



Handheld Data Acquisition & Instrumentation in the Field

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Andrew Girson
InHand Electronics, Inc.
agirson@inhandelectronics.com

Presentation Overview

- Market Opportunity & Evolution
 - Mass-Market Battlegrounds
 - Sensor Market Requirements
 - Examples
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- *Remote/wireless sensors & handheld sensing platforms share similar needs*

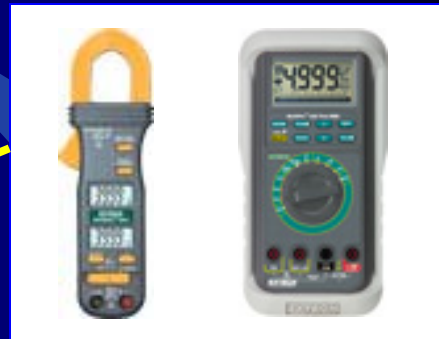
Handhelds - A Growing Mass-Market

- Over 350M ARM CPUs shipped in first half of 2003
 - majority of these CPUs in cellular telephones, PDAs, and other wireless devices
- Yet, cellular telephone penetration was just 16% in China in 2003

Industrial Markets Adjust

- Industrial handhelds were fixed-function
 - logistics
 - warehousing
 - retailing
- Now, they are becoming programmable
 - Symbol, Intermec, Trimble
- Homeland security and other new markets are increasing opportunities for small, battery-operated sensing solutions

Mass-Market Meets Vertical-Market



As the handheld and wireless technology markets continue to innovate, opportunities in instrumentation and sensor markets will grow

Industrial/T&M Markets Adopt Mass-Market Handheld Technology



**Embedded
&
Fixed-Function**

**Plug-and-Play
&
Programmable**

Even "fixed-function" T&M handhelds will be based on mass-market architectures

Fixed-Function Industrial Devices

- “Embedded” computing markets undergoing a renaissance, due to Internet, wireless, and handheld technology
- Use of mass-market technologies will continue to grow
- OEMs “control” platform, so industrial features are easier to implement

Programmable Industrial Devices

- Lots of industrial devices based on Palm and Windows CE
- OEMs and technology providers still fighting to control platforms
- Programmable industrial and T&M devices have unique needs
- Many key industrial and T&M technology providers waiting for “shakeout”

Mass-Market Technology Battlegrounds

- Operating Systems
- CPU Architectures
- Peripheral Interfaces
- Wireless
- Form Factors

Operating Systems

- Palm OS traditionally has been market leader
 - Lead is slipping
 - Limited ability to create new device types
- Microsoft's Pocket PC and Windows CE are coming on strong
- Symbian, Java, and Linux are contenders
- *Analysis: This is war!!!*

CPU Architectures

- ARM is becoming the de facto standard
- Pocket PC is only on ARM
 - Other CPU cores were dropped
- Latest PalmOS is based on ARM
 - partnerships with ARM, Intel, and TI
- *Analysis: Standardization on ARM may make development easier*

Peripheral Interfaces

- PC Card (long legacy)
- Compact Flash (PC Card replacement?)
- Palm Universal Connector (Palm)
- Springboard (PalmOne) - future?
- iPAQ Expansion Connector (HP) - future?
- SDIO (becoming more popular)
- USB 2.0, Firewire, Ethernet, ExpressCard
- *Analysis: Range of standards suits diverse needs but encourages fragmentation*

Wireless

- 2.5G and 3G cellular
- 802.11b
- Bluetooth
- New technologies (802.11a/g, UWB, Zigbee)
- *Analysis: Intense mass-market interest will fuel lots of innovation and volatility; wireless security is of great interest*

Form Factors

- PDA
- Cell-phone (“convergence” devices)
- Web Tablet
- Wearable Computer
- Wireless Terminal
- *Analysis: Each form factor has benefits for different applications*

Key Sensor Market Requirements

- As shakeout in OS, CPU, Peripherals, and Wireless occurs, sensor and T&M markets need:
 - DAQ peripherals
 - Signal conditioning and connectivity
 - Software development tools

DAQ Peripherals

- Many of today's peripherals not suited for handhelds
 - too big
 - too power hungry
 - too fragile
- *Analysis: As "winning" standards and tools evolve, industry leaders will develop a new generation of peripherals*

Signal Conditioning & Connectivity

- Lots of rugged devices now
- No uniform method for attaching signal conditioning modules and connectors
- *Analysis: Market fragmentation and unique needs may result in proprietary solutions*

Software Development Tools

- Developers want to use familiar desktop tools
 - LabView
 - HP-VEE
 - Softwire
- Handheld form factor poses challenges
- *Analysis: Convergence around a limited number of CPU and OS architectures will lead to tool migration*

What's Happening Now

- Lots of embedded “fixed-function” sensing and instrumentation devices are adopting mass-market technologies
- “Early adopter” plug-and-play products are appearing

Datastick Systems



- DAS-1245
 - Plugs into Palm Universal Connector
 - 4 A/D channels
 - up to 400 samples/sec
 - Software for PalmOS

DATASTICK
SYSTEMS

Imagiworks



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imagiworks

- Imagiprobe
 - Based on Palm OS
 - Plug-in for serial sync port

C-Cubed



- DATAQ CF2
 - Compact Flash card for Pocket PCs
 - 4, 24-bit A/D channels
 - 2, 12-bit D/A channels
 - up to 38,400 samples/sec
 - 170mW power consumption

Oz Optics



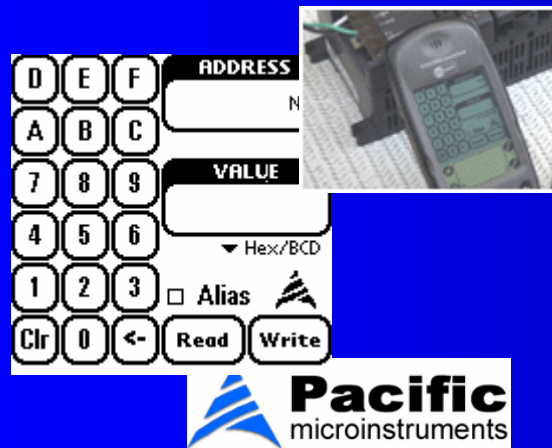
- PocketPower Meter
 - Springboard A/D card for Handspring Visor
 - Troubleshoot fiber networks
 - Measures light at several wavelengths

Aceeca



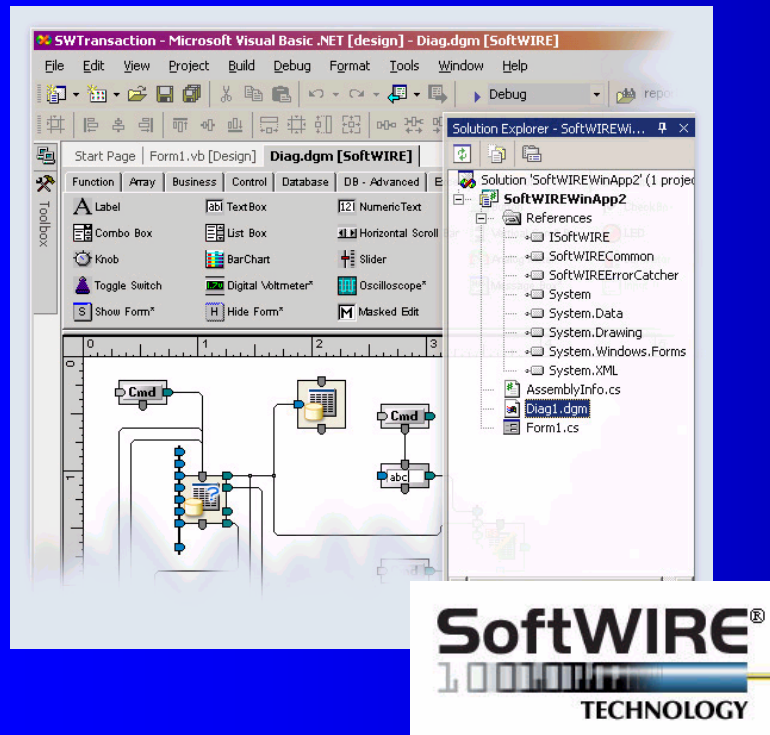
- Meazura
 - Ruggedized Palm device
 - Industrial peripheral connectivity via MZIO slot

Pacific Microinstruments



- Mobile SPC Suite - Java-based acquisition and display of monitoring info for cell phones
- PLC Pilot - PLC software for Palm Pilots

SoftWIRE Technology



- SoftWIRE visual development software for PDAs
- Graphical development environment based on Visual Basic

National Instruments



- LabView 7, PDA Module
- Develop on a PC and emulate device
- Execute and debug on handheld
- Some DAQCard support

In Summary, Lots of Activity...

- Handheld and wireless are driving innovation in today's technology markets
- Embedded and fixed-function sensing and instrumentation devices are increasingly based on mass-market technologies
- Lots of rugged programmable handhelds are appearing

...But Still A Ways To Go

- A new generation of peripherals is needed
- Development tools starting to migrate
- Signal conditioning and connectivity problems must be solved
- *As handheld and wireless mass-markets evolve, the vertical-markets will follow!!!*