



Dr. NMS

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

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Jose

David



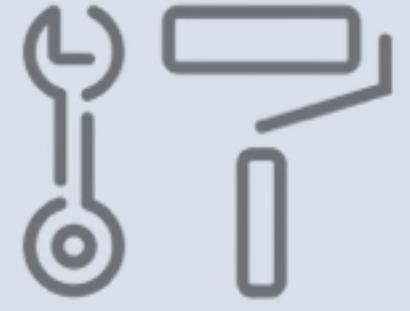
facebook
INFRASTRUCTURE

ZERO IMPACT NETWORK

We'll be talking about



Facebook scale



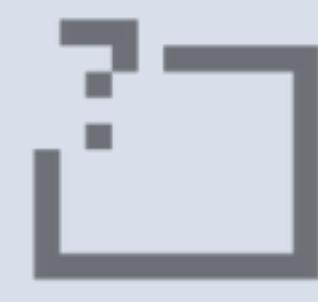
FDN



**Tales from
the real world**



**This journey
is 1% finished**



Q&A



Facebook scale

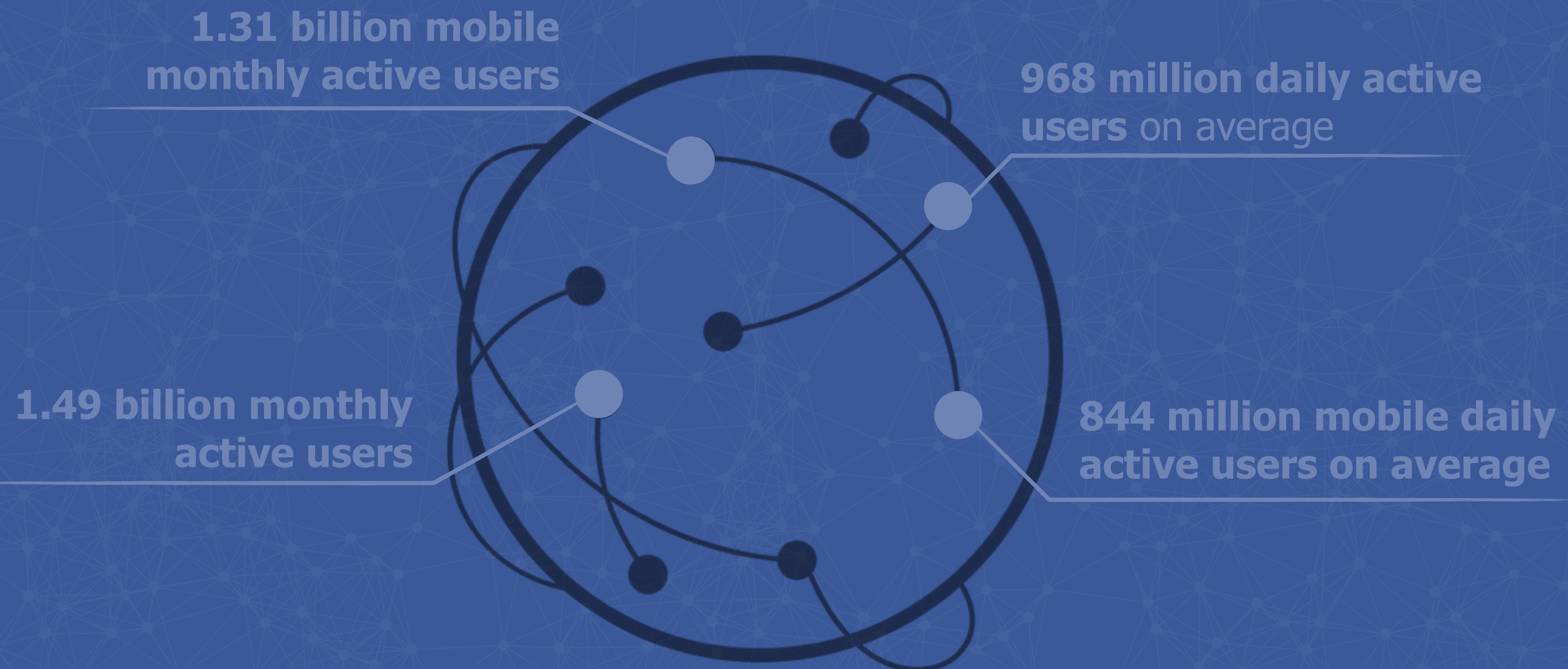
Facebook scale

as of June 2015

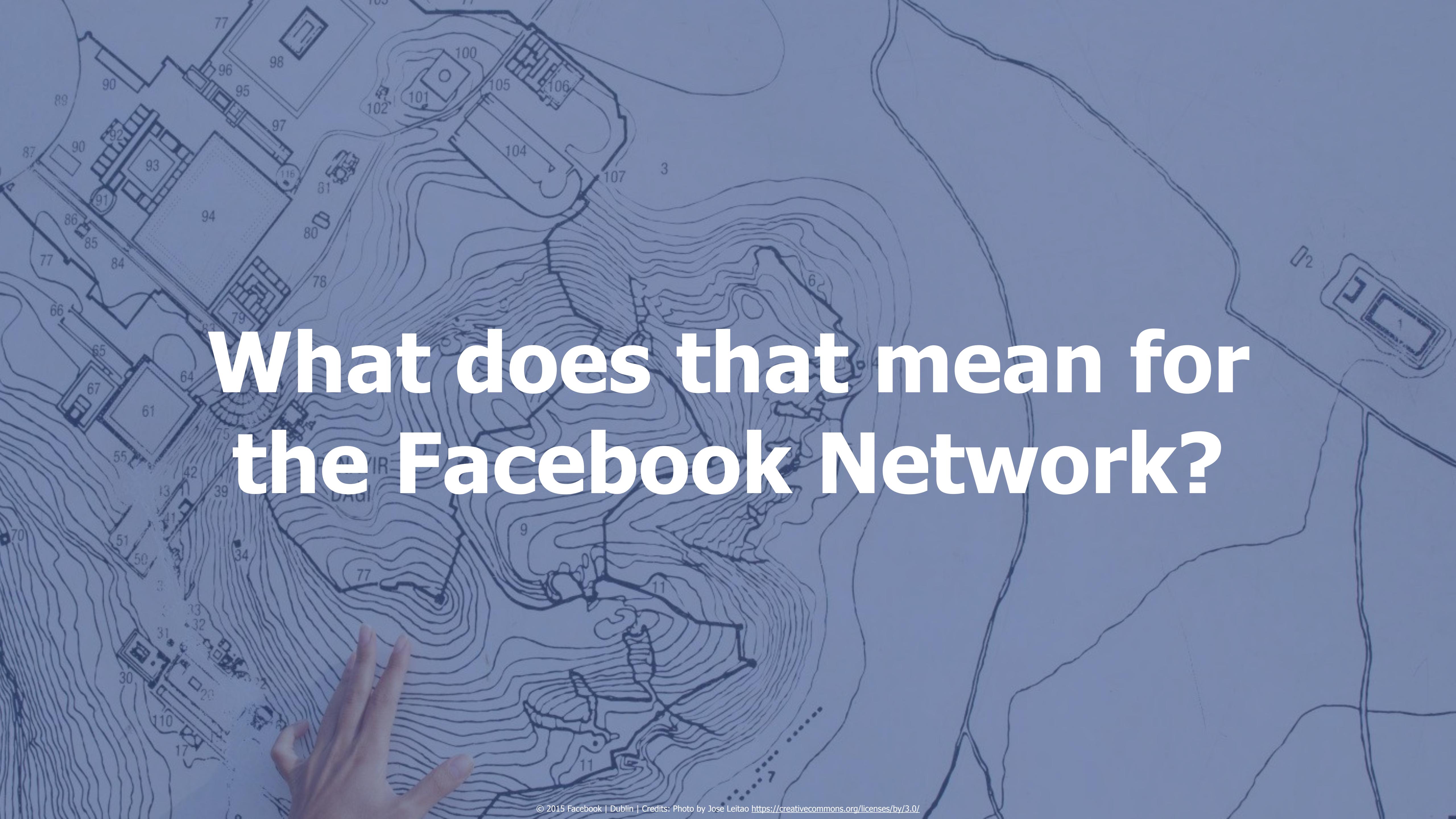


Facebook scale

as of June 2015



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

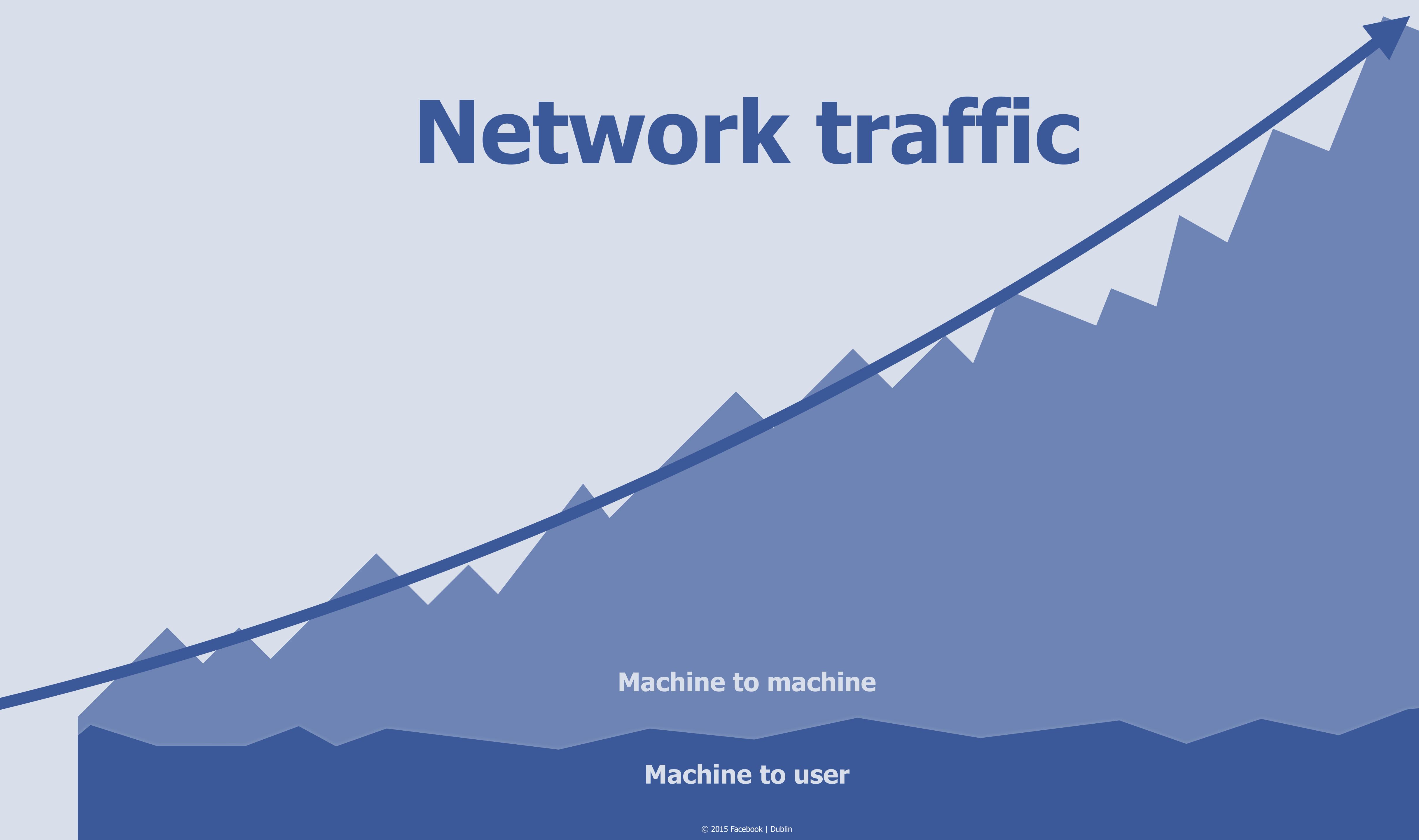


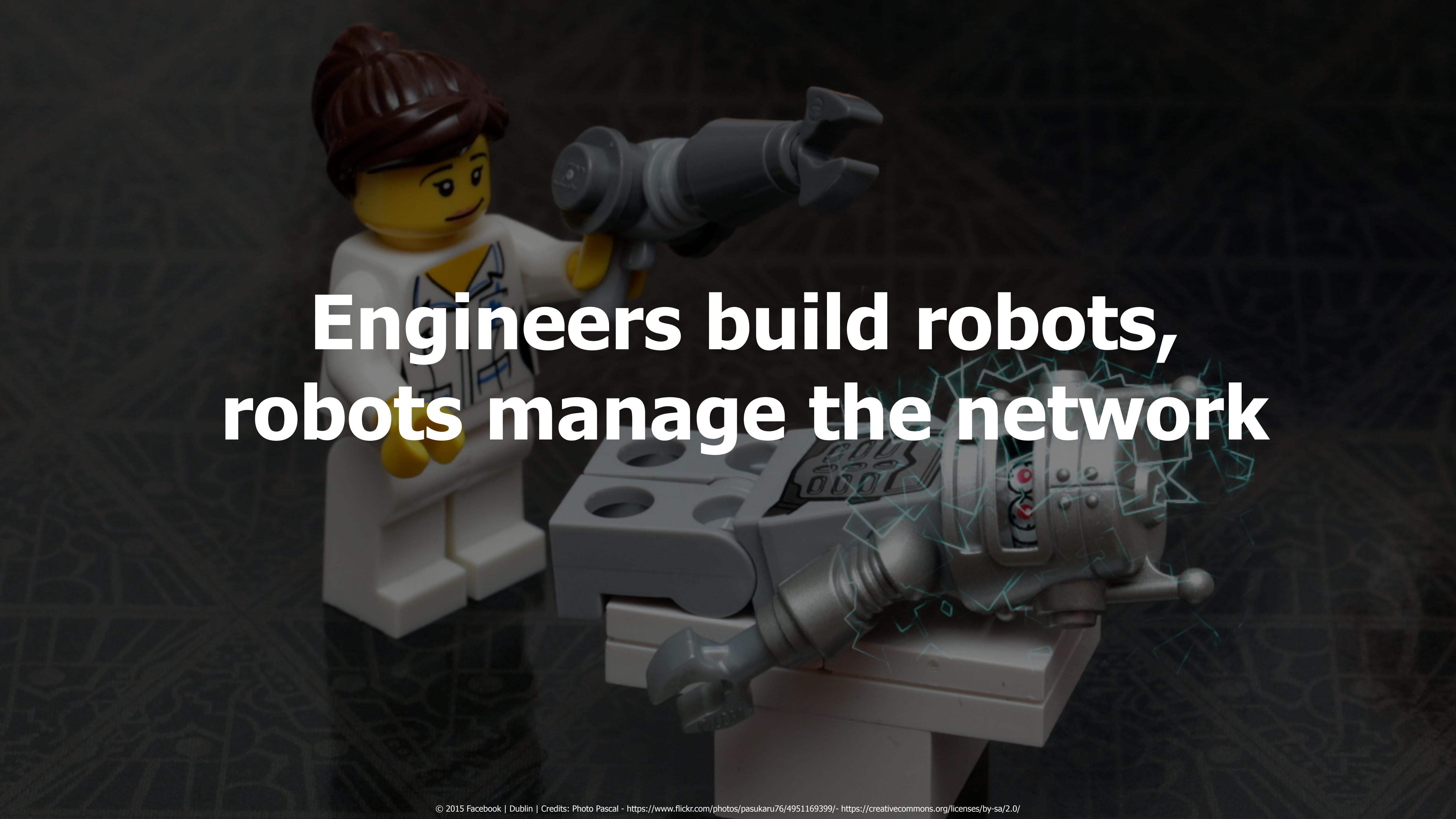
What does that mean for the Facebook Network?



Lots of traffic and global footprint

Network traffic

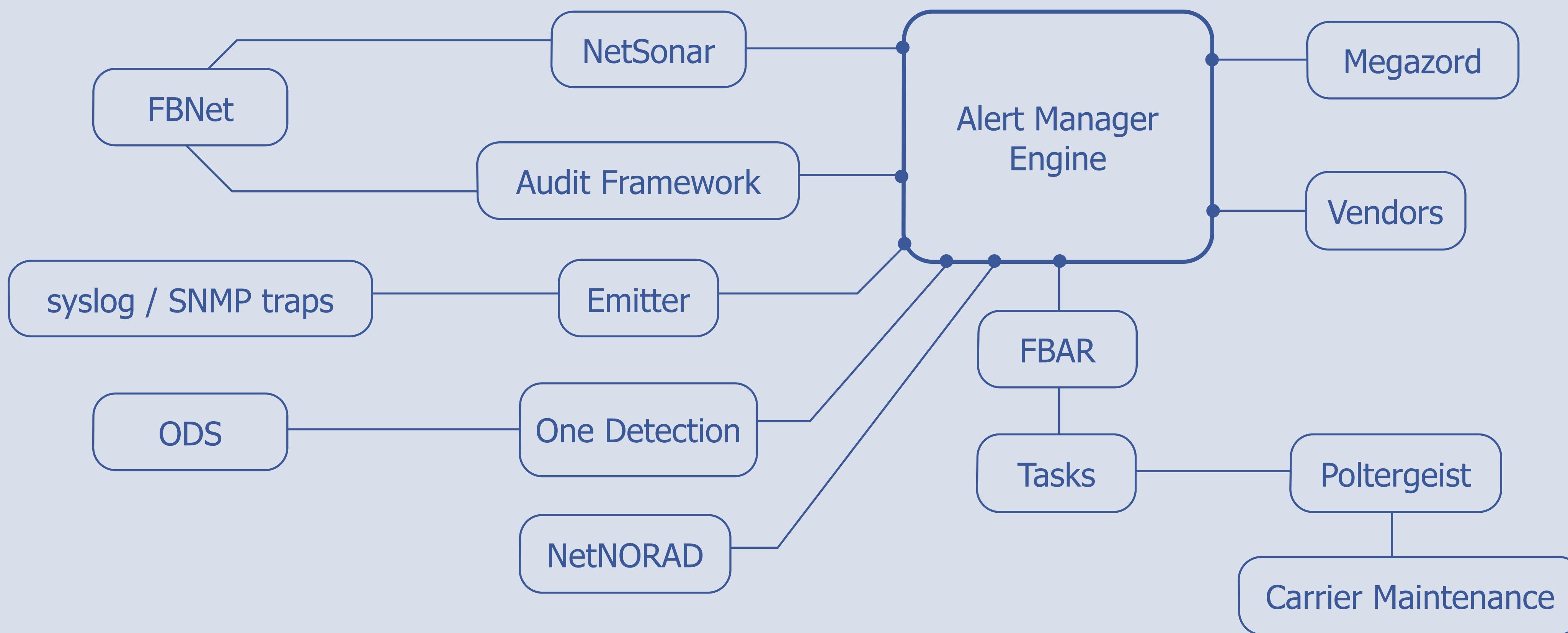


A LEGO minifigure with brown hair and a white jumpsuit featuring a blue and yellow emblem on the chest stands next to a large, articulated grey LEGO robot arm. The robot's hand is open, revealing a glowing blue energy field. The background is dark, and there are faint glowing blue energy patterns on the floor.

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

Facebook Defined Networking

Facebook Defined Networking



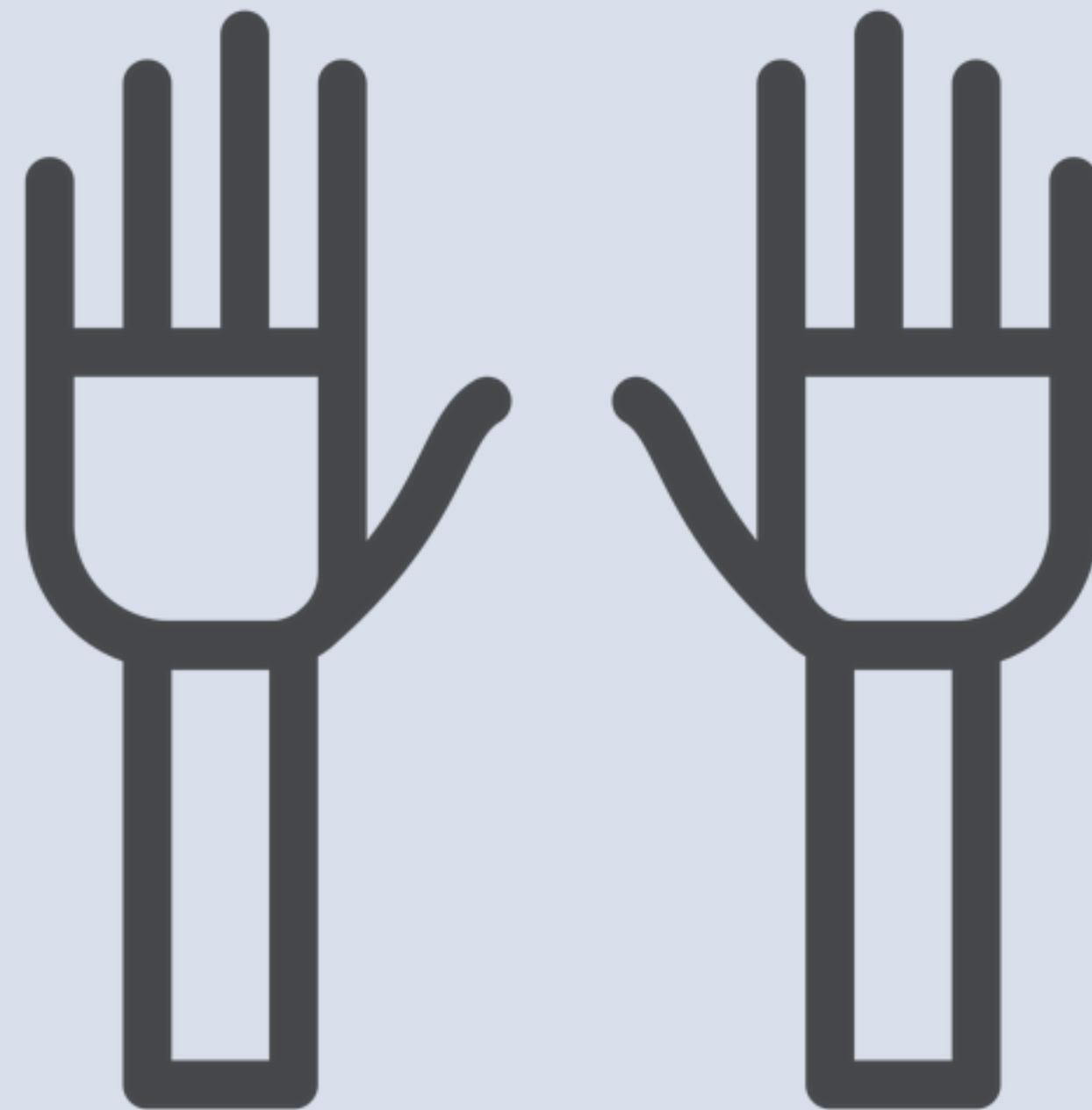
FBNet

The brains to help guide our robots run the network



Drain Services

The movers of traffic on the network devices



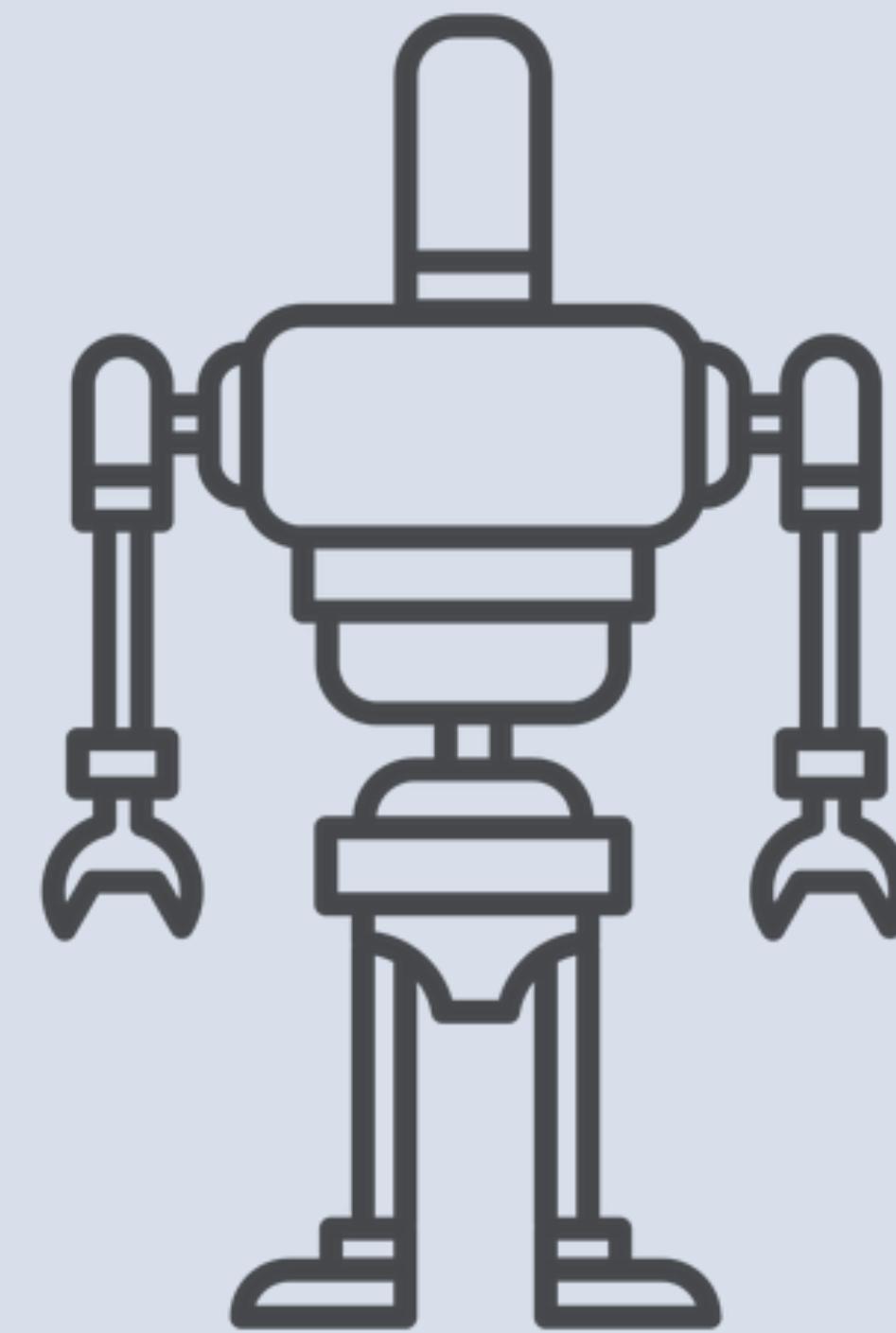
NetNORAD

Our Packet Loss detection system



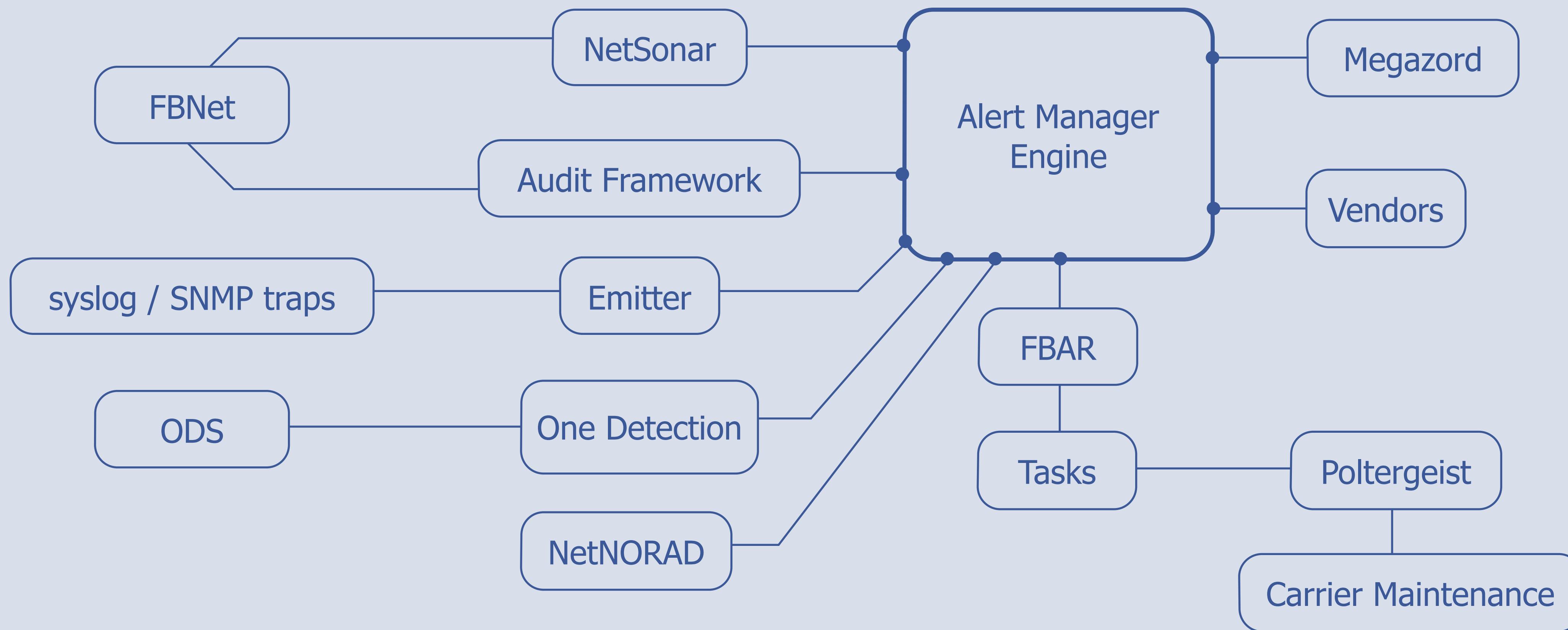
Megazord

Our alarm correlation engine



Facebook Defined Networking

all components in action

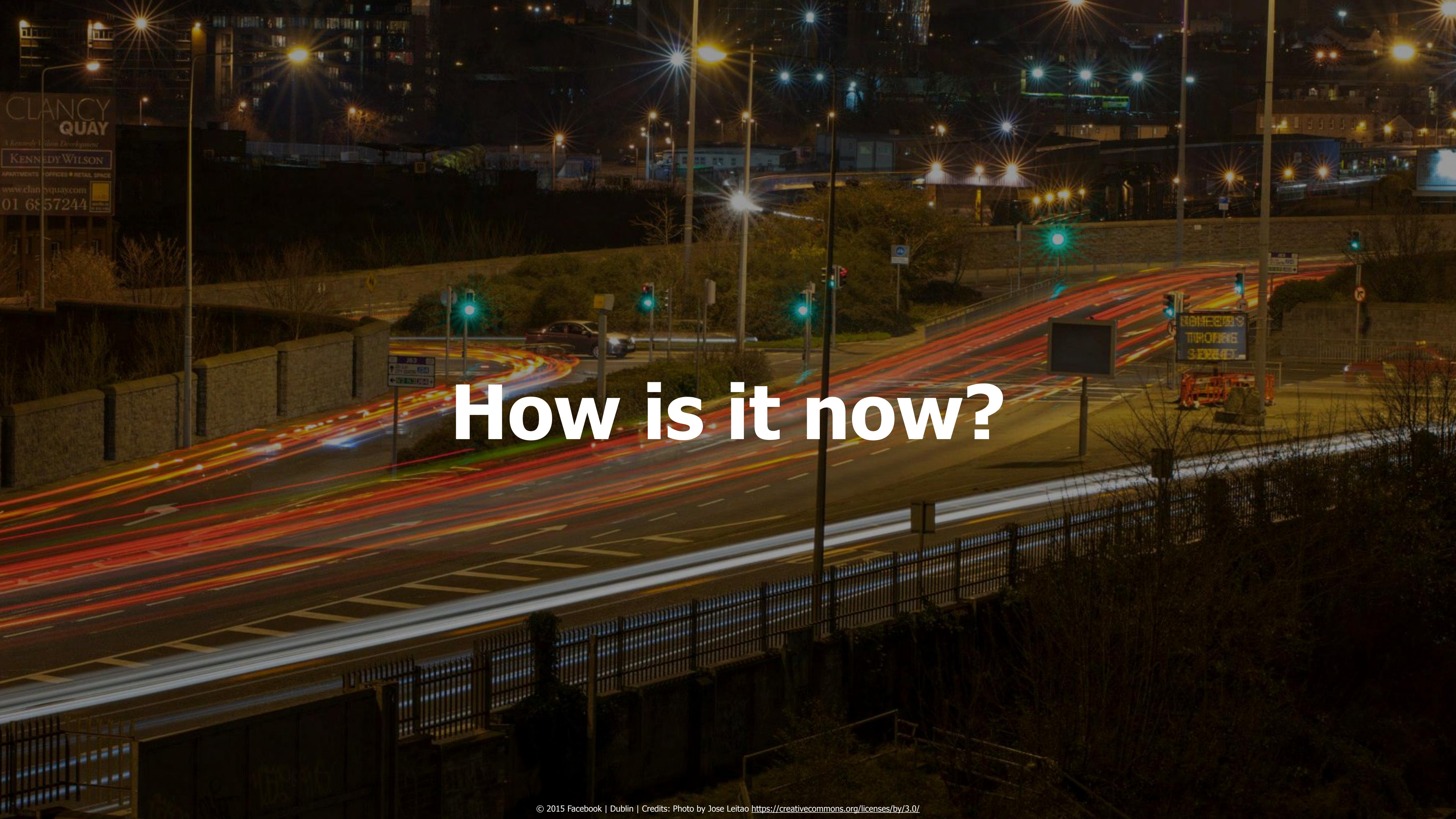




Tales from the real world

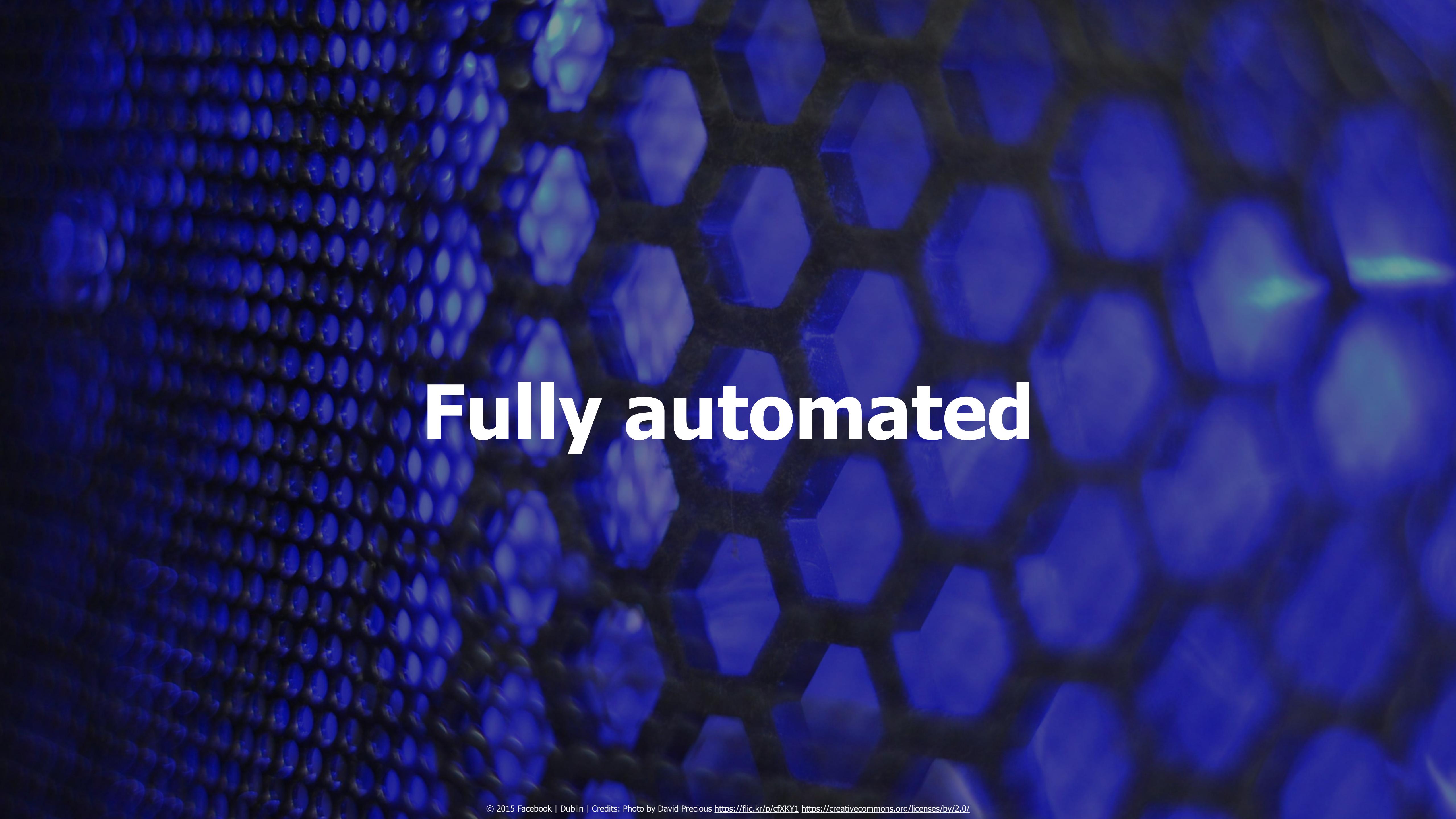
Circuits @ scale





How is it now?

CLANCY
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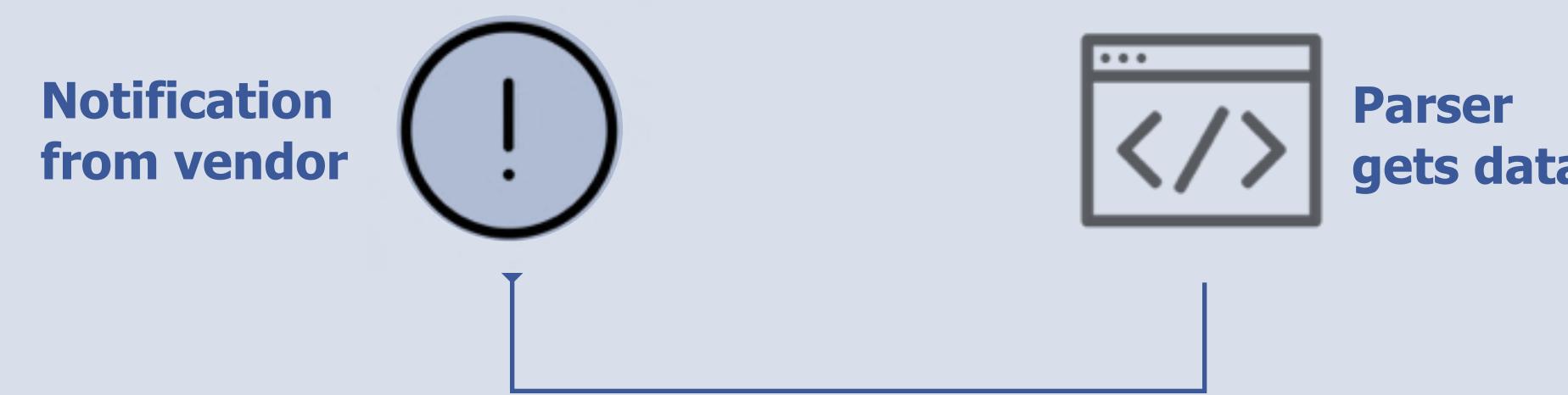
Fully automated

How is it now?

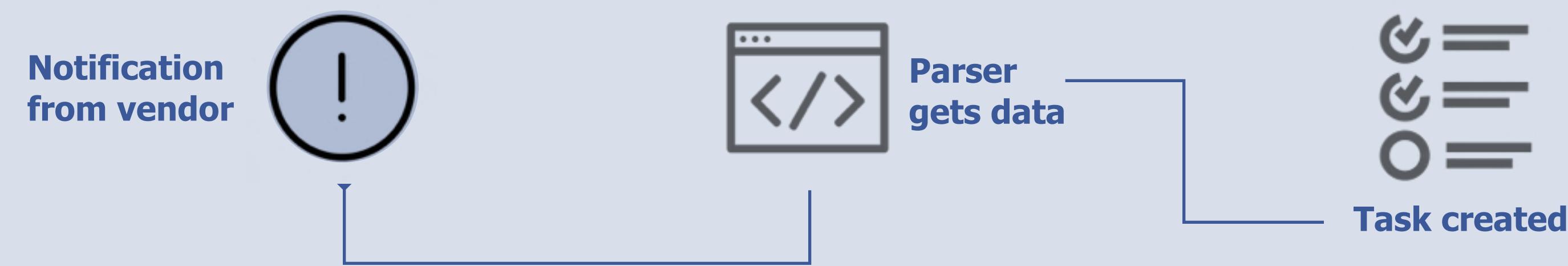
Notification
from vendor



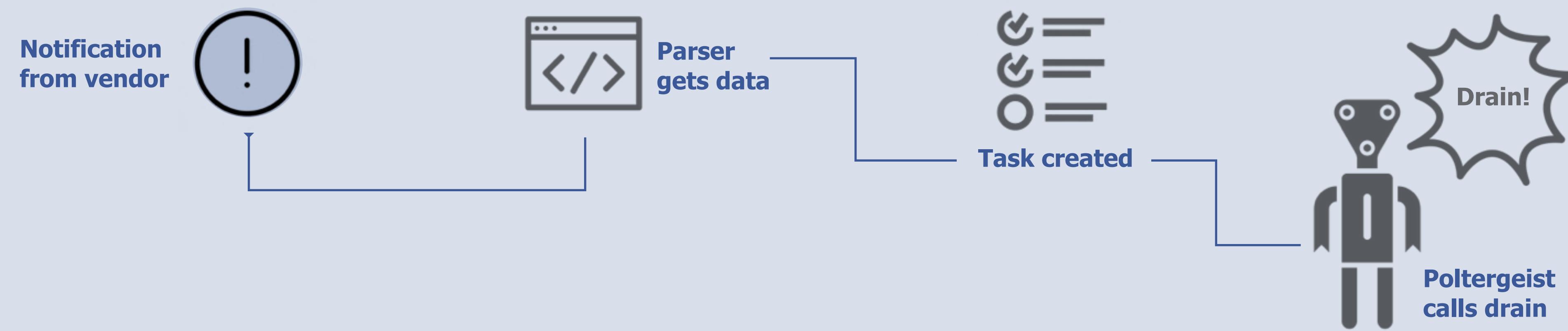
How is it now?



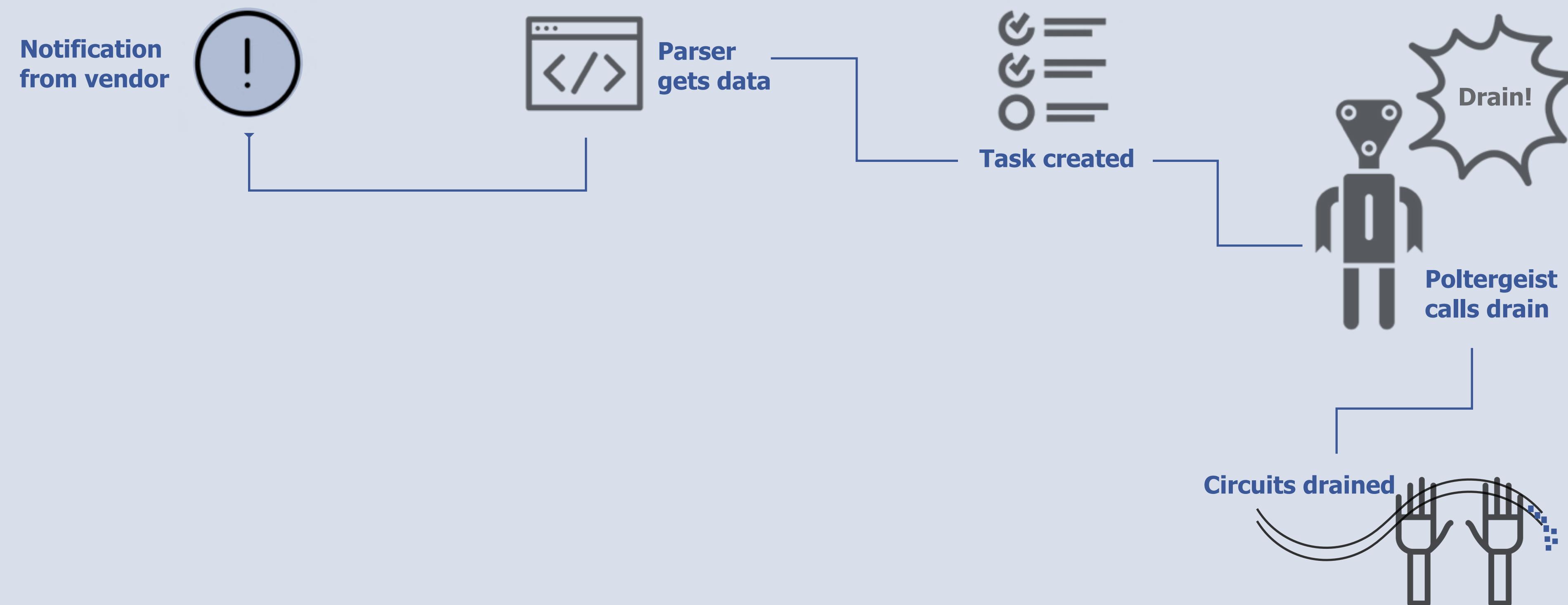
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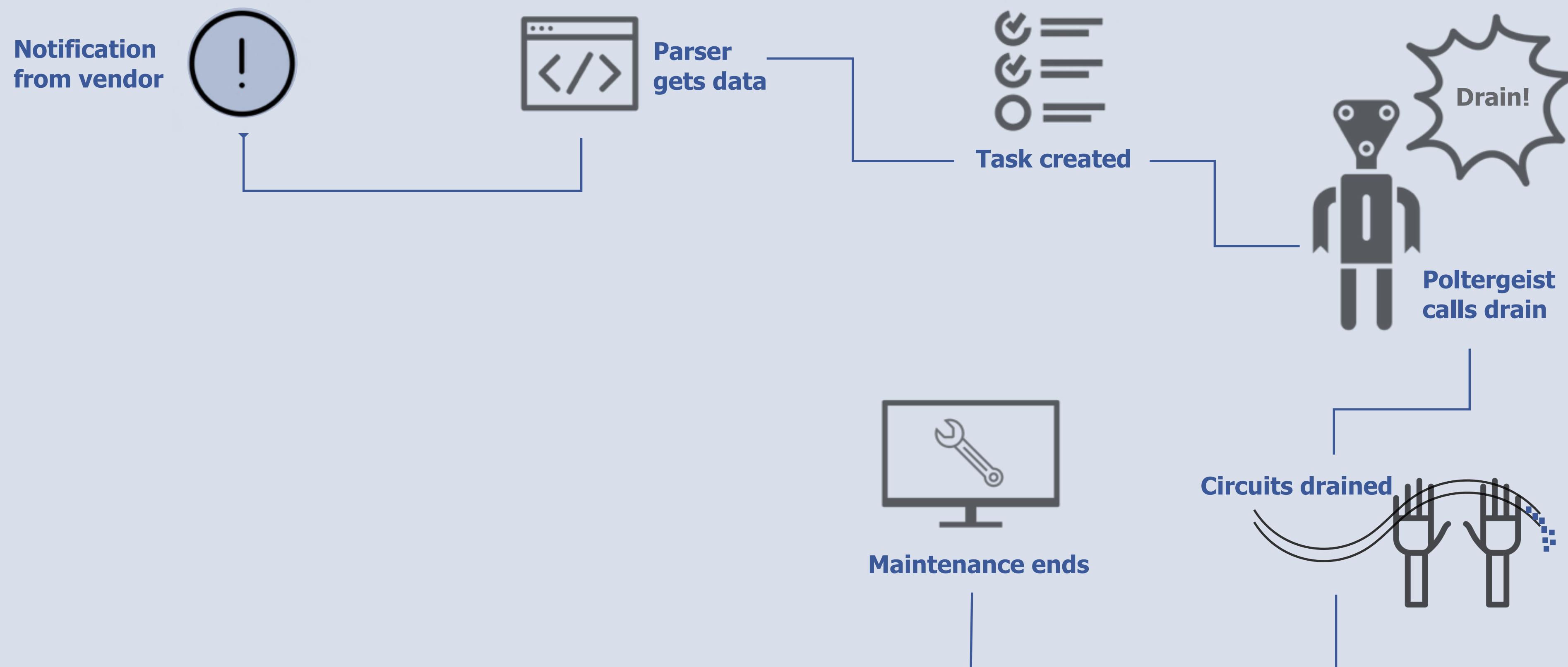
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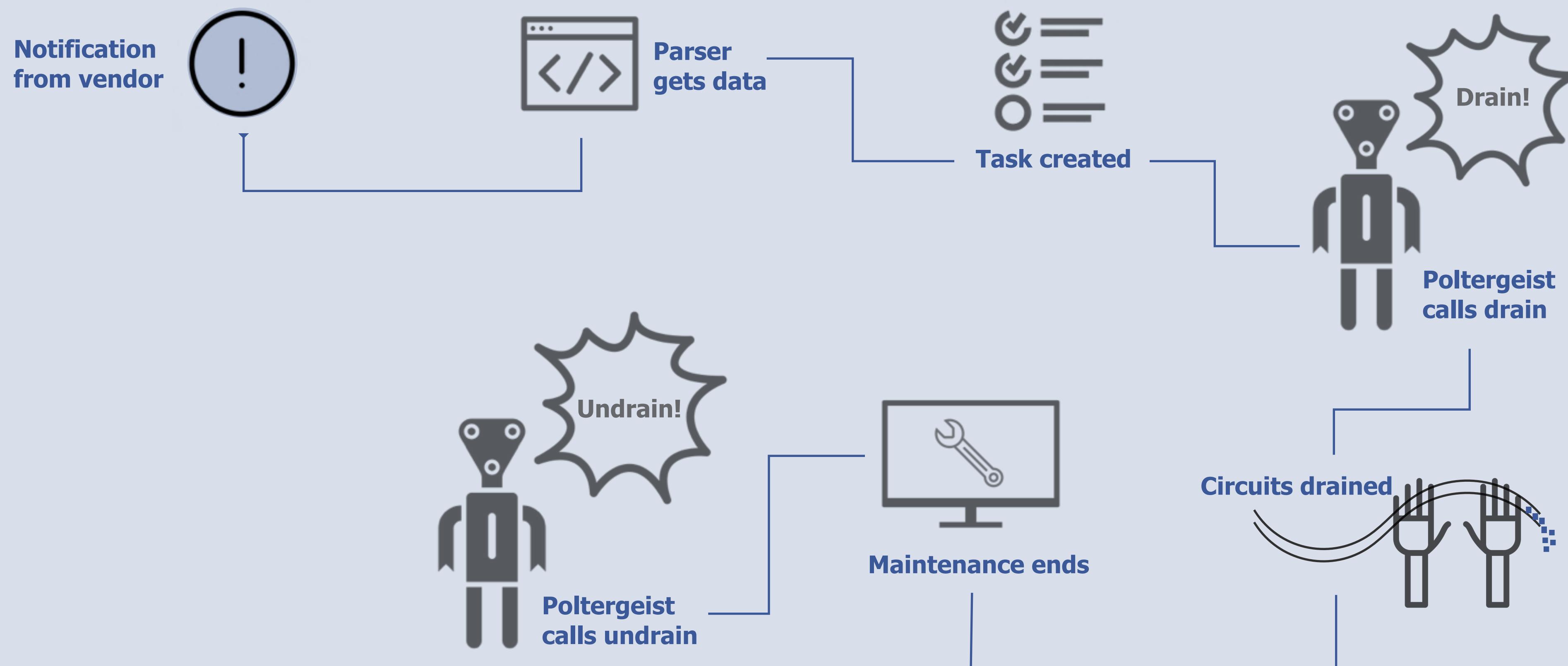
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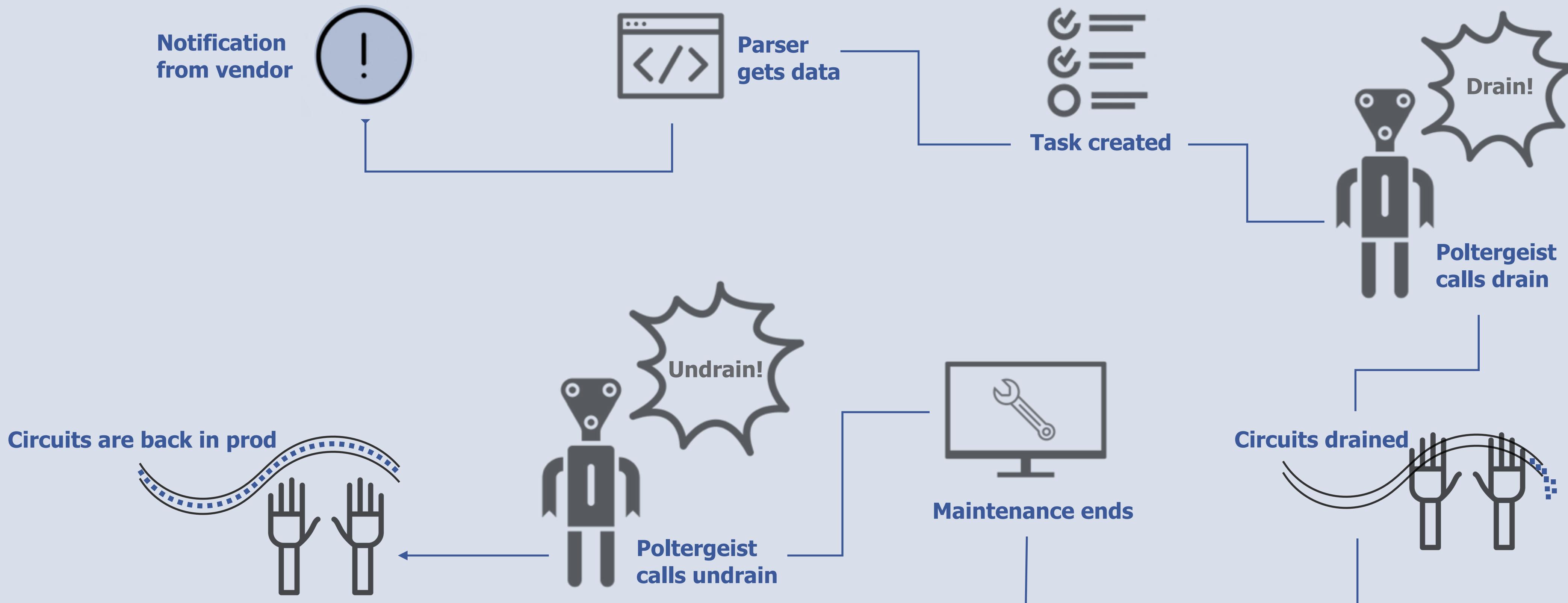
How is it now?



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...

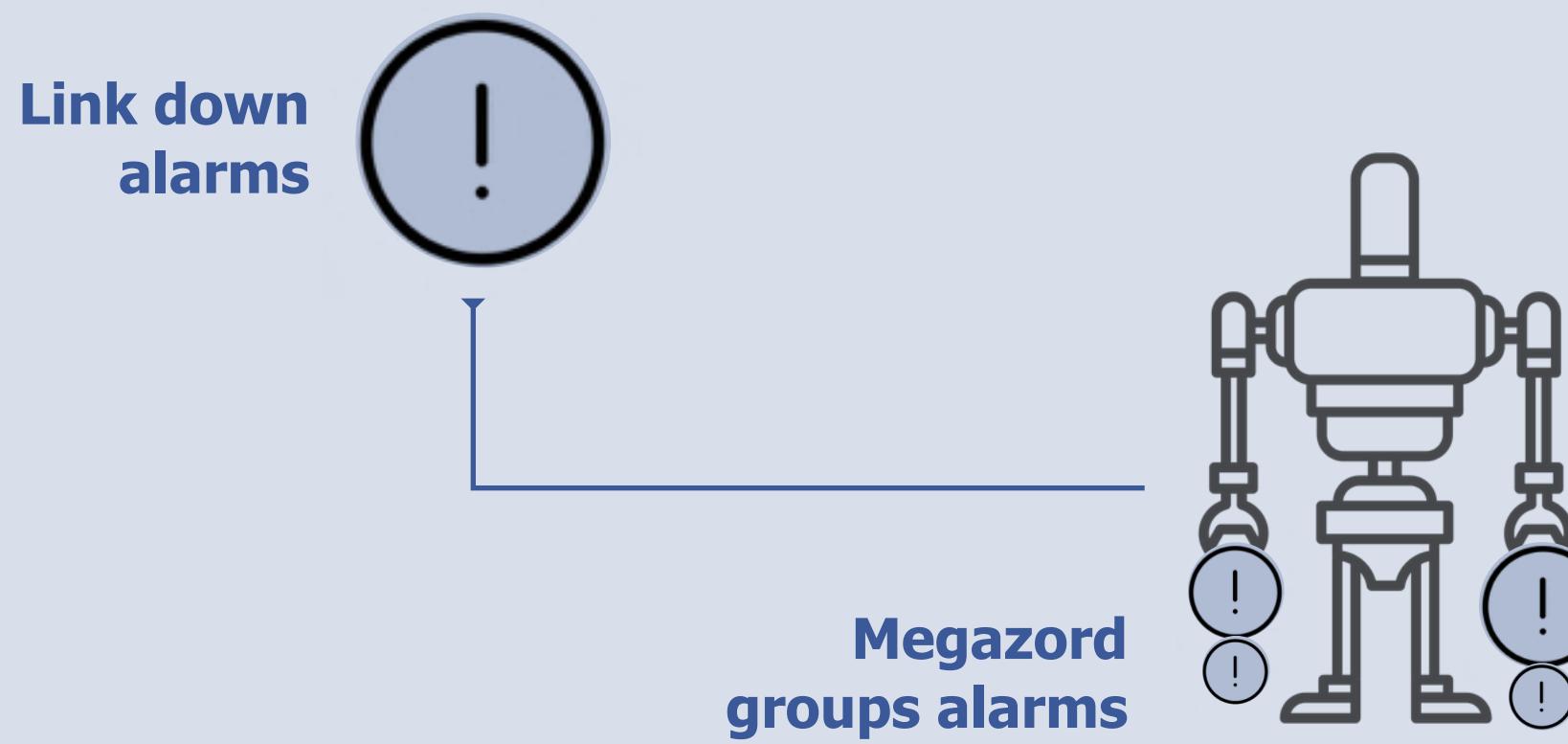


How is it now?

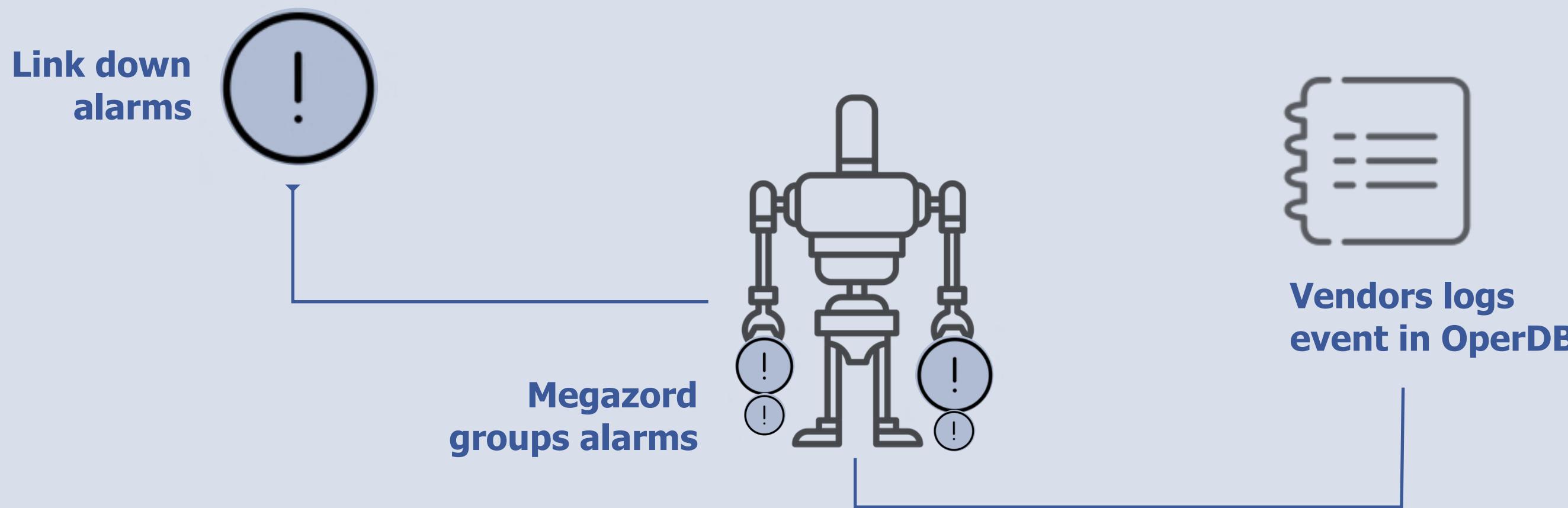
Link down
alarms



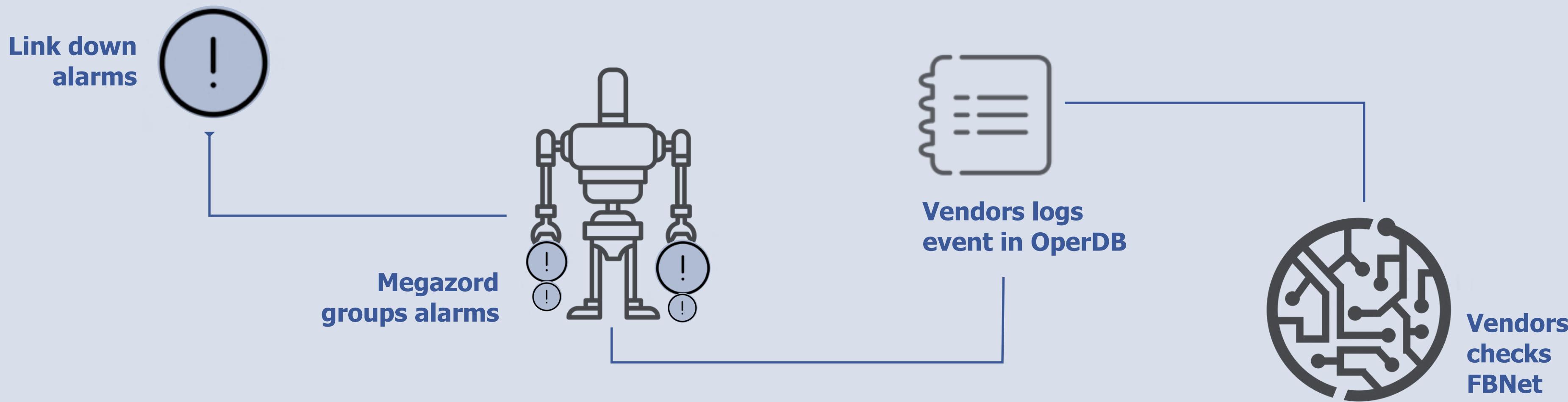
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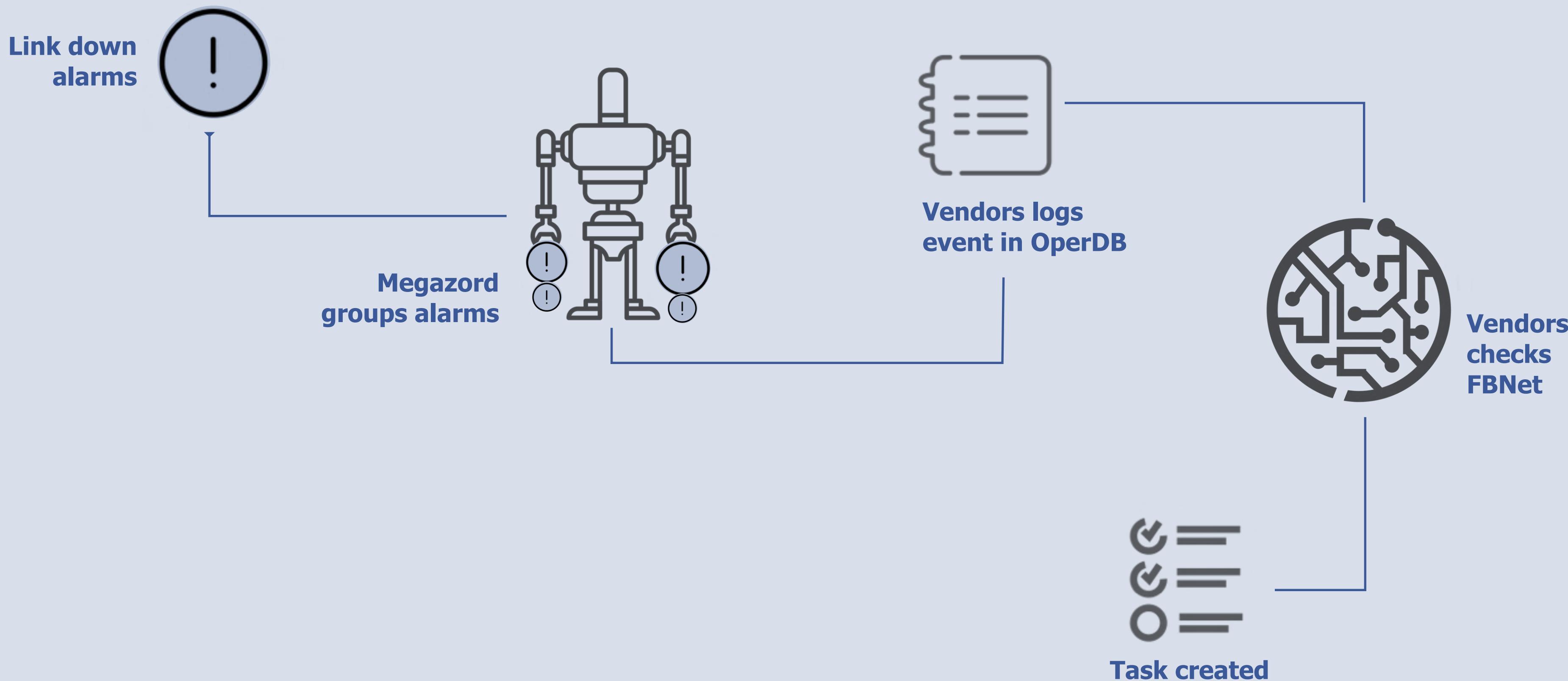
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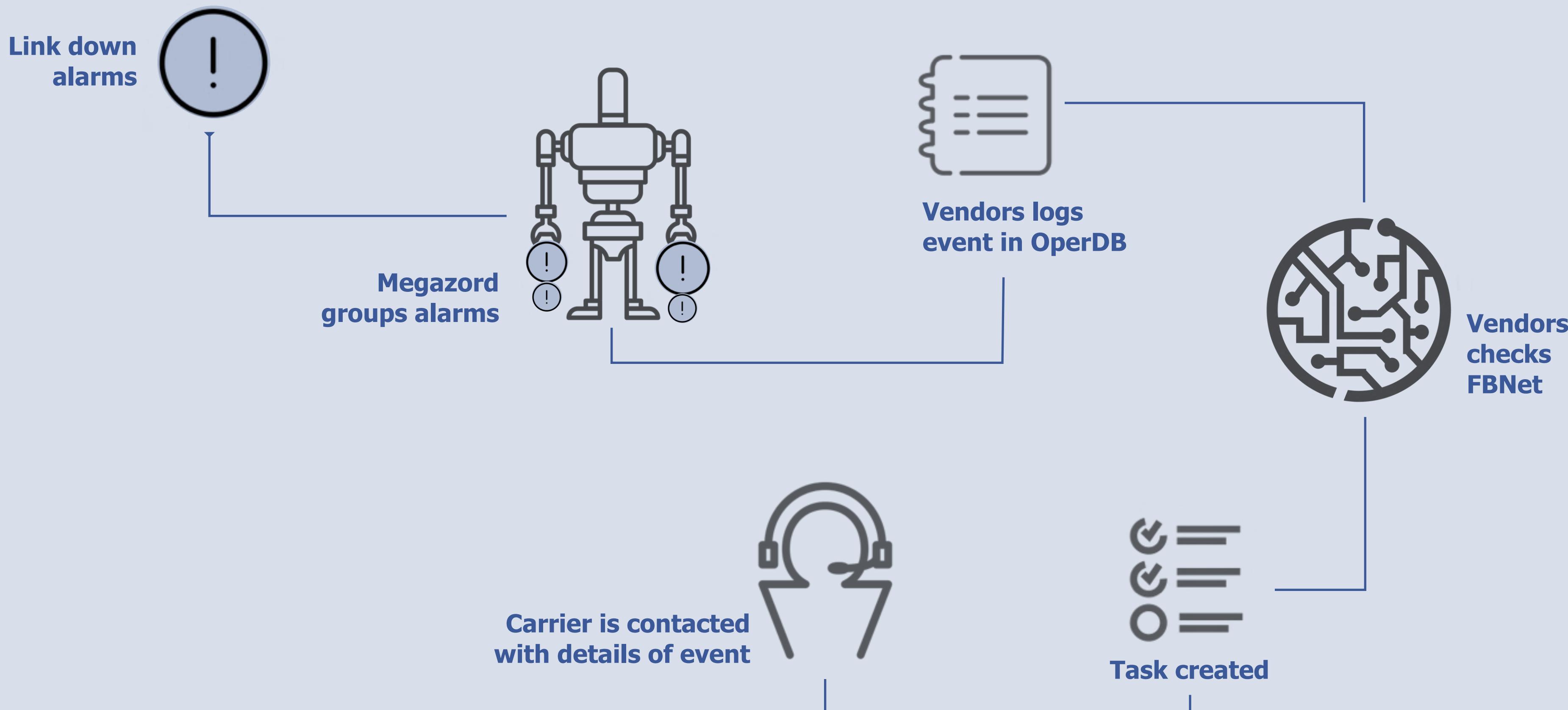
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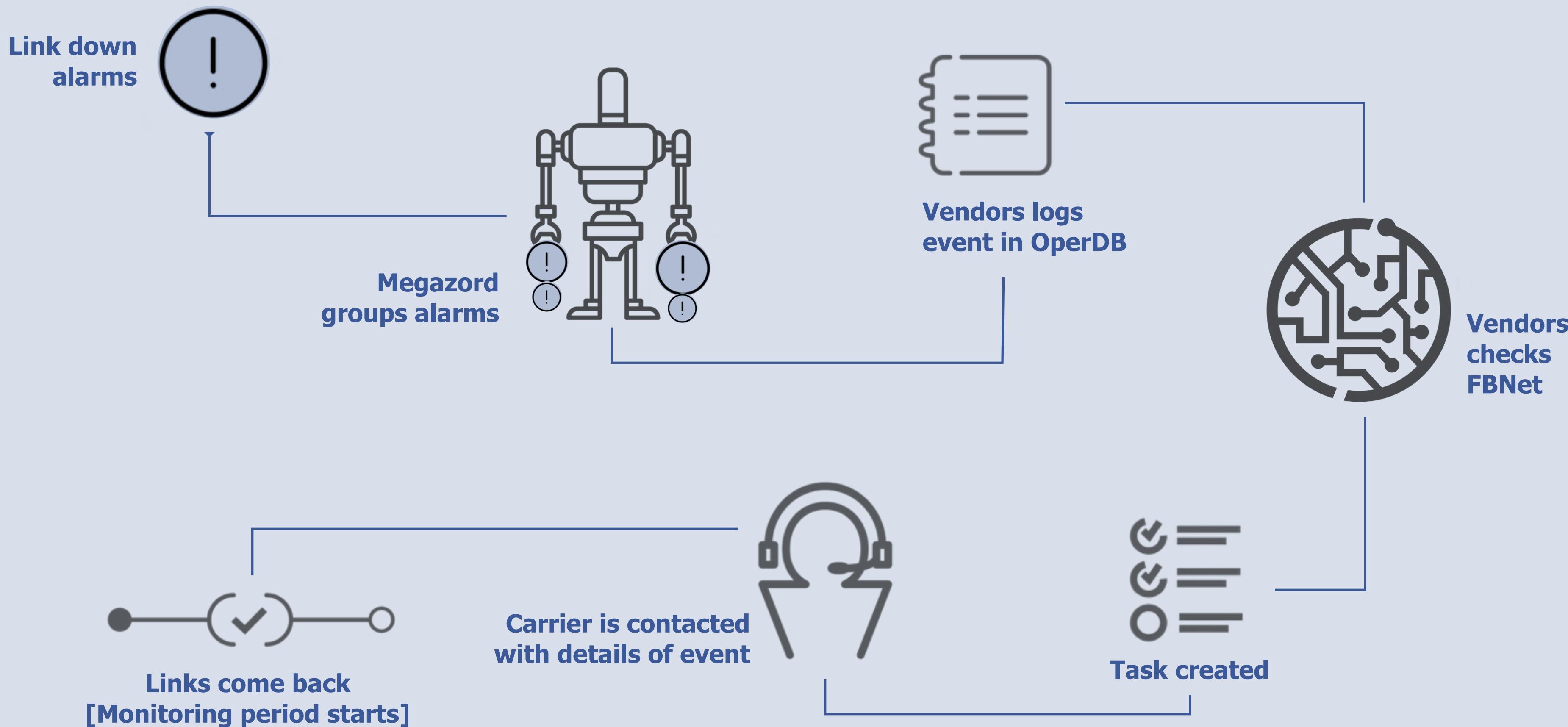
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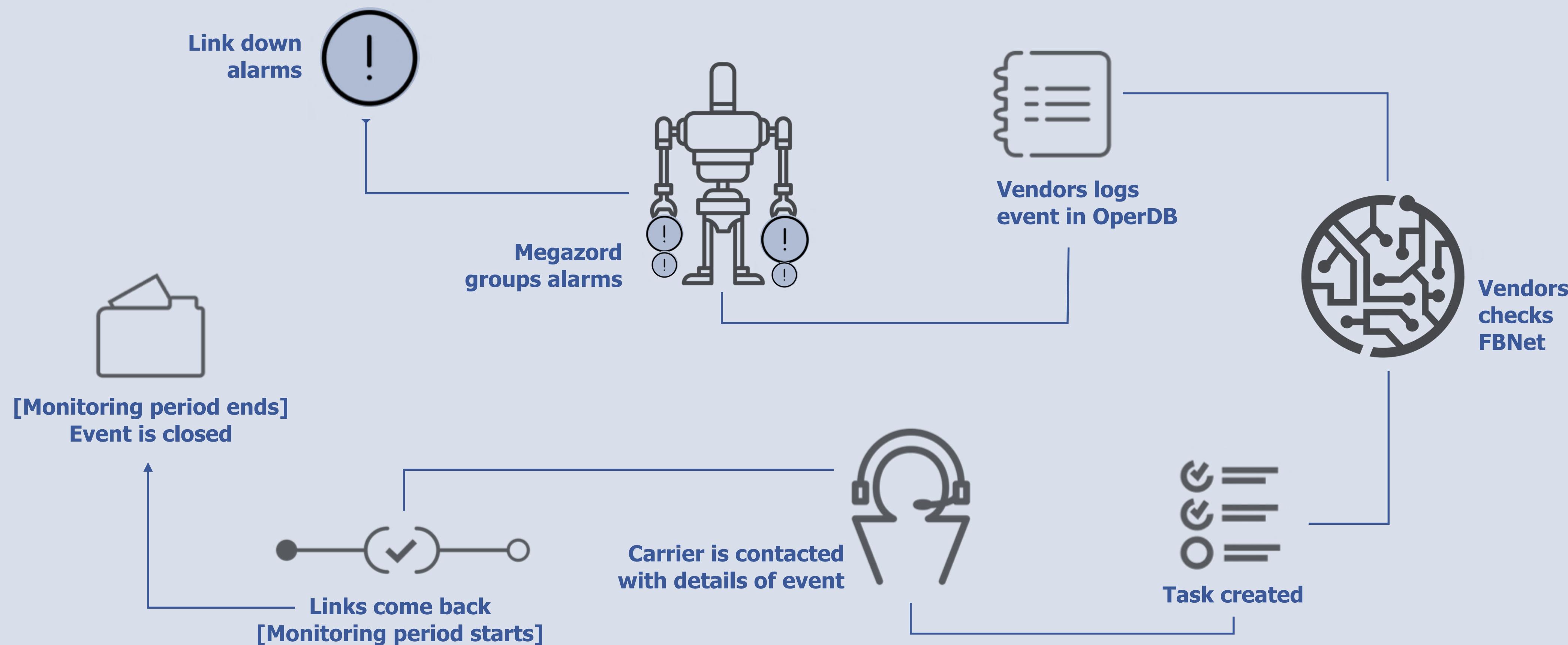
How is it now?



How is it now?

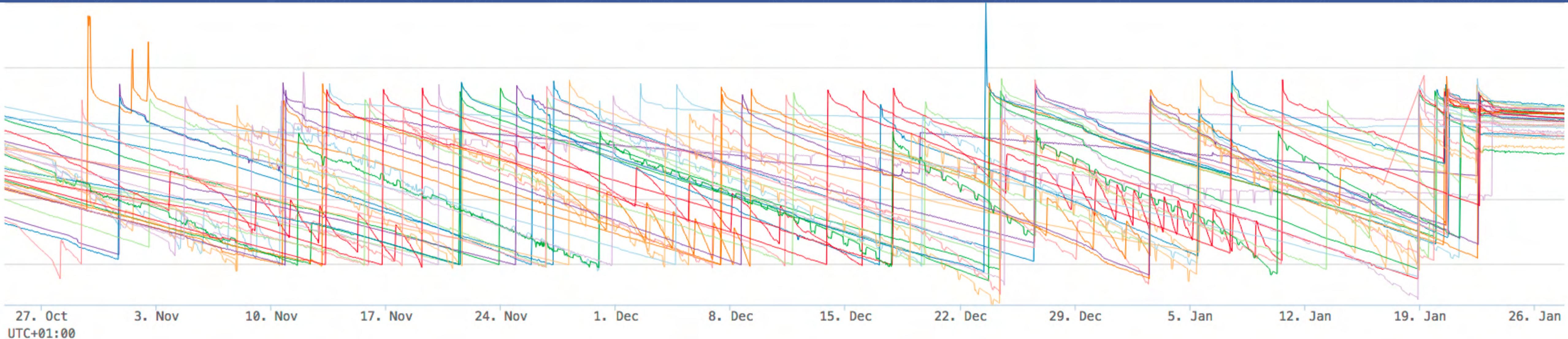


How is it now?



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. In the center, two prominent figures stand out: a man with a long white beard (Plato) and a man with a shorter beard (Aristotle). Plato is shown pointing upwards, while Aristotle points downwards, symbolizing their different philosophical approaches. Other figures include Pythagoras, Euclid, and Ptolemy, each absorbed in their own work or conversation. The floor is filled with students, some sitting on the steps of a large staircase, others standing, all seemingly engrossed in their studies. The overall atmosphere is one of a vibrant intellectual community. The painting is framed by a decorative border featuring a repeating Greek key (meander) pattern.

How would this be solved with humans?

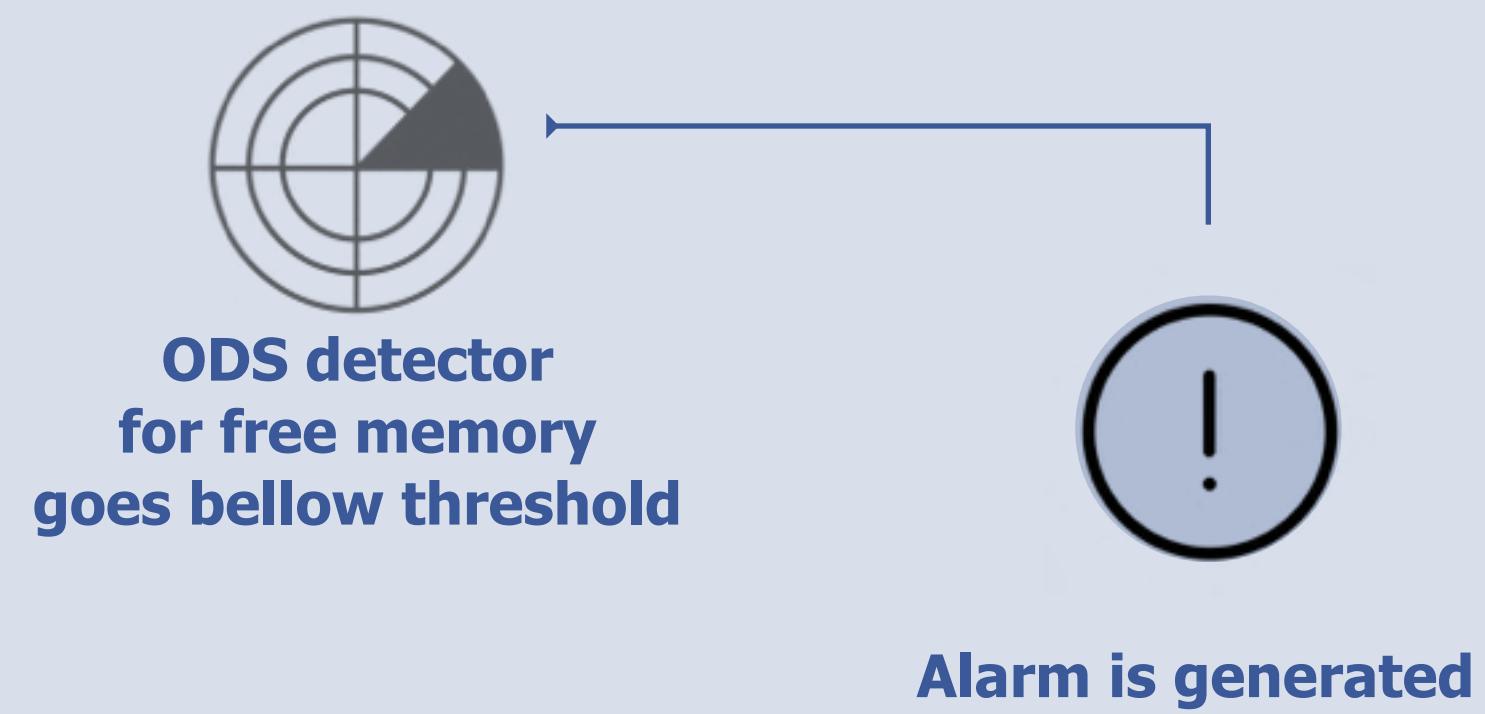
Lots of them + coffee

How is it now?

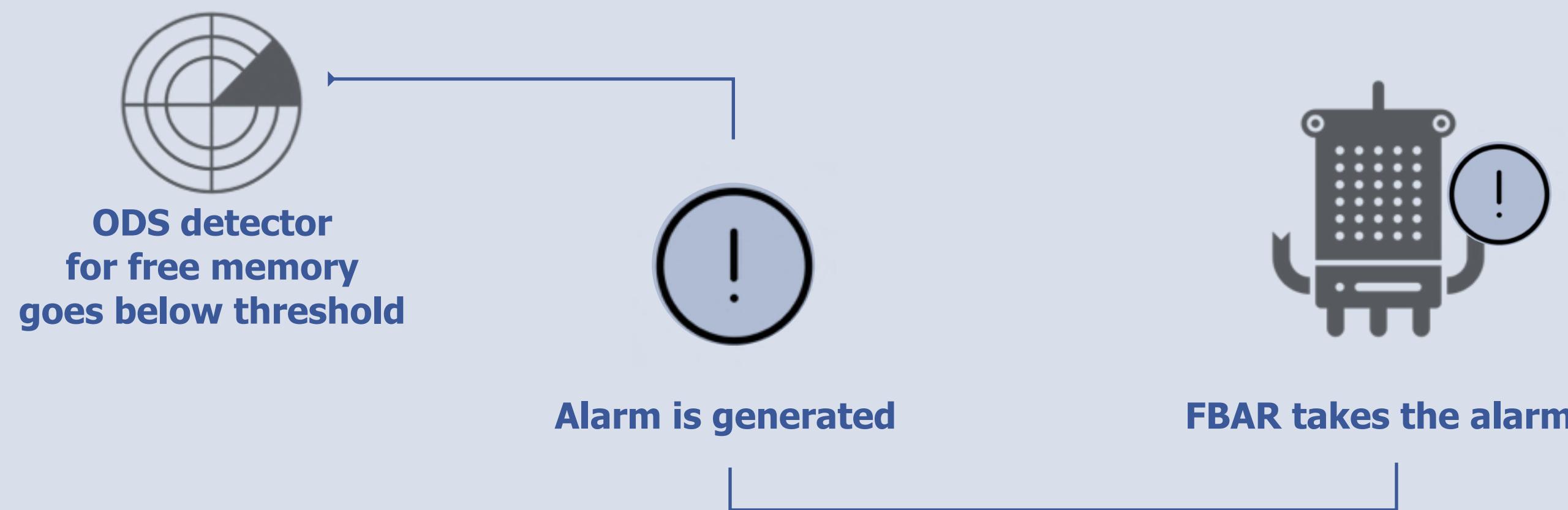


**ODS detector
for free memory
goes bellow threshold**

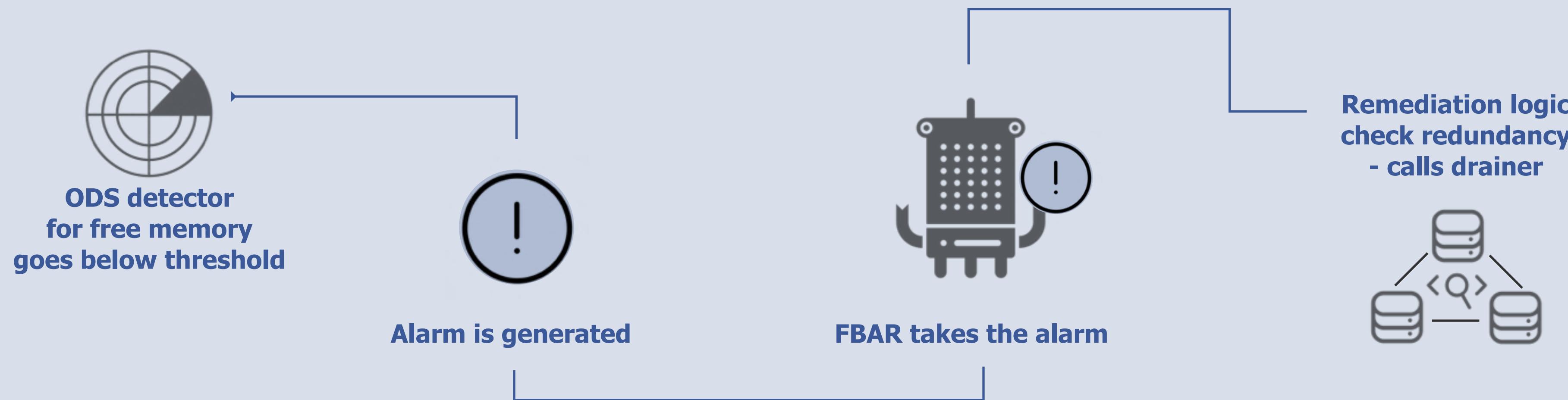
How is it now?



How is it now?



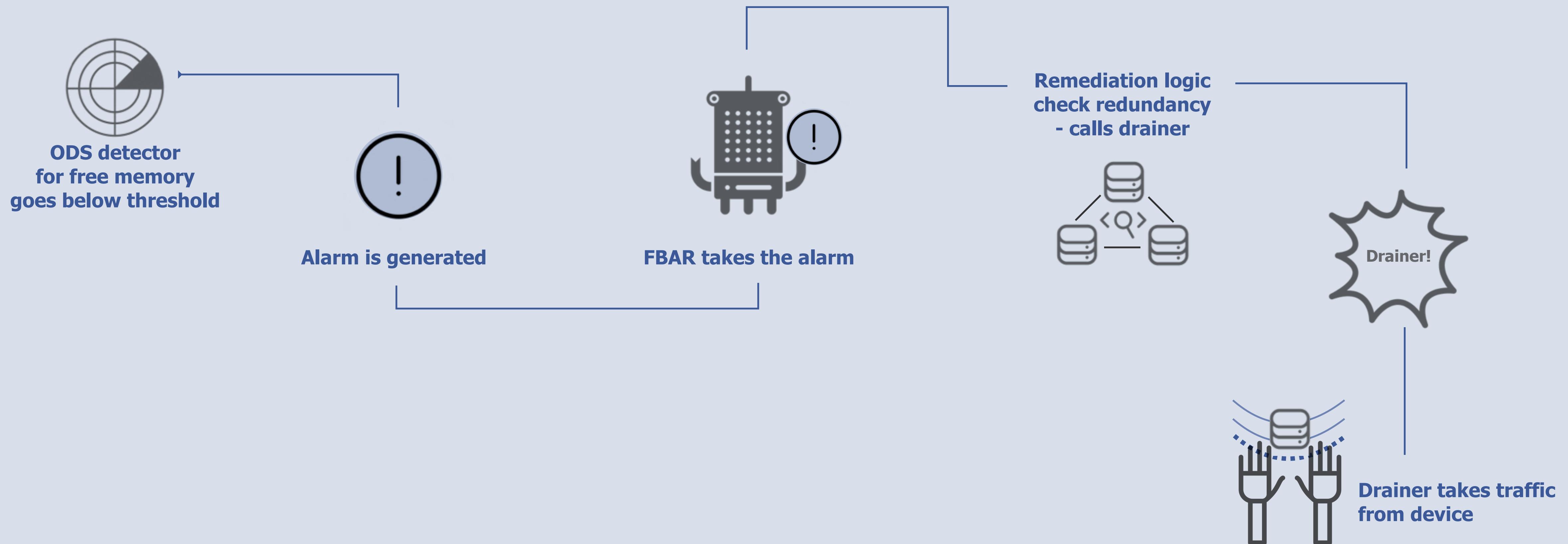
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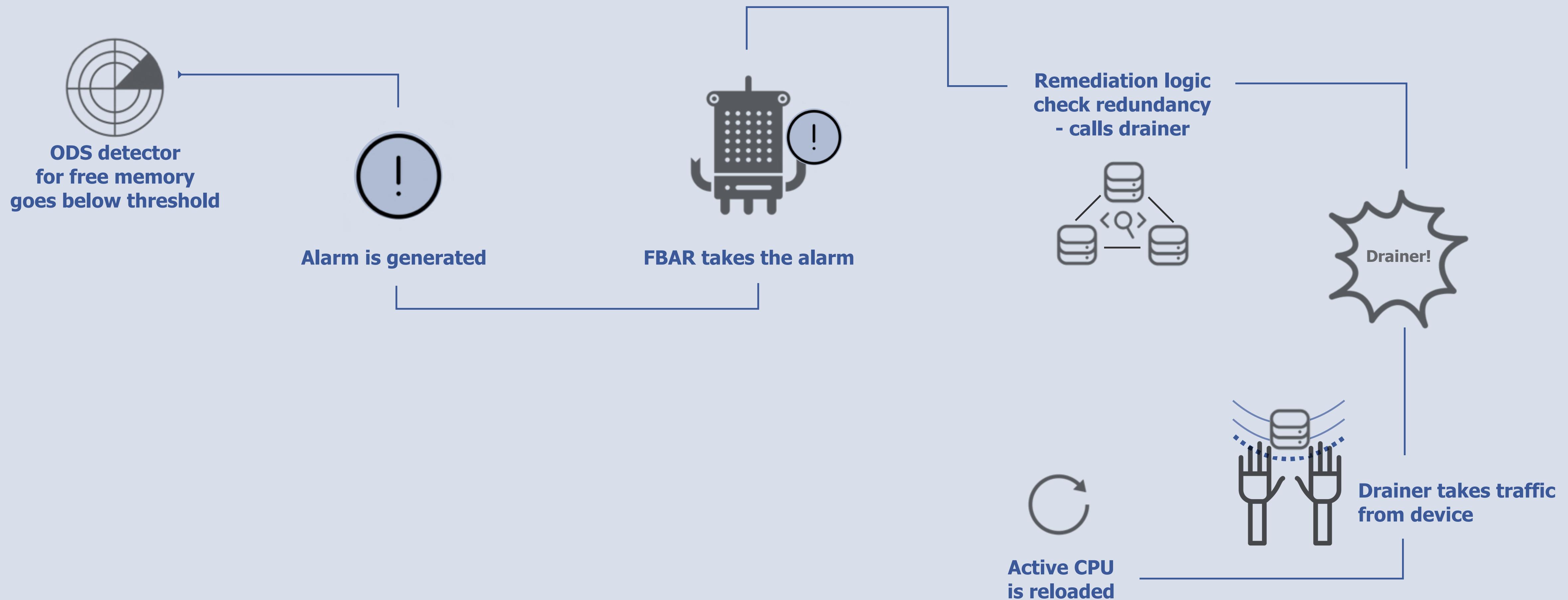
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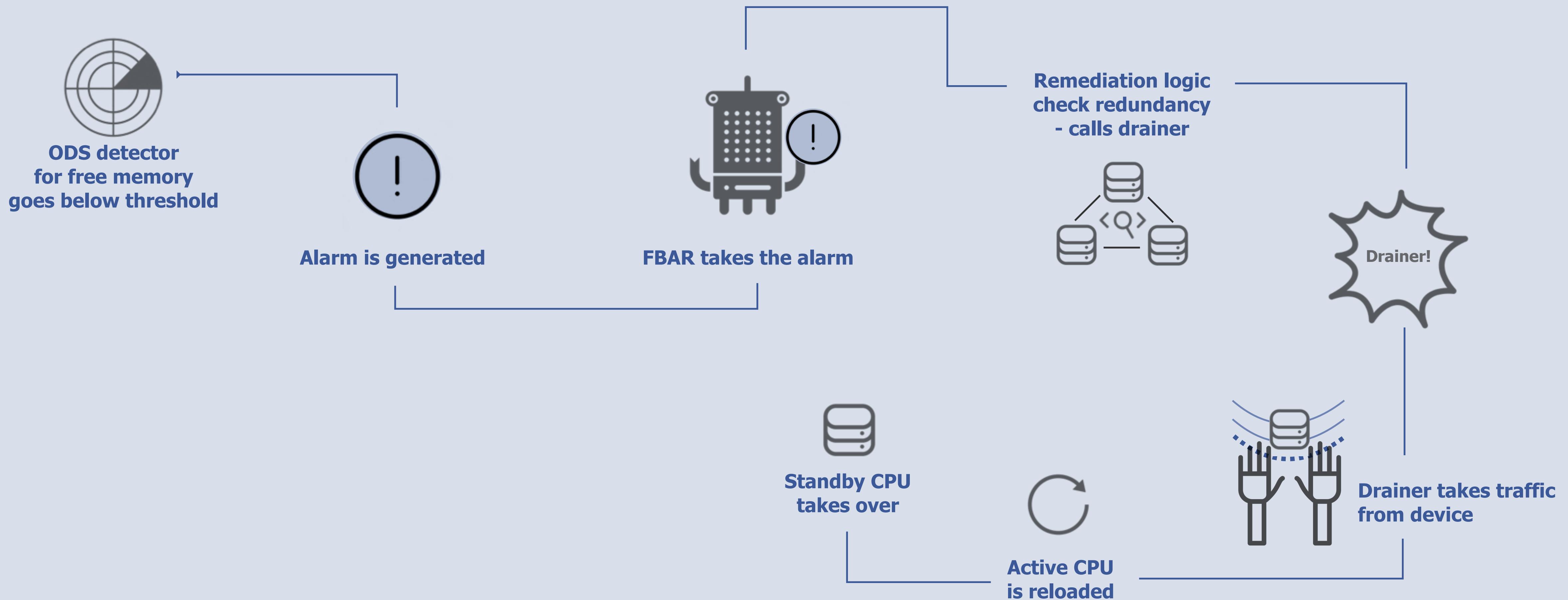
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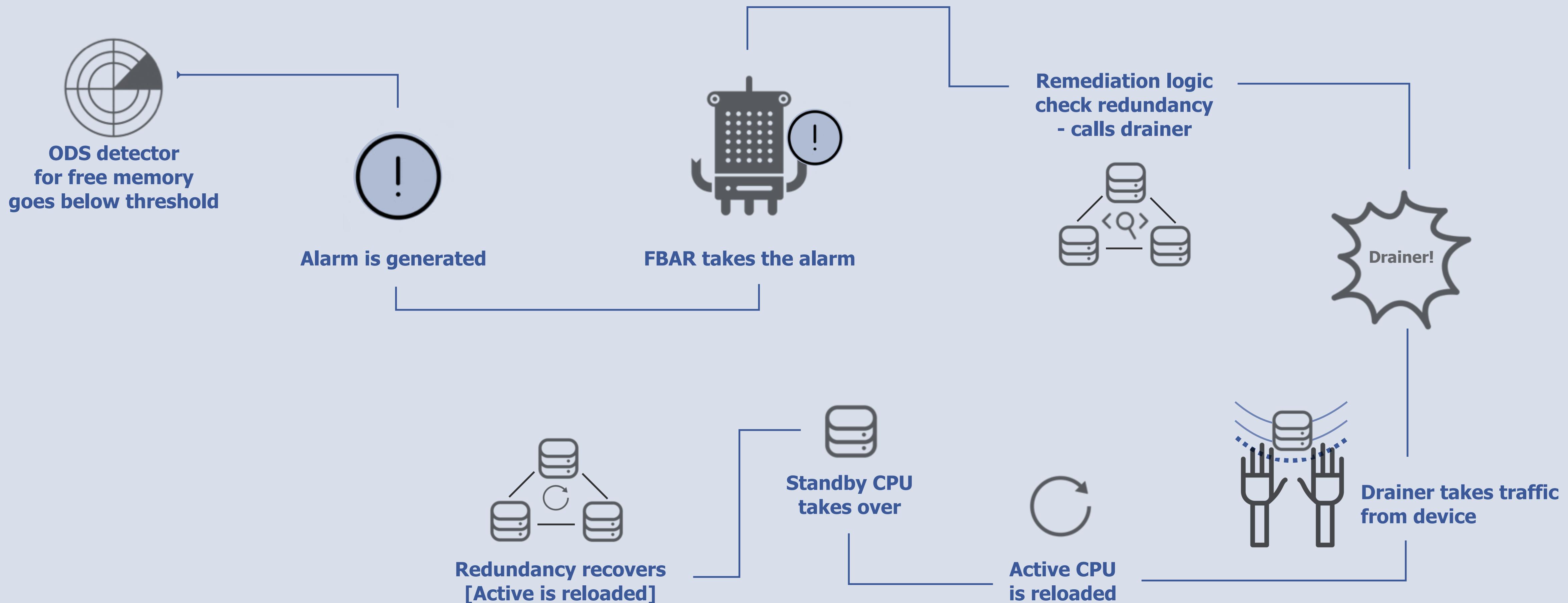
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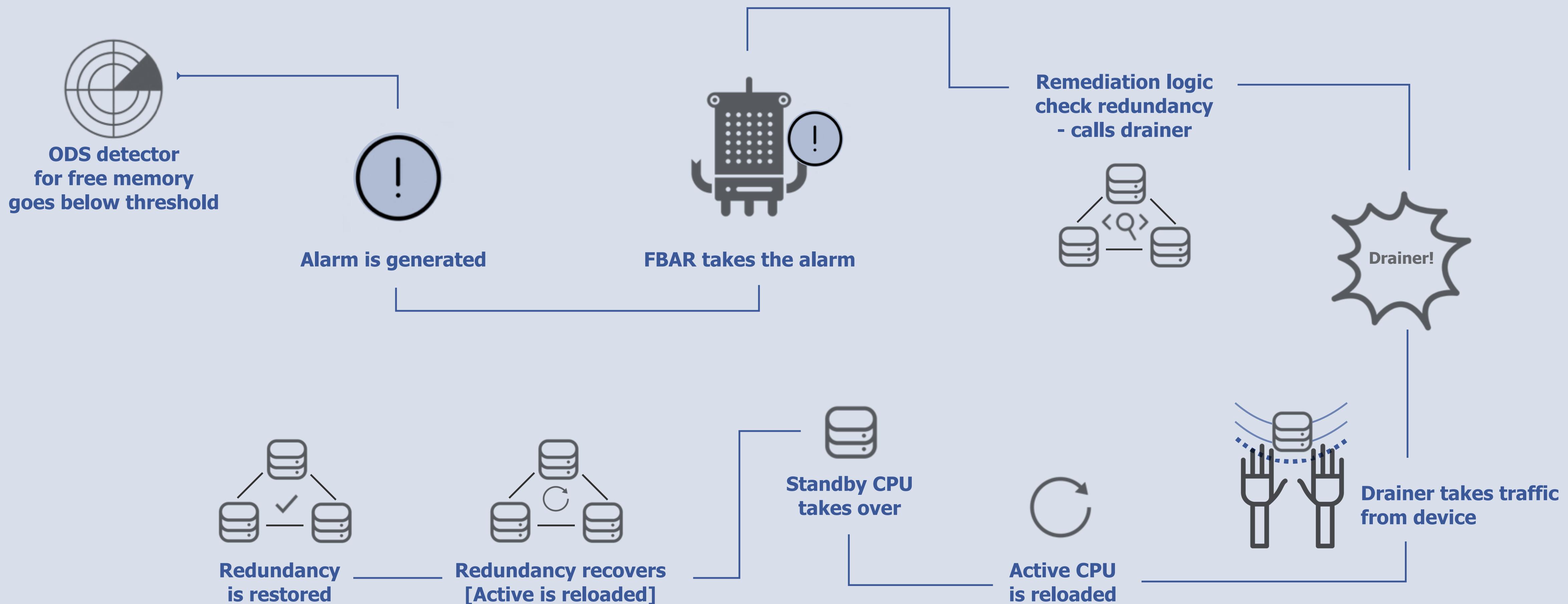
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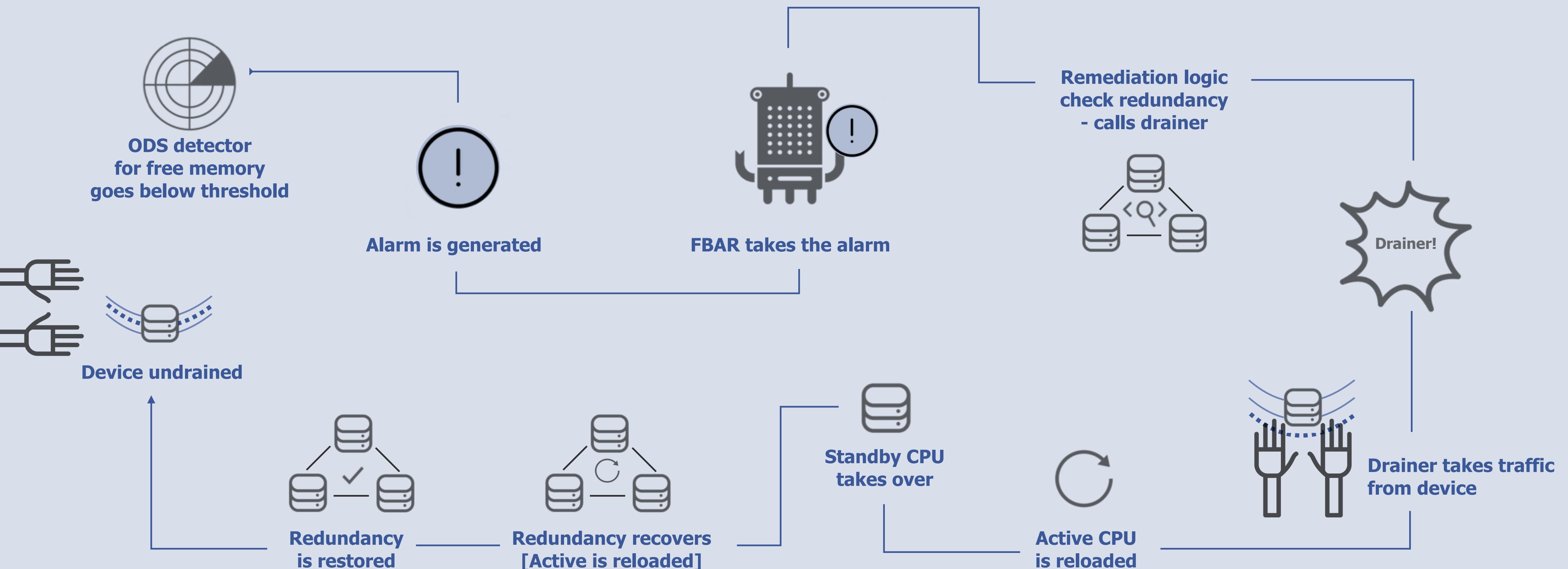
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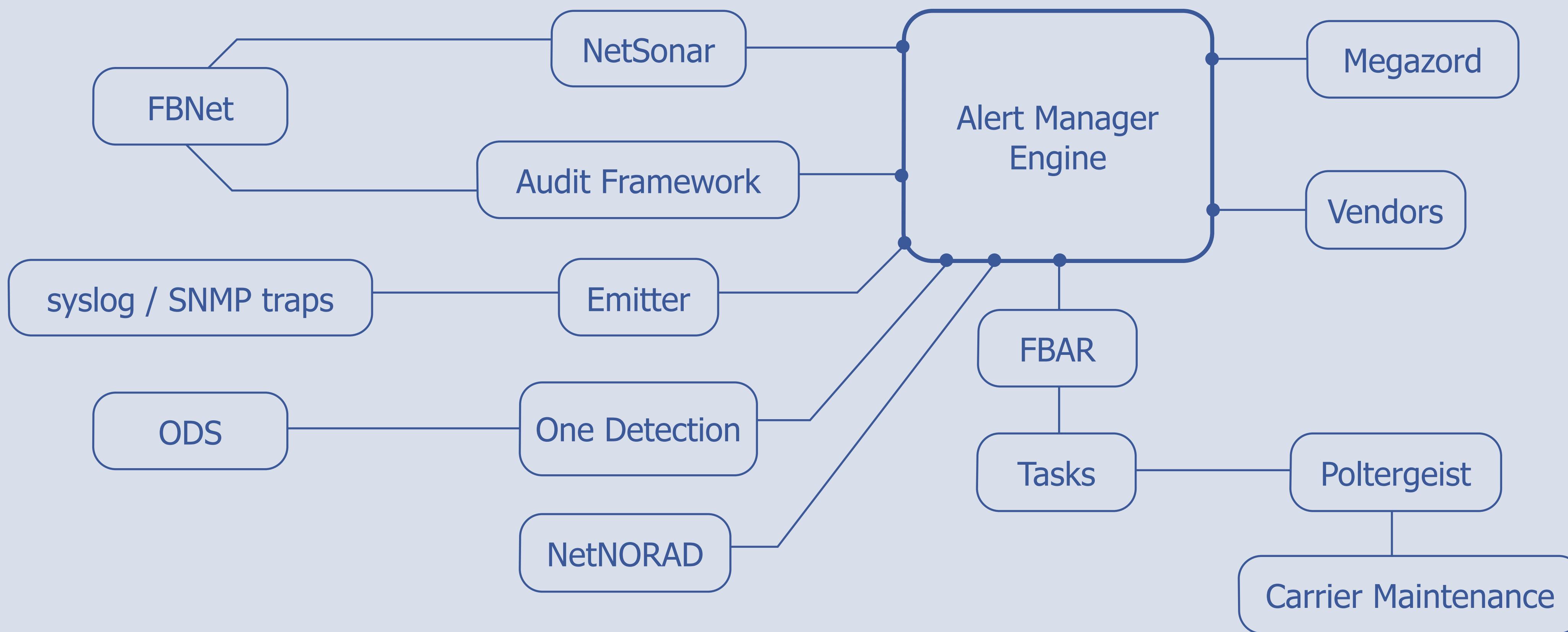


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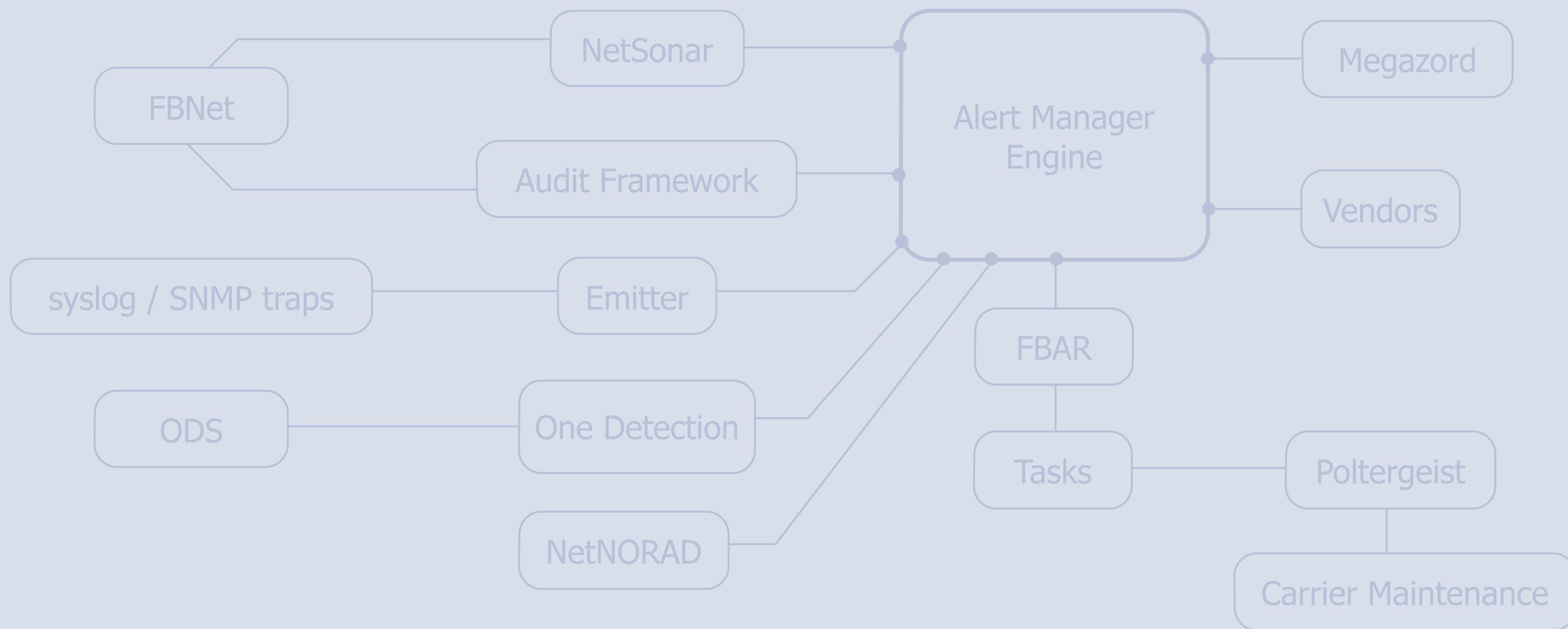
Facebook Defined Networking

all components in action



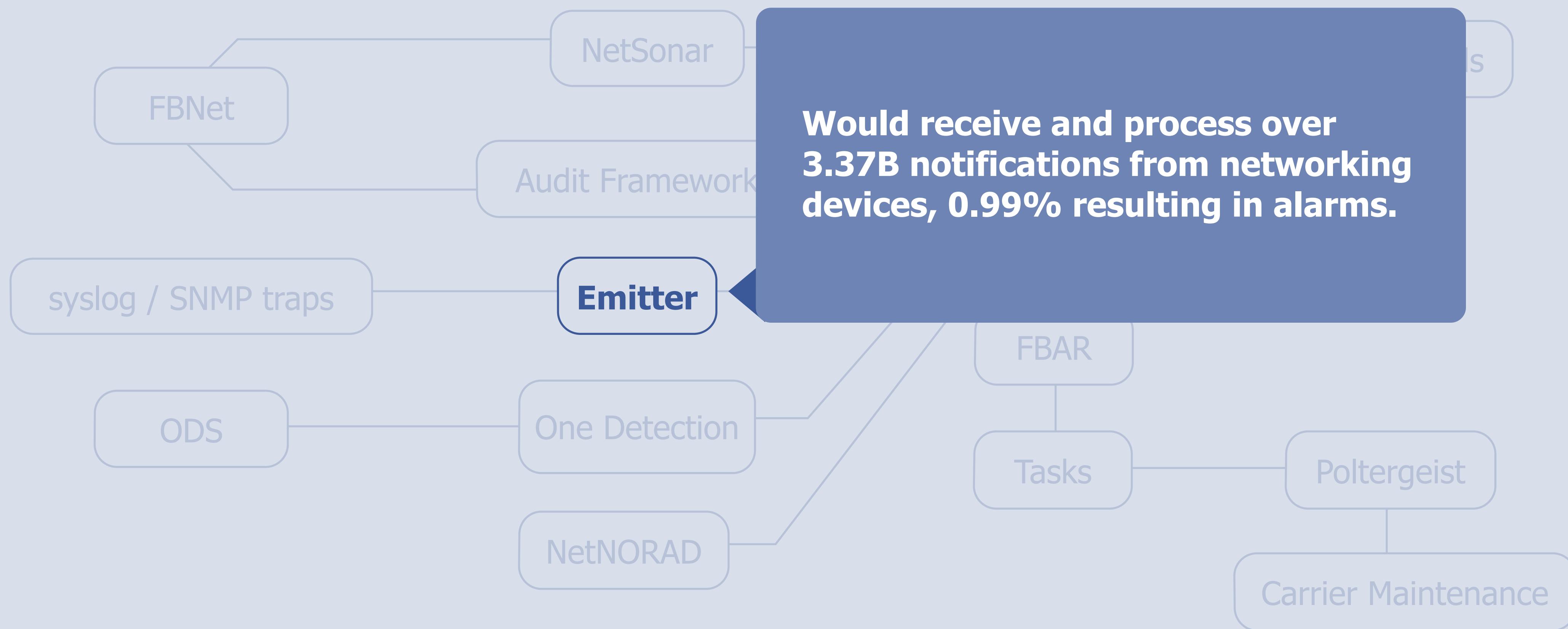
So, in 30 days...

all components in action



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all components in action



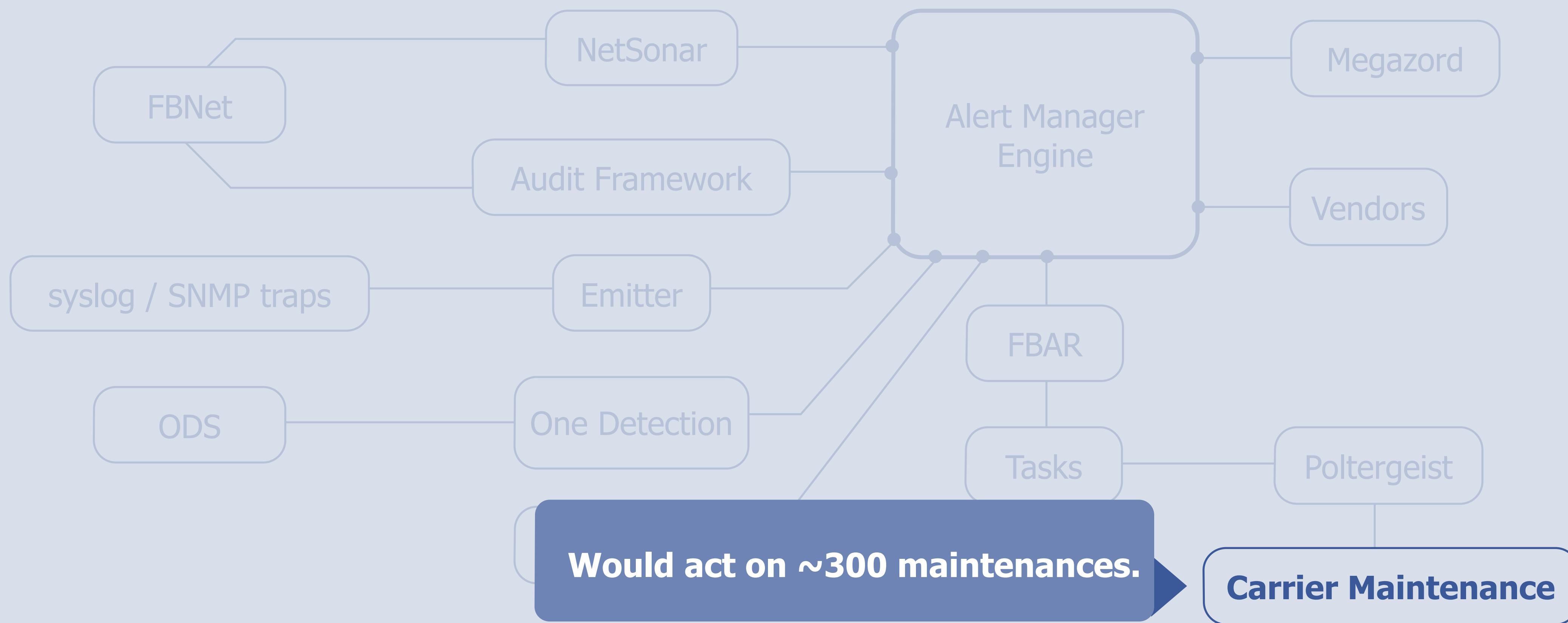
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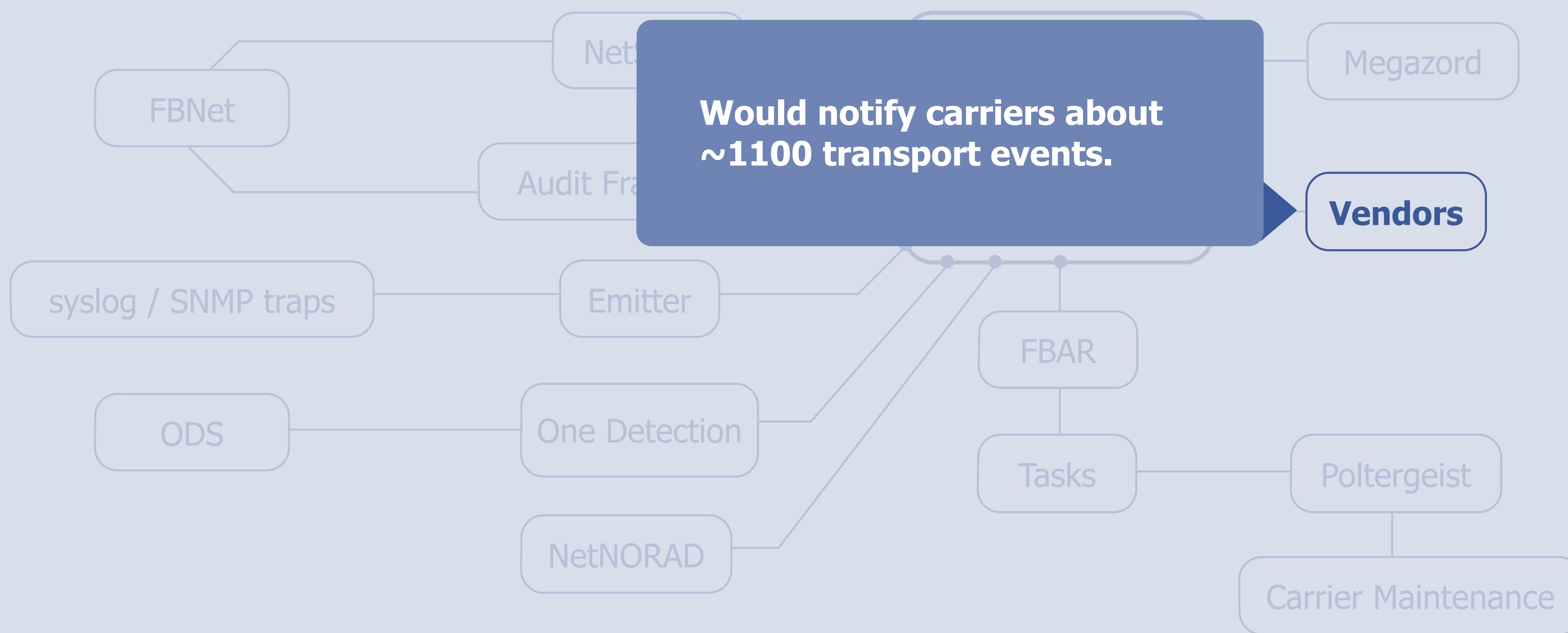
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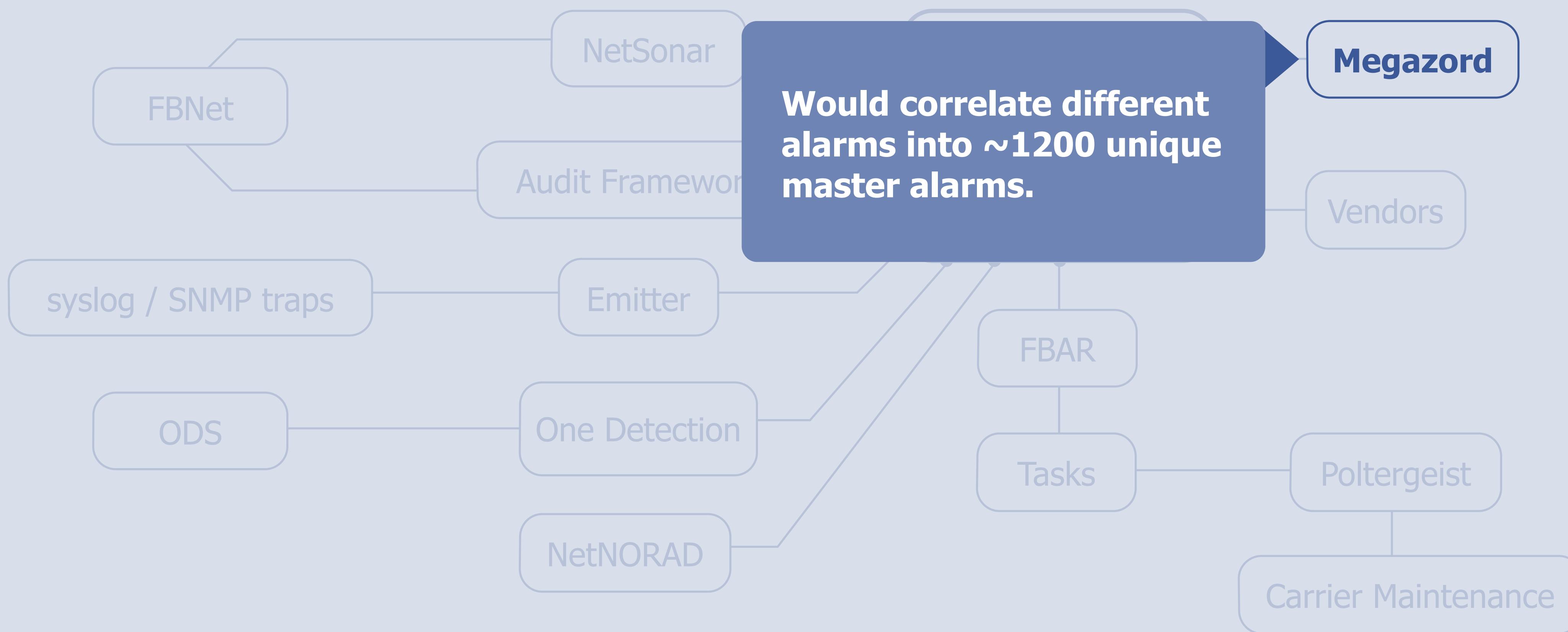
So, in 30 days...

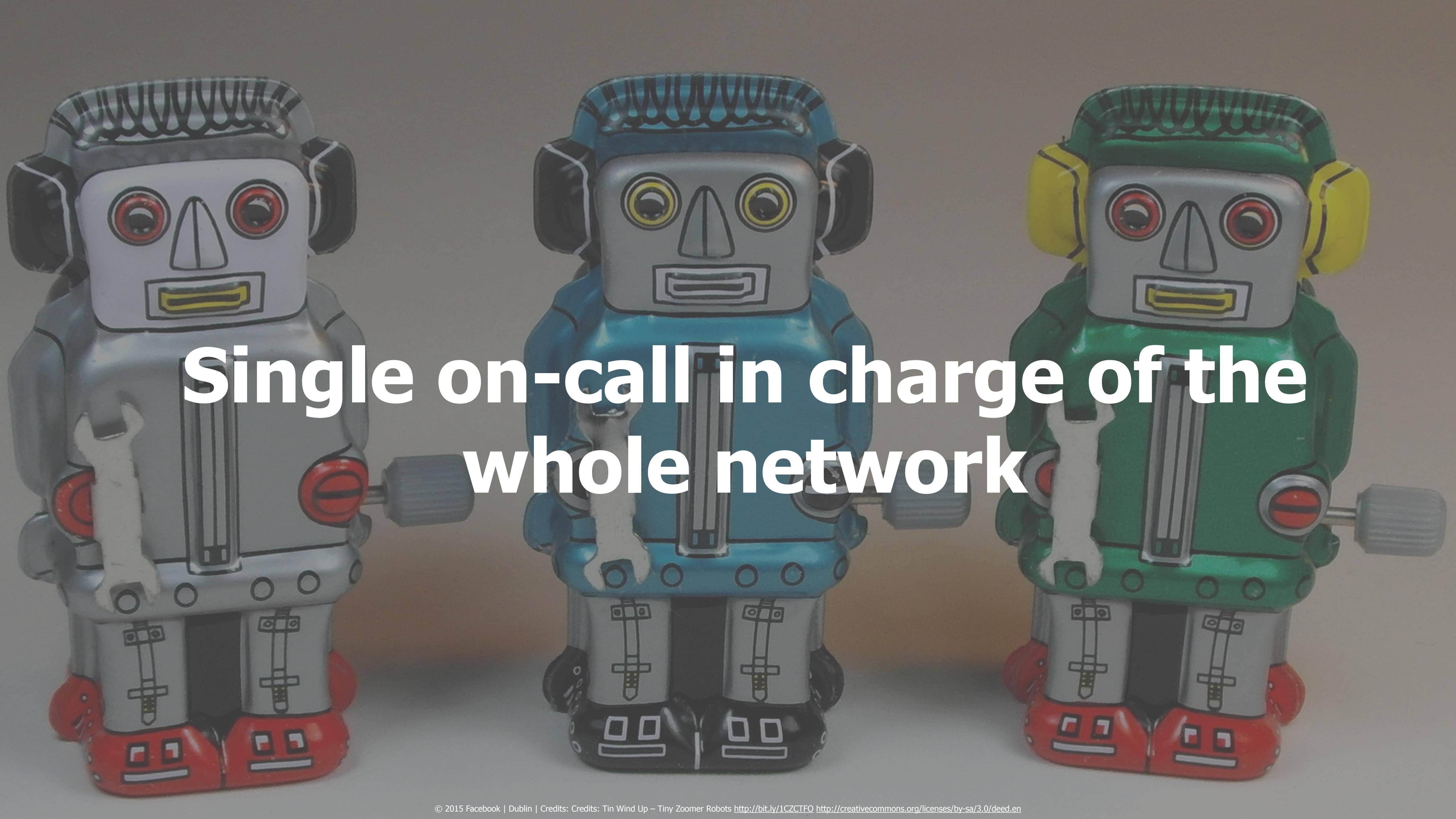
all components in action



So, in 30 days...

all components in action



Three vintage-style wind-up robots are standing in a row against a light brown background. The robots are metallic with large, expressive eyes and a central triangular mouthpiece. They have mechanical arms and legs. The robot on the left is silver with red accents on its hands and feet. The middle robot is blue with yellow accents. The robot on the right is green with yellow accents.

Single on-call in charge of the
whole network



Lessons Learned & Recommendations

8 Lessons Learned & Recommendations

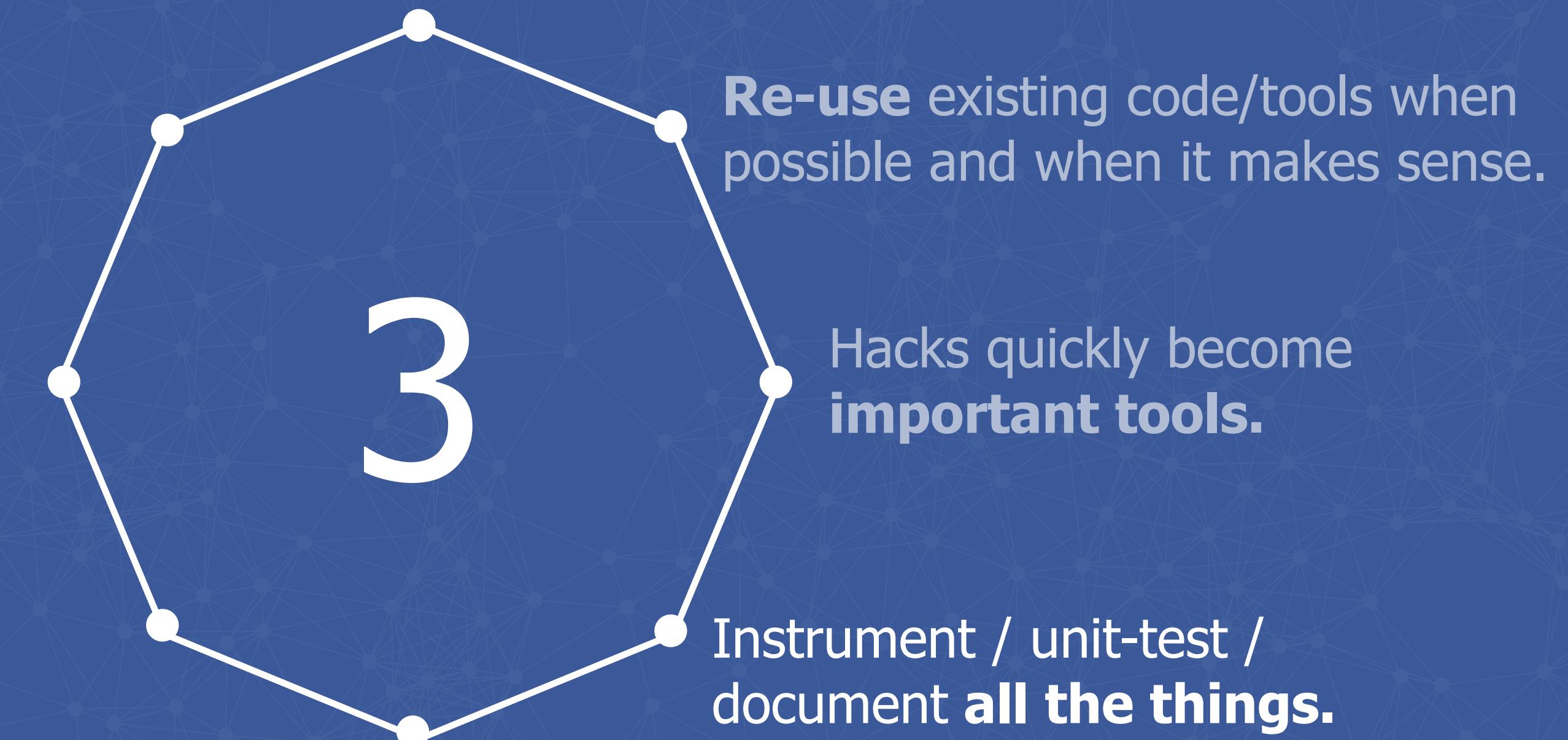
1

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

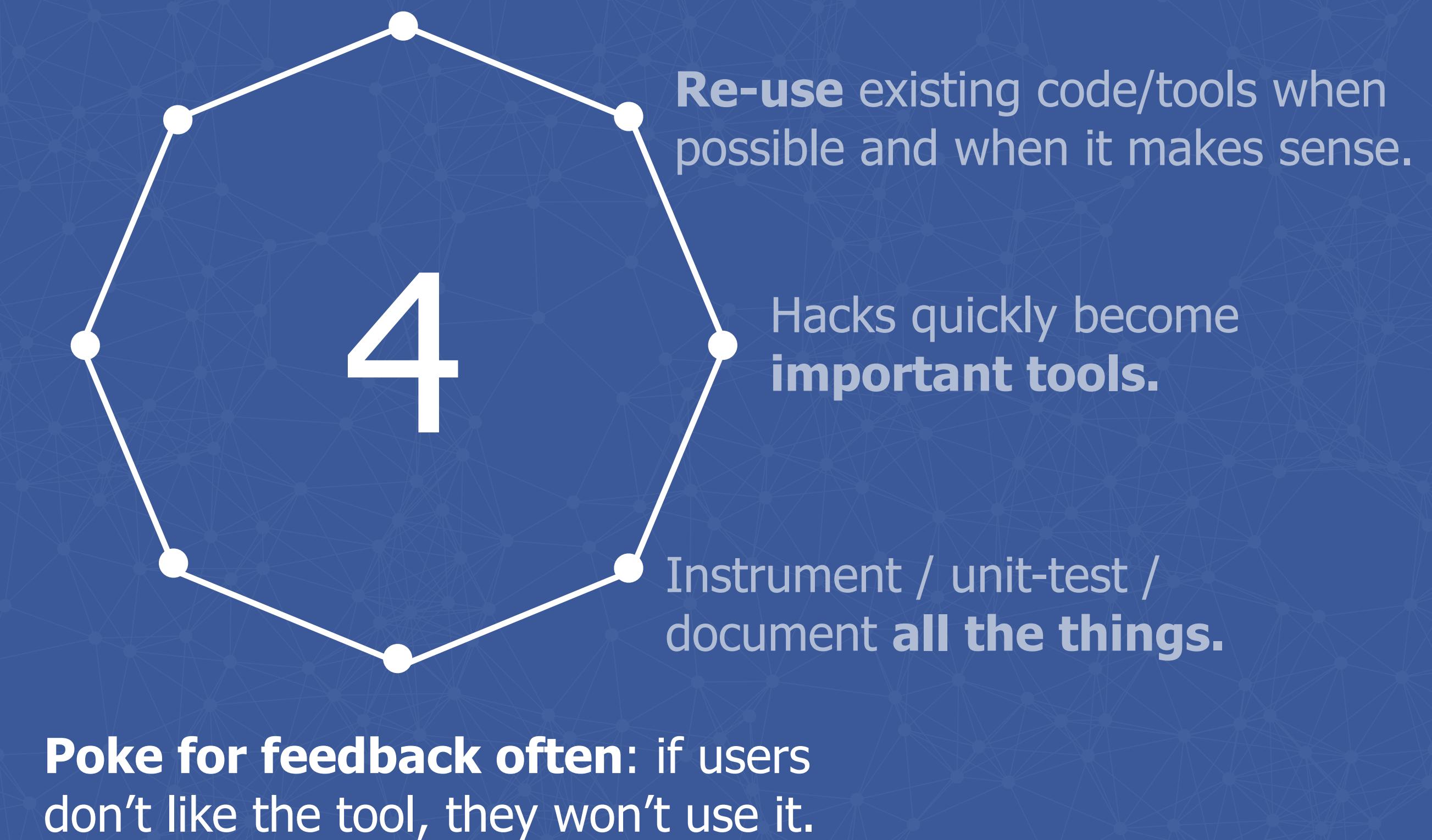
8 Lessons Learned & Recommendations



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8 Lessons Learned & Recommendations



8 Lessons Learned & Recommendations

5

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

6

The sooner the robots take over, the better.

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

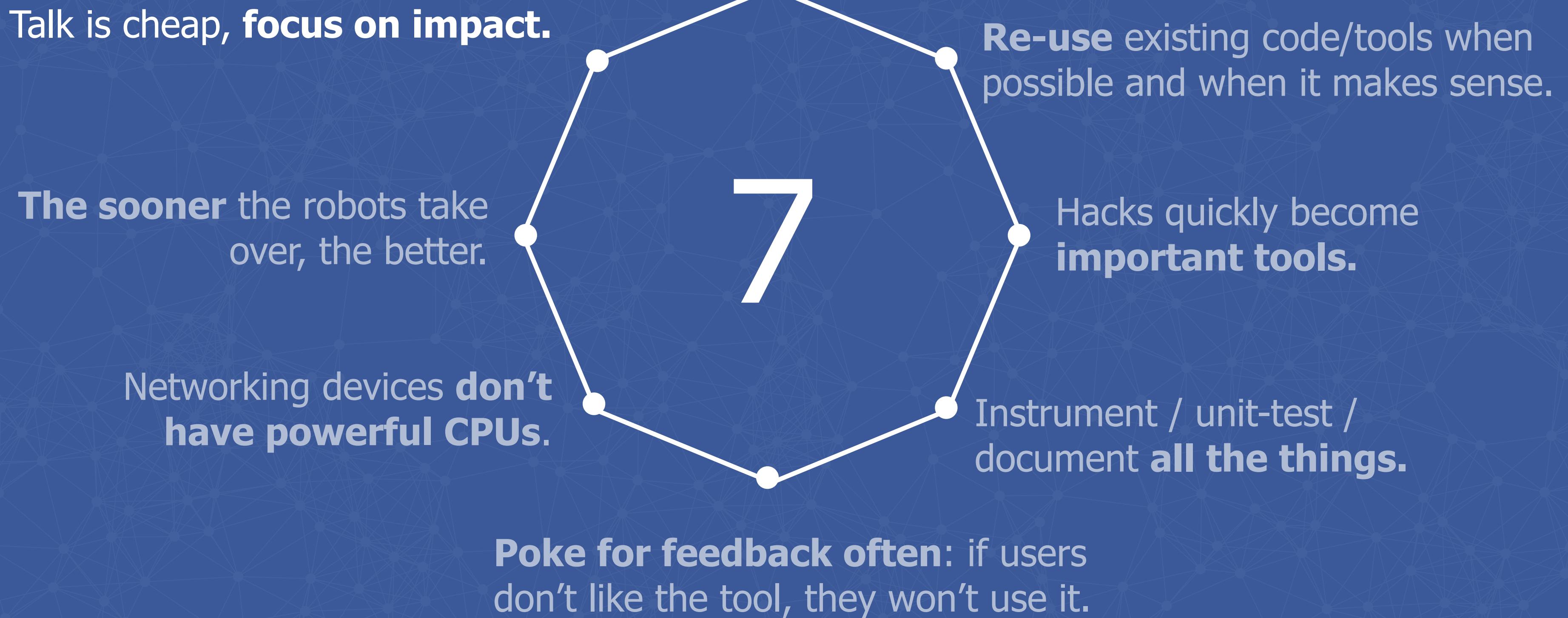
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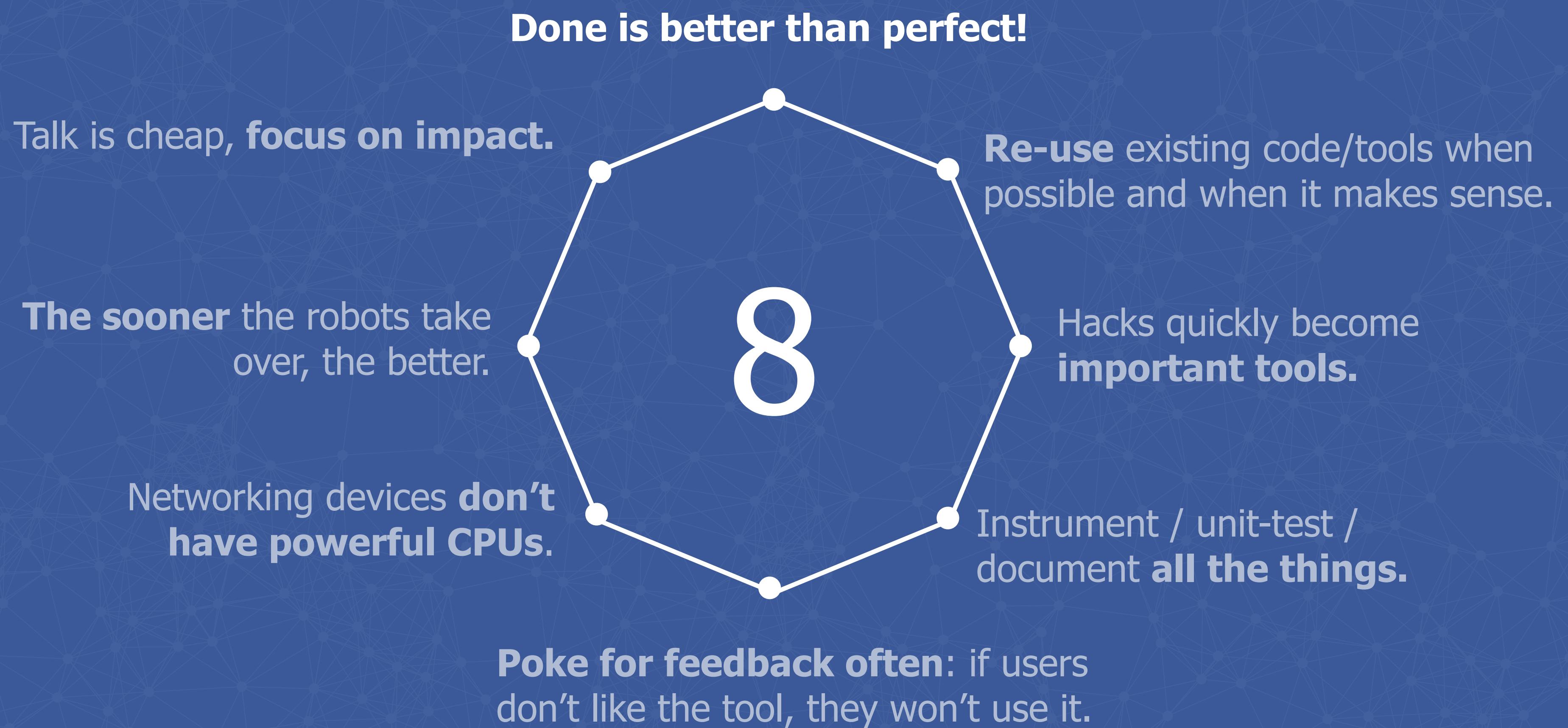
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Instrument / unit-test / document **all the things**.

8 Lessons Learned & Recommendations



8 Lessons Learned & Recommendations



This journey is 1% finished

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

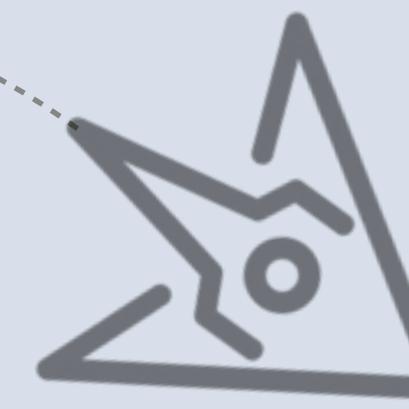
What's in the near future?

The journey is 1% finished

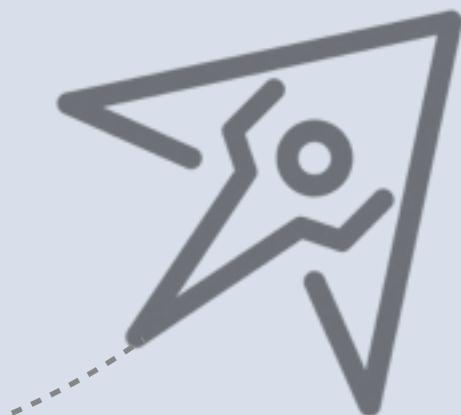


FBOSS / Wedge / sixpack
operationalization
improvements

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

