



Dr. NMS

or: How Facebook Learned to Stop Worrying and Love the Network

David Rothera [drothera@fb.com]



Jose

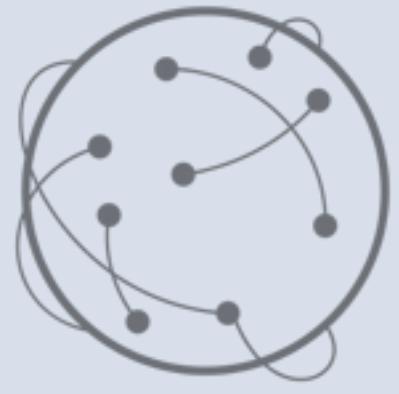
David



facebook
INFRASTRUCTURE

ZERO IMPACT NETWORK

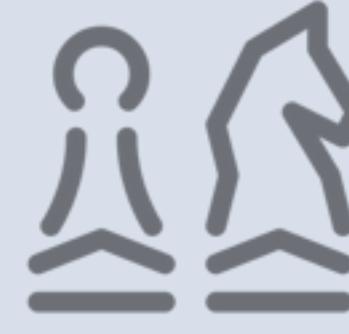
We'll be talking about



Facebook scale



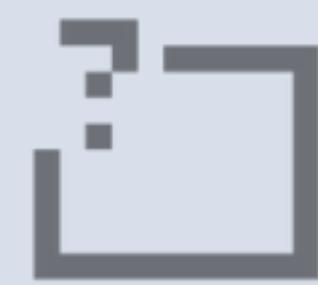
FDN



**Tales from
the real world**



**This journey
is 1% finished**



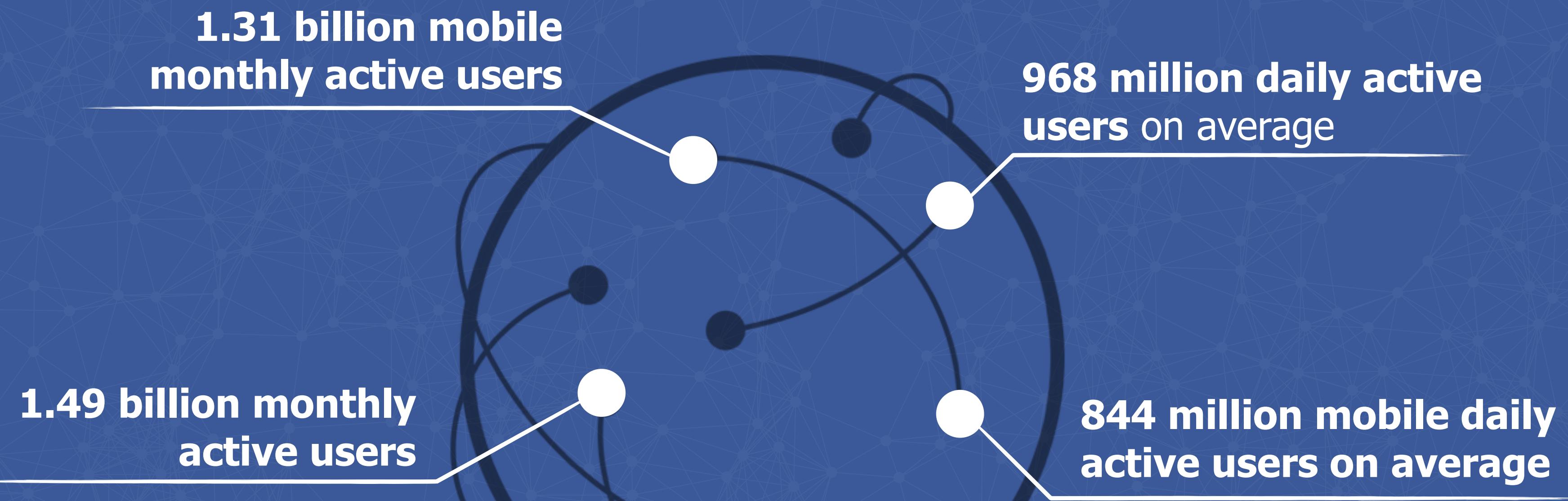
Q&A



Facebook scale

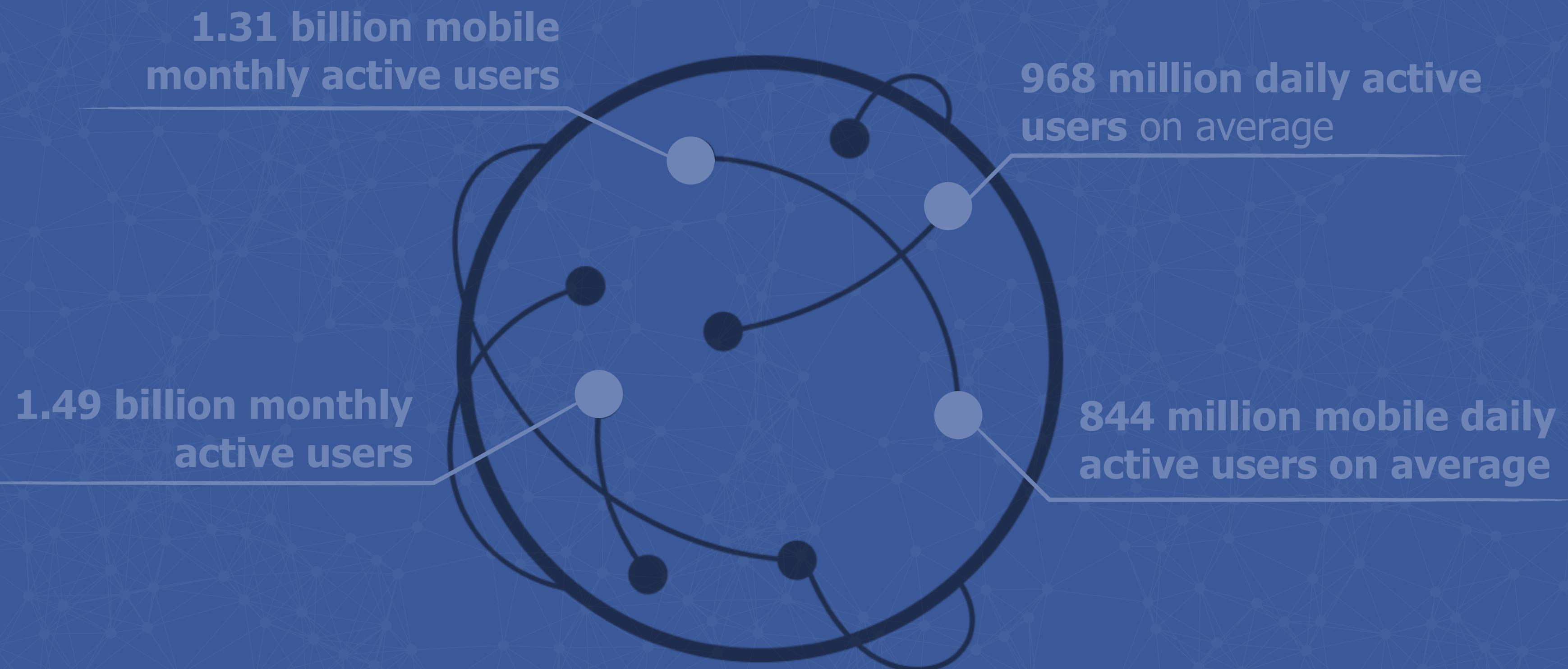
Facebook scale

as of June 2015

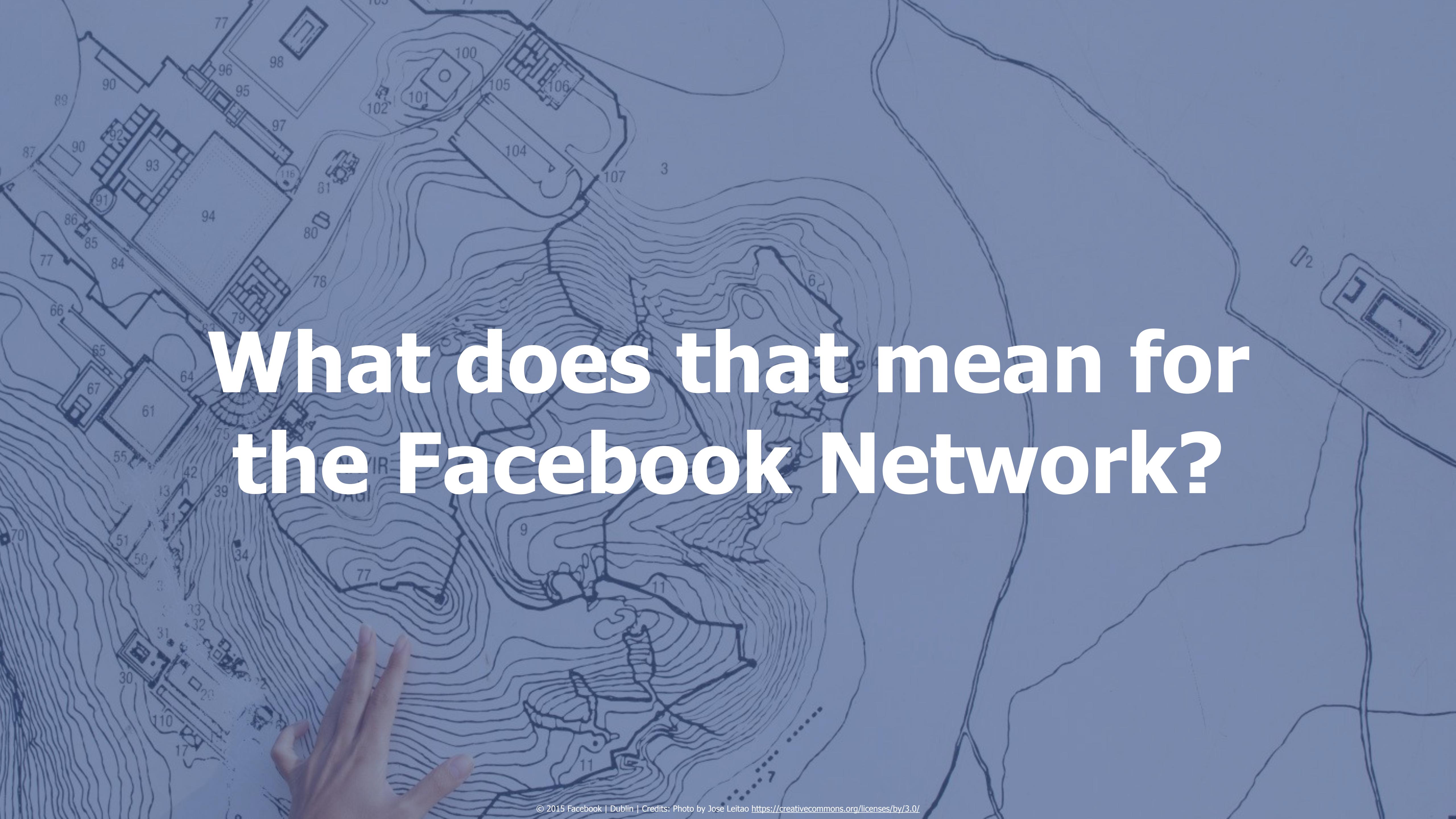


Facebook scale

as of June 2015



Approximately 83.1% of our daily active users are outside the US and Canada

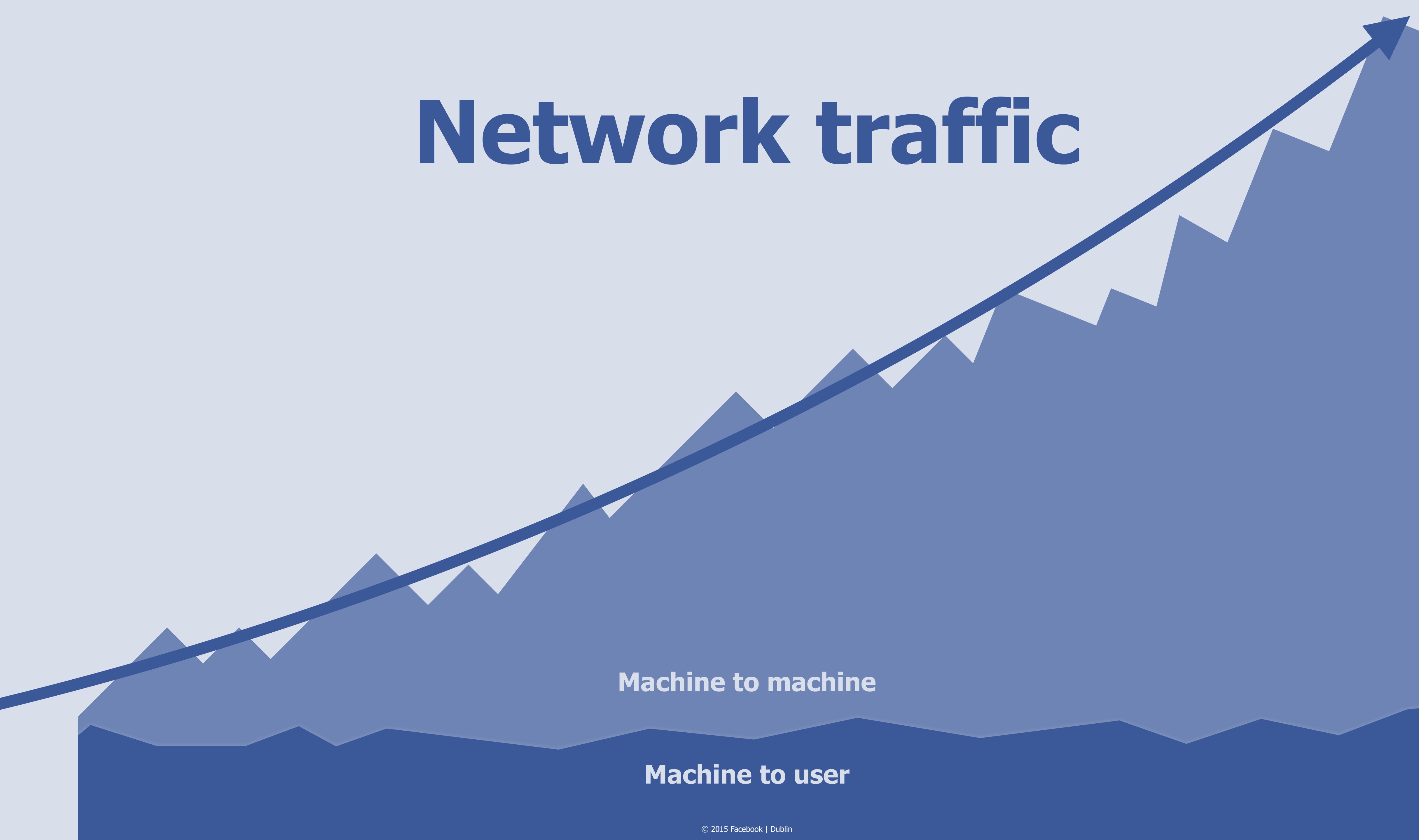


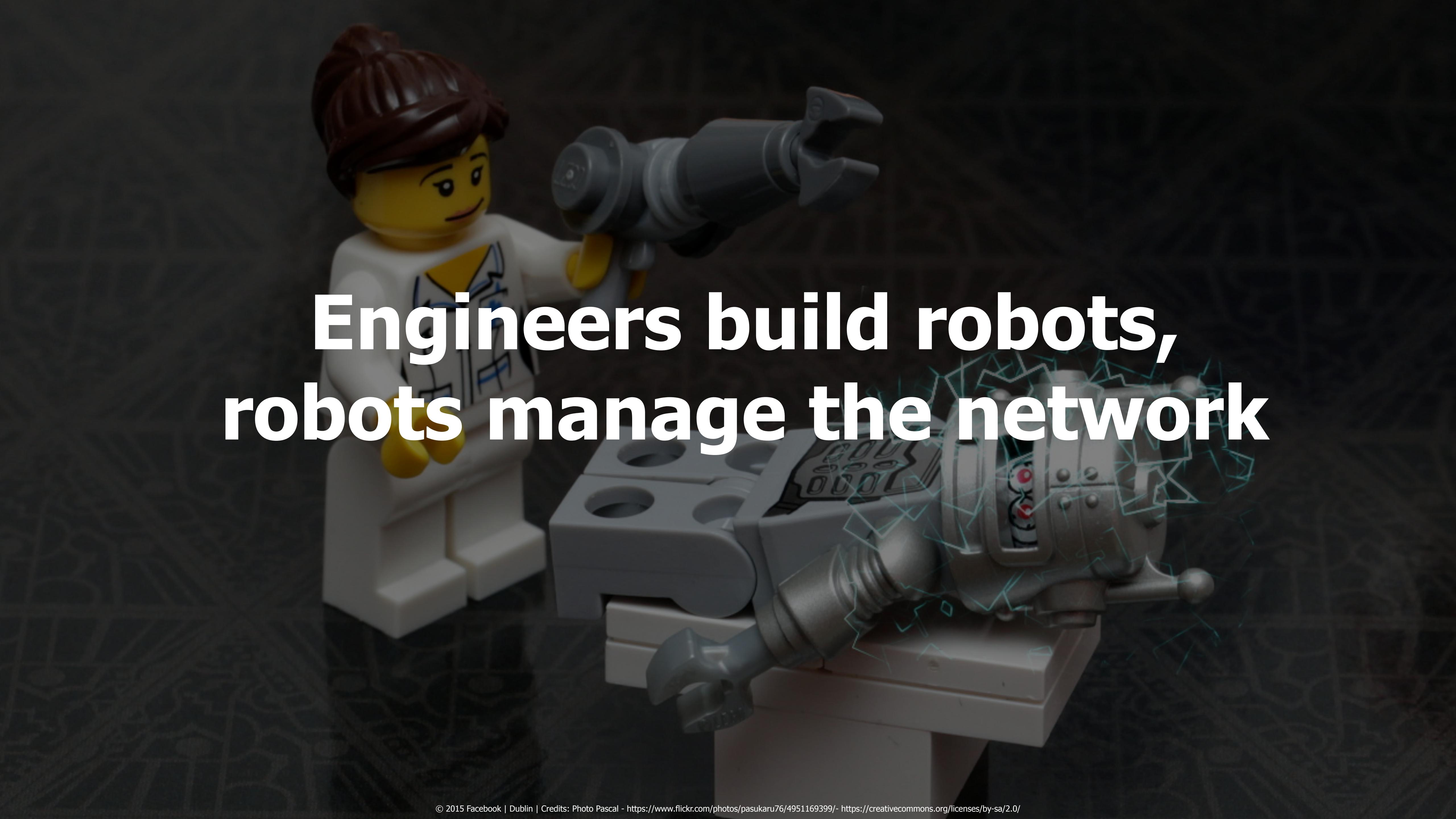
What does that mean for the Facebook Network?

A photograph of a city street, likely in Europe, showing a tram in the foreground. The street is lined with trees and buildings. A complex network of overhead power lines and cables spans the street. Several traffic lights are visible, some showing red. The overall atmosphere is urban and somewhat hazy.

**Lots of traffic and
global footprint**

Network traffic

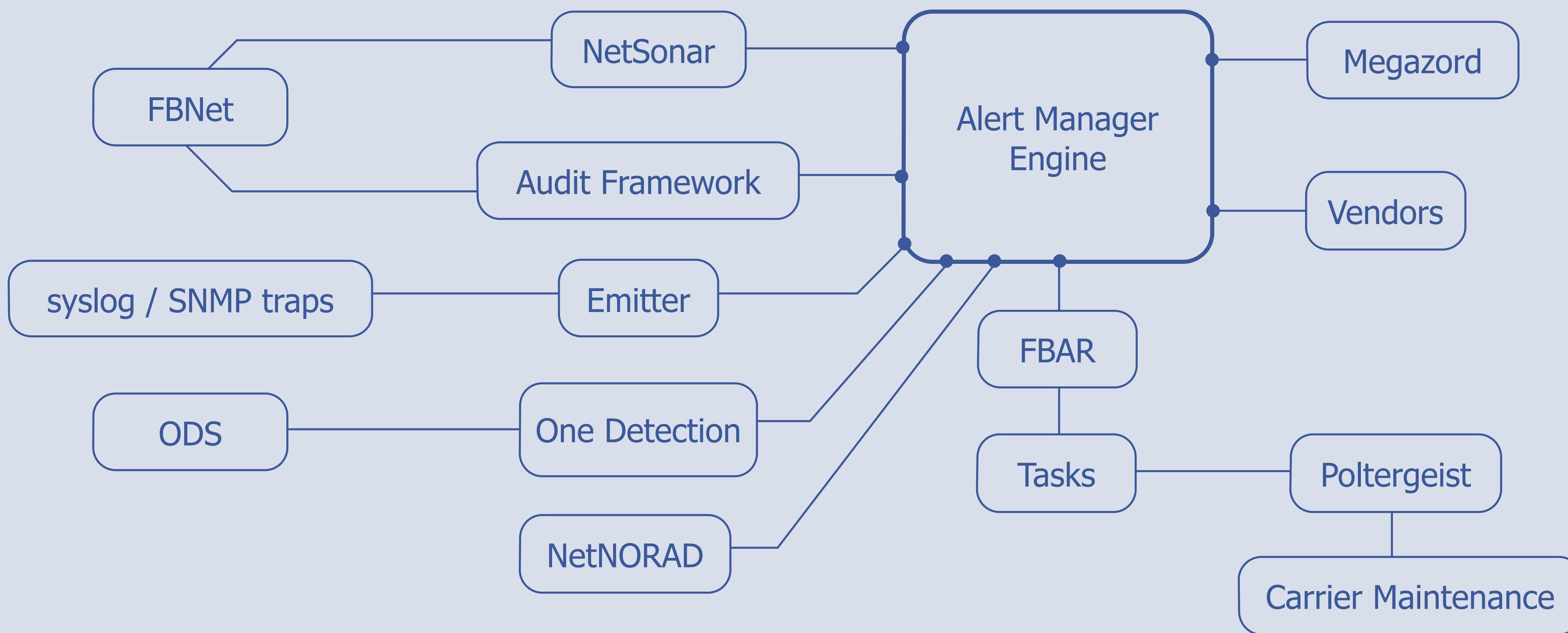




**Engineers build robots,
robots manage the network**

Facebook Defined Networking

Facebook Defined Networking



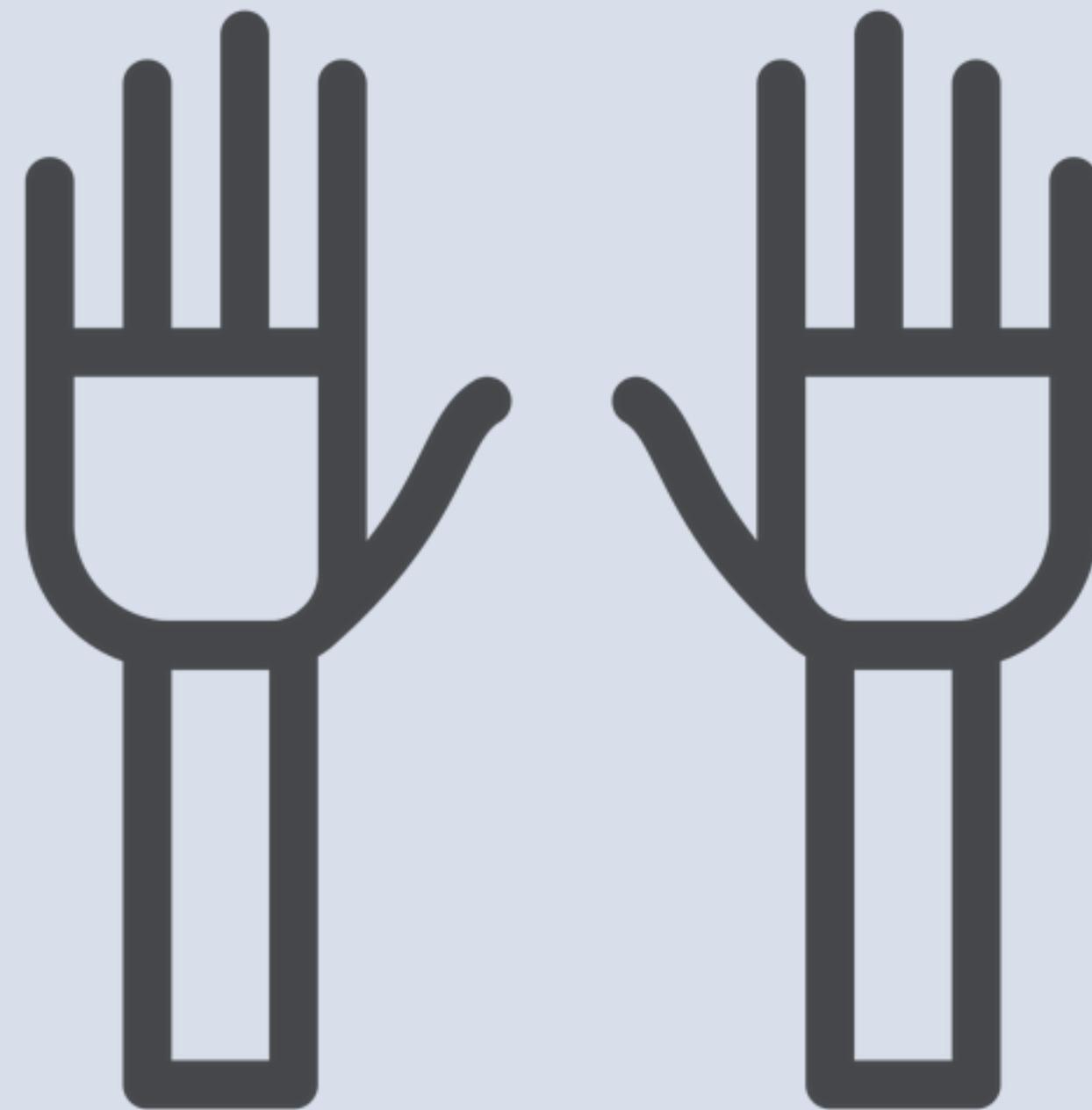
FBNet

The brains to help guide our robots run the network



Drain Services

The movers of traffic on the network devices



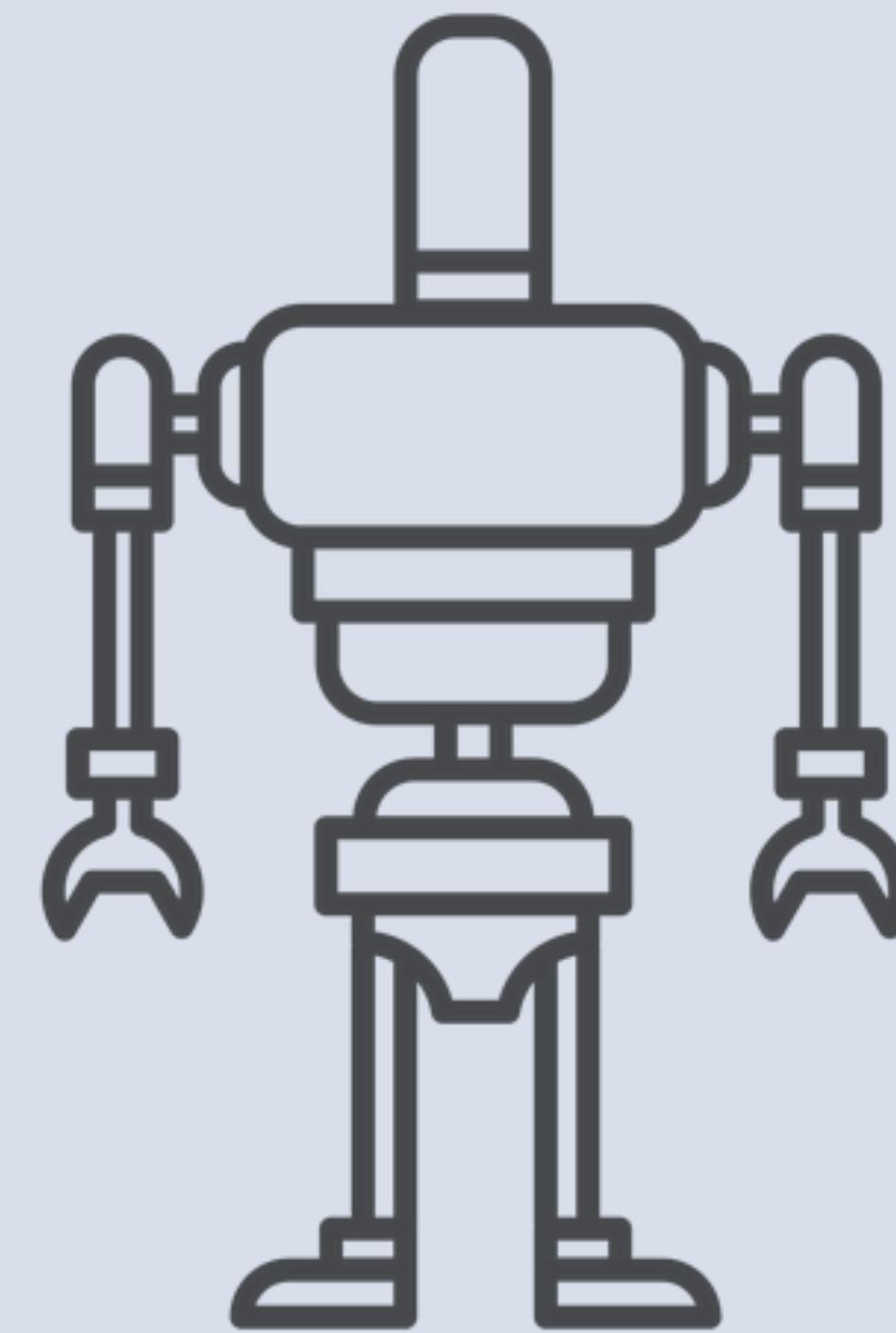
NetNORAD

Our Packet Loss detection system



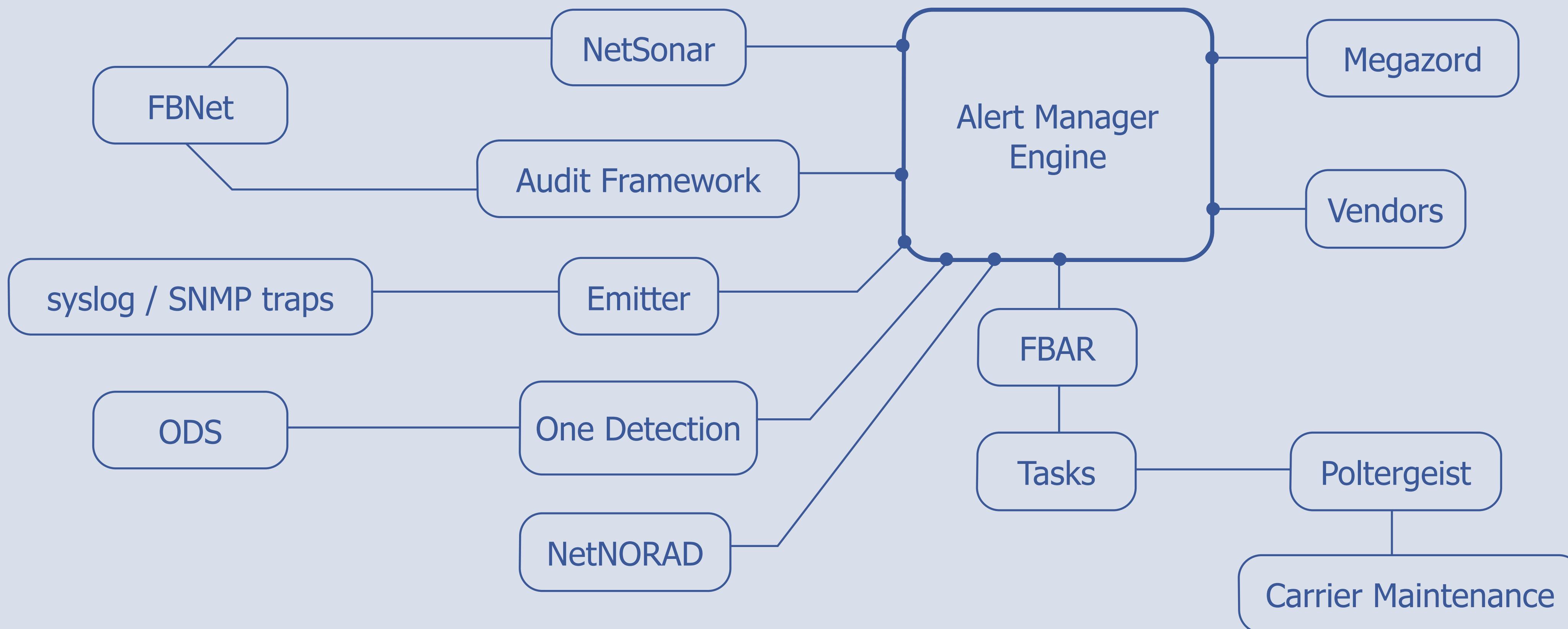
Megazord

Our alarm correlation engine



Facebook Defined Networking

all components in action

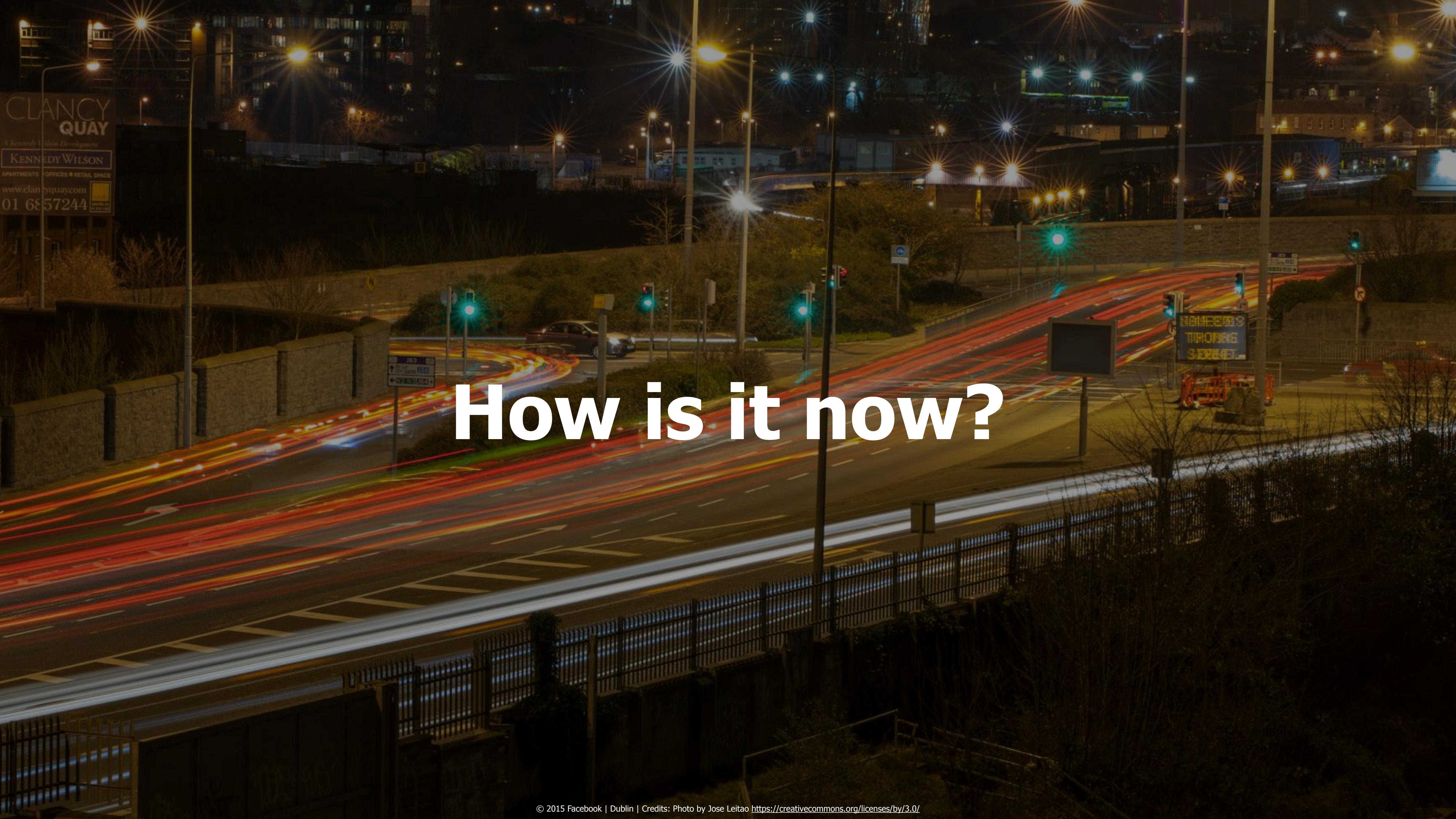




Tales from the real world

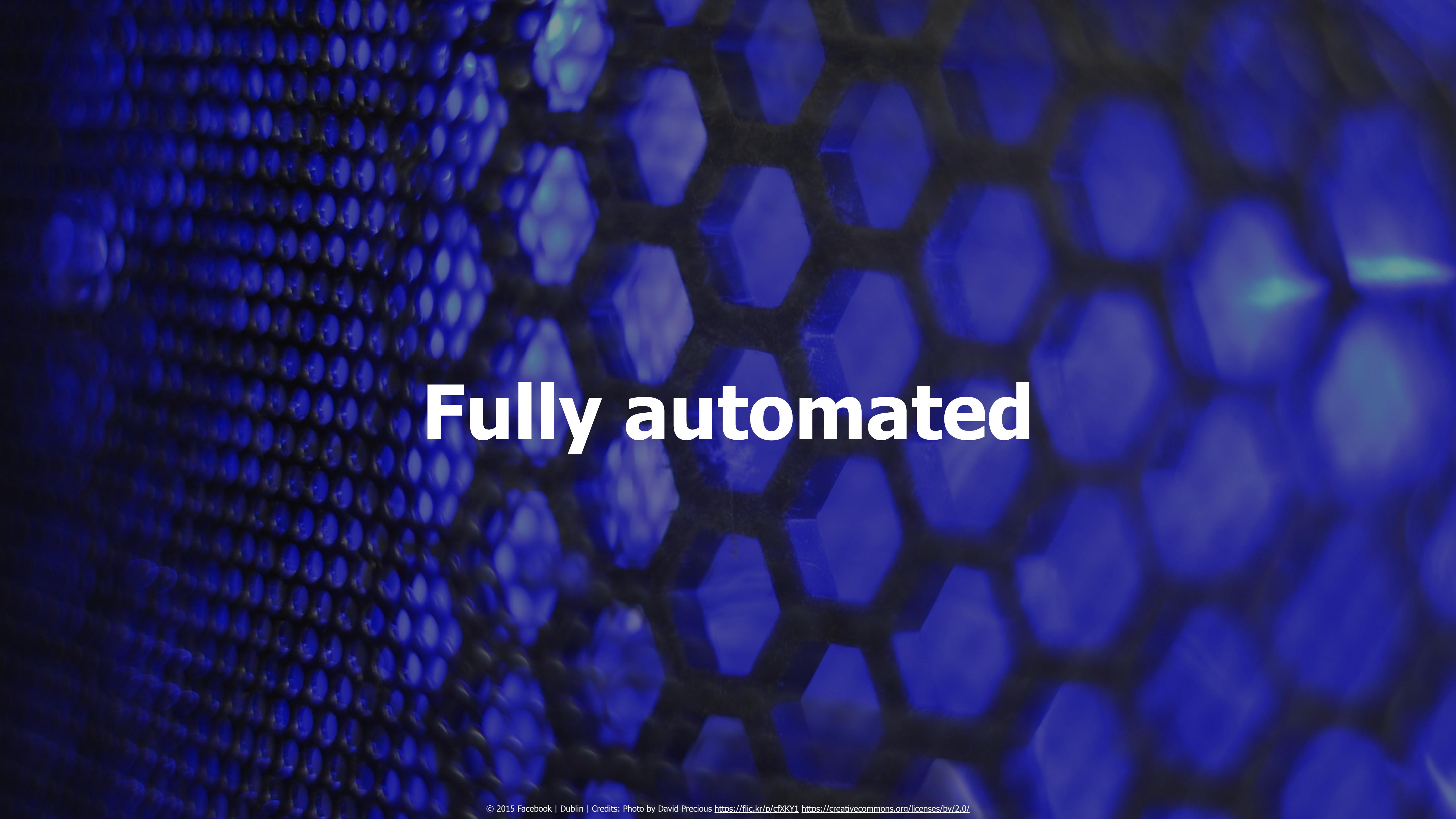
Circuits @ scale





How is it now?

CLANCY
QUAY
A Kennedy Wilson Development.
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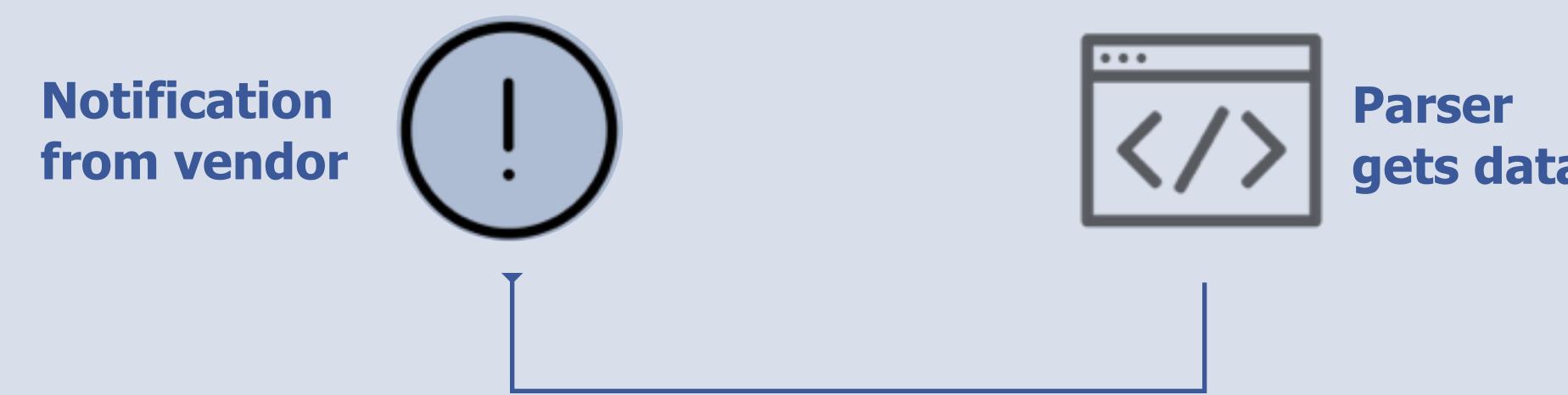
Fully automated

How is it now?

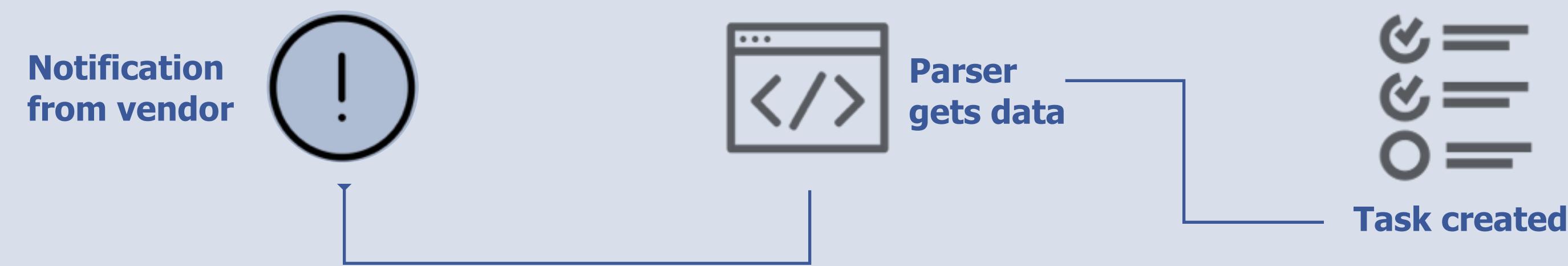
Notification
from vendor



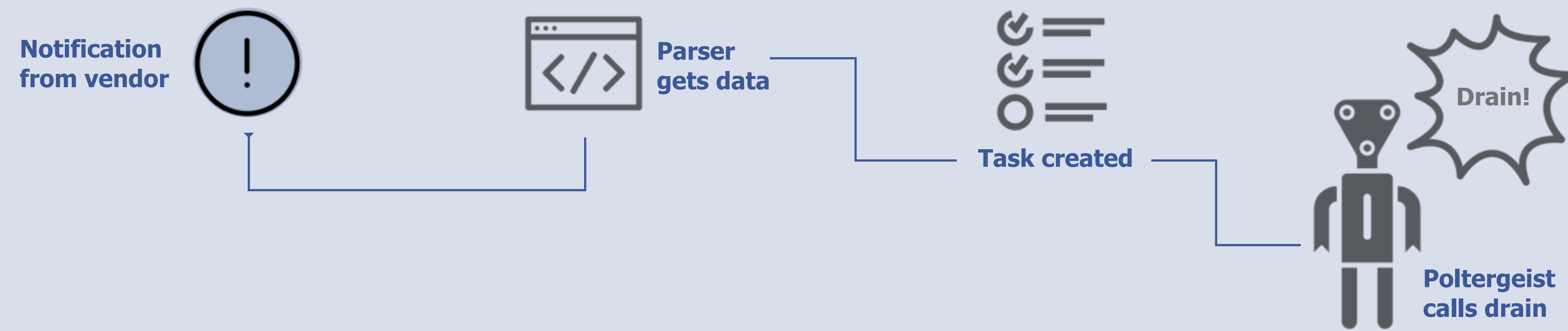
How is it now?



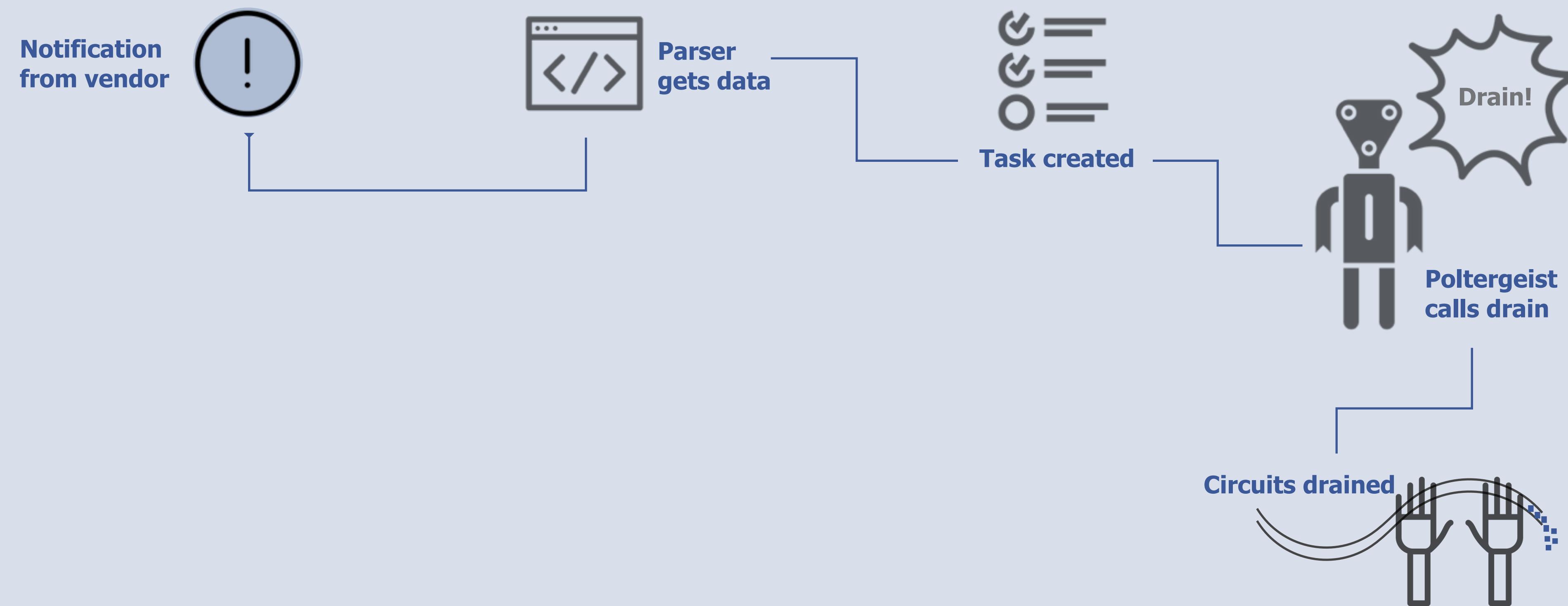
How is it now?



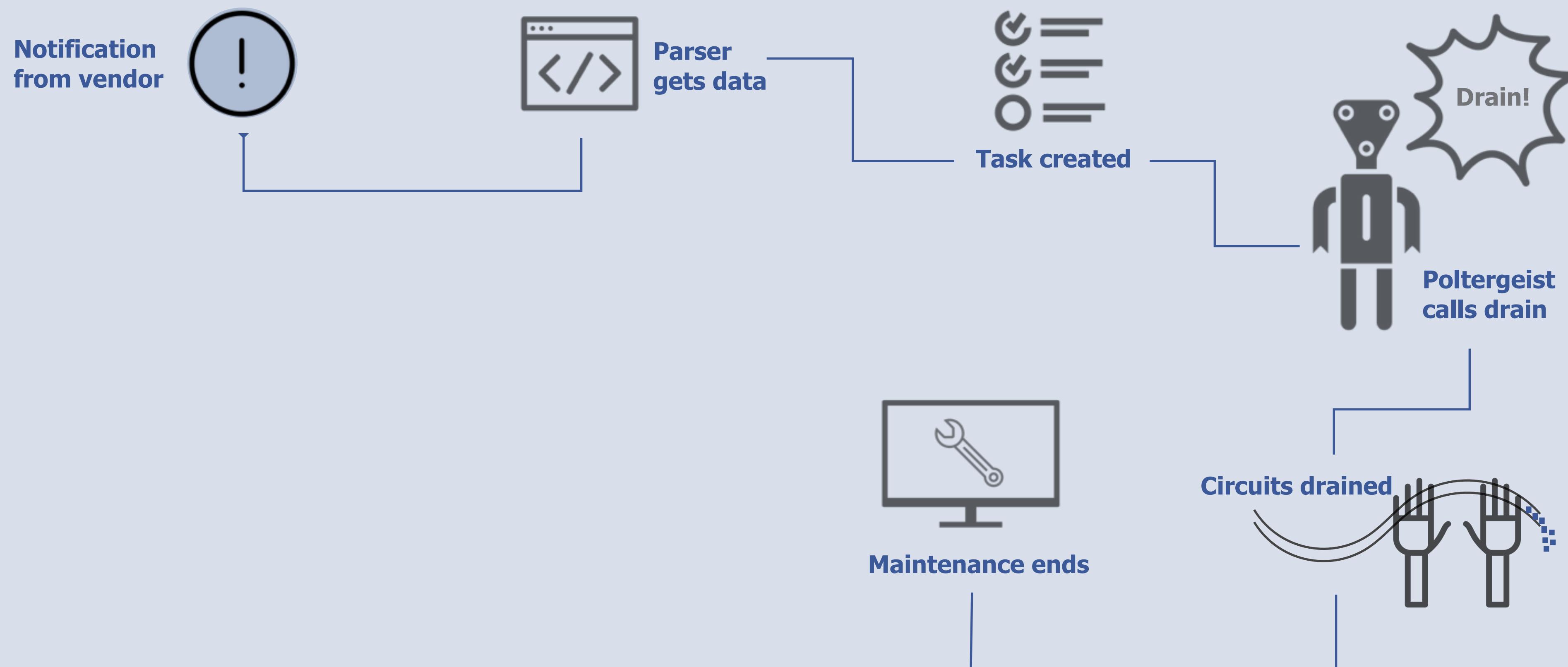
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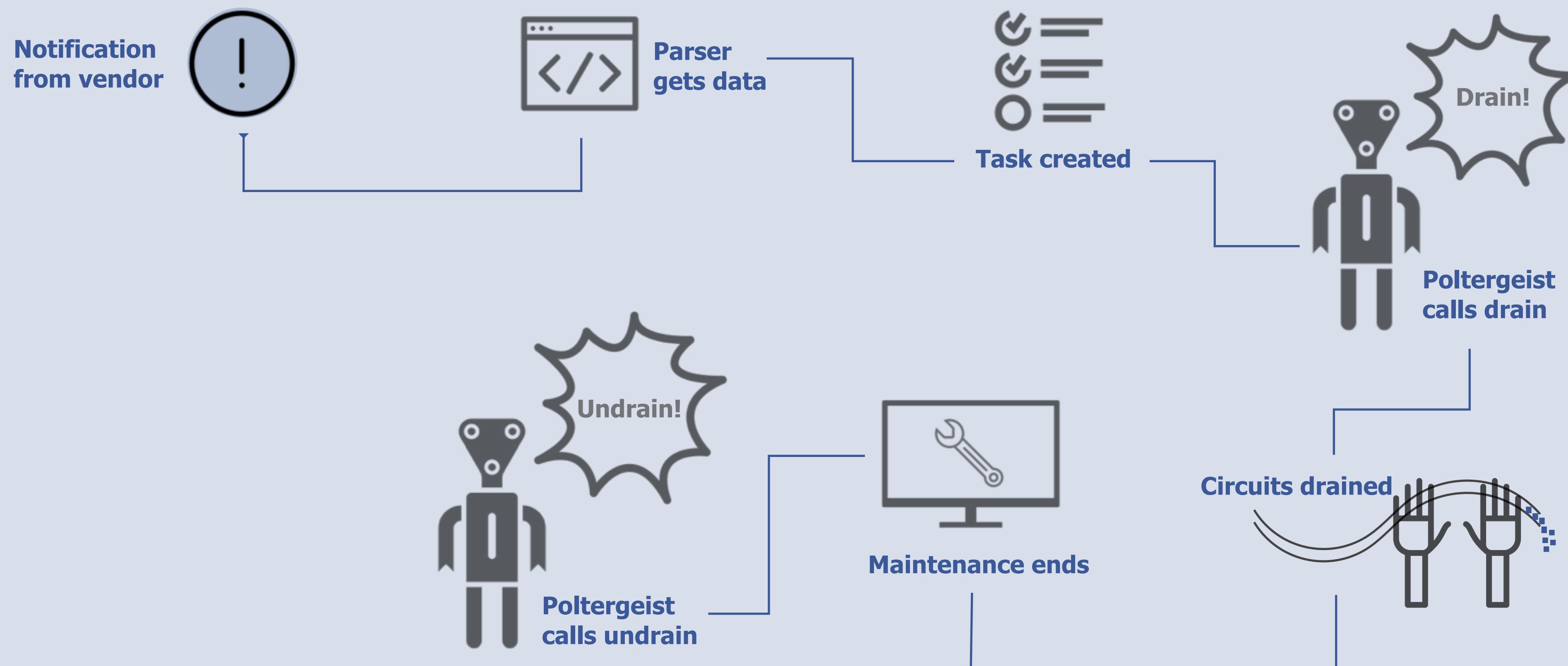
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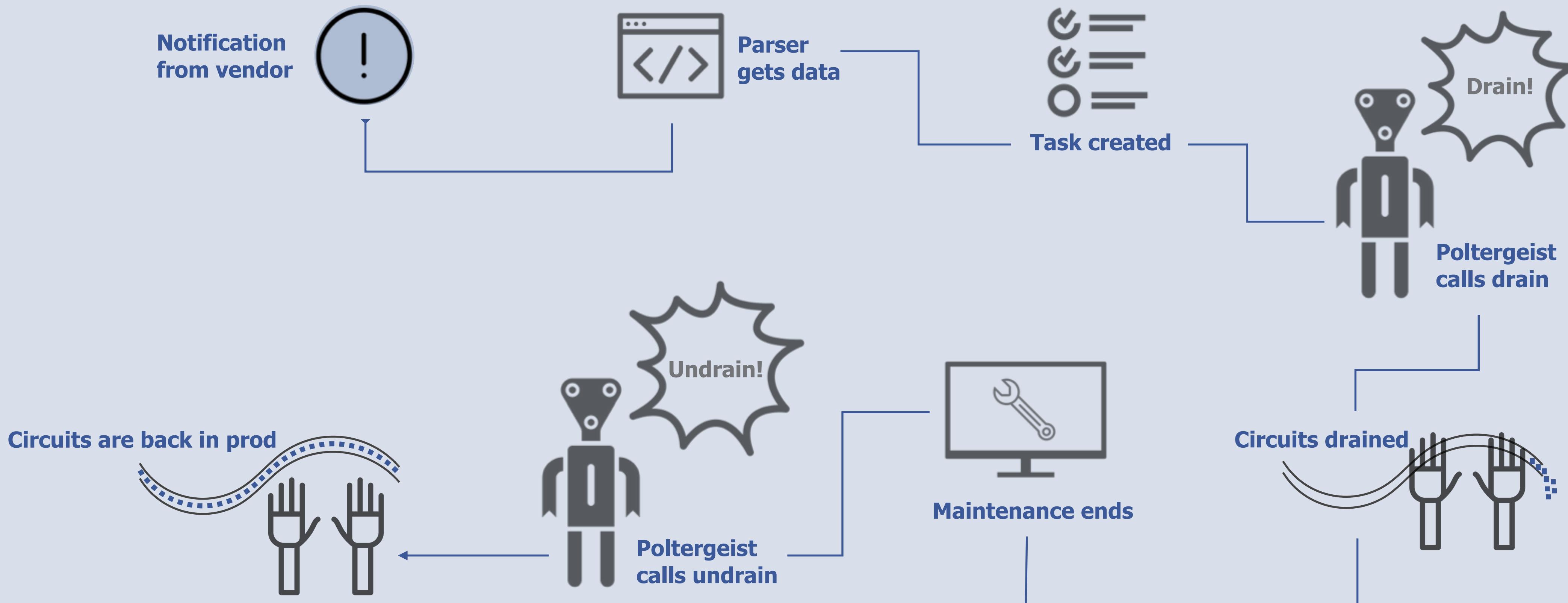
How is it now?



How is it now?



How is it now?



A large school of hammerhead sharks is swimming in the ocean. The sharks are silhouetted against a bright, overexposed background, creating a dramatic effect. They are moving in various directions, some facing left and some right, creating a sense of motion.

What about fiber-eating sharks?

Seriously...

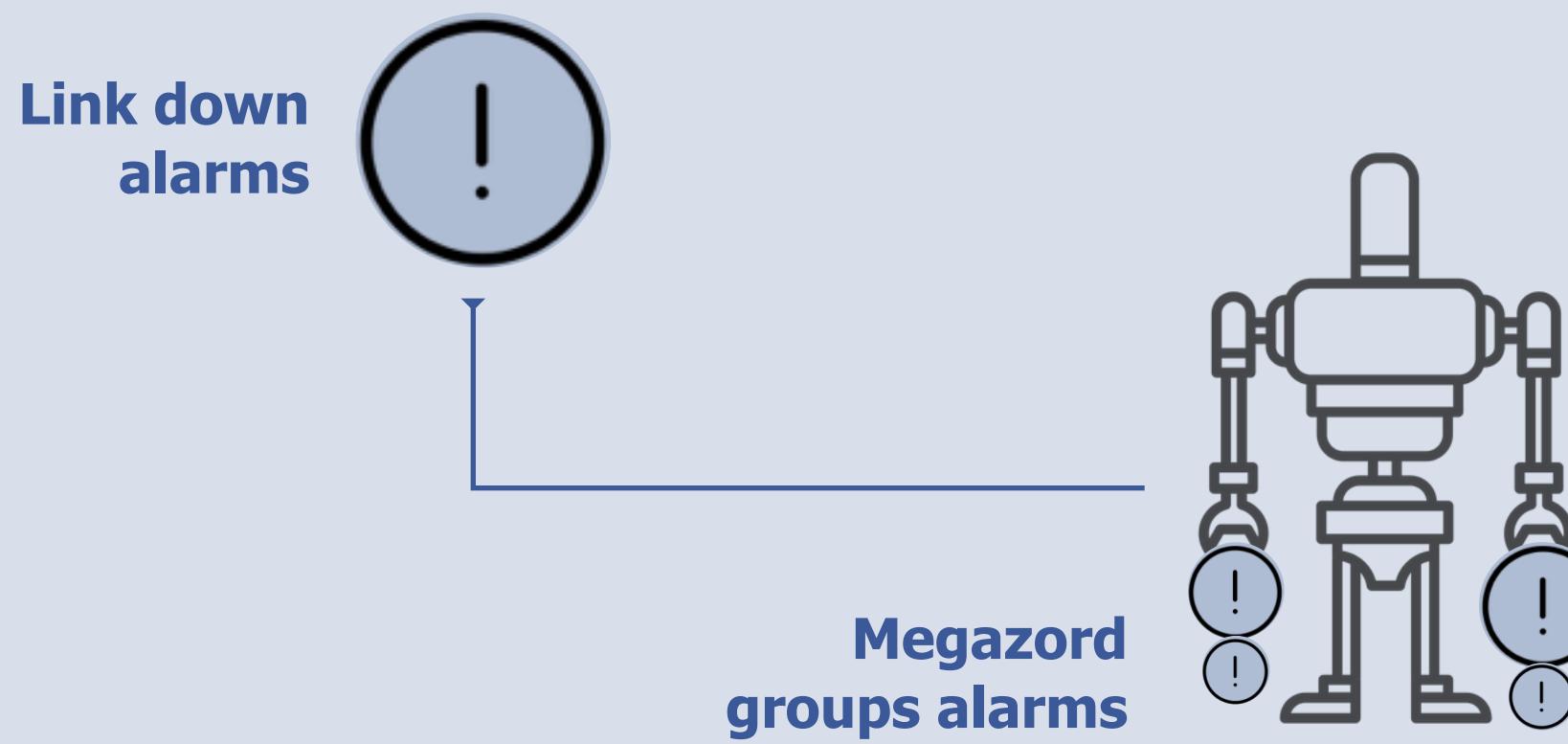


How is it now?

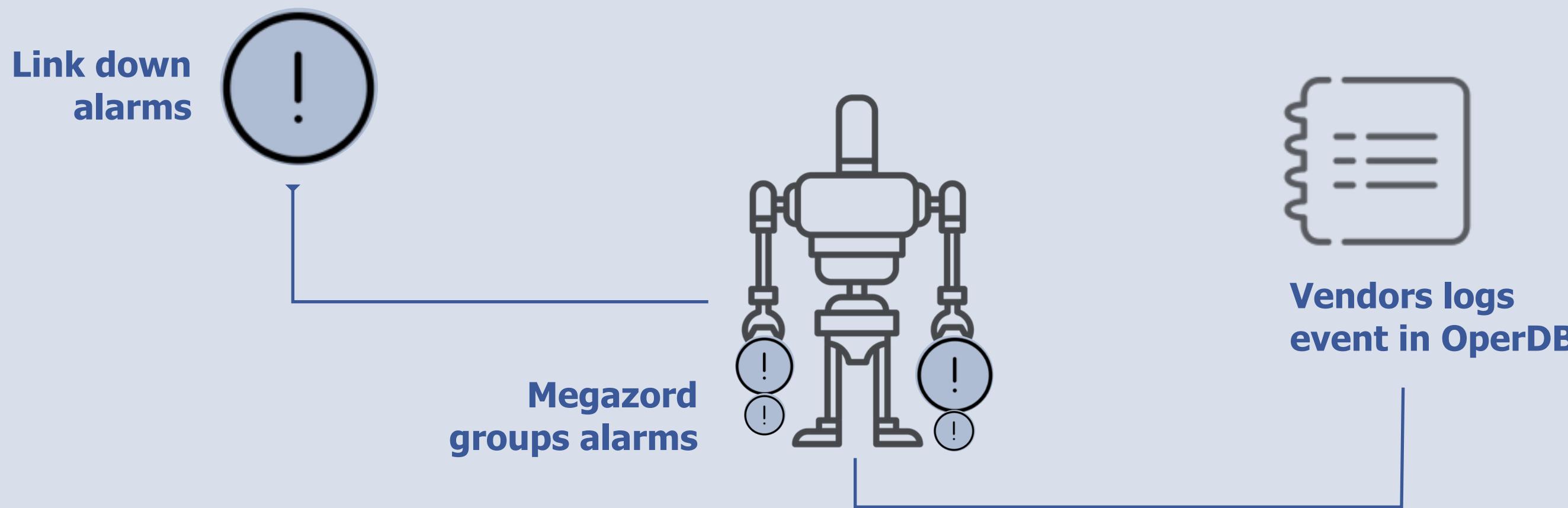
Link down
alarms



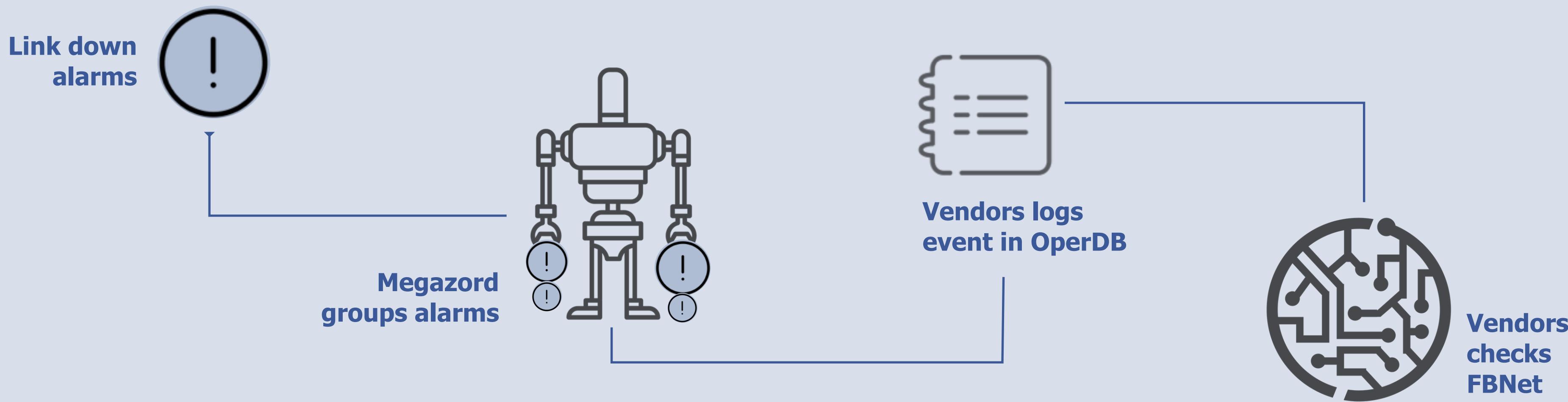
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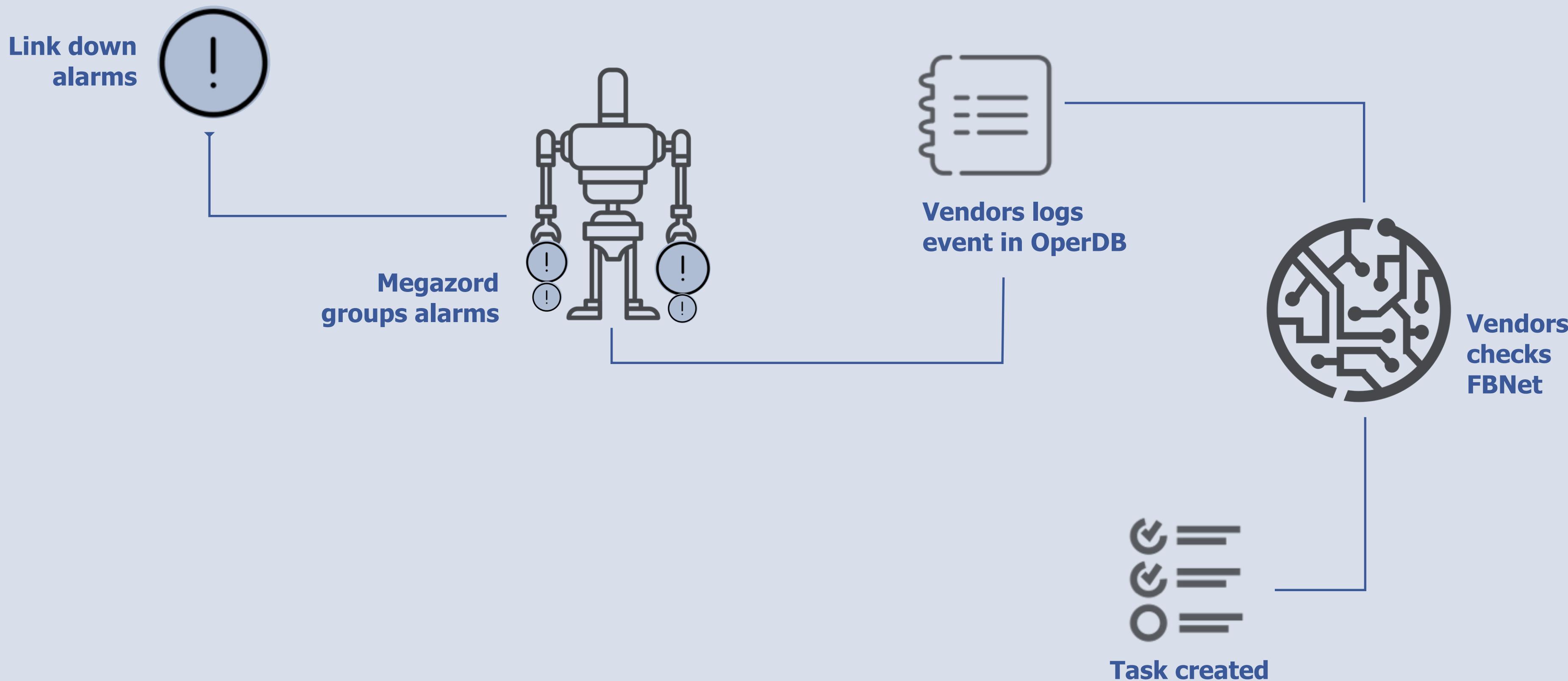
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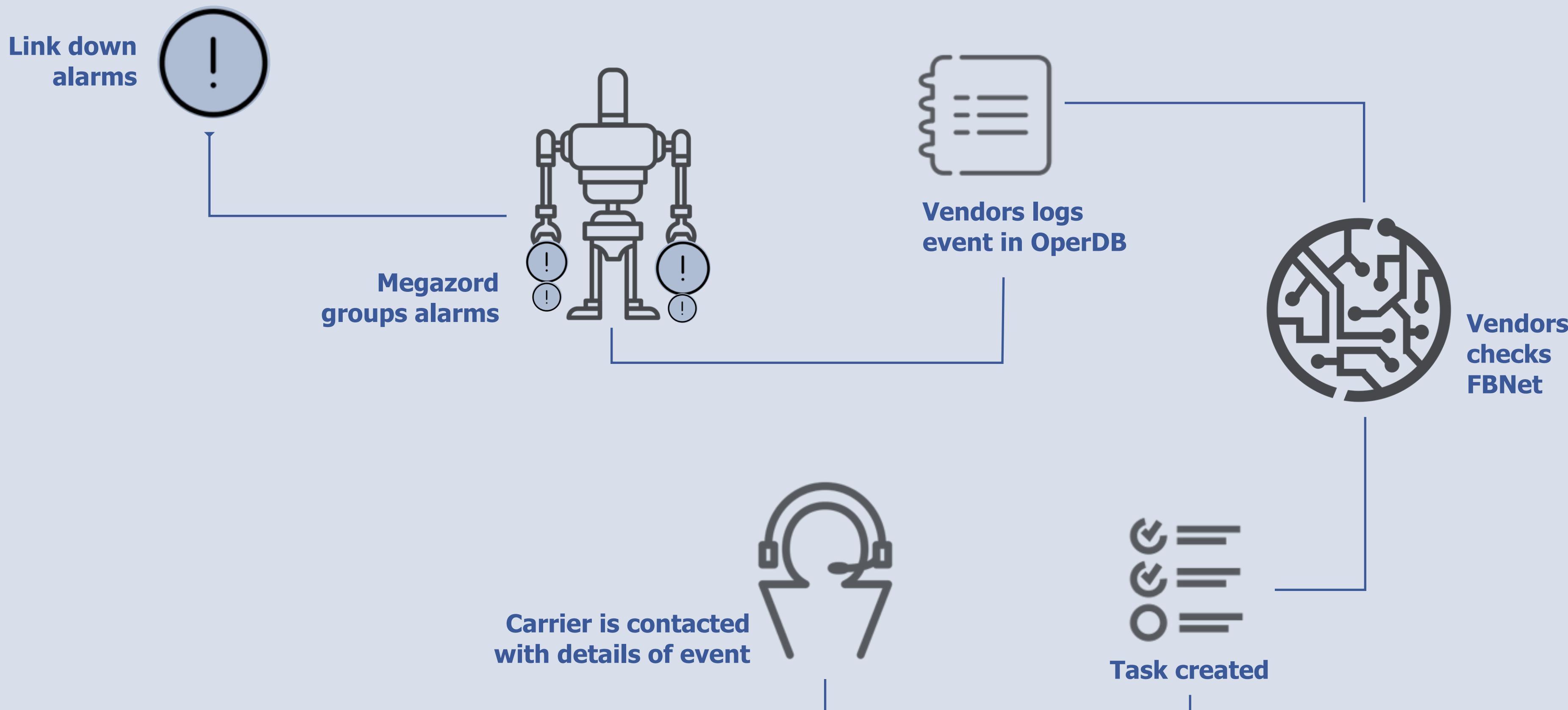
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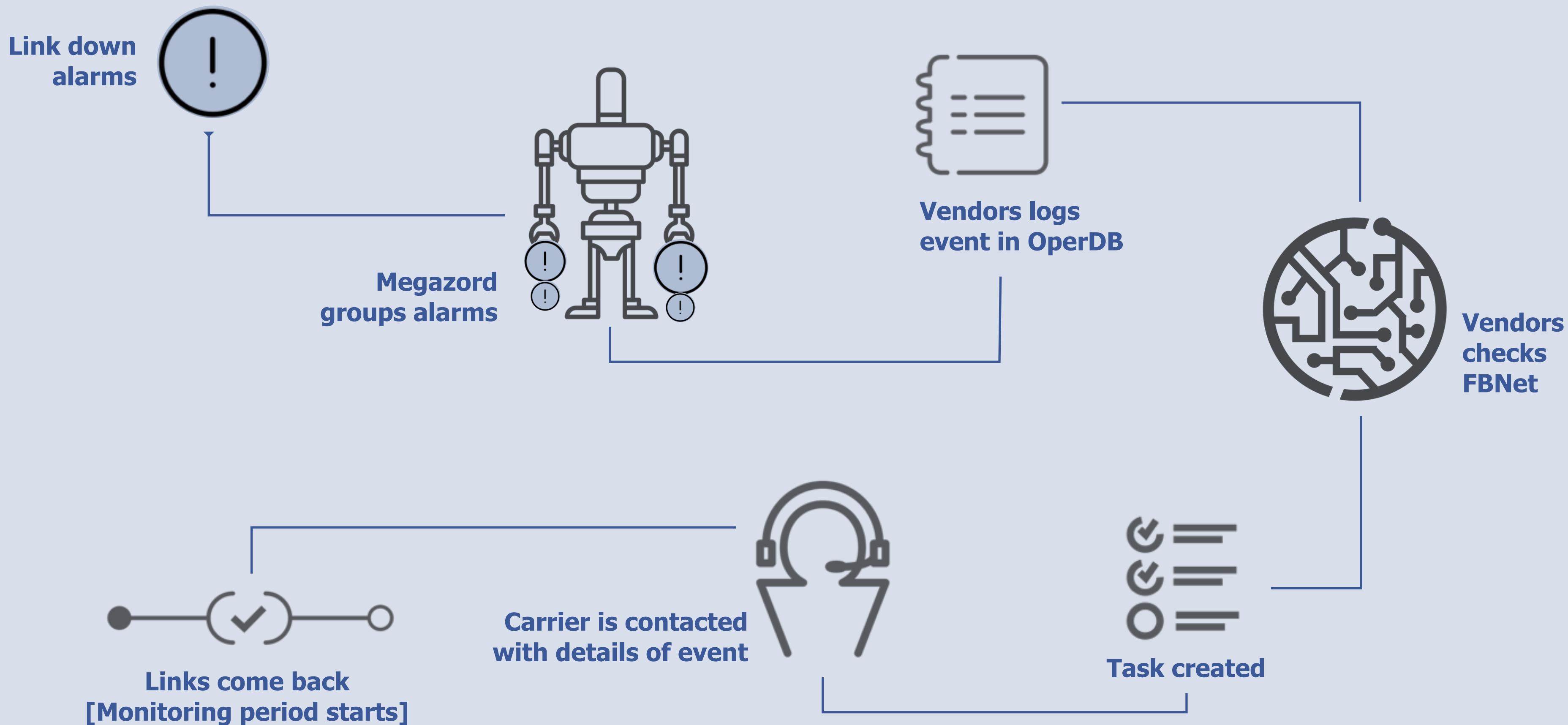
How is it now?



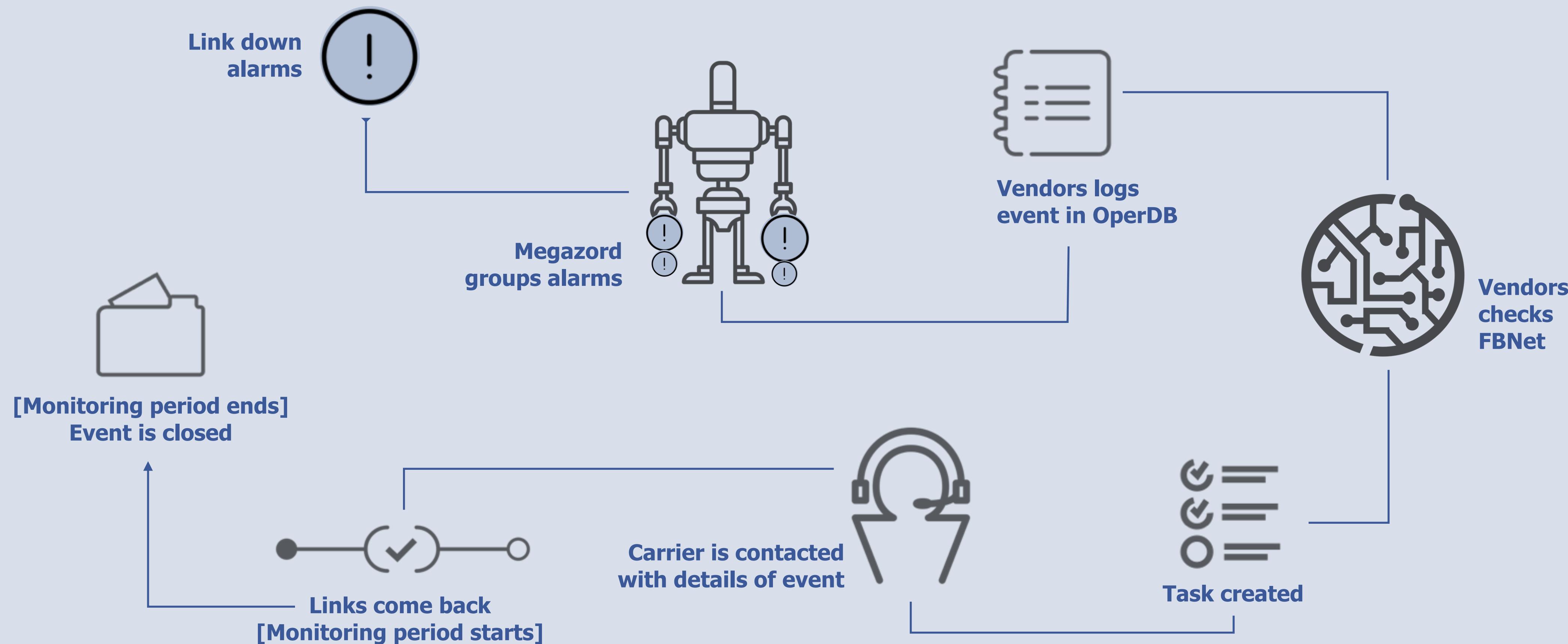
How is it now?



How is it now?

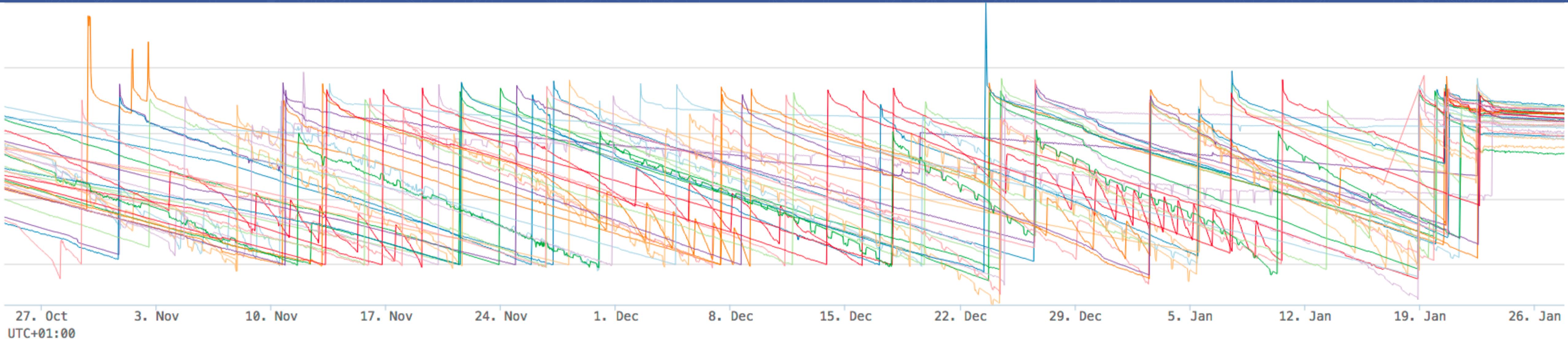


How is it now?



The memory leak debacle

Free memory over time



A detailed reproduction of Raphael's fresco "The School of Athens" from the Vatican Palace. The scene is set in a grand, classical hall with tall columns and a vaulted ceiling featuring a geometric pattern. Numerous figures in ancient Greek attire are depicted, engaged in discussion and study. Key figures include Plato standing on the left, Aristotle standing on the right, and other philosophers like Euclid, Pythagoras, and Plutarch. The floor is filled with students and spectators, some holding scrolls or globes. Large statues of Apollo and Athena stand on pedestals on either side of the main archway.

How would this be solved with humans?



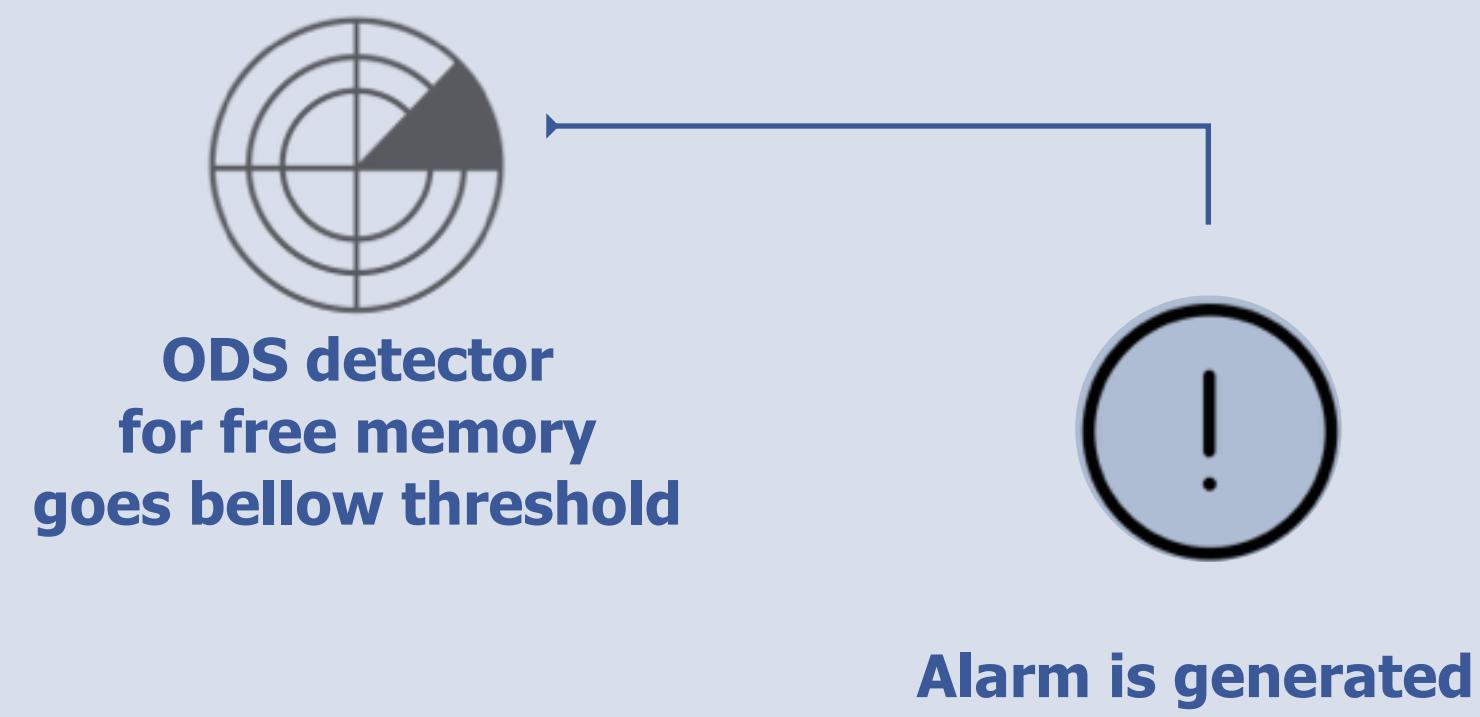
Lots of them + coffee

How is it now?

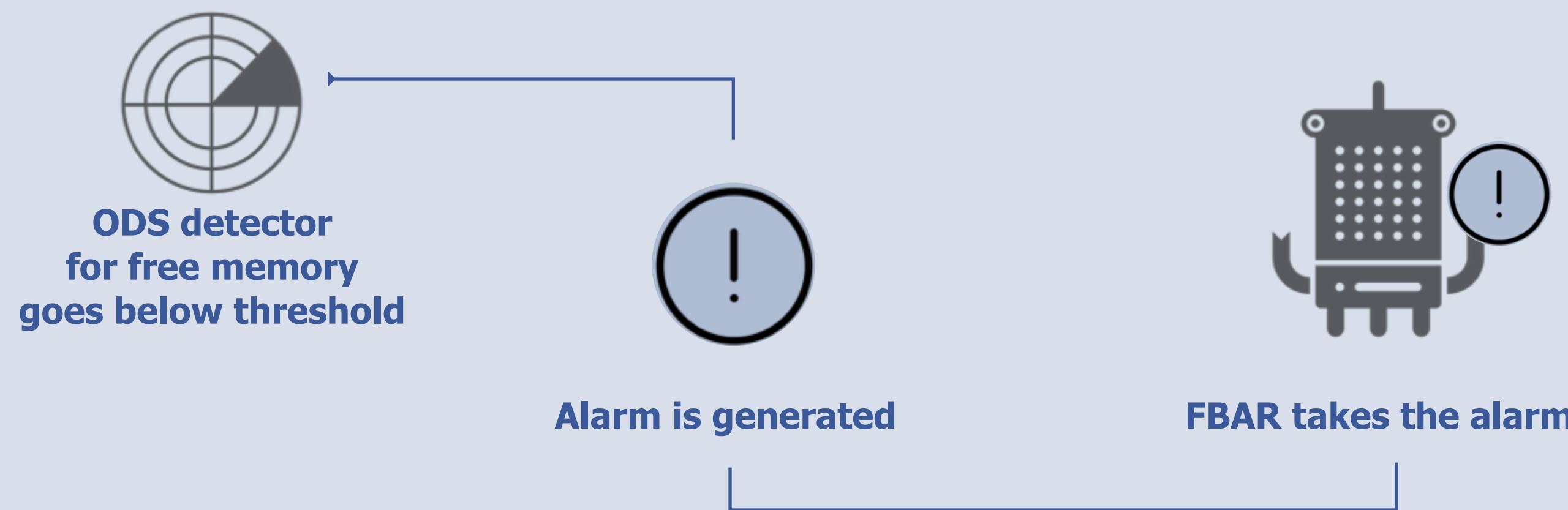


**ODS detector
for free memory
goes bellow threshold**

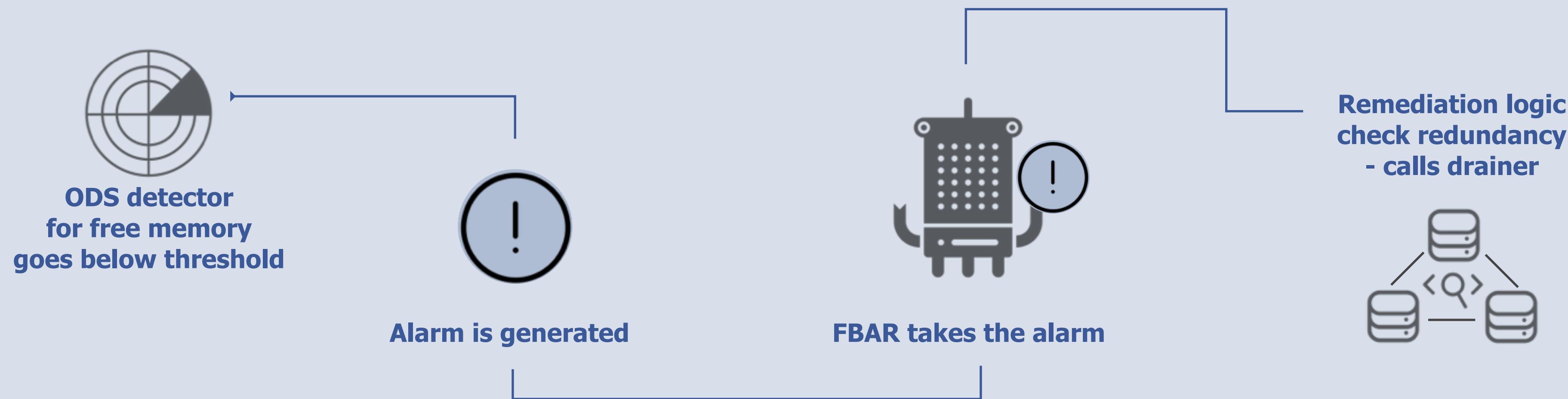
How is it now?



How is it now?



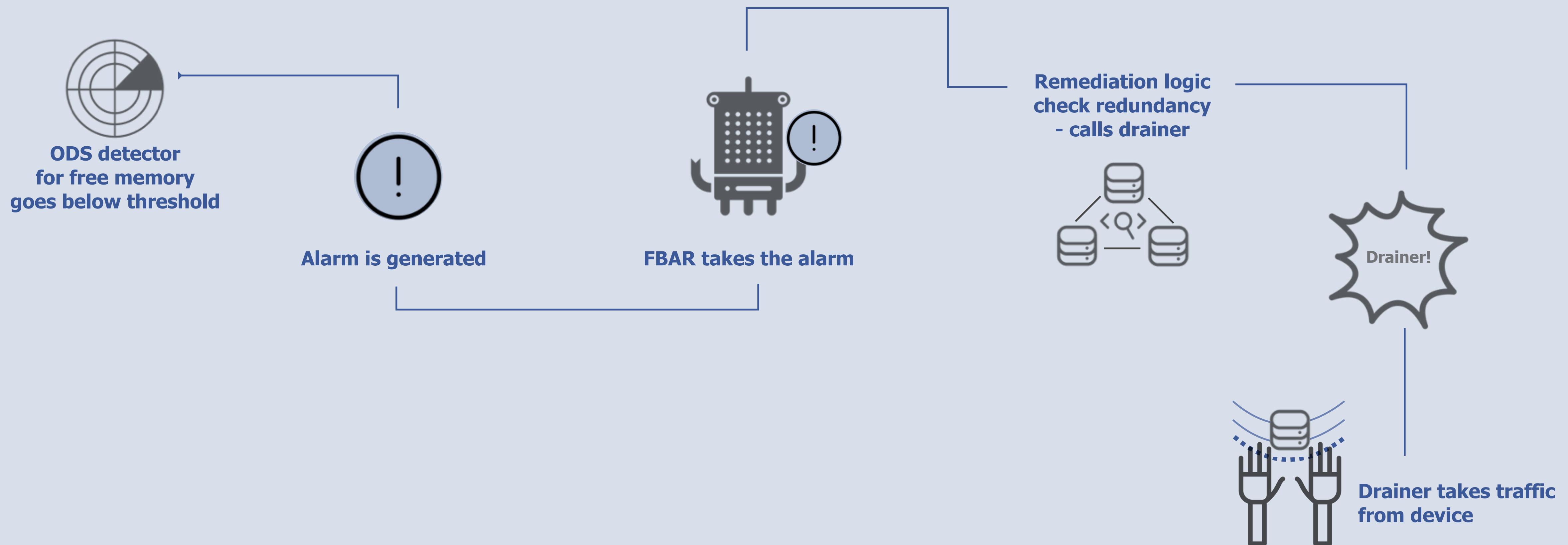
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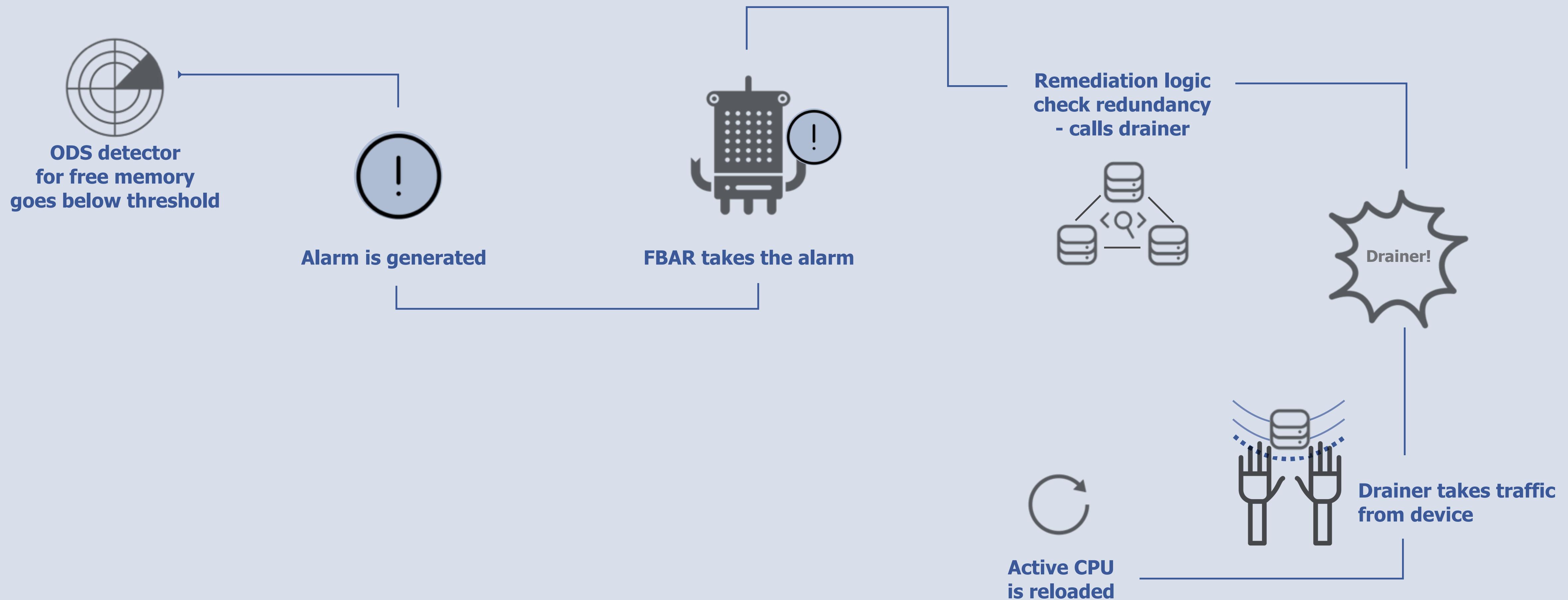
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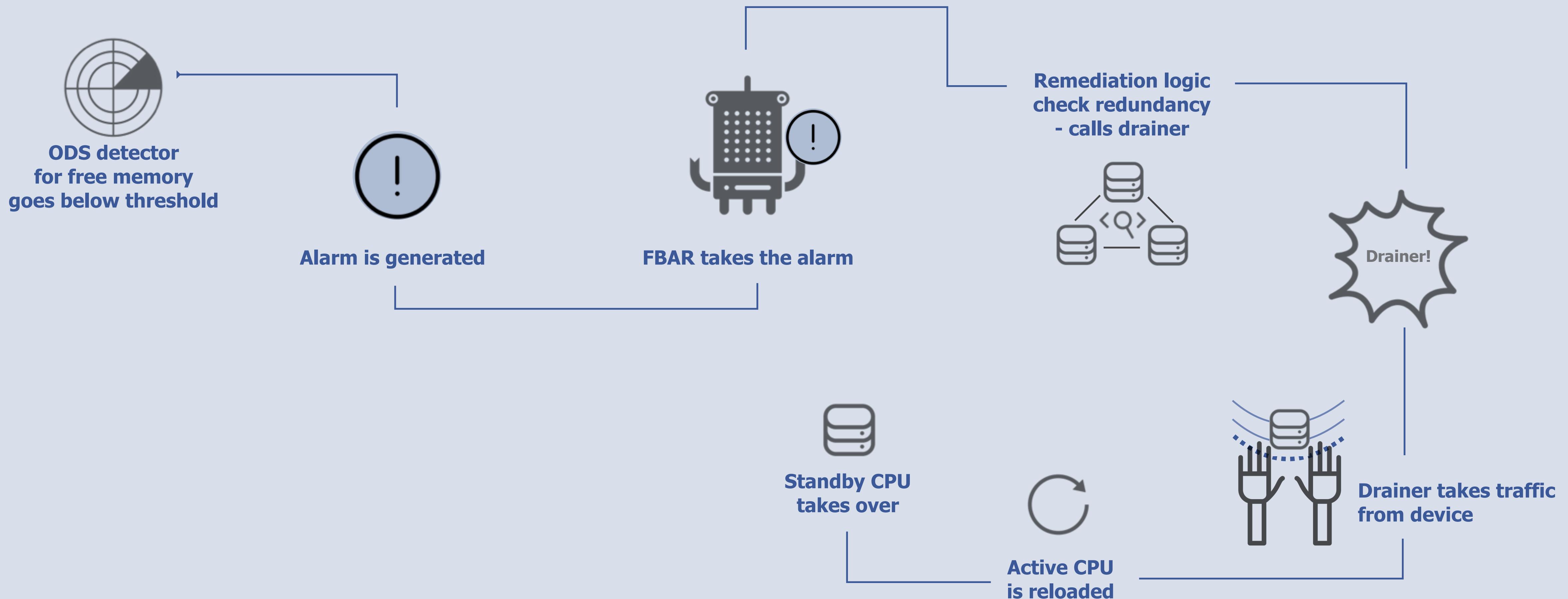
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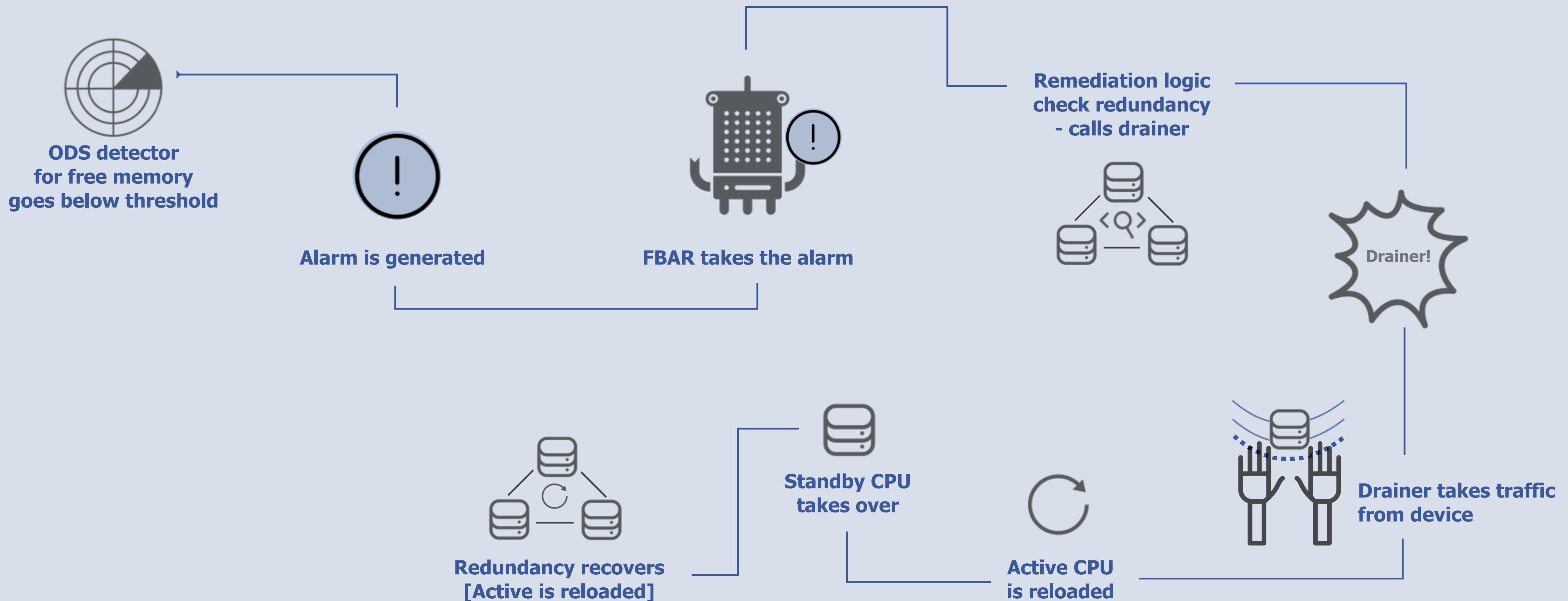
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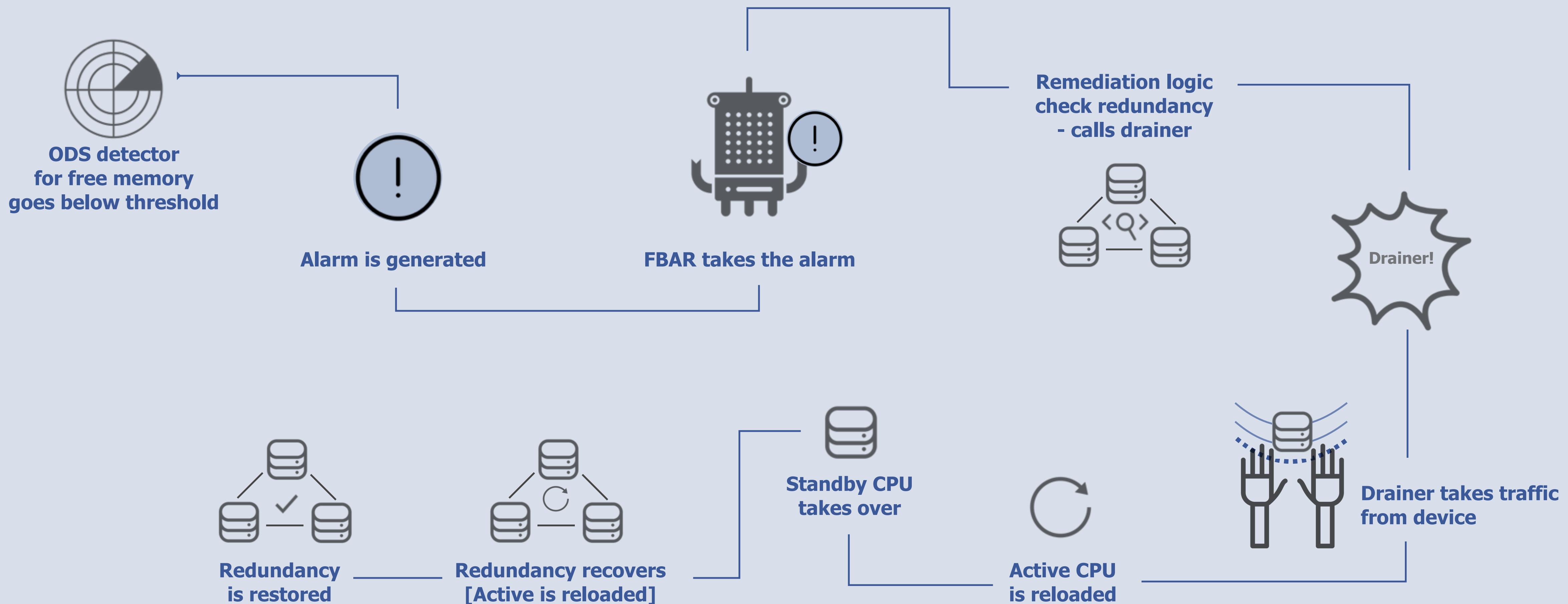
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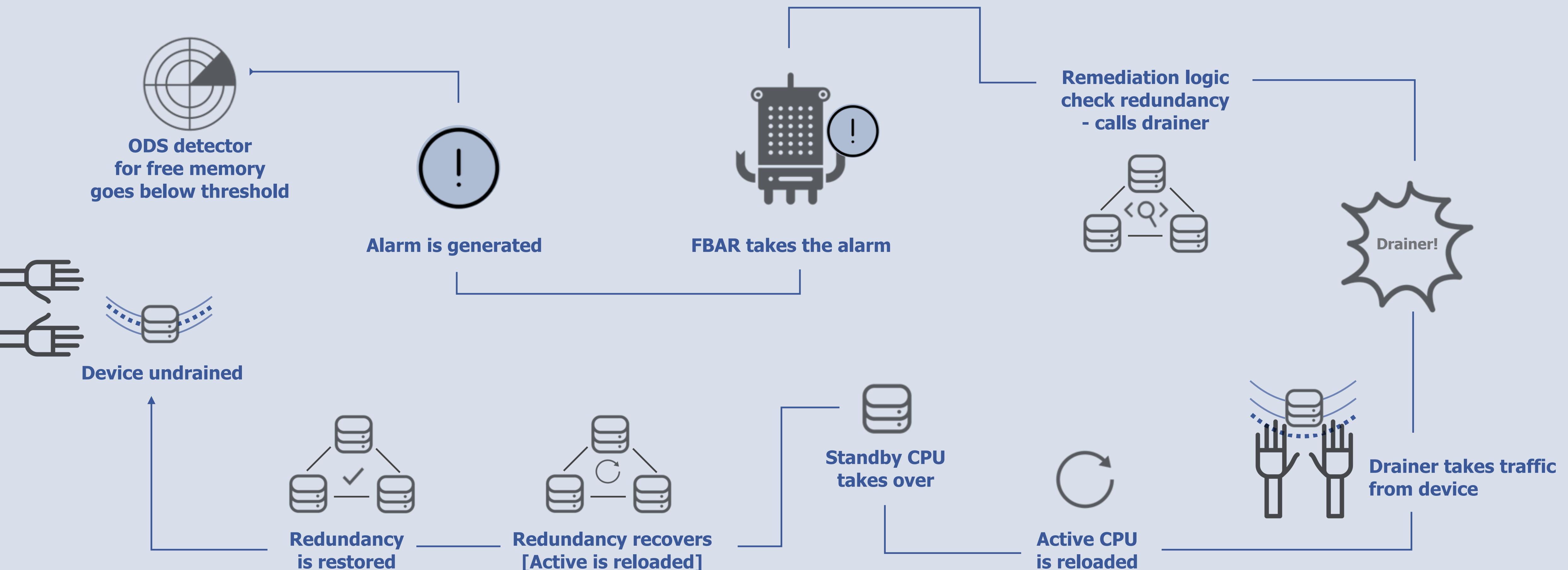
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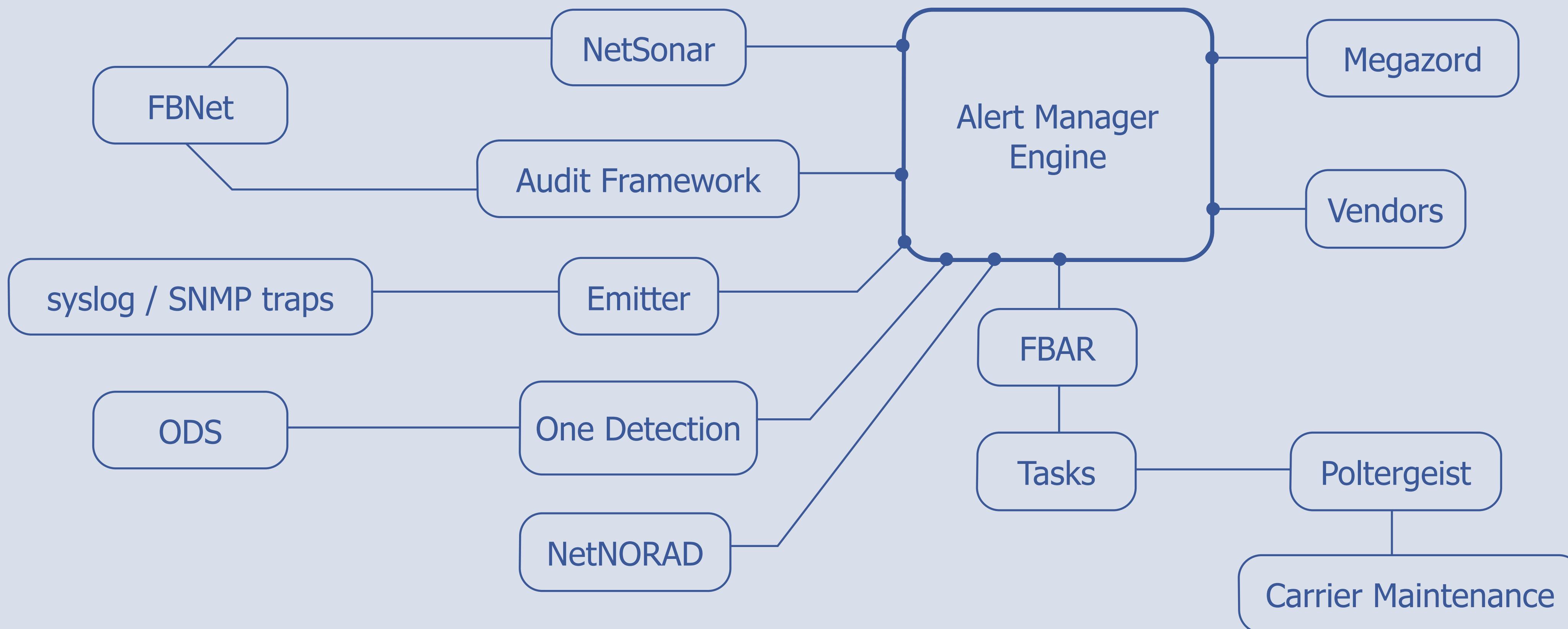


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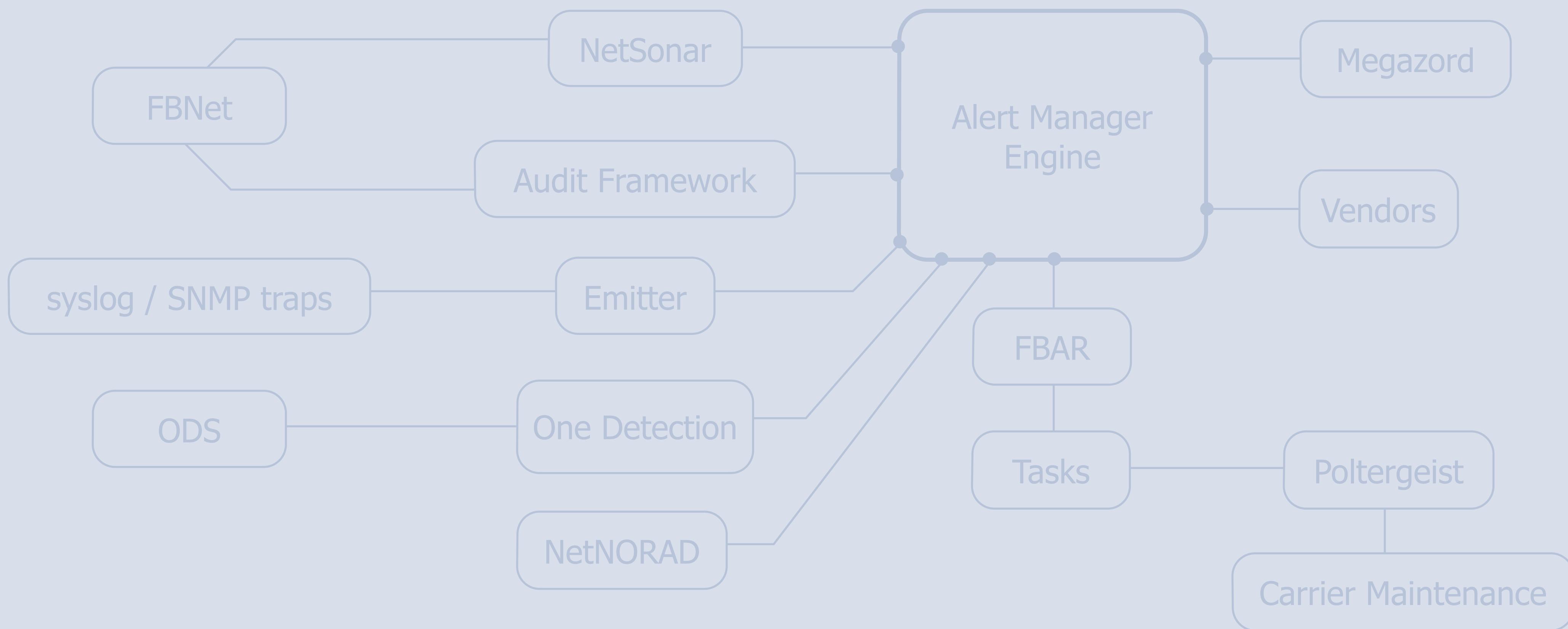
Facebook Defined Networking

all components in action



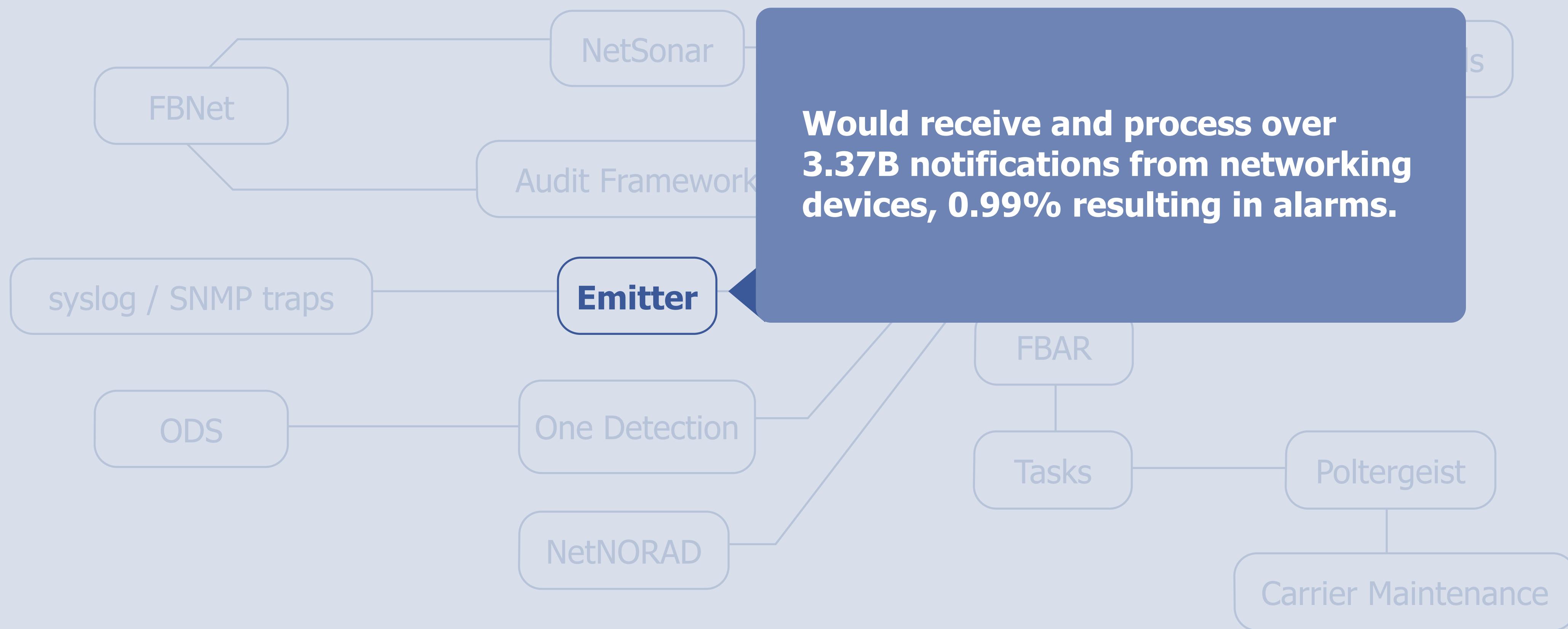
So, in 30 days...

all components in action



So, in 30 days...

all components in action



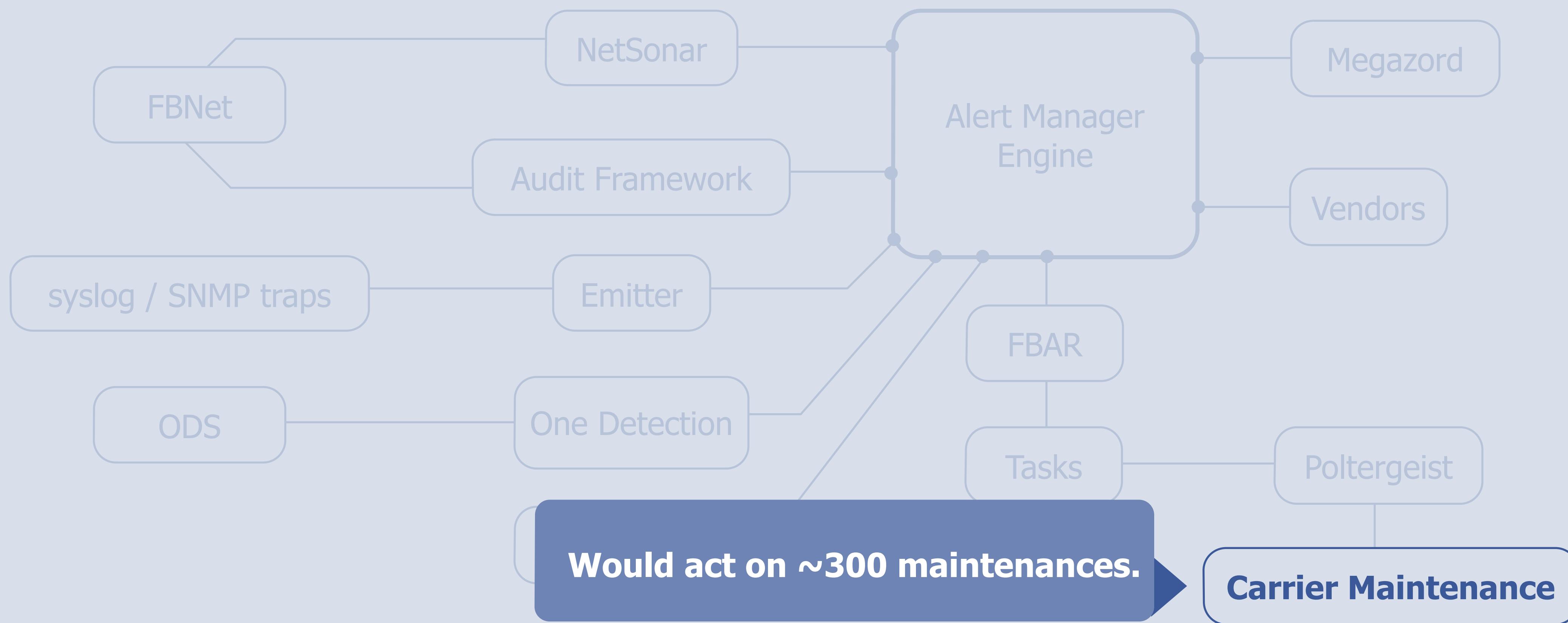
So, in 30 days...

all components in action



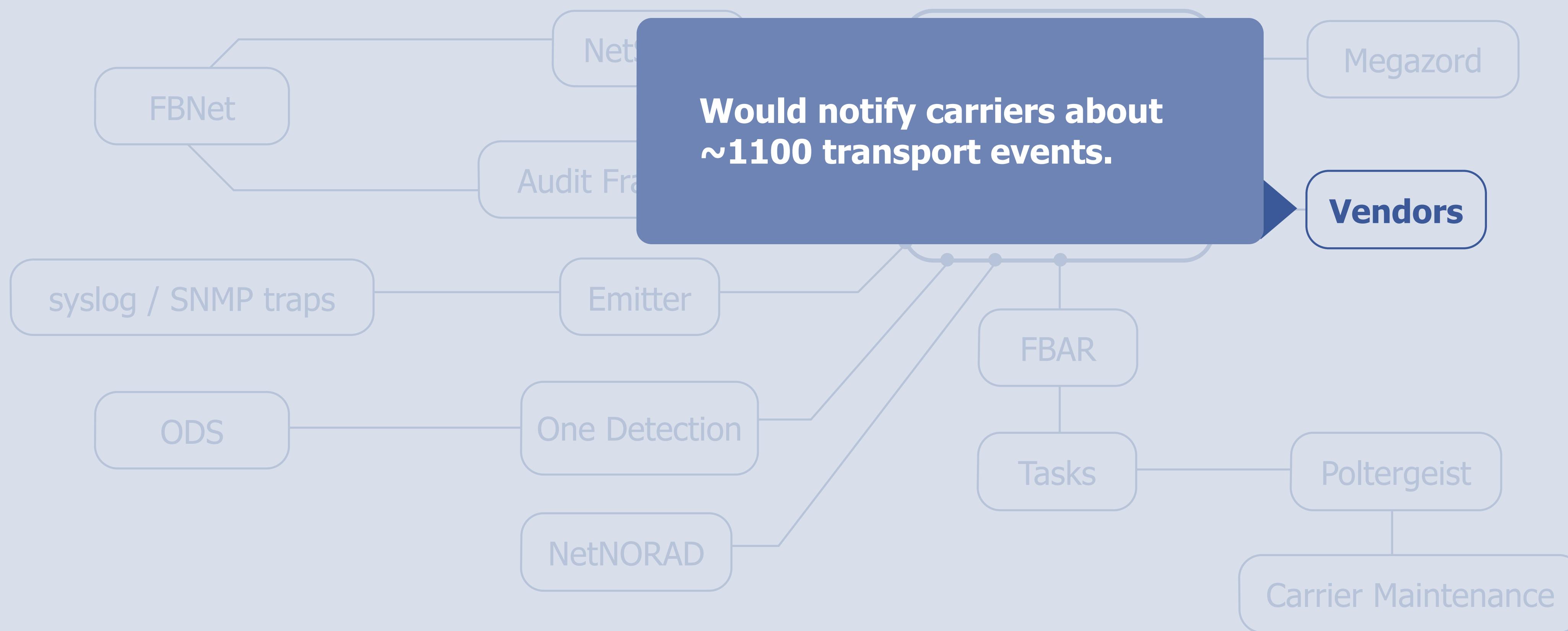
So, in 30 days...

all components in action



So, in 30 days...

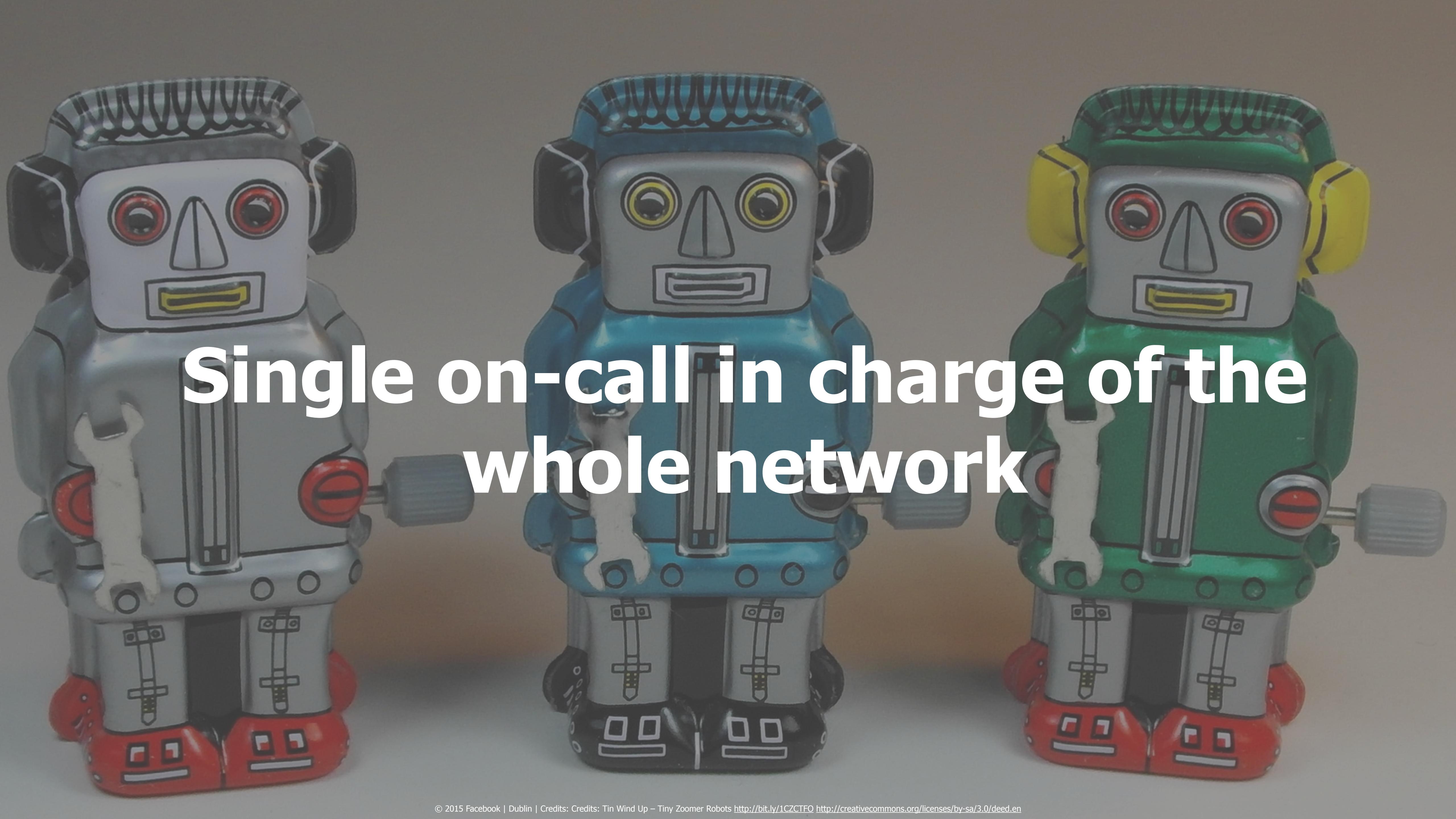
all components in action



So, in 30 days...

all components in action



Three vintage-style wind-up robots are standing in a row against a plain background. The robot on the left is silver with red eyes and a red base. The middle robot is blue with yellow eyes and a grey base. The robot on the right is green with red eyes and a grey base. They all have large, expressive faces with prominent eyebrows and mouths.

Single on-call in charge of the
whole network



Lessons Learned & Recommendations

8 Lessons Learned & Recommendations

1

Re-use existing code/tools when possible and when it makes sense.

8 Lessons Learned & Recommendations



8 Lessons Learned & Recommendations

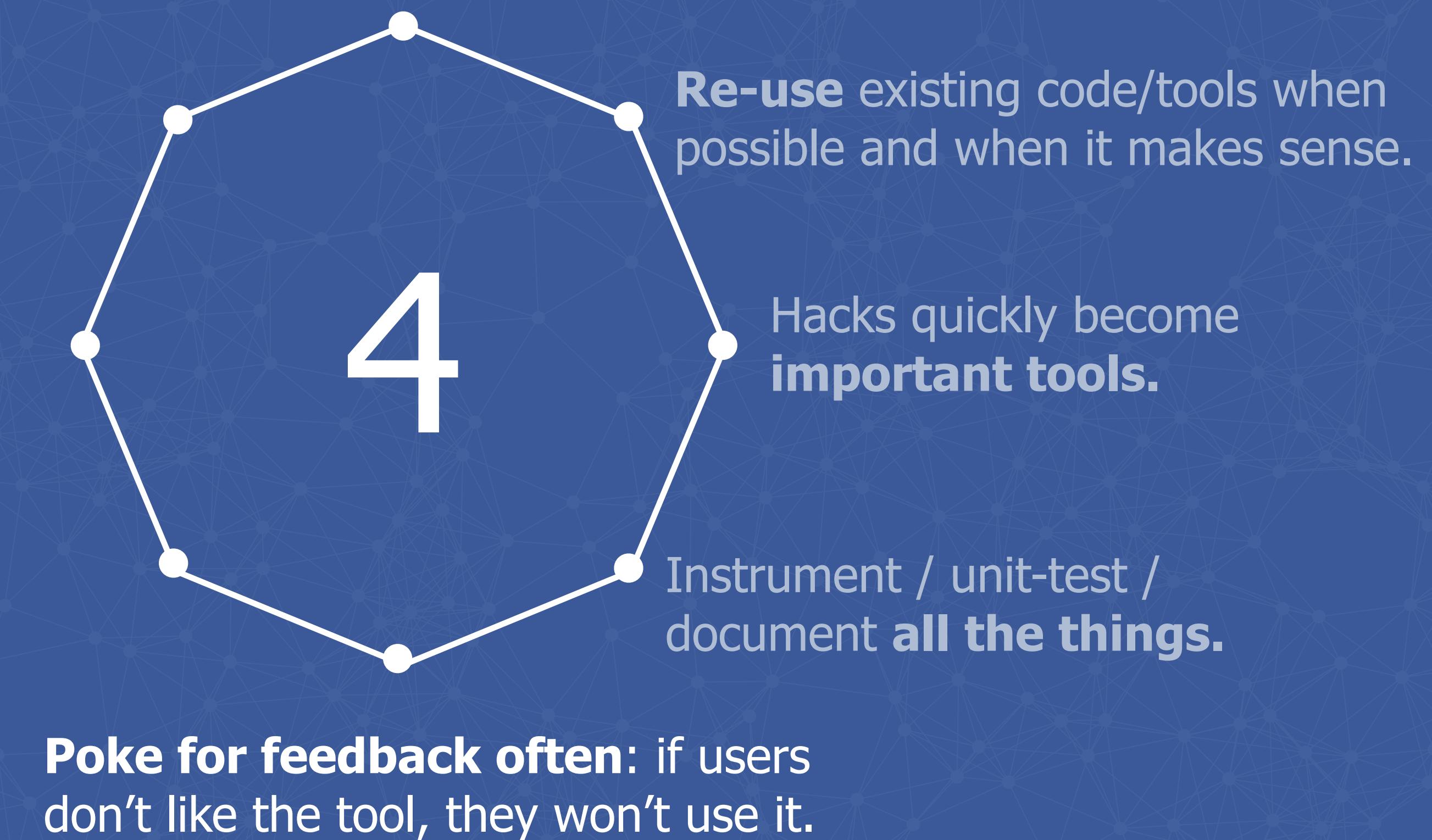
3

Re-use existing code/tools when possible and when it makes sense.

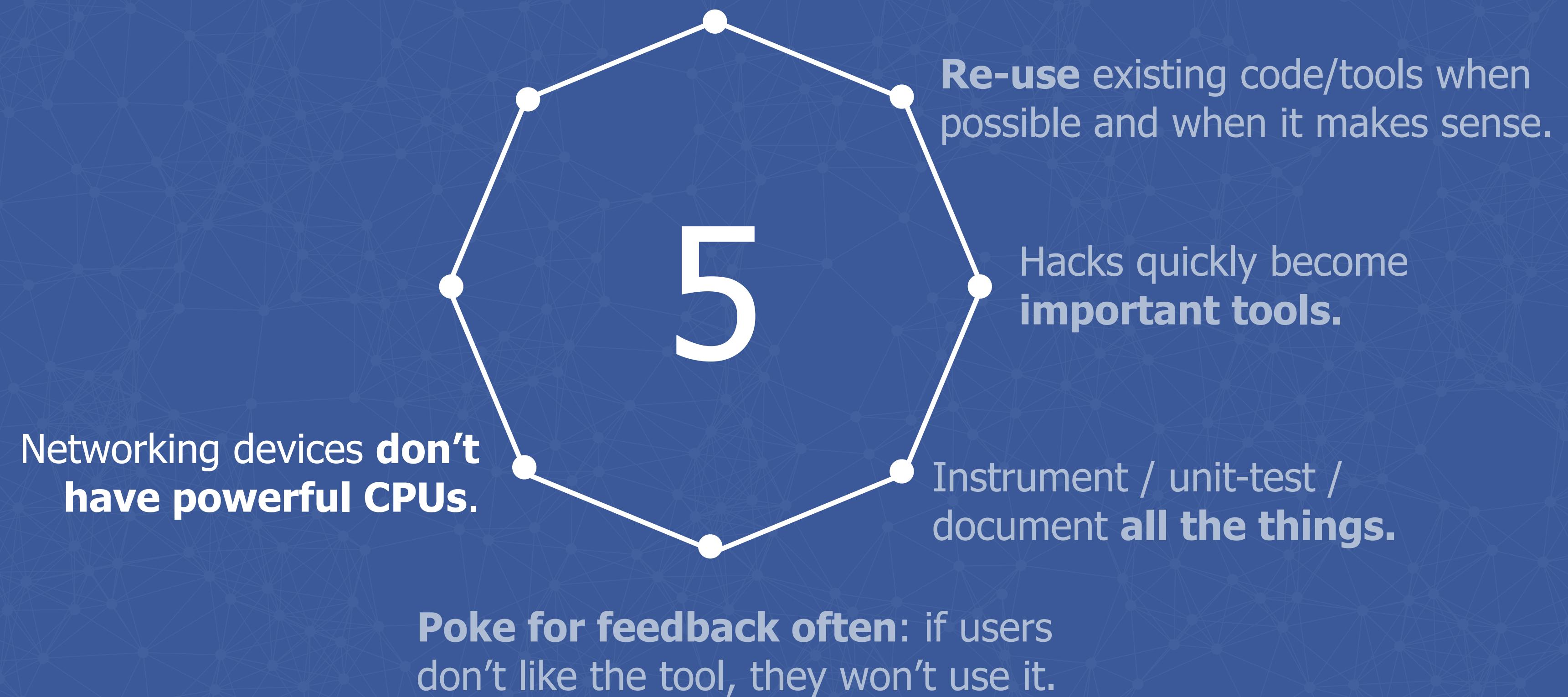
Hacks quickly become **important tools**.

Instrument / unit-test / document **all the things**.

8 Lessons Learned & Recommendations



8 Lessons Learned & Recommendations



8 Lessons Learned & Recommendations

6

The sooner the robots take over, the better.

Networking devices **don't have powerful CPUs**.

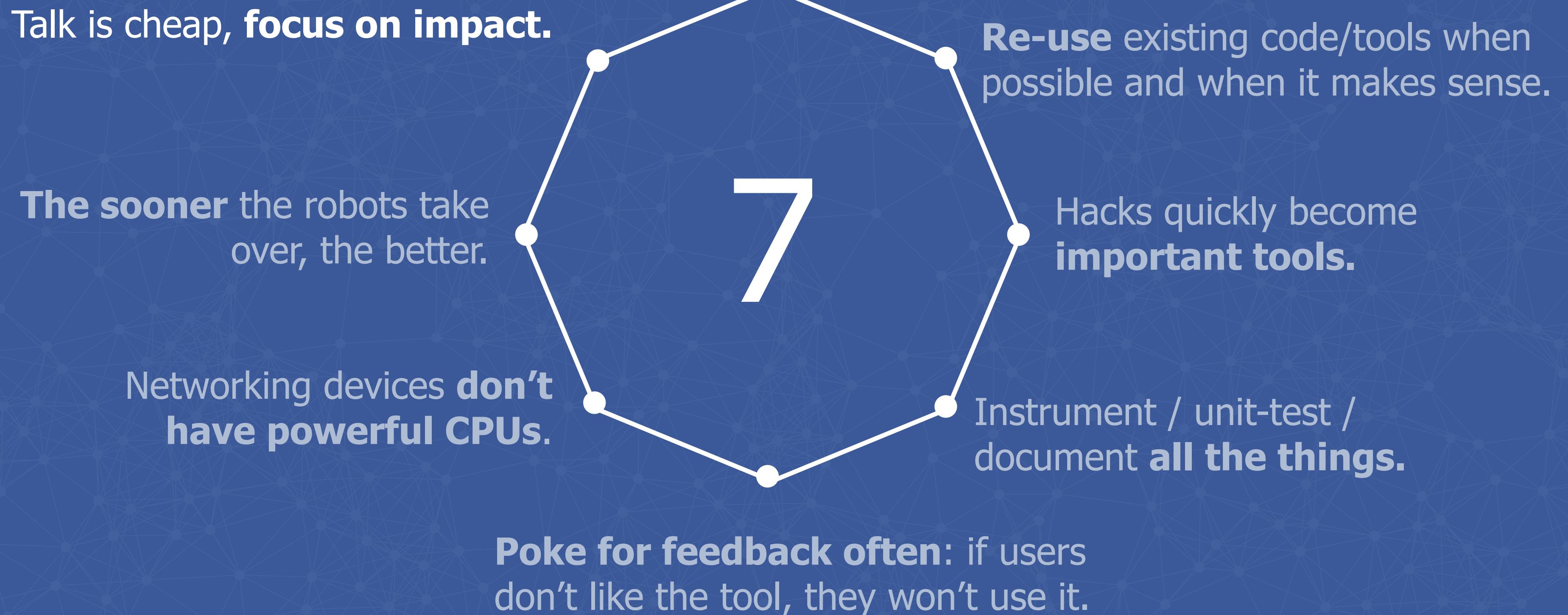
Poke for feedback often: if users don't like the tool, they won't use it.

Re-use existing code/tools when possible and when it makes sense.

Hacks quickly become **important tools**.

Instrument / unit-test / document **all the things**.

8 Lessons Learned & Recommendations



8 Lessons Learned & Recommendations



This journey is 1% finished

**WHAT WOULD
YOU DO IF YOU
WEREN'T
AFRAID?**

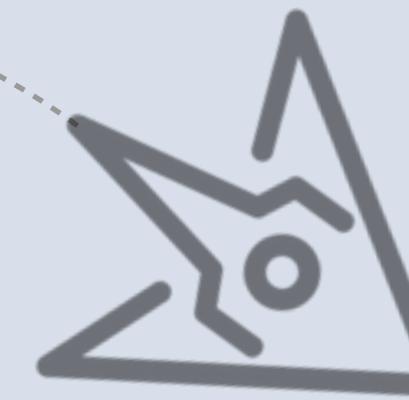
What's in the near future?

The journey is 1% finished



FBOSS / Wedge / sixpack
operationalization
improvements

Better visibility in the
WDM space and
correlation between the
Optical / IP worlds



PCE



Continuous development
of existing tools



**WHAT WOULD
YOU DO IF
YOU WEREN'T
AFRAID?**

POSTER BROUGHT TO YOU BY YOUR FRIENDS AT  THE FACEBOOK ANALOG RESEARCH LABORATORY

