セキュリティ最重視のサーバ設計

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概要

ITインフラのセキュリティ確保において、サーバ機器のセキュリティ機能はきわめて重要な要素です。しかし多くのお客様は、サイバーセキュリティについてはOSとアプリケーションにフォーカスをして、その基盤となるサーバインフラ（ハードウェアとファームウェア）はあまり意識されていません。

サーバのセキュリティの重要性は強調してもしきれません。サイバー侵入・攻撃を受ければ、システムはもちろん事業にダウンタイムが生じ、ビジネス損失・顧客損失・データ改ざん・データ保護関連の政府規制違反による企業としての信用にも傷がつくからです。

最新のPowerEdge サーバには、サイバー攻撃に対する防御・検知・リカバリーの為のセキュリティ機能が装備されています。これは製品に後付けで追加された機能ではなく、開発段階で設計に組み込まれたものです。

開発時点で設計に組み込まれたPowerEdge サーバのセキュリティ機能

IT部門からCxOまであらゆる層のお客様にとって、ITセキュリティがいかに重要かつ懸念材料になっているか。これは、お客様との会話、業界誌の動向、市場調査の結果の、いずれからも明らかです。その理由にはシステムのダウンタイム、生産性の低下、ビジネスの損失、データ改ざんと企業としての信用の低下などへの、潜在的なリスクがあります。しかしIT部門の多くは、サイバーセキュリティへの意識は持ちつつも、やはりOSとアプリケーションのレイヤーを悪意ある攻撃から守ることにフォーカスをあてており、その基となるサーバインフラ（ハードウェアとファームウェア）のセキュリティに関する意識や具体的な計画はあまり見られません。(図1)

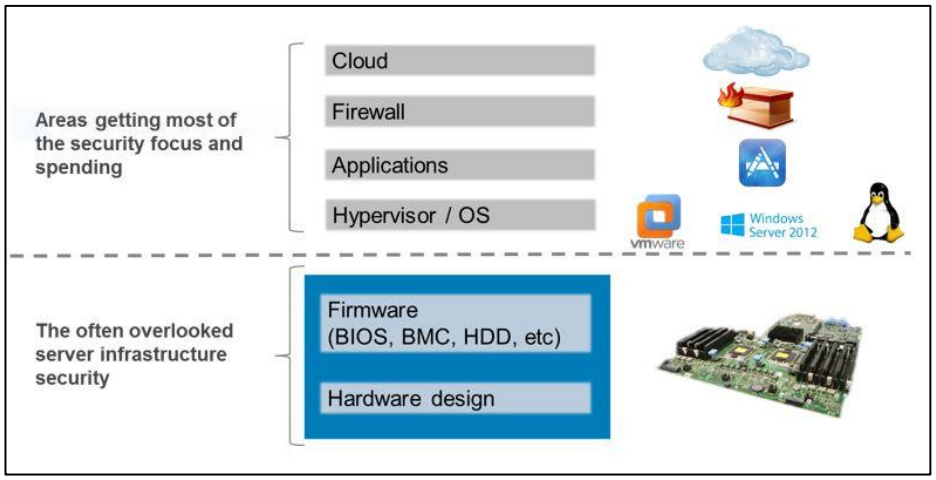

図 1: データセンターのセキュリティ確保にクリティカルな要素となるサーバインフラ

IT
は
一言でサーバのファームウェアといっても、そこには例えばBIOS、BMC (PowerEdgeの場合iDRAC) 、ハードドライブやネットワークアダプタなど、複数のコンポーネントが該当します。

強化された「サイバー・レジリエント・アーキテクチャ」

PowerEdge サーバは過去数世代に渡り、シリコンベースのセキュリティや、暗号化によるルート・オブ・トラスト認証を利用したサーバの起動やファームウェア更新など、きわめて堅牢なセキュリティ機能を提供してきました。これらの機能はNIST SP800-147BやUEFI セキュアブートといったセキュリティ規格に沿ったものです。

with security standards such as NIST SP800-147B and UEFI Secure Boot. Dell EMC 14th Generation PowerEdge servers feature an enhanced **Cyber Resilient Architecture** that provides a hardened server design to protect, detect and recover from cyber attacks. Some of the key aspects of this architecture are:

Effective Protection	○ Silicon-based Hardware Root of Trust ○ Signed Firmware Updates ○ System Lockdown ○ Secure Default Passwords
Reliable Detection	○ Configuration and Firmware Drift Detection ○ Persistent Event Logging including user activity ○ Secure Alerting
Rapid Recovery	○ Automatic BIOS Recovery ○ Rapid OS Recovery ○ System Erase

図2: 第14世代Dell EMC PowerEdge サーバ「サイバーレジリアントアーキテクチャ」主要な要素

Security Development Lifecycle

Delivering the Cyber Resilient Architecture requires security awareness and discipline at each stage of development. This process is called the Security Development Lifecycle (SDL) model, in which security is not an afterthought but is rather an integral part of the overall server design process. This design process encompasses a view of security needs through the entire server lifecycle, as bulleted below and as depicted in Figure 3:

- Features are conceived, designed, prototyped, implemented, set into production, deployed and maintained, with security as a priority criteria
- Server firmware is designed to obstruct, oppose and counter the injection of malicious code during all phases of the product development lifecycle
  - Threat modeling and penetration testing coverage during the design process
  - Secure coding practices are applied at each stage of firmware development
- For critical technologies, external audits supplement the internal SDL process to ensure that firmware adheres to known security best practices
- Continuous testing and evaluation of new potential vulnerabilities using the latest security assessment tools
- Rapid response and reporting to customers of critical Common Vulnerabilities and Exposures (CVEs) including recommended remediation measures if warranted

図 3: Dell EMCのセキュリティ開発サイクル

Innovative Security Features

A compelling example of Dell EMC's innovation in server security is the use of a **hardware root of trust** based in silicon. This feature anchors our Cyber Resilient Architecture that validates both iDRAC and BIOS firmware as each module is booted in a chain of trust. All firmware for critical components (NICs, HBAs, RAID, CPLD, storage drives, PSUs, etc.) is likewise validated using cryptographic signatures to ensure that only authentic firmware is running in the server.

PowerEdge servers also support **UEFI Secure Boot** which checks the cryptographic signatures of UEFI drivers and other code which is loaded prior to the OS running. These include:

- Operating System boot loaders
- UEFI drivers that are loaded from PCIe Cards
- UEFI drivers and executables from mass storage devices

In addition, 14th Generation PowerEdge servers offer customers the unique flexibility of using a customized boot loader certificate not signed by Microsoft. This is primarily a feature for Linux environments that want to sign their own OS boot loaders.

Another example of a new security feature of PowerEdge 14G servers is **System Lockdown**.

- System Lockdown helps prevent change (or "drift") in system firmware image(s) and critical configuration data
- Lockdown mode provides a level of protection yielding higher protection against inadvertent or malicious modification of server firmware and configuration
- Lockdown mode is a feature included with the iDRAC Enterprise license
- Dell tools or interfaces that support/enforce lockdown mode are: iDRAC GUI, RACADM, WS-MAN, Redfish, DUPs, OMSA/OMSS, BIOS F2, DTK, and IPMI.
- Certain key operations such as power capping, power operations, etc. are allowed when the system is in lockdown mode
- Some 3rd party vendor tools may be able to configure their respective server components such as networking adaptors though their use is not recommended

As another example, highly relevant for hosting providers, 14G PowerEdge servers provide additional security via **Domain Isolation**, an important feature for multi-tenant, hosting environments. In order to secure the server's hardware configuration, the hosting providers may desire to block any re-configuration by the tenants. Domain isolation, new with PowerEdge 14G servers, is a configuration option that ensures that management applications in the host OS have no access to the out-of-band iDRAC service processor or to the chipset functions like Management Engine (ME) or Innovation Engine (IE).

Securing server operations via Automation

Table 1 below briefly summarizes some key actions users can take to provide additional server security. With Dell EMC OpenManage systems management tools, many of these routine tasks can be automated, which eliminates the configuration errors and security vulnerabilities that manual processes can introduce. For example, iDRAC provides robust APIs such as WS-Man or the new RESTful Redfish API to script automated deployment of hardware security features. Security policies that are not automated will typically result in errors and possible security breaches.

Table 1: Key actions users can take to provide additional server security

Control Access	Monitor	Update	Maintain
• Employ LDAP or AD for user & role authorization and authentication • Set up 2-Factor Authentication • Customize the iDRAC log-on security notice to your company's policy • Enforce stronger encryption • Restrict users to a specific source IP address range • Set a BIOS password	• Alert for unplanned configuration or firmware changes • Use SNMP v3 or Redfish eventing for secure alerting • Monitor for chassis intrusion events • Monitor mobile device ID logs associated with Quick Sync 2 usage • Monitor iDRAC logs for tracking suspicious user access behavior	• Use only Dell EMC signed firmware updates • Select HTTPS (instead of CIFS & NFS) for file transfers from update repositories • Use System Lockdown to prevent inadvertent or malicious changes to firmware	• Use the iDRAC Direct dedicated USB port to locally and securely remediate server or OS issues • Use HTML5 mode instead of Java for remote console • Use System Erase to securely and quickly wipe all user data from drives and embedded non-volatile memory • Reset configurations to factory defaults

Conclusion

Data center security is paramount to business success and the security of the underlying server infrastructure is critical. Cyber intrusions and attacks carry with them the potential for system and business downtime, lost revenue, lost customers, corrupted data, the inability to comply with government regulations for data protection, and damaged corporate reputation. To protect, detect and recover from cyber attacks, security needs to be built into server hardware design, not added on after the fact. Dell EMC PowerEdge servers are designed from the ground up according to the Security Development Lifecycle (SDL), a robust methodology that is an integral part of our overall hardware and firmware design. Many new features and capabilities that enhance and harden security are available with PowerEdge 14G servers, making them trustworthy servers that form the bedrock of the modern data center.