

# Problem Statement of Peer to Peer Streaming Protocol (PPSP)

## IETF73

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# P2P Streaming Companies

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# What are we standardizing?

- Answer: Two protocols.
  - PPSP Signaling Protocol:
    - Peer ↔ Peer, Peer ↔ Tracker
    - Allows a peer to report status such as chunk availability, and find related peering information
  - PPSP Transmission Protocol:
    - Allows peers to exchange data contents

# Why PPSP?

- **Foundation**
  - **Industrially: P2P Live and VoD streaming applications are becoming dominant traffic in some networks**
    - Surpassed that of file sharing in China
    - accounting for ~50% P2P traffic.
  - **Technically: Current P2P streaming technologies have similar architecture and interfaces**
- **Benefits to each party in the value chain**
  - P2P streaming service providers
  - End users and terminal companies
  - ISP and other network service providers
  - Network equipment vendors

# Benefits to P2P streaming service providers

- **Cooperation with ISPs for comprehensive services**
  - Fixed and Mobile Convergence service
  - Interactions with network equipments
  - Gateways, routers and access nodes may act as super nodes
- **Integration with CDNs and caches to improve QoS and reduce bandwidth consumption**
- **Interoperability with other PPSP service providers for better performance outside one's own network coverage in case of**
  - Emergency communication
  - Large-scale programing broadcasting
  - VoD in different areas
- **Expanded audience by allowing 3<sup>rd</sup> party client softwares to access**

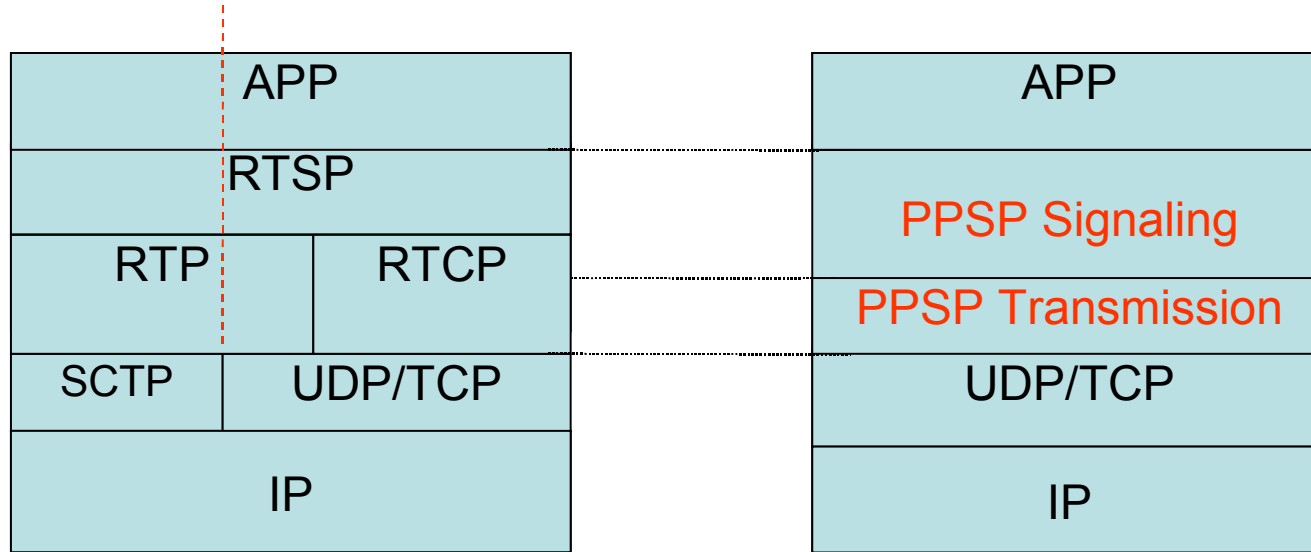
# Benefits to end users and terminal companies

- Unified client software
- Reducing redundant code on resource-constrained devices
  - Mobile phones/PDA
  - Setbox in IPTV
- Easy usage with comprehensive services support
- Easy sharing information

# Benefits to other parties

- **ISP**
  - Better traffic engineering
- **CDN, Cache, cloud computing providers**
  - Revenues from streaming acceleration
- **Network equipment vendors**
  - Revenues from having routers/gateways/access equipments with PPSP support

# Stack Position and Problem Statement of PPSP



Current IETF Stack

PPSP Stack

## Task

Realizing real-time streaming from one source in Client/Server environment

## Problem Statement

How to realize real-time data retrieval and transmission from multiple sources with different pieces for a streaming application in peer to peer environment?

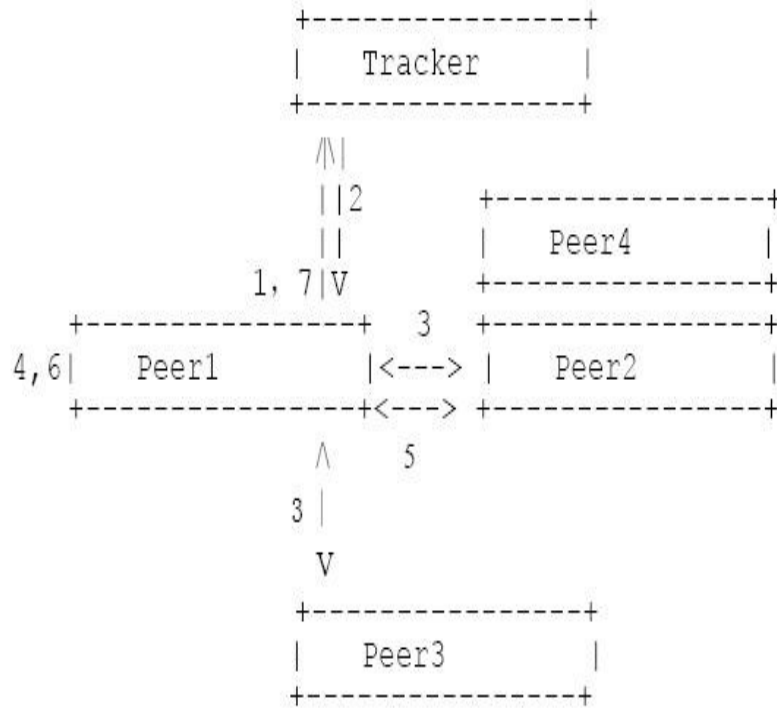
# Requirements for PPSP(1)

- Mandatory requirements
  - Lightweight and Low overhead
  - Short delay
    - Startup delay(6~8s/20~30s)
    - Channel switch time
    - Re-buffering time after a dragging or forward/backward in VoD(6~8s)
    - Latency between the broadcasting time and the audience view time(120s)
  - Resilient to network and peer dynamics

# Requirements for PPSP(2)

- Recommended requirements
  - Higher quality vs. bandwidth consumption reduction
    - high bandwidth is not enough for high quality, many other factors
      - Link quality (Wireless)
      - Asymmetrical upload and download bandwidth
    - Network condition monitor
    - Traffic Locality aware (ALTO)
    - CDN compatible to use
  - Mobility support
  - Suitable for both live and VoD streaming (may extend to more other app)
  - Interoperability with related protocols such as P2PSIP, ALTO and maybe LEDBAT

# An Example of PPSP Preliminary Operation



- **1. Peer sending PPSP signaling request with parameters (e.g., QoS, location)**
- **2. Tracker returning candidate peer list (Interface with ALTO)**
- **3. Gossiping communication among peers and find a chunk**
- **4. Peer Scheduling and cache replacement**
- **5. Chunk transmission among peers**
- **6. Re-assembling**
- **7. Peer Reporting to Tracker chunks availability**

## Note:

**CDN is viewed as a special peer both for data delivery within CDN and with other peers.**

# PPSP Protocols Scope

- Signaling protocol
  - Design protocol for
    - Chunk availability report
    - Peer list request and reply
    - Bitmap exchange
- Transmission protocol
  - Evaluate the feasibility of current protocols
    - TCP/RTP/UDP
  - Discuss the new requirements for P2P streaming
    - May augment network condition measurement

# What are out of scope

- Service providers dependent Part
  - Peer/CDN scheduling (e.g., Gossip list selection and ordering)
  - Peer/CDN caching strategy
  - Re-assembling

# Previous and Ongoing Work

- Set the mailing list PPSP  
<https://www.ietf.org/mailman/listinfo/ppsp>
- Ongoing problem statement (version1)
- Ongoing survey on current P2P streaming technology
- Starting a P2P streaming system development with carrier-class QoS assurance supporting both wired and wireless network
- Researching mobility support for P2P streaming
- Launched a question of distributed service network in ITU-T (supporting P2P streaming as well)

# Why not Start Right Now?!



# Acknowledgement

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  - Lars Eggert
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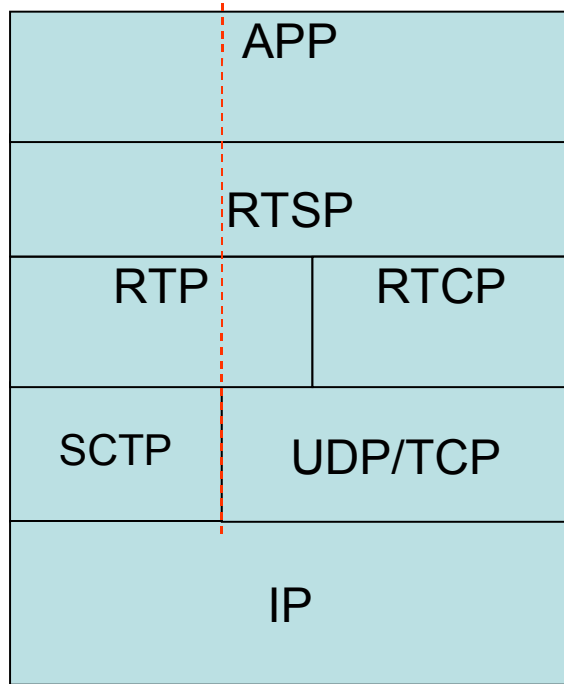
Comments?

Thanks for your attention!

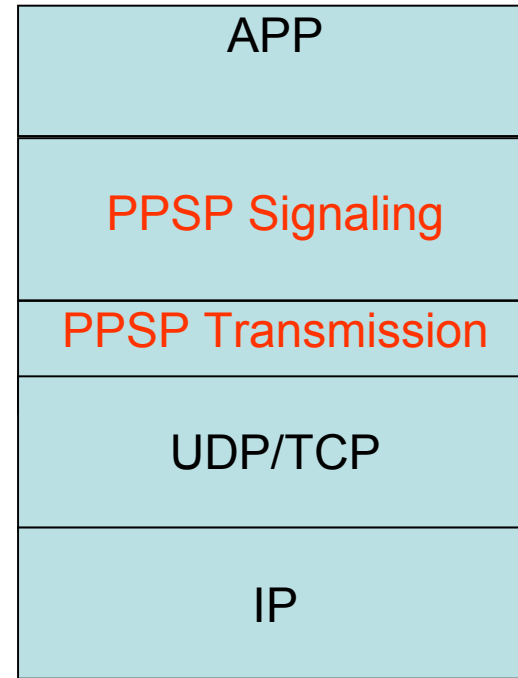
# Appendix 1: Why not Just P2PSIP

- **The key of PPSP is to find and transmit the suitable real-time data efficiently**
  - **Search inefficiency**
    - In P2P streaming, the content information of each peer (e.g. buffer map) is highly dynamic and real-time
    - P2PSIP has a registration process to a DHT node; if every streaming node claims what it has and registers this information to a specific node for storage, too much latency is introduced in searching a real-time data
    - The same reason as above in iterative and recursive routing in P2PSIP for the content and local peer searching process
  - **Much overhead**
    - Too heavyweight to Maintaining these highly dynamic information in P2PSIP for non-session applications with much more interactions among peers compared with P2PSIP applications
  - **P2PSIP doesn't involve in data transmission while PPSP need transmission assurance**
    - Heterogeneous nodes;
    - Node Churn and Data Churn (the data update quicker than P2PSIP)
    - Topology-aware

# Appendix2:PPSP Design Vision



RTP: timing and stream syn for streaming data  
RTCP: Flow and Congestion control in streaming  
RTSP: Operation information maintenance with the server  
SCTP: Stream Control Transmission Protocol



**RTP** Timing and syn is done by PPSP signaling protocol without explicit RTP timing item;  
Less or no assured transmission by **RTCP** or **SCTP**, rather using a better peer connection;  
Operation information maintenance with the server in **RTSP** is replaced PPSP protocol