AN3883

Software Options for VSC Switches

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INTRODUCTION

VSC switches require some amount of software to run, either on the internal CPU or on an external CPU. This must be considered during the architecture stage of the design, because it will impact the hardware/schematics and the software development resources required for the project.

Some Ethernet switch integrated circuits (IC) in the market can be pin-strapped and come up operating without software involvement, and can optionally be provisioned further via an MII or SPI interface. This is the case for Ethernet switches from other Microchip switch families (LAN and KSZ) for example. It is, however, not the case for the VSC Ethernet switches.

Note: Operation of a VSC switch via pin-strapping only, or direct register accesses, or both is not supported.

This application note is intended to provide only an overview of software options for VSC switches. For specifics and details, please refer to the documentation on the Ethernet Switches and Ethernet Software product pages on the Microchip website.

Sections

This document includes the following topics:

References

Consult the following references for details on the specific parts referred to in this document:

- Ethernet Switches page (www.microchip.com/en-us/products/high-speed-networking-and-video/ethernet/ethernet-switches)
- Ethernet Software page (www.microchip.com/en-us/products/high-speed-networking-and-video/ethernet/software)
- VSC6803 product page (www.microchip.com/VSC6803)
- *ENT-AN1067 Application Note*
- *ENT-AN1199 Application Note*
- *VSC751X PCIe - Using the* `bringup` *image* (https://microchipsupport.force.com/s/article/VSC751X-PCIe-Using-the-bringup-image2)

ETHERNET SOFTWARE OPTIONS

Microchip provides an overview of software options for VSC Ethernet switches on the Ethernet Software page on the Microchip website.

Ethernet Switch and PHY API (MESA)

Most VSC Ethernet switches are supported in the API. The Ethernet Switch and PHY Application Programming Interface (API), also known as MESA, provides a comprehensive, user-friendly function library that is operating system (OS) independent.

For new designs, use the VSC6803.

Ethernet Switch and PHY API	Product Number
ETH API	VSC6803
Unified API	VSC6802

This approach requires the user to develop their own application on top of the API. Typically, this application runs on an external CPU. (See Note on external CPU.)

Note: Technically, it is possible to use the API on the internal CPU of a switch. However, Microchip support for this approach is limited, because this will constitute the same basic architecture as using a Turnkey Software Solution (APPL). Instead, investing in the Turnkey Software Solution (APPL) license is recommended, which reduces development risk and support needed, and accelerates Time to Market.

In the schematics, the API approach requires an external CPU to be connected via SPI, PCIe®, or MII-Management bus.

It does not require SPI Flash or DRAM connected to the VSC switch. (Exception: See the *VSC751X PCIe - Using the `bringup` image* article on the Microchip Support page.)

The VSC Ethernet switch relies on the external CPU to be up and operating. API warm start is not supported for VSC switches at the time of publishing this document.

For software, the user must write an application on top of the API and integrate it with the BSP and OS of the external CPU. Microchip provides a `demo_app` example as part of the API package. The API package can be downloaded from Github; access the links provided on the VSC6803 product page.

Going forward, the Ethernet Switch and PHY API will be split into MESA (Switch API) and MEPA (PHY API). This work is ongoing at the time of this writing. Having a separate MEPA will ensure that VSC PHYs and third-party PHYs are integrated into the application in the same way.

Note: With the API approach, it is the user's responsibility to develop and integrate the software. Microchip's ability to support software developments beyond what is documented in the API package is limited. Hence, users must familiarize themselves with the API software package before deciding to take an API-based software approach.

Turnkey Software Solutions (APPL)

For most VSC Ethernet switches, application software packages are available. These packages provide a comprehensive set of features for Enterprise, Carrier, and Industrial designs. These easily customizable turnkey solutions shorten the development cycle and reduce development costs.

For new designs, use the Linux®-based version.

The eCOS-based versions are legacy. There is no expectation going forward that new bugs will be fixed or features will be added to the eCOS-based versions.

Application Software Name	Description	Product Number	
		Linux® OS	eCos
WebStaX	For Basic L2 Enterprise Switch Applications	VSC6819	VSC6812
SMBStaX	For Advanced L2+ Enterprise Switch Applications	VSC6816	VSC6813
IStaX	For Industrial Ethernet Switch Applications	VSC6817	VSC6815
CEServices	For Carrier Ethernet Switch Applications	VSC6818	VSC6810

The application software runs on the internal CPU of the switch. It can be managed by an external entity using CLI (UART/Telnet/SSH), WebGUI, JSON-RPC (over Ethernet ports), or SNMP (mix of private and standard MIBs).

In the schematics, this approach requires Boot Flash and DRAM connected to the switch. For specifics, see the reference designs available from the product page of the respective Ethernet switch.

The application software running on the internal CPU creates a self-sufficient system. An external CPU processor is not required, but can be connected via an Ethernet interface for data injection/extraction, or management (via JSON-RPC), or both if desired.

For the software, this approach only requires customization of the software package to the user's particular board and feature set. This customization is documented in the turnkey software package. The resulting image is programmed to the Boot Flash, and then the switch can boot and operate autonomously.

The turnkey software solution packages require a one-time Software License (SLA) fee and a yearly Software Maintenance fee to get access to future releases with bug fixes, new features, and new switch support. With a single license, the software can be used at any client location, on any VSC switch, and on any number of client projects and platforms. There is no per-platform royalty. The source code is provided. Contact your Microchip Sales Contact for a quote.

The Turnkey Software (APPL) simplifies development, reduces cost, and speeds up Time to Market. The software is standards based and is tested and certified by independent third parties such as the UNH-IOL and European Advanced Networking Test Center (EANTC).

The APPL software runs on top of the same API (MESA) that is described in the previous chapter. The APPL software is licensed by hundreds of Microchip clients and is used in production systems. It is maintained with new releases (typically four releases per year), which provide bug fixes and new features.

As an example, a full suite of TSN features is currently being released in the IStaX package. Also, a full suite of IEEE1588/PTP solutions is included in IStaX.

Unmanaged/Lightly Managed Software

For some VSC switches, Microchip also offers software for Unmanaged or Lightly Managed applications.

Ethernet Switch and PHY API	Product Number
Unmanaged/Webconfig	VSC6811
Ocelot Unmanaged	VSC6825

VSC6811 software is available for VSC7420, VSC7421, and VSC7422 switches. On the other hand, VSC6825 software is available for VSC7511 and VSC7512 switches.

Both software packages are free but require a Keil compiler, which is used to build an image, determining the switch configuration. The image is programmed to an external SPI Flash, from where the switch boots.

VSC6811 has two types:

- **Unmanaged** - There is no management interface but only a UART-based debug interface. VSC6811 Unmanaged requires a small SPI Flash and no DRAM. The switch configuration cannot be changed during run time, but only at compile time.
- **Webconfig (Lightly Managed)** - There are basic UART and WebGUI interfaces. Webconfig requires a larger SPI Flash size than Unmanaged but still requires no DRAM. With Webconfig, the switch configuration can be changed during run time. See the *ENT-AN1067* application note for the supported feature set. VSC6811 Webconfig is provided "as is" and with limited technical support available for it. There is no expectation going forward that new bugs will be fixed or features will be added. For a maintained software, please consider one of the Turnkey Software Solutions (APPL) instead.

VSC6825 has *only* the Unmanaged type. There is no management interface but only a UART-based debug interface. VSC6825 requires a small SPI Flash size and no DRAM. The switch configuration cannot be changed during run time, but only at compile time. See the *ENT-AN1199* application note for the supported feature set.

It is important to remember that the features available in the Unmanaged or Lightly Managed applications depend on the software, and not only the hardware. Not all features shown in the switch data sheets (for example, VSC7420 or VSC7512) will be available and supported by the software (that is, VSC6811 or VSC6825). With the Unmanaged or Lightly Managed software, only a small subset is available (for example, no RSTP, not VLAN aware). See the *ENT-AN1067* and *ENT-AN1199* application notes for details.

SUMMARY

When planning on using a VSC switch in your project, consider the supported software options and their impact on the schematics or PCB, and the software development needed.

For a full list showing which VSC switches are supported via which software option, visit the Ethernet Software page on the Microchip website.

APPENDIX A: APPLICATION NOTE REVISION HISTORY

TABLE A-1: REVISION HISTORY

Revision Level & Date	Section/Figure/Entry	Correction
DS00003883A (04-10-21)	Initial release	

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