

# Requirement for A General Transport Protocol for In-Network Computing in Support of RPC-based Applications

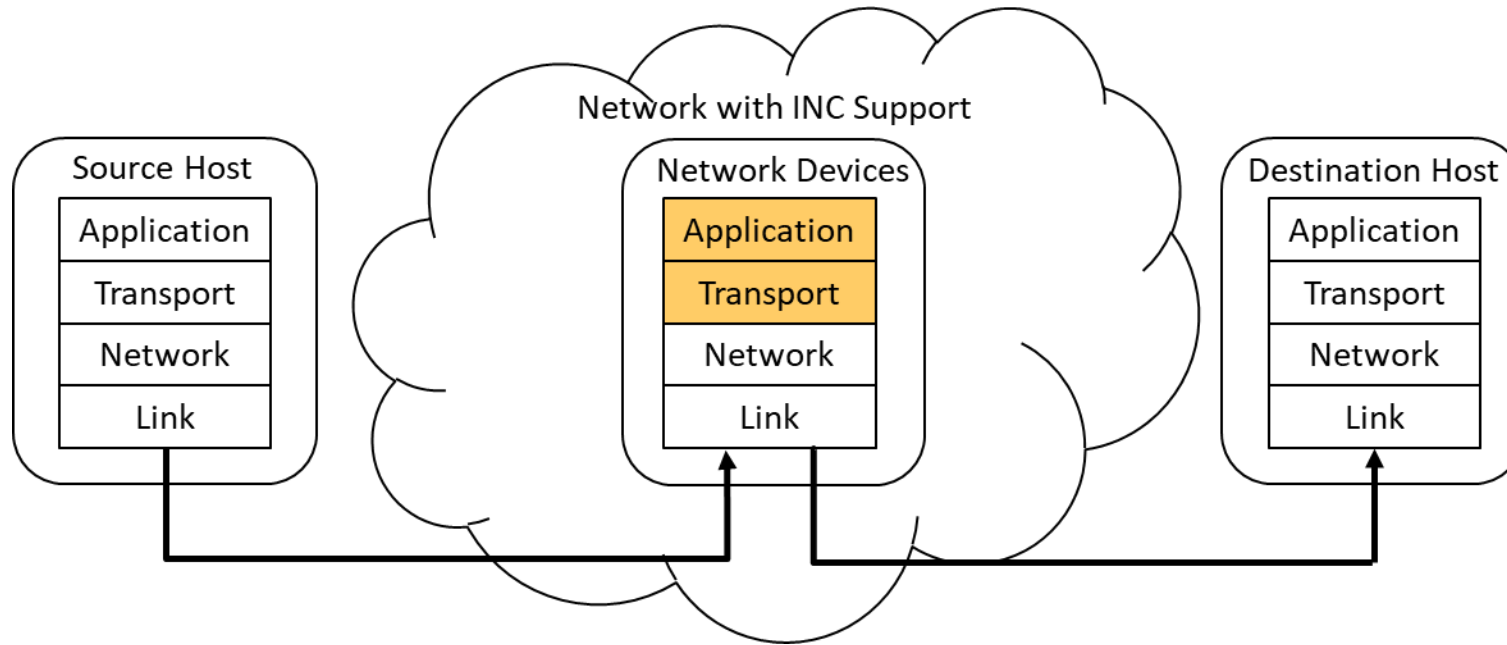
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Haoyu Song, Wenfei Wu

# Background

- In-network computing (INC) is a new paradigm that involves the programmable network switches to improve the application performance (e.g., lower latency, higher throughput) or reduce the system cost (e.g., lower power consumption, fewer servers)
  - IETF COINRG is dedicated for the related research
- Specifically, here INC means the applications supported by on-path programmable switches
- The most promising INC applications (aggregation, caching, agreement) follows the same RPC pattern
- Each packet is an individual message that can be processed
  - The computing can be solely or partially done by network devices in the network, and the result can be replied by a network device or a server

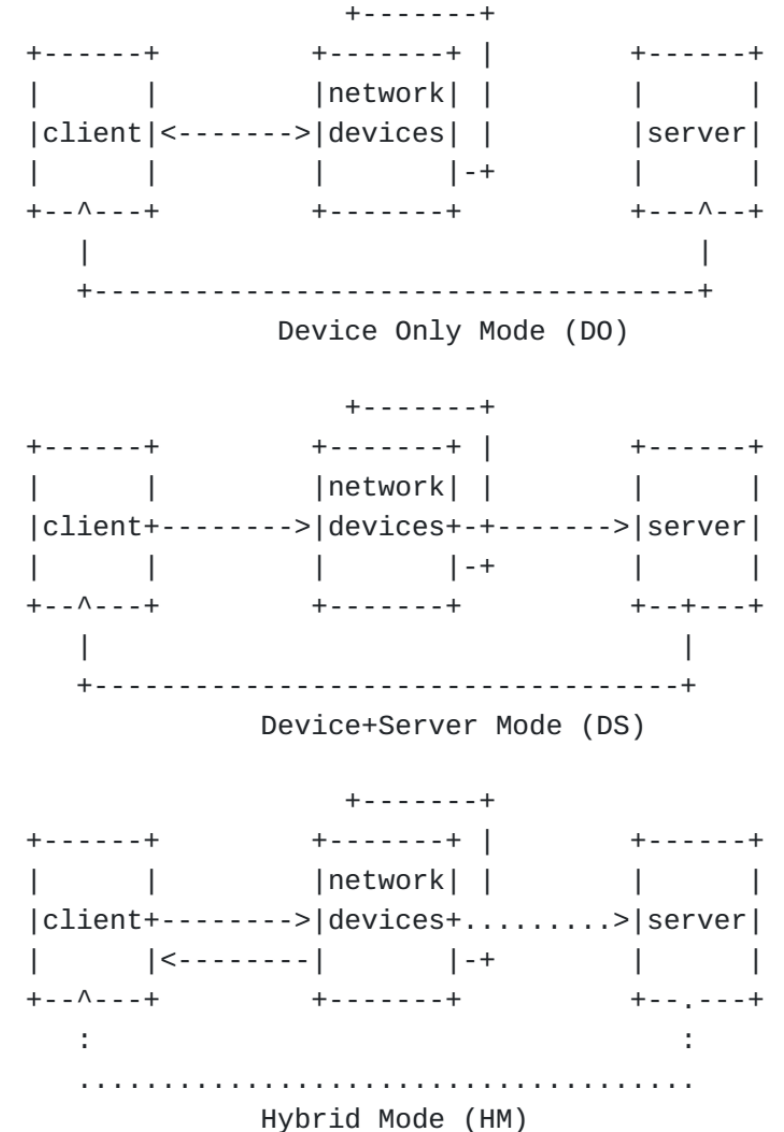
# INC Network Protocol Layer Model



- Break the E2E assumption of the transport layer
- A new E2M2E model (M stands for middle point)

# INC Service Model and Communication Pattern

	DO	DS	HM
Sync Collaboration(SC)	x	x	x
Async Collaboration(AC)		x	
Individual Request(IR)	x		x



# INC Transport Protocol Function and Requirements

- Main function:
  - Signaling
    - Request in-network processing and get acknowledged
    - Allow falling back to server processing
  - Reliability
    - Packet loss detection and retransmission
  - Congestion control
    - Window-based
    - ECN
- Requirement:
  - Keep complex logic out of switch, only done in end servers
  - General to all the INC applications with the RPC pattern
  - Extensible for future enhancements
- Advantage:
  - Transparent to algorithms for packet loss detection (in switch and in server) and congestion control (in server)
  - Transparent to application logic

# Existing Transport Protocols

- TCP
- UDP
- QUIC
- MTP
- RDMA
- HOMA
- Ad hoc protocols
- ...

# Requirements for INC Transport Protocol

- Simplicity
- Generality
- Openness
- Compatibility

# Purpose of draft

- Raise the community awareness to the problem
- Understand the problem space
- Explore the opportunities
- Collaboration welcome!