

Back-to-Back Optical Diode Solution

Secure Bidirectional Data Exchange
With MetaDefender NetWall Diodes



Certain critical applications cannot be converted into a unidirectional data flow because they require a true request-and-response communication model but operate between networks with vastly different security levels such as OT and IT environments. Traditional firewalls and bidirectional network connections introduce unacceptable risk by establishing routable pathways between these networks.

A back-to-back deployment architecture using two MetaDefender Optical Diodes enables secure application-layer request-and-response communication while preserving physical network isolation. MetaDefender Optical Diode is a hardware appliance within the MetaDefender NetWall family that uses optical isolation to provide physically enforced one-way data transfer. By deploying two optical diodes in opposite directions, organizations can support bidirectional application workflows without establishing direct network connectivity between protected environments.

Business Challenge

Organizations operating in regulated or high-risk environments often face a difficult tradeoff:

- One-way data diodes provide excellent security but limit application functionality
- Traditional bidirectional connectivity enables operational functionality but introduces routable network connections that increase cyber risk
- Many industrial and critical infrastructure applications require bidirectional communication while maintaining strict separation between OT and IT networks

OPSWAT Solution

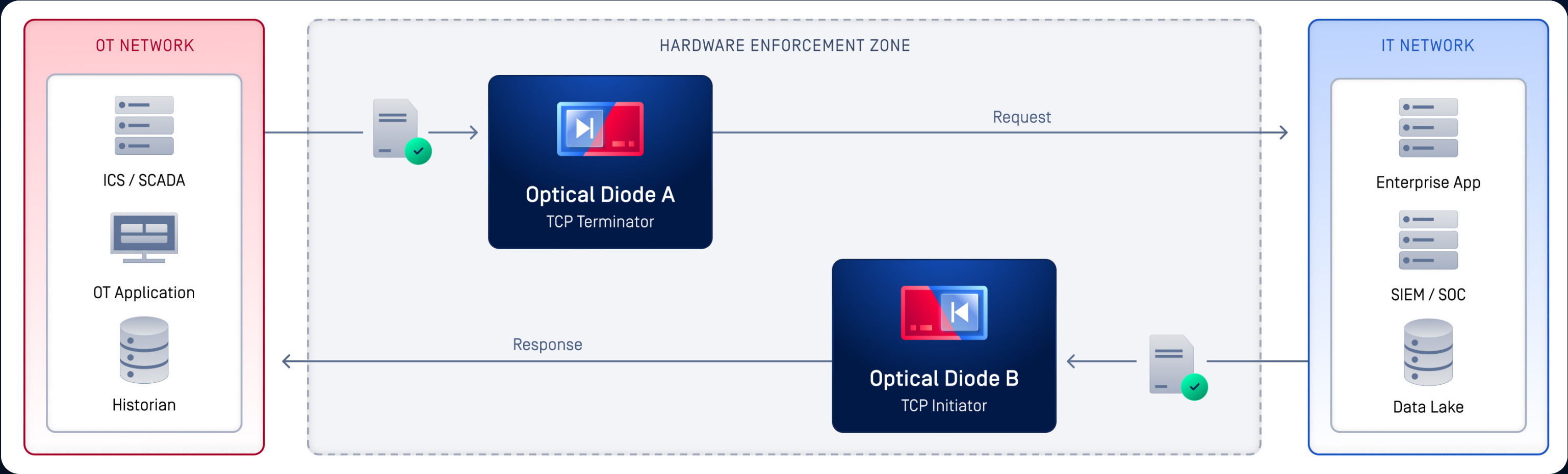
OPSWAT uses a back-to-back MetaDefender Optical Diode architecture with integrated TCP Initiator and Terminator protocol adapters, enabling controlled request-and-response at the application layer while preserving strict network isolation at the transport and routing layers. At no point do protected networks directly communicate, route IP traffic, or establish trust.

How It Works

- Two MetaDefender Optical Diodes are deployed in opposite directions
- Each optical diode provides physically enforced one-way data transfer through optical isolation
- Each MetaDefender Optical Diode pair enforces non-routable network protocol break between networks
- TCP sessions are terminated and re-originated at the controlled enforcement points
- Each data flow across the optical diode must be explicitly whitelisted and approved end-to-end
- Ethernet frames crossing the diode contain no routable IP information

Use Cases

- OT-to-IT and IT-to-OT application integration
- ICS / SCADA environments requiring secure command-response behavior
- Critical infrastructure and regulated industries
- Environments where firewall-based trust is unacceptable



Deployment Requirements

- Two MetaDefender Optical Diodes
 - One for one-way flow: OT (High) → IT (Low)
 - One for one-way flow: IT (Low) → OT (High)
- TCP Initiator and TCP Terminator protocol adapters configured for each communication path
- A customer application requiring application-layer responses

Why OPSWAT

- Proven physically enforced one-way data transfer through optical isolation
- Application compatibility without architectural compromise
- Granular, auditable control of every data flow
- Confidence to enable business-critical integrations securely

Key Security Benefits

- Physically enforced one-way data transfer through optical isolation
- Hardware security dongle must be inserted for all configuration changes
- No IP routing or network address exposure between environments
- Configurable Session Initiation - High or low-side can allow/block
- Protocol-level isolation and inspection
- Elimination of direct network trust and lateral movement
- Security posture exceeds traditional firewall-based software architectures

A back-to-back deployment architecture using two MetaDefender Optical Diodes provides a practical balance between operational functionality and cybersecurity. Organizations can support application-layer bidirectional communication while preserving physical network isolation through optical data transfer, enabling critical business processes without exposing critical networks to the risks associated with traditional bidirectional connectivity.

Learn more about
MetaDefender Optical Diode:
[opswat.com/products
/metadefender/optical-diode](https://opswat.com/products/metadefender-optical-diode)



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