

Isolario: <http://www.isolario.it>  
Slides: [http://www.isolario.it/publications/20151211\\_INF\\_seminar.pdf](http://www.isolario.it/publications/20151211_INF_seminar.pdf)  
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Note: the following theses are mostly experimental. It is required that the student actively participate in the decision process during the thesis evolution. If you are interested, contact me via e-mail and I will provide you any kind of documentation you may require.

Available theses:

#### **ENHANCEMENT OF AN EXISTING BGP ROUTE COLLECTING DAEMON IN A BGP DAEMON**

Isolario exploits a route collecting engine that the Isolario team specifically created with the purpose of route collecting. The main objective is to obtain a BGP daemon with better performances than current state of the art.

In this thesis, we would like to:

- 1) Improve its performances introducing data compression in stored routing information
- 2) Enhance it with a proper BGP decision process

The code is written in C and C++ (STL libraries).

#### **NEWS AND FORECAST SERVICE CREATION**

Isolario allows to analyse in real-time BGP events from every of its feeders. Current services are devised for network operators, in order to attract them to participate. However, there is no service devised to understand from the analysis of the incoming BGP flows whether a routing event is currently happening on the Internet in real-time, or if it will happen.

In this thesis, we would like to:

- 1) Refine the geolocation module in Isolario
- 2) Create a new service working 24/7 and able to use geolocation information to understand if any geopolitical event is occurring
- 3) *[Facoltative]* Create a new service able to infer future events by analysing the routing events in the past

The geolocation module code is written in C, while the new services should be written using C and C++ (Isolario components, STL libraries) on the server side, HTML5 and Javascript on the website side.

## **GRAPH INFERENCE MODULE**

Isolario allows to collect many BGP data from its feeders, which can be merged together with other route collecting projects such as Route Views and RIPE NCC RIS. Up to date, the most common way to analyse the Internet AS-level is by extracting the AS-level topology from BGP data collected, and then analyse the graph. BGP however is known to be driven by economic relationships. Each of this relationship translates directly in a peculiar BGP export policy on each border router. And every policy can be potentially different from each other. Thus, the AS-level topology cannot be 100% representative of the real inter-domain characteristics of the Internet.

In this thesis we would like to:

- 1) Re-create the routing table behavior of each AS, analysing the information available in BGP data and inferring the portion of routing table which are totally missing
- 2) Create metrics and definitions for this new kind of graph, composed by routing tables
- 3) Study the potential impact of IXPs on a graph like that, to prove their importance

The module should be written using C and C++ (Isolario components, STL libraries) on the server side, HTML5 and Javascript on the website side (if required).

## **CDN SELECTOR** (possible collaboration with Sky Italia)

Content Delivery Networks (CDN) are geographically distributed servers specialized in providing web and multimedia content to Internet-connected devices. In recent years they became very importance in the Internet, especially with the explosive growth of companies offering video on demand (VOD) and real-time streaming multimedia content. These latter companies are extremely interested in CDNs, since CDNs offer a distribution network which is very often close to the end user which would reduce latencies and improve the quality of the service perceived by the user. The CDN market, however, is very large, and every CDN has its own pros and cons. Thus, it is extremely difficult to dynamically choose the best CDN for the end user for content providers such as Sky Italia, if not through the use of active measures and heuristics for monitoring the load of each CDN under analysis. In this sense, it is required the development of a software module for the optimal selection of CDN to allow end users to be able to enjoy the best possible service.

In this thesis we would like to:

- 1) Develop a browser plugin that can do active measures on the network using the least possible bandwidth and interfering as little as possible with the media stream input
- 2) Develop an Android/iOS app that can do active measures on the network using the least possible bandwidth and interfering as little as possible with the media stream input
- 3) Development a software to run on a central server able to analyze the huge amount of data coming from the customer, maintain a map of the distribution network and compute an optimization problem to select a priori the CDN ideal for a given user.

The browser plugin should be written in HTML5, Javascript and Java (applet). Mobile apps should be written in their native language (Java and objective C). Server code should be written in C/C++ or Java.