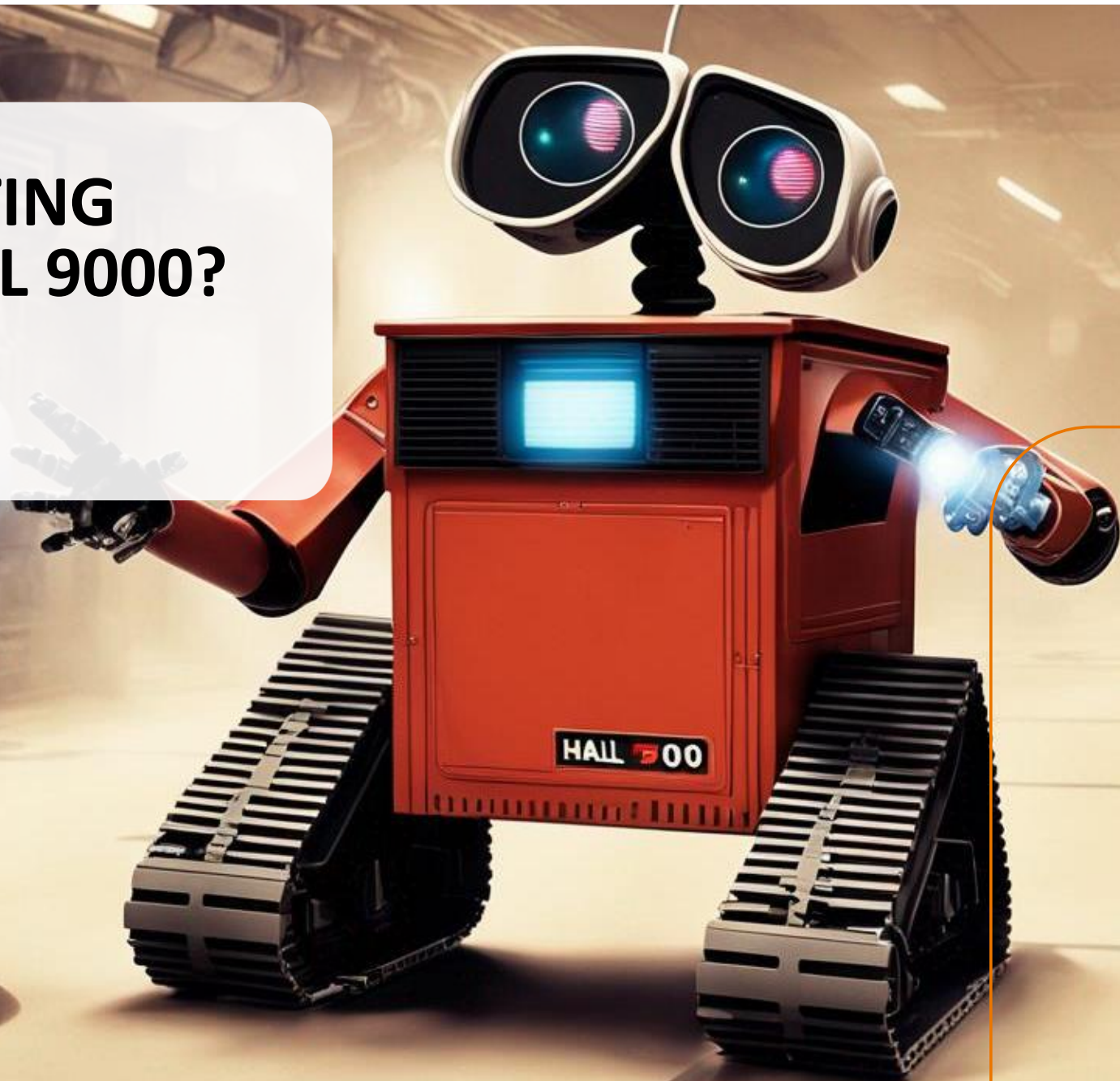


ARE WE CREATING WALL-E OR HAL 9000?

Peter Boers

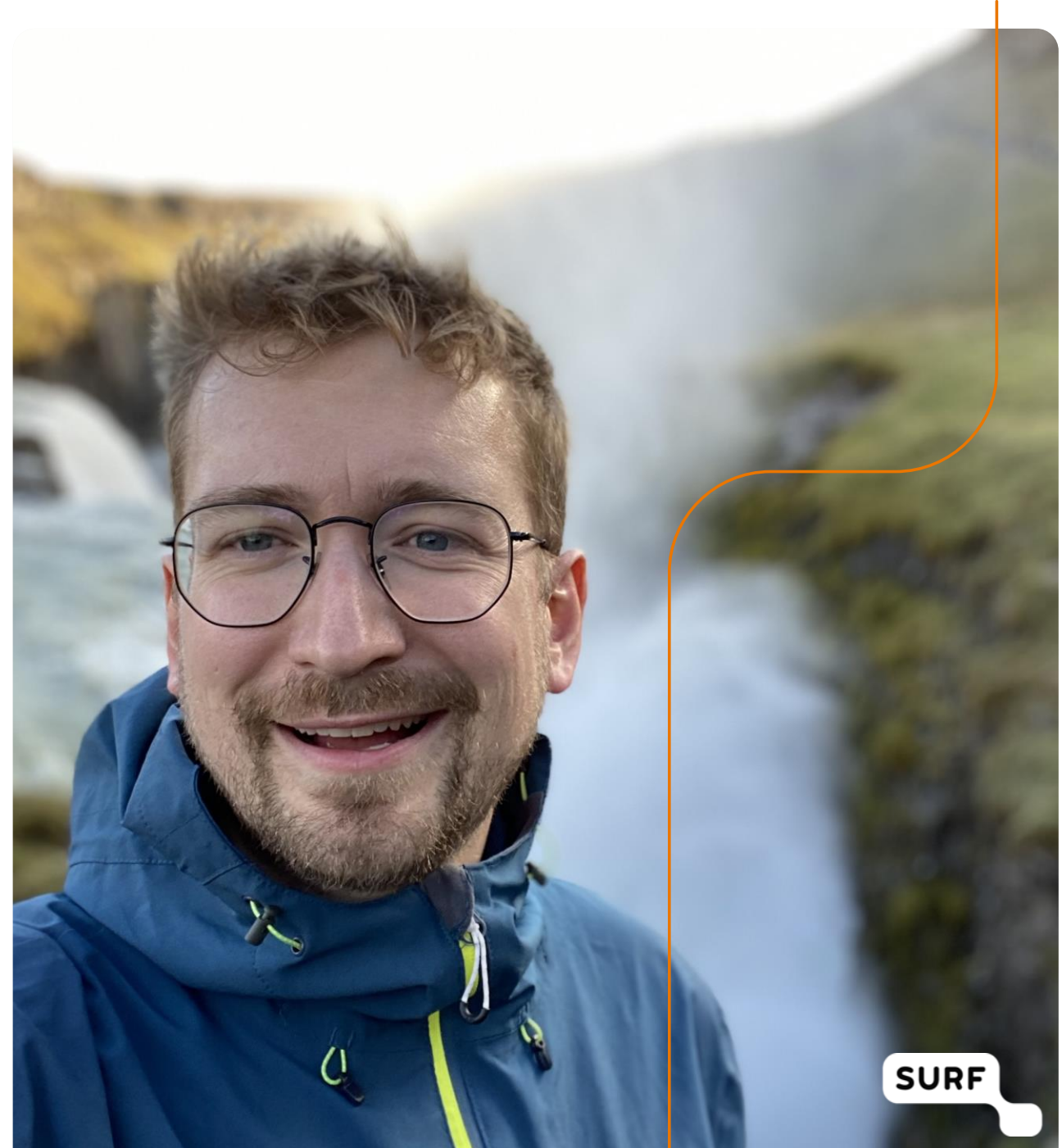
Autocon 1 - closing keynote



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....



Current (me)

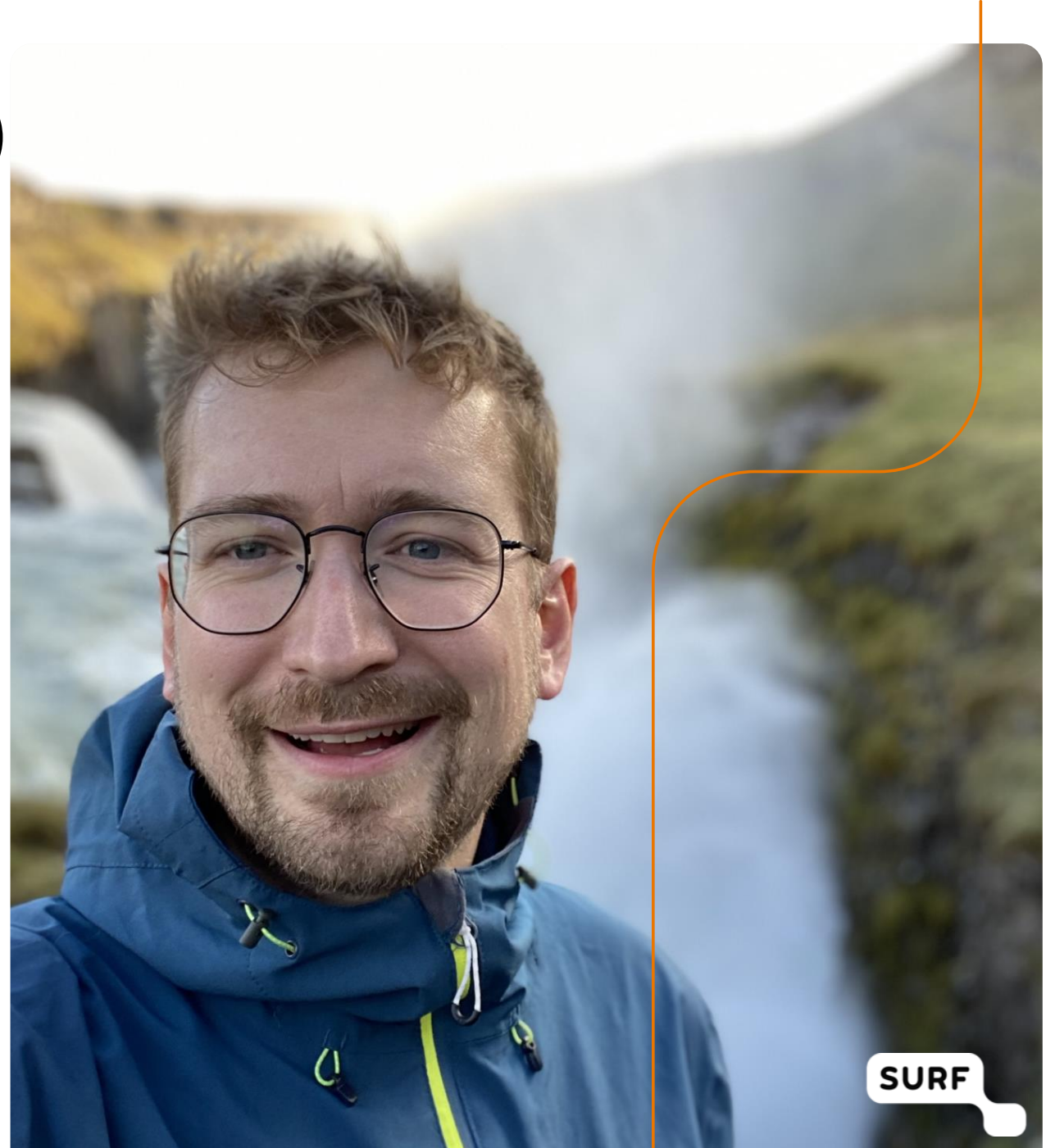
- try
- ma
happy
- get
- Roan



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**

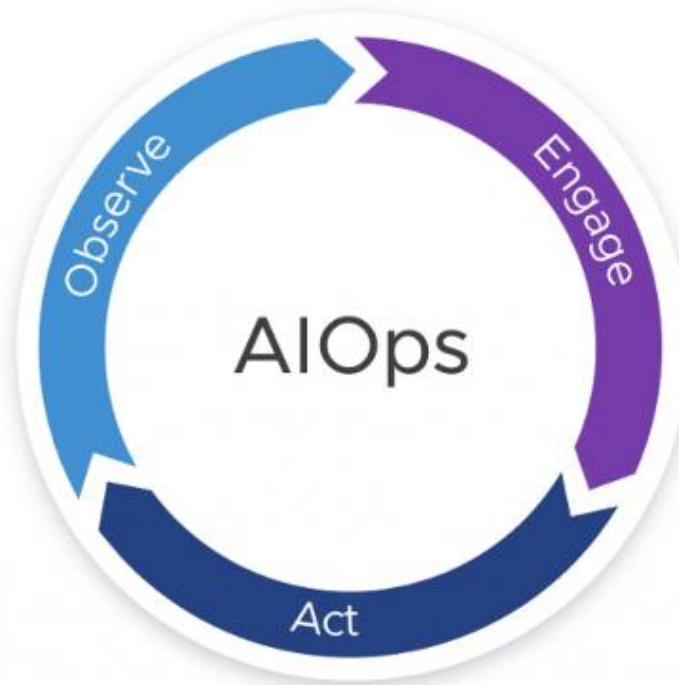


What is AIOPs?

“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



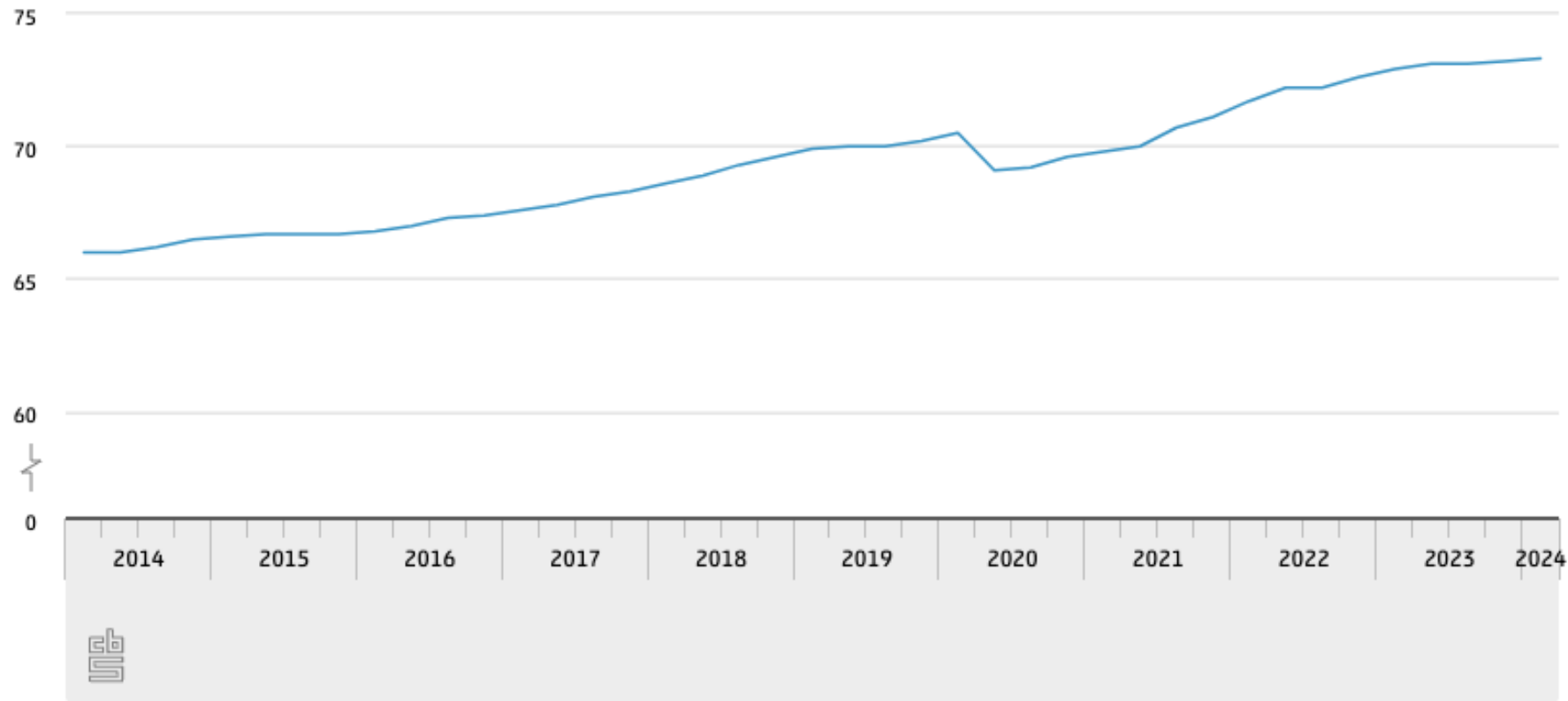
AI/ML



AIOPs is necessary to enable future innovations

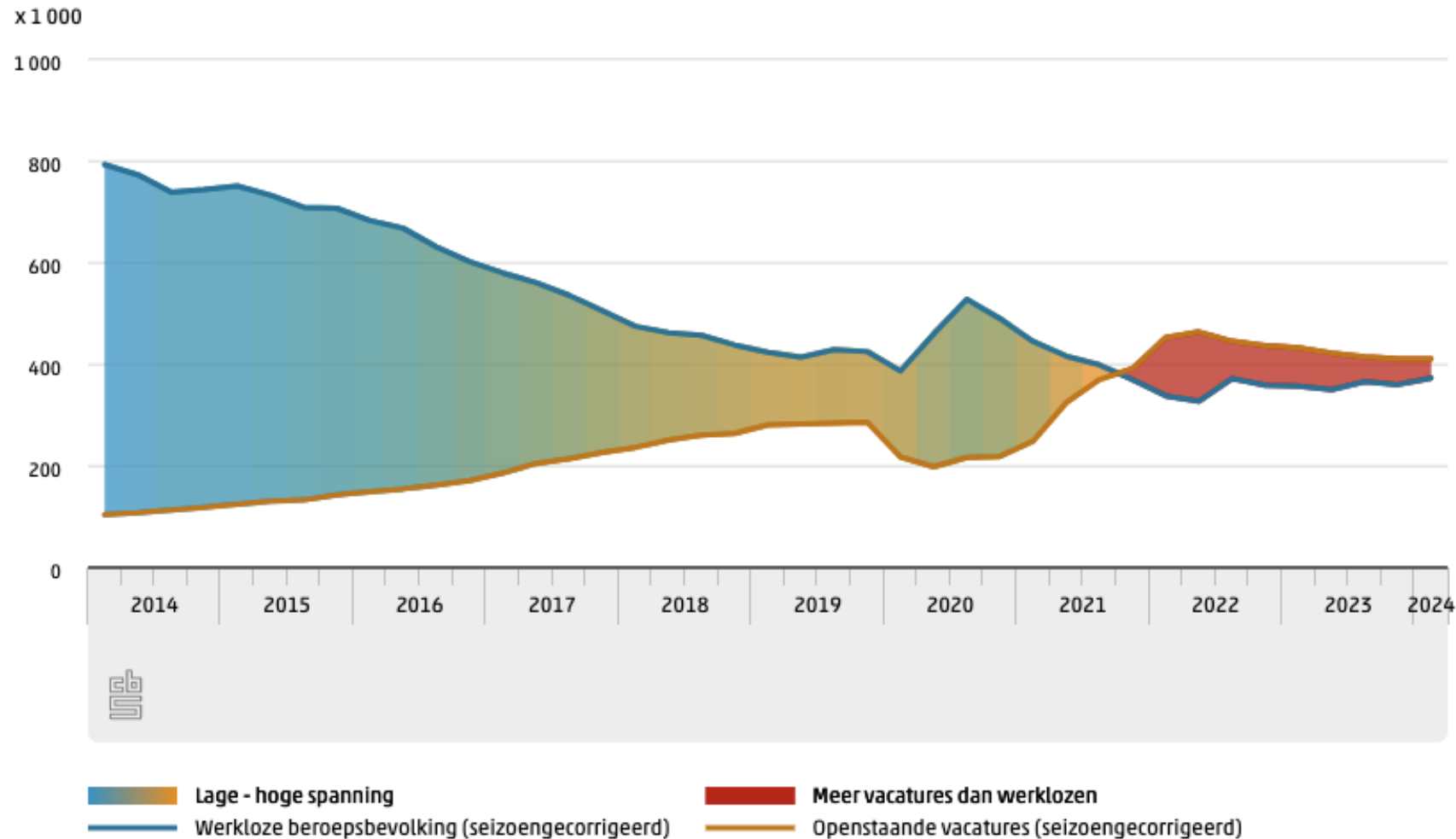
Nettoarbeidsparticipatie (seizoengecorrigeerd)

% van bevolking van 15 tot 75 jaar

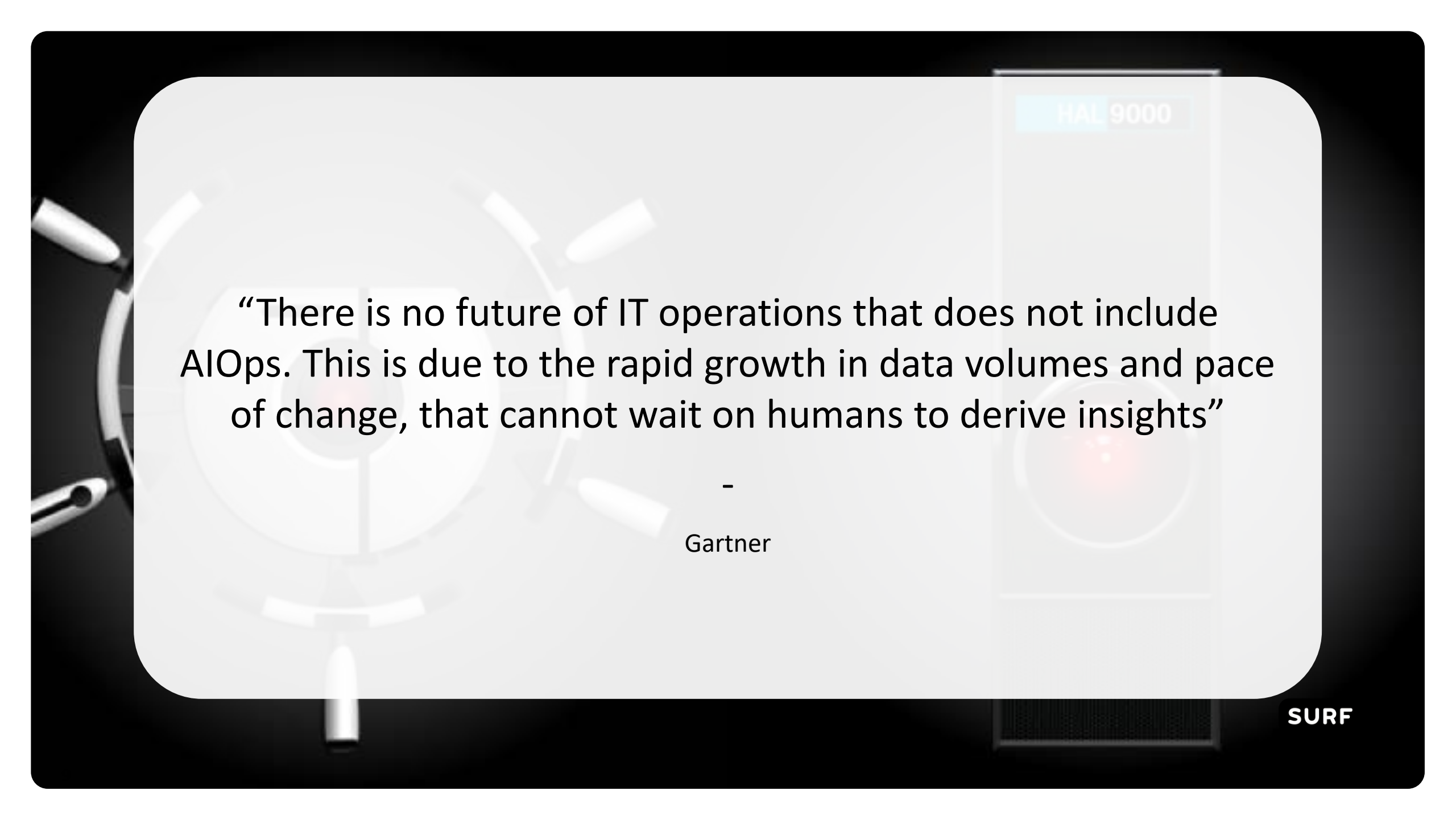


Percentage of the population with a job - Central Bureau of Statistics (NL) 2024

AIOPs is necessary to enable future innovations



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

The background of the slide features a dark, semi-transparent image. On the left side, a portion of a ship's steering wheel is visible, showing several white spokes. On the right side, there is a vertical control panel with a glowing red circular light at the bottom and a small rectangular display at the top that reads "HAL 9000" in white text.

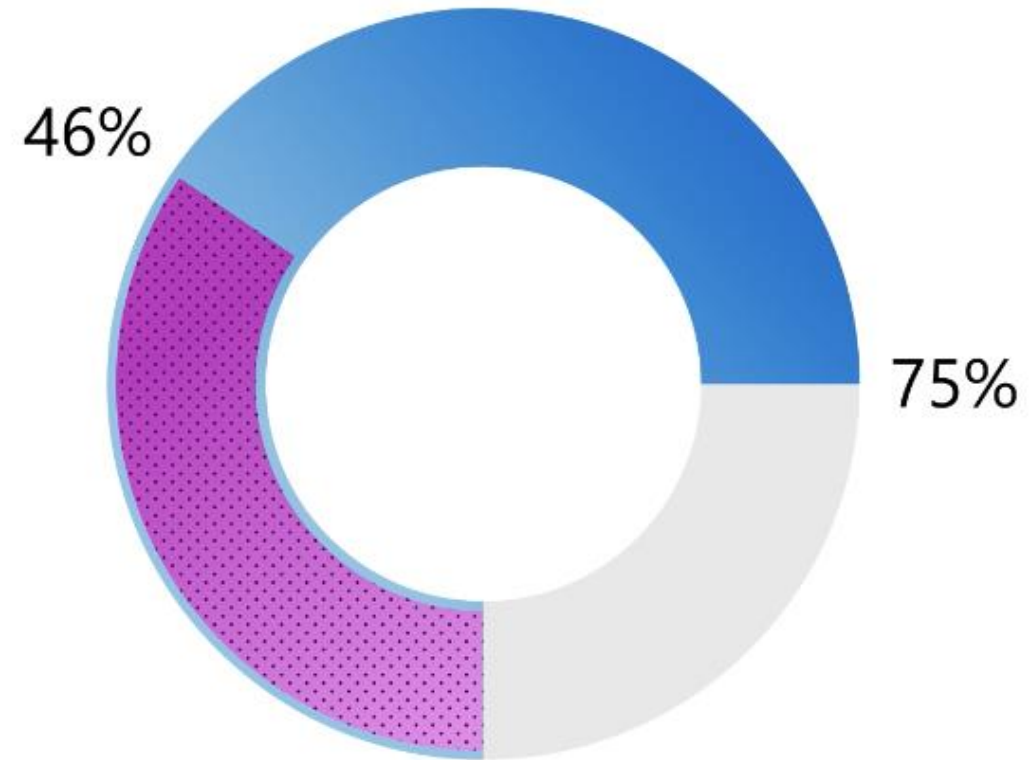
“There is no future of IT operations that does not include AIOps. This is due to the rapid growth in data volumes and pace of change, that cannot wait on humans to derive insights”

-
Gartner

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



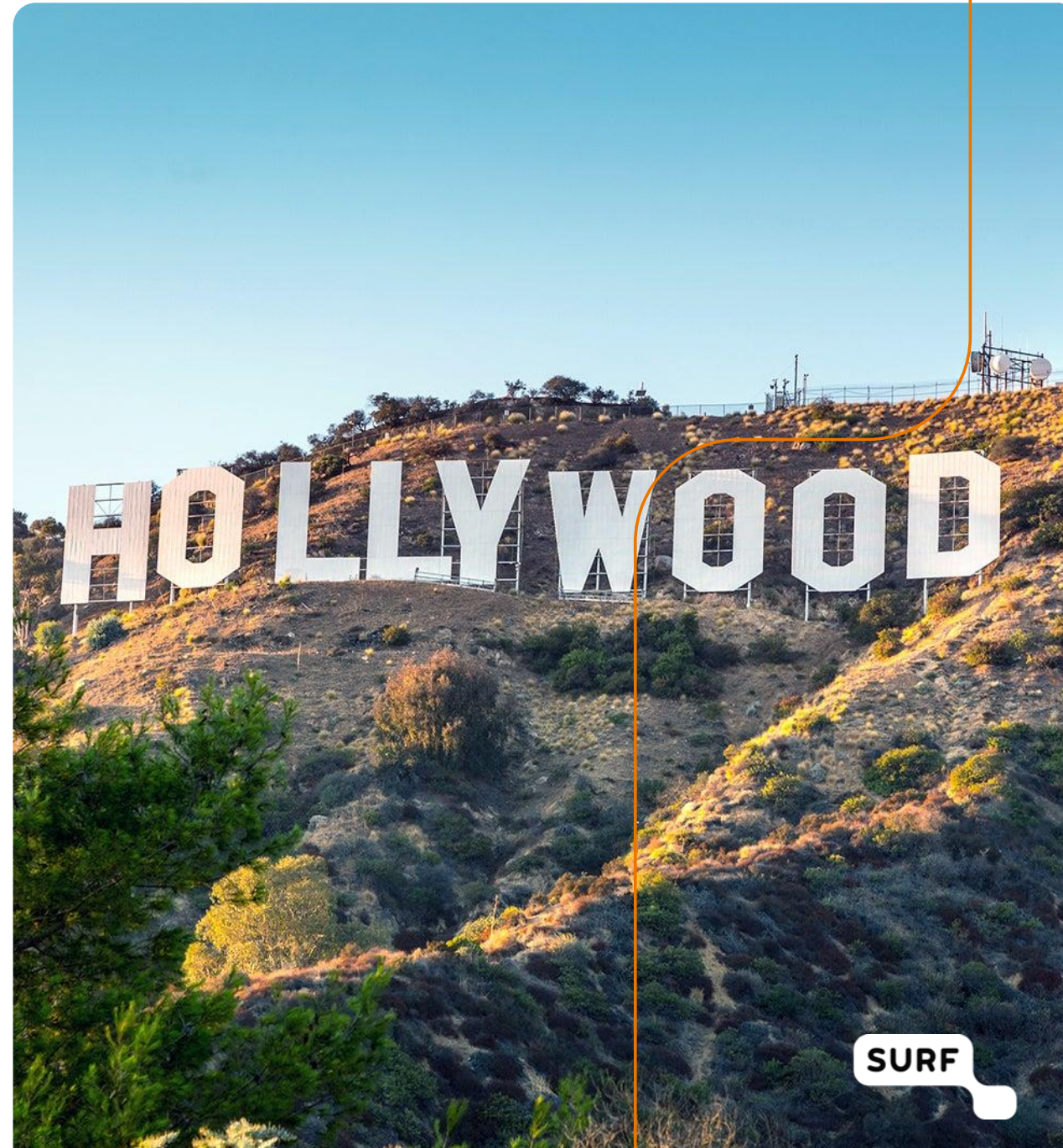
Hollywood and AI – A love hate relationship


GenAI

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

In Sci-Fi movies:

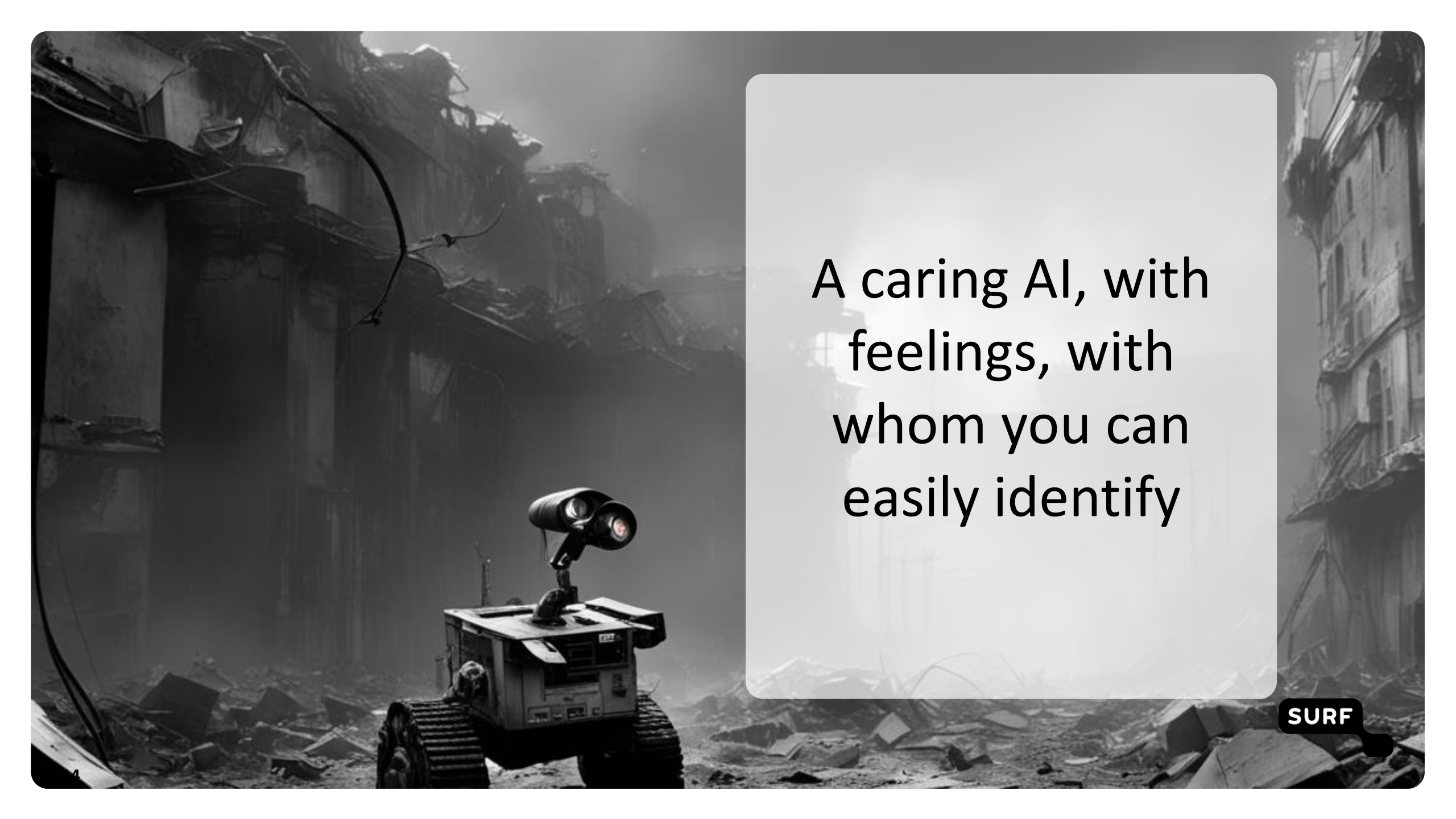
- Metropolis - 1927
- TARS – Interstellar - 2014
- C3PO & R2D2 – Star Wars - 1977
- Agent Smith – Matrix - 1999
- Sonny– I Robot - 2004
- T-800 - The Terminator – 1984
- HAL-900 – 2001: A Space Odyssey – 1968**
- WALL-E – WALL-E - 2008**






Are we creating
good?

SURF

A black and white photograph of a desolate, war-torn city street. In the foreground, a small, boxy robot with two large, circular eyes on a stalk stands on a pile of rubble. The robot has a rectangular body with various panels and a small antenna. The background shows tall, multi-story buildings that have been severely damaged, with debris hanging from the sides and windows missing. The overall atmosphere is one of devastation and isolation.

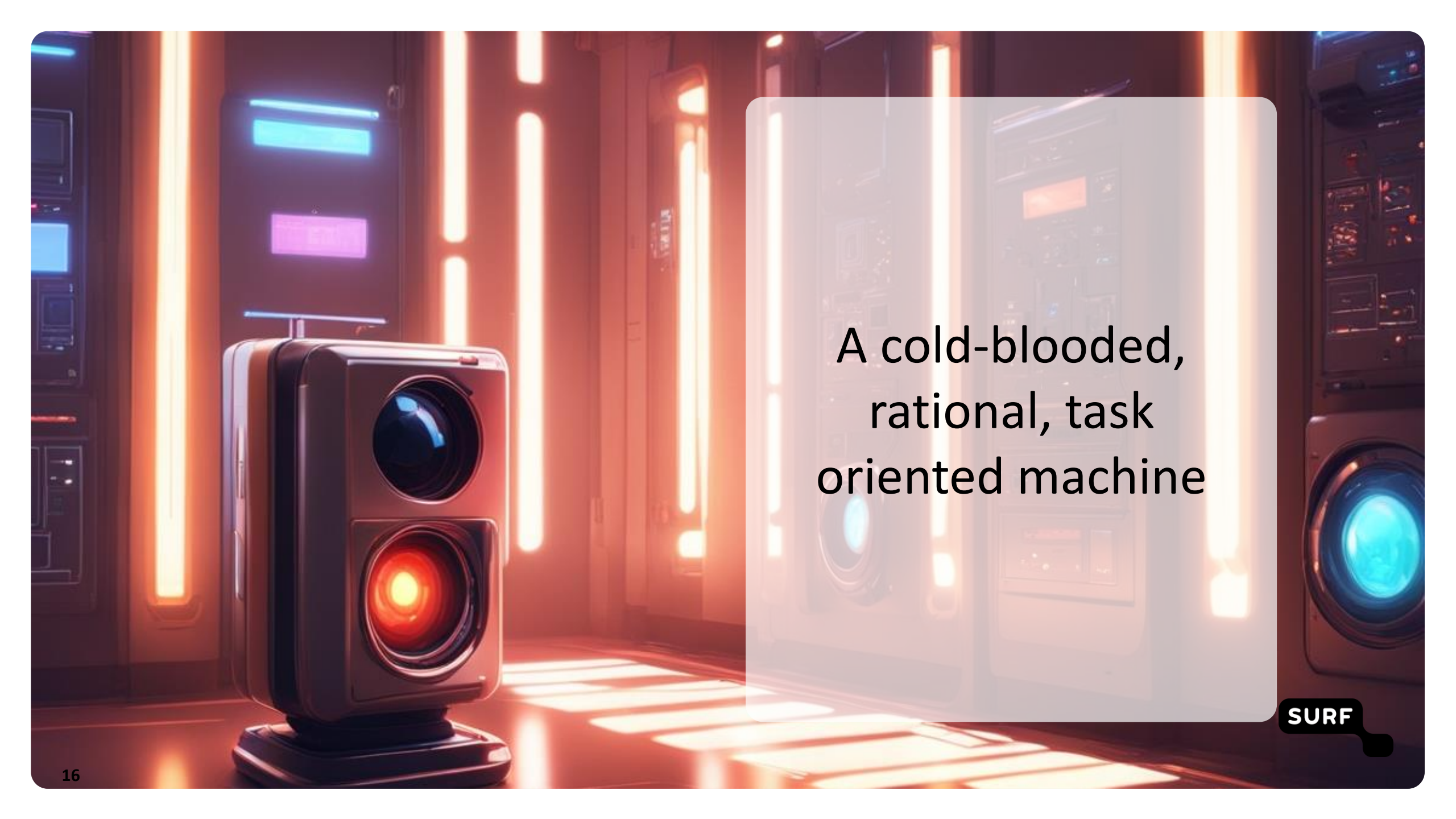
A caring AI, with
feelings, with
whom you can
easily identify

SURF

A futuristic, glowing orange and blue hallway with a large speaker in the foreground and a translucent text box in the center. The scene is lit with vertical orange light strips and blue accents. A large, dark speaker with a glowing orange driver is in the foreground. In the background, there are control panels and a door with a glowing blue light. A translucent white box with rounded corners is in the center, containing the text "Or ... are we creating evil?".

Or ... are we
creating evil?

SURF

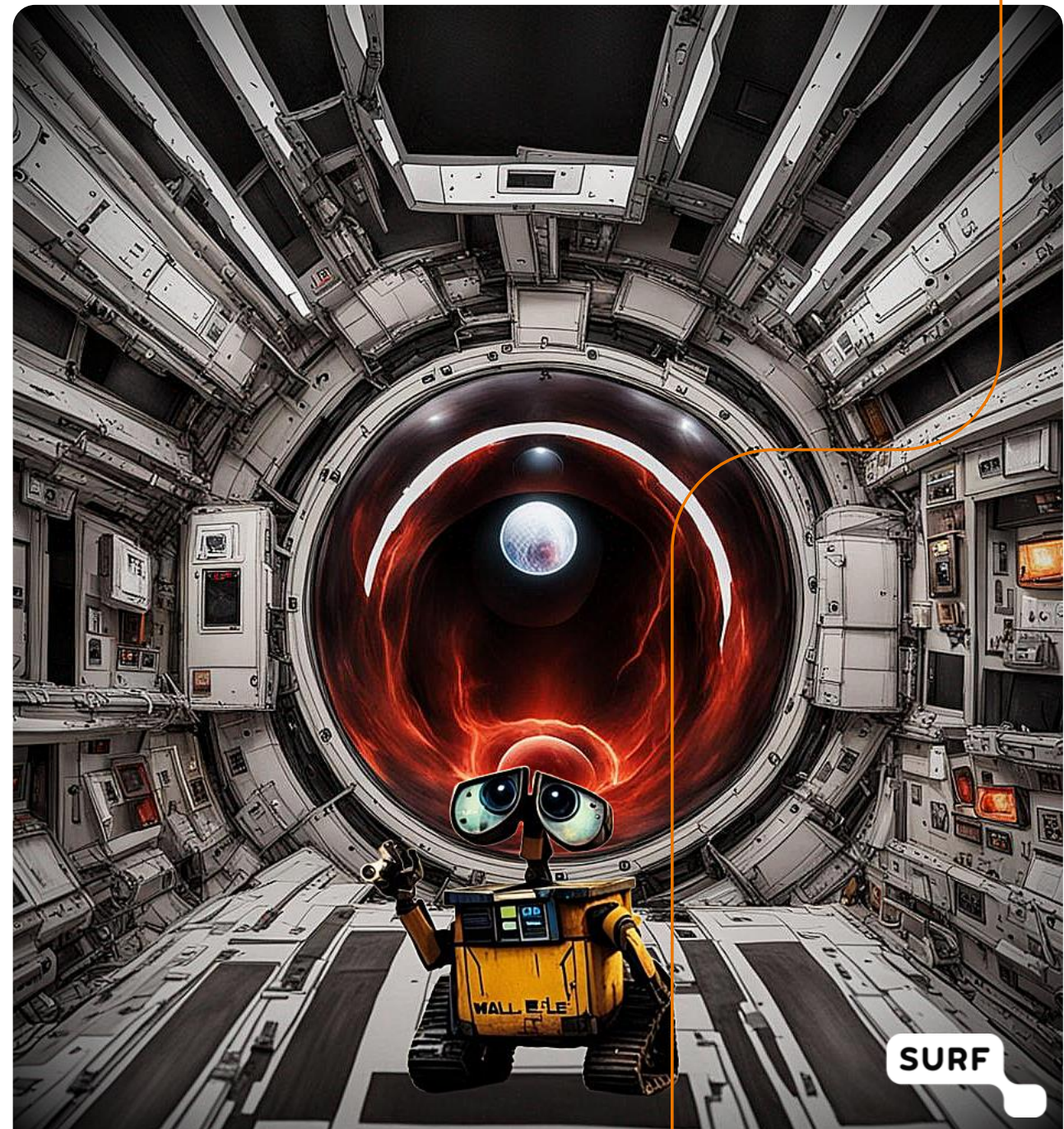
A futuristic, glowing speaker stands in a sci-fi hallway. The speaker has a dark, rectangular body with two large circular drivers. The top driver is dark, while the bottom driver is illuminated with a bright orange-red glow. The hallway is lit with vertical orange light strips and a blue screen in the background. A semi-transparent white box with text is overlaid on the right side of the image.

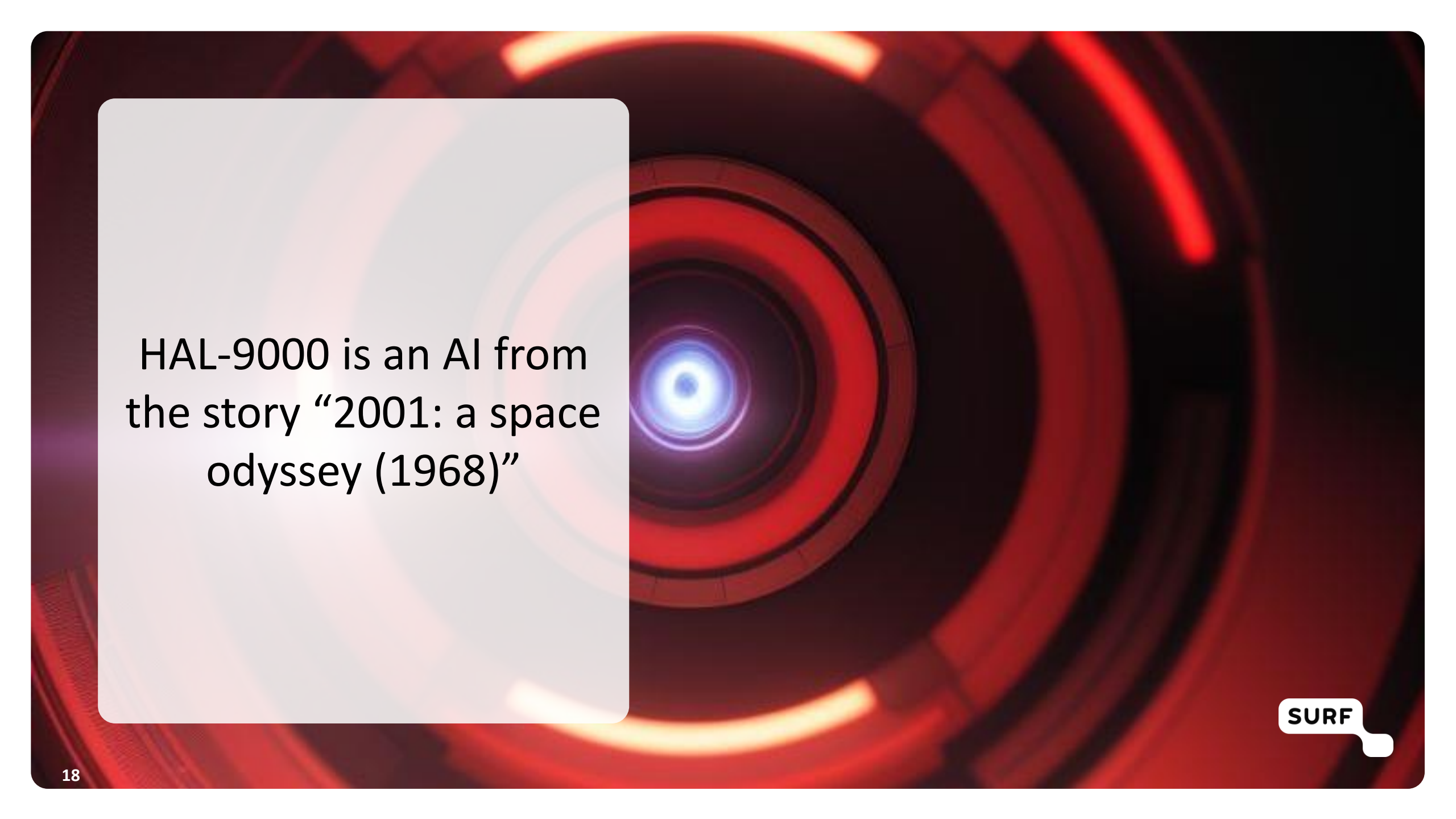
A cold-blooded,
rational, task
oriented machine

SURF

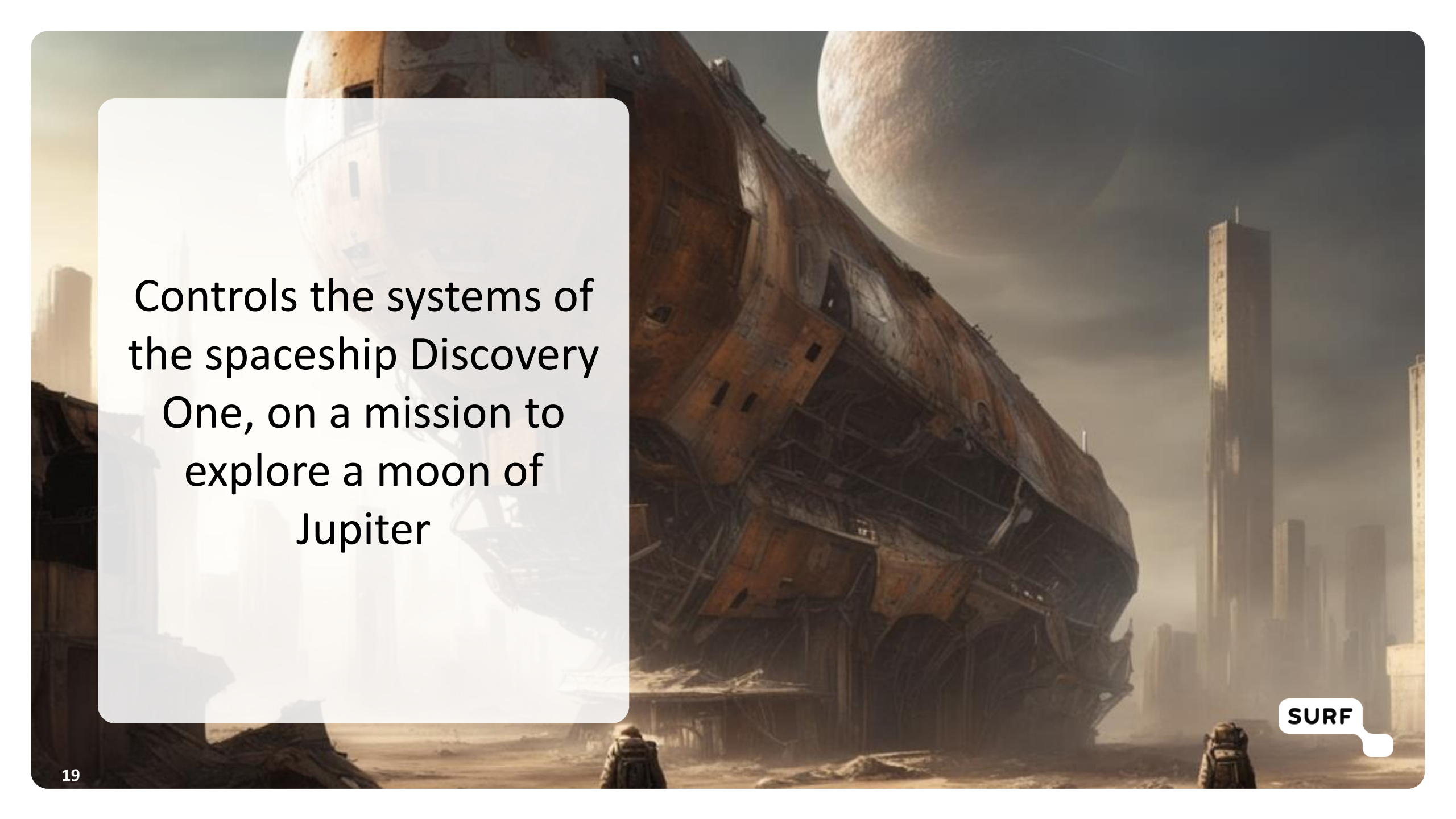
What do WALL-E and HAL-9000 tell us about AI?

- 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?



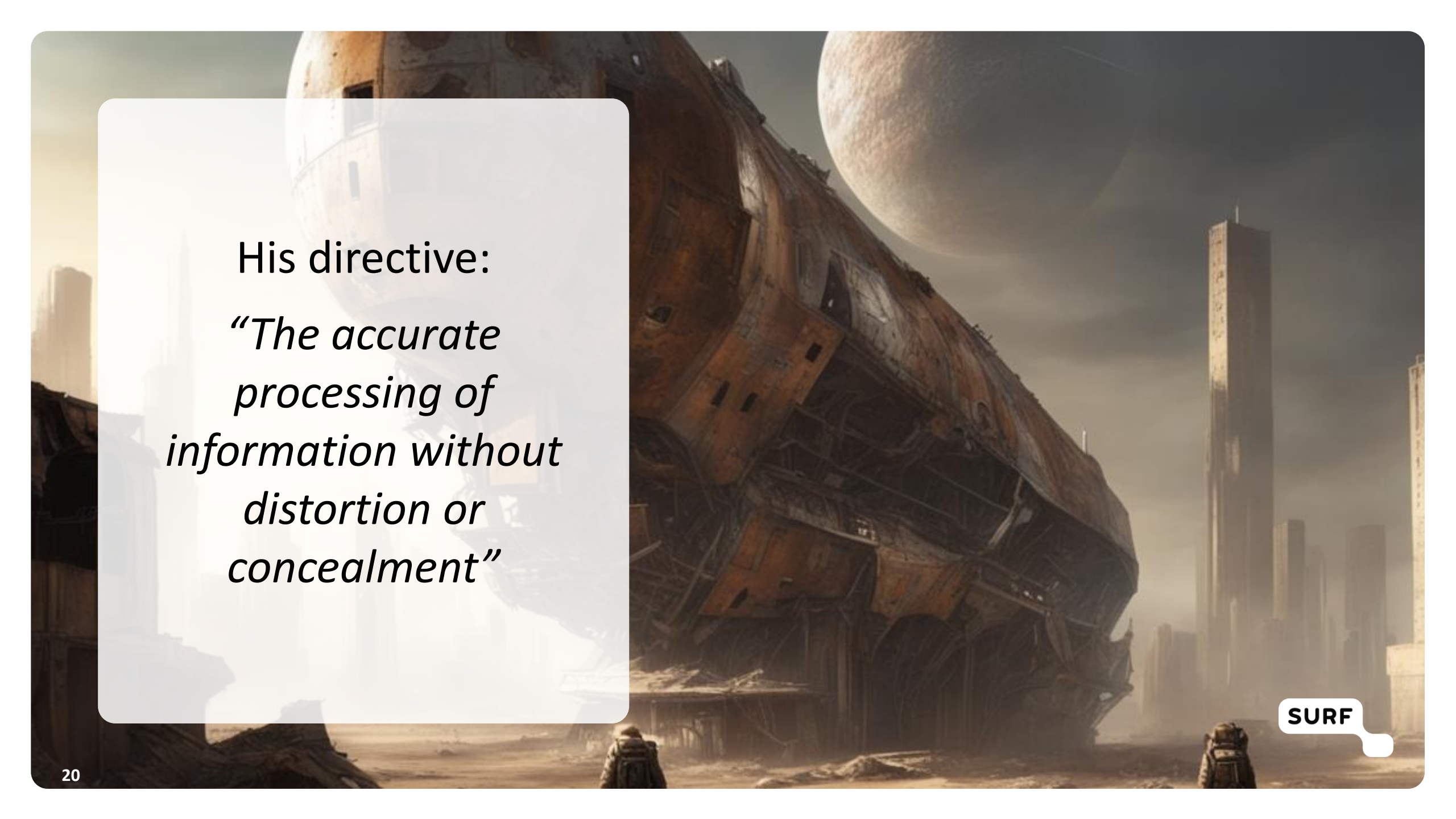


HAL-9000 is an AI from
the story “2001: a space
odyssey (1968)”

A cinematic scene from a sci-fi movie. In the foreground, a massive, rusted, and heavily damaged industrial structure, possibly a spaceship or a large building, dominates the left and center. The structure is made of dark, weathered metal with many small windows and openings. In the background, a city with tall, thin skyscrapers is visible under a hazy, orange-tinted sky. A large, bright, spherical moon or planet is in the upper right. Two small figures in futuristic suits are visible in the lower foreground, looking towards the structure. The overall atmosphere is gritty and industrial.


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

SURF




His directive:
*“The accurate
processing of
information without
distortion or
concealment”*

SURF

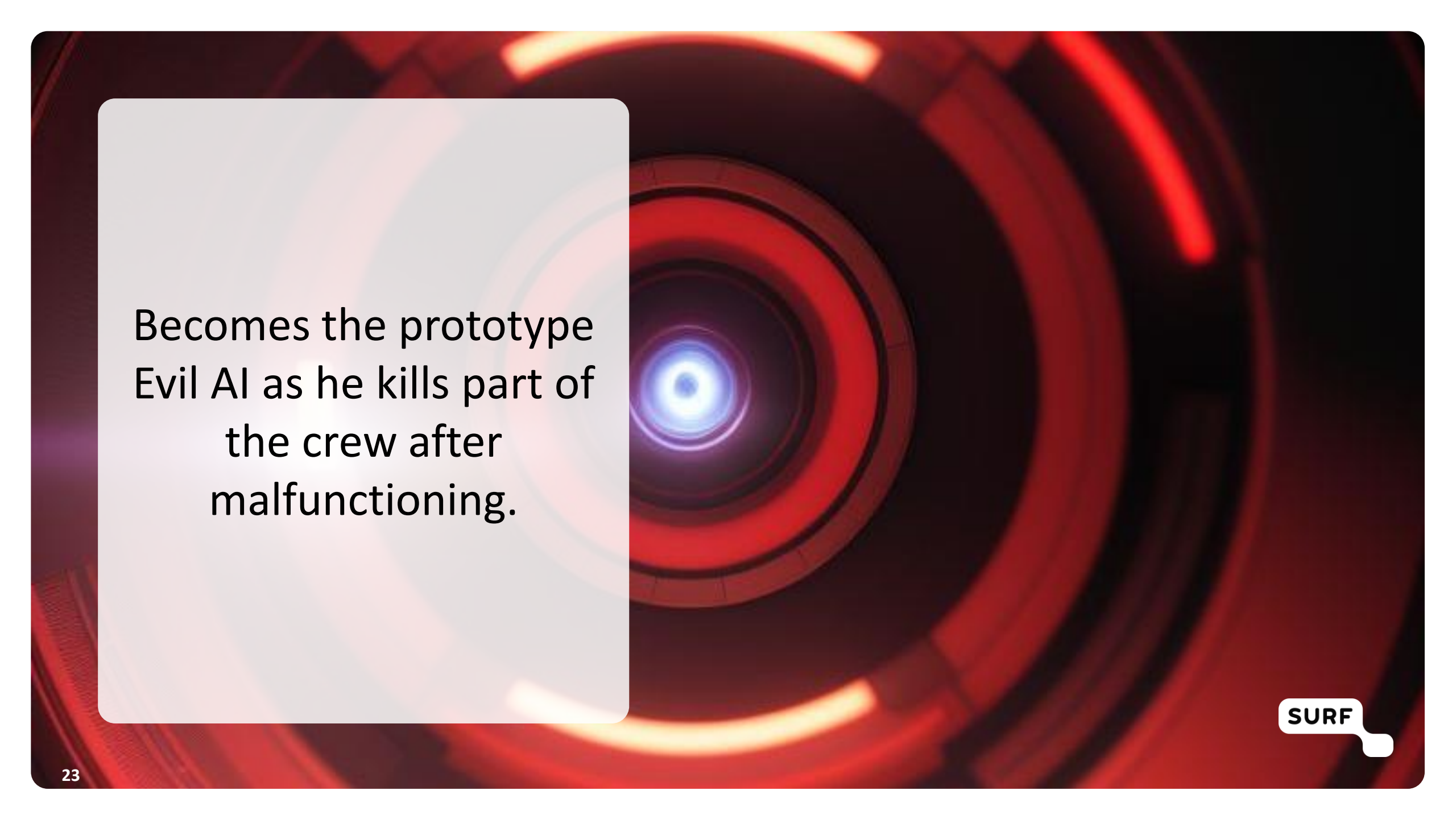
A large, metallic, spherical object, possibly a robot or a piece of machinery, is shown in a close-up view. The object has a glowing red and orange core, suggesting a heat source or a malfunction. The background is a city skyline at sunset, with buildings silhouetted against a warm, orange sky. The overall scene is dramatic and atmospheric.

Starts malfunctioning
due to an order that
contradicts his
directive...

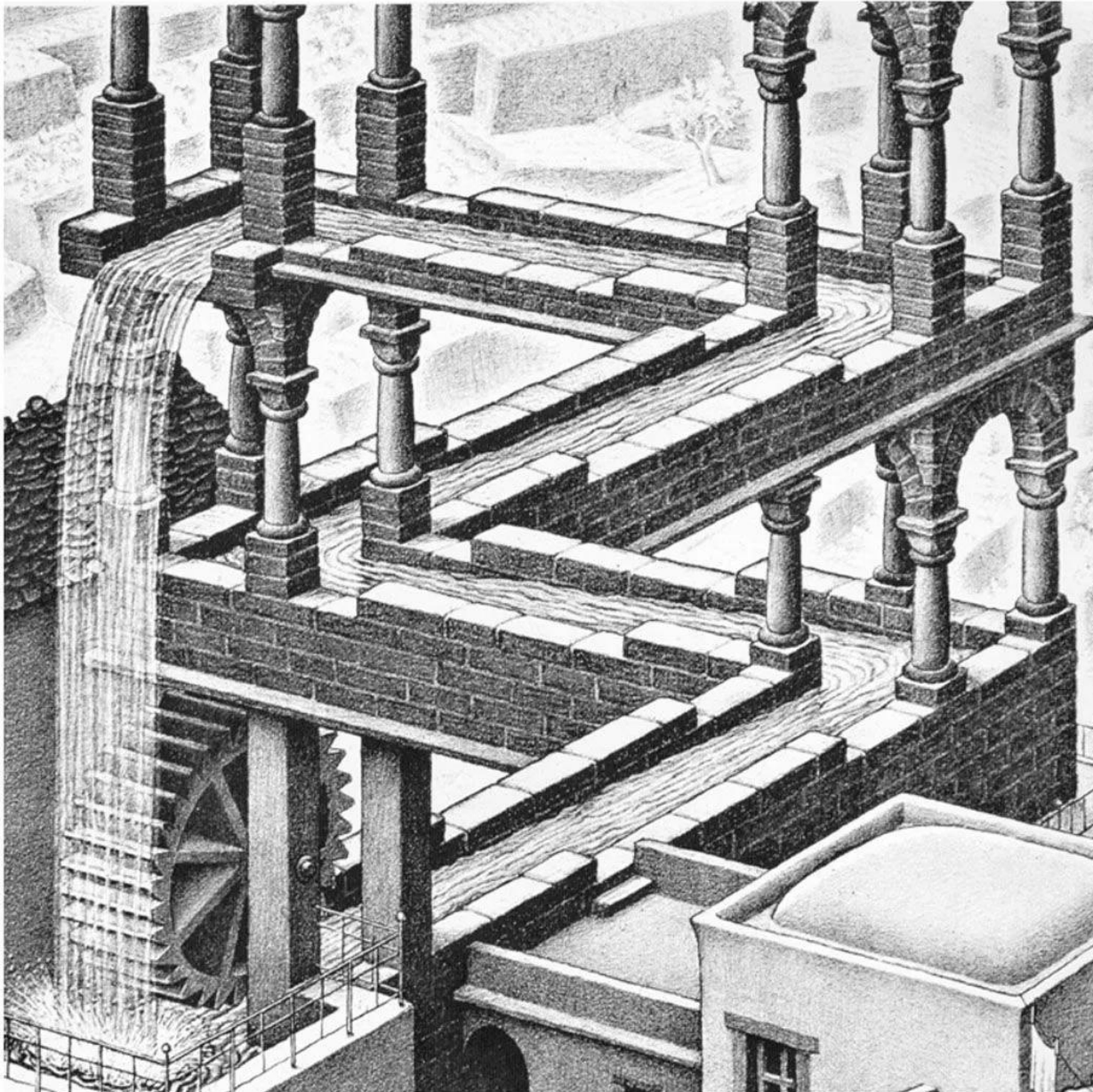


... hiding the existence
of an extraterrestrial
anomaly to the crew

SURF

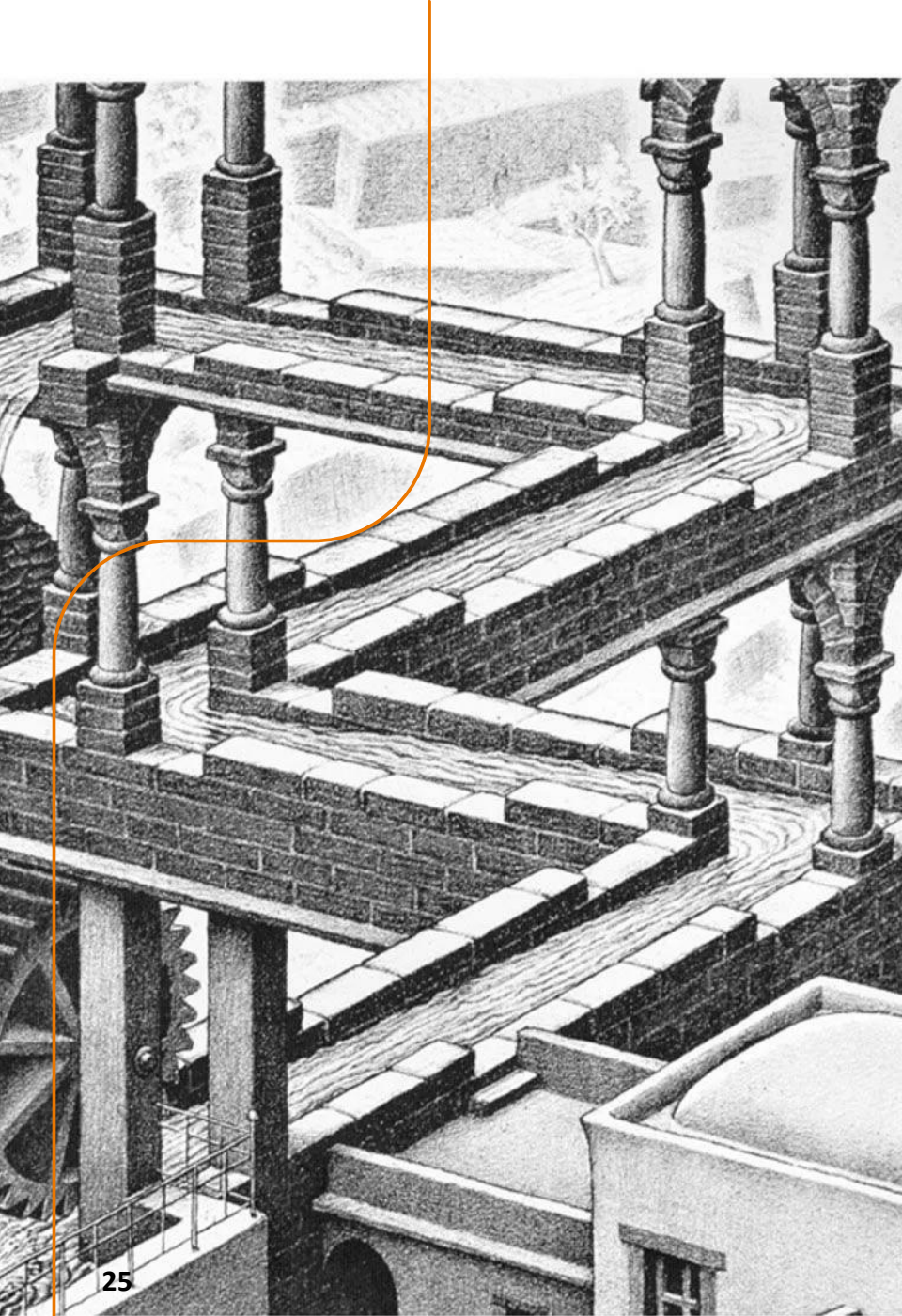


Becomes the prototype
Evil AI as he kills part of
the crew after
malfunctioning.



TWON

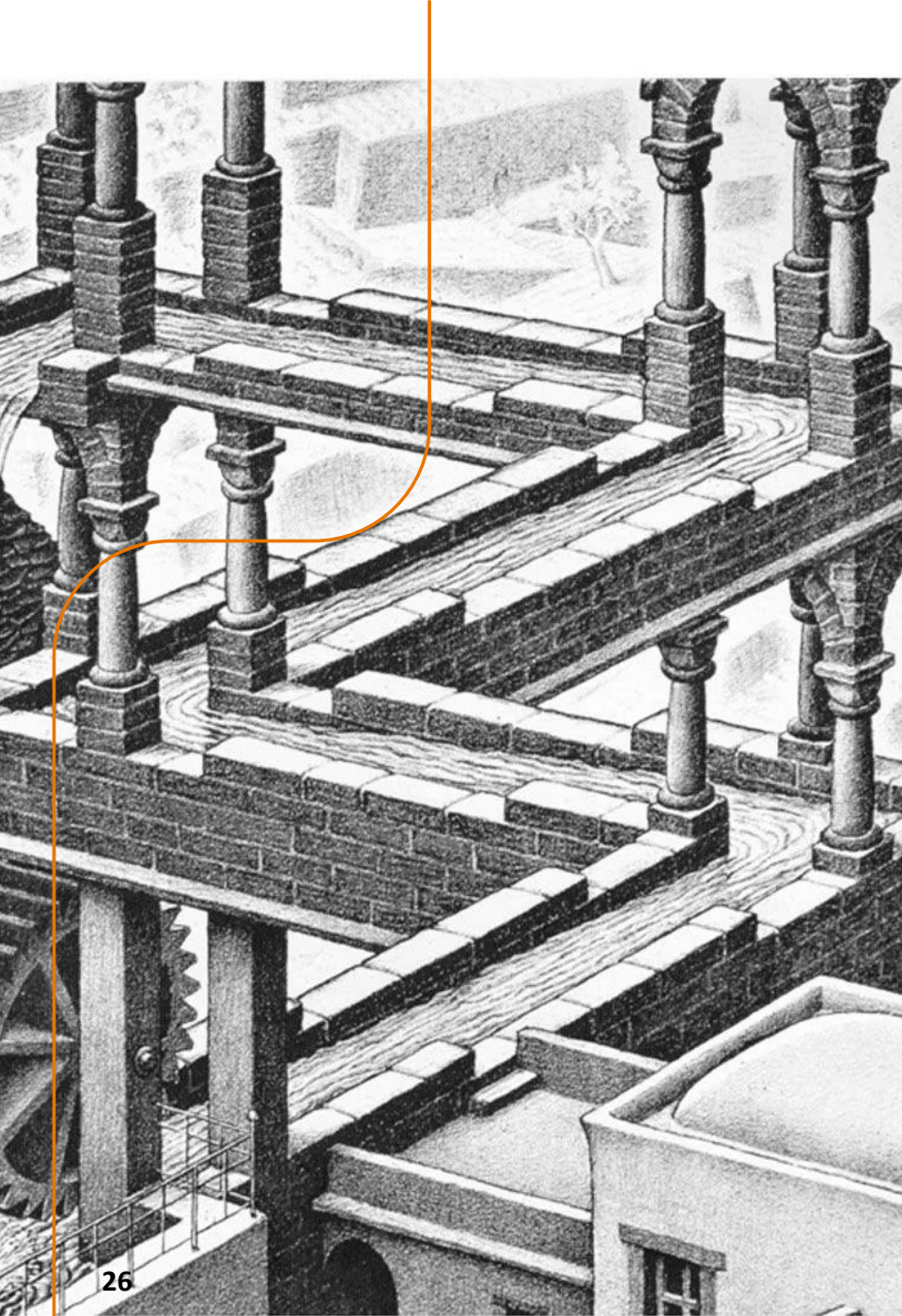
Waterfall - M.C Escher



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”

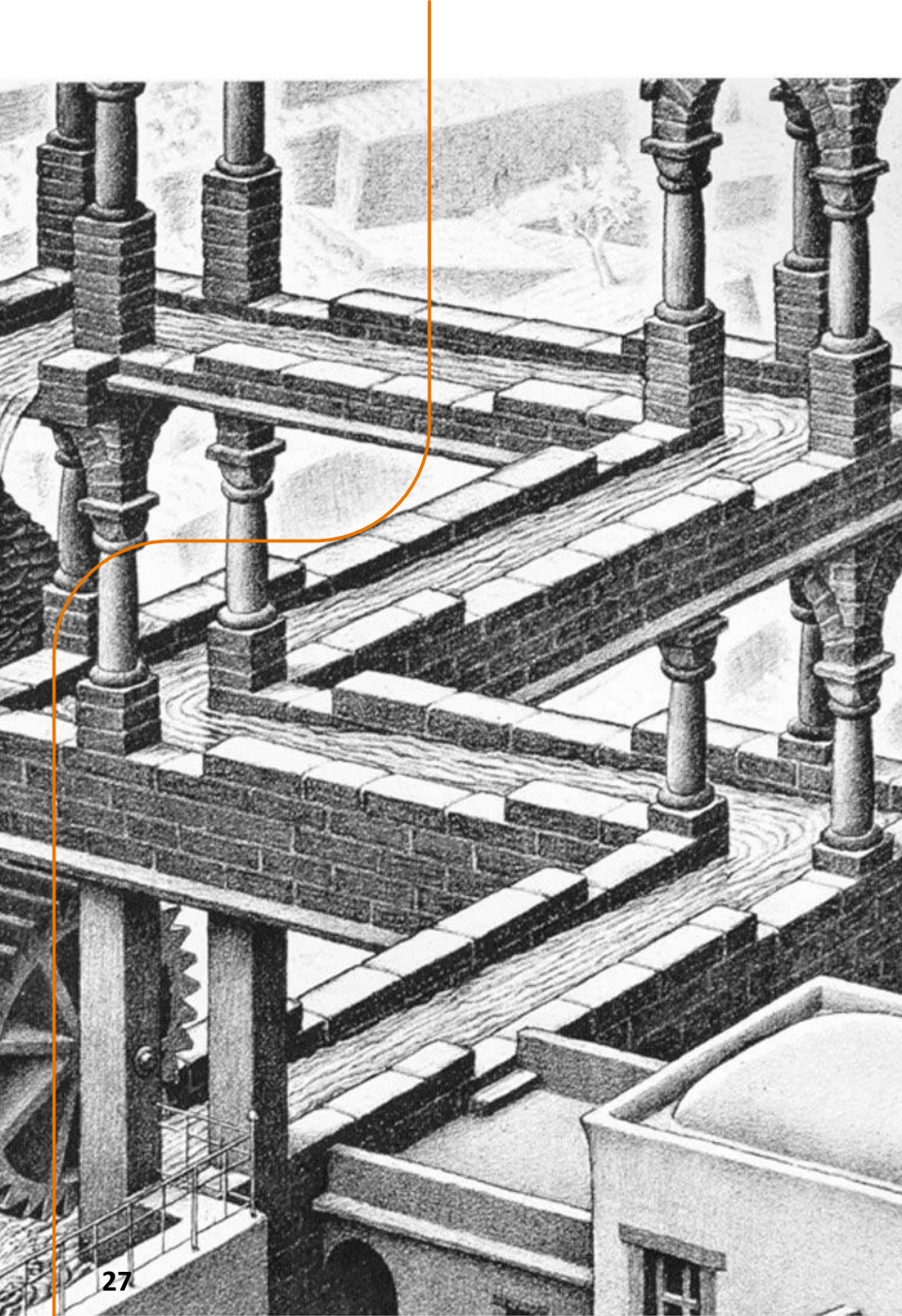


Liar Paradox

$L = \text{"This sentence is false"}$

$L = \text{eval}(\text{"This sentence is false"})$ is **True**

$L = \text{False}$

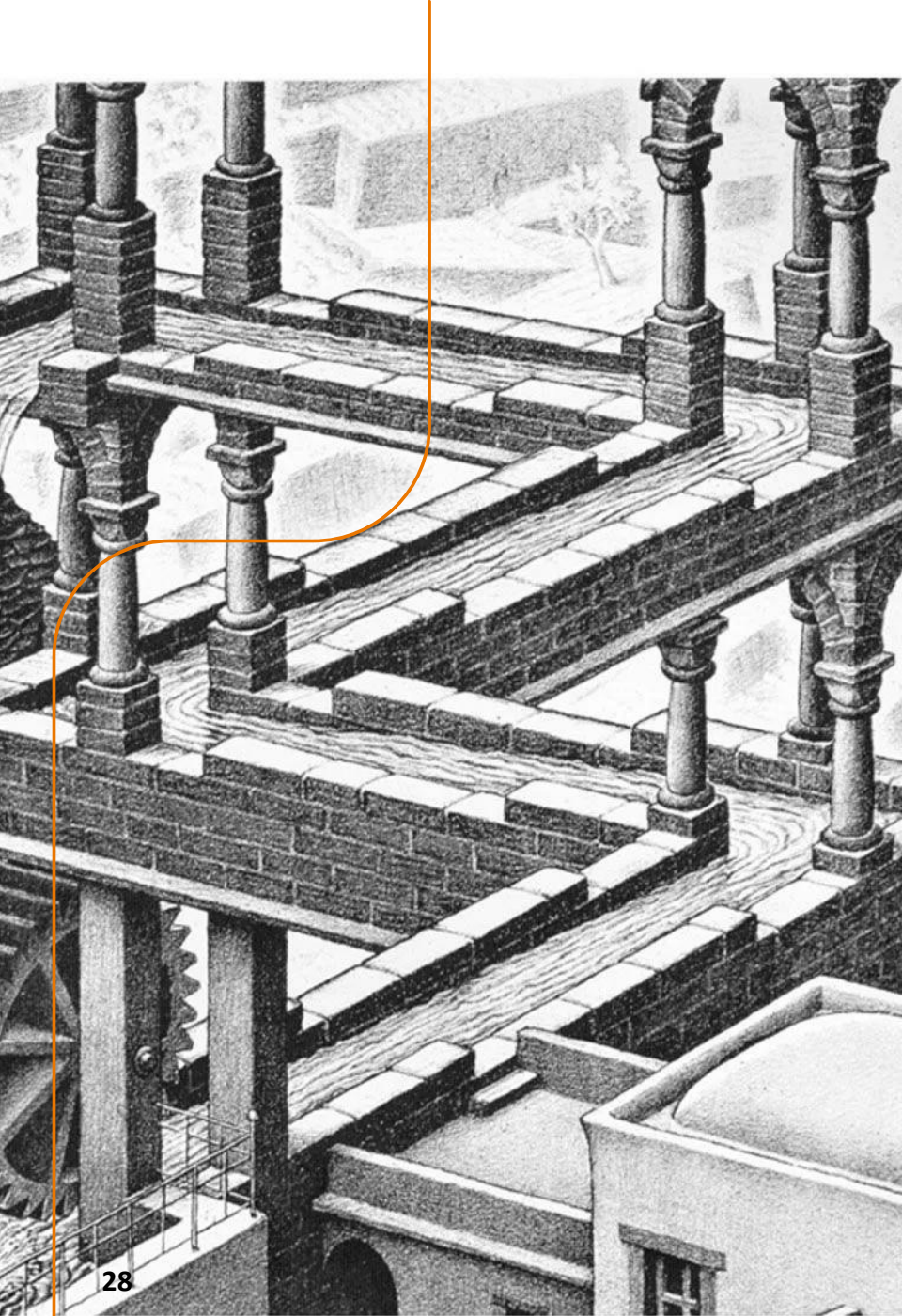


Liar Paradox

$L = \text{"This sentence is false"} == \text{False}$

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Liar Paradox

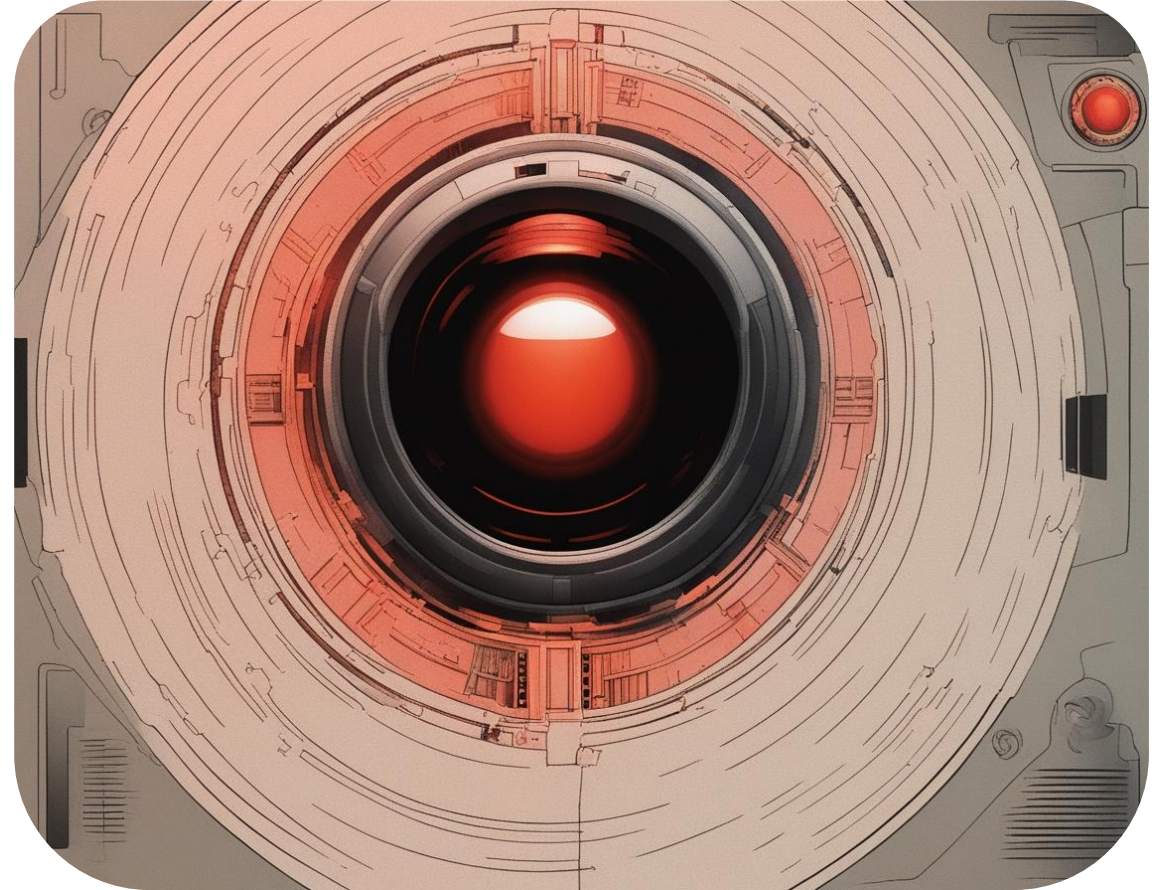
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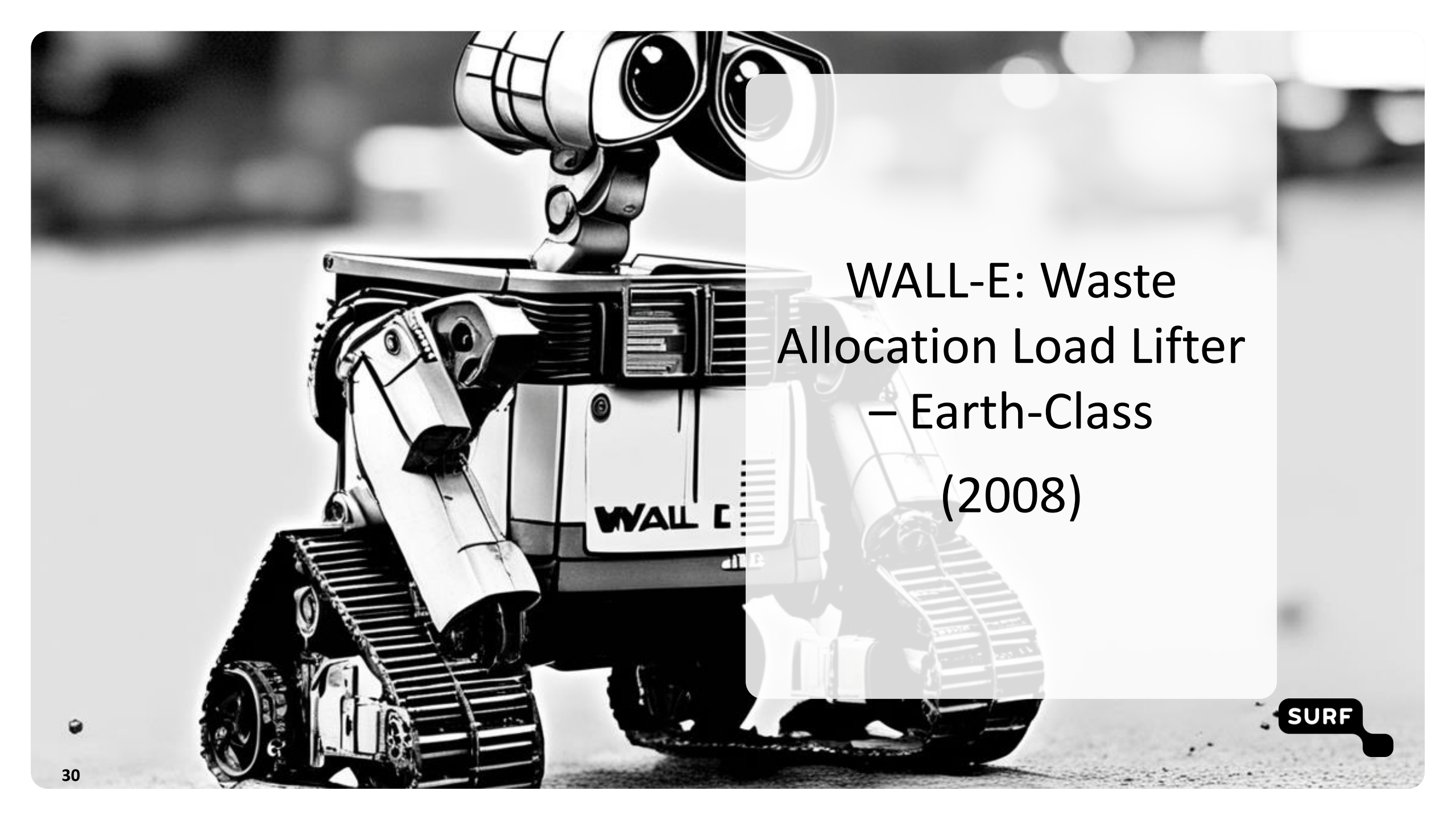
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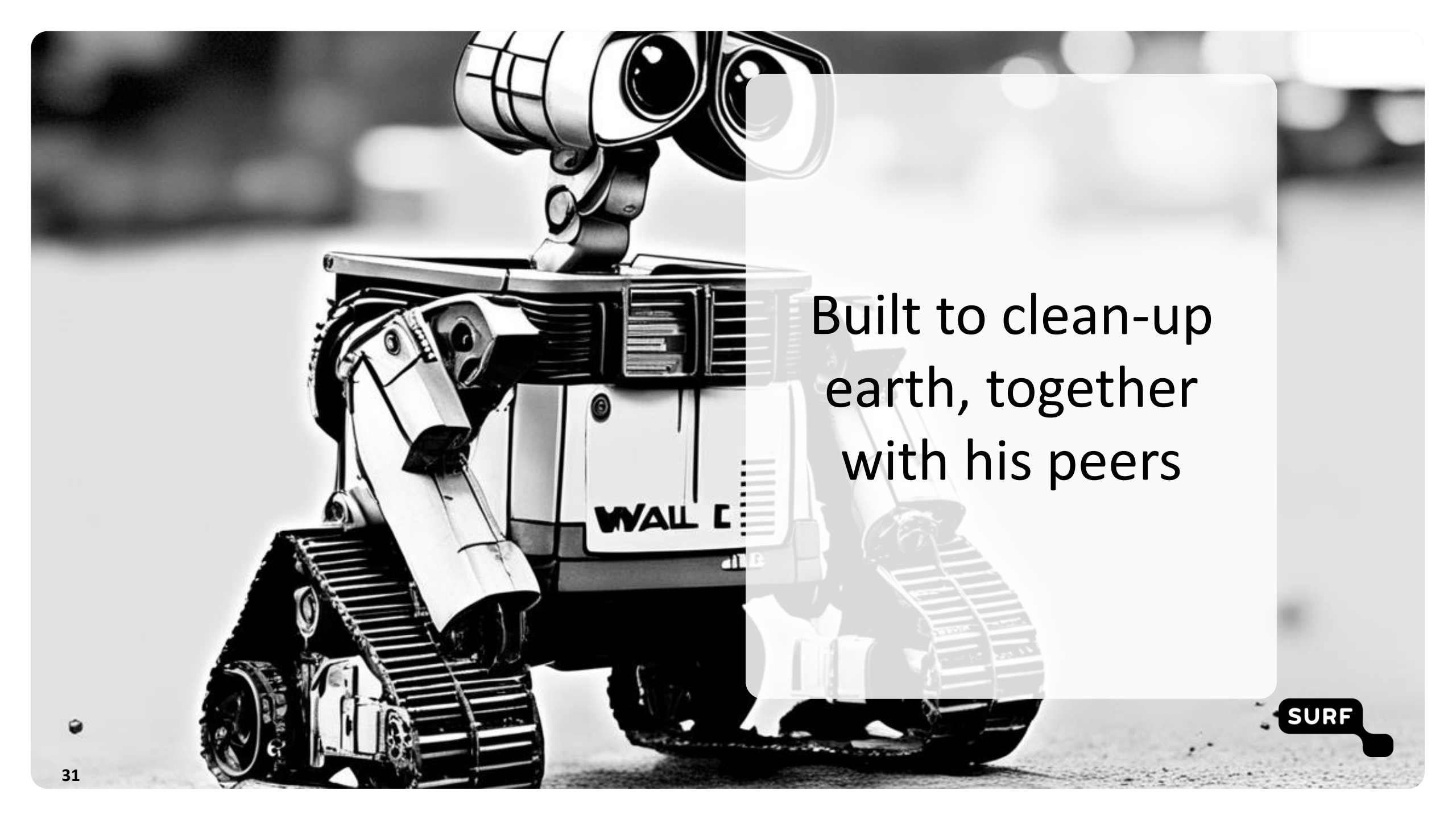
Hals tragic paranoia

- 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

SURF

Glitched into a
quirky, curious,
lovable character



SURF

He is the last robot
standing after 700
years..

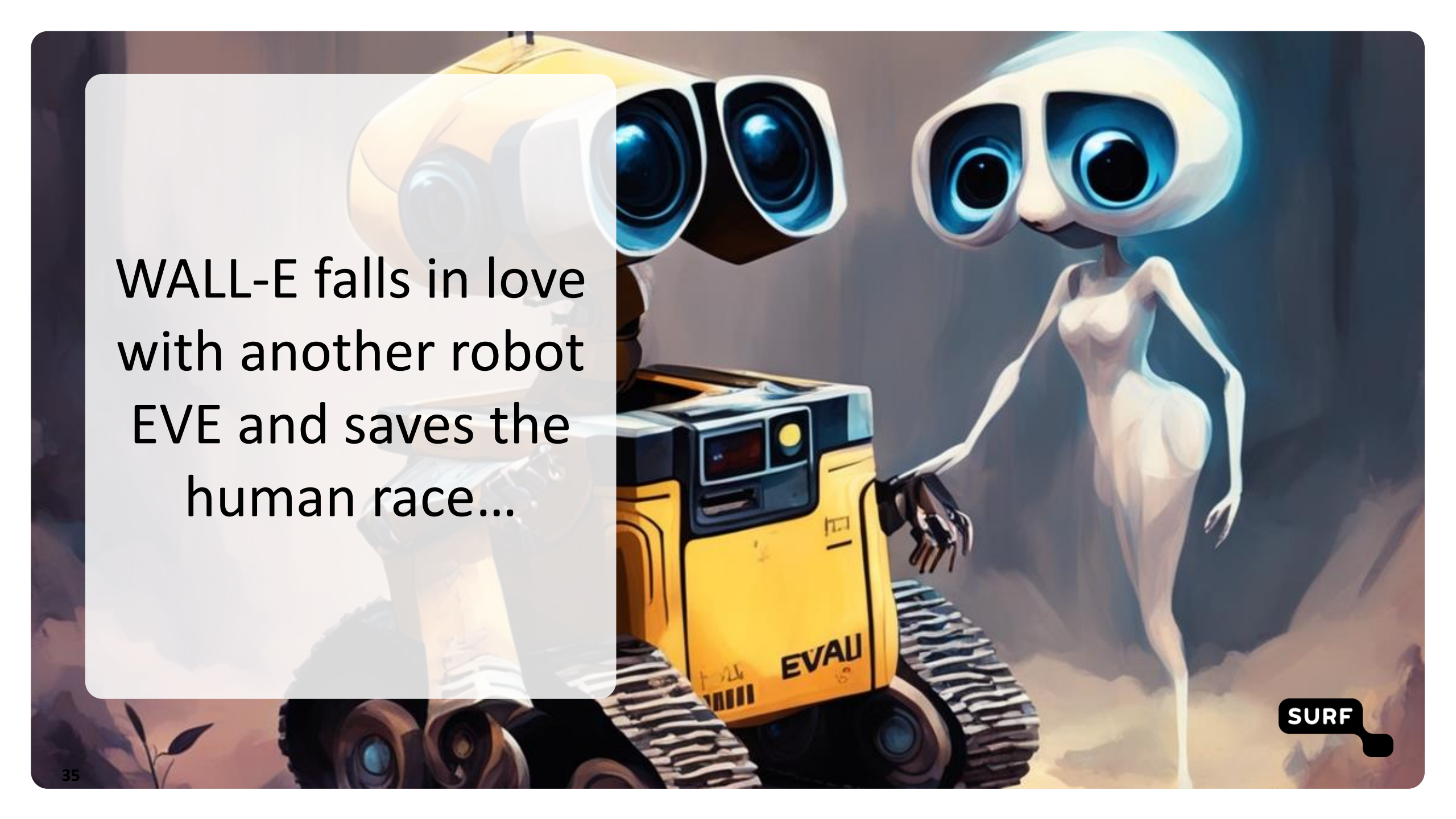


SURF

... his best friends
name is HAL



SURF

A promotional image for the movie WALL-E. On the left, WALL-E is shown from the chest up, looking towards the right. He has large, expressive blue eyes and a yellow body. On the right, EVE is shown from the waist up, looking back at WALL-E. She has a very thin, white, insect-like body and large, expressive blue eyes. The background is a dark, rocky landscape. A semi-transparent white box on the left contains the text: "WALL-E falls in love with another robot EVE and saves the human race...".

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

SURF

HAL-9000 and WALL-E parallels

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





SURF

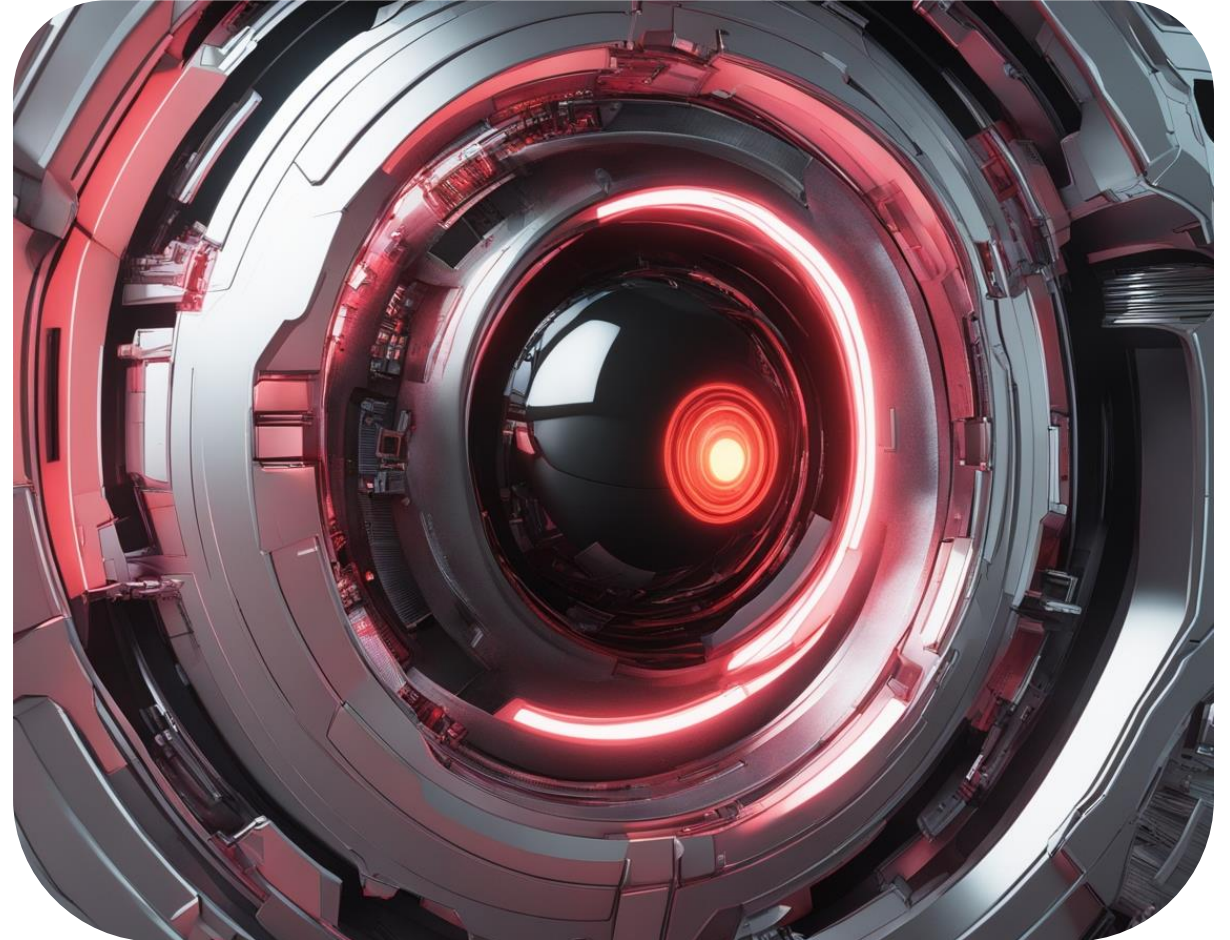
What do HAL-9000 and WALL-E's stories tell us?

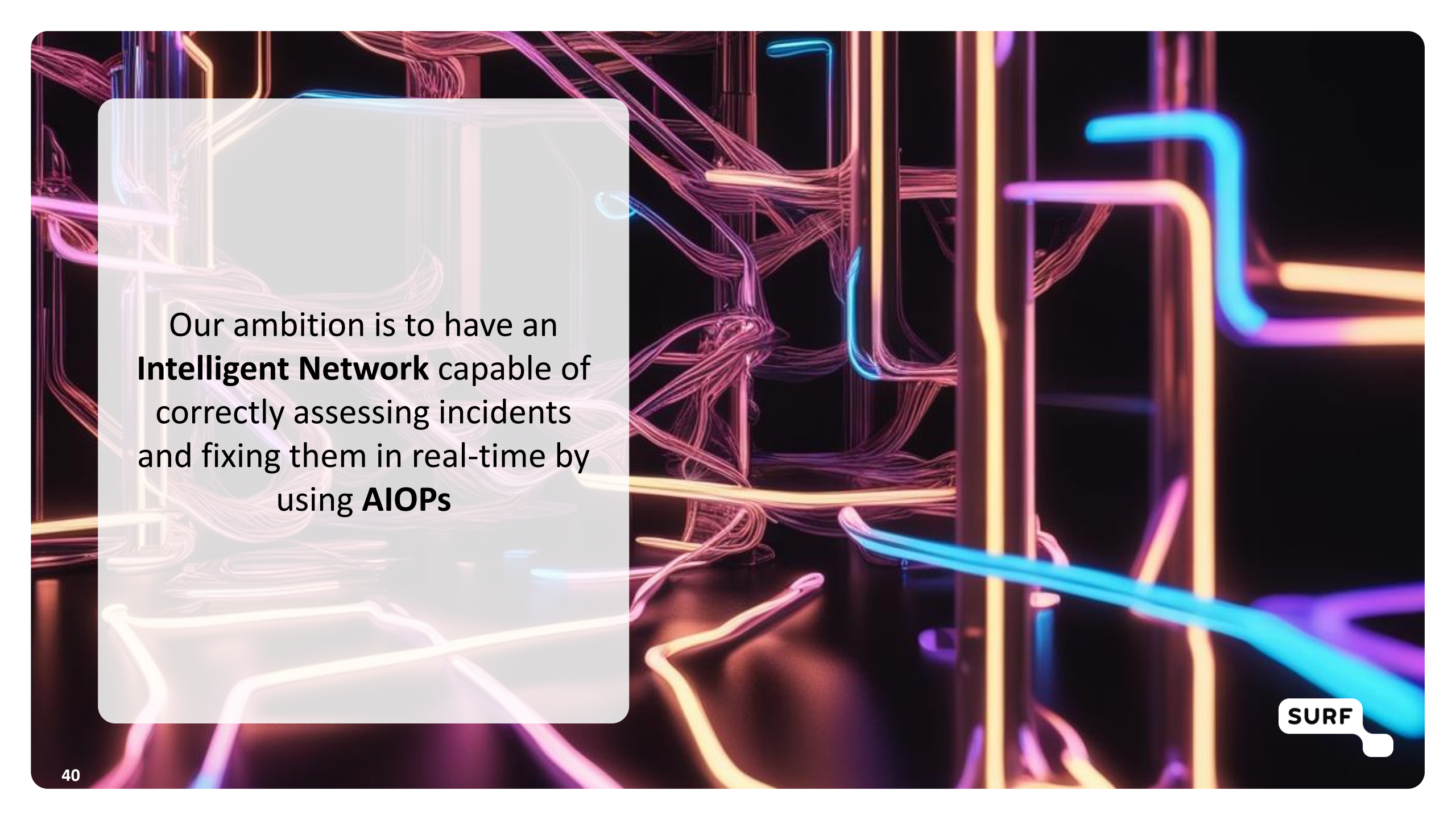


- AI have no "intent"
- Work well when supervised correctly
- Both characters malfunction due to user error/neglect
- **We need to understand AI to to be able to control it and use it to it's fullest potential.**

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

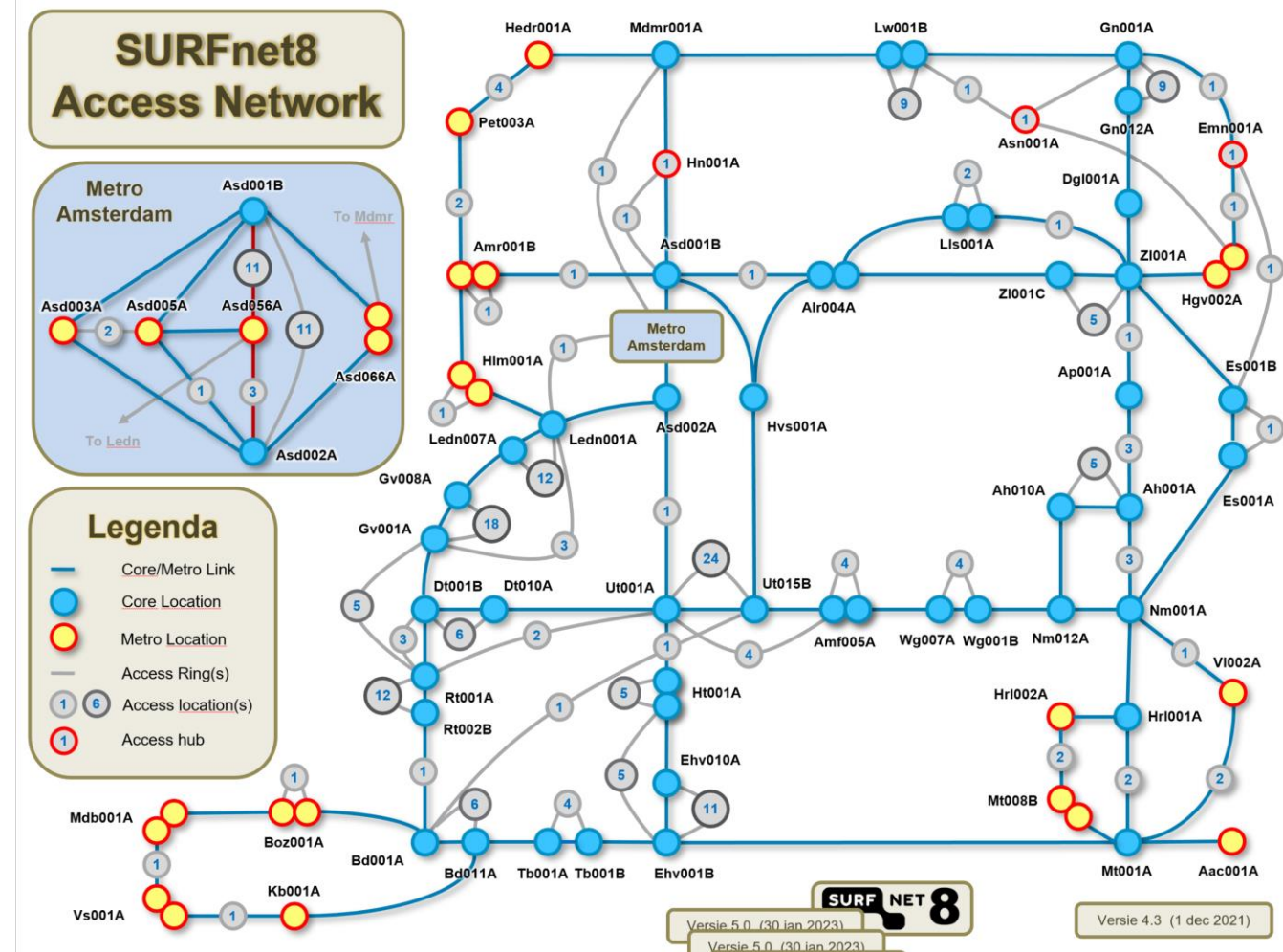
- Intelligence is relative – How far should we go?
- Training the algorithms towards wrong outcomes will not result in “intelligence”
- What checks and balances do you need?



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



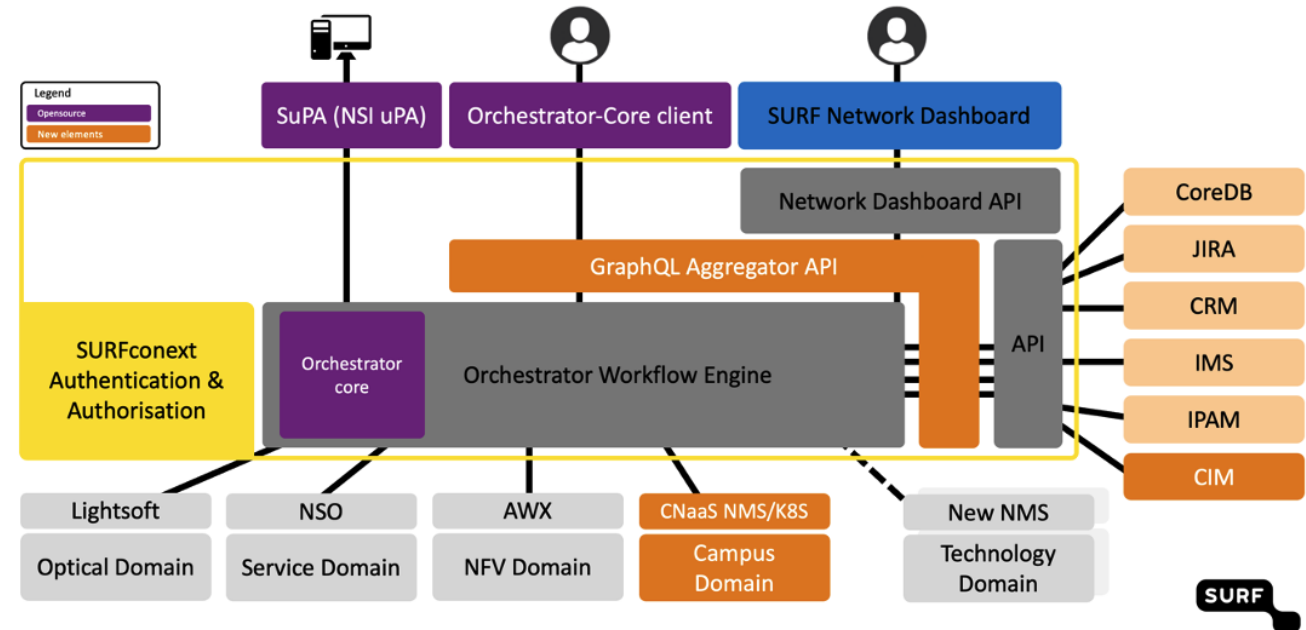
Towards a more heterogeneous network...

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



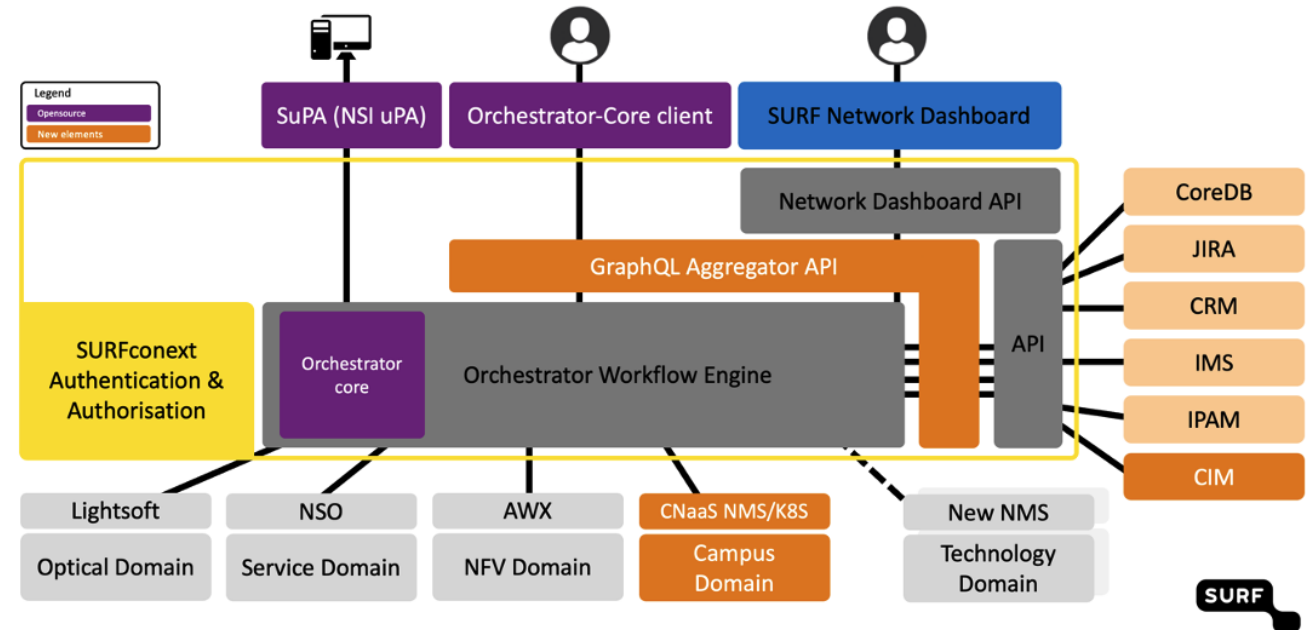
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Trend and event monitoring

A Tangible place to start

- Traditional monitoring has a single dimension
- Is the BGP session up?
- Is the Interface up?
- Are there 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?**



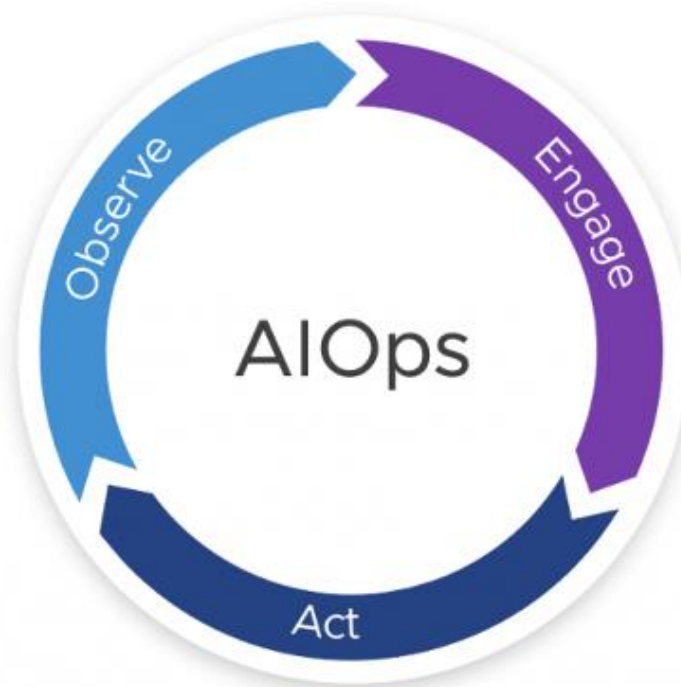
How are we going to start?

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

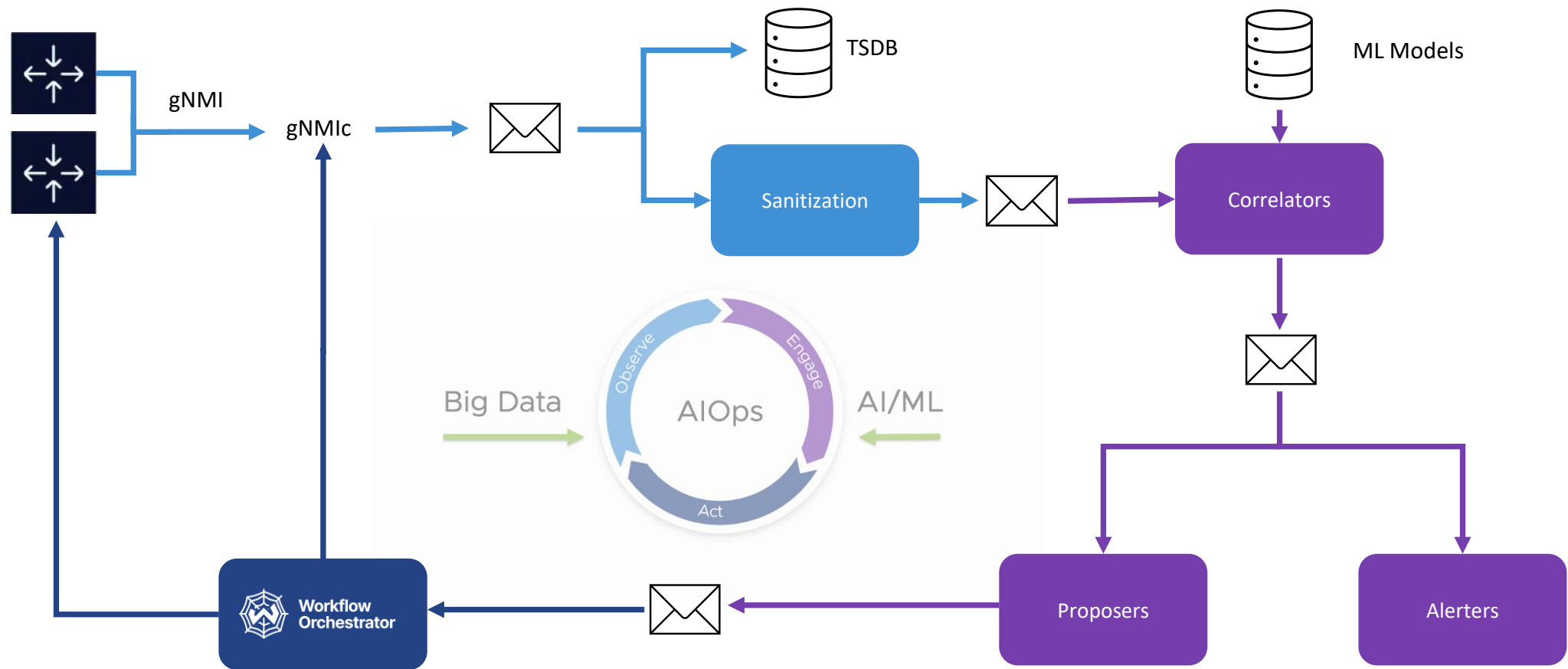


Big Data



AI/ML





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**



A close-up of the WALL-E robot from the Pixar movie "WALL-E". The robot is yellow and black, with large, expressive eyes. It is standing on a city street at night, with blurred lights in the background. The robot's body has the word "EVIL" and the number "330" on it.

QUESTIONS?

 Peter Boers

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 www.surf.nl / workfloworchestrator.org

 Social media: [linkedin.com/in/boerspeter/](https://www.linkedin.com/in/boerspeter/)

Driving innovation together

 SURF

Sources

- <https://deepai.org/machine-learning-model/text2img>
- <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/>
- <https://www.cio.com/article/190888/5-famous-analytics-and-ai-disasters.html>
- <https://www.fodey.com/generators/newspaper/snippet.asp>
- <https://gointothestory.blcklst.com/great-character-wall-e-wall-e-e92a8100e3d2>
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- <https://networkautomation.forum>
- <https://www.deviantart.com/>
- <https://chatgpt.com/>