

Michael Bayer Computer Telephony Solutions www.CTExpert.com

## Introductions



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## Agenda



- 1. Evolution of Computer Telephony
- 2. What makes CT compelling?
- 3. CT Server Architecture
- 4. CT Server Specifications
- 5. Putting It All Together
- ∎ Q&A

What this session is NOT about



- Product reviews and recommendations
- Unified messaging or other specific product categories in depth
- Detailed implementation practices and tips



## Evolution of Computer Telephony





- Communications & Collaboration
  - ► Telephony
  - Shared Visual Workspaces
  - ► Mail & Messaging
  - ► Broadcast & Publishing







**Computer Telephony Revolution** 



 Using off-the-shelf computer technologies to implement telephone system components
Shift from Monolithic to Modular systems





- Telephony
- Computer Telephony
- Computer Telephony Integration (CTI)
- Media Services
- IP Telephony



## CTI Defined



# Call Control

Monitoring and directing calls in a telephone system

- Telephone Control
  - Monitoring and controlling features of a telephone set
- Media Binding
  - Relating other communications/telephony functionality to calls in a telephone system

## CT Media Access/Services



- Tone Detection and Generation
- Recording and Playback
- Text-to-Speech
- Speech Recognition
- Modulated Data (Modem/Fax)
- Digital Data (Compressed Video, etc.)
- Call Binding



- Establishes media stream channels between endpoints and conveys signaling information
- Traditional Switching Fabric
  - TDM bus backplanes connecting line cards
  - Analog (POTS) and digital (T-1, ISDN, proprietary) telephony circuits
- IP Telephony Switching Fabric
  - Packetized voice over conventional IP networking infrastructure
  - Typically based on off-the-shelf computer technology

## Admin



- System configuration
  - System customization
  - ► Moves / Adds / Changes
- Fault monitoring
- Accounting
- Performance management

■ Security













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## What is a CT Server?



- Platform for computer telephony modules:
  - ► Call Control / CTI
  - ► Media Services
  - Administrative Services
  - ► Switching Fabric
- Centralized vs. Distributed
  - All modules may be installed on a single server
  - System may consist of many single-purpose CT servers



## What makes CT compelling?



## **Telephone systems** that are tailored to the specific needs and preferences of users









## User Requirements



- Take full advantage of user-identified telephony features
- Integration with mainstream applications
- No functional limitations to prevent personalization
- Add-on as needed

## **Customer Requirements**



- No limits to addition of functionality
- Easy to scale
- No barriers to multi-vendor systems
- No barriers to multi-platform support
- System-centric (rather than vendor-centric) administration





Integrator's Point of View



- Maximize opportunity for value-add through customized solutions
- Ability to source solution components from a diversity of vendors





## Vendor's Point of View



- Expose underutilized features and capabilities to differentiate products
- Maximize the opportunities to sell best-ofbreed components rather than monolithic systems
- Not dependent on a particular platform or OS/tool vendor









- Deliver more benefits associated with existing service offerings
- Opportunity to deliver new services
- Opportunity to differentiate offerings in a more competitive marketplace

**Computer Telephony Solutions** 



- May utilize just one technology:
  - ► CTI Solutions
  - ► Media Services Solutions
  - ► VoIP Solutions
- May incorporate multiple technologies to create custom solutions or new categories:
  - Unified Messaging
  - ► Call Center
  - Personal Agents
- CTI offers the most opportunities
  - Potential for added value, diversity of applications

How...



- ...do you take advantage of the opportunity?
- ...do you cope?

## Focus on Modularity and Prioritize Interoperability



Standards and other interoperability specifications allow for modular systems

■ Modularity is a measure of maturity



## **CT Server Architecture**

## **CT** Frameworks



Everyone has to talk the same language before they can discuss interoperability



- First Phase of CTI: Custom Systems
- Second Phase of CTI: APIs
- Third Phase of CTI: CTI Protocols
















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## Generic CT Server



- All components are modular
- Server can be scaled and enhanced as required
- Server can interoperate with other servers and clients
- Server supports local applications







# **CT Server Specifications**





- Standards Bodies
  - ≻ ITU
  - ► ECMA
- Individual Vendors
  - ► Microsoft
  - ► Lucent/Novell
  - ≻ Sun
- Industry Organizations
  - ► IETF
  - ► ECTF



### ECTF Framework



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### Architecture Framework

- ► Architecture for CT services
- ► ECTF view of CT systems evolution
- Framework for developing interoperability agreements
- Drives ECTF technical working groups





**ECTF** Framework and Specifications

### Call Control

► C.001, C.100

### Hardware

- ► H.100, H.110
- Administration
  - ► M.001, M.100, M.500
- Media Services
  - ► S.100, S.200, S.300, S.410

Application Interoperability



# ■ H.100

► CT Bus for PCI Specification

■ H.110

► CT Bus for Compact PCI Specification



# Vendor Specific Extensions



- CTI interfaces generally support "escape mechanisms" that allow access to proprietary features that cannot be accessed through a standard abstraction.
- Use of these escape mechanisms requires that a given computer have specific knowledge of a particular telephone system's vendor specific extensions.

# Call Control Specifications



- Universal Call Control Model
  - ► ECTF C.001 / Versit CTIE / ECMA CSTA
- Protocols
  - ► Versit / CSTA
- Interfaces
  - ► TSAPI
  - ► Java Telephony
  - ► Windows Telephony

# Call Control Specifications



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Universal Call Control Model



- Everyone has to talk the same language before they can discuss interoperability
- A single model has emerged
  - ► ECTF C.001 / Versit CTIE / ECMA CSTA





## **CTI** Protocols



- Versit protocols have the same functionality but vary in their encoding
- Versit Protocol 1
  - Intended for switch-server streams
- Versit Protocol 2
  - Optimized for client-server streams
- Versit Protocol 3
  - Optimized for direct-connect streams
- CSTA Phase III Protocol
  - ► Variant of Versit Protocol 1

### ECTF Framework



# C.100 Call Control API

 Allow portability of applications between platforms and call control implementations.



# JTAPI 1.3 (Any Java Virtual Machine)



# ■ ECTF C.100

 Designed to be layered over CTI APIs, or Protocols, or directly over implementations





### Shipping versions:







Windows Telephony







## For More Information



- C.001 specifications and Versit CTIE: http://www.ectf.org
- Lucent TSAPI information at:

http://www.lucent.com/enterprise/who/docs/product11.html

Novell TSAPI information at:

http://www.novell.com/catalog/qr/sne24310.html

■ JTAPI information at:

http://java.sun.com/products/jtapi/index.html

■ TAPI information at:

http://www.microsoft.com/communications/telephony.htm





- Framework
  - ► ECTF S.100
- Protocols
  - ► ECTF S.200
- APIs/SPIs
  - ► ECTF S.100
  - ► ECTF S.300
  - ► JTAPI Media (ECTF S.410)
  - ► Windows Telephony







- Client-Server
  - Application Interface Adapter (AIA)
- Resources
- Groups
- Containers and Data Objects
- Extensible name space
- System Call Router (SCR)
- Runtime Control (RTC)



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- Session represents a single association with local or remote logical server
- Applications may have one or more



Containers and Data Objects



- OS-independent file system abstraction
- Supports location-independent operation
- Containers are equivalent to directories
- Data Objects are equivalent to files

### S.100 Resources



- CCR (Call Channel Resource)
- SPR (Switch Port Resource)
- Player
- Recorder
- Signal Detector
- Signal Generator
- ASR
- TTS (Type of Player Resource)

### ■ Fax

# Groups



- "Virtual dynamically-configured media device"
- Consists of Resources and media streams
- Implied switching between Resources
- Target for all Resource commands
- Applications are independent of physical configuration of resources





# Group Configuration



- Resources allocated from shared pools
  - dedicated until released
- Statically configurable via Application Profile
- Dynamically configurable via application request
- Reconfiguration allows for resource sharing












# ECTF S.200 Protocol



- Operating-system independent, applicationlayer protocol complementing S.100 and M.100
- S.100 client AIA software can be developed independent of server vendors







# ECTF S.100 Media Services API



- ECTF Media Services "C" API and Framework
- Operating system independent
- Extensible support for new media services
- Multiple applications share locationindependent resources and calls
- Location-independent support for modular media resources

# ECTF S.410 JTAPI Media



- Java API for computer telephony media services
- Extension to core JTAPI (Optional Package)
- Based on ECTF Architecture and S.100
- Location independent resources



- Service provider Interface for CT resources
- Enables the mixing and matching of hardware and software resources within a given S.100based service platform



# For More Information



- S.100 R2 and S.200 specifications and the ECTF product directory can be found at: http://www.ectf.org
- JTAPI information at:

http://java.sun.com/products/jtapi/index.html

■ TAPI information at:

http://www.microsoft.com/communications/telephony.htm



Administrative Services Specifications

- System configuration
  - ► System customization
  - Moves / Adds / Changes
- Fault monitoring
- Accounting
- Performance management

■ Security

## ECTF Framework



- M.001 Administrative Services
  - Framework for system management
  - Roadmap for technical working groups



# ECTF M.100



- Management API for CT Services
- Supports management of:
  - ► configuration data
  - ► safe startup and shutdown of CT servers
  - service provider information
  - ► application profiles



## ECTF M.300



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### Service Provider Interface (SPI) corresponding to M.100

■ Allows management of S.300-based resources



# ECTF M.500



- SNMP Management Information Base (MIB) for computer telephony servers
- Defines information made available to SNMP monitoring tools



# ECTF Framework



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## A.001 Application Interoperability

- Framework for multiple applications to share calls and exchange call-related information
- Roadmap for technical working groups



# Application Interoperability



- A.100 Application Interoperability
  - Requirements for call handling, hand-off, and accepting calls in S.100 environments
- A.130 Shared Data Specification
  - Data types for application interoperability





# **Putting It All Together**





IVR Software

CT Server



















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CT Server Product Maturity Checklist

Published Protocols

■ Framework

- Reference Implementations
- Plug & Play Products

# Conclusions



# Call Control

- Universal framework has emerged
- Newest generation of APIs are/will be functionally rich
- CTI Plug & Play dependent upon adoption/completion of Versit/CSTA Phase III protocols

# Conclusions



- Media Services
  - ► ECTF framework is the focus
  - Availability is a function of vendor adoption

# Conclusions



# Admin

- M.100, M.300, M.500 are a solid suite for management and fault monitoring
- ► HTML/HTTP is a good bet for configuration interfaces
- Interfaces / protocols are still required for accounting (e.g., CDR)
- Watch for standard directory schemas for call control configuration (MAC, CoS, etc.)
## Conclusions



## Switching

- ► TDM backplanes are here to stay in one form or another
- ► H.100 and H.110 are the way to go for PCI and cPCI
- Support for both traditional and packet-based telephony networks



Q&A

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