

Future NESDIS Network Data Distribution

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Outline

The Focus of this presentation is on near real-time satellite data distribution to NOAA partners within the US and internationally.

- Satellite Data Distribution
 - Current Generation
 - New Generation Requirements
- Future NOAA Data Superhighways
 - Internet2 and National Research & Education Networks (NRENS)
 - Internet
- New distribution technologies
 - Multicast: Internet2
 - Cloud Server (Option): Internet
 - Multicast Proof Of Concept
- Summary
- Q&A

Satellite Data Distribution: Current Generation

- NOAA current operational satellites (except SNPP) have relatively small data distribution bandwidth requirements. Distribution is accomplished using direct point to point links.
- NOAA traditionally has had a limited number of partners (international and domestic) to whom we distributed data. The policy is partners have to come to NOAA to receive our data, i.e. partners have to pay for a circuit. This has been expensive for partners but generally doable.
- NOAA traditionally has had a limited number of partners (international and domestic) from whom we receive data. The policy of our partners is similar, that NOAA has to go to partners to receive their data, i.e. NOAA has to pay for a circuit. This has been expensive for NOAA but generally doable.
- Currently mostly use 1.5 to 45 Mbps point to point circuits.
- Existing World Weather Watch Global Telecommunication System (GTS) bandwidth is limited. (NOAA has ~2 Mbps access to GTS)

Satellite	Downlink/Day	Product/Day	External Distribution/Day
GOES-East/West each	~60 GB	~100 GB	Minimal
POES 15, 18, 19 each	~8 GB	~50 GB	~300 GB

Satellite Data Distribution: New Generation

- The new generation of NOAA satellites, including SNPP, collect much more data and have much larger product data sets, resulting in much greater distribution bandwidth requirements.
- More partners want new product data sets than in the past (international and domestic). It would be very expensive for them with the NOAA policy that they have to pay for a circuit to get it, probably prohibitively.
- NOAA would also have to pay for circuits to receive partner data. It would be very expensive, probably prohibitively.
- Existing bandwidth is insufficient for new generation satellite's larger data sets [from GigaBytes (GB) to TeraBytes (TB)]. Would need 1 Gbps or greater point to point circuits (expensive).

Satellite	Downlink/Day	Product/Day	External Distribution/Day
SNPP	250 GB	3-4 TB	~3+ TB/day (Requested)
GOES-R, S, & T each	350 GB	3-4 TB/350 GB*	~3+ TB/day**
JPSS-1 & 2 each	250 GB	3-4 TB	~10+ TB/day**
Himawari 8		200 GB*	~1+ TB/day** (US Only)
Sentinel 3 A&B		3-4 TB	~8+ TB/day** (US Only)

* Estimates of Full Disk Scans (only), of interest to external partners

** Early estimates

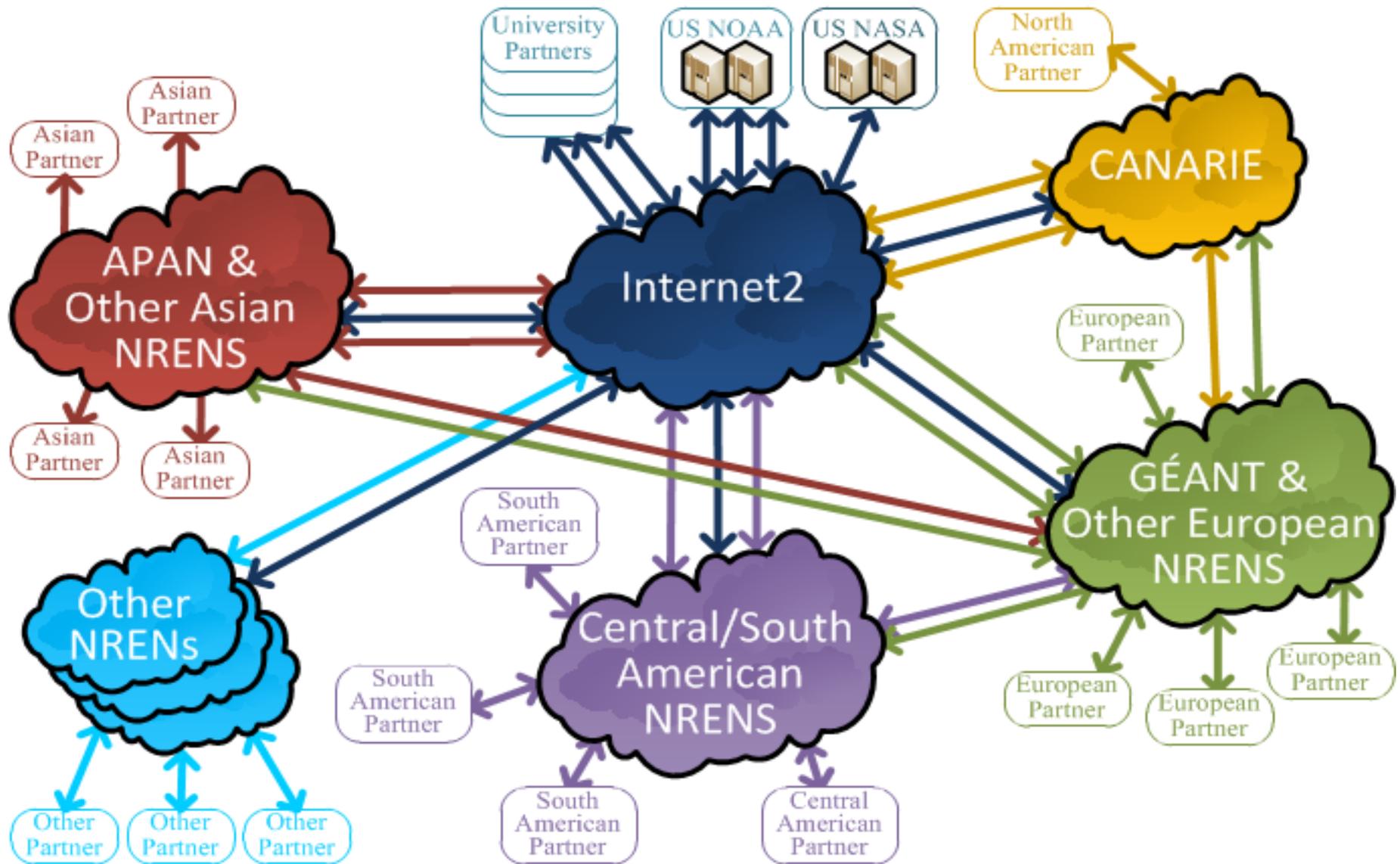
Future NOAA Data Superhighways

- Pathways
 - Internet2 (I2)/National Research & Education Networks (NRENs)
 - Internet
- Advantages
 - **High Bandwidth**; NOAA connections are large and the networks themselves support large data flows.
 - **Cost**; Inexpensive NOAA local access circuit(s) eliminate need for many expensive long haul international dedicated links.
 - **Simplicity**; Reduced external connection interfaces with only need for circuits connecting to Internet/I2. All partners should be reachable via these links.
 - **Security**; Reduced number of network interfaces that need to be protected. Aggregation points enable more efficient and better security (including meeting US Government security mandates). Pathways can be encrypted end to end when needed to protect content.

Internet2 & NRENS

- Replace dedicated point-to-point circuits, Frame Relay, MPLS, and Internet traffic paths, especially internationally.
- NOAA policy is to use Internet2 and connected NRENS for external network traffic.
- NOAA has high bandwidth connections to I2 in place in Silver Spring (10G), Boulder (20G), and Seattle (1G).
- I2 has high bandwidth connections (10+ Gbps) to NRENS of many NOAA partners.
- NOAA domestic university partners are all connected to I2.
- I2 supports both standard data transport and also Multicast.
- I2 and connected NRENS are controlled and monitored 7/24/365.

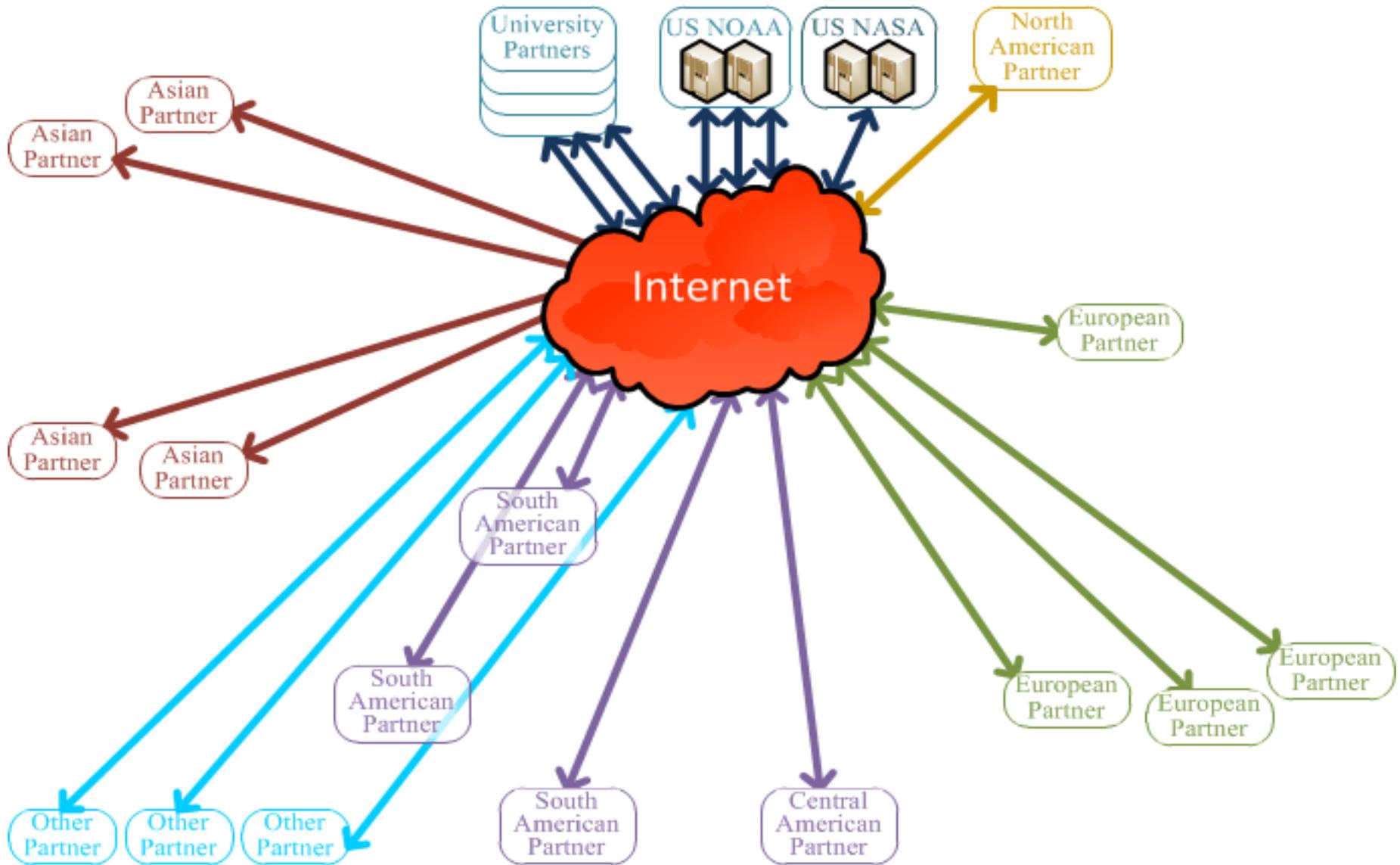
Internet2 & NRENS Connectivity



Internet

- Replace dedicated point-to-point circuits, Frame Relay, and MPLS, especially internationally.
- NOAA policy allows use of the Internet for data distribution.
- NOAA has existing high bandwidth connections to the Internet already in place in Silver Spring (10G), Boulder (20G), and Seattle (1G).
- The Internet has high bandwidth connections all over the world and many NOAA partners are connected.
- NOAA domestic university partners are all connected to the Internet.

Internet Connectivity



New Distribution Technologies

Will provide the capability to deliver NESDIS satellite product data to current and future external partners in a reliable and cost effective manner.

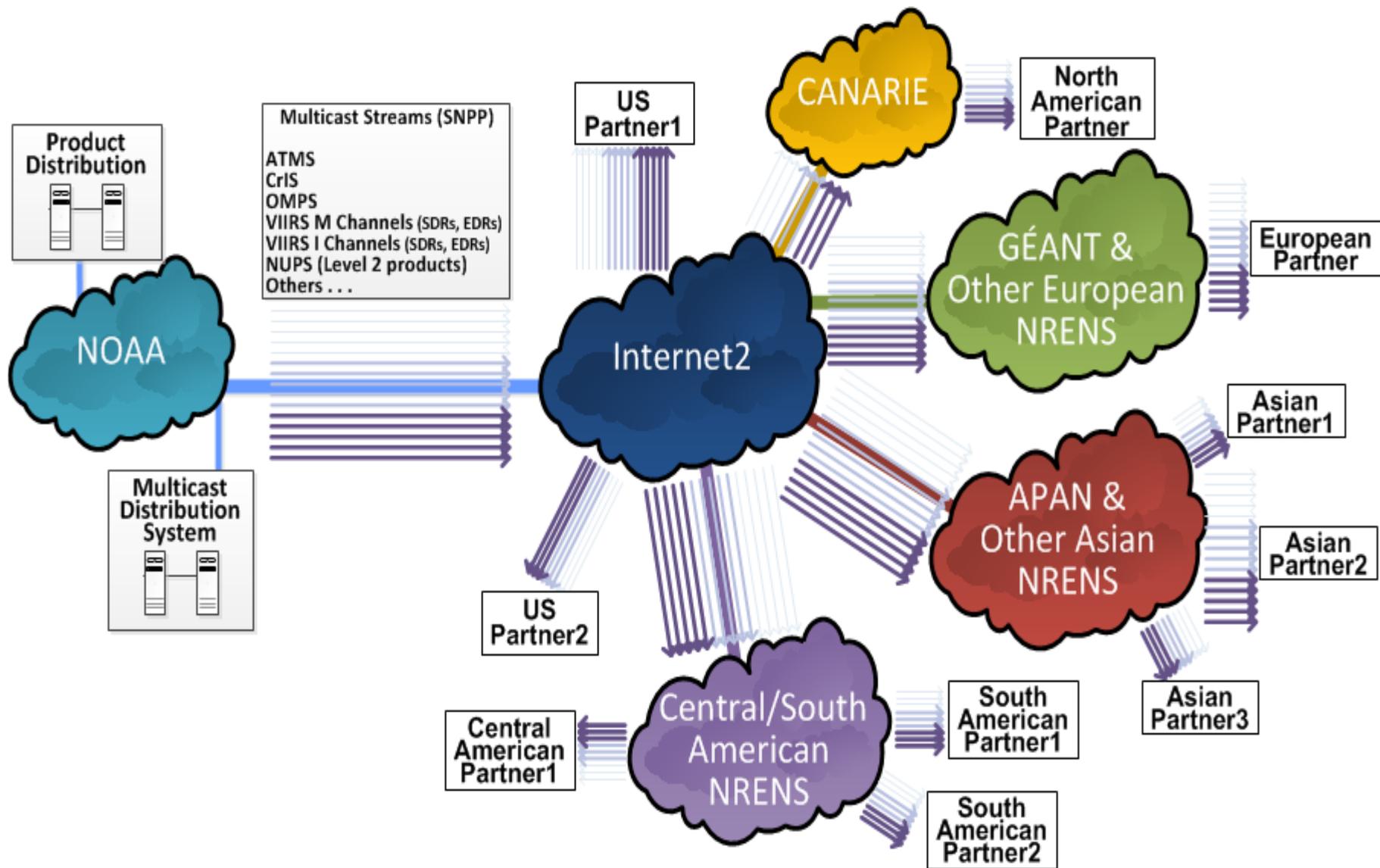
- **Scalable:** Add many users with little NOAA infrastructure impact.
 - NOAA distribution servers send a single data set once.
 - “Wholesale” data distribution. No tailoring products or geographical sectoring.
 - NOAA distribution servers need fixed sized and smaller systems.
 - NOAA networks need fixed sized and less bandwidth.
- **Simple Connectivity:** Similar path for data distribution to all external partners.
- **Enhanced security:**
 - NOAA traffic goes through secure connection points.
 - Users must register and be approved; Can be encrypted.
- **Standard implementations for all partners:** Domestic and International. All get data the same way using similar data paths.

Multicast

Deliver NESDIS satellite product data via Internet2 simultaneously in a timely manner.

- **Scalable:**
 - Separate streams for each product. Users register for streams they want.
 - ~100+ product streams (SNPP) for 3-4 TB/day volume.
 - Data only sent once.
- **Simple Connectivity:** Internet2 and partner NRENS data path.
- **Enhanced security:**
 - Connectionless protocols used for data distribution.
 - NOAA distribution system at edge of network; not on internal network.

Multicast Data Flow

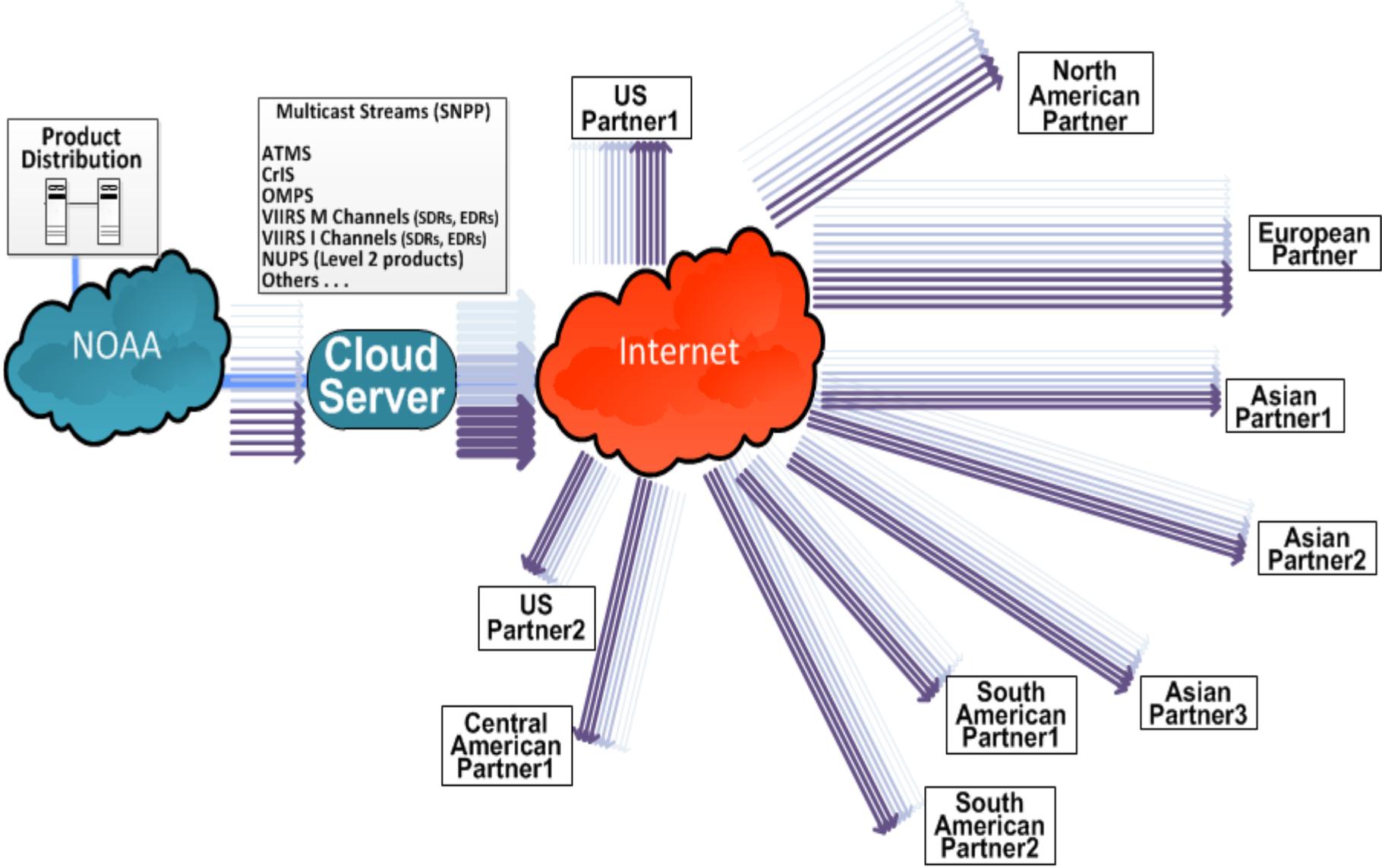


Cloud Server (Option)

Deliver NESDIS satellite product data via the Internet.

- **Scalable:**
 - Cloud Server will have very high bandwidth connection to Internet to accommodate many users.
 - Each user to access data separately and download only what they need (but same data sent many times).
- **Simple Connectivity:**
 - Internet data path.
 - Uses standard TCP/IP protocols for file distribution.
- **Enhanced security:** Distribution system external to NOAA networks.

Cloud Server (Option) Data Flow



Multicast Proof Of Concept

- Starting Soon
- Participants
 - NOAA: Internal networking systems and support
 - Internet2: Provide Multicast addresses and networking support
 - International NRENS: Provide Multicast addresses redistribution and networking support
 - US Partners: Test data receivers; provide feedback
Need participants!
 - International Partners: Test data receivers; provide feedback
Need participants!

Summary

- NOAA is committed to meeting the challenge of distributing large data volumes from the new generation of satellite to our partners.
- NOAA will be using Internet2 and connected NRENs as well as the Internet as the primary data distribution pathways.
- NOAA will be utilizing Multicast and Cloud Server (option) mechanisms as the primary data delivery methodologies.

Questions?

Contact Information & Social Media

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