Virtual Training Labs: Delivering Hands-On Classrooms in Cloud Environments
2 Reinventing Virtual Learning: Delivering Hands-On Training using Cloud Computing

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Virtual Training Labs: Delivering Hands-On Classrooms in Cloud Environments

1. Today’s Training Delivery Challenges

Most companies have an ever-growing need to provide software and technical training for employees, but are under increased budget pressure to reduce per-seat training costs and eliminate travel expenses. Furthermore, training attendees are under pressure to continue their regular work functions and often do not have the luxury to block out entire days on their schedule to attend training. To address these pressures, we’ve seen many training organizations look to online and distance learning, and new self-paced education delivery methods to solve cost, location and personnel constraints.

However, implementing effective distance learning and reducing costs is not simple. Emulating a complex software application typically requires building out a training environment with multiple servers and perhaps client machines or VMs for students, preconfigured with numerous components. In addition, making a classroom environment remotely available over the Web requires specialized virtualization software and complex IT infrastructure. Finally, administration and maintenance of remote classroom equipment requires full-time, skilled technical staff that is too costly for most organizations.

The question then becomes: can training organizations with limited resources take a traditional classroom environment online and achieve the same learning outcomes? And simultaneously, can they reduce equipment and administration costs for both traditional and virtual training? This is the challenge this whitepaper will explore.

2. Virtual Classrooms: Reinventing the Traditional Learning Environment

The proven approach to effective technical training has traditionally been Instructor Led Training (ILT). In this model, an instructor lectures, presents slides and demos on a projector, draws on the whiteboard to help explain concepts, and instructs students to practice using the concepts presented by completing hands-on labs using the computers in the classroom. The students, all in the same physical classroom with the instructor, each have a computer in front of them for lab purposes where the software has been pre-installed. When students need lab assistance the instructor is there to clarify instructions and offer technical assistance.

Taking all the various components of this rich technical learning environment online has been
an elusive but continuously pursued goal. Web conferencing and online collaboration tools (such as WebEx or Citrix GoToMeeting) offer the voice conferencing and presentation tools necessary to deliver the slide/lecture, discussion, and white boarding components remotely. When most learners can get access to network bandwidth speeds of DSL or better, the user experience of using these tools has improved. Live video of the instructor can usually be included as well, improving student engagement, and phone conferencing over VOIP further reduces costs. However, that only takes care of the presenter’s side of the equation.

3. What’s Missing? From Hands-On to Self-Paced Training

Noticeably absent from the online version of our ideal technical training experience is the hands-on lab component. After going over concepts (through slide/lecture/demo/discussion) the effective online course should make the learning practical by enabling students to “learn by doing.” No lesser an authority than Confucius once said, “I hear and I forget, I see and I remember, I do and I understand.”

Technical training without the hands-on lab component too easily becomes a passive experience similar to watching television. The student is left in observation mode. No matter how good the presenter or the demo, the learner never gets hands-on practice with the software and as a result knowledge retention rates suffer and skills are not learned. Relegated to the role of viewer, the students tune out or ‘change the channel’ by accepting easily available distractions (such as email, web browsing, work colleagues, etc.).

Introducing a hands-on lab component changes this equation and helps instructors engage the students and allow them to practice using the software being taught. To add this needed component to our virtual training, we need an enabling tool which students can use to apply the concepts learned and synthesize conceptual information into practical skills.

Many training organizations have not discovered or implemented such a tool, instead simply leaving the lab component out of their online course offering all together. Alternatively, some organizations try to custom-build interactive courseware using a combination of screen captures and UI “hot spots” to attempt to take the user through a single usage scenario.

Unfortunately none of these approaches are effective for achieving desired learning outcomes when the topic involves complex software or variable use cases on the part of students.

In addition, enterprises and employee students are increasingly favoring a current approach of self-paced training, so educational goals can be met on an at-will basis whenever the student prefers to learn, and when they have time available to fit their course work around real work commitments.
4. No IT Dependencies with Skytap

Skytap provides a powerful and flexible classroom environment accessible to instructors and students over the Internet. Just in the same way that a WebEx solution is available online for presentation and audio conferencing, Skytap is available online as a platform for delivering hands-on labs and self-paced learning exercises. There is no dependency on IT for support with Skytap, beyond overall administrative oversight when it is called for by the organization.

Skytap’s Environments-as-a-Service can mirror all the systems needed in a training environment in a virtual training library that can be called up on-demand. As a result, Skytap training customers have access to a large, shared pool of virtual environments which can be accessed whenever, and wherever they are required. Computing resources are charged for by the hour, which means a training organization can align classroom lab costs to student demand and no longer have to pay for underutilized classroom equipment.

Skytap enables instructors and lab administrators to access class templates through a self-service interface, and set up and tear down lab environments in minutes instead of manually configuring labs. There’s no need for submitting provisioning requests.

Furthermore, IT administration is dramatically reduced because Skytap is a fully managed, hosted service that offers complete visibility into usage metrics and quotas. Let’s explore how Skytap is used during a typical training class.
4.1 Classroom Set-Up

An instructor can create a classroom to suit his or her specific course needs and power the virtual machines on in a matter of minutes. By simply logging into the Skytap web client, a classroom environment can be assembled using server and client machine templates. These templates may be images captured from traditional training machines and uploaded to Skytap, or they can be created from scratch using any of the numerous operating systems in Skytap's public library including many variants of Windows XP, Windows Server, Mac OSX, Linux, etc.

Each classroom (or “environment” in Skytap) resides on its own private network. Instructors have a high degree of control over the network settings in the classroom, including the ability to change the hostname of a virtual machine, use static IP addresses within a virtual subnet, map network drives within the subnet, run their own DNS or WINS servers within the subnet and more. Internet access from the virtual machines can be turned on or off.

During class there is often a need to provide students with lab files. In preparation for this, an instructor will typically download materials to a shared folder on a single server in the virtual classroom to which the student machines are mapped. In this way the instructor can easily share the software installers and lab files required for a particular course with all students.

To prepare for a course in which the labs build upon each other, instructors can create a snapshot of the virtual machines at the end of each lab. During a class, this enables the instructor to help a student who had trouble on a previous lab to continue on to the next lab by providing a snapshot of a virtual machine with prior exercises completed.

![Creating a Classroom Lab Environment from Pre-Built 'Templates']
Before a class starts, instructors will invariably want to control what students can access and when they can access it. Skytap provides full access control settings. A best practice is for the instructor to configure Skytap settings specifying the hours when given machines are available to students and whether or not the student can power on the machine. Because machines can be accessed from anywhere, the instructor may decide to allow students to access machines at much broader hours, as often seen in self-paced training scenarios.

4.2 Class Delivery

During class delivery, each student accesses his or her dedicated virtual machine desktop via Skytap Remote Access, a standard web browser, or via a Remote Desktop Protocol (RDP) client. A student is sent a unique Web URL (or “Published URL” in Skytap) with the class registration email to access their machine. With a “full screen” view of the Desktop, and a good connection to the Internet, the student may soon forget that the labs are not running on their local machine. In addition, the instructor will have access to some very helpful features including:

» Thumbnail View - the instructor can see thumbnail views of each student machine desktop from a single web page. This allows the instructor to easily monitor student progress or alerts during labs.

Instructors find this feature very useful since it gives them quick insight into what students are doing during assigned labs.

![Instructor 'Over-the-Shoulder' View for Monitoring Progress and Assisting Students](image)
» **Over the Shoulder** – Instructors can monitor student progress and if a student requests assistance during a lab, the instructor can easily access the student’s desktop and assist. Both the student and the instructor will see the same view of the desktop simultaneously. Unlike with web conferencing tools, there is no need to “share the desktop” or grant presenter privileges back and forth. This feature in combination with an audio conferencing tool provides a remote lab troubleshooting capability as good as if the student and the instructor were in the same room together.

» **Add Hardware Resources** – if a virtual machine requires additional memory or processing power for a particular lab, the instructor can easily increase the amount of RAM or CPU dedicated to the machine, even during class.

One of powerful features available within Skytap is the ability to create ‘snapshots’. Using the snapshot feature, an instructor can save a copy of the student’s machine in its exact state at any time. Now even the instructor’s support staff can unobtrusively help the instructor troubleshoot a student’s lab issue on a cloned copy of the environment, while the student can continue on to other labs. Once the solution is discovered on the clone, the support staff can discreetly communicate the fix to the instructor who can then knowledgeably instruct the student how correct the issue.

Another use of snapshots is to revert a machine back to an earlier state. For example, the instructor could snapshot machines before a lab that demonstrates an irreversible software error. In this way you can allow students broader leeway to experiment on resolving complex issues.

![Students Access Virtual Machines Using a Web Browser or a Remote Desktop Client](image-url)
4.3 **Classroom Reuse**

Once a set of class environments has been created, they can be saved back into the Skytap library as a ‘template’ of the classroom and easily deployed for future training sessions. Templates can be customized and an instructor may find that they like to adjust the standard training templates used by their colleagues to better support their personal training approach. Rather make these adjustments to each machine in the classroom every time a new classroom is created, the instructor can make these changes once, snapshot these changes, and then use the snapshot as their new template each subsequent time they teach or offer the class remotely.

A template can be just one machine, or an entire classroom of machines. Skytap has powerful automation and deployment capabilities, so once a template has been created, a new classroom can be deployed through the Web interface in just a few seconds or minutes, saving hours of manual set-up time.

5. **Skytap Benefits**

Skytap provides compelling benefits for any training organization with a hands-on lab component in their classes. The benefits typically cited by training organizations include:

**Productivity with Less IT Involvement Required**

Instructors have self-service access to create classroom environments on demand, usually with little or no IT involvement. Unlike many traditional training lab approaches, there is no need to send an email or log a support ticket to acquire access to machines, or add new machines to a classroom. Instructors have a greater sense of control since they can add, delete, copy, modify, and power on and off machines on their own. The user interface is easy to learn and simple to use, so time-to-value is quick.

IT can still retain visibility and control over usage as needed, but in most cases they too prefer having training organizations service their own needs, so they can focus on the general infrastructure needs of the business.

**Reach more global customers, with more effective training.**

We are hearing a clear message from customers that the flexibility of leveraging cloud-based classrooms has revolutionized their ability to deliver more effective, realistic training scenarios, to far more students around the world with ease. Gone are the days when training was limited by the dimensions of a physical classroom and the number of available workstations.

Students and classes can be added at a moment’s notice. A typical result we see over the first 2 years is a 300% increase in student training delivery due to self-enrollment and self-paced training offerings to a larger, global audience.

Hands-on training in Skytap is far more realistic than traditional methods, because the labs can replicate real software environments that students will use hands-on, rather than walking through rote exercises. One major software vendor said that partners who took their enablement training offered through Skytap started generating 5 to 7 times more revenue than their peers!
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Operational Cost and Usage Controls

Many training vendors will charge by the day, so that whether students access machines for 5 minutes or 24 hours, you pay the full day price. Furthermore, machines typically have to be reserved well in advance and there is little flexibility to change lab size on the fly (e.g. add machines or increase hardware resources for individual machines) to mirror changes in student demand.

In contrast, Skytap only charges for the actual minutes that environments are running, and machines can be added on demand from an elastic pool of allocated cloud resources. Since instructors can power them on or off as needed, and features such as ‘auto-suspend’ ensure machines are not left on inadvertently, significant operational cost savings can be realized. Instructors can also set time limits for completion of a class, so reservations are less likely to sit idle.

Deliver Self-Paced Training

Today’s enterprises demand self-paced training, and Skytap provides the student with an immersive training experience that can happen at any time, and anywhere they have access to a browser. If authorized by instructors, students can suspend a class, store a snapshot of it in its exact state, and resume work right where they left off.

Ease of Integration and Customization

The expensive and time-consuming tasks of buying or upgrading equipment, and manually configuring and installing software and class data can be handled by Skytap infrastructure. With our robust API and easy import and integration tools, you can enable your existing Learning Management and custom training portals to run in Skytap. Furthermore, you don’t have to rewrite your existing applications or configure complex networks to get cloud labs provisioned and set up.

6. Conclusions

Taking technical training online without sacrificing the quality of the learning experience is a challenge organizations continue to struggle with. Many companies have yet to expand beyond the use of web conferencing tools or rote “movie watching” for online course delivery.

Skytap fills in this gap by providing a hosted computing environment the students can easily access, and gives instructors full control of the classroom. Features such as ‘over the shoulder’ and ‘thumbnail views’ give the instructor a real-time view of what the students are doing and the ability to offer lab assistance when requested.

Skytap can still be used for standard ILT where the instructor is in the same physical classroom as the students. With this model, instructors no longer bear the burden of lengthy classroom pre-configuration tasks. The organization only needs to provide machines that have an internet connection and a Web browser to access ready Skytap labs in the classroom environment.

Skytap can help your organization transform the training delivery model into one that serves far more customers, with higher quality educational experiences.
About Skytap

Skytap provides Environments-as-a-Service (EaaS) to the enterprise. Our solution removes the inefficiencies and constraints that companies have within their software lifecycles. As a result, our customers release better software faster, train and support customers more effectively, and deliver more business value over the life of their software investments.

Today’s enterprise is challenged to continuously deliver new applications and services to meet the needs of end customers, partners and employees, while overcoming increasing change and complexity in their IT infrastructures. Our customers use Skytap to manage, import, deploy and decommission on-demand environments that contain everything needed to accelerate every stage of the software lifecycle, without unnecessary costs and project delays due to manual configuration and dependencies.

Enterprise IT organizations maintain full visibility and cost control, while allowing dev/test, training and sales demo teams to self-provision labs, and copy and share complex environments across global cloud regions with ease for a lasting boost in velocity.

Customers can import existing virtualized applications without recoding, or build new applications in the cloud with Skytap EaaS. Skytap can be easily accessed through any modern web browser, smartphone, REST-based API, Command Line Interface (CLI), or ALM tool (Jenkins, Visual Studio TFS, etc.).