ENABLING HIGH PERFORMANCE GEOSPATIAL APPLICATIONS IN THE CLOUD

_WHITE PAPER

LUCIAD
CONNECT • VISUALIZE • ANALYZE • ACT

CONTENTS

I. INTRODUCTION

Geospatial technologies have been deployed in the cloud (whether private or public) for quite some time. A common misconception is that cloud-based applications inherently bring about some degree of performance and capability loss compared to powerful desktop-based and GPU-powered applications. That is not necessarily the case: this white paper explains how even GPU-powered, desktop-based geospatial applications can be deployed in the cloud through virtualization. This allows to bring extreme geospatial performance to any user connected with the cloud.

II. CHALLENGES OF DEPLOYING VIRTUALIZED HIGH PERFORMANCE GEOSPATIAL CAPABILITIES IN THE CLOUD

A. CHALLENGES

When deploying a virtualized desktop application in the cloud, there are some large obstacles that must be addressed:

- **Platform dependency**: Many conventional GIS tools have important platform limitations and dependencies. Moving a desktop application to a "server farm" necessitates platform independence to ensure the stability and sustainability of a virtual application.
- **Experience in GPU acceleration and support of varying GPU types**: Similar to the previous point, server farms may be equipped with hardware with varying graphics processing unit (GPU) performance. Users need a geospatial technology that can flexibly handle various GPU types. Additionally, the geospatial technology will need to be optimized for allowing multiple users to access the same GPU. Such configuration is common in a virtualized GPU setup, but most conventional GIS suppliers lack with this approach.
- **Different controller commands**: Once the desktop application is deployed in the cloud, users can ideally access it with any device – whether a laptop, desktop or tablet. Consequently, the selected technology must easily adapt to users controlling the application with a mouse and those users who use touch commands.

B. AVAILABLE GEOSPATIAL TECHNOLOGIES

Many Luciad customers expressed a desire to run their powerful GPU-based applications fully in the cloud. Together with partner companies such as Cloudalize, Luciad has successfully virtualized and deployed its software in the cloud for use on any type of device. Below the white paper explains how LuciadLightspeed can be deployed virtually to achieve maximum geospatial performance.

III. LUCIADLIGHTSPEED: CONNECT, VISUALIZE, ANALYZE AND SHARE IN THE CLOUD WITH MAXIMUM PERFORMANCE

A. INTRODUCTION

This section describes how you can deploy LuciadLightspeed as a GPU Cloud Desktop application, also known as GDaaS™ (GPU Desktop as a Service). Through this technology, Luciad has a proven capability to allow you in a matter of minutes to:

- Set up a virtualized LuciadLightspeed environment in the cloud, using high performance servers equipped with powerful GPUs
- Connect from any device (laptop, tablet, smartphone) to the LuciadLightspeed environment using a simple Citrix plug-in
- Experience the power, performance and precision of LuciadLightspeed on any device, as if you were running the application locally on a powerful desktop
- Avoid the need for rebuilding native applications and tailoring them to a web-based model

B. ADVANTAGES

The advantages of LuciadLightspeed as a GPU Desktop as a Service are multiple:

- → Platform independence
- → Access to a highly powerful geospatial application from anywhere at any time
- → Centralized management and maintenance of the application on one (server) location
- → No need to rebuild an entire cloud-based application.

C. ABOUT LUCIADLIGHTSPEED

Luciad offers various software components that allow organizations to rapidly build any type of geospatial application that is mission-critical or that has to manage big geospatial data. Luciad offers multiple software components, as is apparent from the below diagram:

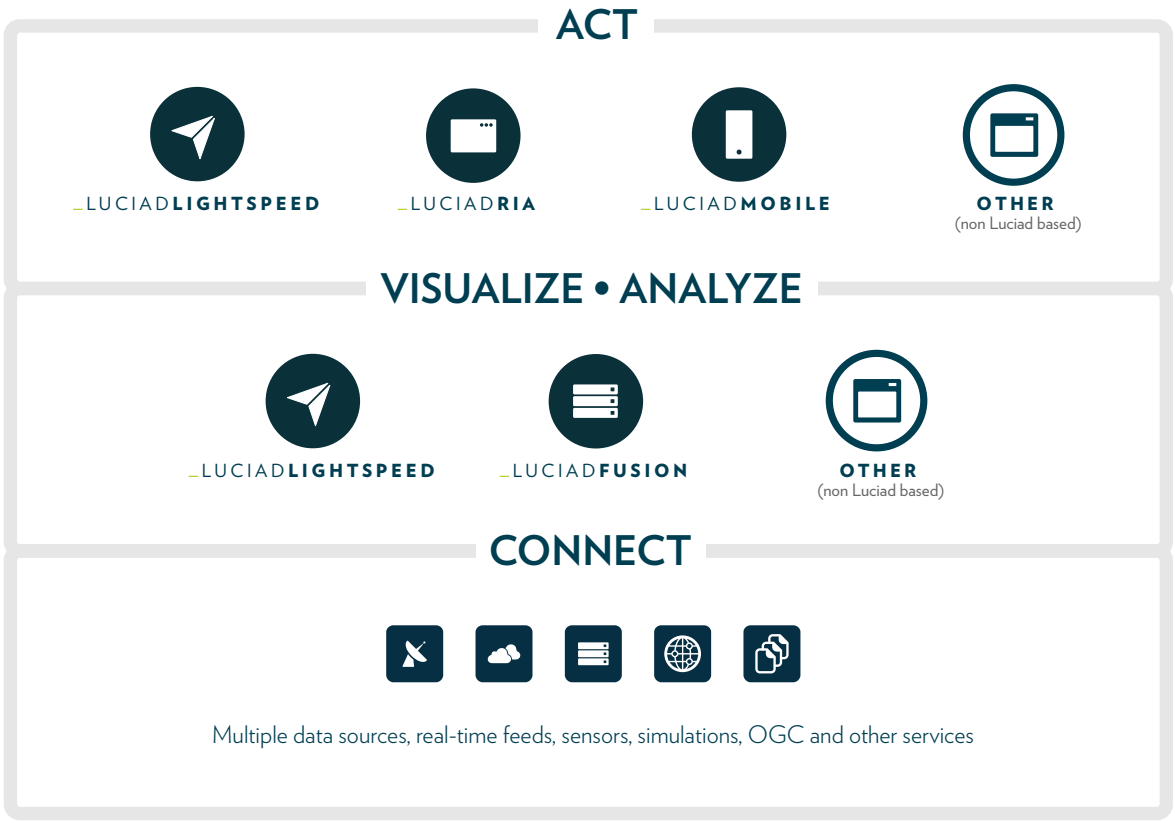

Figure 1: Luciad product diagram

LuciadLightspeed is Luciad's flagship product. LuciadLightspeed consists of a set of highly flexible software components. These are used by thousands of software developers worldwide to rapidly create high performance geospatial systems.

LuciadLightspeed is used by customers worldwide to:

- → Connect to various data sources
- → Perform numerous kinds of analysis and calculations, and
- → Visualize these data sources and analysis

> LuciadLightspeed is renowned for its unmatched performance, both in terms of processing speed as well as in precision of its calculations and analysis

LuciadLightspeed is renowned for its unmatched performance, both in terms of processing speed as well as in precision of its calculations and analysis. LuciadLightspeed can handle hundreds of thousands of moving tracks with a sub-second refresh rate, millions of static points and offers on-the-fly re-projections and calculations – such as 60-frame-per-second viewshed/line of sight calculations, or instant route calculation or imagery analysis – with a retained data accuracy at centimeter level on world scale.

D. HOW TO USE LUCIADLIGHTSPEED AS A 'GPU CLOUD DESKTOP'?

Different LuciadLightspeed use cases

LuciadLightspeed is a highly versatile product. Figure 2 below shows how LuciadLightspeed can be deployed in various use cases that vary from

- Fully disconnected standalone environments to high bandwidth environments (horizontal axis), and
- Lightweight users that require little functionality to "power users" that rely heavily on GPU processing power to get the most out of their C4ISTAR applications (vertical axis).

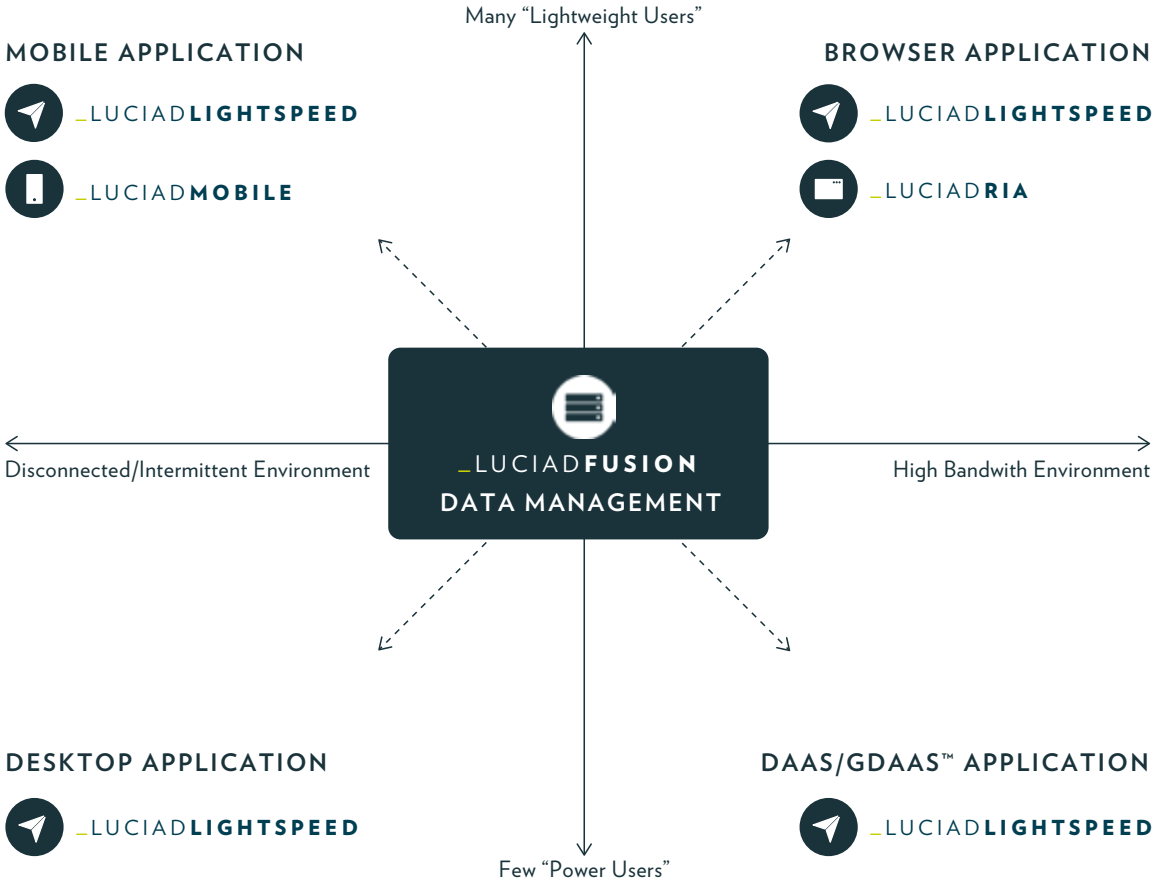

Figure 2: Deployment scenarios of the Luciad Product suite in a cloud architecture

As Figure 2 shows, LuciadLightspeed can be deployed:

- As a standalone desktop/laptop/tablet application (lower left quadrant)
- As a browser-based application running in the browser using a small plug-in (upper right quadrant)
- On mobile platforms, such as the Microsoft Surface Pro (upper left quadrant)
- In a virtualized environment in the cloud, such as a GPU Cloud Desktop or GDaaS™. This last deployment mode will be explained further below.

LuciadLightspeed deployed as a "GPU Cloud Desktop" (GDaaS™)

Deploying LuciadLightspeed in a virtualized environment in the cloud is merely a matter of minutes.

LuciadLightspeed is natively equipped to be used on touch devices. Thus, any device supporting a Citrix plug-in can run LuciadLightspeed as a GPU Cloud Desktop

- The LuciadLightspeed-based application is uploaded to a GPU-enabled server farm. LuciadLightspeed is platform-independent and can thus be deployed on various operating systems like for instance Windows and Linux. This comes in handy as various virtualization vendors are going multi-platform. For instance, VMware now also supports GDaaS with a Linux guest OS (VMware version 6).
- Luciad has more than five years of experience offering a suite of GPU-accelerated products to the market. From the beginning the company has optimized its products for multiple users accessing the same GPU, so multi-user access is built in from the outset.
- Using a Citrix plug-in, the user can then access the cloud-based LuciadLightspeed application over any broadband internet connection. Broadband use is limited as only a picture is streamed, while all the heavy-weight processing is done on the server-side. Users also benefit from the fact that LuciadLightspeed-based applications can run alongside data sources in data centers with ultra-fast broadband connections.
- LuciadLightspeed is natively equipped to be used on touch devices. Thus, any device supporting a Citrix plug-in can run LuciadLightspeed as a GPU Cloud Desktop.

Figure 3: Deployment of LuciadLightspeed on a virtual desktop infrastructure as presented at the 2014 Luciad User Conference

Luciad presented this capability to its worldwide customer base at the 2014 Luciad User Conference. Customers from the entire world witnessed in a live demo how all the LuciadLightspeed performance and capability was ported to a standard off-the-shelf iPad device, simply by relying on a virtualized LuciadLightspeed instance running on GPU-powered servers. A virtualized LuciadLightspeed infrastructure has already been operationally deployed in a major Air Command and Control system of a Western European NATO member nation

A virtualized LuciadLightspeed infrastructure has already been operationally deployed in a major Air Command and Control system of a Western-European NATO member nation

What to do with bandwidth or architecture constraints?
Deploying LuciadLightspeed in a virtualized environment in the cloud is just one of the many options that Luciad offers to customers seeking web-based operations. Other technologies are also available.

LuciadRIA allows you to rapidly build HMTL5 browser-based geospatial applications that can be run on any type of browser, on any device. LuciadFusion is a very powerful geospatial data server that is optimized for deployment in the cloud.

Luciad can address your geospatial needs, through any architecture. We aim to meet your geospatial needs and help you be successful in your operations.

USEFUL REFERENCES

Please contact Luciad for a selection of references that have implemented a Luciad-based solution in the cloud.

MORE INFORMATION

For more technical information or to find out more about our other products and services, please contact us at **info@luciad.com**.

www.luciad.com **U.S. & Canada** +1 202 507 5895 • **Europe & Rest of World** +32 16 23 95 91