Proposed Communication Protocol for SANS Sample Environment with ICE

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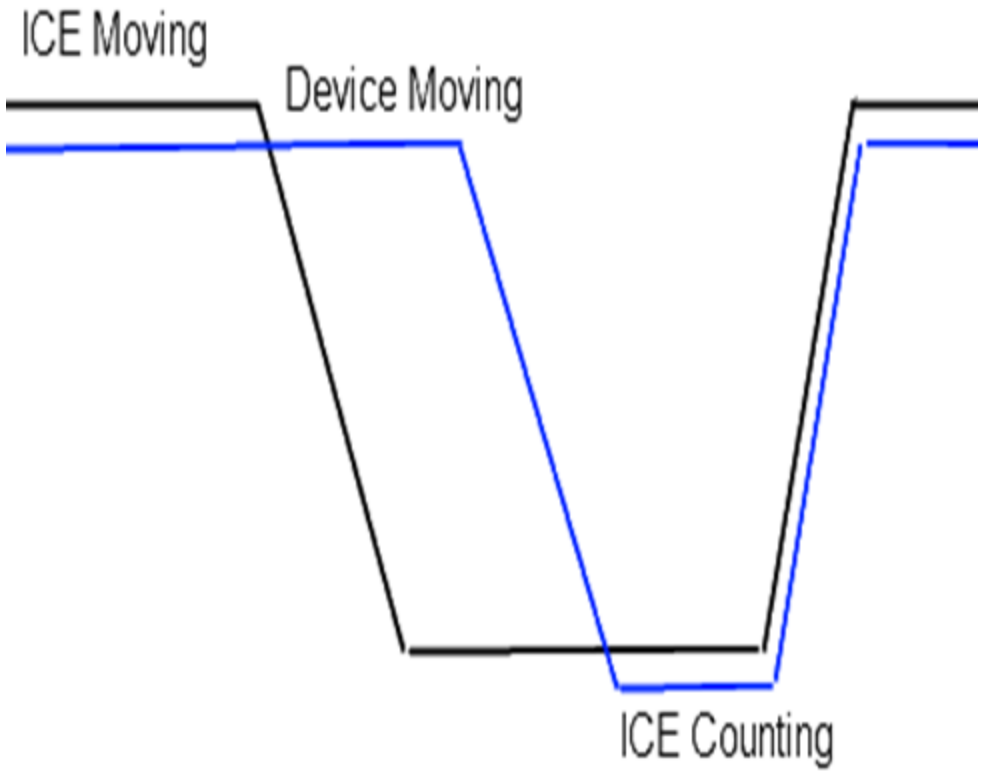
Outline

- Current Coordination Method - Handshaking
- “Black-Box” Communication
- Specifics on Protocol
- Implementation
- Time Line

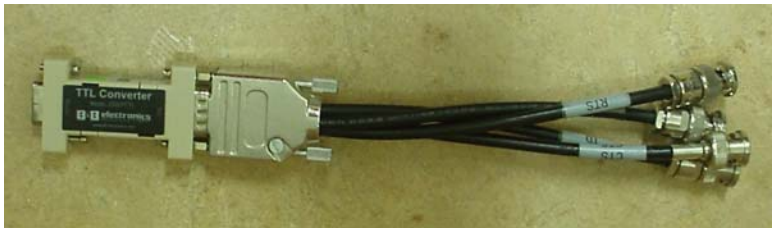
Current System

Handshaking

- ICE initiates a TTL signal change at the beginning of each SANS run and waits for a matching return signal
- External program (LabVIEW) reads TTL input and sends response when ready



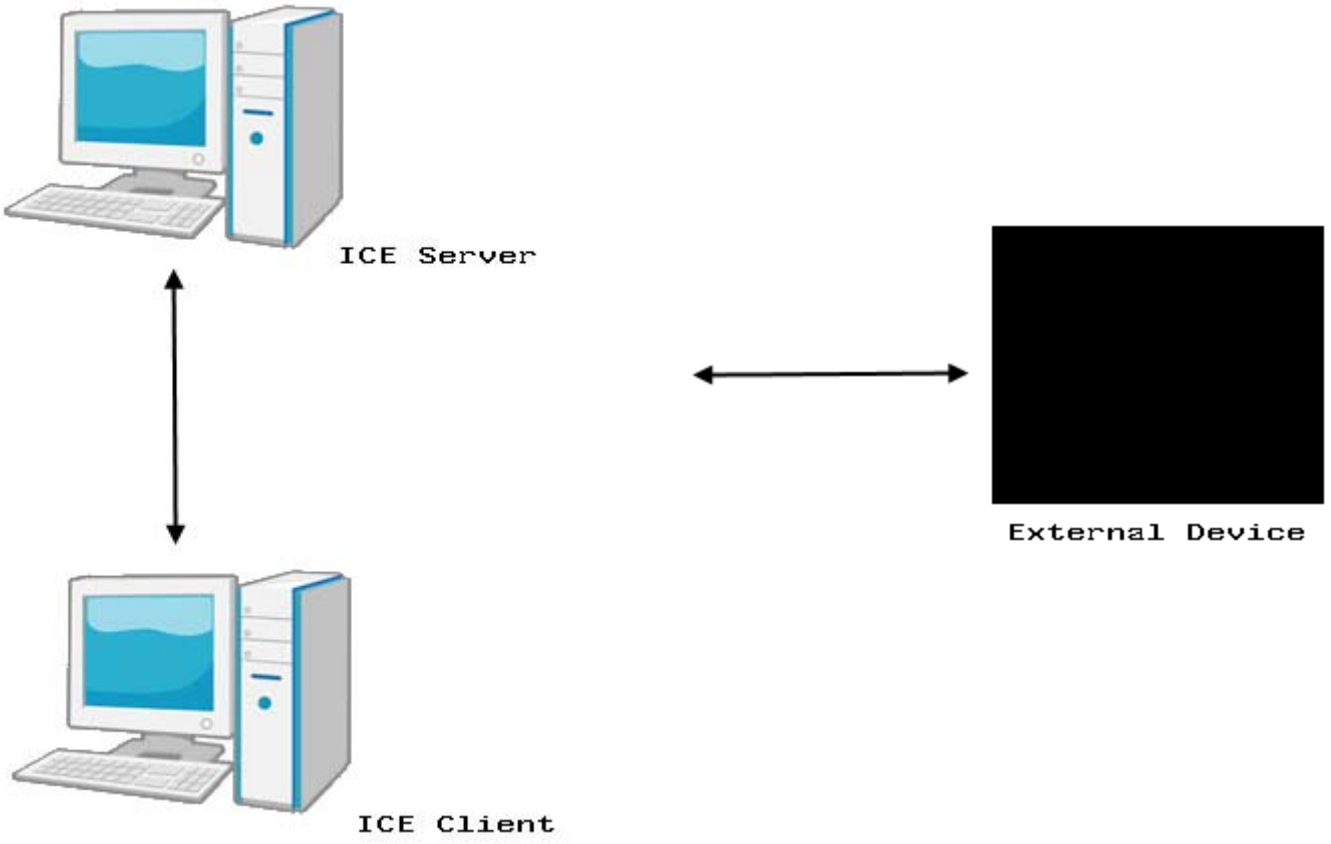
Handshaking Problems



- Data Logging and instrument Control on Multiple Computers
- Difficult to Test Outside NCNR
  - Specialized Hardware to run and test
  - Electronics not readily available in a general lab setting
  - Homebuilt device(s)

The Proposal

“Black Box” Communication



Desired Feature Set

- API of simple ASCII commands
  - Published Specification for instrument scientists and users
  - Feedback between ICE and Device
- Communication through TCP and/or RS232 – Dedicated line for external devices
- Auto-detect devices and attributes through a query sequence
  - Details sent by black box program
- Data Logging Through ICE

Auto-Detect

- Tell ICE Device Connected
- ICE Sends General Query
  - No Device Connected/Timeout
  - Device Sends Information
    - Mandatory: Name/Type, Read/Write Capabilities, Readable/Writable Values and Units
    - Optional: Hard and Soft Limits, Read/Write Precision, Control Parameters, Number of Sensors
- Inputs Added to ICE Auto Control Panel
- How Optional Parameters Dealt With Defined By Device Programming

Changes Users Would See

- No need to enter instrument and SE parameters into separate computers*
- All data logged by ICE*
- Software for equipment brought by users could be written before arriving at NIST
- Any equipment with control software could easily and rapidly wrapped in the API

Other Thoughts and Unfinished Ideas

- Command IDs - Command/Response linked by ID
- Error Handling performed by black box but reported through ICE
  - How should errors be dealt with?
- Data Log specifics – log file look/feel, polling time, time out – Where to define these?
- How applicable is this to other instruments?

Implementation Features

- Test Application
  - Distributed software package that speaks the ICE-side API for easy testing
- Embedded Controllers
  - Replace outdated controllers with programmable ones

General Timeline

- Phase II of SANS Software/vSANS
- Now → March 2011: Planning and Specifications
- March 2011 → February 2012: ICE and SE Software Refactoring
- February 2012 → January 2013: Coding and Testing in ICE