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An important hurdle to overcome when trying to bring together several emerging technologies in one place is data connectivity.

That is why ATS Bus was chosen to serve as the Manufacturing Service Bus development platform for the LASAM project at the Manufacturing Technology Centre (MTC) in the UK.

About the Manufacturing Technology Centre

The Manufacturing Technology Centre (MTC) was established in 2010 as an independent Research & Technology Organisation (RTO) that bridges the gap between academia and industry.

The MTC aims to raise the UK's competitive advantage by validating and implementing concepts identified from primary research.
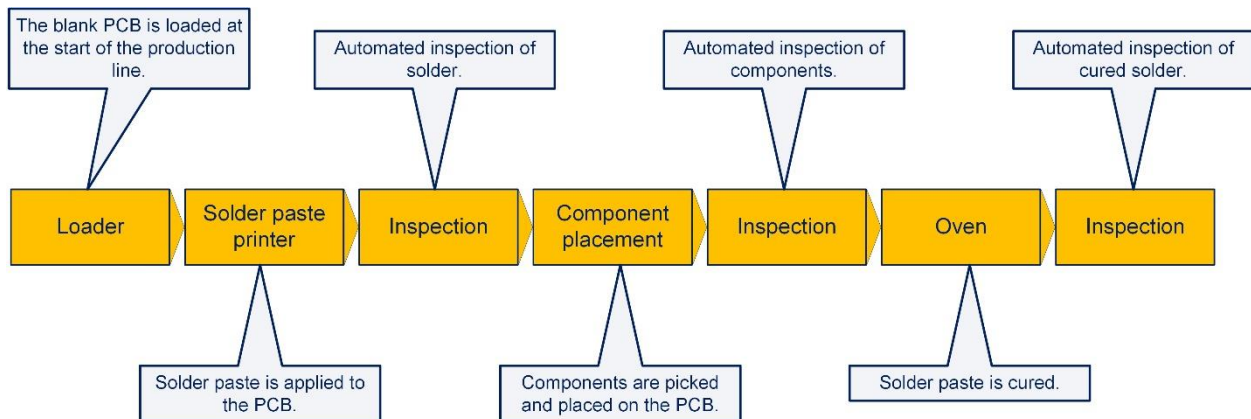
Housed in a purpose built facility at Ansty Park, Coventry, the centre provides a unique environment bringing the country's leading academics, engineers and industry professionals together to develop and demonstrate new technologies on an industrial scale. This allows the MTC's clients to develop new manufacturing processes in a safe, neutral industrial setting, whilst reducing the associated financial risks.

The LASAM Project

LASAM stands for *Location Awareness Services for Advanced Manufacturing* and is a joint venture between several manufacturers and research technology organisations.

The project is designed to solve real-world problems related to Manufacturing Operations Management (MOM) in electronics manufacturing plants. It also explores solutions for tracking tools and materials used within the process.
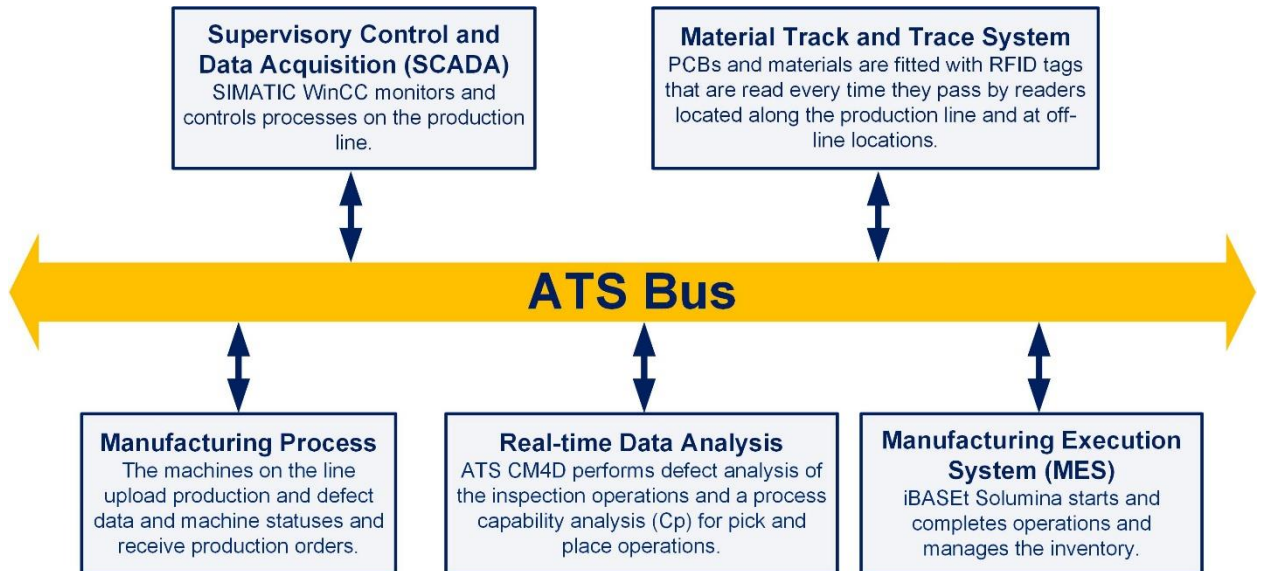
It is designed around a production capable Surface Mount Technology electronics assembly line at the MTC. Deploying the combined technologies in this trial environment allows issues to be resolved before the solution is deployed in the real world. The production line is laid out as follows:

The blank PCB is loaded at the start of the production line. → **Loader** → **Solder paste printer** → Solder paste is applied to the PCB. → **Inspection** ← Automated inspection of solder. → **Component placement** → Components are picked and placed on the PCB. → **Inspection** ← Automated inspection of components. → **Oven** → Solder paste is cured. → **Inspection** ← Automated inspection of cured solder.

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ATS Bus – Bringing Technology Together

The role of ATS Bus within the project was to combine and exchange data between the key systems shown below. This could have been achieved in many ways but the following pages will demonstrate why ATS bus was chosen to provide the added security and flexibility for this project.

Supervisory Control and Data Acquisition (SCADA)
SIMATIC WinCC monitors and controls processes on the production line.

Material Track and Trace System
PCBs and materials are fitted with RFID tags that are read every time they pass by readers located along the production line and at off-line locations.

ATS Bus

Manufacturing Process
The machines on the line upload production and defect data and machine statuses and receive production orders.

Real-time Data Analysis
ATS CM4D performs defect analysis of the inspection operations and a process capability analysis (Cp) for pick and place operations.

Manufacturing Execution System (MES)
iBASEt Solumina starts and completes operations and manages the inventory.

Connecting All Levels of the Automation Hierarchy

The power of ATS Bus is in its ability to efficiently connect systems at every level of the automation hierarchy. In this particular example the MES system can communicate directly with the equipment on the factory floor.

The equipment sends data to ATS Bus as XML files. ATS Bus takes this data and converts it into a different XML format that can then be read by the MES system (Solumina).

Likewise, the RFID scanners send data relating to the location of products and materials to ATS Bus which again converts it into XML files for the MES system. The location data is also sent to the SCADA system for presentation on an overhead display.

Each of the systems may be at different levels of the hierarchy, with either time-driven or event-driven methods for sending and receiving data, but ATS Bus enables them all to work together securely in complete harmony.

Providing Traceability

The fast data transmission provided by ATS Bus enables a track and trace solution as it provides a real-time location of PCBs and materials and a record of when each PCB passed through a machine.

The location information is fed from RFID scanners to MES which handles materials and order progression. When a part is scanned arriving at a machine MES receives the part ID and can then send down the correct program to be used in the machine for that part.
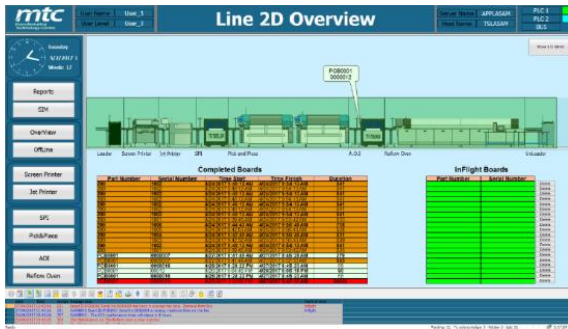
In high-mix manufacturing ATS Bus allows these part-by-part decisions to be made quickly and securely.

Location information is also sent to the SCADA system via ATS Bus. The SCADA system can then display the real-time location of every item as well as providing a traffic light reference to highlight how much longer time-sensitive materials have.

Same Data – Multiple Uses

Thanks to the publish-subscribe model used by ATS Bus, data collected at one location can be used at multiple destinations. For example, the machine that places components on the PCB uploads a data file to the bus. This data is read by the MES system which uses it for traceability purposes. At the same time the data is read at another location and stored in an archive.
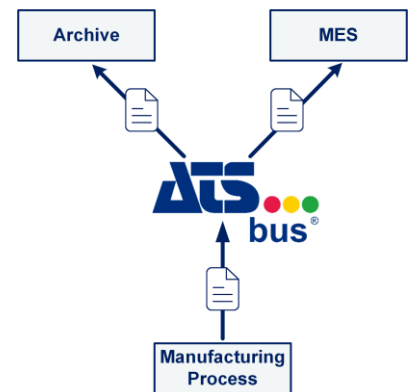
In another example, the results of inspections are published to the bus. These results are then read by the SCADA system, which can present them to the operator, as well as by ATS CM4D which performs an analysis on the accuracy of the component placement.

The publish-subscribe methodology makes it easy to re-use information across different systems in different contexts, adding potential value to all the data.

Prediction and Prevention

An important part of the LASAM project is the ability to visualise what's happening on the production line and to predict where problems may occur. To achieve this ATS Bus smoothly links together three separate systems that then work together to help the operator prevent foreseeable issues.

It starts by collecting the results of inspections carried out on PCBs along the production line. The results include details on the quality of every solder joint and component on each PCB. The results are received as an XML file and then converted into the native B2MML format used on ATS Bus.
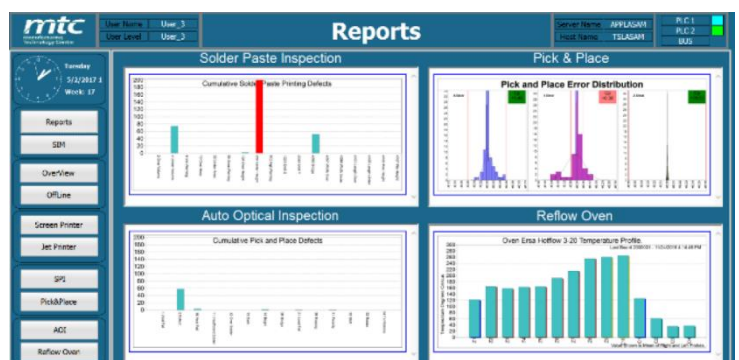
ATS Bus then converts the data into a format readable by ATS CM4D which carries out a process capability analysis (Cp) of the data before uploading it back to ATS Bus.

Finally, the results of the data analysis are sent to the SCADA system (WinCC) which presents the results to the operator in an overhead display. These results enable the operator to see which processes are degrading over time so that they can carry out preventative maintenance before serious issues occur.

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A Flexible Solution for Flexible Production

The LASAM project aims to solve real-world problems faced by manufacturers using the latest technologies and methodologies. But as new technologies become available they need to be able to swap out machines quickly with as little disruption to the production line and connected systems as possible.

Rather than having to create a separate connection to every other existing network, any new machine or system will simply connect to ATS Bus. All data translation, communication and security requirements are then handled by ATS Bus. This reduces integration and running costs by reducing the number of separate data interfaces.

System integration is also made easier with the intuitive ATS Bus configuration application. There's no need to write individual scripts for each machine interface as data conversions are all executed within ATS Bus.

Adding, exchanging or even removing machinery on a commercial electronics assembly line is streamlined by ATS Bus as it can communicate with any interface protocols, so even if the connection technology changes ATS Bus can communicate with it. This reduces the costs and complications involved in modifying the project, giving increased flexibility when new technologies emerge.

ATS is *The Independent* **Solution Provider for Smart Digital Transformation**. ATS is a global company offering decades of experience in strategy, deployment and support of IT & OT (Operations Technology) solutions.
our experience, your success.

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