

Dual-Core Switch Technical Report



Overview

ICSS SWITCH FIRMWARE uses two PRU to implement three port Ethernet switch with one single MAC and IP address.

Key Takeaways

Dual-core architectures in switches and embedded systems enhance performance, enable efficient multitasking, and improve real-time data handling by distributing workloads across two processing cores. Overview of Dual-Core Architectures

Dual-core systems integrate two independent processing cores on a single chip or SoC, allowing simultaneous execution of multiple tasks. This approach improves throughput, reduces latency, and mitigates the limitations of increasing clock speeds, which can lead to heat dissipation and power consumption issues. In networking and embedded applications, dual-core designs are used to handle high-speed data transfers, real-time control, and complex signal processing.

Microcontroller-Based Dual-Core Systems TMS320F2837xD Dual-Core MCU

The TMS320F2837xD from Texas Instruments features a dual-core C28x floating-point CPU architecture, each running at 200 MHz. Key features include:

- TMU and VCU accelerators for fast trigonometric and complex math operations.
- Control Law Accelerator (CLA) coprocessors for concurrent execution with the main CPU.

- Integrated analog and control peripherals to consolidate system architecture and reduce the need for multiple processors.

- Applications include industrial motor drives, solar inverters, and electric vehicles.

KW47 Dual-Core Microcontroller

The KW47 MCU integrates two Arm Cortex-M33 cores, with one core dedicated to the Narrowband Unit (NBU) for radio processing . Highlights include:

- Offloading heavy computations like FFT to the NBU to reduce main core load.
- Efficient multitasking for wireless applications, signal processing, and UI management.
- Dedicated peripherals and memory for each core to maintain real-time performance.

Dual-Core DMA Implementation

Dual-core AHB DMA systems allow data transfers between memory points without CPU intervention, improving efficiency and reducing power consumption . Features include:

- Independent read/write control for multiple AHB ports.
- Support for 32- or 64-bit buses with maximum throughput regardless of alignment.
- Integration into SoCs for simultaneous processing of multiple tasks.

Enterprise Network SwitchesCisco Catalyst 9300 Series

The Catalyst 9300 Series employs high-performance switching architectures capable of handling up to 1760 Gbps standalone and 14 Tbps when stacked . Dual-core or multi-core processors in these switches enable:

- High-speed packet forwarding (up to 3.8 billion packets per second).
- Efficient handling of multiple access layer endpoints with varying speeds (1-10 Gbps, Multigigabit, and fiber uplinks).
- Flexible stacking and management of multiple switches as a single logical unit.
- Support for advanced features like Universal Power over Ethernet (UPoE) and optional uplink modules for 25G, 40G, and 100G connectivity.

Benefits of Dual-Core Switch Architectures

- Enhanced throughput: Parallel processing allows simultaneous handling of multiple data streams.
- Reduced latency: Offloading tasks to secondary cores improves real-time responsiveness.

- **Energy efficiency:** Lower clock speeds per core reduce heat and power consumption compared to single-core high-frequency designs.
 - **Scalability:** Supports complex applications such as deep learning, signal processing, and high-speed networking without hardware redesign.
- Conclusion

Dual-core architectures, whether in microcontrollers like the TMS320F2837xD and KW47 or in enterprise switches like the Cisco Catalyst 9300, provide significant performance improvements by enabling parallel processing, efficient DMA operations, and real-time task management. These systems are essential for modern high-speed networking, industrial control, and embedded applications where both throughput and responsiveness are critical.

Article Content

Ultrafast all-optical switching in a dual-core fiber nonlinear coupler

We report the first demonstration of a nonlinear coupler switch capable of substantially complete all-optical switching

7.1. Dual EMAC and Switch — Processor SDK RTOS Documentation

ICSS SWITCH FIRMWARE uses two PRU to implement three port Ethernet switch with one single MAC and IP address. To provide

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