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Introduction to Virtual Desktop Load Profiling

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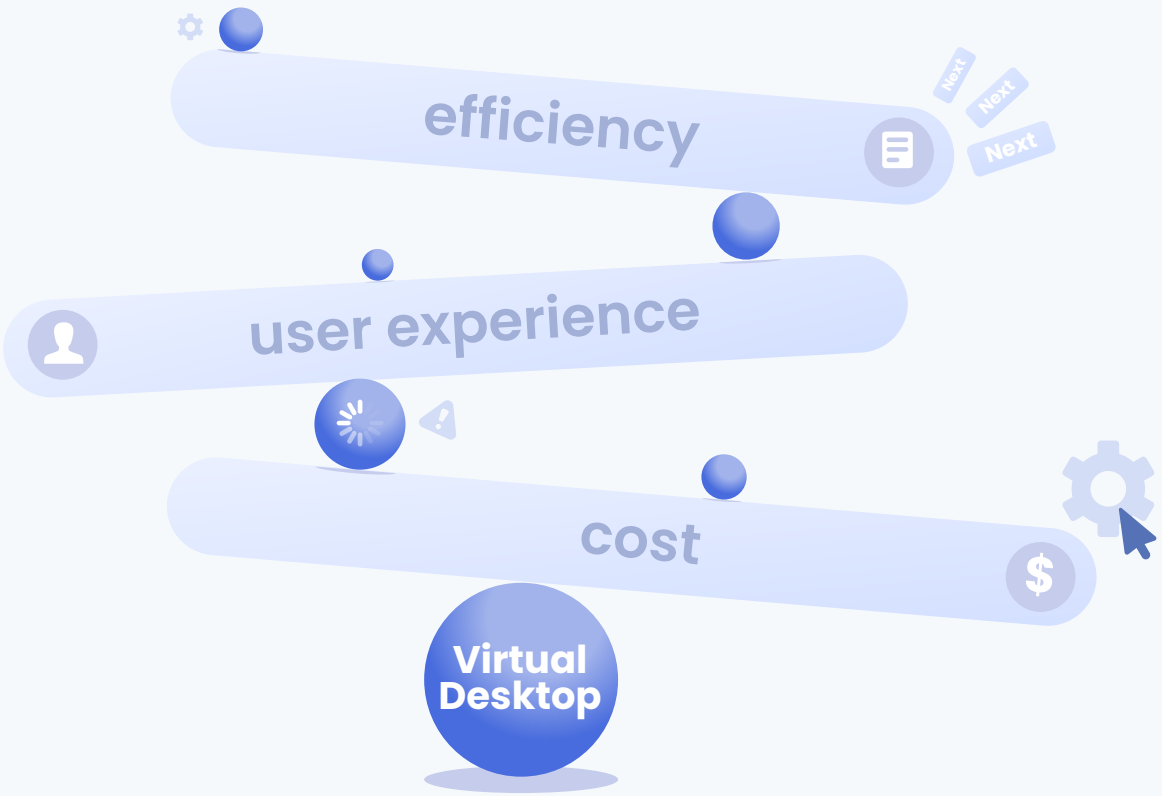
Executive Summary

Virtual desktops are a significant building block in modern IT infrastructure for achieving enhanced operational efficiency, security, and scalability. However, the successful deployment of these environments, particularly in Azure Virtual Desktop (AVD) systems, hinges on a critical but often overlooked factor: effective load profiling.

Load profiling identifies and understands the various demands placed on your virtual desktop infrastructure by different applications and user behaviours. Understanding the load profiles ensures that the deployed resources align precisely with your users' needs, avoiding underutilization and overburdening your IT infrastructure and shaping the user experience.

In an AVD environment, where resources are dynamically allocated and shared across the network, any misjudgment in load estimation can lead to lag, application unresponsiveness, or even system downtime. Such scenarios are disruptive and can diminish the confidence of your user base in the virtual desktop solution.

Lastly, the concept of load variability merits attention. Load demands are not static; they fluctuate based on various factors such as time of day, specific business processes, or even the time of year. Understanding these patterns of variability is crucial in designing a flexible and resilient virtual desktop environment that can adapt to changing demands without compromising on performance or user satisfaction.



Understanding Applications: The Starting Point of Load Profiling

In Virtual Desktop deployments, applications play a pivotal role as the primary drivers of load patterns. Understanding the nature and demands of different applications is the first step in effective load profiling.

Applications can be broadly categorized based on resource consumption patterns - some are CPU-intensive, others demand more memory or disk resources, and some voraciously consume all available resources.

Figure 1:
Applications are hungry for resources, but not always the same resources.

CPU-Intensive Applications

These are applications that primarily demand processing power. Consider software like Monte Carlo simulations modelling software - These applications require significant CPU cycles for real-time data processing or running complex calculations.

Memory-Intensive Applications

Applications like large databases or data analysis tools (e.g., SAP, financial simulation software, Large XLS) are typically memory-hungry. They rely on substantial RAM capacity for efficient data retrieval and manipulation. In virtual desktop scenarios, insufficient memory allocation for these applications can result in sluggish response times and cause system crashes.

Disk Resource-Intensive Applications

Certain applications, particularly those involved in continuous data read/write operations like file-sharing services or backup software, can be intensive on disk resources. Inadequate disk I/O capabilities can lead to bottlenecks, impacting not just the specific application but the overall performance of the virtual desktop.

Graphics Processing intensive applications

Graphics-intensive applications such as Adobe Photoshop, AutoCAD, and 3D rendering software present unique challenges in Virtual Desktop Infrastructure. Often require specialized handling due to their heavy reliance on Graphics Processing Units (GPUs) .

Network

Apps that require a fair amount of bandwith for screen sharing, live calls, access to online databases.

Applications Demanding Multiple Resources

Some applications, like high-end graphics design software or Video editing software like Adobe Premier Pro, require a harmonious blend of CPU, GPU, memory, and disk resources. These applications can stretch the capabilities of your virtual desktop infrastructure if not appropriately accounted for in the load profiling process. And often should be isolated on their own virtual desktop hosts.

In addition to categorizing applications based on their resource demands, it is crucial to consider the usage patterns. For instance, a word processor like Microsoft Word, generally considered light on resources, can become quite demanding when dealing with large documents, embedded graphics, or complex macros. Similarly, while not inherently resource-heavy, Microsoft TEAMS, can significantly escalate their demands during video conferences or extensive real-time collaboration. And bad experience in calls, lead to immediate user complains.

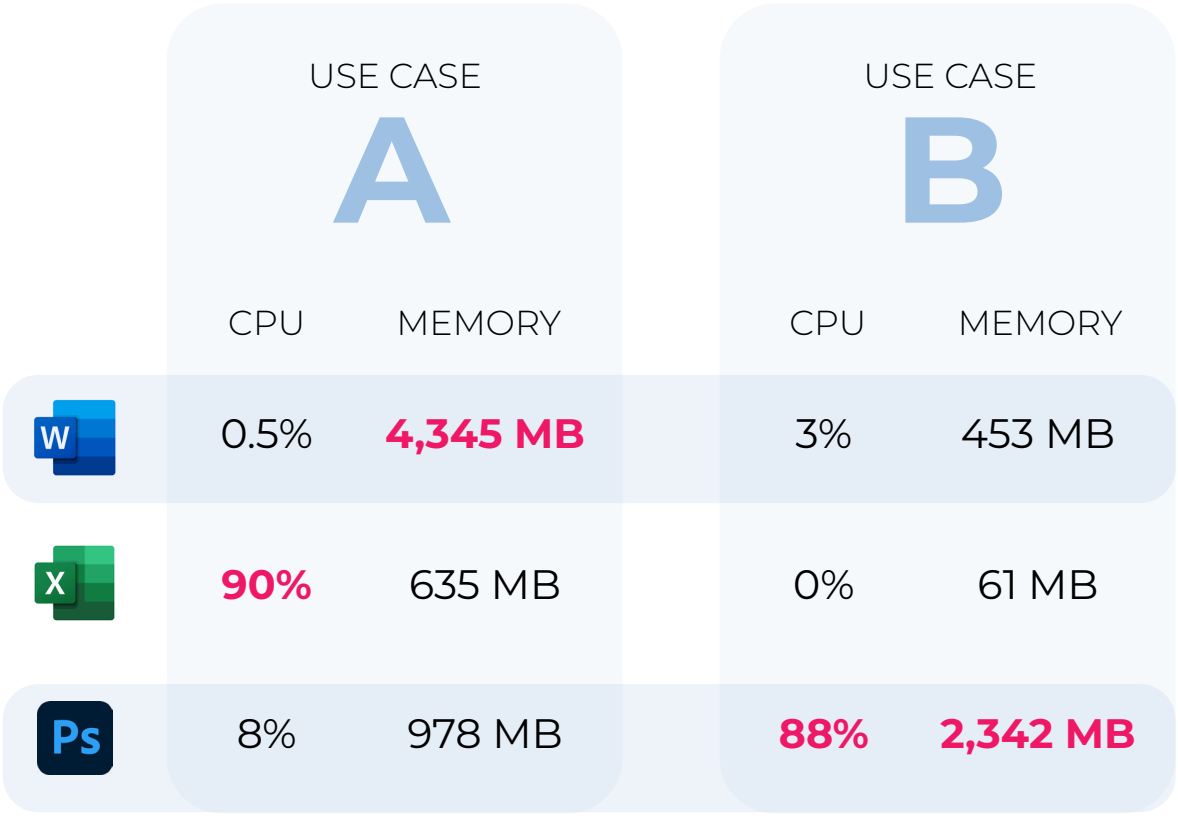


Figure 2:
Different load patterns from the System Manager illustrate the very different loads over time,in different use cases.

As we move forward in virtual desktops, the application landscape continues to evolve, with cloud-native applications and SaaS offerings changing how resource consumption impacts. These modern applications often have different performance characteristics than traditional desktop software, necessitating a nuanced approach to load profiling.

User Profiles: From Light to Power Users

Building on our understanding that different applications generate varying loads in virtual desktop environments, it's crucial to recognize that the same application can have dramatically different impacts depending on the user. This variation is evident in applications like Microsoft Excel, which can be used for simple tasks or complex operations involving macros and SQL server data sources, going from a few % CPUs and memory load to nearly maxing out the system (see Fig 2 above)

Varied Application Usage Among Users

How users interact with applications often reflects their organizational roles and responsibilities. For instance, a user who employs Excel for basic data entry will have a significantly lighter load profile than a financial analyst who uses complex Excel sheets with advanced macros and external data connections. Despite both users operating the same application, their impact on the virtual desktop infrastructure vastly differs.

Jane, HR
Uses Excel for basica data entry.

🟢 *light load*

Bob, financial analyst
Uses complex Excel sheets with advanced macros and external data connections.

🔴 *high load*

Correlation Between Job Titles and Load Profiles

Generally, there is a strong correlation between a user's job title and their load profile. Administrative staff, for example, might use a standard set of office applications and hence have a predictable and consistent load pattern. In contrast, roles like graphic designers, engineers, or data analysts are likely to use more resource-intensive applications and thus have a heavier load profile. Understanding this correlation is essential for effective load profiling.

Administrative staff
Use a standard set of Office apps

🟢 *light load*

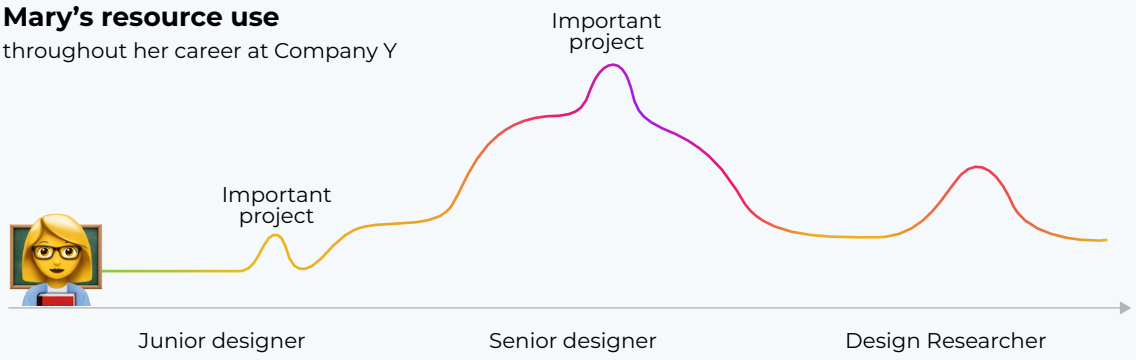
Graphic designers
Use resource intensive apps

🔴 *high load*

Correlation Between Job Titles and Load Profiles – In a virtual desktop environment, users can be categorized into various profiles based on their application usage intensity; below the Microsoft recommended categorizations:

- **Light Users –** Typically utilize basic applications like word processors, email clients, and simple spreadsheets. Their resource demands are minimal and predictable.
- **Moderate Users –** Engage with more complex functionalities of standard applications and may occasionally use more resource-intensive software.
- **Heavy Users –** Engage regularly with Graphics, or Video editing, doing engineering design and simulation, or heavy programming with automated testing.
- **Power Users –** Regularly use high-demand applications for data analysis, design, or development tasks. Their activities result in significant, variable load patterns.

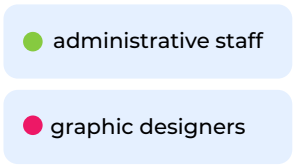
Dynamic Adjustments for Peak Performance – Besides static profiling, it's important to consider dynamic adjustments. A user's load profile can change due to project demands or role evolution. An adaptable virtual desktop infrastructure responding to these changing needs is essential for optimal performance and user satisfaction.



In conclusion, recognizing the diverse ways users interact with applications is crucial for accurate load profiling in virtual desktop environments. Organizations can ensure efficient use of their virtual desktop infrastructure by aligning resource allocation with user profiles, leading to enhanced performance, reduced costs, and improved user experiences.

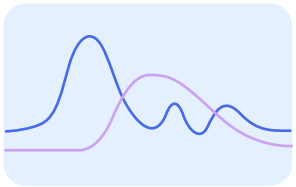
Correlation Between Job Roles and Load Profiles

The complexity of load patterns in virtual desktop environments, shaped by diverse applications and user interactions, may appear overwhelming. Yet, understanding the link between job roles and their load profiles simplifies predicting and planning initial resource needs.

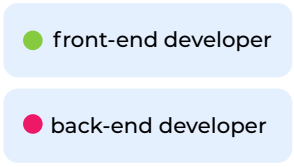


Job Titles as Indicators of Load Profiles – Experience shows that individuals with the same job title typically generate similar load patterns. For instance, graphic designers will likely use resource-intensive design software, whereas administrative staff might primarily use office productivity tools. IT managers can develop a reliable baseline for expected resource usage by categorizing users based on their job roles.

Developing User Profiles Based on Job Roles – The first step in leveraging this correlation is categorizing users into distinct profiles based on their job titles. These profiles should consider the typical applications and workflows associated with each role. For example, an 'Accountant' profile might include heavy use of Excel with complex spreadsheets, whereas a 'Sales Representative' profile might focus more on CRM software and presentation tools.



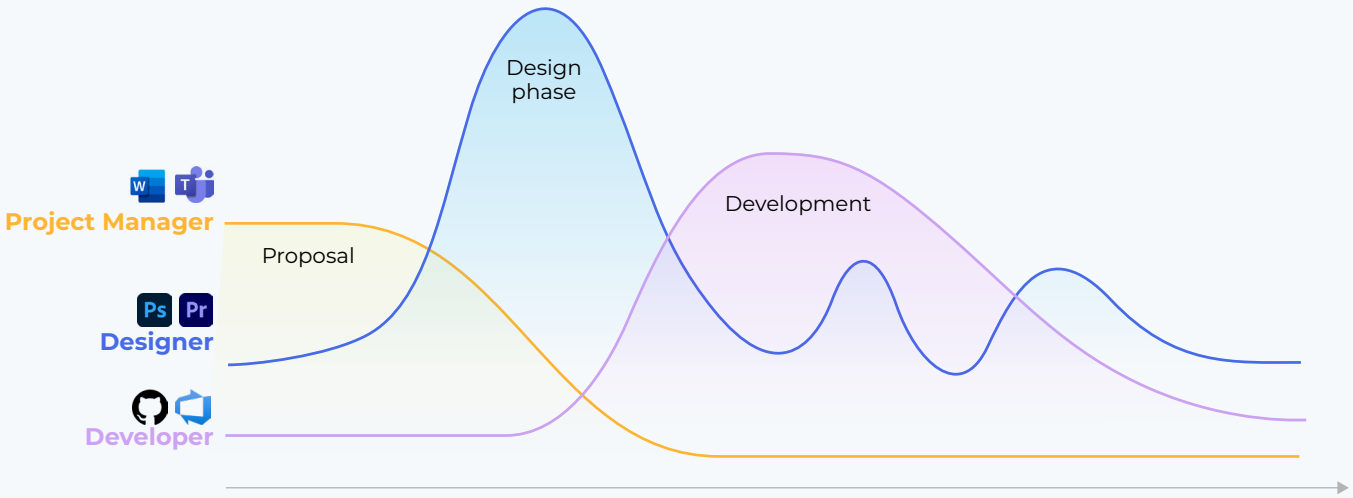
Utilizing Analytics for Refined Profiling – To further refine these profiles, IT departments can use analytics tools to gather data on application usage within each job role. This data can reveal nuances, such as the frequency and intensity of application use, providing a more accurate picture of load requirements. It's important to note that while job titles are a good starting point, actual usage data is critical to fine-tuning your load profiling.



Accounting for Variability Within Roles – While job titles can indicate load patterns, variability still exists within roles. For instance, a 'Developer' role might include a frontend developer, who primarily works with code editors and light development tools, and a backend developer, who might require more intensive database and server applications. Recognizing and planning for such variability within job roles is crucial.

In conclusion, organizations can simplify the otherwise complex resource allocation task in virtual desktop environments by understanding and leveraging the correlation between job roles and load profiles. This approach facilitates more accurate and efficient resource planning and enhances the overall user experience by ensuring each user has the necessary resources to perform their job effectively.

Figure 3:
Resource use variation by role in a time period



Load Fluctuations Over Time

Load patterns within a Virtual Desktop Infrastructure (VDI) are inherently dynamic and vary significantly over different periods, influenced by each organization's unique operational rhythms and workforce habits. Understanding and optimizing these fluctuations is crucial for maintaining an efficient and cost-effective VDI system.

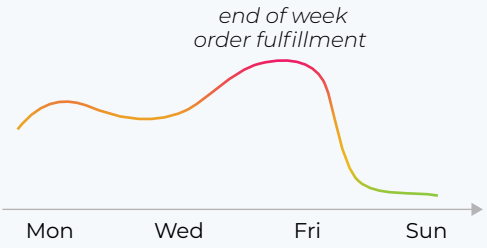
Figure 4: Load varies over time, within days, weeks, and even a year.

Daily Load Variations

VDI load patterns exhibit noticeable fluctuations in a typical workday. The load escalates as employees commence work, usually peaking in the morning. A midday dip often occurs as employees take lunch breaks, followed by a resurgence in the afternoon. As the workday draws to a close, the load gradually decreases. This daily ebb and flow is essential for resource planning, ensuring that the VDI environment scales dynamically to match the changing demand.

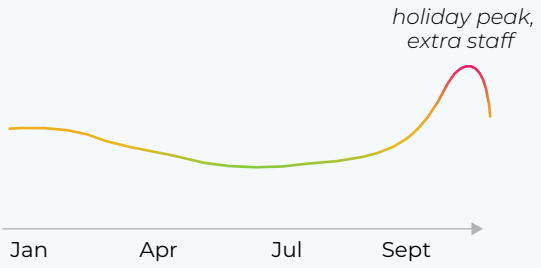
Weekly Trends

Weekly patterns often reveal insights into workflow processes. It's common for organizations to experience a relatively stable load from Monday to Thursday, with a noticeable uptick on Fridays. This rise might be due to weekly reporting, order completion, or project deadlines. By identifying these weekly patterns, resources can be allocated strategically so that the VDI environment can cope with the end-of-week peak without affecting performance.



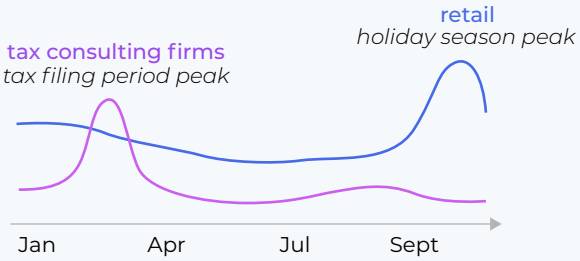
Quarterly and Annual Fluctuations

VDI loads can fluctuate based on quarterly and annual cycles beyond daily and weekly patterns. For example, a company might experience increased VDI activity in December due to year-end processes or during quarterly reporting periods. These periods may require an additional virtual desktop capacity to accommodate the increased workload. Planning for these seasonal variations is essential to prevent system overload and ensure continuous smooth operation.



Adapting to Organizational Rhythms

Each organization's VDI load pattern is unique and reflects its operational tempo. For instance, retail companies may see a spike in VDI load during holiday seasons, while tax consulting firms might experience their peak during tax filing periods. Understanding these unique patterns is critical to customizing the VDI deployment to align with the organization's needs.



In conclusion, recognizing and planning for the dynamic nature of load patterns in a VDI environment is essential for ensuring a robust, responsive, and cost-effective virtual desktop infrastructure. By understanding these patterns and implementing scalable solutions, organizations can enhance their operational efficiency and adapt to the ever-changing demands of their workforce.

Pragmatic Guidelines to Load Data Capture and Analysis

We have different app profiles, users using different apps, and even using apps in different ways – and then we add that the load is not constant over the day, the week, month or year. It is daunting to figure out what load is coming from the users when they go to a Virtual desktop.

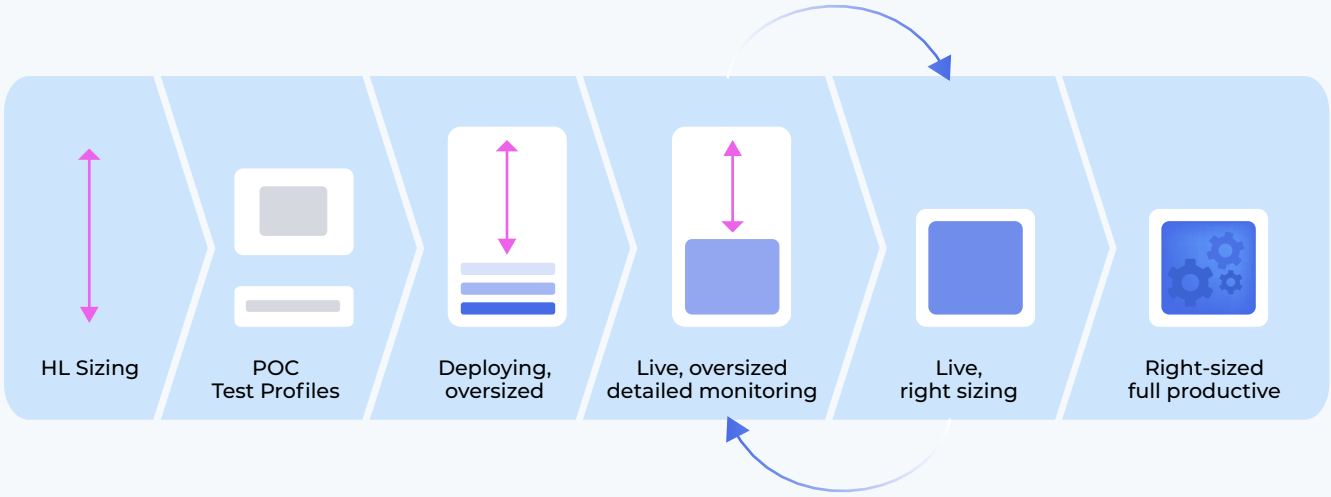
A pragmatic approach is required – and we will try to give some guidelines on estimating and working with load and sizing.

Figure 5:
The 4-step approach to get an initial idea about load in a Virtual desktop Environment

1. Get **a list of job titles in the company** and a list of the applications typically used.
2. Group the job title into **Light, Medium, Meavy and Power** users from your knowledge about the role and their work and the Microsoft recommend table below. *(Simulation, Modelling, Video Editing, and Graphical editing should sound the alarm bells and indicate Power user).*
3. Spot-check **specific user roles but measure a typical load**, *i.e. capture CPU, memory, and disk usage for several users.*
4. **Use the Nudge workload** to recommend users for a given machine size vCPU/RAM – to get a count of Memory and CPU needed. Use our spreadsheet to calculate the number of machine equivalents initially needed (16 vCPU/32GB RAM).

You can accurately estimate the necessary resources and associated costs using the initial sizing. Instead of deploying all resources at once, adopt an adaptive approach. NUDGE IT has perfected a process that guides a company from initial sizing on paper through a Proof of Concept (POC), to a fully optimized production environment. By leveraging our Monitoring and Automation tools, we efficiently achieve the rightsized configuration that balances cost with user experience.

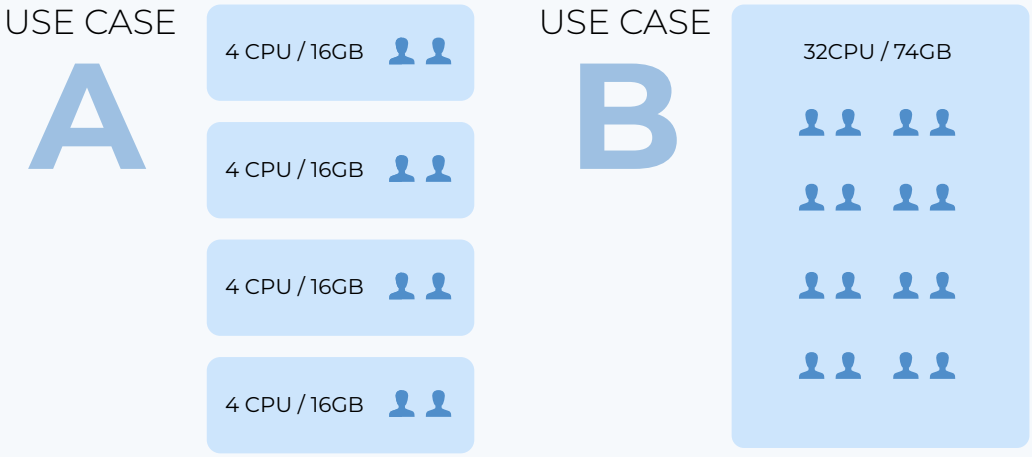
Figure 6:
The Adaptive NUDGE IT Approach to rightsizing a new Virtual Desktop Environment



Selecting the suitable Host Machine sizes

For the details of which machine to use, this is tricky as there are many options, if you need 16 medium load users (2vCPU/4 GB per user) is it better to use 8 * 4CPU/16GB machines (only two users for each VD host) or to use a single 32vCPU/64 GB Machinefor all users – the short answer is it depends, but generally for optimal performance and cost-efficiency in multi-session virtual desktop environments, it's recommended to use a more significant number of smaller VMs, carefully considering the core-to-user ratio.

Figure 7:
The distribution of users across different virtual machine sizes



This approach enhances user experience and offers greater resource management flexibility, making the deployment more resilient and easier to maintain. If you want to understand more, contact one of our virtual desktop specialists and have a chat. Reach out and talk to a NUDGE IT AVD Expert.

Another complexity here is that you could choose to run only Legacy applications from AVD, which means you can have a lot more users on each machine; we have seen cases with +40 virtual clients on a single 8 vCPU Host.

So mapping hosts and user load and balancing cost and user experience is tricky. Get to talk to the team that has done this repeatedly. Arrange for a call by filling in.

Get to speak to a specialist

References

Microsoft, Session host virtual machine sizing guidelines
Available at: https://learn.microsoft.com/en-us/windows-server/remote/remote-desktop-services/virtual-machine-recs