Root Cause Analysis

Intrado Government Solutions Division (GSD)

01/28/16
Helpdesk Ticket # 150816 & 150839
Opened: 04:34 ET
Location: Broward County, Florida
Channel: Direct
Impact of Impairment: Severity 1 – Severe degradation to 911 call processing
Event Start: 01/14/2015 at approximately 04:05 am ET (TI#150816)
Event End: 01/14/2015 at approximately 08:35 am ET (TI#150816)
Sub-Event Start: 01/14/2015 at approximately 12:20 pm ET (TI# 150839)
Sub-Event End: 01/14/2015 at approximately 08:30 pm ET (TI# 150839)

System Overview

The Broward County Florida Viper system consists of two individually redundant Viper systems that make up the greater fully redundant, geo-diverse Broward County Viper multi-node system. In the event of a catastrophic failure at either of the host sites, the alternate Viper node is configured to support 100% of the customer’s call traffic. Consequently Viper system upgrades when performed correctly can be applied to each node individually without effecting system availability.

Event Summary

- TI#150816. At 4:05 am ET on 01/14/16 while applying a software update to the redundant Broward County Viper system during a planned CMR event, the VoIP servers on the Broward Central Viper node entered into a continuous stop / restart state causing a degradation to call processing operations for the duration of the event.

Event / Sub Event Timeline

- The application of KB008121 for VIPER 4.1.4 started as part of a scheduled CMR event on the Broward County Viper multi-node system on 01/14/2015 at 3:31 am ET.

- NOC Monitoring to the GSD Helpdesk was disabled just prior to the upgrade process starting.

- Manual Viper upgrade process was selected to control the VoIP softswitch switchover process.

- The local Intrado technician running the upgrade confirms no active calls are present on the primary Viper node (Central) after the update process on the VOIP-SRV1 server completes, and proceeds to upgrade VOIP-SRV2. No issues with the system are observed at this point.

- At 4:05 am ET the first VoIP server node down event occurs from VOIP-SRV2 on the primary Viper node followed by several other VoIP server node down events on both the VOIP-SRV1 & VOIP-SRV2 servers on the primary Viper node.
• Although the local Intrado technician was monitoring a system dialog window, the first VoIP server node down message was missed.
• The local Intrado technician again confirms no active calls on the system and proceeds with the update process on VoIP2-srv1 of the secondary Viper node (North).

• Shortly after beginning the update process on the secondary Viper node, the local Intrado technician observes a spike in abandon call volume.

• Test call is performed which continues to ring on the caller side until the local Intrado technician disconnects the line at which point the test call presents as an abandon call.

• At 4:28 am ET both VOIP-SRV1 & VOIP-SRV2 at the primary Viper node are simultaneously detected offline and multiple gateways automatically register to the VoIP servers at the secondary Viper node. Although the VoIP level registration of these gateways is with the North Viper node, due to a software issue with Viper version 4.1.4, these gateway's application level registration remains with the Potsrv1 of the Central Viper node. This does not contribute to any call processing issues, but will cause any calls answered through gateways in this hybrid registration during to be falsely flagged as abandon calls in MIS.

• Severity 1 Ticket#150816 is opened up with the GSD Helpdesk at 4:34 am ET.

• A joint decision is taken between the local Intrado technician on-site and the GSD Helpdesk to allow the upgrade process to continue before taking any further remedial actions.

• Upgrade process completes across both Viper nodes at 5:01 am ET.

• Issues with calls ringing in until abandon and calls dropping and re-presenting continue.

• At approximately 5:30 am ET Ticket#150816 is escalated to the GSD L2 support team who connects to the system.

• At approximately 6:00 am ET Mark Jones contacts Rafael Diego.

• At approximately 6:30 am ET Ticket#150816 is escalated to the GSD L3 support team.

• VOIP-SRV1 on the primary Viper node is rebooted at 6:58 am ET in an attempt to stabilize the situation.

• At approximately 7:45 am ET the L3 support team indentifies issues with VoIP servers is contained to the primary Viper node (Central) and confirms that VoIP servers on secondary Viper node (North) are not affected.
• A decision is made to try registering one AIM and one CIM gateway over to the North Viper node for testing.

• Just prior to 8:00 am ET a recommendation to forego the testing of one AIM and one CIM gateway and instead register all gateways from the primary Central Viper node as the preferred destination to the secondary North Viper node is made.

• Process to logically change all gateway configurations in the PMG is started with an estimated time of completion of 30 minutes for the PMG sync to complete.

• VOIP-SRV2 is rebooted at 8:12 am ET causing VOIP-SRV1 to take over as master on the primary Viper node.

• The condition which was impairing regular call processing on the primary Viper node was relieved at 8:12 am ET when VOIP-SRV2 was rebooted allowing call processing operation back to normal.

• A joint decision is made between Intrado and Broward County to force all gateways to register to the secondary Viper node by removing the primary Viper node from the network.

• At 8:35 am ET the primary Viper node has been taken offline forcing all gateways to use the secondary Viper node as their preferred destination, returning call processing operations back to normal.

• TT# 150839 is opened up with the GSD helpdesk at 12:21 pm ET on a report from AT&T that 4 CAMA trunks are out of service.

• At 2:00 pm ET GSD L3 support team analyzes affected trunks and determines the issue is being caused by unanswered 911 calls which were not presented to the agent in the ACD queue before eventually displaying as an abandon call.

• At approximately 2:30 pm ET Intrado isolates the issue to be related to a corrupted agent table on the VoIP servers of the active secondary Viper node.

• At 2:45 pm ET Intrado advises Broward County that the issue only affects new ACD agent logins and warns against any additional ACD log off or log on attempts.

• 4:40pm ET the corrupted agent table on the VoIP servers is re-created and communication is restored yet agents are still reporting log on issues.
• 5:00 pm ET an additional issue with the Power 911 software is identified which is preventing Agent Ring Group logons while the primary Viper node is unavailable.

• 5:30 pm ET a Power 911 software patch is successfully tested on one call-taking position.

• 8:30 pm ET all call-taking positions in Broward County have been patched.

• A joint decision is made by Intrado and Broward County to keep the primary Viper node (Central) offline until a root cause is established.

• Normal call processing continues with all gateways registered to the Broward secondary Viper node (North) with no further issues reported for the remainder of 01/14/16 through 01/16/16.

• Emergency Event to restore the Broward County Primary node (133BWCONODRES16) commences at 4:00 am ET on 01/17/16.

• Emergency Event to restore the Broward County Primary node (133BWCONODRES16) is suspended at 1:31 pm ET on 01/17/16.

• Emergency Event to restore the Broward County Primary node (133BWCONODRES16) is restarted at 4:00 am ET on 01/18/16.

• Emergency Event to restore the Broward County Primary node (133BWCONODRES16) is completed at 7:35 am ET on 01/18/16.

Root Cause Summary:

<table>
<thead>
<tr>
<th>Issue:</th>
<th>Root Cause:</th>
<th>Takeaways:</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT#150816. At 4:05 am ET on 01/14/16 while applying a software update to the redundant Broward County Viper system during a planned CMR event, the VoIP servers on the Broward Central Viper node entered into a continuous stop / restart state causing a degradation to call processing operations for the duration of the event causing a majority of incoming calls to abandon before before presenting to an agent or drop and represent in</td>
<td>The condition which began on the primary Viper node (Central) at 4:05 am ET on Thursday January 14th 2016 was caused by a software issue that under a very specific set of circumstances can cause the VoIP server software to enter into a stop / restart state during the installation of KB008121 for Viper 4.1.4. For the condition to occur the Viper system must be configured to use 4 or more dynamic ACD queues and at the time that KB008121 is applied to the VoIP servers, one or more ACD agents who have previously been utilized within a dynamic ACD queue</td>
<td>KB008276 which contains protection against the condition will be officially released in the coming weeks. Additional KBs which will: 1) automatically initiate a Viper node switchover should the Viper node be operating in this type of degraded state 2) a new feature which will allow the user to automatically register all gateways to one Viper node or</td>
</tr>
</tbody>
</table>
some cases. Gateways did not automatically register to the Secondary Viper node (North) because the Primary Viper node (Central) although operating in a deteriorated state was not detected as being completely unreachable / down with the exception of a few moments at approximately 4:28 am ET.

must be logged into the system. With these dynamic queue conditions in place during the application of KB008121, the VoIP servers will go into a stop / restart state until the affected VoIP servers lose communications with all calltaking positions (rebooted) which will permanently relieve the condition. Once the KB has been installed and the VoIP servers have been cleared from this stop / restart state, the Viper system is no longer susceptible to the condition.

another with the press of one button are currently under planning and development.

TT#150839. At approximately 12:00 pm ET on 01/14/16, 6 out of a total of 199 CAMA trunks are taken out of service.

The condition was caused by a corrupted agent table on the VoIP server's agent database which was present since August 16th and a Power 911 software issue preventing Agent Ring Group logons while the primary Viper node was unavailable. The corrupted agent table on the VoIP servers is re-created at 4:40 pm ET and the application of a Power 911 software patch is successfully completed across all positions at 8:30 pm ET.

VoIP server health-check Job Aid to include steps to check mySQL health on the Viper servers as part of regular PMI process.

**Call Impact:**

- 426 total 911 calls entered the Broward Viper systems between 4:05 am ET and 8:35 am ET on 01/14/16.
- Of those 426 calls, 55 were processed by agents.
- 93 additional calls were falsely flagged as abandoned due to the state of the system but these calls were actually processed by an agent. Please note that some of these 93 calls dropped, represented, and were re-answered, but in all cases it was the agent who eventually released the call.
- 36 calls dropped and the caller disconnected before the call was represented.
- 16 calls contained no routing information from the Viper. Intrado can confirm that all of these 16 calls with valid ANI were redialed, but the lack of routing information does not allow for any further details on whether the call was dropped before presentation or abandon.
- 226 calls abandoned.
- All abandoned calls with valid ANI were redialed by the PSAPs.

**Operational Post Mortem:**

<table>
<thead>
<tr>
<th>Issue:</th>
<th>Follow Up:</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOC Monitoring was disabled just prior to the application of KB008121 commencing.</td>
<td>Effective immediately NOC Monitoring will no longer be disabled in advance of any system upgrades. The Intrado NOC will be advised of the start and stop time of each update but will continue to monitor the Viper system throughout the upgrade process.</td>
</tr>
<tr>
<td>Standard Intrado Incident Management process for Severity 1 / 2 type events was not followed adding delays to the restoration of service.</td>
<td>All Intrado field technicians and Helpdesk personnel will be required to participate in Incident Management training.</td>
</tr>
<tr>
<td>Delays in escalation process contributed to length of service disruption.</td>
<td>Moving forward all upgrades to the Broward County Viper system will run through Intrado's standard Event process.</td>
</tr>
<tr>
<td>“Pause” feature which allows the upgrade process to pause before proceeding to the next Viper server or next Viper node allowing verification of prior step was not properly utilized during the 01/14/16 upgrade event.</td>
<td>New comprehensive Viper pre / post update checklist which will validate system health on each step in the update process before moving onto next step is currently in development. Checklist will be part of all Event / CMR plans moving forward.</td>
</tr>
<tr>
<td>Underlying condition which triggered the issues reported on TTH#150839 was present on the VoIP servers at the North Viper node since August 16/15.</td>
<td>VoIP server health-check Job Aid to include steps to check mySQL health on the Viper servers as part of regular PMI process.</td>
</tr>
<tr>
<td>Both 150816 &amp; 150839 were triggered by underlying conditions on the Viper VoIP servers.</td>
<td>Engineering level inspection of Broward County Viper system is scheduled for the week of 01/25/16.</td>
</tr>
</tbody>
</table>