



AGENCY INTEGRATION DESIGN SPECIFICATIONS

Systems Integration

Version 1.0

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*This report is confidential and intended solely for the use and
information of the client to whom it is addressed.*

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Record of Changes

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1. Introduction

Grantee-organizations are often faced with overwhelming challenges when applying for federal government grants, regardless of which agency they address. Various program requirements and administrative differences necessitate the constant updating of procedures, and disparate data standards and business processes require redundant data entry, often resulting in inaccurate application submissions. Twenty-six agencies with approximately 900 programs collect grant information. However, the grant information is typically not shared among the programs, the grantee is often left with a time-consuming follow-up through a multitude of databases, web sites, and telephone calls.

The Grants.gov initiative aims to produce a simple, unified “Storefront” for all customers of Federal grants to electronically find opportunities, apply, and manage grants, as well as facilitate the quality, coordination, effectiveness, and efficiency of operations for grant makers and grant recipients.

The four primary goals of the Grants.gov initiative defined by consensus among the grant-making agencies include:

1. Eliminate the burden of redundant or disparate electronic and paper-based data collection requirements.
2. Define and implement simplified standard processes and standard data definitions for Federal grant customer interactions.
3. Protect the confidentiality, availability, and integrity of data.
4. Standardize the collection of financial and progress report data in support of audit and performance measurement activities.

Implementing the Grants.gov Storefront is only a part of the process of deploying an effective government-wide grants application system. Other significant challenges in ensuring system success involve supporting individuals and organizations at each end of Grants.gov’s external interfaces – the applicants and grant-making agencies. Grants.gov must be adopted and used by these stakeholders if the system is to be successful.

1.1 Purpose

The Agency Integration Design Specifications is a key component in the adoption and use of the Grants.gov system by grant-making agencies. Its primary purpose is to provide detail design specifications for system-to-system integration so that grant-making agencies can develop and adapt their back office systems based on given standards and systems requirements. It provides agency IT personnel detail technical information needed to interface with Grants.gov.

1.2 Scope

The Grants.gov Agency Integration Design Specifications describes all of the interfaces between the Grants.gov “Front Office” operations and an agency’s “Back Office” operations; i.e., the interfaces between the grantee-facing and agency-facing aspects of the grant lifecycle. The following figure represents a general, two-sided view of the grant lifecycle that identifies some of the more common parts of the lifecycle that are grantee-facing (“Front Office”) as well as those that are solely internal agency processes (“Back Office”):

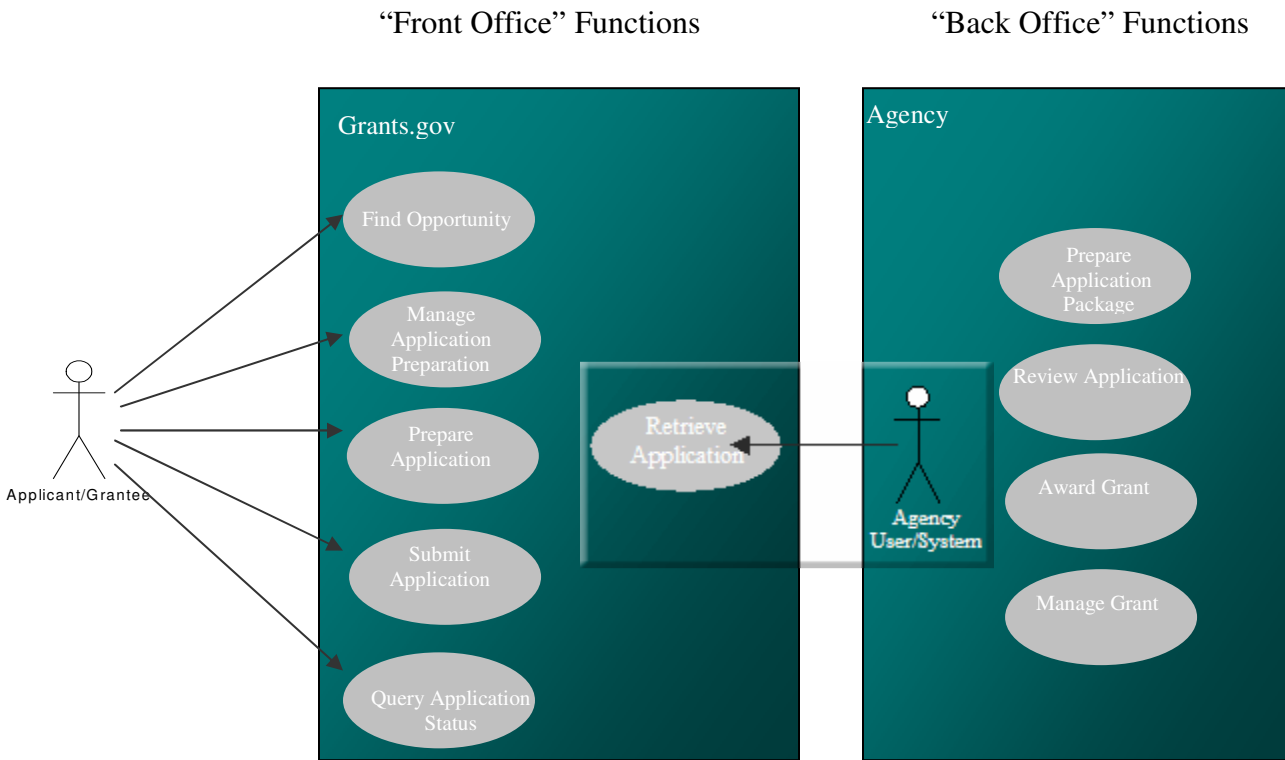


Figure 1-1. Grant Lifecycle View

This design document will focus primarily on the Application Retrieval options available to agencies via the Agency Integration interfaces once an applicant has successfully submitted (filed) an application. It will also describe the one-stop set of interfaces where emerging e-business technologies and best practices are used to give agencies access to grantee applications gathered in a full service manner. The Agency Integration interfaces will be the single point of entry for agencies, offering both application data retrieval and secure e-business transaction processing.

1.3 Format of This Document

The Agency Integration Design Specifications is a document that provides specific technical requirements and standards in which Grants.gov has adopted for System-to-System integration with grant making agencies. The agencies can utilize these detail specifications to enhance their existing grants management systems or develop new components in order to use the technology.

This document contains the following sections:

- Section 2** Summarizes Grants.gov and Agency interface mechanisms, Web Services Description Language, system-to-system conversation exchange, SOAP message structure, and Web Services error handling.
- Section 3** Describes web services security and system-to-system-authentication.
- Section 4** Presents the Acronyms used in this document, and
- Appendix A** Provides a detail listing of Agency Integration WSDL.

2. Summary of Grants.gov Interface Mechanism

This section describes two proposed solutions to the question of how agencies electronically interface with Grants.gov:

- Grants.gov to Agency integration via system-to-system interfaces, and
- Grants.gov to Agency integration via system-to-person interfaces.

Applicants can interact with Grants.gov via person-to-system or system-to-system interfaces. These are referred to as *inbound* interfaces. Similarly, Grants.gov can interact with the agencies in two ways, system-to-system or system-to-person interfaces. These are referred to as *outbound* interfaces.

A Person-to-System *inbound* interface is basically a set of Grants.gov provided Graphical User Interface (GUI's) through which an applicant can download a grant application, complete it, and submit (file) it to Grants.gov. Similarly, a System-to-Person *outbound* interface is basically a set of Grants.gov provided Graphical User Interfaces (GUI's) through which an agency user can pull (download) the submitted application in a PDF or PureEdge format with any related attachments in their native format. Details of these interfaces have been provided in the Agency Integration Toolkit Document.

There are two options under the system-to-system *inbound* and *outbound* interfaces. The first option provides SOAP Client to Web Services exchange (inbound), and Web Services to SOAP Client exchange (outbound). The second option provides Web Services to Web Services exchange (inbound and outbound). Since the Grants.gov system will provide Web Services, (as opposed to just implementing a SOAP Client) any interfacing organization (applicant or agency) can use either of the above options to integrate with Grants.gov.

If an Agency uses a SOAP Client, no exchange of messages will occur until a request is initiated from the Agency (client). In the case of Web Services to Web Services interaction, both Grants.gov and Agency systems will be running and both can request and respond to messages. In either of these cases, once the message exchange “hand shake” is established, the transfer protocol and transfer of SOAP messages occurs in the same manner. Figure 2-1 below provides a high level visual of the Grants.gov interfaces.

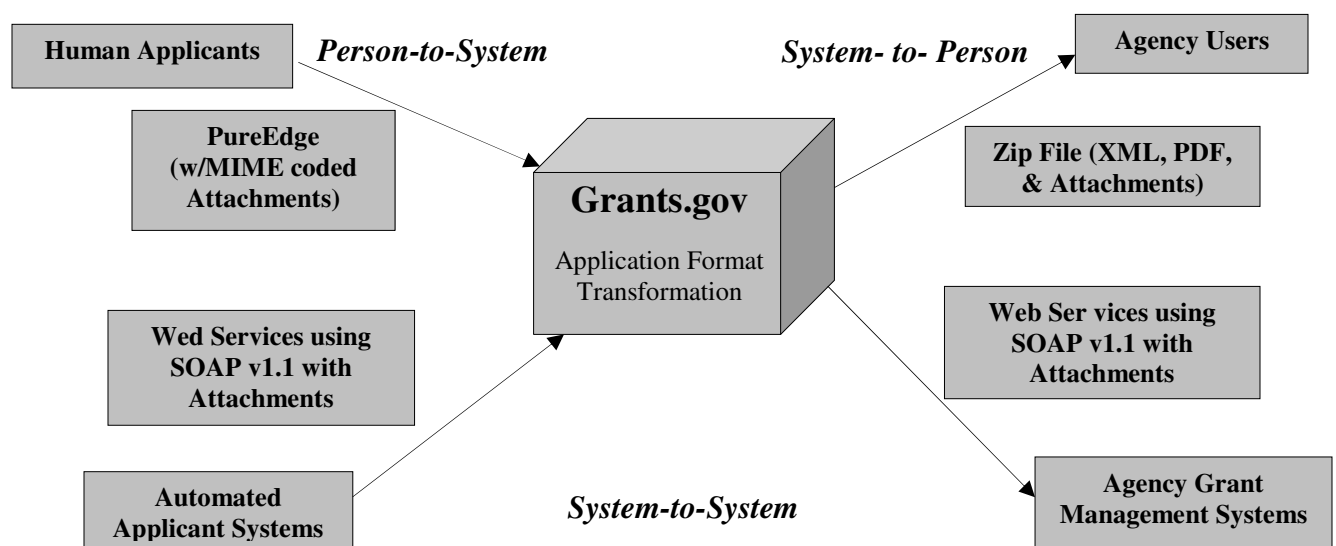


Figure 2-1. Grants.gov Interfaces

The following sections discuss detail system specifications for the system-to-system interface.

2.1 System-to-System Integration Details

For the *outbound* system-to-system interfaces, Grants.gov-to-agency integration will be achieved via a message exchange that utilizes XML Web Services using SOAP v1.1 with Attachments and HTTP with Secure Socket Layer (SSL).

Two versions of the message exchange model are being proposed: a *client-server* relationship (polling) model, and a *peer-to-peer* relationship model. In both solutions the manner in which web services are implemented within Grants.gov does not change. The differences arise in the sequence of transactions and the degree of automation implemented by a given Agency.

In the Client-Server model, agencies *will not* implement their own web services. Instead, agencies will simply implement SOAP clients that invoke the Grants.gov web services. In this usage of the exchange model, a *client-server* relationship has been established between an Agency and the Grants.gov systems, respectively.

In the Peer-to-Peer model, agencies *will* implement not only SOAP clients, but also web services that the Grants.gov system can invoke to notify the agency that new applications/submissions are available for download. In this usage of the exchange model, a *peer-to-peer* relationship has been established between an Agency and the Grants.gov system.

The implications of each of the two uses of the exchange model is further detailed below.

2.1.1 Client-Server Relationship (Polling) Model

In this model, the agency has *not* implemented any Web Services that the Grants.gov system can invoke. The implication is that an agency SOAP client always initiates the communication exchange with Grants.gov web services, and only the Grants.gov web services will be up and running at all times (or within certain predetermined hours of the day), listening for agency requests.

2.1.2 Peer-to-Peer Relationship Model

In this model, both the agency and Grants.gov will implement web services that can be invoked by either partner. The implication is that both Grants.gov and agency web services will need to be up and running at all times (or within certain predetermined hours of the day), listening for messages. Also, either Grants.gov or the agency system may initiate a message exchange. Figure 2-2 shows an example of a web service and a client invoking in two different ways. Each invocation consists of a request and a response message.

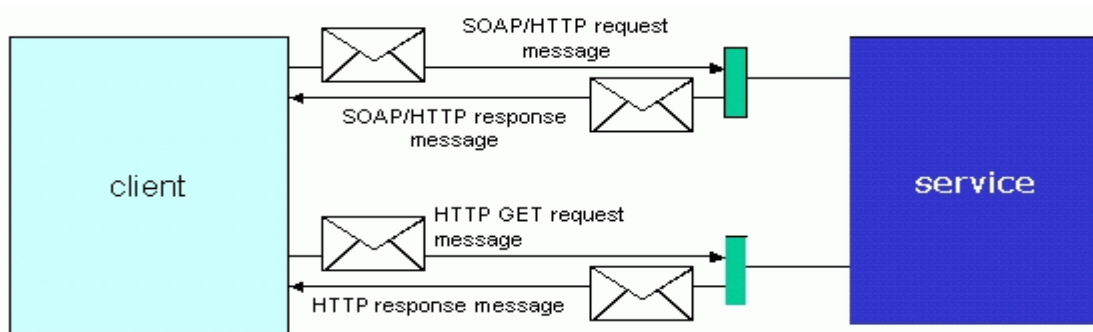


Figure 2-2. Peer-Peer Model

2.1.3 Message Interaction Pattern

Since all agencies may not choose to implement their own web services, any system-to-system message exchange between Grants.gov and agency systems will be conducted (at least initially) using an *asynchronous request/response interaction pattern*. A connection will be established directly to the ultimate recipient (Agency) instead of using a provider that would store (queue) and forward messages until they can be delivered.

2.1.4 Grants.gov-Agency Interface "Conversation"

The following depicts a typical request/response "conversation" between an Agency System and Grants.gov:

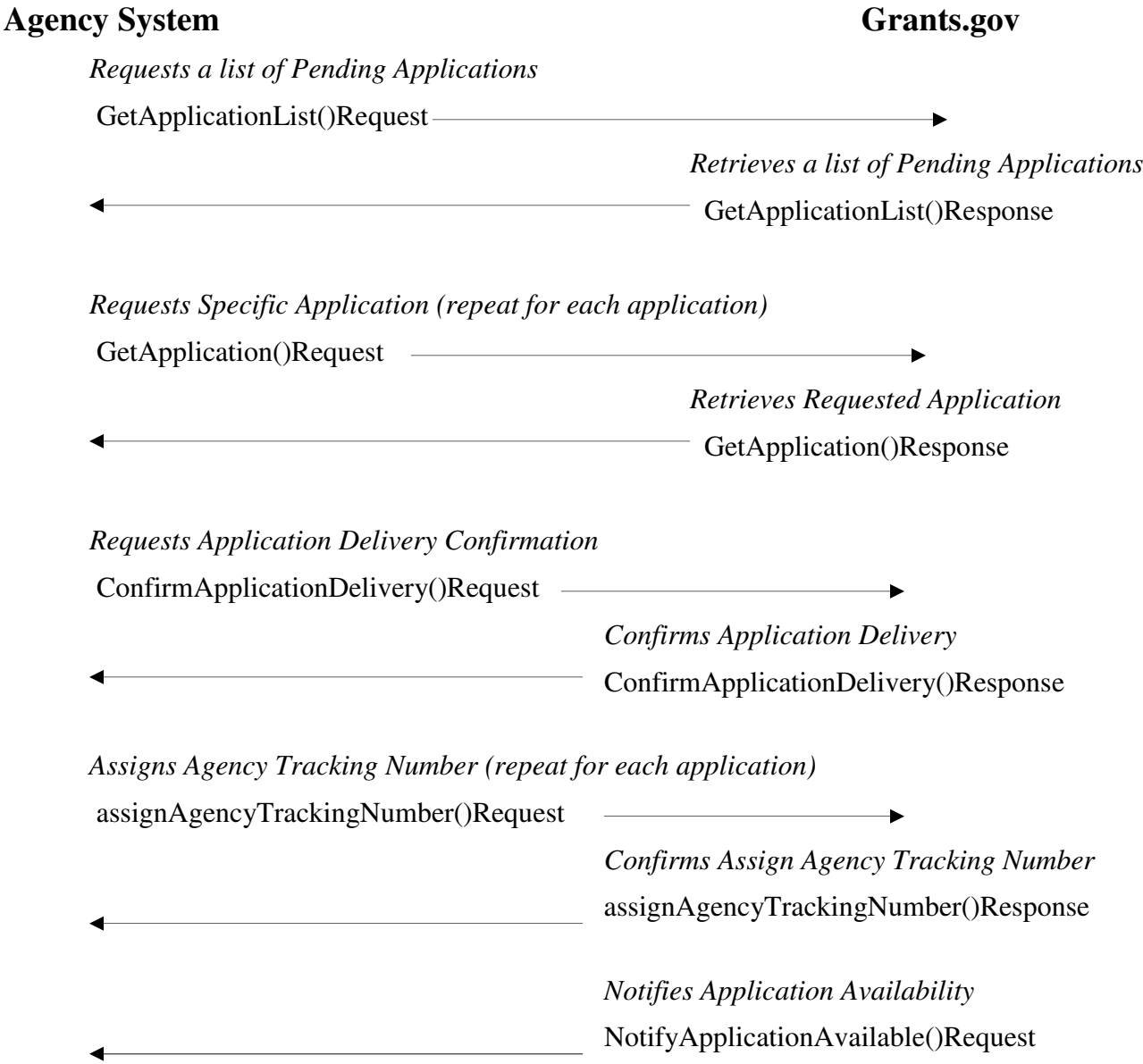


Figure 2-3. Request/Response "Conversation" between an Agency System and Grants.gov

Table 2-1 summarizes the interface “conversation” described above with corresponding request-response including input-output messages used in Agency Integration WSDL:

Table 2-1. Grants.gov-Agency Interface Conversation

Method Name	Description	Parameters
GetApplicationList()Request	Used by an <i>Agency</i> to request a list of applications.	Input: Filter Type, Filter Value = Pending Download, Downloaded, Agency Assigned Tracking Number.
GetApplicationList()Response	Used by <i>Grants.gov</i> to provide the list of applications that are ready to be downloaded.	Output: Application Status, Grants.gov Tracking Number, Opportunity Number, CFDA Number, Received Date and Time.
GetApplication()Request (Repeat for each application)	Used by an <i>Agency</i> to request a specific application.	Input: Grants.gov Tracking Number
GetApplication()Response (Repeat for each application)	Used by <i>Grants.gov</i> to provide the requested application.	Output: Application Package
ConfirmApplicationDelivery()Request	Used by an <i>Agency</i> to confirm the retrieval of an application.	Input: Grants.gov Tracking Number.
ConfirmApplicationDelivery()Response	Used by <i>Grants.gov</i> to acknowledge confirmation.	Output: Succeed or Failed, Grants.gov Tracking Number
AssignAgencyTrackingNumber()Request	Used by an <i>Agency</i> to notify Grants.gov of an agency’s internal tracking number for a given application.	Input: Grants.gov Tracking Number, Agency Tracking Number.
AssignAgencyTrackingNumber()Response	Used by <i>Grants.gov</i> to acknowledge the receipt of Agency Tracking Number for a specific application.	Output: Succeed or Failed, Agency Tracking Number.
NotifyApplicationAvailable()Request	Used by Grants.gov to notify an agency that a given application is ready to be downloaded.	Input: Literal.



2.2 Web Services Description Language (WSDL) Overview

A WSDL is an XML-based document that describes web services and how to access them. A WSDL document defines services as collections of network endpoints, or ports. In WSDL, the abstract definition of endpoints and messages is separated from their concrete network deployment or data format binding. A WSDL document defines a web service using the following elements:

Element	Defines
<portType>	The operations performed by the web service. The <portType> element is the most important WSDL element. It defines a web service, the operations that can be performed, and the messages that are involved. The <portType> element can be compared to a function library (or a module, or a class) in a traditional programming language.
<message>	The messages used by the web service. The <message> element defines the data elements of an operation. Each message can consist of one or more parts. The parts can be compared to the parameters of a function call in a traditional programming language.
<types>	The data types used by the web service. For maximum platform neutrality, WSDL uses XML Schema syntax to define data types.
<binding>	The communication protocols used by the web service. The <binding> element defines the message format and protocol details for each port.

The main structure of a WSDL document is as follows:

```
<definitions>
<types>
  definition of types.....
</types>

<message>
  definition of a message....
</message>

<portType>
  definition of a port.....
</portType>

<binding>
  definition of a binding....
</binding>

</definitions>
```

Figure 2-4. Main Structure of a WSDL Document

A WSDL document can also contain other elements, like extension elements and a service element that makes it possible to group together the definitions of several web services in one single WSDL.



2.3 SOAP Message Structure Overview

This section provides a brief summary of the structure of the SOAP v1.1 with Attachment compliant messages to be used by any system-to-system message exchange between the Grants.gov and agency systems, or vice-versa. A more detailed breakdown of the message is provided in the Agency Integration Toolkit Document.

Messages used in Grants.gov system-to-system message exchange are formatted according to the SOAP with Attachments (SwA) specifications¹. Some applications may not have any attachments; however, the corresponding SOAP messages are still encapsulated in MIME via the transport protocol.

Figure 2-5 depicts, at a high level, the structure of a SOAP message object, which is compliant with SOAP v1.1 with Attachments specifications. It consists of a MIME envelope that embeds other MIME parts. The primary part of the multipart MIME message is the XML SOAP document itself; the subsequent parts contain any attached data.

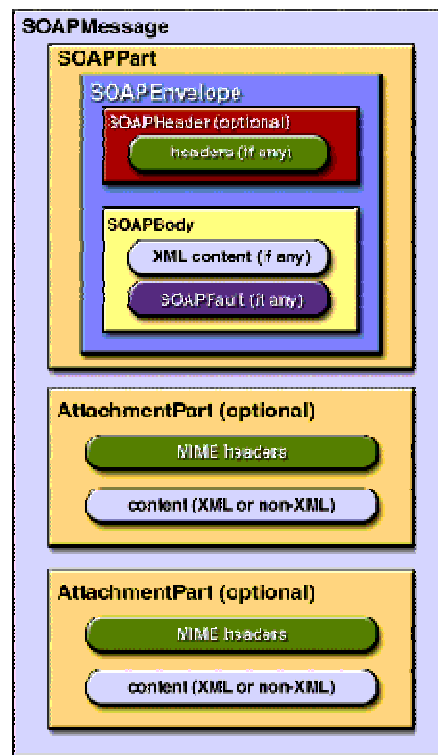


Figure 2-5. SOAP Message Structure

¹ <http://www.w3.org/TR/SOAP-attachments>

The grant applications that are received by Grants.gov may include attachments such as Budget Narrative, Project Narrative, as well as any other user-selected attachments in their native format, as part of the application package. The subsequent XML documents that are produced by Grants.gov for delivery to corresponding agencies in a system-to-system integration environment will have the following structure:

1. SF424 and other Agency-related forms in text format,
2. A description of each attachment in the XML Document, and
3. Attachments in their native binary format.

2.3.1 WSDL Bindings with SOAP

As WSDL describes the request-response interaction between systems, SOAP is the transport mechanism of message exchanges. Generally, a request-response WSDL using SOAP binding is constructed as follows:

```
<message name="getTermRequest">
  <part name="term" type="xs:string"/>
</message>

<message name="getTermResponse">
  <part name="value" type="xs:string"/>
</message>
<portType name="glossaryTerms">
  <operation name="getTerm">
    <input message="getTermRequest"/>
    <output message="getTermResponse"/>
  </operation>
</portType>
<binding type="glossaryTerms" name="b1">
<soap:binding style="document"
transport="https://schemas.xmlsoap.org/soap/http" />
  <operation>
    <soap:operation
      soapAction="http://example.com/getTerm"/>
    <input>
      <soap:body use="literal"/>
    </input>
    <output>
      <soap:body use="literal"/>
    </output>
  </operation>
</binding>
```

Figure 2-6. A Request-Response WSDL Using SOAP Binding

The *binding* element has two attributes - the name attribute and the type attribute. The name attribute defines the name of the binding, and the type attribute points to the port for the binding, in this case the "glossaryTerms" port.

The *soap:binding* element has two attributes - the style attribute and the transport attribute. The style attribute can be "rpc" or "document". In the above example, document attribute is used. The transport attribute defines the SOAP protocol to be used. The above example uses HTTPS.

The *operation* element defines each operation that the port exposes.

Figure 2-7 below shows the example that was shown earlier with WSDL terminology pointing to the various items that WSDL describes.

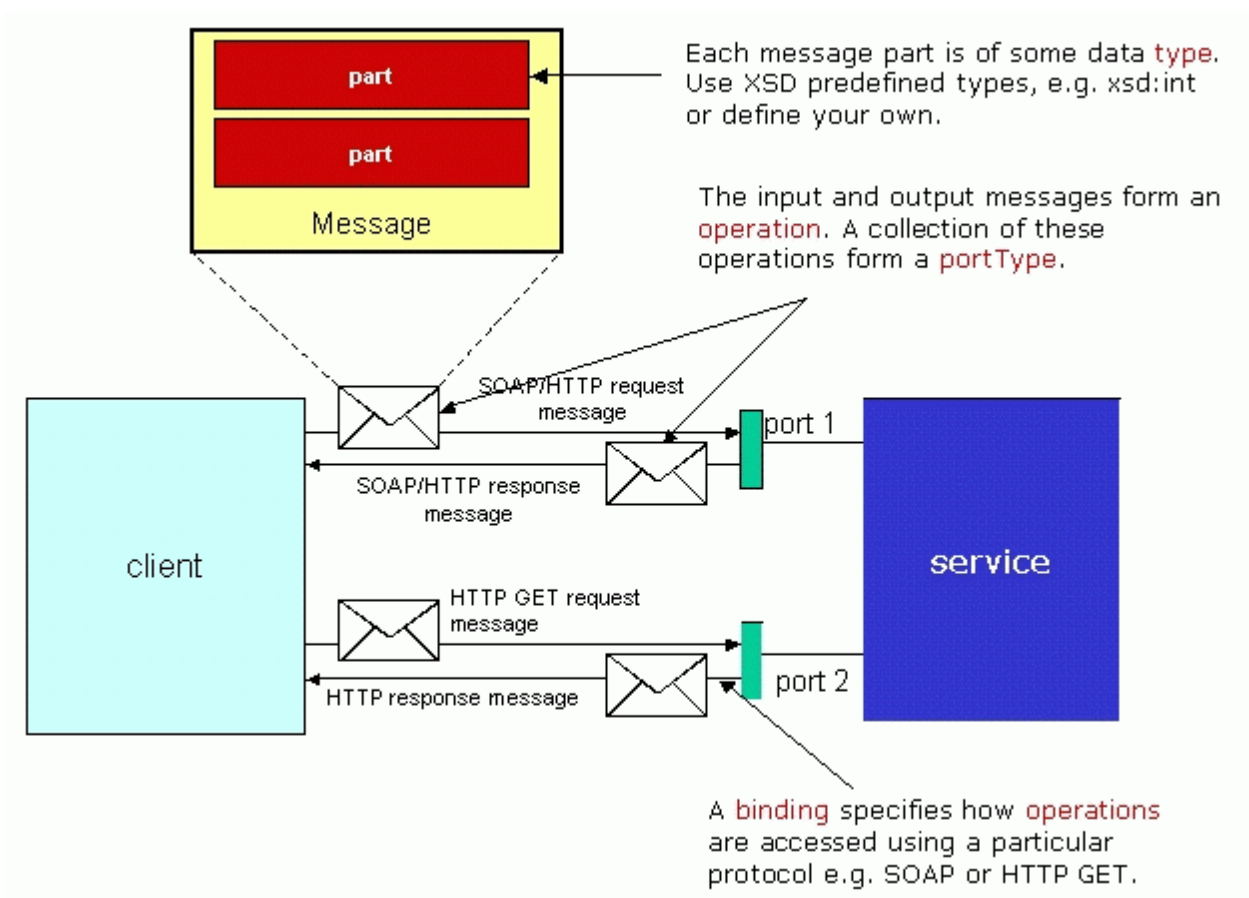


Figure 2-7. WSDL Binding with SOAP

2.4 Grants.gov Web Services Invocation Frame Work

Grants.gov uses Document-style web services. Document-style web services are loosely coupled and document-driven. The client sends the parameter to the web service as an XML document, instead of a discrete set of parameter values. The input XML document can also be described in WSDL. Unlike RPC-Style Web Services, which are synchronous (i.e., the client sends the request and waits for the response until the request is processed completely), Document-style web service does not follow call/response semantics. The web service receives the entire document, processes it and may or may not return a response message. The SOAP Body of a Document-style carries one or more XML documents, within its body. The protocol places no constraint on how that document needs to be structured, which is totally handled at the application level. Document-style web service follows asynchronous processing.

Grants.gov utilizes WebLogic web services with SOAP v1.1 with attachments. Grants.gov will also use JAXM v1.1.2 which is Java's API for XML Messaging for enabling message exchange between web services.

To show the capability and as a proof of concept, the Grants.gov System Integration team has developed the system-to-system integration functionality in a two phased Reference Implementation.

In the first phase, an application was developed that consumed an XML document generated by InFlowSuite™; parsed the document, created Java object classes for the data elements, and inserted the data into a relational database. To demonstrate the capability in this phase, several Java sever pages were developed that showed the selection, import, and display of the parsed data. The standalone application can be downloaded from the Grants.gov web site.

In the second phase, another standalone application was developed that retrieved sample XML list and documents from the local file system via SOAP stubs to simulate the InFlowSuite™ wrappers, parsed the documents and load the parsed data into a relational database. Two instances of Tomcat application servers were installed on separate PCs to provide web services message exchange functionality and JAXM was used as the API to establish the message exchange. The application performs *GetApplicationList* and *GetApplication* functions described above and it is integrated with the functionality in Phase I. This application can also be downloaded from the Grants.gov site.

2.5 System-to-System WSDL Specifications

The following are the specifications of the Grants.gov system-to-system Agency Integration WSDL. The detail WSDL listing has been provided in Appendix A. Note that references to certain file locations such as WSDL Location, soapOperation, etc. will be changed when WSDL is implemented in production.

WSDL location: <http://apps.grants.gov/WebServices/AgencyIntegrationServices-V1.0.wsdl>
 targetnamespace: <http://apps.grants.gov/WebServices/AgencyIntegrationServices>

services	bindings	porttypes	messages
AgencyIntegrationService	AgencyIntegrationSoapBinding	AgencyIntegrationPortType	AssignAgencyTrackingNumberRequestMessage
			AssignAgencyTrackingNumberResponseMessage
			ConfirmApplicationDeliveryRequestMessage
			ConfirmApplicationDeliveryResponseMessage
			ErrorMessage
			GetApplicationListRequestMessage
			GetApplicationListResponseMessage
			GetApplicationRequestMessage
			GetApplicationResponseMessage
			NotifyApplicationAvailableMessage

service **AgencyIntegrationService**

ports	AgencyIntegrationSoapPort binding agis:AgencyIntegrationSoapBinding extensibility <soap:address location="https://ws.grants.gov/AgencyIntegration"/>
source	<code><wsdl:service name="AgencyIntegrationService"> <wsdl:port name="AgencyIntegrationSoapPort" binding="agis:AgencyIntegrationSoapBinding"> <soap:address location="https://ws.grants.gov/AgencyIntegration"/> </wsdl:port></code>

	</wsdl:service>
--	-----------------

binding **AgencyIntegrationSoapBinding**

type	agis:AgencyIntegrationPortType
extensibility	<soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
operations	<p>GetApplication extensibility <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/GetApplication" style="document"/> input <soap:body use="literal"/> output <soap:body use="literal"/></p> <p>GetApplicationList extensibility <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/GetApplicationList" style="document"/> input <soap:body use="literal"/> output <soap:body use="literal"/></p> <p>ConfirmApplicationDelivery extensibility <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/ConfirmApplicationDelivery" style="document"/> input <soap:body use="literal"/> output <soap:body use="literal"/></p> <p>AssignAgencyTrackingNumber extensibility <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/AssignAgencyTrackingNumber" style="document"/> input <soap:body use="literal"/> output <soap:body use="literal"/></p> <p>NotifyApplicationAvailable extensibility <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/NotifyApplicationAvailable" style="document"/> input <soap:body use="literal"/> output <soap:body use="literal"/></p>
used by	Service AgencyIntegrationService in Port AgencyIntegrationSoapPort
source	<pre><wsdl:binding name="AgencyIntegrationSoapBinding" type="agis:AgencyIntegrationPortType"> <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/> <wsdl:operation name="GetApplication"> <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/GetApplication" style="document"/> <wsdl:input> <soap:body use="literal"/> </wsdl:input> <wsdl:output> <soap:body use="literal"/> </wsdl:output> <wsdl:fault name="GetApplicationErrorMessage"> <soap:body use="literal"/> </wsdl:fault> </wsdl:operation> <wsdl:operation name="GetApplicationList"> <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/GetApplicationList" style="document"/> <wsdl:input> <soap:body use="literal"/> </wsdl:input> <wsdl:output> <soap:body use="literal"/> </wsdl:output> <wsdl:fault name="GetApplicationListErrorMessage"> <soap:body use="literal"/> </wsdl:fault> </wsdl:operation> </wsdl:binding></pre>




```

</wsdl:operation>
<wsdl:operation name="ConfirmApplicationDelivery">
  <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/ConfirmApplicationDelivery" style="document"/>
  <wsdl:input>
    <soap:body use="literal"/>
  </wsdl:input>
  <wsdl:output>
    <soap:body use="literal"/>
  </wsdl:output>
  <wsdl:fault name="ConfirmApplicationDeliveryErrorMessage">
    <soap:body use="literal"/>
  </wsdl:fault>
</wsdl:operation>
<wsdl:operation name="AssignAgencyTrackingNumber">
  <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/AssignAgencyTrackingNumber" style="document"/>
  <wsdl:input>
    <soap:body use="literal"/>
  </wsdl:input>
  <wsdl:output>
    <soap:body use="literal"/>
  </wsdl:output>
  <wsdl:fault name="AssignAgencyTrackingNumberErrorMessage">
    <soap:body use="literal"/>
  </wsdl:fault>
</wsdl:operation>
<wsdl:operation name="NotifyApplicationAvailable">
  <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/NotifyApplicationAvailable" style="document"/>
  <wsdl:output>
    <soap:body use="literal"/>
  </wsdl:output>
</wsdl:operation>
</wsdl:binding>

```

porttype **AgencyIntegrationPortType**

operations	<p>GetApplication input agis:GetApplicationRequestMessage output agis:GetApplicationResponseMessage fault agis:ErrorMessage</p> <p>GetApplicationList input agis:GetApplicationListRequestMessage output agis:GetApplicationListResponseMessage fault agis:ErrorMessage</p> <p>ConfirmApplicationDelivery input agis:ConfirmApplicationDeliveryRequestMessage output agis:ConfirmApplicationDeliveryResponseMessage fault agis:ErrorMessage</p> <p>AssignAgencyTrackingNumber input agis:AssignAgencyTrackingNumberRequestMessage output agis:AssignAgencyTrackingNumberResponseMessage fault agis:ErrorMessage</p> <p>NotifyApplicationAvailable output agis:NotifyApplicationAvailableMessage</p>
used by	binding AgencyIntegrationSoapBinding
source	<pre> <wsdl:portType name="AgencyIntegrationPortType"> <wsdl:operation name="GetApplication"> <wsdl:input message="agis:GetApplicationRequestMessage"/> <wsdl:output message="agis:GetApplicationResponseMessage"/> <wsdl:fault name="GetApplicationErrorMessage" message="agis:ErrorMessage"/> </wsdl:operation> <wsdl:operation name="GetApplicationList"> <wsdl:input message="agis:GetApplicationListRequestMessage"/> </pre>



	<pre> <wsdl:output message="agis:GetApplicationListResponseMessage"/> <wsdl:fault name="GetApplicationListErrorMessage" message="agis:ErrorMessage"/> </wsdl:operation> <wsdl:operation name="ConfirmApplicationDelivery"> <wsdl:input message="agis:ConfirmApplicationDeliveryRequestMessage"/> <wsdl:output message="agis:ConfirmApplicationDeliveryResponseMessage"/> <wsdl:fault name="ConfirmApplicationDeliveryErrorMessage" message="agis:ErrorMessage"/> </wsdl:operation> <wsdl:operation name="AssignAgencyTrackingNumber"> <wsdl:input message="agis:AssignAgencyTrackingNumberRequestMessage"/> <wsdl:output message="agis:AssignAgencyTrackingNumberResponseMessage"/> <wsdl:fault name="AssignAgencyTrackingNumberErrorMessage" message="agis:ErrorMessage"/> </wsdl:operation> <wsdl:operation name="NotifyApplicationAvailable"> <wsdl:output message="agis:NotifyApplicationAvailableMessage"/> </wsdl:operation> </wsdl:portType> </pre>
--	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

message **GetApplicationListRequestMessage**

parts	ApplicationListFilters type agis:ApplicationFilterTypeList
used by	PortType AgencyIntegrationPortType in Operation GetApplicationList
source	<pre> <wsdl:message name="GetApplicationListRequestMessage"> <wsdl:part name="ApplicationListFilters" type="agis:ApplicationFilterTypeList"/> </wsdl:message> </pre>

message **GetApplicationListResponseMessage**

parts	ReturnedApplicationList type agis:ApplicationListType
used by	PortType AgencyIntegrationPortType in Operation GetApplicationList
source	<pre> <wsdl:message name="GetApplicationListResponseMessage"> <wsdl:part name="ReturnedApplicationList" type="agis:ApplicationListType"/> </wsdl:message> </pre>

message **GetApplicationRequestMessage**

parts	Grants_govTrackingNumber type
used by	PortType AgencyIntegrationPortType in Operation GetApplication
source	<pre> <wsdl:message name="GetApplicationRequestMessage"> <wsdl:part name="Grants_govTrackingNumber" ref="footer:Grants_govTrackingNumber"/> </wsdl:message> </pre>

message **GetApplicationResponseMessage**

parts	ReturnedApplication type
used by	PortType AgencyIntegrationPortType in Operation GetApplication
source	<pre> <wsdl:message name="GetApplicationResponseMessage"> <wsdl:part name="ReturnedApplication" ref="grant:GrantApplication"/> </wsdl:message> </pre>

message **ConfirmApplicationDeliveryRequestMessage**

parts	Grants_govTrackingNumber type
used by	PortType AgencyIntegrationPortType in Operation ConfirmApplicationDelivery
source	<pre> <wsdl:message name="ConfirmApplicationDeliveryRequestMessage"> <wsdl:part name="Grants_govTrackingNumber" ref="footer:Grants_govTrackingNumber"/> </wsdl:message> </pre>



message **ConfirmApplicationDeliveryResponseMessage**

parts	Grants_govTrackingNumber type ResponseMessage type agis:ResponseMessageType
used by	PortType AgencyIntegrationPortType in Operation ConfirmApplicationDelivery
source	<pre><wsdl:message name="ConfirmApplicationDeliveryResponseMessage"> <wsdl:part name="Grants_govTrackingNumber" ref="footer:Grants_govTrackingNumberType"/> <wsdl:part name="ResponseMessage" type="agis:ResponseMessageType"/> </wsdl:message></pre>

message **AssignAgencyTrackingNumberRequestMessage**

parts	AssignAgencyTrackingNumber type agis:AssignAgencyTrackingNumberType
used by	PortType AgencyIntegrationPortType in Operation AssignAgencyTrackingNumber
source	<pre><wsdl:message name="AssignAgencyTrackingNumberRequestMessage"> <wsdl:part name="AssignAgencyTrackingNumber" type="agis:AssignAgencyTrackingNumberType"/> </wsdl:message></pre>

message **AssignAgencyTrackingNumberResponseMessage**

parts	AssignAgencyTrackingNumberResponse type agis:AssignAgencyTrackingNumberResponseType
used by	PortType AgencyIntegrationPortType in Operation AssignAgencyTrackingNumber
source	<pre><wsdl:message name="AssignAgencyTrackingNumberResponseMessage"> <wsdl:part name="AssignAgencyTrackingNumberResponse" type="agis:AssignAgencyTrackingNumberResponseType"/> </wsdl:message></pre>

message **NotifyApplicationAvailableMessage**

parts	NotifyApplicationAvailable type agis:ApplicationInformationType
used by	PortType AgencyIntegrationPortType in Operation NotifyApplicationAvailable
source	<pre><wsdl:message name="NotifyApplicationAvailableMessage"> <wsdl:part name="NotifyApplicationAvailable" type="agis:ApplicationInformationType"/> </wsdl:message></pre>

message **ErrorMessage**

parts	ErrorMessage type
used by	PortType AgencyIntegrationPortType in Operation GetApplication PortType AgencyIntegrationPortType in Operation GetApplicationList PortType AgencyIntegrationPortType in Operation ConfirmApplicationDelivery PortType AgencyIntegrationPortType in Operation AssignAgencyTrackingNumber
source	<pre><wsdl:message name="ErrorMessage"> <wsdl:part name="ErrorMessage" ref="soap:fault"/> </wsdl:message></pre>

2.5.1 Sample SOAP Message with Attachment

The following is a sample code of Grants.gov message exchange web services using SOAP with Attachments. The XML document that is represents the application contains forms SF424 and one PDF attachment. Please note that this is just a sample and does not represent the complete code and attachment data.

```
-----=_Part_19_5704740.1063741728366  
Content-Type: text/xml
```



```

<?xml version="1.0" ?>
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"><SOAP-ENV:Header/><SOAP-
ENV:Body>
<grantapplication:GrantApplication xsi:schemaLocation="http://www.grants.gov/grantapplication"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:grantapplication="http://www.grants.gov/grantapplication" xmlns:core="http://www.grants.gov/core"
xmlns:sf424="http://www.grants.gov/sf424" xmlns:sys="http://www.grants.gov/system"
xmlns:glob="http://www.grants.gov/global" xmlns:sf424a="http://www.grants.gov/sf424a"
xmlns:sf424b="http://www.grants.gov/sf424b" xmlns:sf424c="http://www.grants.gov/sf424c"
xmlns:sf424d="http://www.grants.gov/sf424d">
<sys:GrantSubmissionHeader xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:sys="http://www.grants.gov/system" xmlns:glob="http://www.grants.gov/global"
xsi:schemaLocation="http://www.grants.gov/header" glob:schemaVersion="1.0">
<glob:HashValue glob:hashAlgorithm="kkt1ftf">LS0tLS0tLS0t</glob:HashValue>
<sys:AgencyName>HHS</sys:AgencyName>
<sys:CFDANumber>93.051</sys:CFDANumber>
<sys:ActivityTitle>Alzheimers Disease Demonstration Grants to States</sys:ActivityTitle>
<sys:OpportunityID>99</sys:OpportunityID>
<sys:OpportunityTitle>Test opp</sys:OpportunityTitle>
<sys:OpeningDate>2003-01-01</sys:OpeningDate>
<sys:ClosingDate>2003-12-31</sys:ClosingDate>
<sys:SubmissionTitle>Testing 3</sys:SubmissionTitle>
</sys:GrantSubmissionHeader>
<sf424:AwardingAgencyGrantApplication xmlns:fo="http://www.w3.org/1999/XSL/Format"
xmlns:glob="http://www.grants.gov/global" xmlns:sf424="http://www.grants.gov/sf424"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.grants.gov/sf424/
SF424.xsd" glob:coreSchemaVersion="1.0" glob:agencySchemaVersion="1.0">
<glob:FormVersionIdentifier>04/03</glob:FormVersionIdentifier>
<sf424:SubmissionTypeCode>AN</sf424:SubmissionTypeCode>
<sf424:SubmittedDate>2003-07-01</sf424:SubmittedDate>
<sf424:ApplicationTypeCode>N</sf424:ApplicationTypeCode>
<sf424:Revision>
<sf424:RevisionCode1>A</sf424:RevisionCode1>
<sf424:RevisionCode2>A</sf424:RevisionCode2>
<sf424:RevisionOtherExplanation>Some Explanation</sf424:RevisionOtherExplanation>
</sf424:Revision>
<sf424:AgencyName>NIH</sf424:AgencyName>
<sf424:CFDANumber>93.051</sf424:CFDANumber>
<sf424:ActivityTitle>Alzheimers Disease Demonstration Grants to States</sf424:ActivityTitle>
<sf424:SubmittingOrganization>
<sf424:OrganizationIdentifyingInformation>
<sf424:ApplicantTypeCode>Individual</sf424:ApplicantTypeCode>
<sf424:Organization>
<sf424:OrganizationName>Testing</sf424:OrganizationName>
<sf424:DUNSID>00-000-0000</sf424:DUNSID>
<sf424:EmployerID>12-1231231</sf424:EmployerID>
</sf424:Organization>
</sf424:OrganizationIdentifyingInformation>
<sf424:Address>
<sf424:Street>Test</sf424:Street>
<sf424:City>Test</sf424:City>
<sf424:County>Test</sf424:County>
<sf424:StateCode>MO</sf424:StateCode>
<sf424:ZipCode>32112</sf424:ZipCode>
</sf424:Address>
<sf424:DelinquentFederalDebtIndicator>N</sf424:DelinquentFederalDebtIndicator>
<sf424:CongressionalDistrict>23123123123</sf424:CongressionalDistrict>
</sf424:SubmittingOrganization>
<sf424:Project>

```



```

<sf424:ProjectTitle>test</sf424:ProjectTitle>
<sf424:Location>test</sf424:Location>
<sf424:ProposedStartDate>2003-10-01</sf424:ProposedStartDate>
<sf424:ProposedEndDate>2004-09-30</sf424:ProposedEndDate>
<sf424:CongressionalDistrict>312123132132</sf424:CongressionalDistrict>
</sf424:Project>
<sf424:Budget sf424:currencyCode="USD">
<sf424:FederalEstimatedAmount>5000000</sf424:FederalEstimatedAmount>
<sf424:ApplicantEstimatedAmount>100</sf424:ApplicantEstimatedAmount>
<sf424:StateEstimatedAmount>1500000</sf424:StateEstimatedAmount>
<sf424:LocalEstimatedAmount>0</sf424:LocalEstimatedAmount>
<sf424:OtherEstimatedAmount>0</sf424:OtherEstimatedAmount>
<sf424:ProgramIncomeEstimatedAmount>0</sf424:ProgramIncomeEstimatedAmount>
<sf424:TotalEstimatedAmount>6500100</sf424:TotalEstimatedAmount>
</sf424:Budget>
<sf424:Assurance>N</sf424:Assurance>
<sf424:Individual>
<sf424>Contact>
<sf424:GivenName1>test</sf424:GivenName1>
<sf424:FamilyName>test</sf424:FamilyName>
<sf424:TelephoneNumber>(703) 555-5555</sf424:TelephoneNumber>
<sf424:FaxNumber>(703) 555-5555</sf424:FaxNumber>
</sf424>Contact>
<sf424:AuthorizedRepresentative>
<sf424:GivenName1>Milton</sf424:GivenName1>
<sf424:FamilyName>Waddams</sf424:FamilyName>
<sf424:TelephoneNumber>(703) 555-5555</sf424:TelephoneNumber>
<sf424:RepresentativeTitle>Software Engineer</sf424:RepresentativeTitle>
</sf424:AuthorizedRepresentative>
</sf424:Individual>
<sf424:StateReviewCode>Not Reviewed</sf424:StateReviewCode>
</sf424:AwardingAgencyGrantApplication>
<sf424a:BudgetInformation xmlns:glob="http://www.grants.gov/global" xmlns:sf424a="http://www.grants.gov/sf424a"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.grants.gov/sf424a
SF424A.xsd" sf424a:programType="Non-Construction" glob:coreSchemaVersion="1.0">
<glob:FormVersionIdentifier>XXXX</glob:FormVersionIdentifier>
<sf424a:BudgetSummary>
<sf424a:SummaryLineItem sf424a:activityTitle="activityTitle1">
<sf424a:CFDANumber>93.051</sf424a:CFDANumber>
<sf424a:BudgetFederalEstimatedUnobligatedAmount>5000000.00</sf424a:BudgetFederalEstimatedUnobligatedAmount>
<sf424a:BudgetNonFederalEstimatedUnobligatedAmount>1500100.00</sf424a:BudgetNonFederalEstimatedUnobligatedA
mount>
<sf424a:BudgetTotalNewOrRevisedAmount>6500100.00</sf424a:BudgetTotalNewOrRevisedAmount>
</sf424a:SummaryLineItem>
<sf424a:SummaryLineItem sf424a:activityTitle="activityTitle2">
<sf424a:CFDANumber>93.051</sf424a:CFDANumber>
<sf424a:BudgetTotalNewOrRevisedAmount>0.00</sf424a:BudgetTotalNewOrRevisedAmount>
</sf424a:SummaryLineItem>
<sf424a:SummaryLineItem sf424a:activityTitle="activityTitle3">
<sf424a:CFDANumber>93.051</sf424a:CFDANumber>
<sf424a:BudgetTotalNewOrRevisedAmount>0.00</sf424a:BudgetTotalNewOrRevisedAmount>
</sf424a:SummaryLineItem>
<sf424a:SummaryLineItem sf424a:activityTitle="activityTitle4">
<sf424a:CFDANumber>93.051</sf424a:CFDANumber>
<sf424a:BudgetTotalNewOrRevisedAmount>0.00</sf424a:BudgetTotalNewOrRevisedAmount>
</sf424a:SummaryLineItem>
<sf424a:SummaryTotals>
<sf424a:BudgetFederalEstimatedUnobligatedAmount>5000000.00</sf424a:BudgetFederalEstimatedUnobligatedAmount>

```



```

<sf424a:BudgetNonFederalEstimatedUnobligatedAmount>1500100.00</sf424a:BudgetNonFederalEstimatedUnobligatedA
mount>
<sf424a:BudgetFederalNewOrRevisedAmount>0.00</sf424a:BudgetFederalNewOrRevisedAmount>
<sf424a:BudgetNonFederalNewOrRevisedAmount>0.00</sf424a:BudgetNonFederalNewOrRevisedAmount>
<sf424a:BudgetTotalNewOrRevisedAmount>6500100.00</sf424a:BudgetTotalNewOrRevisedAmount>
</sf424a:SummaryTotals>
</sf424a:BudgetSummary>
<sf424a:BudgetCategories>
<sf424a:CategorySet sf424a:activityTitle="activityTitle5">
<sf424a:BudgetOtherRequestedAmount>6500100.00</sf424a:BudgetOtherRequestedAmount>
<sf424a:BudgetTotalDirectChargesAmount>6500100.00</sf424a:BudgetTotalDirectChargesAmount>
<sf424a:BudgetTotalAmount>6500100.00</sf424a:BudgetTotalAmount>
</sf424a:CategorySet>
<sf424a:CategorySet sf424a:activityTitle="activityTitle6">
<sf424a:BudgetTotalDirectChargesAmount>0.00</sf424a:BudgetTotalDirectChargesAmount>
<sf424a:BudgetTotalAmount>0.00</sf424a:BudgetTotalAmount>
</sf424a:CategorySet>
<sf424a:CategorySet sf424a:activityTitle="activityTitle7">
<sf424a:BudgetTotalDirectChargesAmount>0.00</sf424a:BudgetTotalDirectChargesAmount>
<sf424a:BudgetTotalAmount>0.00</sf424a:BudgetTotalAmount>
</sf424a:CategorySet>
<sf424a:CategorySet sf424a:activityTitle="activityTitle8">
<sf424a:BudgetTotalDirectChargesAmount>0.00</sf424a:BudgetTotalDirectChargesAmount>
<sf424a:BudgetTotalAmount>0.00</sf424a:BudgetTotalAmount>
</sf424a:CategorySet>
<sf424a:CategoryTotals>
<sf424a:BudgetPersonnelRequestedAmount>0.00</sf424a:BudgetPersonnelRequestedAmount>
<sf424a:BudgetFringeBenefitsRequestedAmount>0.00</sf424a:BudgetFringeBenefitsRequestedAmount>
<sf424a:BudgetTravelRequestedAmount>0.00</sf424a:BudgetTravelRequestedAmount>
<sf424a:BudgetEquipmentRequestedAmount>0.00</sf424a:BudgetEquipmentRequestedAmount>
<sf424a:BudgetSuppliesRequestedAmount>0.00</sf424a:BudgetSuppliesRequestedAmount>
<sf424a:BudgetContractualRequestedAmount>0.00</sf424a:BudgetContractualRequestedAmount>
<sf424a:BudgetConstructionRequestedAmount>0.00</sf424a:BudgetConstructionRequestedAmount>
<sf424a:BudgetOtherRequestedAmount>6500100.00</sf424a:BudgetOtherRequestedAmount>
<sf424a:BudgetTotalDirectChargesAmount>6500100.00</sf424a:BudgetTotalDirectChargesAmount>
<sf424a:BudgetIndirectChargesAmount>0.00</sf424a:BudgetIndirectChargesAmount>
<sf424a:BudgetTotalAmount>6500100.00</sf424a:BudgetTotalAmount>
<sf424a:ProgramIncomeAmount>0.00</sf424a:ProgramIncomeAmount>
</sf424a:CategoryTotals>
</sf424a:BudgetCategories>
<sf424a:NonFederalResources>
<sf424a:ResourceLineItem sf424a:activityTitle="activityTitle9">
</sf424a:ResourceLineItem>
<sf424a:ResourceLineItem sf424a:activityTitle="activityTitle10">
</sf424a:ResourceLineItem>
<sf424a:ResourceLineItem sf424a:activityTitle="activityTitle11">
</sf424a:ResourceLineItem>
<sf424a:ResourceLineItem sf424a:activityTitle="activityTitle12">
</sf424a:ResourceLineItem>
<sf424a:ResourceTotals>
</sf424a:ResourceTotals>
</sf424a:NonFederalResources>
<sf424a:BudgetForecastedCashNeeds>
<sf424a:BudgetFirstYearAmounts>
</sf424a:BudgetFirstYearAmounts>
<sf424a:BudgetFirstQuarterAmounts>
</sf424a:BudgetFirstQuarterAmounts>
<sf424a:BudgetSecondQuarterAmounts>
</sf424a:BudgetSecondQuarterAmounts>

```



```

<sf424a:BudgetThirdQuarterAmounts>
</sf424a:BudgetThirdQuarterAmounts>
<sf424a:BudgetFourthQuarterAmounts>
</sf424a:BudgetFourthQuarterAmounts>
</sf424a:BudgetForecastedCashNeeds>
<sf424a:FederalFundsNeeded>
<sf424a:FundsLineItem sf424a:activityTitle="activityTitle13">
</sf424a:FundsLineItem>
<sf424a:FundsLineItem sf424a:activityTitle="activityTitle14">
</sf424a:FundsLineItem>
<sf424a:FundsLineItem sf424a:activityTitle="activityTitle15">
</sf424a:FundsLineItem>
<sf424a:FundsLineItem sf424a:activityTitle="activityTitle16">
</sf424a:FundsLineItem>
<sf424a:FundsTotals>
</sf424a:FundsTotals>
</sf424a:FederalFundsNeeded>
<sf424a:OtherInformation>
</sf424a:OtherInformation>
</sf424a:BudgetInformation>
<sys:GrantSubmissionFooter xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:sys="http://www.grants.gov/system" xmlns:glob="http://www.grants.gov/global"
xsi:schemaLocation="http://www.grants.gov/footer" glob:schemaVersion="1.0">
<glob:HashValue glob:hashAlgorithm="kkt1ftf">LS0tLS0tLS0t</glob:HashValue>
<sys:ReceivedDateTime>2003-06-26T17:02:30</sys:ReceivedDateTime>
<sys:SubmitterName>Northrop Grumman</sys:SubmitterName>
<sys:Grants_govTrackingNumber>GRANT00000053</sys:Grants_govTrackingNumber>
</sys:GrantSubmissionFooter>
</grantapplication:GrantApplication>

</SOAP-ENV:Body></SOAP-ENV:Envelope>
-----=_Part_19_5704740.1063741728366
Content-Type: application/pdf
Content-Id: Data_Binding_With_JAXB.pdf
Content-Location: Data_Binding_With_JAXB.pdf
%PDF-1.3 %«-4 0 obj << /Type /Info /Producer (null) >> endobj 5 0 obj << /Length 700 /Filter /FlateDecode >> stream
xœifXBo>0□~ç- ðÛZis±ÄüØÛ°-S«UêT!Uªùâ€°□ÎĈEO,ÿýœ @æ#0eš&EjQ^ü□!;Ÿÿİ□Byâœ]x^ú(TM:..š9□!æG□
□]0Š,8Â4*PRçû“□\óSô†+□vÑÉ$~²¼šÛ□«İ-°zww~Š-Pre\□f[□İ“□□{,;i ~ú-ù□%jQi“□-
k;ÎÄ“(äB”oR=Ö- íµ*çj fRañT,—3%ç[P/µT9/j□è~æ”x8@ □Ç0<,&ÎRâT-gŸ€Z□-
□ç;Ëä'çbÁlŸ;□□GI“Ä^ç□1/□,@Ä □°u¾8çl“§□zo¾ZLBçqžđI□V'švü^šäU□,□
<< /Type /Page /Parent 1 0 R /MediaBox [ 0 0 612 792 ] /Resources 3 0 R /Contents 5 0 R /Annots 7 0 R >> endobj 7 0 obj
%%EOF

```

2.6 Error handling

The errors that may be generated during a system-to-system message exchange between Grants.gov and an Agency system will be of two types:

- Those that would be generated by Grants.gov application namely InFlowSuite™, and
- Those that would be generated during the message exchange between systems.

In both instances SOAP Fault element will handle the transport of error messages.

The application-related errors occur when Grants.gov cannot fulfill a request from an Agency system. For example, when an Agency system sends a request in form of *GetApplication* function through a SOAP exchange, it would need to provide a valid Grants.gov Tracking Number. If the tracking number is incorrect, or there are no applications associated with that tracking number, the



InFlowSuite™ would generate an error code for that incident. The error code would then be associated with a message, which will then be transported via SOAP Fault element to the agency system.

In the case of system-to-system message exchange, an error could occur when a message cannot reach its destination. An example of that would be interruption in network, issue with the message structure, or message load, etc. In these instances, web services will generate an error relevant to the incident and SOAP Fault element will transport the message to the agency system, if it can be delivered.

2.6.1 SOAP Fault Structure

As stated above, SOAP Fault element is used to carry error and/or status information within a SOAP message. If a Fault element is present, it must appear as a child element of the Body element. A Fault element can only appear once in a SOAP message.

The SOAP Fault element has the following sub elements:

Sub Element	Description
<faultcode>	A code for identifying the fault
<faultstring>	A human readable explanation of the fault
<faultactor>	Information about who caused the fault to happen
<detail>	Holds application specific error information related to the Body element

The code values defined below must be used in the faultcode element when describing faults:

Error	Description
VersionMismatch	Found an invalid namespace for the SOAP Envelope element
MustUnderstand	An immediate child element of the Header element, with the mustUnderstand attribute set to "1", was not understood
Client	The message was incorrectly formed or contained incorrect information
Server	There was a problem with the server so the message could not proceed

2.6.2 Error Codes and Messages

The following are the error codes and associated messages that will be used in the system-to-system integration:

Error Code	Message
01	No Session
02	No User Certificate
03	No User ID (serial #) in Certificate
04	Invalid Certificate
05	Missing Agency Tracking Number
06	Missing Grants.gov Tracking Number
07	Missing User ID
08	Unable to Retrieve Application



2.6.3 Sample SOAP Fault Message

The following is a sample code of Grants.gov message exchange web services using SOAP Fault with errors:

```
<soap-env:Envelope xmlns:soap-env="http://schemas.xmlsoap.org/soap/envelope/"><soap-env:Header></soap-env:Header><soap-env:Body><soap-env:Fault><faultcode>Server</faultcode><faultstring>Error in processing or replying to a message: javax.xml.bind.UnmarshalException: tag name "att:GrantsNarrativeExplanations" is not allowed. Possible tag names are: &lt;Assurances&gt;,&lt;BudgetInformation&gt;,&lt;GrantSubmissionFooter&gt; - with linked exception: [com.sun.msv.verifier.ValidityViolation: tag name "att:GrantsNarrativeExplanations" is not allowed. Possible tag names are: &lt;Assurances&gt;,&lt;BudgetInformation&gt;,&lt;GrantSubmissionFooter&gt;]</faultstring></soap-env:Fault></soap-env:Body></soap-env:Envelope>
```

3. Web Services Security

3.1 Secure Socket Layer (SSL) and Digital Certificates

SSL is a commonly used protocol for managing the security of a message transmission on the Internet. SSL contains its own server-side authentication and an optional client authentication. SSL is a framework that specifies how two hosts connect, pass certificate between one another, negotiate which keys to use, and decide on an encryption mechanism. At this time SSL is the de-facto standard for all Internet-based secure communications.

SSL comes in two strengths, 40-bit and 128-bit, which refer to the length of the "session key" generated by every encrypted transaction. The longer the key, the more difficult it is to break the encryption code. Most browsers support 40-bit SSL sessions, and the latest browsers enable users to encrypt transactions in 128-bit sessions - trillions of times stronger than 40-bit sessions.

The encryption technique or Cryptography is performed in two ways: symmetric and asymmetric. In symmetric cryptography, the sender and the receiver share the same secret (key) about the information that is sent between them. In asymmetric cryptography, the sender and the receiver have different secrets (keys).

When HTTP is passed over the SSL infrastructure, HTTP can use all features of SSL. This combination of HTTP and SSL is commonly used for secure Internet systems and it is referred to as HTTPS.

SSL is normally used in tandem with a Digital Certificate. This means that it uses a third party, a Certification Authority (CA), to identify one end or both ends of the transactions. Digital certificates are electronic files that are used to uniquely identify people and resources over the Internet. They contain information about who owns the certificate as well as information about the issuing certificate authority. It also provides a legal basis to perform transactions on the Internet.

Virtually all web servers and the leading browsers, including Internet Explorer and Netscape Communicator, are optimized and ready for SSL. To activate SSL sessions a digital certificate is required.

3.2 Agency System to Grants.gov Authentication

Grants.gov will utilize SSL with digital certificate to authenticate Agency systems. To do so, Grants.gov will install a server certificate and Agency systems will install client certificates. The certificates will be used during the authentication process to establish an SSL connection between



Agency systems and Grants.gov. The following are the requirements for authenticating with Grants.gov:

- Registration of Agency system with Grants.gov as part of their Profile Set up with the following information:
 - Name and Telephone Number of Agency Point of Contact
 - Information included in the client Digital Certificate to include certificate serial number, agency name, and certification authority. This certificate must be installed on the registered server. All the information on the installed certificate will subsequently be sent to Grants.gov via any https:// call.
- Installation of a separate certificate on Grants.gov. The information on the certificate will be sent to the agency system during the authentication process via https://.

To establish a secure layer between an agency system and Grants.gov, the following will occur:

- Agency sends a request via an https:// call to Grants.gov web server that would include a copy of its certificate.
- Grants.gov validates the agency certificate serial number against the information in the agency profile. It also checks the valid period and the CA of the certificate. If validation fails, the SSL will not be established, otherwise, the following steps will occur.
 - Grants.gov web server presents the Agency with its certificate and sends certificate's public key.
 - If the Agency accepts the certificate, it uses the public key to encrypt the data it is about to send.
 - Grants.gov using its own certificate private key decrypts the sent encrypted data and a secure connection will be established. The subsequent request/response message exchanges occur over the secure socket.

Once the authentication step is completed and a secure connection is established, the Grants.gov system conducts an internal authorization process to ensure that the requesting Agency is allowed to retrieve the requested application in form of an XML document.

3.3 Grants.gov to Agency System Authentication

The question regarding Grants.gov authentication to agency systems arises when Grants.gov notifies an agency system of the availability of their submitted applications through the *NotifyApplicationAvailable* function. Since the messages that are sent by Grants.gov to Agency systems are informational in nature and non-sensitive, and agency systems are required to authenticate to Grants.gov each time they request a service, it appears that Grants.gov to Agency system authentication serves no purpose and is unnecessary.

4. Acronyms

Table 4-1. Acronyms/Definitions

Acronym	Definition
API	Application Program(ming) Interface
CA	Certification Authority
CRL	Certificate Revocation List
GUI	Graphical User Interface
HTTP	Hyper Text Transfer Protocol
HTTPS	Hyper Text Transfer Protocol Secure Sockets
IT	Information Technology
JAXM	Java API for XML Messaging
MIME	Multipurpose Internet Mail Extensions
PDF	Portable Document Format
POC	Point of Contact
SOAP	Simple Object Access Protocol
SSL	Secure Socket Layer
SwA	SOAP with Attachment
URL	Uniform Resource Locator
WSDL	Web Services Description Language
XML	eXtensible Markup Language

Appendix A Agency Integration WSDL

The following is the Agency Integration Web Services Description Language (WSDL):

```
<wsdl:definitions xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/" xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:http="http://schemas.xmlsoap.org/wsdl/http/" xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/" xmlns:mime="http://schemas.xmlsoap.org/wsdl/mime/"
xmlns:agis="http://apps.grants.gov/WebServices/AgencyIntegrationServices-V1.0"
xmlns:grant="http://apps.grants.gov/system/MetaGrantApplication-V1.0"
xmlns:globLib="http://apps.grants.gov/system/GlobalLibrary-V1.0" xmlns:header="http://apps.grants.gov/system/Header-
V1.0" xmlns:footer="http://apps.grants.gov/system/Footer-V1.0"
targetNamespace="http://apps.grants.gov/WebServices/AgencyIntegrationServices-V1.0"
name="AgencyIntegrationServices" version="1.0">
  <wsdl:types>
    <xsd:schema targetNamespace="http://apps.grants.gov/WebServices/AgencyIntegrationServices-V1.0">
      <xsd:import namespace="http://apps.grants.gov/system/Header-V1.0"
schemaLocation="http://apps.grants.gov/system/Header-V1.0.xsd"/>
      <xsd:import namespace="http://apps.grants.gov/system/Footer-V1.0"
schemaLocation="http://apps.grants.gov/system/Footer-V1.0.xsd"/>
      <xsd:import namespace="http://apps.grants.gov/system/GlobalLibrary-V1.0"
schemaLocation="http://apps.grants.gov/system/GlobalLibrary-V1.0.xsd"/>
      <xsd:import namespace="http://apps.grants.gov/system/MetaGrantApplication-V1.0"
schemaLocation="http://apps.grants.gov/system/MetaGrantApplication-V1.0.xsd"/>
      <xsd:simpleType name="FilterType">
        <xsd:restriction base="xsd:string">
          <xsd:enumeration value="Status"/>
          <!-- the valid values for "Status" will be either "Pending Download",
"Downloaded" or "Agency Assigned Tracking Number", any other values will be fault-->
          <xsd:enumeration value="OpportunityID"/>
          <xsd:enumeration value="CFDANumber"/>
        </xsd:restriction>
      </xsd:simpleType>
      <xsd:complexType name="ApplicationFilterTypeList">
        <xsd:sequence>
          <xsd:element name="ApplicationFilter" type="agis:ApplicationFilterType"
minOccurs="0" maxOccurs="unbounded">
            <!-- if there is no filter, it will return the list of ALL the applications -
->
            <xsd:unique name="filter">
              <xsd:selector xpath="/ApplicationFilter/FilterType"/>
            </xsd:unique>
          </xsd:element>
        </xsd:sequence>
      </xsd:complexType>
      <xsd:complexType name="ApplicationFilterType">
        <xsd:all>
          <xsd:element name="Filter" type="agis:FilterType"/>
          <xsd:element name="FilterValue" type="xsd:string"/>
        </xsd:all>
      </xsd:complexType>
      <xsd:simpleType name="GrantsGovApplicationStatusType">
        <xsd:restriction base="xsd:string">
          <xsd:enumeration value="Pending Download"/>
          <xsd:enumeration value="Downloaded"/>
          <xsd:enumeration value="Agency Assigned Tracking Number"/>
        </xsd:restriction>
      </xsd:simpleType>
      <xsd:complexType name="ApplicationListType">
```

```

                <xsd:sequence>
                    <xsd:element name="AvailableApplicationNumber" type="xsd:int"/>
                    <xsd:element name="ApplicationInformation"
type="agis:ApplicationInformationType" minOccurs="0" maxOccurs="unbounded"/>
                </xsd:sequence>
            </xsd:complexType>
            <xsd:complexType name="ApplicationInformationType">
                <xsd:all>
                    <xsd:element ref="header:OpportunityID" minOccurs="0"/>
                    <xsd:element ref="header:CompetitionID" minOccurs="0"/>
                    <xsd:element ref="header:CFDANumber" minOccurs="0"/>
                    <xsd:element ref="footer:Grants_govTrackingNumber"/>
                    <xsd:element ref="footer:ReceivedDateTime" minOccurs="0"/>
                    <xsd:element name="Grants_GovApplicationStatus"
type="agis:GrantsGovApplicationStatusType"/>
                </xsd:all>
            </xsd:complexType>
            <xsd:complexType name="ConfirmApplicationDeliveryType">
                <xsd:all>
                    <xsd:element ref="footer:Grants_govTrackingNumber"/>
                    <xsd:element name="ConfirmationResponseMessage"
type="agis:ResponseMessageType"/>
                </xsd:all>
            </xsd:complexType>
            <xsd:complexType name="AssignAgencyTrackingNumberType">
                <xsd:all>
                    <xsd:element ref="footer:Grants_govTrackingNumber"/>
                    <xsd:element ref="agis:AgencyTrackingNumber"/>
                </xsd:all>
            </xsd:complexType>
            <xsd:complexType name="AssignAgencyTrackingNumberResponseType">
                <xsd:sequence>
                    <xsd:element ref="footer:Grants_govTrackingNumber"/>
                    <xsd:element name="AssignAgencyTrackingNumberResponseMessage"
type="agis:ResponseMessageType"/>
                </xsd:sequence>
            </xsd:complexType>
            <xsd:element name="AgencyTrackingNumber" type="xsd:string"/>
            <xsd:simpleType name="ResponseMessageType">
                <xsd:restriction base="xsd:string">
                    <xsd:enumeration value="Succeed"/>
                    <xsd:enumeration value="Failed"/>
                </xsd:restriction>
            </xsd:simpleType>
        </xsd:schema>
    </wsdl:types>
    <wsdl:message name="GetApplicationListRequestMessage">
        <wsdl:part name="ApplicationListFilters" type="agis:ApplicationFilterTypeList"/>
    </wsdl:message>
    <wsdl:message name="GetApplicationListResponseMessage">
        <wsdl:part name="ReturnedApplicationList" type="agis:ApplicationListType"/>
    </wsdl:message>
    <wsdl:message name="GetApplicationRequestMessage">
        <wsdl:part name="Grants_govTrackingNumber" ref="footer:Grants_govTrackingNumber"/>
    </wsdl:message>
    <wsdl:message name="GetApplicationResponseMessage">
        <wsdl:part name="ReturnedApplication" ref="grant:GrantApplication"/>
    </wsdl:message>

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<wsdl:message name="ConfirmApplicationDeliveryRequestMessage">
  <wsdl:part name="Grants_govTrackingNumber" ref="footer:Grants_govTrackingNumber"/>
</wsdl:message>
<wsdl:message name="ConfirmApplicationDeliveryResponseMessage">
  <wsdl:part name="Grants_govTrackingNumber" ref="footer:Grants_govTrackingNumberType"/>
  <wsdl:part name="ResponseMessage" type="agis:ResponseMessageType"/>
</wsdl:message>
<wsdl:message name="AssignAgencyTrackingNumberRequestMessage">
  <wsdl:part name="AssignAgencyTrackingNumber" type="agis:AssignAgencyTrackingNumberType"/>
</wsdl:message>
<wsdl:message name="AssignAgencyTrackingNumberResponseMessage">
  <wsdl:part name="AssignAgencyTrackingNumberResponse"
type="agis:AssignAgencyTrackingNumberResponseType"/>
</wsdl:message>
<wsdl:message name="NotifyApplicationAvailableMessage">
  <wsdl:part name="NotifyApplicationAvailable" type="agis:ApplicationInformationType"/>
</wsdl:message>
<wsdl:message name="ErrorMessage">
  <wsdl:part name="ErrorMessage" ref="soap:fault"/>
</wsdl:message>
<wsdl:portType name="AgencyIntegrationPortType">
  <wsdl:operation name="GetApplication">
    <wsdl:input message="agis:GetApplicationRequestMessage"/>
    <wsdl:output message="agis:GetApplicationResponseMessage"/>
    <wsdl:fault name="GetApplicationErrorMessage" message="agis:ErrorMessage"/>
  </wsdl:operation>
  <wsdl:operation name="GetApplicationList">
    <wsdl:input message="agis:GetApplicationListRequestMessage"/>
    <wsdl:output message="agis:GetApplicationListResponseMessage"/>
    <wsdl:fault name="GetApplicationListErrorMessage" message="agis:ErrorMessage"/>
  </wsdl:operation>
  <wsdl:operation name="ConfirmApplicationDelivery">
    <wsdl:input message="agis:ConfirmApplicationDeliveryRequestMessage"/>
    <wsdl:output message="agis:ConfirmApplicationDeliveryResponseMessage"/>
    <wsdl:fault name="ConfirmApplicationDeliveryErrorMessage" message="agis:ErrorMessage"/>
  </wsdl:operation>
  <wsdl:operation name="AssignAgencyTrackingNumber">
    <wsdl:input message="agis:AssignAgencyTrackingNumberRequestMessage"/>
    <wsdl:output message="agis:AssignAgencyTrackingNumberResponseMessage"/>
    <wsdl:fault name="AssignAgencyTrackingNumberErrorMessage"
message="agis:ErrorMessage"/>
  </wsdl:operation>
  <wsdl:operation name="NotifyApplicationAvailable">
    <wsdl:output message="agis:NotifyApplicationAvailableMessage"/>
  </wsdl:operation>
</wsdl:portType>
<wsdl:binding name="AgencyIntegrationSoapBinding" type="agis:AgencyIntegrationPortType">
  <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
  <wsdl:operation name="GetApplication">
    <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/GetApplication"
style="document"/>
    <wsdl:input>
      <soap:body use="literal"/>
    </wsdl:input>
    <wsdl:output>
      <soap:body use="literal"/>
    </wsdl:output>
    <wsdl:fault name="GetApplicationErrorMessage">

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                <soap:body use="literal"/>
            </wsdl:fault>
        </wsdl:operation>
        <wsdl:operation name="GetApplicationList">
            <soap:operation soapAction="https://ws.grants.gov/AgencyIntegration/GetApplicationList"
style="document"/>
            <wsdl:input>
                <soap:body use="literal"/>
            </wsdl:input>
            <wsdl:output>
                <soap:body use="literal"/>
            </wsdl:output>
            <wsdl:fault name="GetApplicationListErrorMessage">
                <soap:body use="literal"/>
            </wsdl:fault>
        </wsdl:operation>
        <wsdl:operation name="ConfirmApplicationDelivery">
            <soap:operation
soapAction="https://ws.grants.gov/AgencyIntegration/ConfirmApplicationDelivery" style="document"/>
            <wsdl:input>
                <soap:body use="literal"/>
            </wsdl:input>
            <wsdl:output>
                <soap:body use="literal"/>
            </wsdl:output>
            <wsdl:fault name="ConfirmApplicationDeliveryErrorMessage">
                <soap:body use="literal"/>
            </wsdl:fault>
        </wsdl:operation>
        <wsdl:operation name="AssignAgencyTrackingNumber">
            <soap:operation
soapAction="https://ws.grants.gov/AgencyIntegration/AssignAgencyTrackingNumber" style="document"/>
            <wsdl:input>
                <soap:body use="literal"/>
            </wsdl:input>
            <wsdl:output>
                <soap:body use="literal"/>
            </wsdl:output>
            <wsdl:fault name="AssignAgencyTrackingNumberErrorMessage">
                <soap:body use="literal"/>
            </wsdl:fault>
        </wsdl:operation>
        <wsdl:operation name="NotifyApplicationAvailable">
            <soap:operation
soapAction="https://ws.grants.gov/AgencyIntegration/NotifyApplicationAvailable" style="document"/>
            <wsdl:output>
                <soap:body use="literal"/>
            </wsdl:output>
        </wsdl:operation>
    </wsdl:binding>
    <wsdl:service name="AgencyIntegrationServices">
        <wsdl:port name="AgencyIntegrationSoapPort" binding="agis:AgencyIntegrationSoapBinding">
            <soap:address location="https://ws.grants.gov/AgencyIntegration"/>
        </wsdl:port>
    </wsdl:service>
</wsdl:definitions>

```

