Smart Client Offline Data Caching and Synchronization

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About Brian

• Principal Software Architect, IDesign Inc. (www.idesign.net)
• Microsoft MVP in ASP.NET
• Writing
  – Data Binding in Windows Forms 2.0, Addison-Wesley, expected release fall 2005
• Speaking
  – Microsoft TechEd US, Europe, Malaysia, SDC, Visual Studio Connections, DevTeach, VSLive!, INETA Speakers Bureau
• Participate in Microsoft design reviews
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Agenda

• What is a Smart Client?
• Offline Operations Challenges
• Data Communications Strategies
• Connection Management
• Client Side Data Caching and Synchronization
• Offline Application Block

What is a Smart Client

• Rich user interface (Windows Forms)
• Connects to back-end services
• Runs securely on the client
• Supports auto-deployment and update over the network
• Supports disconnected operations
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Offline Operations Challenges

• Offline use case identification
• Online communications transport
• Connection management
• Client-side caching approach
• Offline data synchronization
• Security
The Big Picture

Client

Data Cache

Communications Layer

Server

Business Layer

Communications Layer

Data Access Layer

Data Tier

Database

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Communications Strategies

• Database
• .NET Remoting
• Enterprise Services (COM+)
• MSMQ
• Web Services
• Indigo

Data Transfer Strategies

• Object-Oriented
  – Pass a Data Transfer Object via a method call or property
    • DataSet or custom business entity
• Service-Oriented
  – Invoke operation, passing or receiving parameters
  – Deliver message containing data
• Data-Oriented
  – Query execution / Replication / Queues
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Connection Management

• Detect and control online vs. offline operations
  – Modify UI / Functionality
• Detection techniques
  – Try connected operation – handle failure
  – WinInet API
  – Offline Block Connection Management
  – NetworkChange/NetworkInterface classes (.NET 2.0)
Demo: Connection Detection

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Client Data Caching

- Memory
- Saved Data Transfer Object
- Database
  - MSDE, SQL Express, SQL Mobile
- Message Queues
  - MSMQ
  - Database
    - Custom, SQL Service Broker
    - Enterprise Services

Data Synchronization

- Reference data vs. operational data
- Data oriented
  - Merge replication
- Service oriented
  - Remote method invocation
  - Message delivery
    - Confirmation return message
    - Poll for completion
Data Synchronization

- Concurrency resolution
  - ADO.NET detection / exception propagation
  - Distributed transactions
    - Enterprise Services
    - Indigo

Demo: Client Data Caching and Synchronization Options

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Offline Application Block

• Connection State Detection / Control
• Download / Upload Data
• Queued data requests
• Reference Data Caching
• Asynchronous request processing
• Encryption / signing of stored data
• Provider model for connection detection, data request queuing, data caching, service agents
Offline Application Block

Application

Connection Manager

Service Agent Manager

Data Loader Manager

Queue Manager

Executor

Online Proxy

Reference Data Cache

Cache Block

Application Code
Block Components
Block provides some components

Demo: Offline Application Block Client

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Summary

- Design for disconnected operations early
  - Identify offline use cases
  - Pick data communications technology
  - Select caching and synchronization mechanism
- Prefer decoupled, service oriented approaches for enterprise applications
- Simplest option: Isolated Storage caching of DataSets passed through Web Services
- Explore the Offline Application Block for maximum flexibility

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Resources

COM and .NET Component Services, Juval Lowy, O’Reilly & Assoc:
http://www.oreilly.com/catalog/comdotnetsvs/

Smart Client Architecture and Design Guide:

Smart Client Offline Application Block:

SQL Express: http://msdn.microsoft.com/express/sql/