Using Object-Oriented Technologies in SPEED

Lucent Technologies

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Talk Overview

• What is SPEED?
• Why C++?
• How about CORBA?
What is SPEED?

- broadband, scalable switching product built on an open architecture and standard hardware and software interfaces.

- basis for many wireless applications in Lucent.

- suited for applications involving packet or circuit switching and/or processing of broadband, multimedia traffic.
SPEED II Architecture – Configuration

**SPEED Host**
- Performs administrative tasks
- Provides User Interfaces
- Stores Provisioning data and master software images

**SPEED Shelf**
- Fully redundant (highly reliable)
- Processes bearer channel traffic
- Continues operating if SPEED Host is temporarily unavailable
SPEED II Hardware – Shelf Components

- ATM fabric to any slot on the system
- TDM switching to any processor on the card
- ATM/TDM interworking on board
- Network boot or SPEED Host boot

Shelf
16 slots / 14 ICCs

- Segmented Power
- Dual Hot Swap
- Dual Utility Cards
  - I²C Board Monitor
  - Modem port
  - RS-232 Local Control
  - Alarm Contacts
  - Distribution ATM Arbitration
- Gateway ICC
  - Clock Distribution
• GICC = Gateway ICC
• UC = Utility Card
• MII = Media Independent Interface
SPEED II Hardware – PCI Mezzanine Cards (PMCs)

- 4 PMC slots in ICC
- Physical interfaces (e.g., ATM, DS-1/E-1)
- Processing Power (e.g., DSP)
SPEED II Software – Platform Software Mapping

Architecture

SPEED HOST

- Solaris
- Connection Mgmt.
- Resource Mgmt.
- Support & Config.
- Protocol Stream Framework
- External Interfaces (except EAI)
- EvCore
- Internal Control Network
- Applications

Intelligent Carrier Card

Emergency Action Controller:
- Shelf Maintenance & Control
- Emergency Action Interface

FC

Utility Card

EAC

Fabric Controller:
- Shelf Maintenance & Control
  (Fabric Driver)

Intelligent Carrier Card

Power PC:
- VxWorks
- Connection Mgmt.
- Resource Mgmt.
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Intelligent Carrier Card

Emergency Action Controller:
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PPC

PQII

Intelligent Carrier Card

PQII

EAC

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Distributed Functions

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SPEED II Software – Platform Software Mapping

Traffic Processing

SPEED HOST

Intelligent Carrier Card
Utility Card
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Traffic Processing

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Embedded Systems Workshop
PTZK/SPEED Team
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Support & Configuration

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SPEED II Software – Platform Software Mapping

**External Interfaces**

- **SPEED HOST**
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    - *Emergency Action Interface*
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- **Emergency Action Controller:**
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- **Fabric Controller:**
  - Shelf Maintenance & Control
SPEED II Software – Platform Software Mapping

Operating Environment

- Intelligent Carrier Card
- Utility Card
- Utility Card
- Intelligent Carrier Card
- Intelligent Carrier Card

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Application Environment

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Why C++?

Ref: EE Times Special Issue on Embedded Systems 9/25/00

- 3 major factors for language selection:
  
  • unification of design flow elements
  • speed of use provided by the language
  • evolution for older technologies

- In addition:
  
  • natural mapping into object classes
  • ease of collaboration among developers
Connection Management Framework

- Provides applications with life cycle control of connections

- Views system as a set of computing and I/O resources and a set of connection domains

- Object classes:
  
  • Connection Manager (singleton pattern, one per processor)
  
  • Switch Fabric Manager (one per switching domain)
  
  • Trunk Manager (connects switching domains)
  
  • Service Access Point (connection endpoint)
Resource Management Framework

- Responsible for resource naming and states:
  • Resource naming and inventory
  • State interrogation and reporting
  • State change requests
  • Driver control to map states to resources

- Object classes:
  • Maintainable resource
  • Message class
Data Management Framework

- Serves processes with configuration and/or persistent data.
- Consists of a DMF server and a Client Library
- Object classes:
  • Container class
  • Transaction objects
  • Registration objects
EvCore Framework

- Provides facilities for creating event-driven applications or other frameworks.

- Loosely coupled collection of code modules composed of one or a few related C++ classes.

- Code Modules and Object classes:
  
  • Event and Event Queue classes
  
  • Timer and Timer Manager classes
  
  • I/O Select and Select Manager classes
  
  • Kernel Modules and Classes
  
  • Signal Handling Classes
How about CORBA?

- Prototyping work
- Future Work
Prototyping Work: Protocol Streams Framework

- Streams bearer traffic through a collection of channel processing modules

- Original version used a subset of Adaptive Communication Environment (ACE) Framework
  • Adaptive Service Executive (ASX) Stream Framework

- Prototype implementation to do wireless protocol processing
  • Very demanding in performance, efficiency

- Stream Framework (based on Unix System V Release 4 streams)
Future Work: Next Generation Platform

- Scalable capacity to 2.5Tb/s
- Scalable availability to 5 9’s or better
- Multi-protocol support for interfaces
- Highly modular and configurable
- Advanced software infrastructure
  - Explore the use of Fault Tolerant CORBA to provide the functions of the Fault Detection and Recovery Framework