

Network Working Group
Internet-Draft

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Voice over IP Directory Services

(pronounced as 'voip *D S*')
(*D S* pronounced as 'D S')

Status of this document:

This document is an Internet-draft and currently not offered in accordance with section 10 of RFC 2026. This document is subjected to change. For latest version, please refer to <http://www.voipds.org>

Abstract:

This document describes the concept of Voice over IP Directory Services (voipDS) and explains voipDS protocol. voipDS is a central repository and a discovery service. The central repository contains the 'peer' connection information for the VOIP devices. Any VOIP user who wants to establish a peer-to-peer communication with other VOIP user, can query this service and get the peer connection information of other VOIP user. The VOIP device that initiates the connection can then automatically configure its system and have a peer-to-peer communication with other VOIP user's device. The voipDS protocol describes how the devices would interact with the repository to initiate the query, get the results and based on the results how to automatically configure the peer-to-peer connection.

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1. Introduction

With the explosion of VOIP, in near future majority of households and Businesses would have VOIP devices and / or solutions implemented. In case of individual users, there would be a need to discover friends, family members and relatives with whom one can have a peer-to-peer VOIP communication. Peer-to-peer VOIP communication is better than service provider based VOIP communication because of the fact that peer-to-peer communication is 'free' as in 'free beer'.

Taking this one step ahead, companies can setup such peer-to-peer VOIP communication with their partner companies (Vendors, Suppliers, Manufacturers etc) and they by completely eliminating their communication costs.

Peer-to-peer communication is enabled by default in majority of VOIP devices (phones and servers). For e.g. in Xten VOIP Softphone, one can call other Xten Softphone by directly entering other Softphone's IP address. Same is the case with IPphones from GrandStream. In VOIP servers like Asterisk, peer-to-peer communication can be established by registering the other server.

In order to have a peer-to-peer VOIP communication globally

- there should be central repository where one can register their 'peer' connection information
- this central repository would let others to search for the 'peer' connection information of the user they want connect to
- download the 'peer' connection information and automatically configure their VOIP device
- and start having peer-to-peer communication by just selecting the configured user in their VOIP device
- overall the 'peer' connection information should be securely stored and the user has to have complete control on who can get their 'peer' connection information

The purpose of Voice over IP Directory Services (voipDS) is to address the above requirement with a goal of helping to setup a global peer-to-peer VOIP communication.

voipDS

- is a distributed global repository which would let users to register their 'peer' connection information
- is a service that would let users to search for 'peer' connection information of the users they want to connect to
- retrieves and sends the peer connection information to the user or the VOIP device which initiated the search query

voipDS protocol

- defines communication protocol between VOIP device and voipDS repository
- is based on XML and defines how a VOIP device can REGISTER, SEARCH,

GET and CONFIGURE the peer connection information

1.1 voipDS Terminology

The following keywords used in the document are defined as follows

VOIPDS

Voice over IP Directory Services. Providing directory services to VOIP users.

VOIP DEVICE

A VOIP device could be a VOIP softphone (like Xtern), IPphone (like BudgeTone) or VOIP server (like Asterisk)

PEER

Another VOIP device to which one wants to connect to. Typical context is 'peer VOIP device'.

PEER CONNECTION INFORMATION (PCI)

The connection information required to connect to the peer device. This typically contains the VOIP protocol to be used for communication (SIP, IAX), Credentials (UserId and Password) and the code to be used.

INITIATOR

VOIP device that initiates the communication with voipDS

REGISTER

Stores the peer connection information of the VOIP device in voipDS

SEARCH

Searches the voipDS for peer connection information of a user based on FirstName, LastName, DomainName etc.

GET

Get the peer connection information of the selected user from voipDS

CONFIGURE

Configure the VOIP device from which the search was initiated with the peer connection information received from voipDS to enable peer-to-peer communication.

1.2 voipDS Interfaces

voipDS will provide two sets of interfaces

a) Web based

This is for the users who don't have voipDS protocol enabled devices.

Using the web based UI provided by the voipDS, one can register their PCI

(peer connection information), search for PCI of the users they want to connect to, get the PCI and 'manually' register it on their device.

b) XML services based (voipDS protocol)

This would be used by voipDS protocol enabled devices. Based on user actions, the device could register the PCI with voipDS, search voipDS for other users, get other user's PCI and 'automatically' configure their VOIP device to have peer-to-peer communication with other user.

1.3 Applicability

For general users, voipDS helps them

- to 'register' their peer connection information
- to 'discover' other VOIP users with whom they can have peer-to-peer communication

For Business users, voipDS helps them

- to 'register' their peer connection information
- to 'discover' the peer connection information of their business partners
- in certain scenarios, after registration, Business users can also exchange their phone directories

1.4 Privacy

Peer Connection Information (PCI) is very similar to phone number. With this information anyone can make unsolicited calls to the user. voipDS would implement the following to prevent misuse

- All the 'peer connection information' will be classified into either 'private' or 'public'
- To access the private information, the owner's approval is required.

1.5 Process Overview

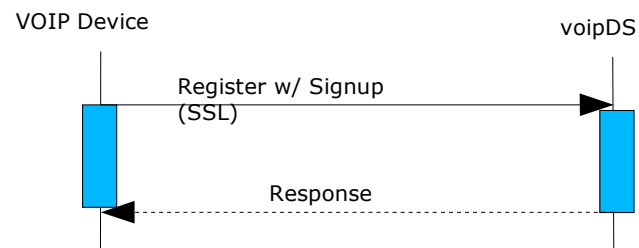
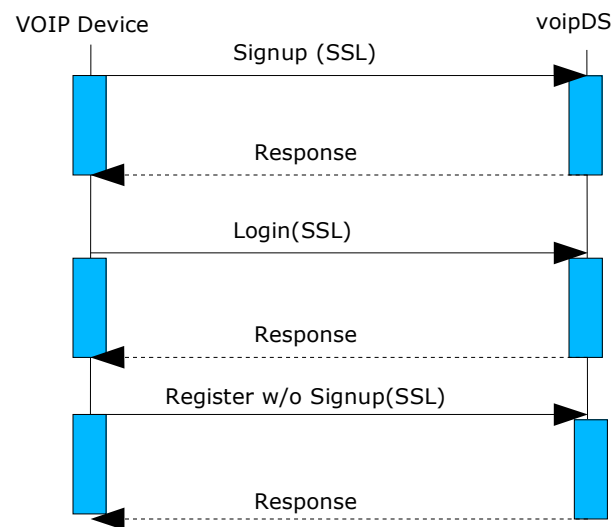
The following is the high level process flow.

- All users need to be registered with voipDS with a user name, password and a valid email address for confirmation.
- Only authenticated users would be able to register their PCI. During registration they can specify it as either private or public
- Search could be performed by anonymous user.
- Authenticated user can retrieve PCI that's classified as public
- Only user names and domain names would be displayed in case of PCIs classified as private.
- To retrieve private peer connection information, the user has to login and get authenticated first. Then a request message is sent to the owner of the

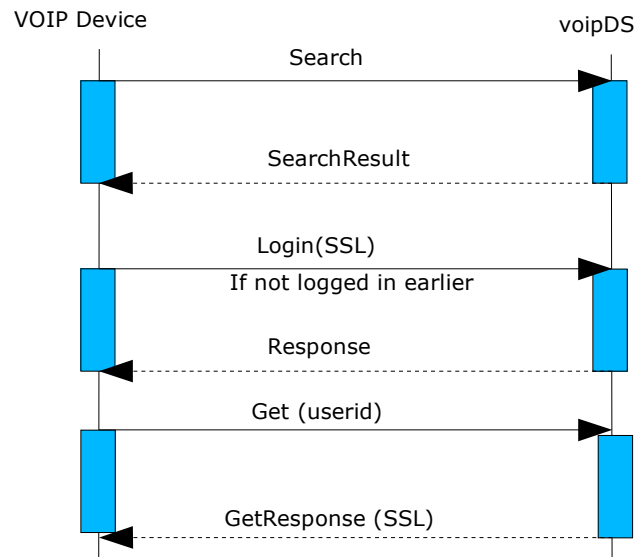
- PCI. After the owner approves, the user then gets the PCI.
- Initial registration and retrieval of PCI is done over SSL

1.6 Sequence diagrams

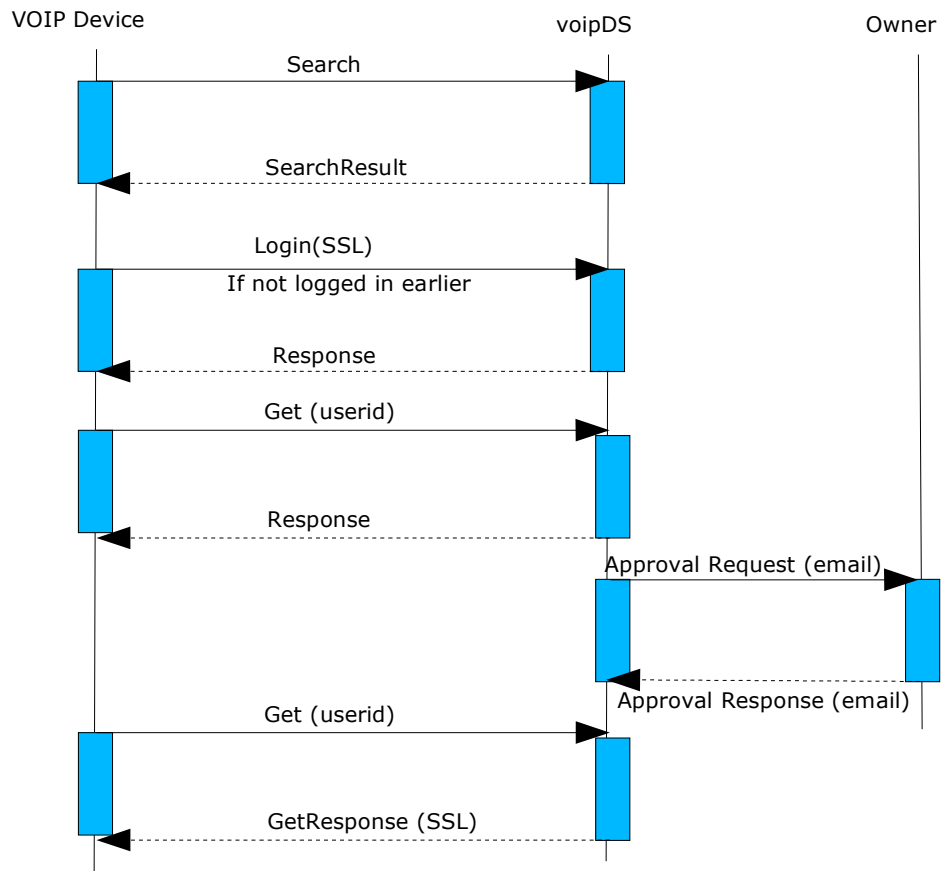
1.6.1 Sequence diagram for Registration



1.6.2 Sequence diagram for retrieving PCI (public)



1.6.2 Sequence diagram for retrieving PCI (private)



2. voipDS Protocol

voipDS is a XML based protocol. Its the protocol that defines the communication between the VOIP devices and voipDS. voipDS protocol consists of five basic messages. They are Signup, Login, Register, Search and Get. In addition to that we have standard Response, SearchResponse and GetResponse messages.

All messages should be UTF-8 encoded and should use entity escape codes for the following characters

Character		Escape Code
Ampersand	&	&
Single Quote	'	'
Double Quote	"	"
Greater Than	>	>
Less Than	<	<

Below is an example that uses non-ASCII character and a character that requires entity escaping.

ümlat with UTF-8 encoding becomes %C3%BCmlat

John's with entity escaping becomes John's

2.1 Signup

Signup message is used to Signup new users with Voice Over IP Directory Services. A sample Signup message is shown below. Optional elements are shown in Italics.

```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <signup >
    <firstname>John</firstname>
    <lastname>Doe</lastname>
    <businessname>John%20Doe&apos;s%20Consulting</businessname>
    <domainname>www.example.com</domainname>
    <username>JohnDoe</username>
    <password>mypassword</password>
    <emailaddress>john@example.com</emailaddress>
  </signup>
</voipds>
```

2.1.1 Definitions of Signup XML tags

Signup XML tags are defined below

Tags	Required	Description
<voipds>	required	voipDS protocol root node
<signup>	required	Parent node for Signup tags
<firstname>	required	First Name
<lastname>	required	Last Name
<businessname>	optional	Business Name
<domainname>	optional	Domain Name
<username>	required	User Name to be used to log into voipDS
<password>	required	Password for the above user name
<emailaddress>	required	Email address for signup confirmation and private requests

Note: Since Signup contains user credentials it should be sent over SSL.

2.2 Signup Response

voipDS on receiving a valid signup message would return a generic Response message as defined below.

```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <response>
    <action>signup</action>
    <status>200</status>
    <sessionid>null</sessionid>
  </response>
</voipds>
```

2.2.1 Definitions of Signup Response tags

Signup Response XML tags are defined below

Tags	Required	Description
<voipds>	required	voipDS protocol root node
<response>	required	Parent node for Response tags

Tags	Required	Description
<action>	required	Action is the name of the message for which the response is delivered. It could be Signup, Login, Search, Register and Get.
<status>	required	Status is an ID that describes response for the message. For e.g. status 200 means 'Signup success and confirmation email sent'. For more details on Status Ids, refer section Status Codes.
<sessionid>	optional	If the messages are in a session then it contains the Session ID generated by the server.

2.3 Login

Login message is used to log into Voice over IP Directory Service. A sample Login message is shown below

```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <login>
    <username>JohnDoe</username>
    <password>mypassword</password>
    <emailaddress>John@example.com</emailaddress>
  </login>
</voipds>
```

2.3.1 Definitions of Login XML tags

Login XML tags are defined below

Tags	Required	Description
<voipds>	required	voipDS protocol root node
<login>	required	Parent node for Login tags
<username>	required	Login User Name
<password>	required	Login password.
<emailaddress>	required	Login email address.

Note: As Login message contains the credentials it should be sent over SSL.

2.4 Login Response

voipDS on receiving a valid Login message would return a generic Response message

as defined below

```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <response>
    <action>login</action>
    <status>210</status>
    <sessionid>123456789012345678</sessionid>
  </response>
</voipds>
```

In case of login failure, the status would contain 410 or any similar status codes and the value of <sessionid> would be null. A successful login response should contain a valid SessionID.

2.5 Register

Register message is used to register the Peer connection information PCI with voipDS. Register message contains optional Signup message. This is because one can Signup and Register at the same time. A sample Register message would be as follows

```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <signup >
    <firstname>John</firstname>
    <lastname>Doe</lastname>
    <businessname>John%20Doe&apos;s%20Consulting</businessname>
    <domainname>www.example.com</domainname>
    <username>JohnDoe</username>
    <password>mypassword</password>
    <emailaddress>john@example.com</emailaddress>
  </signup>
  <register>
    <sessionid>123456789012345</sessionid>
    <pci>
      <peername>publicpeers</peername>
      <public>1</public>
      <protocol>iax</protocol>
      <username>peerusername</username>
      <password>peerpassword</password>
      <codec>gsm,ulaw,alaw</codec>
      <servername>voip.example.com</servername>
      <ipaddress>123.456.789.012</ipaddress>
      <description>some comments about this peer</description>
    </pci>
  </register>
</voipds>
```

If register message contains signup information then it can be sent via SSL.

2.5.1 Definitions of Register XML tags

The following table describes Register message XML tags

Tags	Required	Description
<voipds>	required	voipDS protocol root node

Tags	Required	Description
<signup>	conditional	Parent node for Signup tags. The entire node is only required only if SessionID node is empty.
<firstname>	required	First Name
<lastname>	required	Last Name
<businessname>	optional	Business Name
<domainname>	optional	Domain Name
<username>	required	User Name to be used to log into voipDS
<password>	required	Password for the above user name
<emailaddress>	required	Email address for signup confirmation and private requests
<register>	required	Parent node for Register tags
<sessionid>	conditional	Contains the Session ID. This would contain the session id only when signup node is not present. The goal is if the user/voip device is already authenticated by login message, then they can simply send the session id in this message.
<pci>	required	parent node for peer connection information
<peername>	optional	A friendly name for this peer
<public>	required	Public refers to whether this peer information should be Private or Public. (IsPublic) <ul style="list-style-type: none"> - 0 denotes Private - 1 denotes Public
<protocol>	required	Peer connection protocol. This can be IAX, SIP or any other standard protocol
<username>	required	User name that would be used by the peer device
<password>	optional	password that would be used by the peer device
<codec>	optional	Codec that would be used to connect to this peer. It can contain more than one codec, comma separated, in the order of priority.
<servername>	conditional	If its a server to server connection then this would contain the fully qualified domain name. Servername is required if IPaddress tag is empty.
<ipaddress>	conditional	This contains the IPaddress of the server/device to which peers connect to. IPaddress is required if servername tag is empty.
<description>	optional	A friendly description about this peer connection

Note: In order to avoid cyber squatting it might be a good practice to match the domain names of email address, Domain Name and PCI Server name. All should contain the same FQDN in them.

2.6 Register Response

voipDS on receiving a valid Register will return a generic Response message.

```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <response>
    <action>register</action>
    <status>220</status>
    <sessionid>123456789012345678</sessionid>
  </response>
</voipds>
```

Note: In case of Signup failure, the action tag will still be 'register' but the status could be 400, which is 'user name already in the system'.

2.7 Search

Using Search message, an user or a device would be able to search the Voice over IP Directory Service repository for peer connection information of their friends, family members or their business partners. A sample Search message would be like the following.

```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <search>
    <firstname>John</firstname>
    <lastname>Doe</lastname>
    <businessname>John%20Doe&apos;s%20Consulting</businessname>
    <domainname>example.com</domainname>
    <pagesize>200</pagesize>
  </search>
</voipds>
```

2.7.1 Definitions of Search XML tags

The following table defines Search XML tags

Tags	Required	Description
<voipds>	required	voipDS protocol root node
<search>	required	Parent node for Search tags
<firstname>	conditional	First Name
<lastname>	conditional	Last Name
<businessname>	conditional	Business Name
<domainname>	conditional	Domain Name. Search message should contain any one of these tags, firstname, lastname, businessname and domainname.
<pagesize>	required	The number of search records returned. It has a maximum of 1000 records.

2.8 Search Response

A Search message results in two different responses depending upon the search results. A Search message would result in generic Response message if there are no search results and would return 'SearchResponse' message if there are search results.


```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <searchresponse>
    <result>
      <firstname>John</firstname>
      <lastname>Doe</lastname>
      <businessname>John%20Doe&apos;s%20Consulting</businessname>
      <domainname>example.com</domainname>
      <public>0</public>
      <userid>123456</userid>
    </result>
  </searchresponse>
</voipds>
```

With multiple search results.

```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <searchresponse>
    <result>
      <firstname>John</firstname>
      <lastname>Doe</lastname>
      <businessname>John%20Doe&apos;s%20Consulting</businessname>
      <domainname>example.com</domainname>
      <public >0</public >
      <userid>123456</userid>
    </result>
    <result>
      <firstname>Jane</firstname>
      <lastname>Doe</lastname>
      <public >1</public >
      <userid>1234356</userid>
    </result>
    <result>
      <firstname>John</firstname>
      <lastname>Doe1</lastname>
      <public >0</public >
      <userid>123459</userid>
    </result>
    <result>
      <firstname>John</firstname>
      <lastname>Doe1</lastname>
      <businessname>John%20Doe1&apos;s%20Consulting</businessname>
      <domainname>example1.com</domainname>
      <public >1</public >
    </result>
  </searchresponse>
</voipds>
```

```

        <userid>125656</userid>
      </result>
    </searchresponse>
  </voipds>

```

Incase of no search results, Search message would get the following response from voipDS.

```

<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <response>
    <action>search</action>
    <status>440</status>
    <sessionid>123456789012345678</sessionid>
  </response>
</voipds>

```

2.8.1 Definition of SearchResponse XML tags

SearchResponse tags are defined as

Tags	Required	Description
<voipds>	required	voipDS protocol root node
<searchresponse>	required	Parent node for SearchResponse tags
<result>	required	parent node for search results. A searchresponse can contain one or more result tags.
<firstname>	required	First Name
<lastname>	required	Last Name
<businessname>	optional	Business Name
<domainname>	optional	Domain Name. Search message should contain any one of these tags, firstname, lastname, businessname and domainname.
<public >	required	Its the type of the PCI. IsPublic - 0 denotes Private - 1 denotes Public
<userid>	required	This is the UserID in the voipDS for the User in the result. This userid would be used to retrieve PCI for this user.

2.9 Get

Get message is used to get the peer connection information of the selected user. PCI can be obtained only if its public or approved by the owner. Get message returns GetResponse message for valid PCI and returns generic Response message for error or private PCIs. The following is a sample Get message.

```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <get>
    <userid>123456</userid>
    <sessionid>1234567899012345</sessionid>
  </get>
</voipds>
```

2.9.1 Definition of Get XML tags

Get message tags are defined below

Tags	Required	Description
<voipds>	required	voipDS protocol root node
<get>	required	Parent node for Get tags
<userid>	required	UserID obtained from Search
<sessionid>	required	Session ID. Only authenticated users can Get PCI.

2.10 GetResponse

On receiving a valid Get message, if the PCI for the given userid is public or approved by the owner, then voipDS returns a GetResponse message with all the PCI details. If the PCI of the userid is private or doesn't exists, voipDS returns a generic Response message.

A sample GetResponse message would be as follows.

```
<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
  <getresponse>
    <userid>123456</userid>
    <sessionid>1234567899012345</sessionid>
    <pci>
      <protocol>iax</protocol>
    </pci>
  </getresponse>
</voipds>
```

```

        <username>peerusername</username>
        <password>peerpassword</password>
        <codec>gsm,ulaw,alaw</codec>
        <servername>voip.example.com</servername>
        <ipaddress>123.456.789.012</ipaddress>
    </pci>
</getresponse>
</voipds>

```

In case of an error or if the PCI is private, voipDS would return a generic Response message.

```

<?xml version="1.0" encoding="UTF-8"?>
<voipds xmlns="http://www.voipds.org/schemas/0.1">
    <response>
        <action>get</action>
        <status>430</status>
        <sessionid>123456789012345678</sessionid>
    </response>
</voipds>

```

2.10.1 Definition of GetResponse XML tags

GetResponse XML tags are defined as follows

Tags	Required	Description
<voipds>	required	voipDS protocol root node
<get>	required	Parent node for Get tags
<userid>	required	UserID contained in Get message
<sessionid>	required	Session ID contained in the Get message.
<pci>	required	parent node for peer connection information
<protocol>	required	Peer connection protocol. This can be IAX, SIP or any other standard protocol
<username>	required	User name that would be used by the peer device
<password>	optional	password, if available.
<codec>	optional	Codec, if available.
<servername>	conditional	Server name, if available.
<ipaddress>	conditional	IP address, if available.

2.11 Status Codes

Response message contains a status code that denotes the result of a particular request. Various status codes and their meanings.

- o 1xx: Informational - Not used, but reserved for future use
- o 2xx: Success - The action was successfully received, understood, and accepted.
- o 3xx: Redirection - Further action must be taken in order to complete the request
- o 4xx: Client Error - The request contains bad syntax or cannot be fulfilled
- o 5xx: Server Error - The server failed to fulfill an apparently valid request

(not a complete list)

- 200 Signup success. Confirmation Email sent (to be used only with Signup)
- 210 Login Success
- 220 Registration Success (to be used only with Registration)
- 230 Success - Search results
- 240 Success - PCI information

- 400 UserID already exists in the system
- 401 Email address already in the system
- 402 Password doesn't meet the criteria
- 403 Domain Name already in the system
- 404 Invalid PCI protocol
- 405 Invalid PCI codec
- 406 Invalid PCI type
- 407 Invalid PCI Server Names
- 408 Invalid PCI IP address

- 410 Login failed
- 411 Invalid UserID (optional)
- 412 Invalid Password (optional)
- 413 Invalid Email address (optional)
- 414 User not activated
- 415 Invalid Session

430 error - no PCI information
431 error - private PCI
432 error - private PCI - request sent
433 error - request rejected

440 no search results

500 Server error

3. Version Changes

#	Description	Version	ChangedBy	Date
1	First Draft	0.1	Balaji NJL	2005/09/25

4. Open Issues

Tracking open issues

1. How to send a telephone directory.