



Malaspina Labs Inc.

**Overcoming the Challenges of Speech
Interaction for Low-Power Devices**

“A guy walks into a bar...”

A guy walks into a car dealership...

“I want a car that can pull my boat.”

“and I’d like it to get over 40 MPG.”

“and I need it to cost under \$20,000.”

The Evolution of Voice on Ultra-Low Power Devices



\$600 ASP
3000 mAh battery
3000 MIPS
2000 KB RAM



\$250 ASP
300 mAh battery
2000 MIPS
500 KB RAM



\$100 ASP
200 mAh battery
200 MIPS
250 KB RAM



\$1400 ASP
90 mAh battery
50 MIPS
15 KB RAM

The Evolution of Voice on Ultra-Low Power Devices



- ▶ Lower ASPs
- ▶ Smaller batteries
- ▶ More constrained hardware & user interfaces
- ▶ Conflicting design constraints

Operational Challenges

- ▶ Speech is not the primary purpose of the device
- ▶ Design not optimized for speech use cases
- ▶ Single mic devices more common
- ▶ Far-field & off-axis orientations more common



Competing Constraints

- ▶ Price constraints imposed by BOM ceilings
- ▶ Power constraints imposed by battery size & life expectations
- ▶ Performance constraints imposed by use cases, industrial design & user expectations

Three Axes of Optimization

- ▶ Memory equates to cost
 - ▶ Smaller memory size means software can execute on cheaper processors
 - ▶ Can be achieved at the expense of MIPS
- ▶ MIPS equates to power
 - ▶ Lower MIPS means software consumes less power
 - ▶ Can be achieved at the expense of memory
- ▶ Algorithm sophistication equates to performance
 - ▶ Scalable performance can be achieved at the expense of MIPS and memory

Thank You

Malaspina Labs

Voice communications & speech interfaces for ultra-low power devices

Focus on small footprint implementations for use in noisy environments