Developing Real-Time Embedded Object-Oriented Applications with CORBA

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Three Applications

- Ultrasound scanner
- Theodolite
- Scale
Ultrasound Scanner
Product Requirements

- User views ultrasound images in real-time
  - Presentation software must keep up with DSP
  - Sensor emits data every 2 milliseconds

- Play back images later
  - Access to remote data storage

- Diagnostics & monitoring from across Internet

- Support mobility
  - Paramedics, In-hospital facilities
  - Small and rugged
Ultrasound Scanner
Development Requirements

- Reduce development and maintenance costs
  - reduce use of proprietary H/W, S/W
  - this version and down the line

- Maximize “image quality” over successive product generations
  - all measurements (heart rate, blood pressure, fetal parameters) are derived from images

- Shorten development schedule
  - build software before hardware
    - OO design, 3rd party tools, portable software layer
Theodolite
Product Requirements

- User measures/records land topography from GPS data
  - Position and height updates generated every 100 ms
  - GPS receiver generates Real-Time Kinematic (RTK) data with 1 cm accuracy
  - Must transform real-time time-series data into coordinate data; algorithm based on time-series windows
- Plug-and-play architecture
  - Interface between components from different vendors
  - Interface to standard PCs
- Must interface with radio modem for real-time, on the fly rover
- System initialization less than 30 seconds
- Device has limited memory (4 Mb to 85 Mb flash or PCMCIA)
Theodolite
Development Requirements

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- Shorten development schedule
  - build software before hardware
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Theodolite Architecture

- GPS Sensor
- GPS-Based Terminal
- Computational Engine
- Data Logger Engine
- Data Store
- Analysis PCs
- Reporting PCs
- Display Unit

CORBA
IIOP
GIOP/TCP/RS232

Internet
Scale

Product Requirements

- Measure weight of merchandise and calculate price
- Scales are VxWorks, displays are PCs
- Sell by component—card, display, bus
  - Freedom to change card or displays
  - Platform-independent applications
  - Non-proprietary communication protocols
Scale
Development Requirements

- COTS HW/SW
Summary

- 2-bus architecture separates fast real-time bus from outside-the-box bus
  - RT at layers just above HW
  - Interoperable outside the box

- Real-time embedded CORBA enables a COTS approach
  - Small footprint
  - High performance
  - Real-Time QoS
  - Shorter development schedule and reduced risk
Thank You

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