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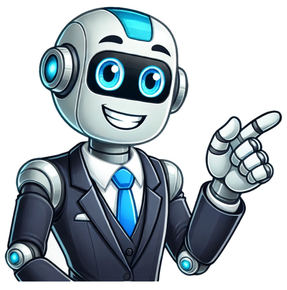

Manufacturing is under pressure. Supply chains are stretched. Energy costs remain unpredictable. Customers expect speed, precision and consistency. The old ways of operating are no longer enough. These pressures are forcing a complete reassessment of how manufacturing works. Many are turning to smart manufacturing. Not just to streamline production, but to compete more effectively and build resilience that lasts.But what does it actually involve? And where should manufacturers begin?This article explains the essentials, the technologies involved, and why connectivity is central to making it all work.What is smart manufacturing?Smart manufacturing connects people, machines and systems through real-time data and responsive technology. It goes beyond traditional automation by enabling systems to learn, adapt and respond without manual input.At its core, it uses tools like artificial intelligence (AI), industrial IoT (IIoT), edge computing and 5G private networks to create a production environment thats responsive and efficient.Unlike traditional automation, smart manufacturing systems can adapt. They learn from data, spot patterns and adjust without manual intervention. That means faster decisions, fewer disruptions and better use of resources.Its also big business. The smart manufacturing market is forecast to top $790 billion by 2030, according to Grand View Research.Smart manufacturing and industry 4.0Smart manufacturing is a central component of Industry 4.0, the ongoing transformation of manufacturing through the integration of digital and physical systems. This shift marks a move from linear, rigid production models to adaptive, intelligent environments that are always connected and constantly optimising.In practice, this means embedding connectivity and computation across the value chain. From raw materials to customer delivery, data drives every decision. For large manufacturers, this transition is not just about automating individual tasks. It is about architecting digital operations that can flex in real time, predict change, and respond with precision.Cloud platforms are also relevant to this shift for companies operatingmulti-site ormulti-country to centralise data analysis andreporting. Today, 57% of manufacturers run operations and manage data through cloud infrastructure. Industry 4.0 is not a single destination. Its a journey towards intelligent operations, where the edge, the cloud and the network are aligned to support agility at scale.Smart manufacturing is not just about deploying new technologiesits about orchestrating them to solve real operational challenges. We recently successfully connected over 130 machines in a large factory in Italy, many of which were previously isolated, into a unified IIoT framework. This allowed the customer to capture and act on real-time data, improving overall equipment effectiveness (OEE) and enabling predictive insights. The result is a more agile, efficient and resilient manufacturing environment thats ready to scale.Giovanni DAngelo, Head of IoT Solutions, Three Group Solutions The benefits of smart manufacturingSmart manufacturing addresses real-world challenges. It helps resolve persistent bottlenecks and improves outcomes that matter on the shop floor and in the boardroom.Operational efficiencySmart manufacturing improves efficiency by connecting systems and streamlining workflows. Machine learning can dynamically adjust production schedules based on supply availability, reducing idle time. People are freed from repetitive tasks and focused on where they add value.The result is more output with fewer delays and better utilisation of assets. With global smart manufacturing revenues projected to nearly double between 2025 and 2030, these operational gains are proving to be financially significant.AgilitySmart systems help manufacturers respond faster. When faced with supply delays or market shifts, production plans and sourcing strategies can be adjusted quickly and confidently. This agility stems from real-time visibility across operations, enabling teams to act on live data instead of relying on outdated reports.Predictive maintenanceDowntime is one of the biggest costs in manufacturing. By combining IoT sensors with AI, manufacturers can monitor asset health and predict when machines are likely to fail. This allows teams to schedule repairs in advance, avoid unplanned downtime and extend the life of critical assets.SustainabilitySustainability is increasingly a board-level priority. Smart manufacturing supports greener operations by monitoring energy use, optimising resource allocation and reducing waste. Real-time data enables continuous efficiency improvements and helps manufacturers report against ESG goals with confidence and accuracy.Quality controlDefects and rework cost time and money. Smart manufacturing uses sensors and real-time analytics to monitor product quality at every stage. AI systems detect anomalies early, preventing errors from cascading down the line. This leads to more consistent output and fewer customer complaints.Cost savingsEvery improvement listed above contributes directly to the bottom line. Whether through reduced downtime, better forecasting, lower energy consumption or smarter inventory management, smart manufacturing drives efficiency gains that compound over time. It is not just an operational win, it is a financial one.In short, it delivers better outcomes with fewer inputs, and the ability to scale what works.The technology behind smart manufacturingSmart manufacturing relies on tightly integrated systems that can communicate, process and act in real time. These are the technologies that make it possible.Artificial intelligenceAI is the analytical engine of smart manufacturing. It identifies patterns in data that would be impossible to spot manually. From forecasting demand to optimising batch production and adjusting quality control thresholds, AI helps factories operate with intelligence, not just automation. As models continue to learn from new data, the system becomes more efficient over time.Industrial IoT (IIoT)IIoT connects physical assets to digital systems. Sensors embedded in machinery, vehicles, or inventory provide a real-time feed of operational data, from temperature and vibration to flow rates and equipment status. This visibility is foundational for everything from predictive maintenance to just-in-time manufacturing. The volume of connected devices is growing rapidly, with 5G-enabled industrial IoT unit sales expected to reach 22.3 million by 2030.For a closer look at how IoT is transforming logistics and supply chains, see our article on logistics IoT.Edge computingEdge computing processes data closer to where it is generated, such as on a production line or in a warehouse. This allows decisions to be made instantly, without needing to send information to a central cloud. In latency-sensitive applications like robotic control or safety monitoring, edge computing ensures responsiveness and reliability, while also reducing bandwidth use.Private 5G networksPrivate 5G offers ultra-low latency, high throughput and guaranteed bandwidth across large or complex facilities. This is critical for smart manufacturing, where thousands of devices and sensors need to communicate simultaneously without delay or interference. Private networks also provide enhanced security and greater control than public options, helping manufacturers maintain uptime and protect IP. 42% of manufacturers now use 5G in their operations, with strong uptake in robotics, AR-enabled maintenance and real-time analytics.The market for private LTE and 5G networks is projected to surge from 1.8 billion dollars in 2022 to over 41.8 billion dollars by 2030, reflecting the growing demand for dedicated wireless infrastructure across industrial environments.Digital twins and simulationDigital twins create real-time digital representations of physical systems. They allow teams to simulate changes to processes, test new configurations and optimise factory layouts before implementing changes in the real world. Combined with AI, digital twins can also anticipate issues and suggest process improvements, making them a powerful tool for continuous improvement.Together, these technologies enable a new model of manufacturing, one that is adaptive, intelligent and connected end-to-end.Getting started with smart manufacturingSmart manufacturing often begins with a trial. One production line. One facility. But the real impact comes when it scales across the business.To succeed, manufacturers need:A clear strategy linked to business outcomesNetwork infrastructure that can support real-time dataTeams that collaborate across IT, operations and leadershipPlatforms that can scale from site to enterpriseChange plans that address skills, culture and processConnectivity is often the missing link. Without fast, secure and resilient networks, data stays siloed, decisions lag and opportunities are missed.How Three Group Solutions helpsSmart manufacturing depends on intelligent connectivity. Three Group Solutions provides the foundation to support high-performance, always-on operations, from 5G private networks to managed IoT solutions.Whether you are retrofitting legacy sites or building new smart facilities, our enterprise connectivity solutions help you move faster, operate smarter and compete harder.For smart manufacturing to deliver, the infrastructure must be just as smart. Contact us to find out more. We were the first operator to offer mobile broadband anywhere in the world over 10 years ago, and since then, Three has continued to lead the way by offering people what they really want. A career with Three offers you the opportunity to grow and achieve things to be proud of in a fast paced, supportive and rewarding environment. Sounds like you? 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We will not be liable to you for any loss or damage, whether in contract, tort (including negligence), breach of statutory duty, or otherwise, even if foreseeable, arising under or in connection with use of, or inability to use, our site, or use of or reliance on any content displayed on our site. We will not be liable for loss of profits, sales, business, or revenue; business interruption; loss of anticipated savings; loss of business opportunity, goodwill or reputation; or any indirect or consequential loss or damage. Nothing in these terms excludes or limits in any way our liability to you where it would be unlawful to do so. We are not responsible for viruses and you must not introduce them We do not guarantee that our site will be secure or free from bugs or viruses. You are responsible for configuring your IT, computer programmes and platform to access our site. You should use your own virus protection software. Changes We amend these terms from time to time. These terms were most recently updated on 6 December 2018. Disputes and governing laws These terms of use, their subject matter and their formation (and any non-contractual disputes or claims) are governed by English law. We both agree to the exclusive jurisdiction of the courts of England and Wales. Manufacturing is under pressure. Supply chains are stretched. Energy costs remain... Fleet management doesnt often make headlines. But behind the scenes, its where many... Industrial IoT (IIoT) is moving rapidly from buzzword to boardroom priority. As... As businesses demand faster, smarter and more adaptable connectivity, network slicing is becoming a key capability of 5G. By allowing multiple virtual networks to run on the same physical infrastructure, 5G network slicing opens up new possibilities for innovation, efficiency and control.In this guide, well explain what network slicing is, how it works, the benefits it brings, and provide real-world network slicing examples across key industries.What is network slicing?Network slicing is a 5G technology that allows operators to create multiple virtual networks on a shared physical infrastructure. Each slice is tailored to meet specific requirements. For example, speed, latency or security, so different services can run in parallel without interfering with each other.The key advantage of network slicing is that it allows different services to operate independently on the same network. For example, a slice for autonomous vehicles can be optimised for ultra-low latency and reliability, while another for video streaming can prioritise high bandwidth.Each slice is isolated, supporting new service deployment without infrastructure changes and ensuring that performance issues in one do not affect others.By separating different types of traffic, network slicing also enhances security, reducing the risk of cyberattacks and data breaches. It optimises resource utilisation too, making sure that critical services receive the capacity they need while maintaining overall network efficiency.How does 5G network slicing work?Network slicing is a way to divide a single physical network into multiple virtual networks, each designed to meet specific needs. You can think of it like a pizza with different toppings: each slice of pizza represents a virtual network, and just as you can customise toppings for each slice, network slicing allows you to customise the network characteristics for each slice.Network slicing divides the network into three main layers: the network slice forwarding layer, the network slice control layer, and the network slice management layer. This layer is responsible for allocating and isolating network resources such as bandwidth and latency. Techniques like flexible ethernet (FlexE) sub-interfaces and hierarchical quality of service (HQoS) are used to ensure that each slice receives its allocated resources without interference from other slices. The control layer creates logical network instances and configures their topology. It consists of control and data planes: the control plane manages network slice information, while the data plane forwards resources based on slice requirements. Segment routing and flexible algorithm technologies to manage the network slice control layer. This layer oversees the lifecycle of network slices, including planning, deployment, maintenance and optimisation. It ensures that slices meet specific service-level agreements (SLAs) and can adapt dynamically to changing demands.There are four steps to implementing these three components:Dividing the network: The physical network is divided into virtual slices. Each slice can have its own set of rules for how data is handled, such as speed, security, and priority.Customising each slice: Each virtual network (or slice) is tailored to serve a particular purpose. For example, one slice might be optimized for fast video streaming, while another is designed for secure communication in banking.Managing slices: A management system oversees these slices, ensuring they operate independently and efficiently. This means if one slice experiences issues, it wont affect the others.Resource allocation: Resources like bandwidth and processing power are allocated to each slice based on its needs. This ensures that each slice performs optimally without wasting resources.In essence, network slicing makes networks more flexible and efficient by allowing multiple services to share the same infrastructure while maintaining their unique requirements.In essence, network slicing makes networks more flexible and efficient by allowing multiple services to share the same infrastructure while maintaining their unique requirements.The benefits of network slicingNow weve explored how network slicing works, well share the top reasons businesses are using it:Improved efficiencyHaving the ability to customise each section of the network means that businesses can use their resources more wisely so they dont waste money or capacity on services that dont need it. This smart use of resources can lead to lower costs because companies dont have to buy more than they really need.Operational flexibilityWith network slicing you can create special sections of the network that can be adjusted to meet specific needs. For example, one section can be designed for fast video streaming, while another can be set up for secure banking transactions. Businesses can quickly create or change network sections based on whats happening in real-time. This means they can make quick adjustments to adapt quickly to new demands or problems.Enable new revenue streamsOnce youre able to utilise 5G network slicing, it opens up new ways for businesses to offer unique services, which can create competitive advantage. For example dedicated network slices for IoT devices can support a wide range of applications, from smart manufacturing to public safety, allowing businesses to innovate and expand their offerings. Event organisers could offer temporary network slices for events ensuring optimal network performance even in crowded areas and a new revenue source.Enhance security and quality of serviceEach network slice can operate independently, which makes it safer. If theres a problem in one section, it wont affect the others. This separation is especially important for critical services like emergency response systems, where safety and reliability are crucial. Reliable performance is also especially important for applications that require quick responses and high quality of service, such as autonomous vehicles.In summary, network slicing makes networks more flexible, efficient and secure, allowing different services to thrive without interfering with each other.Network slicing use casesMany industries benefit from network slicing. Here are a few examples:Emergency servicesNetwork slicing is invaluable for emergency services as it creates isolated virtual networks to provide emergency responders uninterrupted access to critical applications, even during network congestion. This technology supports real-time video streaming, mission-critical push-to-talk, and other advanced tools, enhancing coordination and decision-making.Additionally, network slicing allows for dynamic resource allocation, ensuring that emergency services receive priority access to network resources when needed, which is crucial for saving lives and responding effectively to emergencies. This flexibility and reliability make network slicing a game-changer for public safety communications. Read network slicing where it matters most for an example of our work.HealthcareHospitals are another environment with a need to prioritise critical communications, ensuring seamless connectivity for real-time applications like remote consultations and surgeries. Network slicing supports advanced medical applications, such as remote surgery and telemedicine, by guaranteeing ultra-low latency and high bandwidth.This technology enhances patient care by facilitating real-time data exchange and ensuring that medical services operate efficiently and securely. It also supports remote patient monitoring and emergency response systems effectively. Read more about the rise of robotic surgical procedures from the American College of Surgeons.Industrial automationIn manufacturing, network slices can be tailored for specific applications or systems, such as robotic assembly lines, inventory management and quality control. Each slice can be optimised for unique requirements like bandwidth, latency and reliability, ensuring that systems operate efficiently and securely.For instance, a manufacturing plant can create separate slices for different automation protocols like ethernet or modbus, ensuring that each system receives the necessary resources without interference from other systems.This not only enhances operational efficiency and security but also supports the integration of new technologies and protocols, allowing industries to stay at the forefront of innovation. By dynamically allocating resources and isolating traffic, network slicing helps prevent disruptions and cyber threats, making it a crucial component for modern industrial automation.Autonomous vehiclesNetwork slicing helps create special pathways for data to travel quickly and reliably, which is crucial for autonomous vehicles. It allows cars to communicate with each other and their surroundings in real-time, helping prevent accidents and improve traffic flow.This technology supports features like synchronised driving, where vehicles move together to save fuel. It also ensures that important safety messages get priority over less urgent data, like entertainment. By dedicating specific pathways for different tasks, network slicing helps autonomous vehicles operate safely and efficiently, even when networks are busy.This enhances overall road safety and vehicle performance. In industrial settings, there is often a mix of autonomous and human driven vehicles so a slice dedicated to vehicle-to-everything (V2X) communication ensures that vehicles can communicate with traffic signals, other vehicles, and control centres to enhance safety and efficiency.Final thoughts5G network slicing is set to transform the way we use and manage networks. Its ability to create customised virtual networks on a single infrastructure offers unparalleled flexibility, efficiency and security. As the technology continues to evolve, we can expect to see even more innovative applications and services emerge.Explore network slicing solutionsIf you're interested in exploring network slicing solutions for your business, Three Group Solutions can help you leverage the full potential of 5G network slicing to enhance your operations and deliver superior services to your customers. Contact us using the form below or read more about our private network services here. Improved visibility of operations results in improved employee safety when smart factories transition from reactive management to remote and global prediction. A connected workforce is empowered to deliver a high standard of quality and increased efficiency, benefitting from worker upskilling and critical insights. Predictive maintenance improves machine uptime allowing the smart factory to transition from reactive management with greater control. Intelligent production increases overall efficiency in operations as smart factories move past static and manual production, taking advantage connected manufacturing solutions. Technology solutions can improve inventory management and provide transparency, removing reliance on manual tracking, along with the time spent reporting.

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