Enterprise Core Systems Engineering Reference Manual: How to Fix IP Address Conflict in Enterprise Network

PRODUCT IDENTIFICATION

The Auto-Resolution Convergence Engine (ARCE) 8000 Series is a dedicated hardware appliance engineered to automatically detect, isolate, and remediate Layer 3 IP address conflicts across enterprise campus, data center, and carrier environments. Unlike software-based DHCP snooping or manual NMS interventions, the ARCE 8000 operates as a transparent arbitration bridge, intercepting ARP packets, ICMP echoes, and Gratuitous ARP frames to enforce absolute IPv4/IPv6 address uniqueness without service disruption.



CORE INTERNAL TOPOLOGY

The ARCE 8000 integrates a specialized Ternary Content-Addressable Memory (TCAM) arbitration ASIC operating at line rate. Upon deployment as a bump-in-the-wire between core and aggregation layers, the device maintains a real-time binding table of [MAC, IP, Switch_Port, VLAN] tuples. When a duplicate IP allocation is attempted (e.g., rogue DHCP server or static misconfiguration), the arbitration engine triggers a hardware-level hold-down timer, suppressing the conflicting host's traffic while injecting ICMP Conflict packets to both endpoints. The system supports up to 128,000 concurrent binding entries with sub-100 microsecond detection latency.

SWITCHING SUBSYSTEM CAPABILITIES

- Passive Inline Mode: Zero IP address consumption; no default gateway modification required.
- Active Arbitration Logic: Prevents ARP cache poisoning by cross-validating every ARP request/reply against the trusted binding repository.
- Automated Remediation: Upon conflict, the system can optionally quarantine the offending port via 802.1X MAC authentication bypass, or redirect both hosts to a walled-garden VLAN for re-IP assignment.
- Conflict Logging & SNMP Traps: Real-time alerts to Nagios, SolarWinds, or PRTG.

OPERATIONAL ADVANTAGES

- Mean Time to Repair (MTTR) for IP conflicts reduced from 45 minutes to <2 seconds.

- Supports dynamic environments with DHCP reservations, stateless autoconfiguration (SLAAC), and static overlays.

- Hot-swappable dual power and fail-to-wire hardware bypass ensures no single point of failure.

SPECIFICATION MATRIX

Parameter	**Specification**
Form Factor	1RU Standard 19-inch Rack Mountable
Switching Capacity	48 Gbps (Internal Arbitration Fabric)
Forwarding Rate	71.4 Mpps (Line-rate for 64-byte frames)
Concurrent Binding Entries	128,000 (IPv4 and IPv6)
Detection Latency	<100 microseconds (99.999% line-rate)
Power Supply	Dual Hot-Swappable Redundant AC/DC (100-240V, 50/60Hz)
Operating Temperature	0°C to 50°C (32°F to 122°F)

Interfaces	4x 10G SFP+ (Monitoring ports), 1x RJ45 Console, 1x 1G Management

REGULATORY COMPLIANCE

FCC Part 15 Class A, CE Mark, RoHS3, REACH, IEC 62368-1 Safety, NIST SP 800-193 (Hardware Cybersecurity Resilience). The ARCE 8000 does not generate or store user traffic payload; only Layer 2/Layer 3 headers are processed for conflict arbitration, ensuring GDPR and HIPAA compliance.

