UNITE 2007 Technology Conference

Some Considerations for MCP Applications using Web Services

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Session MCP4027
1:30pm – 2:30pm
Monday, September 10, 2007

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MGS, Inc.

- Software Engineering, Product Development & Professional Services firm founded in 1986
- We provide products and services to solve business problems:
  - Software Engineering Services
  - Professional Services
    - Management Support Services
    - Consulting and Technical Services
    - Application Development Services
  - Product Development
    - Performance/Capacity Management
    - Web Services
    - MCP Client Access

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Web Services

- In this presentation you will learn about …
  - The “Vision” and the “Reality”
  - Services Oriented Architecture
  - The “Business Case”
  - General Web Service Technology
  - “MCP” Implementations
  - “Resiliency” Issues
  - Performance Considerations
  - Security Considerations

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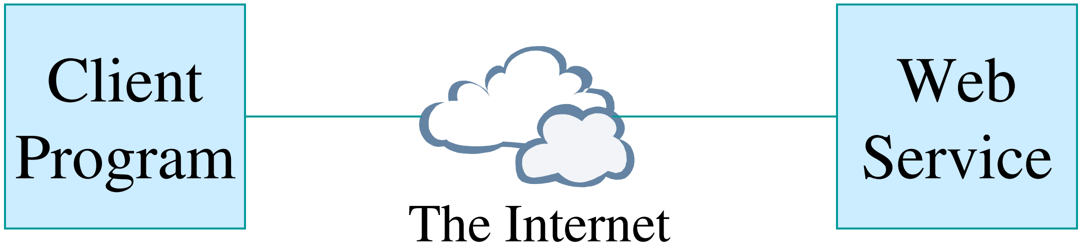
Web Services – The Vision

- Goal
  - Make Internet program-to-program exchanges as easy as browsing the Web



Web Services – The Vision

- Internet based
- Universal directory
  (like TCP/IP host name services)
- “Loose Coupling” between service provider and service consumer
  - Anonymous client
  - Service discovery
  - Flexible data content
  - asynchronous
- Charge per service
- Create a world-wide fabric of computing services (and commerce)

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Web Services – The Reality

- Mission critical applications cannot depend on:
  - the Internet
  - “vended” services
  - the hope that someone is vending needed services
  - the hope that “vended” services operate exactly as the business requires
- Business interfaces do not benefit from:
  - Dynamic service discovery
  - Data flexibility

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Web Services – The Reality

- However, the Web Services concept contains extremely powerful elements:
  - Simple, well-defined, standards-based interface
  - Technology independent implementation
  - Each set of services has a description file
  - Integrated directory of service descriptions and documentation

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Services Oriented Architecture

- Services Oriented Architecture (SOA)
  - Componentize new Enterprise business functions
  - Encapsulate existing business functions for easier access
  - IT Functionality now available as a set of objects that can be mixed and matched as needed
  - Application development done by architecting service consumers
  - Avoids tying a user to a specific application implementation
  - Avoids tying data to a specific application implementation

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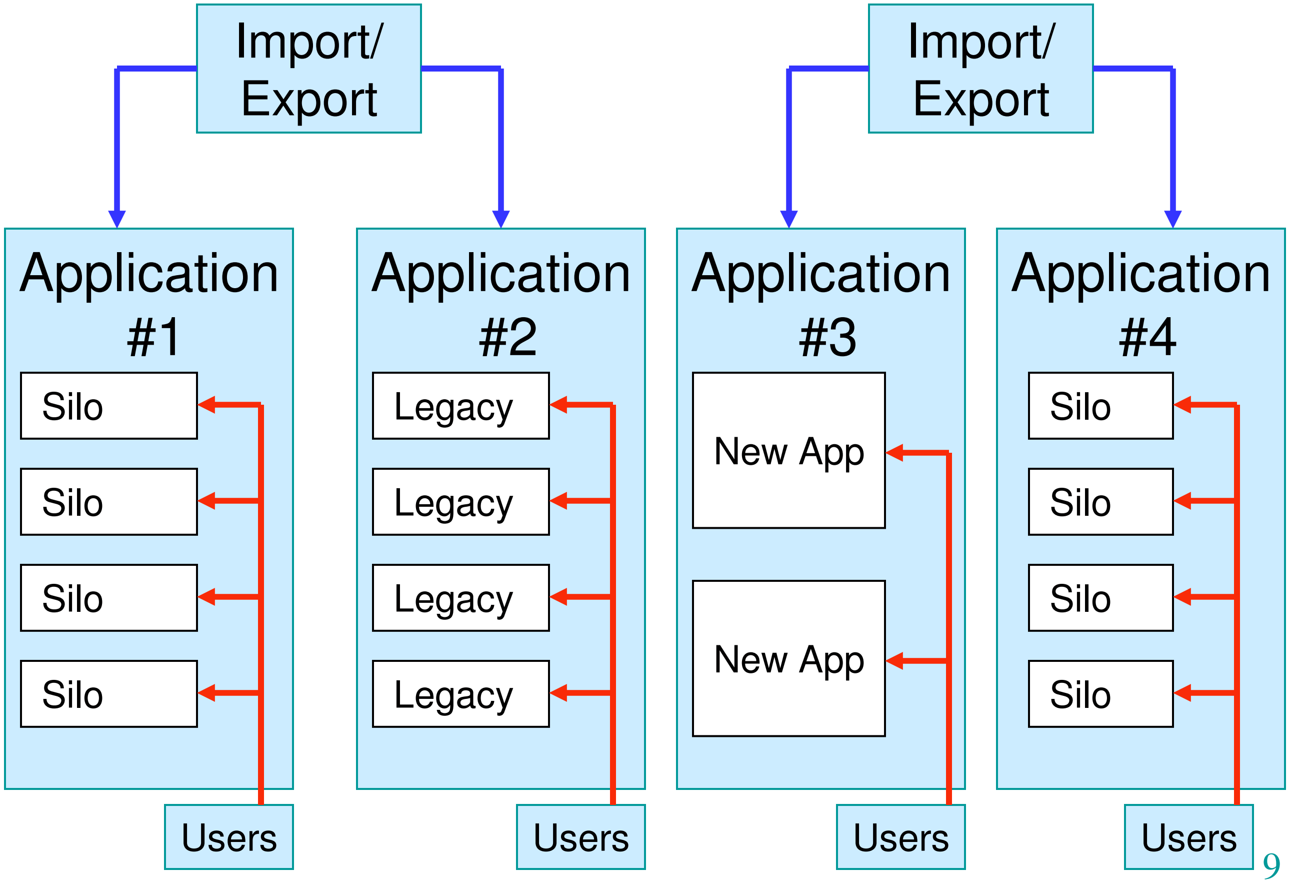
Traditional Architecture



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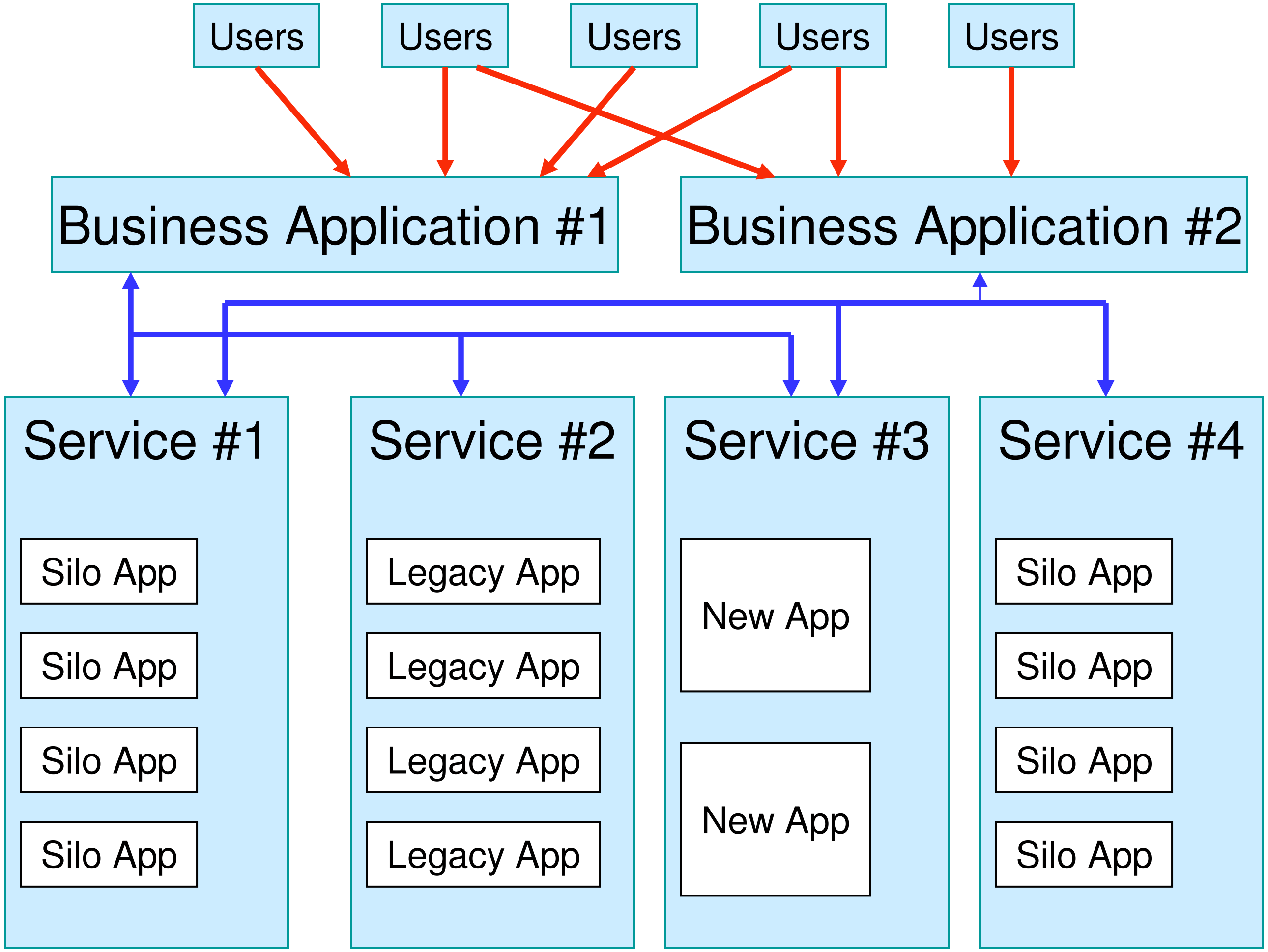
Services Oriented Architecture



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Web Services- Business Case

- Provides SOA building blocks
- Simpler and more flexible then "open" transaction protocols
  - **EDI – Electronic Data Interchange**
  - **DTP – Distributed Transaction Processing (OLTP)**
- Not technology dependent
  - **RPC – Remote Procedure Calls**
  - **DCOM – Distributed Component Object Model**
  - **RMI – Remote Method Invocation**
  - **CORBA – Common Object Request Broker Architecture**

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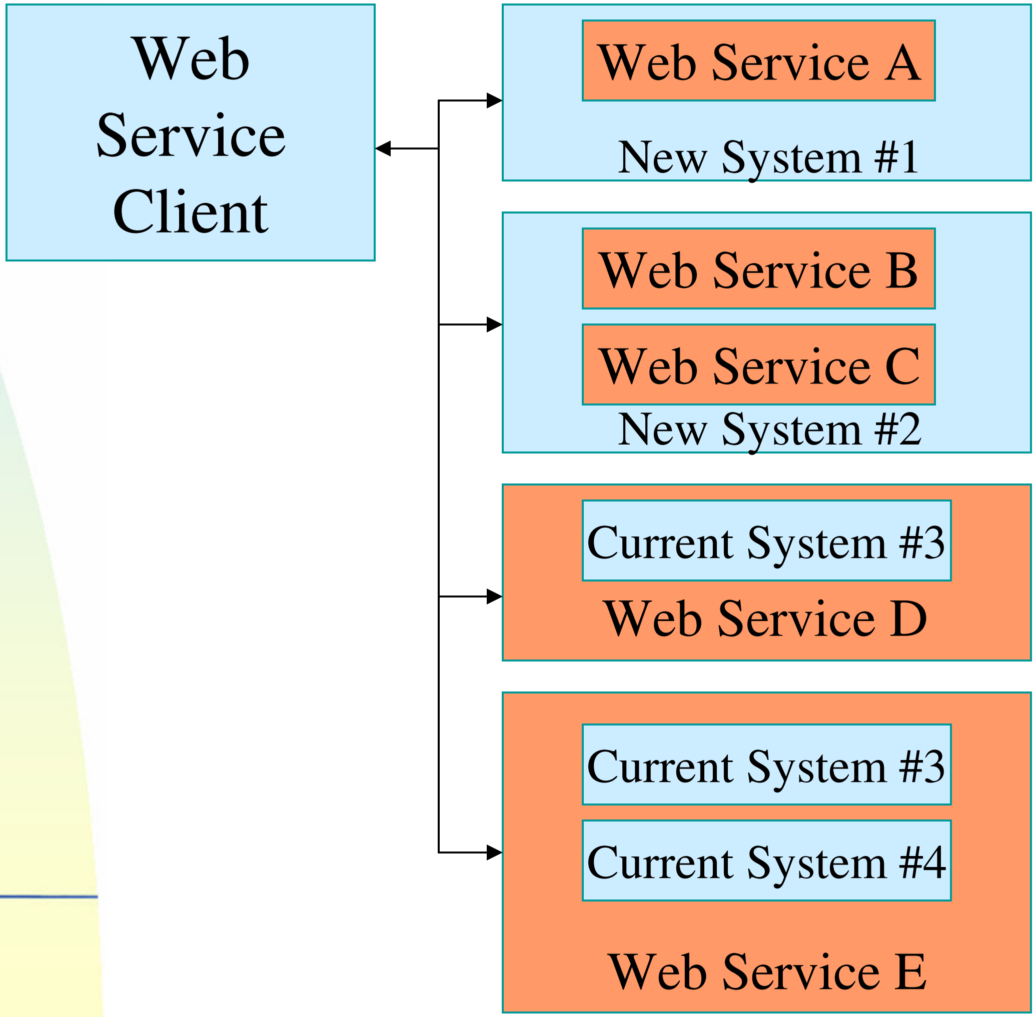
Web Services- Business Case



New Business Components

Encapsulated Existing Solutions

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Web Services- Business Case

- Built on proven Internet communications standards
  - **HTTP – HyperText Transfer Protocol**
  - **SOAP protocol**
  - **XML – eXtensible Markup Language**

- Includes service description and service directory
  - **WSDL – Web Services Description Language**
  - **UDDI – Universal Description, Discovery and Integration**

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Web Services- Business Case

- Supported by software IDEs
  - Discovery of service
  - Automatic creation of Web Services client objects
  - Web Services Server object support
    - WSDL generation
    - UDDI update
    - Server program

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Web Services- Business Case

- Supported by software IDEs
  - Included as part of the application framework
    - Microsoft .NET
    - Sun Microsystems J2EE
    - Unisys EAE (AB Suite)
  - Support for MCP 3GL Applications
    - MGS-Web
    - Unisys ePortal
    - SBG Web Services Gateway

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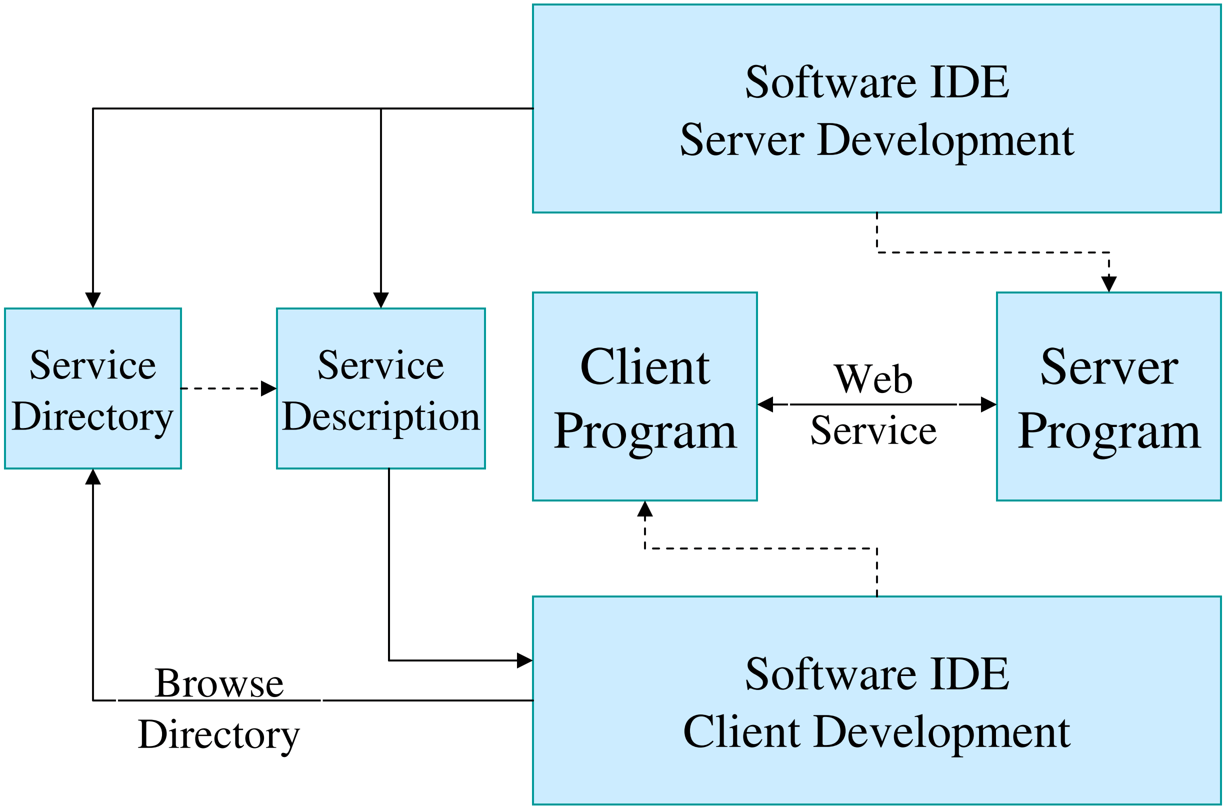
Web Services- Business Case



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Web Services- Business Case

- Abstracts out business functionality
  - Creates machine (technology) independent functionality
  - Indirect reference to service
  - Trivial to re-locate the business function or functions
  - Improved scalability
  - Improved ability to re-host

Web Services- Business Case

- Leverage existing business functionality
  - Rewrites are expensive
  - Redesigns are even more expensive
  - Placing a Web Services envelope around existing functionality is relatively inexpensive
  - Preserves investment in known, reliable business solutions

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Web Services - Technology

- Development components:
  - Business function (application)
  - Web Service definition (WSDL)
  - Web Service directory (UDDI)
  - Web Service enabled IDE
    - UDDI browser
    - Create client objects from WSDL
    - Create Web Services servers

- Runtime components
  - Client application program
  - HTTP or HTTPS Server
  - SOAP envelope
  - XML data request/response
  - Server application program

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Web Services- Technology

- Directory contains Web Service description and documentation
  - **UDDI** – Universal Description, Discovery and Integration
  - **WSDL** – Web Services Description Language
- UDDI specifies location of the Web Service description
  - For use with HTTP
  - Includes web server host name
  - Includes WSDL name

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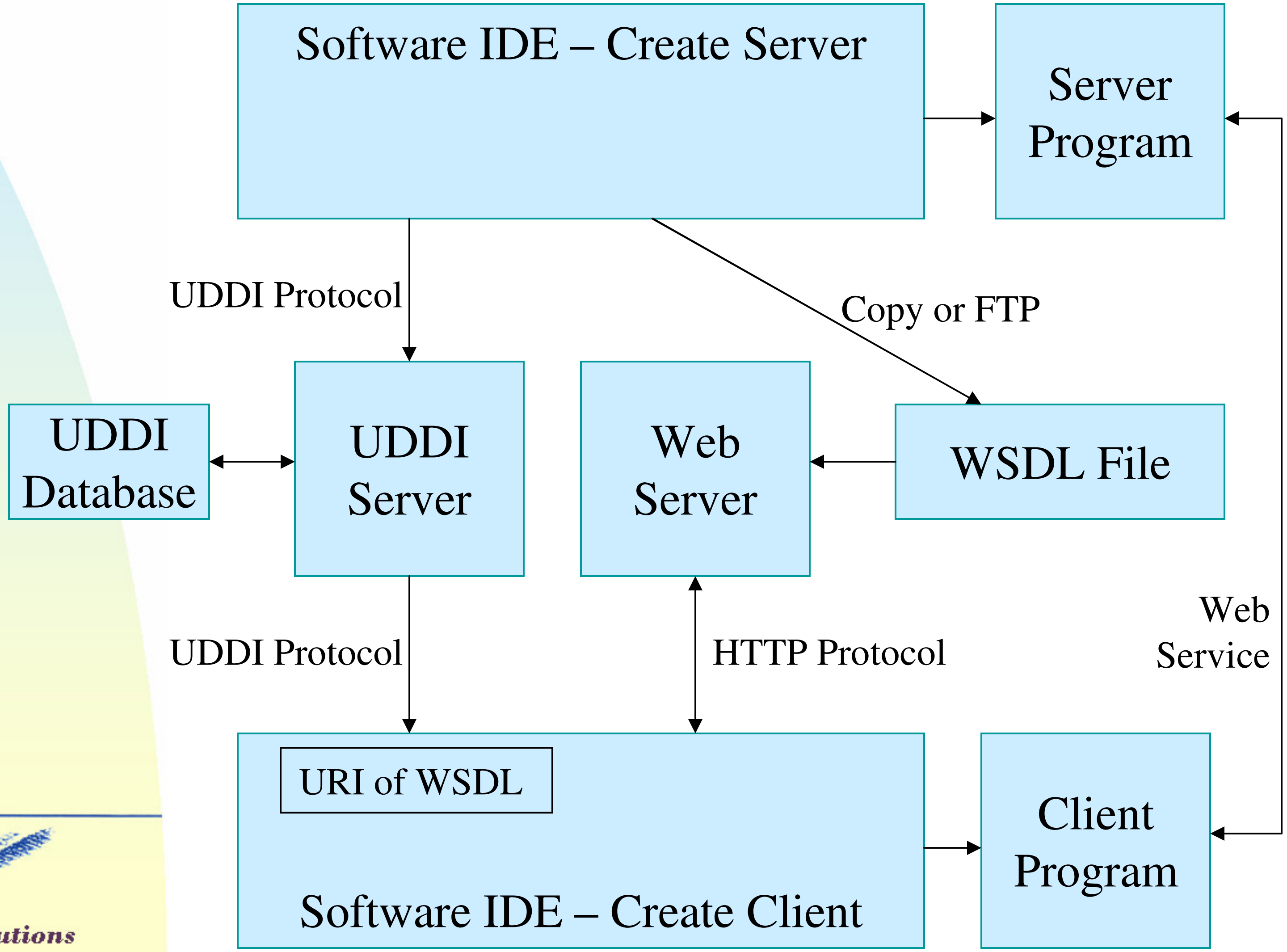
Web Services- Technology



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Web Services- Technology

WSDL File Excerpt:

```
<message name="WSTEST_SCRN01">
  <part name="Trancode" type="xsd:string" />
  <part name="Input_data" type="xsd:string" />
</message>
<message name="WSTEST_SCRN01Response">
  <part name="Trancode" type="xsd:string" />
  <part name="Input_data" type="xsd:string" />
  <part name="statusLine" type="xsd:string" />
</message>

<service name="COMSWebServices">
  <documentation>Access COMS applications via Web Services
  </documentation>
    <port name="WSTEST" binding="wsdl:WSTESTHttpBinding">
    <soap:address location="http://laptop1mcp/COMSWebServices/" />
    </port>
</service>
```

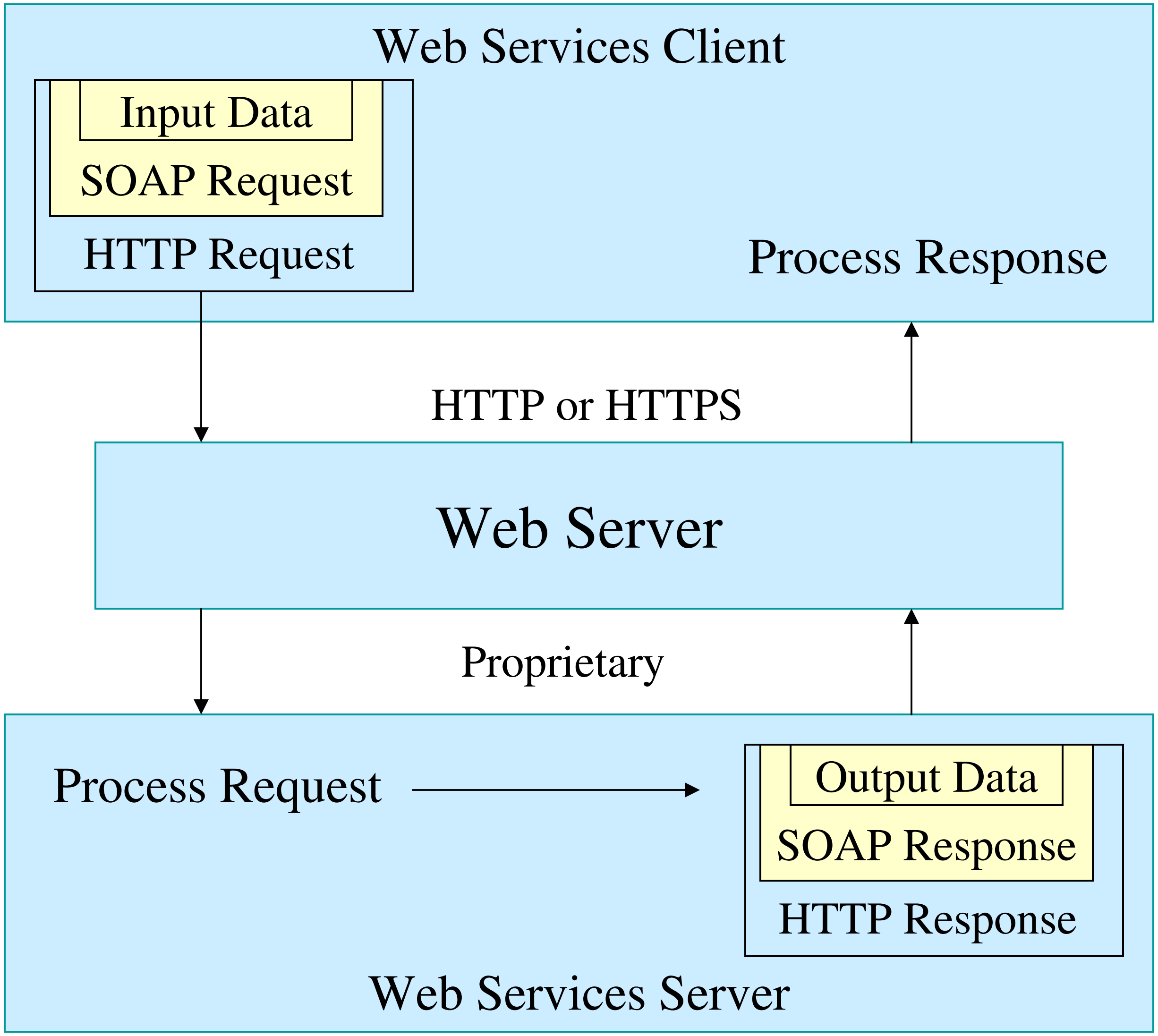
Web Services – Technology

- Web Services is built on Internet communications standards
  - **HTTP** – HyperText Transfer Protocol
  - **SOAP protocol**
  - **XML** – eXtensible Markup Language

- Web service is addressed with the server's URI obtained from the WSDL

Web Services – Technology

Indicates XML Encoding



Web Services Client

Input Data

SOAP Request

HTTP Request

Process Response

HTTP or HTTPS

Web Server

Proprietary

Process Request

Output Data

SOAP Response

HTTP Response

Web Services Server

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Web Services – Technology

SOAP Request:

```
<soap:Envelope>
   <soap:Body>
     <tns:WSTEST_SCRN01>
       <Trancode>SCRN01</Trancode>
       <InputData>lower case letters</InputData>
     </tns:WSTEST_SCRN01>
   </soap:Body>
 </soap:Envelope>
```

SOAP Response:

```
<soap:Envelope>
   <soap:Body>
     <tns:WSTEST_SCRN01Response>
       <Trancode>SCRN01</Trancode>
       <InputData>LOWER CASE LETTERS</InputData>
       <statusLine />
     </tns:WSTEST_SCRN01Response>
   </soap:Body>
 </soap:Envelope>
```

Web Services - MCP

- MCP Web Services Server
  - Allow MCP functionality to be easily accessed from the rest of the Enterprise
  - Can be done with minimal/no MCP code changes
  - Extends value of corporate investment in MCP environment
  - Allows MCP functionality to migrate to an Service Oriented Architecture (SOA)
- MCP Web Services Client
  - Web Services Client interface allows MCP environment to use existing Enterprise SOA functionality

Web Services - MCP

- 3GL Support
  - Wintel Gateway Server (ePortal, SBG)
  - MCP Based Client & Server (MGSWeb)
- EAE (AB Suite) Integration
  - Both Web Services Server and Client
  - Uses Wintel Gateway

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Web Services Server - MCP

- MCP Apps as Web Services
  - Requires some form of wrapper around the MCP functionality
  - Wrapper allows Web Service request to be routed to/from MCP application
  - Non-proprietary Connection to MCP applications via COMS
    - COMS Station
    - TP-to-TP (may require small TP change)
  - Proprietary Connections to applications
    - Library
    - Port File
    - TCP/IP Port
    - RATL (EAE)

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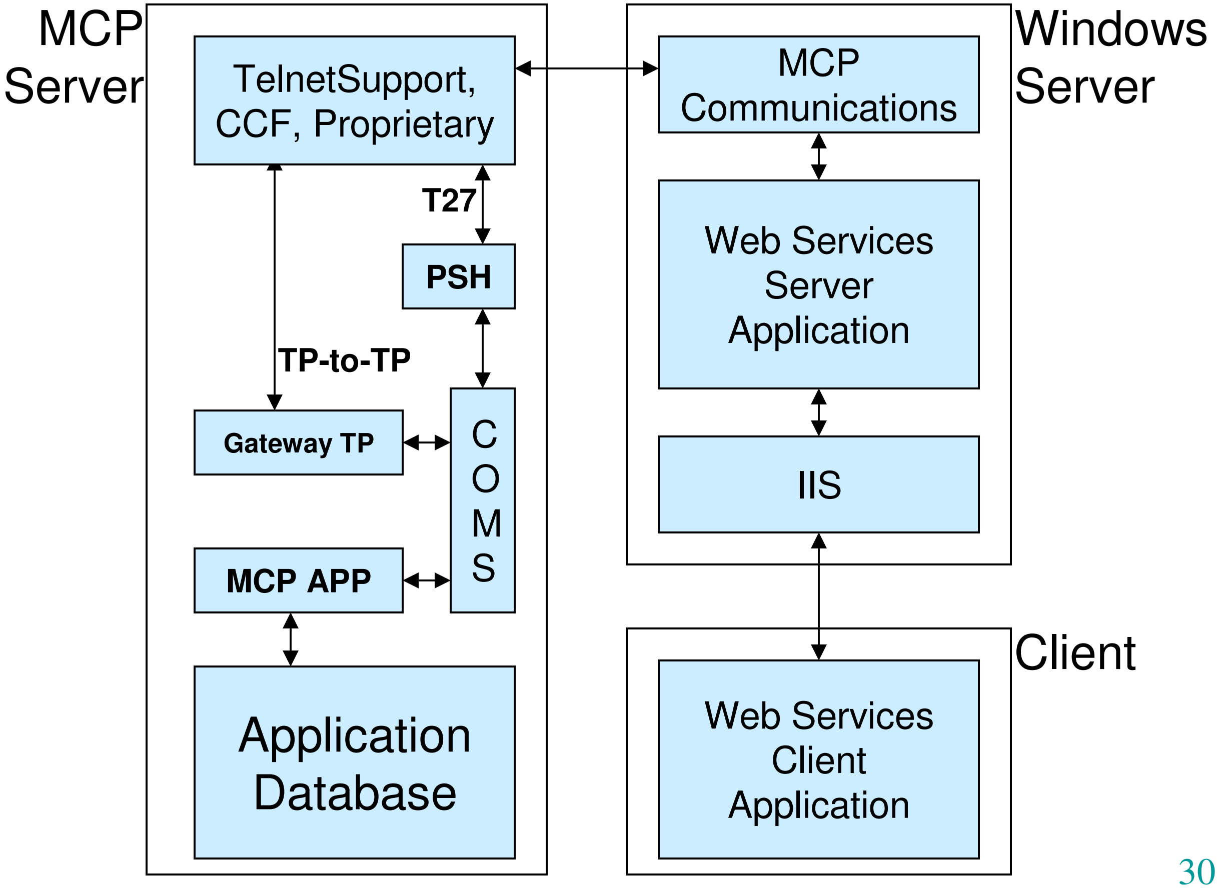
Web Services Server - MCP

- Web Services Server via a Wintel Gateway
  - Intel hardware
  - Windows OS, IIS
  - Web Services using .NET (most cases)
  - Backend Module to Communicate to MCP

- Gateway to MCP Communications
  - Telnet Terminal Emulation
  - CCF Terminal Emulation
  - Proprietary TCP/IP port/protocol

Web Services Server - MCP

- Web Services Server via a Wintel Gateway



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Web Services Server - MCP

- MCP Based Web Service
  - Web Service Server runs under MCP control
  - Routes to MCP App via COMS station or COMS TP-to-TP
  - T27 interface (COMS station) requires no existing code changes
  - TP-to-TP is more efficient (no screen scraping) and allows for larger data interchange

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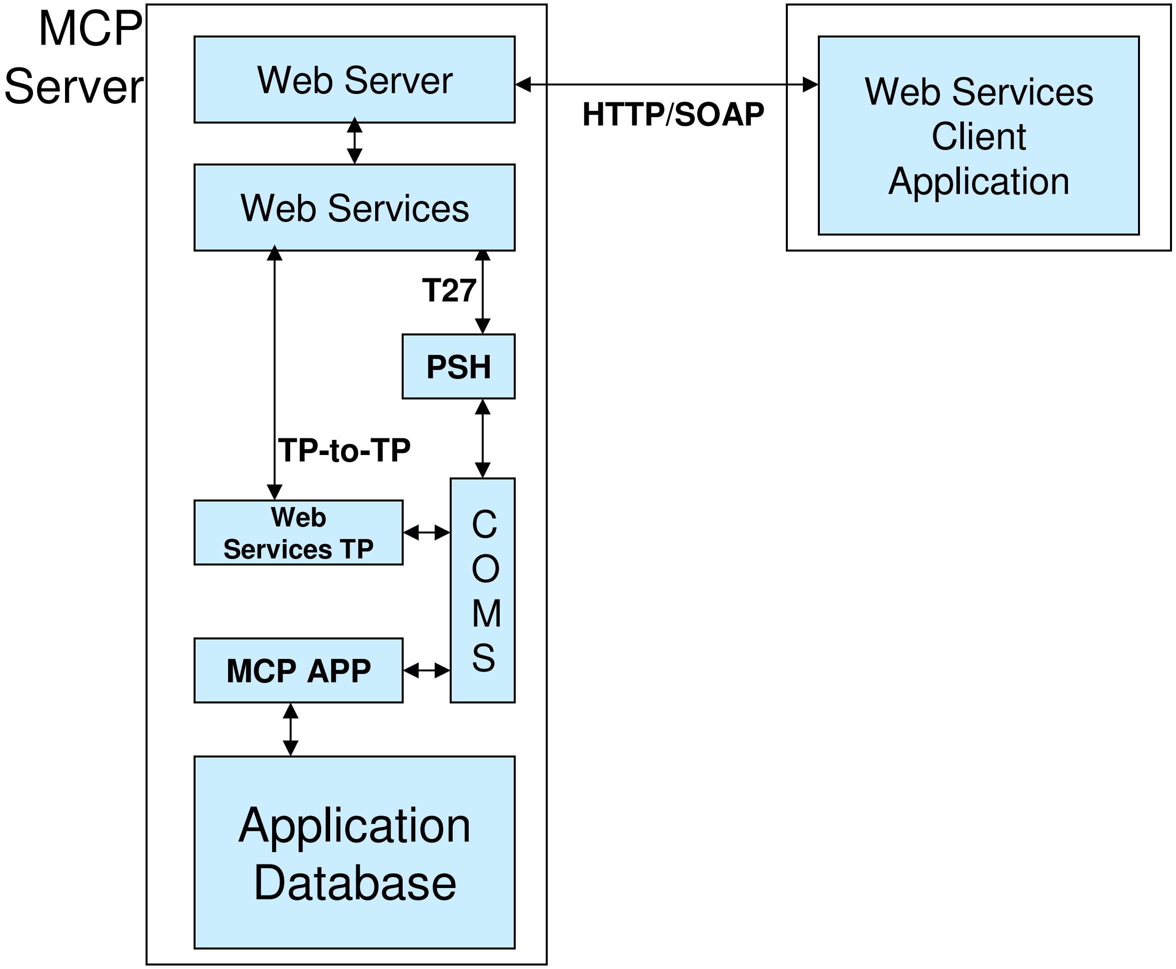
Web Services Server - MCP

- MCP Based Web Service



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Web Services Client - MCP

- MCP Based WS Client
  - Allows MCP applications to make a Web Services call on another server
  - Supported by EAE and MGSWeb
  - MCP Application does a simple library call to make the outbound WS Client call

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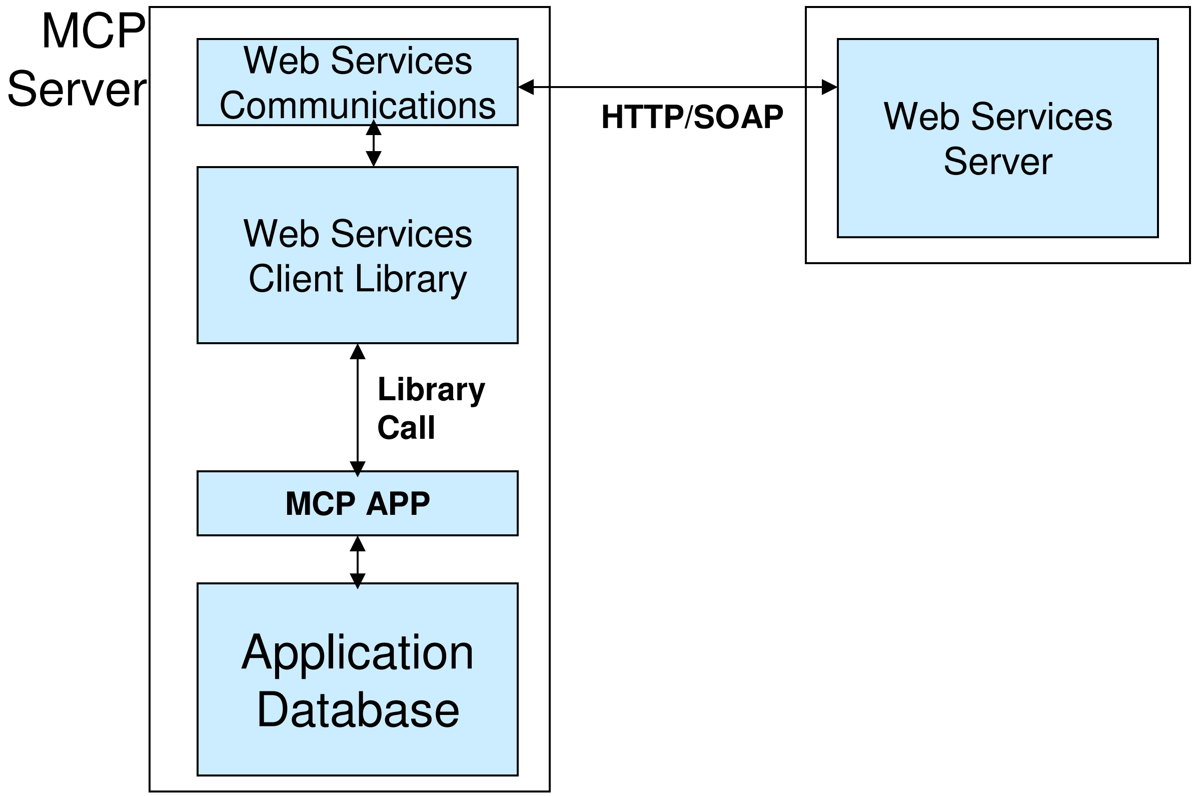
Web Services Client - MCP

- MCP Based WS Client



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Considerations - Data

- Re-Use of Existing Logic
  - 80x24 screens are good for proof-of-concept web services requiring no code changes
  - 80x24 screen transactions may not contain enough information for production purposes
  - Custom code, based on existing TP logic, seems the most common path

Considerations – Test/Failover

- Test vs Production
  - Preference is to move ALL test WS Server/Client code and config to production environment
  - Preference to have WS Client select Test vs Prod by setting the server URL
- Failover
  - Switch to backup or DR system with networking changes

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Considerations - Connections

- Persistent Connections
  - MCP TCP/IP connect/disconnect slows throughput
  - On close, TCP/IP port must “time wait” for TTL*2 seconds on most systems
  - Most servers default to persistent HTTP connections
    - Connection:Keepalive
  - Client then controls persistence
  - Persistence provides a 4 to 50 times throughput increase

Considerations - Connections

- Non-Persistent Connection

Client Connect --------------->
<--------------- Server Accept

SOAP Request --------------->
<--------------- SOAP Response

Client Disconnect --------------->

Client Connect --------------->
<--------------- Server Accept

SOAP Request --------------->
<--------------- SOAP Response

Client Disconnect --------------->

Considerations - Connections

- Persistent Connection

Client Connect	--------------->	
	<---------------	Server Accept
SOAP Request	--------------->	
	<---------------	SOAP Response
SOAP Request	--------------->	
	<---------------	SOAP Response
SOAP Request	--------------->	
	<---------------	SOAP Response
Client Disconnect	--------------->	

Considerations - Connections

- Pipelining
  - Requires a persistent connection
  - Multiple requests are sent without waiting for responses
  - Responses return in send-order
  - Most web servers (including ATLAS) support this
  - Use controlled by whether WS Client application is coded to take advantage of this

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Considerations - Connections

- Piplining

Client Connect	--------------->	
	<---------------	Server Accept
SOAP Request	--------------->	
SOAP Request	--------------->	
SOAP Request	--------------->	
	<---------------	SOAP Response
	<---------------	SOAP Response
	<---------------	SOAP Response
Client Disconnect	--------------->	

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Considerations - Security

- Different types
  - SSL
  - HTTP Logon
  - SOAP Headers
  - Actual WS call to logon
  - WS-Security

Considerations - Security

- Secure Socket Layer (SSL)
  - Done underneath Web Service
  - SSL – Authenticates server
    - Get certificate from Server
    - Validate certificate from a Trusted Certificate Authority
  - Two way SSL
    - Client Authenticates server
    - Server Authenticates client
  - Encryption, provided by the certificate keys, is transparent to application
  - Application must get/supply authentication info through an external interface

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Considerations - Security

- HTTP Logon
  - Logon required for a specific virtual directory
  - Uses HTTP AUTHORIZATION header
  - BASIC uses a Base64 exchange so SSL is required for secure communications
  - DIGEST uses MD5 encrypted exchange
  - No data encryption, can use with SSL
  - Application must get/supply authentication info through an external interface

Considerations - Security

- SOAP Headers
  - One must pre-acquire authentication information
  - The SOAP message can contain both a HEADER section as well as a body
  - Authentication information is provided as in SOAP HEADER fields
  - SSL is still needed to encrypt HEADERs
  - Application must supply authentication info using special code

Considerations - Security

- SOAP Headers

```
<Envelope>
  <Header>
    <NASAHeader xmlns="service.nasa.gov">
      <MessageData>
        <MessageID>568425287</MessageID>
      </MessageData>
      <AccessTicket>n)EvgLK^Cb#3TX@ApE^sdiZH4bJ
        )nNX.K+,Qy[oeqe0O-59`G-</AccessTicket>
      <UserAuthorization>
        <UserName>MS0281331</UserName>
      </UserAuthorization>
    </NASAHeader>
  </Header>
  <Body>
     ..... SOAP body …..
  </Body>
</Envelope>
```

Considerations - Security

- WS Call to Logon
  - One must pre-acquire authentication information (usercode/password)
  - An initial web services call is made for authentication
  - The response contains a token to be placed in the body of all subsequent web services calls
  - Application must be “token” aware
  - SSL is still needed to encrypt dialogs

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Considerations - Security

- WS Call to Logon

Client Connect	--------------->	
	<---------------	Server Accept
Logon Request	--------------->	
	<---------------	Logon Response (token)
SOAP Request (token)	--------------->	
	<---------------	SOAP Response
SOAP Request (token)	--------------->	
	<---------------	SOAP Response
SOAP Request (token)	--------------->	
	<---------------	SOAP Response
Client Disconnect	--------------->	

Considerations - Security

- WS-Security (WSS)
  - Originally developed by IBM, Microsoft, VeriSign and Forum Systems
  - Attach signature and encryption headers to SOAP messages
  - Provides end-to-end integrity for each message
  - Protocol uses SAML, Kerberos and x.509 certificates
  - Requires application awareness

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Reference Material

- **WC3 Web Services Architecture Requirements**
  http://www.w3.org/TR/wsa-reqs/
- **WC3 Web Services Description Requirements**
  http://www.w3.org/TR/ws-desc-reqs/
- **Web-Enablement: Setting the Foundation for Web Services, eCommunity Presentation October 10, 2002**
  Wayne Kernochan, Aberdeen Group
- **Web Services and the Microsoft Platform,**
  Payam Shodjai, Microsoft Corporation
  http://msdn2.microsoft.com/en-us/library/aa480728.aspx

Additional Questions?

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