TCMTF: Tunneling, Compressing and Multiplexing Traffic Flows

draft-saldana-tsvwg-tcmtf-02

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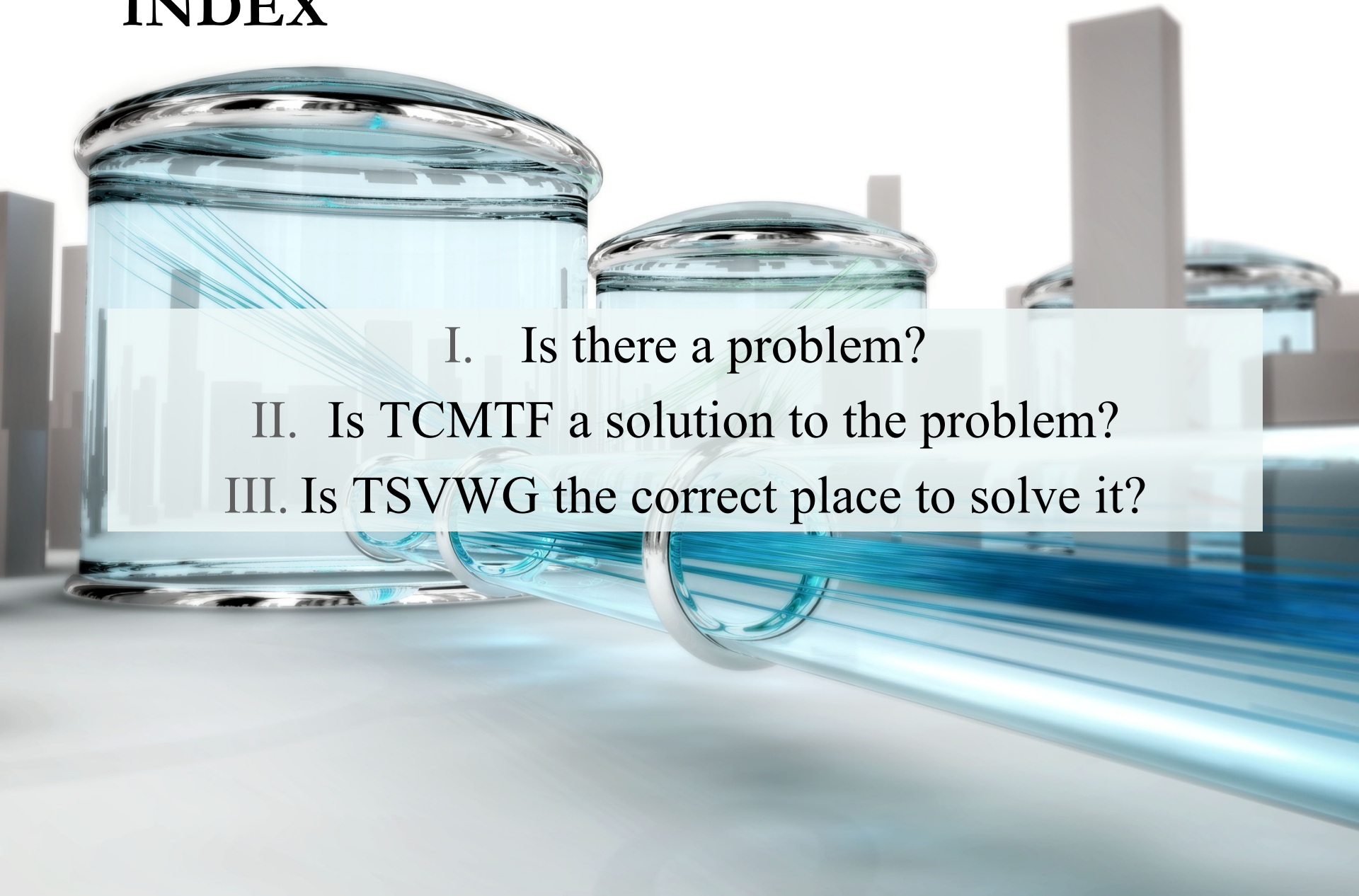

I. Is there a problem?

II. Is TCMTF a solution to the problem?

III. Is TSVWG the correct place to solve it?

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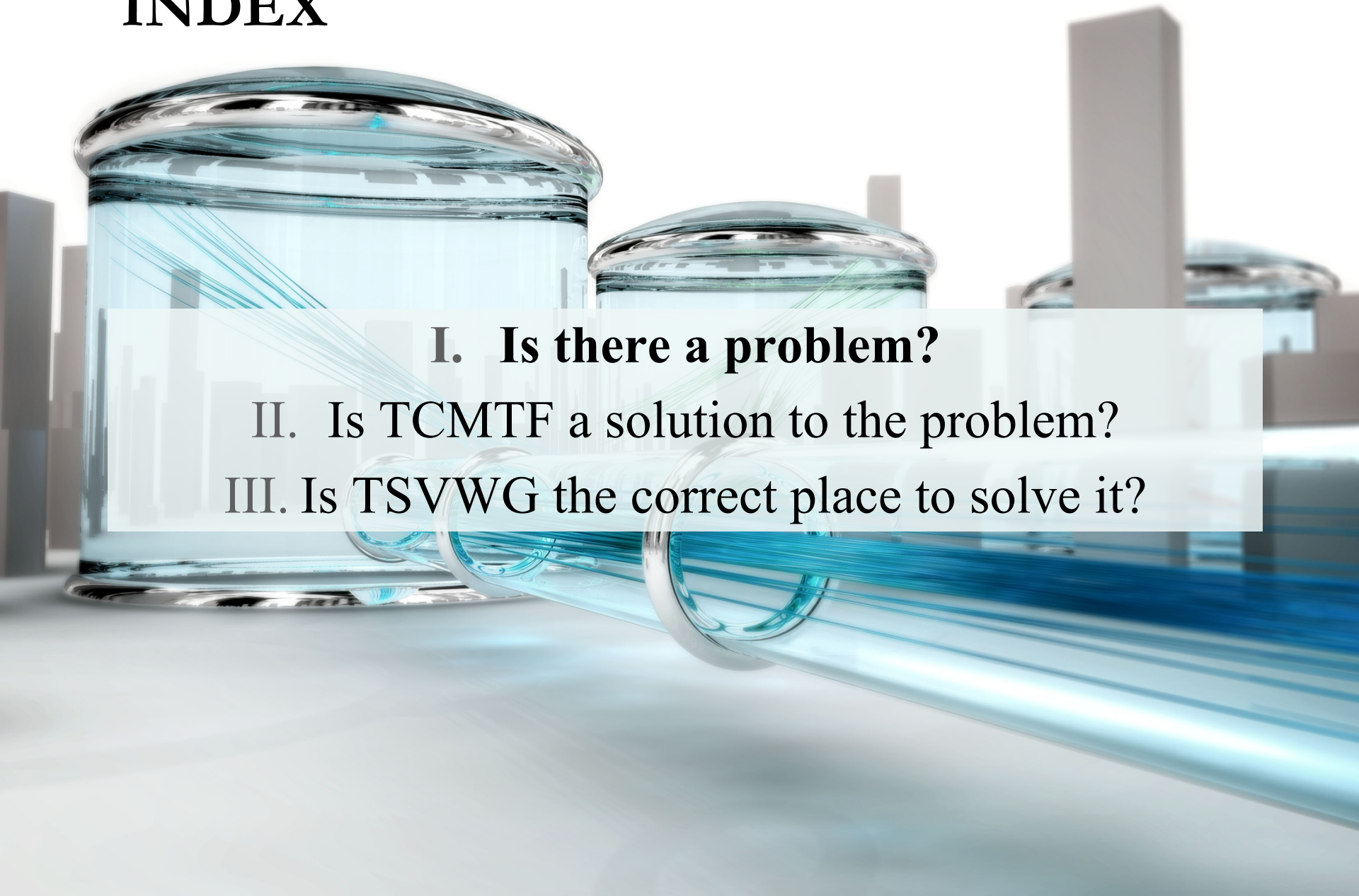


I. **Is there a problem?**
II. Is TCMTF a solution to the problem?
III. Is TSVWG the correct place to solve it?

Is there a problem?

Problem: Inefficiency of real-time flows

- High frequency implies:
  - Small payloads
  - IP**v4**/UDP/RTP headers: 40 bytes

One IPv4/TCP packet 1500 bytes
η=1460/1500=97%

One IPv4/UDP/RTP VoIP packet with two samples of 10 bytes
η=20/60=33%

Is there a problem?

Problem: Inefficiency of real-time flows

- High frequency implies:
  - Small payloads
  - IP**v6**/UDP/RTP headers: 60 bytes

One IPv6/TCP packet 1500 bytes
η=1440/1500=96%

One IPv6/UDP/RTP packet of VoIP with two samples of 10 bytes
η=20/80=25%

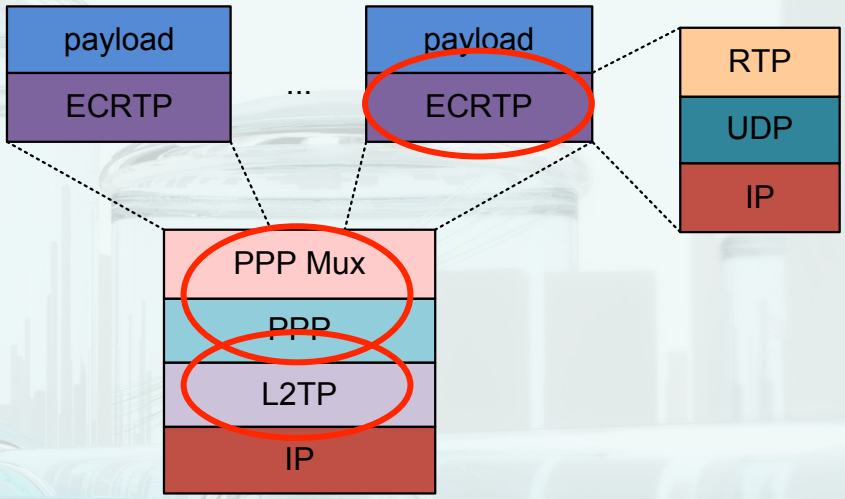
Is there a problem?

- Ten years ago: **Question**: Can we **improve efficiency** when a number of flows share the same path?

- **Answer**: TCRTP (RFC 4170) **2005**: *Best current practice.*
  - Audio/Video **Transport** (avt) (concluded WG) of RAI Area: it was designed for RTP

Is there a problem?

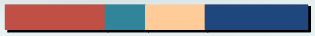
TCRTP for IPv4



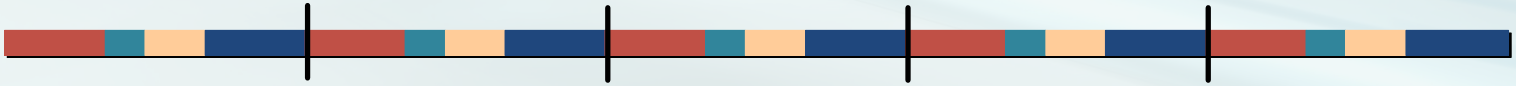
VoIP

40 to 6-8 bytes compression

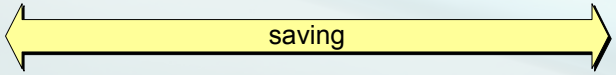
One IPv4/UDP/RTP VoIP packet with two samples of 10 bytes
η=20/60=33%



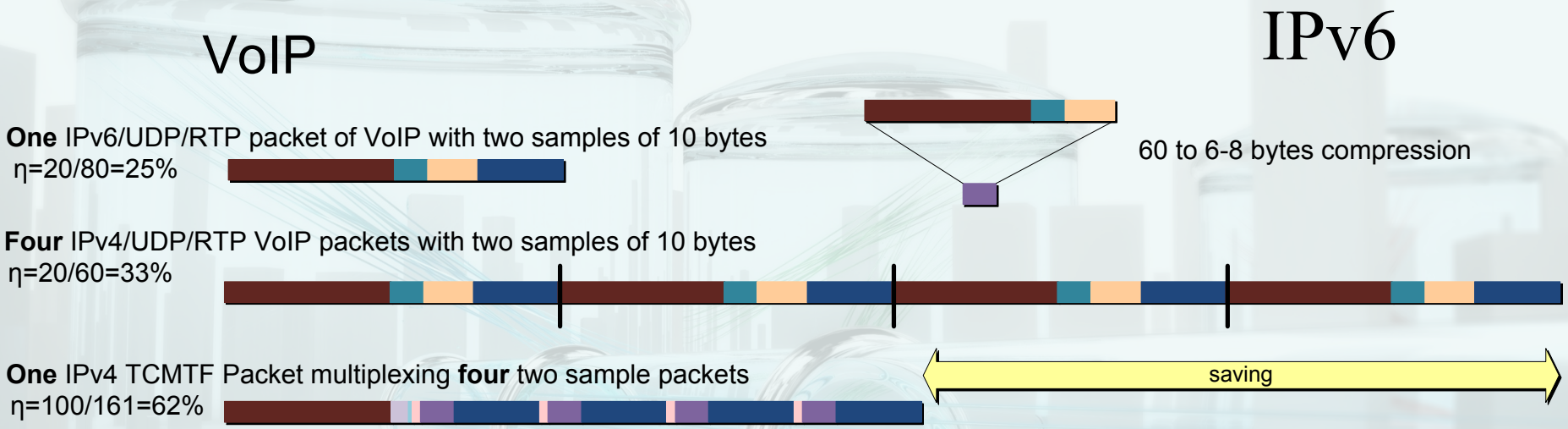
Five IPv4/UDP/RTP VoIP packets with two samples of 10 bytes
η=20/60=33%



One IPv4 TCMTF Packet multiplexing **five** two sample packets
η=100/161=62%



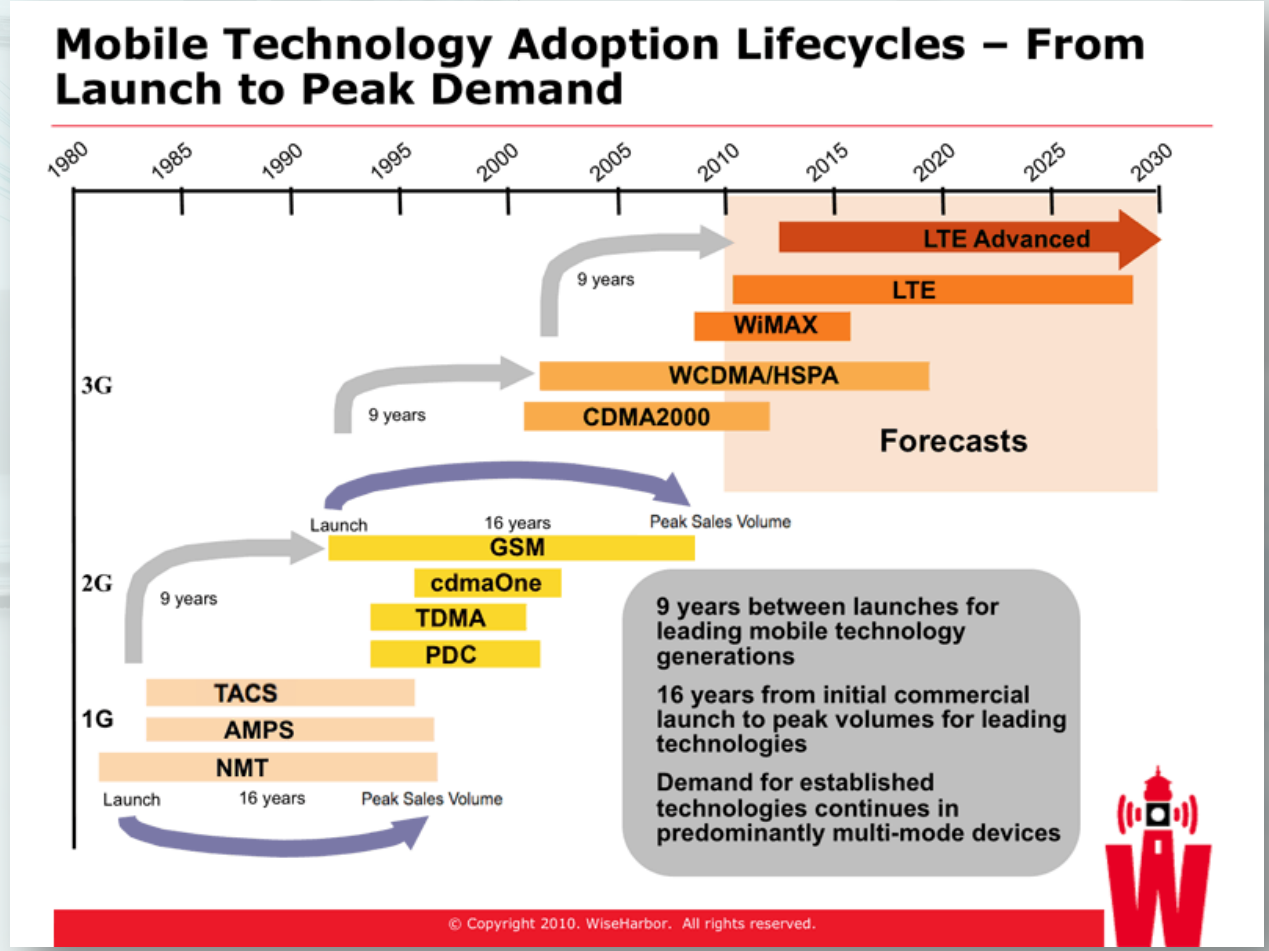
Is there a problem?



TCRTP saves bandwidth, **but what has happened since its publication in 2005**?

Is there a problem?

1) Outbreak of **wireless access networks***



* http://www.wiseharbor.com/forecast.html

Is there a problem?

2) Publication of **ROHC** (RFC 4995), 2007*:
Designed for robustness when dealing with high RTT, packet loss. Typical in wireless scenarios.

- Able to compress: **RTP**/UDP/IP, **UDP**/IP, **TCP**/IP
- Robust: it is able to maintain context synchronization
- Drawback: Implementation complexity

- May 2010: RFC 5856: ROHC over IPSec

*updated by RFC 5795 in 2010

Is there a problem?

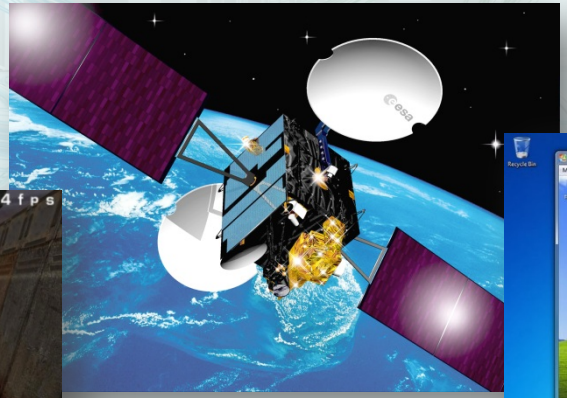
3) **New real-time services** have increased their popularity (e.g. online games)

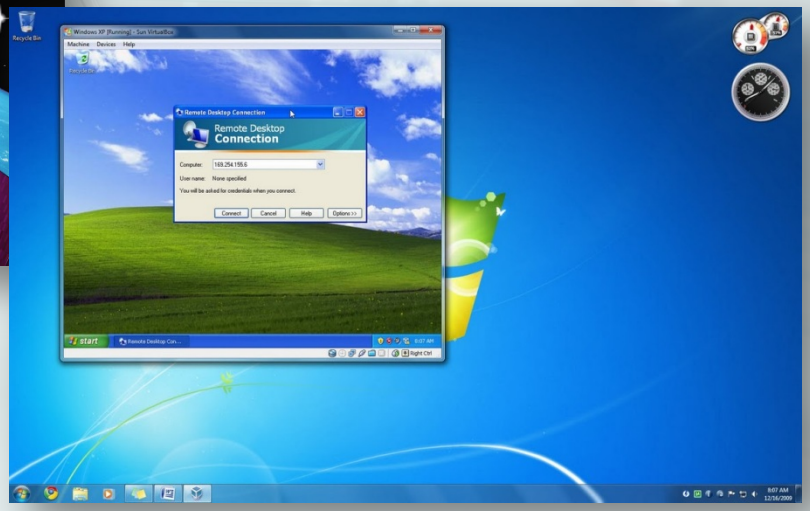
- Some of them **do not use RTP** (bare UDP, or TCP)
- They generate **tiny packets**
- The users are very **sensitive to delay**

Is there a problem?

So…why not widen TCRTP's scope in order to:

- Allow **other traffics** different from RTP
- Allow these **new** developed **header compression** techniques





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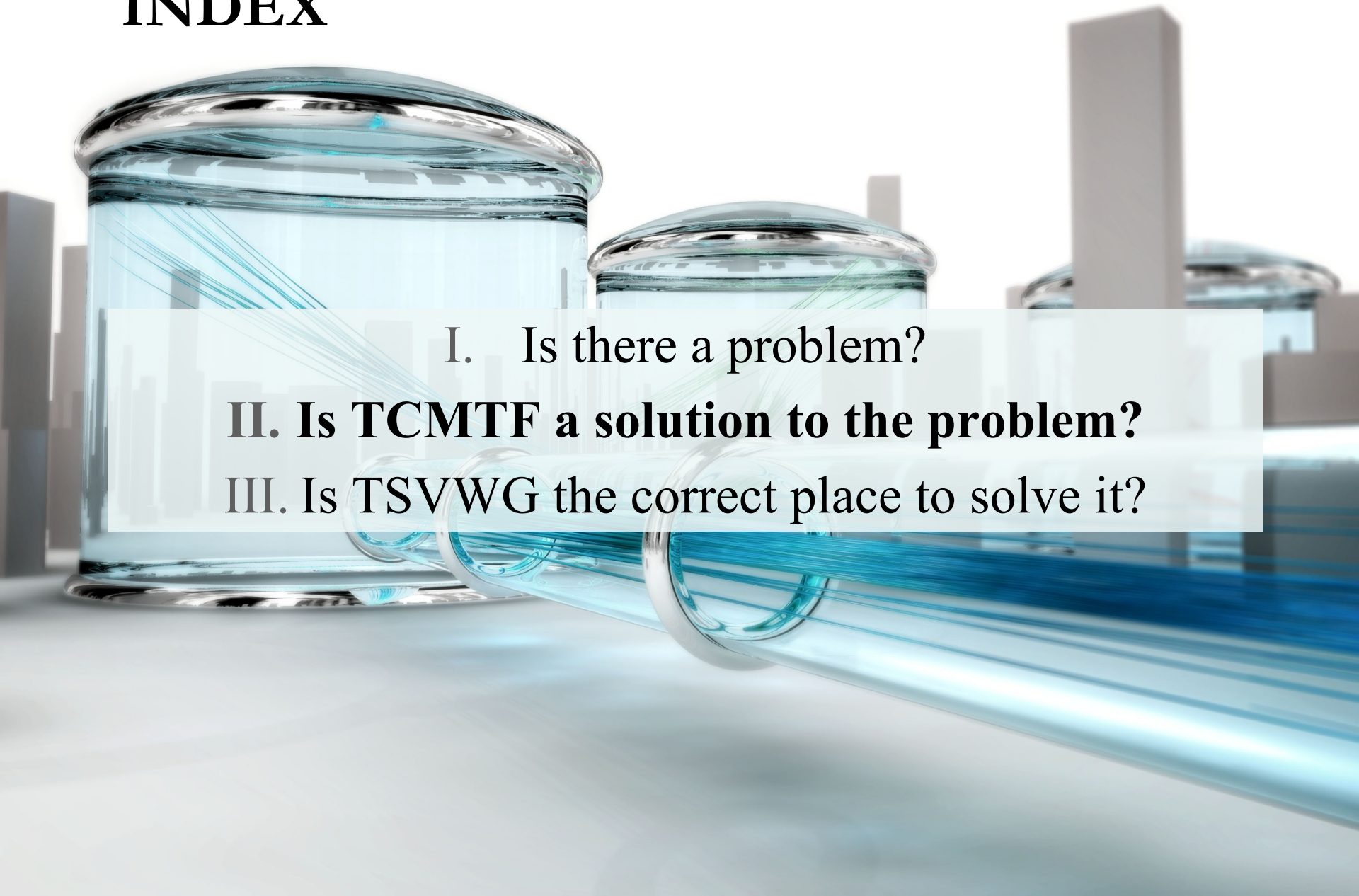

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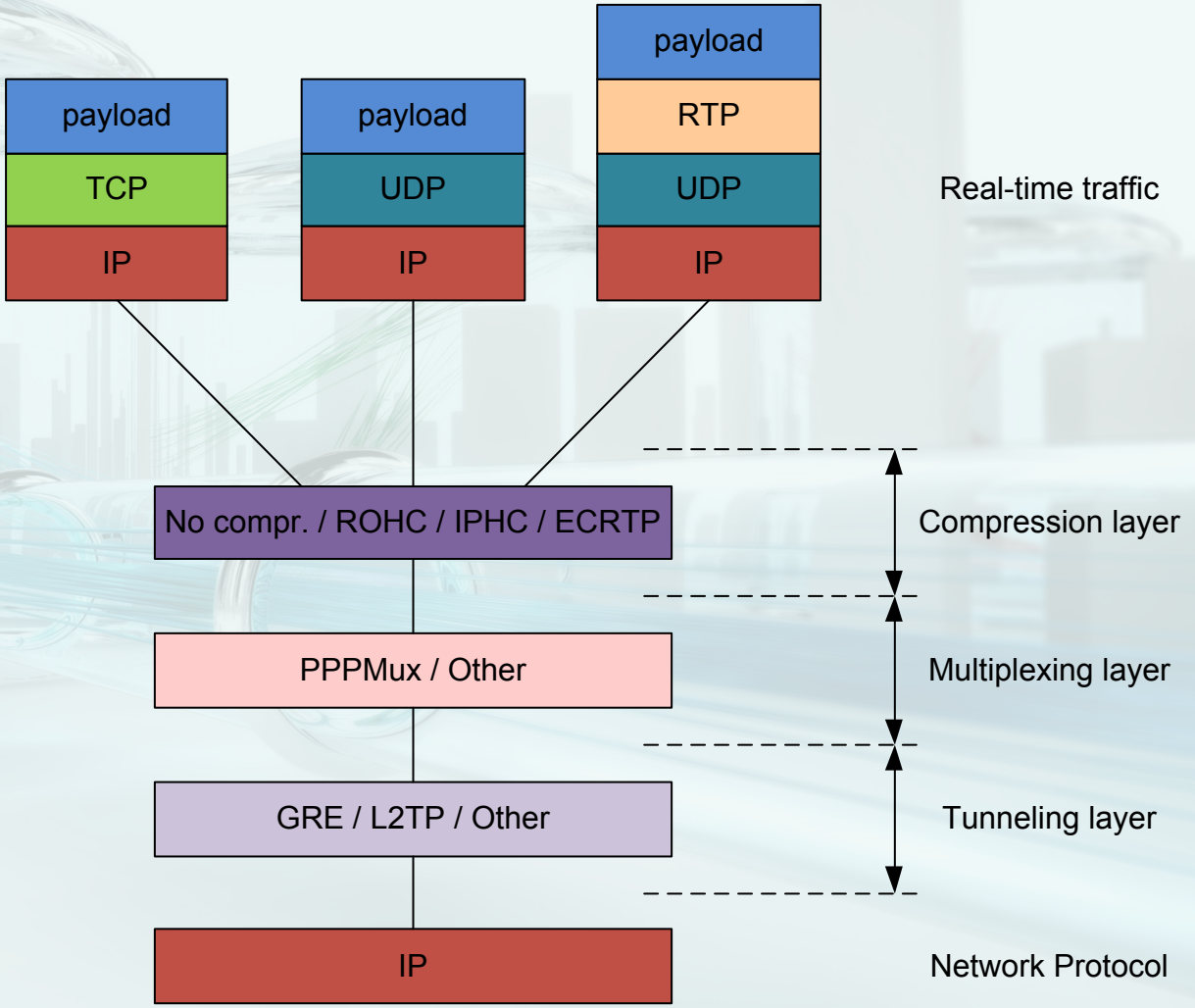
Is TCMTF a solution to the problem?

TCMTF proposal:

Three layers

1. Tunneling
2. Multiplexing
3. Compressing

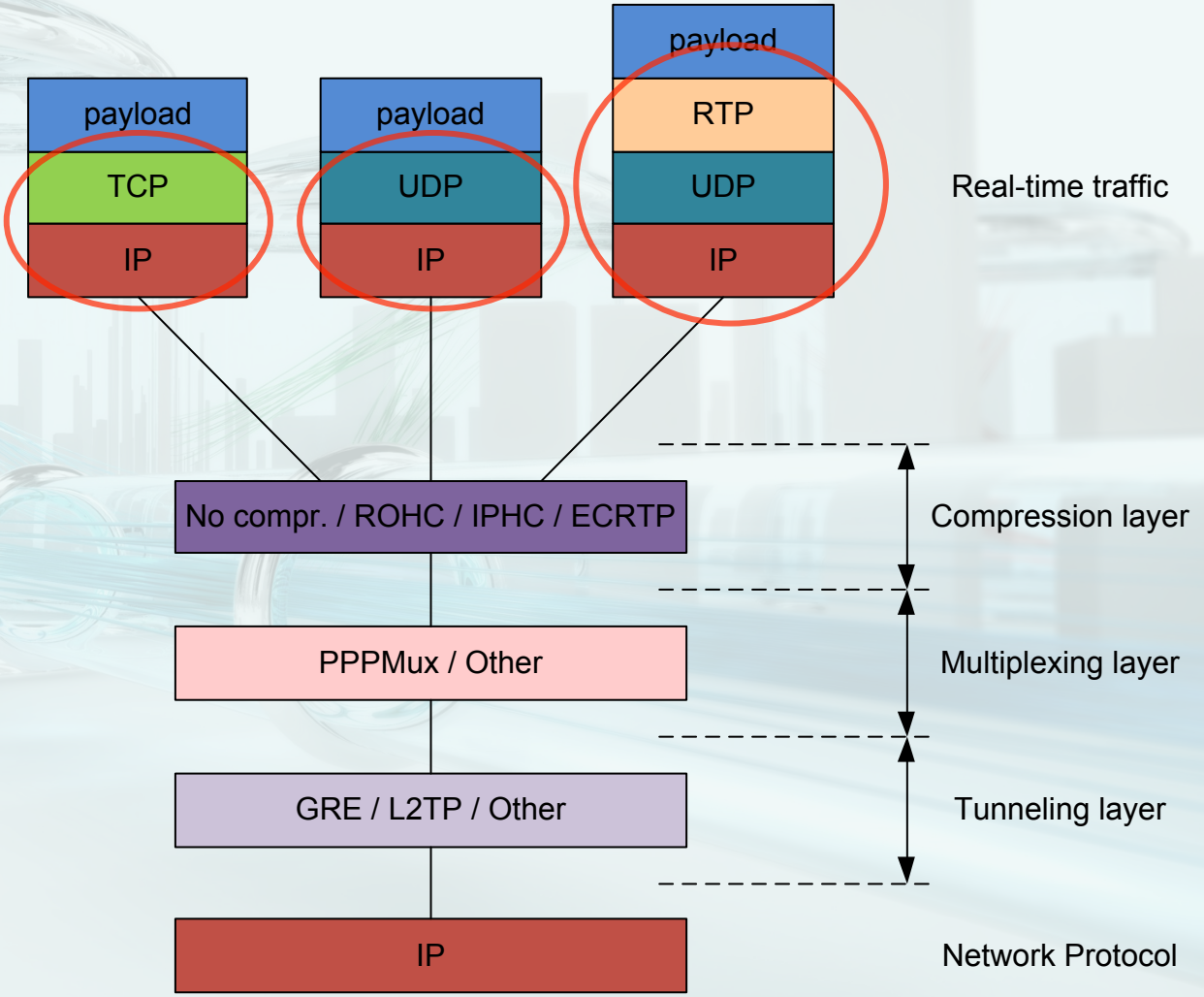


Is TCMTF a solution to the problem?

New options:

1) Different **traffics**

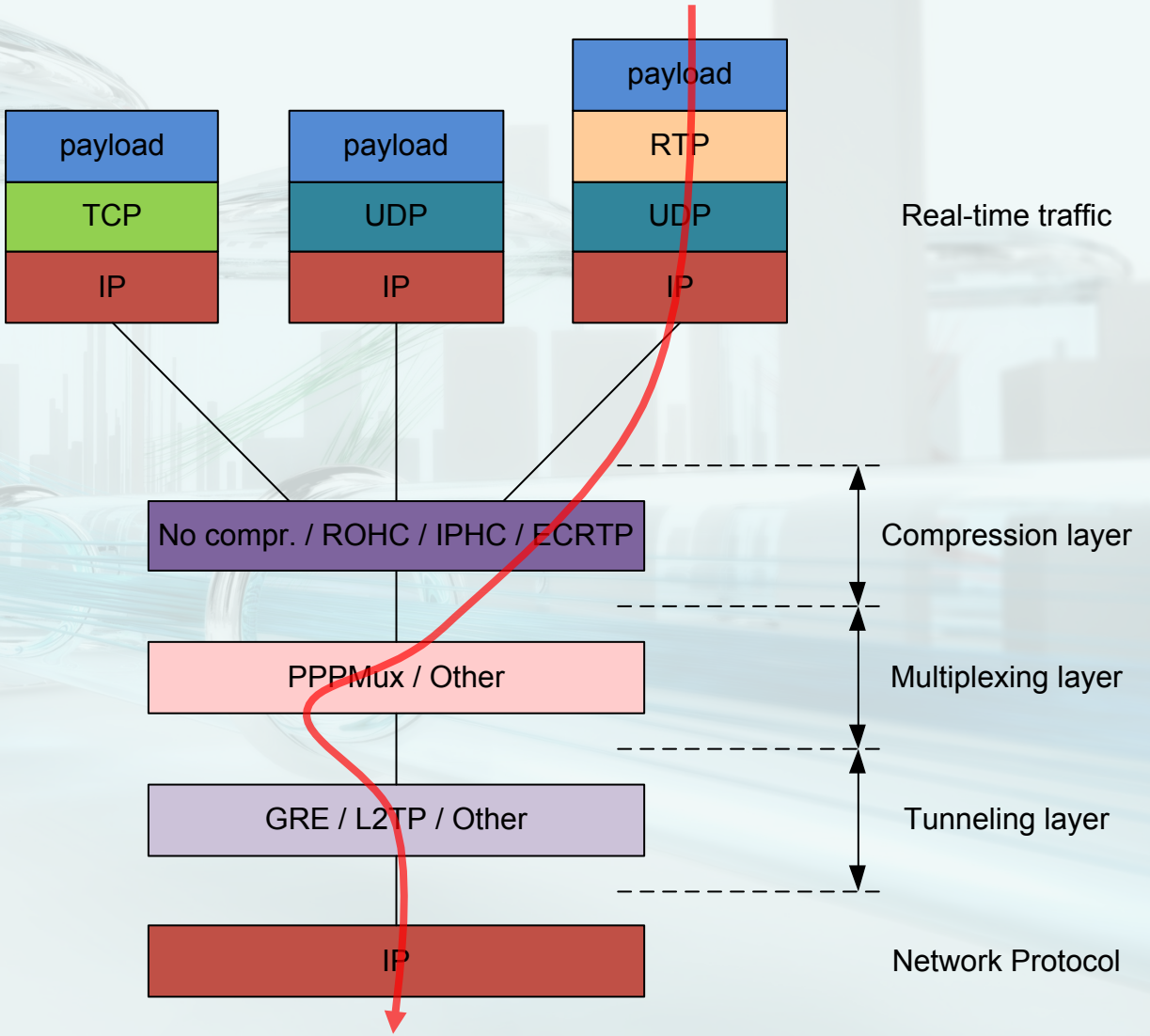
- RTP
- UDP
- TCP



Is TCMTF a solution to the problem?

Backwards compatibility:

TCRTP is this "branch"



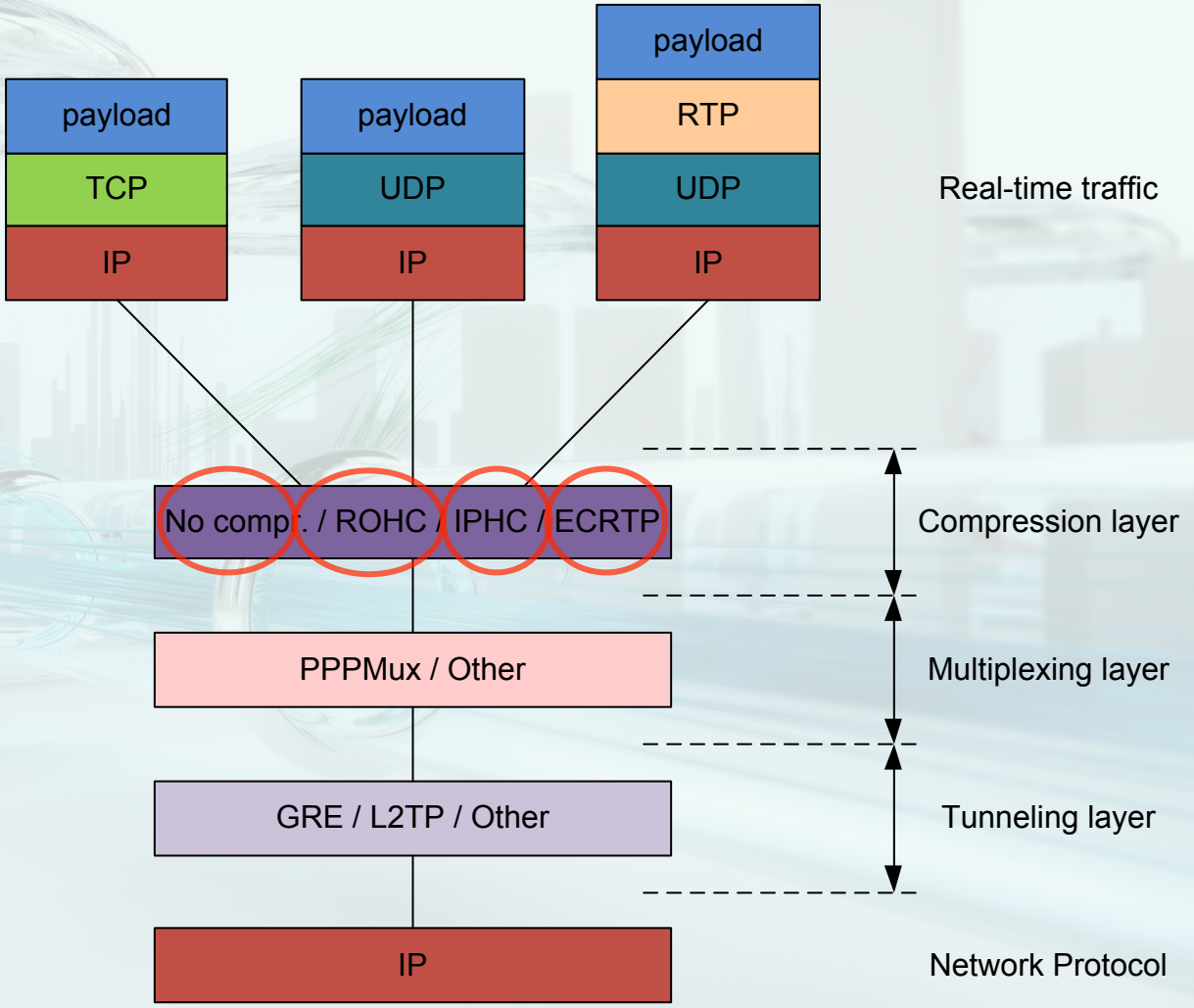
Is TCMTF a solution to the problem?

New options:

2) Different **header compression** algorithms.

The most adequate one can be selected according to:

- Kind of traffic
- Scenario: loss, delay
- Processing capacity
- Etc.

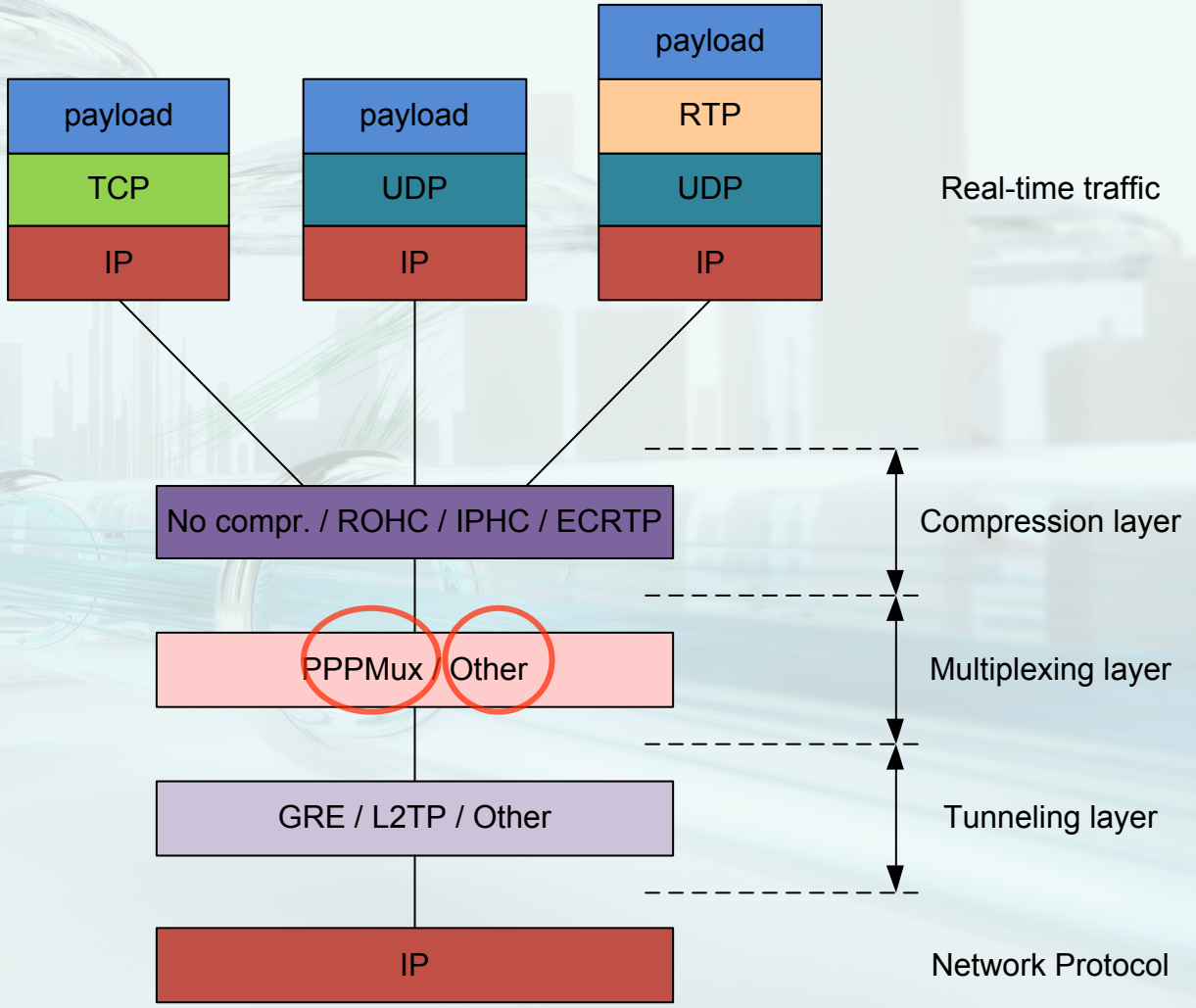


Is TCMTF a solution to the problem?

New options:

3) Different **mux** algorithms

- Currently: PPPMux
- New developed ones

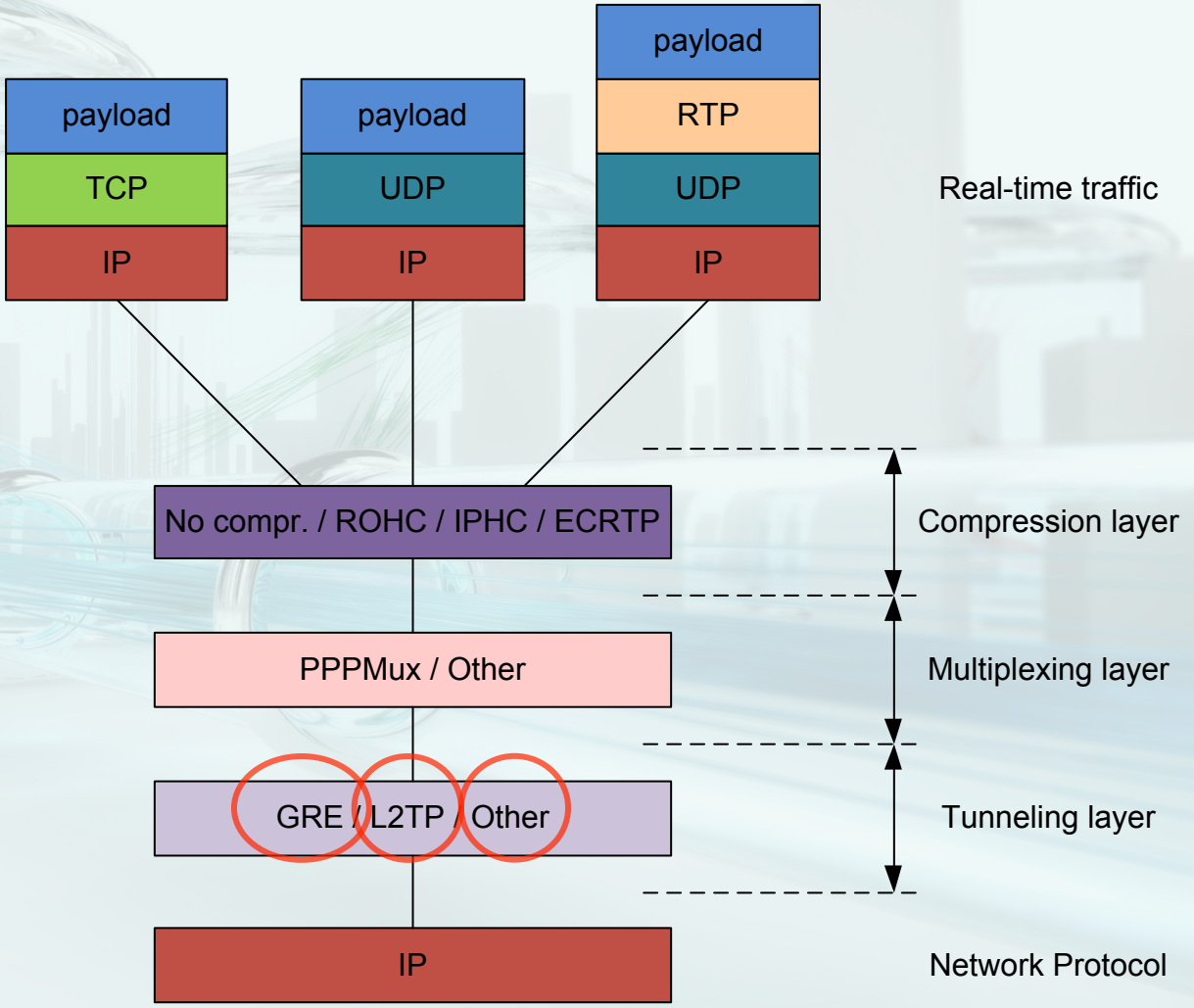


Is TCMTF a solution to the problem?

New options:

4) Different **tunneling** algorithms

- Currently: L2TPv3
- GRE
- others



Is TCMTF a solution to the problem?

Does it work?

First Person Shooter game (UDP)

One IPv4/UDP server-to-client packet of Counter Strike with 9 players
η=160/188=85%

28 to 4 bytes compression

Four IPv4/UDP client-to-server packets of Counter Strike
η=61/89=68%

One IPv4/TCM packet multiplexing **four** client-to-server Counter Strike packets
η=244/293=83%

saving

Massively Multiplayer Online Role Playing Game (TCP)

40 to 7-9 bytes compression

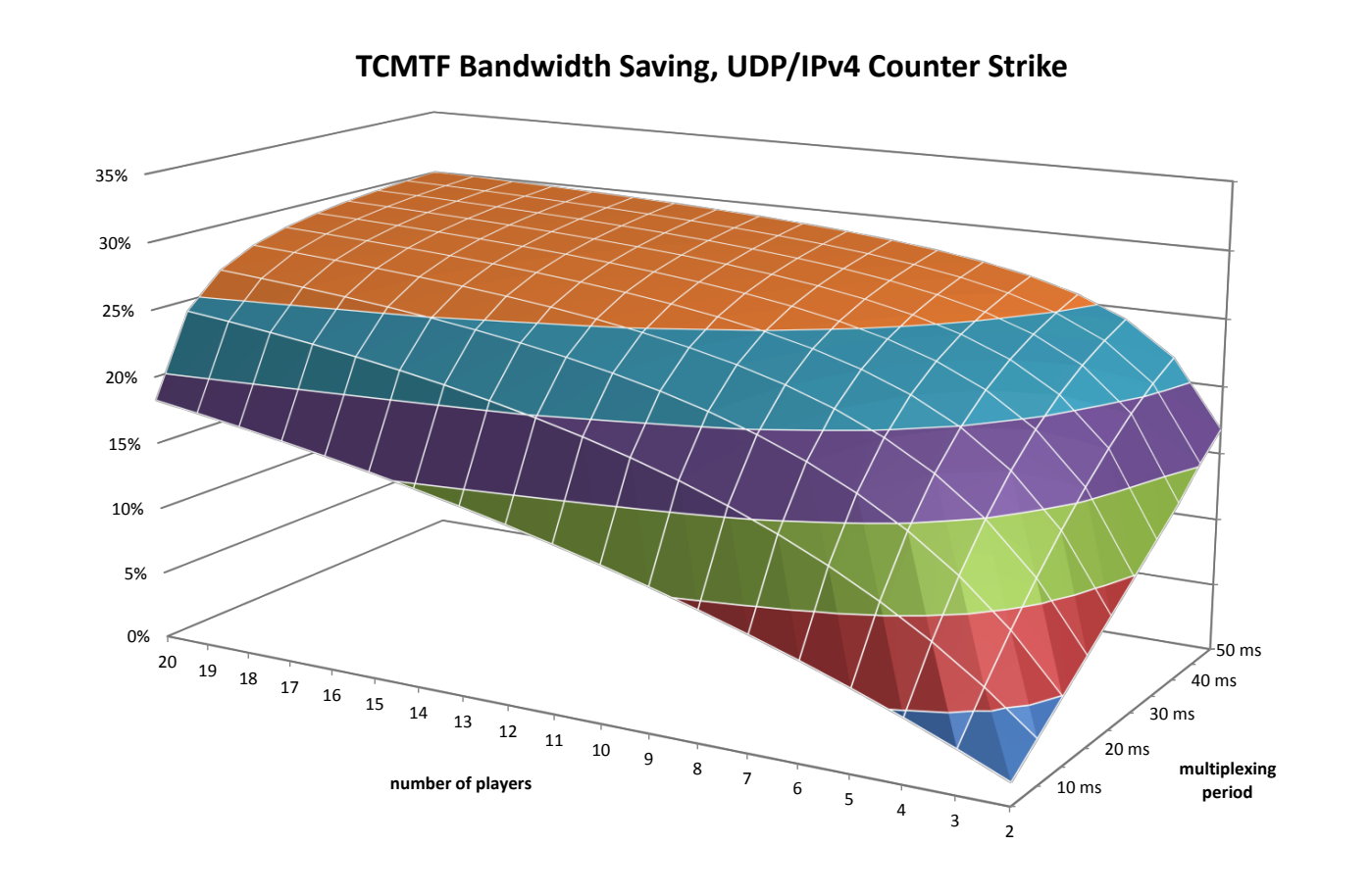
Six IPv4/TCP client-to-server packets of World of Warcraft. E[P]=20bytes
η=20/60=33%

One IPv4/TCM packet multiplexing **six** client-to-server World of Warcraft packets
η=120/187=64%

saving

Is TCMTF a solution to the problem?

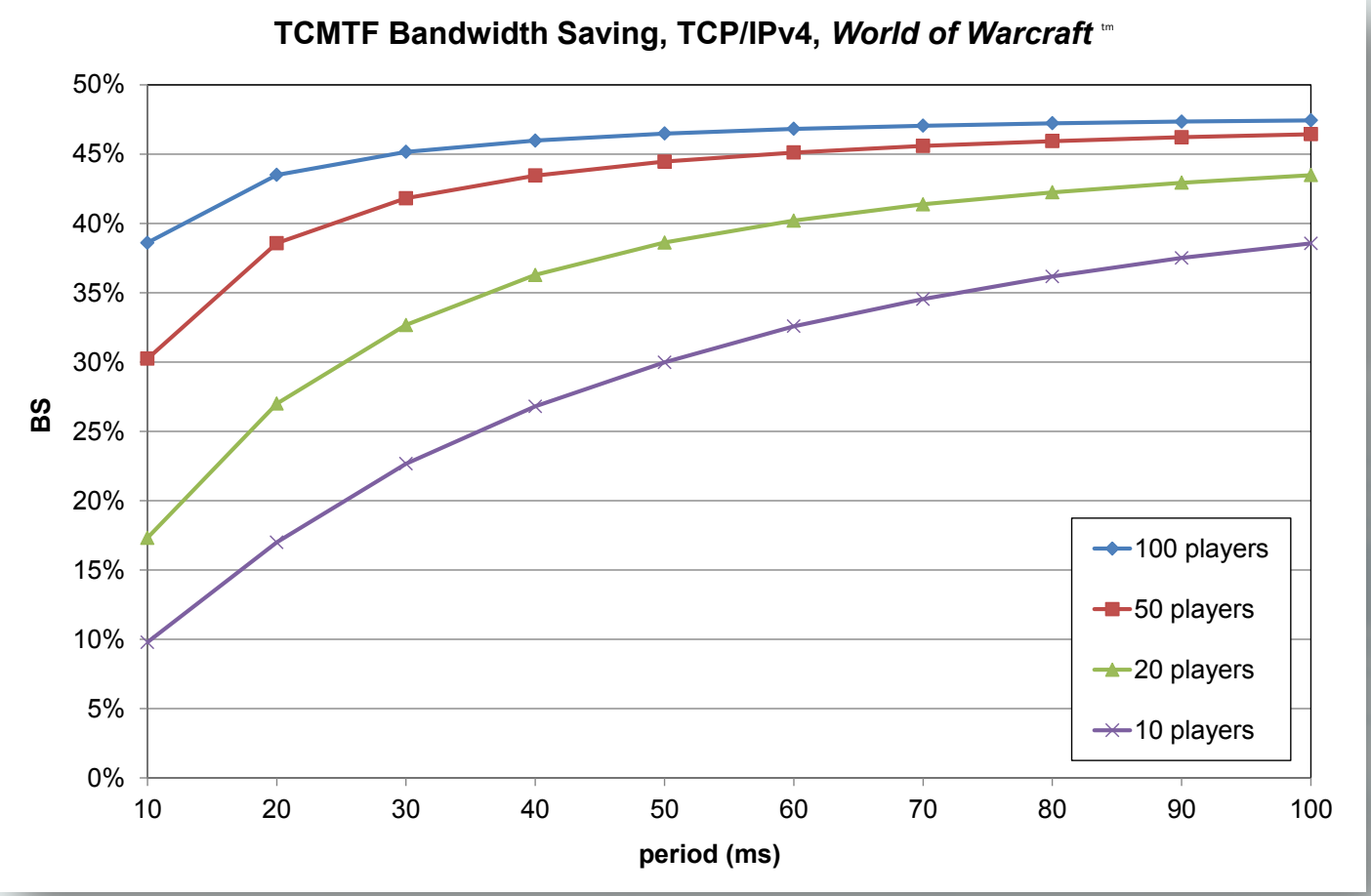
Does it work?: UDP First Person Shooter



First Person Shooters: Can a Smarter Network Save Bandwidth without Annoying the Players?," IEEE Communications Magazine, vol. 49, no.11, pp. 190-198, November 2011

Is TCMTF a solution to the problem?

Does it work?: TCP MMORPG



"Widening the Scope of a Standard: Real Time Flows Tunneling, Compressing and Multiplexing," IEEE ICC 2012, Workshop on Telecommunications: from Research to Standards, June 10-11, 2012, Ottawa, Canada. In press

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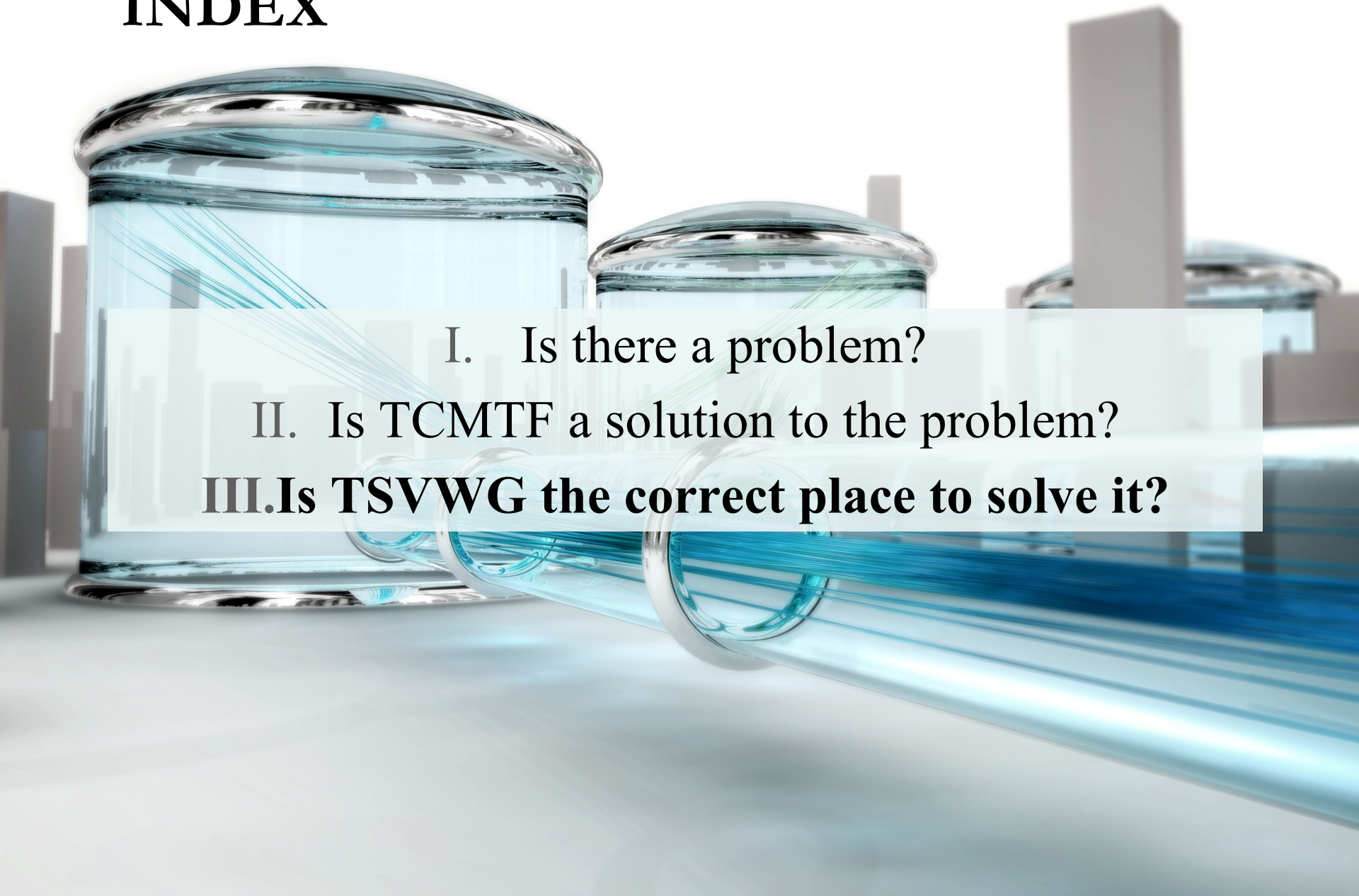

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Is TSVWG the correct place to solve it?

- This is **cross-area work**. It relates to RAI, Transport, and Internet.
  - L2TPv3: **Internet** Area (RFC 3931, March 2005)
  - PPPMux: **Internet** Area (RFC 3153, August 2001)
  - ECRTP: **RAI** Area (RFC 3545, July 2003)
  - ROHC: **Transport Area**, although it can also compress RTP (RFC 5795, March 2010)
- RAI Area: It does not fit, because RTP is only a **particular case** of the solution.
- **Internet** or **Transport** Area?

Is TSVWG the correct place to solve it?

- RFC 1122:
  - Transport Layer: "The transport layer **provides end-to-end communication services** for applications".
  - Internet Layer: "All Internet transport protocols use the Internet Protocol (IP) to carry data from source host to destination host. IP is a connectionless or datagram internetwork service, providing **no end-to-end delivery guarantees**".
- TCMTF is an **end-to-end solution**, requiring some knowledge of the traffic to multiplex, and a synchronization of the context **on both sides**.


So, why not **TSVWG**?
Thank you

Additional slides

Is there a problem?

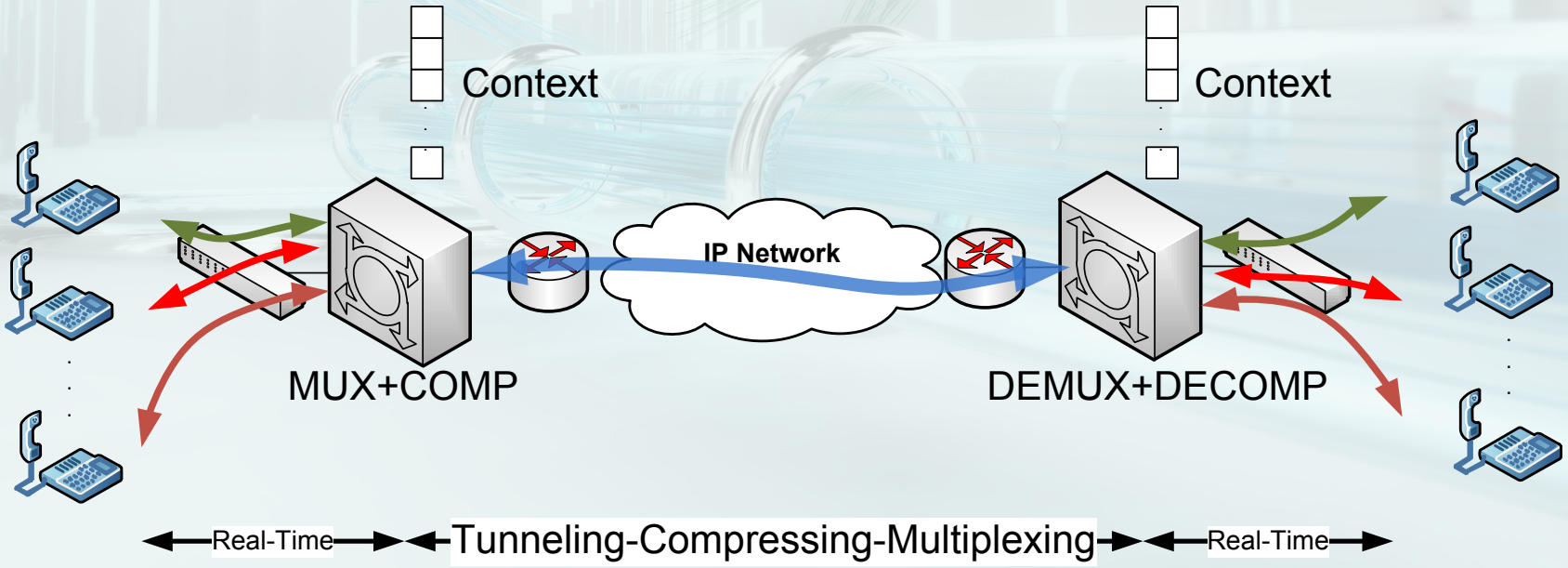
Ten years ago: Question: Can we **improve efficiency** when a number of flows share the same path?

- Does this **scenario** exist?
- Are the **added delays** reasonable?

Is there a problem?

Does **this scenario** exist?

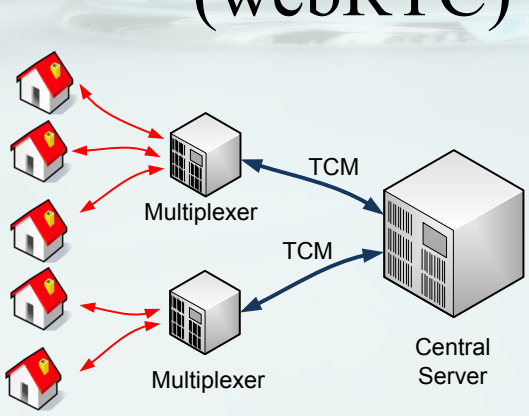
- An enterprise with different offices
  - A number of calls share a common path: they can also share the common header

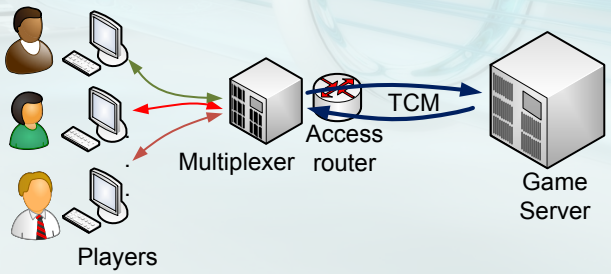


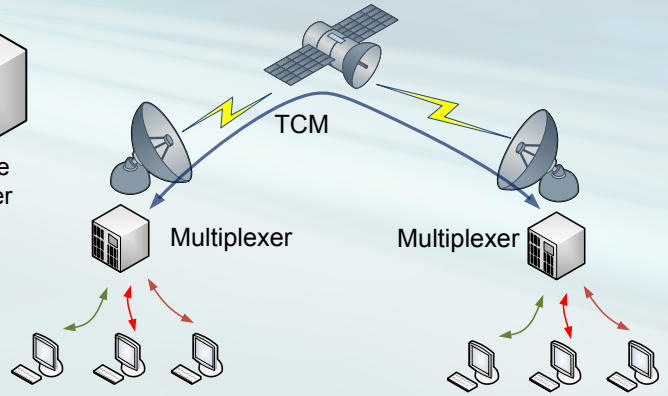
Is there a problem?

Other non-RTP scenarios

- Proxies of a **game-provider** or access network
- **Internet café**
- Satellite link: **Reducing pps**: Compressing ACKs of different flows
- A group of users of a remote desktop system (webRTC)

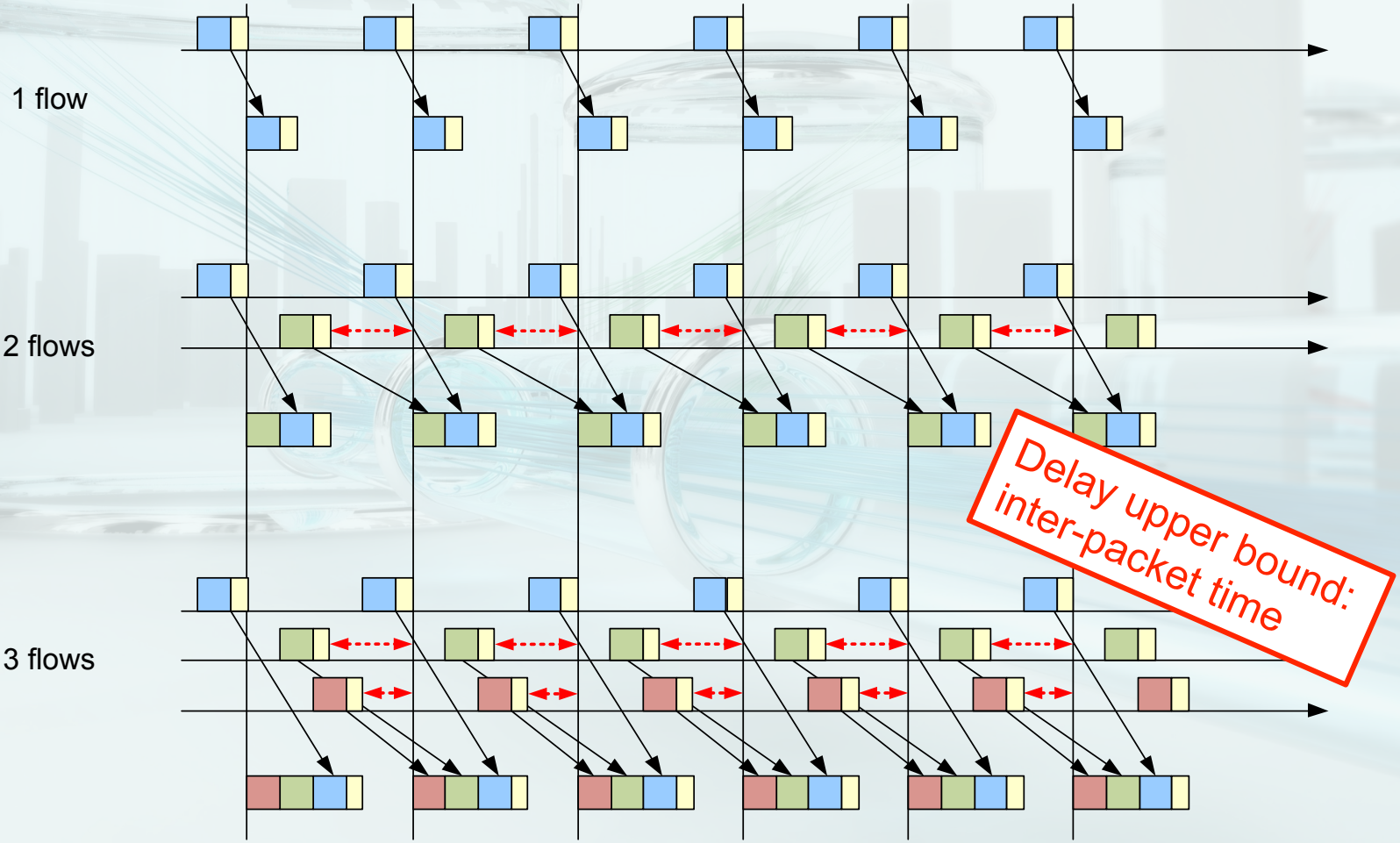






Is there a problem?

Are the **added delays** reasonable?



Is there a problem?

3) **New real-time services** have increased their popularity (e.g. online games)

- Some of them **do not use RTP** (bare UDP, or TCP)
- They generate **tiny packets**
- The users are very **sensitive to delay**
- They use **wireless access** networks
- **Supporting infrastructures are critical**. They MUST work 24/7.
  - Over-provisioning?. Multiplexing tradeoff: in the rush hour, we can save bandwidth at the cost of adding small delays: **flexibility**

Is there a problem?

The CLQ - The #1 in global gaming statistics - GAMES - Windows Internet Explorer

http://www.t

The CLQ - The #1 in global g...

TheCLQ.COM

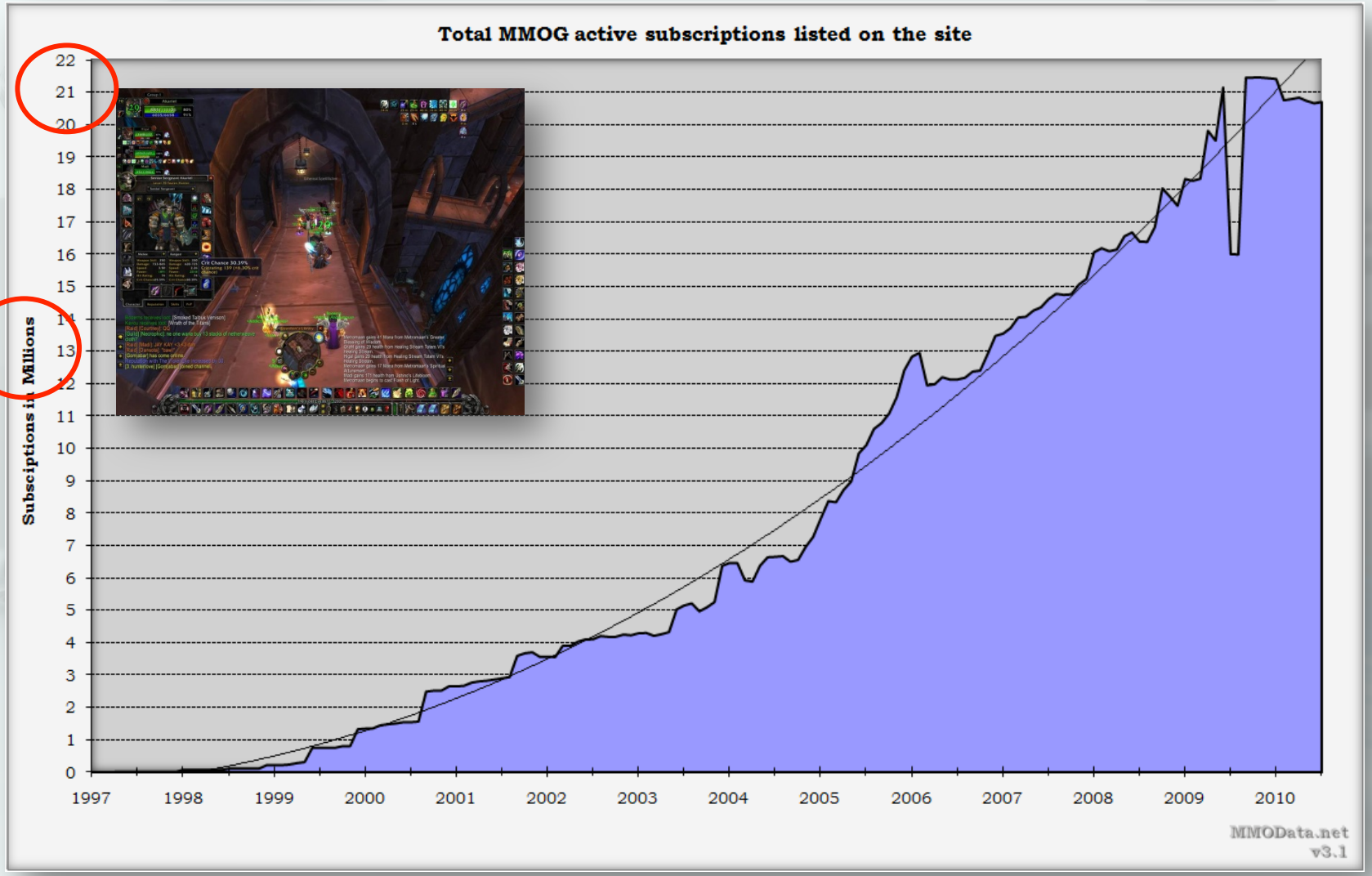
Home | Games | Servers | Players | Player | Register | Login | FAQ / ABOUT

Ads by Google | Online Games Play | Xbox Video Games | Play Video Games | For Play Games

Last updated	4 hours ago
Total players	50,381,205
Online human players	271,869
Online players (humans + bots)	430,427
Total servers	1,335,608
Online servers	87,350

Game	Online human players	Online players (humans + bots)	Online servers	Total Servers
America's Army	26	26	55	5,555
BattleField 1942	528	596	255	4,607
BattleField 2	4,248	5,308	957	21,822
BattleField 2142	427	541	137	4,233
Battlefield Bad Company 2	804	804	59	404
Call of Duty	592	614	144	2,156
Call of Duty 2	3,088	3,384	1,897	29,035
Call of Duty 4	11,581	13,365	6,806	91,995
Call of Duty: United Offense	615	804	511	6,633
Call of Duty: World at War	469	597	217	7,913
Counter-Strike	167,304	284,468	27,854	592,414
Counter-Strike: Source	47,082	70,029	28,190	322,610
Crysis	113	114	20	805
Day of Defeat	1,096	1,608	108	4,228
Day of Defeat: Source	1,906	5,744	1,418	14,539
Doom 3	1	1	32	499
Enemy Territory: Quake Wars	220	391	91	2,106
F.E.A.R.	41	43	101	2,625
Fortress Forever	2	2	9	4,907
Half-Life	879	1,003	248	2,789
Half-Life 2	20	624	690	9,325
Halo	429	429	318	7,531
Left 4 Dead 1	499	510	1,129	29,013

Is there a problem?



http://designcult.org/designcult/2010/08/mmo-subscription-charts.html

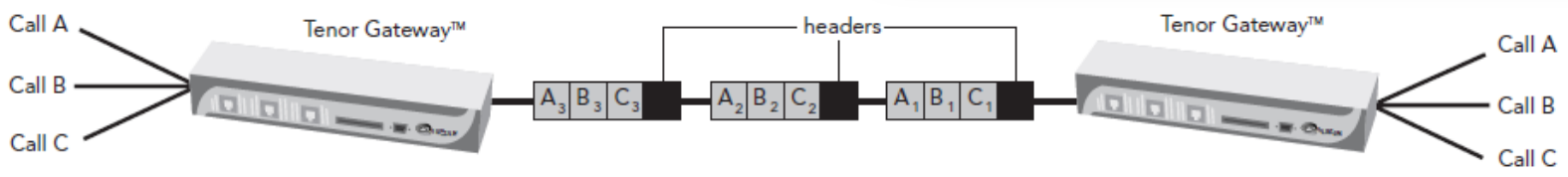
Is there a problem?

Does this scenario exist?

QUINTUM™
TECHNOLOGIES, INC.

PacketSaver™

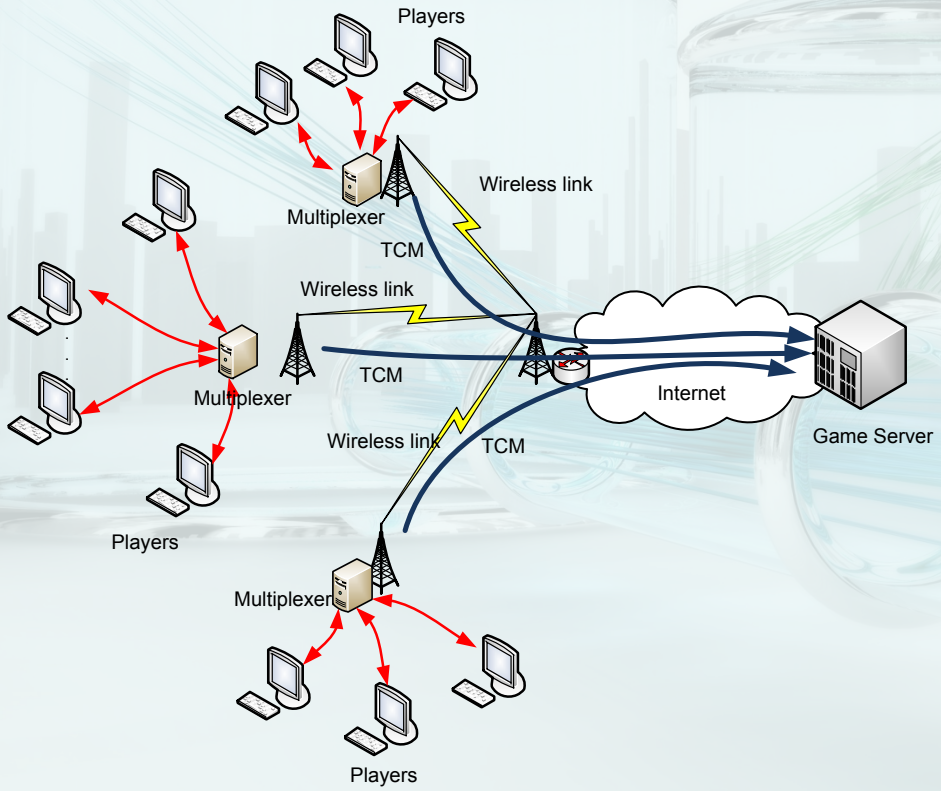
More Efficient, More Reliable VoIP



Quintum's *PacketSaver* technology multiplexes small voice/fax-over-IP packets into larger packets to increase network efficiency, thereby reducing the total amount of packet "overhead" required to transmit voice and fax over IP networks

Is there a problem?

1) Outbreak of **wireless access networks**

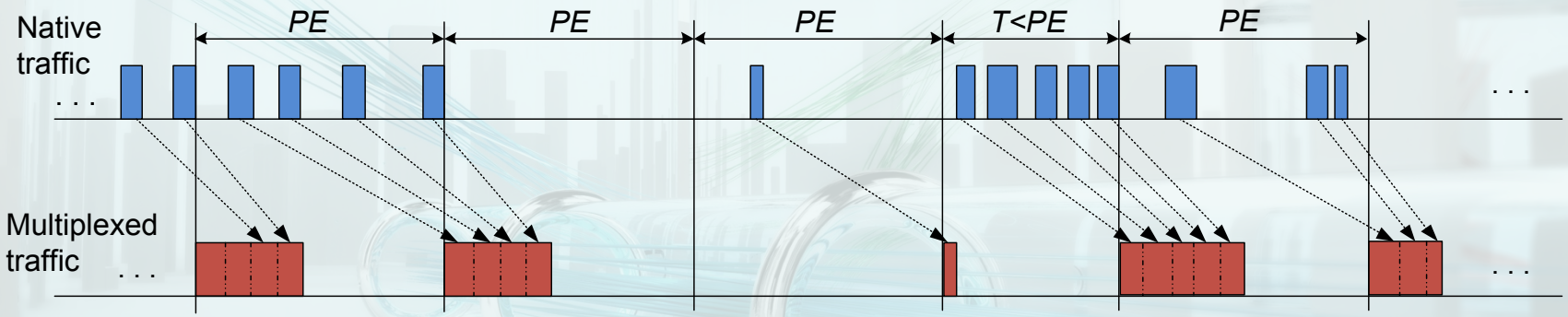


Is there a problem?

http://designcult.org/designcult/2010/08/mmo-subscription-charts.html

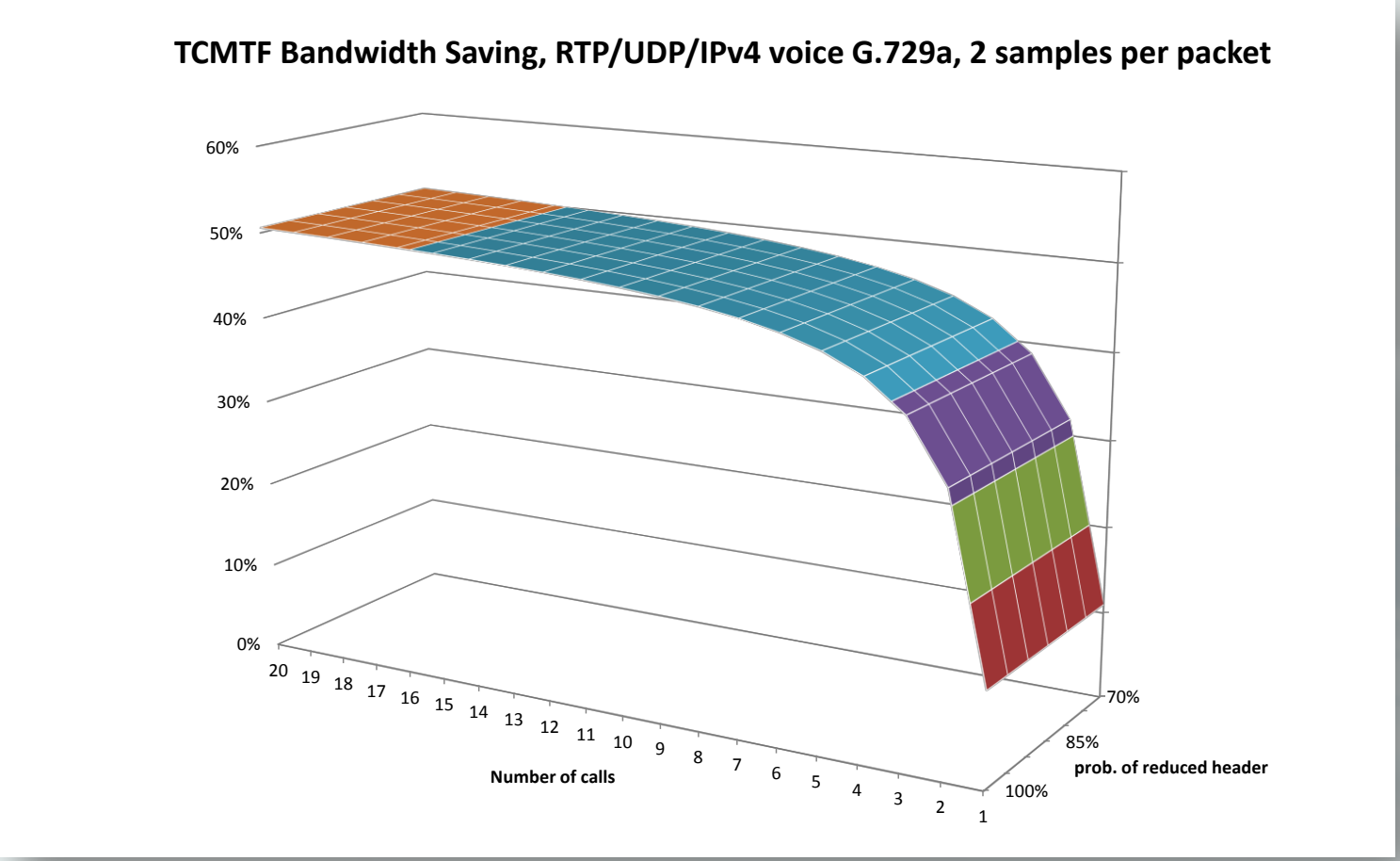
Is TCMTF a solution to the problem?

- As inter-packet time is not fixed, we would need a policy to select the packet to multiplex.



Is TCMTF a solution to the problem?

Does it work?: RTP VoIP



"Evaluating the Influence of Multiplexing Schemes and Buffer Implementation on Perceived VoIP Conversation Quality," Computer Networks (Elsevier). http://dx.doi.org/10.1016/j.comnet.2012.02.004

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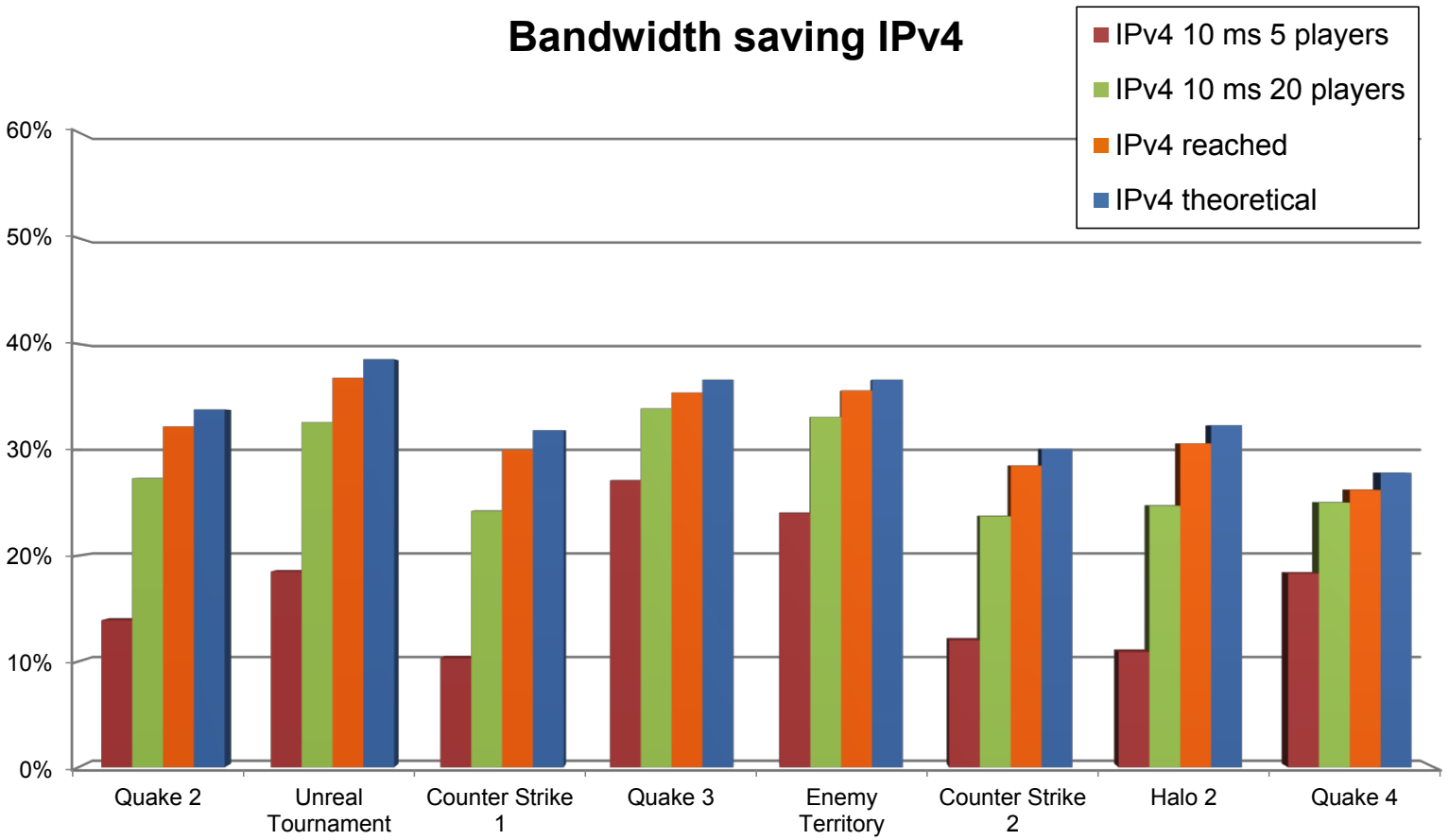

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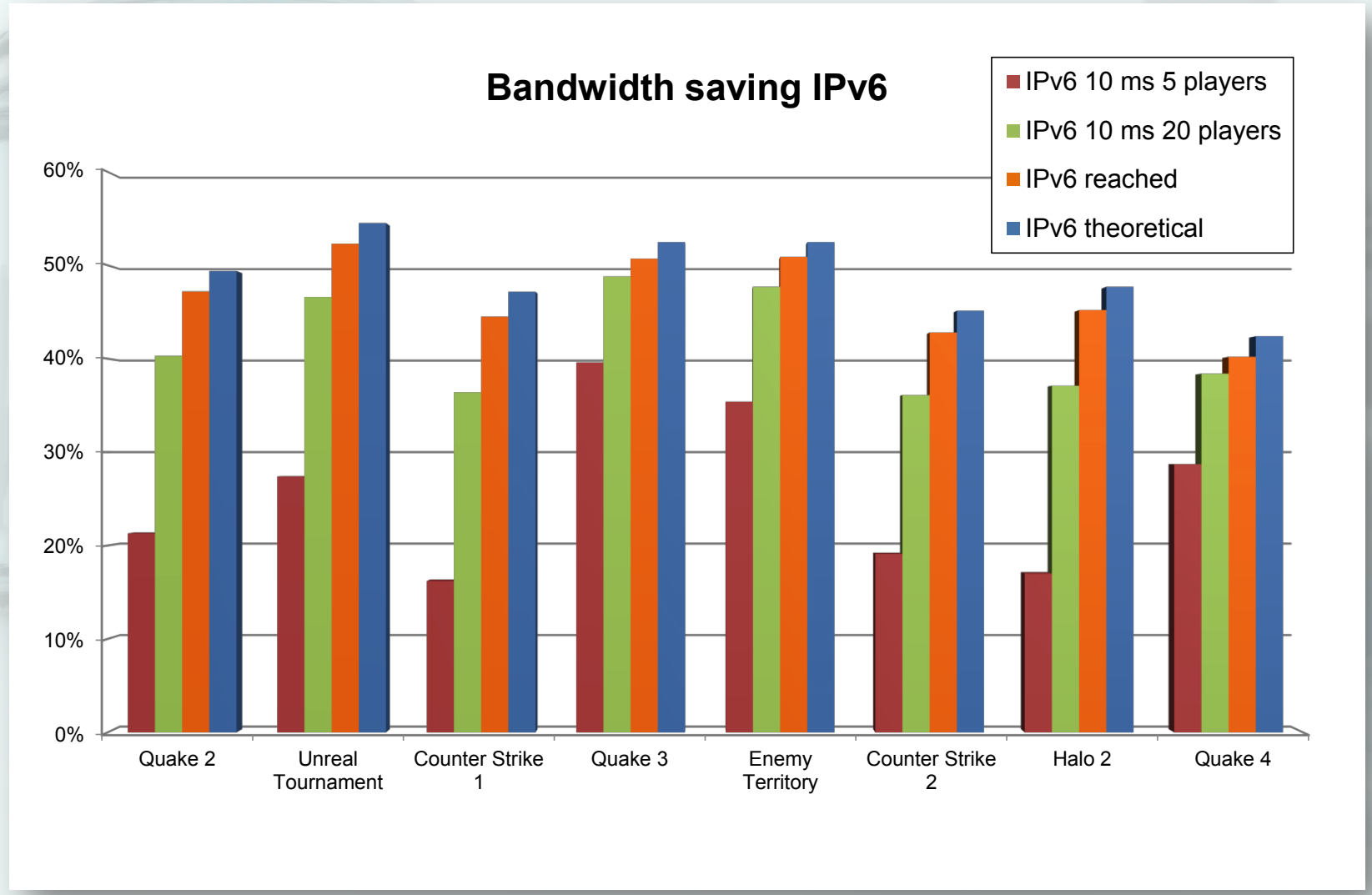

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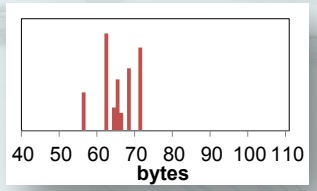
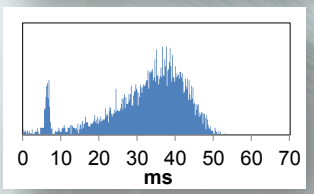
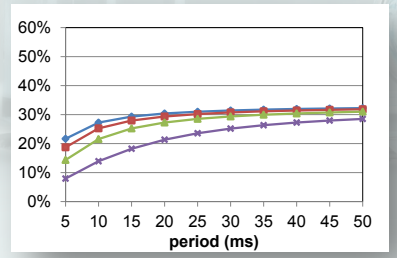
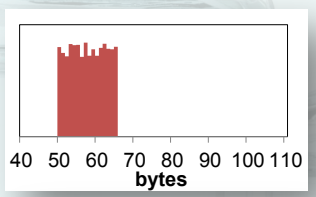
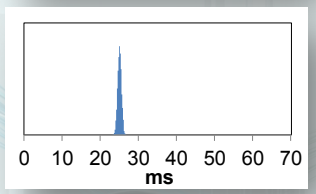


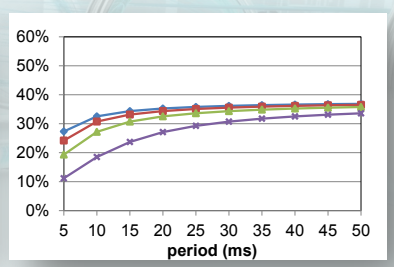




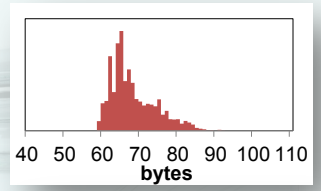
Quake II

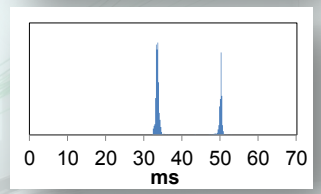


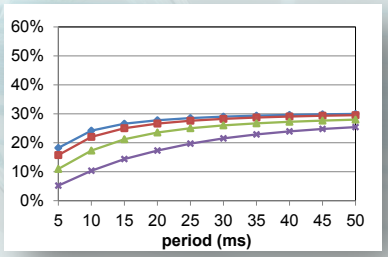




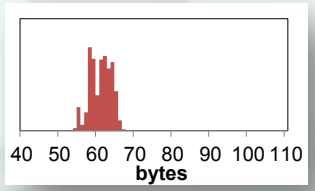
Unreal Tournament

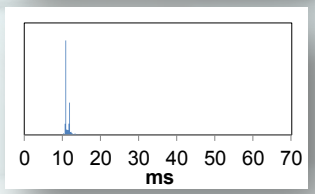


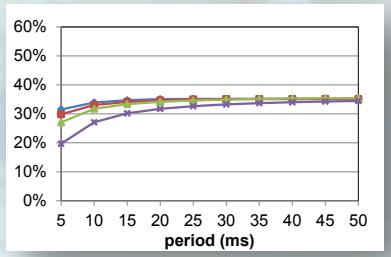




Counter Strike I

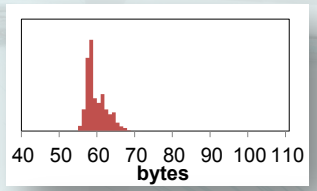


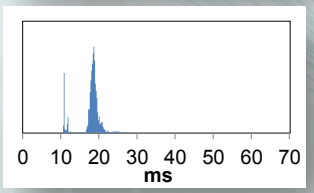


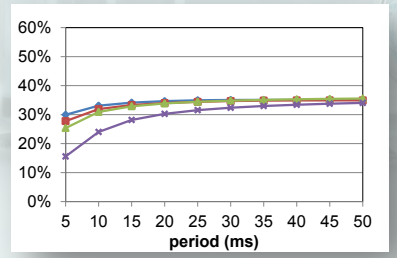


Quake III

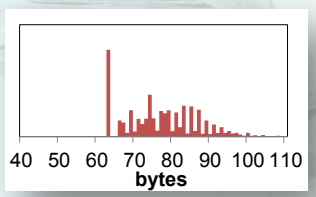
Is TCMTF a solution to the problem?

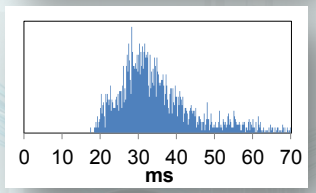


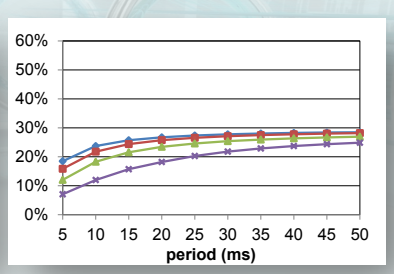




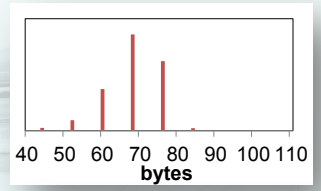
Wolfenstein: Enemy Territory

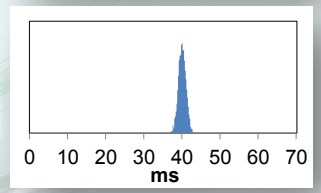


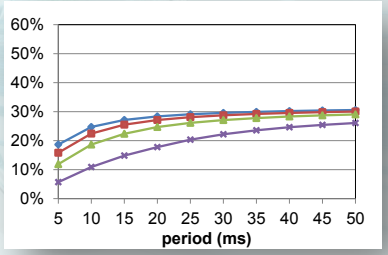




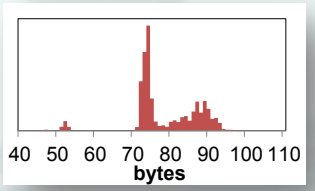
Counter Strike II

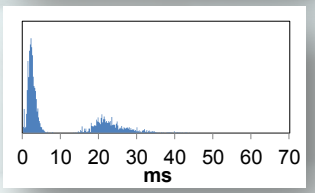


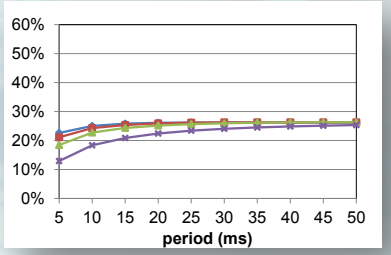




Halo II







Quake IV