上海交通大學
SHANGHAI JIAO TONG UNIVERSITY

QoE-based Bandwidth Allocation with SDN in FTTH Networks

Kailong Li, Wei Guo, Wenyu Zhang, Yuan Wen, Chengjun Li, Weisheng Hu

Shanghai Jiao Tong University

long_kl@sjtu.edu.cn

IEEE / IFIP SDNMO 2014

Outline of Presentation

- **Motivation and Challenges**
  - **Users' Individualized Requirements**
  - **Inflexible Traffic Differentiation in BRAS**
- **Novel BRAS based on SDN**
- **Prototype Implementation and Result**
- **Conclusion**

Users' Individualized Requirements

Three main services in FTTH:

- Internet Protocol Television (IPTV)
- Voice over Internet Protocol (VoIP)
- High Speed Internet (HSI)

Browsing
Video Streaming
Large Downloads
…

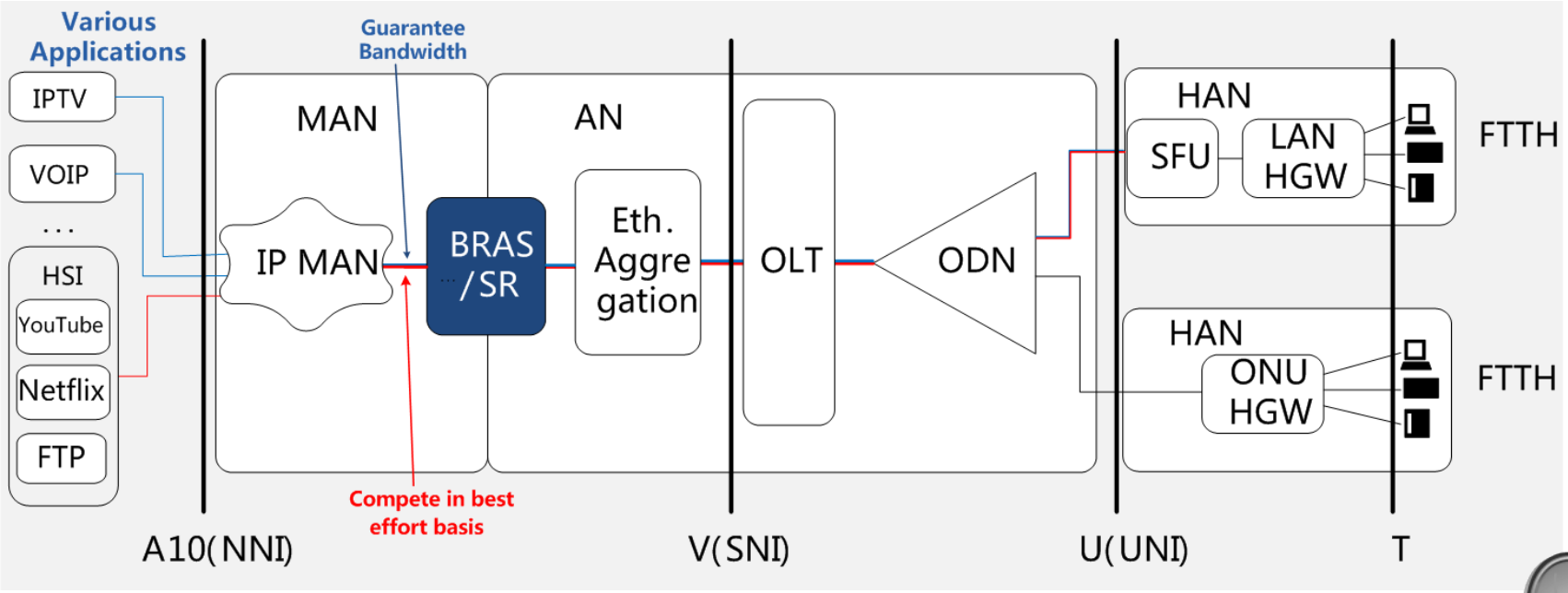
Individualized Requirements at Different Times.

Different users may have different requirements at different times.

Sometimes users prefer to watch YouTube.
Sometimes users prefer to play online game.
Sometimes users prefer to skype.
Sometimes …

Inflexible Traffic Differentiation in BRAS

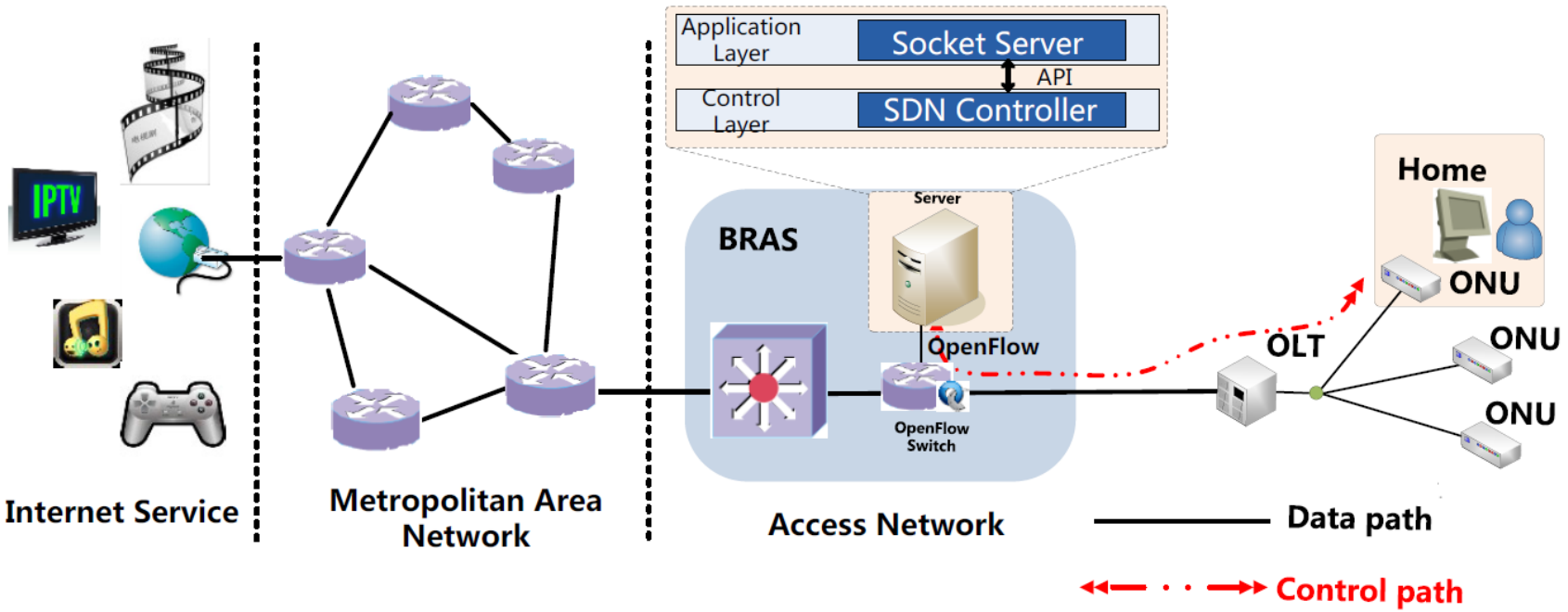
- In **BRAS**(Broadband Remote Area Server), various applications compete for bandwidth in best effort basis.
- The **BRAS** has no functionality to provision bandwidth to the specific application.



Outline of Presentation

- Motivation and Challenges
- **Novel BRAS based on SDN**
  - **Network Architecture**
  - **QoE-based Bandwidth Allocation Method**
- Prototype Implementation and Result
- Conclusion

Network Architecture



Novel BRAS based on SDN

Socket Server: Receive the request from users.

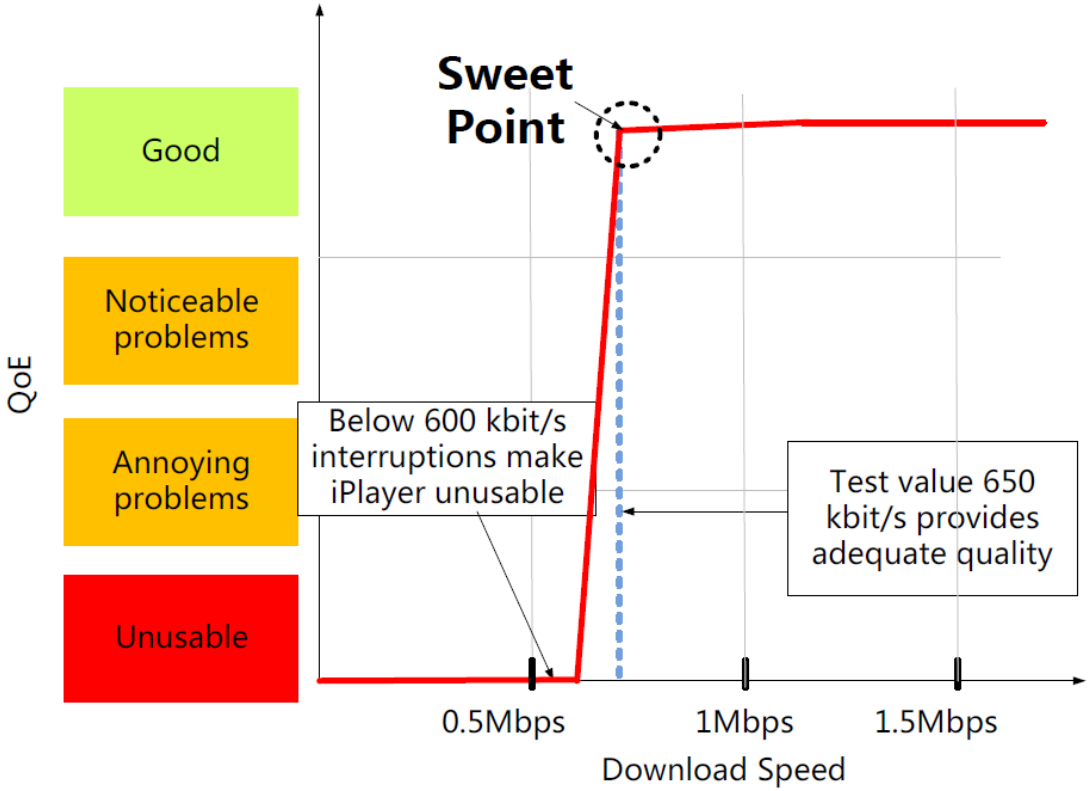
SDN controller: Handle scheduling under the given flow table strategy.

OpenFlow Switch: Process the data forwarding and status collection.

Bandwidth and QoE

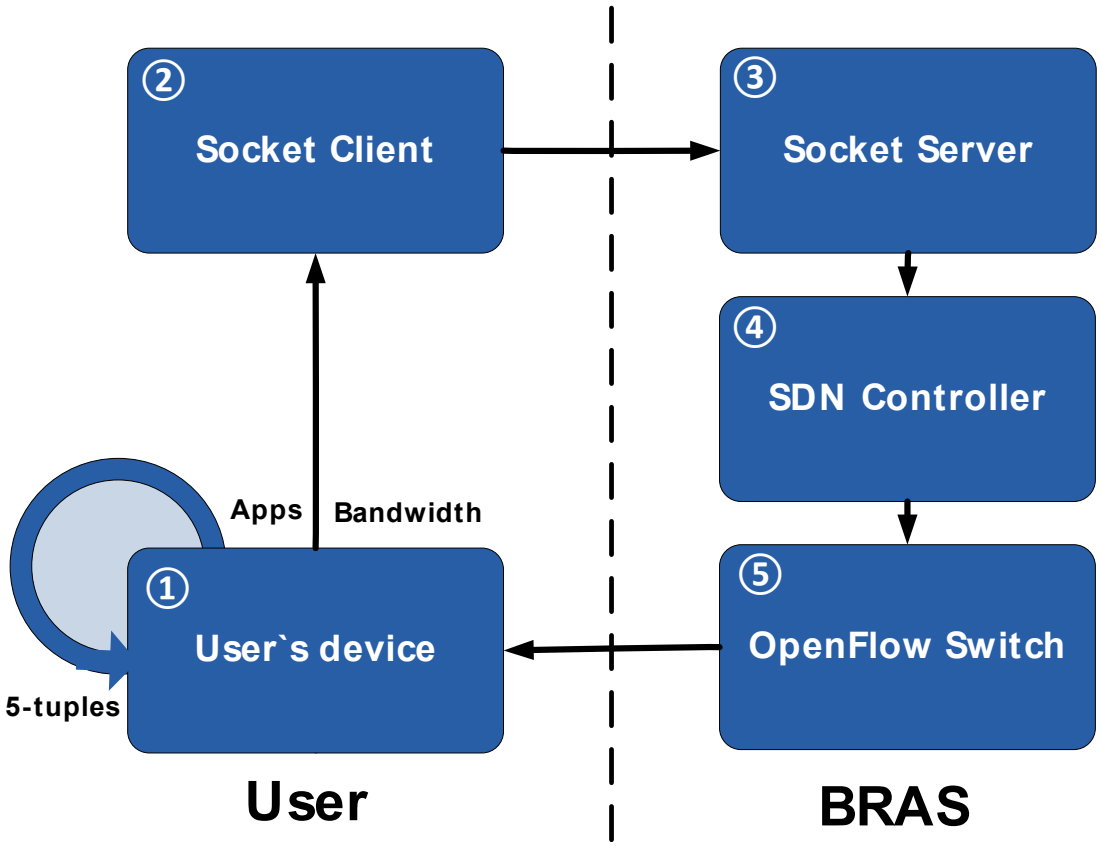
Sweet point: A specific bandwidth value.

The **QoE** gets **worse quickly** when **bandwidth < sweet point**, and keeps the **same approximately** when **bandwidth > sweet point**.



The relationship between bandwidth of the BBC iPlayer and QoE

QoE-based Bandwidth Allocation Method



Step 1: Select application and input bandwidth value.

Step 2: Send information to socket server.

Step 3: Pass the accepted request information to the SDN controller.

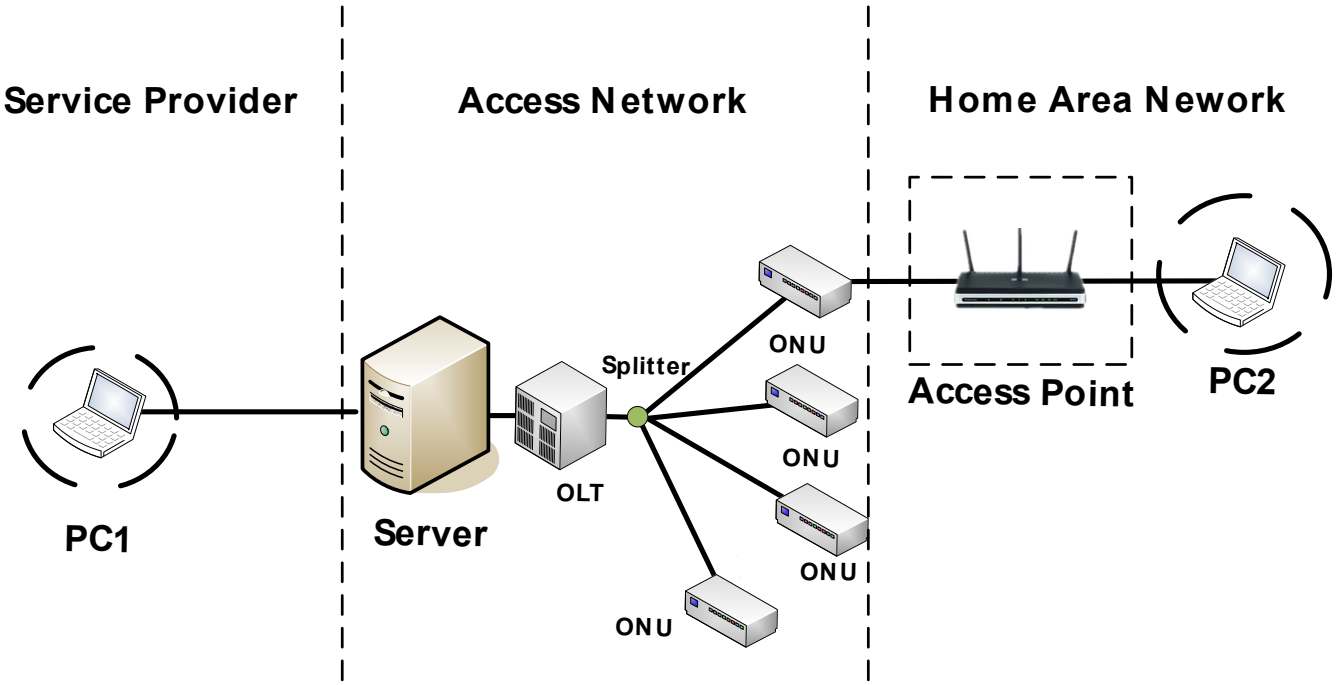
Step 4: Send the flow entry to the OpenFlow Switch.

Step 5: Forwarding packets according to the flow entry.

Outline of Presentation

- Motivation and Challenges
- Novel BRAS based on SDN
- Prototype Implementation and Result
  - Experimental Setup
  - Comparison of Two Bandwidth Allocation Scheme
  - Feasibility of QoE-based Bandwidth Allocation Method
- Conclusion

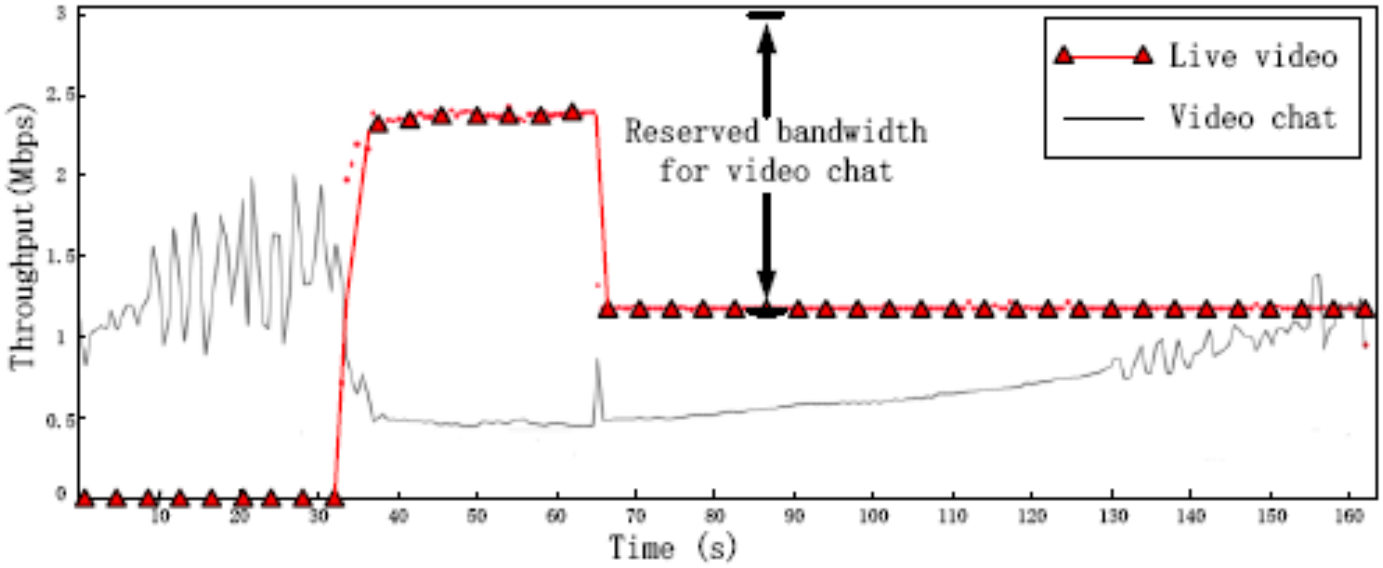
Experimental Setup



- Access Point: TP-LINK WR841N
- EPON: P3305 OLT、1×16 PLC Splitter、P1004T ONU
- Server: Dell Power Edge R710 server (VoD).

Comparison of Two Bandwidth allocation Schemes

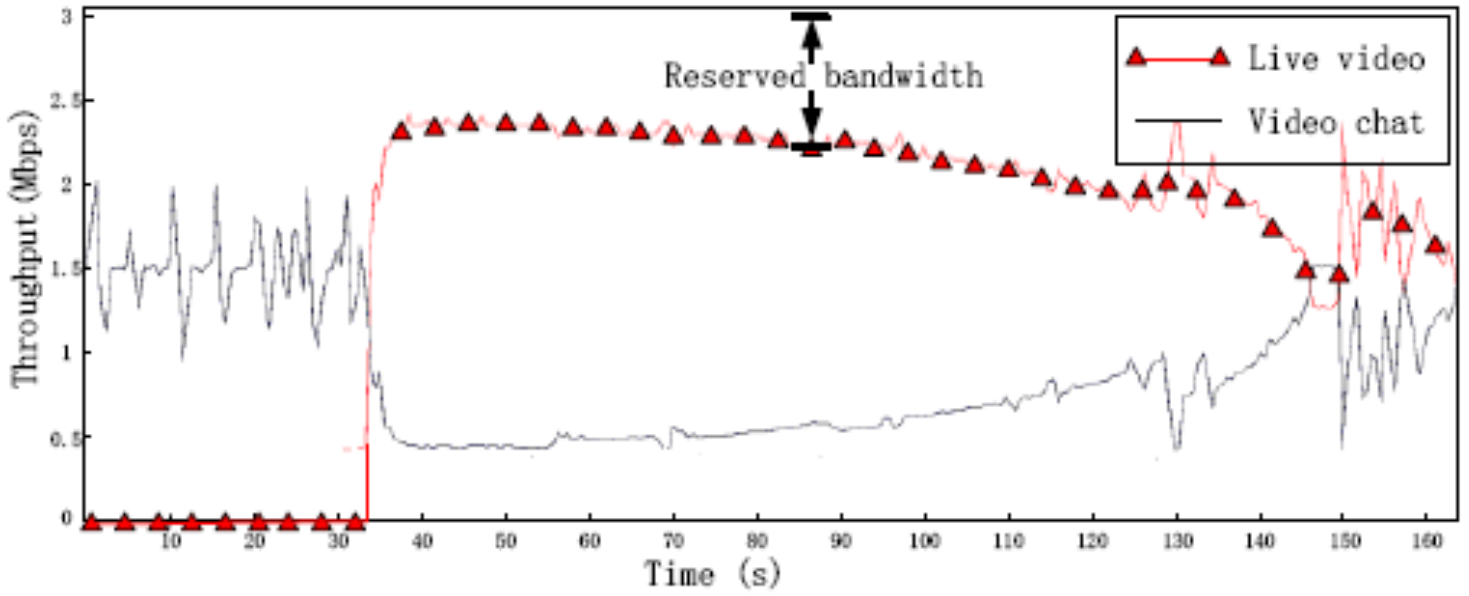
- Adjust the bandwidth allocated to specific applications by two schemes.
- Scheme 1: Limit other applications' bandwidth to raise the specific one.



- The bandwidth utilization efficiency will be less than 100%.

Comparison of Two Bandwidth allocation Schemes

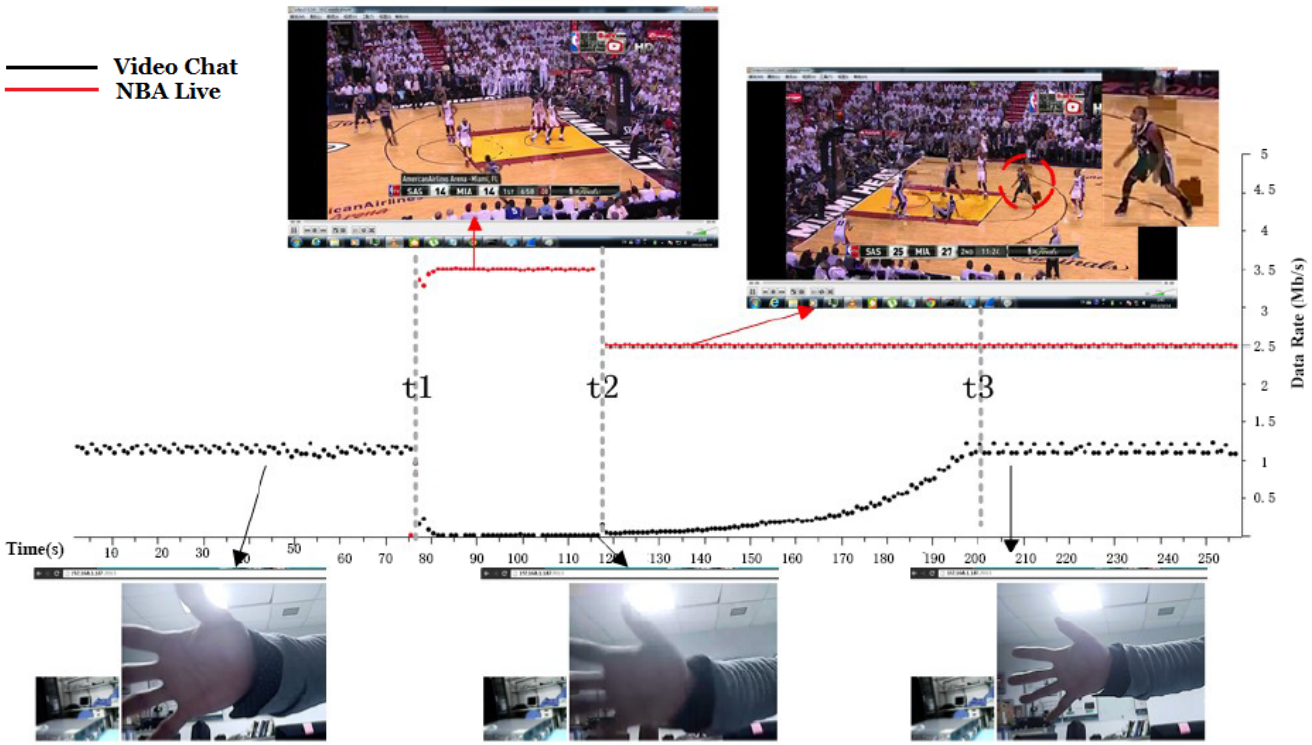
- Scheme 2: Set a higher priority to the specific application.



- The bandwidth utilization efficiency will be almost 100% theoretically.

Feasibility of QoE-based Bandwidth Allocation Method

- T1: Video chat's QoE drops because of the NBA Live's operation.
- T2: Limit the bandwidth to the sweet point of NBA Live.
- T3: Both applications run well based on provided bandwidth.



Outline of Presentation

- Motivation and Challenges
- Novel BRAS based on SDN
- Prototype Implementation and Result
- Conclusion

Conclusion

- We proposed a novel BRAS architecture based on SDN to adjust the bandwidth of a specific application to its “sweet point” according to the user’s requirement.

- Experimental results prove our novel architecture’s ability to improve the user’s QoE towards specific applications.

Thank you for your attention !