



COUPLING SOA-BASED APPLICATIONS WITH HPC RESOURCES

Fraunhofer SCAI is an established specialist in HPC and parallel applications. Through benchmarking activities in the last 10 years SCAI became an expert in measuring and optimizing parallel applications (commercial and Open-Source) on Linux and Windows HPC clusters. Besides simple runtime measurements and scale-out studies (with varied node, socket and core allocations), specific attention was paid to potential influences of the cluster's interconnect type (Gigabit Ethernet vs. QDR Infiniband), different MPI versions (Intel MPI, MVAPICH, Open MPI, MS MPI) and MPI parameters or underlying file systems on the application's overall performance. Impacts of different compilers (Intel, PGI etc.) and their respective flags have been analysed as well. In addition to this, comparisons of standard benchmarks such as SpecMPI2007 or HPCC have been conducted.

In addition to intrinsic parallel applications, the potential of integrating service-oriented applications into the HPC cluster has been recognized and researched. Thus, SCAI has become an expert in providing solutions for integrating and coupling SOA-based applications with HPC resources. An example is the transformation of existing optimization products that are developed by SCAI. Two such products are AutoNester-T and AutoNester-L.

AutoNester-T optimizes the automatic placement of markers onto fabric panels. By configuring the optimal nesting pattern, the software minimizes the amount of wasted fabric. Leading manufacturers in the garment and upholstery industries already implement this software to optimize their production.

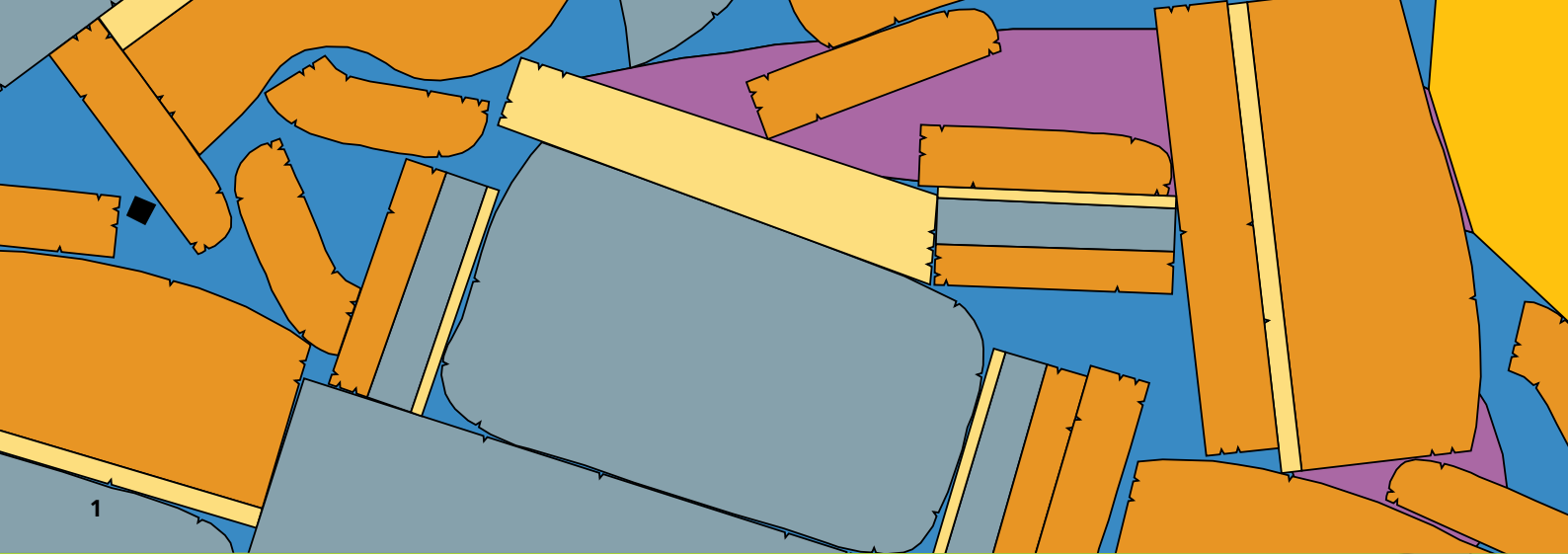
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AutoNester-L creates automatically optimized markers for leather hides. The software nests the pieces optimally in a very short time, minimizes wasted material, while adhering to various constraints. AutoNester-L is used in the leather and car manufacturing industries.

By extracting the valuable routines of both products on to the private Windows HPC cluster at SCAI, IPR can be safeguarded and sophisticated licensing and accounting models can be applied. Now both products (AutoNester-T and AutoNester-L) are provided as a service that is running on SCAI's internal Windows HPC cluster. This solution is offered as a prototype for a selected group of customers. The actual optimization routine is running on the HPC cluster and is accessed via an API, distributed by SCAI. Besides the HPC API, SCAI has developed a user-, application- and accounting-tool to manage and control the execution on the HPC cluster.

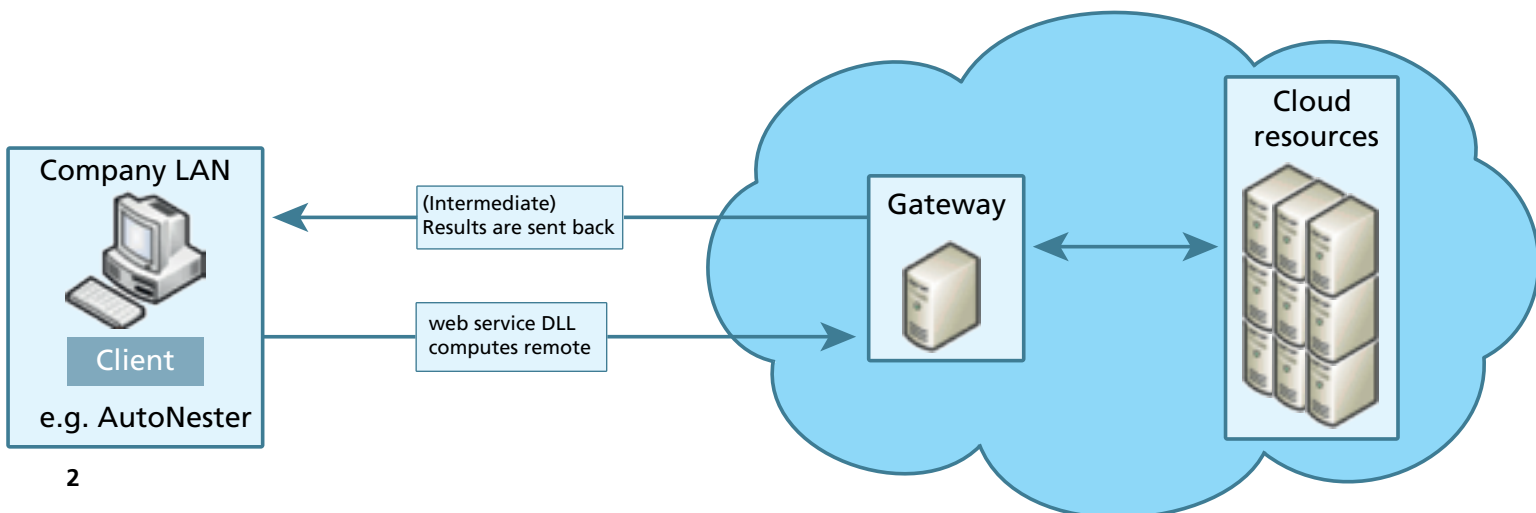
The whole solution is based on WCF, Microsoft's framework for service-oriented applications.

Another popular example for exploiting cluster resources via service-oriented programming is the integration of Excel (»Microsoft's Parallel Excel«). SCAI has successfully demonstrated its knowledge in this area by leading workshops, giving presentations and co-authoring articles in one of the most popular IT magazine in Germany.

In the last months, SCAI has extended its internal MS HPC cluster capabilities by additional Azure compute nodes. This enables SCAI to absorb bursts of user's processing requests by scaling out applications (such as the aforementioned AutoNester) to Azure compute resources.

1 *Markers on a leather hide calculated by the AutoNester-L software package. The colors in the pieces mark different quality levels.*

2 *Coupling SOA-based applications with HPC resources*



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