Going with the Flow

Companies today strive to shorten the lead-time to release new products in the market to achieve a higher market share

OEMs have adopted global collaboration and are gradually switching to digital and actual-parts assembly houses. Detail design, finite element analysis and manufacturing are increasingly being considered by global partners. While this helps organisations to reduce time-to-market and improve cost savings, the absence of a robust system to manage data flow creates problems related to data management, security and exchange. As these issues are faced throughout the product lifecycle and also within the organisation, many companies are now focusing on managing digital and actual assemblies.

Key factors affecting the data flow management are:

Managing data from heterogeneous systems

New software emerges everyday for effective and user-friendly data creation, to reduce training time and increase productivity. This often leads to different companies using different software for data design and analysis. Managing data from such heterogeneous systems of physically distributed partners is one of the biggest challenges that OEMs face today. Data conversion for use by various design tools for contextual design results in data loss, which consumes additional time and incurs more capital expenditure in downstream processes and associated risks.

Process dissimilarities

CAD methods differ depending on the software used to create solid geometry, 3-D data and drawing. Industrial partners tend to follow their own methods and processes rather than standardised OEM methods. A slight deviation in processes from industrial partners and suppliers may cause considerable delay and rework in the downstream processes. For example, a supplier may use a different drawing format from that of an OEM. For the supplier, it is just a drawing format but it may not be in sync with some of the OEM's downstream processes such as auto-printing or digital image capturing.

Data exchange

Digital mock-up (DMU) is a virtual assembly and integration of 3-D models, replicating real-time product assembly. The DMU today plays a significant role in the product development process. It is being increasingly used in the end-to-end processes of product development including procurement, design, manufacturing, marketing, etc. Since contextual design integration requires an updated DMU, it is desirable that the data be exchanged from the suppliers on a weekly basis, or even more frequently. However, due to the high volume of data transfer, there is always a backlog and often a time delay in design, reducing its importance and pushing the problem downstream.

Instant data exchange is essential for working with multi-industrial partners in contextual design mode.

OEM database connection to the industrial partners could be one of the solutions to eliminate the time delay due to data exchange. However, the possibility of partners having access to the entire product data raises data security issues.

Data security

When design houses and suppliers work with major OEMs, it is probable that design ideas are transferred or duplicated without the knowedge of the OEM. Therefore, it is important that adequate security measures are in place while working with external design partners. Data security becomes critical when working with multiple suppliers. If the data exchanged between two suppliers is routed through the OEM, it becomes an overhead to maintain, track and store the details. If it is not routed through the OEM, there is little control that the OEM has on the data exchange. An optimal information exchange system is required to take the burden off the OEM and to track data exchanges.

Data release process

A remote replica of the OEM database at the suppliers' end could accelerate the release process (Figure 1). This would allow partners to check in and release the data at their end. However, this approach throws up new challenges related to database synchronisation, network/bandwidth, data loss due to high volume of replication, access control and complex import/export routines.

Dealing with version control at database synchronisation and working with multiple suppliers makes configuration management and change management more challenging.

Digital data quality

CAD data quality plays an important part in today's modern design environment. With data arriving into the DMU from a globally dispersed design community, it is imperative that the CAD data be of the right quality.

CAD data quality has two main categories – conformance to predefined standards, and geometric integrity. Non-adherence to either category results in inaccuracy in the DMU and expensive rework in the physical model.

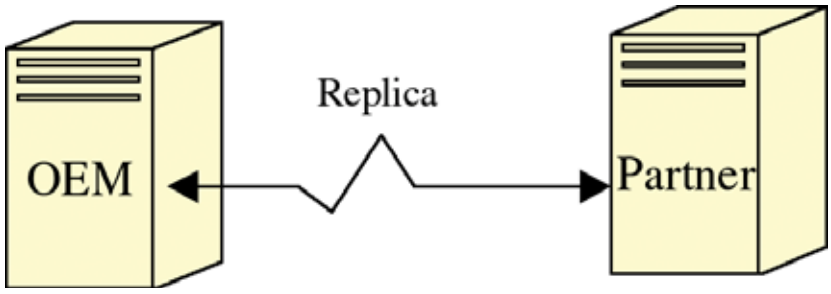
Organisations are now beginning to recognise the cost and impact on their businesses if the data quality requirements are not met. They must therefore ensure that suppliers enforce quality to reduce the number of data exchanges and interlinked delays in the programme.

Secure design context collaborator

Collaboration with suppliers globally has helped OEMs to build clusters of excellence worldwide. However, data exchange, security and associated overheads do not allow them to utilise the benefits of collaboration across clusters. There is a need to integrate the multiple tiers of suppliers on a single platform driven by OEMs, so at any given point of time both suppliers and OEM understand the status of the data. In such a system, robust controls, warnings and key performance indicators are imperative.

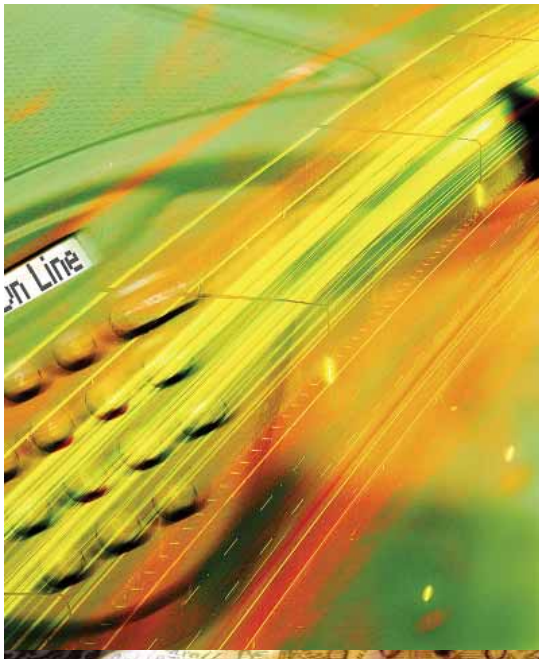
Imagine a setup where each supplier has his own area per work package in the OEM's database to check-in and check-out the work package data. Also, it has a visual /geometric access to the interfacing data for the contextual design.

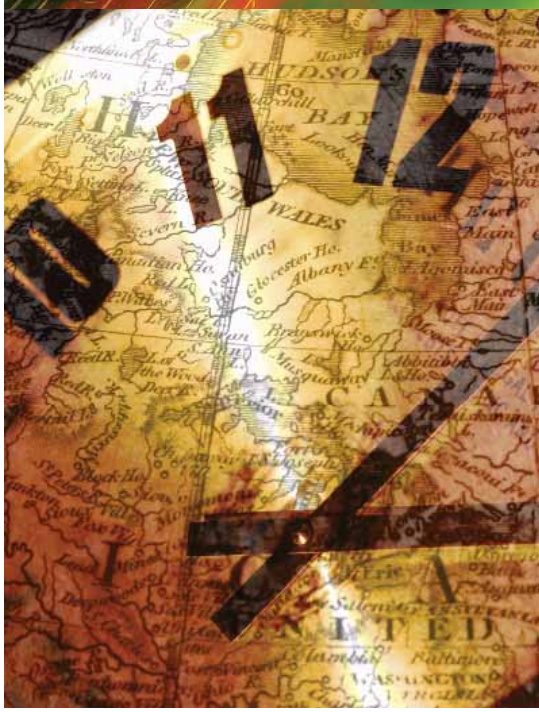
Figure 2 (page 24) shows a typical setup at the OEM's end. Consider three suppliers 1, 2, 3 who work on work packages



- **Database Synchronisation**
- **Network / bandwidth**
- **Data loss due to high volume**
- **Access control**

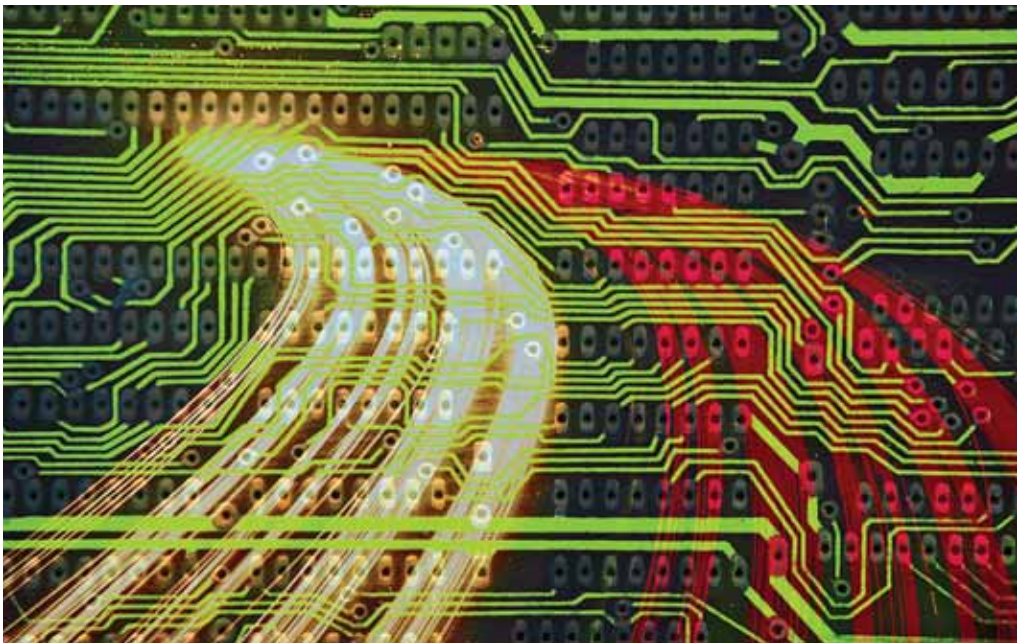
Figure 1: Data release process





Distribution of digital data to manufacturing

OEMs are increasingly trying to turn themselves into 'digital factories' where data, as far as possible, exist in digital form. For achieving this ideal, it is necessary to IT-enable collaborative engineering and link it seamlessly with the supply chain to reduce manufacturing costs and time. Collaborative engineering reduces the cycle time of availability of the latest design for manufacturing. However, the loophole in the system is interaction between different tiers of suppliers and manufacturing within the supply chain to reduce the time.



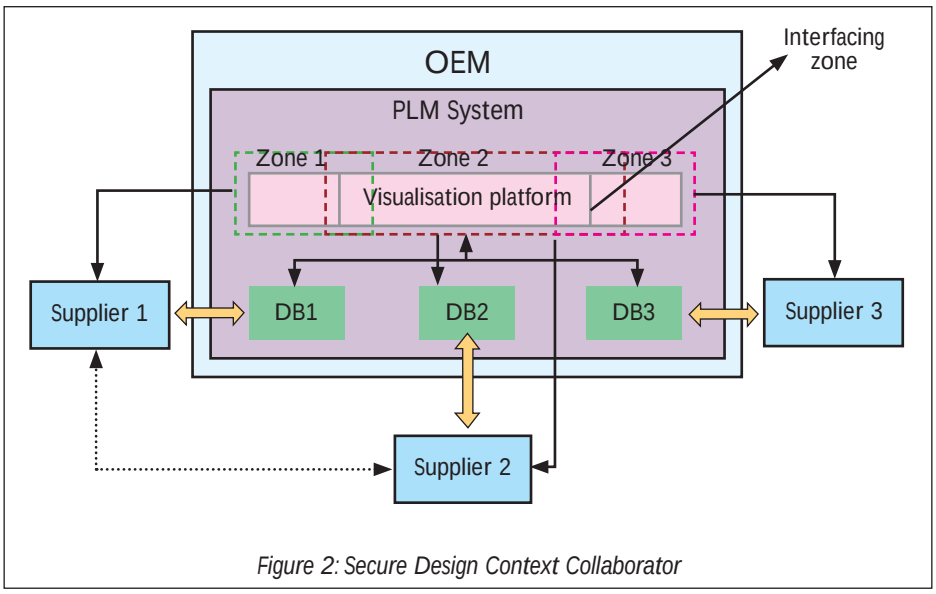


Figure 2: Secure Design Context Collaborator

WP1, WP2, and WP3. Each supplier has a dedicated server or the area in the server to check-in and check-out data using the web-based applications. The individual databases (DB1, DB2 and DB3) are connected to a visualisation platform, wherein the data is checked in to the individual database and converted to visual data. The visualisation data is independent of the CAD software and can be used in contextual design. This eliminates the delays caused by traditional data exchange.

The visual database platform is divided into different zones depending on the work packages. The zones of data and publishing of visual files is controlled by the OEM using the PLM system. Supplier1 will have to access Zone1 only, which contains the data from DB1 and visual data from WP2 required for contextual design. Similarly, supplier 2 will have access to Zone2, which contains data from DB2 and data from Zone1 and Zone2 required to work on WP2. At any given time, an individual supplier will not have complete access to the full product structure. This set-up reduces the amount of data exchange between the OEM and the supplier.

Loading the visualisation files as compared to the actual parts/assemblies saves time and enhances machine performance. The benefits are visible in harness routing, hydraulic/tubing or system design where a whole product assembly is required to be loaded. Data that takes a few hours to load could be opened in a few minutes when using the visualisation files. The visualisation environment files can be used in contextual design to pick centrelines, reference surfaces, etc.

To maintain the quality of incoming data, an automated check tool can be integrated with each database – DB1, DB2 and DB3 – allowing only clean data to be vaulted. The same setup can be integrated for multiple manufacturing suppliers, giving them proper access. As the whole system is driven by the OEM, it provides full data control and an overview of the situation.

Conclusion

Apart from the engineering design challenges, today's geographically dispersed and complex operating landscape creates unique challenges in achieving a completely secure and manageable digital definition with seamless data-flow management. However, despite the challenges, we have to push ahead with complete digital design due to the large benefits to be gained. Collaborative engineering extends its boundaries into manufacturing, extended enterprise, assembly and support. Collaborative, converging of disciplines, integrated product development, facilitated by effective data flow management, is an imperative for success today.

About the authors

Martin Horwood is a manager for methods and processes, deployment and integration at Airbus UK with over 15 years experience in CAD/PDM. He is currently responsible for method and process deployment and integration at Airbus, covering all aspects of methods development and application of the use of CAD/PDM techniques. As a trans-national Airbus team leader, Martin is responsible for harmonising methods and processes across the whole Airbus organisation.

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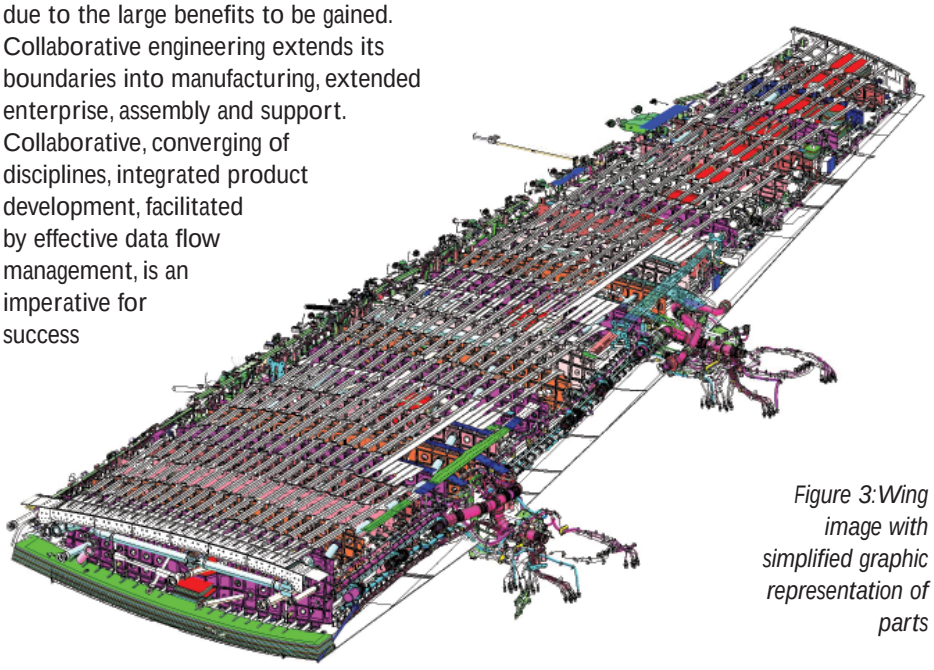

Figure 3: Wing image with simplified graphic representation of parts