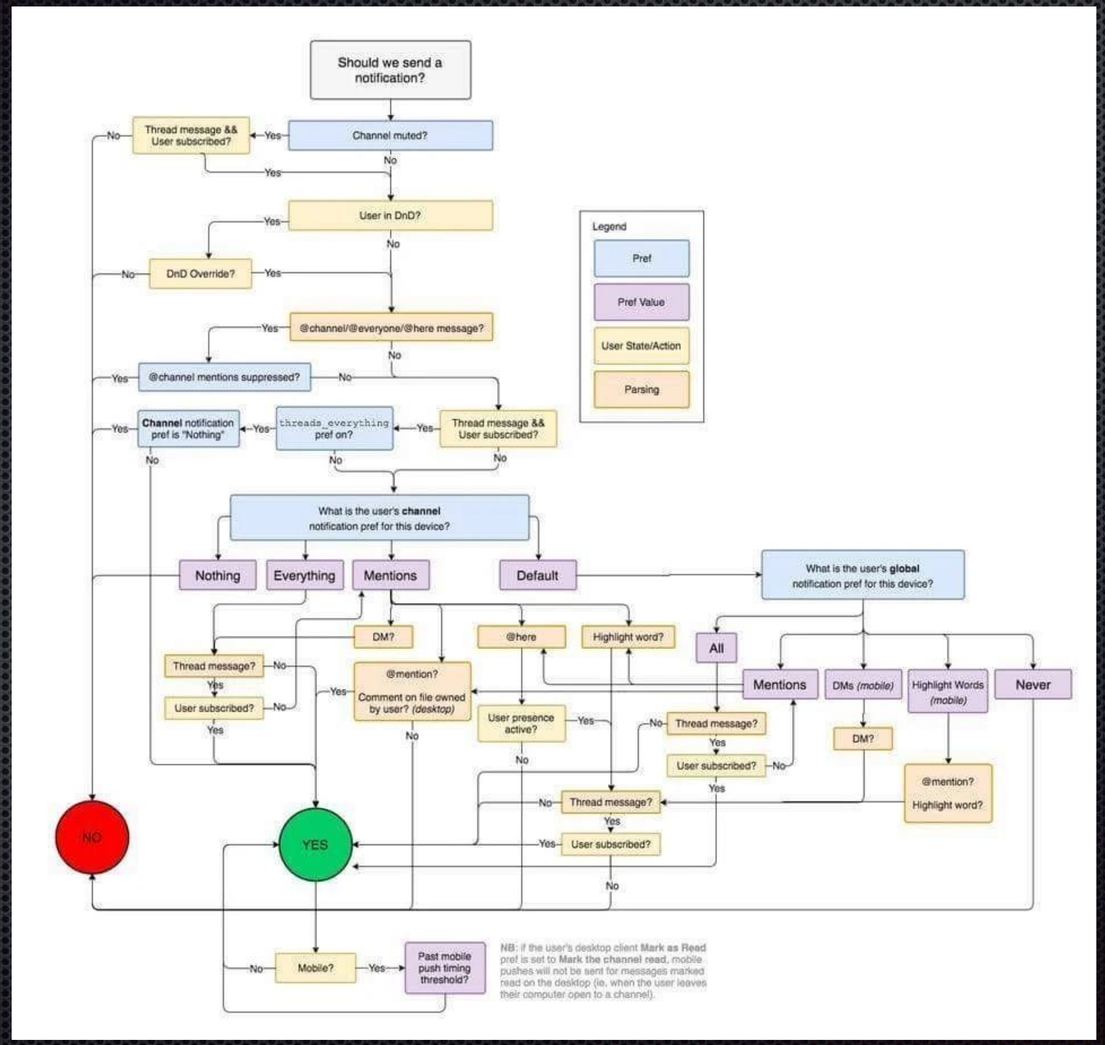
A “Simple” Question?



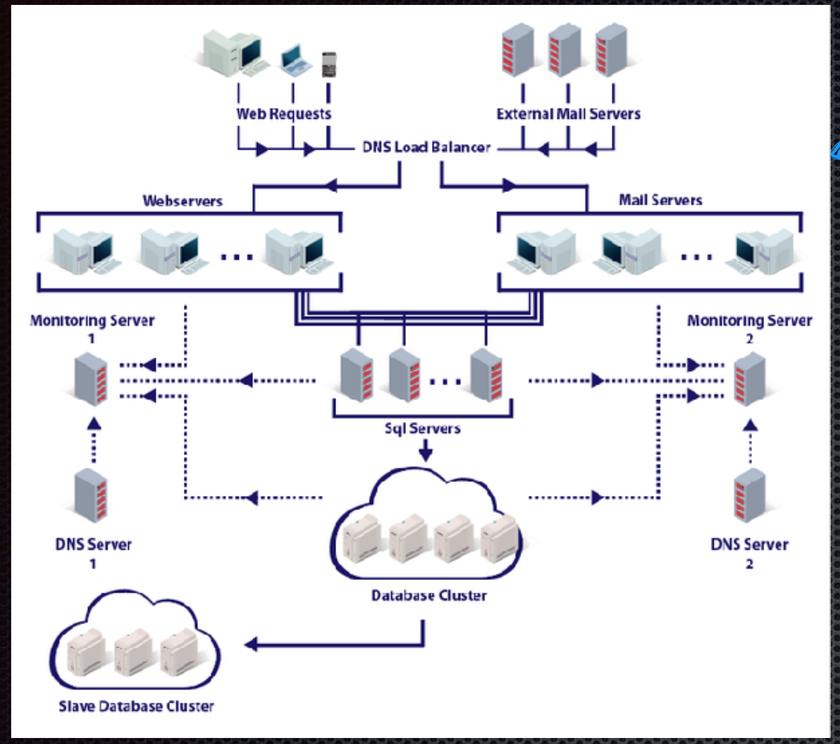
A World of Complex Automation

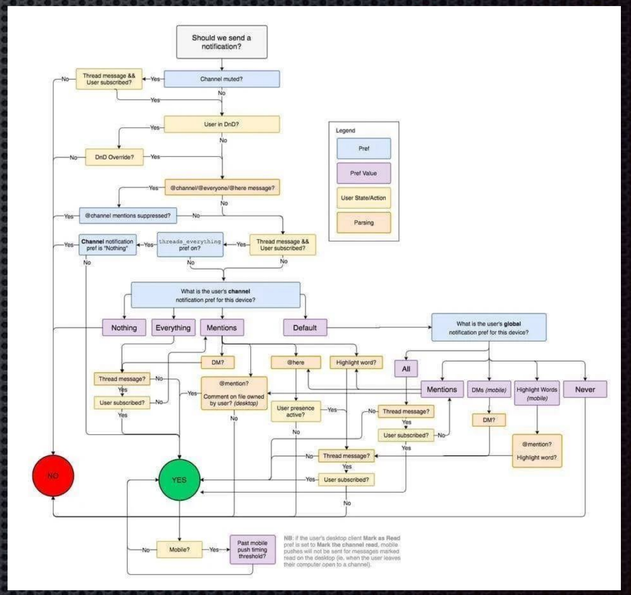


A World of Complex Automation

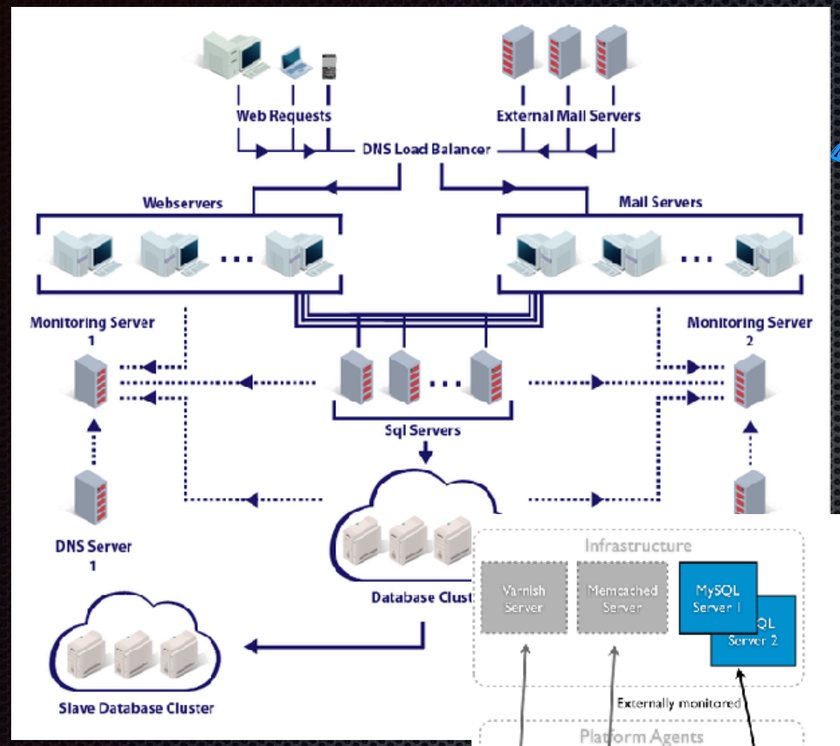


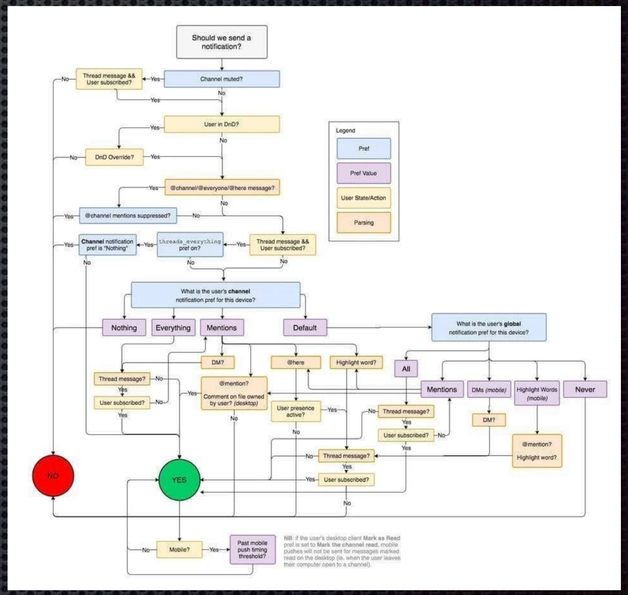
Complex, *Interconnected* Automation

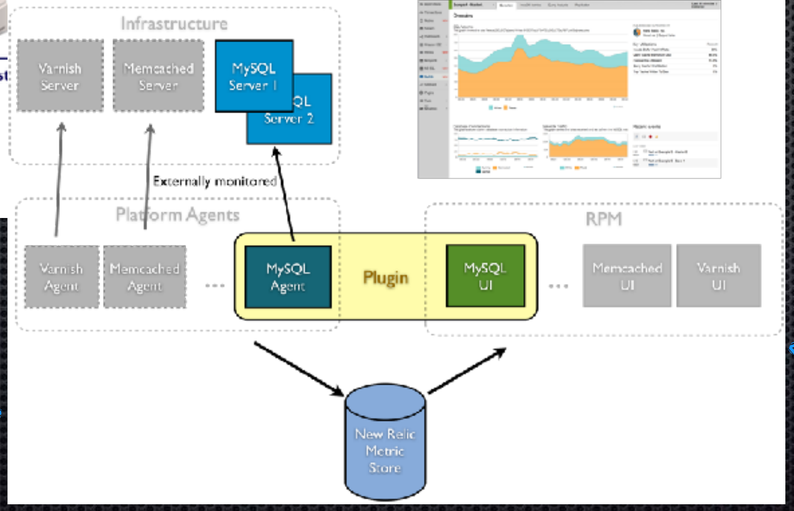




Complex, *Interconnected* Automation



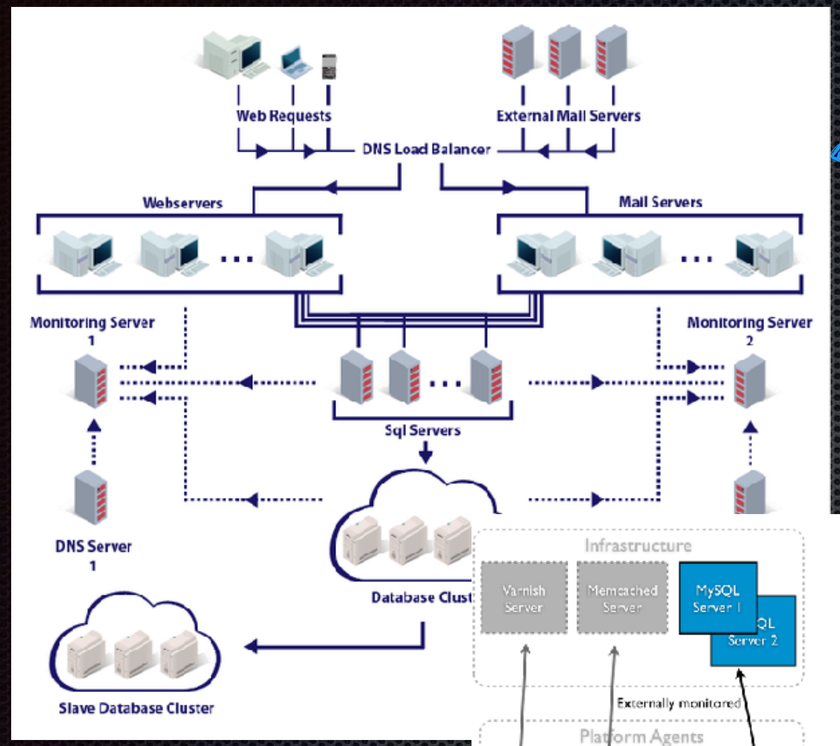


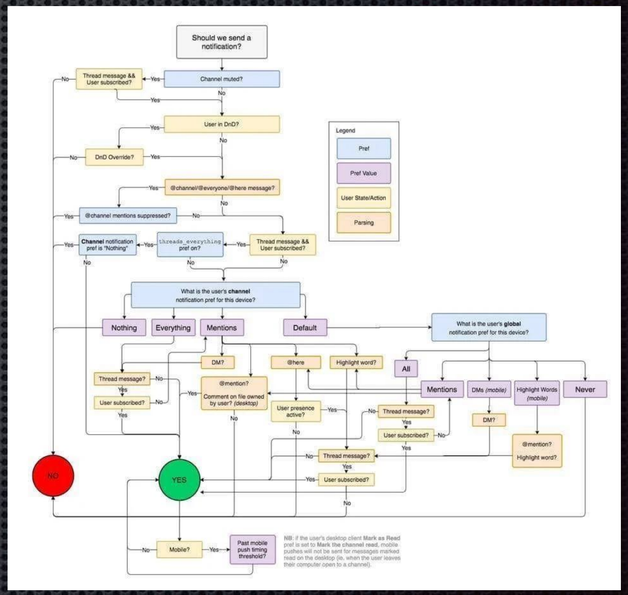


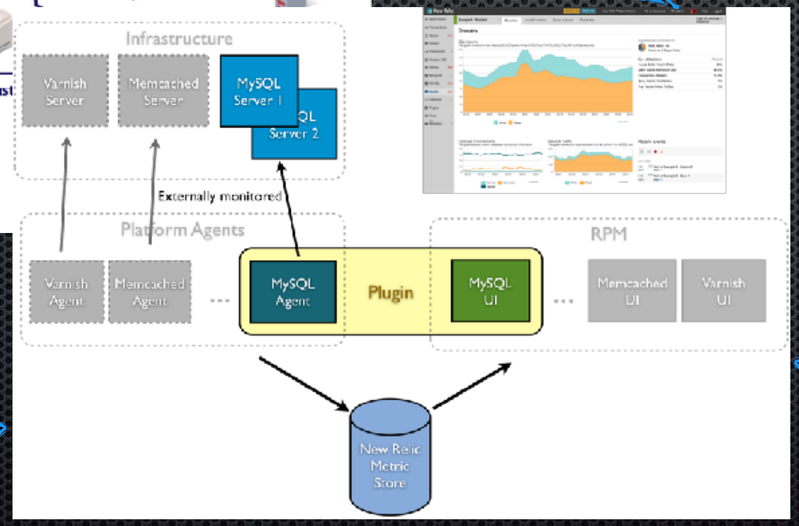
#SREcon

@jpaulreed

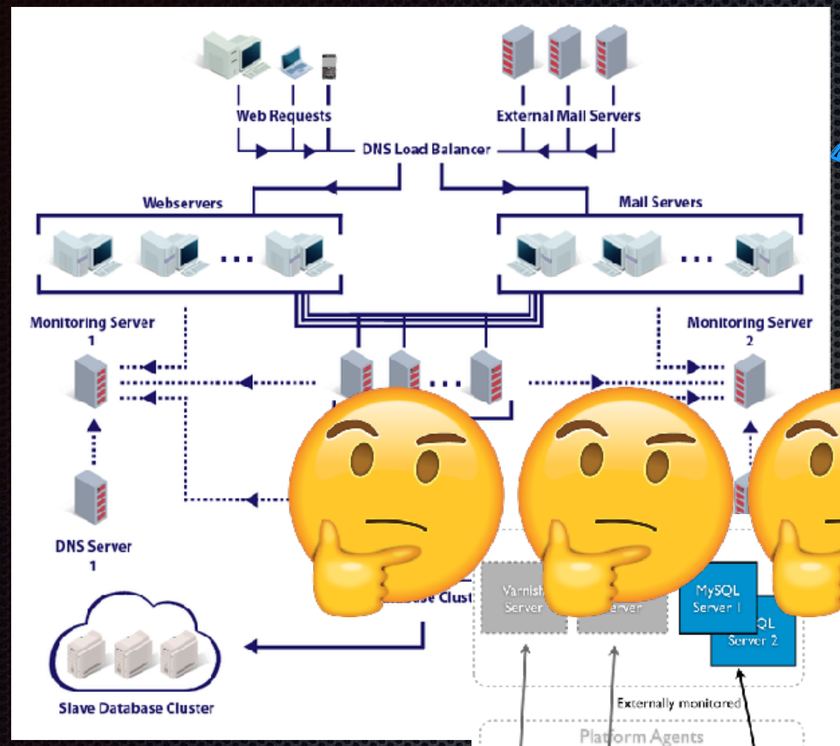
Complex, *Interconnected* Automation

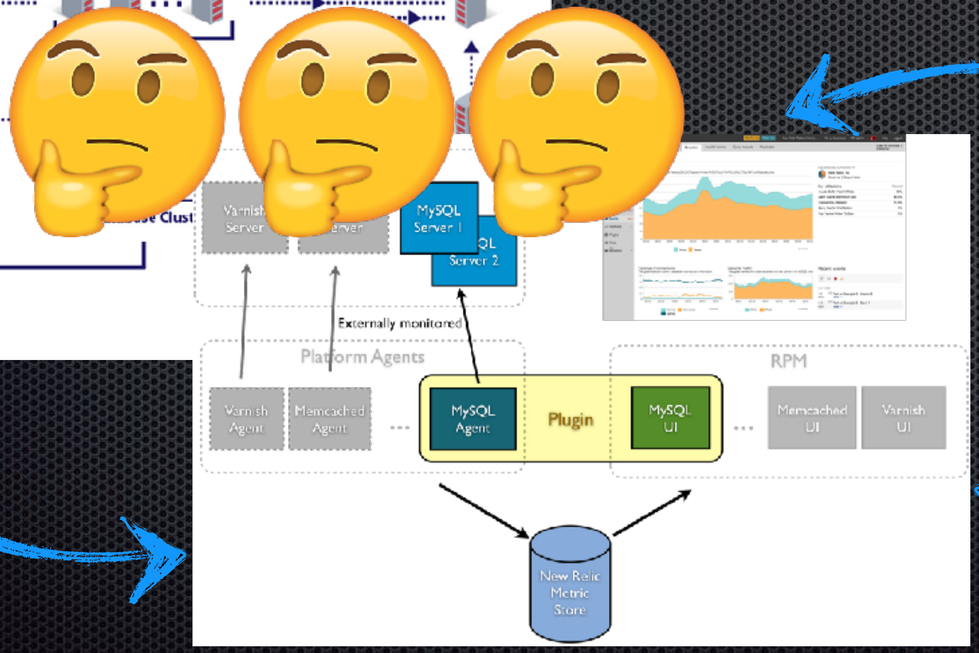


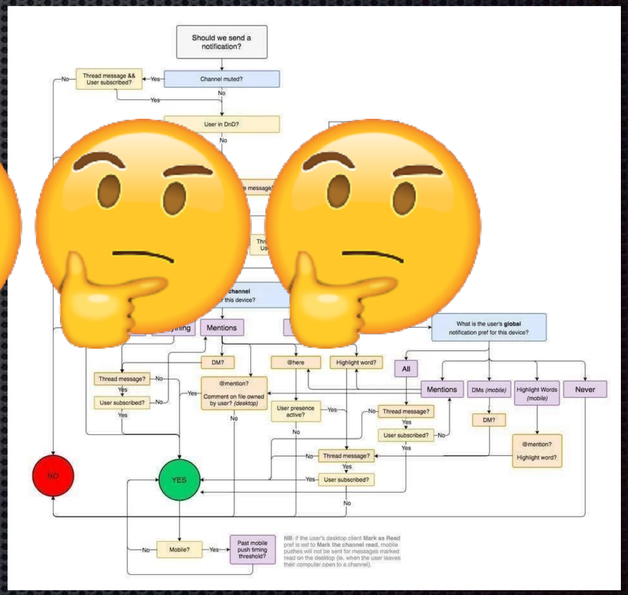


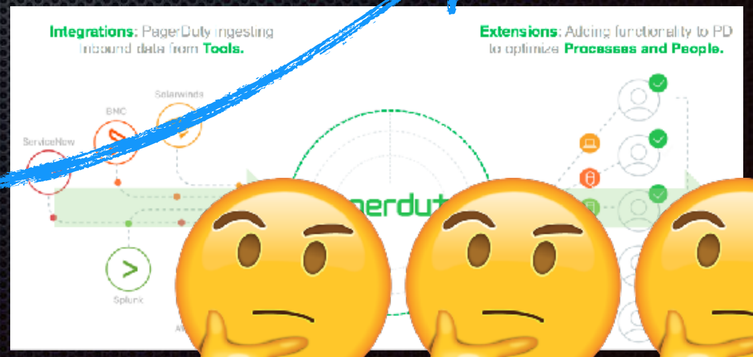


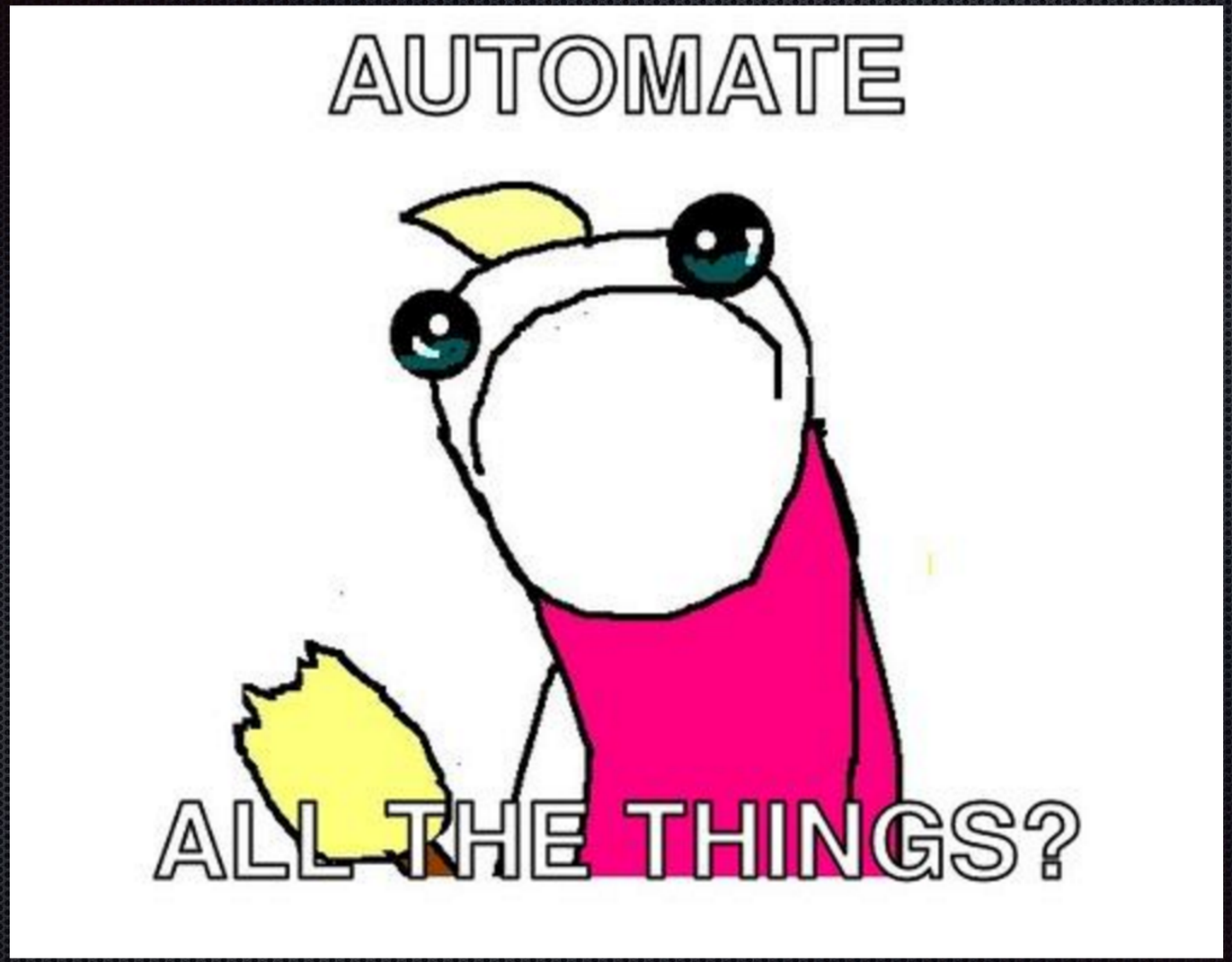
Complex, *Interconnected* Automation










AUTOMATE
ALL THE THINGS?

A Longstanding Question

Automatica, Vol. 19, No. 6, pp. 775–779, 1983
Printed in Great Britain.

0005–1098/83 $3.00 + 0.00
Pergamon Press Ltd.

Brief Paper

Ironies of Automation*

LISANNE BAINBRIDGE†

Key Words—Control engineering computer applications; man–machine systems; on-line operation; process control; system failure and recovery.

Abstract—This paper discusses the ways in which automation of industrial processes may expand rather than eliminate problems with the human operator. Some comments will be made on methods of alleviating these problems within the 'classic' approach of leaving the operator with responsibility for abnormal conditions, and on the potential for continued use of the human operator for on-line decision-making within human–computer collaboration.

Irony: combination of circumstances, the result of which is the direct opposite of what might be expected.
Paradox: seemingly absurd though perhaps really well-founded

designer errors can be a major source of operating problems. Unfortunately people who have collected data on this are reluctant to publish them, as the actual figures are difficult to interpret. (Some types of error may be reported more readily than others, and there may be disagreement about their origin.) The second irony is that the designer who tries to eliminate the operator still leaves the operator to do the tasks which the designer cannot think how to automate. It is this approach which causes the problems to be discussed here, as it means that the operator can be left with an arbitrary collection of tasks, and little thought may have been given to providing support for them.

A Longstanding Question

Automatica, Vol. 19, No. 6, pp. 775–779, 1983
Printed in Great Britain.

0005–1098/83 $3.00 + 0.00
Pergamon Press Ltd.

Brief Paper

Ironies of Automation*

LISANNE BAINBRIDGE†

factors are important." This paper suggests that the increased interest in human factors among engineers reflects the irony that the more advanced a control system is, so the more crucial may be the contribution of the human operator.

Abstr
indus
with
methods of alleviating these problems within the 'classic' approach of leaving the operator with responsibility for abnormal conditions, and on the potential for continued use of the human operator for on-line decision-making within human–computer collaboration.

blems.
is are
cult to

Irony: combination of circumstances, the result of which is the direct opposite of what might be expected.
Paradox: seemingly absurd though perhaps really well-founded

interpret. (Some types of error may be reported more readily than others, and there may be disagreement about their origin.) The second irony is that the designer who tries to eliminate the operator still leaves the operator to do the tasks which the designer cannot think how to automate. It is this approach which causes the problems to be discussed here, as it means that the operator can be left with an arbitrary collection of tasks, and little thought may have been given to providing support for them.

Ironic Automation

- Manual skills deteriorate when they are not used.
- The generation of “new strategies” requires an adequate knowledge of the [system].
- “There is some concern that the present generation of automated systems, which are monitored by former manual operators, are riding on their skills, which later generations of operators *cannot be expected to have*.”
- Automation generally requires a speed versus correctness tradeoff.
- Automation can camouflage current system state.

Ironic Automation, continued

- Automatic systems should fail obviously.


@LateNightSeth
YA THINK?

Ironic Automation, continued

- Automatic systems should fail obviously.
- Tracing the decision trees made by algorithms can be difficult (*or today, impossible)*.
- This leads to the inability to fully understand the current context of the system when you are paged.

How did I get into *this* mode?

Why did it do this?

How do I **stop it** from doing this?

What it is doing now?!

I know there is some way to get it to do what I want…

Stop interrupting me while I'm busy!

What will it do next?

Ironic Automation, continued

- Automatic systems should fail obviously.
- Tracing the decision trees made by algorithms can be difficult (*or impossible*).
- This leads to the inability to fully understand the current context of the system when you are paged.
- “It is ironic to train operators to follow instructions, and then put them in the system to provide intelligence to it.”

Other Problematic Automation Aspects

- Automation often disconnected or treated distinctly from the application.
- Automation is not co-evolved with the application or treated as a product.
- Teams can (oddly?) devalue the implementation / ownership of automation

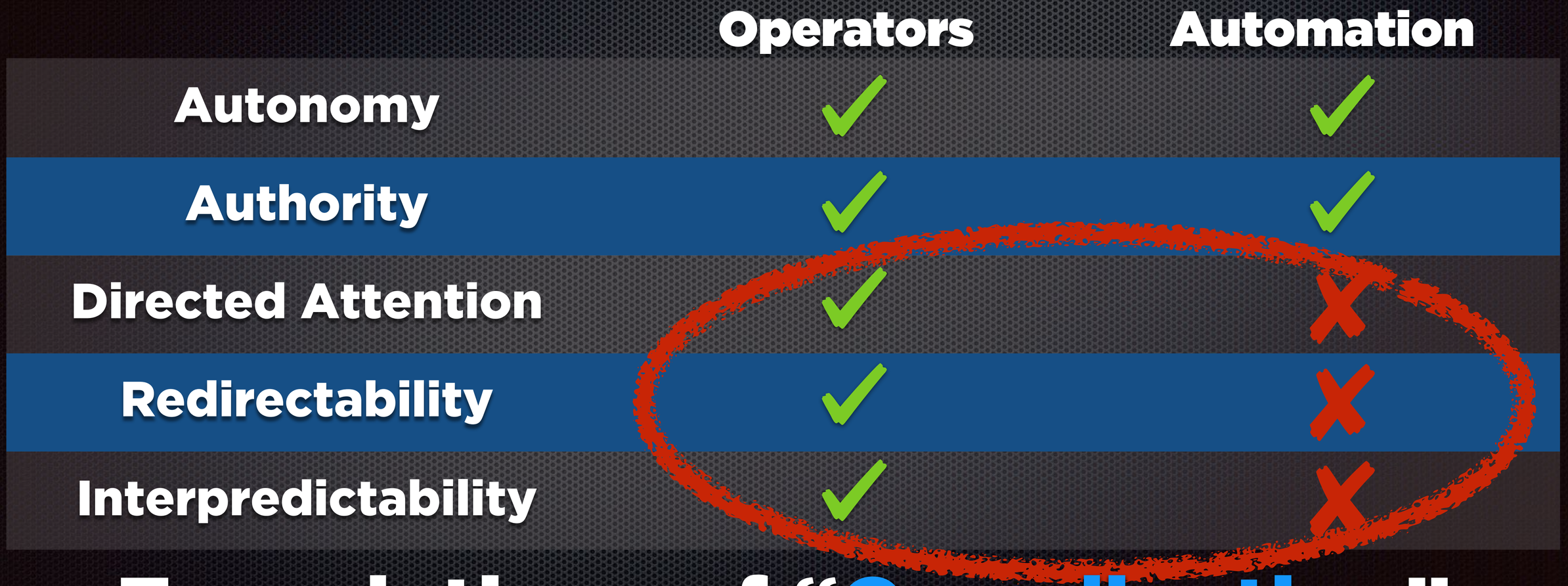
Joint Cognitive System

	Operators
Autonomy	✓
Authority	✓
Directed Attention	✓
Redirectability	✓
Interpredictability	✓

Joint Cognitive System

	Operators	Automation
Autonomy	✓	✓
Authority	✓	✓
Directed Attention	✓	✗
Redirectability	✓	✗
Interpredictability	✓	✗

Joint Cognitive System



Foundations of "Coordination"

“Coordination”

Technologists often mistake connectivity

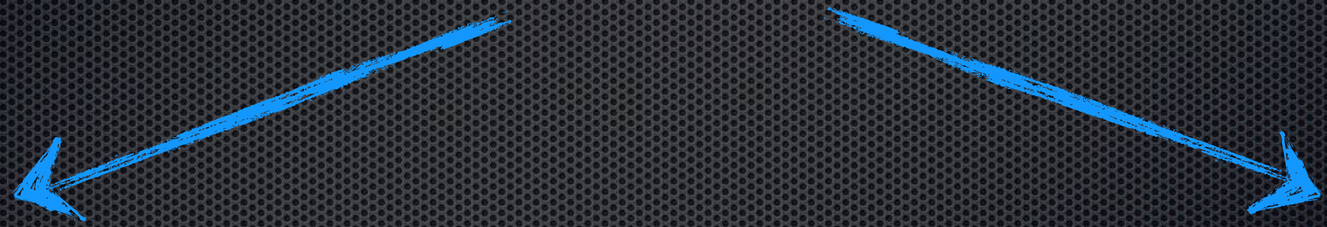
(the technical capability to connect to disparate parties and data sources)

for *coordination*.

— Dave Woods

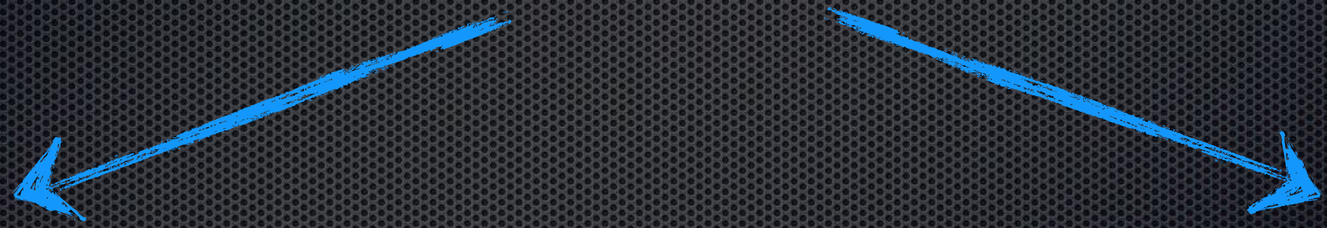
The “Animacy” Paradox

Automated systems, as they increase in autonomy and authority have two kinds of interpretations



The “Animacy” Paradox

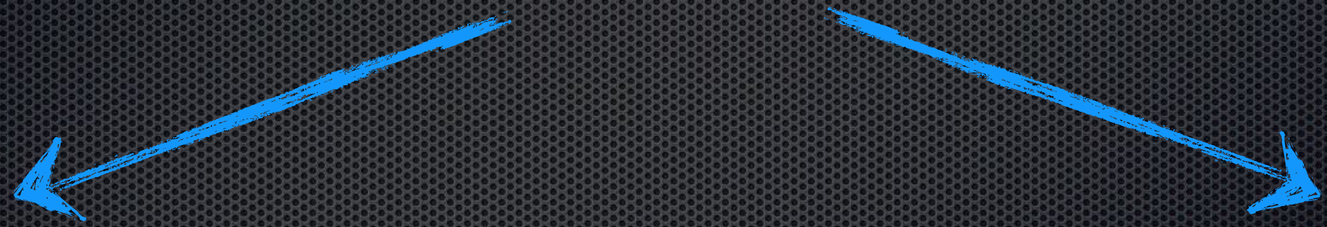
Automated systems, as they increase in autonomy and authority have two kinds of interpretations



As a deterministic machine

The “Animacy” Paradox

Automated systems, as they increase in autonomy and authority have two kinds of interpretations

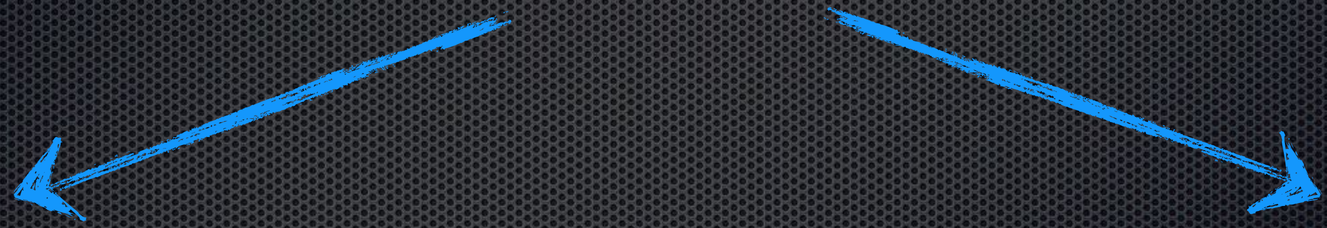


As an animate agent capable of activities independent of the operator

As a deterministic machine

The “Animacy” Paradox

Automated systems, as they increase in autonomy and authority have two kinds of interpretations



As an animate agent capable of activities independent of the operator

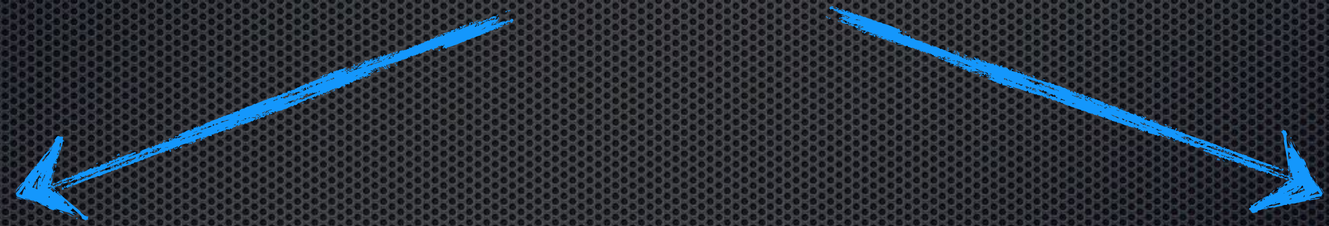
In Context!

As a deterministic machine

In Hindsight!

The “Animacy” Paradox

Automated systems, as they increase in autonomy and authority have two kinds of interpretations



As an animate agent capable of activities independent of the operator

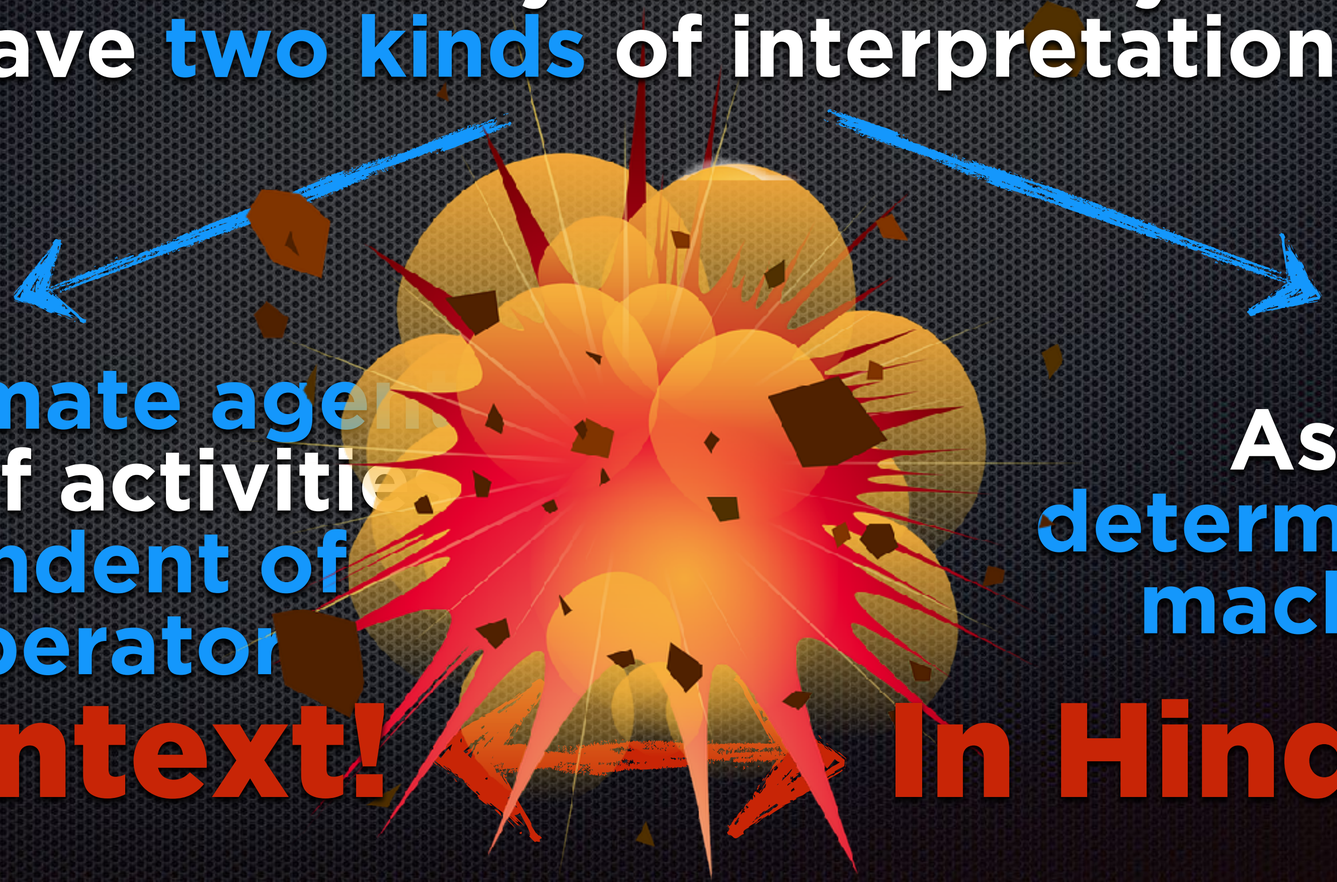
??

As a deterministic machine

In Context!  **In Hindsight!**

The “Animacy” Paradox

Automated systems, as they increase in autonomy and authority have two kinds of interpretations



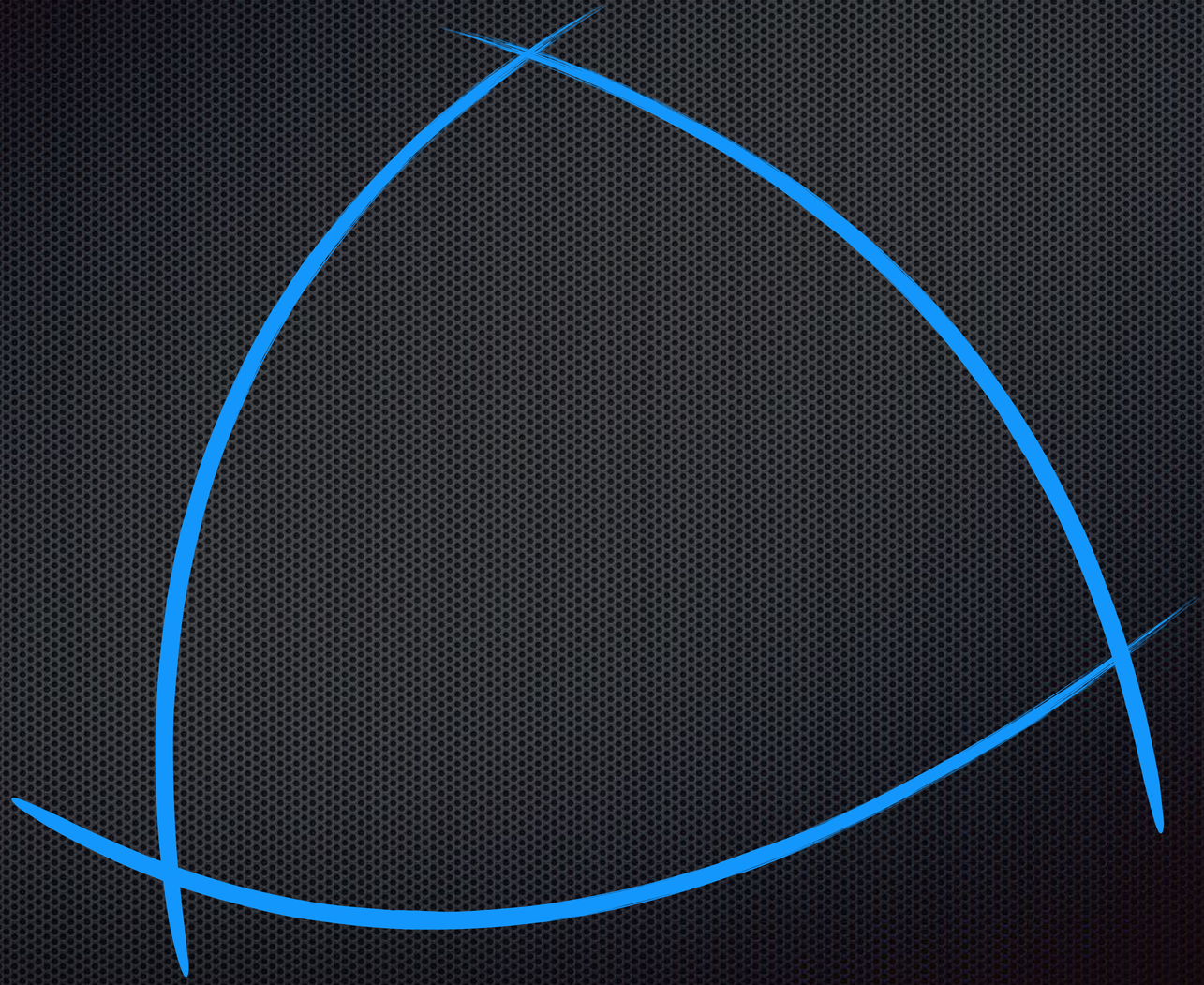
As an animate agent capable of activities independent of the operator

In Context!

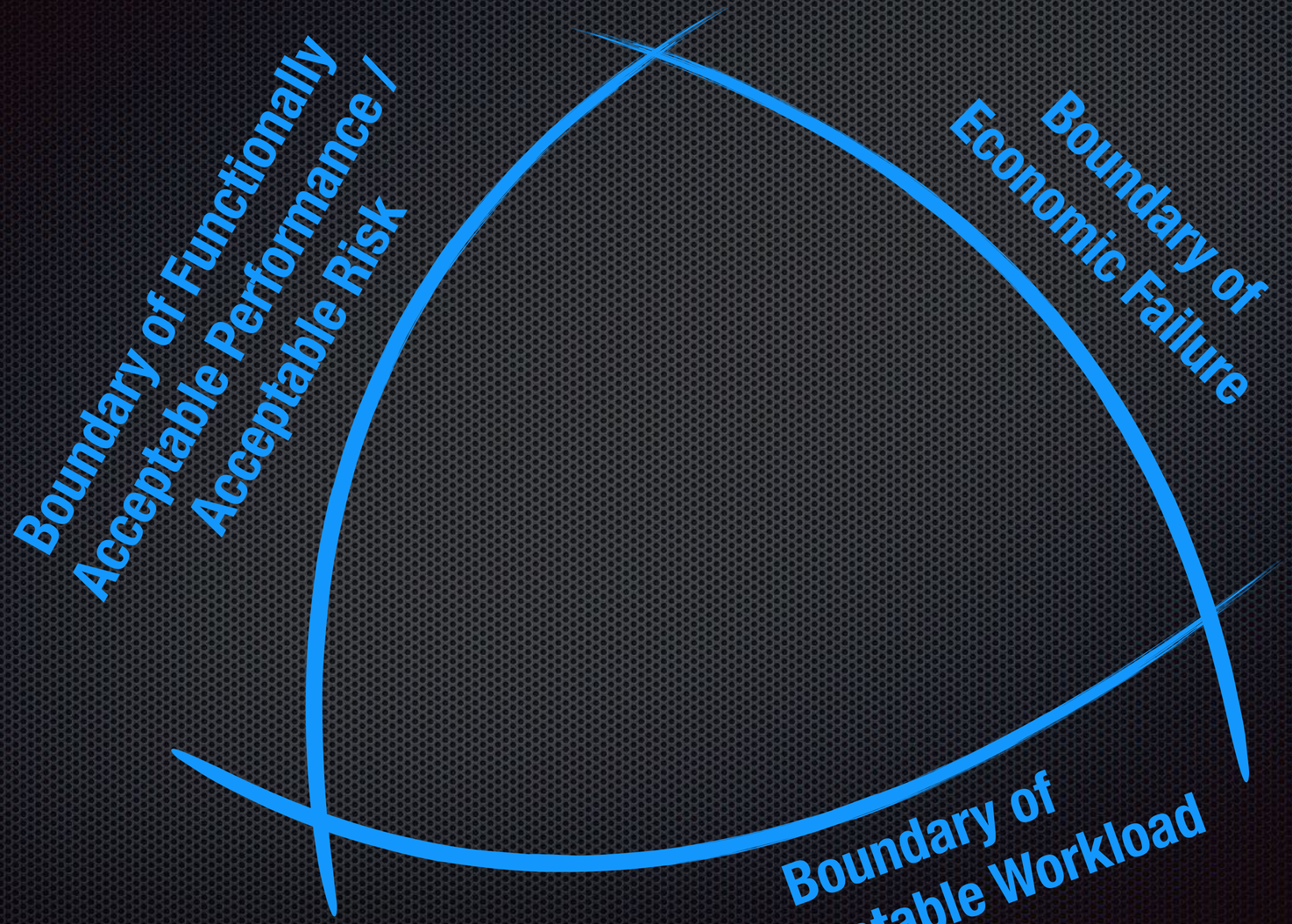
As a deterministic machine

In Hindsight!

The Rasmussen Triangle

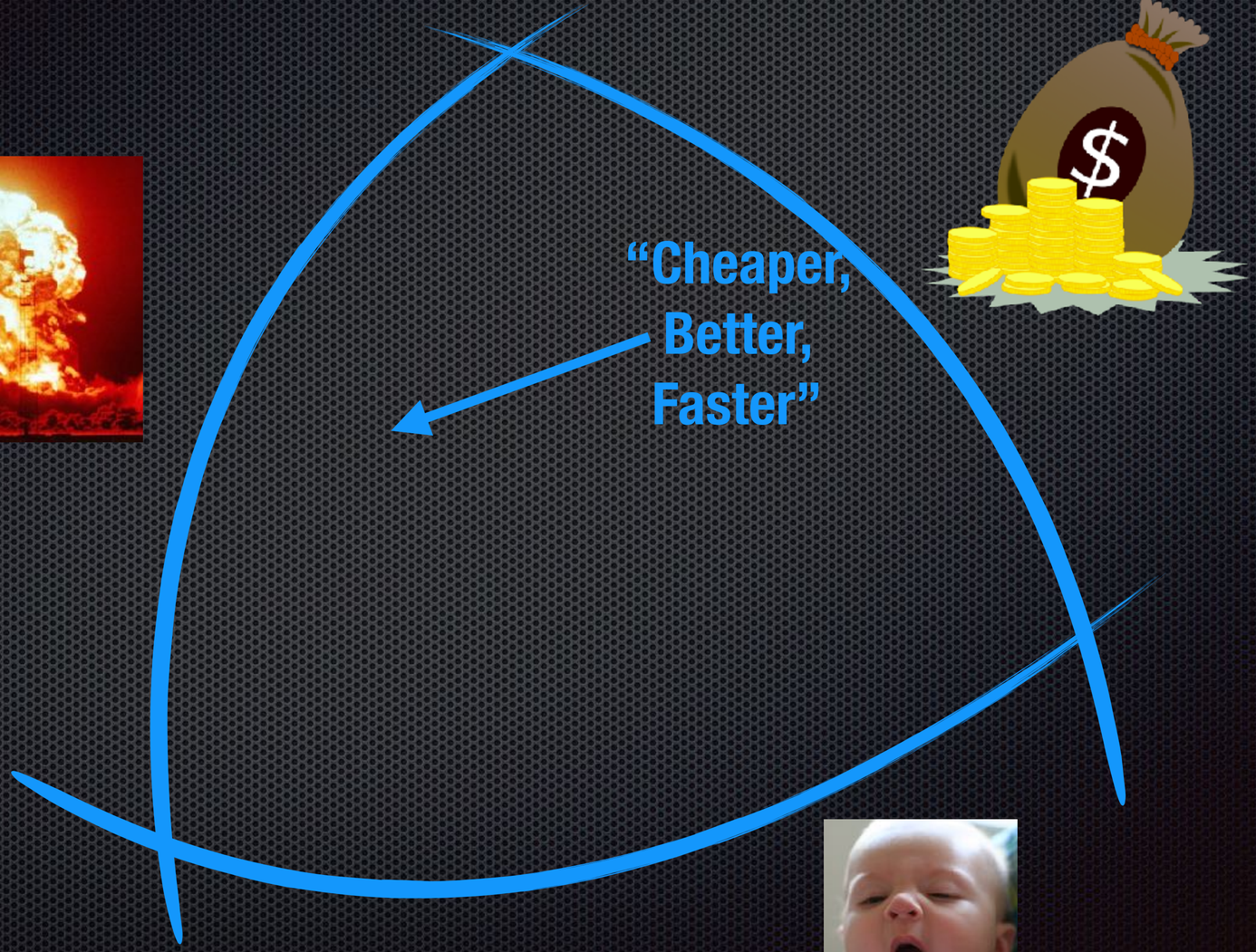


The Rasmussen Triangle

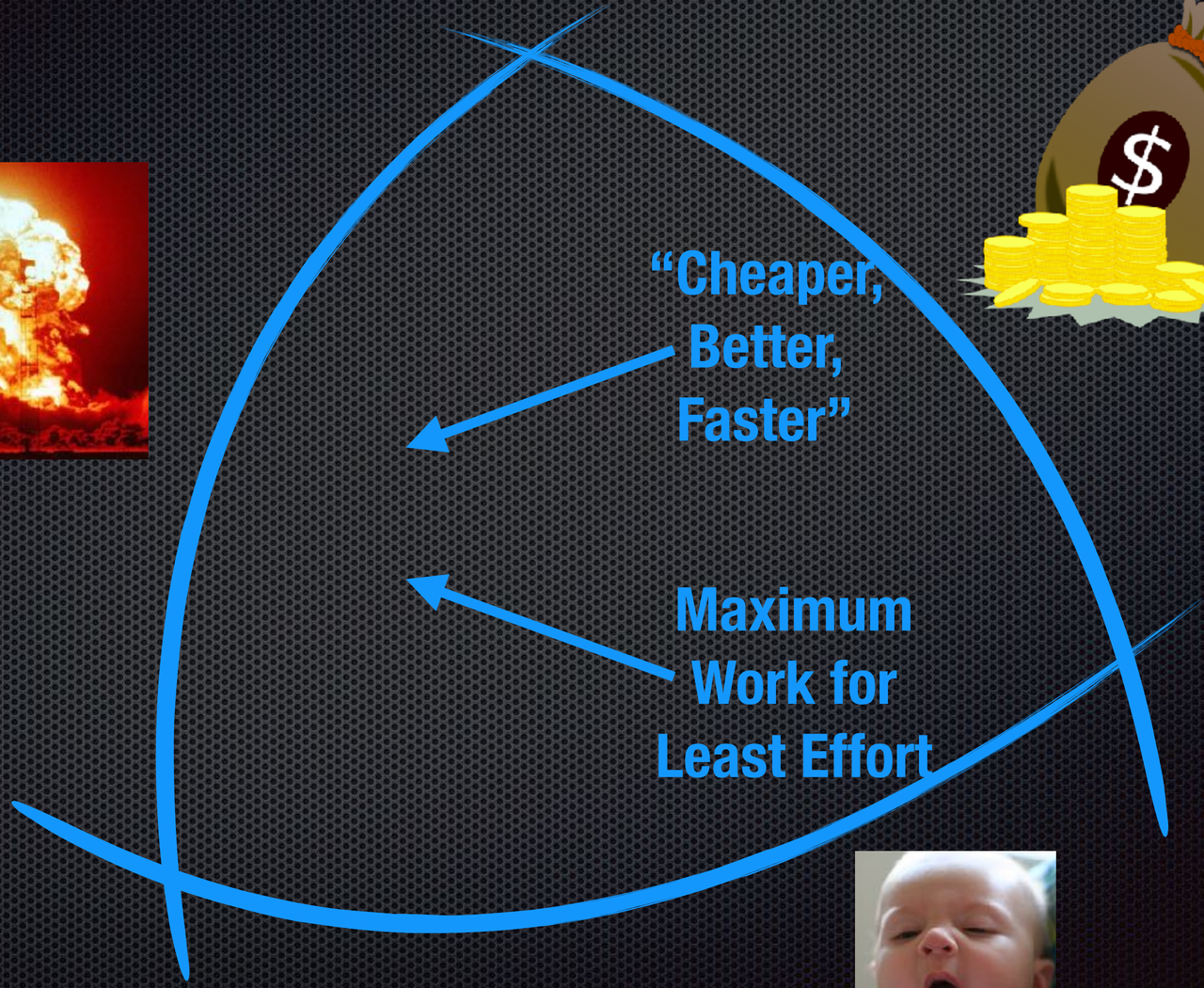


The Rasmussen Triangle

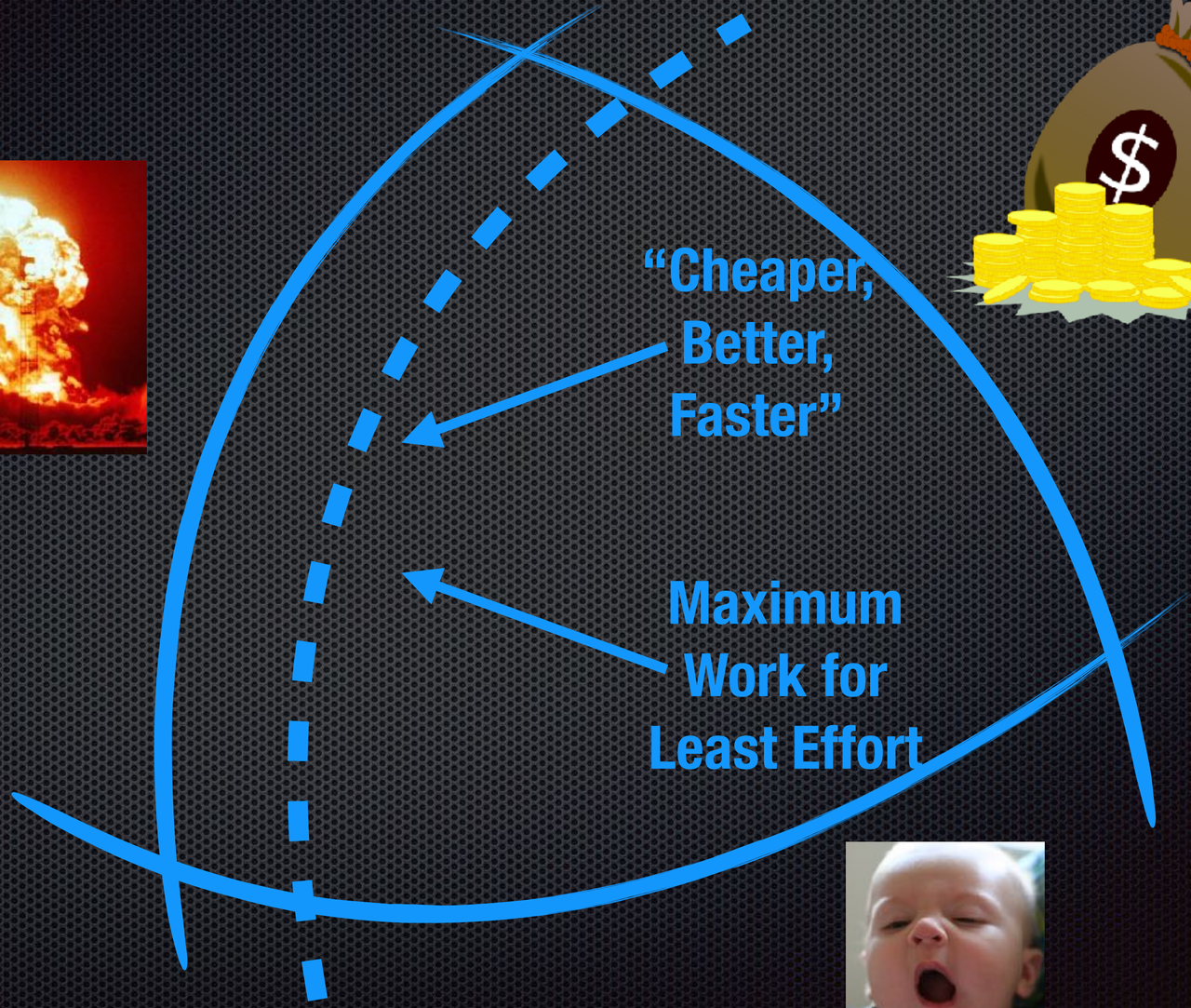
The Rasmussen Triangle



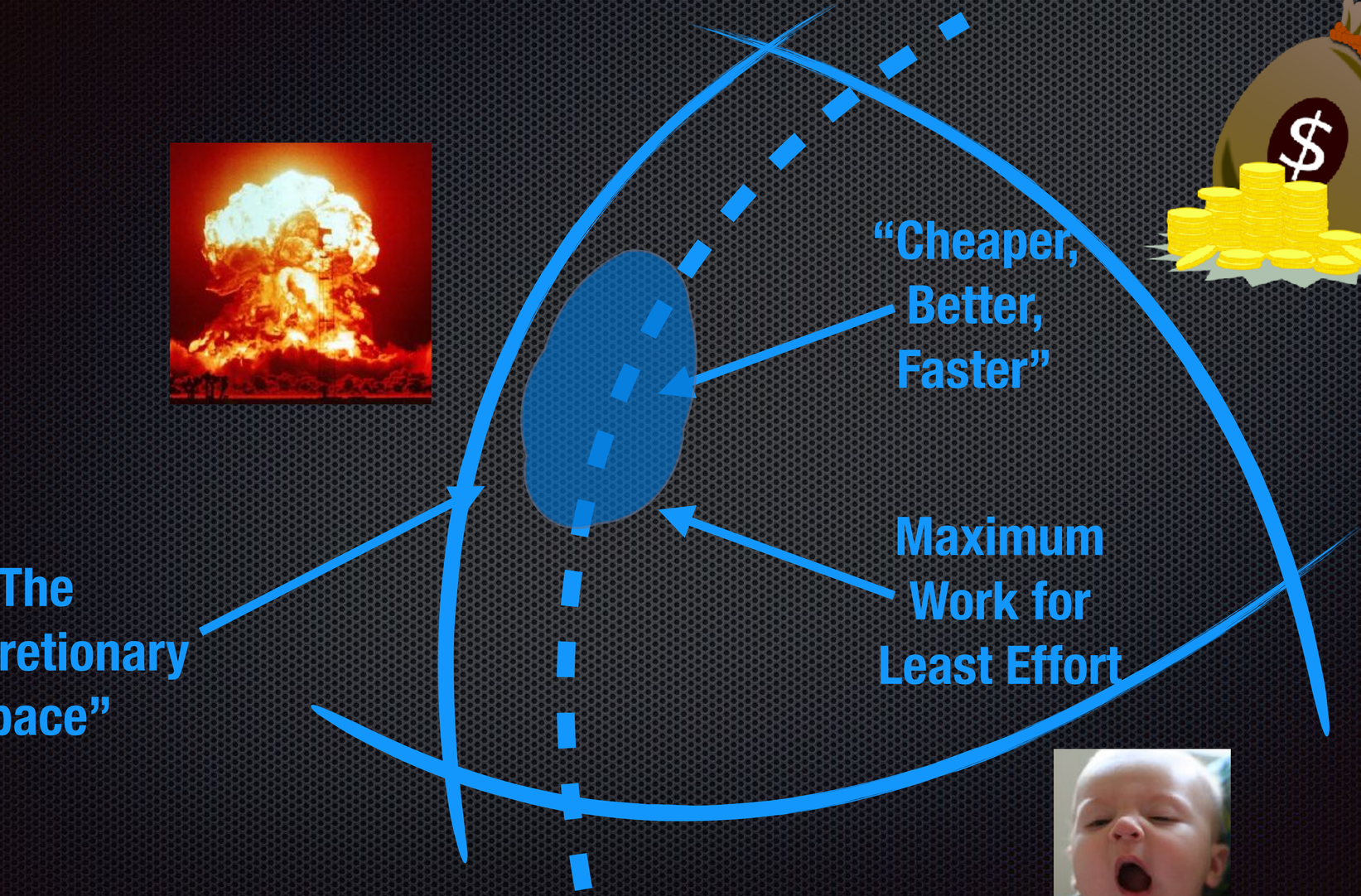
The Rasmussen Triangle



The Rasmussen Triangle



The Rasmussen Triangle



The Rasmussen Triangle

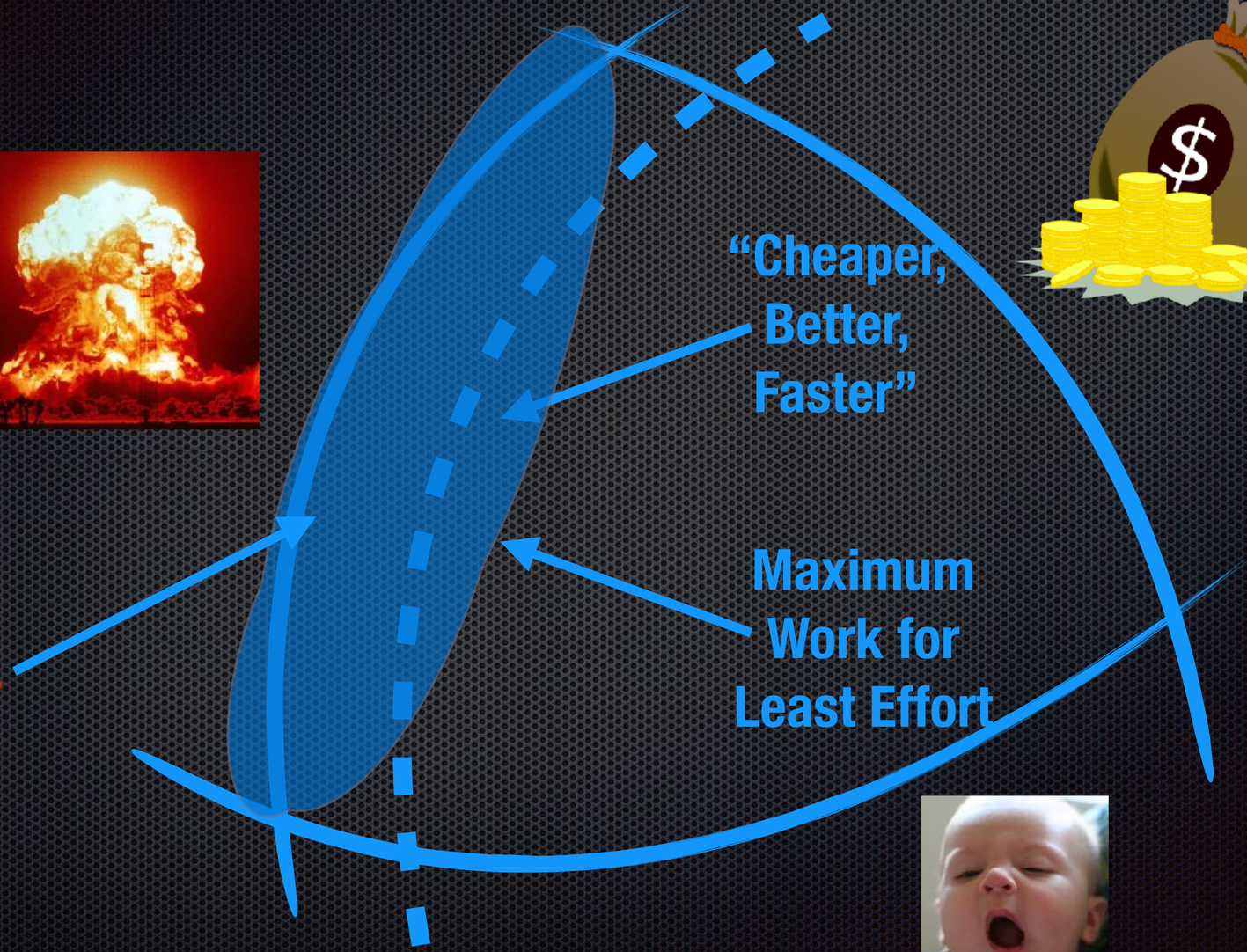
"Cheaper, Better, Faster"

Maximum Work for Least Effort

The "Discretionary Space"

The Rasmussen Triangle

Automation Cannot Deal with The "Discretionary Space"



"Cheaper, Better, Faster"

Maximum Work for Least Effort

So...
We Just Stop Automating Anything?!

So...
We Just Stop Automating Anything?!

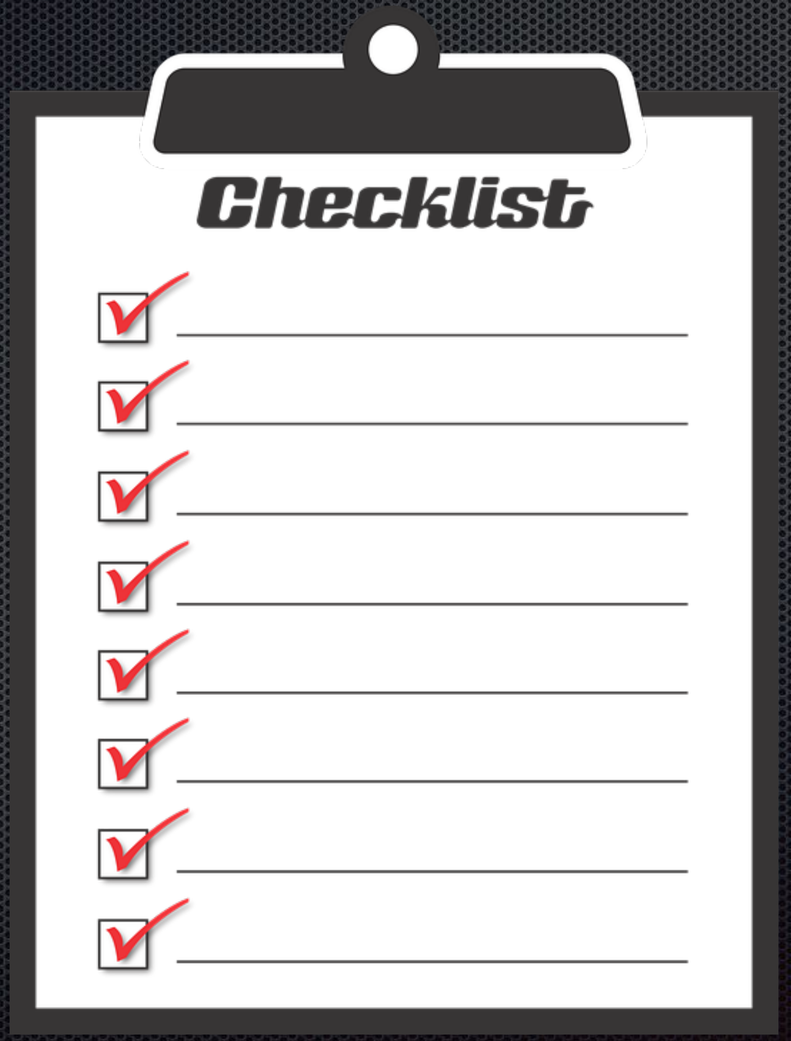
(No.)

A Manifesto

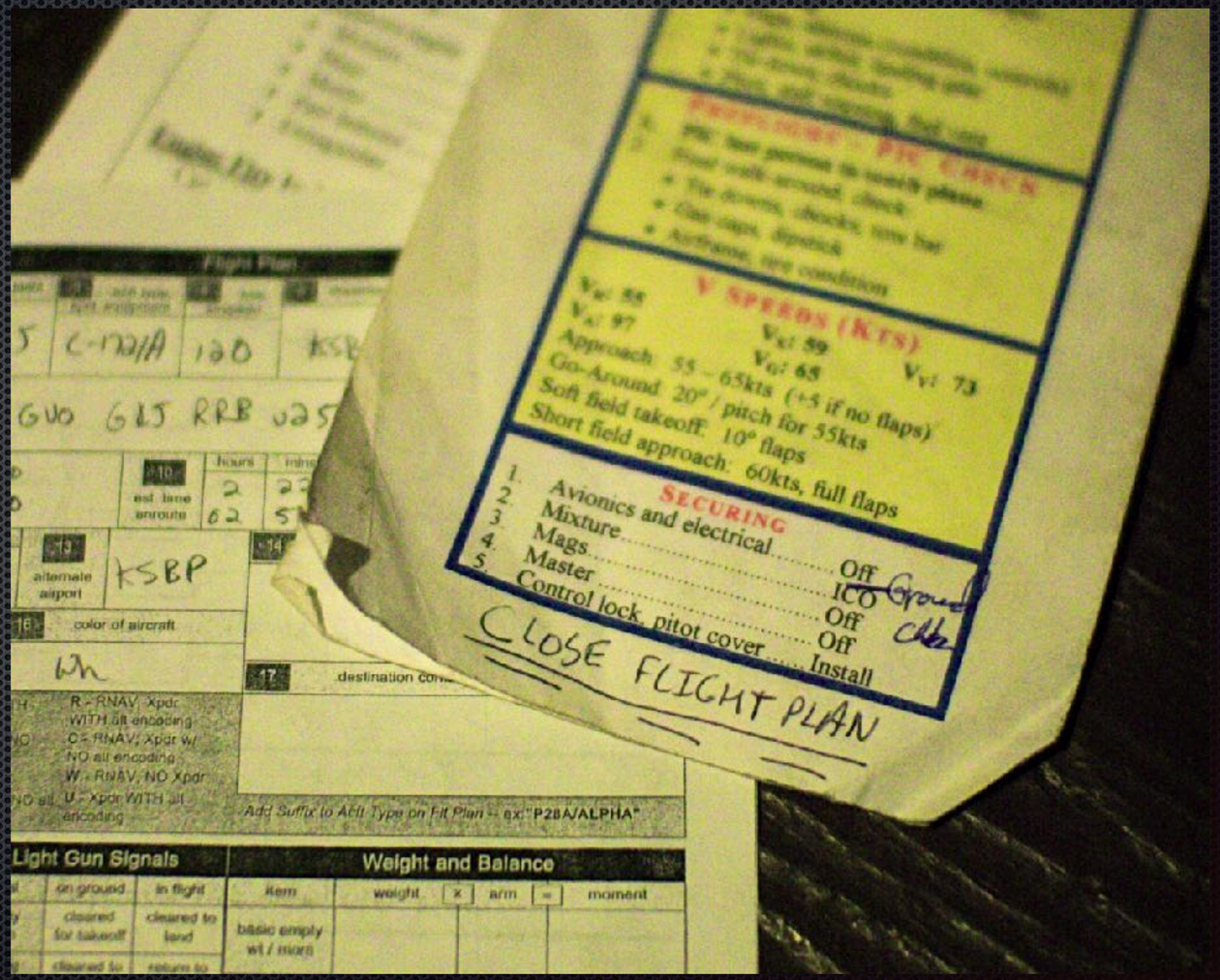
We're obsessed in medicine with having great components—the best drugs, the best devices, the best specialists—but pay little attention to how to make them *fit together well*.

— Atul Gawande

The Checklist™



The Checklist™



The Checklist™

Pre-Release

Checklist

ID	Task	Dep Task	Exec	Vrfy	Notes+Deviations+Observations
1.1	Identify/confirm **Release Reps** from each team		P	All	
1.2	Identify/confirm **projected release dates**		P	E	
1.3	Validate **expected User Stories** have landed		P	E	
1.4	Select **Agent Version** number		P	E	
1.5	Create internal **Release Summary** document	1.3	P	-	
1.6	Determine whether this release will trigger an **AFP run**	1.5	P	-	
1.7	**Schedule QA** Time block (6 hours); validate schedule with Engineering release team	1.2	E	-	
1.8	Create release-specific **Slack Channel**		E	-	

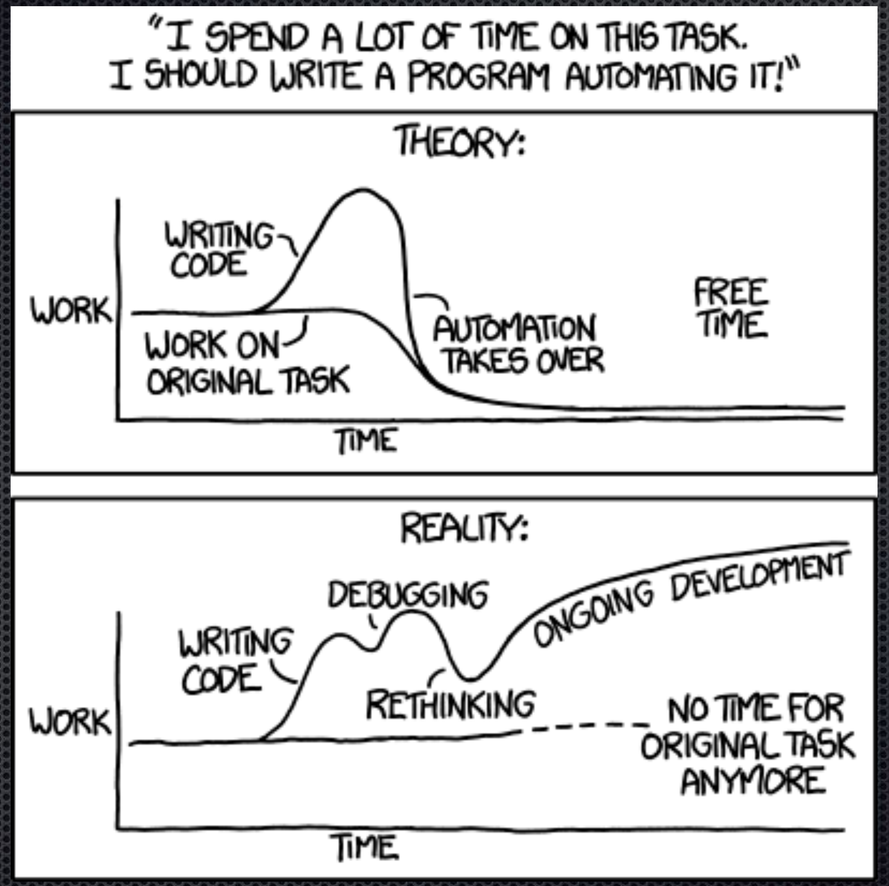
The Checklist™

Pre-Release

Checklist

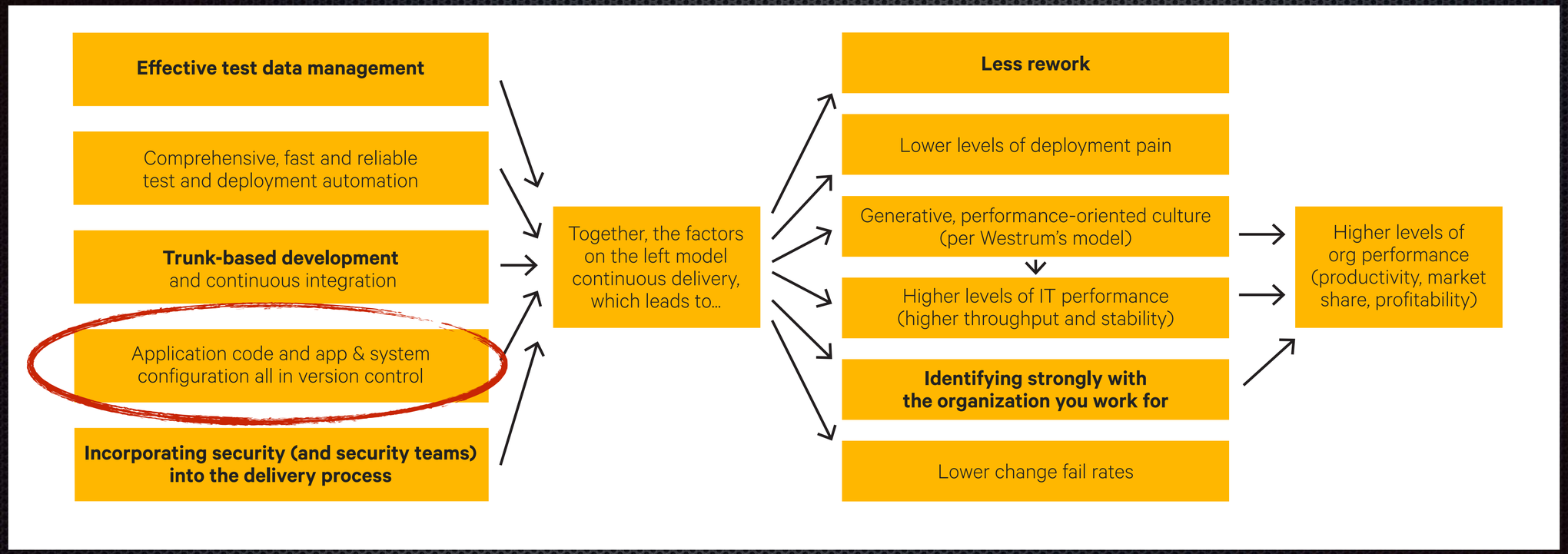
ID	Task	Dep Task	Exec	Vrfy	Notes+Deviations+Observations
1.1	Identify/confirm **Release Reps** from each team		P	All	
1.2	Identify/confirm **projected release dates**		P	E	
1.3	Validate **expected User Stories** have landed		P	E	
1.4	Select **Agent Version** number		P	E	
1.5	Create internal **Release Summary** document	1.3	P	-	
1.6	Determine whether this release will trigger an **AFP run**	1.5	P	-	
1.7	**Schedule QA** Time block (6 hours); validate schedule with Engineering release team	1.2	E	-	
1.8	Create release-specific **Slack Channel**		E	-	

The Real Value: A Requirements Spec



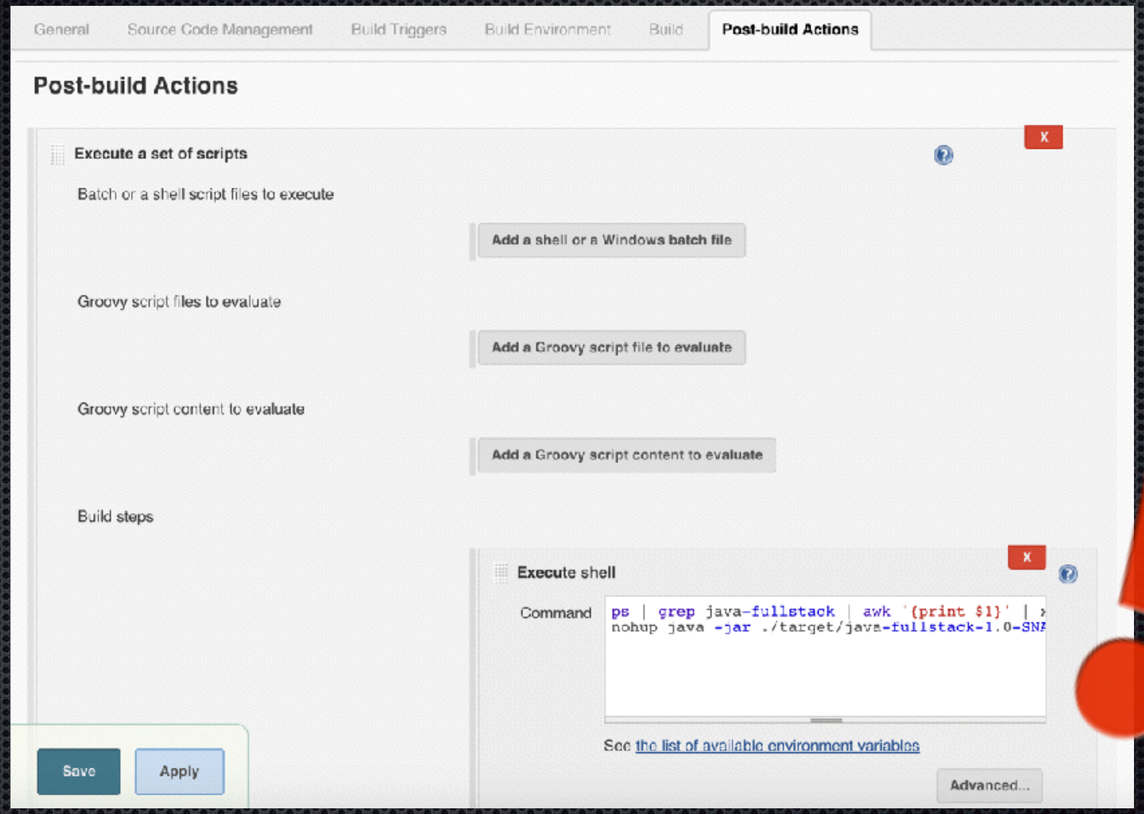
Courtesy XKCD

Version Control: Mattering. *Still.*



2016 State of DevOps Report

Version Control: Mattering. *Still.*



And yet...

Dealing With the Ironies

- Engage in practices that cultivate ability to “buy time”
  - Simulation (i.e. Chaos Engineering, game days, etc.)
  - Widen system understanding
- “Checks” over “locks”
- Consider the element of time pressures when designing automation

Framing Automation Coherently

- Chef / Puppet / Ansible / etc.
- QuickRelease
  - Execute and Verify
  - Rerun single steps
  - Automatic logging

The Checklist™

Pre-Release

Checklist

ID	Task	Dep Task	Exec	Vrfy	Notes+Deviations+Observations
1.1	Identify/confirm **Release Reps** from each team		P	All	
1.2	Identify/confirm **projected release dates**		P	E	
1.3	Validate **expected User Stories** have landed		P	E	
1.4	Select **Agent Version** number		P	E	
1.5	Create internal **Release Summary** document	1.3	P	-	
1.6	Determine whether this release will trigger an **AFP run**	1.5	P	-	
1.7	**Schedule QA** Time block (6 hours); validate schedule with Engineering release team	1.2	E	-	
1.8	Create release-specific **Slack Channel**		E	-	

Framing Automation Coherently

- Chef / Puppet / Ansible / etc.
- QuickRelease
  - Execute and Verify
  - Rerun single steps
  - Automatic logging
- Rerun

https://rerun.github.io/rerun/

--version : Print the rerun version.

USING

Help

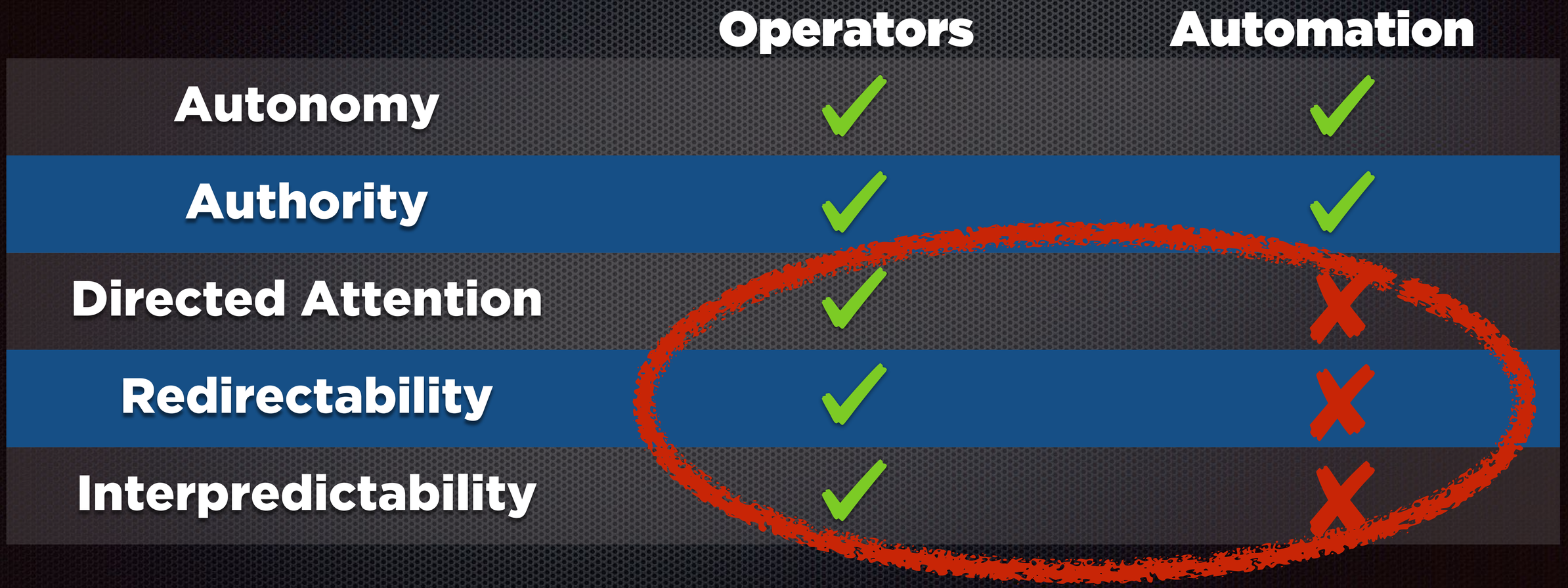
For command line syntax and example usage execute `rerun` using the `--help` flag:

```
$ ./rerun --help
 _ __ ___ _ __ _   _ _ __
| '__/ _ \ '__| | | | '_ \
| | |  __/ |  | |_| | | | |
|_|  \___|_|   \__,_|_| |_|
Version: v0.1. License: Apache 2.0.

Usage: rerun [-h][-v][-V][--version] [-M <dir>] [module:[command [opti

Examples:
| $ rerun
| => List all modules.
| $ rerun waitfor
| => List all waitfor commands.
| $ rerun waitfor:http --url http://google.com
| => Execute the waitfor:http command.
| $ rerun -M /var/rerun waitfor:http
| => Execute the waitfor:http command found in /var/rerun
```

Listing

Without arguments, `rerun` will list existing modules:

Improving Coordination



Improving Coordination

	Operators	Automation
Autonomy	✓	✓
Authority	✓	✓
Limited Control Span	✓	✓
Decomposable Stop/ Start	✓	✓
Interpredictability	✓	🤔

Improving Coordination

	Operators	Automation
Autonomy	✓	✓
Authority	✓	✓
Limited Control Span	✓	✓
Decomposable Stop/ Start	✓	✓
Interpredictability	✓	🤔
Retrospective Audit	✓	✓

So...
We Can Keep Automating Things??

(Yes!)

Automation Isn't "Dangerous" (usually) *but* the way Our Industry Thinks About It... *Can Be*.

Automation *Must* Be Designed.

(And That's a Team Sport.)

Automation Should Be Treated Like a Product

(With an Owner)

Automation That Truly Participates in Our Cognitive Joint Systems Is Still Nacent

Go forth... and Automate!

J. Paul Reed
www.jpaulreed.com
@jpaulreed