network perception

TSA Pipeline Directive: Guide to Compliance

Version 1.0

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Key Summary

The Transportation Security Agency (TSA) released their latest Security Directive (SD) on July 27, 2022, entitled Pipeline-2021-02C. This SD represents a continuation of previous versions and includes many new compliance requirements. In this SD, pipeline responsible parties must verify appropriate network segmentation (III.B) and sufficient access control measures (III.C) for all connections to a control, or OT, system. The SD further requires that responsible parties must maintain a clear understanding of all communications paths between their IT and OT systems (111.F.1.b & d). Lastly, the SD requires responsible parties to create network architecture diagrams (111.G.2.b) with clear markings to indicate both logical zone boundaries and zone criticality. This whitepaper presents the requirements and provides step-by-step guidance on how to comply.

Pipeline Security Background

Pipeline security and regulations were assigned to the **Transportation Security Administration (TSA)** by Congress in 2001 through the Aviation and Transportation Security Act. For two decades, TSA advocated for voluntary pipeline cybersecurity standards under the rationale that it enabled greater flexibility to protect against rapidly evolving cyber threats.

In light of the May 7, 2021 Colonial Pipeline incident, TSA administrators changed course by issuing Security Directive Pipeline-2021-01 on May 28, 2021, quickly followed by Security Directive Pipeline-2021-02 on July 26, 2021.

The first directive placed three **mandatory requirements on pipeline owners and operators**:

1. Report all cybersecurity incidents to CISA within 12 hours,
2. Designate a primary and alternative Cybersecurity Coordinator, at the corporate level, who is accessible 24/7 to TSA and CISA, and
3. Conduct a cybersecurity vulnerability assessment and provide a report of this assessment to TSA and CISA within 30 days.

The second directive added three mandatory requirements:

1. Implement immediate mitigation measures to protect against cyberattacks
2. Develop a cybersecurity contingency and recovery plan, and
3. Conduct a cybersecurity architecture design review.

Failure to comply can lead up to fines as high as **$11,904 per day, per violation**, which is the maximum civil penalty for pipelines under the latest TSA guidance.

The eminent nature of the threat led TSA to issue these security directives without going through a rulemaking or stakeholder feedback process. The industry reacted with concerns and perceived the requirements to be overly burdensome and not readily attainable for most pipeline owners and operators. In response, TSA engaged with cybersecurity experts and industry stakeholders over the past 12 months and decided to offer more flexibility to

meet the intended security outcomes by **transitioning to a performance-based approach**. The new requirements have been issued through Security Directive Pipeline-2021-02C on July 27, 2022. The new approach supersedes previous directives and is presented below.

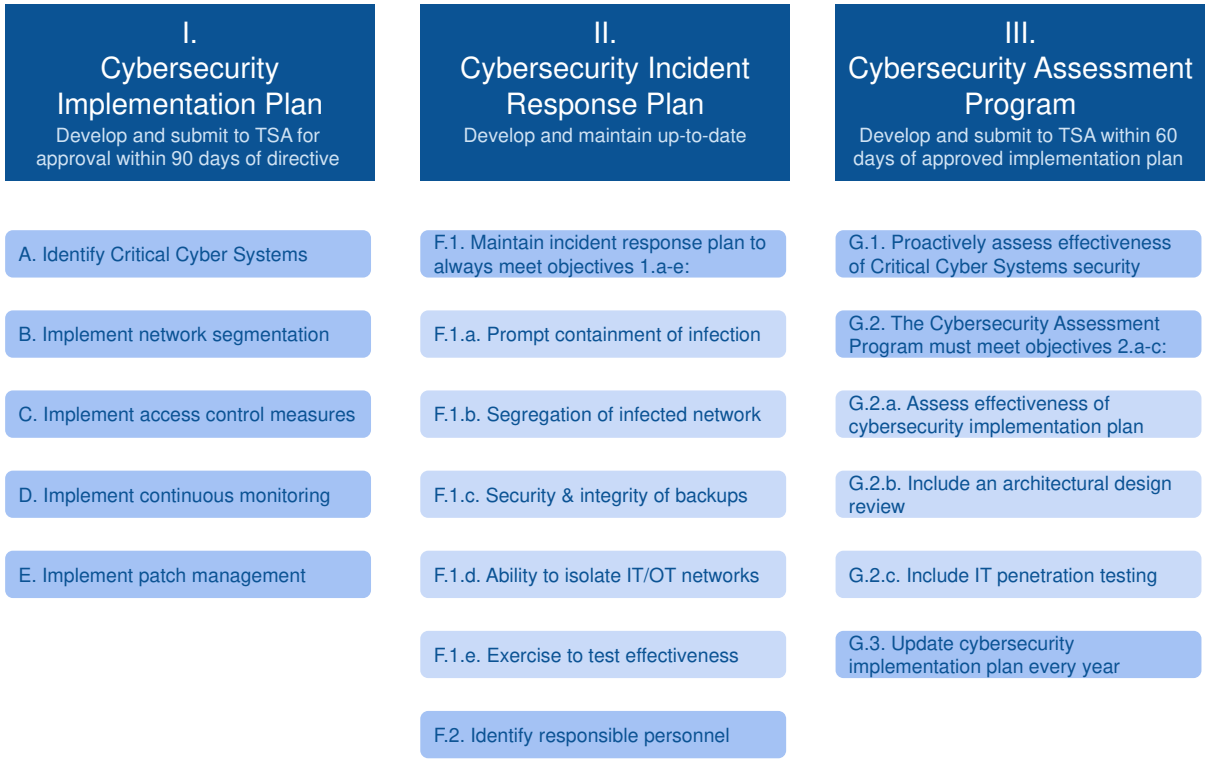
TSA Security Directive Overview

The latest Security Directive Pipeline-2021-02C released on July 27, 2022 includes the following three requirements:

1. Establish and implement a TSA-approved **Cybersecurity Implementation Plan** that describes the specific cybersecurity measures employed and the schedule for achieving the outcomes described in Section III.A. through III.E of the directive.
2. Develop and maintain an up-to-date **Cybersecurity Incident Response Plan** to reduce the risk of operational disruption, or the risk of other significant impacts on necessary capacity, as defined in the directive, should the Information and/or Operational Technology systems of a gas or liquid pipeline be affected by a cybersecurity incident (Section III.F. of the directive).
3. Establish a **Cybersecurity Assessment Program** and submit an annual plan that describes how the Owner/Operator will proactively and regularly assess the effectiveness of cybersecurity measures apd identify and resolve device, network, and/or system vulnerabilities (Section III.G. of the directive).

The following diagram provides a breakdown overview of the requirements and related cybersecurity objectives.

Overview of TSA Security Directive Requirements



Documentation to Establish Compliance

One important aspect of the revised Security Directive allows owners and operators to map their Cybersecurity Implementation Plan on a performance-based schedule. The directive also includes the following list of **documentation to establish compliance**:

- Hardware/software asset inventory that includes the SCADA environment
- Firewall rulesets and filtering policies
- Network diagram including switch and router configurations
- Documents that informed the development and implementation of the Cybersecurity Implementation Plan, the Cybersecurity Incident Response Plan, and the Cybersecurity Assessment Program
- Snapshot activity data including log files and up to 24 hours of network traffic capture

The next section describes how to best prepare for a TSA audit by leveraging a network access modeling and verification solution such as NP-View.

Preparing for a TSA Audit with NP-View

TSA relies upon existing investigative and enforcement procedures to ensure compliance with the security directive requirements. **The pipeline owners and operators must make records necessary to establish compliance with the requirements available to TSA upon request for inspection**. TSA already went through an information collection process in 2021 by visiting critical pipeline facilities and sending Critical Facility Security Review (CFSR) form to the top 100 most critical pipelines.

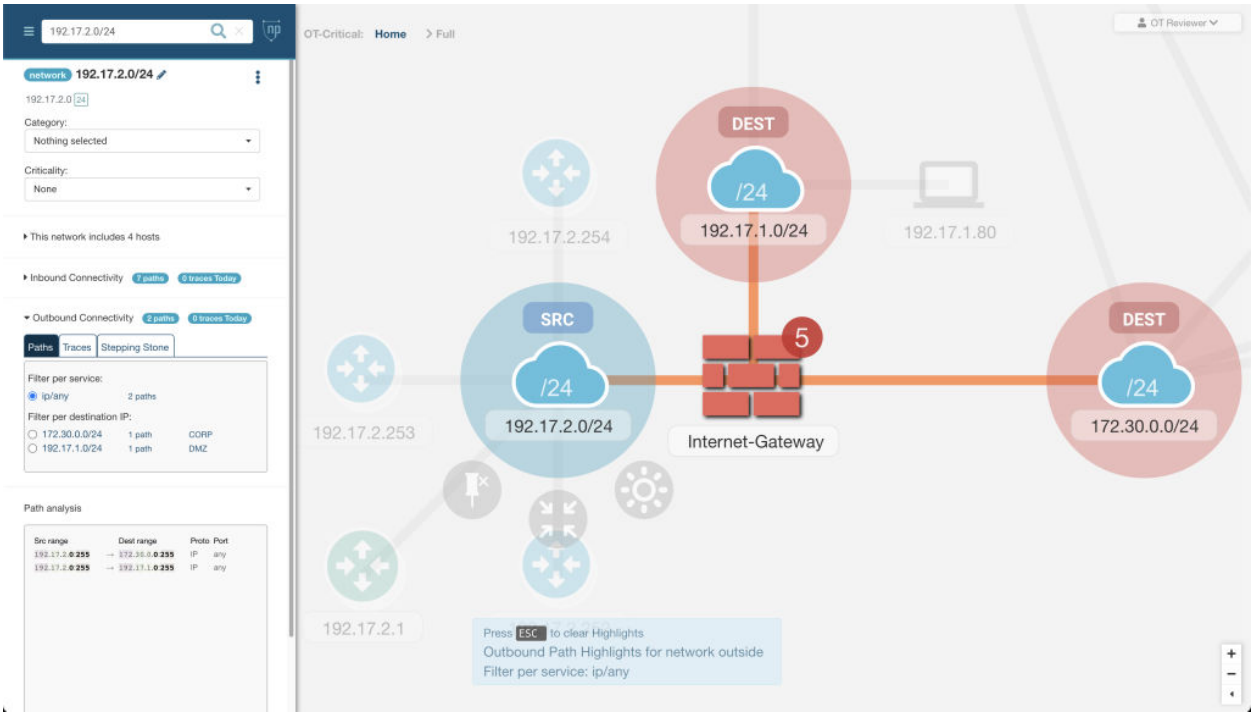
During critical facility visits, TSA documents and provides recommendations to pipeline operators to improve the security posture of the reviewed facility. TSA then follows up with pipeline operators via email on the status toward implementation of the recommendations made during the critical facility visits. The follow up is conducted at intervals of 6, 12 and 18 months after the facility visit.

To understand how an audit works, one should look at how the Federal Energy Regulatory Commission (FERC) has long required electric power systems to comply with mandatory NERC CIP cybersecurity regulations. It is recommended for pipeline owners and operators to make their **TSA policies and procedures consistent with NERC CIP cybersecurity standards** across their telecommunication infrastructure.

The Network Perception team knows the NERC CIP framework well and developed the NP-View software specifically to support the network diagramming and firewall rule verification needs of both the NERC auditors and the compliance teams at electric utilities. NP-View works by ingesting firewall, router, and switch configuration files offline to automatically produce evidence to demonstrate compliance. The network modeling capabilities enables users to:

- **Verify the correct implementation of network segmentation** (III.B) and access control measures (III.C), including all external connections to the OT system.

- **Ensure clear understanding of communication paths between IT and OT** (III.F.1.b and III.F.1.d).
- **Generate automatically network architecture diagram** (III.G.2.b) with a representation of logical zone boundaries and their criticality.



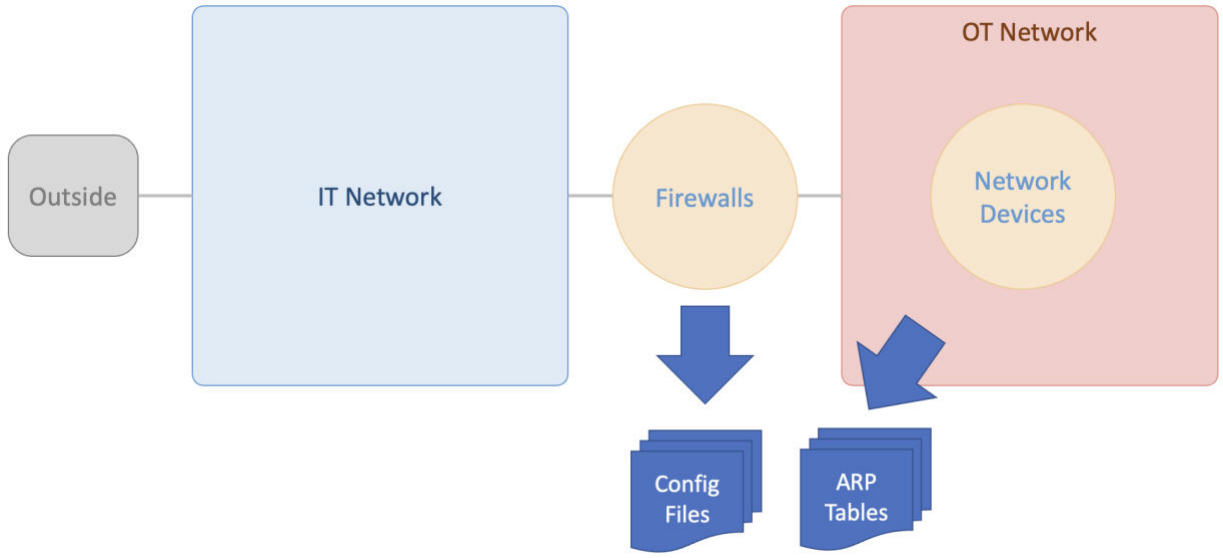
Screenshot of NP-View representing a layer-3 network diagram with connectivity path analysis. Visit the Knowledge Base to learn more.

Preparing for an audit means collecting relevant evidence of compliance to prove that the Security Directive requirements have been followed. NP-View enables compliance teams to achieve this objective in 3 steps:

Step 1: Collect Raw Data

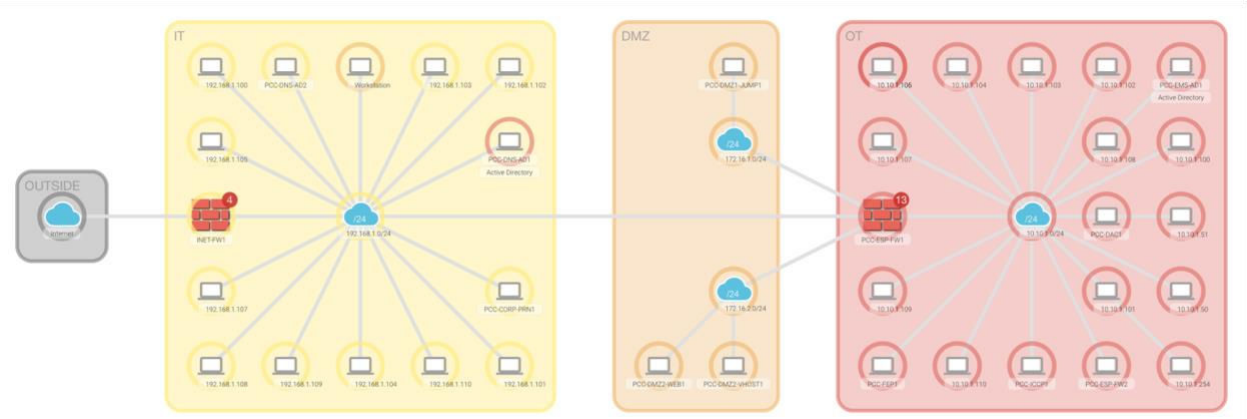
Network access modeling works by ingesting raw configuration files from network devices including firewalls, routers, and switches. The first step to prepare for an audit is to define network devices in scope and export the latest version of their configuration files into a

folder. Another important data source to build an accurate network topology diagram is the asset inventory. The list of all connected assets can be obtained by exporting the ARP table from network switches in scope of the Security Directive. The exported ARP tables should be stored as flat files next to the network device configuration files.



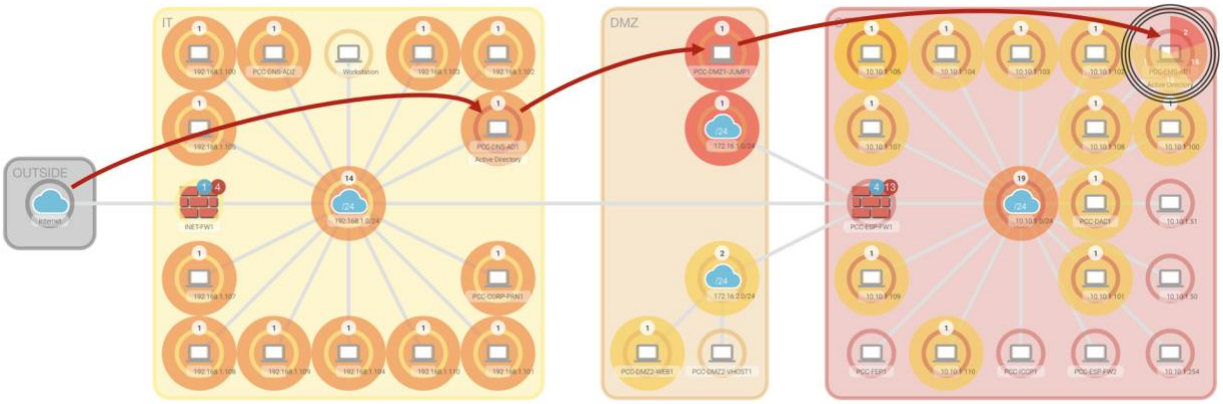
Step 2: Generate Network Topology Diagram

Once raw data has been collected, it can be imported into the NP-View desktop application. NP-View will parse each configuration file and ARP table to extract the list of IP addresses, subnets, VLANs, VPNs, and gateways. NP-View will also build a model of the network using the firewall rulesets, access policies, and network routes extracted from the configuration files. After a few minutes of data processing, NP-View will show an accurate and up-to-date layer-3 network architecture representation. This diagram is interactive, enabling analysts to assign criticalities to nodes and network zones. Importing the ARP tables will ensure that all connected endpoints are displayed in the network map.
After labeling the topology map, it can be exported as a PDF and stored as evidence of compliance with requirement III.G.2.b: "Architecture Design Review".



Step 3: Document Communication Paths

By modeling network access, NP-View automatically calculates all possible communication paths in the network. This capability enables analysts to verify the correct implementation of network segmentation by reviewing and understanding all external connections to the OT system, as well as communication between IT and OT. Those paths can be iteratively visualized with NP-View. In addition, a comprehensive table that includes all communication paths with source IP, destination IP, services, and related firewall rules can be easily exported and stored as evidence of compliance with requirements III.B (network segmentation review), III.F.1.b and III.F.1 (communication paths between IT and OT).



NP-View is designed to help save up to 80% of the time required to audit complex firewall rulesets. The three-step process presented above offers a solid and efficient workflow to strengthen your TSA Cybersecurity Implementation Plan.

About Network Perception & NP-View

NP-View is a proactive software product developed by a team of networking and security experts at Network Perception. It works offline and generates a network topology diagram by analyzing configuration files from firewalls, routers, and switches. The interface design of NP-View allows users to easily identify and track overly-permissive network access policies, as well as recording justifications for rules, ports and services. If you have questions or would like to know more about NP-View, please contact the Network Perception team at:

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