The IGT Open Innovation Platform – a cloud approach to interventional image guidance

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Extended Abstract

Introduction

Image Guided Therapy (IGT) is characterized by a heterogeneous environment of real-time data generating equipment which are used to perform minimally invasive interventions. While several initiatives have been taken to develop platform for interventional image guidance [1,2,3], it remains a difficult task to establish access to all peri-interventional data sources and bring them together in a single platform. Even more challenging is to roll out such a setup to various labs over the world, each equipped with their own mix of interventional data sources, architectures and requirements. The IGT Open Innovation Platform aims to not only create such a platform, but also aims to have it available as a cloud service.

Architecture

The architecture of the IGT Open Innovation Platform is based on a central hub, dubbed the 'CloudCast', which receives all real-time data streams and casts these to cloud based storage and to all subscribed clients, see Figure 1. In order to guarantee network security, the CloudCast hub has separate network connections for the real-time data and the public internet. There are two parallel upload mechanisms; one for long-term storage with relaxed latency requirements, and another one for real-time streaming (RTS) data. The RTS upload is only available for registered clients, and can e.g. be based on WebSocket or Server-sent Event (SsE) technologies. While the IGT Open Innovation Platform is language agnostic, it does provide a comprehensive set of sample code snippets in Python that make use of standard packages and libraries, such as ITK [4] and VTK [5].

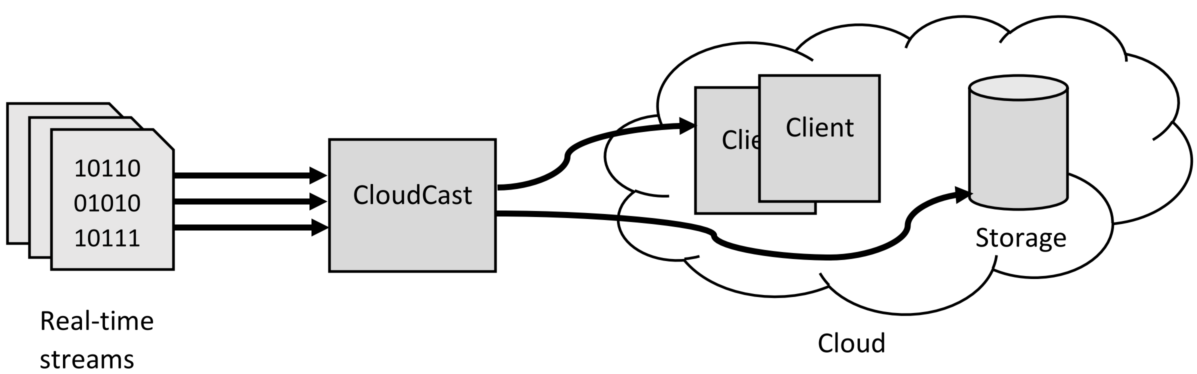

Figure 1: IGT Open Innovation Platform architecture design

Applications

The cloud based platform is an ideal setup for developing and deploying deep learning (DL) applications in an interventional environment. Firstly, the cloud nature facilitates multi-site data collection, curation and annotation. Secondly, the DL algorithms can be deployed on the cloud platform, whereby compute capabilities are matched with the demand at any given moment. Machine learning applications, such as DL-based catheter tracking [6] benefit from this setup, but also data or computationally intensive algorithms, like computational fluid dynamics simulations [7], registration algorithms [8], or advanced visualization algorithms [9].

Conclusions

The IGT Open Innovation Platform aims at making the data sources in an interventional lab for image-guided therapy procedures available in the cloud through a single hub. Rapid prototyping of new interventional applications benefits from having these data available in the cloud, since data collection and application deployment is facilitated by the platform.

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