



NeuroLink

A Brain Computer Interface

for ALS Patients by

MindMeld

Team MindMeld

- Andrew Black – Algorithmic Magician
 - Computer Science, BSMS program
- Matthew Bodofsky – Packaging Specialist
 - Information Technology, Bachelor's Degree
- Ken Fox, CISSP, CSSLP – Team Lead, Design
 - Computer Science, Math Minor, Bachelor's Degree
- Eric Loi -- Development Manager
 - Computer Science, Bachelor's Degree

Stakeholders

- Sara Feldman
 - Drexel College of Medicine
 - Philadelphia PA.
- Jeff Salvage
 - Drexel College of Computing and Informatics
 - Philadelphia PA
- EPICS provided funding for Muse & EyeTribe
- Dr. Greg Hislop - Advisor

NeuroLink

- Two aspects to NeuroLink
 - Computer accessibility system for the immobile
 - ALS patients
 - Research system/platform to
 - Integrate or develop new sensor devices
 - Evaluate new signal processing methods

ALS

- **Amyotrophic Lateral Sclerosis**
 - Lou Gehrig's Disease
 - Motor Neurons in Brain & Spinal cord degenerate
 - Eventual loss of all voluntary Muscle control:
 - Walking, speech, facial muscles
 - Senses still work
 - Always fatal, no cure, limited mitigations
- Need a way to communicate with the world
 - Family
 - Care providers (Doctors, Nurses, Therapists, etc)

Existing Assistive Technologies



Eyegaze Edge Talker
\$10K

Tobii PCEye
\$3.5K

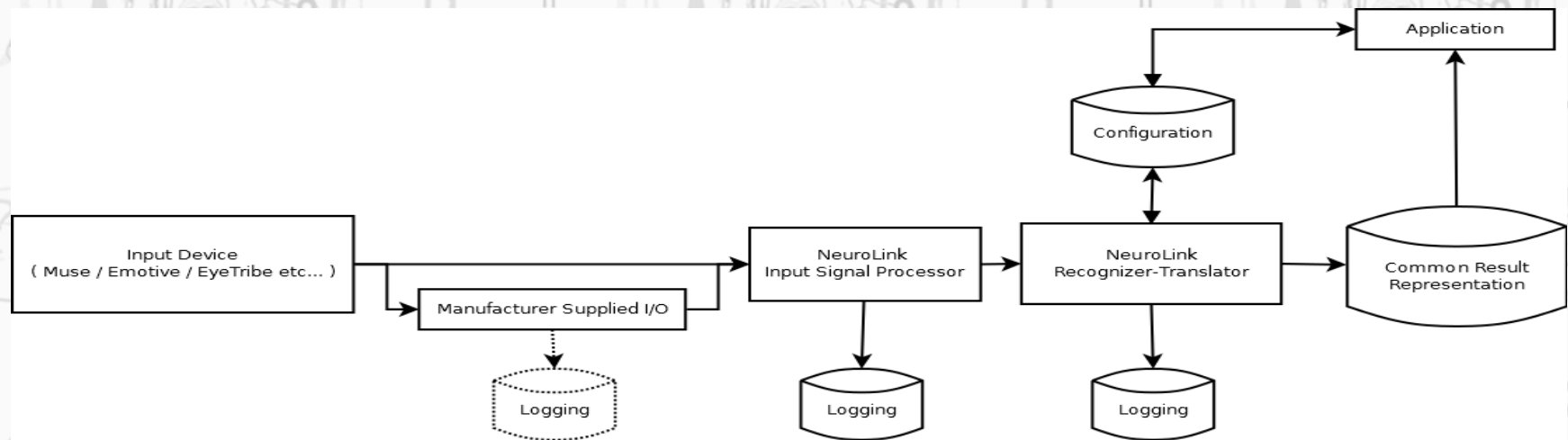


intendiX Speller
\$17.5K

Challenges

- EyeTribe eye-tracker finally arrives
 - Technology Evaluation Report – Can we use it?
 - Wait, can't download the SDK?
 - Not so open source, no direct access to eye position data
 - Resolution/accuracy
 - Steep minimum hardware requirements
- Muse Changes their API
- EEG state classification
 - Alpha, Beta, Theta waves a dead end
 - Switch to processing raw EEG data
- Weather...

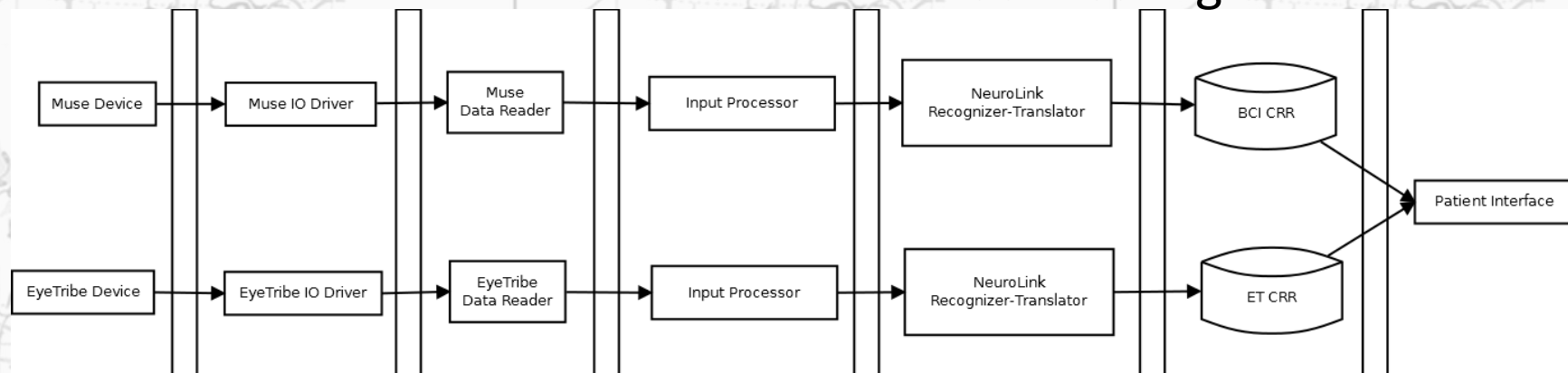
Modular Staged Architecture



Above – From our design documents

thalamic input 300 μ m cortical output

Below – From our Testing documents

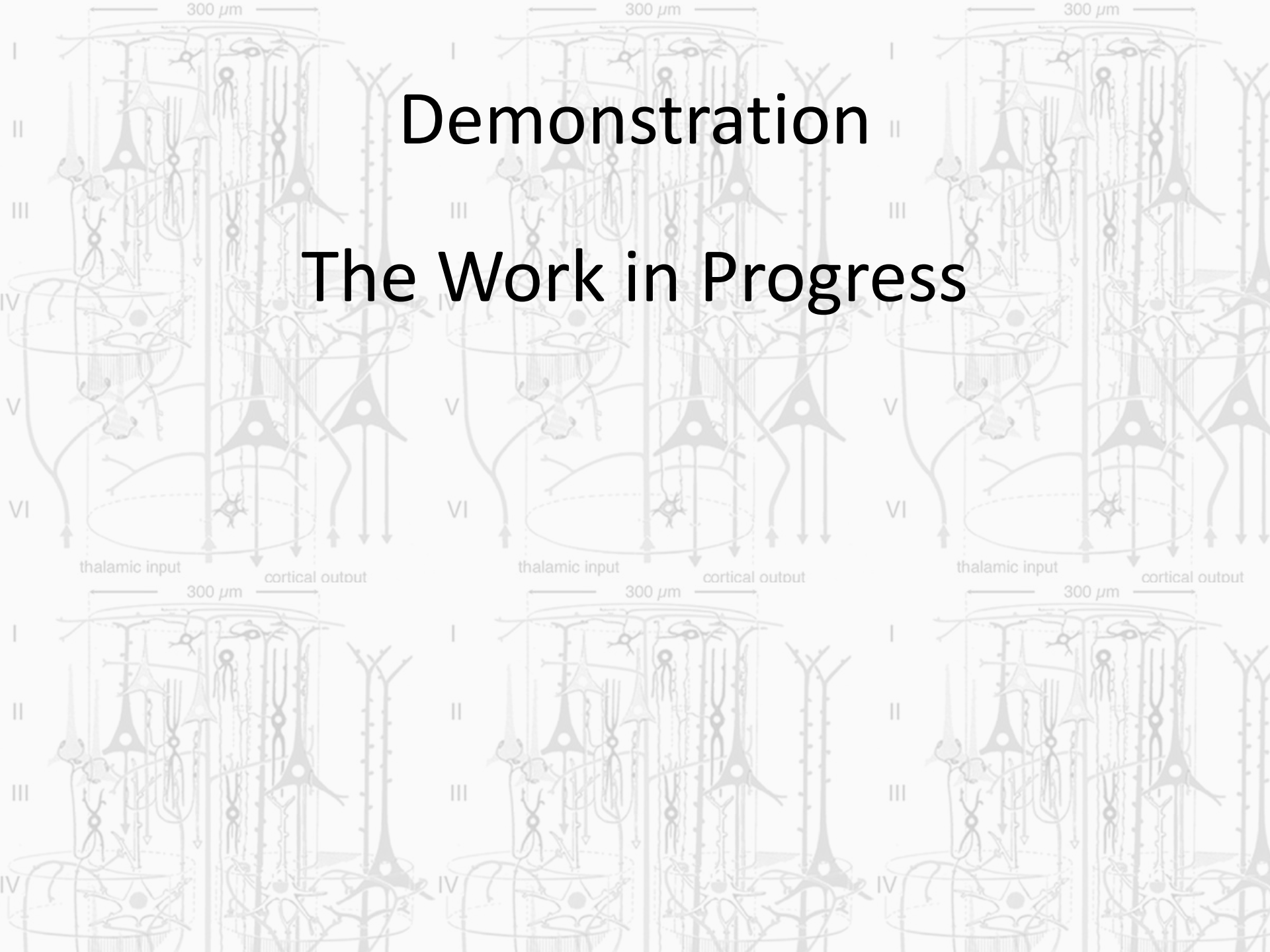


Stages

- Device
- Manufacturer I/O (drivers, utilities, tools, SDK)
- Input Signal Processor (ISP)
- Recognizer-Translator (RT)
- Common Result Representation (CRR)
- Application

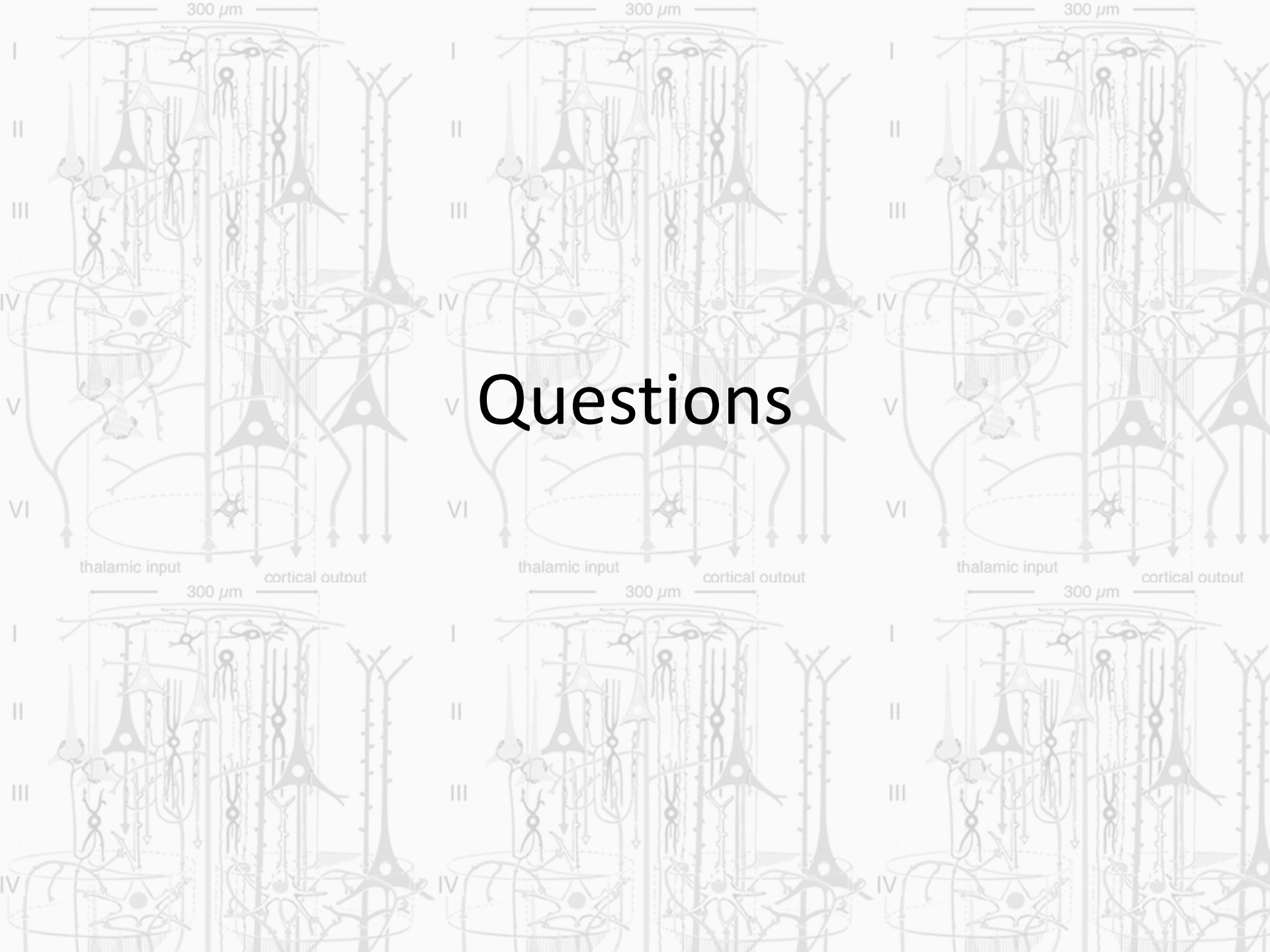
Demonstration

The Work in Progress



Summary

- Help people with Neuro Degenerative Diseases
- Use inexpensive (relatively) technology
- Support multiple input devices
- Support multiple targets (systems/applications)
- Modular/flexible processing
 - Supports change
 - Supports research



Questions



THANK YOU