# ADVANCING THE HUMAN INTERFACE

## How Advancements in Edge Computing Can Improve User Experience

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# Abstract

Once reserved for expensive devices like smartphones, AI-driven neural networks, processed at the edge in the smart home, hold the key to addressing challenges in performance and robustness, as well as address privacy concerns. Voice control does not always need internet connectivity. Secure inferencing at the edge addresses many of the challenges of more widespread adoption of IoT devices and opens up new possibilities for the human interface whether it's audio, voice, touch or visual. At the same time edge processing increases privacy, security and users' control over their own data. For a device to become contextually aware, and enable more seamless interaction, it requires the device to listen for more than just a trigger word. For example, the device should be able to perform sophisticated levels of speech-to-text and natural language understanding even when the cloud is not accessible.
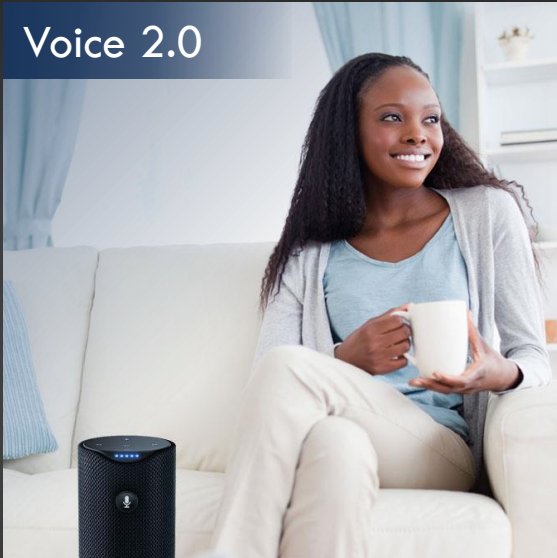
# Evolution of the Voice Interface

## Voice 1.0
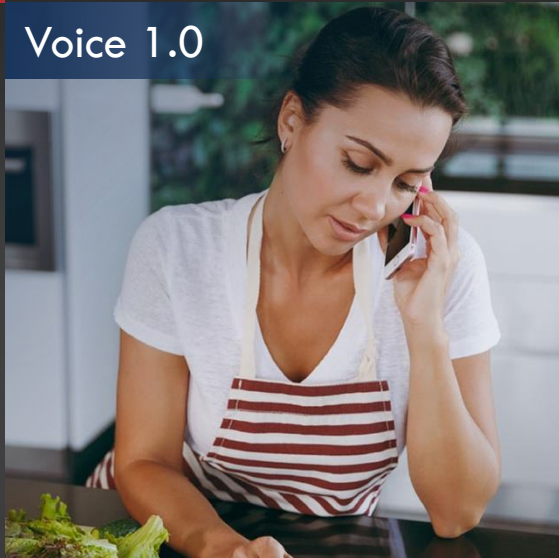
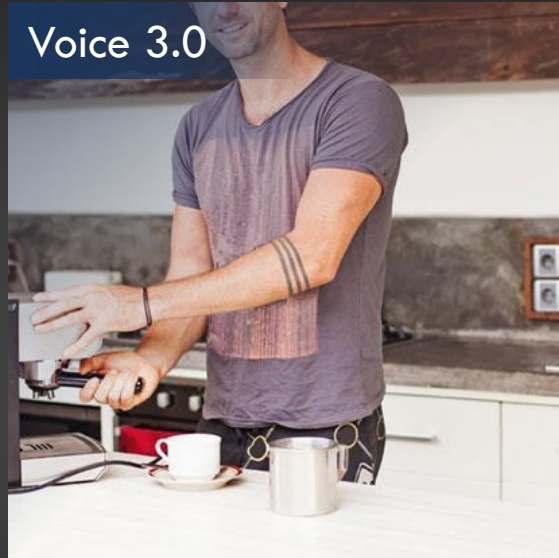**Voice primarily for calling**
- Home phones
- Mobile devices
- PCs

## Voice 2.0

**Voice enhanced for far-field**
- Focus on speech recognition
- Enabled with cloud intelligence

## Voice 3.0

**Superior voice experience through local intelligence**
- Personalized
- Better privacy
- Increased accuracy
- Multimodal

# Secure Inferencing at the Edge Addresses Consumer Concerns

## PRIVACY

- User identifiable data stays on device while only abstracted data sent to the cloud

- Multimodal interface where audio and video streams are not sent to the cloud

## LATENCY

- Functions handled locally – Home control and security functions performed with lower latency

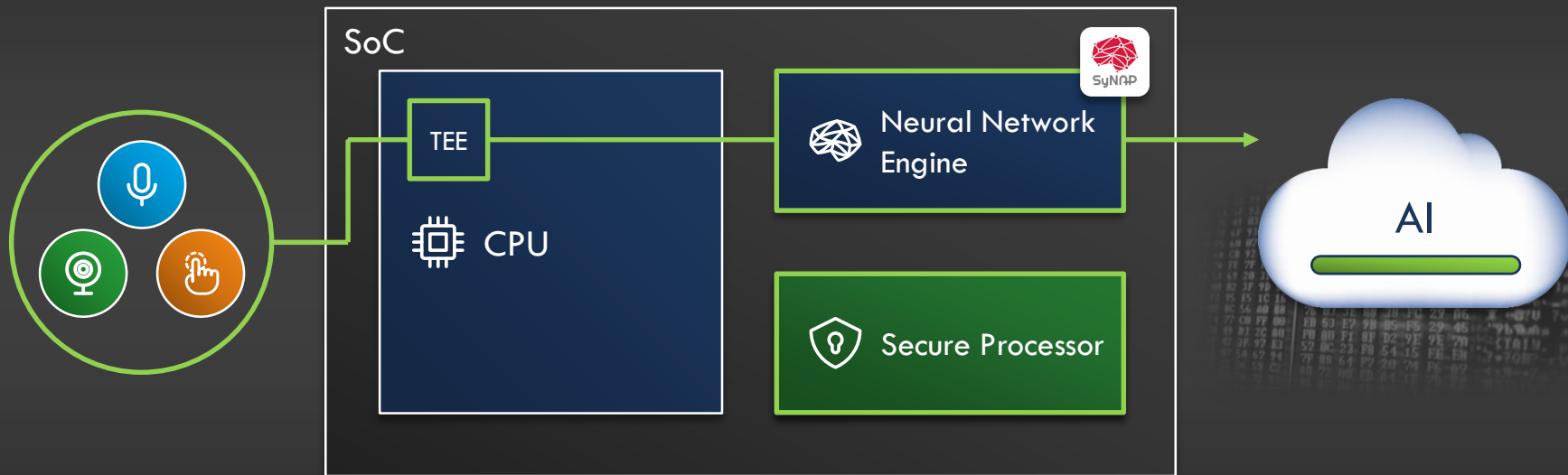- Contextual awareness anticipates user intent

## ROBUSTNESS

- Functions handled locally – available even in case of an outage

- Out of the box voice UI experience for appliances etc.

# How Do We Implement Voice 3.0?

# Google Nest Mini Launch

Google

Release: October 2019

## Making the best Assistant better

Nest Mini is smarter and faster than the original Mini. *We embedded a dedicated machine learning chip with up to one TeraOPS of processing power,* which lets us move some Google Assistant experiences from our data centers directly onto the device. In the U.S., Nest Mini can now learn your most common commands and process them locally for a much faster response time.

Google

# Enterprise Use Case

*Let's get started.*

Calling meeting participants

Rolling down window shades

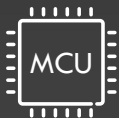Displaying slides on main screen

Ordering lunch options

Transcribing meeting notes

# Ecosystem Opportunity for Secure Edge AI

**ASR/NLU Technology**

## Current

**MCU** | Limited Functionality Embedded

**Cloud** | Full Functionality Cloud

## Opportunity

Full Functionality Embedded

● Cloud capability on device

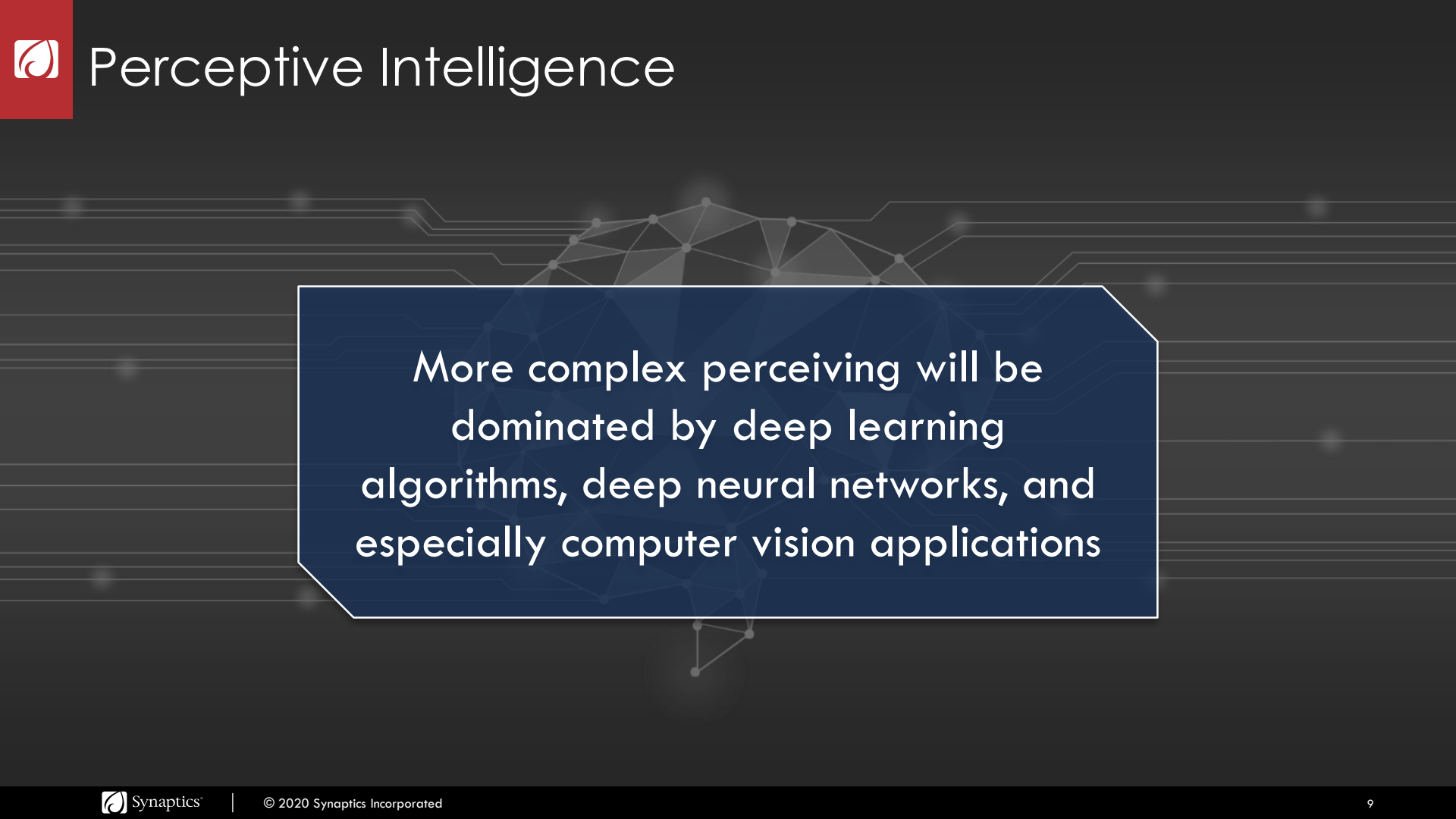Features that benefit from running locally:


Voice Identification


Security Monitoring


Local Meeting Transcription

# Perceptive Intelligence

More complex perceiving will be dominated by deep learning algorithms, deep neural networks, and especially computer vision applications
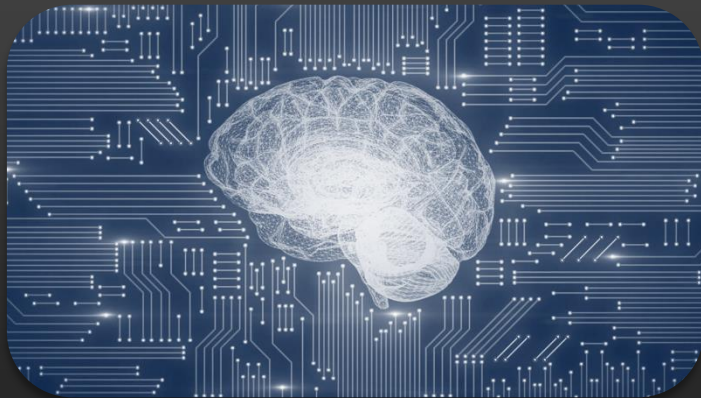
# Enabling a New Generation of Smart Devices



## Computer Vision

- Automating the human visual system
- High bandwidth sensing enables visual awareness



## Intelligence at the Edge

- AI/machine learning/DNN at the source of data generation
  - From sense to perceive
- Privacy, low latency, reduced reliance on network, relief from IoT data deluge

# What if…

**Alerting Foreman**

# Synaptics has Differentiated Technologies for Voice 3.0

**Voice / Audio**

**Video**

**Vision**

**AI**

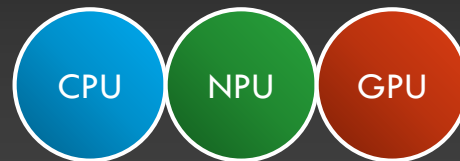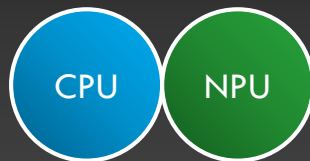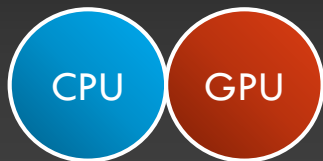**Security / Privacy**

# Synaptics Edge AI Roadmap

| <1 TOPS (GPU) | 1 TOPS (Dedicated NPU) | >6 TOPS (Dedicated NPU) |
|---|---|---|
| VS550 | AS371 | VS600 |
| STBs | Speakers, Soundbars, Wi-Fi Mesh, Appliances | STBs, Smart Displays |
| Video Analytics AI | Voice and Sensor Real-Time AI | Voice, Video, Imaging Real-Time AI |

THANK YOU