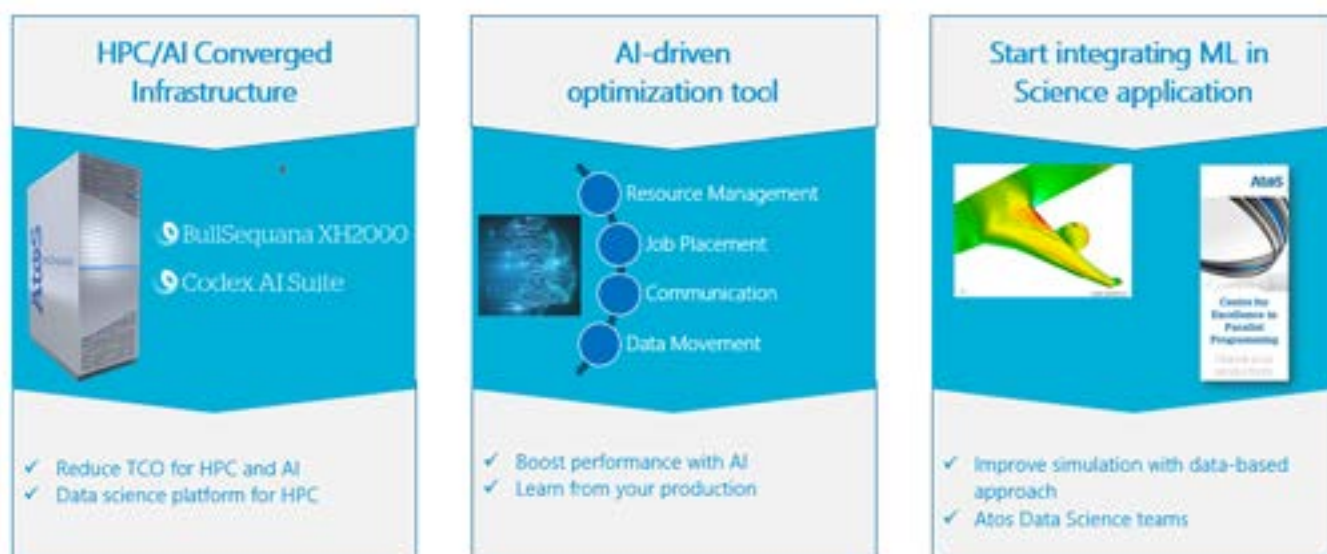


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# The Atos Artificial Intelligence Implementation in HPC – Accelerate Scientific and Industrial Breakthroughs

As the cornerstone for the next decades in digital transformation, the introduction of Artificial Intelligence (AI) has opened a new paradigm of applications in various scientific and industrial domains. AI workloads are more and more common on High-Performance Computing (HPC) infrastructures, taking advantage of the high computation power to train models or for other AI operations. The conjunction of CPU and GPU is also of great benefit, mixing AI and standard HPC workload. Though AI has been widely demystified compared with its debut, its full materialization in real field implementation entails diversified challenges. To take the full advantage of AI in its HPC continuum, Atos has been working on “AI in HPC, AI for HPC and AI Enhanced HPC” approach.



- **HPC/AI & Large-scale AI Infrastructure:**

Atos has embedded AI in both hardware and software as the new data science platform in its HPC architecture. Customers are able to accelerate data access and workload optimization with reduced TCO. Leveraging the best-of-breed GPU, Atos has successfully delivered a new deep learning supercomputer built on the NVIDIA DGX SuperPOD™ architecture in UK, which will enable UK academics and industry to drive forward scientific discoveries and innovation in machine learning and AI. This largest AI-focused supercomputer with over 500 GPUs is providing advanced GPU computing facilities to world-leading AI and machine learning experts from a consortium of eight UK universities and the Alan Turing Institute. It will more than triple the capacity of the original HPC machine and provide increased computing capabilities to a wider consortium of over twenty universities and the Turing Institute.

In addition to architect, build, deliver and maintain large scale AI Infrastructure, Atos is also pioneering to secure the Atos SuperPOD with its Cybersecurity products & services and providing multi-tenancy support on the Data Science layer. With its Center of Excellence in Advanced Computing, Atos is accompanying scientific and industrial communities to optimize AI workflows and simulations through trainings and AI business consulting services.

- **AI-driven optimization tool:** Thanks to our AI development for HPC, Atos can transparently bring customers to a new level of performance by effectively managing job placement, communications, data movement and resource optimization by leveraging historical executions to boost the system performance.

In HPC, understanding and optimizing I/O patterns is a very complex task. The Atos Smart Data Management Suite brings a complete framework to gather data from jobs about I/O calls (IO Instrumentation) as well as represent I/O exchanges. It detects abnormal or sub-optimal patterns (IO Pattern Analyzer). Based on the information, optimization can be performed directly on application code or can be managed through Smart IO Optimizer that dynamically changes malformed I/O thanks to Machine Learning algorithms. This approach can boost applications up to 30%, a significant gain in performance as well as in energy consumption.

In a similar philosophy, the Atos Cognitive Data Center (CDC) adopts a prescriptive maintenance framework, allowing for the detection, prescription and investigation of infrastructure incidents (hardware and software). Based on historical executions and AI-based algorithms, CDC can understand system behavior, detect anomalies and outlier in advance (before they occur). By anticipating incidents and providing faster root cause analysis, the overall availability of HPC clusters is significantly increased.

- **ML integration into science applications:**

By optimizing efficiency and enhance simulation capabilities in various scientific and industrial applications, Atos is unfolding the benefit of AI into science applications. The "AI4Simulation" is the Atos AI R&D program for simulation, which encompasses:

- (a) Exploring DL & ML technics to surrogate Physical Models in architecture modelling;
- (b) Coupling AI & Simulation in enabling AI/HPC workflow orchestration and coupling advanced data between ML inference & numerical solvers;
- (c) Online learning strategy: AutoML for hyperparameters & topologies optimization; Automatic data refinement for surrogate modeling & simulation efficiency.

Thanks to this initiative, Atos is accompanying leading edge companies in Europe across many use cases such as body forces modeling, autonomous driving or weather forecast.

**Underpinned by performance and AI, the Atos HPC is delivering unprecedented advanced computing power for accelerated scientific and industrial breakthroughs!**

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