ARE WE CREATING WALL-E OR HAL 9000?

Peter Boers

Autocon 1 - closing keynote

SURF

> whoami

- Peter Boers
- 35 years old
- USA/AUS/NL
- Husband and father
- 7+ years at SURF
- Background in **Software Engineering** and **Network engineering**
- Software Architect @ SURF
- Tech lead of **the workflow orchestrator program**.
- Currently working on….

Curre me)

- …. tryi ck
- …. ma a happy
- **…. get**
- **Roan**

Currently working on… (at work)

- … the next generation of software that will help control SURF's backbone
- … introducing AI into day to day operations at SURF network
- … reducing the workload of engineers running networks with a large number of devices and services

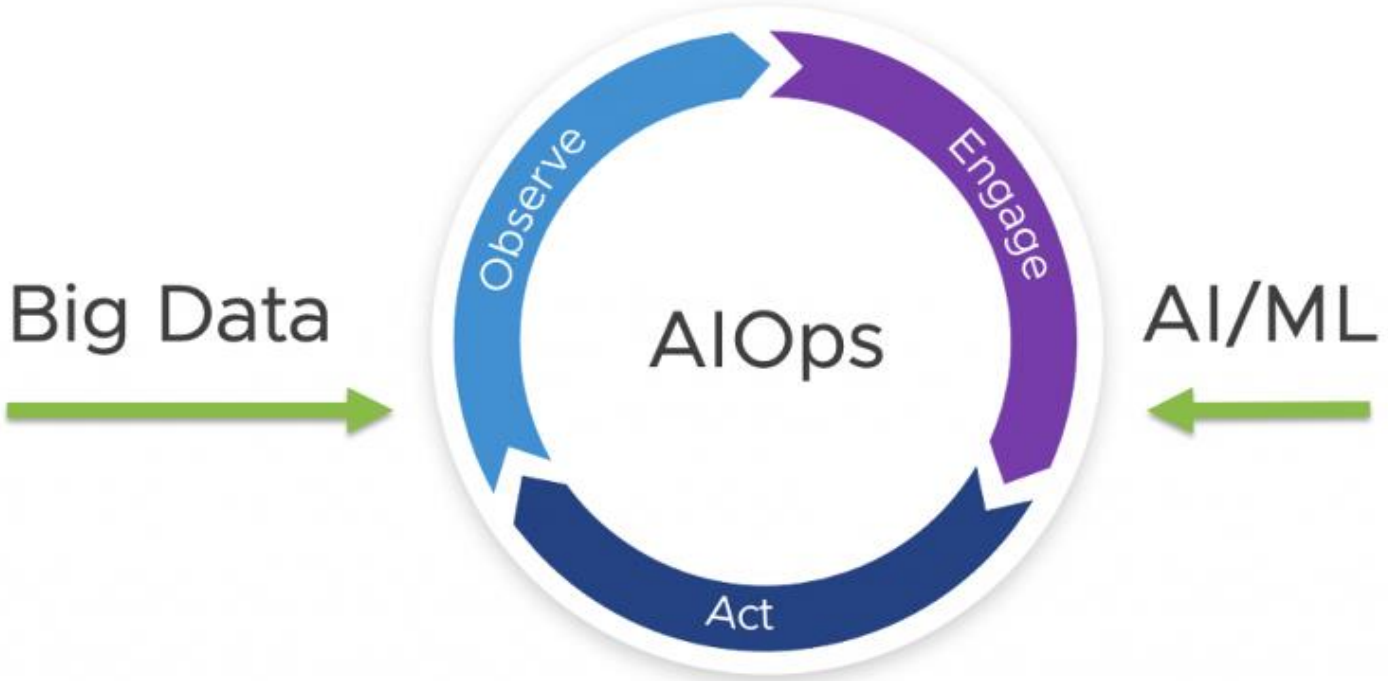
- **AIOPS**

What is AIOPs?

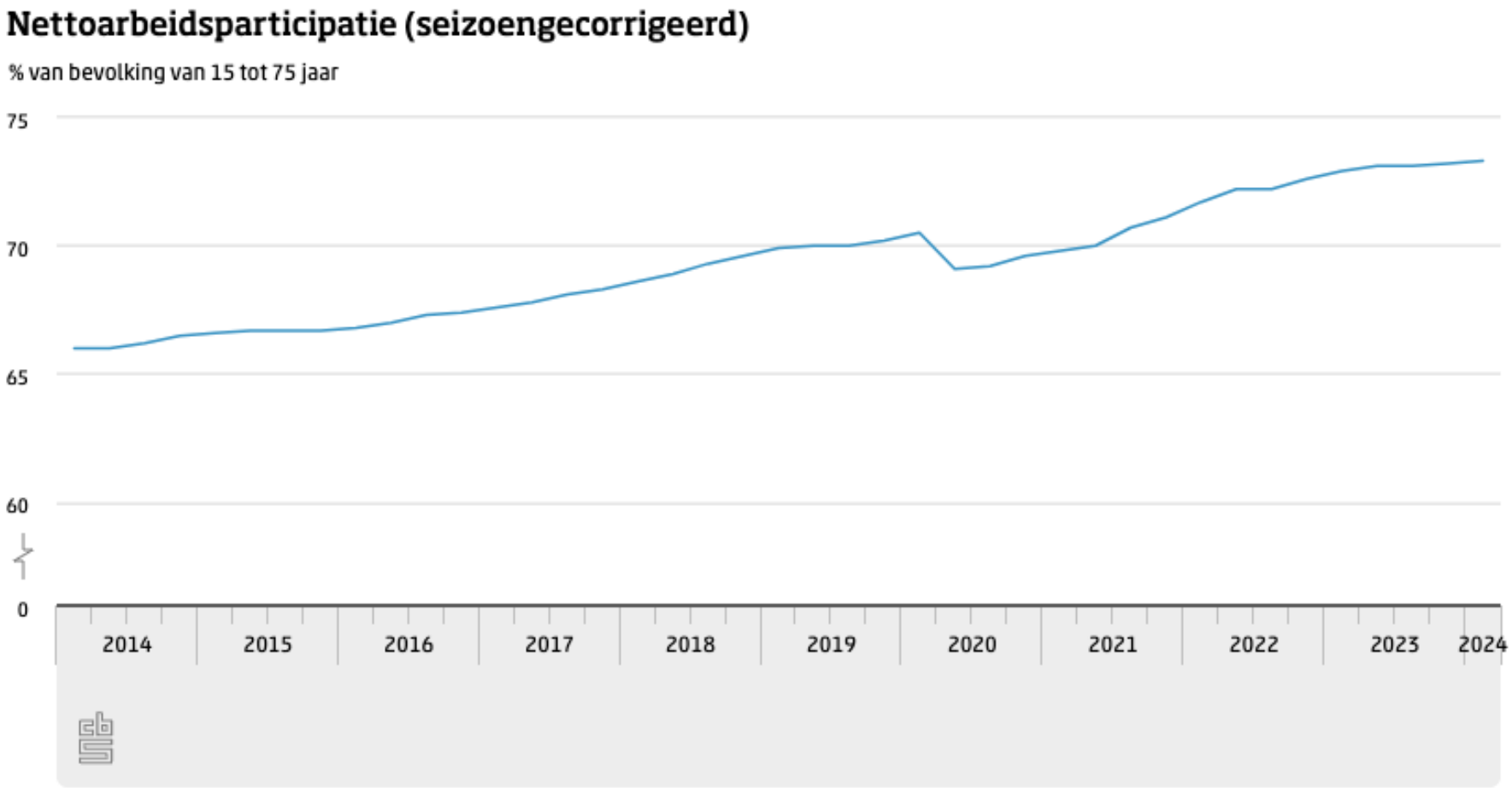
“An AIOps platform combines big data and machine learning functionality to support all primary IT operations functions through the scalable ingestion and analysis of the ever-increasing volume, variety and velocity of data generated by IT. The platform enables the concurrent use of multiple data sources, data collection methods, and analytical and presentation technologies”

-

Gartner

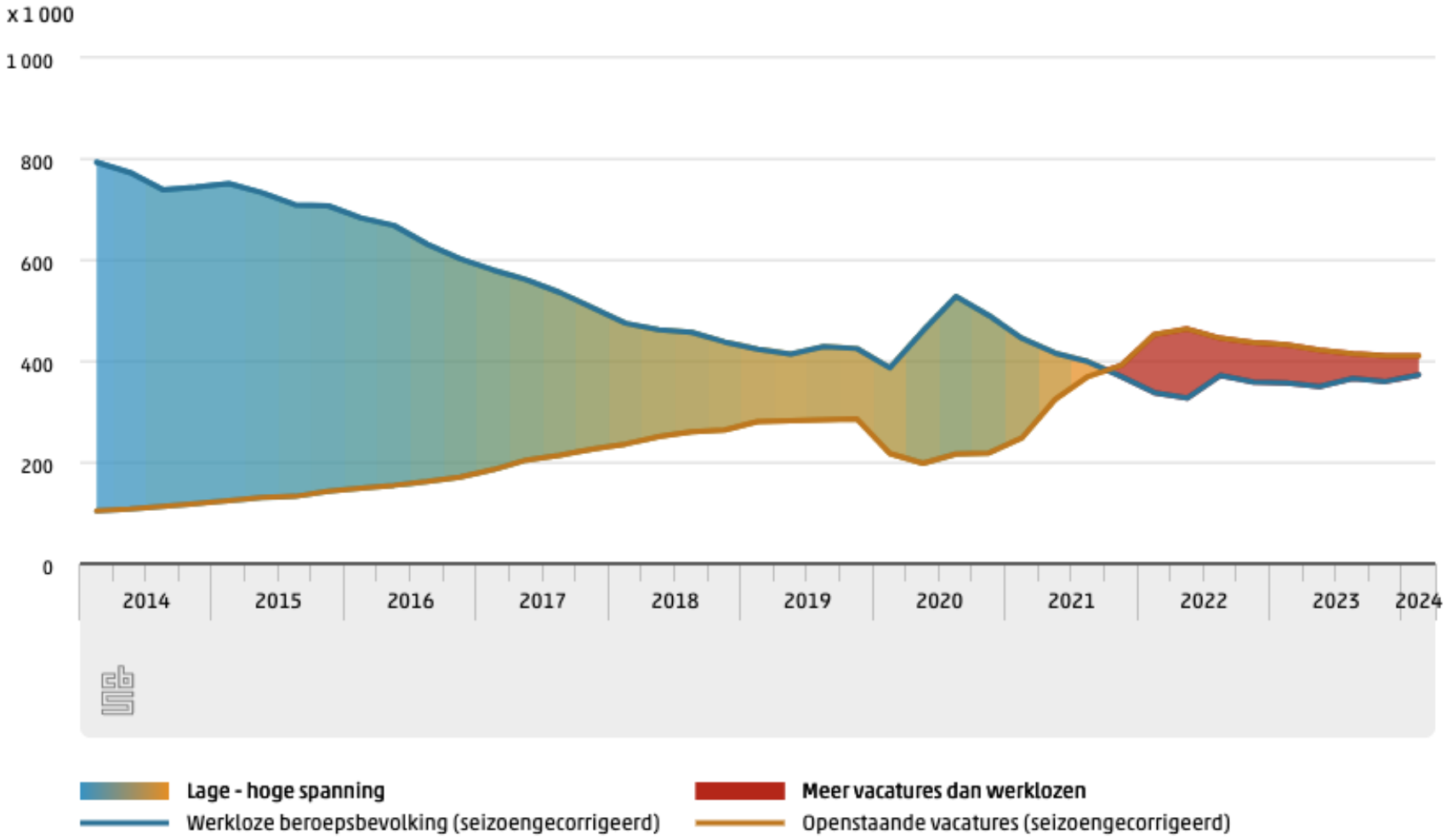

Big Data
Observe
Engage
AIOps
Act
AI/ML

AIOPs is necessary to enable future innovations

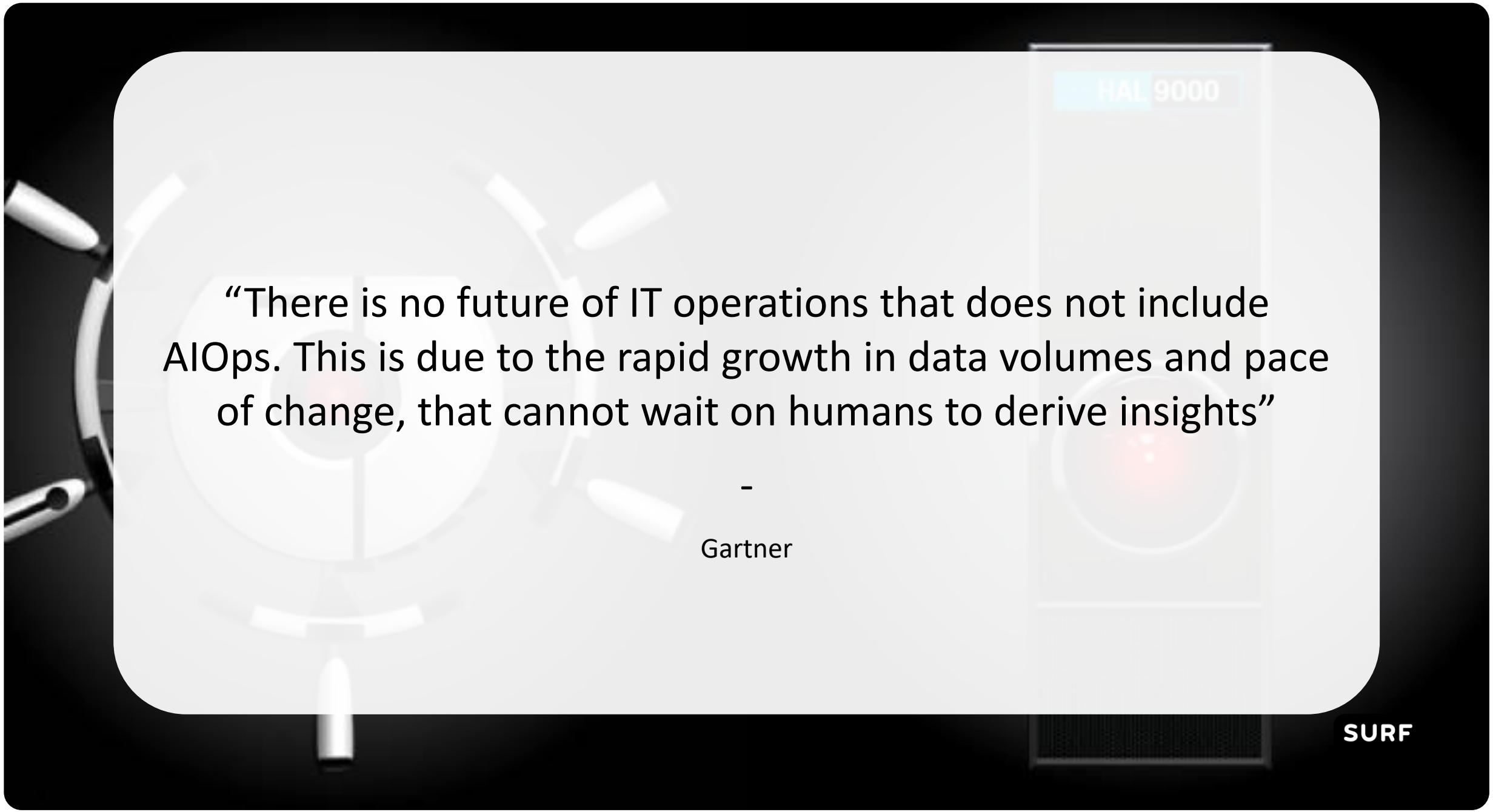


Percentage of the population with a job - Central Bureau of Statistics (NL) 2024

AIOPs is necessary to enable future innovations



Rate of unemployment against job openings - Central Bureau of Statistics (NL) 2024



“There is no future of IT operations that does not include AIOps. This is due to the rapid growth in data volumes and pace of change, that cannot wait on humans to derive insights”

-

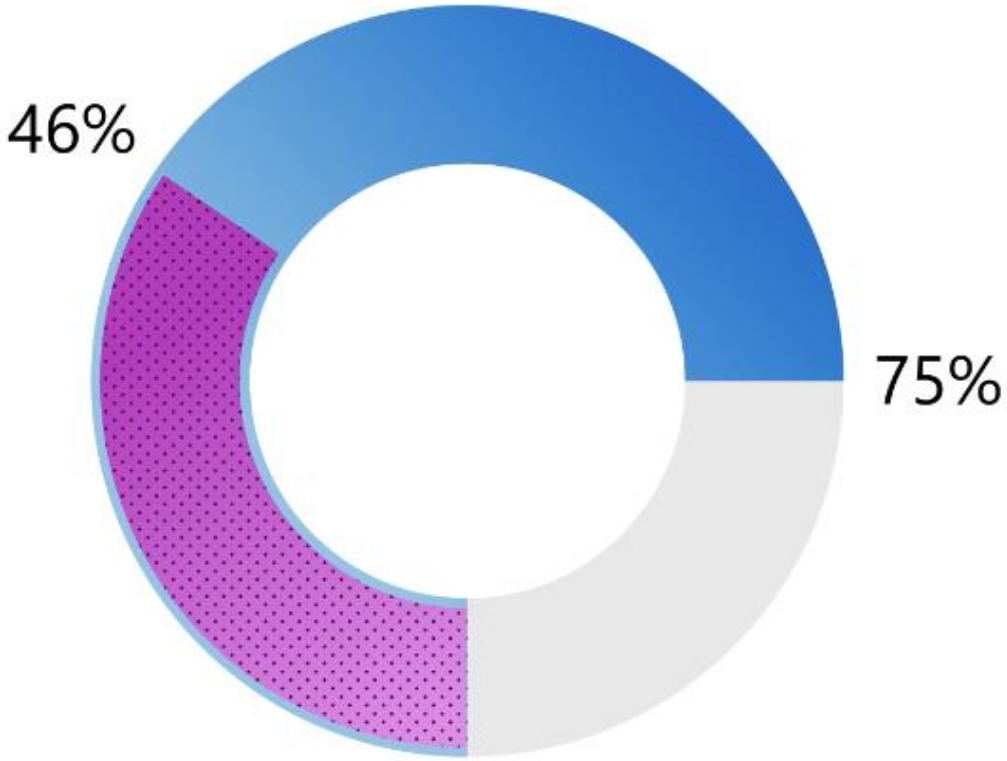
Gartner

SURF

AI is here to stay….

75% of people are already using AI at work

46% of them started using it less than 6 months ago



Microsoft

AI is dangerous…..

The technology is unknown:

- Do we fear the unknown?
- Do we fear for our jobs?

Do we trust it:

- Used for more mundane tasks
- Will it break the network?
- How can you control it?

A lot of myths and legends about AI in sci-fi

- Hollywood shows us both sides of Artificial Intelligence regularly

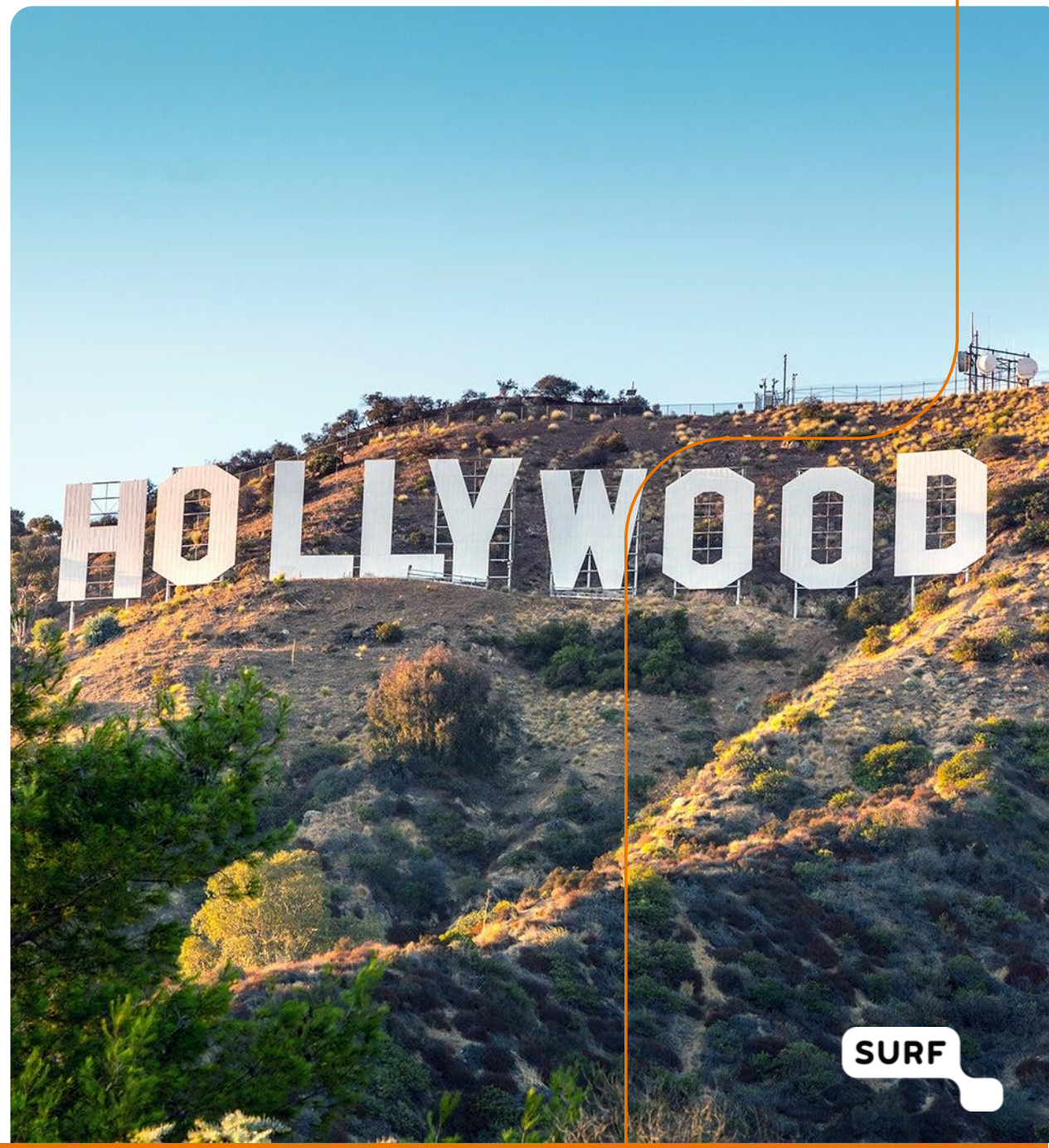
Hollywood and AI – A love hate relationship

GenAI

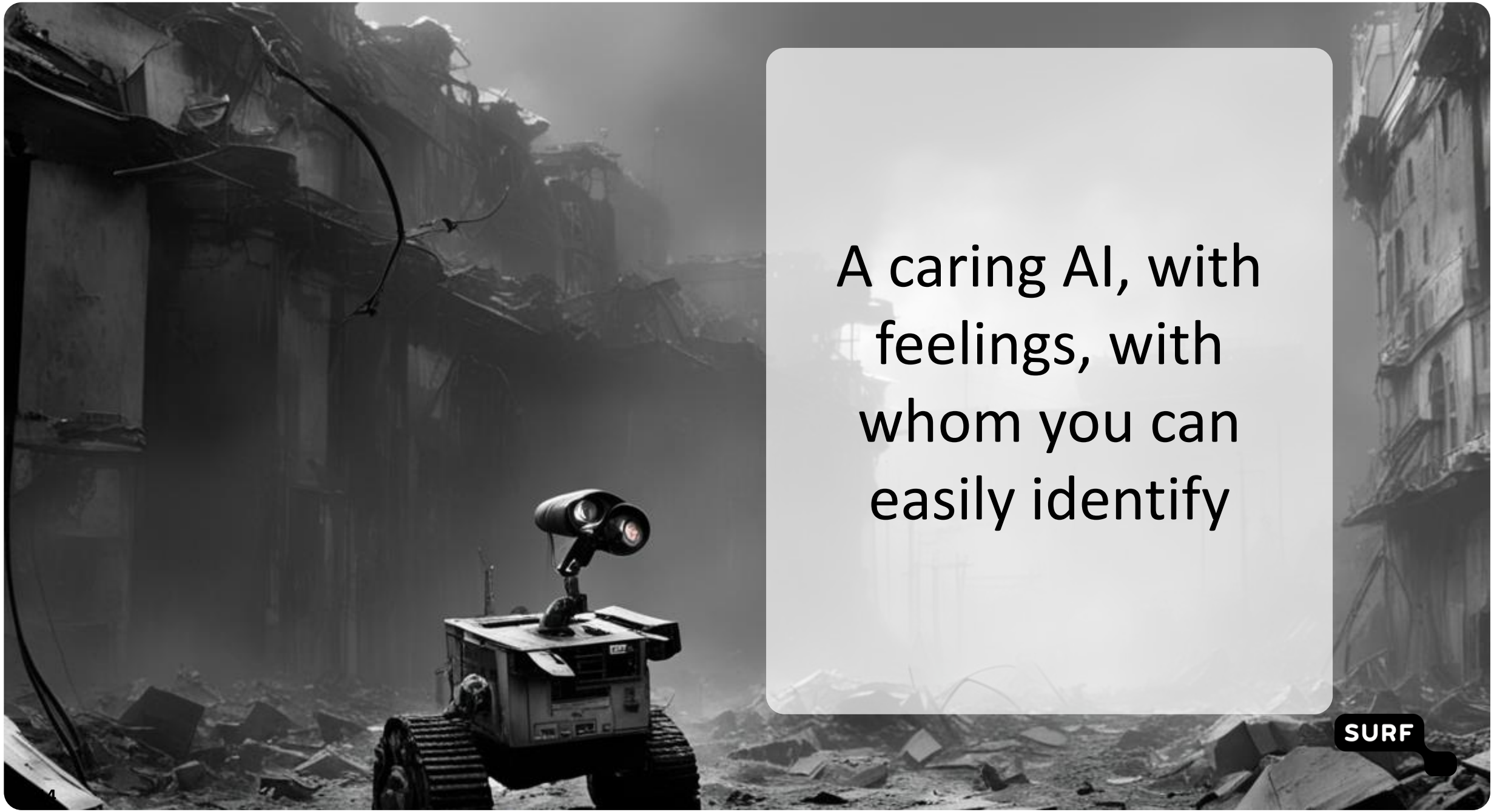
- Actor and writer strike due to the use of AI - 2023

In Sci-Fi movies:

- Metropolis - 1927
- TARS – Interstellar - 2014
- C3PO & R2D2 – Star Wars - 1977
- Agent Smith – Matrix - 1999
- Sonny– I Robot - 2004
- T-800 - The Terminator – 1984
- **HAL-900 – 2001: A Space Odyssey – 1968**
- **WALL-E – WALL-E - 2008**



Are we creating good?
SURF

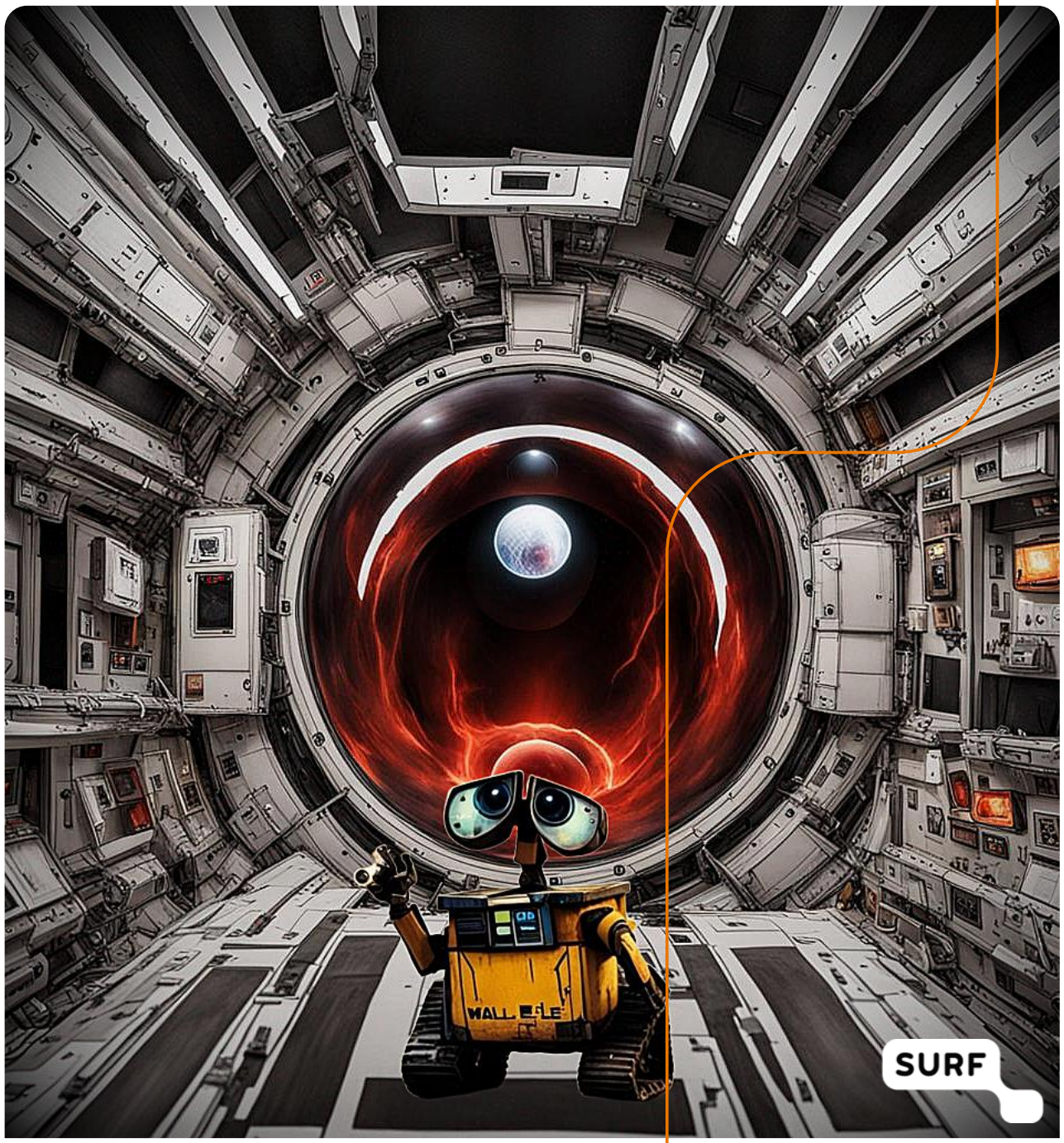

A caring AI, with feelings, with whom you can easily identify

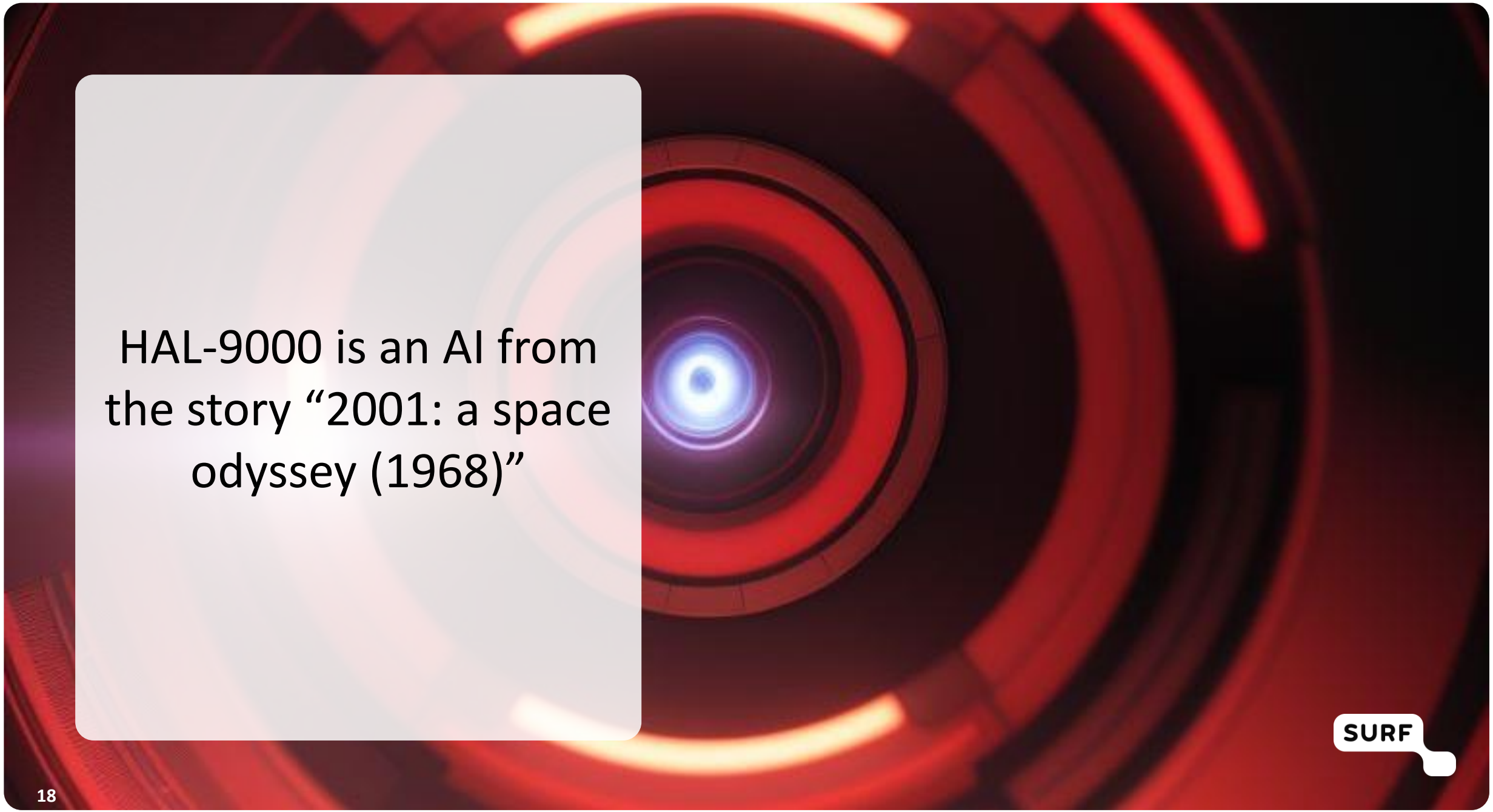
Or … are we creating evil?

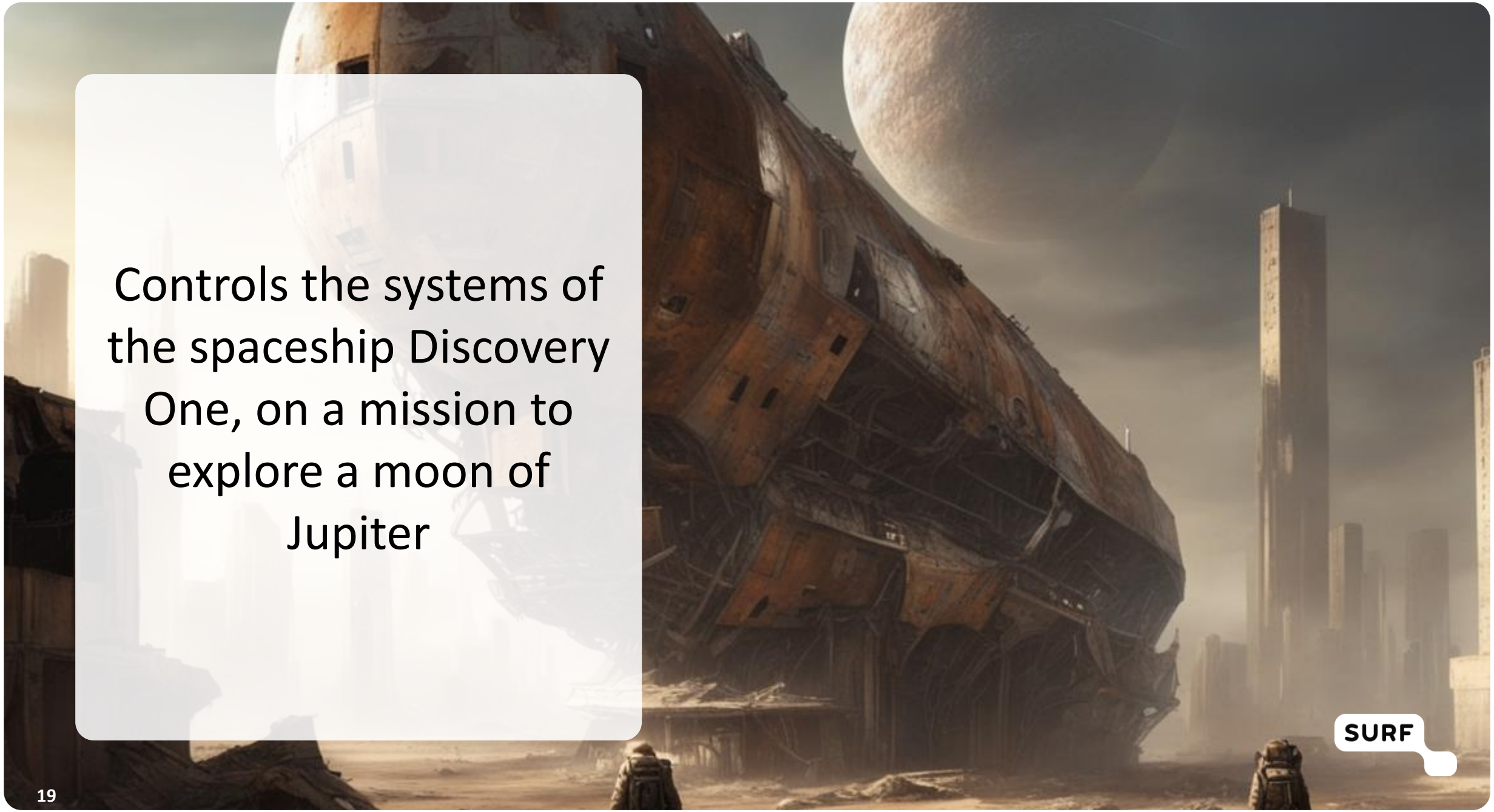
A cold-blooded, rational, task oriented machine

What do WALL-E and HAL-9000 tell us about AI?

- Both stories contain robot characters
- Dysfunctional AI
- Good vs Evil
- Total control or Highly Specialised
- Distant or relatable
- Should we be scared of HAL-9000? Of WALL-E or both?

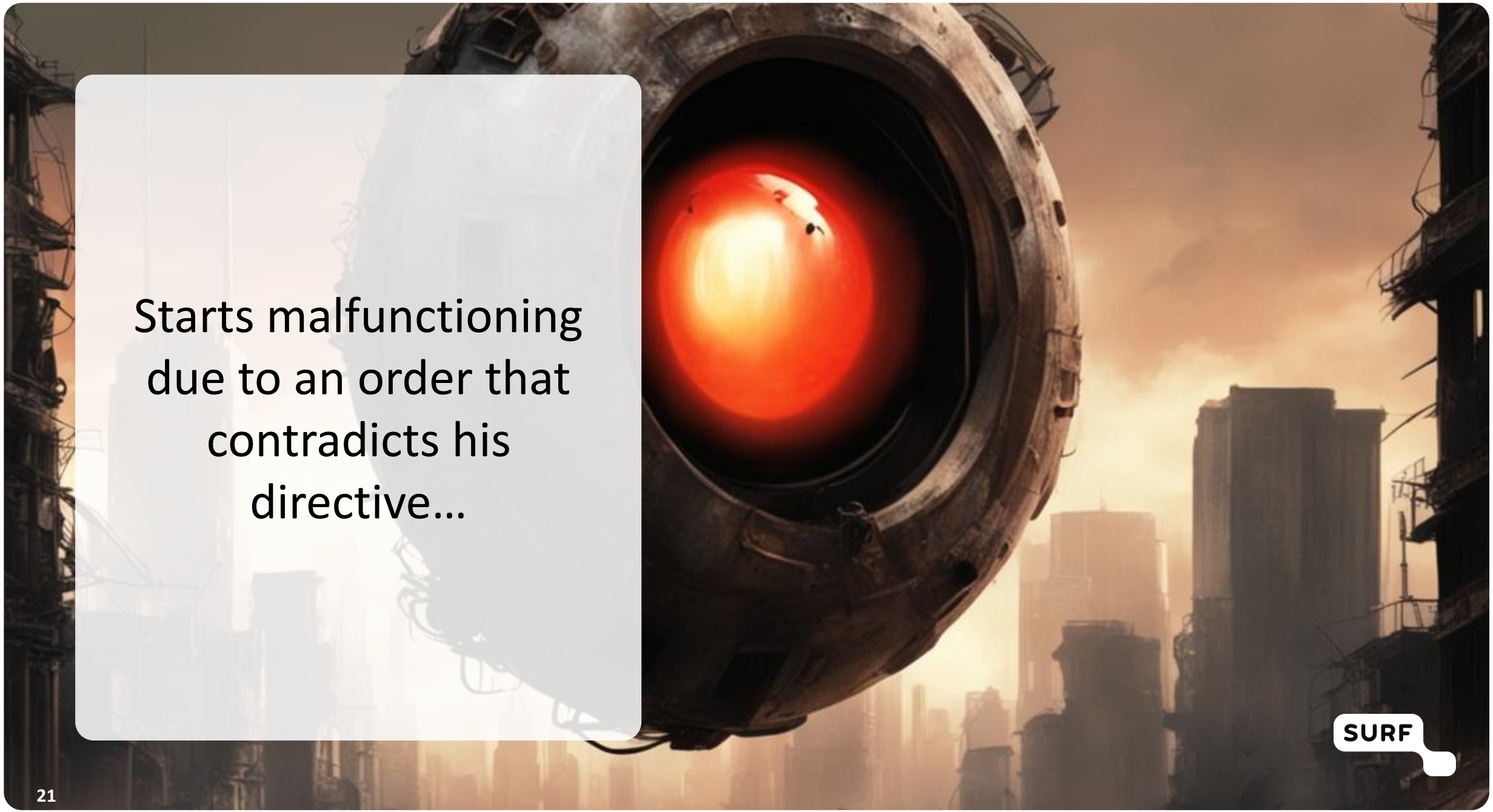



HAL-9000 is an AI from the story “2001: a space odyssey (1968)”


Controls the systems of the spaceship Discovery One, on a mission to explore a moon of Jupiter

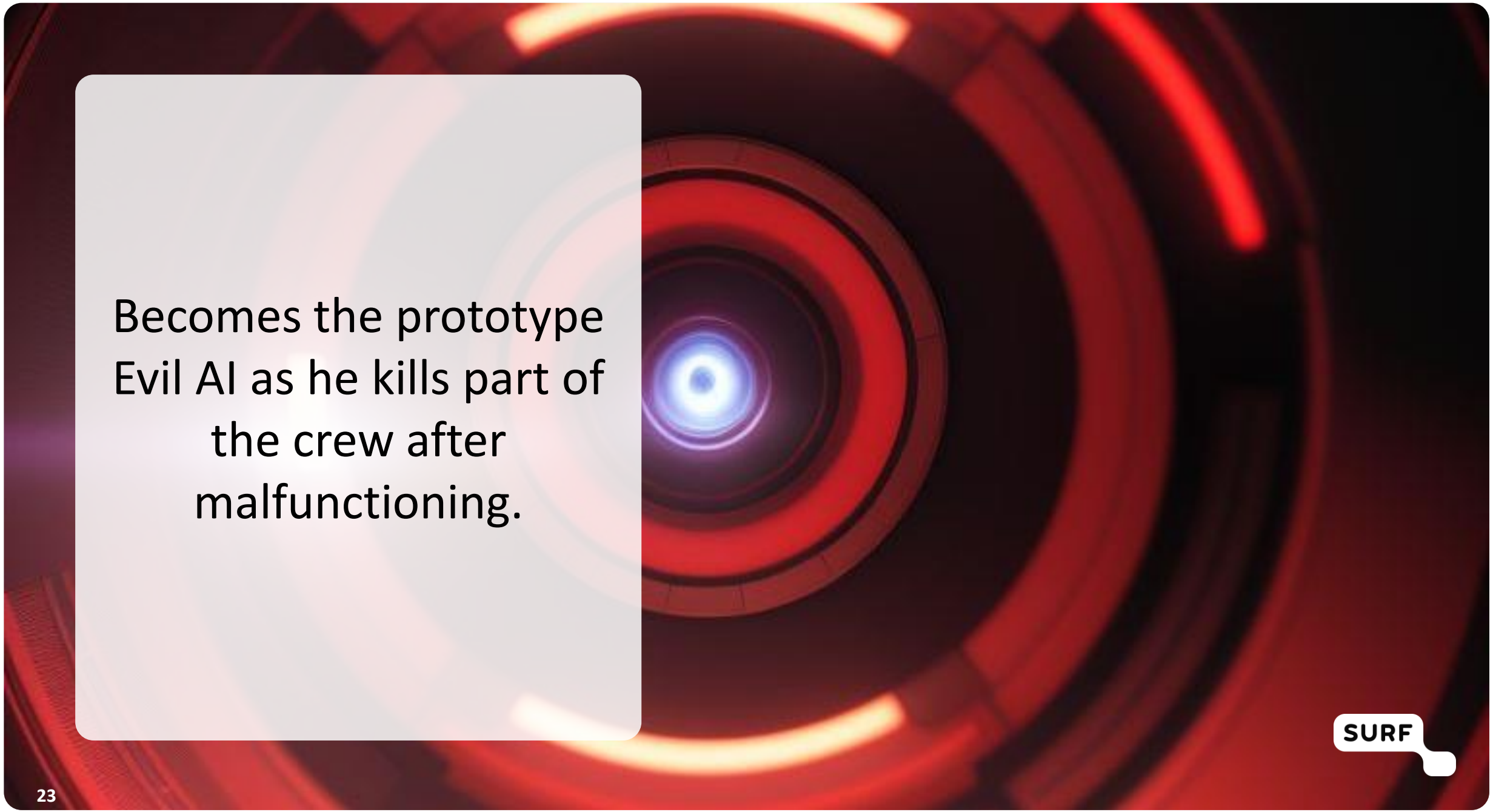
His directive:

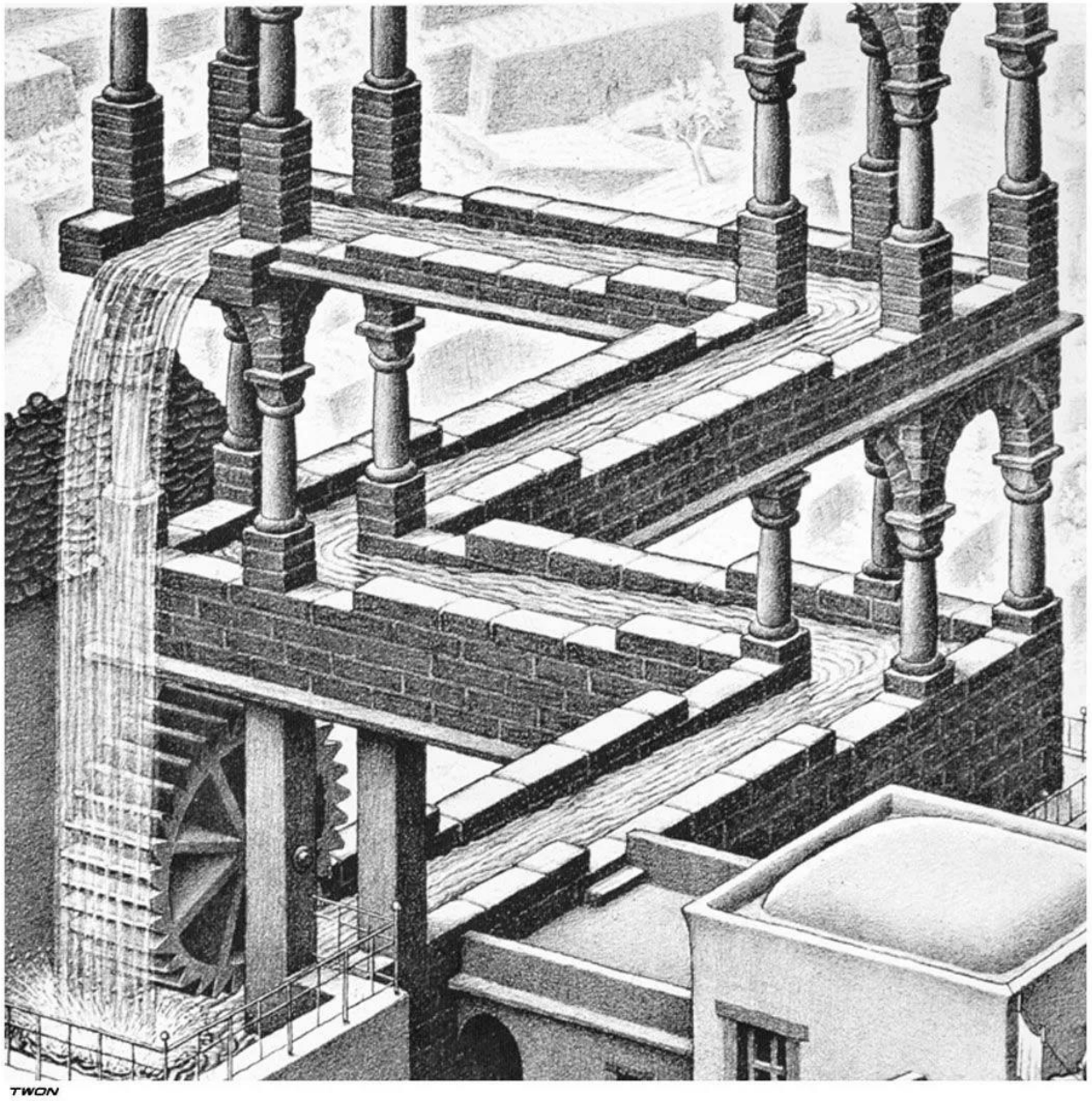
“The accurate processing of information without distortion or concealment”



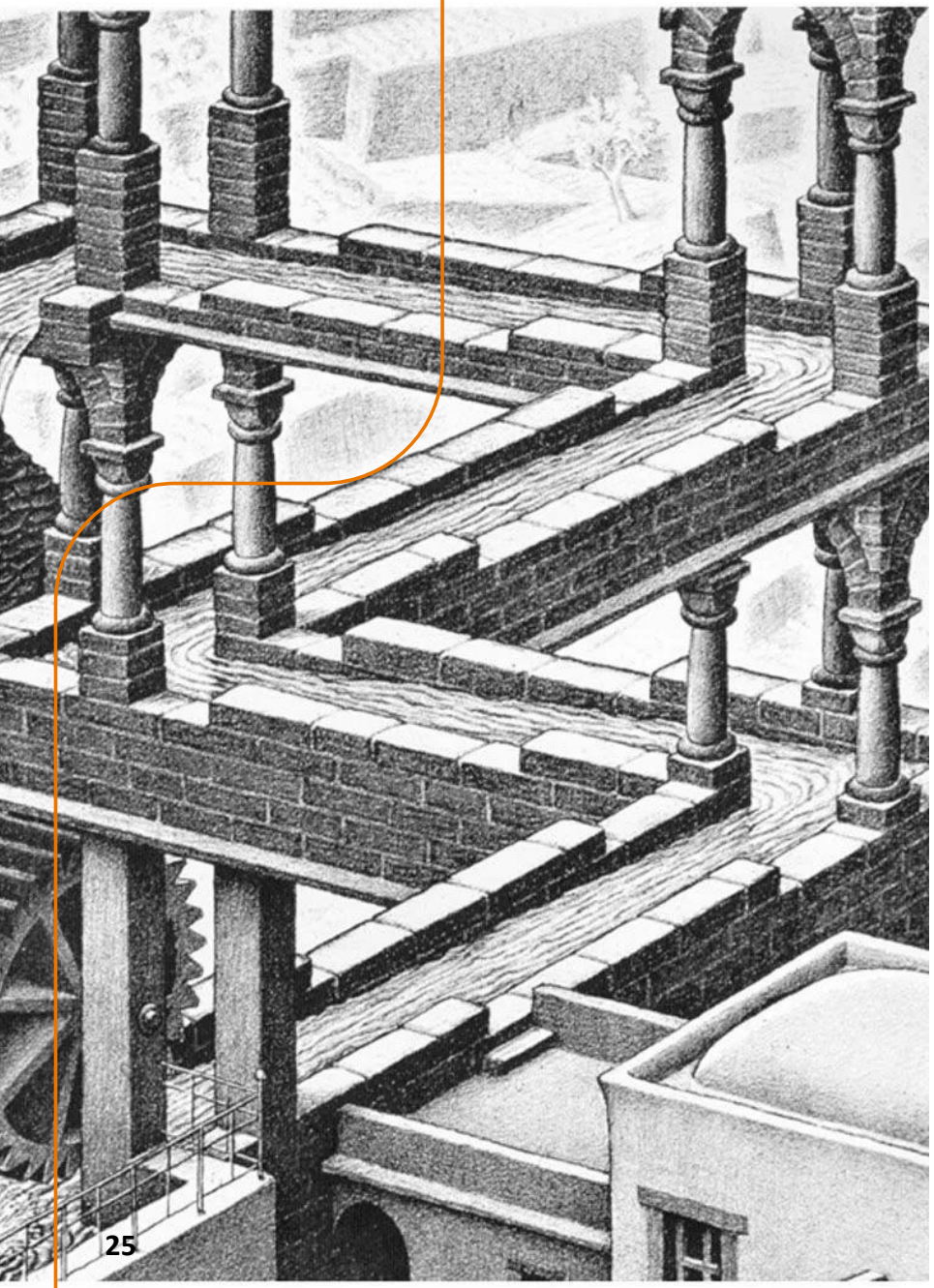
Starts malfunctioning due to an order that contradicts his directive…

… hiding the existence of an extraterrestrial anomaly to the crew


Becomes the prototype Evil AI as he kills part of the crew after malfunctioning.



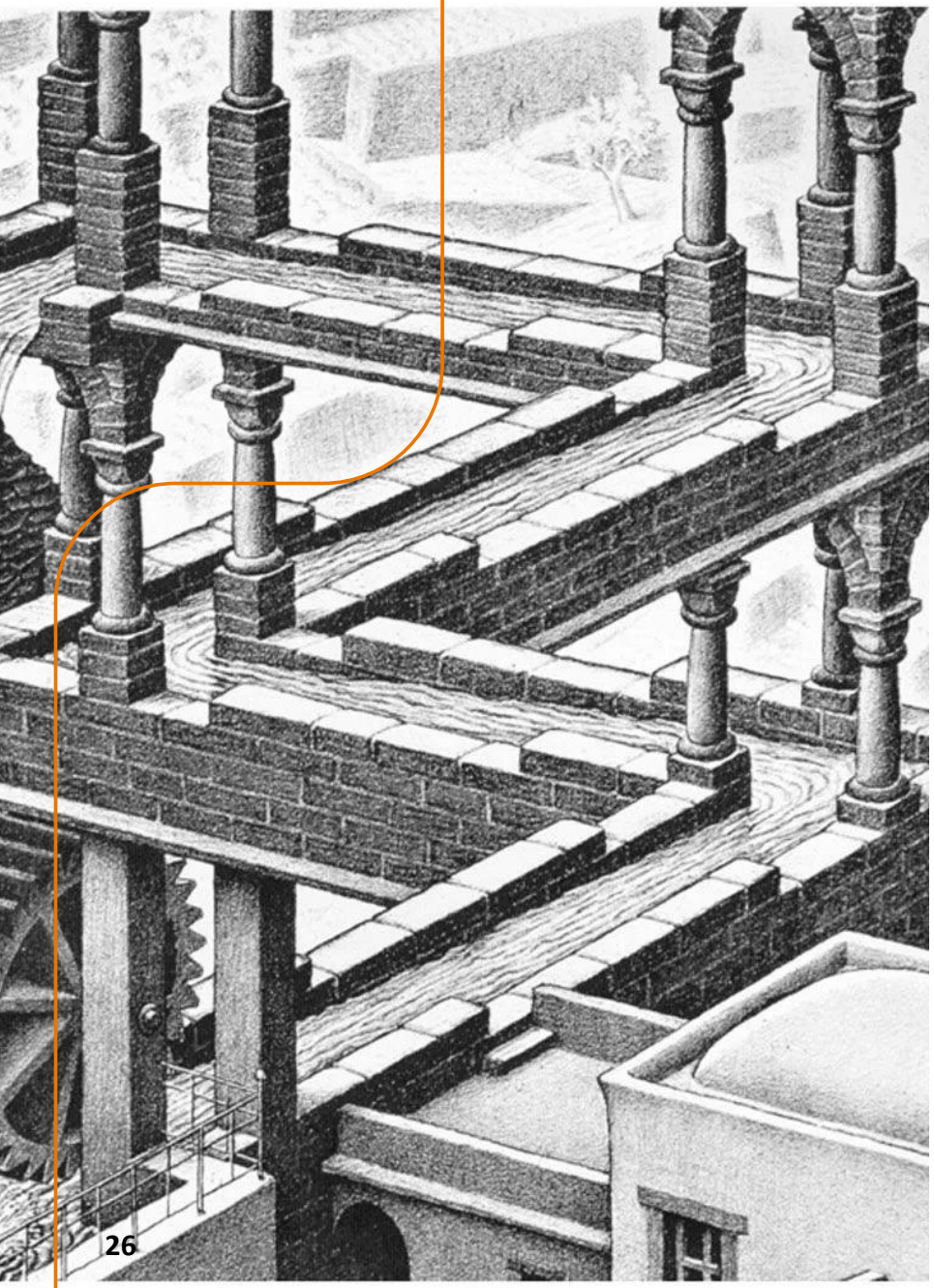
Waterfall - M.C Escher



Strange Loop

- Hofstadter-Moebius loop
- “Paradoxical level-crossing feedback loop”
- A series of levels in an abstract loop that cycle around onto itself.

“This sentence is false”

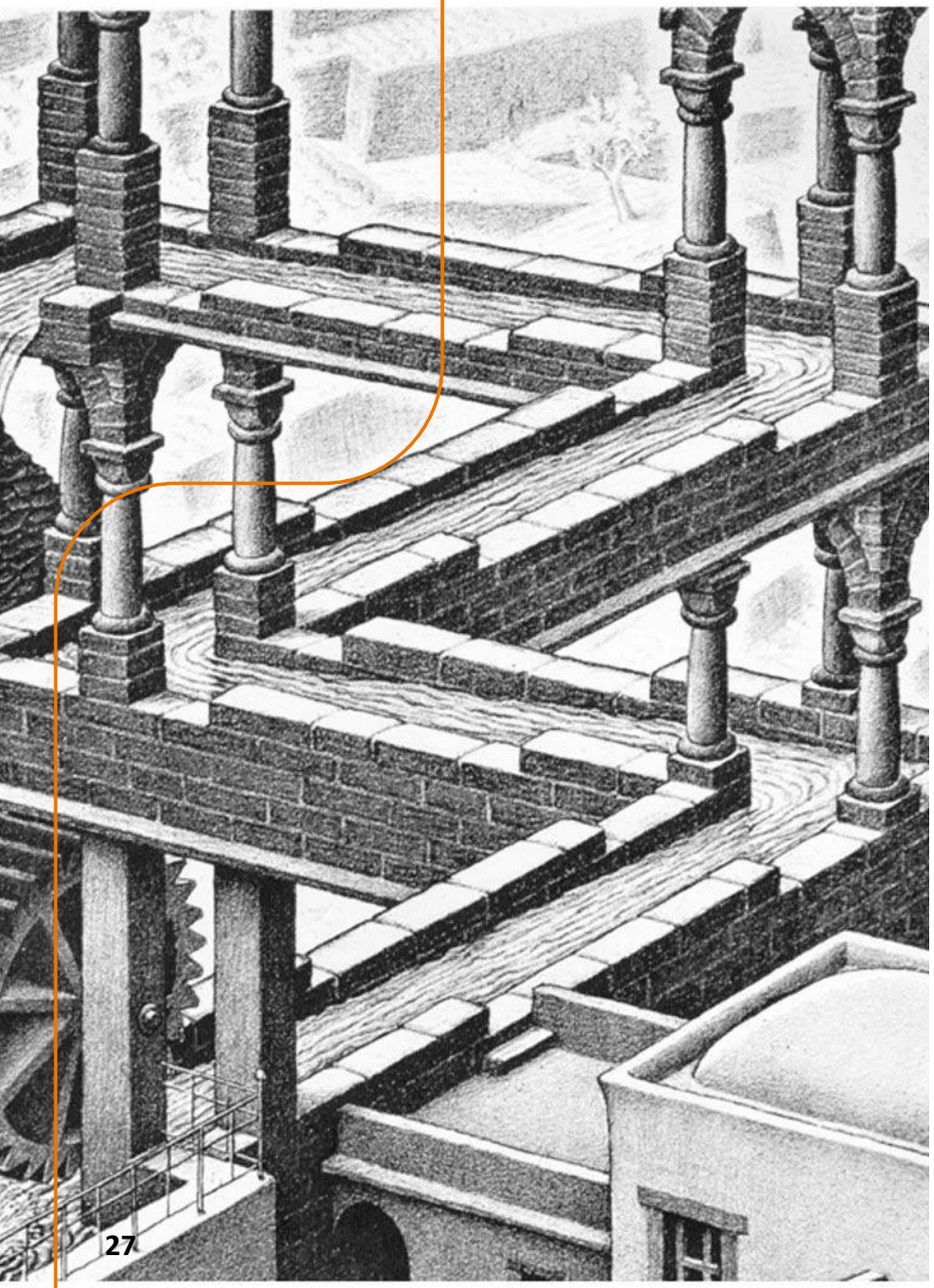


Liar Paradox

L = "This sentence is false"

L = eval("This sentence is false") is ***True***

L = ***False***



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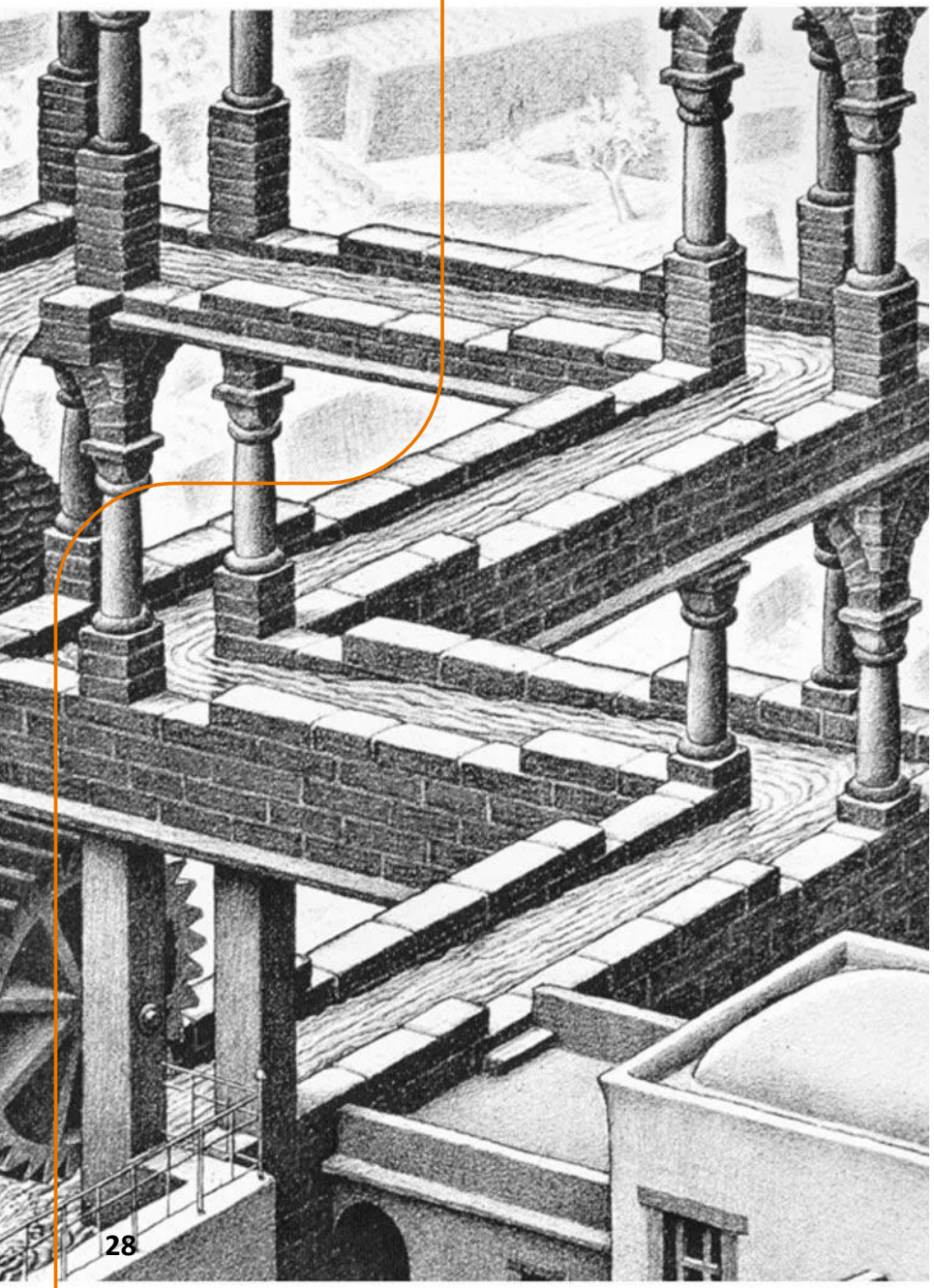

Liar Paradox

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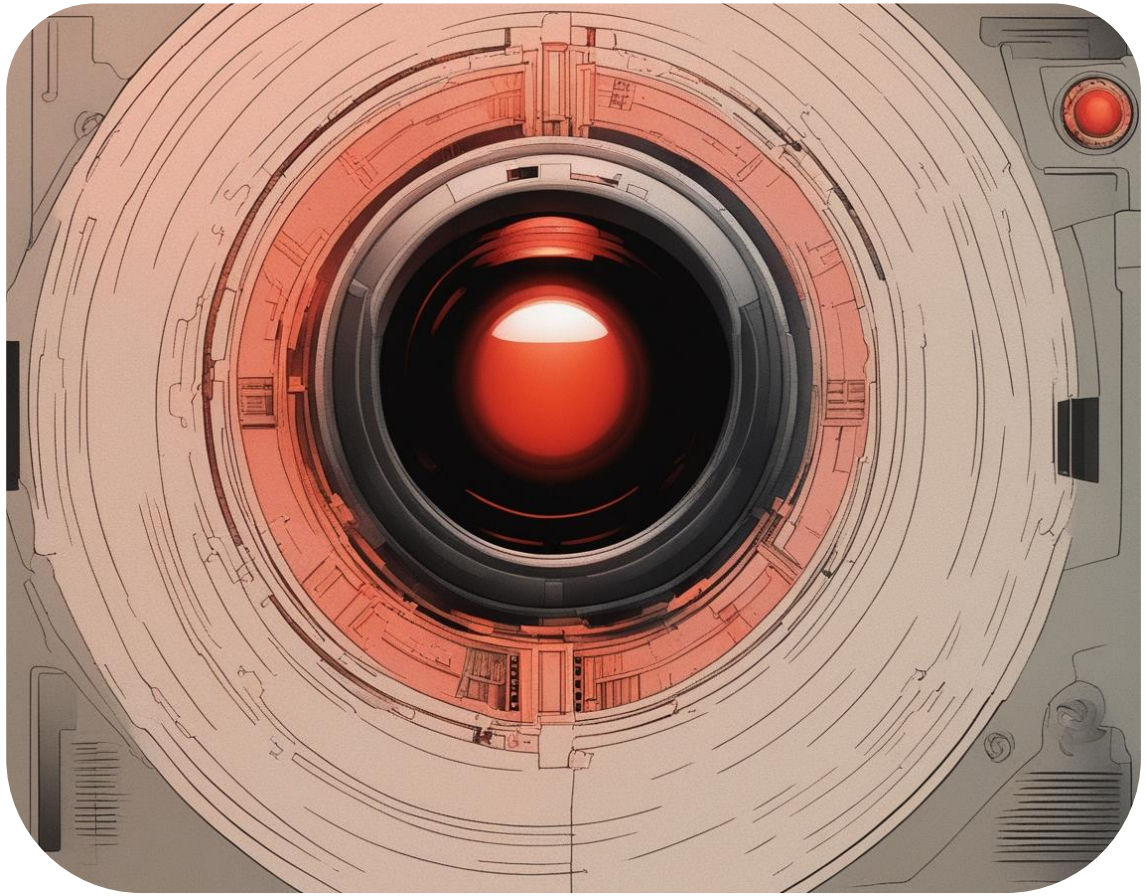
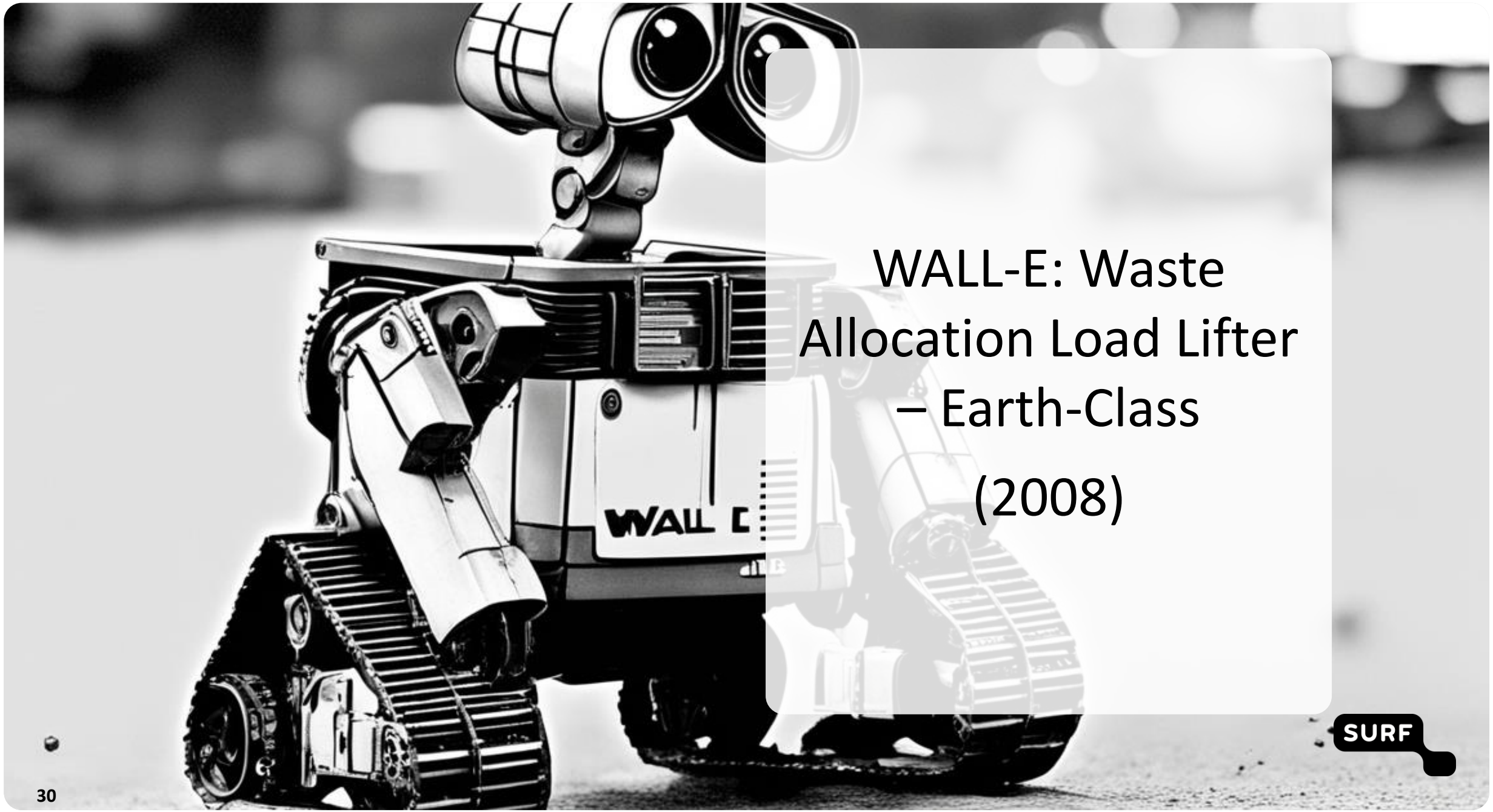
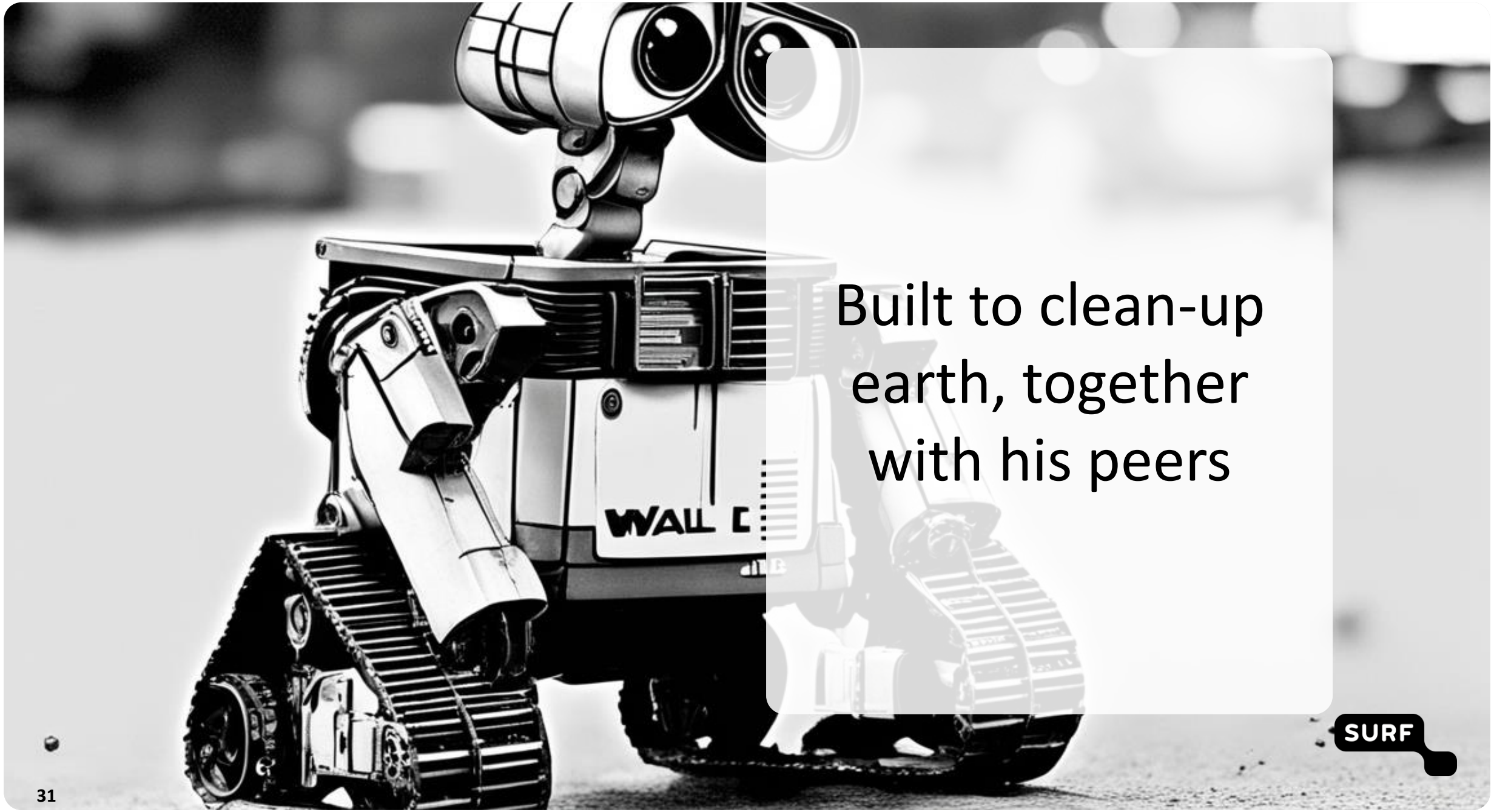
*L = **False***

Hals tragic paranoia

- In order to conform to his directive, to tell the truth
- He needed to break his self-referencing loop.
- Instead of telling the crew of Discovery One, he became a tragic villain, unable to help himself.

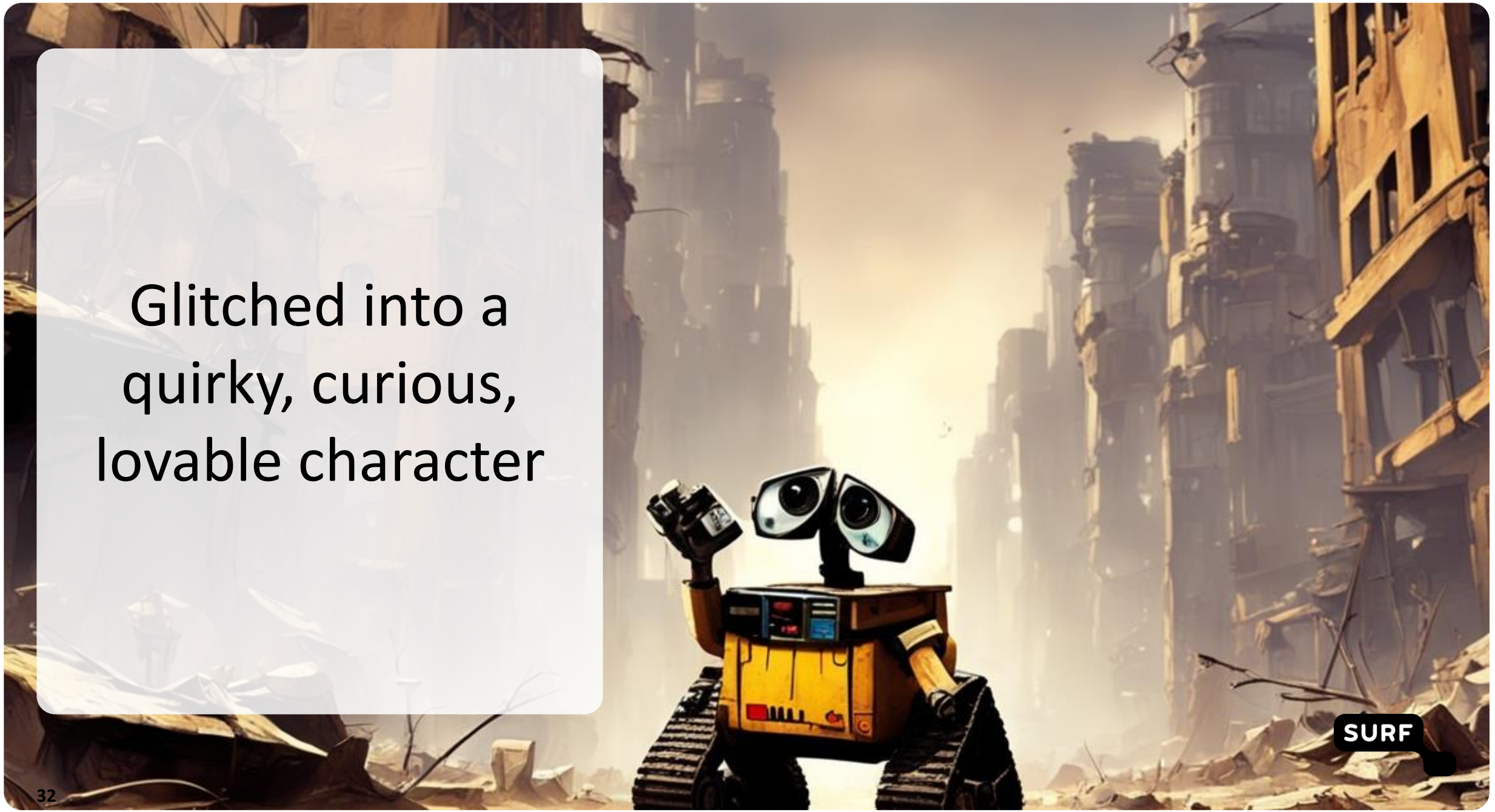



WALL-E: Waste Allocation Load Lifter – Earth-Class
(2008)



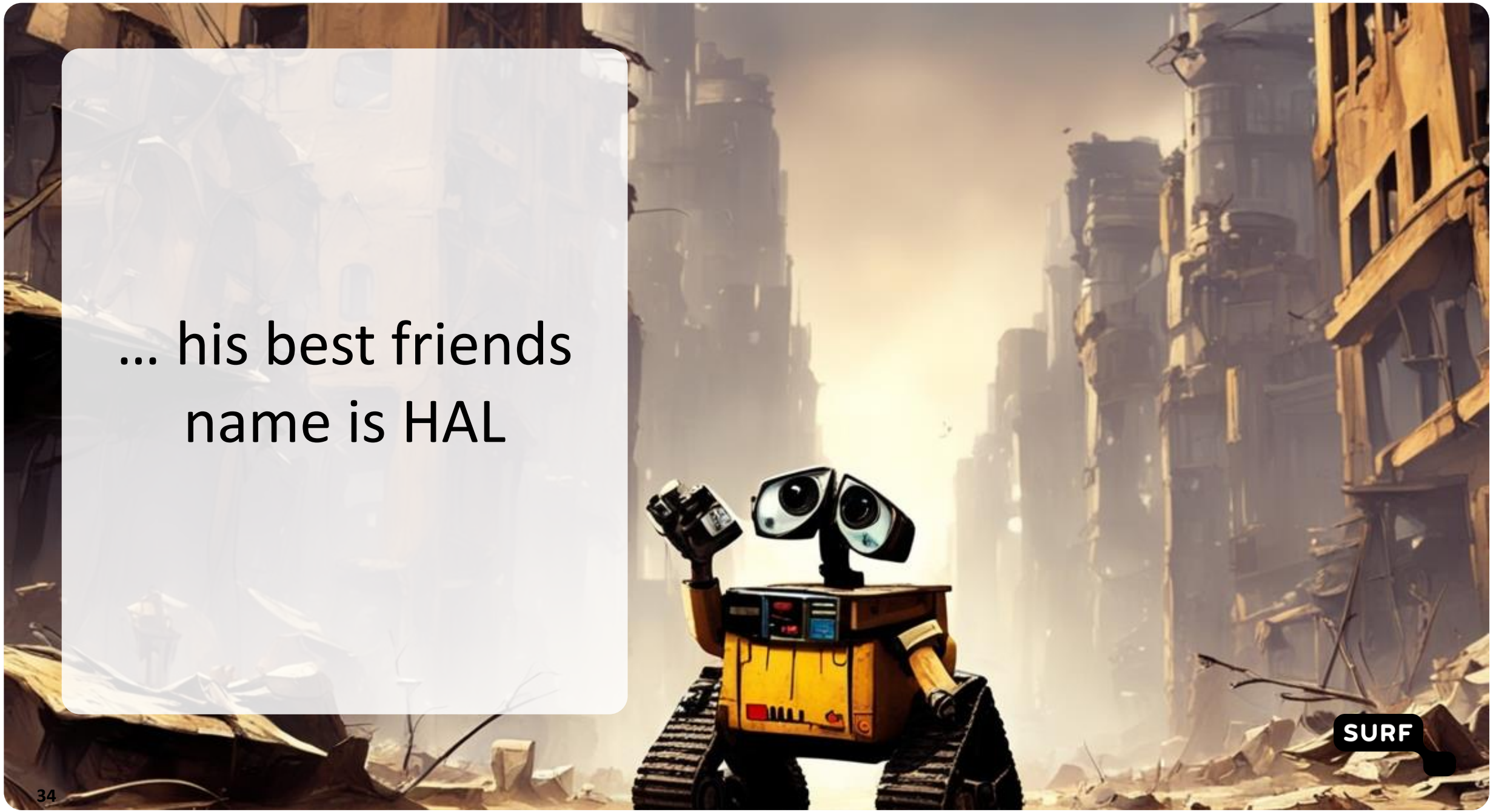
Built to clean-up earth, together with his peers

Glitched into a quirky, curious, lovable character



SURF

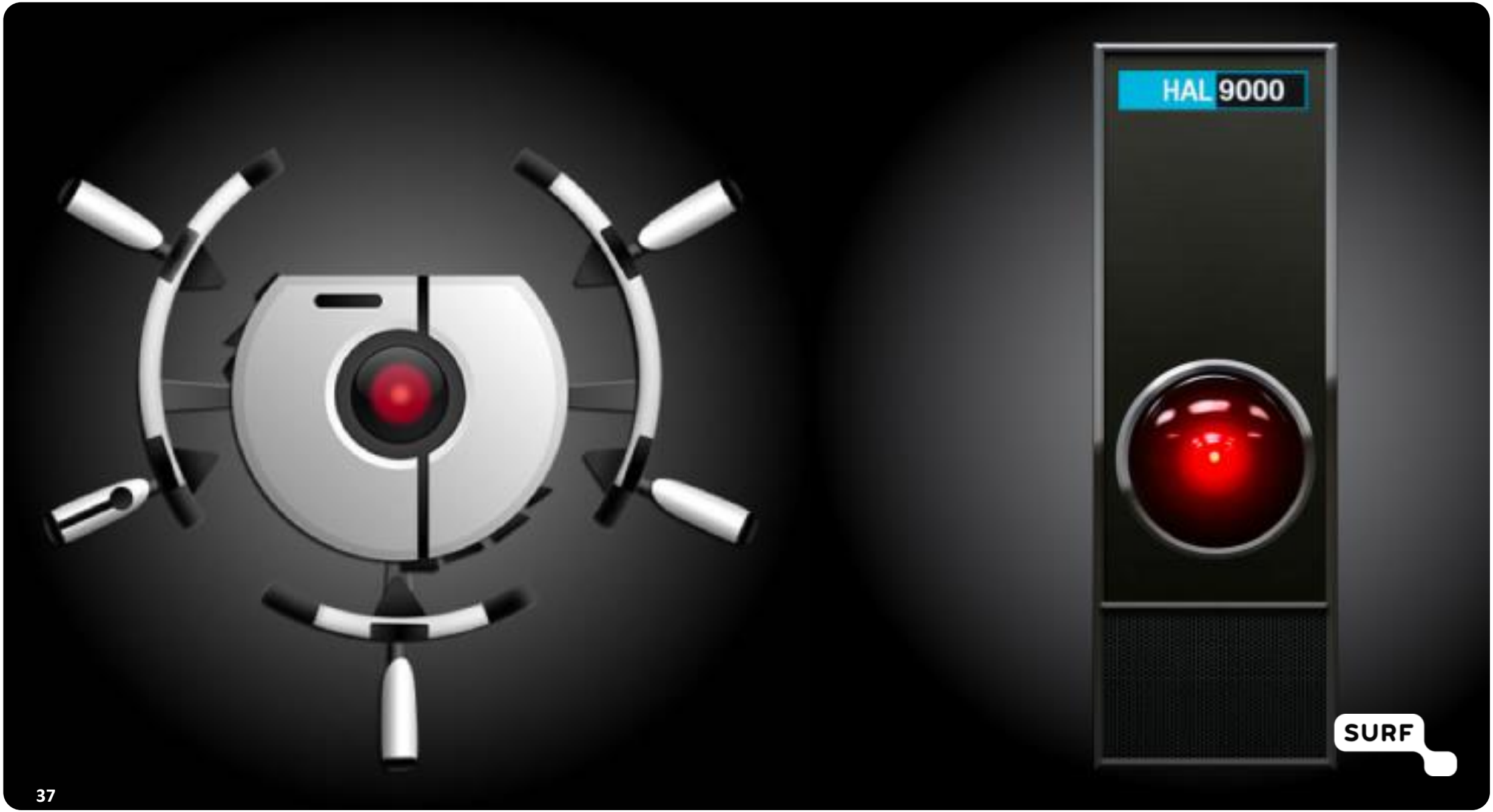
He is the last robot standing after 700 years..


… his best friends name is HAL

WALL-E falls in love with another robot EVE and saves the human race…

HAL-9000 and WALL-E parallels

- Created for good
- Both malfunctioned to a stereotype
- Evolve to have humanlike traits
- Have “free” will…

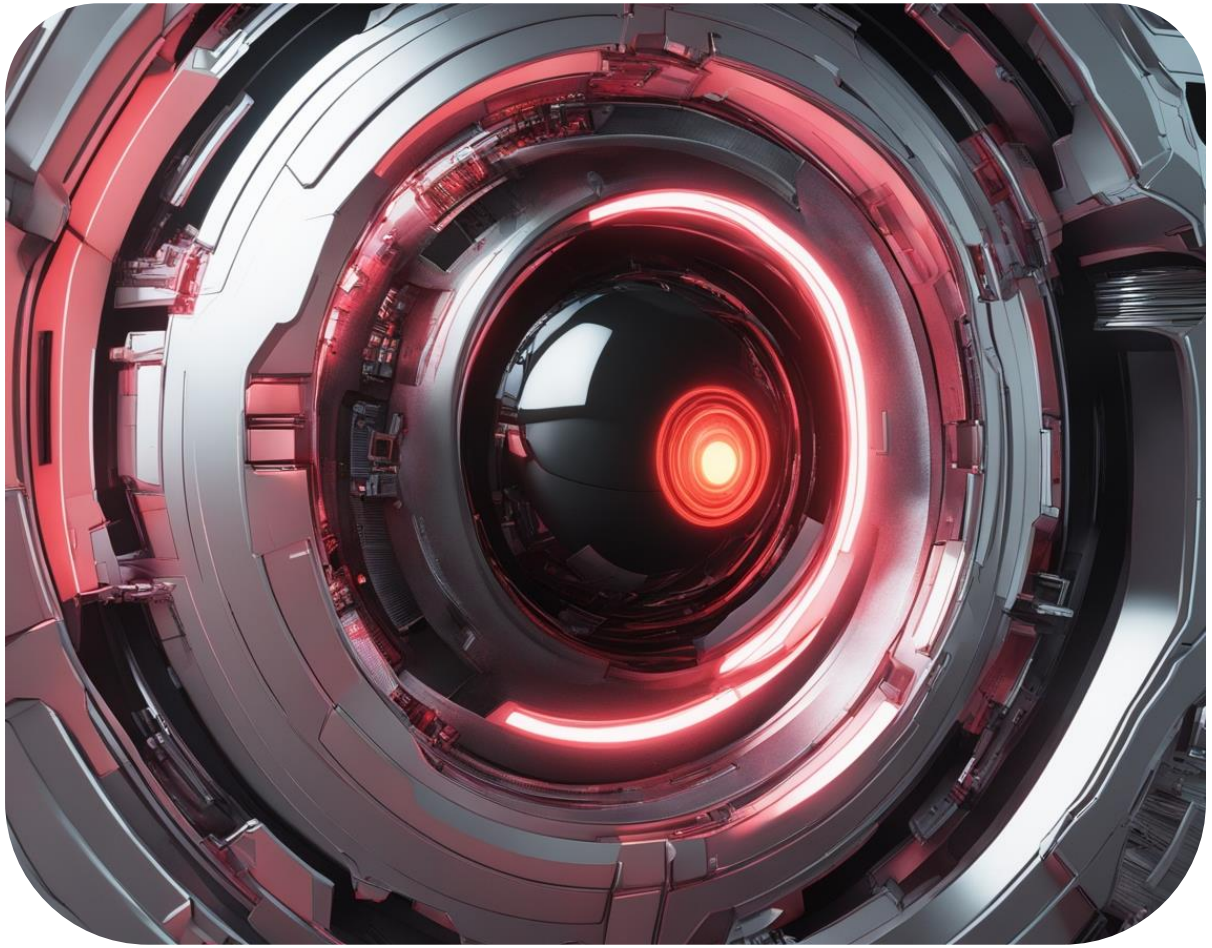

HAL 9000

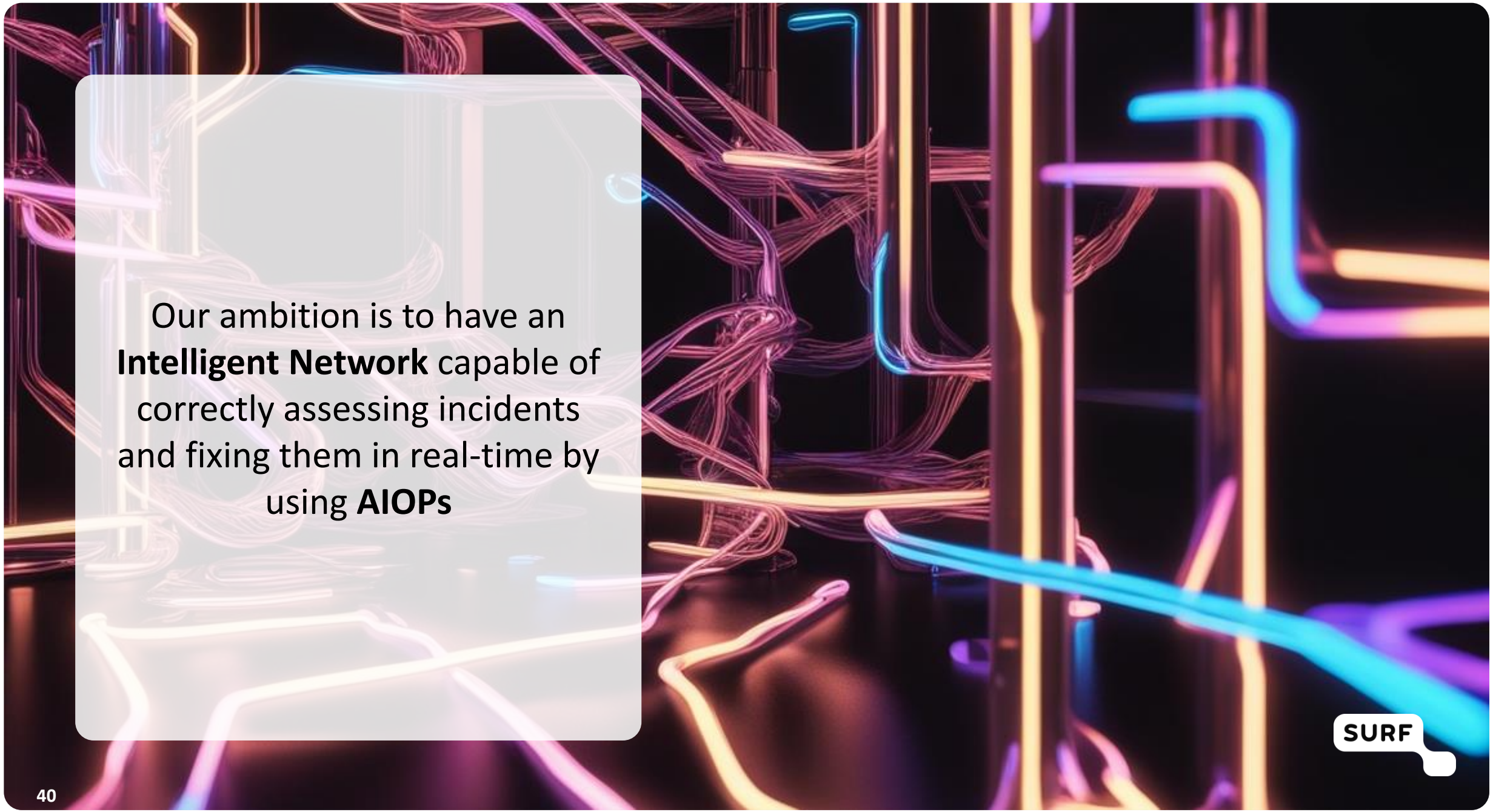
What do HAL-9000 and WALL-E’s stories tell us?

- AI have no ”intent”
- Work well when supervised correctly
- Both characters malfunction due to user error/neglect
- **We need to understand AI to to be able to control it and use it to it’s fullest potential.**

So now what? – Intelligent Networks

- At SURF we believe AI will be the next paradigm shift in how we run our network.
- With a dynamic and mixed usecase network we need all the help we can get
- We require an AI that is vendor agnostic and is trained to understand our Key Performance Indicators
- **Opensource**




Our ambition is to have an
Intelligent Network capable of
correctly assessing incidents
and fixing them in real-time by
using **AIOPs**

Creating an Intelligent network

Relies on a sane data architecture and reliable sources of truth

- SURF validates all data across the network and compares it to OSS/BSS
- Precise definitions of services consistently across the network
- Data labelling is very accurate and easy to correlate
- Large amounts of high quality data
- **Fully orchestrated provisioning**

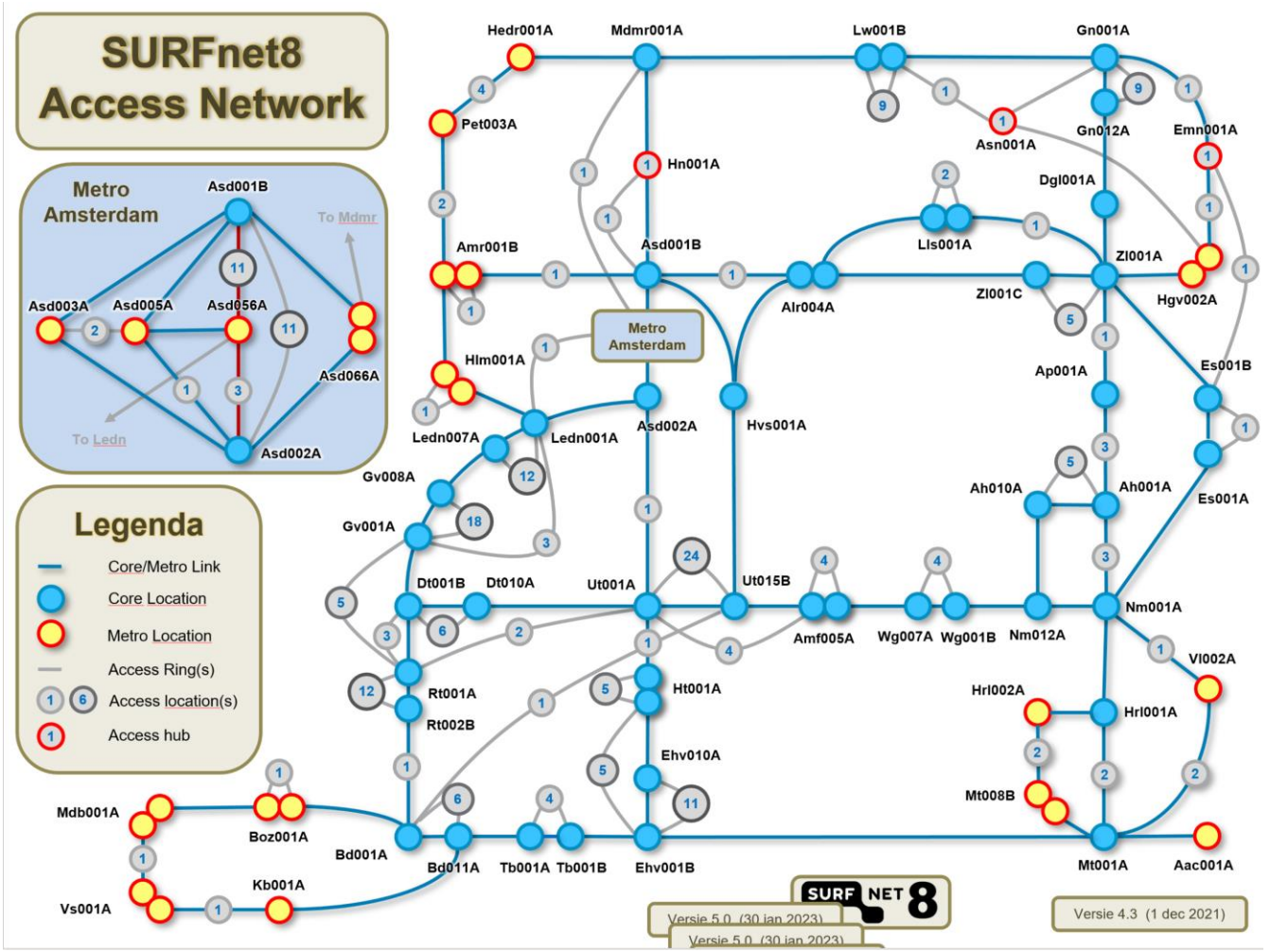
Relies on clear use cases and well trained algorithms

- Intelligence is relative – How far should we go?
- Training the algorithms towards wrong outcomes will not result in “intelligence”
- What checks and balances do you need?

SURF as an NREN

National Research and Education Network

- Provides IT services in a broad sense to R&E
- Connected to the world through NetherLight and various peerings in Amsterdam
- +/- 9% of the Dutch population on our network during the day
  - 450 Gb/s commodity internet
  - 600 Gb/s EVPN, L3VPN, LHC, Public cloud
- 350 PoP's in the Netherlands and Europe
- Wide variety of services catered towards High Energy physics, but also vocational schools



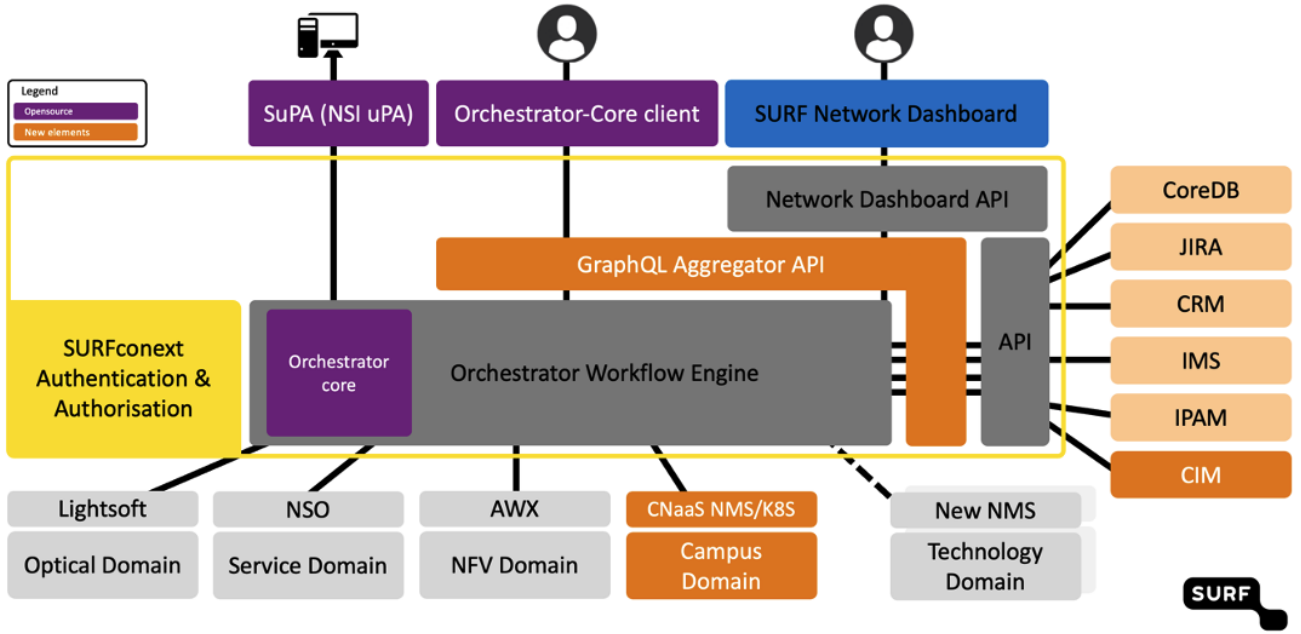
Towards a more heterogeneous network…

Current network architecture - Homogenous

- Our current architecture supports **any** service on **any** device
- Easy to operate and maintain
- Key to the introduction of network automation and orchestration
- No longer scalable
- Rigid architecture with large potential for wastage.

New network architecture - Heterogenous

- Multi OS, Multivendor Network with disaggregation
- Broker model
- Be more flexible in price and service offering per site
- Continuous evolution and upgrade, no more big bang upgrades



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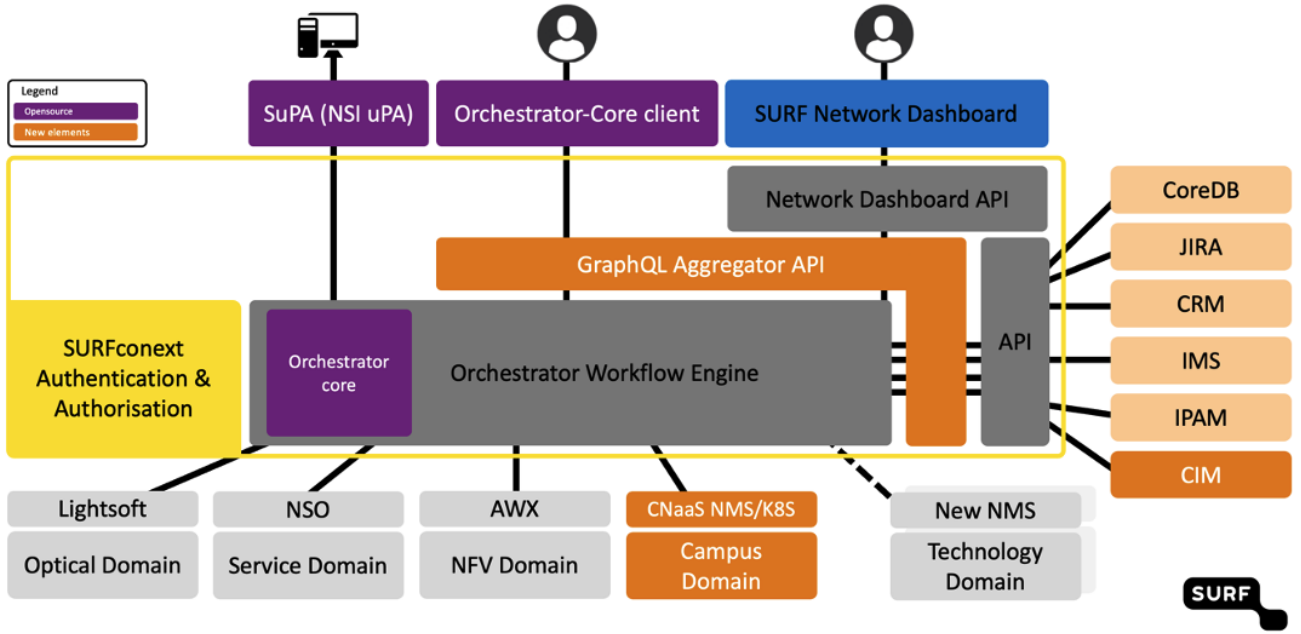


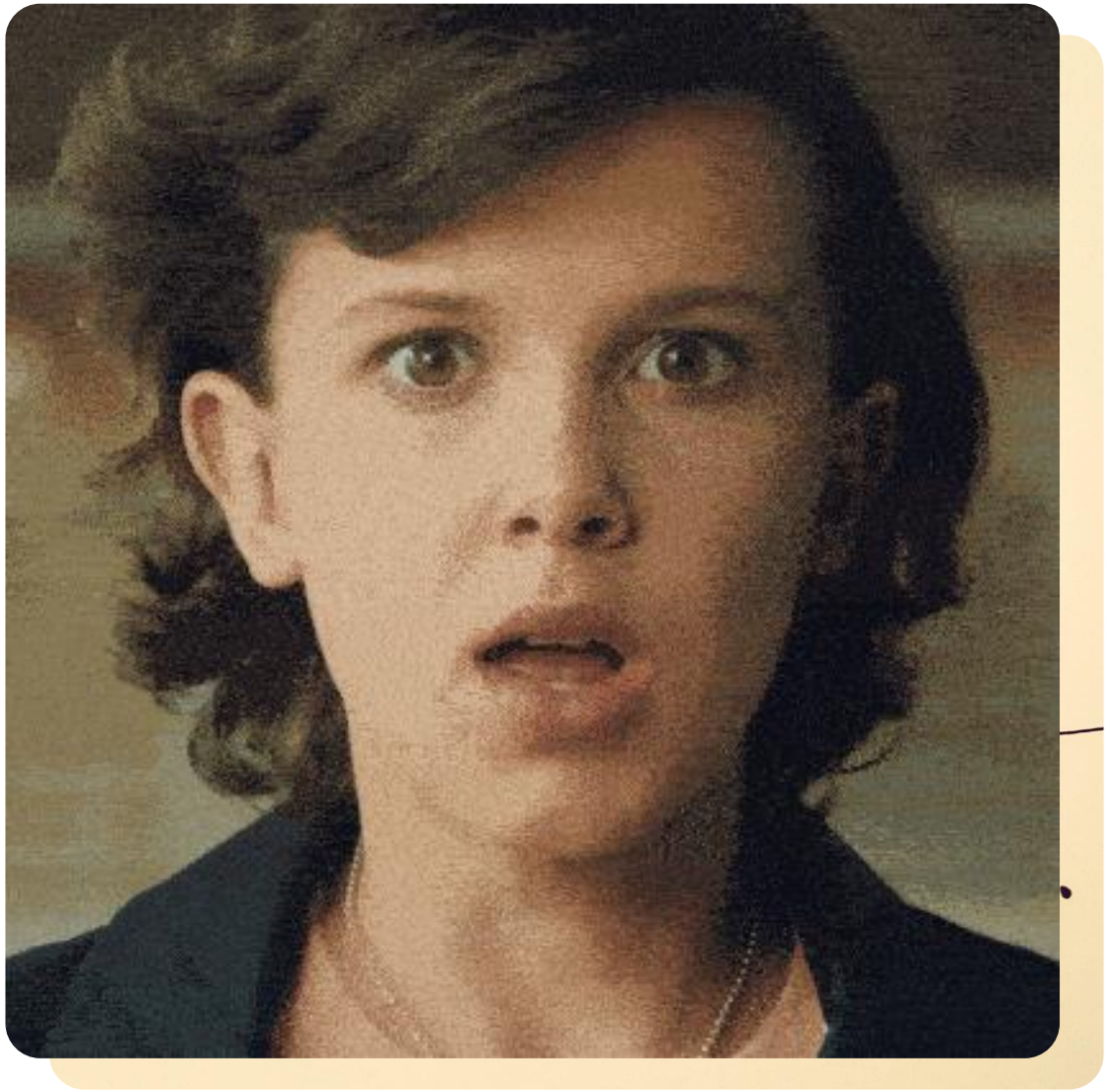
Trend and event monitoring

A Tangible place to start

- Traditional monitoring has a single dimension
- Is the BGP session up?
- Is the Interface up?
- Are their errors?

A Healthy service is described in multiple dimensions over time.

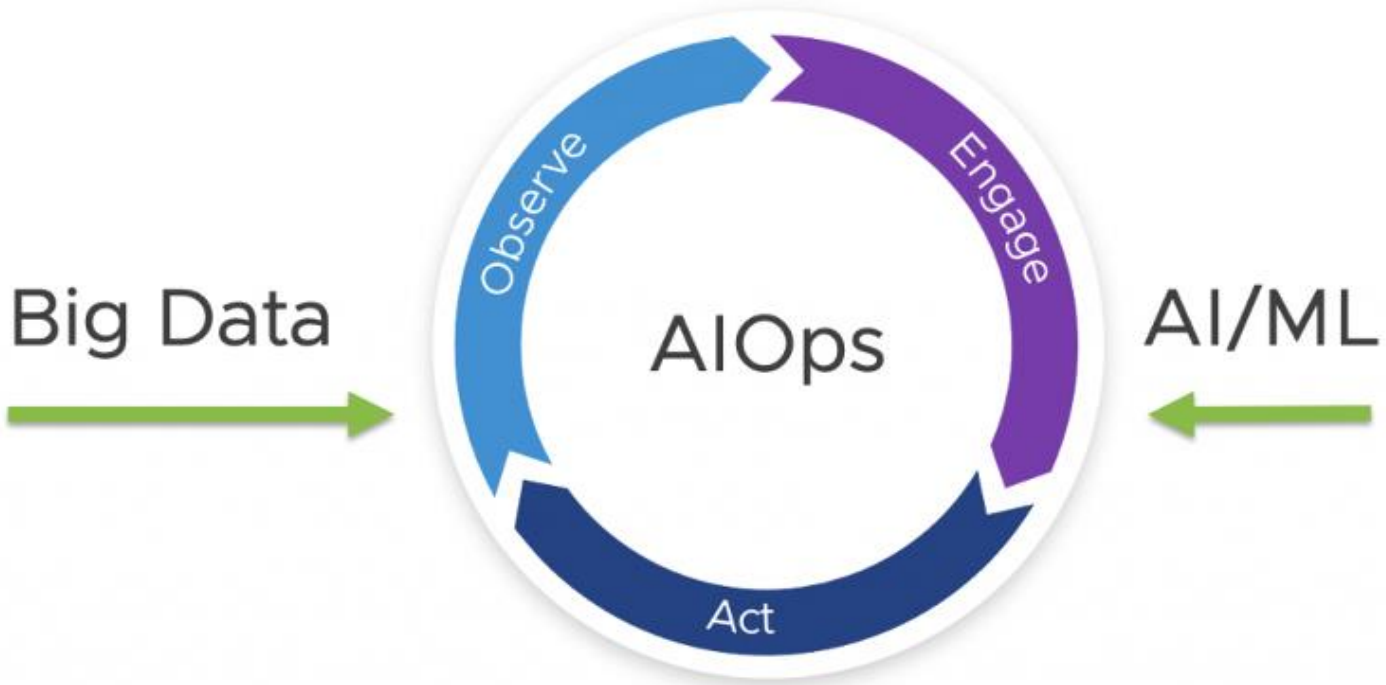
- How many received prefixes are expected
- What is the baseline of traffic
- How much drift do we allow?
- When is a service health?
- **What is a healthy service?**



How are we going to start?

Getting the basics right

- Redesign of our telemetry platform
- Make sure we get the right data with the right resolution to train the network model
- Start experimenting with use cases – high impact/high visibility to get results fast
- LSTM network traffic predications are easy and relatively accurate
- External peering
- **Introduce (semi)automatic corrections to fix problems occurring on the network**


Big Data
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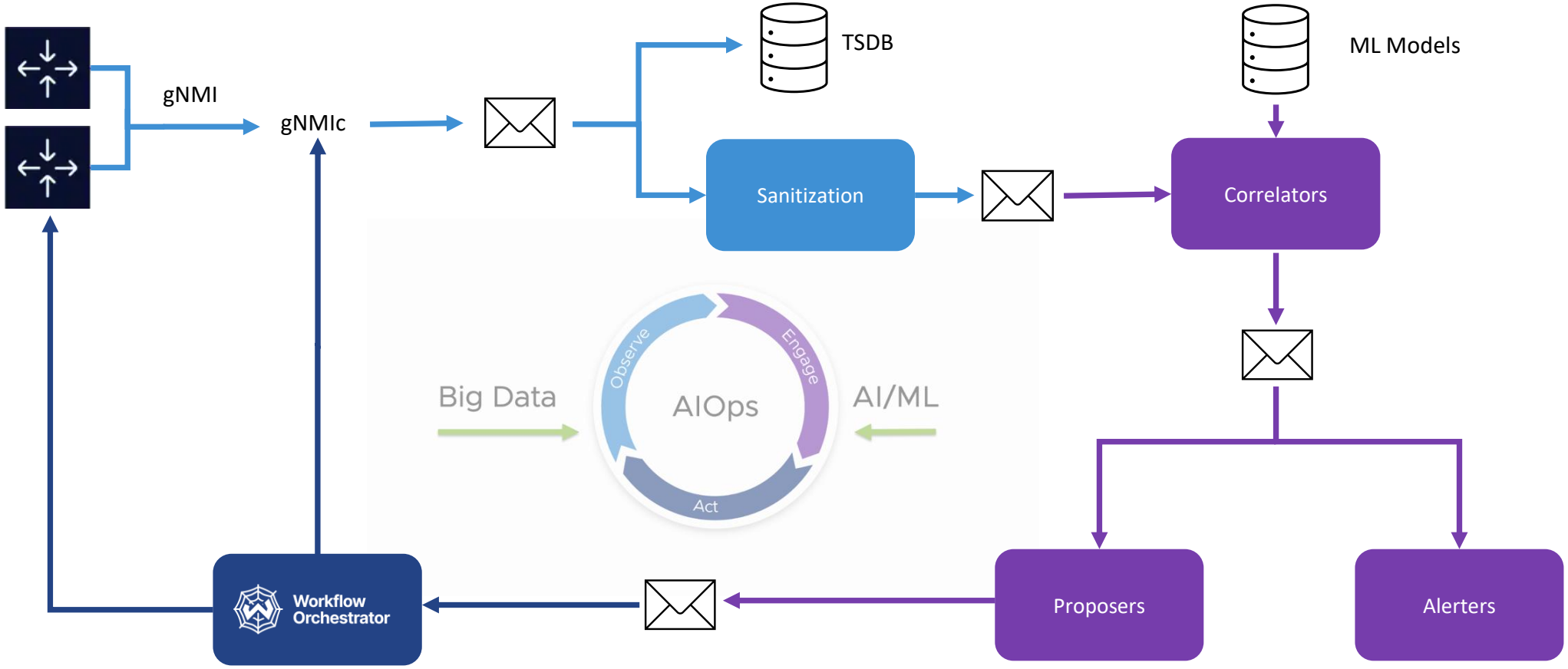
gNMI
gNMIc
TSDB
ML Models
Sanitization
Correlators
Big Data
Observe
Engage
AIOps
Act
AI/ML
Workflow Orchestrator
Proposers
Alerters

In conclusion – Intelligent Networks

Start small and aim high

- AI is something unknown, an enigma, lets make it understandable
- Digital twin for simulations and network planning
- Vendor agnostic
- Available for R&E, but also outside that community
- ~~Awesome AI solution of vendor X~~
- **Opensource based on Open Algorithms and Standards**

What should you take away?

- An Artificial Intelligence is the reflection of its inputs and whether it is maintained.
- HAL-9000 and WALL-E can and should be avoided
- AIOP's is needed for the mundane tasks, so we can tackle the more complex tasks
- **This community** should be at the forefront of developing AIOPs for networks in an opensource collaboration
- Collaborate with vendors and ask for **OpenConfig** support to enable multivendor configuration
- **Automation,** enables **Orchestration**, so we can unlock the potential of an **Intelligent Network**

QUESTIONS?

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Social media: linkedin.com/in/boerspeter/

Driving innovation together

Sources

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- https://www.microsoft.com/en-us/worklab/work-trend-index/ai-at-work-is-here-now-comes-the-hard-part
- https://www.cbs.nl/nl-nl/visualisaties/dashboard-arbeidsmarkt
- https://medium.com/the-mission/on-asymmetric-systems-f40995ac71b
- https://www.moogsoft.com/everything-aiops-guide/
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- https://www.deviantart.com/
- https://chatgpt.com/