

▷ **EXPAND THE CAPACITY AND CAPABILITIES OF YOUR ON-PREMISES HIGH-PERFORMANCE CLUSTERS WITH VIRTUAL SERVERS AND THE PUBLIC CLOUD**

HYBRID CLOUD WITH BRIGHT CLUSTER MANAGER





Hybrid Cloud

▷ EXECUTIVE SUMMARY

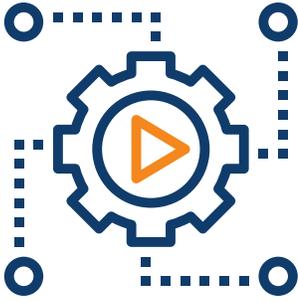
High-performance computing (HPC) systems that once hosted a consistent set of modeling and simulation applications are now being pressed to take on a new breed of applications in the areas of machine learning (ML) and data analytics, making it necessary for organizations to expand the capacity and capabilities of their HPC systems.

Historically, HPC systems have been anchored to physical on-premises servers that typically offer greater performance, lower cost for sustained use over time, and greater control over resources and data, but those trends are changing. Public cloud offerings and virtualized systems in general provide viable new options to host a range of applications that require HPC-like performance, while at the same time offering increased flexibility and the benefit of utility-based pricing.

Most organizations see the advantages of using both on-premises systems and the public cloud, and as a result, find themselves grappling with the challenges of implementing a hybrid cloud infrastructure for their business.

When embarking on a hybrid cloud journey, experience tells us we should strive for several things:

- The hybrid system should present itself as a single (seamless) environment and interface to users and administrators, rather than two disparate systems.
- The system should be able to detect when public cloud resources are no longer needed and automatically turn them off to avoid on-going usage fees.
- The system should be able to automatically stage data on cloud servers where computation will be performed, and intelligently manage data traffic to reduce networking and cloud storage costs.
- The system should be able to automatically scale out an on-premises system with additional public cloud servers, based on demand and policies set.
- The skills and knowledge required to use the tools necessary for the hybrid system should reflect the staff's capabilities, while also factoring in the learning curve new hires will face as staff turns over.
- The system should be able to leverage multiple/different public cloud environments and servers from different hardware vendors simultaneously to avoid vendor lock-in and ensure forward-looking flexibility.



Bright automates the process of building and managing high-performance Linux clusters that automatically extend to the public cloud or VMware vSphere for additional computing capacity—eliminating complexity and enabling flexibility.

- ▶ Establishing a hybrid cloud system with these capabilities (and more) is a considerable task. One option is to build the necessary integrations and management system yourself. Organizations following this approach should ascertain if the requisite investment in time and resources will add strategic value to their business, and decide if they want to be dependent on retaining the staff who build it in perpetuity.

Another option is to use the tools offered by individual cloud providers or server vendors. When considering this approach, give thought to how each vendor's development direction for their tools might be affected by their broader strategy and interests, which might not align with those of your organization.

A third option for your hybrid cloud infrastructure is Bright Cluster Manager. Bright automates the process of building and managing high-performance Linux clusters that automatically extend to the public cloud or VMware vSphere for additional computing capacity—eliminating complexity and enabling flexibility. Bright-managed clusters can simultaneously host HPC, ML, and data analytics applications. Bright is also platform- and cloud-provider-independent, and it affords your staff time to work on more important projects.

Bright Cluster Manager—the most-cited commercial system management package among surveyed HPC users¹—is enabling the new era of HPC for organizations worldwide.

▶ THE CASE FOR HYBRID CLOUD

The attraction of public cloud is expanding beyond its origins of supporting back-office applications, ascending to the realm of high-performance computing. This expansion is driven by necessity, technology changes, and performance improvements. Public clouds offer the distinct advantages of immediate availability, utility-based fee structures, and hands-off administration of the physical infrastructure. These are powerful benefits for organizations seeking agility in their IT operations, reduced capital expenditures, and (effectively) worry-free management of computing infrastructure.

¹Intersect360 Research, HPC User Budget Map data, 2020.

- ▶ Despite those benefits, situations exist where owned, on-premises computing systems make more sense or are necessary. The sustained high utilization of resources for high-performance computing, machine learning, and data analytics applications can be cost prohibitive in public clouds, as compared to owned systems. System performance, data control, and security also tend to favor on-premises systems.

For many organizations, the right answer is a hybrid cloud approach that represents the best of both worlds. With an effective hybrid cloud infrastructure, organizations can place each workload where it makes the most sense, factoring in the considerations mentioned above.

▶ **IMPORTANT FEATURES IN A HYBRID CLOUD**

When implementing a hybrid cloud, an organization can easily get caught up in the nuts and bolts of particular offerings, causing decision makers to lose sight of the overarching factors that ultimately determine success or failure of the system. With that in mind, here is a set of important overarching points to look for (and look out for):

Seamless

Just because your hybrid cloud consists of multiple systems (on-premises, public cloud, and potentially edge) does not mean each component needs to appear as a disparate system. To be effective, the hybrid system should present itself as a single (seamless) environment and interface to users and administrators. Admins should not need to “learn” multiple systems or use different tools for each environment, and end users should be shielded from the fact that multiple systems are available to them.

Smart

The benefit of utility-based public cloud resources is only realized if you are not charged for them when you do not need them. The system should be able to detect when public cloud resources are no longer needed, and automatically turn them off to avoid on-going usage fees. With a broader set of applications (i.e., HPC, ML, and data analytics) running on clusters, your hybrid cloud environment should be able to “understand” application resource demands and dynamically reassign resources among applications, based on the priorities defined by the business.



**Efficient**

Where your applications run is only half the picture. The data required to drive the applications must be staged, and the results must be processed efficiently and effectively in a hybrid cloud model. The system should be able to automatically stage data on cloud servers where computation will be performed, as well as intelligently manage data traffic to reduce networking and cloud storage costs.

(Auto) Scalable

A hybrid cloud system is inherently more dynamic than a fixed on-premises system. When you need to extend the capacity of your on-premises system with resources from the public cloud, it should not require intervention if you have defined the conditions that are permissible. The system should also be able to automatically scale out your on-premises system with additional public cloud servers, based on demand and policies you set.

Simple

To be effective for your administrators and end users, a hybrid cloud system cannot be difficult or labor intensive. At the same time, the skills and knowledge required to use and manage the system should reflect your staff's capabilities, while also factoring in the learning curve new hires will face as staff turns over. An "easy button" approach to building and managing your hybrid cloud ensures its long-term effectiveness and safeguards against staffing skill shortages that might arise in the future.

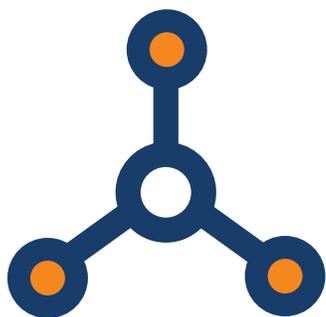
For many organizations, the right answer is a hybrid cloud approach that represents the best of both worlds.

Agnostic

The pace of technology change is overwhelming, with vendor offerings leap-frogging each other and sometimes creating the potential for lock-in. Your hybrid cloud system should be able to simultaneously leverage multiple/different public cloud environments, as well as servers from different hardware vendors, to avoid vendor lock-in and ensure forward-looking flexibility.

Edge-ready

Most organizations have not fully fleshed out their plans for edge compute in support of IoT and/or 5G, but their hybrid cloud should be capable of provisioning and managing edge compute resources to support these technologies when they are ready. Edge computing has several unique requirements that are different from on-premises and cloud computing; these requirements must be accounted for when choosing your hybrid cloud approach and solution.



Bright Cluster Manager provides a single interface that allows you to build, provision, and manage your computing resources from edge to core to cloud.

▶ OPTIONS FOR CREATING YOUR HYBRID CLOUD

One option for creating your hybrid cloud is to build and/or integrate the piece-parts yourself. The mindset behind this approach is typically, “We have smart people who can do this,” or, “We can save money by doing the work ourselves.”

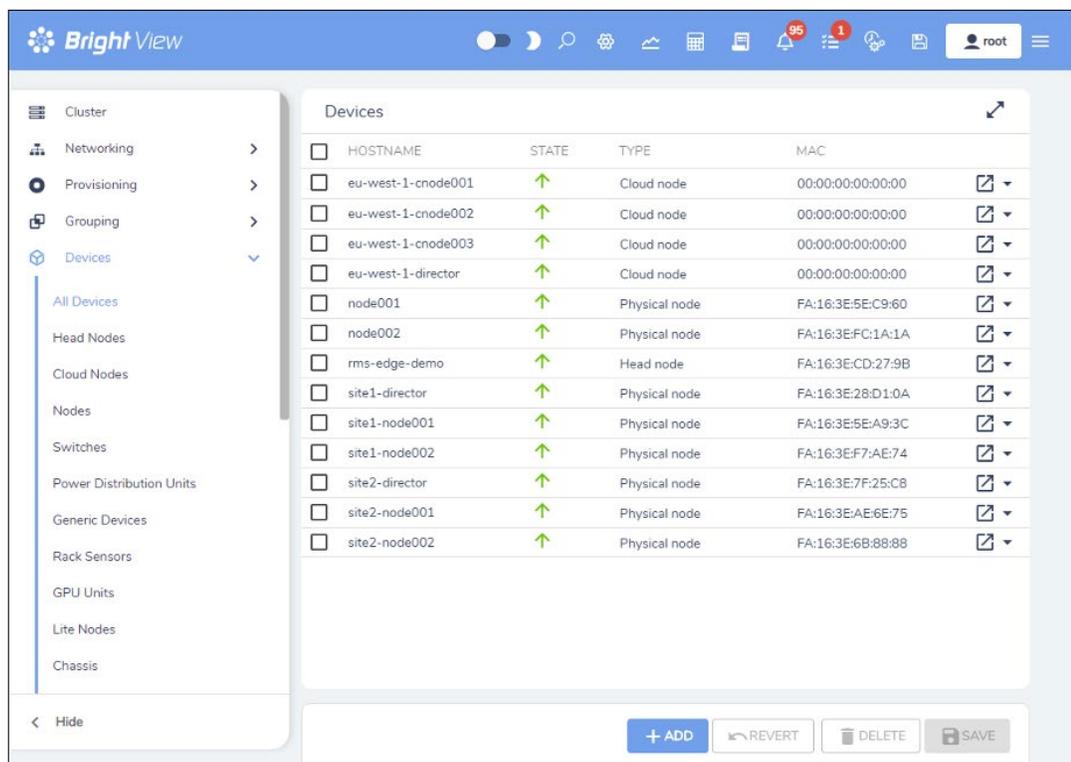
With enough time and energy, your people could certainly figure out how to build a hybrid cloud. However, the more fundamental question is, “Should you?” Will doing the work yourself add strategic value to your business? Or will you simply be reinventing the wheel, and perhaps end up with a less capable result? Beyond that, if the “smart people” leave, how will you maintain and evolve what you have created when the knowledge of what was built leaves your organization? On the point of saving money, be sure to consider the cost of human resources to build and maintain your hybrid cloud environment over its lifetime.

Another option is to use the tools offered by individual cloud providers or server vendors. Your immediate focus might be on the features/capabilities offered by the vendors’ tool, but other considerations should be contemplated first. Consider how each vendor’s development direction for their tools might be affected by their broader strategy and interests, which might not align with the goals of your organization. For example, is the vendor likely to encourage and support the use of a competitor’s products as part of your hybrid cloud? Weigh the risks of being constrained or locked-in alongside the capabilities offered in any vendor’s tool.

A third option for your hybrid cloud infrastructure is Bright Cluster Manager. Bright automates the process of building and managing high-performance Linux clusters that span from your core data center to the edge and to the cloud—eliminating complexity and enabling flexibility. Bright automatically extends to the public cloud for additional computing capacity, it is platform- and cloud-provider independent, and it provides centralized visibility and control through a single interface. In addition, Bright clusters can simultaneously host HPC, ML, and data analytics applications on bare metal, virtual machines (VMs), or containers—all from the same cluster.

Bright Makes Your Hybrid Cloud **SEAMLESS**

Bright Cluster Manager provides a single interface that allows you to build, provision, and manage your computing resources from edge to core to cloud. Bright abstracts the differences of various vendor products, processors, accelerators, physical and virtual resources, cloud environments, and location of resources—providing a consistent and uniform approach and representation for managing and monitoring all computing resources within the cluster. .



Bright Makes Your Hybrid Cloud **SMART**

Bright monitors the load and demand for resources running jobs in the public cloud, and automatically shuts down resources when they are no longer needed. This way, Bright ensures you only pay for cloud resources you use. Bright also understands how different applications use resources, and it can dynamically reassign servers on the fly to shift computing resources to high-priority workloads specified by the business.

The screenshot displays the configuration interface for a Scale Dynamic Nodes Provider named 'aws'. The breadcrumb trail is: Settings > Roles > Edit ScaleServerRole > Scale Resource Providers > Edit ScaleDynamicNodesProvider. A search bar for settings inputs is at the top. The configuration is organized into sections:

- NAME and 1 other parameter:** Name is 'aws', and the provider is **Enabled**.
- PRIORITY:** Priority is set to '5'.
- WHOLE TIME and 1 other parameter:** (Section header)
- KEEP RUNNING:** (Section header)
- EXTRA NODES and 3 other parameters:** Extra Nodes is 'eu-west-1-director', Extra Node life Time is '3,600', Extra Node Start is **Enabled**, and Extra Node Stop is **Enabled**.
- ALLOCATION PROLOG and 2 other parameters:** (Section header)
- TEMPLATE NODE and 2 other parameters:** Template Node is 'cnode001', and Node Range is 'cnode002.cnode005'. An 'Activate Windows' watermark is present.

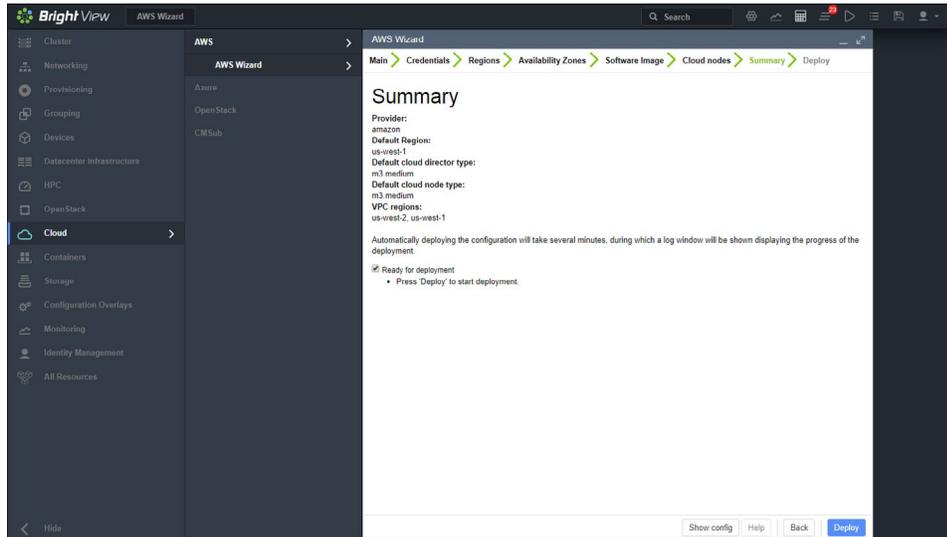
Navigation buttons at the bottom include BACK, REVERT, DELETE, and SAVE.

Bright Makes Your Hybrid Cloud **EFFICIENT**

When extending your on-premises cluster to the public cloud for additional servers to run jobs, Bright automatically stages the data required for those jobs in the cloud ahead of provisioning the compute nodes. This approach avoids wasting money on idle compute. Bright also allows you to tag data that will be used for multiple jobs running in the cloud, which avoids unnecessary transmission of data back and forth.

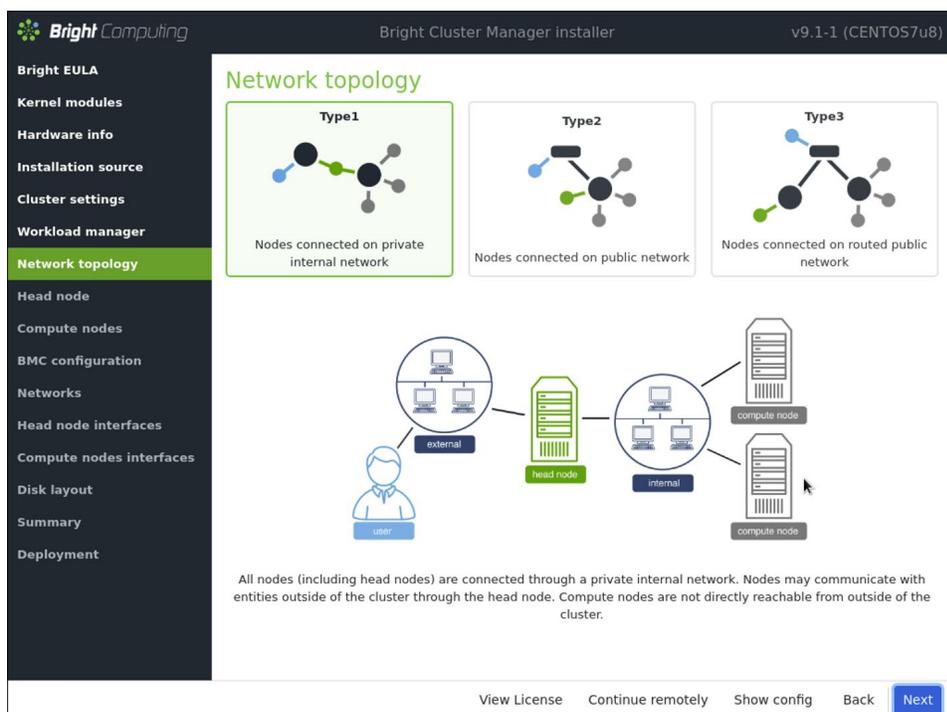
Bright Makes Your Hybrid Cloud **AUTO-SCALABLE**

Bright monitors the demand on resources within the system, and it can automatically provision virtual cluster nodes from the public cloud that are identical (in specification and software image) to your physical nodes. A wizard guides administrators through the setup process that enables the system to automatically provision virtual servers based on policies you set, and the system automatically terminates those servers when they are no longer needed.



Bright Makes Your Hybrid Cloud **SIMPLE**

With more than a decade of development and thousands of installations world-wide, Bright Cluster Manager is a highly refined tool that embodies an enormous amount of real-world high-performance system experience. From automated setup and configuration of your system's networking, DNS, user directories, and security to one-step propagation of server software updates and automated set-up of HPC workload managers and Kubernetes, Bright Cluster Manager reduces the skills and expertise necessary to build and manage your hybrid cloud.

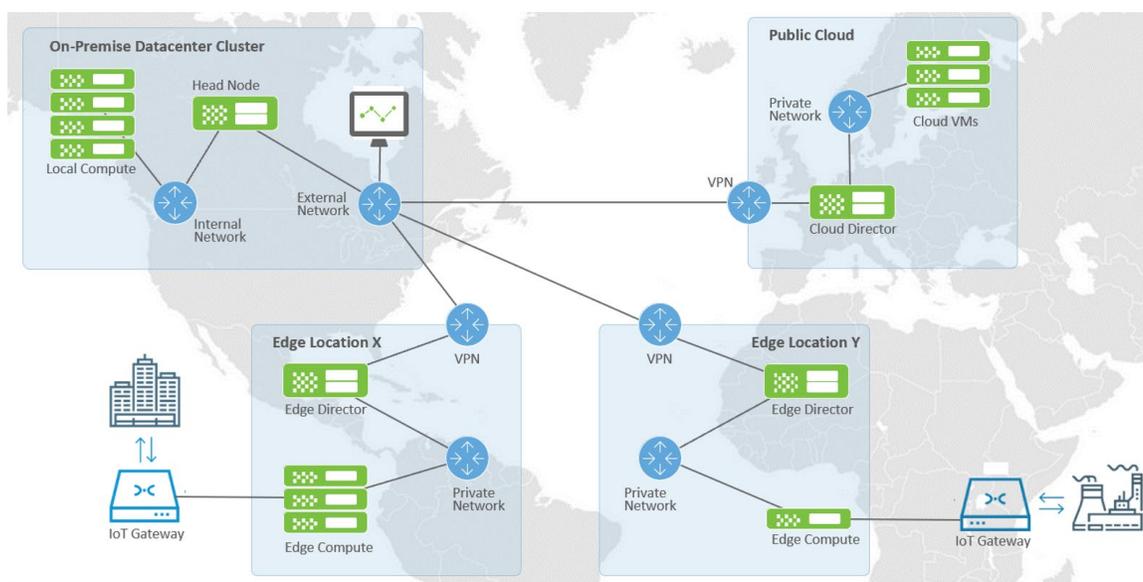


Bright Makes Your Hybrid Cloud **VENDOR AGNOSTIC**

To maximize flexibility now and in the future, Bright Cluster Manager enables you to create hybrid cloud environments that combine X86, Arm, NVIDIA, and other processors/accelerators; different server manufacturers; and different cloud providers in the same system.

Bright Makes Your Hybrid Cloud **EDGE-READY**

In the same way that Bright automates provisioning and management of compute in your data center and the public cloud, Bright Cluster Manager automates provisioning and management of edge servers in remote locations as an extension of your hybrid cloud system. Once edge servers are placed in an edge location with power and a network connection, Bright automatically connects to the cluster's central head node, installs the necessary software images on the edge servers, and sets up the local edge environment. Any number of remote sites can be managed from a central location, and additional compute nodes can be easily added at edge locations to increase the local computing capacity.



▷ CONCLUSION

Hybrid cloud infrastructures allow organizations to strategically manage their compute requirements from core data center to public cloud and edge, but they are very complex to build and manage. Automation is essential, and verifying your staff's abilities to work with your tool of choice is mandatory.

The inherent complexity of hybrid cloud makes vendor solutions an attractive alternative to building it yourself, but you must consider the implications of being locked in to a particular vendor's platform strategy and the resulting limitations it will impose on your organization's flexibility.

The platform-agnostic automation capabilities of Bright Cluster Manager allow you to overcome the complexities of building and managing a hybrid cloud, with complete flexibility to work with your vendor/s and technologies of choice.

Learn More

For more information about Bright Cluster Manager, please contact us directly at info@brightcomputing.com

