**Multi-Level Precedence and Preemption - MLPP**

Multi-Level Precedence and Preemption allows an authorized user the ability to specify a precedence level when making a call and preempt any existing calls that have a lower precedence level. Preemption allows important calls the ability to take precedence over less important calls. Precedence determines the level of importance of a call and makes the decision as to whether the call can be preempted or not. MLPP is supported between the ISDN protocol and the SIP protocol (ISDN to SIP, SIP to ISDN). Below is a table displaying the supported Precedence levels.

<table>
<thead>
<tr>
<th>Precedence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLASH OVERRIDE (0 = Highest Priority)</td>
</tr>
<tr>
<td>FLASH (1)</td>
</tr>
<tr>
<td>IMMEDIATE (2)</td>
</tr>
<tr>
<td>PRIORITY (3)</td>
</tr>
<tr>
<td>ROUTINE (4 = Lowest Precedence)</td>
</tr>
</tbody>
</table>

Calls with a higher precedence level preempt calls with a lower precedence. For example, a call with a precedence level of FLASH can preempt a call with a Precedence level of IMMEDIATE. Refer to the information below.

**Network Diagram/Functionality**

As displayed in the diagram below, the Multi-Level Precedence and Preemption feature requires that a SIP Application Server be configured so that it determines and implements the MLPP functionality. The MLPP functionality on the IMG 2020 will work in conjunction with the Application Server and reroute calls as necessary. Refer to diagram below.

In the network diagrams below, DSN is short for Defense Switched Network which refers to a United States government network whose namespace is defined in RFC 4412.

**ISDN to SIP**

- A call is made to either the PSTN or DSN depending on the scenario using the ISDN protocol.
- Call is routed through the IMG 2020 to an Application Server on the SIP network. Each call originating from the DSN will have a precedence level associated with it. The IMG 2020 will convert to a universal format and pass the call with the precedence and preemption information to the SIP Application Server. The AS Server will then determine the following:
  - Are all outgoing resources are busy. If the answer is yes then are there any existing calls with a precedence level lower than the new call being made.
  - If all resources are busy, and the new call is of higher priority than an existing call, the Application Server will send a message to the IMG 2020 to terminate a lower priority call.
Once the Application Server determines the precedence and preemption information it will tear down any existing calls to get the required resources to make the newer higher priority call.

When the IMG 2020 receives specific information (described below) from the Application server the IMG 2020 will tear down whatever resources required to be able to route the higher priority call.

**SIP to ISDN**

- Call is made from SIP side to either the PSTN or DSN. The IMG 2020 will look at the incoming INVITE message and a check will be made for the presence of a Resource Priority Header.
  - If the Resource Priority Header is present, the call will be decoded and then translated to a precedence level and sent out in the ISDN setup message.
  - If the Resource Priority Header is **NOT** present, the IMG 2020 will add a Resource Priority Header with a precedence level of ROUTINE and send this information out in the ISDN setup message.
  
  Refer to the Call flow diagram and additional Information sections below for a more in depth information.

**Call Flow Diagrams**

- A call is made from ISDN side with high precedence. If the MLPP functionality is configured and enabled, the IMG 2020 will inter-work the Precedence-Level in the incoming Setup message into the Resource Priority Header in the SIP INVITE to the SIP Application Server. The SIP Application Server will determine the precedence of the call. If the precedence is higher than any existing calls, the SIP Application Server then determines which resources to preempt. The SIP App Server will then send a BYE message back to the IMG 2020 with a Reason Header that has a cause code=5.
- The IMG 2020 receives the Reason Header and inter-works to a cause code=9 (Preemption - circuit reserved for reuse). The resource is then released and made available for reuse.
- Upon receiving the 200 OK from the RELEASE message, the SIP Application server then sends an INVITE back to the IMG 2020 and the New Call with the higher precedence is connected using the previously released resource.
Configuration

The Multi-Level Precedence and Preemption feature needs to be configured in both the SIP and ISDN protocols. On the SIP side, the feature is configured in the SIP Headers object. On the ISDN side, the feature is configured in the channel group object. Follow instructions below to configure.

The procedure below assumes the Basic Configurations topic has already been achieved and any objects configured in that topic will have already been configured.

Enable Resource Priority Header Support Field in SIP Headers Object

- Right click on the SIP Profiles object and select New SIP Profile. The SIP Profile allows a user to configure attributes/features that will be used with the SIP Signaling, External SIP Gateway, and ENUM Server Set objects. The first SIP Profile object created is a default object and all the fields are shaded green indicating modifications can not be done to this profile. Create a second SIP profile object and the individual fields can now be modified. Modify each field as needed. For information on the individual fields, refer to the SIP Profile - SGP topic.
- Right click on the second SIP Profile object created and select New SIP Headers. In the Resource Priority Header Support (MLPP) field select Enabled from the drop down menu.

Configure SIP Channel Group and Insert into Channel Group

- Right click on the Dialogic object and select New External Network Elements. The External Network Elements object is a container object and no configuration is needed here. For more information on this object refer to the External Network Elements topic.
- Right click on External Network Elements and select New External Gateways. The External Gateways object is a container object and no configuration is needed here. For more information on this object refer to the External Gateways topic.
- Right click on External Gateways object and select New External Gateway. Enter a name that identifies this gateway.
- Select SIP from drop down menu in the Protocol field.
- Enter the IP address of the external gateway in the IP Address field.
- Select the SIP Profile created earlier from the drop down menu of the SIP Profile field. For more information on configuring the External Gateway object, refer to the External Gateway topic.

Configure Channel Group and External Network Element

Configure a SIP Channel Group. The SIP channel group will communicate with the external SIP gateway created above. After configuring the channel group, configure the external network element that the channel group will communicate with.

- Right click on the Dialogic object and select New Routing Configuration. The Routing Configuration object is a container object and no configuration is needed here. For more information on this object refer to the Routing Configuration topic.
- Right click on the Routing Configuration object and select New Channel Groups. The Channel Groups object is a container object for multiple channel groups. No configuration is needed here. For more information refer to Channel Groups topic.
- Right click on the Channel Groups object and select New Channel Group. In the Name field, either except the default name or enter a name that identifies the Channel Group being configured.
- Select SIP from the drop down menu in the Signaling Type field. For more information on configuring the channel group, refer to the Channel Group topic.
- Right click on the SIP Channel Group and select New IP Network Element. Select from drop down menu the gateway configured in the Configure External Gateway object section above.

Configure ISDN Channel Group

- Right click on the Channel Groups object again and select New Channel Group. Enter a name for this channel group in the Name field.
- Select ISDN from the drop down menu of the Signaling Type field.
- Select Enabled from the drop down menu of the Multi Level Precedence and Preemption (MLPP) Support field drop down menu. Refer to the Channel Group topic for information on configuring the individual fields in this object.
- To finish configuring the ISDN channel group, right click on the channel group and select New Circuit Group. Select the starting and ending spans for this channel group. Refer to the ISDN Circuit Group under Channel Group topic for more information on this object.
- Click on the Channel Groups object again. At this point, a yellow exclamation point will be displayed in the Icon. Click on the Download Resource Tables button and the Channel Group configuration will be sent to the IMG 2020.

The MLPP feature has been configured. Routing Tables and Translation Tables can now be configured to route the calls between the two channel groups configured.
Additional Information

- MLPP is by default set to Disabled in both the SIP Headers object and the ISDN Channel Group object.
- If the MLPP feature is disabled the following is true
  
  - The IMG 2020 will NOT look for a precedence level in the Incoming Setup message from ISDN.
  - The IMG 2020 will NOT include a Resource Priority Header in outgoing INVITE message to the SIP Application server.
  - The IMG 2020 will NOT look for a Resource Priority Header in the incoming INVITE message from Application server.
  - The IMG 2020 will NOT include a precedence level in the outgoing Setup message.

If the MLPP feature is enabled, the following is true.

- The IMG 2020 WILL look for the Precedence level in the Incoming Setup message.
- The Precedence level in the incoming setup will be interworked into the Resource Priority Header in the SIP INVITE message.
- The Resource Priority Header format will be as displayed below.

  Resource-Priority: namespace.priorityValue

  where namespace=dsn and priorityValue is routine(0), priority(2), immediate(4), flash(6), and flash override(8). The namespace and priorityValue are NOT case sensitive.

  Examples:
  
  Resource-Priority: dsn.routine
  Resource-Priority: DSN.Flash

- Precedence levels in Setup range from 0 to 4. Refer to Precedence Level table above.
- If the Precedence level is not present in the incoming Setup message, the IMG 2020 will include a Resource Priority Header with a Precedence level of 0 or Routine in the INVITE message.
- The IMG 2020 will accept the Resource Priority Header from the SIP side and interwork it into the Precedence Level IE in the outgoing Setup message on ISDN side. The levels are interworked as displayed below:

<table>
<thead>
<tr>
<th>SIP Routine (0)</th>
<th>--&gt;</th>
<th>ISDN Routine (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIP Priority (2)</td>
<td>--&gt;</td>
<td>SIP Priority (3)</td>
</tr>
<tr>
<td>SIP Priority (2)</td>
<td>--&gt;</td>
<td>SIP Immediate (2)</td>
</tr>
<tr>
<td>SIP Flash (6)</td>
<td>--&gt;</td>
<td>SIP Flash (1)</td>
</tr>
<tr>
<td>SIP Flash Override (8)</td>
<td>--&gt;</td>
<td>SIP Flash Override (0)</td>
</tr>
</tbody>
</table>

- If the Resource Priority Header is not present in the incoming Invite, the IMG 2020 WILL include a Precedence-Level IE with value Routine (4) in the outgoing Setup.
- If IMG 2020 receives a BYE that includes the Reason Header as displayed below, it shall interwork to a cause of 9 ("Preemption - circuit reserved for reuse")

  Reason:preemption; cause=5; text "Network Preemption"

- If from the SIP side the 2020 receives a 488 Not Acceptable Here with a Warning Header that includes a warning code of 370 (Insufficient Bandwidth) of the format displayed below, the IMG 2020 will respond to the Setup message with a DISCONNECT that includes a cause code of 46 (precedence level blocked).

  Warning: 370 dsn "precedence level insufficient to preempt"

- If the IMG 2020 is out of ISDN channels on the outgoing leg, the IMG 2020 will respond to the INVITE message to the SIP Application Server with a 503 Service Unavailable and a Reason Header cause code of 34. Subsequently the Application Server will relay the same SIP response to the incoming leg and the IMG 2020 in turn would send a disconnect with cause code 34 to the ISDN side.
- The Resource Priority Header will be ignored in all messages except the SIP INVITE.