



Avaya Solution & Interoperability Test Lab

Application Notes for Configuring Objectworld CallAttendant Office – TAPI Wave Integration with Avaya IP Office - Issue 1.0

Abstract

These Application Notes describe the procedure for configuring Objectworld CallAttendant Office – TAPI Wave integration to work with Avaya IP Office. Information in these Application Notes has been obtained through compliance testing and additional technical discussions. Testing was conducted via the *DeveloperConnection* Program at the Avaya Solution and Interoperability Test Lab.

1. Introduction

These Application Notes focus on the steps required for configuring Objectworld CallAttendant Office – TAPI Wave integration to work with Avaya IP Office.

The configuration information provided in these Application Notes assumes the prior successful configuration of CallAttendant Office – analog integration with IP Office as instructed in reference [1] and focuses solely on the changes necessary to implement the TAPI Wave configuration.

Objectworld CallAttendant Office (CAO) works with integrated e-mail systems such as Microsoft Exchange, Lotus Notes and IMAP Compliant E-mail systems to provide users with a single storage and access point for voice, fax, and e-mail messages. Non-integrated e-mail systems are also supported through an integrated messaging client to allow users to visually manage their voice and fax messages. CAO provides full fax server capabilities including management of incoming and outgoing faxes.

Users can retrieve and manage messages either over the telephone or directly from their desktop PCs. Using text to speech technology, CAO allows reading of e-mails over the telephone. While listening to e-mail messages, a user can simply respond with a wave file attachment to the original sender of the e-mail.

CAO users can be configured in one of two available modes: personal assistant or personal business assistant mode. Personal business assistant mode provides users with a simple user interface that allows configuration and management of greetings, one-time messages, services, announcements, fax cover pages, and faxes. Personal assistant mode provides users with the ability to route specific callers to one-time messages and to filter calls to their extensions by activating call transfer, active message delivery, and pager notification based on Caller ID, Outlook Contact, and/or Time of Day. In addition to unified communications features, CAO provides seamless Active Directory (AD) integration for user management. CAO users can be linked to AD users via the CAO administration user interface or via an MMC snap-in visible in the AD user dialog. User details like first/last/display name and state (enabled/disabled) are synchronized automatically with AD on a continual basis. The snap-in also provides mechanisms for modifying CAO-specific details like extensions and message store. AD linked users are automatically authenticated when they log into the CAO server using the CAO client. CAO supports different/multiple messages stores, in addition to the option to not use Active Directory. The steps outlined in these Application Notes address one possible configuration available with CAO.

CallAttendant Office – TAPI Wave integration interacts with IP Office via TAPI Wave integration for the media and TAPI third party for the control. The TAPI Wave integration provides media for voice messages; IP Office TAPI Wave does not support fax.

The IP Office TAPI interface is used by CAO during a call to gather caller and called telephone number information as well as call reason information. The call reason gives CAO the ability to determine how calls are answered. For example, does it act as an automated attendant, prompt for a mailbox password or prompt the callers to leave a message in a mailbox. Message waiting indication is set and canceled via TAPI.

The configuration in **Figure 1** shows a network consisting of an Avaya IP Office 406v2 with Avaya IP400 Phone Module, Avaya IP Office Manager PC, Objectworld CAO server, Avaya 6408D+ digital telephones, Avaya 4600-series IP telephones and analog telephones and a Microsoft Active Directory and Exchange server. Avaya IP Office has T1/PRI and analog trunks to the central office.

The Avaya IP Office TAPI driver must be installed on the CAO server to establish a TAPI 3rd party call control connection to Avaya IP Office. The Avaya IP Office TAPI Wave driver must be installed on the CAO server to establish a connection to Avaya IP Office for media. A CAO hunt group was created and configured as the system voicemail on Avaya IP Office. The hunt group was made up of TAPI Wave station ports defined in IP Office and used by CAO server.

The tested configuration is shown in **Figure 1**.

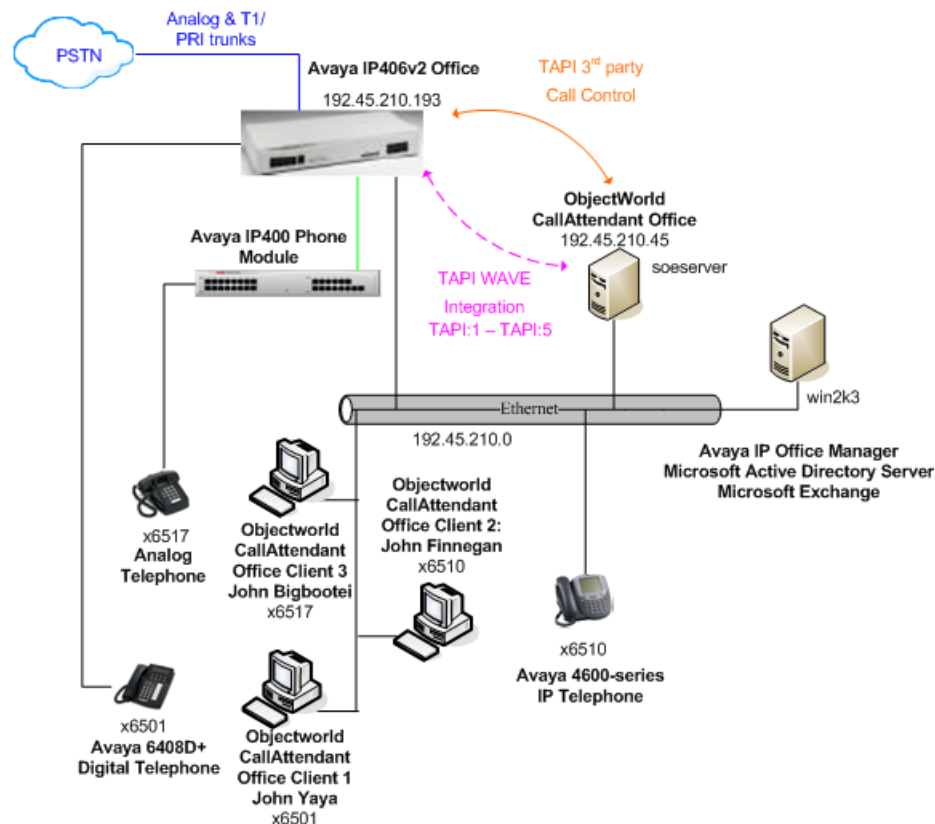


Figure 1 – Network Configuration Diagram

Note: For security purposes, Avaya IP Office does not support nested forwarding. In the event CAO becomes unavailable, calls to extensions, which are forwarded to the CAO hunt group as coverage calls, will not be routed to the CAO hunt group's overflow or fallback path. If such a scenario occurs, the administrator must make alternate call routing arrangements until the CAO becomes available.

Table 1 lists all users and associated extension numbers for **Figure 1**.

End User Name	Extension
John Yaya	6501
John Finnegan	6510
John Bigbootei	6517
CAO Hunt Groups	
cao vm	6599
cao auto aa	6570
TAPI WAVE ports	
TAPI:1	250
TAPI:2	251
TAPI:3	252
TAPI:4	253
TAPI:5	254

Table 1 – User to Extension Mapping

2. Equipment and Software Validated

The following equipment and software/firmware were used for the sample configuration provided:

Equipment	Software/Firmware
Avaya IP Office 406v2	3.2(17)
Avaya IP400 Phone Module	5.2(17)
Avaya IP Office Manager	5.2(17)
Avaya IP Office TAPI Driver	1.0.0.27
Avaya IP Office TAPI WAVE Driver	2.0.0
Avaya 4600-series IP Telephones (4610SW, 4620SW)	2.3
Avaya 6408D+ Digital Telephones	-
Objectworld CallAttendant Office – TAPI WAVE integration	4.0.2

Table 2 – Equipment and Software / Firmware Versions Validated

3. Configure Avaya IP Office

The configuration information provided in this section describes the steps required to set up Avaya IP Office for this solution and assume the IP Office configuration described in reference [1] has already occurred. In particular,

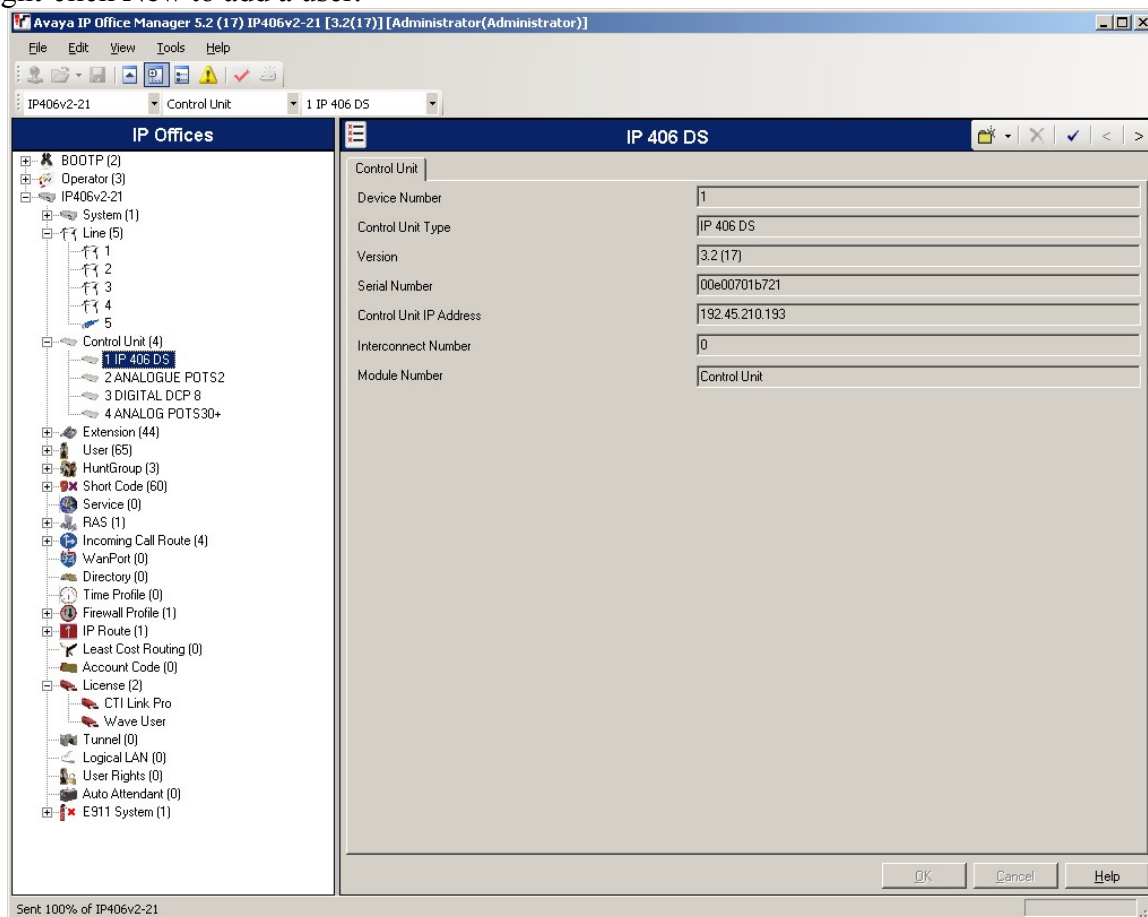
- The system password for TAPI applications was verified.
- The cao vm hunt group (6599) was created.
- The cao vm hunt group was configured as the IP Office system voicemail.
- The cao auto aa hunt group (6570) was created and configured.
- The incoming call route was configured to route calls to the cao auto aa hunt group.
- End-user extensions (6501, 6510, and 6517) were created.
- The CTI Link Pro license was installed.

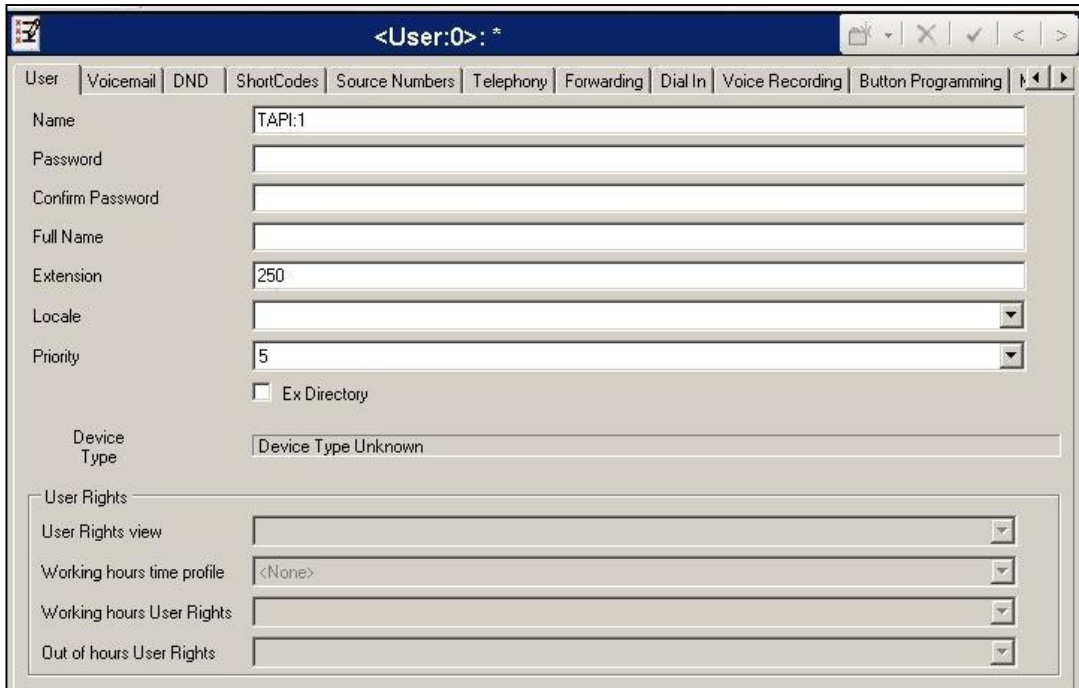
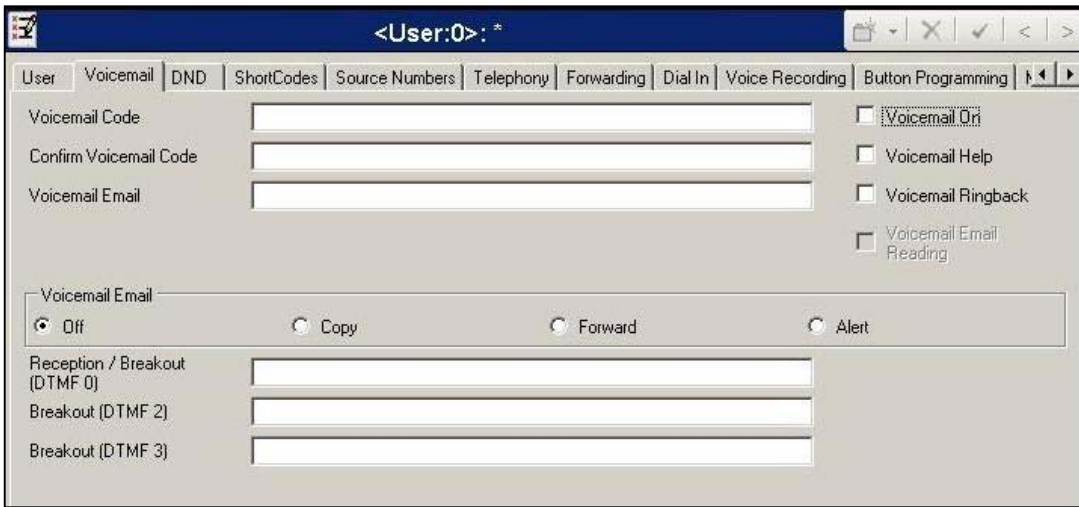
*Be sure to have the **Avaya IP Office Wave User** license key on hand as it will be required as part of this configuration.*

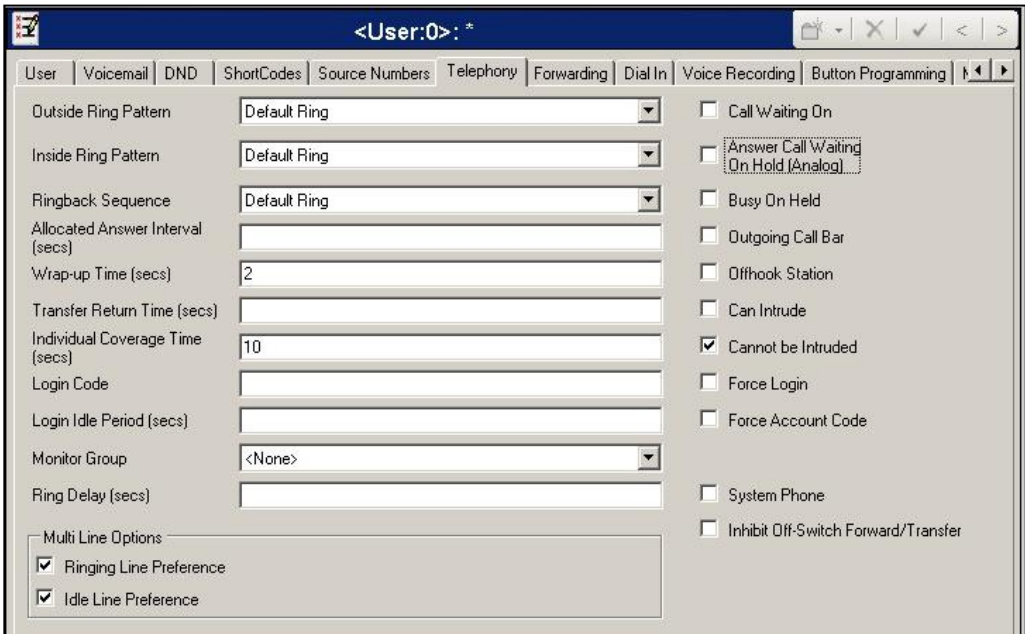
For all other provisioning information, such as Avaya IP Office installation and configuration, please refer to Avaya IP Office product documentation in reference [2].

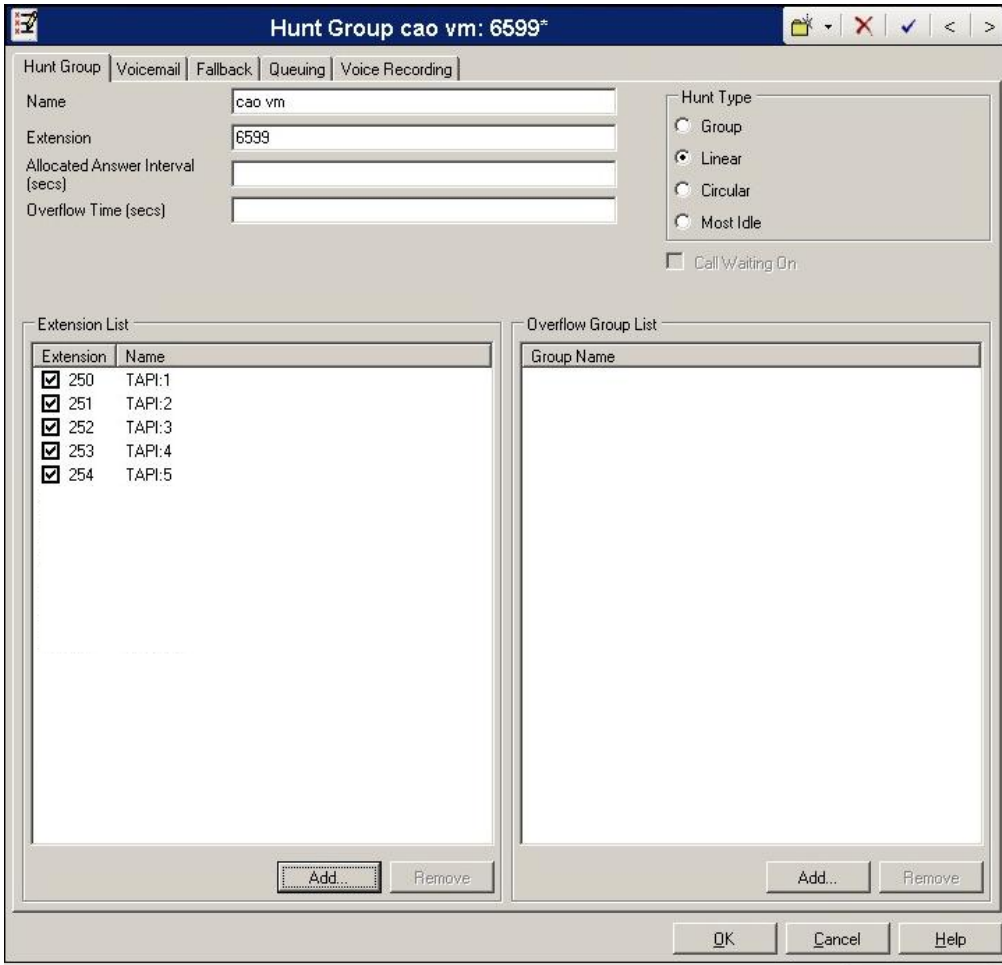
Step	Description
1.	Log into the IP Office Manager PC and go to Start → Programs → IP Office → Manager to launch the Manager application.
	Open IP Office configuration
2.	In the Manager window, select File → Open to search for IP Office in the network.
3.	Log into IP Office using the appropriate login credentials to receive its configuration.
	Configure TAPI Wave Ports

Step	Description
4.	In the Manager window, go to the Configuration Tree and click User . In the right hand pane, right-click New to add a user.



Step	Description
5.	<p>In the User window that appears, set Name to the name of the first TAPI WAVE port listed in Table 1, set Extension to the extension number for the first TAPI WAVE port listed in Table 1. Select the Voicemail tab.</p> 
6.	<p>In the Voicemail tab, uncheck Voicemail On. Select the Telephony tab.</p> 

Step	Description
7.	<p>In the Telephony tab, uncheck Call Waiting On, uncheck Answer Call Waiting On Hold (Analog) and click OK.</p> 
8.	<p>Repeat Steps 4 – 7 for each TAPI WAVE port listed in Table 1. For the purposes of these Application Notes, TAPI WAVE ports 250 – 254 were configured.</p>
	<p>Modify cao vm hunt group configuration</p>
9.	<p>In the Manager window, go to the Configuration Tree and double-click Hunt Group. In the list of hunt groups that appears, click 6599 cao vm.</p>

Step	Description
10.	<p>In the hunt group window that appears, remove all the CAO port extensions from the Extension List and add all the TAPI Wave ports listed in Table 1 to the Extension List. Click OK.</p> 
Install Wave User license	
11.	In the Manager window, go to the Configuration Tree and click System → IP406v2-C7 . In the right pane, verify the License Server IP Address is set to the IP address of the machine to which the Avaya Software Sentinel key (dongle) is connected. If the dongle is connected to Avaya IP Office directly, it should be set to 0.0.0.0 .
12.	In the Manager window, go to the Configuration Tree and double-click License . In the right-hand pane, right-click New in the popup that appears.
13.	In the License popup that appears, enter the license string for the Wave User license and click OK . Though an unlimited TAPI WAVE lab license was used for compliance testing, for the purposes of these Application Notes, a 5-user Wave User license would have been sufficient.
14.	In the Manager window, select File → Save to push the configuration to IP Office and wait for the system to update. This completes configuration of Avaya IP Office for this solution.

4. Configure Objectworld CallAttendant Office PC

The configuration information provided in this section describes the steps required to configure Objectworld CallAttendant Office – TAPI Wave integration for this solution, and assumes the CAO configuration described in reference [1] has already been carried out. In particular,

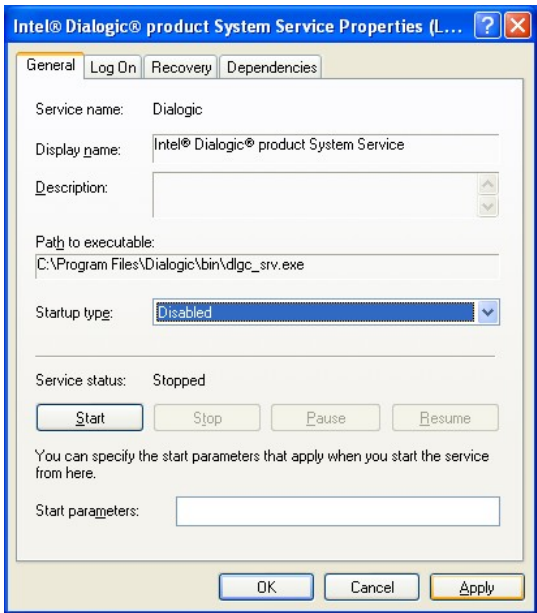
- The Avaya TAPI Driver was installed and configured.
- The CAO server was configured to work with Avaya IP Office.

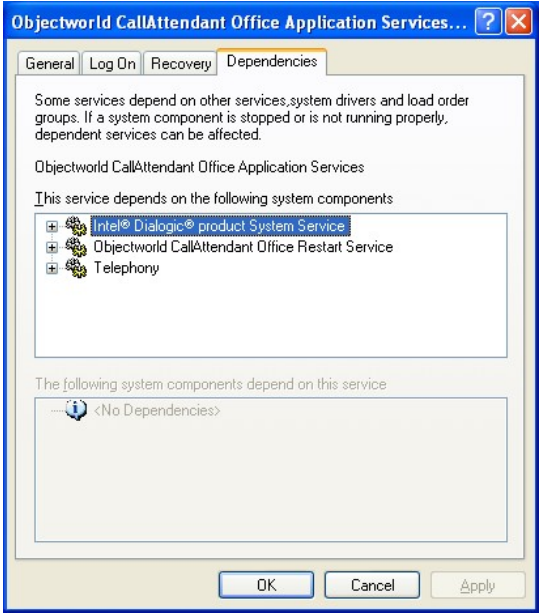
For all other provisioning information, such as software installation, Windows domain administration and configuration for Objectworld, installation of optional components, and/or the configuration of CAO, please refer to the Objectworld product documentation in reference [4].

4.1. Disable Intel Dialogic Drivers

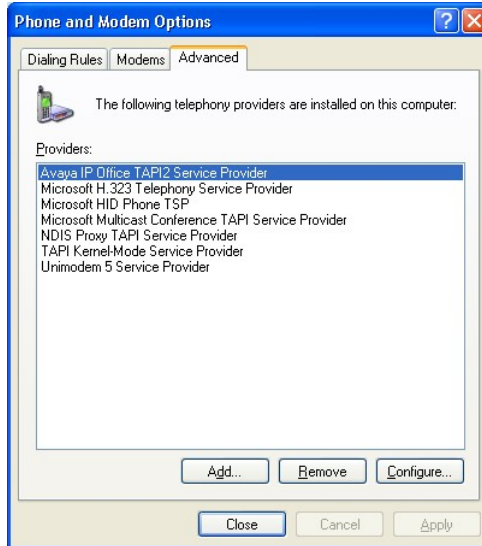
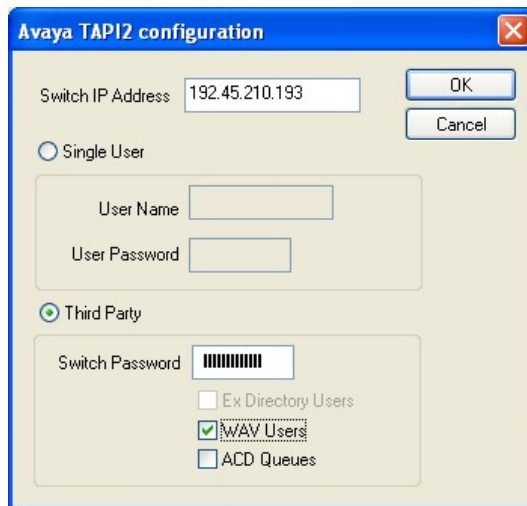
The steps in this section were not required in a typical installation; however, they were necessary to convert the CAO server from analog integration to TAPI wave integration during the compliance test. Should a hybrid analog/TAPI wave implementation be required, (i.e., integrating CAO server with IP Office using both analog station ports and TAPI wave ports), then this section should be skipped.

Step	Description
1.	Log into the CAO PC with administrative privileges, go to Start → Control Panel , double-click the Administrative Tools icon in the Control Panel window that appears. Then double-click Services .
2.	In the Services window that appears, right-click the Intel Dialogic Product System service and select Properties in the popup menu that appears.
3.	In the Intel Dialogic product System Service Properties window that appears, select Disabled for Startup type and click OK .



Step	Description
4.	In the Services window, right-click Objectworld CallAttendant Office Application Services and select Properties in the popup menu that appears.
5.	<p>In the Objectworld CallAttendant Office Application Services Properties window that appears, select the Dependencies tab. In the Dependencies tab that appears, delete Intel Dialogic product System Service, and click OK.</p>  <p>The screenshot shows the 'Objectworld CallAttendant Office Application Services...' window with the 'Dependencies' tab selected. The window contains a list of system components that the service depends on. The list includes 'Intel Dialogic product System Service', 'Objectworld CallAttendant Office Restart Service', and 'Telephony'. The 'Intel Dialogic product System Service' is currently selected and highlighted. Below the list, there is a section for components that depend on this service, which currently shows '<No Dependencies>'. At the bottom of the window are 'OK', 'Cancel', and 'Apply' buttons.</p>

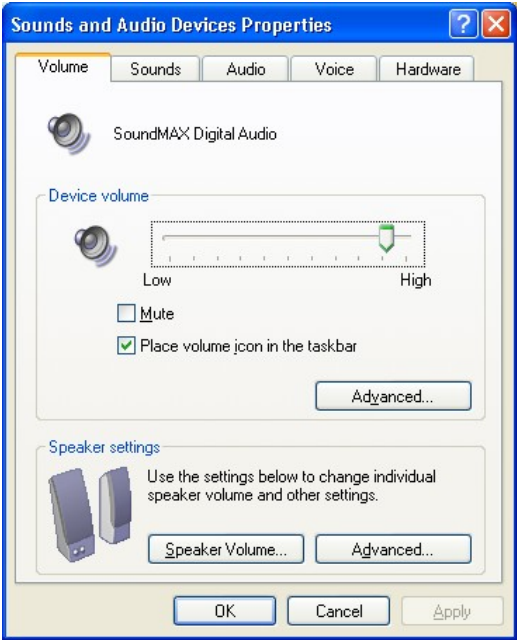
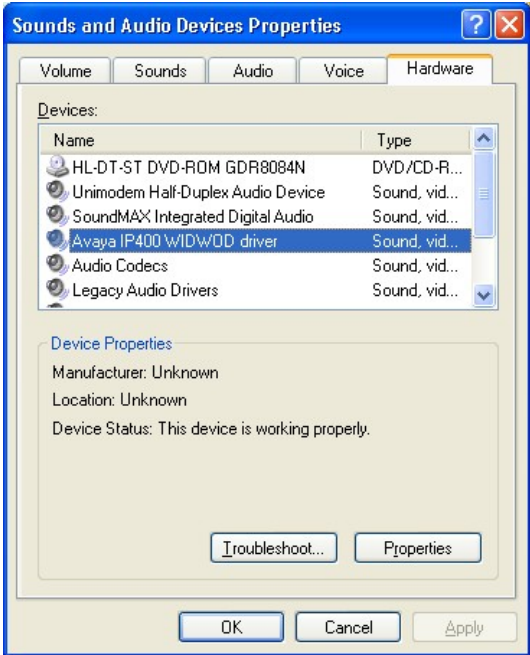
4.2. Modify Avaya IP Office TAPI Driver Configuration

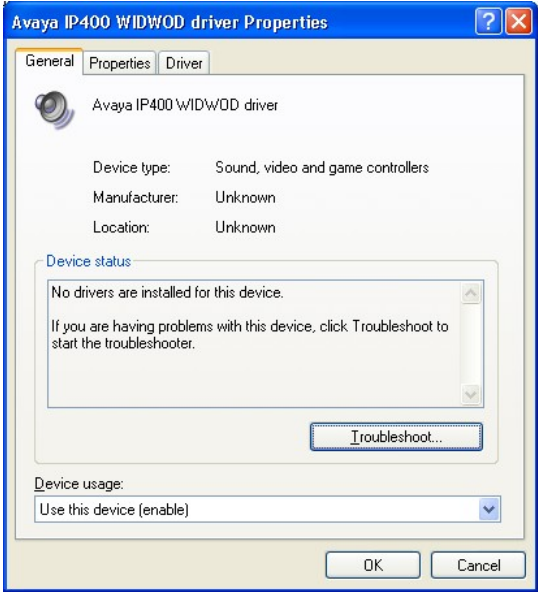
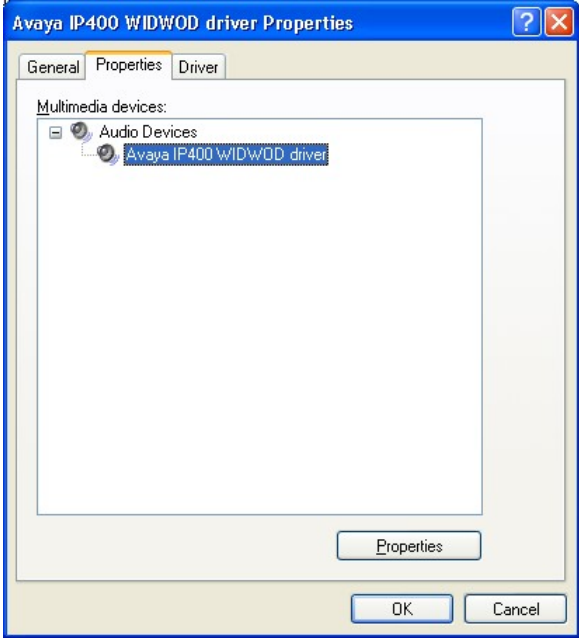
Step	Description
1.	Log into the CAO PC with administrative privileges, go to Start → Control Panel and double-click the Phone and Modem Options icon in the Control Panel window that appears.
2.	In the Phone and Modem Options window that appears, select the Advanced tab.
3.	In the Advanced tab window that appears, highlight Avaya IP Office TAPI2 Service Provider and click the Configure... button.
	
4.	In the Avaya TAPI2 configuration window that appears, check WAV Users . Click OK .
	
5.	In the Phone and Modem Options window, click Close .
6.	Reboot the CAO PC for the changes to take effect. This completes modification of the Avaya IP Office TAPI Driver on the CAO PC for this solution.

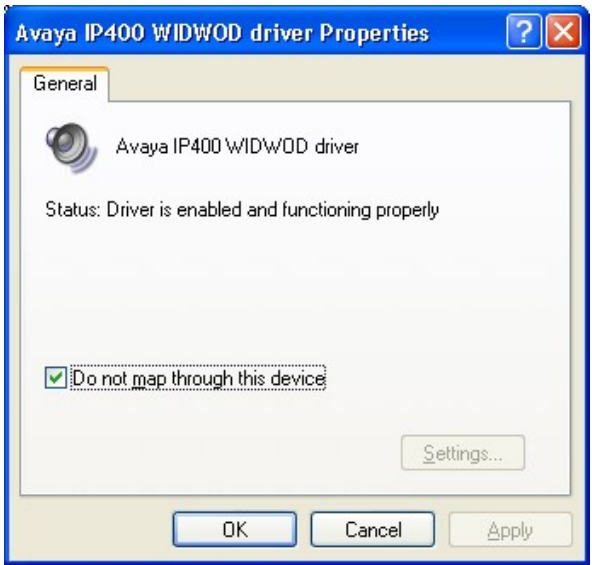
4.3. Install and Configure Avaya IP Office TAPI WAVE Driver

The steps provided in this section assume a copy of the Avaya IP Office TAPI WAVE driver has been placed in a folder of the CAO PC.

Step	Description
1.	Log into the CAO PC using administrative privileges and go to Start → Control Panel and double-click the Add Hardware icon in the Control Panel window that appears.
2.	In the Add Hardware Wizard window that appears, click Next .
3.	In the next Add Hardware Wizard window that appears, select Yes, I have already connected the hardware . Click Next .
4.	In the next Add Hardware Wizard window that appears, select <i>Add a new hardware device</i> for Installed hardware . Click Next .
5.	In the next Add Hardware Wizard window that appears, select Install the hardware that I manually select from a list (Advanced) . Click Next .
6.	In the next Add Hardware Wizard window that appears, select Sound, video and game controllers . Click Next .
7.	In the next Add Hardware Wizard window that appears, click Have Disk...
8.	In the Install From Disk popup that appears, click Browse...
9.	In the Locate File popup that appears, navigate to the location where the Avaya IP Office TAPI WAVE driver has been placed and select the oemsetup.inf file. Click Open .
10.	In the Install From Disk popup, click OK .
11.	In the Software Installation popup that appears, click Continue Anyway .
12.	In the next Add Hardware Wizard window that appears, Avaya IP400 WIDWOD driver should be listed as the device driver to be installed. Click Next .
13.	In the next Add Hardware Wizard window that appears, click Next .
14.	In the Hardware Installation popup that appears, click Continue Anyway .
15.	In the next Add Hardware Wizard window that appears, click Finish .
16.	In the System Settings Change popup that appears, click Yes to reboot the computer.
17.	Following the system reboot, log into the CAO PC using the appropriate administrative credentials.
18.	Go to Start → Control Panel and double-click the Sounds and Audio Devices icon in the Control Panel window that appears.

Step	Description
19.	<p>In the Sounds and Audio Devices Properties window that appears, select the Hardware tab.</p> 
20.	<p>In the Hardware tab that appears, double-click Avaya IP400 WIDWOD driver.</p> 

Step	Description
21.	<p>In the Avaya IP400 WIDWOD driver Properties window that appears, select the Properties tab.</p> 
22.	<p>In the Properties tab that appears, double-click Avaya IP400 WIDWOD driver.</p> 

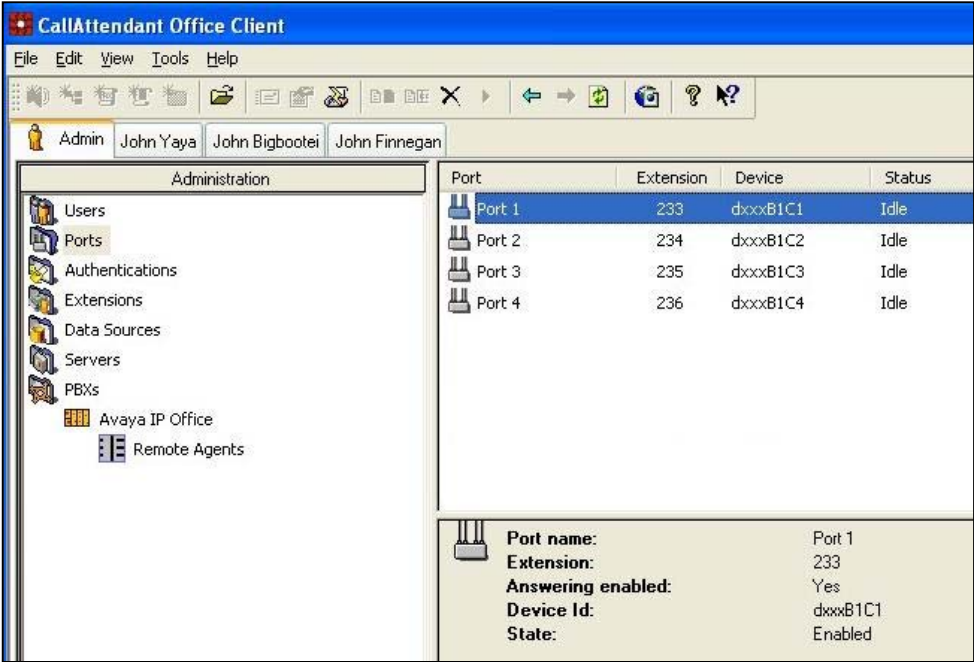
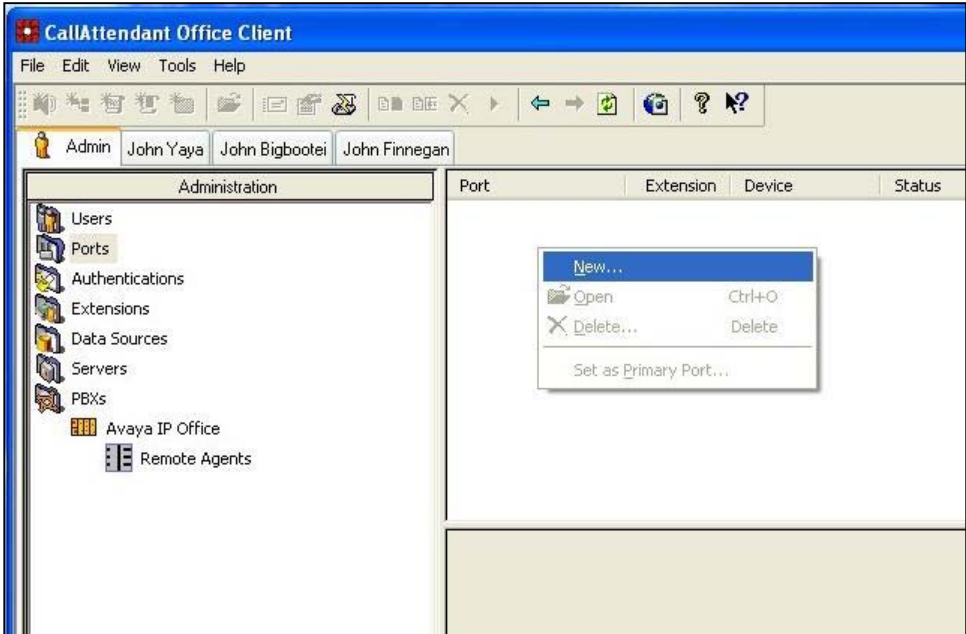
Step	Description
23.	<p>In the Avaya IP400 WIDWOD driver Properties popup that appears, check Do not map through this device. Click OK.</p> 
24.	<p>Reboot the CAO PC for the changes to take effect. This completes configuration of the Avaya IP Office TAPI Wave Driver on the CAO PC for this solution.</p>

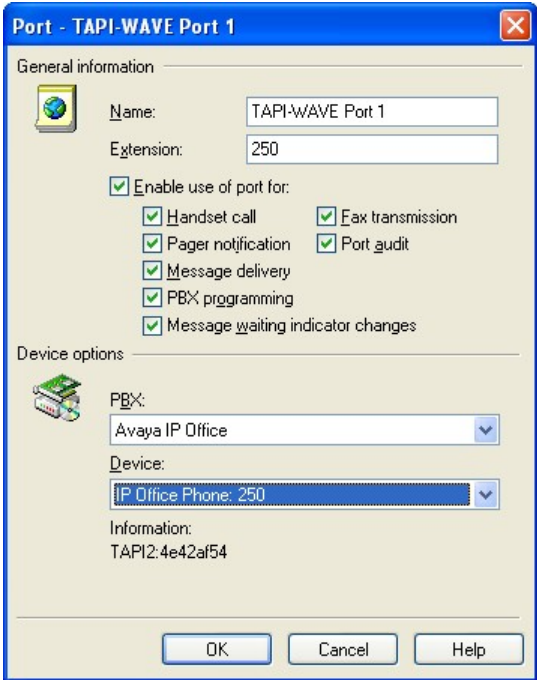
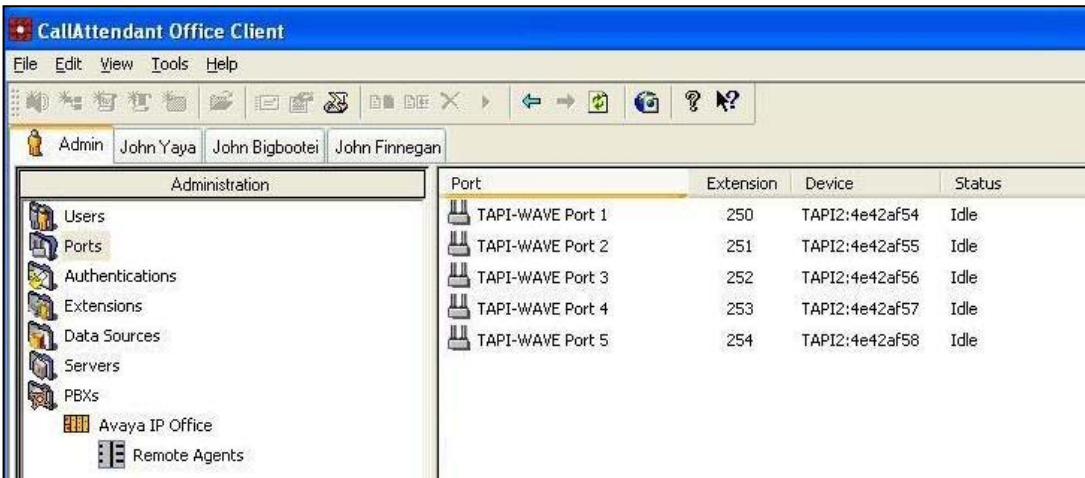
4.4. Configure CallAttendant Office


The configuration information provided in this section describes the steps required to configure Objectworld CallAttendant Office – TAPI Wave integration for this solution and assume the CAO configuration described in reference [1] has already been carried out. In particular,

- First Time Configuration was completed, including end-user creation.
- Wizard Configuration was verified.
- CAO Auto Attendant was configured.

Step	Description
1.	<p>Log into the CAO PC as a domain user with domain administrator privileges. Go to Start → Programs → Objectworld CallAttendant Office → CallAttendant Office Client and login using the appropriate administrative privileges.</p>

Step	Description
2.	<p>In the CallAttendant Office Client window, click Ports in the left pane. Delete the Analog integration CAO ports that appear in the right pane (Extensions 233 – 236).</p>  <p>Note: This step was necessary because the compliance test configuration used only TAPI-wave integration. If a hybrid analog/TAPI wave integration was used, this step would have been skipped.</p>
3.	<p>Right-click the now empty right pane and select New... in the popup menu that appears.</p> 

Step	Description																								
4.	<p>In the Port window that appears, set Name to the name desired for this port such as TAPI-WAVE Port 1, set Extension to the first TAPI WAVE port extension listed in Table 1, check Enable use of port for:, select Avaya IP Office for PBX, and select IP Office Phone: xxx where xxx matches the first TAPI WAVE port extension listed in Table 1. Click OK.</p> <div></div>																								
5.	<p>Repeat Step 4 for each TAPI Wave port listed in Table 1. For the purposes of these Application Notes, ports were created for TAPI Wave port extensions 250 – 254.</p> <div><table><thead><tr><th>Port</th><th>Extension</th><th>Device</th><th>Status</th></tr></thead><tbody><tr><td>TAPI-WAVE Port 1</td><td>250</td><td>TAPI2:4e42af54</td><td>Idle</td></tr><tr><td>TAPI-WAVE Port 2</td><td>251</td><td>TAPI2:4e42af55</td><td>Idle</td></tr><tr><td>TAPI-WAVE Port 3</td><td>252</td><td>TAPI2:4e42af56</td><td>Idle</td></tr><tr><td>TAPI-WAVE Port 4</td><td>253</td><td>TAPI2:4e42af57</td><td>Idle</td></tr><tr><td>TAPI-WAVE Port 5</td><td>254</td><td>TAPI2:4e42af58</td><td>Idle</td></tr></tbody></table></div>	Port	Extension	Device	Status	TAPI-WAVE Port 1	250	TAPI2:4e42af54	Idle	TAPI-WAVE Port 2	251	TAPI2:4e42af55	Idle	TAPI-WAVE Port 3	252	TAPI2:4e42af56	Idle	TAPI-WAVE Port 4	253	TAPI2:4e42af57	Idle	TAPI-WAVE Port 5	254	TAPI2:4e42af58	Idle
Port	Extension	Device	Status																						
TAPI-WAVE Port 1	250	TAPI2:4e42af54	Idle																						
TAPI-WAVE Port 2	251	TAPI2:4e42af55	Idle																						
TAPI-WAVE Port 3	252	TAPI2:4e42af56	Idle																						
TAPI-WAVE Port 4	253	TAPI2:4e42af57	Idle																						
TAPI-WAVE Port 5	254	TAPI2:4e42af58	Idle																						
6.	<p>To verify proper function, place a call to extension 250 from an IP Office telephone extension. Verify that the CallAttendant Office Voicemail answers. Repeat for each CAO TAPI WAVE port configured, e.g., 250 – 254. This completes configuration of the CallAttendant Office – TAPI Wave integration.</p>																								

Step	Description
7.	<p>In the CallAttendant Office Client window, click Users in the left pane and verify the end user names and corresponding extensions listed in Table 1 appear in the right pane.</p> 

5. Interoperability Compliance Testing

Interoperability compliance testing examined the ability of Objectworld CallAttendant Office – TAPI Wave integration to work with Avaya IP Office. The following CAO – TAPI Wave integration features were verified with IP Office: automated attendant, voicemail, transfer, assisted transfer, pager notification, active message delivery, and one-time message.

5.1. General Test Approach

Feature functionality testing was performed manually. Inbound calls were made to Avaya IP Office through analog and T1/PRI trunks, as well as from internal extensions (analog, digital and IP Telephone). For automated attendant functionality, IP Office routed inbound calls to the CAO auto aa hunt group, which transferred calls based on caller DTMF input. For voicemail functionality, CAO treated covered calls according to the settings defined by the extension owner, via CAO's Personal Voicemail or Personal Auto Attendant interfaces. CAO emailed voice messages to the extension owner's messaging server. Extension owners would then review messages using a messaging client (Outlook or CAO).

A load test was performed using a call generator to generate inbound calls over eight channels on a PRI trunk to Avaya IP Office. Eight client PCs were configured with CAO client software and messaging clients. For the load test, a call generator script would navigate the CAO automated attendant and select a transfer to a destination extension, which would not answer. Upon being routed to coverage, the call generator script would leave a voicemail message and hang up. The voicemail message would then be emailed to the CAO user's messaging server, and would appear in the CAO user's messaging client. A second script was then used to place another inbound call over the PRI trunk to Avaya IP Office, navigate the CAO automated attendant, log

into the called extension's voicemail, retrieve, listen then delete the voicemail and hang up. The deleted message would also disappear from the CAO user's messaging client.

5.2. Test Results

Except for the modifications needed in the call generator to permit load testing this solution, all executed test cases completed successfully. Issues and/or observations made during testing are noted below.

- **Call generator default DTMF tones altered for successful load test:** The call generator default DTMF tones of 80 ms on/off were altered to 200 ms on/off during load testing. Issues were experienced during load testing where either the Windows system of the CAO server or the TAPI Wave driver was not capturing all DTMF input resulting in incomplete or failed load test calls. The IP Office team suggested this issue was an operating system limitation that might be resolved by altering some TAPI WAVE registry settings; however, due to time constraints, this could not be attempted. To workaround the issues experienced, the default DTMF tones on the call generator were modified as previously indicated. These modifications allowed successful load testing of this solution using five TAPI WAVE ports and the call rates indicated below. Using higher numbers of TAPI WAVE ports or call rates will require a new compliance test.
- **Voicemail Load Test:** A load test with a call rate of ~744 call attempts per hour using 8 PRI trunk channels, and calls averaging 28.97 seconds in length was run for one hour. The call generator was limited to placing no more than 8 calls at a time. The call generator reported 784 calls, which matched the number of calls reported by CAO. At the conclusion of the load test, all message-waiting lamps on the telephone extensions used for the load test were off as expected and all voicemail accounts were empty¹.

6. Verification Steps

The following steps may be used to verify the configuration:

- To verify TAPI WAVE is enabled on Avaya IP Office, confirm the CTI Link Pro and Wave User licenses are installed and valid via Avaya IP Office Manager (Section 3).
- To verify the CAO PC is TAPI Wave enabled, confirm the Avaya TAPI Wave driver is installed and configured on the CAO PC (Section 4.3).
- To verify the CAO System Auto Attendant is operating properly: place a call to the CAO auto aa hunt group. Verify the CAO Welcome greeting plays and enter a valid

¹ One additional modification that was required for this load test to run successfully was to further reduce the load on the Windows system or TAPI Wave driver by modifying the voicemail retrieve script. The script was modified from "log into voicemail, retrieve the message, play it then delete it" to "log into voicemail, retrieve the message then delete it".

extension number on the Avaya IP Office system. Verify the call is transferred to the correct extension.

- To verify the CAO Personal Voicemail is operating properly: place a call to an extension and do not answer it. Verify the call is routed to the CAO Voicemail and leave a message. Verify the voice message is emailed to the user's messaging client (Outlook or CAO provided client), and the user can play back the message via telephone or PC.
- To verify the CAO Personal Auto Attendant is operating properly: place a call to an extension number configured to use CAO Personal Auto Attendant and do not answer the call. Verify the call is treated according to the treatment defined by the user

7. Support

For technical support on CallAttendant Office, consult Objectworld at www.objectworld.com or contact the Objectworld Technical Support at:

- Phone: 613-599-9698 (Option 5)
- E-mail: CAOSupport@objectworld.com

8. Conclusion

These Application Notes describe the steps for configuring Objectworld CallAttendant Office – TAPI WAVE integration to work with Avaya IP Office. Except for the call generator and load test modifications described in Section 5.2, all test cases completed successfully. This solution is compliance tested for configurations using up to five TAPI WAVE ports with call rates no higher than those described in Section 5.2. Larger configurations or higher call rates should be verified prior to deployment.

9. Additional References

Product documentation for Avaya products may be found at <http://support.avaya.com>.

[1] Application Notes for Configuring Objectworld CallAttendant Office – analog integration with Avaya IP Office, Issue 1.0, December 2006

[2] Avaya IP Office 3.2 Manager, Issue 18g, 28th June 2006

[3] Avaya IP Office CTI Link Installation Manual, 40DHB0002UKAB – Issue 11a, 22nd September 2005

Product documentation for Objectworld products may be found at <http://www.objectworld.com>.

[4] Objectworld CallAttendant Office Administration Guide, CAO-1011-003

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