CHAPTER 10

Packaging Simulation Results With CostGlue *

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Abstract. Researchers performing simulations in the field of computer telecommunications are often faced with the time-consuming task of converting huge quantities of data to and from different formats. We examine some of the requirements of the telecommunications simulation community and propose an architecture for a general purpose archiver and converter for big quantities of simulation data to be released as free software.

1. INTRODUCTION

We describe the motivation, design issues and the approach to the implementation of a low-overhead software package that can import simulation or measurement results into a common data structure, launch post-processing applications on the imported data and store data or export it into various output formats.

Modern simulation packages and statistical tools use different, even proprietary formats for the results. This can be a major obstacle to the

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efficient exchange of scientific data. Moreover, if we consider issues like storage and data management, documentation and meta description, to handle simulation results becomes apparent. This topic has been addressed [1] in the framework of the European COST 285 Action "Modelling and Simulation Tools for Research in Emerging Multi-service Telecommunications" (See Chapter 1), a forum where researchers from all around Europe periodically meet to address issues related to simulation of communications systems. The point made was that apparently no general purpose tools exist for exchanging big quantities of simulation data coming from different sources in different formats. Not only the need of a common format for exchanging data was highlighted, but also the need of feeding this data to different tools for postprocessing them, each requiring a different input format.

To better understand the scope of different requirements we define a reference model that encompasses data creation, flows and processing in the analysis of the telecommunications systems by simulation. The main functional parts composing such a model (simulators, data collectors, graphing tools, statistical tools) are covered by the many existing tools that are used by the research community; we focus on the input data in form of simulation, like ns-2 [2] traces, or measurements, like Tcpdump [3] traces. Raw data can be post-processed (e.g. calculating average packet delay) and the results stored separately from the raw data or complementing it, so that further analysis is possible based on both raw and preprocessed data. Finally, the results can be exported in various more or less widespread output formats, like ASCII or XML [4].

Data storage is based on the HDF5 [5] data format, which was selected after an analysis of the available options. HDF5 has been successfully applied in several scientific projects; it enables efficient data storage and lookup. Among the features most relevant to our purpose, it provides support for extremely large quantities of data, for meta descriptors and for embedded compression. A set of programming libraries is available in C and Python, which simplifies software development based on HDF5.

The proposed CostGlue software architecture is modular, to make it possible to include the future development contributions from other research communities. It is composed of three building blocks. The core is a Python application called CoreGlue, which provides HDF5 database connection, a simple command line, an HTML based interface and basic functions for import, filter and export. It also controls and executes other parts of the application. Specific functions, such as conversion from