European Commission

RITE: Working smarter not Harder will make the Internet Faster.

RITE proposes to remove the root causes of unnecessary latency over the Internet. Whilst time-of-flight delay is inevitable, greater delays can result from interactions between transport protocols and buffers. It is this that RITE will tackle. The consortium consists of seven research and industry partners from five different countries.

At A Glance:

R / T E

REDUCING INTERNET TRANSPORT LATENCY

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EC Contribution: *€ 3,569,000.00*

Contract Number: CNECT-ICT-*317700*

Main Objectives

The ultimate goal of RITE is to bring stable, low-latency services to Internet users and businesses, and lay the groundwork for consistent low latency in Internet communication.

Starting by better understanding how latency is traded off for throughput and what generates latency in the Internet, we will investigate the Internet systems to find the latency-inducing bottlenecks, both in the end-systems and in the network. Finally we will design mechanisms that can be integrated with the existing infrastructure to improve the experienced latency.

Reducing latency may pave the way for new, exiting uses of the Internet. Applications that to this point have been unthinkable may be realised with constant low-latency service.

RITE has a strong focus on standardization, and will work through the IETF to transform the results of the project into standards. The partners also aim to contribute new code to the Linux kernel, making the improvements available to the public.

The project is driven by three specific use-cases: Financial applications, networked games and interactive video. These are applications with very different characteristics, but all have strict latency requirements. The industry partners will benefit from reduced Internet latency in a wide range of applications that they either provide infrastructure or hardware for, ultimately benefitting their customers.

Reducing latency may pave the way for new, exiting uses of the Internet. Applications that to this point have been unthinkable may be realised with consistent low-latency service. Also, lower latency for our time-dependent use-cases will improve the experience for the users drastically, giving our industry partners a competitive benefit.

Technical Approach

RITE is structured into two main scientific work packages: 1) “End systems and applications” focusing on the cases where latency can be reduced without changing the intermediate network nodes. 2) “Network and interaction” exploring mechanisms to improve the latency for network nodes, as well as interactions between end-hosts and network.

In work package 3, “use-case trials”, we will deploy the results from work packages 1 and 2 in testbeds reflecting the chosen use-cases of the project (financial applications, networked games and interactive video).

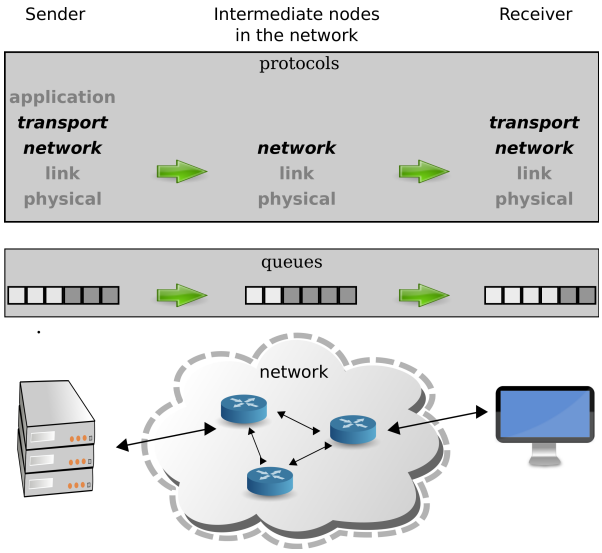

Figure 1: The areas of focus for the research performed in RITE.

Key Issues

In RITE we aim to explore and develop changes to the existing infrastructure, so that the changes can be deployed without having to redesign the Internet. Latency can arise from a myriad of different reasons. As an example, setting up all connections for loading a dynamic web page, including DNS and background database connections, may delay the loading of the page with several extra RTTs. This will, unnecessarily, reduce the load speed. In RITE we will analyse network traces and investigate network components and operating systems to locate the bottlenecks. RITE researchers will use what we learn from this investigation to develop mechanisms that can be deployed in the existing infrastructure to improve the latency for generic Internet use, as well as for our chosen use-cases.

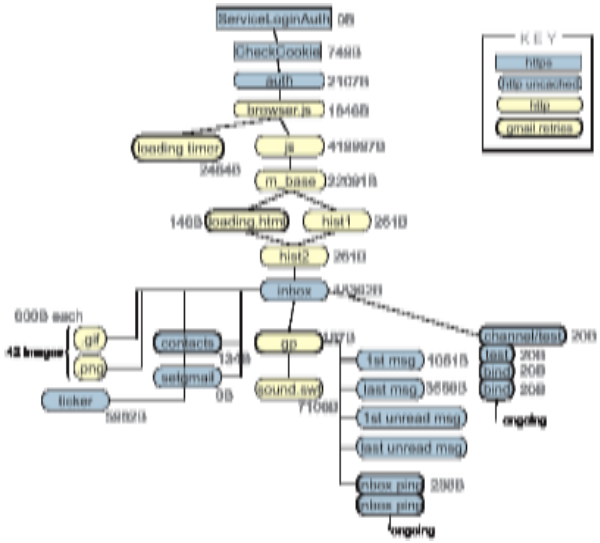

Figure 2: Unnecessary delay multiplier. More then 50 objects may be involved in a simple task like logging into Gmail. Each object may imply 3 to 4 data transfers each adding to the total latency.

Expected Impact

In RITE, we envision an Internet that *always* responds near-instantly. We have come together in the RITE project because we know that is a perfectly reasonable aspiration. Achieving that goal will have a profound impact –an impact that is difficult to truly imagine. It might seem exaggerated to argue that removing tens or hundreds of milliseconds of delay will change the world. However, delay must be multiplied by the number of messages passing back and forth. Distributed systems involving machine to machine interactions, e.g. Web services, consist of long sequences of automated interactions in between each human intervention. Therefore removing unnecessary delay per transfer will enable previously unimagined scale of interaction, not merely a slight performance improvement.

For financial applications, a few milliseconds of lowered latency is enough to justify building new cross-Atlantic fibers. For a game company, a game that can offer stable low latency may level the playing field, allowing skill to trump random delays in the gameplay. For interactive video, having the experience of a natural conversation rests on the ability to convey the video and audio in a timely manner. RITE aims to achieve this.