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High-Tech Manufacturing

Manufacturing is among the vertical sectors to have received the largest impact of the technological developments of the last decade. Beyond the incredible cross-industry disruption created by the Internet of Things (IoT), new paradigms in consumer purchasing behavior, manufacturing services, and industrial security are beginning to upend traditional production models, leaving companies both large and small scrambling to catch up to ensure competitiveness.

The Evolution of Scale and Complexity

As new market demands created by these technologies grow, manufacturing facilities need to evolve both in terms of the scale and the complexity of their operations. In some industries, this can represent an expansion of physical production capabilities, with some companies building facilities that may occupy a space the size of a small town. In other cases, it’s a matter of enhancing the density and complexity of the technology integrated on the production line.

Production of advanced technologies, such as semiconductors, has borne the brunt of this disruption more deeply than traditional industries due to demands for strict environmental controls and manufacturing precision all the way down to the microscopic level.

The mutual implications of size and complexity are requiring new and innovative connectivity solutions to support development in this constantly evolving industry.

Challenges for Solutions Implementers

• **Long Distances + Legacy Equipment**
  In a large-sized facility such as a semiconductor fabrication plant (fab), distances between individual production areas can be very long, making it inefficient to travel between and monitor each line individually. In addition, legacy production line equipment that is too expensive to replace may offer no Internet connection.

• **Clean Room Requirements + Limited Access**
  These advanced facilities present another unique difficulty – the high-precision wafer manufacturing process requires a perfectly clean, sterile environment, making it hard to enter and leave the fab frequently to check the machinery.

• **Management Integration + Flexible MES**
  Efficiency and quality control as the result of a well-implemented and flexible manufacturing execution system (MES) is also essential for improved production results and reduced manufacturing costs. But if too much testing equipment needs to be integrated on the line, management becomes a problem. That’s why integrating test equipment and high-efficiency management solutions to perform the various testing procedures can yield enormous benefits.

• **Control Prioritization + Emergency Response**
  Also vital is prioritized control of key equipment on the production line with different levels of control for different users, such as view-only or full control for administrators. What’s more, the lack of local priority restricts on-site operators from taking control during an emergency.

• **Network Performance + Security**
  Additionally, the need to install software on both the local and remote PCs will affect those PCs’ performance and network bandwidth. Some manufacturers are wary of VNC (virtual network computing) solutions since the system’s resources will be occupied, meaning data security is not assured. This makes a KVM solution using the existing company Ethernet the ideal choice in this kind of environment.

To meet the demands of the wide variety of high-tech production environments and increase production line efficiency, ATEN has developed a series of KVM over IP solutions that provide convenient, flexible, and efficient management of production control systems and quality-testing operations.
Industry 4.0 Moves from Concept to Reality

Among the many subsets of the Internet of Things (IoT) is the Industrial Internet of Things (IIoT), also referred to as Industry 4.0. Whereas IoT can cover all devices with embedded sensor technology, IIoT refers specifically to how sensor technology is applied in industries and how said sensors’ efficiency can bring overarching benefits to the manufacturer and customer alike.

According to an IHS Markit report, worldwide shipments of IIoT devices are predicted to rise to 252 million in 2021, an increase from 99 million in 2016, showing that Industry 4.0 has already grown beyond the conceptual stage and is seeing genuine adoption across global manufacturing facilities.

High-tech manufacturing facilities are particularly well-positioned to reap the benefits of these advanced analytical processes, with the constant input of real-time data helping to ensure stable environmental control and prevent against defects occurring during the production process.

Demand for Optimized and Automated Production

As demand outpaces production speed, optimizing and automating manufacturing processes becomes critical. By 2021, 20% of the world’s top manufacturers will rely on a secure backbone of embedded intelligence to automate large-scale processes and speed execution times by up to 25%, according to IDC.

One of the most important things a company looking to optimize its production must do is to make sure its MES is Industry 4.0-ready. This includes being able to process and integrate IoT data, such as making factory-wide operations data available for use in advanced analytics.

On the hardware side, the role of robotics - which have been used in the industry for decades - will continue to grow as machine intelligence enhances these robots’ capabilities far beyond their present functions and bolsters their role in automated production. Taking these factors into account, industries will have to significantly increase their technology investments to ensure their MES and overall production methodology remains efficient enough to stay in the game. This in turn will feed demand for scalable access management solutions to allow companies to maintain centralized control of an ever-expanding technological infrastructure.

Drive for Increased Security

The benefits of increased industrial connectivity also bring new threats. While most manufacturers are still in the early phases of implementing IIoT solutions, hackers have already shown a capability for exploiting the vulnerabilities such a system creates.

Even more disconcerting is the overall lack of investment in cybersecurity, which has left the manufacturing industry the second most vulnerable to attacks after healthcare, according to a report from Manufacturing Business Technology.

However, as the industrial sector grows increasingly aware of these profound dangers, we will see a new drive among manufacturing facilities to seek out solutions that provide essential performance-enhancing, cross-factory connectivity while not putting vital operations data at risk. Therefore, the need for solutions with improved security means we will continue to see updating of legacy KVM equipment in this segment.
ATEN specializes in the design and manufacture of high-performance KVM as Remote Control & Monitoring (RCM) management solutions, helping its customers to improve efficiency, centralize management, and maintain safe operations in high-tech production line environments such as semiconductor foundry, assembly, and testing.

Our KVM over IP series of solutions can provide the following benefits:

- Reduce frequency of entering the production line / clean room
- Panel Array Mode™ to monitor multiple machines at once
- Immediate emergency response / alarm monitoring
- Instant prioritization control
- Secured authentication and authorization protocols
- Open APIs for software integration
- No impact on machine system performance

ATEN Solutions for Production Lines

ATEN’s Three Kinds of Solutions

1. **Remote Management Solution**
   - For simple remote management
   - KVM over IP Switch
   - Remote KVM Console
   - KVM Sharing Device

2. **Real-Time Monitoring Solution**
   - For remote control & monitoring
   - KVM over IP Switch
   - Access Control Box
   - Video Distribution

3. **API for Automation Solution**
   - For automatic management and data collection
   - KVM over IP Switch
   - API
   - Access Control Box
   - Remote KVM Console
   - KVM Sharing Device
   - Video Distribution

High-Tech Production Line Key Advantages

- **Remote Management Power for Real-Time Control**
  - ATEN KVM over IP solutions put supervisors and operators in complete control of all production equipment connected to over IP devices no matter where they are deployed.
  - Our solutions allow you to eliminate the distance restrictions of production line management, allowing centralized real-time operation and maintenance and enabling a faster response to emergencies.
  - Diversified port operation mode enables flexible remote access for production line operators with Occupy, Exclusive, and Share modes.

- **Priority Control for Safe, Flexible Supervision**
  - ATEN solutions offer priority control of remote and local operations in a center of manufacturing, ensuring that control of your production line equipment is always in the correct hands.
  - KVM over IP switches work with the access control box in the production line, allowing instant local over remote prioritization to take over control to ensure operational accuracy and to handle errors.
  - Solutions provide prioritized control of key equipment on the production line with different levels of control for different users.

- **Efficient Operations for Simplified Management**
  - Panel Array Mode™ allows production line administrators to display the video output of up to 64 servers on their monitors at the same time, dramatically increasing efficiency, especially for equipment testing.
  - A user-friendly toolbar within the KVM user interface provides convenient management through configurable function icons.
  - Broadcast Mode allows the installer to simultaneously handle and copy actions to all computers at once. Keyboard input, mouse input, or both, can be broadcast across multiple PCs or Macs simultaneously, instead of weaving between all the PCs.

- **Secured Data for No Risk + Zero Impact on Performance**
  - Our KVM over IP solutions for production lines increase security and reduce risk by utilizing the industry’s highest security authentication and encryption standards and protocols.
  - ATEN offers remote management of your production facility’s entire IT infrastructure without the use of VNC software, further ensuring the security of your data, with zero impact on your production line PC’s performance and bandwidth.

- **Scalable, Customizable for Future-Proof Solutions**
  - Our extensive line of over IP KVM switches provides flexible, scalable solutions ensured to future-proof your high-tech production line environment against changes such as additions of newer manufacturing equipment.
  - Customized APIs for software integration applications and automated actions.
  - Cascading and daisy-chaining allows for a fully scalable KVM production line management solution that grows in step with your business.

- **Superior Video up to 4K for Seamless Visual Experience**
  - High-definition images up to 4K make ATEN KVM over IP solutions an excellent choice for production environments in which high resolution monitoring is required.
  - ATEN’s unique Auto Signal Compensation (ASC), Real Visual compression, and patented Deskew technologies correct signal distortions that occur over long distances to provide clear, sharp, optimized video to remote displays to avoid impairment of the operator’s experience.
ATEN High-Tech Production Line
Solutions in Action

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02 API for Automation and Data Collection
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Remote Monitoring and Control

In addition to it being highly inconvenient to get in and out of clean room production environments, in large-sized manufacturing facilities with vast floor areas, distances between individual production areas can be so huge that it is virtually impossible to physically monitor each line individually. This, along with the inconvenience and wasted effort of constantly moving from one industrial PC to another as well as the costs of purchasing a separate keyboard, mouse, and monitor for each computer, adds up to high costs in terms of both technology and personnel. Furthermore, control rooms for remote monitoring purposes can be hindered by solutions that do not provide suitable conditions for effective troubleshooting and fast decision making.

Multiple Clean Room Environment with Control Room, Taiwan

A high-end manufacturing company had a huge facility area with multiple clean rooms that made running physical maintenance both time-consuming and costly, so they required a remote monitoring solution that provided complete system management across all facilities and significantly lowered response times. They also needed a control room that facilitated efficient remote troubleshooting by allowing remote admins to log into the same servers at the same time.
**API for Automation and Data Collection**

Production line automation faces many challenges, from data collection and checking data accuracy, to recipe automation and error detection. In many cases, it is not only difficult to identify production information feedback, but also to assess the type of system warning, while the manual selection of recipes are prone to human error. Before OCR automation, service operations had to be performed manually by operators who needed to suit up and enter the fab, and errors had to be confirmed by manual inspection. These situations require solutions that allow machine information data to be effectively identified in an automated process for analysis to be carried out, and errors to be processed automatically and immediately, while also improving equipment utilization rates and preventing human operation error.

**Automated Semiconductor Production Line, Taiwan**

A manufacturer wanted to install a new automated control solution that would integrate with its production line MES and perform checks and corrections for tests, emergency handling, automatic run recipes, data collection, and keep system logs. Its running production equipment does not support open Application Program Interfaces (APIs), while an installed software would use too much of the machine’s system resources and impact utilization rate. Even machine vendors do not provide this kind of upgrade.

**Challenges**

- Requires a secure solution that can process KVM information and correctly identify production information feedback
- Needs to integrate with MES and to facilitate data collection for analysis
- How to replace human operation
- No impact to the production line utilization

**Solutions**

- Provides security and reliability as there is no data transfer between the manufacturing machines and the KVM over IP
- Provides APIs for software integration applications while OCR solution directly captures the device display screen data and collects the data for analysis
- Provides APIs for HMI operation by software program for automated actions
- Hardware architecture does not impact or reduce system performance of the production line machines

**API**

**KN4116A**
16-Port Cat 5 KVM over IP Switch with Virtual Media

**CS231**
USB VGA Computer Sharing Device

**API**
Electronics Testing and Quality Control

Electronics Testing and Quality Control

Engineers assembling a system for electronics testing and quality control have to ensure that said system can guarantee that all products are built to exact specifications. This means that all racks in the testing environment must have the ability to operate, configure, and test every available computer and software platform before being shipped. While getting devices through the configuration process can be time consuming, and reducing machine wait time without sacrificing quality of the testing procedure is vital, engineers must also grapple with the challenge of products being tested in multiple labs in different locations. This necessitates KVM solutions that allow for remote operations along with the ability to monitor the status of all products being tested.

Electronics Manufacturer, USA

This company is a global provider of products, services, and solutions to industrial and commercial users of electronic components and enterprise computing solutions. They serve as a supply channel partner for more than 900 suppliers and 125,000 original equipment manufacturers (OEMs), contract manufacturers and commercial customers through a global network of more than 310 locations in 51 countries and territories. They were looking for a solution that allowed engineering support personnel to perform troubleshooting on all of the units being tested on the rack without interrupting the technician at the local console or compromising the integrity of the testing.
Remote Operations and IT Maintenance

Speeding up operations and improving troubleshooting efficiency in a manufacturing environment is not only related to emergencies. While remote operation solutions can help to remove the need for troubleshooting personnel to be constantly present on the factory floor, there are day-to-day operations where centralized remote access can also be a great advantage. For example, IT managers in production line environments are often required to configure and set up many computers with repeat keyboard/mouse operations for mass deployment or refurbishing computers, which is time consuming and frustrating. Solutions that boost efficiency in this area must be able to broadcast keyboard input, mouse input, or both, across multiple PCs or Macs simultaneously, instead of weaving between all the PCs. Further requirements are keyboard macro features that allow IT staff to record their own keyboard macros and recall the functions with hotkeys to increase work efficiency.

Manufacturing Production Line, UK

A large manufacturing company needed a way to not only selectively and remotely monitor multiple production line servers but also to quickly and easily maintain and update them. The servers were positioned at various locations across the large manufacturing facilities. With up to 16 simultaneous computer installations required per individual production line, the solution needed to be able to send installation steps to each of the computers using files taken from a central storage system. It was also required that if something were to happen on a specific server, the operators would be able able to view and act upon it immediately by taking control from wherever they are.

Challenges

- Needed a convenient and secure solution to enable constant monitoring of server status when broadcasting commands
- Provide process enhancement to shorten the time to install and update a large amount of PCs and servers
- Provide ability to selectively and intuitively monitor attached servers
- Required OS flexibility and accessibility to a variety of operating systems while on the go

Solutions

- ATEN KVM over IP Console Station Series provides dual-view display for both monitoring and broadcasting commands
- Broadcast Mode allows the installer to simultaneously handle and copy actions to all computers at once
- Panel Array Mode allows support personnel to monitor the video output of up to 64 servers on one screen simultaneously
- PadClient app allows swift surveillance and access to the servers via KVM switches
Critical Monitoring and Control

Critical monitoring concerns are challenging because supervisors and remote engineers need to take remote control of non-personnel areas and provide support for field engineers. Solutions that provide customized firmware to work in conjunction with access priority components can help to prevent accidents in these situations. Another issue that engineers must consider is that system resources might be occupied, which can create a data security issue if a software solution such as VNC is enabled. It’s up to engineers to incorporate a KVM solution that provides critical monitoring and control along with secure access and high-quality data throughput between the consoles and analytical servers over extended distances that also incorporates emergency access prioritization.

Panel Fabrication, South Korea

A global manufacturer of LCD panels has several manufacturing and module assembly plants. The production equipment is extremely expensive and requires 3-shift engineers for full-time operation, with two engineers handling the control system for individual equipment, one in the fab clean room doing field operation and another in the control room doing remote monitoring. The supervisor needed a solution to provide them priority access, allowing them to take remote control of areas without staff.

Solutions

- Remote access allows instant visibility for supervisors
- Provides ability for remote engineers to take remote control of non-staffed areas and the access control box with priority access when needed
- Remote engineer can monitor four browsers on one screen via Web-based GUI
- KVM over IP solution takes up minimal space while allowing for experienced engineers to set up new production lines more efficiently
Critical Monitoring and Quality Control in 4K

For production environments in which high-resolution monitoring is required, 4K over IP solutions can be an excellent choice. For example, automotive production companies need to invest heavily in their IT infrastructure to provide operators with ultra-high resolution, low-latency monitoring and access to every analytical server, allowing them to ensure internal compliance at all times. Creating a system integrating consolidated, remote, multi-operator access for various types of analytical servers without loss of video quality is an engineer’s most important responsibility in this environment. Often, each operator needs to have access to only their own dedicated servers to avoid tarnished results, meaning that test reports and record logs of the testing procedure remain uncompromised. Solutions also need to provide access to servers from many locations, including different testing rooms and overseas facilities.

Standards Testing for Automotive Industry, USA

A leading car manufacturer in the UK relies heavily on high-end analytical systems to ensure every vehicle is compliant with the emissions targets in each export market. The company therefore needed a solution that would allow them to consolidate remote monitoring and control of the different system servers while providing secure access to help prevent mistakes during the testing process. It also had to provide high-resolution monitoring with low latency.
ATEN International Co., Ltd., established in 1979, is the leading provider of AV/IT connectivity and management solutions. Offering integrated KVM, professional AV, and intelligent power solutions, ATEN products connect, manage, and optimize AV/IT equipment in corporate, government, education, broadcasting and media, and transportation environments. ATEN has 570+ issued international patents and a global R&D team that produces a constant stream of innovative solutions, resulting in a comprehensive portfolio of products available worldwide.