Technical white paper

MAC Address Pass Through

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Version 2.0

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Document version history

Version No.	Version date	Affected section and description of change
2.0	11/08/2017	Feature enhancement

* Action types: Approve, Review, Inform, File, Action Required, Attend Meeting, Other (please specify).

List of figures

1 MAC Address Pass Through

1.1 Purpose

The purpose of this white paper is to describe the BIOS, SW and HW functionality of the HP feature called MAC Address Pass Through or also known as Host Based MAC Address (HBMA) solution. This white paper will describe the MAC Address Pass Through feature set and how to configure and utilize the feature for end customers.

1.2 Introduction

1.2.1 MAC Address Pass Through Overview

This System HBMA address is not directly associated with the embedded or attached NIC devices, instead it is a unique system MAC address that is stored in BIOS and can be applied to any one of the supported dongle or dock NICs that are attached to the system. Similar to other device MAC addresses, the system MAC address is a unique number assigned and stored on each system during manufacture. When MAC Address Pass Through is enabled, it allows the system administrator or image deployment professional to uniquely identify that system on the network based on only the MAC address, no matter what dongle or dock is used to connect to the network. Essentially the system's unique MAC address is extended to the peripheral device and exposed onto the network.

There is also a user defined "Custom" MAC address that could be used as the HBMA address instead of the System HBMA address. Optionally systems that have an embedded NIC the user can choose to "Reuse the embedded NIC MAC" address instead of both the System and Custom HBMA addresses, which allows the same MAC address to be used if either the embedded NIC or the dongle or dock NIC is connected to the network.

MAC Address Pass Through is supported in both PXE and OS environments.

1.3 Supported Devices

There are several usage cases in which customers want to have a single MAC address exposed to the network for system identification purposes for both management and security purposes. MAC Address Pass Through works with authorized HP NIC accessories such as dongles or docks.

1.3.1 External NIC Accessories:

The main intent of MAC Address Pass Through, is to provide NICs that are not embedded on the system, a system unique MAC address that can be identified as originating from a specific system.

MAC Address Pass Through feature works with MAC Address Pass Through enabled docks. With older docks and dongles MAC Address Pass Through provides a subset of the functionality.

1.3.2 Embedded NIC Devices:

MAC Address Pass Through does not apply the System HBMA address to the embedded NIC since it already has a system unique MAC address. However, MAC Address Pass Through provides the option to reuse the embedded NIC's MAC address, for cases where the system administrator would like a single unique MAC address for a system no matter the NIC interface that is chosen (embedded, dongle or dock).

1.4 Supported Operating Systems

MAC Address Pass Through feature supports UEFI PXE boot, Legacy PXE boot, Windows PE, Windows 7, Windows 8.1 and Windows 10.

1.4.1 Preboot Execution Environment (PXE):

MAC Address Pass Through is developed to support UEFI PXE and Legacy PXE environments, to enable customers to image systems using PXE based on the system's unique MAC address. This is important for systems that do not have an embedded NIC, and depend on external NIC dongles or docks to connect to the PXE network.

1.4.2 Existing PXE problem with external NICs

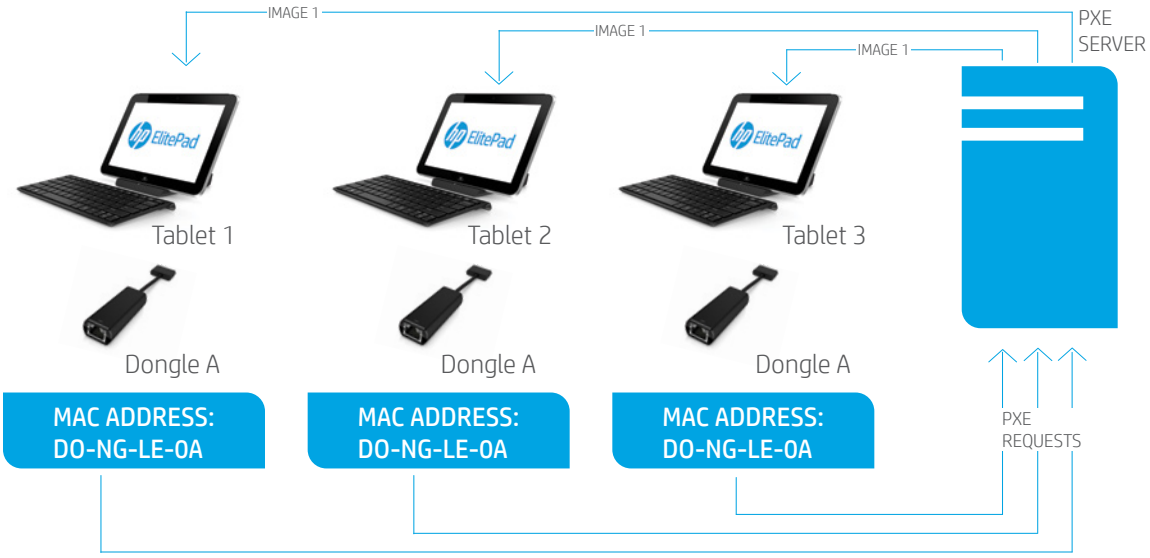

Figure 1 Existing PXE issue with dongles

Currently if multiple systems are plugged into a dock at different times, the MAC address presented to the network is always associated with the dock, and therefore there is no way to differentiate between systems (or PXE images).

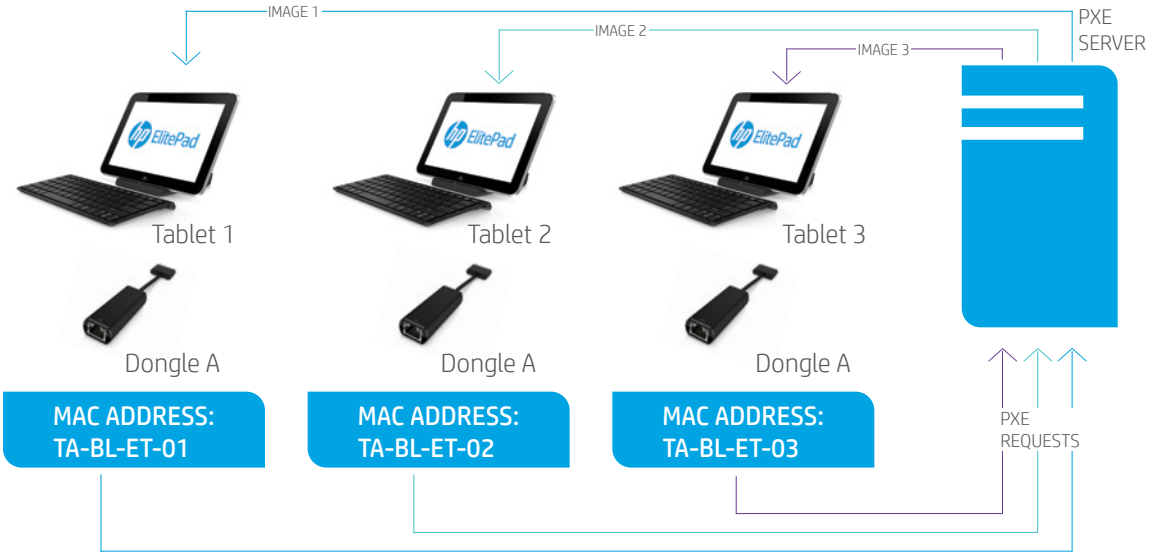

Figure 2 New HBMA PXE solution

The MAC Address Pass Through feature allows the dongle or dock's NIC to use the System or Custom HBMA address, and thereby allow the PXE network to uniquely identify and manage the PXE image based on the attached system.

1.4.3 Windows Operating System:

Customers who manage their assets (laptops) via MAC address will have issues if MAC addresses are not unique to the system. The default MAC addresses for dongles or dock that have integrated NICs are only associated with the dock. In the floating workplace environments in which docks are used and those docks are not specifically assigned to a single user, it is impossible to uniquely track and/or manage a user's system based on the dock's MAC address. MAC Address Pass Through solves this issue by applying the HBMA address to the dock's NIC when the system is On and the dock is attached and transitions to Sleep, Hibernate or Off states, and also if the dock is attached to the system after it is in the Sleep, Hibernate, or Off state.

On older dongles and docks MAC Address Pass Through is supported when the system is On and the dock is attached and transitions to Sleep state.

1.5 MAC Address Pass Through Configuration

1.5.1 MAC Address Pass Through Storage

Factory will store a unique MAC address on each system in BIOS. The System HBMA address is globally unique and will be different than the embedded NIC MAC address on the system.

The System HBMA Address will appear in the BIOS F10 MAC Address Pass Through menu, and cannot be changed. The Custom HBMA Address will also appear in the BIOS F10 setup pages, and can be modified by the user.

The Custom HBMA address is reset to 00-00-00-00-00 whenever the user restores BIOS defaults.

1.5.2 Custom HBMA Address Format

Based on the IEC 10039 standards, the Custom MAC addresses is required to have the second byte to be either 0, 2, 4, 6, 8, A, C, or E. To accommodate for this format, BIOS will perform an error check during each write, to ensure that the user inputs a MAC address conforming to the required format.

Custom MAC Address	Example	Limits
zy-xx-xx-xx-xx-xx	22-44-66-AA-BB-DD	z=0-9, A-F y=0, 2, 4, 6, 8, A, C, E

1.5.3 MAC Address Pass Through Parameters

BIOS maintains the settings for MAC Address Pass Through in the F10 BIOS menu, this allows for the administrator to setup the parameters and password lock them as needed. HP BIOS configuration BCU tool, has also incorporated the MAC Address Pass Through feature. The BCU tool allows an administrator to automate the process of MAC Address Pass Through configuration.

The MAC Address Pass Through parameter settings configured in BIOS are applicable to both PXE and Windows environments.

Host Based MAC Address – This parameter allows the administrator to Disable MAC Address Pass Through, use the System Address, or use a Custom Address. “System Address” is the default setting. When MAC Address Pass Through is disabled the MAC Address and Reuse Embedded LAN Address parameters will be grayed out and unavailable for configuration.

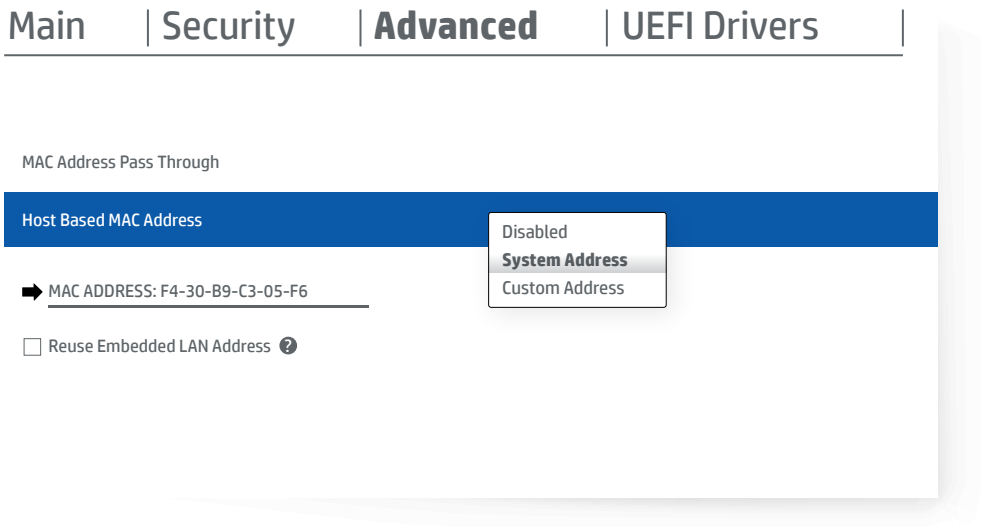

Figure 3 Host Based MAC Address configuration

Custom Address – If the Custom Address is selected, the MAC Address parameter will become selectable to allow the administrator to enter a customized MAC address. The custom MAC address must conform to format as specified in section 1.5.2 Custom HBMA Address Format.

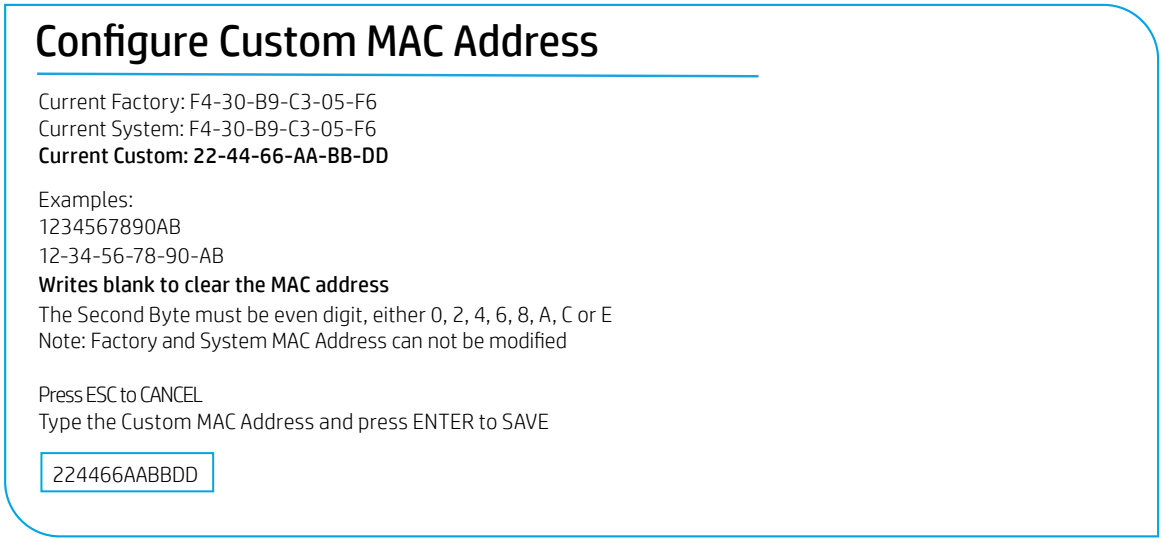

Figure 4 Custom MAC Address configuration

Reuse Embedded LAN Address – If the system has an embedded NIC, the Reuse Embedded LAN Address parameter will be available. When the Reuse Embedded LAN Address is enabled, both the System and Custom Addresses are replaced by the embedded NIC MAC address, and the dongle or dock NIC will be configured with the embedded IC MAC address.

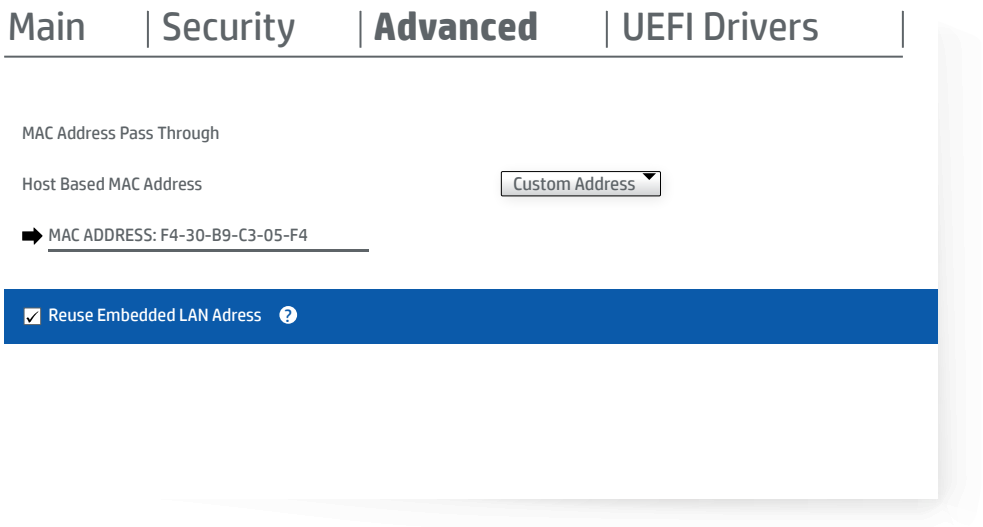

Figure 5 Reuse Embedded LAN Address configuration

1.5.4 BCU Tool MAC Address Pass Through sample

The BCU tool exposes the MAC Address Pass Through parameters so an administrator can automate the configuration. The following is a sample of the MAC Address Pass Through parameters that can be modified via the BCU tool.

Host Based MAC Address
- Disable
- System
- *Custom

HBMA Custom MAC Address
- 22-44-66-AA-BB-DD

Reuse Embedded LAN Address
- *Disable
- Enable

Note:
1. All other MAC Address Pass Through parameters exposed via the BCU tool are read only

1.6 FAQs

1.6.1 Can Multiple NICs share the HBMA address at the same time?

Yes, if the Reuse Embedded LAN Address parameter is enabled, then the dock's NIC MAC address will be set to the same MAC address as the embedded NIC.

Similarly, if Reuse Embedded LAN Address parameter is not enabled and a dongle and a dock are connected to the system, then the NICs on both the dongle and dock will be configured with either the System or Custom Address.

1.6.2 Does MAC Address Pass Through support WoL?

Yes, if the system supports MAC Address Pass Through, then Wake On LAN (WoL) is also supported. WoL is supported from all the system sleep states (On, Sleep, Hibernate, and Off) when MAC Address Pass Through is enabled or disabled.

Both the NIC network adaptor and the Wake On LAN parameter in BIOS needs to be configured to enable WoL. From Windows device manager and within the NIC network adaptor properties dialog, the "Allow the device to wake the computer" option must be checked under Power Management option.

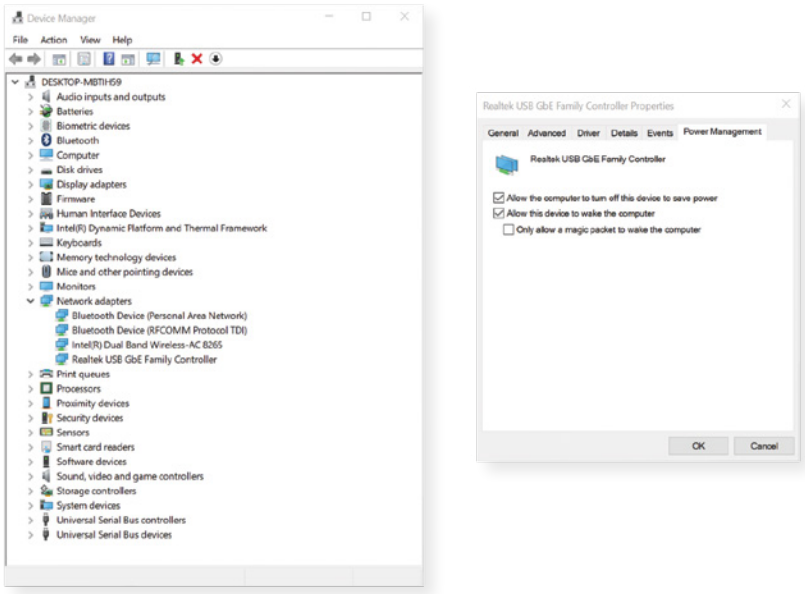

Figure 6 WoL Network Adaptor configuration

On modern standby enabled systems the Power Management option is not available, however, WoL will continue to work when those systems are in Hibernate or Off states.

The BIOS Wake On LAN parameter which is located under the Built in Device BIOS F10 menu. The Wake On LAN default is enabled and set to Boot to Hard Drive.

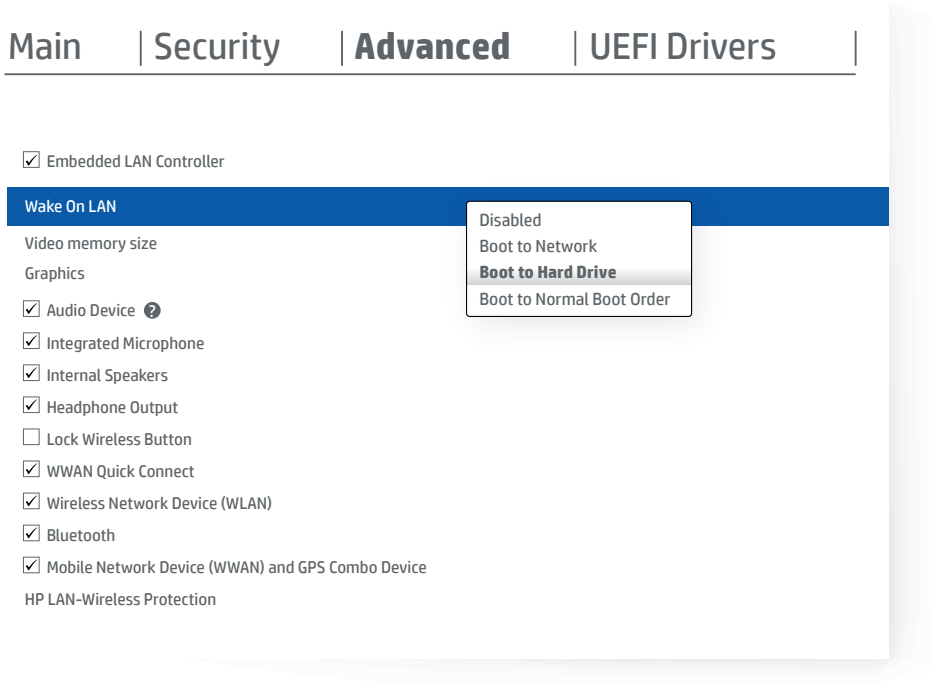

Figure 7 Wake on LAN parameter configuration

1.6.3 Is the System HBMA address unique?

Yes, the System HBMA Address is globally unique, like any native MAC addresses that appear on NIC devices. This address can be used to uniquely identify a system on the network.

1.6.4 Will my dock's NIC native address appear on the network?

The HBMA address is applied to the dock's NIC once it is connected to the system in ether On, Sleep, Hibernate, or Off states, and the dock's native address will not be exposed to the network.

With older dongles and docks the HBMA address is configured via a Windows service. Sometimes a device will first enumerate with its native MAC address and then be provided the HBMA address and re-enumerate. The service tries to limit the occurrence of this situation, and likely this only occurs when a new NIC device is connected to the system.

1.6.5 Does HBMA also force the IP address to remain constant?

Mostly Yes, although HBMA only interacts with the MAC address (layer 2), most DHCP servers will provide the NIC device with the same IP address once it sees the same MAC address requesting it.

1.6.6 Which PXE modes and Windows versions are supported?

MAC Address Pass Through supports both UEFI PXE boot, Legacy PXE, and Windows PE, 7, 8.1, and 10 OS versions.

1.6.7 Does MAC Address Pass Through work with Custom OS installs?

Yes. However, on Windows 10 installs, to support older dongles and docks you will need to ensure the HP MAC Address Manager service is installed and running. HP MAC Address Manager can be downloaded from hp.com

1.6.8 Which docks are the MAC Address Pass Through capable?

HP Elite USB-C Dock G3, HP USB-C Universal Dock, and HP USB-C Mini Dock are capable of supporting both MAC Address Pass Through and WoL in all the system sleep states (On, Sleep, Hibernate, Off) states.

MAC Address Pass Through and WoL is only supported for On and Sleep states with older dongles and docks for example HP Elite USB-C Docking Station, HP USB Travel Dock etc.

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