The impact of virtualization in the City of Miami – Over 2.5 Million Dollars Savings

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The City of Miami began its server virtualization initiative in 2005 by migrating four physical application servers to an existing server used as a Virtual Host. These four application servers became the first VMware virtual machines (VMs) in the City. It was a time when project managers were reluctant to move production servers from a tangible environment into a virtual one. In addition to that, it was common practice for many vendors to deny support for applications running on abstract containers.

One way to break through these barriers was to make a gradual migration, starting with development servers, and demonstrating that the applications could continue to run and sometimes, even exceeded their previous performance. 2006 was a good year for virtualization in the City since 28 servers were migrated to VMs, including a few production ones. The fact that a SAN was available and the VMOTION feature was enabled provided an improvement on availability and reliability. As a consequence of this, the virtual machines were able to be moved between hosts during maintenance time, without service interruption. Application owners and users started to notice an improvement in reliability and, in some cases, such as with the WEB servers, a better performance.

By 2007 internal resistance was almost inexistent and more application providers were supporting VMs. The virtualization process continued growing. In some cases where the vendor would require the existence of a physical machine in order to provide support, the application was temporarily moved to a physical server for the duration of the troubleshooting period. 55 VMs were created in this year, some of them, as a result of migrating physical servers to VMs, others due to new server requirements.
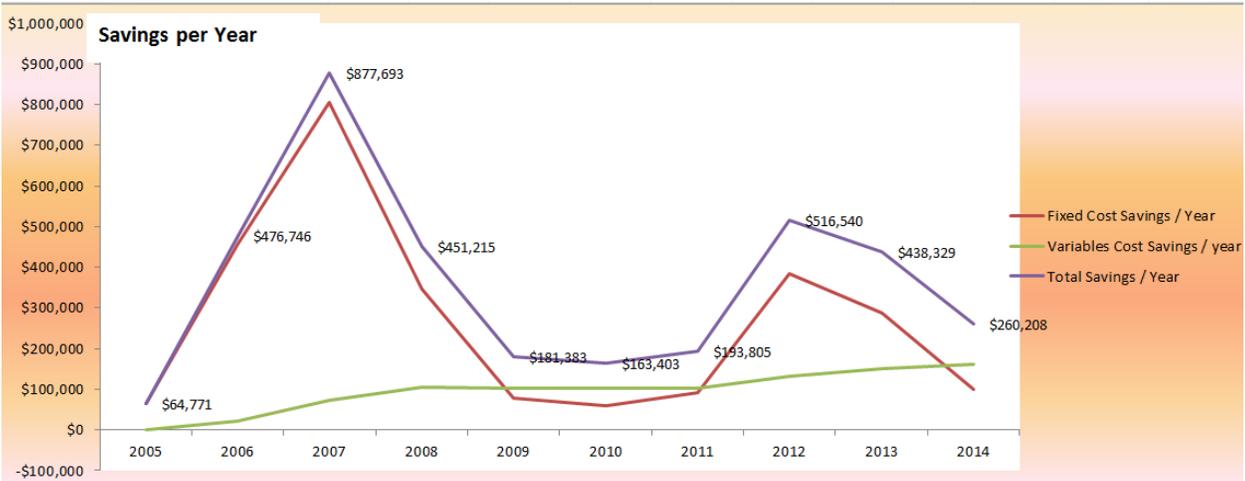
During the following years, the virtualization process continued as physical servers completed their life cycle and new servers were required. Components from the retired servers (see picture below) were and are being used to fix others that are out-of-warranty.

As a result of virtualization, in the last nine years, the City of Miami has saved **$2,672,926** in fixed costs, such as servers, network equipment (Ethernet switches, KVM switches, wiring, rack, PDUs), power and AC equipment, and **$951,167** in variable/recurrent costs from reduction in power and AC consumption, datacenter space, insurance, administration costs and others. Currently, the annual recurrent saving exceeds $160,000. It is important to mention that the downtime factor was not taken into account in the savings computation. It is a known fact that application downtime can be substantially reduced when running on virtual servers; especially when using VMOTION and when arranged in a cluster. A detailed spreadsheet showing the formulas used to calculate the savings can be found at:
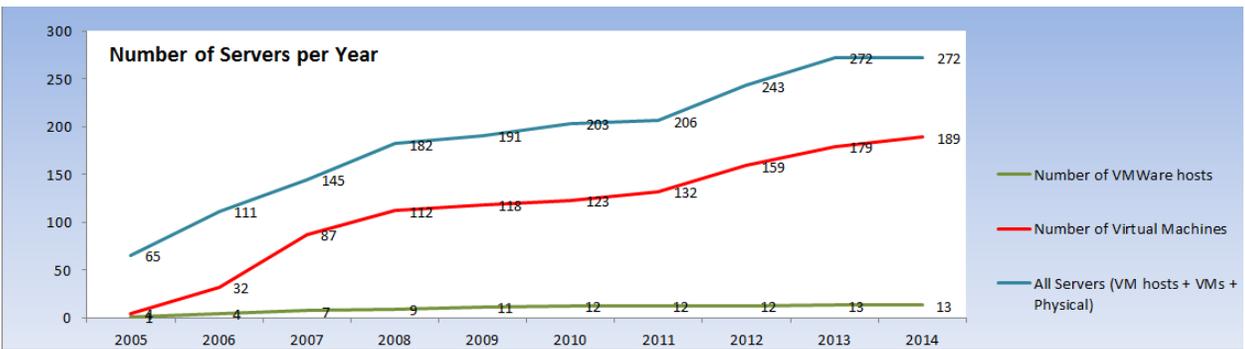http://www.miamigov.com/itd/savingscalculations /savings.xlsx

Production Environment: The City currently uses 6 six servers, configured in a cluster, to run over 80 virtual production servers. The cluster allows servers from different families and provides VMotion and high availability capabilities. File, SQL, Exchange, Oracle, Domain Controllers, Print servers, third vendor application machines, ISA, WEB are some examples of City virtual servers. A similar configuration is used to support the development, staging, QA and disaster recovery environments. Site Recovery manager 5.1 is being evaluating to enhance the DR support.

The following chart shows the fixed, variable, and total savings as a result of virtualization.

Savings per Year

- Fixed Cost Savings / Year
- Variables Cost Savings / year
- Total Savings / Year

$877,693
$516,540
$476,746
$451,215
$438,329
$260,208
$193,805
$181,383
$163,403
$64,771

The following chart shows the growth in the number of host and virtual servers during the last 9 years. See http://www.miamigov.com/itd/powersavings for more details on how the math was done and all factors used to estimate the saving output.

Number of Servers per Year

- Number of VMWare hosts
- Number of Virtual Machines
- All Servers (VM hosts + VMs + Physical)

272 272
243
206
203
191
189
182
179
159
145
132
123
118
112
111
87
65
32

Part of the retired and disconnected physical servers as a result of virtualization