Version 1.0

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by Vmidc Team

McAfee Security Broker Scalability

# Vmidc Performance Tests and Results

## A1. Meni’s Spec:

* Measure and document the following use cases:
  1. Service profile to Policy assignment (… perform NSX assignment to measure service profile policy assignment NSM propagation job. As per discussion, for the DAI propagation part which is not there, we may be able to extrapolate from other transactions (such as IP/password change)
  2. 5MB Sigfile propagation (1, 10, 30 agents)
  3. Agent upgrade (1, 10, 30 agents)
  4. Agent Password change (1, 10, 30 agents)
  5. Server IP change (1, 10, 30 agents)
* Resource consumption measurements
  + Capture data points (every sec?) during run for CPU, Memory, IO (Which tool will be using?)
  + Preferably, data capturing is logged automatically to ensure accuracy and consistency
  + Measurements should be taken on actual appliance Broker server VM
* Run duration
* Extrapolate max headroom sizing based on our default appliance configuration (2 cores, 4G)
* Tips
  + For agent count, use all VCs/hosts(10) available in our lab and create multiple DAs.
  + Figure out how to clear thread pool cached tasks before run to get a valid memory measurement

## A2. Setup:

* Vmidc Server is running inside the MLOS VM.
* Monit tool is also running on the same VM as Vmidc Server.
* For every 2 seconds, Monit outputs cpu and memory usage (log to csv file) of the Vmidc Server process (java). Monit also logs the System-level memory, cpu, and I/O Wait usage into a text file.
* We use this Website to generate linear regression function:

<http://www.xuru.org/rt/LR.asp>

* Raw measurement data, Excel charts, and documentation are captured here:

[\\10.40.64.32\Controlled\_Specs\vmidc\Backup\TrinhPOCCodeBackup\performance\_results](file:///\\10.40.64.32\Controlled_Specs\vmidc\Backup\TrinhPOCCodeBackup\performance_results)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Scenario** | **1 Agent** | **10 Agents** | **30 Agents** | **Extrapolated max supported count** |
| **Agent Upgrade** | **Initial Run:**  -CPU delta: **7.4%** spike for 6 sec  -Mem delta: **180KB** -I/O delta: < 1% -Duration: 4 sec (job duration only) | **Initial Run:**  -CPU delta: **22%** spike for 22 sec. -Mem delta:**960KB** -I/O delta: <1% -Duration: 17sec (job duration) | **Initial Run:**  -CPU delta: **48%** spike for 60sec  (sometimes it spiked to 100% and stay there for a long long time when we open the JOB view)  -Mem delta: **5.4 MB** -I/O delta: < 1% -Duration: 60sec (job duration) | -CPU Linear Regression function: **cpu = 1.383358548 \*count + 6.894099849** (good linear correlation due to small r and rss. **So if cpu=100, count is 67 with spike duration increased too**)  -Correlation Coeficient: r = 9.980839462•10-1 -Residual Sum of Squares: rss = 3.295007564  -MEM Linear Regression function: **mem = 186.98941 \* count - 375.5219365** (bad linear correlation due to huge rss **but it seems that memory is increased when count is increased but memory increases faster**)  (1 agent to 10 agents, mem increases by 800KB. So assumes if we have linear correlation, if we count increased from 1 to 30 agents, we should have memory increase of 800kb x 3 = 2400 kb or 2.4 MB but we saw 5.4 MB)  -Correlation Coeficient: r = 9.857444424·10-1 -Residual Sum of Squares:ss: rss = 448872.6172  **-Job duration is also increased when count is increased.** |
| **Agent Password Change** | **Initial Run:**  -CPU delta: **14%** spike for 4 sec -Mem delta: **27 MB** -I/O delta:< 1% -Duration:1 sec (job duration) | **Initial Run:**  -CPU delta: **12.4%** spike for 4 sec -Mem delta:**15.5MB** -I/O delta:<1% -Duration:2 sec (job duration) | **Initial Run:**  -CPU delta:**32%** spike for 6 sec -Mem delta:**16MB** -I/O delta:<1% -Duration: 5 sec (job duration) | -CPU Linear Regression function: **cpu = 0.680484115 \* count + 10.1667171** (not-clear-cut linear correlation due to not-so-small rss but small r **but cpu spikes less than 50% for roughly 5 sec which is not bad**)  -Correlation Coeficient: r = 0.928077942 -Residual Sum of Squares: rss = 32.85216339  -MEM Linear Regression function: **mem = 186.98941 \* count - 375.5219365** (bad linear correlation due to huge rss **but it seems that memory is NOT increased when count is increased**)  -Correlation Coeficient: r = 9.857444424·10-1 -Residual Sum of Squares:ss: rss = 448872.6172  **-Job duration is also increased when count is increased.** |
| **3.3 MB Sigfile Propagation** | **Initial Run:**  -CPU delta: **5%** for 2 sec -Mem delta: **260KB** -I/O delta: < 1% -Duration: 1 sec (job duration) | **Initial Run:**  -CPU delta:**99%** spike for 10 sec -Mem delta:**45MB** -I/O delta: < 1% -Duration: 10 sec (job duration) | **Initial Run:**  -CPU delta:**89%** spike for 14 sec -Mem delta: **39MB** -I/O delta: < 1% -Duration: 14 sec (job duration) | -CPU Linear Regression function: **cpu = 2.331316188 \* count + 32.4720121** (No linear correlation found due to r not closed to 1 and huge rss. **But we do see big cpu spike regardless if count=10 or count=30. This also means high throughput due to parallel tasks**)  -Correlation Coeficient: r = 6.702942845·10-1 -Residual Sum of Squares: rss = 2935.627837  -Mem Linear Regression function: **mem = 1063.630862 \* count + 13550.37821**  (no linear correlation found due to r not closed to 1 and huge rss. **But It seems mem consumption is stabilized after 10 counts or so**)  -Correlation Coeficient: r = 6.501294017·10-1 -Residual Sum of Squares: rss = 680954190.6  **Job duration is also increased when count is increased but at slower rate.** |
| **Service Profile to Policy Assignment** | **Initial Run:**  -CPU delta: **16%** spike for 4 sec -Mem delta: **8.8MB** -I/O delta: < 1% -Total Duration: 18 sec (from NSX to Vmidc, but job duration is only 3 sec) | **Initial Run:**  -CPU delta: -Mem delta: -I/O delta: -Duration: | **Initial Run:**  -CPU delta: -Mem delta: -I/O delta: -Duration: | **We might retest memory usage for count>=10 cases due to 9MB mem delta even count=1** |
| **Server IP Change** | **Initial Run:**  -CPU delta: **11%** spike for 4 sec -Mem delta: **816KB** -I/O delta: < 1% -Duration: 1 sec (job duration) | **Initial Run:**  -CPU delta:**29%** spike for 4 sec -Mem delta:**2MB** I/O delta: <1% -Duration:2 sec (job duration) | **Initial Run:**  -CPU delta: **76%** spike for 4 sec -Mem delta:**34MB** -I/O delta:<1% -Duration: 4 sec (job duration)  (sometimes it spiked to 100% and stay there for a long long time when we open the JOB view) | -CPU Linear Regression function: **cpu = 2.259455371 \* count + 7.787443268** (good linear correlation due to r closed to 1 and small rss. So if cpu=100, count is 46. It looks like spike duration is the same – 4sec)  -Correlation Coeficient: r = 9.993333967·10-1 -Residual Sum of Squares: rss = 3.002269289  -Mem Linear Regression function: **cpu= 1220.114977 \* count - 4402.90469** (no linear correlation found due to huge **rss but mem usage does increase when count is increased but at faster rate**)  (assume if we have linear correlation, if we have count increased from 1 to 10 agents with mem increased by 1 MB, then if we have 1 to 30 agents, we should have mem increased by 1MB \* 3 = 3 MB but we have 34MB increase so the mem is increased faster)  -Correlation Coeficient: r = 9.620012862·10-1 -Residual Sum of Squares: rss = 52848004.84  **-Job duration is also increased when count is increased.** |

## A3. Conclusion:

- We might need to use 4-core cpu VM template since we will experience high cpu spikes (100%) for more than 10 minutes if we concurrently have many backend running jobs/tasks and at the same time bring up the Vmidc Job view UI.

- Might need to run more tests with more data points and higher counts (like 60, 100, 200, and so on) to find better correlations and more accurate extrapolation.

- Need to measure at least 3 times for each data point to average out to make data points more accurate statistically.

# B. Vmidc Application Scalability Research and Design

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Scenario** | **Priority**  **(H, M, L)** | **Effort Estimates (in days)** | **Invocation Frequency**  (How often we encounter the scenario) | **Element Count at Peak Load**  (before system starts degraded) | **Service**  **Level Objective**  (acceptable latency) | **Response Time Baseline** | **Res.**  **Time at**  **Peak Load**  (realized) | **Resoure**  **Usage for Single Trans.**  (cpu, mem, db) | **Potential Contention**    (locks, semaphore) | **Measurement Methods and Tools**  (JUnit tests or UI to simulate/run scenarios,  then use Monit, Top, JMap, JHeap,  netPerf, JProfile/JProbe for system  usage measurement, and log4j  timestamps to measure response time/delay) |  | **­­­Effort Estimates** |
| I want to deploy an appliance(s) and have it shown in Broker/NSM. | L |  | Ongoing:  ?  Initial:  ? | Number of DAI’s deployed | Response time < 5 min? |  |  |  | Yes  (tomcat, db) | Write a script to deploy DA’s and use log4j  timestamp traces to measure  overall system response time. Or simply use  NSX UI to deploy manually and manually  Measure the response time.  How long it takes for agent VM to start up. |  |  |
| I want to assign a policy to a security group. How soon can I see the newly assigned policy being enforced? | H |  | How often we create security group? | Number of DAI’s | < 2 min? |  |  |  | Yes  (how many jobs running) | Use vCenter/NSX to bind an NSM Policy  to a Security Group and check how long  it takes for a vsensor to enforce  the policy (use timestamp traces from log) |  |  |
| I want to create a new Policy in NSM. How long will it take before I can use it in NSX? | M |  | How often we create a new policy? | 1 | < 2 min? |  |  |  | no | Use log4j timestamps to measure time  in NSM callback API and time to update NSX. |  |  |
| I want to change my Broker Server IP. What is the maximum amount of ‘downtime’ I should plan for? | H |  | How often we change vmidc server IP? | Number of DAI’s,  Number of NSX’s,  Number of NSM’s | < 2 min? |  |  |  | yes | Use log4j timestamp traces.  JUNIT bench-marking tests  (run with 1,2,4,8 agents) |  |  |
| I changed my policy SIGFILE. How long will it take for signatures to propagate? (sigfile update/change case) | H |  | How often you change policy content like response action? (as part of sigfile content) | Number of DAI’s | < 5min? |  |  | Pay attention to mem usage | yes  (we already removed locking in end tasks) | Need to create a JUNIT test to simulate of  number of DAI’s to which we propagate.  We can run bench-marking tests like  support 1, 2, 4, 8 vsensors and see how  the number of vsensors are correlated to  the system performance/usage |  |  |
| How long will it take to upgrade a server’s image bundle? | M |  | < 4 times /year | 1 | < 2 min? |  |  |  | no | Use log4j timestamp traces |  |  |
| How long will it take to upgrade agents’ image bundles? | M |  | < 4 times /year | Number of concurrent DAI’s to which we upgrade | < 5 min?  Slo:  MaxRes:  MinRes: |  |  |  | yes | Do bench-marking tests for 2,4,8 agents,…  .and find the performance correlation. Use  Log4j timestamp traces. |  |  |
| How long will it take to backup a Vmidc database | M |  | daily | 1 | < 1min? |  |  |  | yes | Use log4j timestamp traces |  |  |
| How long will it take to restore a Vmidc database? | M |  | < 2 times /year | 1 | < 1min? |  |  |  | no | Use log4j timestamp traces |  |  |
| How long will it take to do database migration including schema rebuild/upgrade? | L |  | < 4 times /year | 1 | < 1min?  Depending on db size…. |  |  |  | no | Use log4j timestamp traces |  |  |
| How long will it take to create a DA (ServiceMgr registration) for a list of associated VS’s? | L |  | A few times | Number of VS’s |  |  |  |  | yes | Use log4j timestamps to measure  response time. |  |  |
| How long will it take to propagate NSM pubkey, vsensor pubkey, vsensor private key as part of appliance registration? | L |  | Every 3 minute as part of agent registration scheduling | Number of DAI’s | < 1min? |  |  |  | yes | Use log4j timestamp traces |  |  |
| How long will it take to download a vsensor’s ovf that is hosted by Vmidc server (via static hosting)? | L |  | How often we add new host to cluster  How often we upgrade vsensor ovf? | Number of vCenter’s | < 5min? |  |  |  | no | JUNIT test and timestamp traces. |  |  |
| How long will it take to propagate credentials to all agents? | H |  | How often we change password/crentials? | Number of DAI’s to which we can update credentials | < 5min? |  |  |  | yes | JUNIT bench-marking tests  (run with 1,2,4,8 agents) |  |  |

# Potential Performance-Impacting Areas of Vmidc App

## Communication Channels between NSM and Vmidc Server

* NSM Callbacks to Vmidc Server.

## Communication Channels between VMWare (vCenter/NSX) and Vmidc Server

* NSX/vCenter Callbacks to Vmidc Server.
* DA/Service Manager Registration.

## Communication Channels between Vmidc Agents and Vmidc Server

* Agent Registration including PKI Key Propagation.
* Agent Bundle Upgrade.
* NSM Sigfile Propagation to Agents.
* Agent Network Settings Update.

## Vmidc Server Hosting of vSensor OVF Files

* Vmidc Appliance/vSensor Deployments.

## Vmidc Server Functionalities/Features

* Database Backup and Restore.
* Server Bundle Upgrade.
* DA and VS Creation.
* Database Migration and Schema Rebuild.
* Vmidc Server Startup.

## Vmidc Agent Functionalities/Features

* Vmidc Agent Startup.

***======= Discussion Notes and Meeting Minutes ================================***

* 1. **Scenarios:**
     1. I want to deploy an appliance(s) and have it shown in Broker/NSM.
     2. I want to assign a policy to a security group. How soon can I see the new policy being enforced?
     3. I want to create a new Policy in NSM. How long will it take to before I can use it in NSX?
     4. I want to change my Broker Server IP. What is the maximum amount of ‘downtime’ I should plan for?
     5. I changed my policy SIGFILE. How long will it take for signatures to propagate?
     6. Followings are team input (in green):
     7. How long will it take to upgrade a server’s image bundle?
     8. How long will it take to upgrade agents’ image bundles?
     9. How long will it take to start up a vmidc server JVM?
     10. How long will it take to start up a vmidc agent JVM?
     11. What is the average size of Vmidc database?
     12. How long will it take to backup a Vmidc database?
     13. How long will it take to restore a Vmidc database?
     14. How long will it take to do database migration including schema rebuild/upgrade?
     15. How long will it take to create a DA (ServiceMgr registration) for a list of associated VS’s?
     16. How long will it take to propagate NSM pubkey, vsensor pubkey, vsensor private key as part of appliance registration?
     17. How long will it take to download a vsensor’s ovf that is hosted by Vmidc server (via static hosting)?
     18. How many concurrent jobs we can execute?
     19. How long it take to upgrade a new vsensor ovf image?
     20. Need to define max number of DAI’s (or ALL) to be upgraded.
  2. **Frequency:**
     1. How often we create a new policy?
     2. How often we create a security group?
     3. How often we create an admin domain?
     4. How often new hosts get added to a cluster?
     5. How often SIGFILES get updated? (2 weeks?).
     6. Etc, <Add yours>
  3. **Acceptable SLO thresholds**
  4. **Suggest ways to simulate/test above:**

We can write JUnit tests to run/simulate the above scenarios and use one or more of the following tools to measure system/performance usage:

* + - * 1. custom JUnit tests.
        2. Microsoft PerfMon tool (PDH) (assume we can run server in windows environment).
        3. JProbe/JProfile (commercial?).
        4. netPerf/iPerf.
        5. JConsole (JMX).
        6. Linux Top.
        7. JHeap, JMap, JHat,….
        8. Open-source Monit:  
           \* For Linux env, we can use open-source monit tool: <http://freecode.com/projects/monit>

<http://mmonit.com/monit/>

* 1. **Based on above, answer questions such as element count we can support at peak load:**
     1. Like how many DAI’s? how many VS’s?
     2. What is the size of jobs/tasks in DB?
     3. -Do we need to clean up tasks/jobs’ entries in DB?
     4. -Max number of Appliances and Appliance software versions.
     5. -Concurrent user threads and sessions.