Infrastructures for Cloud Computing and Big Data

Project Work

Distributed Cloud Gaming Pipeline

Implementation of the streaming module

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Abstract

Since the rise of Cloud infrastructures and the increased accessibility to platforms capable of playing videogames, Gaming as a Service (GaaS) has been on the rise. The aim in this field is to give the players the possibility to play videogames anytime anywhere on any device through a streaming service. A lot of effort is being put in the research of new methods to overcome the limits of current Game Engines, built as monolithic entities, and of the QoS of the streaming. This Project Work aims to address the former problem by researching and implementing (a part of) a serverless alternative to the monolithic architecture, focused on splitting the engine into independent modules. These modules would then be able to be distributed along the whole cloud continuum depending on the required QoS.

1 Introduction

In the past ten years the Gaming industry has more than doubled in revenues, thanks, especially, to the rise of mobile gaming and the increased connectivity that has enabled multiplayer games to be easily accessible.

Meanwhile, Cloud infrastructures have evolved and permeated most industries, making only natural that the gaming industry would be interested in reaching even more players by providing Gaming as a Service (GaaS). Some of the biggest companies have already implemented this sort of service successfully, such as Google Stadia, PlayStation Now and NVIDIA GeForce Now, thanks to the great resources they have. Still, there are many challenges to be faced to bring good QoS in GaaS while minimizing the resources employed to do so.

Related literature has been produced extensively, mostly concerning specific optimization practices revolving around the topics of 3D graphics, physics, or streaming. The main assumption in these papers, though, has most often been to keep the engine architecture "as-is". One of the main challenges, indeed, derives from the fact that the engines used to run games are developed as monolithic entities, therefore they are not able to provide the scalability and flexibility that cloud distribution requires.

Some research has been carried out to achieve an architecture capable to decompose the traditional game engine into interacting distributed services, such as in SMASH [1], though a number of challenges are still still to be addressed, especially the problem of interaction delays introduced by the distribution of the different processing modules.

The architecture that wants to be researched aims to be a serverless cloud gaming pipeline, organised as seen in Figure 1.

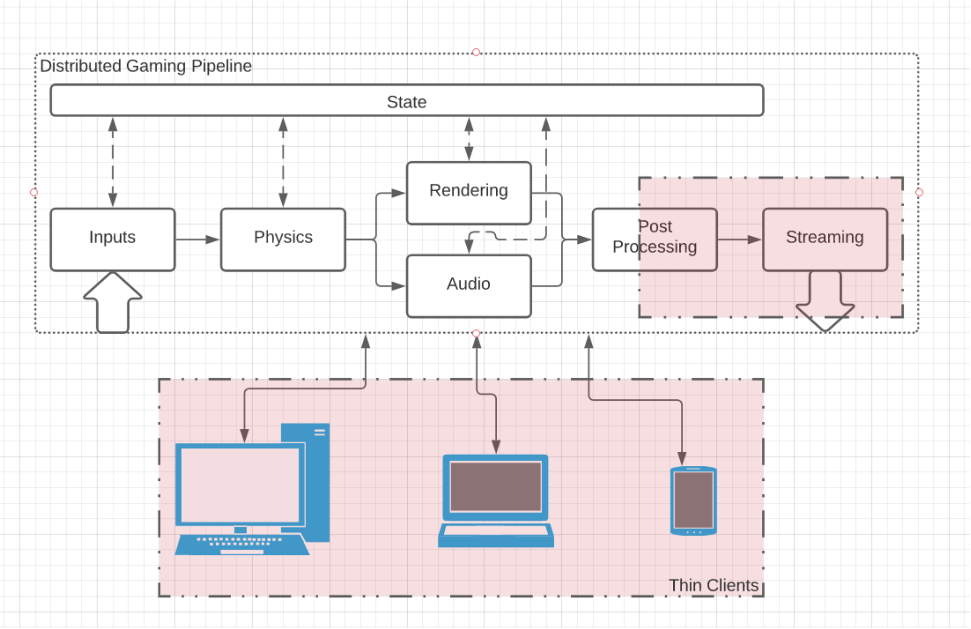

Figure 1: The complete architecture for the Distributed Gaming Pipeline. The red blocks represent the modules implemented in this Project Work.

This project work will focus especially on the implementation of the streaming module and the client's side applications that can receive the stream.

To do so, the implementation of the streaming module and the client side application will be done using the GStreamer framework, a library for constructing graphs of media-handling components.

References

[1] Dario Maggiorini et al. “SMASH: A distributed game engine architecture”. In: *2016 IEEE Symposium on Computers and Communication (ISCC)*. 2016, pp. 196–201. doi: 10.1109/ISCC.2016.7543739.