Managing APC Software with Virtual Machines

March 2013

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John Campbell, Director—APC Product Management, Aspen Technology

Previously, John managed AspenTech's APC development group and has recently moved into a new role as the APC Product Manager. He earned a B.S. in Chemical Engineering from the University of Illinois at Urbana-Champaign, an M.S. in Chemical Engineering from The University of Texas at Austin, and a Ph.D. in Chemical Engineering from the University of Wisconsin-Madison.
Goals

- Why virtual machines?
- How can you use virtual machines?
- Aspen APC machine deployment strategy
  - Software requirements
  - Hardware requirements

- Heard and overheard...
- Wish list
- How you can help!
Reducing the Barriers to Adoption

- Virtual machines reduce the complexity of the installation process
- VMs make posting releases and patches a much simpler process
- Supports multiple concurrent images
- Better software from AspenTech!
Speed

- For a single site...moving to VMs is **not** much quicker than buying new machines and upgrading operating systems and software
- For multiple machine sites your work will pay off.
- Adding new CPs can be **marginally** faster
- Upgrading to new versions can be **substantially** faster
Agility

- It is time upgrades are based on new features and not on mechanics of hardware and software upgrades!
Cost

- Imagine catastrophic equipment failures that only leave controllers down for hours....

- Imagine, upgrading at a fraction of the cost...
Choices

- Plenty!! Just Google “Virtual Machine Choices”
- Work with your IT department to get expert support
- Develop your own expertise
A Closer Look

Let’s look at Hyper-V
Demo Points

- Hyper-V is available on the primary supported server platform (Windows 2008 server) for V7.3 and V8
- Virtual images are easily configured to fit the computational need
- Backups are possible via snapshots
APC V8 installation information

The following installation kits are included in the aspenONE media:

- APC Builder
- APC Online
- APC Watch Server
- APC Web Server

Virtualization Candidates
Virtual Server Machine Specs

- Pick a virtual machine host that is powerful enough for your needs
- To run an APC solution for a control room consider
  - 8 to 16 cores
  - 32 GB RAM
  - Disk space (TBs)

- This should be sufficient to handle multiple VMs:
  - APC Online Server (1-15 controllers)
  - APC Web Server
  - APC Watch Server
  - Space for a “transition” machine or two
## APC Online hardware requirements

The following hardware requirements must be met when installing any Online product.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Minimum Requirements</th>
<th>Recommended Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>Dual-core 2.5 GHz</td>
<td>Quad processor, 3 GHz or faster</td>
</tr>
<tr>
<td>Physical Memory</td>
<td>2 GB (see note below)</td>
<td>6 GB (see note below)</td>
</tr>
<tr>
<td>Hard Disk Space</td>
<td>2 GB free (see note)</td>
<td>2 GB free (see note)</td>
</tr>
<tr>
<td>Display</td>
<td>1024x768</td>
<td>1280x1024</td>
</tr>
</tbody>
</table>

**Note:** Memory requirements are highly dependent on the number and type of applications. Additional disk space may be required for larger applications and data sets. The numbers listed above are guidelines.
## Hardware Requirements

### Web server hardware requirements: 1 to 5 users

<table>
<thead>
<tr>
<th>Resource</th>
<th>Minimum Requirements (1-5 users)</th>
<th>Recommended Requirements (1-5 users)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform</td>
<td>Windows Server 2008 R2 Standard Edition (64-bit) and IE 7</td>
<td>Windows Server 2008 R2 Standard Edition (64-bit) and IE 8 or IE 9</td>
</tr>
<tr>
<td>Processor</td>
<td>Dual-core 2.5 GHz</td>
<td>Quad processor, 3 GHz or faster</td>
</tr>
<tr>
<td>Physical Memory</td>
<td>2 GB</td>
<td>6 GB</td>
</tr>
<tr>
<td>Hard Disk Space</td>
<td>1 GB</td>
<td>2 GB</td>
</tr>
<tr>
<td>Display</td>
<td>1024x768</td>
<td>1280x1024</td>
</tr>
</tbody>
</table>

### Web server hardware requirements: 6 to 30 users

<table>
<thead>
<tr>
<th>Resource</th>
<th>Minimum Requirements (6-10 users)</th>
<th>Recommended Requirements (10-30 users)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform</td>
<td>Windows Server 2008 R2 Standard Edition (64-bit) and IE 7</td>
<td>Windows Server 2008 R2 Standard Edition (64-bit) and IE 8 or IE 9</td>
</tr>
<tr>
<td>Processor</td>
<td>Dual processor, 3 GHz</td>
<td>Quad processor, 3 GHz or faster</td>
</tr>
<tr>
<td>Physical Memory</td>
<td>4 GB</td>
<td>16 GB</td>
</tr>
<tr>
<td>Hard Disk Space</td>
<td>4 GB</td>
<td>4 GB</td>
</tr>
<tr>
<td>Display</td>
<td>1024x768</td>
<td>1280x1024</td>
</tr>
</tbody>
</table>
## Hardware Requirements

### APC Performance Monitor hardware requirements

The following hardware requirements must be met when installing Aspen Watch Performance Monitor Server or Aspen RTO Watch Performance Monitor Server.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Minimum Requirements (6-10 monitored applications)</th>
<th>Recommended Requirements (10-30 monitored applications)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Platform</strong></td>
<td>Windows Server 2008 R2 Standard Edition (64-bit) and IE 7</td>
<td>Windows Server 2008 R2 Standard Edition (64-bit) and IE 8 or IE 9</td>
</tr>
<tr>
<td><strong>Processor</strong></td>
<td>Dual processor, 2.5 GHz</td>
<td>Quad processor, 3 GHz or faster</td>
</tr>
<tr>
<td><strong>Physical Memory</strong></td>
<td>4 GB</td>
<td>16 GB</td>
</tr>
<tr>
<td><strong>Hard Disk Space</strong></td>
<td>7200 RPM or higher speed drive required. For calculating actual hard disk space required, see the WatchDiskSizeCalcs.xls file, available from AspenTech Support or, after installation, from the Tools folder.</td>
<td>7200 RPM or higher speed drive required. For calculating actual hard disk space required, see the WatchDiskSizeCalcs.xls file, available from AspenTech Support or, after installation, from the Tools folder.</td>
</tr>
<tr>
<td><strong>Display</strong></td>
<td>1024x768</td>
<td>1280x1024</td>
</tr>
</tbody>
</table>
Machine Specs

- Bottom line...keep the Online server and the Watch server separate so that there will be no disruption to the controllers
- Put the Web server on the online box
- Put the SLM server on the online box
Deployment Strategy

- Pick the hardware and the number of virtual images in your solution
- Stage a solution. Use example applications that do not write to the DCS to validate some important connections
  - Onlines → Web Server
  - Onlines → Aspen Watch
  - Web Server → Aspen Watch
- In the production environment get the Onlines and Watch Server to talk to the DCS
  - This may be custom by location
- Carefully record changes that make the DCS connection possible. This information will be needed later!
Deployment Strategy

- If you keep Cim-IO on the Online server then you can keep AT software off your DCS servers. You will need to use COM in that case to communicate to the OPC server. Aspen Process Controller can speak OPC directly without the need for Cim-IO.

- Don’t be afraid to start from scratch
  - Different control rooms or sites may have different requirements or even different virtualization environments!
  - Installs on clean machines are easy! Post install configuration can be the challenge.
  - Use a common strategy even if multiple base images are needed.
Back Ups – Three strategies

- Follow vendors' suggestion on backups
- Use snapshots
  - Before and after upgrades (MS or AT)
- Treat like a physical machine
  - Grab the files that are changing
Client Experience #1

- Initial roll out does not produce the savings.
- Future maintenance will be easier, faster, and cheaper.
- Well prepared for disaster recover either from hardware failure, virus attacks, incompatible upgrades, etc.
- Hardware independent!
- Tailored to the individual sites based on need.
- Uses migration to the virtual environment as an opportunity to sit down and train local administrators about Aspen software, DCS/OPC connectivity, and troubleshooting.
- Better remote troubleshooting (can be pretty confident about what the sites have!)
Client Experience #2

- Substantial rollout across multiple sites. No virtualization specific complaints.
- Less hardware in already crowded control rooms is a nice side effect.
- VMs have a learning curve...new things to learn about access, backups, administration, etc.
- Removes the “fear factor” from attempting upgrades. The roll-back features are excellent.
- Some successful experimentation with “golden” images, or images that can be shared across sites.
Client Experience #3

- Large scale rollout.
- The amount of time saved by deploying and VM image versus deploying our kit on a physical server is probably negligible (in terms of hours saved).
- Expecting to see substantial gains from the VM platform is during the major migrations of the production servers (Window 2003 to Windows 2008, Aspen V7.X to V8.0, etc.)
- Server outages during upgrades may be reduced by 50 percent by utilizing VM images to deploy and migrate the on-line data to the next version.
Client Experience #4

- Involved AT to install software on a blank image.
- Used flash drives to share images
- Found machines specifically suited for a given PCN
- Changes were needed to move it to another PCN
Wish List

- Change machine name easily and reliably
- Establish best practices for security (e.g. moving files to and from the servers)
Summary

- Virtual machine deployments for APC
  - Its real and it's here!

- The tools are mature and the APC software works.

- The opportunities to be more agile and keep costs down are available now.

- We need to become experts, quickly.
What’s Next

- Next update is at the Optimize 2013 conference in Boston in May

- Please share your company’s VM experience. We can keep the information confidential
  - What vendor do you use?
  - What is your deployment strategy?
  - Tips, tricks, and gotchas?
  - Security strategies?
  - How to handle Aspen Watch history when it gets large?
  - How can Aspen help?

Email john.campbell@aspentech.com with your contributions
Thank you!

Questions?
OPTIMIZE™ 2013
Global Conference

Join us in Boston for the industry’s must-attend event!

OPTIMIZE 2013
6 – 8 May 2013
The Westin Waterfront Hotel
Boston, MA USA

For more information, visit
www.aspentech.com/agc
# Conference Agenda Overview

<table>
<thead>
<tr>
<th>TIME</th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 a.m. -</td>
<td>John Campbell, AT - “Goals and Objectives for SW Deployment Using Virtual Machines”</td>
<td>Goustaf Gous - Sasol - Using Manipulated Variable Overshoot as a Tuning Metric</td>
<td>Steve Williams - AspenTech - Creating additional profit opportunities in the synergy between aspenONE products</td>
</tr>
<tr>
<td>9:30 a.m. -</td>
<td>Practitioner’s Corner</td>
<td>Doug Robertson, Marathon, APC Level Control</td>
<td>Saudi Aramco - Neelay Bhatattacharya - Process Modeling Applied to Development of LP Model for a new Hydrocarbons Complex</td>
</tr>
<tr>
<td>10:00 a.m. -</td>
<td>BREAK</td>
<td></td>
<td>Ray Coher - Marathon - Linkages between Planning &amp; Scheduling and APC</td>
</tr>
<tr>
<td>10:30 a.m. -</td>
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<tr>
<td>11:00 a.m. -</td>
<td>Brian Ashcraft &amp; Eduardo Arrieta, DOW, “Providing a time-varying move plan for a feed-forward variable in DMC”</td>
<td>George Shen, Air Products, “Using intermediate process variables with fast dynamics for better disturbance rejection”</td>
<td></td>
</tr>
<tr>
<td>11:30 a.m. -</td>
<td>Practitioner’s Corner</td>
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<td></td>
</tr>
<tr>
<td>12:00 a.m. -</td>
<td></td>
<td>Evonik, Uwe Piechotta, “APC Applications in Specialty Chemicals”</td>
<td></td>
</tr>
<tr>
<td>12:30 p.m. -</td>
<td>LUNCH</td>
<td></td>
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</tr>
<tr>
<td>2:00 p.m. -</td>
<td>Stefano Lodolo, AT - “Benchmarks for APC Deployments in Southern European Refineries”</td>
<td>Erik Debie, Sitech - Implementation of an APC solution for Utilities: Providing steam for more than 40 plants</td>
<td>Sinopec MaoMing, Mr. Tan Zhibo, Polymer APC w/ Alex Kalafatis</td>
</tr>
<tr>
<td>2:30 p.m. -</td>
<td>Opening Plenary &amp; Keynote Address</td>
<td>Rajalingam Ramachandran - Reliance Mumbai - “Advanced Process Control in Captive Power Plant using Aspen DMCPplus”</td>
<td>Srisurang Pongsapo - SCG (TPE/TPP) - Driving Enterprise Value and Maximizing Return on Asset With Non-linear APC Across Multiple Polyolefin Manufacturing Units</td>
</tr>
<tr>
<td>3:00 p.m. -</td>
<td>APC in Energy</td>
<td></td>
<td>Rahul Bindlish, DOW, Application of a Non-Linear APC at Dow</td>
</tr>
<tr>
<td>3:30 p.m. -</td>
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<tr>
<td>4:00 p.m. -</td>
<td>Speaker 1: Opening Address - Sriram Ramaganesan, Valero, ACOWUG Chairman</td>
<td>Abdullah Al Ajmi - KNPC - Optimizing Methanol requirement in MTBE Unit to maximize Iso-Butylene Conversion</td>
<td>V8 Demos and feedback - group discussion led by Product Management</td>
</tr>
<tr>
<td>4:30 p.m. -</td>
<td>Openinn Plenary &amp; Retrospective</td>
<td>Luis Andrs Rodriguez , Ecopetrol, “Aspen DMCPplus and Inferential Qualities on Diesel and Gasoline HDTs and on hydro desulfurization plants,”</td>
<td>V8 Model Builder</td>
</tr>
<tr>
<td>5:00 p.m. -</td>
<td>Speaker 2: John Campbell, APC PM - “Update on aspenONE APC”</td>
<td>Philip Bhaskar, ESSAR, “Overcoming Unique Challenges in Implementing DMCPplus in High Capacity FCCU”</td>
<td>Roundtable Innovation Discussion</td>
</tr>
<tr>
<td>5:30 p.m.</td>
<td>Jack Adair, Valero - “Adaptive Process Control for Parallel Revamps”</td>
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</tr>
</tbody>
</table>
Want to see similar results?

Consider a training class from AspenTech

http://training.aspentech.com
Advanced Process Control Installing and Configuring (APC1020)

April 11, 2013 – Houston, TX
May 30, 2013 – Houston, TX
June 27, 2013 – Houston, TX

http://support.aspentech.com/supportpublictrain/CourseInfo.asp?course=APC1020

• Learn how Aspen APC Software runs on different computers in the Process Control LAN.
• Learn how to configure the overall infrastructure to fully support Aspen APC.
  • Increased effectiveness installing, maintaining and troubleshooting the Aspen APC infrastructure.
Introduction to Advanced Process Control

Introduction to Advanced Process Control (APC1400)

March 25, 2013 – Singapore
April 1, 2013 – Houston, TX
April 22, 2013 – Reading, UK
April 29, 2013 – Reading, UK

http://support.aspentech.com/supportpublictrain/CourseInfo.asp?course=APC1400

- Learn how to develop and build control models and applications, and perform off-line tuning and simulation.
  - Learn how to use the SmartStep mode of Aspen DMCplus.
  - Develop skills to carry out Aspen DMCplus control projects and troubleshooting and maintaining Aspen DMCplus controllers.
APC Project Pretesting Using a Virtual Plant (APC2300)

March 25, 2013 – Houston, TX
April 22, 2013 – Houston, TX
May 13, 2013 – Houston, TX
May 20, 2013 – Virtual-Americas

http://support.aspentech.com/supportpublictrain/CourseInfo.asp?course=APC2300

- Develop hands-on control experience using AspenTech’s Virtual Plant, while under the guidance of a seasoned process control engineer.
- Bridge the gap from academic process control concepts to real-world control practice
- Define the preliminary design phase for an Advanced Process Control project
Advance Process Control Application Development and Online Deployment

Advance Process Control Application Development and Online Deployment (APC2400)

April 25, 2013 – Houston, TX
May 16, 2013 – Houston, TX
May 207, 2013 – Singapore

http://support.aspentech.com/supportpublictrain/CourseInfo.asp?course=APC2400

- Explore fundamental concepts of client/server communication and implementation details using Aspen CIMIO™ software.
- Configure, and maintain Aspen DMCplus Online, Aspen Watch and Aspen Production Control Web Server software.
- Perform all steps of an Aspen DMCplus project: data collection and extraction, loading and starting a controller, commissioning the controller, and updating configurations as operating objectives change.
- Explore the capabilities of the Production Control Web Interface