



.: [www.totalrecallvr.com](http://www.totalrecallvr.com) :.

## Multicast Audio

*Step by Step Guide*

20 April, 2016

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**Related Documents:**

- [1] Prolancer Pty Ltd, Total Recall VR Overview User Guide, 13.0, March 2016
- [2] Prolancer Pty Ltd, Total Recall VR Deployment User Guide, 13.0, March 2016
- [3] Prolancer Pty Ltd, Total Recall VR Manager User Guide, 5.0, March 2016
- [4] Omnitronics Pty Ltd, IPR400 4-Channel VoIP Interface Product Manual, 3.01, March 2015
- [5] CyberData Corporation, VoIP Paging Server Operations Guide, 11.5.4, 18 April 2016
- [6] CyberData Corporation, VoIP V2 Speaker Operations Guide, 6.5.5, 25 September 2015

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## 1. Preface

### 1.1. Conventions

Our guides use several conventions to highlight certain words and phrases and draw attention to specific pieces of information.

#### 1.1.1. Notes & Warnings

We use the following visual styles to draw attention to information that might otherwise be overlooked:



Notes are tips, shortcuts or alternative approaches to the task at hand. Ignoring a note should have no negative consequences, but you might miss out on a trick that makes your life easier.



Important boxes detail things that are easily missed: configuration changes that only apply to the current session, or services that need restarting before an update will apply. Ignoring the information will not cause data loss, but may cause irritation and frustration.



Warnings should not be ignored. Ignoring warnings will most likely cause data loss.

#### 1.1.2. Typographic Conventions

We use typographic conventions to call attention to specific words and phrases. These conventions, and the circumstances they apply to, are as follows.

| Example                               | Meaning   |
|---------------------------------------|---|
| Select <u>Guide</u> to display ...    | Locate the link named "Guide" on the screen, position the cursor over the link and then depress the appropriate mouse button to follow the link.                                |
| Select <b>Add</b> to create a new ... | Locate the button or menu item named "Add" on the screen, position the cursor over the button or menu item and then depress the appropriate mouse button to initiate an action. |

|                                |  |
|--------------------------------|--|
| Enter <i>Commission</i> ...    | Locate the field named "Commission" on the screen, position the cursor over the field and then depress the appropriate mouse button to select the field. Once the cursor appears in the field, enter a value.  |
| Choose <i>Country</i> ...      | Locate the field named "Country" on the screen, position the cursor over the field and then depress the appropriate mouse button to display the available options. Then position the cursor over the desired option and depress the appropriate mouse button to select it. |
| Tick <i>Active User</i> ...    | Locate the check box named "Active User" on the screen, position the cursor over the check box and depress the appropriate mouse button to place a visual tick in the box.   |
| Un-tick <i>Active User</i> ... | Locate the check box named "Active User" on the screen, position the cursor over the check box and depress the appropriate mouse button to remove the visual tick in the box.  |
| Enter \$30.95 ...              | Enter "\$30.95" using the keys on your keyboard.   |

### 1.1.3. Procedures

We use numbered sequence of steps to define procedures for performing certain tasks. For example:

#### *Procedure Title*

1. This is the first step of the procedure.
2. This is the second step of the procedure.
  - a. This is the first sub-step of step 2.
  - b. This is the second sub-step of step 2.
3. This is step three.

## 1.2. We Need Feedback

If you find a typographical error in this guide, or if you have thought of a way to make this guide better, we would love to hear from you.

Please submit your feedback using the feedback form on our web site:

<http://www.prolancer.com.au/contact/feedback>.

If you have a suggestion for improving the guide, then try to be as specific as possible when describing your suggestion. Otherwise, if you have found an error, please include the section number and some of the surrounding text so we can find it easily.

## 2. Introduction

### 2.1. About This Guide

This guide explains, via examples, how to record communication with a Total Recall VR recorder between endpoints on an IP network where the endpoints communicate by multicasting audio packets on the network.

The examples are also applicable to IP networks where endpoints communicate by broadcasting audio packets on the network.

### 2.2. What is Multicasting

It is beyond the scope of this guide to explain multicasting on IP networks in detail, however the following is a short summary.

In most cases endpoints on an IP network send traffic to a single address which identifies only one other endpoint on the network. However, endpoints can send traffic to special group addresses, called multicast addresses. In such cases multiple endpoints on the IP network receive the traffic as long as the endpoints are configured to listen to traffic on the multicast addresses.

In addition to multicast addresses, there exists another group of special addresses, called broadcast addresses. Endpoints rarely use broadcast addresses, however if they do, then all other endpoints on the network receive the traffic.

A lot of audio equipment use multicast communication on IP networks to efficiently send audio to multiple endpoints on the network. For example public announcement (PA) systems use multicast communication to send audio from the master station to a group of speakers. Another example is communication between RoIP gateways where the audio from one radio is sent to multiple RoIP gateways (thus multiple radios).

### 2.3. What is Total Recall VR

Total Recall VR is a professional audio logging and call recording system which is self-contained, fully featured and cost-effective. Enterprises and governments worldwide use it to create electronic records of many forms of audio communication including telephone, 2-way radio, broadcast radio, public address, room microphones and much more.

Total Recall VR is the ideal solution for:

- Recording business telephone conversations;
- Recording agent calls in contact centres;
- Logging emergency response communication;
- Logging business operations communication;
- Logging radio broadcasts;
- Logging public announcements;

- Creating audio records of meetings, legal proceedings, public enquiries and similar events; and
- Creating compliance records to meet duty of care and legal requirements.



For additional information on Total Recall VR see the Total Recall VR overview guide [1].

### 3. Background

Please note the following:

#### 3.1. Multicast and Ethernet Switches

Ethernet switches use different strategies to handle multicast traffic and it is important to understand what your switches are doing when trying to record multicast traffic.

In most cases cheaper, dumb and web managed, switches do not have the capability to discover which ports are connected to endpoints which are listening to multicast addresses. As a result, when a multicast packet arrives on one port, the switch simply copies the packet to all other active ports. Consequently, all endpoints connected to the switch, including other switches, receive the broadcast packet.

We use this behaviour of lower cost switches to our advantage when recording multicast traffic with Total Recall VR as explained in subsequent sections.

More sophisticated (and usually more expensive) switches have support for multicast group discover protocols that make it possible for each endpoint to ‘tell’ the switch about the multicast group addresses that it wants to be a member of. Such switches forward multicast packets only to the ports (endpoints) that are members of the multicast group specified by the address of the multicast packets.

As a result of this behaviour of more sophisticated switches, proper switch configuration is necessary to record multicast traffic with Total Recall VR.

#### 3.2. RTP Traffic

There are numerous, standard and non-standard, ways to send audio on an IP network. Of those, Total Recall VR is capable of recording audio that is sent in RTP packets.

RTP is a standard protocol for media transport on IP networks. [RFC 3550](#) describes the protocol in detail.

### **3.3. Passive VoIP Recording**

The examples presented in this document use “passive IP recording”. The Total Recall VR deployment guide [2] has in-depth explanation of passive IP recording and we strongly recommend that you familiarise yourself with the concept in order to understand the details of the examples. Briefly:

Passive recording is completely transparent to the communication systems being recorded and the way they are used. The recorder connects to IP network via what is known as a “high-impedance tap” in order to capture conversations. There is no need to modify communication systems equipment in any way.

Total Recall VR uses a software based IP packet collector which is capable of detecting, extracting and then processing SIP, H.323 and RTP packets when connected to an Ethernet link. The packet collector does not interact with the packets on the Ethernet link in any way. It does not add, remove or modify packets. It simply detects and takes a copy of each packet for further processing.

In all other cases, Total Recall VR must be deployed in such a way so that all SIP, H.323 and RTP packets are presented to the LAN interface that is used by the IP packet collector. There are a number of ways to present packets to the packet collector:

1. Ethernet hub.
2. Aggregating Ethernet tap.
3. SPAN port on an Ethernet switch.

However, in order to record multicast traffic, this is not necessary. All that is needed is to connect the LAN interface that is used by the IP packet collector to a switch port that receives all multicast traffic that should be recorded.

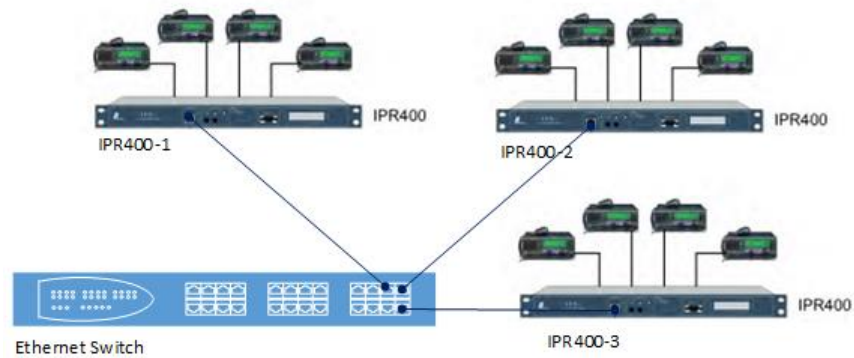
However, if your switch has the capability to discover which ports are connected to endpoints which are listening to multicast addresses, then you must configure the switch to forward multicast traffic to the port that is used to connect the LAN interface that is used by the IP packet collector. Total Recall VR does not support multicast discovery protocols and cannot dynamically tell the switch that it wishes to receive multicast packets.

## **4. Solution Example – RoIP Gateways**

### **4.1. Example RoIP Solution**

This section shows how to record radio communication in a radio system that uses multicast communication between the RoIP gateways. For the purpose of this example we are using the IPR400s RoIP gateways [4] from Omnitronics.





The following is an extract of the IPR400 configuration that is relevant to configuration of Total Recall VR:

IPR400-1 configuration:

| Configuration Page | Setting                  | Value         |
|--------------------|--------------------------|---------------|
| Network            | Static IP Address        | 192.168.2.1   |
|                    | Netmask                  | 255.255.255.0 |
| Linking            | Radio 1/ VoIP 1          | Checked       |
|                    | Radio 2/ VoIP 2          | Checked       |
|                    | Radio 3/ VoIP 3          | Checked       |
|                    | Radio 4/ VoIP 4          | Checked       |
| VoIP/RTP Channel 1 | VoIP Group Enable        | Checked       |
|                    | Remote IP Address        | 239.0.0.1     |
|                    | RTP Receive Port Number  | 5004          |
|                    | RTP Transmit Port Number | 5004          |
| VoIP/RTP Channel 2 | VoIP Group Enable        | Checked       |
|                    | Remote IP Address        | 239.0.0.1     |
|                    | RTP Receive Port Number  | 5006          |
|                    | RTP Transmit Port Number | 5006          |
| VoIP/RTP Channel 3 | VoIP Group Enable        | Checked       |
|                    | Remote IP Address        | 239.0.0.1     |
|                    | RTP Receive Port Number  | 5008          |
|                    | RTP Transmit Port Number | 5008          |
| VoIP/RTP Channel 4 | VoIP Group Enable        | Checked       |
|                    | Remote IP Address        | 239.0.0.1     |
|                    | RTP Receive Port Number  | 5010          |
|                    | RTP Transmit Port Number | 5010          |

The configuration for the IPR400-2 and IPR400-3 is the same except for the ‘Static IP Address’ value. IPR400-2 uses 192.168.2.2 and IPR400-3 uses 192.168.2.3.

The important thing to note in the configuration is the use of the multicast address 239.0.0.1 as a value for ‘Remote IP Address’. This instructs the gateways to share audio via multicast.

## 4.2. Total Recall VR Interface Requirements

The example system uses an IP network to transmit audio. As a result, we need a Total Recall VR with IP recording channels (4 channels to be exact, however the minimum is 10 recording IP channels).

Any of the following Total Recall VR models can be used when equipped with IP recording channels:

- Total Recall VR LinX Altus (<http://totalrecallvr.com/products/total-recall-vr-linx-altus>)
- Total Recall VR LinX Neos (<http://totalrecallvr.com/products/total-recall-vr-linx-neos>)
- Total Recall VR LinX Omnia (<http://totalrecallvr.com/products/total-recall-vr-linx-omnia>)
- Total Recall VR Essence (<http://totalrecallvr.com/products/total-recall-vr-linx-essence>)
- Total Recall VR Evolution (<http://totalrecallvr.com/products/total-recall-vr-linx-evolution>)

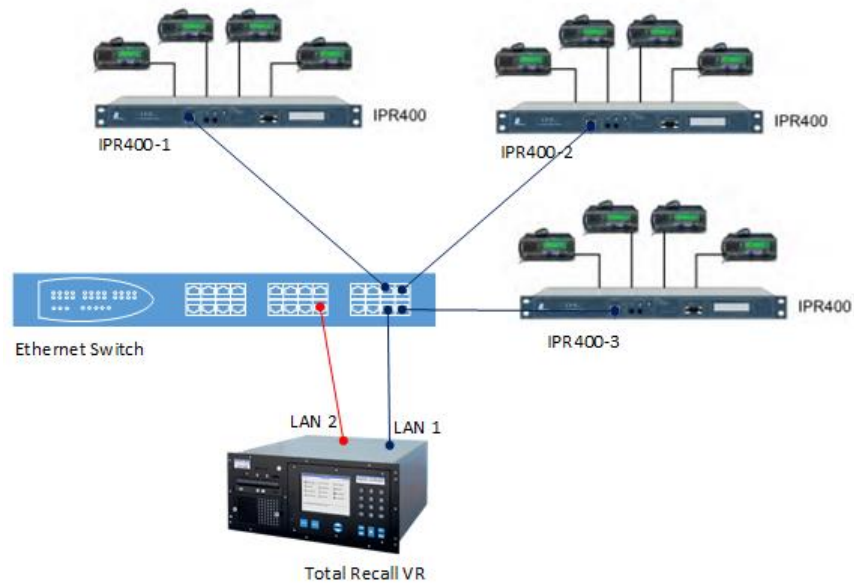
Total Recall VR can record both in active and passive mode on its IP recording channels. In this case we will use the passive mode.

In passive mode, Total Recall VR uses a software based IP packet collector capable of detecting and collecting SIP, H.323 and RTP packets on IP networks. The packet collector uses one of the system LAN interfaces (Ethernet interfaces) to detect and collect such packets.

This interface does not interact with the packets on the network in any way. It does not add, remove or modify packets. It simply detects and takes a copy of each packet.

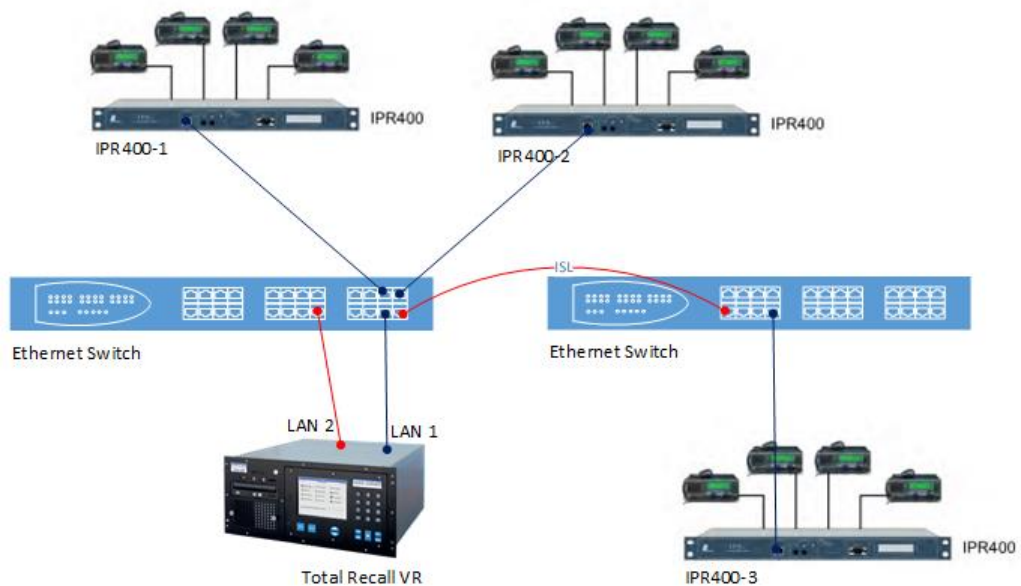
## 4.3. Total Recall VR Deployment

The following figure shows how we will connect Total Recall VR to the rest of the system.



Note that we simply connect both LAN interfaces on the Total Recall VR to the same switch. The assumption here is that when a multicast packet arrives on one port of the switch, the switch simply copies the packet to all other active ports. As a result, all multicast packets will be present on the LAN 2 interface of the Total Recall VR.

The deployment is the same even when multiple switches are in use. For example:



In such cases the switches will most likely be connected with Inter Switch Links (ISLs) to allow multicast and other IP traffic between the switches.

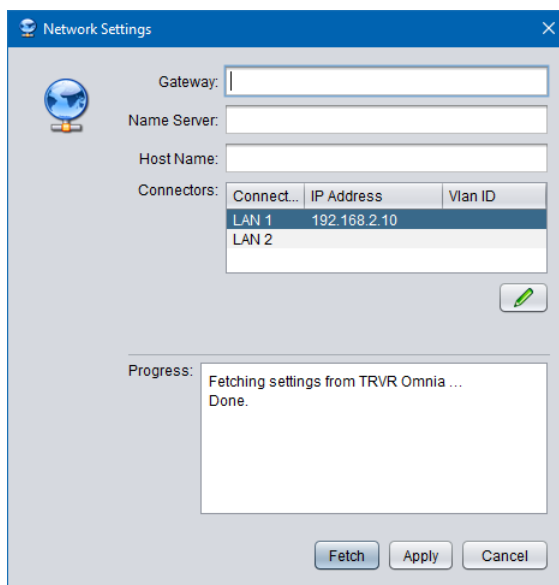
## 4.4. Total Recall VR Configuration



You can use the Total Recall VR Manager [3] PC application to complete the configuration described in this section.

### 4.4.1. Network Settings

The following screen capture shows the network configuration on the Total Recall VR:

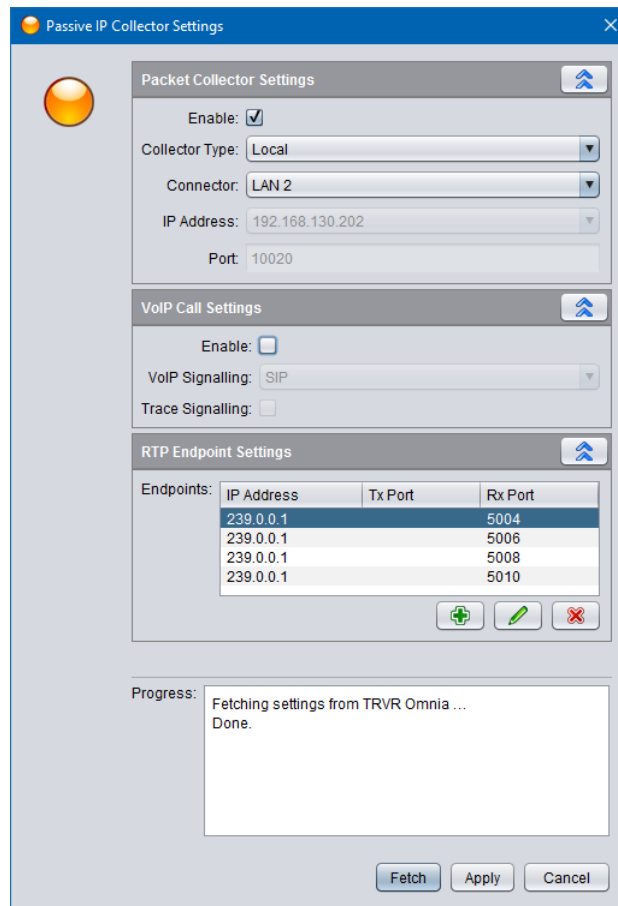


In summary:

1. We assigned a free IP address (assuming 192.168.2.10 is free) to the LAN 1 interface so we can connect the Total Recall VR to the same network as the rest of the equipment.
2. We do not assign an IP address to the LAN 2 interface as we will use this interface to record communication.

### 4.4.2. Passive IP Collector

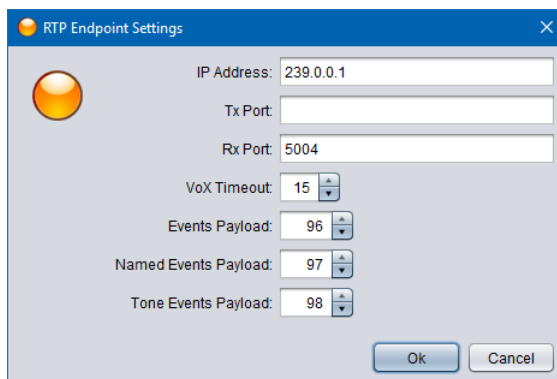
It is necessary to configure the passive IP connector on the Total Recall VR as shown on the following screen capture:



In summary:

1. We enabled the IP packet collector and configured it to collect packets on the LAN 2 interface.
2. We disabled VoIP call recording.
3. We created an RTP Endpoint for each of the VoIP/RTP Channels on the IPR400s.

Each of the RTP Endpoints have additional settings which are shown on the following screen capture:



RTP Endpoint Settings

IP Address: 239.0.0.1

Tx Port:

Rx Port: 5004

VoX Timeout: 15

Events Payload: 96

Named Events Payload: 97

Tone Events Payload: 98

Ok Cancel

Note:

1. You should adjust VoX Timeout based on the time between overs. Here we use 15 seconds, however a value of 2 seconds may be more appropriate if there are only short pauses between overs.
2. Named Event Payload must be set to 97.
3. Tone Event Payload must be set to 98.

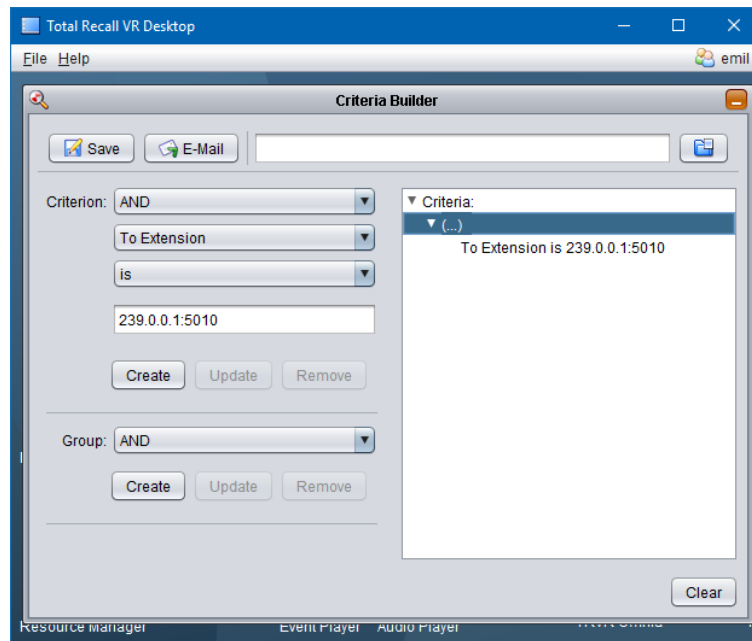
Finally, the RTP Endpoint configuration is very flexible. For example, the same configuration is possible with a single entry that uses regular expressions for Rx Port. For more details consult the Total Recall VR documentation.

#### 4.4.3. Signalling Mapping

You can use the Signalling Map Settings to create user friendly names for each of the radio channels. If so, users can use the user friendly names to search for recordings.

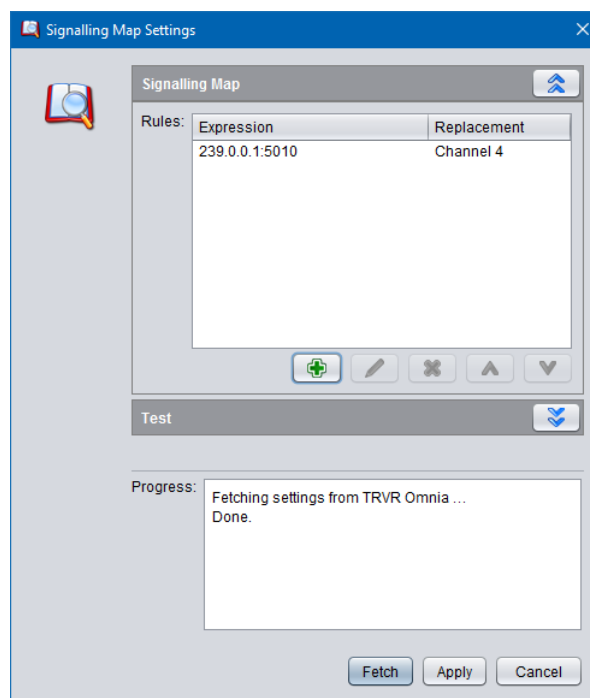
Without Signalling Map Settings, Total Recall VR creates the “To” and “From” identifiers for recordings that have the format <IP address>:<port #>. For example, if an RTP packet has source IP address 192.168.2.1 and UDP port 5004 and destination IP address 239.0.0.1 and UDP port 5010, then Total Recall VR will use 192.168.2.1:5004 as a “From” identifier and 239.0.0.1:5010 as a “To” identifier.

Then, when a user wishes to search for a recording to channel 4 for example, they need to use values such as 239.0.0.1:5010 in the search criteria. This is not very user friendly. Here as what a search criteria would look like:

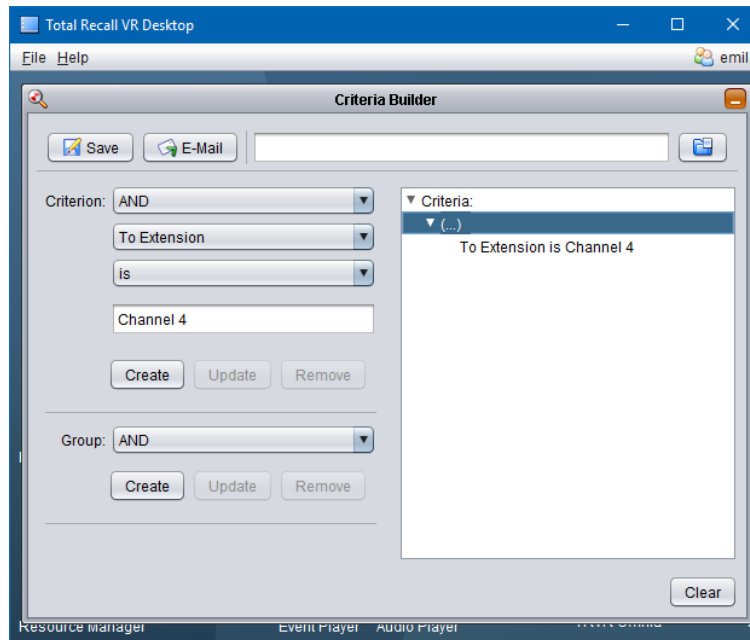


Likely, we can change that and let users use values like “Channel 4” instead. To do this we need to add mapping entries to the Signalling Map Settings.

The following screen capture is an example that shows how to map the IDs for channel 4 to more user friendly values:



With this configurations users can use “Channel 4” as a value for search parameters when searching for recording. For example:



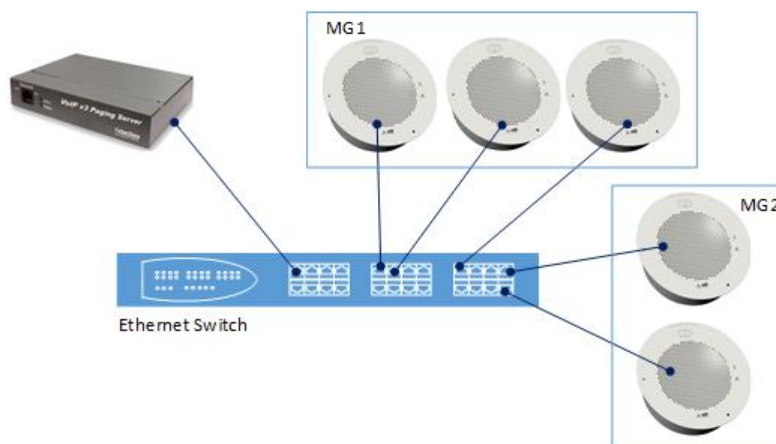
I think we can all agree that it is easier for users to remember “Channel 4” rather than “239.0.0.1:5010”.

## 5. Solution Example – IP Based Paging

### 5.1. Example Paging Solution

This example shows how to record public announcements on an IP based paging system that has been configured to use multicast for the distribution of audio between the paging server and the speakers.

For the purpose of this example we are using the IP paging server [5] and speakers [6] from CyberData.





The assumption here is that paging server and speakers have been configured for multicast communication.

The following is an extract of the IP speaker configuration that is relevant to configuration of Total Recall VR:

IP speakers in the MG1 group configuration:

| Configuration Page      | Setting       | Value         |
|-------------------------|---------------|---------------|
| Network Configuration   | IP Addressing | Static        |
|                         | IP Address    | 192.168.2.x   |
|                         | Netmask       | 255.255.255.0 |
| Multicast Configuration | Priority      | 0             |
|                         | Address       | 239.168.3.1   |
|                         | Port          | 2002          |
|                         | Name          | MG1           |

IP speakers in the MG2 group configuration:

| Configuration Page      | Setting       | Value         |
|-------------------------|---------------|---------------|
| Network Configuration   | IP Addressing | Static        |
|                         | IP Address    | 192.168.2.x   |
|                         | Netmask       | 255.255.255.0 |
| Multicast Configuration | Priority      | 0             |
|                         | Address       | 239.168.3.2   |
|                         | Port          | 2004          |
|                         | Name          | MG2           |

The important thing to note in the configuration is the use of the multicast address 239.168.3.1 and 239.168.3.2 for each group of speakers.

## 5.2. Total Recall VR Interface Requirements

The example system uses an IP network to transmit audio. As a result, we need a Total Recall VR with IP recording channels (2 channels to be exact, however the minimum is 10 recording IP channels).

Any of the following Total Recall VR models can be used when equipped with IP recording channels:

- Total Recall VR LinX Altus (<http://totalrecallvr.com/products/total-recall-vr-linx-altus>)
- Total Recall VR LinX Neos (<http://totalrecallvr.com/products/total-recall-vr-linx-neos>)
- Total Recall VR LinX Omnia (<http://totalrecallvr.com/products/total-recall-vr-linx-omnia>)

- Total Recall VR Essence (<http://totalrecallvr.com/products/total-recall-vr-linx-essence>)
- Total Recall VR Evolution (<http://totalrecallvr.com/products/total-recall-vr-linx-evolution>)

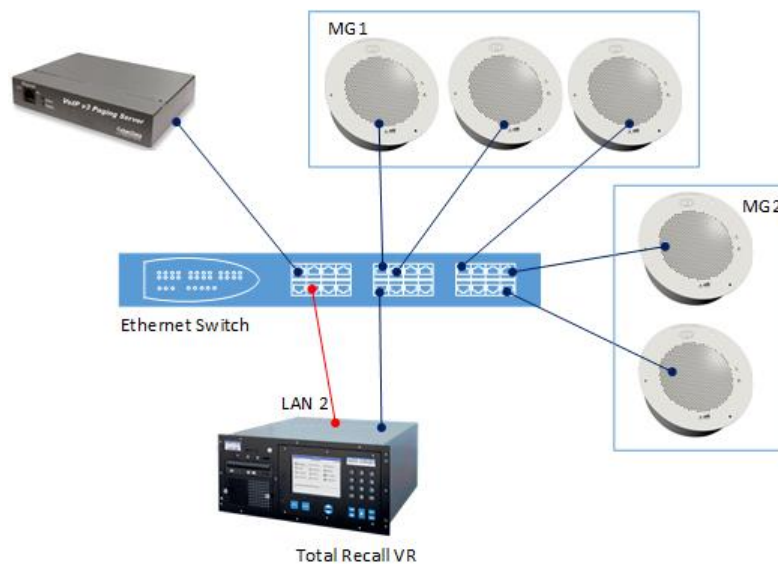
Total Recall VR can record both in active and passive mode on its IP recording channels. In this case we will use the passive mode.

In passive mode, Total Recall VR uses a software based IP packet collector capable of detecting and collecting SIP, H.323 and RTP packets on IP networks. The packet collector uses one of the system LAN interfaces (Ethernet interfaces) to detect and collect such packets.

This interface does not interact with the packets on the network in any way. It does not add, remove or modify packets. It simply detects and takes a copy of each packet.

### 5.3. Total Recall VR Deployment

The following figure shows how we will connect Total Recall VR to the rest of the system.



Note that we simply connect both LAN interfaces on the Total Recall VR to the same switch. The assumption here is that when a multicast packet arrives on one port of the switch, the switch simply copies the packet to all other active ports. As a result, all multicast packets will be present on the LAN 2 interface of the Total Recall VR.

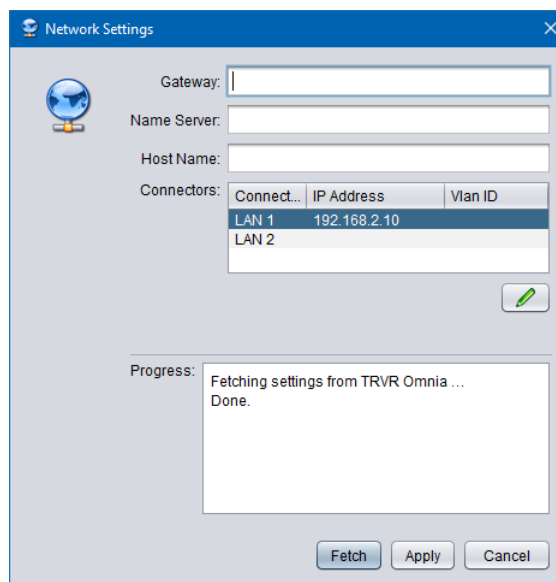
## 5.4. Total Recall VR Configuration



You can use the Total Recall VR Manager [3] PC application to complete the configuration described in this section.

### 5.4.1. Network Settings

The following screen capture shows the network configuration on the Total Recall VR:

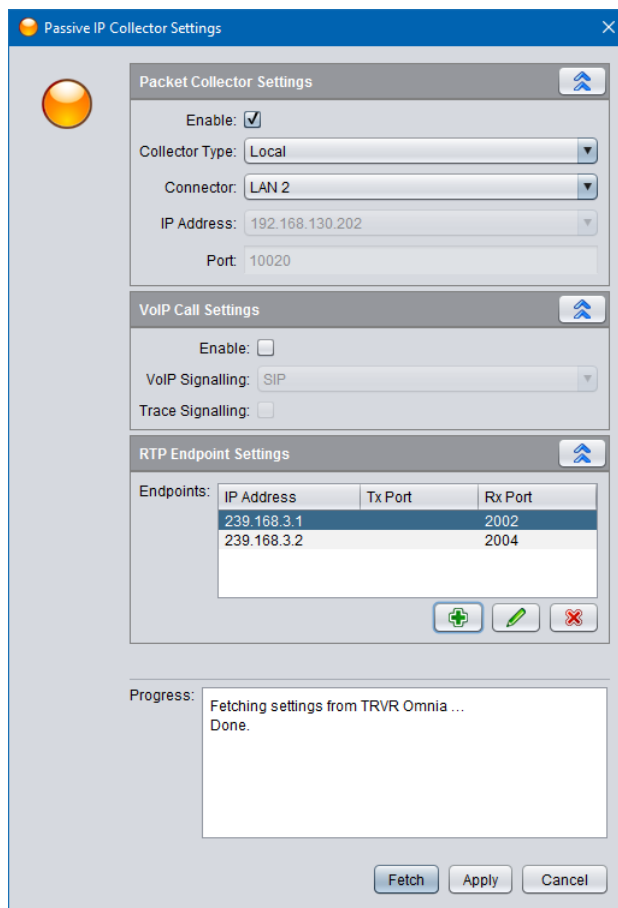


In summary:

1. We assigned a free IP address (assuming 192.168.2.10 is free) to the LAN 1 interface so we can connect the Total Recall VR to the same network as the rest of the equipment.
2. We do not assign an IP address to the LAN 2 interface as we will use this interface to record communication.

### 5.4.2. Passive IP Collector

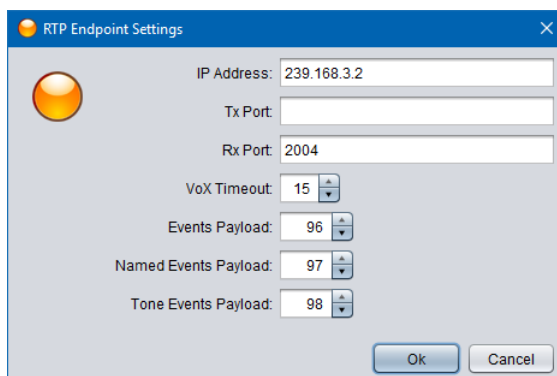
It is necessary to configure the passive IP connector on the Total Recall VR as shown on the following screen capture:



In summary:

1. We enabled the IP packet collector and configured it to collect packets on the LAN 2 interface.
2. We disabled VoIP call recording.
3. We created an RTP Endpoint for each group of speakers.

Each of the RTP Endpoints have additional settings which are shown on the following screen capture:



Note:

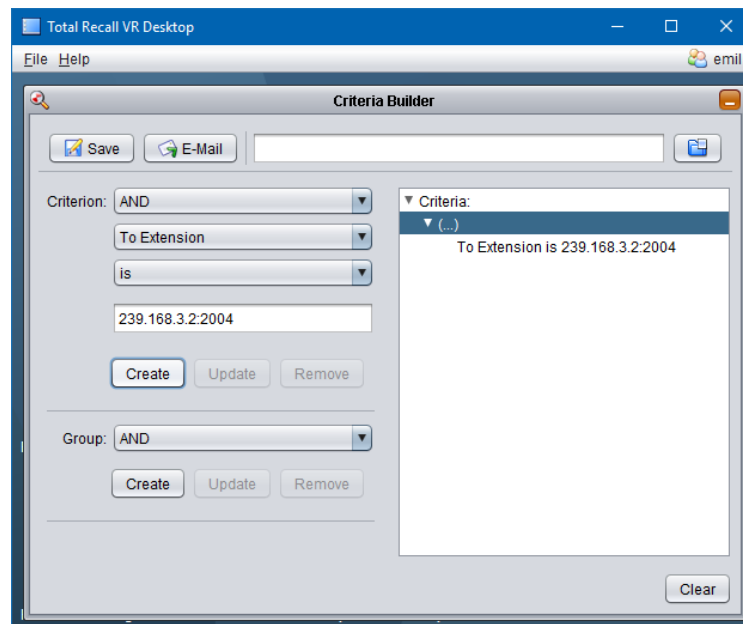
1. You should adjust VoX Timeout based on the time between announcements. Here we use 15 seconds, however a value of 2 seconds may be more appropriate if there are only short pauses between announcements.
2. Event Payload, Named Event Payload and Tone Event Payload are not applicable to this solution. You can leave them at their default values.

### 5.4.3. Signalling Mapping

You can use the Signalling Map Settings to create user friendly names for each of the speaker groups. If so, users can use the user friendly names to search for recordings.

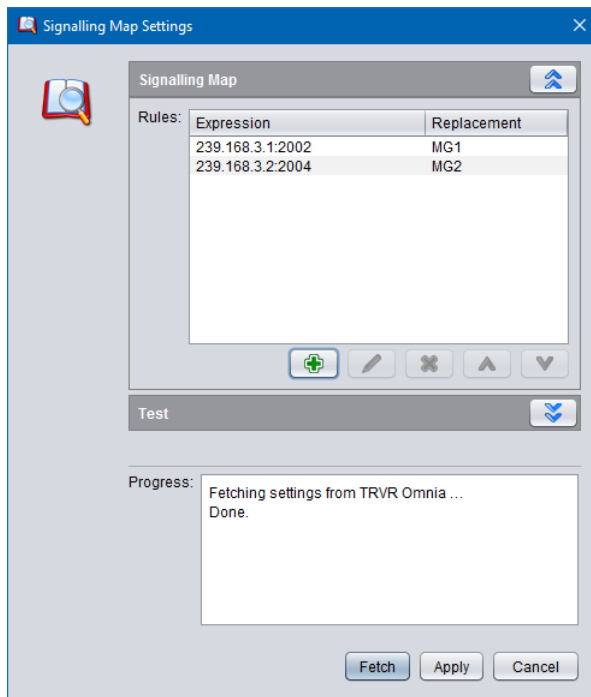
Without Signalling Map Settings, Total Recall VR creates the “To” and “From” identifiers for recordings that have the format <IP address>:<port #>. For example, if an RTP packet has source IP address 192.168.2.1 and UDP port 5004 and destination IP address 239.168.3.2 and UDP port 2004, then Total Recall VR will use 192.168.2.1:5004 as a “From” identifier and 239.168.3.2:2004 as a “To” identifier.

Then, when a user wishes to search for a recording to speaker group MG2, they need to use values such as 239.168.3.2:2004 in the search criteria. This is not very user friendly. Here as what a search criteria would look like:

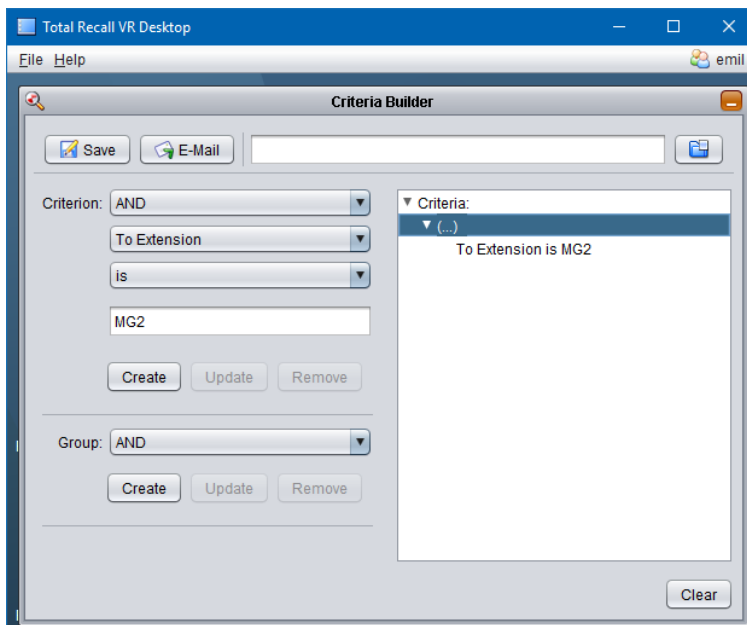


Likely, we can change that and let users use values like “MG2” instead. To do this we need to add mapping entries to the Signalling Map Settings.

The following screen capture is an example that shows how to map the IDs for each speaker group to more user friendly values:



With this configurations users can use “MG2” as a value for search parameters when searching for recording. For example:



I think we can all agree that it is easier for users to remember “MG2” rather than “239.168.3.2:2004”.

[End of Document]