Enabling Technologies for DER: Alternative Communications Study

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Agenda

- Background

- Overview & Purpose

- Existing and Alternative Telemetry Solutions

- Failure Modes

- Redundancy Requirements

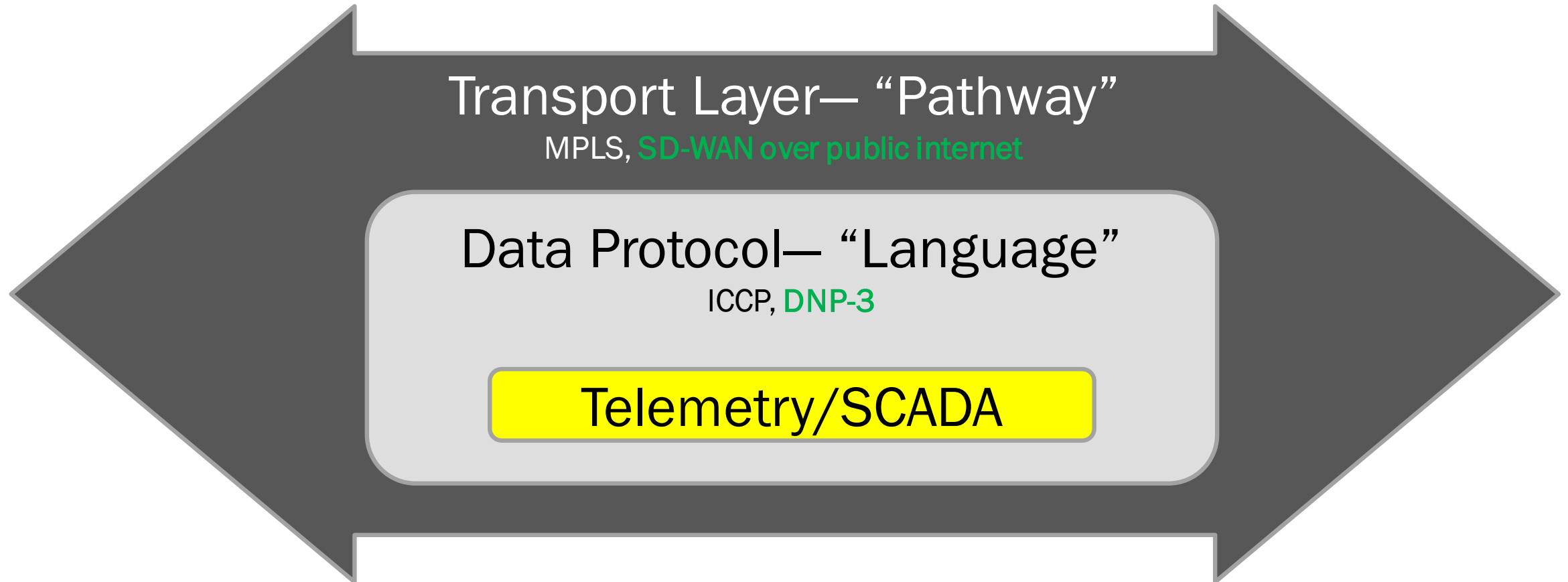- Study Conclusions

- Next Steps & Timeline

Background

Background

- The NYISO's proposed Distributed Energy Resource (DER) participation model will integrate new, distributed, facilities participating in Aggregations with the ability to serve multiple purposes

  - The NYISO investigated whether alternatives to existing telemetry communication requirements may improve the efficiency of establishing required secure connections and reduce costs

  - The NYISO requires that telemetry data be exchanged between the Aggregator, NYISO and applicable TO

Review: Today's Telemetry Requirements

- NYISO's existing telemetry requirements for all Generators (including Intermittent Power Resources and Energy Limited Resources), and DSASP Resources to participate in NYISO's Energy Market include:

  - 6-second (or faster) scan rate

  - Not to exceed 10-sec one-way latency (from the resource to NYISO or from NYISO to the resource)

  - Not to exceed 20-sec round-trip latency (from NYISO to resource and back to NYISO)

  - Not to exceed ±5% full-scale error

Telemetry Communication Components

Transport Layer— "Pathway"

MPLS, SD-WAN over public internet

Data Protocol— "Language"

ICCP, DNP-3

Telemetry/SCADA

*Proposed alternative solutions identified in green

Existing Telemetry Pathway

- ## Multi-Protocol Label Switching (MPLS) – Data 'pathway'

  - MPLS service commonly requires direct connection

    - i.e. Ethernet, Tier 1

  - Average of 45 days to establish required connections

  - MPLS requires an entity requesting connection to establish a physical connection to the NYISO

  - Depending on the specific circumstances, circuits can be expensive to setup and operate

  - MPLS connections to Transmission Owners and Direct Connect DSASP Resources

  - Telemetry received from most resources via TO

Existing Telemetry Requirements

- **Inter-Control Center Communications Protocol (ICCP) – Data 'language' over MPLS– Data 'pathway'**
  - Framework used to move telemetry data over a private network

Overview & Purpose

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# Enabling Technologies for DER: Alternative Communications Study

- The NYISO evaluated additional protocol and public internet-based alternatives to existing telemetry framework (ICCP over MPLS)
  - Transport layer alternative: SD-WAN
  - Transport layer alternative: ISP SSL
  - Protocol alternative: DNP-3
- Examined performance capabilities of existing ICCP over MPLS
  - Meeting or exceeding current NYISO telemetry requirements
  - Security, latency, reliability, quality
  - Cost, time it takes to establish connection
- Identified required telemetry performance requirements

Performance Considerations

- **NYISO Requirements - Ability to maintain telemetry requirements described on slide 5**
  - Impacts to NYISO and Aggregators
    - Costs, connection set up time
- **NYS Transmission Owners Requirements**
  - Joint Utilities coordination
- **NERC Reliability Standards**
- **ISO/RTO Evaluation**
  - Current applications of other protocol/solutions

Options for Real-time Telemetry Data Communication Paths

Option 1 – Aggregator communicates only with DSP and DSP provides data to/from NYISO
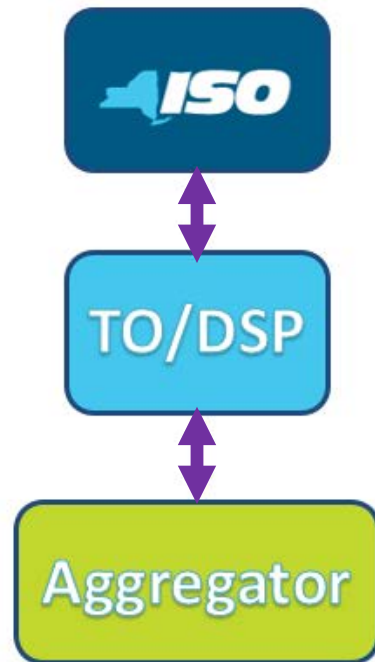
Option 2 – Aggregator communicates with both DSP and NYISO in parallel

Study Focus

Telemetry communication pathways
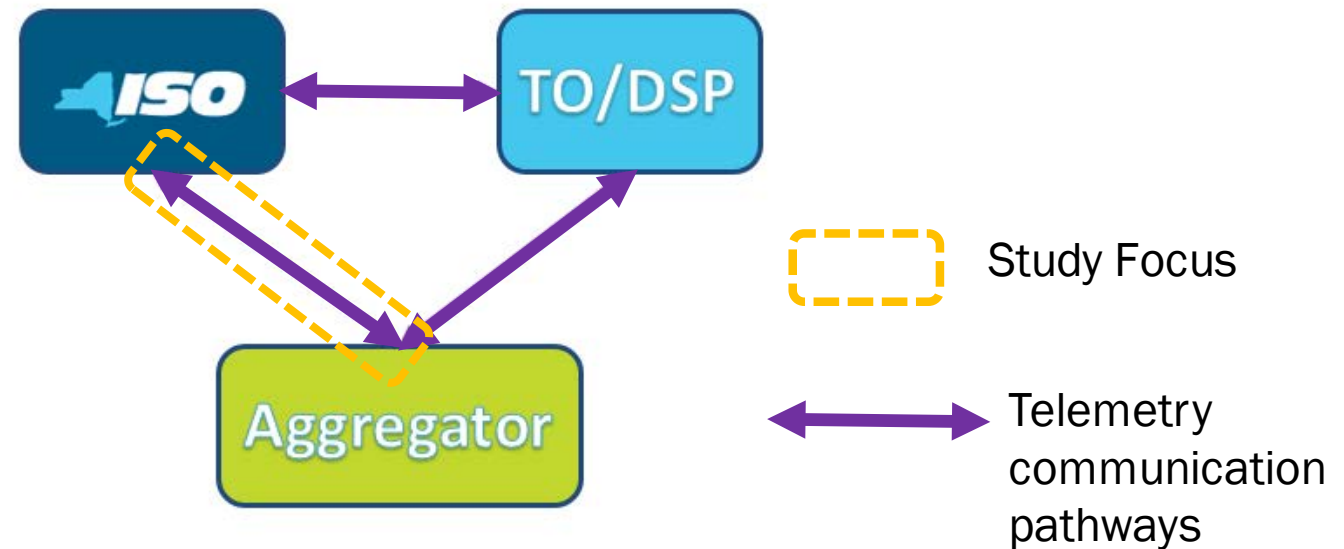
Existing and Alternative Telemetry Solutions

Telemetry Communication Components: Transport Layer

Transport Layer— "Pathway"
MPLS, SD-WAN over public internet

Data Protocol— "Language"
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Telemetry/SCADA

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Software-Defined Wide Area Network (SD-WAN)

- **Public Internet overlay provided by a vendor**

  - Network maintained by vendor, connection via standard Internet service

  - Security and availability mechanisms differ among SD-WAN providers

- **Requires Public Internet connections at Aggregator locations, TOs, and NYISO**

  - Does not require dedicated circuit to site

SD-WAN

- **Connection established via gateway device at each 'endpoint' for telemetry exchange**
  - NYISO, Aggregator, TOs
- **Data security and network availability is designed to exceed traditional virtual private network (VPN) technology**
- **The NYISO Pilot Program is currently testing one SD-WAN solution**
  - DER Pilot Program Status Update https://www.nyiso.com/documents/20142/8524371/NYISO%20DER%20Pilot%20Status%20Update%20100319.pdf/f112d865-3d93-c885-fe28-9dad17e96a99

SD-WAN

- **Based on NYISO evaluation of SD-WAN:**
  - Faster provisioning time than MPLS
  - Lower costs than traditional MPLS
 - Secure encryption and reliable performance

Failure Modes

Potential Failure Modes for SD-WAN

- ## SD-WAN
  - Internet Service Provider service disruptions
  - Loss of gateway device at the endpoint
  - Attack directed at SD-WAN provider
  - Vendor viability risk
  - Loss of public internet back bone

Redundancy Requirements

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Requirements for Market Participants communicating directly with the NYISO

■ Proposed Future for Aggregators and Market Participants representing non-aggregated resources

- Market Participant portfolios under 100MW will have an option to use either SD-WAN or a MPLS connection
- Portfolios at 100MW or more can send up to 100MW via SD-WAN, and the remainder via MPLS

Option 2
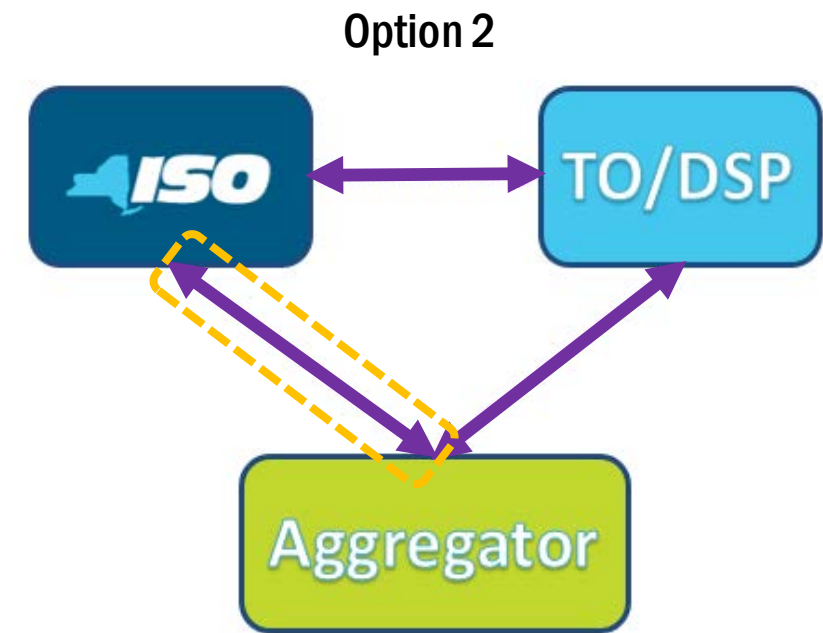
Proposed Redundancy Requirements (by MW)

Aggregator	SD-WAN
X < 25MW	Single Internet Service Provider supporting one gateway for 1 SD-WAN vendor
25MW ≤ X < 100MW	Two Internet Service Providers supporting two gateways for 1 SD-WAN vendor Note: Market Participant may elect to also establish connection with secondary SD-WAN vendor
X ≥ 100MW	SD-WAN not available option for communication with NYISO

Study Conclusions

Study Conclusions

- **The SD-WAN technology is a viable potential alternative to MPLS for telemetry communication in the NYISO-administered market**
  - MPLS will remain an option available to market participants
- **To mitigate single vendor failure point, the NYISO will evaluate supporting two SD-WAN vendors**
  - The NYISO expects to complete review and identify SD-WAN vendors by Q1 2020

Next Steps & Timeline

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Next Steps

B638 Study	DER Participation Model			
Q4 2019	**Q1 2020**	**Q2 – Q4 2020**	**Q3 2021**	**Q4 2021**
Study Published	**NYISO Identification of SD-WAN vendors**	**Work through NYISO manuals and guides with stakeholders related to SD-WAN & potential DNP-3 communications**	**Make SD-WAN & potential DNP-3 available to Aggregators to start connections set up**	**DER 'go-live,' supporting SD-WAN & potential DNP-3 communications**

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits to consumers by:

- Maintaining and enhancing regional reliability

- Operating open, fair and competitive wholesale electricity markets

- Planning the power system for the future

- Providing factual information to policy makers, stakeholders and investors in the power system
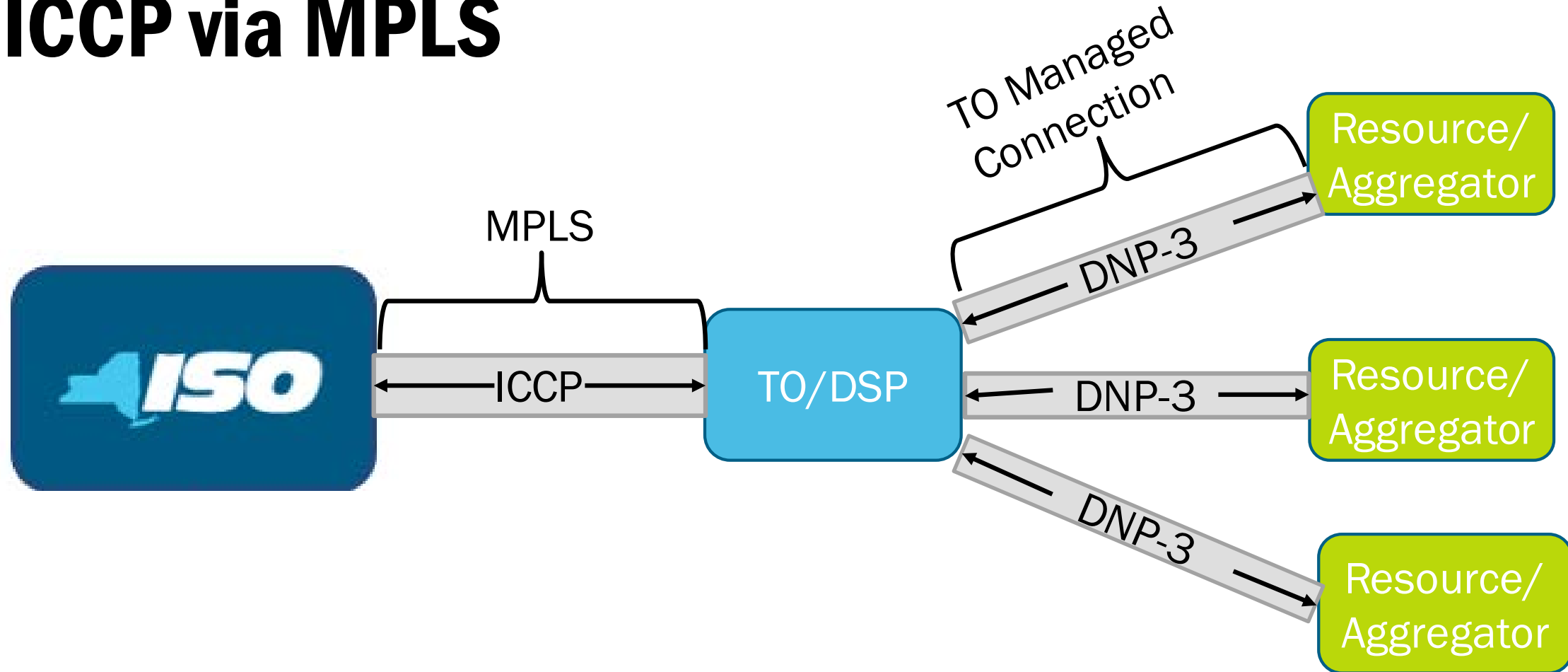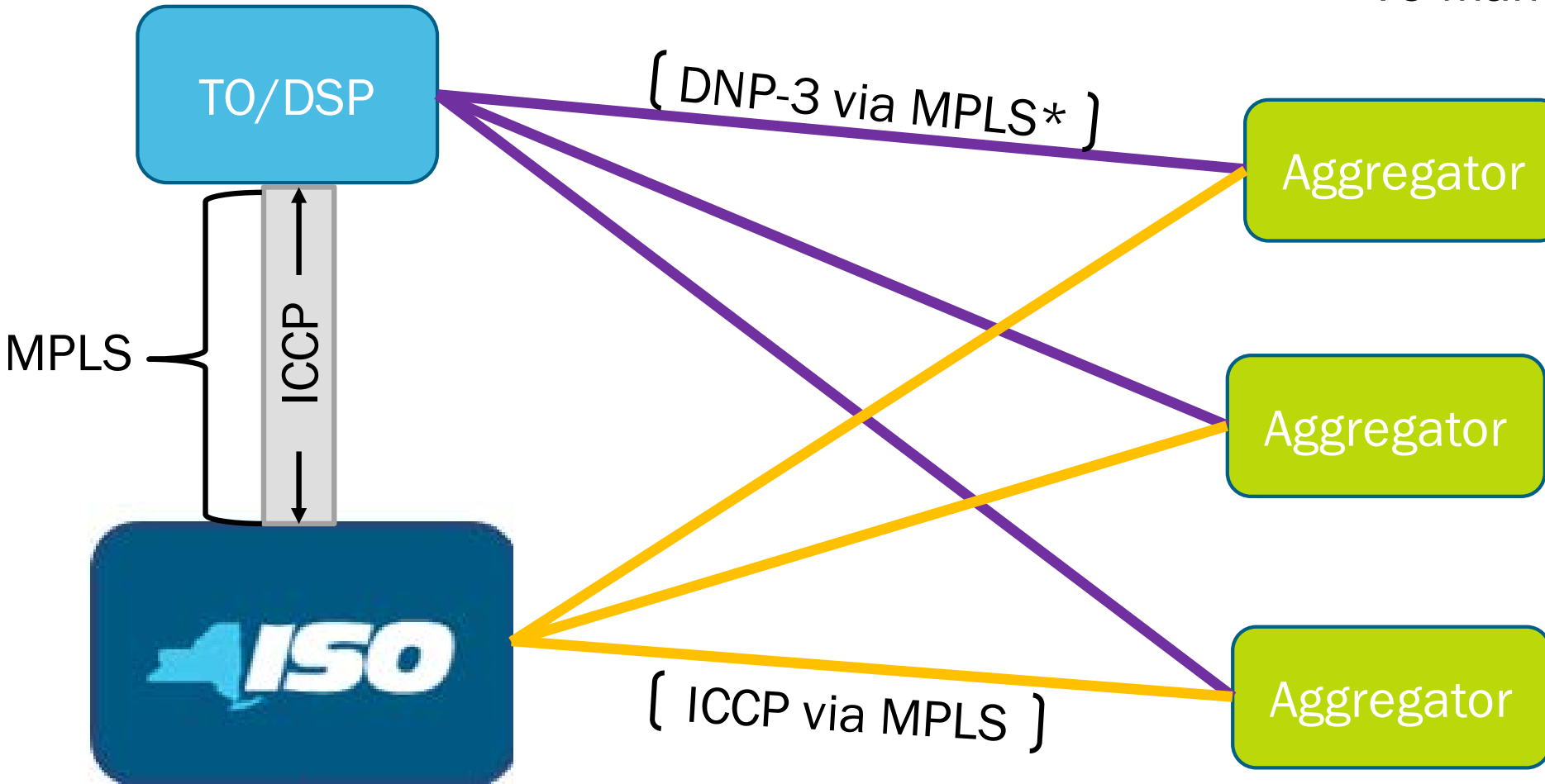
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Appendix

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Technology Overview

MPLS, SD-WAN

Existing: Telemetry Networks & Protocols – ICCP via MPLS

SD-WAN

SD-WAN connection per Aggregator
TO managed connection

TO/DSP

ICCP/DNP-3 via Public Internet SD-WAN

Aggregator

MPLS

ICCP

Aggregator

ISO

ICCP/DNP-3 via Public Internet SD-WAN

Aggregator
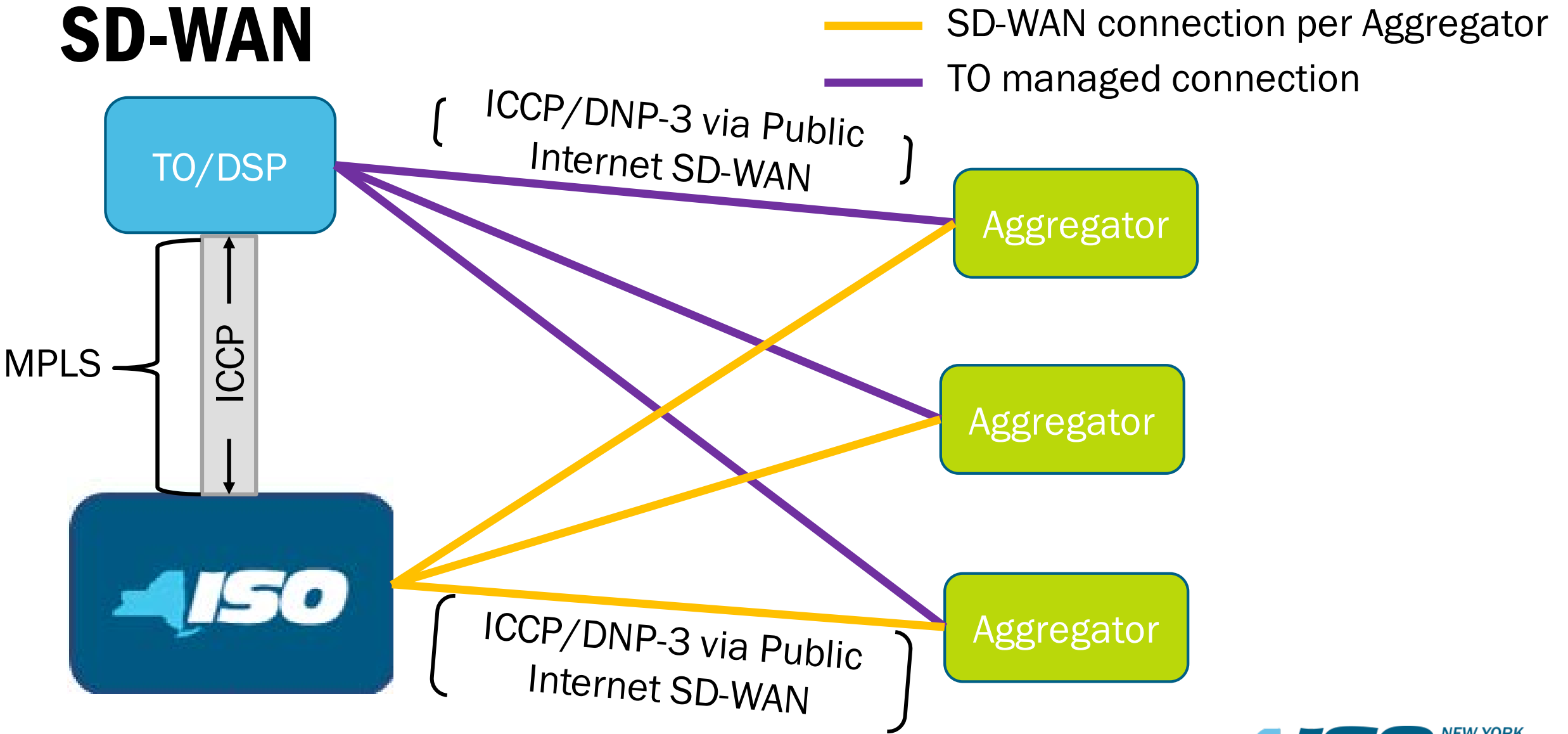
Protocol Overview

ICCP, DNP-3

Telemetry Communication Components: Data Protocol

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Distributed Network Protocol Version 3 (DNP-3)

- Commonly used by TOs for telemetry exchange with resources

- The NYISO has received requests from developers to allow DNP-3

- Other ISOs currently offer DNP-3 as an option
  - Public Internet-based exchange

- Capable of same performance as current ICCP

ICCP

- Inter-Control Center Communications Protocol

- Presently used for telemetry exchange between NYISO and TOs

- Industry standard inter-control center telemetry, widespread market acceptance

- Most efficient for control center to control center use