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## **Automatic/Scalable Firmware and System Software update on Datacenter Products like Server, Storage and Network devices**

### **Abstract:-**

The invention makes the Datacenter intelligent and scalable in case of “Firmware and System Software updates”.

Datacenter ecosystem generally consists of following major components

- Datacenter Products (Servers, Storage and Network devices)
- Central Management System (Manages the lifecycle of Datacenter Products).
- Administrators (Humans maintaining the datacenter)

The innovation introduces a new way to do Firmware and System software upgrade and fresh installation on Datacenter Products. This is achieved with two newly introduced software:

- Smart Update Module
- The Store

### *Smart Update Module:*

The Smart Update Module is intelligent software running on a Management Processor. Management processor is small integrated chip inside each Datacenter Product dedicated for managing the lifecycle of each individual Product.

Capabilities of the Smart Update Module:

- Collects the inventory of Firmware and System software of the host Datacenter product.
- Compares the collected inventory with the Store to check if there are any latest Firmware and System software available for upgrade or fresh installation.
- Sends alerts to Central Management System (Manager) to notify the Administrator to plan for upgrade.
- Finally based on Administrator’s planned maintenance window, downloads the Firmware and System Software and upgrades the product. The product can be a Server, Storage and Network devices.

### *The Store:*

The Store is cloud platform which provides Firmware and System Software over the internet.

Capabilities of the Store:

- The Store contains a huge collection of Firmware and System software required for each Datacenter Product to be usable.
- The Store always maintains the latest available collection of Firmware and System Software to facilitate upgrades of existing firmware and System software.
- The Store allows the Smart Update Module to connect and compare its inventory of Firmware and System software against the latest available in the Store.
- The Store allows the Smart Update Module to pull latest Firmware and System Software for upgrade or fresh installation in case of newly added Datacenter Products.

Together with the Smart Update Module and the Store, the entire Firmware and System software upgrade and fresh installation can be made scalable, with increased performance, lightweight Central Management System (Manager) and the entire process is automated.

### **Prior Solutions:-**

The Prior solution related to “Firmware and System Software Updates Management” involves the following key steps:

1. **Download and upload the Firmware and System Software Support Pack** into Central Management System:

#### ***Support Pack:***

The Support Pack is a comprehensive systems software and firmware update solution, which is delivered as a single ISO image. Support Pack contains a huge list of firmware, software and drivers for all kinds of Datacenter products. Latest versions of Support Pack will be release every six months or so with fixes and improvements in the Firmware and System Software.

#### **Central Management System or Manager:**

Central Management System manages the lifecycle of the data center products such as Servers, Storage and Network devices.

Support Pack is downloaded from trusted site which approximately is 6 Gigabytes. After downloading the Support Pack ISO image it is then uploaded to Manager which will become the source of firmware and system software. Using Manager the software and firmware on Datacenter products are upgraded or freshly installed.

2. **Collect the inventory of system software and firmware** already installed on Datacenter Products and determine the list of systems to be upgraded and also systems which need fresh install.

Administrators collect the inventory of installed software, firmware and drivers on datacenter products with the help of Simple Network Management Protocol (SNMP). After collecting the inventory they can compare the installed firmware and software with the latest available firmware and software in Support Pack. The result is a list of systems that needs upgrade.

3. Finally **upgrade** the software and firmware.

Group the systems with similar types and run an upgrade task in Manager to upgrade the firmware and software on target systems one by one. In case of newly added products then a fresh install is triggered.

NOTE: The Datacenter products are the systems which are part of Datacenter, examples are Servers or compute devices, Storage and network devices like switches, Interconnects or Virtual connects, Routers etc.

### **Disadvantages:**

1. **Manual process:** The entire process of “Firmware and system software update” involves Administrator to collect the inventory and then use the Manager to carefully

categorize the group of similar systems and then initiate upgrade on each group of products. It required lot of effort from Administrators. Administrator has to download the Firmware/Software Pack from the datacenter vendor site and upload the latest Firmware/Software Pack to Manager.

2. **Support Pack consumes lot of Disk Space:** Manager has a dedicated space for storing the Support Pack and it is whopping 6 Giga Bytes approximately and growing in size steadily to include more firmware and software.

For example let us consider a case where there are 1000 customers who need Support Pack, in such cases each customer has to download and upload the Support Pack on their Manager which results in 1000 copies of redundant Support Packs across the globe.

**Complex and non-scalable Manager:** The Manager becomes complex with the logic to collect 1000s of inventory of all the Datacenter products and over long period of time the CMS will become slow and fails to scale for new Datacenter Products added to the ecosystem. Manager also has a burden to constantly update its logic for software, firmware updates. Because there might be changes in the process of updates.

### **Invention Description:-**

The innovation involves two new software entities listed below:

1. **The Store** or in general Firmware and software Store. For simplicity we will call the "Store". Example: Imagine a Supermarket where you can find anything.
2. **Smart Update Module** running in Management Processor. In general intelligent software running on an independent chip inside each Datacenter product. Which mainly helps in automating the firmware and software update on the actual product.

#### **Datacenter Products:**

Broadly there are three product categories:

1. Servers, compute devices
2. Storage, used for storing users data.
3. Network, such as Interconnects or Virtual connect, switches and routers etc.

#### **The Store:**

It is like a supermarket which has all the latest and old firmware and software applicable to all kinds of Datacenter Products stored in one place.

All the Data center products (Server, Storage and Network) use their internally running Smart Update Module to connect periodically to the Store for checking latest firmware and software availability.

### **Store offers capabilities like:**

1. One shop for all software, firmware and drivers that each Datacenter product needs.
2. All Datacenter products connect to the Store for updates.
3. Some software in the Store can be licensed and offered as a service for limited period.
4. Store can also have analytics software which can be installed on Datacenter products for Business analysis.

### **Smart Update Module:**

This is the other counter part of the Store which actually runs on Management Processor without consuming the processing power of Server, Storage and Networking devices.

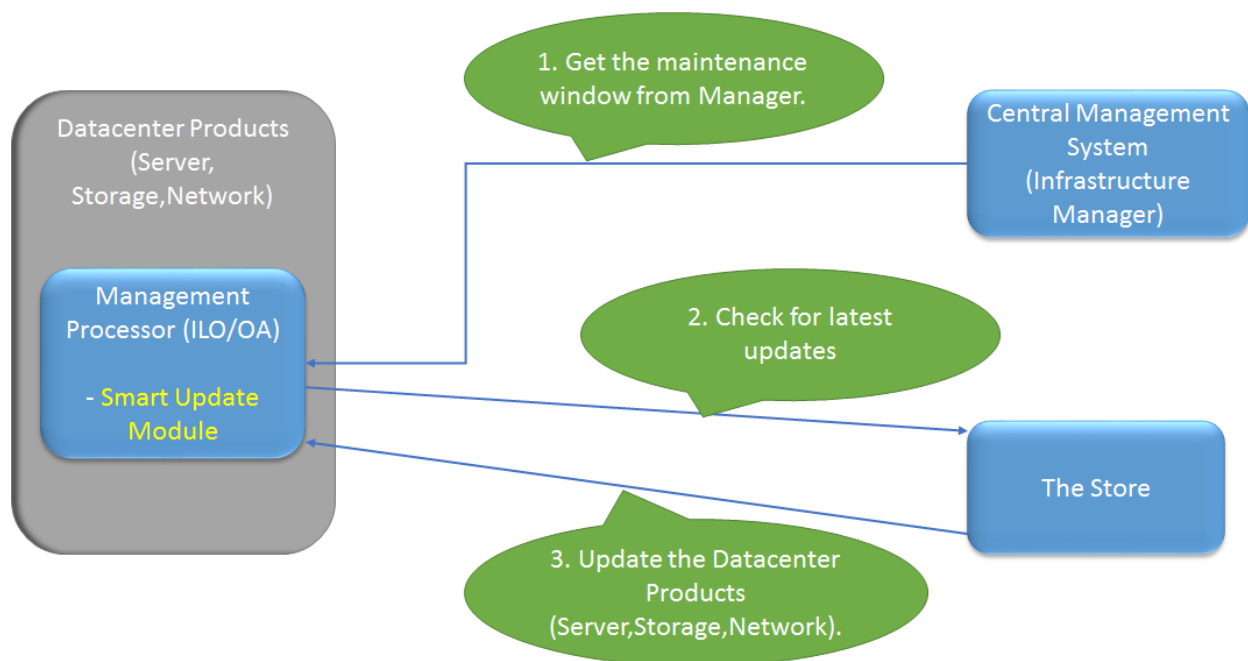
The capabilities of this module are as follows:

1. The module can be configured with the help of Management Processor User interface.
2. The module connects to the Store for checking latest updates.
3. Based on the maintenance window settings the Smart Update Modules automatically updates the server, storage and network to the latest versions.
4. The module can also allow the Administrators to browse the Store within the device for analytics software available in the Store.

Together the Store and Smart Update Module, the entire process of Firmware and System Software updates can be made automatic without Administrator planning and monitoring the entire process. Which gives an edge over other methods.

The diagram explains the entire invention in three steps:

1. *Get the Maintenance Window:*  
Administrator inputs the Maintenance window into the Central Management System (CMS). The Smart Update Module of each Datacenter product retrieves the Maintenance window from CMS.
2. *Check for updates:*  
Smart Update Module periodically checks the Store for updates in Firmware and System software installed on the device. Finally prepares a list of Firmware and System Software which needs update.
3. *Update the datacenter Products:*  
Downloads the latest Firmware and System Software from the Store and installs on its own without Administrator intervention making the entire process Automatic and scalable.



Sample use case showing the flow of the whole automated Support Pack update.

**Advantages:-**

The advantages are listed as points.

1. Customers need not have to download the Support Pack into their Manager. Only one copy exists in the Store either publicly or private on premise. The Manager currently holds the Support Pack which can be eliminated. No duplicates. For example if there are 10 Managers in a Datacenter then there will be 10 redundant copies of Support Pack. In the entire globe if there are 1000s of customers there will be 1000 copies of the Support Pack inside each Manager.
2. Administrators need not plan their maintenance window proactively they are notified of impending updates.
3. Once the maintenance window is planned the updates happens without the intervention of Manager and Administrators.

Overall the entire process is driven by Smart Update Module making the Administrator Life easier and proactive. Manager application can focus on monitoring the environment and forget about Firmware and System Software updates.

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