

Anycast-based Context-Aware Server Selection Strategy for VoD Services

Soraya Ait Chellouche, Daniel Négru

CNRS LaBRI Lab. – University of Bordeaux 1, France

Eugen Borcoci

University Politehnica of Bucharest, Romania

Eric LeBARS

Thomson Grass Valley, France

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Outline

- **Problem statement**
- **System architecture**
- **Communication Protocol**
- **Server Selection Strategy**
- **Simulation results**
- **Conclusion and Future work**

Problem Statement

- **Context**
 - Video Services Popularity
 - The important cost of video services
 - End users' contexts heterogeneity

- **Challenging issues**
 - Scalability & cost optimization
 - QoS on end to end basis

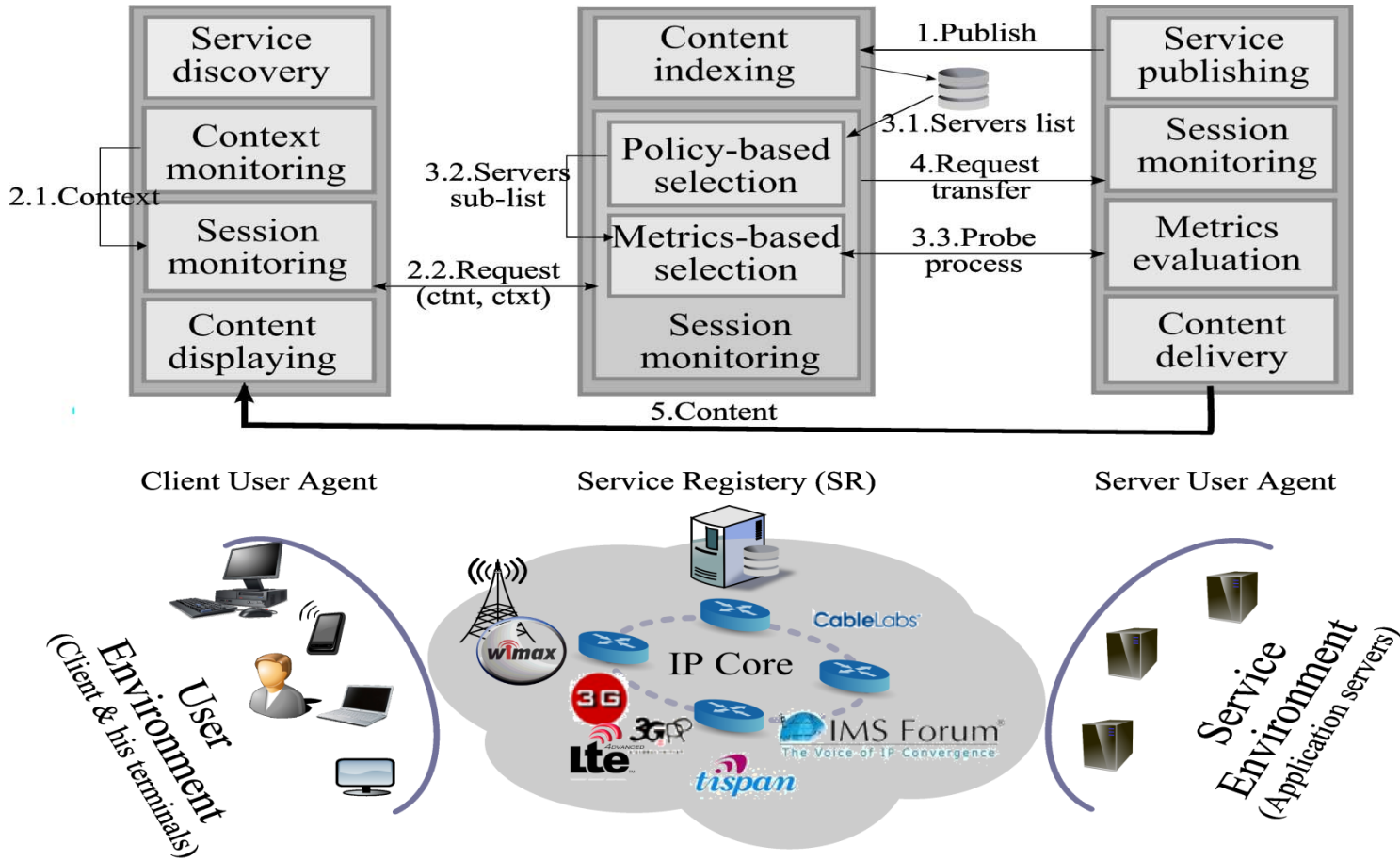
Server Replication

- Common technique to improve service scalability
- Server selection issue => How to designate the “best” server ?
- Usual solutions
 - Preconfigured server
 - Round robin selection sever
 - Server load based selection
 - Anyast-based selection

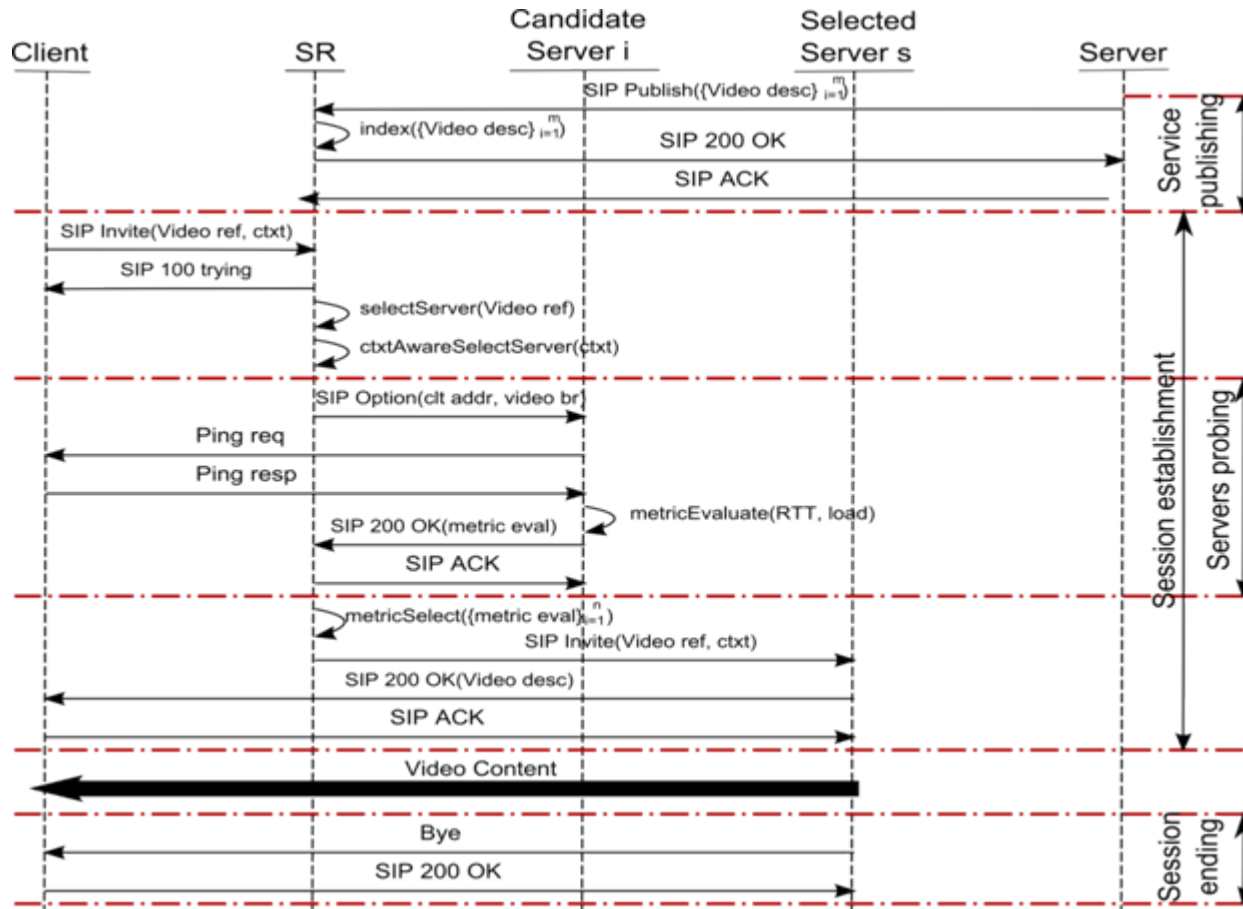
Anycast

- **RFC 1546** “*Anycasting in IP environment is defined as a best effort delivery of an anycast datagram to one, but possibly more than one, of the host that serve the destination anycast address*”
- **Network-layer Anycasting limitation**
 - Difficult integration on the existing infrastructure
 - Non ability to consider the user context information in the selection process

Anycast System Architecture



SIP-based Communication Protocol



Server selection strategy

- **Objectives**
 - Optimize the network and servers' resources
 - Maximize the user satisfaction
- **Two level filtering**
 - **Policy-based filtering: matching between**
 - User context (user language, device resolution, access network bandwidth, etc.)
 - Video parameters (language, resolution, bitrate, etc.)
 - **Metrics-based filtering**
 - Server load
 - Server-to-client delay

Metrics-based filtering

- **Server probing**

$$F(A_c, Rbr_c) \left\{ \begin{array}{l} d_{sc} = \text{delay}(A_c) ; \\ \text{if } \left(\left(\sum_{i=1}^n Rbr_i + Rbr_c \right) / br < 1 \right) \\ \text{then } \{ \text{return } d_{sc} \} \\ \text{else } \left\{ \text{return } \left(d_{sc} * \left(\left(\sum_{i=1}^n Rbr_i + Rbr_c \right) / br \right) \right) \right\} \end{array} \right\}$$

- **Server selection**

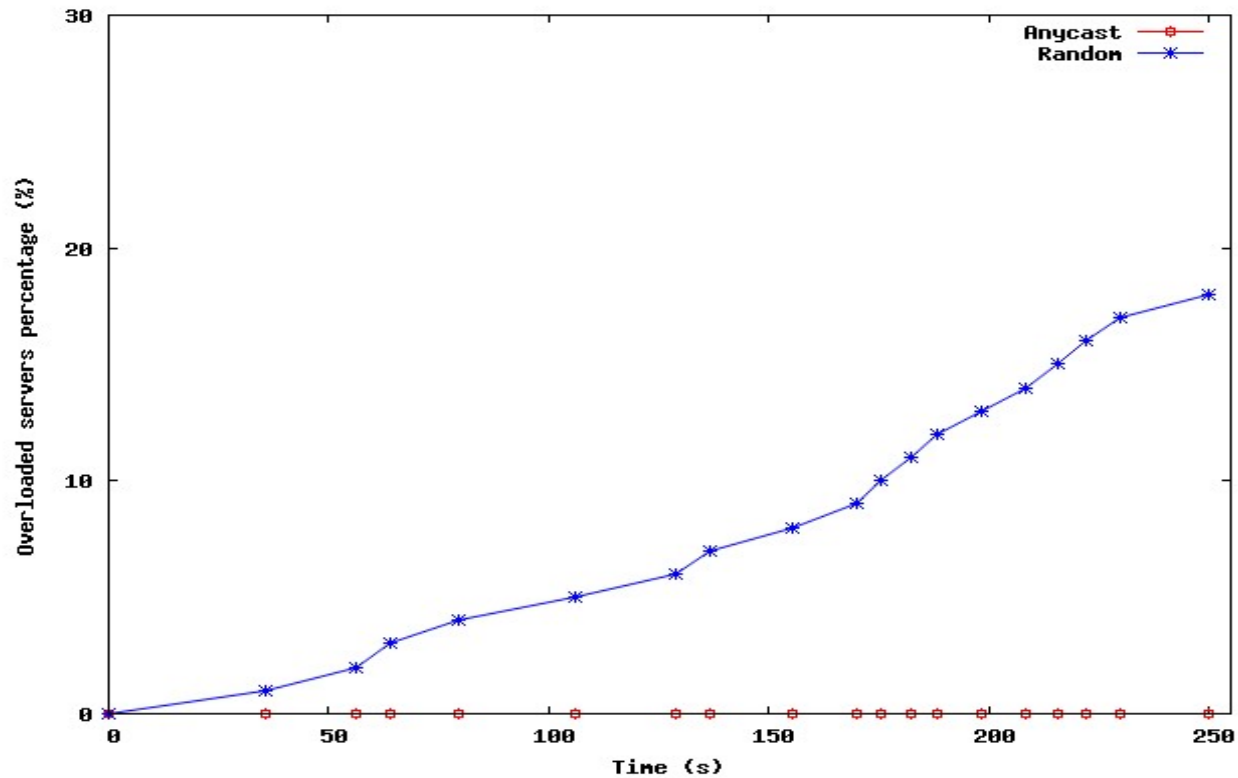
$$F_s(A_c, Rbr_c) = \min_{1 < i < m} (F_i(A_c, Rbr_c))$$

Simulation environment

- Network Simulator NS 2.34
- 1000 clients with Bandwidth $\in [0.512, 100]$ Mb/s
- 500 servers with 20 Mb/s connectivity
- 20 routers with 2 Gb/s connectivity
- 10 videos present at all servers with
 - 3 different resolutions 352 x 288, 720 x 576 and 1408 x 1152
 - For each resolution with 3 different bitrates
 - With probability 1/5, 2/5 and 2/5 respectively
- client requests are generated in a Poisson model during 250 s
- One video session duration: 250 s

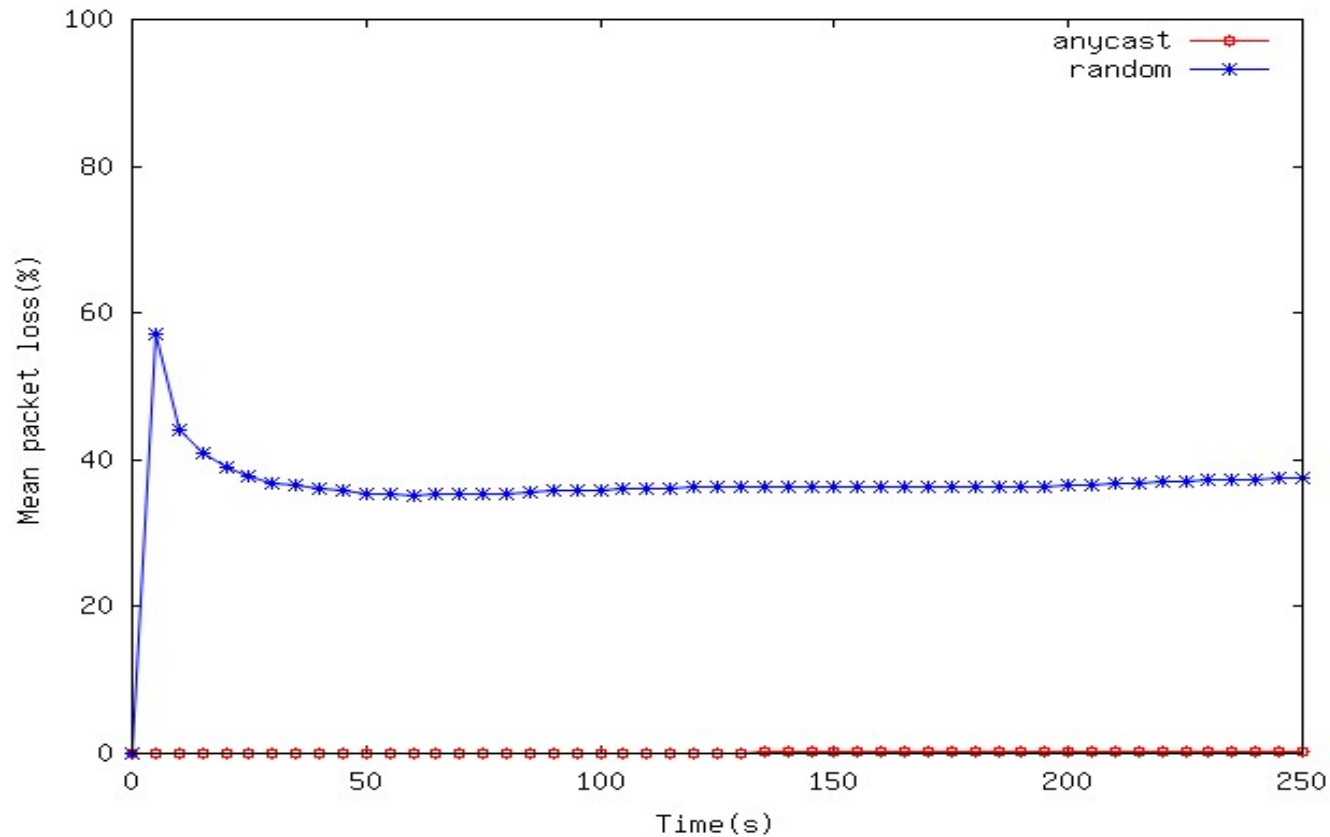
Simulation results 1/4

Overloaded servers' percentage



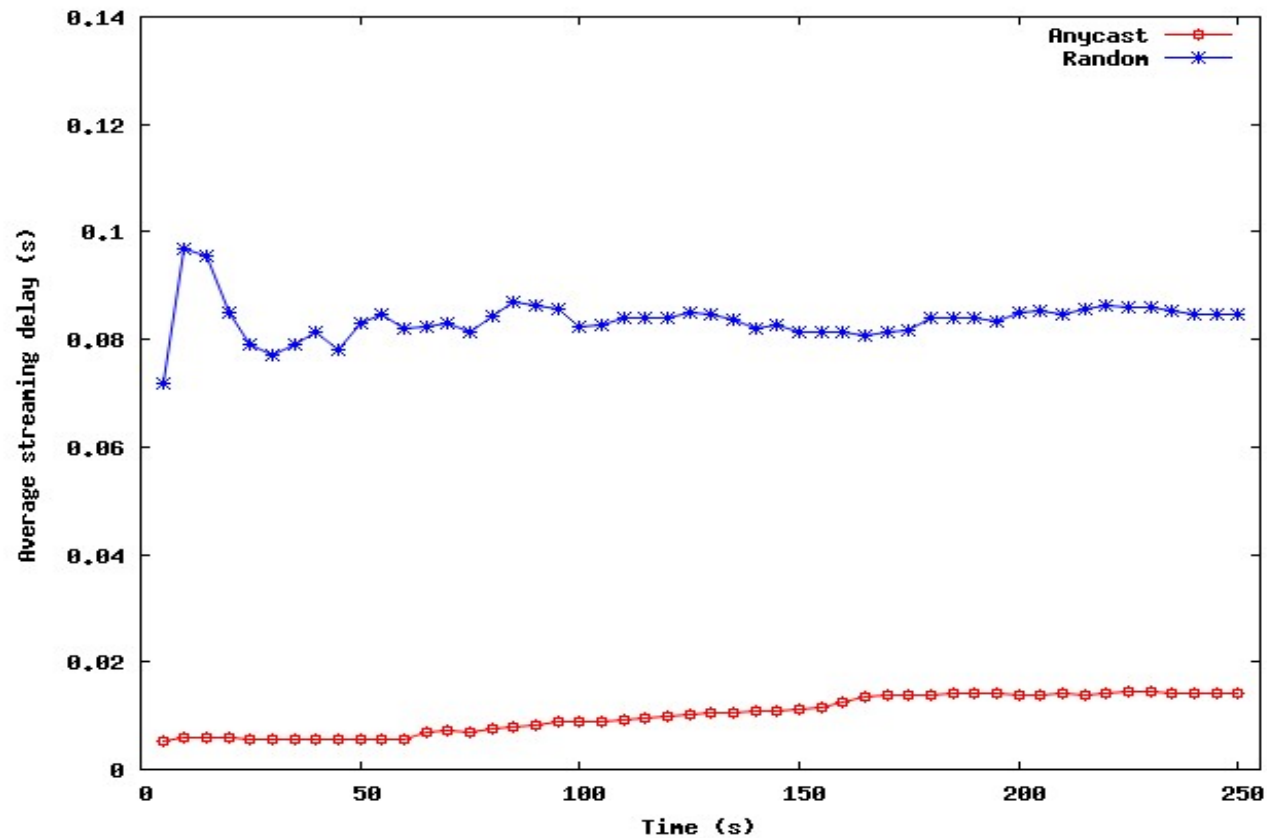
Simulation results 2/4

Mean packet loss



Simulation results 3/4

Mean RTP packet delay



Simulation results 3/4

Additional results

Metric	Random	Anycast
<i>Context matching</i>	33.7%	100%
<i>SIP overhead</i>	1.72 KB	74.59 KB
<i>Total service throughput</i>	219.8 MB	203.14 MB
<i>Average service Response time</i>	0.02 s	1.05 s

Conclusion & future work

- **Summary**

- context-aware video delivery solution based on the application-layer anycast
- Two level server selection strategy
- Promising simulation results

- **Perspective**

- Achieve real development in the framework of the large-scale European project ALICANTE
- Extend the proposed solution to include a new home gateway layer to support the CDN

Thank you !!!

Question ?