



Strategic Briefing Paper Virtual Client Computing

Virtual Client Computing helps improve service quality and security, increase flexibility, and reduce costs. Fujitsu provides Virtual Client Computing solutions based on best-in-class virtualization technologies, proven infrastructure products, and end-to-end services from a single source. Integrated systems help dramatically shorten project times and implementation risks.

Contents	
Challenges with PC workplaces	2
Rethink your workplace architecture	2
Application virtualization	3
User virtualization	3
OS image virtualization	3
Virtualization enables centralization	3
Hosted Shared Desktop	4
Hosted Virtual Desktop	4
Hosted Shared and Hosted Virtual Desktops in combination	5
Central Hosted Desktop	5
Local Virtual Desktop	5
Local Streamed Applications	6
Web Desktop	6
Workplace delivery options and user types	6
Fujitsu's approach – One stop shop for Virtual Client Computing	7
Typical procedure	8
Who should get involved in Virtual Client Computing?	8
Summary	8

Challenges with PC workplaces

During the past decades, PC workplaces have become indispensable for end users. They represent an important productivity tool supporting end users in doing their work.

Each end user may have an individualized environment to fit personal needs. Traditional PC workplaces are fully separated from each other, i.e. you won't suffer from the failure of any other PC nearby. Besides online usage, PC workplaces can be used offline, even if there is no network available. Whenever mobility is required, people will use notebooks or other mobile devices. PC workplaces are easy to use, thus keeping the amount of education and training of end users at a low level. The result of all this is an excellent user experience, which is the reason that PC workplaces are well established in businesses and proven.

However, for IT organizations, PC workplaces also raise a number of serious challenges. Lifecycle management has proved to become increasingly complex. The deployment of new PC workplaces and the application compatibility tests to identify application conflicts may end up in a cumbersome and time-consuming task. PC hardware is distributed across the enterprise, there is an ever-increasing number of remote users who are not always connected to a network, but still require software updates and patches to be applied on a regular basis.

The various user types have different requirements and therefore have to be treated differently.

When a PC fails, it will usually take a considerable amount of time until the problem is solved and the PC is available again for productive use. And of course, in the event of a disaster, the situation will be even worse, because many PCs might be affected.

As a backup by all end users on a regular basis is not ensured, there is always the risk of data loss. Further security risks result from the multitude of vulnerabilities which can potentially cause unauthorized manipulation or destruction of data, as well as data theft. All these risks conflict drastically with regulatory compliance.

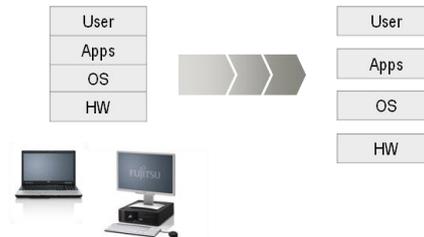
Another issue with PC workplaces is the under-utilization of its resources. But no matter whether a PC is highly utilized or not, it will always consume energy while being switched on. Moreover, PCs require space and they generate noise.

It should also be noted that you may access your workplace environment only, if you are where your PC is, or if you take your PC with you. Besides, there is no flexible access option.

For all reasons mentioned, the total cost of PC workplaces is high, and mostly not fully transparent.

Rethink your workplace architecture

The main cause for the high complexity of traditional PC workplaces is the tight coupling of hardware, operating system and applications which makes these components and their lifecycles dependent from each other. Any change in one of these components will impact its adjacent components, too.



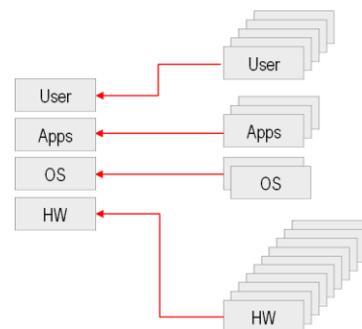
Breaking the tight coupling correspondingly will make the components and their lifecycles independent from each other. This is exactly what virtualization stands for.

Managing single instances of components instead of many unique monolithic desktops reduces complexity, simplifies management, increases flexibility and speed, improves service quality and finally reduces costs.

Thus, virtual client computing helps overcome the limitations of traditional workplace computing.

Depending on where virtualization happens, we speak of user virtualization, application virtualization, operating system image virtualization or device virtualization.

In combination they enable a dynamic and fast assembly of IT workplaces on demand, be it for new users or recovery after failure.



Application virtualization

Applications are the services end users need to do their daily tasks. Running a large number of applications and sometimes even various versions of applications ends up in management efforts which can hardly be accomplished.

To identify compatibility conflicts between applications, organizations perform extensive compatibility tests before a mass deployment.

These efforts can be avoided by application virtualization. Instead of installing an application, a virtualized package with a particular application is created and centrally stored. The application can then be streamed on demand to the target system, where it will run fully isolated and separated from the operating system underneath.

Therefore, incompatible applications, e.g. even different versions of the same application, can be run in parallel on the same system. Likewise applications can run on a system whose operating system actually does not support them. The result: Less error messages, and therefore less escalation for the service desk.

Moreover, only one instance of the applications needs to be maintained, and the end user will always get the latest software version.

For organizations currently engaged in the migration from Windows XP to Windows 7, application virtualization is of utmost urgency.

User virtualization

User virtualization is about decoupling all user-related aspects, such as desktop and application settings from applications, images and devices. User personality is centrally stored and managed and applied on demand to target systems whenever needed.

Users will get a consistent user experience independent from the device or the operating systems platform. Management is simplified, because you manage the user personality only once, no matter how many devices will be used by the individual user.

OS image virtualization

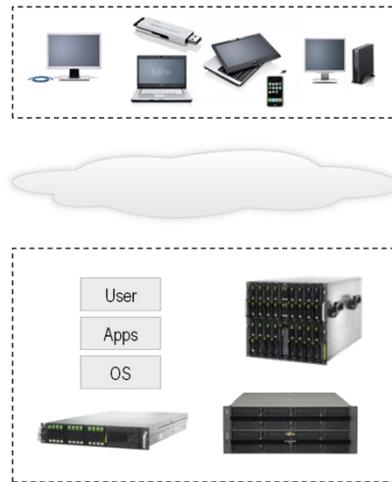
With image virtualization, a single operating systems image is stored centrally and delivered to the target systems of many users on demand.

Users will always get the latest update and security patch, thus avoiding the usual change for the worse known from the traditional PC. At the same time, you can easily roll back to previous versions of the operating system, if needed.

As you have to store and maintain only a single instance instead of dedicated images for each user, you will benefit from simplified management and reduced storage requirements.

Virtualization enables centralization

Virtualization enables IT to move applications, data, user personality or even entire workplace environments from the personal computer into the data center. Instead of a fully equipped PC, a thin client is sufficient for the access. Certainly, the network becomes much more important than ever before.



Centralization enables a flexible access to your workplace environment from any device. Workplace management and maintenance become more simplified, because nearly everything is in the data center. Software can easily be deployed and updated, and patches become effective without touching numerous end user devices and disrupting the end user. Onsite visits for end user support are a thing of the past. The level of application and workplace availability is significantly increased; even disaster recovery concepts known from the server world can be applied to end user workplaces. Furthermore, the flexible workplace infrastructure helps react rapidly on new or changing requirements.

The fact that all data is hosted centrally minimizes the risk of data theft. Data backup no longer depends on whether the device is turned on or whether it is connected, thus minimizing the risk of data loss and improving security. All this helps meet compliance demands.

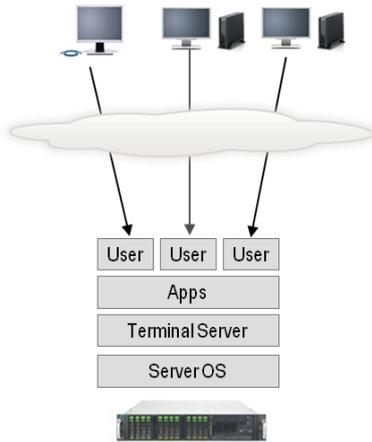
Although additional infrastructure is required in the data center, the overall energy consumption can be reduced, if thinner low-current device hardware is deployed. Besides this, thin clients have fewer moving parts, and they operate without failure for at least twice as long as normal PCs. In case a thin client device once breaks down, it can simply be replaced by a new one.

All these advantages lead to higher efficiency and correspondingly to cost reduction.

When it comes to centralization, there is not just one optimum concept for every situation. Depending on the business processes in organizations, there are various types of end users. As their requirements can be very different, there are different workplace delivery options which we are going to have a closer look at.

Hosted Shared Desktop

For the task workers who use only the same limited set of applications every day, the Hosted Shared Desktop (formerly known as traditional server-based computing or terminal server) is absolutely sufficient. Applications run on a central terminal server farm and can be shared among several users.



Due to sharing resources, Total Cost of Ownership is very low compared with traditional workplaces.

But there are also some restrictions. Applications have to be made multi-user capable what can be a very complex task. The separation from other users is limited too. If, for instance, any user initiated a restart, other users would be affected. Besides this, the level of individuality is limited; users have to accept the scope of available applications; there is no way of getting additional applications for individual purposes.

These restrictions don't make the Hosted Shared Desktop applicable for real knowledge workers who need highest flexibility and individuality.

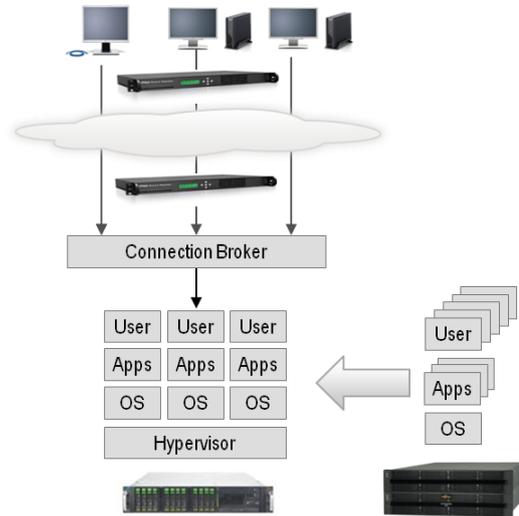
Hosted Virtual Desktop

For knowledge workers the Hosted Virtual Desktop (also known as VDI or Virtual Desktop Infrastructure) is the appropriate choice. Individual desktops with potentially different types and versions of operating systems run as virtual machines on servers in the data center. They are isolated and therefore fully protected from each other. They can be personalized to fit personal needs. And in contrast to "Hosted Shared Desktop", applications need not be adapted.

Basically, the "Hosted Virtual Desktop" provides the advantages of the "Hosted Shared Desktop" without its restrictions.

Virtual desktops can be persistently assigned to end users. However, considering that not all users require their virtual desktops at the same time, it can make sense to create a pool of virtual desktops sized for the maximum number of simultaneously active users. This saves data center resources and further reduces cost.

End users are authenticated and dynamically connected to their virtual desktops by a connection broker. If at logon time the personal environment is not available in a virtual machine yet, an available virtual machine will be selected from a pool and personalized.



Combining the Hosted Virtual Desktop with virtualization on the other layers will enable you to dynamically assemble and deliver virtual desktops on demand. When an end user logs on, the connection broker will connect the user to his persistent desktop or an available virtual desktop from the pool.

With pooled desktops, the connection broker will make sure that the appropriate image and the user's personality are in the virtual desktop. Applications will be streamed into the virtual desktop on demand. And after the logoff, the virtual desktop will be returned to the pool again.

However, it is not just increased flexibility that you can gain from image and application virtualization. Single instances of operating system and applications contribute a lot to reduce storage capacities.

User virtualization assures that only relevant personalization data from the user profile is copied over the network at logon. This reduces logon times dramatically, especially if user profiles are very large in size.

In order to minimize the required network bandwidth, network accelerators can be deployed which reduce and compress data to be transmitted over the network and provide protocol optimization. Thus, you can avoid that the network will become a critical bottleneck, while improving end user experience.

Hosted Shared and Hosted Virtual Desktops in combination

If an existing terminal server infrastructure is supplemented by VDI, applications running on the terminal server farm are frequently needed by VDI users, too. In this case, you will have two options how to make these applications available for the VDI users.

Applications can run inside the virtual machines of these users, or the same applications running on the terminal server farm can be used.

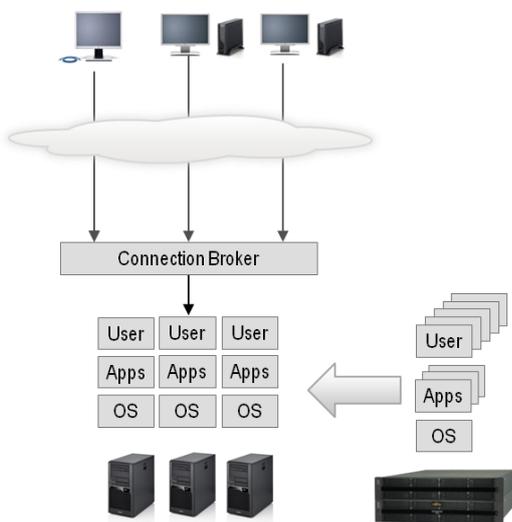
The latter option means lower resource requirements on the VDI side, leaner virtual desktops, more virtual desktops per server, and therefore lower infrastructure costs.

However, this does not mean, that it is always the optimum approach - especially when considering offline usage without network connection to terminal servers in the data center.

Central Hosted Desktop

It is true, that for power users with extremely high graphics performance demands usually dedicated physical workstations are needed. Nevertheless, more and more organizations want to use the advantages of centralization, for instance increased security, less heat and noise, as well as more space at the user's desk, and a flexible access to the workstation from anywhere.

In such cases, workstations can be moved into the data center and remotely accessed. This concept is known as "Hosted Central Desktop".



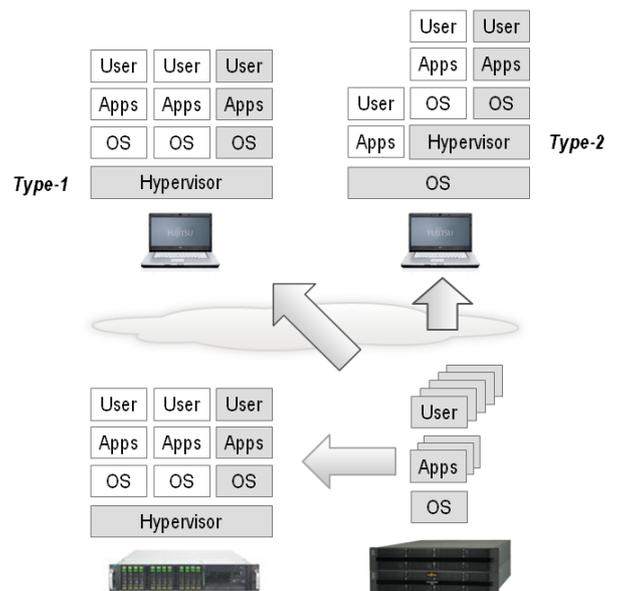
Moving workstations from the user desks into the data center opens up further opportunities. If not all users require their workstation all the time, for resource optimization purposes, a pool of workstations can be established in the data center, whose size is lower than the total number of users. The connection broker will allocate an available physical workstation at logon, and release it again at logoff.

The benefits are obvious. Less workstations means less acquisition costs, less maintenance costs, less energy and less operating costs. Physical workstation pooling requires the separation of the user personality from the physical workstation. This means that user profiles and user data should be on a central storage system.

Local Virtual Desktop

All solution approaches discussed by now require a connection from the access device to the data center. However, there are more and more mobile workers, who are frequently on the move, and need access to applications and data, even when no network is available.

The "Local Virtual Desktop" allows mobile users to run multiple virtual desktops on their portable device. As a prerequisite, a hypervisor is required on the device, either running on the host operating system of the portable device (type-2 hypervisor) or on bare metal (type-1 hypervisor). The virtual desktop is once delivered from a central image to the mobile device. All work done offline will only have an impact on your local copy. As soon as you get connected to the corporate network, your updates will automatically be synchronized with your virtual desktop environment in the data center, as system updates and patches will affect your local virtual desktop. The synchronization eliminates the need for backup from mobile devices, and the automatic update ensures that users always work with the latest software versions and security patches.



Virtual desktops are encrypted and fully isolated from each other and the host environment. Additional security is provided by allowing policies to be put in place. For example, if a device hasn't re-connected to the corporate network for a certain period of time, the image will lock itself down. If the device gets lost or stolen, the virtual desktop can be remotely wiped.

Using local virtual desktops, IT organizations control mobile workplaces more efficient, even without knowing how the end user's device looks like. And what is even more important: They are able to manage IT workplaces of mobile users with offline usage in exactly the same way as they manage Hosted Virtual Desktops.

And what is in it for the mobile user? Everybody is aware of the terrible impact when a notebook crashes or is stolen while you are on the move. With hosted virtual and local virtual desktops in combination, you may flexibly access your virtual desktop environment in the data center immediately, anywhere from any access device. And there is always the option to procure a new notebook and download your virtual desktop.

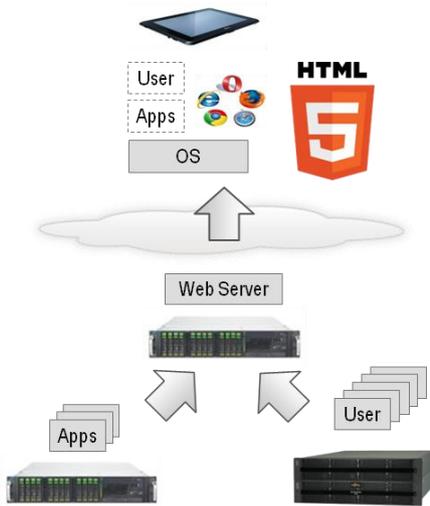
Local Streamed Applications

An alternative for offline usage is Local Streamed Applications. Business applications are once downloaded to the mobile device where they will run in a sandbox. Data used or generated by the applications can be totally isolated and separated from what else is on the device. For the rest, all security mechanisms known from the Local Virtual Desktop, such as data encryption, enforcement of policies and remote wipe are also available.

Web Desktop

In the last couple of years the Web has become the main workspace for many users. More and more of the applications needed to do their work are web-based, or at least accessible through the web.

The Web Desktop becomes the aggregator for these applications. For accessing web-based applications, an HTML5 compatible browser is sufficient, which will be available on any device, no matter which operating system is deployed.



The degree of applicability of a web desktop is certainly the highest for task workers; however, knowledge workers and at a certain extent even power users can take advantage from a web desktop. This is true for stationary users and mobile users being online. Due to the local caching feature, minor disruptions of the connection can be bypassed. Just in case of offline usage for any length of time, this might not be an appropriate approach, yet.

Workplace delivery options and user types

After having discussed the various workplace delivery options for the various types of end users, we are bringing now everything together in one picture.

For task workers using only a few standard applications, the Hosted Shared Desktop that involves a very low total cost of ownership is sufficient. For knowledge workers with high demands regarding personalized environments, the Hosted Virtual Desktop is recommended. Power users with high graphics performance requirements should have their own workstations. If centralization is demanded, the Hosted Central Desktop will be the solution. With all these concepts, any device can be used for the access to applications and data, even thin client devices.

Mobile workers who are frequently on the move should also be able to use their workplace environment offline. Therefore a mobile device with Local Virtual Desktops or Local Streamed Applications could be the solution.

Choosing the right model for external users mainly depends on the specific tasks that need to be done.

Application virtualization and user virtualization, as well as image virtualization, are always beneficial, no matter which of the other models is applied.

And for those users, who mainly need access to web-based applications, the web desktop will be an efficient solution, if network coverage can generally be assumed.

An important finding is the fact that one size does not fit all. Since user diversity is quite high, enterprises need an intelligent combination of diverse models. And sometimes the selection might be influenced by economic aspects, too.

External User				
Task Worker	Knowledge Worker	Power User	Mobile (offline) User	
User virtualization				
Application virtualization				
OS virtualization				
Web Desktop				
Hosted Shared Desktop	Hosted Virtual Desktop	Hosted Central Desktop	Local Virtual Desktop	Local Streamed Apps
Any device: Rich / Thin / Ultra-thin / Zero Clients			Notebook / Tablet	

Fujitsu's approach – One stop shop for Virtual Client Computing

What is Fujitsu's role in virtual client computing? Businesses face an ever-increasing number of technologies from multiple vendors, which are certainly not all relevant for their use case. However, understanding which technologies bring the most beneficial results is an increasingly complex and time-consuming task. Selecting the appropriate technologies according to business requirements, evaluating, testing and combining all these technologies, as well as finding the right mix is a challenge, which should not be underestimated. When once the optimal recipe has been decided upon, the integration of numerous building blocks, such as servers, storage systems and access devices, virtualization middleware, desktop operating systems, management software for virtualization, sometimes even traditional workplace management tools, and applications means that the work has just begun. Uncertain project duration and a multitude of risks can be the consequence.

Fujitsu's virtual client computing approach is concerned with taking out the complexity, reducing the customer's work effort, and reducing the overall risk in putting all the pieces together, with the goal of making IT simple for customers, and helping them overcome the many hurdles in realizing a successful infrastructure solution.

Close partnerships with the major players and market leaders enable us to use best in class virtualization software to optimize the overall solution. Fujitsu can provide the respective licenses, the subscription advantage and the support.

Fujitsu's infrastructure products, such as FUJITSU Server PRIMERGY, FUJITSU Storage ETERNUS and storage systems from our storage partner NetApp, network components, Fujitsu's FUTRO thin clients and Smart Zero Clients, represent an excellent basis for this purpose. These products are certified for all market-leading virtualization products, and have proven success in innumerable virtualization projects.

Through all our activities in real-life projects, we have gained experience as to what is required to successfully introduce virtual client computing.

This broad knowledge of optimizing solutions for specific customer requirements is reflected in our end-to-end services, including consulting, infrastructure design, implementation and migration, and maintenance of the overall infrastructure solution.

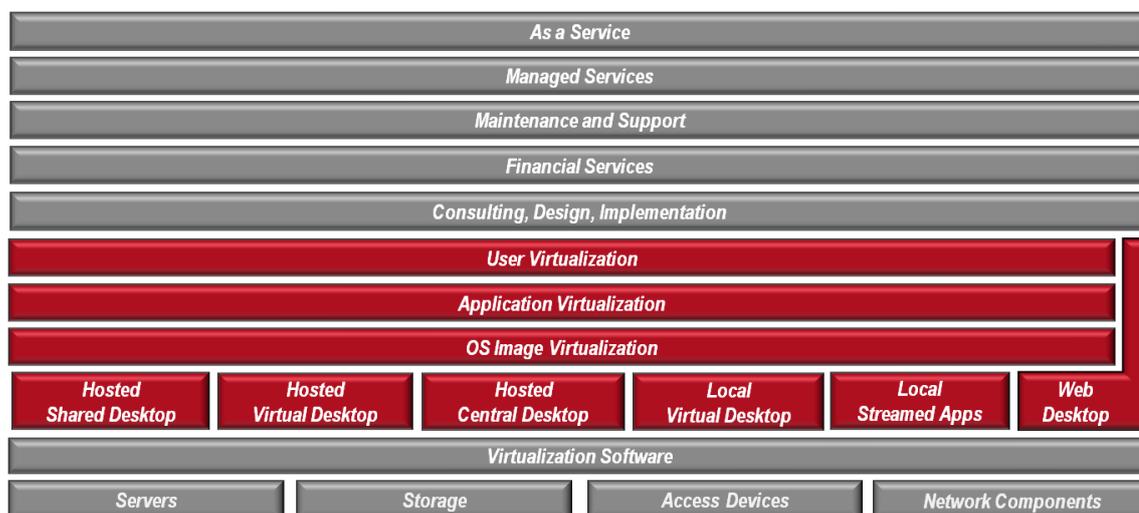
For Hosted Virtual Desktops, the infrastructure design is particularly complex. For this reason, various **Integrated Systems** are available under the PRIMEFLEX brand which enable virtual client computing out of the box. Optimized hardware configurations, resulting from Fujitsu's vast project experience, are pre-installed with the required software, and therefore ready to run. Except to this, reference architectures enable a flexible adjustment to customer-specific situations and requirements. The PRIMEFLEX line-up includes classic integrated systems with separate storage, as well as hyper-converged systems.

Attractive financing options enable the introduction of virtual client computing without any pre-investment.

If IT organizations want to concentrate rather on their core business and strategic projects than daily routine tasks, Fujitsu will operate the customer's workplace infrastructure, based on standardized and optimized processes. Customers take advantage from scale effects, the simple opportunity to alleviate shortages in resources and skills, flexible customer-specific and business-related service levels, and cost reductions. The "price-per-seat" charging model eliminates investment risks and ensures highest cost transparency. At the same time, customers keep their IT infrastructure fully under control. This is what Fujitsu's Virtual Client Services are about.

Alternatively, applications and standardized IT workplaces can be delivered as a service from the cloud, with a standardized service level agreement, as easily as electricity from the socket or water from the tap. A "pay-as-you-use" model is the basis for billing, turning CAPEX to OPEX, and minimizing costs in total.

In other words: Fujitsu is a one-stop shop that provides everything related to virtual client computing from a single source. This helps reduce complexity, project time and risk.



Typical procedure

How does the typical procedure look like? Usually, the first step is a workplace assessment, in which potential cost savings and performance improvements are identified. In a strategy workshop, business needs and goals are analyzed, and based on this the future workplace strategy is jointly defined.

In order to make sure that the expected user experience is achieved, we strongly recommend a proof-of-concept before starting the real project. Of course, the proof-of-concept should be accurately prepared. In a proof-of-concept design workshop, design criteria are jointly formulated based on the technology goals derived from the current situation and the business goals. Moreover, the infrastructure, the test scenarios, and the plan for the proof-of-concept are defined. All this happens again in structured and standardized processes, based on the extensive experience from real customer projects.

During the proof-of-concept, the test infrastructure is delivered. Often pre-defined integrated systems of smaller sizes which are ready-to-run meet the requirements which helps shorten project time either. Then the test plan is executed and the results are documented, analyzed and presented.

Finally, the next steps will be agreed. As a rule, this is the infrastructure design in detail, the implementation and the migration.

Who should get involved in Virtual Client Computing?

Basically, Virtual Client Computing is good for everyone, independent from company size and industry. It is for any organization that intends to improve service quality, increase availability and security, and wants to better fulfill corporate and/or legal compliance requirements. Similarly organizations aiming to increase flexibility, or reduce operating efforts and costs are ideal candidates.

Compelling events can be a planned PC hardware refresh, or the rollout of new desktop software, either a migration to a new operating system version (e.g. from Windows XP to Windows 7) or the introduction of a new application. When introducing BYOD (Bring-Your-Own-Device), from an infrastructure perspective, Virtual Client Computing is an unconditional prerequisite.

Furthermore, typical candidates are organizations with remote and branch offices, off-shore developers and guest workers.

After mergers and acquisitions, new users have to be integrated with existing workplace environments. Virtual client computing tremendously accelerates this process and enables starting the integrated operation at an accurate point of time.

Summary

Virtual client computing improves service quality, increases flexibility and reduces costs. However, it is important to state, that one size does not fit all. Requirements and economy matter with regard to what is the optimum solution for a customer.

Fujitsu enables a one-stop shopping for complete infrastructure solutions including all necessary concepts, best-in-class virtualization technologies, certified and proven infrastructure products, ready-to-run integrated systems and reference architectures, as well as end-to-end services.

Attractive financial solutions enable customers to introduce virtual client computing without any pre-investment.

Alternative sourcing options, such as managed services and cloud services give the customer all the flexibility and choice they need.

Based on a proven methodology and processes and its extensive experience from numerous projects, Fujitsu will pave the way to virtual client computing - simple and fast, while minimizing risk.

This is the role of Fujitsu –
Your partner of choice for Virtual Client Computing.

Contact

FUJITSU Technology Solutions GmbH
Mies-van-der-Rohe-Strasse 8, 80807 Munich, Germany
www.fujitsu.com/primeflex
2015-06-27 WW EN

© Copyright 2015 Fujitsu, the Fujitsu logo are trademarks or registered trademarks of Fujitsu Limited in Japan and other countries. Other company, product and service names may be trademarks or registered trademarks of their respective owners. Technical data subject to modification and delivery subject to availability. Any liability that the data and illustrations are complete, actual or correct is excluded. Designations may be trademarks and/or copyrights of the respective manufacturer, the use of which by third parties for their own purposes may infringe the rights of such owner.