

What Gateway Is and Is Not

Gateway is the **functional logic structure** realised within an FPGA by programming its configurable resources and their interconnections.

Gateway is not the HDL or HLS source used to describe a design. The same design sources may also be synthesised for an ASIC implementation.

Gateway is not the bitstream loaded into the FPGA. The bitstream is the deployment artefact that establishes the gateway.

Gateway is not software or firmware executed as an instruction sequence by a processor. It operates structurally and concurrently.

Gateway is not the FPGA silicon itself. The FPGA is the physical digital hardware that provides the configurable resources within which it is realised.

	HARDWARE	GATEWARE	FIRMWARE	SOFTWARE
Primary design abstraction	Continuous-time and continuous-amplitude physical reality; digital behaviour exists only within valid electrical and timing margins.	Digital logic realised on an analog physical substrate; operation depends on propagation delays, timing, clocking and implementation constraints.	Instruction- and register-level digital abstraction, tightly coupled to a specific hardware platform.	Algorithmic and data-level digital abstraction, mediated by an ISA, operating system or runtime.
Execution model	Intrinsic structural concurrency; natively parallel		Instruction-driven and primarily sequential; concurrency constrained by processing resources and scheduling	
Development toolchain	Schematic, PCB or IC design tools; simulation and verification tools (software)	HDL or HLS-based description; simulator, synthesiser, placer, router, programmer	Programming language; compiler, linker, debugger and programmer	Programming or scripting language; compiler/interpreter, linker, debugger and build tools
Realisation target	PCB fabrication and assembly technology, or semiconductor fabrication process	FPGA device and non-volatile configuration memory	Processor or microcontroller with non-volatile program memory	Processor-based computing platform with memory and storage
Deployment artefact	Manufactured PCB or IC	Bitstream	Image / binary	Executable, package or script
Typical post-deployment modification method	Physical intervention, constrained by the existing design	FPGA reconfiguration	Image reflashing	Storage content update
Typical application role	Physical interfacing, sensing, RF, power conversion and fixed-function circuitry	Custom interfaces, deterministic control, parallel signal processing and hardware acceleration	Boot, device control, drivers, peripheral management and embedded protocols	User applications, data processing, communication, automation and system services
Common application domains	Consumer, industrial, automotive, medical, aerospace and virtually all electronic systems	Telecommunications, aerospace, defence, instrumentation, industrial control, networking and ASIC prototyping	Embedded, automotive, consumer, industrial, medical and IoT devices	General-purpose computing, mobile, cloud, enterprise, and scientific systems