A SPDM SOLUTION FOR GLOABLLY SHARING INFORMATION

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THEME

SPDM

SUMMARY

Information sharing among ANSYS staff is essential to successfully deliver simulation solutions to the market. In particular, this is true for information like demonstration and validation cases, training materials, etc. Given the common reliance on simulation models for these materials, meta-data indexation and data lifecycle management is therefore mandatory.

For this purpose, ANSYS has initiated a project called "ANSYS Worldwide Simulation Data Management" (AWSDM). After investigating different options, the project team decided to implement an SPDM system to cover the requirements for the above described environment. The system was configured to maintain not only demonstration material, but also data with respect to software training, consulting services and software validation. After a successful testing phase the pilot system was migrated to a mature IT hardware environment.

The system design was built upon a clustered architecture with 4 server nodes to distribute the load and provide redundancy in case of a node failure. The data is stored on a clustered file system with a corresponding back-up procedure. The system is accessible using a front-end node. The presently applied configuration makes use of advanced capabilities of the underlying SPDM system such as meta-data extraction (manual as well as automatic), lightweight result visualization, data life cycling, report generation and powerful search capabilities. AWSDM is currently operational and accessible to approximately 1000 users located in literally all ANSYS offices around the world.

ANSYS WSDM: KNOWLEDGE SHARING AT ANSYS

KEYWORDS:

SPDM, Knowledge Sharing, Data Management

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1: Introduction

Sharing knowledge and information is a key factor for ANSYS to successfully and efficiently deliver simulation solutions to the market. This applies to a variety of prospect and customer interactions. In particular, material to demonstrate the capabilities of the software for representative cases is an enabler to effectively introduce the methodology of numerical simulation. At ANSYS such material is generated by local experts on a daily basis, typically for interaction with their customer contacts. However, the resulting simulation models and corresponding documents are also beneficial for other support engineers. While colleagues in the same office are usually aware of such assets, other engineers might be disconnected from this information. As a result, such engineers will use outdated information or will spend additional time creating their own approaches. Obviously, this bears the potential to increase the quality as well as the efficiency of the technical teams by properly distributing the expert's material to the global base.

2: Project Overview

The project began with a thorough assessment of requirements for sharing simulation information at ANSYS on a global basis, with the stakeholders expressing the following general expectations and behaviour of the system:

- Easy and efficient to use
- Globally and robustly available

And the following data management aspects:

- Asset indexation and retrieval
- Data security and accessibility
- Review, approval and sign-off procedures

The collection of requirements indicated that the system has to rely on an SPDM solution provisioned on a state-of-the-art hardware architecture. ANSYS EKM was chosen as the SPDM tool because of its built-in capabilities for simulation data management, such as manual and automatic meta-data definition, meta-data based search functionalities, light-weight data visualization, and data lifecycle management. EKM is a web-based system designed to efficiently manage both the data produced by simulation tools and the processes used to control the collection of that data. It can be accessed using a web browser (such as Internet Explorer, Firefox or Chrome) or by

using non-browser clients, such as ANSYS EKM Desktop or ANSYS Workbench. Figure 1 shows the general software architecture of the selected solution. Examples of SPDM implementations based on ANSYS EKM are described for example in [1] and [2].

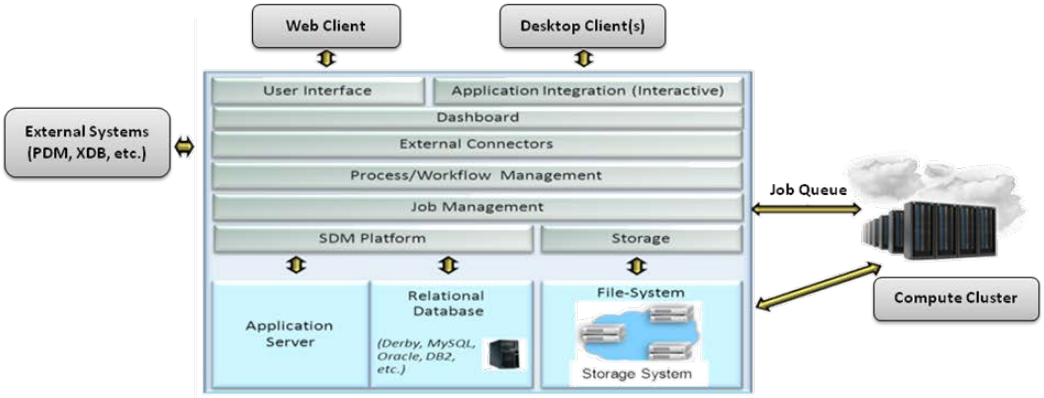

Figure 1: SPDM Solution Architecture

Beside other unique features, ANSYS EKM turned out to be the best solution since it offers superior out-of-the-box support for projects generated within the integration platform ANSYS Workbench.

Workbench projects are typically used to host ANSYS simulation tools and are widely used in almost all assets on the WSDM server. ANSYS Workbench produces a schematic workflow that manages the connections between the various simulation tools from various physic disciplines. In this context, ANSYS EKM is not only able to extract meta data information with respect to the project management (schematic view, design points, referenced files, etc.), but also regarding settings from the simulation subsystems (model specification, boundary condition, etc.). The corresponding information is presented to the user in a single document (so-called simulation details report) which allows the EKM user to quickly gain an overview of the project without opening it in the native application.

On the other hand, ANSYS Workbench offers unique features to directly and smartly interact with an EKM repository. This does not only include the standard operations (saving to and opening from EKM), but also allows to send and get changes only which results in tremendous reduction concerning the amount of data and time when transferring information back and forth.

After the initial assessment phase, a pilot system was implemented. Based on the experiences gained during the pilot testing, the requirements were

iteratively refined and verified. After meeting the expectations of the stakeholders the pilot system was transferred to a production environment and became accessible to ANSYS staff in early 2012 for publishing and retrieving information.

Presently, AWSDM is deployed to publish various assets, including training courses, demonstration material, and validation cases. Additionally, it is used globally as a data exchange portal for collaborating teams within ANSYS.

3: Implementation Details

Hardware Architecture

Based on the defined requirements for high availability, performance and scalability, the system was deployed on a mature hardware architecture in which the components of the SPDM server are distributed over different machines.

In such a clustered deployment (refer to Figure 2), multiple cluster nodes are grouped together to appear as if they are a single server with higher performance. All incoming requests from users (clients) are submitted to a common URL. From there, clients are connected to individual nodes within the cluster. These cluster nodes share a common cluster database server and a common cluster file system. Client sessions are distributed to the cluster nodes using a front-end web server, which performs load balancing, thereby spreading user sessions evenly across the nodes in the cluster. This load balancer provides a common URL to access the cluster.

The data vault is based upon IBM's General Parallel File System (GPFS, see [3] for details) in order to guarantee high reliability and performance in this multiple server environment.

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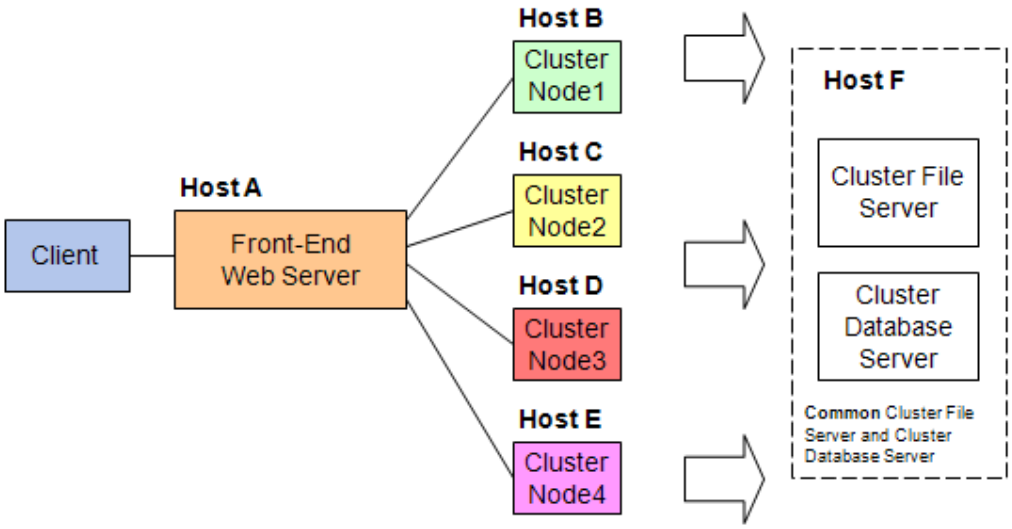

Figure 2: Local Hardware Architecture for ANSYS WSDM

As shown in Figure 2, users connect to the system by pointing their browsers or non-browser tools to the URL of the front-end web server. However, to ensure high performance when transferring data back and forth from a client to the server, a so-called cache server concept is deployed (see Figure 3). A cache instance holds a copy of all files which have been transferred with the help of this cache server. Whenever a user requests a file to be downloaded from the master server, the system will automatically evaluate whether the latest version of the file is already available on the cache server. The performance improvements occur when the cache server determines that it has already an up-to-date file and does not have to download the file from the main server repository again.

Currently, the ANSYS WSDM project deploys cache servers at major offices in Europe and Asia.

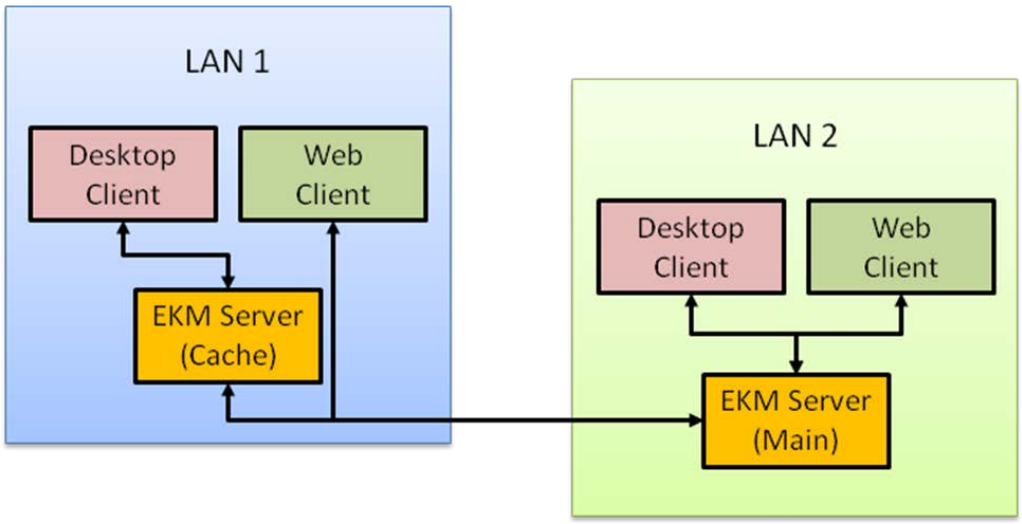

Figure 3: Federated Concept for Global Access to ANSYS WSDM

SPDM System Configuration

Since the deployed SPDM system is based on ANSYS EKM, many capabilities are available out of the box. This applies especially to the automatic meta-data extraction for all ANSYS simulation file formats, as well as keyword extraction from text based files, such as ASCII-TXT, PDF, DOC, PPT, etc. Also by default, information relating to the ownership, creation, and modification of the asset are stored.

To enhance the identification of suitable assets, the data model for the simulation projects is extended such that additional property values can be specified. For example, the demonstration material is tagged with the following (see also Figure 4):

- Field of Application/Industry Sector
- Keywords
- Usage Restriction
- Language of Documentation
- Investment Hours to Create Asset

Additionally, the system is configured to track each asset with specific accessibility and approval stages as they mature. For example, during the creation phase of an asset, only a limited set of users shall have access to the asset, while it should be available to all users of the system as soon as it has

been published. The stage change from the creation phase to the published stage needs to be approved to ensure data validity and consistency. Such procedures are governed by the concept of data life cycling (refer to Figure 4).

A lifecycle is a set of sequential stages that an object such as a file or folder moves through during its lifetime. Lifecycles are defined in terms of *stage* and *transition* elements, where each stage is connected by one or more transitions. In the lifecycle definition, you can define policies for each stage. These include setting permissions for who can access, modify, and perform other operations on an object, and setting criteria for automatic deletion of the object from the EKM repository.

Finally, the system is configured not only to automatically extract meta-data and reports from simulation files as soon as they are brought to the system, but also to provide lightweight visualization information. This information can be used to offer a 3D simulation model and result visualization which is embedded in the browser window. Thus, users will not need to open such files in a local application for visualization purposes of geometry and results (see Figure 4 for an example).

4: Success stories

The material published within the AWSDM project has been successfully reused in various scenarios. The following two examples are representative for other feedback which has been collected so far:

1. In preparation of a contribution to an international conference, an ANSYS employee found a number of demonstration and presentation on the corresponding topic on the AWSDM server. The time effort for searching and investigating the material was recorded to be roughly 2 hours, while the time to reproduce the content was estimated to be 5 days. As a side effect, the engineer also reported that he was able to update and enhance his knowledge on the simulation the simulation settings for the corresponding application for the newest software release.

2. While working on a support case concerning an advanced model feature, an ANSYS employee was able to locate a corresponding asset on the AWSDM server. The asset did not only contain an example for a case setup with this model, but also information with respect to capabilities of the solution from competitors. Thus, the support engineer was not only able to provide a prompt and valuable feedback, but also to position the solution as best-in-class.

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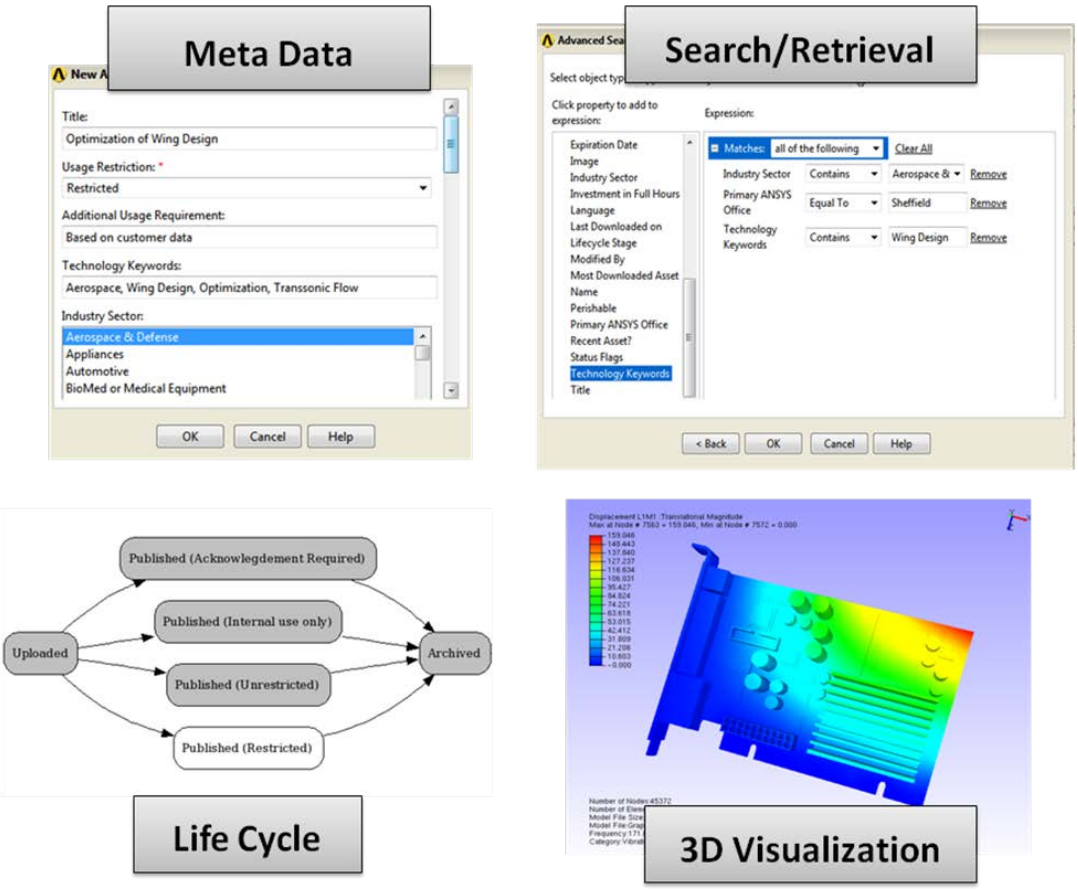

Figure 4: Selection of SPDM Features used on ANSYS WSDM

5: Summary

With the implementation of an SPDM platform, ANSYS has taken a major step forward in enhancing the collaboration and knowledge sharing between employees over different departments and regions. The AWSDM has significantly reduced the effort in re-inventing user-specific demonstration and validation cases. This has been verified by different feedback from within the ANSYS community.

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