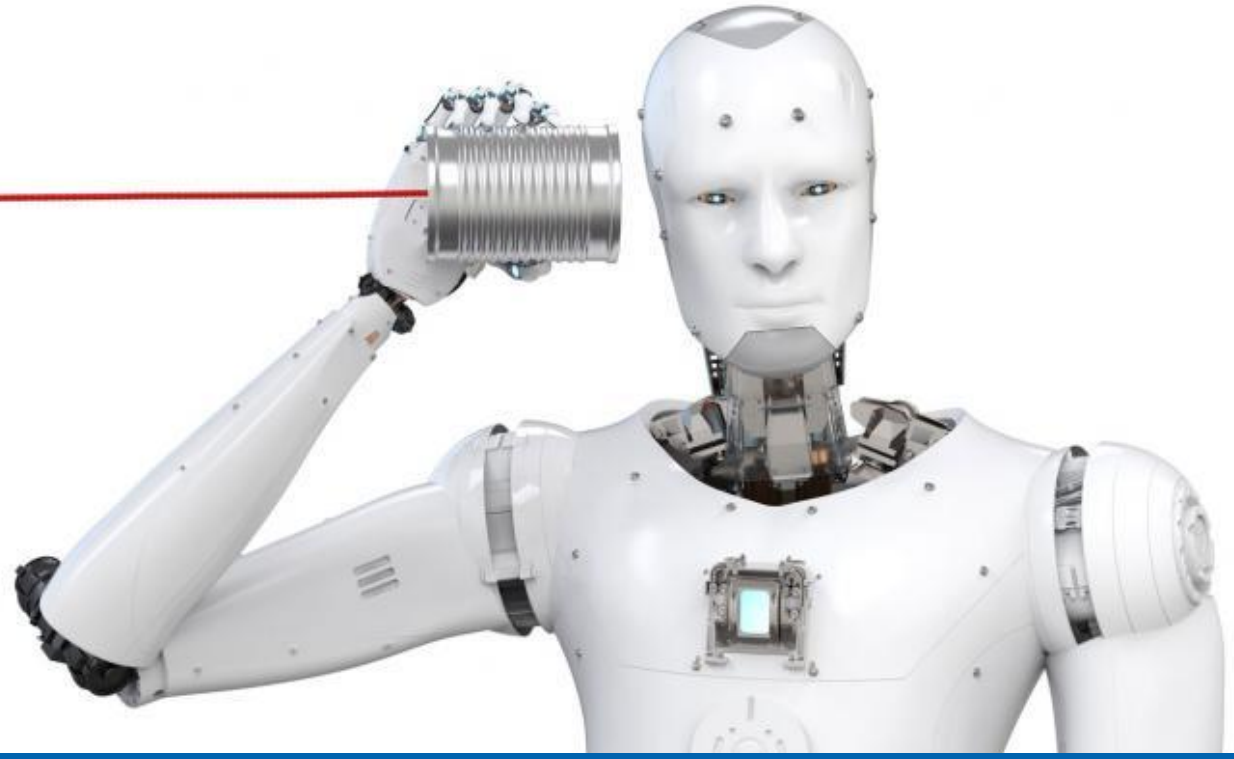
ALANGO

Technologies and solutions



Hearing Sense in Smart Devices

Alexander Goldin, PhD
Founder & CEO

Digital Human – Sarah (MWC 2018)

Alango Technologies – human to human

Since 2002

Voice communication

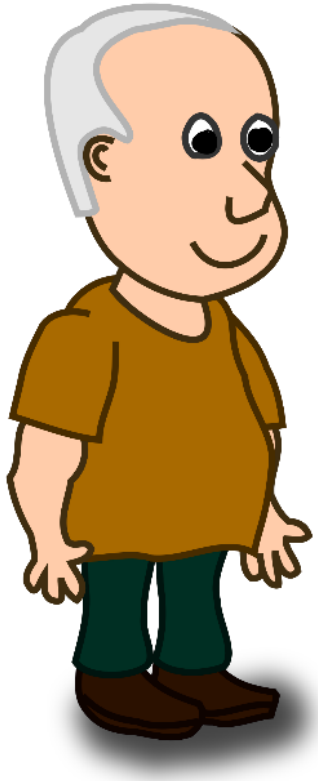
Alango Technologies – human to machine

Voice

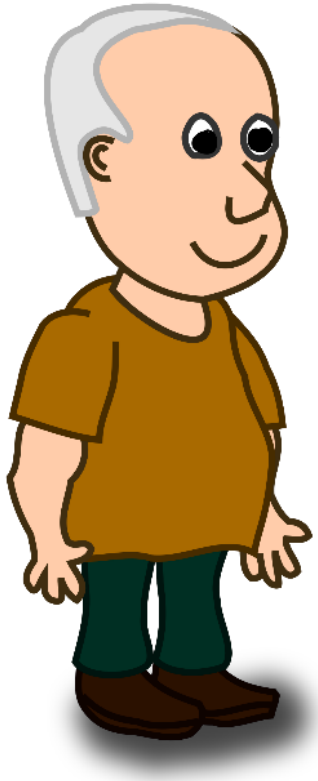
Voice

Since 2014

Our expectations ?



Our expectations: Always ON



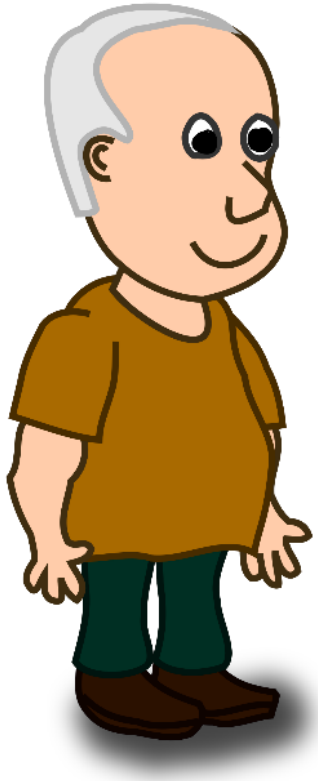
Always ON

listening

understanding

answering

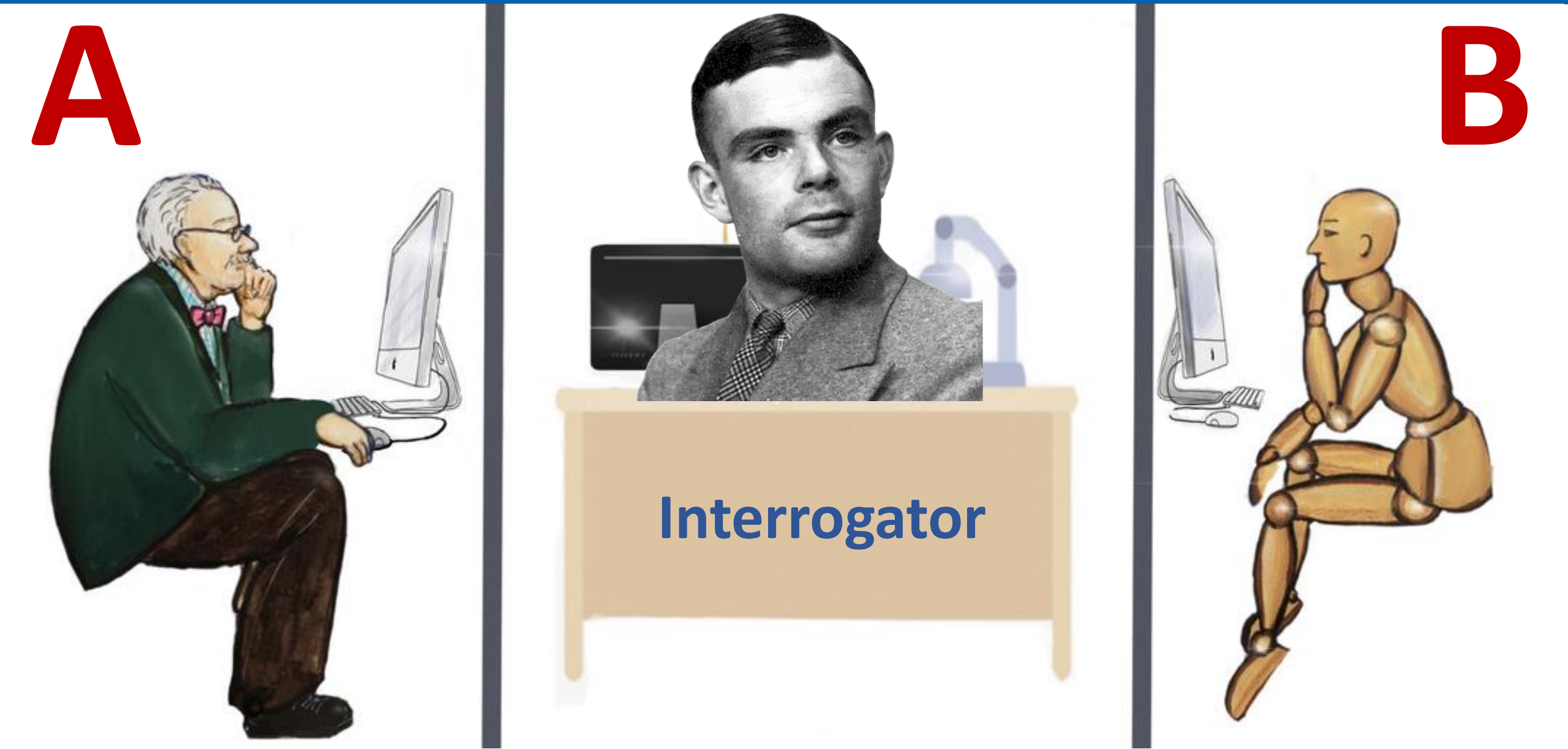
Our expectations: Artificial Intelligence



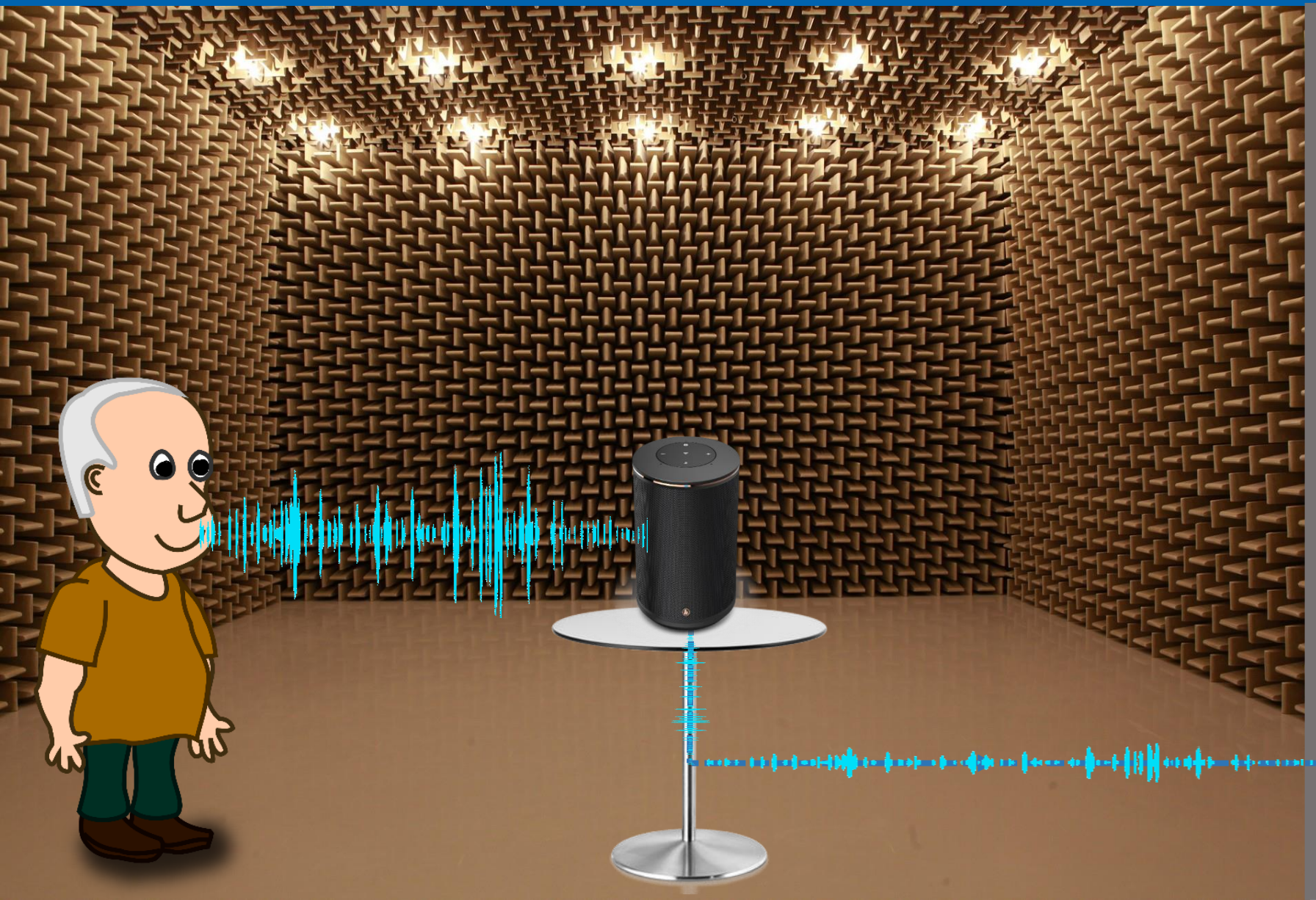
Alan Turing

Alan Turing
1912-1954

1950 - Turing test for artificial intelligence



Turing test nowadays

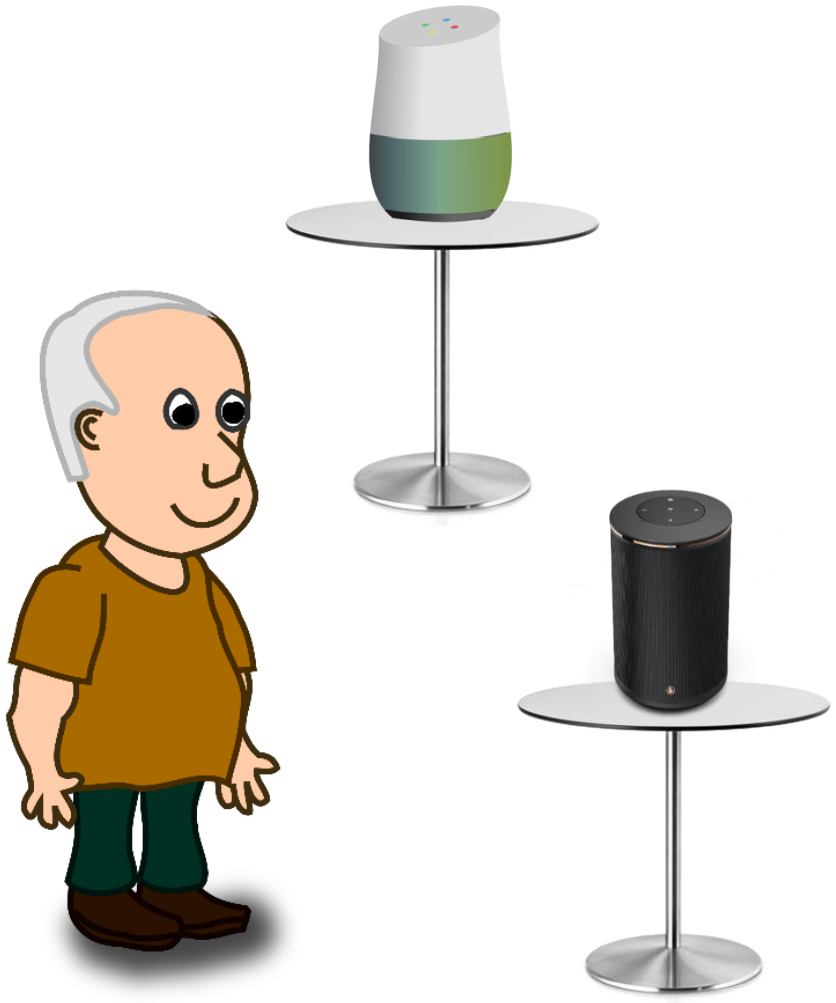


Real test conditions

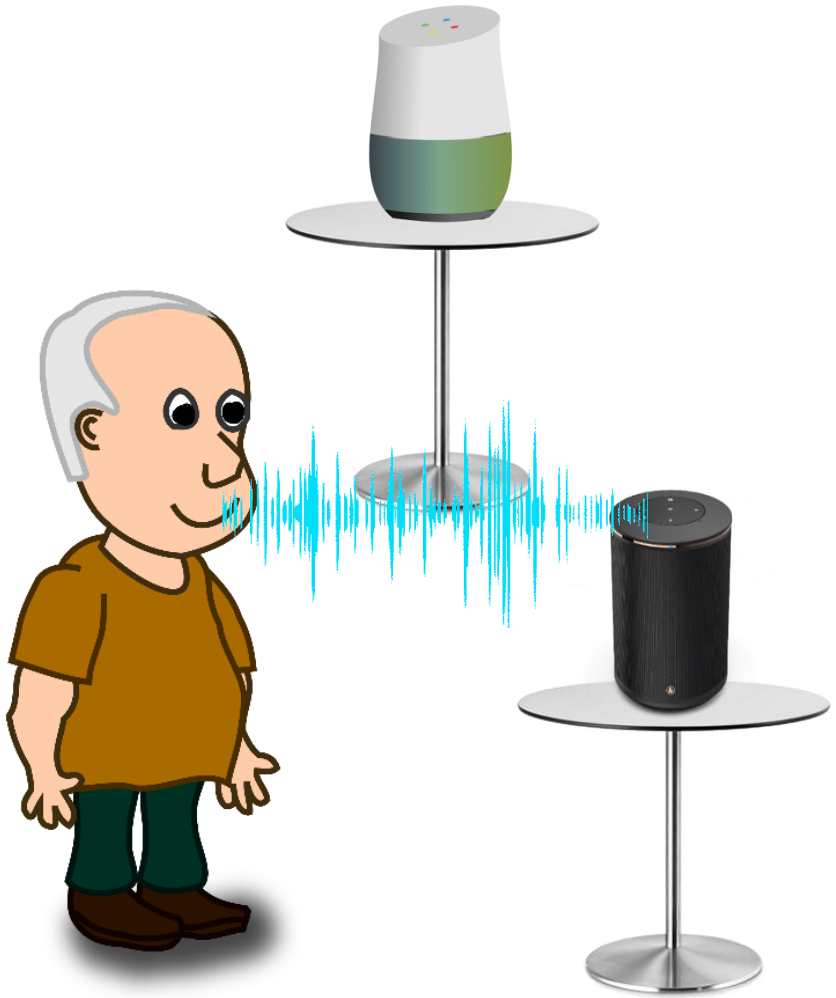
What AI system hears

Unreal test conditions

Intelligent behavior: wait for request of attention

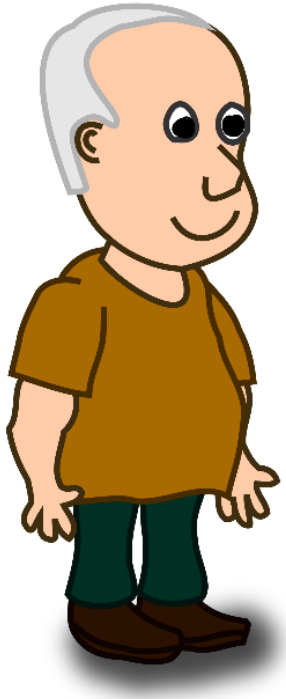


Device name – the trigger phrase



Trigger phrase

What was the first documented voice trigger phrase?



Wait

Alexa

OK Google

Hey Siri

Hey Cortana

Anything else ?

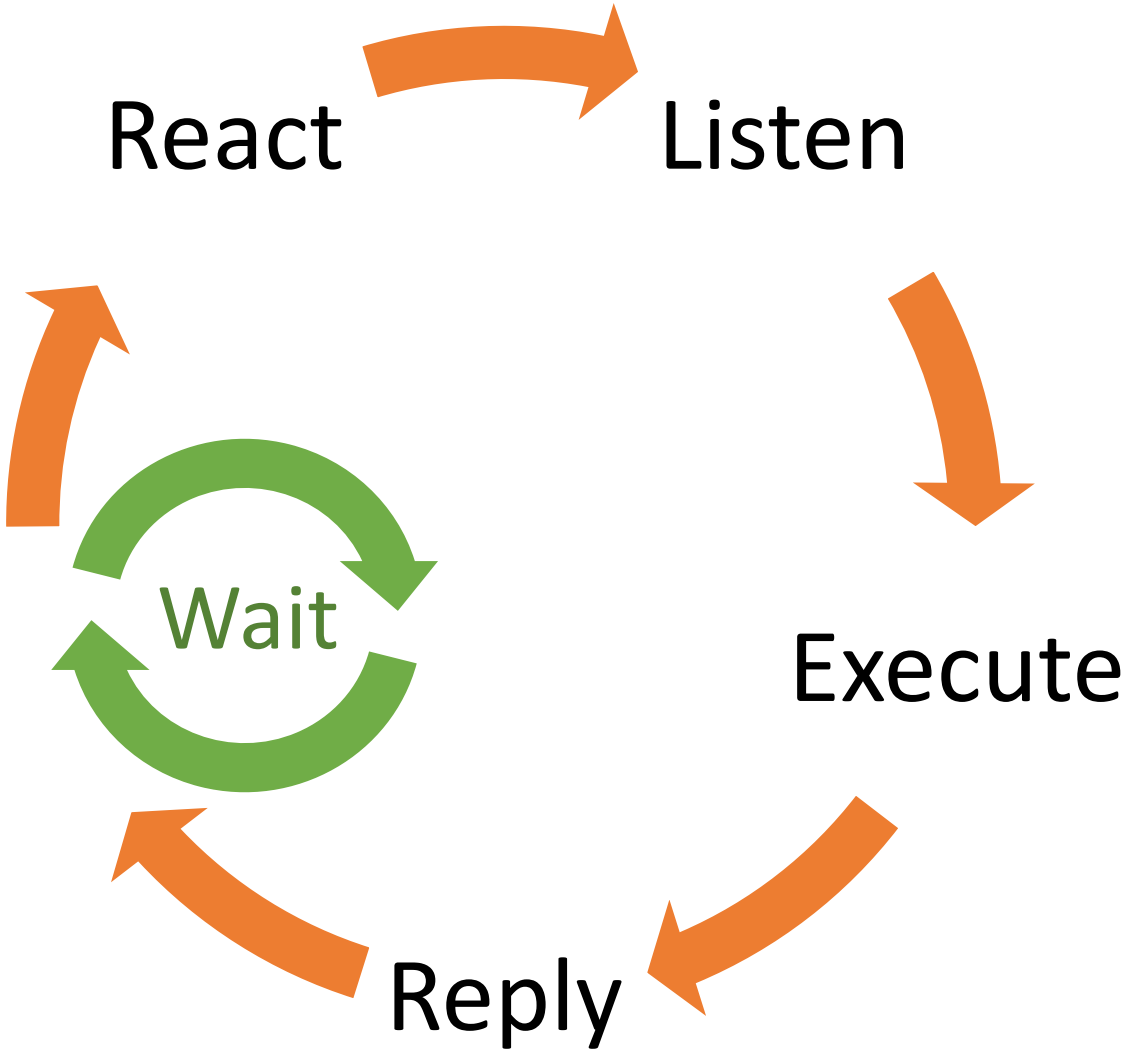
The first voice trigger phrase

"Open Sesame" - 1704

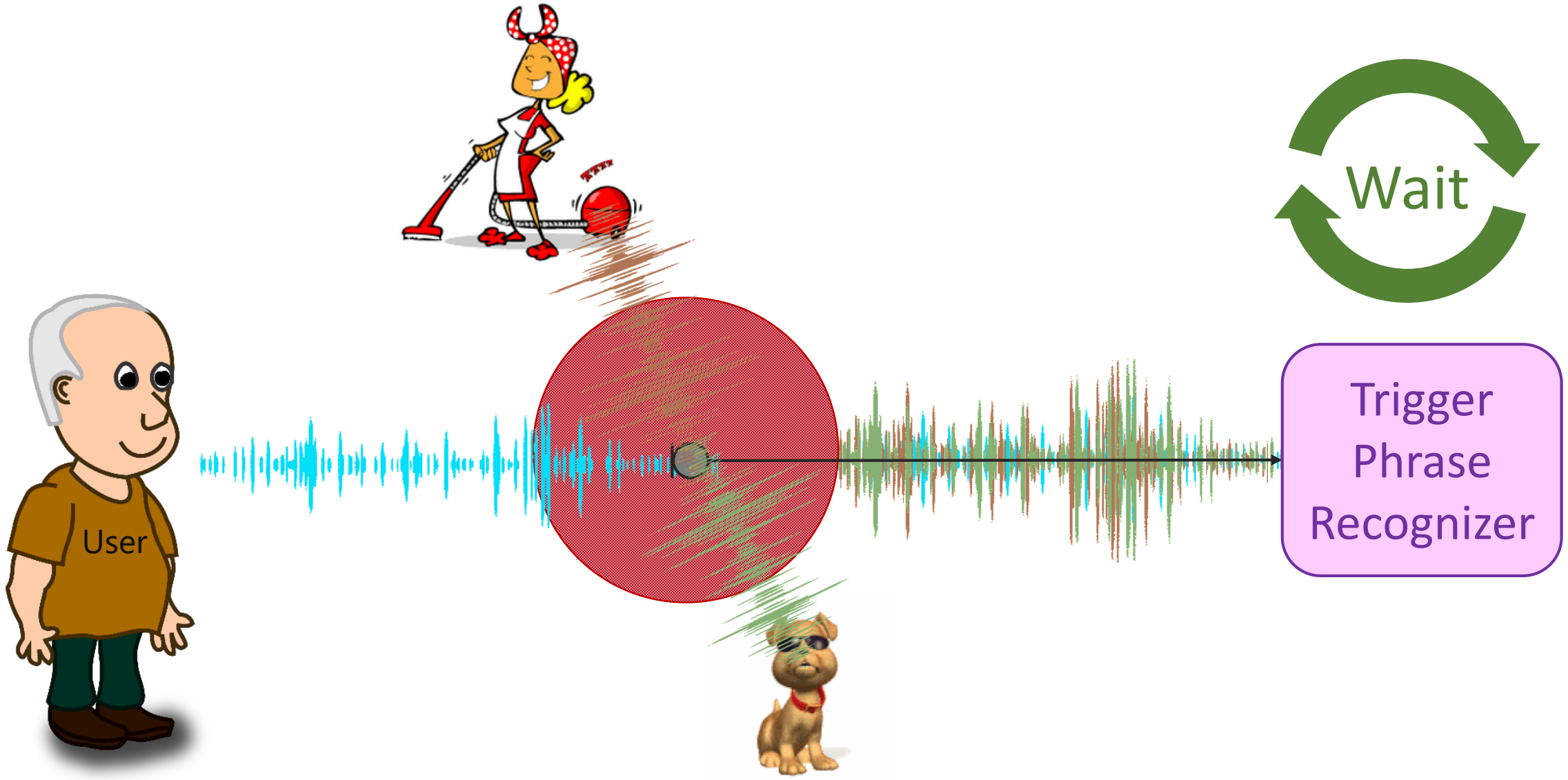
One Thousand and One Nights

by Antoine Galland

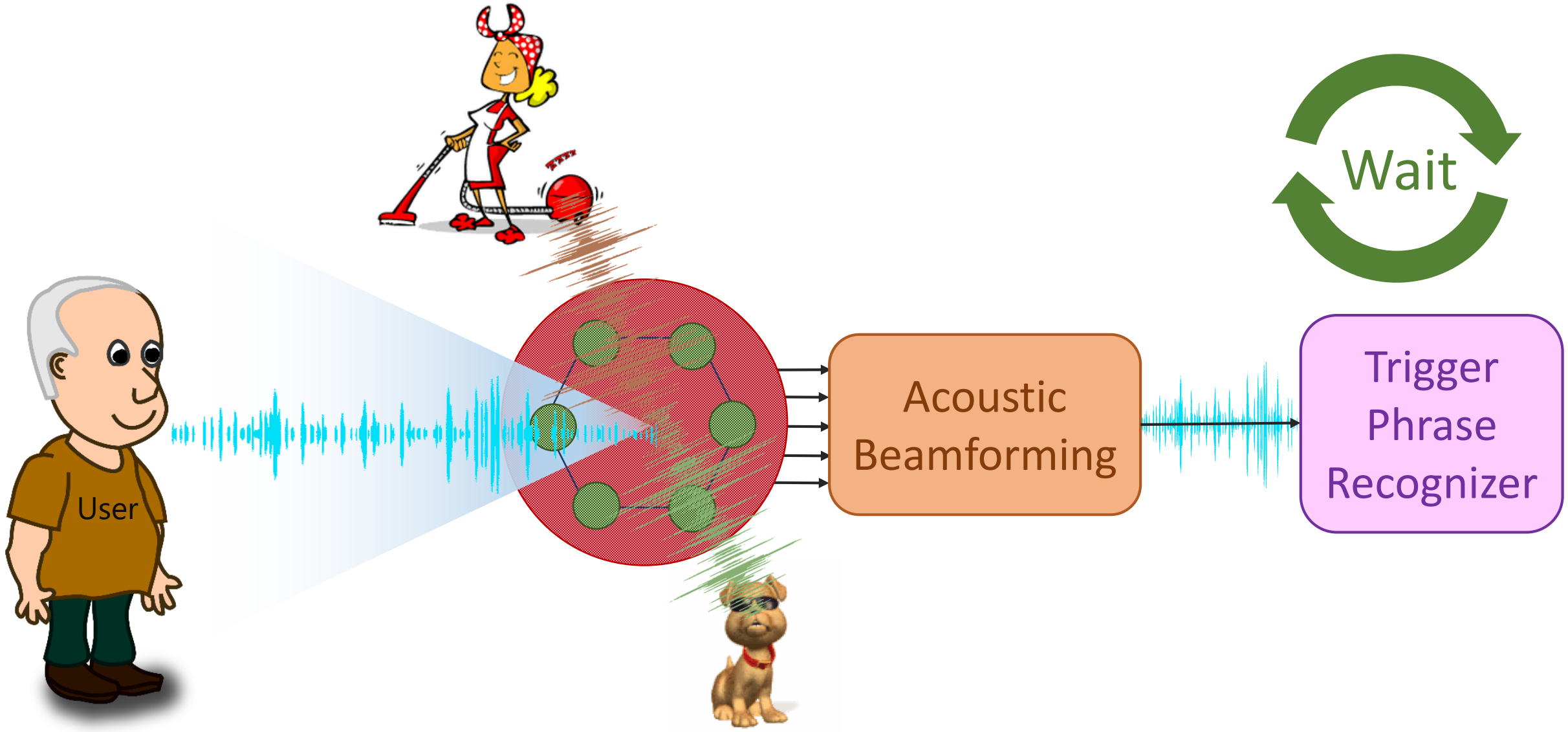
Intelligent behavior: react, listen, execute



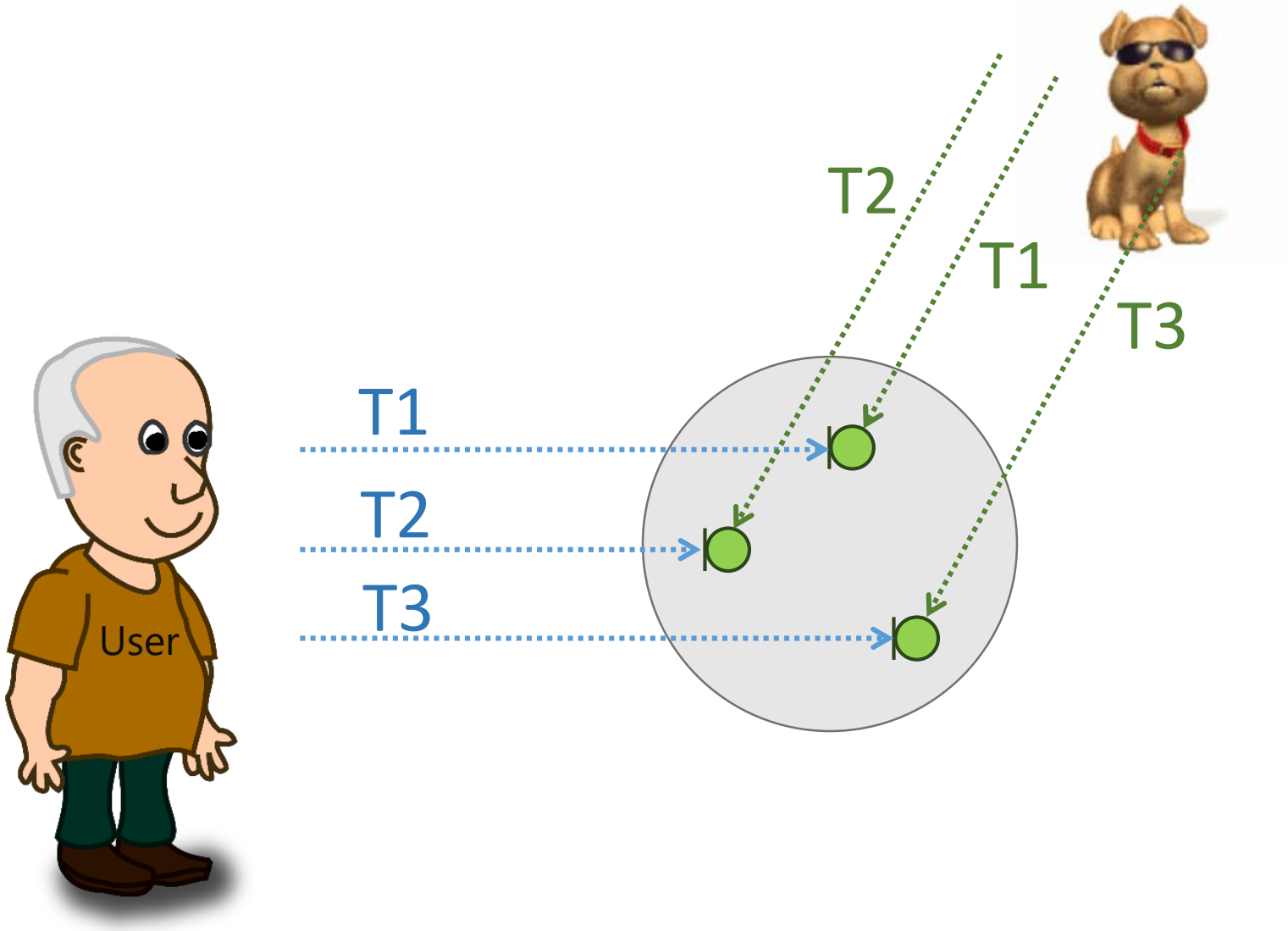
Smart device in real life



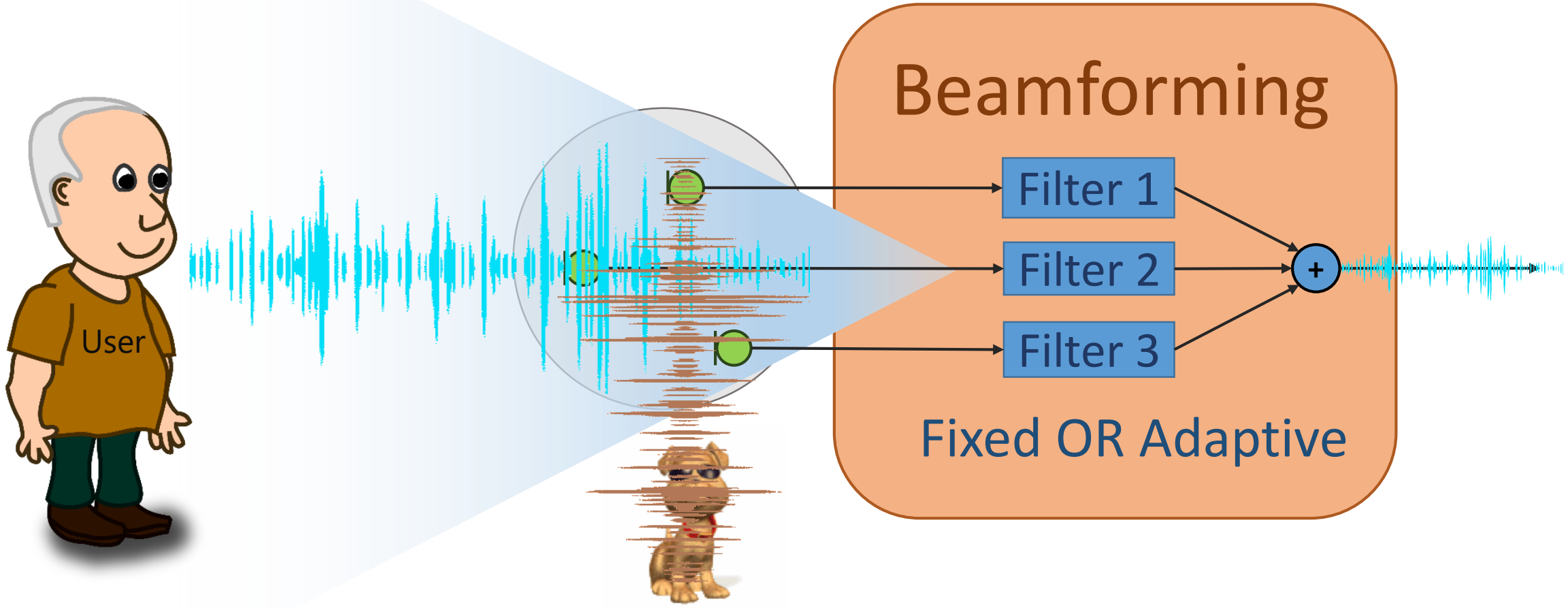
Microphone array and beamforming



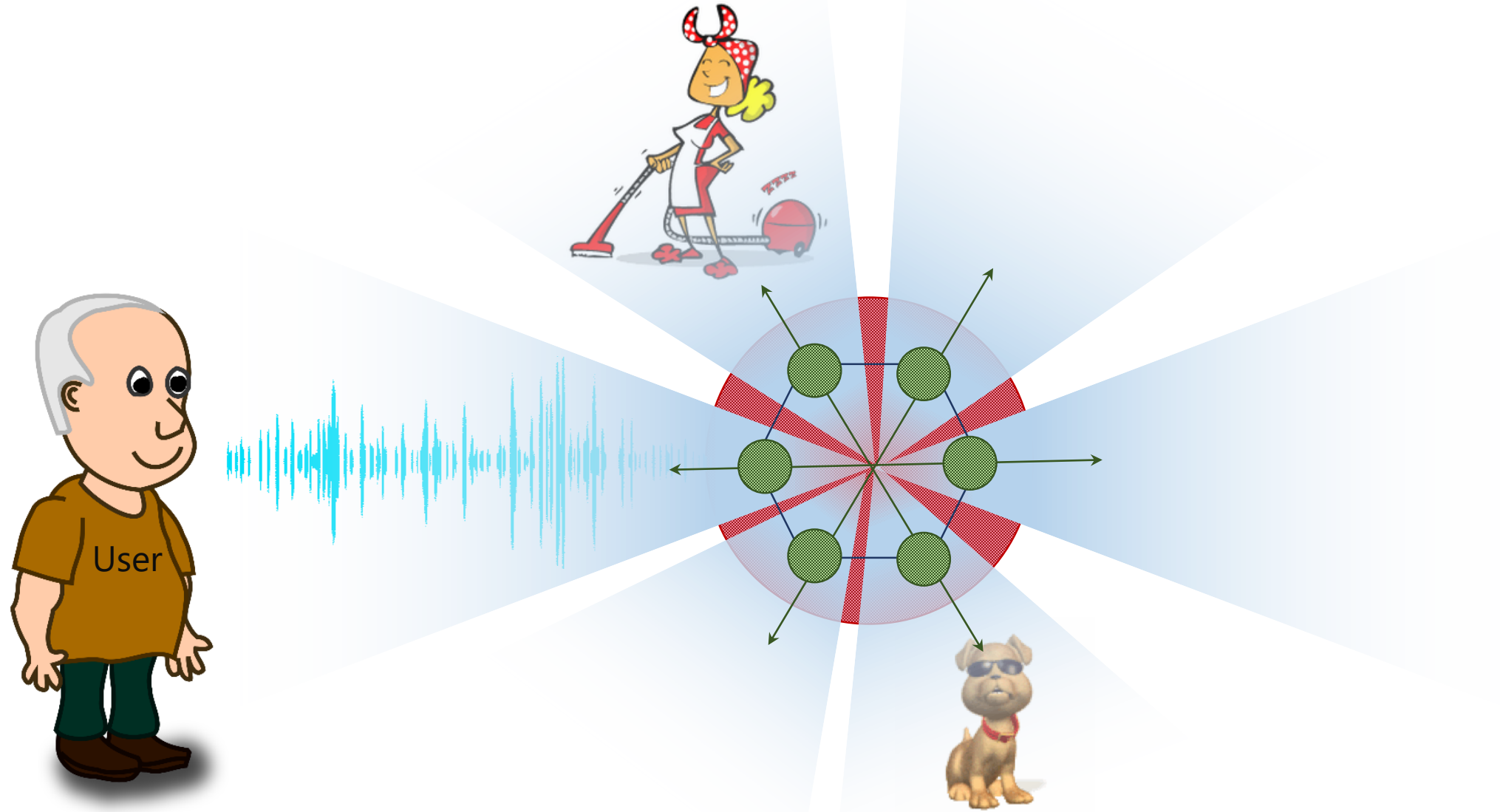
Beamforming “time of arrival” principals



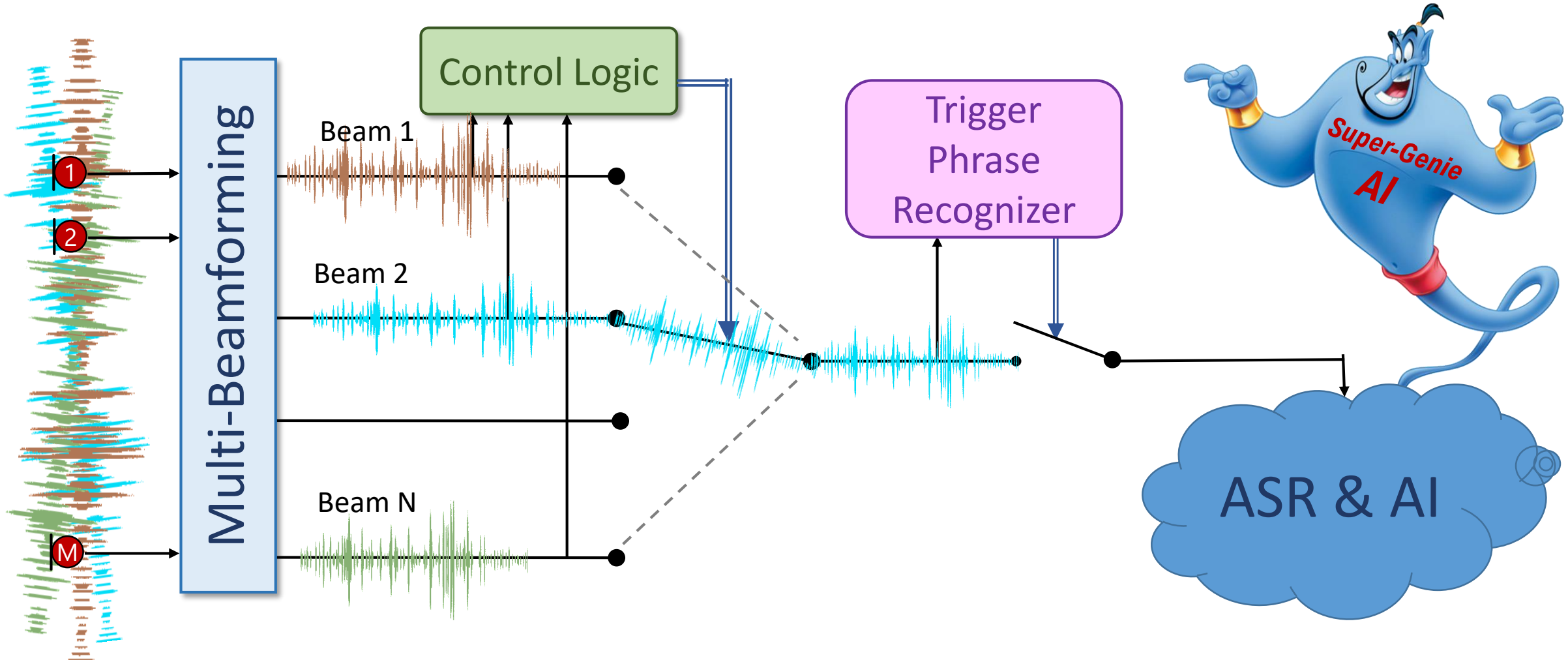
Beamforming algorithm



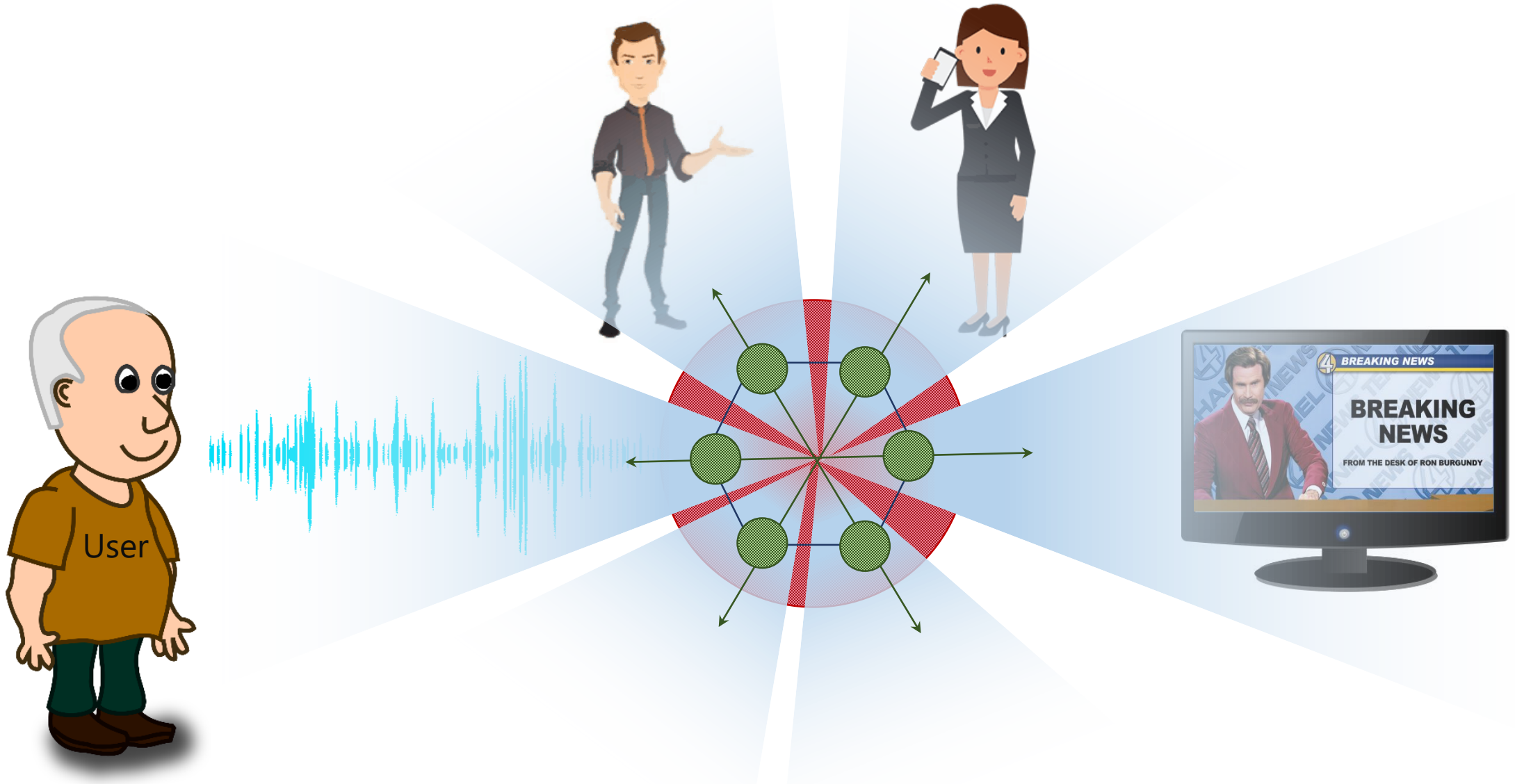
Multiple beamforming



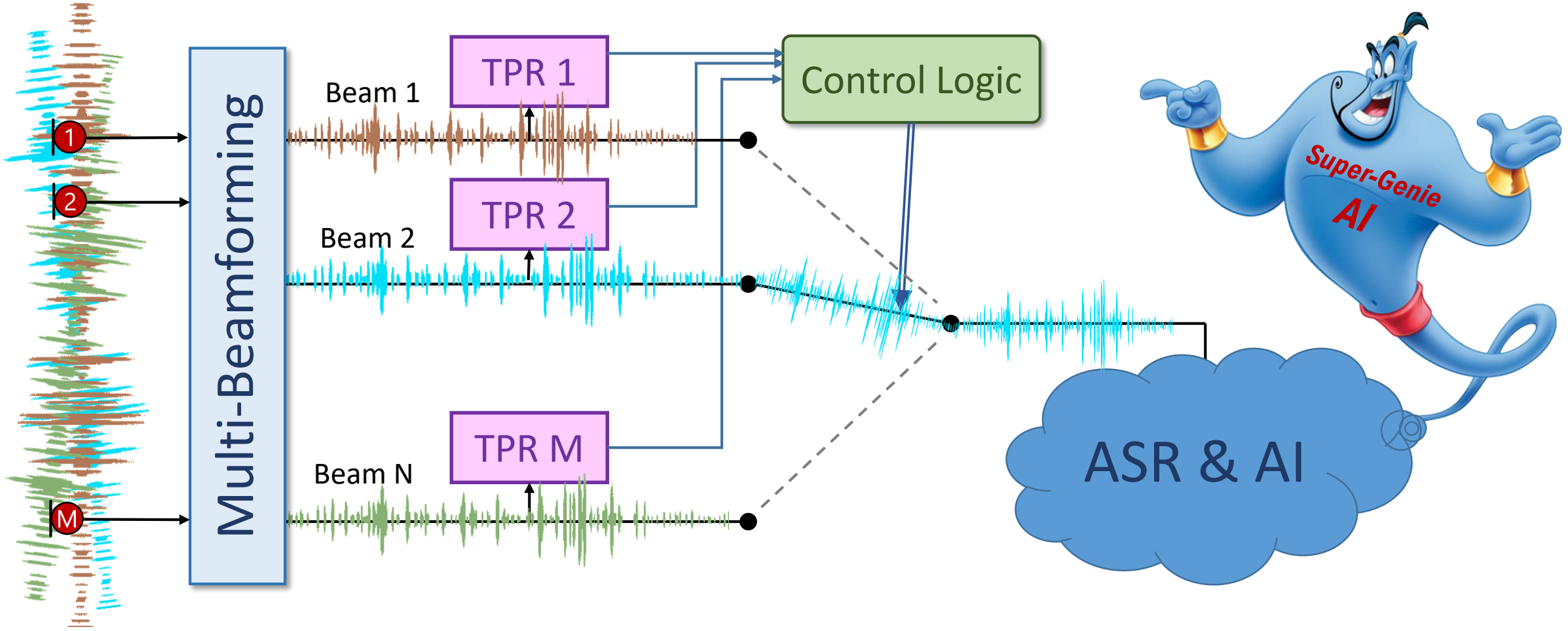
Single Keyword Recognizer architecture



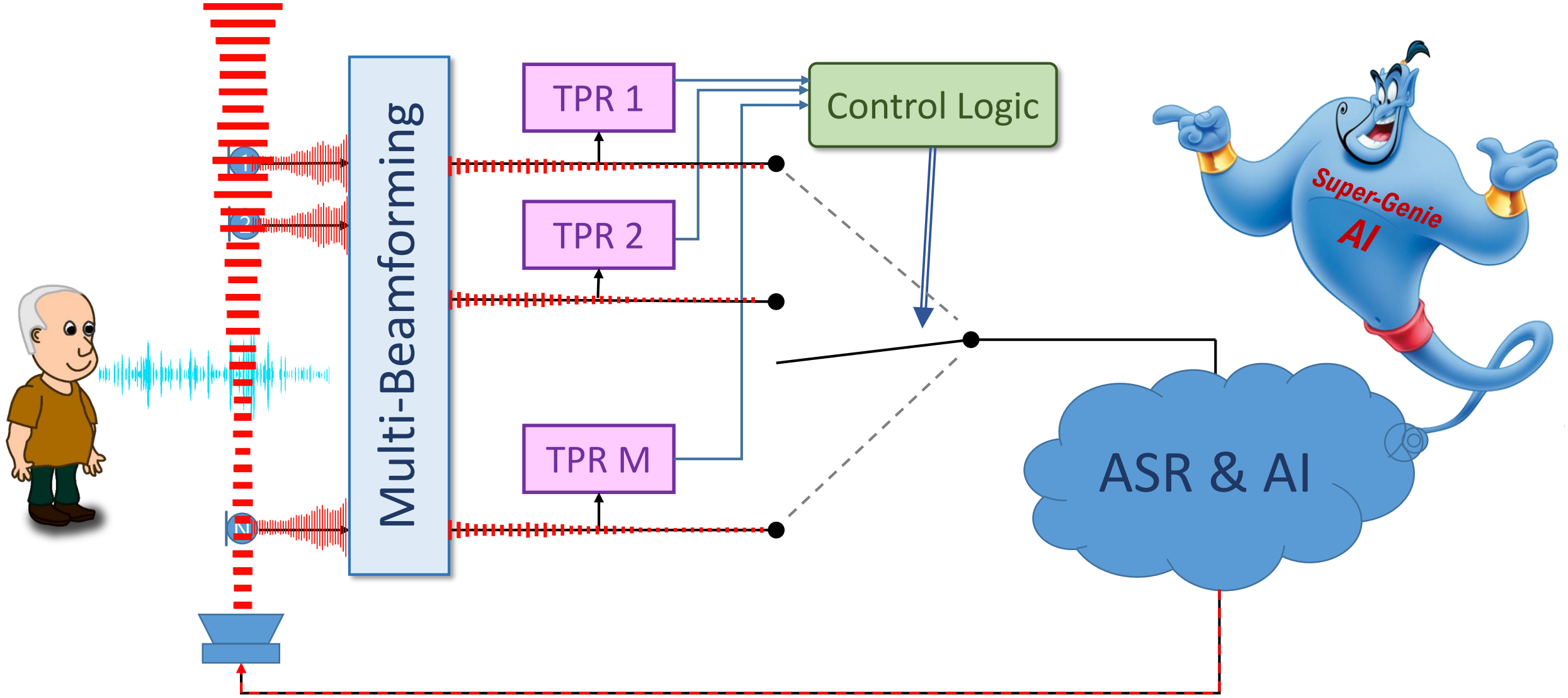
Who is the master?



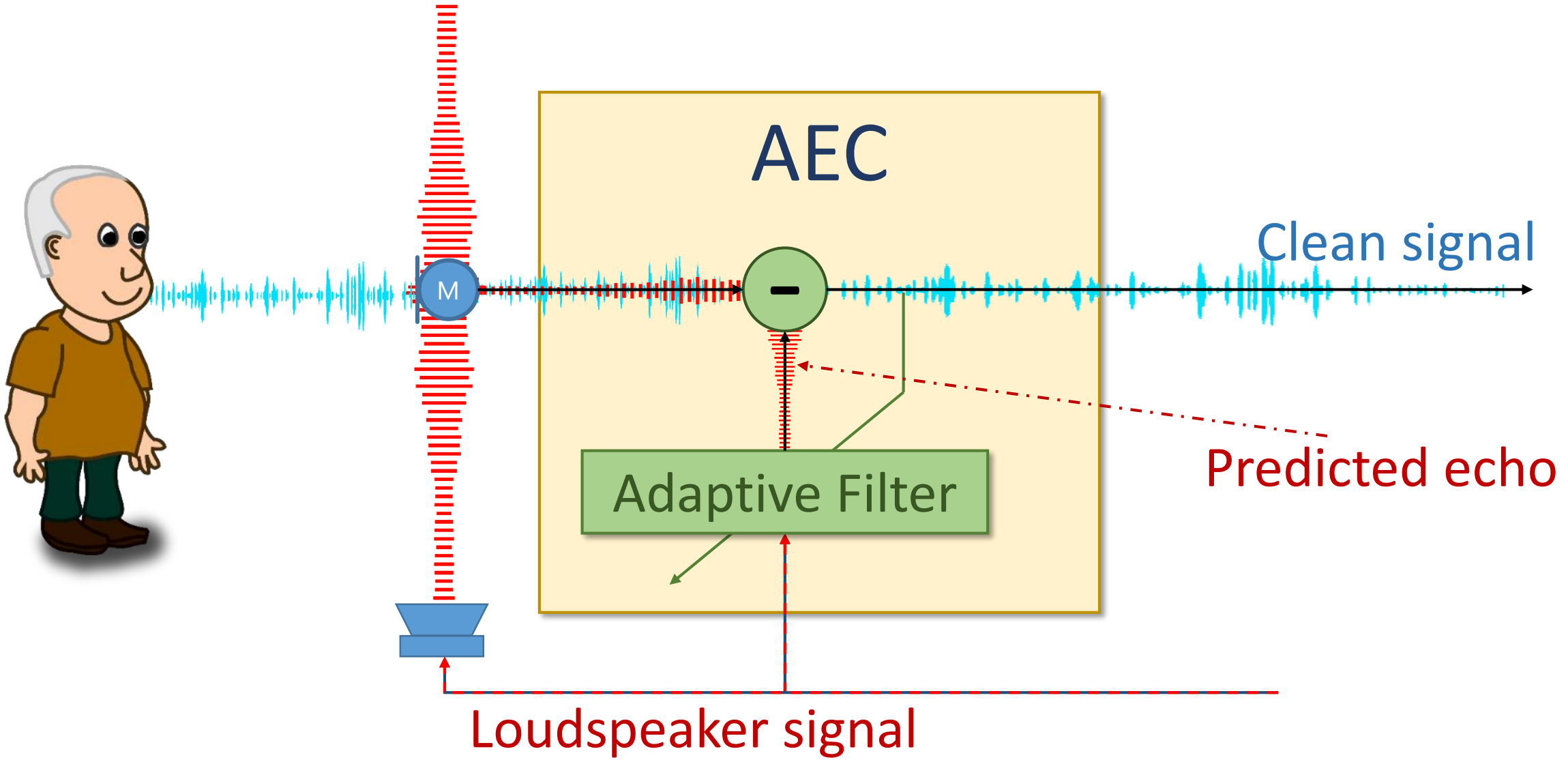
Multiple Trigger Phrase Recognizers (TPR)



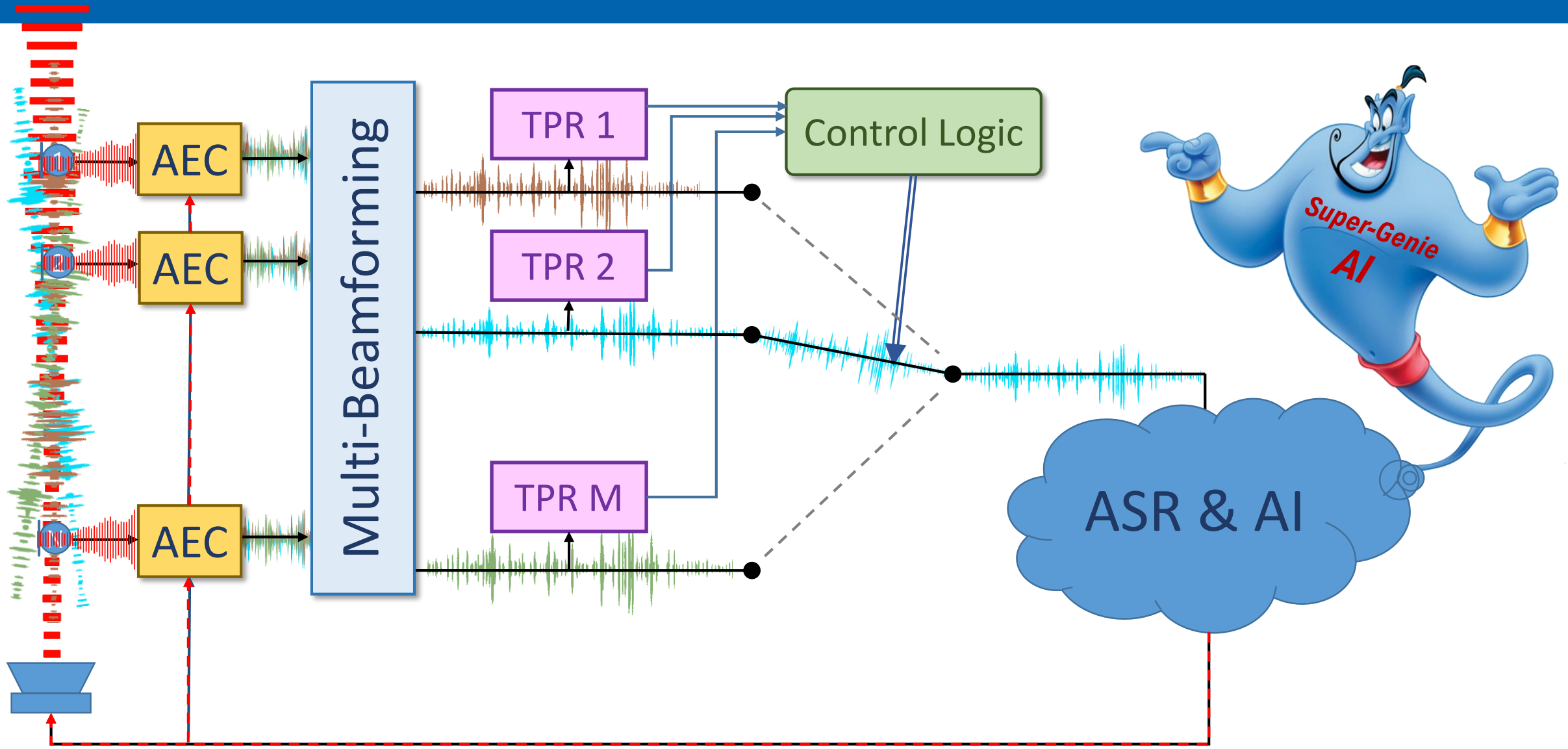
Barge-in problem



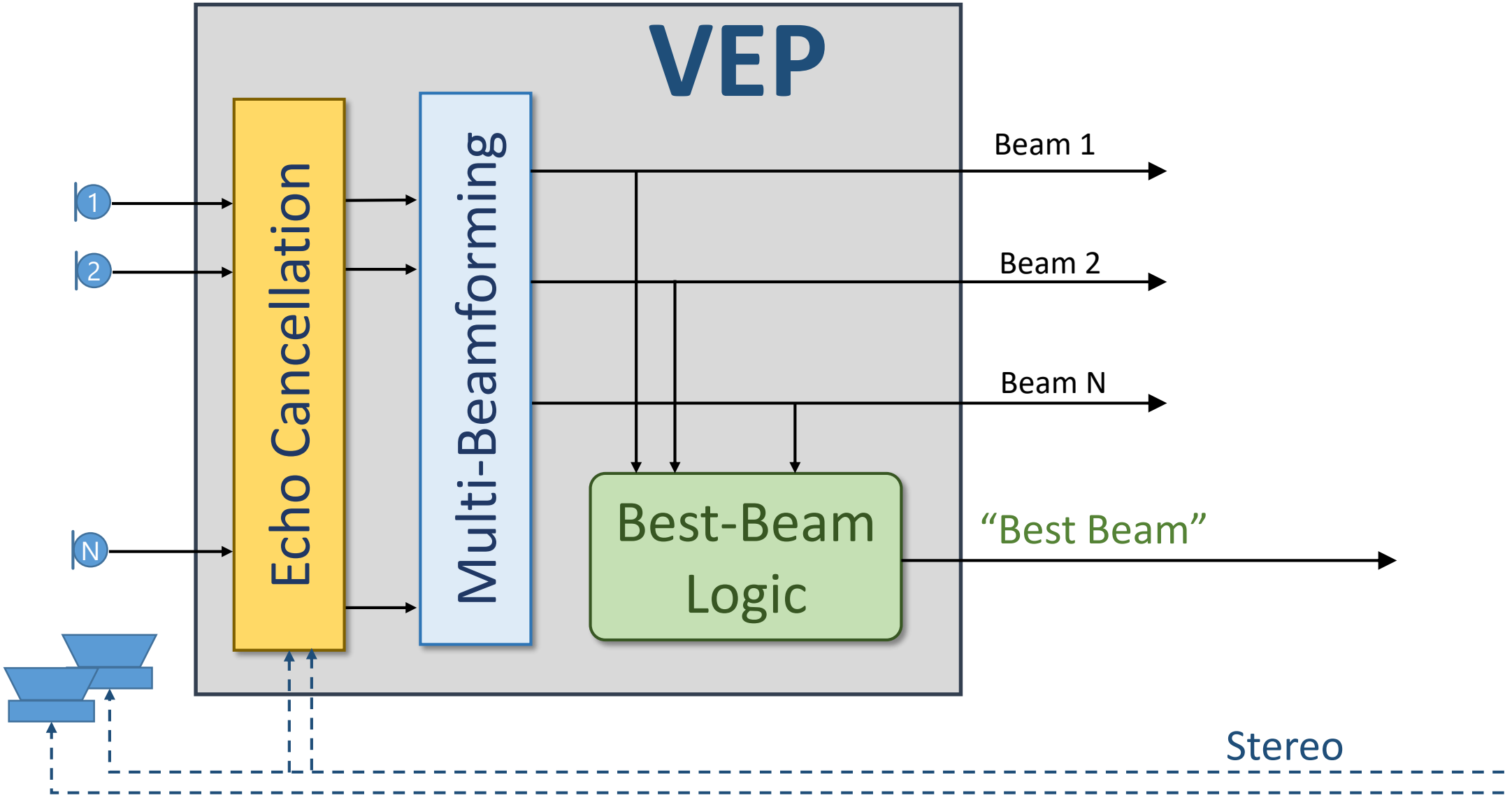
Acoustic echo cancellation principals



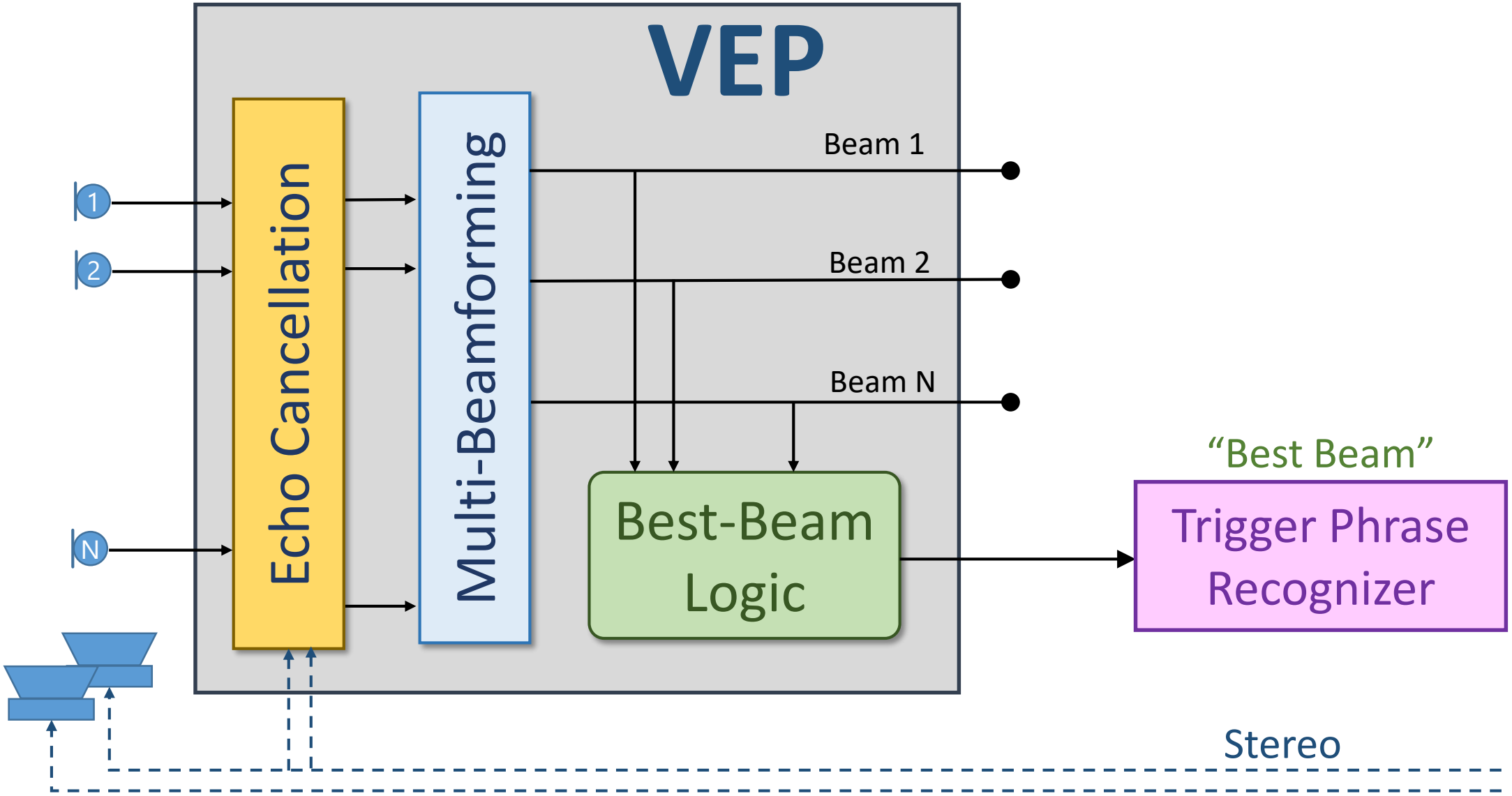
The front end - acoustic echo cancellation



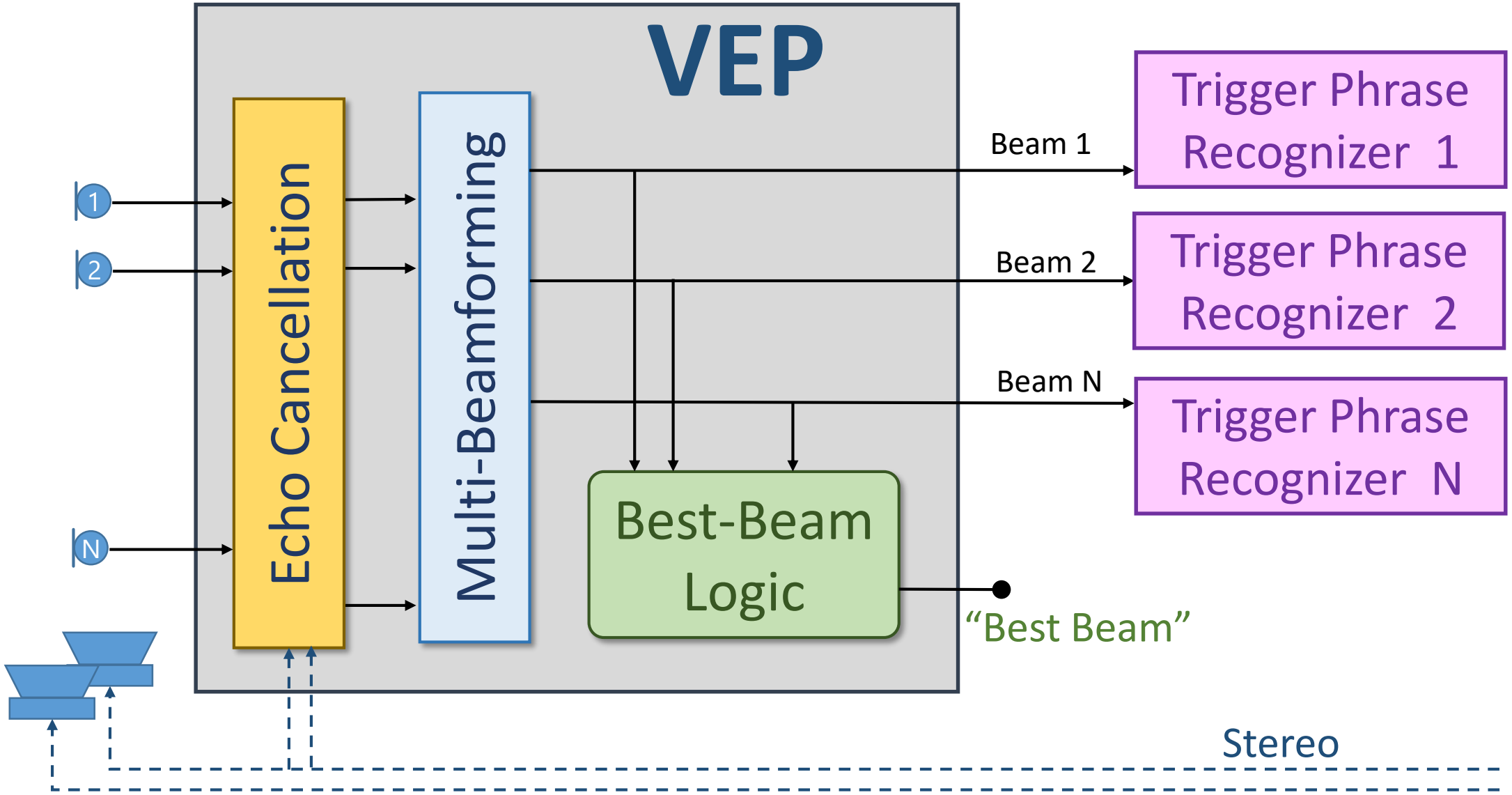
Voice Enhancement Package (VEP)



VEP – “Best Beam” use configuration

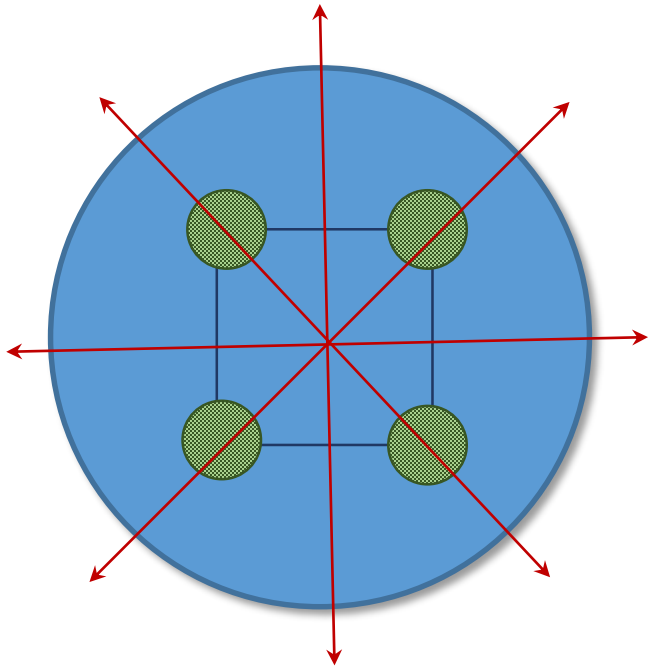


VEP – "Best Beam" use configuration



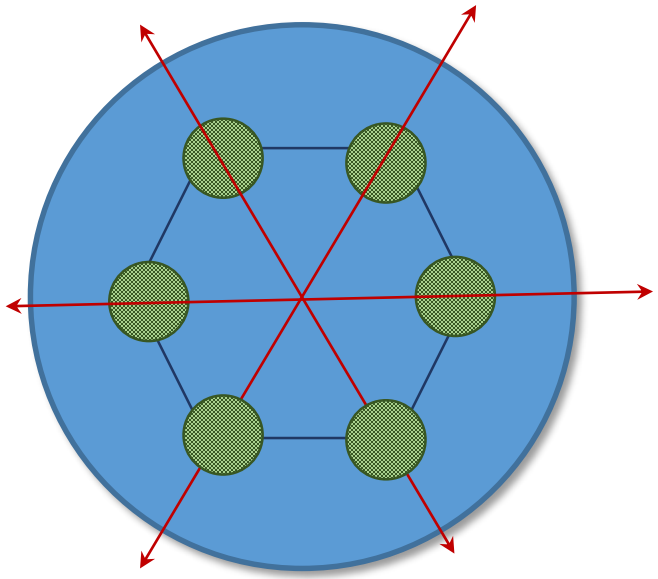
VEP configurability - ANY circular array

4 mics



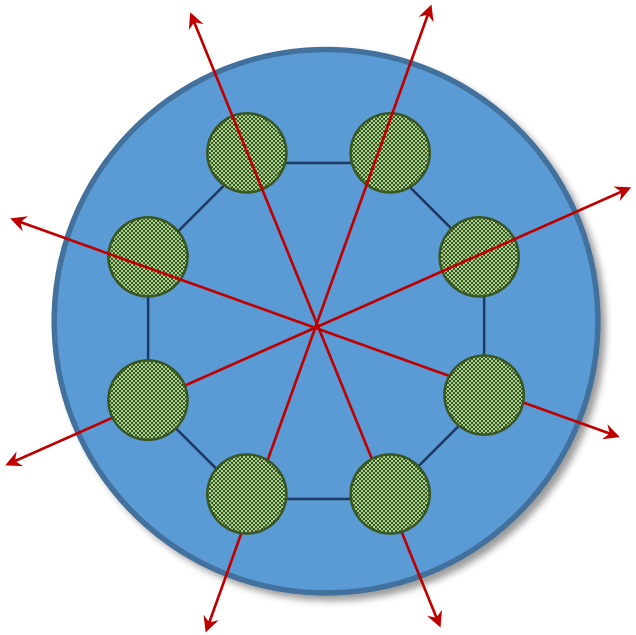
8 beams

6 mics



6 beams

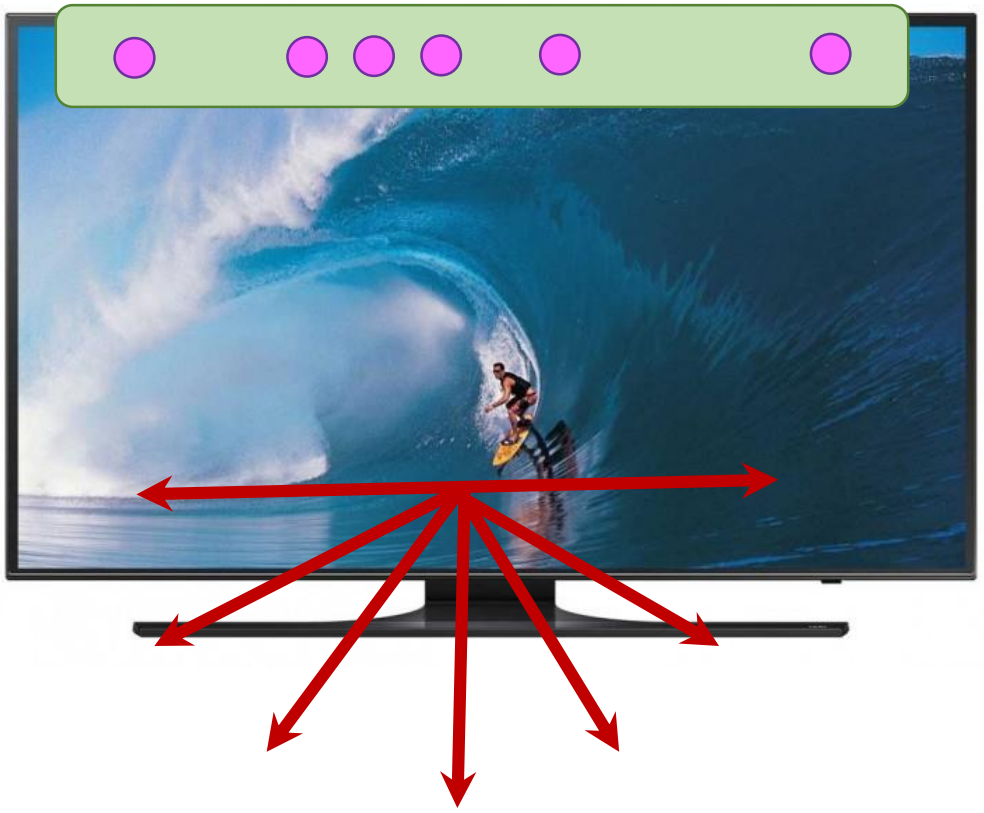
8 mics



8 beams

VEP configurability - ANY (bi) linear array

6 mics

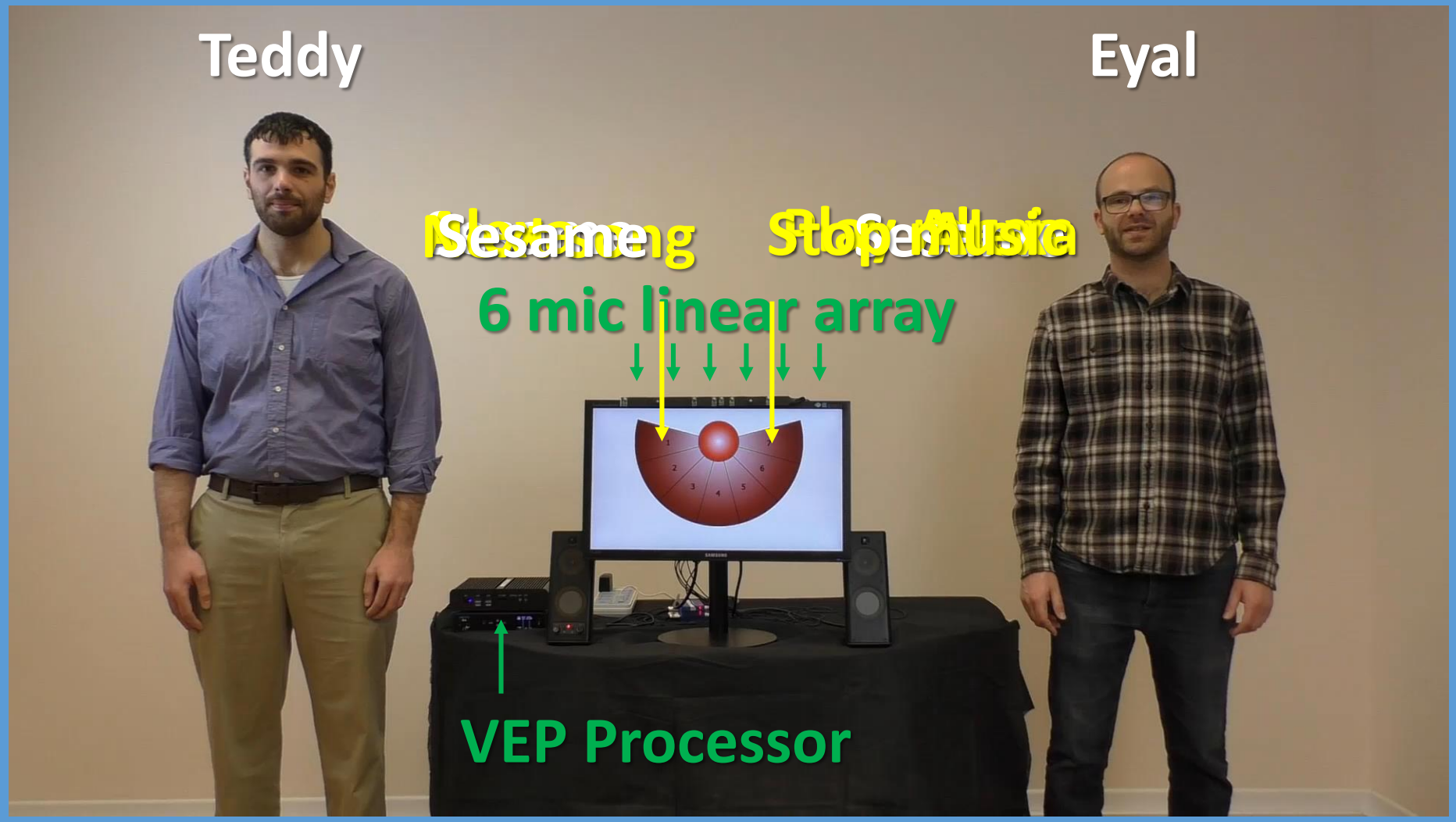


7 beams

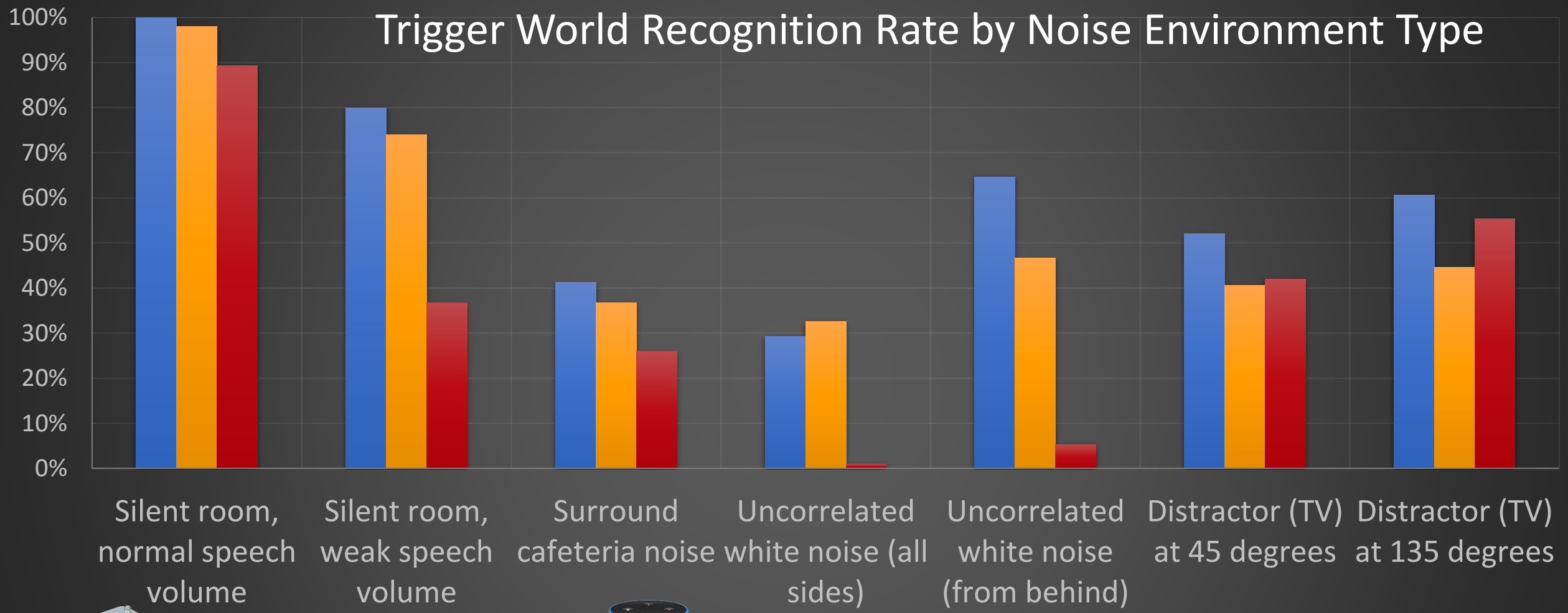
2x4 mics

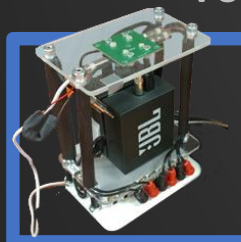
7 beams

VEP performance demo – 6 microphone linear array



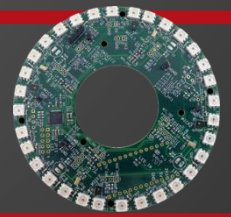
VEP performance: case by case comparison





Alango Duplexa
4-mic

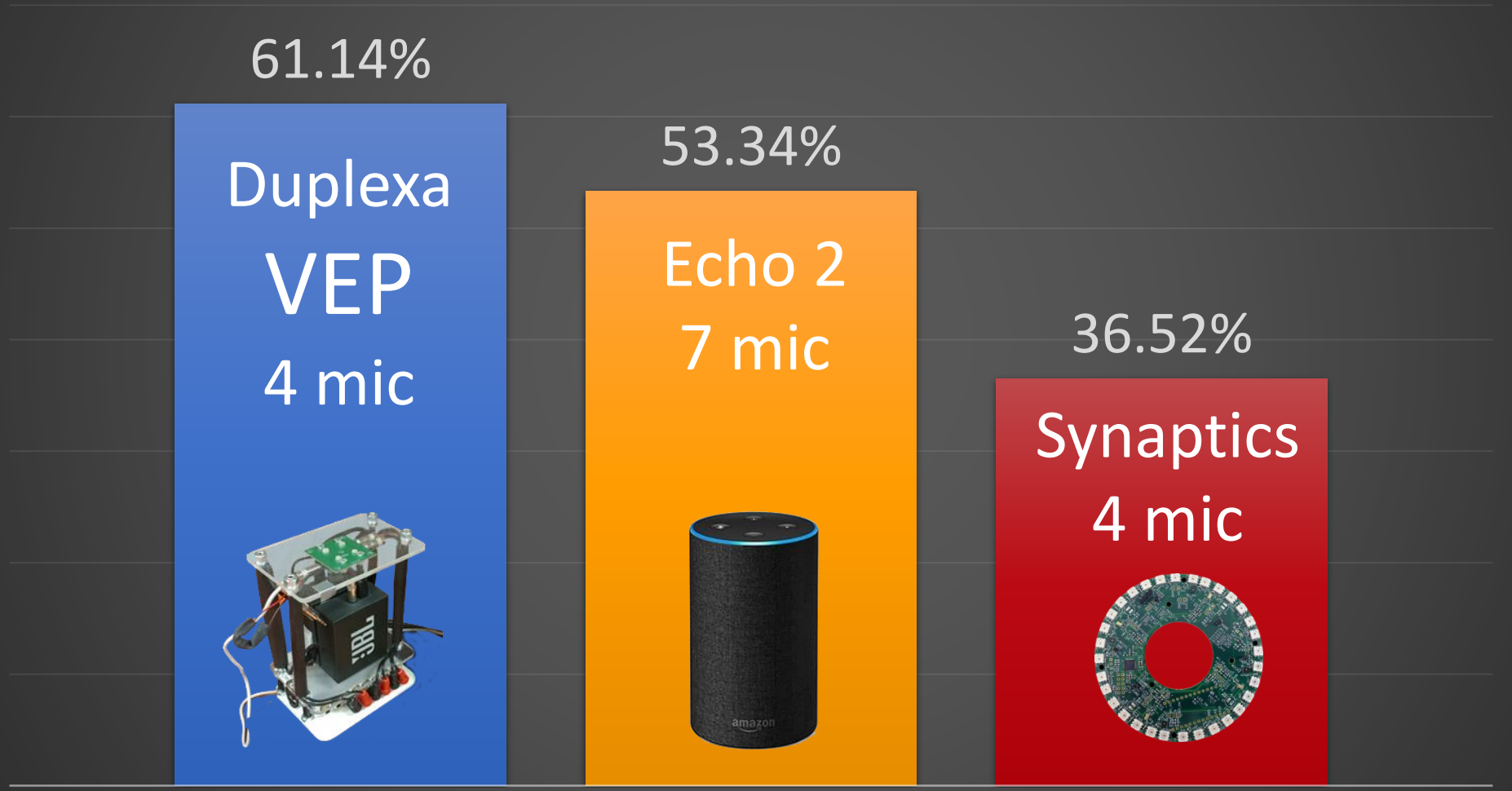
Amazon Echo 2
7-mic



Synaptics
4-mic

VEP performance: Executive Summary

Average “Alexa” Recognition Rate



Live demo: Amazon Echo against Duplexa demo kit

State of the art: How much power is needed ?

Average power draw (watts)

Mode	Amazon Echo	Amazon Echo Dot (first generation)	Google Home
Idle	3	3	2
Listening	5	4	2
Playing music (low volume)	3	3	2
Playing music (high volume)	3	4	3

www.esource.com/es-blog-2-17-17-voice-control/ok-google-how-much-energy-does-alexa-consume

2019 – 120 million smart speakers in US

350 Megawatt just for always listening

3 km^2 of solar panels

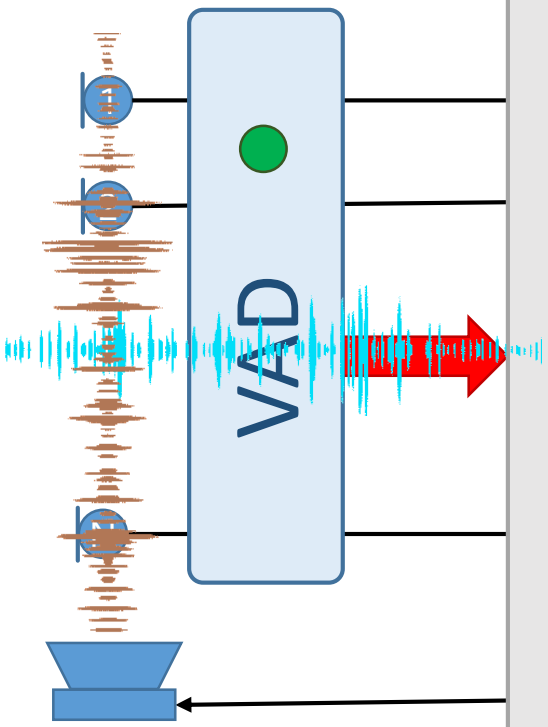
400 Always ON

Soccer fields of solar panels in US only

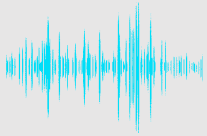
https://marketingland.com/survey-reports-118-million-smart-speakers-in-u-s-but-the-expectation-of-future-demand-is-way-down-254937

“Always Sleep” solution for Always ON problem

Any voice



Sleeping



Alango VAD demo (STM Disco board)

2

MHz

VAD flag

Live demo: Temi Robot

Temi Robot at MWC 2019

VEP with
4 mic square array

Year 2021 : 1.4 billion smart devices sold

https://ovum.informa.com/resources/product-content/press-release-security-and-utilities-devices-to-drive-smart-home-unit-sales

Thank you

Questions, please !