WHITE PAPER

Fortinet Manufacturing Cybersecurity Solutions

Protecting IT and OT Resources Against Advanced Threats in Manufacturing with a Single Platform

Executive Summary

Manufacturing organizations manage expensive and sophisticated equipment at their factories—and the systems that run the machinery are increasingly being connected to the internet. The cybersecurity implications of this trend are significant, including possible threats to physical safety, and in some cases, national security. Companies strive to secure their systems while maintaining business imperatives like operational efficiency, continuity of operations, product integrity, and compliance. The Fortinet Security Fabric provides a broad, integrated, and automated security architecture that covers all aspects of the manufacturing business—from the back office to the manufacturing floor, from air-gapped systems to connected ones, from internal users to third-party partners.

Exploits increased in volume and prevalence in the past year for almost every ICS/SCADA vendor. [4]

The story of today's manufacturing sector is a story of convergence. Companies that previously produced products independently now work closely with a network of partners who perform different parts of the process.[1] And the electronic systems that run factory operations, which were historically air gapped, are increasingly being connected with IT systems—and therefore with the internet. As a result, these operational technology (OT) systems, including industrial control systems (ICS) and supervisory control and data acquisition (SCADA) systems, are exposed to an increasingly advanced threat landscape and are targets for hackers involved in terrorism, cyber warfare, and espionage.

As air gaps are removed around the world, OT systems are increasingly barraged with both recycled IT-based attacks and purpose-built OT exploits.[2] One survey finds that 74% of OT professionals had experienced a breach in the past 12 months.[3] Attacks on the manufacturing sector's critical infrastructure can result in financial loss, a risk to brand reputation, and sometimes even loss of life or threats to national security.

Fortinet has protected OT environments in critical infrastructure sectors such as energy, defense, manufacturing, food, and transportation since 2005. By designing cybersecurity into these complex infrastructures via the Fortinet Security Fabric, organizations can integrate cybersecurity protection across OT and IT environments, from the manufacturing floor to the data center to multiple clouds.

Key Manufacturing Cybersecurity Challenges

Plant, worker, and community safety

Manufacturing facilities contain machinery that can cause physical injury or death if it malfunctions or is not operated correctly. In the current threat landscape, adversaries aiming to disrupt operations with a cyber-physical attack can create safety risk for onsite employees and even nearby residents and passers-by.[5] In addition, attacks can affect the safety of products produced at a factory, extending the risk over a wide geography.

At most organizations, siloed systems for IT, OT, and physical security is the default—and this does not help matters. Integrating just the IT security architecture between the data center, multiple clouds, and the edge is hard enough. But in an age when adversaries can coordinate cyber and physical attacks simultaneously, integrating all elements of security with centralized visibility may be the only viable way to protect human life.

Productivity and uptime

Any unplanned interruption in operations can incur significant costs to a manufacturer, and the outage can create problems that cascade down distribution channels and up the supply chain. Unfortunately, many cyberattacks on manufacturers aim to cause just such a disruption. Others seek to move laterally within the network once they get in, but the attack can still have an impact on operations.

Because they were historically air gapped and system updates are less frequent, OT systems often have less sophisticated cybersecurity protection than IT systems. As a result, they are frequently targeted by cyber criminals on the premise that they are relatively easy to infiltrate.[6] Even air-gapped OT systems can be infiltrated by infecting manufacturers' software updates before they are installed.

Operational efficiency
Siloed security operations resulting from a lack of integration between different security tools inevitably increases operational inefficiencies. Without integration, manual tasks such as correlating log reports from different systems and assembling compliance reports waste the time of highly paid cybersecurity professionals and distract from more strategic work.

Architectural silos also create redundancies in the management of applications. A plethora of point products requires a bigger set of specific product skills to be represented on an overworked cybersecurity team. They can also result in higher software and hardware licensing costs—and the staff time to administer the multiple licenses. These factors can significantly increase overall operational expenses.

Customer experience
Whether their products are for consumers or businesses, manufacturers now routinely engage with customers in a highly targeted way, using social media and other engagement tools alongside the web presence. But these legitimate efforts can be countered by cyber criminals who manipulate social networks for profit. One study found that more than half of the world's social media accounts are fraudulent.[7]

Securing web properties and social media interactions is paramount for manufacturers, as the loss of data from potential customers in the early stages of the buying cycle could be devastating to a company's reputation. Other factors such as website downtime, temporary unavailability of product due to production outages, and the like can negatively impact customer experience.

Product integrity
Degradation of product quality—even if temporary—can be disastrous for a brand's reputation. For example, if a cyberattack affects a food processor's OT system in such a way that temperature is slightly changed or cooking time is slightly altered, spoilage or degraded product quality can occur. Depending on the product, this can also affect customers' physical health and safety.

Compliance
Depending on what goods they are making, manufacturers are subject to a wide variety of regulations and standards. Penalties for noncompliance are sometimes high, but an even higher cost often comes from diminished brand reputation in the event of a breach.[8]

Organizations must be able to demonstrate compliance with multiple regulations and standards without redeploying staff from strategic initiatives to preparing audit reports—which wastes valuable staff time and opens the possibility of human error in the reporting. Manual correlation of data for audit reports is almost always necessary with a disaggregated cybersecurity infrastructure.

Use Cases

Following are the key use cases Fortinet solutions enable manufacturers to solve:

"[C]yber-physical attacks have been touted as a serious threat for several years. But in recent years, these attacks have crept from theory to reality."[9]

53% of logins to social media sites and 25% of new account applications are fraudulent.[10]

Corporate infrastructure

While the factory floor is the center of production, manufacturing companies have similar corporate IT needs to organizations in other industries. This corporate IT network houses important data related to finance, intellectual property, HR, product support, field support, and more. As with other industries, manufacturers are increasingly reliant on cloud-based applications and infrastructure,[11] and Internet-of-Things (IoT) devices are growing in number at the network edge.[12]

45% of SCADA/ICS operators do not use role-based access control.[14]

Whatever sensitive data is housed there, the corporate infrastructure needs a broad, integrated, and automated cybersecurity solution with end-to-end integration. The Fortinet Security Fabric provides just such a solution, built on the foundation of FortiGate next-generation firewalls (NGFWs) and artificial intelligence (AI)-powered threat intelligence from FortiGuard Labs. A wide array of Fortinet cybersecurity tools integrates seamlessly into the Security Fabric, along with dozens of third-party solutions delivered by Fabric Partners. And an open ecosystem and extensive application programming interface (API) tools make the integration of other third-party tools possible.

Air-gapped manufacturing systems

While the majority of OT systems are now connected to IT systems, recent research by Forrester finds that 40% of OT systems are still air gapped—that is, not connected to any other network.[13] While one might assume that such systems are safe from cyberattacks, they still use IP-based control systems and administrators still install software updates provided by the manufacturer. This gives adversaries an opening to penetrate a system by infecting the updates through the vendor's network. And while air-gapped systems may not contain sensitive data, infiltrations can cause costly disruptions and safety issues.

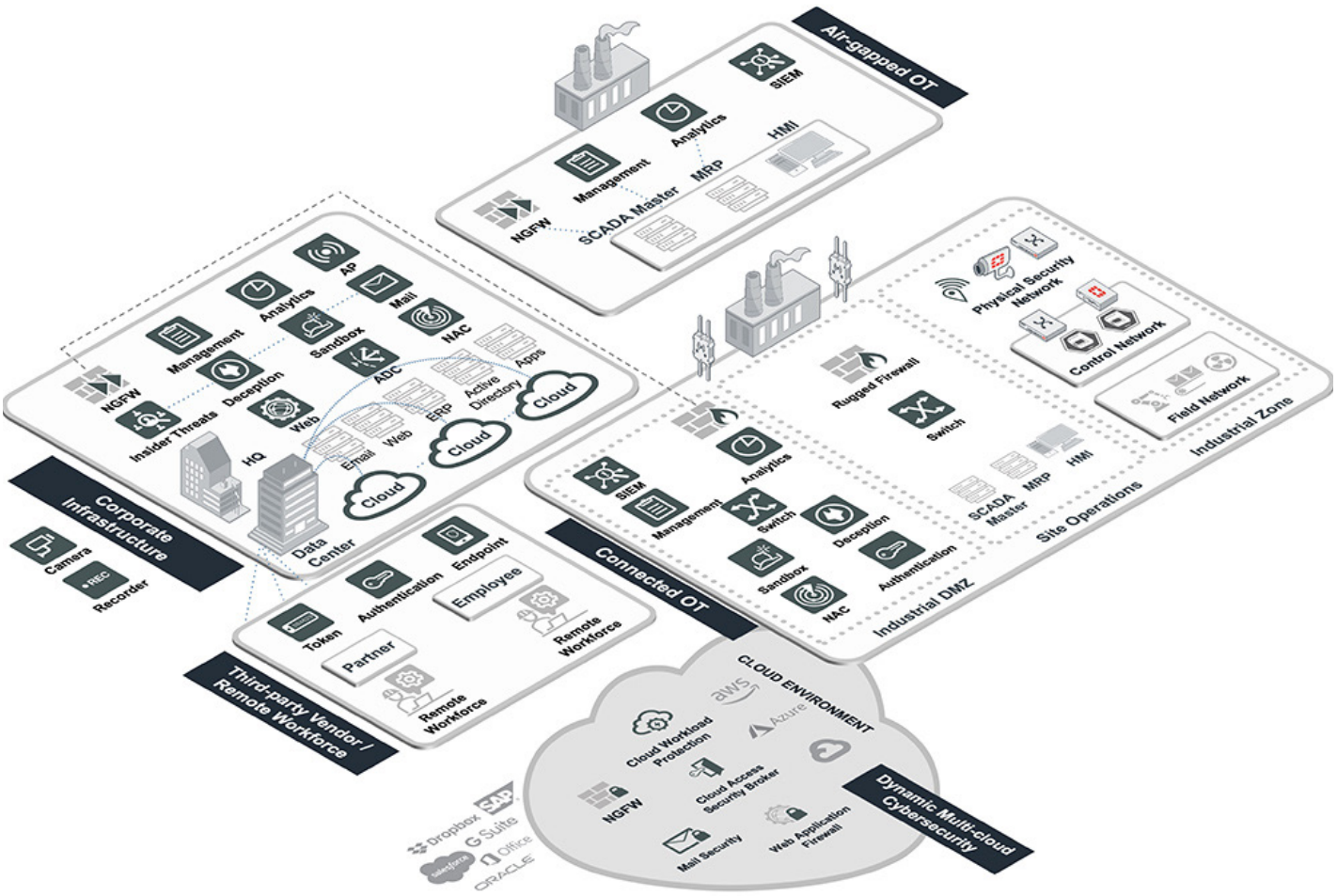
As a result, NGFW protection is required even for air-gapped systems, and this must be accompanied with comprehensive cybersecurity tracking and reporting. FortiGate NGFWs provide robust protection and industry-leading performance when inspecting both encrypted and unencrypted traffic. FortiManager provides single-pane-of-glass management and a variety of reporting tools. FortiAnalyzer delivers analytics-powered cybersecurity and log management for maximum visibility and better detection of breaches. The FortiSIEM cybersecurity information and event management tool enables a coordinated and automated response to attacks.

Connected manufacturing systems

As discussed, digital transformation and the need for business agility are creating increasing co-dependence between IT and OT. From industrial IoT sensors that monitor manufacturing operations to systems that pull publicly available data from the internet to facilitate decision-making, OT systems are less and less isolated. From a cybersecurity perspective, the main result of this convergence is a greatly expanded attack surface. And since OT systems often are not patched consistently, weakening cybersecurity protection, this presents risk to an organization in the short term.

But if cybersecurity issues can be resolved, the potential is great for combining IT and automation networks into a single, secure, manageable, and converged environment. Cybersecurity teams must have centralized visibility into all systems, the ability to segment the network according to business need, and centralized control of both wired and wireless networks.

The Fortinet Security Fabric covers the entire attack surface, giving broad visibility into who is on the network and what they are doing. It also provides integrated control over each system to ensure that it does what it is supposed to do. Additionally, the Security Fabric enables intelligent segmentation to provide greater control, and automated awareness of known and unknown threats. Built on the foundation of FortiGate NGFWs and AI-powered threat intelligence from FortiGuard Labs, the Security Fabric provides seamless integration with dozens of cybersecurity tools from Fortinet and its Fabric Partners.



Fortinet manufacturing cybersecurity solutions enable companies to build an end-to-end, integrated security architecture spanning IT, OT, and physical security, extending from headquarters to the manufacturing plant while covering internal users and those from third-party partners.

Third-party vendor management

As the industry moves in the direction of a Manufacturing-as-a-Service (MaaS) model,[15] third parties have more access than ever before to corporate networks and OT systems. This complicates the notion of the trusted user and forces organizations to continually assess their protection against insider threats—including from third parties. Keeping track of each partner's cybersecurity posture through regular vetting is critical. Organizations also need robust protection against insider threats, whether those threats are accidental or malicious, and whether they come from within the company or from an element of the partner network.

The integrated solutions of the Fortinet Security Fabric provide a multilayered defense against these threats. Intent-based segmentation capabilities in FortiGate NGFWs allow organizations to segment their network intelligently in a world of dynamic trust. The FortiAuthenticator identity and access management solution and FortiToken tokens leverage that segmentation in granting access to users on a need-to-know basis. FortiInsight uses user and entity behavior analytics (UEBA) to identify anomalies in the expected behavior of trusted users and entities that might indicate a compromised account. And FortiDeceptor uses deception technology to deceive, expose, and eliminate attacks originating from internal and external sources.

Multi-cloud cybersecurity

Manufacturers are adopting cloud-based services at a rapid clip.[16] Many now have cloud-based manufacturing resource planning (MRP) and enterprise resource planning (ERP) systems. These systems often pull data from both IT and OT systems for quick and effective decision-making, a process called digital twinning. Cloud-based solutions are also routinely used for services that impact customer experience. Protecting cybersecurity for these assets is critical, meaning that an organization's integrated cybersecurity architecture must extend from the data center to OT systems to multiple clouds.

The Fortinet Security Fabric enables comprehensive protection for the multi-cloud environment, ensuring consistent policy management, configuration management, and threat detection and response across the entire attack surface. FortiGate VM brings the NGFW to a virtual machine that works well for cloud environments, and the FortiWeb web application firewall (WAF), which is available in several form factors, protects the application layer with in-line, AI-powered threat intelligence.

The FortiCASB cloud access security broker (CASB) service provides insights into resources, users, behaviors, and data stored in the cloud with comprehensive reporting tools. This enables advanced policy controls to be extended to Infrastructure-as-a-Service (IaaS) resources and Software-as-a-Service (SaaS) applications. The FortiCWP cloud workload protection (CWP) tool enables cybersecurity and DevOps teams to evaluate their cloud configuration cybersecurity posture and identify potential threats resulting from misconfigurations.

Fortinet Differentiators

Fortinet differentiators for manufacturing cybersecurity

Fortinet solutions offer manufacturers the ability to protect everything across their diverse OT and IT networks. Key differentiators include:

- **Integration**
  Fortinet technology provides manufacturers with an end-to-end, integrated cybersecurity architecture that covers IT and OT, cyber and physical security, factory and headquarters, data center, and multiple clouds. This makes true security automation possible, and enables coordinated workflows from protection to detection to response.
- **Monitoring and management**
  Fortinet enables manufacturers to consolidate networking, cybersecurity, and surveillance functions into a single system, with full visibility and control on a single pane of glass. This helps prevent cyber-physical attacks and breaks down silos between different teams.
- **Ruggedized hardware**
  Hardware can often take a beating in a manufacturing setting, and physical damage to a firewall appliance can often result in a shutdown of factory operations. Fortinet offers a broad selection of ruggedized appliances to fit all environmental needs, and to support business continuity.
- **Proactive protection against insider threats**
  Managing risk around insider threats gets more complex as more third-party suppliers and partners have access to the network. Fortinet offers a comprehensive solution to guard against insider threats, including intent-based segmentation, deceptor technology, and UEBA.

Intrusions Experienced in Manufacturing[17] (in the past 12 months)

- Malware, 61%
- Spyware, 45%
- DDoS, 28%
- Insider threats, 26%
- Phishing, 24%
- Mobile, 21%
- Ransomware, 21%
- Man-in-the-middle attacks, 18%
- Zero-day attacks, 17%
- SQL injection, 8%

Impact of Intrusions in Manufacturing[17] (in the past 12 months)

- 45% suffered an operational outage that affected productivity
- 40% experienced a degradation in brand awareness
- 35% had an operational outage that put physical safety at risk
- 32% experienced an operational outage that impacted revenue
- 26% lost business-critical data

- **OT-specific threat intelligence**
  FortiGuard labs provides robust threat intelligence specific to OT systems, helping manufacturers make better strategic decisions. Fortinet has worked closely with manufacturing customers for 15 years.
- **Security Fabric ecosystem**
  In addition to the broad portfolio of Fortinet security tools, specialized OT solutions can be integrated seamlessly with the Fortinet Security Fabric through the ecosystem of Fortinet Fabric Partners. This helps to streamline data into a single view for informed decision-making.

Conclusion

In a rapidly evolving marketplace that demands just-in-time production, manufacturers cannot afford to be slowed down by cybersecurity events—or by efforts to prevent them. The Fortinet Security Fabric provides a unified platform that can protect IT, OT, and physical security—with broad visibility and integrated control from a single pane of glass.

"CEOs and senior management teams … are in unanimous agreement that strategies aimed at speeding up time to market, improving product quality, and listening to customers are paying off."[18]

"Despite seasonal fluctuations and a wide variety of targets, the data is clear on one thing: IT-based attacks on OT systems are increasing."[19]

[1] Marco Annunziata, "Manufacturing-As-A-Service Platforms: The New Efficiency Revolution," Forbes, May 13, 2019.

[2] "Fortinet 2019 Operational Technology Security Trends Report: An Update on the Threat Landscape for ICS and SCADA Systems," Fortinet, May 8, 2019.

[3] "State of Operational Technology and Cybersecurity Report," Fortinet, accessed November 7, 2019.

[4] "Fortinet 2019 Operational Technology Security Trends Report: An Update on the Threat Landscape for ICS and SCADA Systems," Fortinet, May 8, 2019.

[5] "Cyber Physical Systems Security," Department of Homeland Security, accessed November 7, 2019.

[6] "Fortinet 2019 Operational Technology Security Trends Report: An Update on the Threat Landscape for ICS and SCADA Systems," Fortinet, May 8, 2019.

[7] "Q3 Fraud and Abuse Report," Arkose Labs, September 18, 2019.

[8] "Ninth Annual Cost of Cybercrime Study," Accenture and Pomenon Institute, March 6, 2019.

[9] Elizabeth Montalbano, "Six Cyber-Physical Attacks the World Could Live Without," The Security Ledger, January 18, 2017.

[10] "Q3 Fraud and Abuse Report," Arkose Labs, September 18, 2019.

[11] Louis Columbus, "10 Ways Cloud Computing Will Drive Manufacturing Growth In 2018," Manufacturing Business Technology, February 23, 2018.

[12] "Applications of IoT in Manufacturing Plants," The Manufacturer, April 12, 2018.

[13] "Independent Study Pinpoints Significant SCADA/ICS Security Risks," Fortinet, April 16, 2019.

[14] Ibid.

[15] Marco Annunziata, "Manufacturing-As-A-Service Platforms: The New Efficiency Revolution," Forbes, May 13, 2019.

[16] Louis Columbus, "10 Ways Cloud Computing Will Drive Manufacturing Growth In 2018," Manufacturing Business Technology, February 23, 2018.

[17] Based on a series of survey studies with different personas conducted by Fortinet. Research report forthcoming.

[18] Louis Columbus, "10 Ways Cloud Computing Will Drive Manufacturing Growth In 2018," Manufacturing Business Technology, February 23, 2018.

[19] "Fortinet 2019 Operational Technology Security Trends Report: An Update on the Threat Landscape for ICS and SCADA Systems," Fortinet, May 8, 2019.

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