CLOUDPAGING FOR WINDOWS

July 2017

BACKGROUND

Cloud computing emerged as a way for the industry to offer massive amounts of compute capability via shared and highly scaled data centers. Virtualization of compute resources allowed for greater compute density and consolidation of individual server or desktop operating system sessions onto shared platforms. These virtual machines continued to evolve with greater capabilities on the host platforms. Some assumptions were made by vendors as virtualized computing from the cloud continued to grow:

1. Virtual Machines could be containers for both user applications and OS
2. Web browsers could become the delivery mechanism for applications allowing an increase in scale and efficiency – lowering the need for native operating system applications
3. The network pipe to the users would be near infinite, free of latency and congestion allowing Virtual Machines to not only run local but be delivered via protocols for pixel streaming
4. Clients, aka "the end points" were assumed to be thin and simple; high performance compute or graphics/video processing would not be necessary
5. Customers would not change Cloud vendors and thus not need to be concerned about vendor specific Cloud platforms

While the efficiency of the cloud computing goes without question, these assumptions do not consider the reality of enterprise desktop delivery and application requirements. The original view of the cloud shown in **Figure 1** shows the concept of the cloud as one where all the clients are outside the cloud, ignoring the fact that successful applications run natively and today's clients have a tremendous amount of compute and graphics capability.
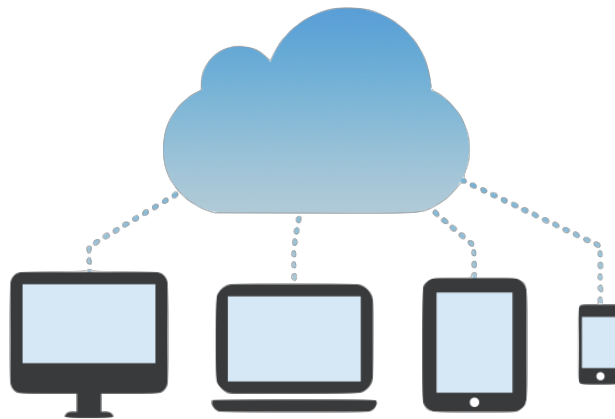

Figure 1- The Cloud in its Infancy: Clients External to the Cloud

Modern web applications can deliver significant capabilities but can lack local processing performance, be affected by latency impacts, and deliver sub-par usage for demanding GPU use cases.

Using Virtual Machines to deliver both OS and native applications addressed physical application capabilities where web apps did not meet user performance criteria. Delivering Virtual Machines to end users as VDI (Virtual Desktop Infrastructure) requires GPU's or vGPUs for heavier graphics needs, further increasing costs while the VDI pixel remoting can provide a sub-par experience to mobile or field facing end users.

Where VDI runs well, on low latency LAN or high bandwidth WAN networks, administrators still must solve how applications are delivered to user. VDI solves the OS system image delivery but does not provide effective IT controls or self service delivery of application to end users that can also be used with non-VDI users. IT organizations therefore build processes for application rollout on VDI users that cannot be applied in most cases to non-VDI users, further burdening limited IT resources.

ORIGIN OF CLOUDPAGING

The origins of Cloudpaging are found in the fact that native applications on Windows platforms would be required for nearly all enterprise organizations even with the proliferation of applications delivered through the web. Cloudpaging was designed to deliver web-scale, native applications to both physical devices' users, who can utilize local processing, and VDI users (i.e. non-physical devices' users), allowing all users to exist within the Cloud as shown in Figure 2.

Cloudpaging is a platform which combines the best attributes of cloud computing (agility, elasticity, manageability, etc.) with the security, performance, and functionality, which traditionally only native applications deliver.
Increasing application delivery flexibility while lowering IT costs for on-boarding new users and new applications in addition to maintaining those users' applications is a key advantage of using Cloudpaging. Another advantage is also being able to efficiently move applications between Cloud vendors without the overhead of re-packaging.
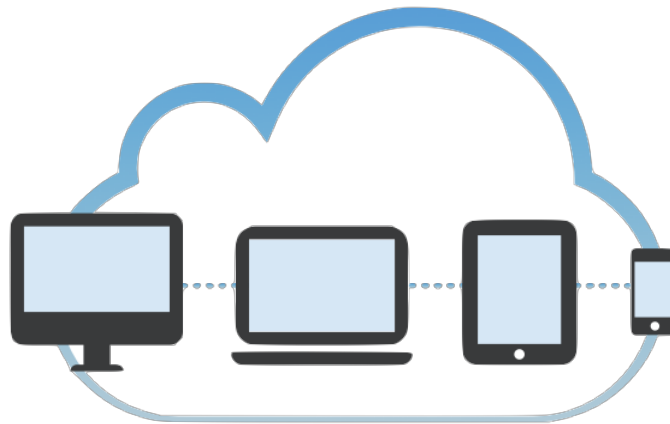

Figure 2- Cloudpaging: All Clients Exist Within the Cloud

CLOUDPAGING FOR WINDOWS

In its simplest form, Cloudpaging is an extension of virtual disk system that leverages the virtual memory computing. By doing so, Cloudpaging extends native applications from only being installed and run from local memory to being delivered from the cloud as soon as users' need for the application functionality arises.

Cloudpaging brings native application delivery to physical user devices like Notebooks and Desktops while also allowing VDI implementations to simplify on demand of applications. One common application deployment strategy can cover all users (VDI and non-VDI) with Cloudpaging.

Three distinct advantages can be found with Cloudpaging:
1. **Rapid deployment with Tiny provisioning footprint**
   - Order of magnitude reduction in application footprint
   - Native applications to behave like web-apps but with full performance
   - Capable to run both online and disconnected with support a variety of paging sources, including traditional CDN's

2. **Benefits of virtualization with full Compatibility of native installation**
   - Configurable virtualization layers that allow for isolation, integration, or physical installs of application assets, such as files, registry keys, fonts, services, drivers, etc.
   - An event-driven provisioning system that can execute customer handles for all types of configuration needs
   - An ability to run different versions of the same application concurrently in isolated mode, for instance different versions of Internet Explorer sandboxed from each other

3. **Real-time asset tracking, enforcement, and analytics**
   - Out-of-the box license policies that can be applied to application secure containers
   - Brings the benefits of web-application delivery and tracking to physical applications

Cloudpaging is an evolution of existing technologies that were at the forefront of application virtualization and streaming, revolving around a patented broad set of new and disruptive technologies to transform native software delivery, deployment and provisioning from the cloud.

Our goal is simple - we want native software delivery to be as clean, agile, rapid, and as friction-free as a single click on a website. Our mission is to be to software, what services like Dropbox or Box.com are to data - yet with license control to know how applications are being used.

Cloudpaging allows applications to be placed into secure encrypted application containers for delivery to users. On initial run of a delivered application, a small subset (approximately 10%) of the application is delivered that can allow the application to be usable right away from within a secure persistent sandbox. Further functionality can be readily available as well and is defined on initial application creation. Continual use of the application will deliver additional instructions from the application container, one memory page at a time to the secure sandbox.

Figure 3 shows the fundamentals of Cloudpaging Windows applications. The fundamental concept of Cloudpaging is to first "cloudify" (e.g. package) the application. This process is achieved by running the application through a tool called Cloudpaging Studio. Cloudpaging Studio observes how an application installs and what instructions are required to bring up the application. These instructions are then placed in a secure container along with virtualized registry and files. This container is then published on the on premise Cloudpaging Server or hosted Cloudpaging CDN service.
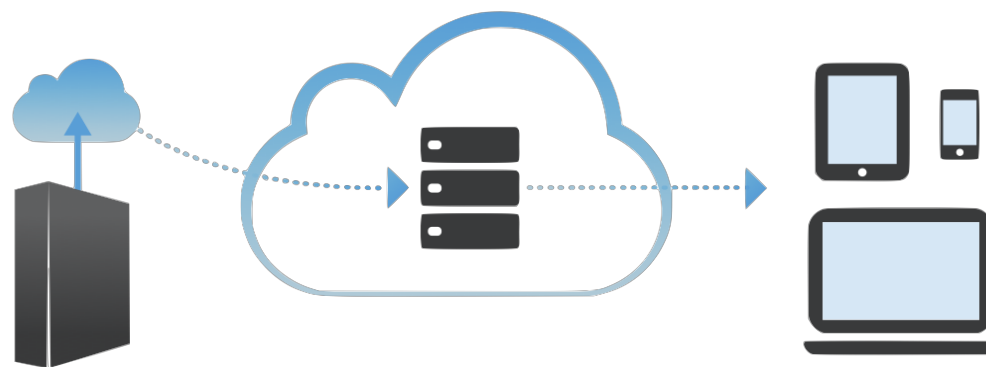

Cloudify Native
Windows Software

Publish on Server or
Cloudpaging CDN

Figure 3 - Fundamentals of Cloudpaging
Deliver 20-100x Faster
While Executing at
Native Speeds

THE VALUE PROPOSITION OF CLOUDPAGING

Cloudpaging has seen great success in Enterprise Customers, ISV's looking for easier delivery of complex applications, Cloud Service Providers, and Managed Service Providers. The common reasons customers deploy Cloudpaging are:

1. **Lowering IT costs and deployment pain points** – In today's architectures, there is a lot of energy spent administering to end user client devices. Cloudpaging technology will dynamically provision any changed instructions when an application is upgraded as soon as the user invokes the application on the client. Cloudpaging will download only changed instructions, minimizing network traffic, freeing up IT resources which further lowers IT costs.

2. **High Compatibility** – 99% of applications supported, with the industry's highest compatibility for application plug-ins and application provided drivers, ensuring that all applications in your organization can be delivered to end users.

3. **Application flexibility for VDI/DaaS environment** – Even with VDI capabilities, users need access to a wide variety of applications that are task or job specific. Creating VDI Pool templates for specific task or job roles generates a constant process to update these templates. Most VDI environments need to support physical non-VDI users still. With Cloudpaging, one application deployment process works across both user types.

4. **Improved user experience** – A user is typically up and running an application via Cloudpaging 20x to 100x faster than download/install. Over the first few weeks the local Cloudpaging secure sandboxed application cache adds more instructions from the application container resulting in even more robust performance.

5. **Scalability** – graphically intensive applications consume servers at a very high rate and pixel streaming over an uncertain channel leaves users wanting. On the other hand, a single Cloudpaging server can support thousands of end users sending lightweight non-time critical packets over the Internet.

6. **Security** – The application is encrypted and compressed before delivery to the client for native execution so there is minimal risk of piracy. Also, data never leaves the client machine and is not stored in the cloud unless the user wants it to be. This provides a high level of security to both the application and the data not available in Cloud 1.0 solutions.

7. **Compliance** – ensure the latest applications are used to comply with any regulatory needs that require validated, certified applications. This is a great benefit for medical, government, and financial verticals that may need greater application control.

8. **Software asset management** – in addition to having tight license control over the containers in which the applications are delivered in, Cloudpaging can deliver complete session data, enabling enterprise customers to know how applications being used and how any downstream ISV licenses that may be used should be scaled to the right user needs.

9. **Application control** – With the application residing on a central cloud server under the control of the Cloudpaging server agent, rogue applications and rogue users can be shut down immediately.

10. **High adaptability** – Cloudpaging solution works in conjunction with almost all existing software delivery and virtualization software such as App-V, ThinApp, XenApp, on variety of Windows desktop offerings (Workstation, Server, Terminal Service, Citrix, etc.), with most number of antivirus supported, giving administrators the highest degree of flexibility without being forced into a limited virtualization and delivering mechanism.

11. **Proven maturity** – Cloudpaging is a mature offering with over 20 years of iterative improvements. It is being actively deployed on hundreds of thousand desktops world-wide, some in high-availability and critical engineering environments. Protected by the earliest Cloudpaging patents and tens more, the product offers one of the simplest yet most powerful application delivery platform exist.

There are other values delivered by Cloudpaging on Windows platforms. These are some of the more common reasons why customers have deployed our technology

CONCLUSION

Numecent Cloudpaging technology is unlike other application delivery technologies. Cloudpaging is a foundational technology framework with over 40 patents and represents our vision to transform native software delivery, deployment and provisioning from the Cloud. It makes the most efficient use of all elements in the cloud computing ecosystem, utilizing proven technology in production today and supported for the future.