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PNNL-SA-221071

File-based Synchrophasor Data Transfer using IEEE 2664 (STTP)

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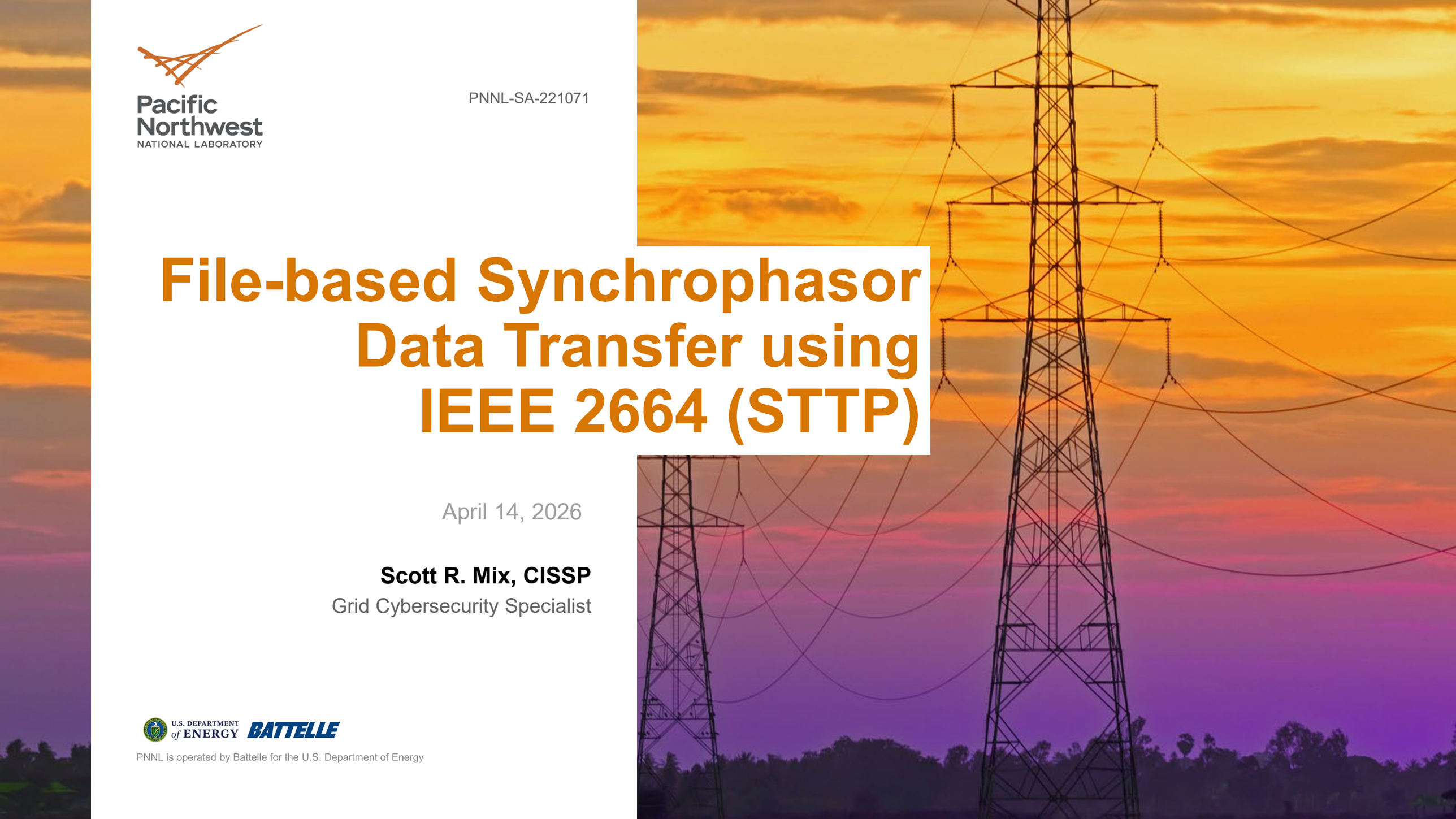

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Agenda

- Quick overview of IEEE 2664
- Why propose a file exchange format?
- Concept and overview of proposed amendment
- Amendment details
- IEEE status of amendment

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IEEE 2664 (STTP) Overview

- IEEE 2664 - Streaming Telemetry Transport Protocol (STTP) provides efficient communication of streaming data (e.g. Synchrophasor data) between a publisher and subscribers
  - Exchange of real-time and historical data
  - Requires a network connection
- Subscribers can request specific points using FilterExpression features of the Subscribe command
- Subscribers can request historical data by specifying a StartTime and a StopTime in the Subscribe command
- Subscribers can specify additional features in the Subscribe command or the DefineOperationalModes command
- STTP supports a combined command and data channel

Problem Statement (PAR Need statement)

- Research into data sharing practices at utilities has determined that the **lack of a standardized request or response format for synchrophasor data results in costly and inefficient processing** for requesting data, preparing the response to the request, and the processing of received data. **Current practices and procedures are *ad hoc* and differ greatly between requesting and responding organizations**, resulting in custom data formatting and processing for each request. By documenting a consistent mechanism for requesting synchrophasor data and an associated file format for returning the requested data, **standardized processing for both requesting and responding to requests will make the data sharing process more consistent, efficient, and straightforward**. Additionally, commercial products that implement the standard can further streamline the process making it less costly and resource intensive for both the data producer and consumer.

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Concept

- Use features of the existing STTP combined command and data channel
- Use existing STTP commands and data/exchange structures
- Redirect them to a request file and a response file rather than through a network connection

Existing STTP Concept

Figure 3 shows a single TCP channel between the publisher and subscriber. The single channel is used to both send commands and manage the subscription, as well as transfer the subscribed data.

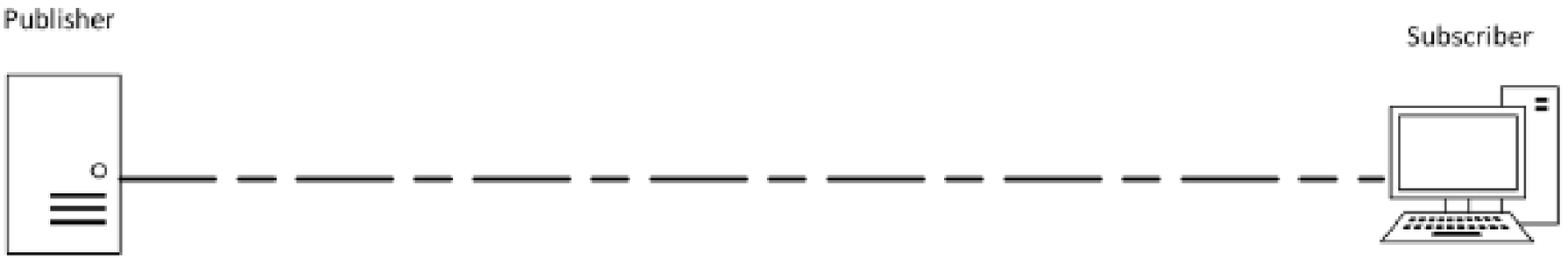

Figure 3—Single combined command and subscription channel

Figure from approved IEEE 2664 standard

Proposed STTP Concept

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Figure 3—Single combined command and subscription channel

Proposed STTP Concept

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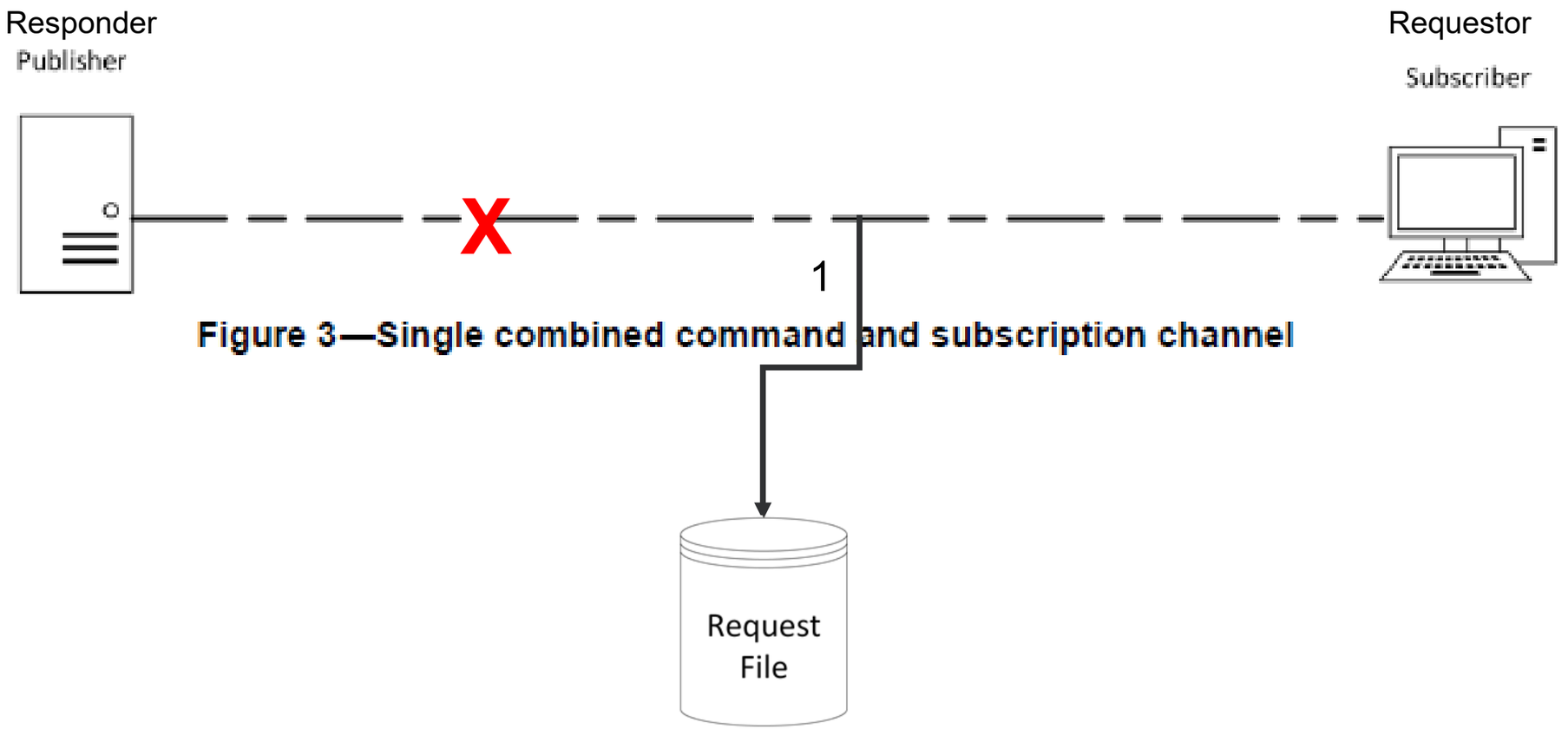

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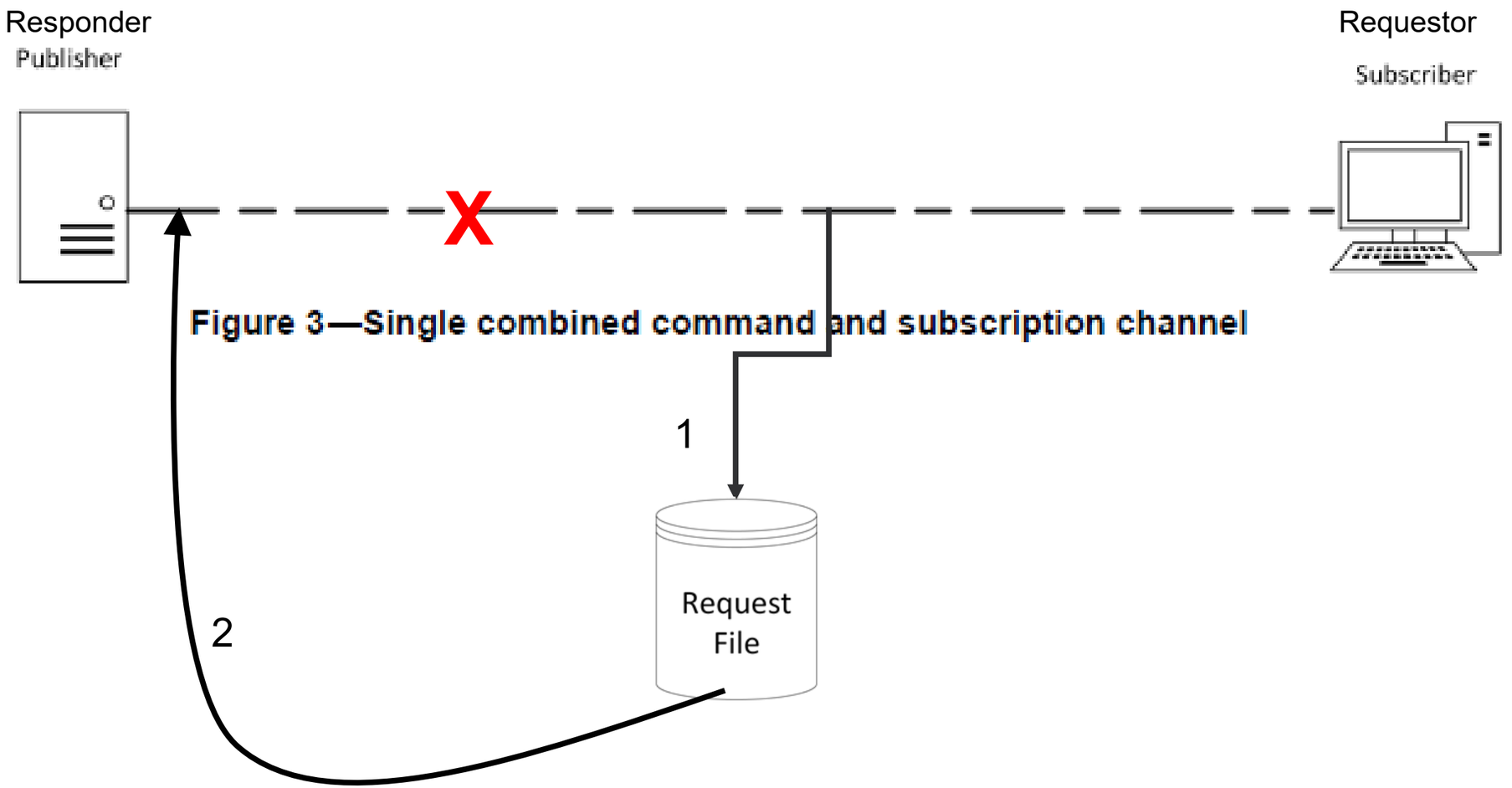

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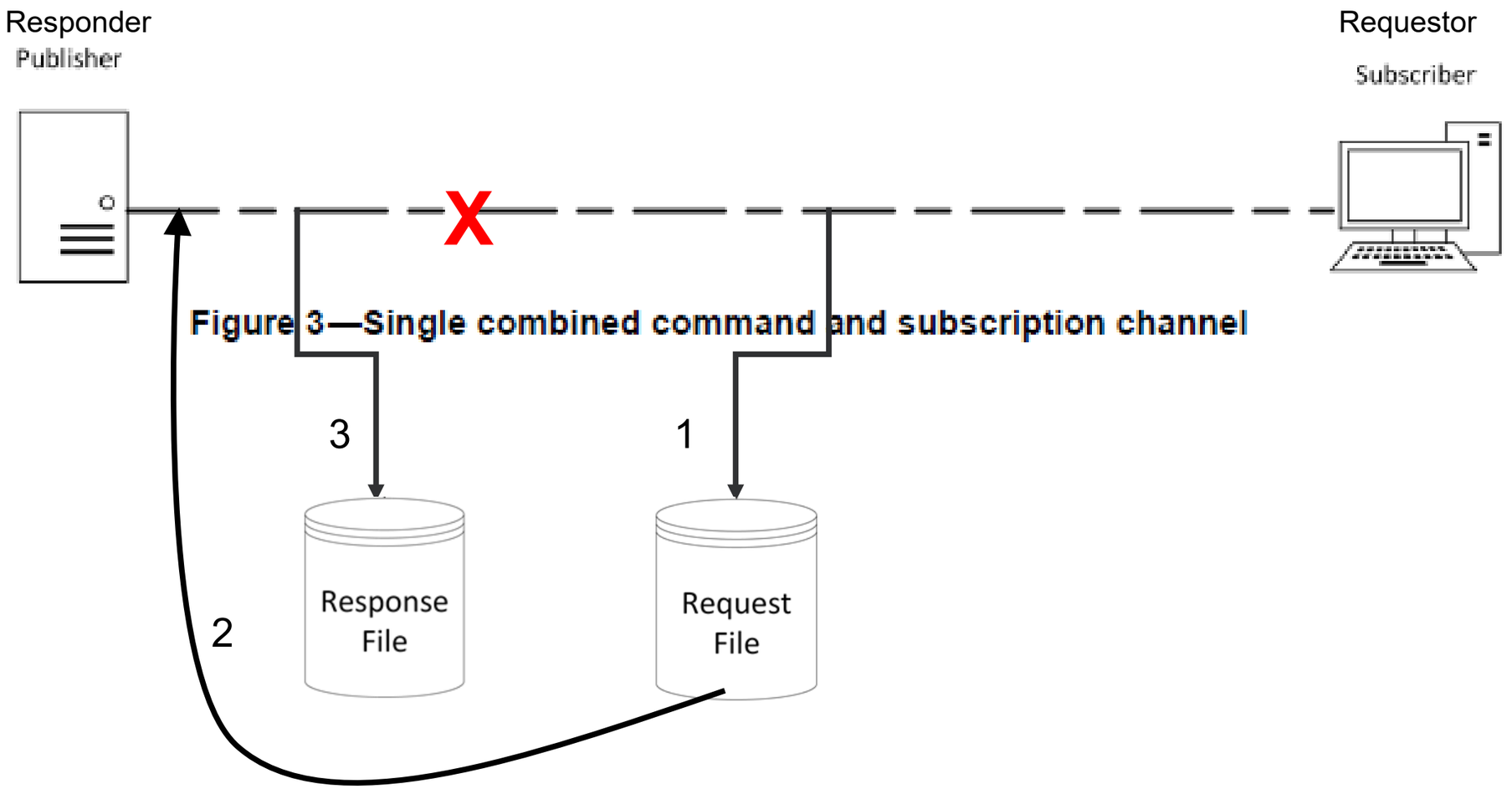

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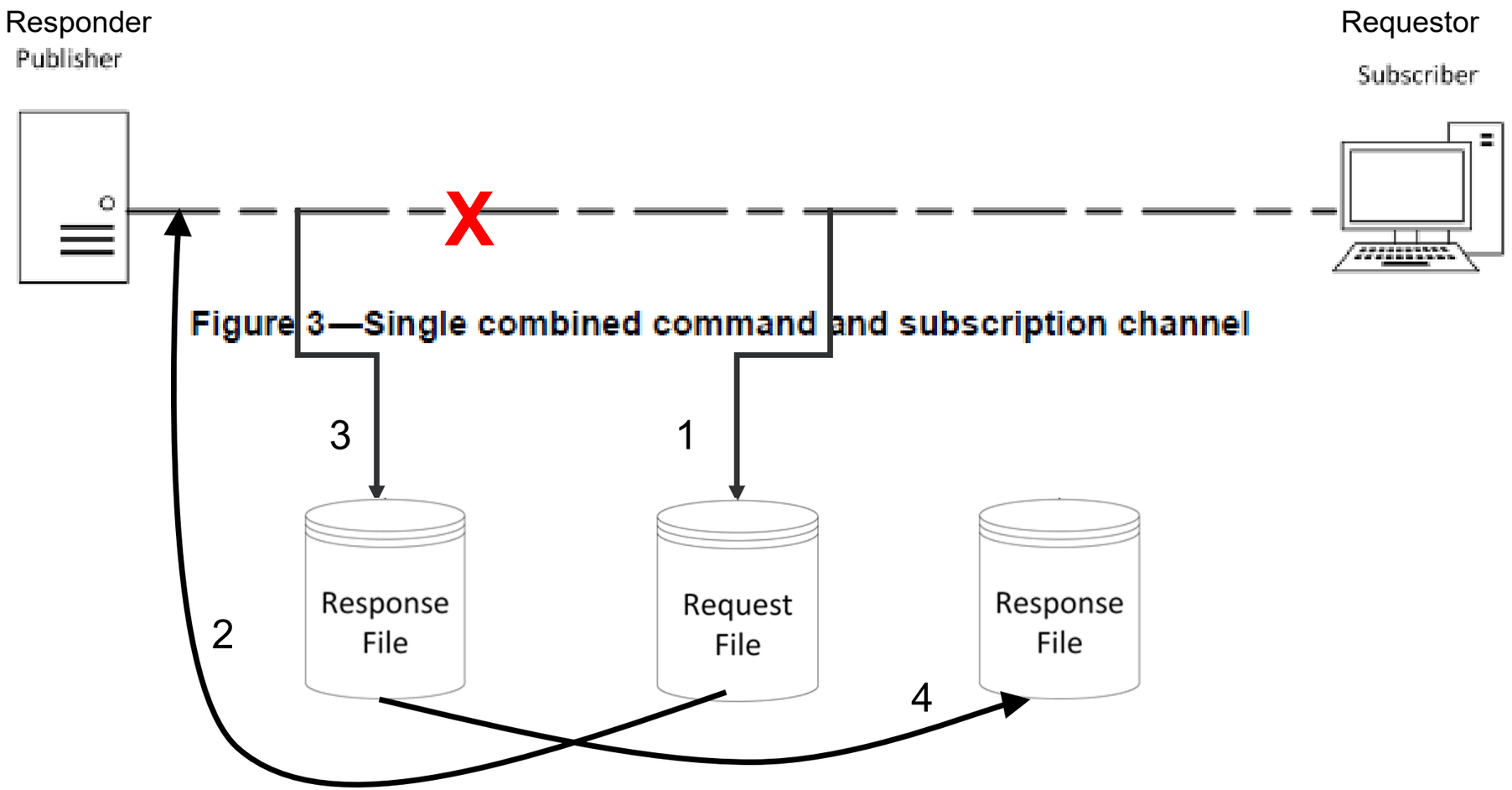

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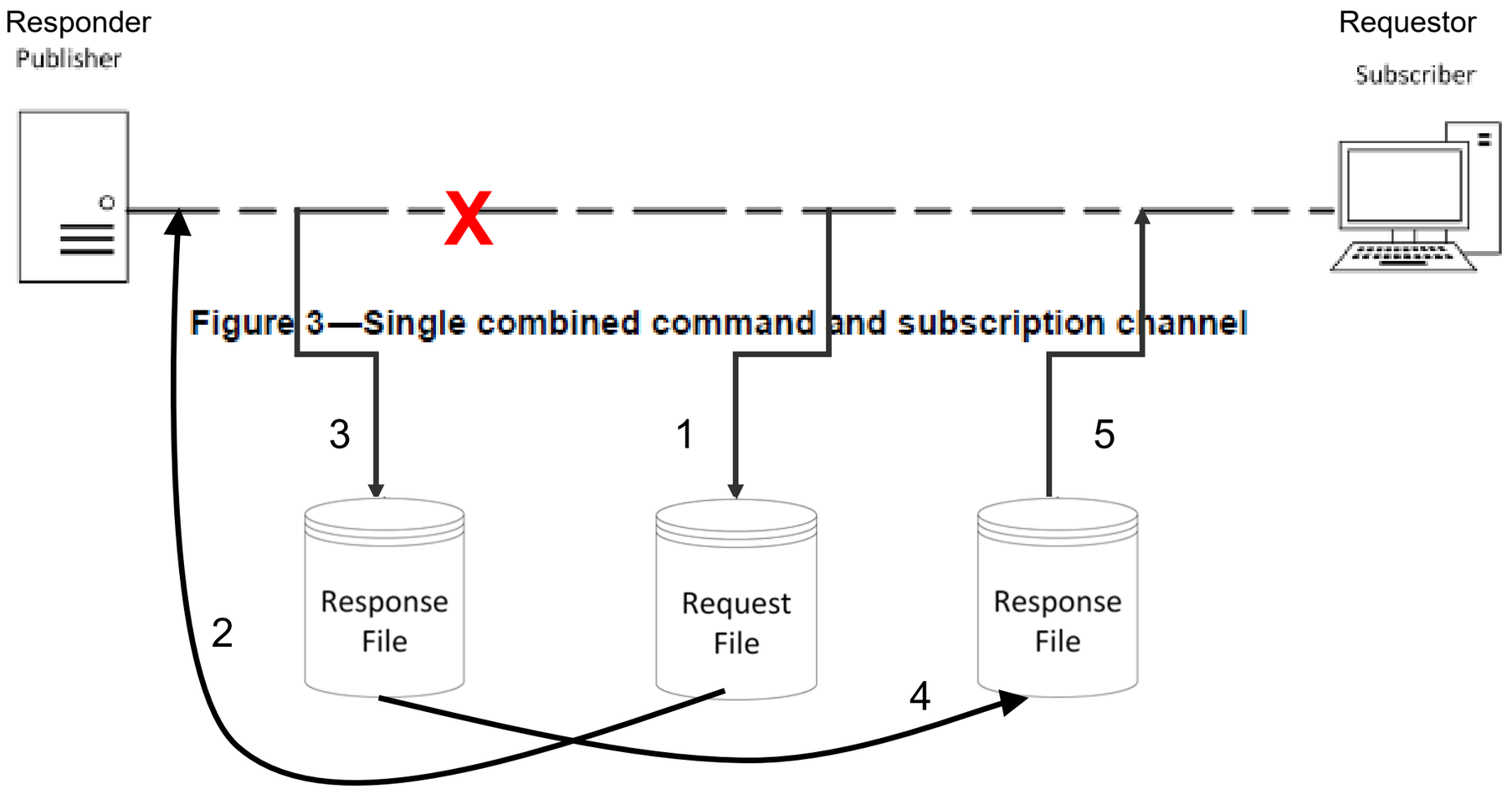

Figure 3—Single combined command and subscription channel

Overall Processing

- Use existing STTP commands
  - Subset required for data request and response
    - ✓No encryption (assume files can be encrypted outside of STTP)
    - ✓No Schema request commands *
- Assume all messages are received (as for a TCP connection)
  - No acknowledgement / Confirm commands
- No negotiation
  - Requests are either accepted (Success) or rejected (Failed)
  - Failure reasons returned in response file
- No modifications to data stream
  - No Unsubscribe
  - No Update commands

* - may be an oversight that could be addressed during the ballot/comment period

Requestor Processing

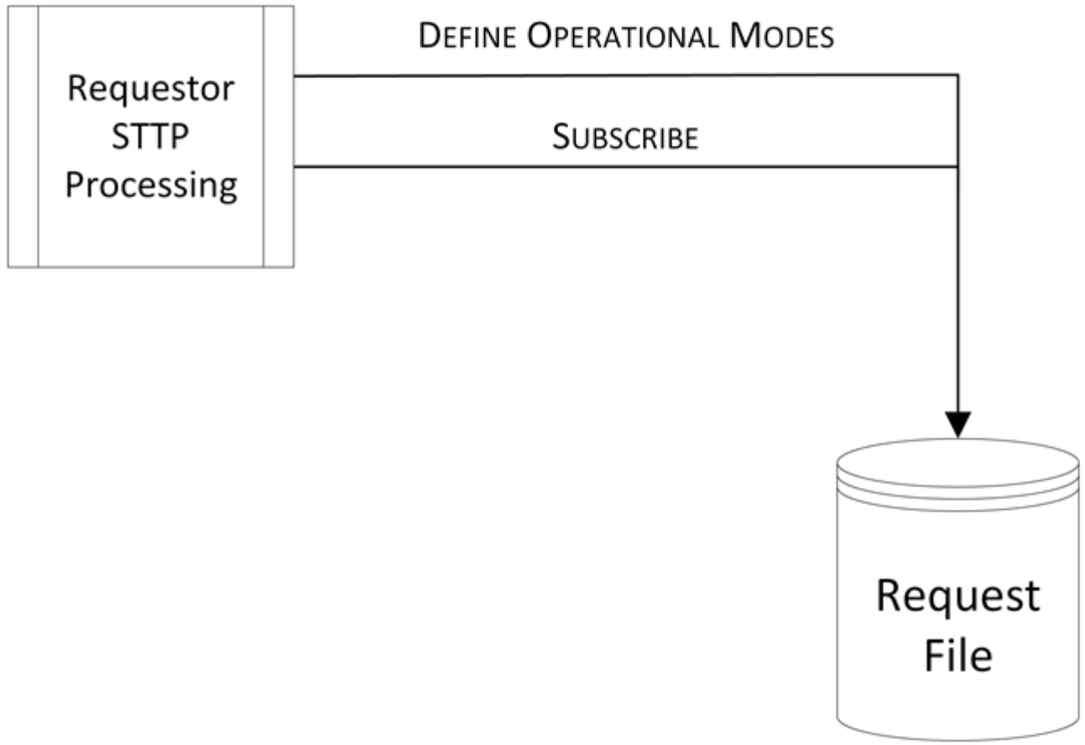

Figure 40 — STTP Requestor Processing

- Write Define Operational Modes command to Request File:
  - Specify compression and other modes
- Write Subscribe command to Request File:
  - Specify point list (using FilterExpression) – may include wildcards
  - Specify DownSampling and SampleInterval
  - Specify TimestampResolution and TimestampPrecision
  - Specify StartTime and StopTime
  - Others

Figure from Proposed IEEE 2664 standard amendment

Responder Processing

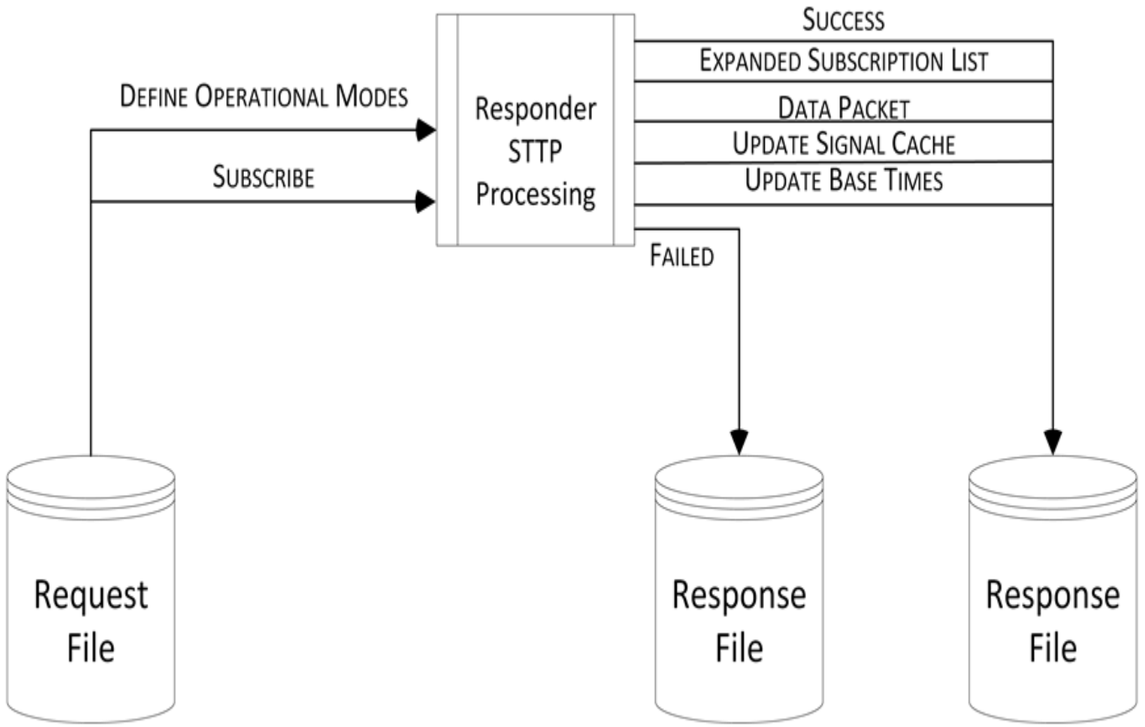

Figure 41 — STTP Responder Processing

- Read Request File:
  - Validate and write Failed or Success to Response File
- If Success, write to Response File:
  - Expanded subscription list
  - Update Signal Cache
  - Data Packets (and Buffer Blocks*) containing requested data
  - If needed, Update Base Times

Figure from Proposed IEEE 2664 standard amendment

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Requestor Processing

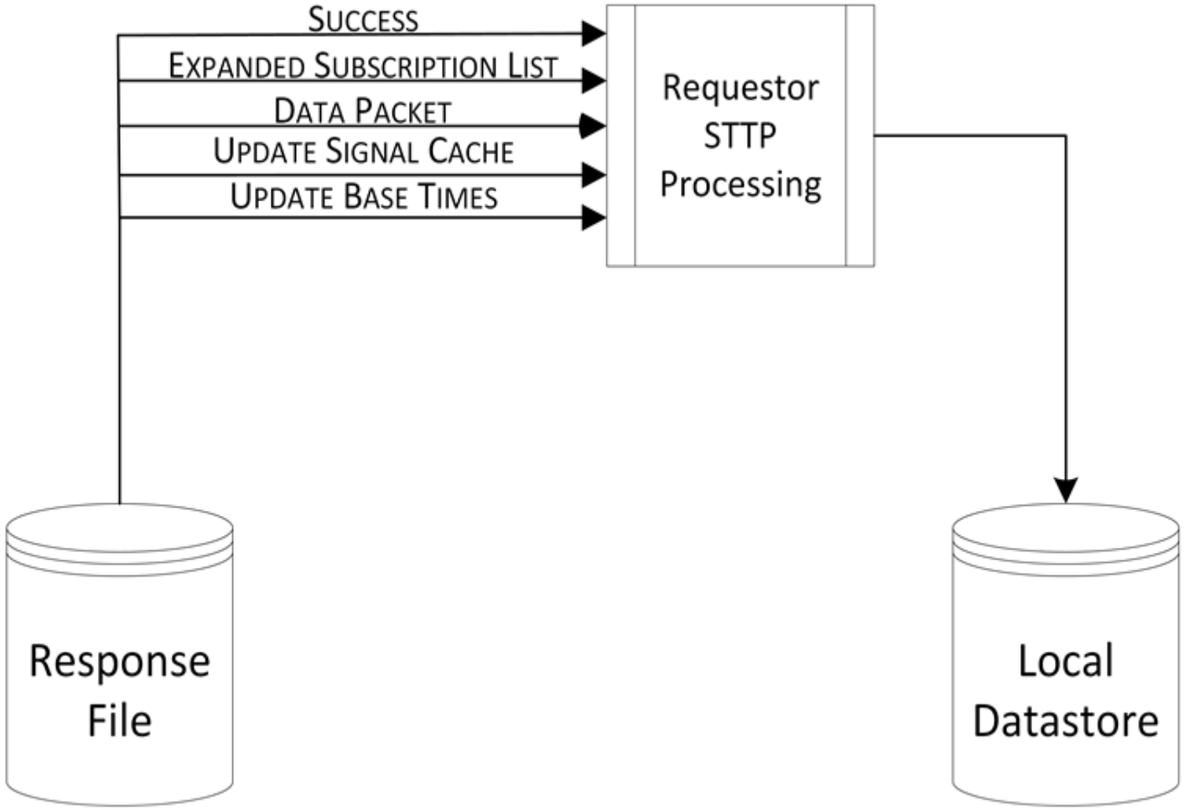

Figure 42 — STTP Requestor processing received data

- Read Response File commands (including Data Packets)
- Process as if they were received from a network connection
  - No confirmation / acknowledgement
  - Uncompress (if compressed)
  - Extract and store data

Figure from Proposed IEEE 2664 standard amendment

IEEE Standards Process

- Draft amendment was approved by the IEEE Power System Communications and Cybersecurity Committee (PSCCC) P10 working group on February 10
- IEEE Standards Association (SA) Ballot Group formation opened March 23
- Ballot Group formation will close soon
  - If interested email me (scott.r.mix@ieee.org) for instructions on how to join
- Amendment will go to ballot soon after the May 14th PSCCC meeting
- Expect to be complete by the end of this year

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Thank you