

bullx

instruments for innovation



Extreme Computing : taking ambition to its limit

The essential key to success: INNOVATION

Extraordinary advances in technology are constantly overturning apparently insurmountable barriers to progress. The time it takes to design a car has fallen from five years to just two; launching a communications satellite into orbit has become almost a commonplace operation; and oil platforms can now drill many kilometers below sea-level, thanks to improvements in risk management.

We have to innovate. Faster and faster. We must do more, do it better, and at lower cost. It's the new paradigm: where success means going to extremes. To help you keep in step with this change, Bull is opening up a whole new dimension in computer simulation: welcome to **the age of Extreme Computing.**

For many years, Bull has made new horizons more accessible to the most ambitious organizations. By pushing back the frontiers, Bull – as a major European player in the digital economy – is now **opening up the way to limitless possibilities** for everyone, whether your organization is a small-to-medium sized enterprise, a major multinational, a design department, research center or university.

Extreme Computing: boosting your power to innovate

Everything points to the fact that constant innovation is the essential prerequisite for growth in globalized and ultra-competitive markets.

Motivated by the drive for ultra-high performance and openness – and building on our pioneering approach to Open Source – Bull is constantly taking the concept of Extreme Computing further, to cover the widest possible spectrum of applications, by creating a comprehensive family of computers: bullx. Our aim? To offer you more closely tailored solutions than ever before, based on industry standards, **allowing you to go even further, to demand more from your systems, to innovate even faster, and to turn the corner into the future at the head of the pack.** By tapping into the world's intelligence and making it work for you, Bull, as 'Architect of an Open World', helps you realize your ambitions.

When nothing holds you back... take the lead

By ensuring that you benefit from our expertise in complex IT infrastructures and networks, Bull is helping to accelerate Europe's growth many sectors of the economy.

Bull is working for you. We're increasing the power and speed of computing. **With our bullx computers, Bull is pushing back the frontiers still further by tackling three major issues head-on: energy, power, and operational efficiency.** By reducing the energy consumption of supercomputers. By co-ordinating the task loading of thousands of cores, all working in parallel. And finally, by orchestrating and administering the complexity of these kinds of systems.

ALL WITH JUST ONE AIM: TO GIVE YOU UNLIMITED POWER TO INNOVATE.

bullx designed without compromise
for unlimited innovation



bullx a range of systems specifically designed for Extreme Computing

The components used to build the bullx family... its whole architecture... have been chosen to ensure that they fulfil their key mission: **to be the ultimate instruments for innovation.** So only the most crucial elements for performance – essential to meet the demands of Extreme Computing – have been included, to exclusion of everything else. The three fundamental principles behind bullx? **To optimize usable space, cut energy consumption and simplify systems administration.**

The **bullx** family has been designed by Europe's largest team of experts in this field. Experts with an unparalleled collection of skills, who you can also trust to be close at hand, to respond fast, and to implement unique solutions, only available from Bull.

'Without compromise': that sums up the design of bullx.

'Easy to use' is its watchword. And **'unlimited innovation'** is its philosophy. As instruments for innovation, bullx systems offer the highest level of perfection and the most scalable route to unlimited innovation.

Delivering anything from a few teraflops* to several tens of petaflops** of power, bullx systems are pushing back the boundaries of innovation, no matter what your needs may be.

* 1 teraflops = 1,000 billion operations per second

**1 petaflops = 1 million billion operations per second

PUSH BACK YOUR LIMITS

bullx: effectively combining processing power and low energy consumption

Controlling cost and the Watt/flops ratio is a constant challenge. To help you overcome this, **bullx** features environmentally efficient technologies. Its **independent cooling system**, built around a water-cooled door, means the whole system does not need to rely on conventional air-conditioning systems, and reduces the energy consumed for cooling by 75%. The net result is **more processing power in a single rack**: a giant leap forward in the flops/m² ratio.

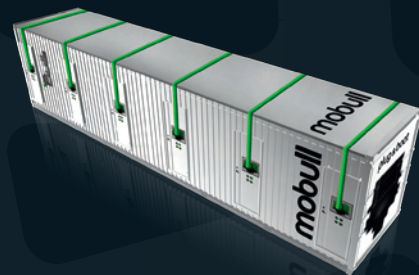
The **bullx** blade and supernode systems are equipped with an ultracapacitor, to protect your system from power supply micro-interruptions of up to 300ms. So there is **no more need for uninterruptible power supplies**, resulting in a cut of around 10% in Data Center power consumption! Similarly, the power management functions mean **consumption is adjusted to the actual compute load**, resulting in significant savings.

bullx: ultra-simple to operate and scaled to fit

Bull supplies its **bullx** cluster suite to **control the entire configuration** – blade and SMP compute nodes, GPU accelerators, interconnection network and storage – as a single system. At every stage of the cluster's lifecycle: when the system is first installed and deployed, when software is implemented or updated, to monitor and process errors, to constantly optimize and extend the cluster, and to support on-going maintenance.

With this software suite for **administering and supervising your bullx cluster**, it becomes a truly industrial tool that is both robust and easy to manage.

To help **optimize data Center design**, Bull offers a whole range of expertise such as the simulation of an entire computing suite, including air flows for optimum cooling, and modeled cable routes and rack locations. And by offering customers direct access to Bull's centers of expertise, we can provide the support you need to develop, port and optimize your computing codes.



mobull: a complementary solution, making it easier to install your Data Center

Bull's **mobull** container – a true mobile Data Center capable of hosting almost 230 teraflops of processing power – is a unique solution of its kind. All that is needed is an electricity supply, a cold-water supply and a small amount of space in a car park. Using **mobull** enables a new IT facility to be established or an existing one to be extended in the shortest possible timescales, by freeing the organization from the constraints associated with building a permanent Data Center.

Nowadays Extreme Computing touches every area of research and every sector of the economy. As a result, researchers and engineers now have an almost limitless range of requirements. And they demand computing solutions that perfectly meet the needs of every kind of application. Bull has designed its new bullx family of computers for just these kinds of user, offering hybrid solutions to cover the widest possible spectrum of applications. Bull offers an infinitely adaptable response to these limitless user needs: incorporating not only 'thin nodes' and 'fat nodes' as required, but also ultra-powerful graphical accelerators. And of course this multitude of components can be combined, in a completely customized way, into a single bullx cluster and managed as a single system using the bullx cluster management software.

bullx blade system: delivering extreme power

Supercomputers generally occupy a lot of floor-space. And space is expensive. The **bullx blade system** packs **18** compute blades – in other words **36** multi-core processors – into one 7U chassis, without any effect on performance. Quite the opposite. Because the blades share resources and connections to the electrical power supply and network access, **resulting in much less cabling, a much smaller footprint, and lower risks!**

bullx blade system: ultra-concentrated power, on demand

Each blade delivers the power of two of the latest-generation Intel® Xeon® 5600 series processors (Westmere-EP) and so benefits from incredibly wide and flexible bandwidth, thanks to the Intel® QuickPath Interconnect (QPI) technology. The InfiniBand Quad Data Rate (QDR) switch used as part of a totally non-blocking architecture means all blades can communicate simultaneously at the maximum nominal capacity.

And to ensure that the **bullx blade system** is a **real tool for sustainable competitiveness**, the scalability and modularity of its nodes means you can tailor your solution to your evolving needs for computing power. Easy maintenance is also a key feature: the blades and ventilator/power supply units are all hot-swappable, so there is never any need to power-down the system.

bullx supernodes: massive shared memory, to satisfy even the most memory-hungry applications

bullx supernodes offer extremely powerful 'computing units'. They capitalize on the very latest generation Intel® Xeon® 7500 series processors (codename: Nehalem-EX), designed for high-end servers and offering enhanced reliability, combined with exceptional scalability. Using these processors, Bull has designed four-socket SMP (Symmetric Multi-Processing) servers which can be extended to 8, 12 or even 16 processors thanks to a new technology exclusively designed by Bull. In their maximum configuration, bullx supernodes offer up to 128 cores and 2TB of shared memory, so they can simultaneously deliver both the very high levels of processing power and the very large amounts of memory needed by certain applications which 'crave' them. These include, for example, all mesh-generation operations (in climatology, aeronautics and automotive engineering, crash simulation, oilfield simulations...) as well as the mechanics of complex structures, for example, or the chemistry or physics of materials, to understand how the constituent elements behave at a molecular level.

bullx supernodes: the art of simplifying even the most complex architectures

Using high-end, bullx supernodes as part of a cluster also simplifies the often complex infrastructures associated with large-scale supercomputers, by reducing the number of compute nodes by a factor of five compared with commodity servers, making it easier both to implement the cluster in the first place and to administer it day to day.

bullx supernodes: two versions, for a made-to-measure solution

The bullx S6010 model is optimized to act as a compute node. Its exclusive format – two L-shaped 1.5U chassis which fit together, with one upside-down on top of the other, to form a 3U chassis – enables a level of density in the 8 or 16-processor configuration (3 or 6U) never before available in this market. Specifically designed to act as compute nodes, S6010 servers feature the best available components for this function, and only those that are essential for processing.

For its part, the bullx S6030 3U drawer is designed to act as a service node. Its advanced connectivity functions, redundant power supply and extended storage options mean it is especially well suited to act as a management or I/O node, that is just as effective as it is reliable.

Rack-mounted bullx servers

The bullx R-series offers a comprehensive family of bi-processor servers optimized for Extreme Computing: from ultra-compact compute nodes, to enhanced service nodes.

Versatile and cost-effective rack-mounted compute nodes

The bullx R422 models have been optimized specifically to act as compute nodes and to offer an optimum balance between cost and efficiency. With two servers mounted in a single 1U chassis, bullx R422 models offer breakthrough density for rack-mounted servers, and all the flexibility of 1U commodity servers. With a 92% power utilization rate, it is far ahead of conventional PSUs, resulting in significant savings in energy consumption.

bullx R422 servers are also perfectly designed to be combined with accelerators: ideally the 2U chassis is used alongside an NVIDIA Tesla S1070 1U Computing System

equipped with two PCIe connections, effectively coupling four CPUs with four GPUs. This combination has proved highly effective for many Bull customers, even in extremely large-scale configurations.

bullx rack-mounted systems: reliable and efficient enhanced service nodes

The bullx R423 service nodes combine advanced connectivity features, extended storage options and redundancy, to ensure efficient and reliable cluster administration services.

The bullx R425 visualization nodes, for their part, are scaled to support the very latest graphics and accelerator cards.

Bull, EUROPE'S LEADER in Extreme Computing

With 500 experts dedicated to Extreme Computing, Bull – working with its subsidiaries science+computing in Germany and Serviware in France – forms the largest center of expertise in this field in Europe.

Our in-depth knowledge of complex infrastructures and networks, combined with the experience of leading players in technologies and solutions for Extreme Computing, mean we are one of the leading players in Europe, widely acclaimed and respected by many different organizations.

Because our approach is always focused on the users' needs, Bull acts as a catalyst for some of the most innovative projects. The result is hundreds of success stories with customers in 15 countries, in less than five years.



“The bullx blade system was the best response to our needs of compute power, density and energy efficiency for our most demanding scientific users. It will help us support the advanced requirements of our researchers in a wide spectrum of application fields, such as life science, chemistry, climate prediction, and physics.”

Prof. Dr.-Ing. Ulrich Lang, Chair of Computer Science and Director of the Computing Centre, University of Cologne

www.bull.fr/extremecomputing

**BULL**

Architect of an Open World™**