

Service-oriented Architecture for Thematic Cartography on the Web

Introduction and Motivation

The fast development of Web technologies and the emerging field of technologies under the paradigm of “software as a service” brings new possibilities for map production and map distribution. This work focuses on the production process of thematic maps on the Web with respect to service-oriented architectures. The motivation is to utilize the benefits of decentralized services for map creation and to benefit from the large amount of data and services available on the Web. The derivation of a conceptual model for map creation is thereby based on standard mapping techniques and considers important concepts for Web cartography.

Conceptual Model

The conceptual model includes the functionalities for map production from data import to publishing in a service-oriented architecture (SOA). In the model we strictly separate the functionalities for data import and processing, which are implemented in seven Web services, from the description of the map symbology,

implemented as an extended WMS to render the map representation (5) and to provide the map to the map user (6).

Map Description and Service Chain

In the SOA the services are defined with standardized interfaces, which allow to orchestrate different services for map creation and to describe the creation process in a service chain description. For the creation of a choropleth map including data standardization a sequence of services is presented in Figure 2. With the specification of the service sequence a map representation can be defined with a map description, which includes the creation process of individual map layers, the composition of the layers, and the definition of additional map elements and is published on the TMS. The map description allows to exchange the

production workflow and enables automated map creation. In addition, it is possible that the map user directly interact with the creation process.

Implementation

For the proof-of-concept the conceptual model is implemented with a browser-based application, which uses server-side services for data processing. The application, presented in Figure 3 includes a map view to visualize geographical data, a data grid to present attributive data, and tools to perform service requests and manage the map production process.

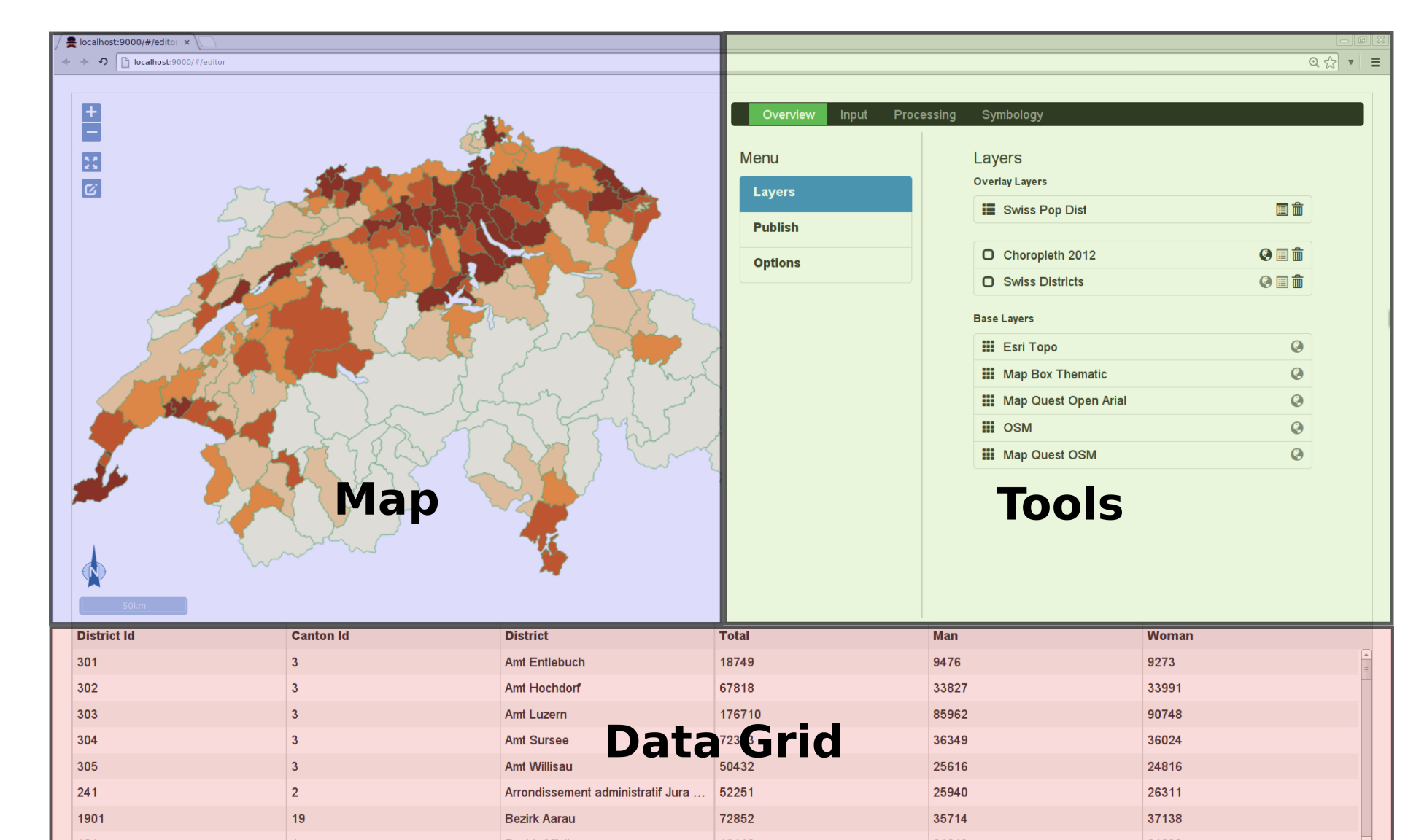


Figure 3: User-Interface of the Prototype

The implementation demonstrates the operability of the conceptual model and reveals the lack of specifications for a data independent description of the map symbology and the definition of the creation process.

Conclusion

The conceptual model provides a continuation of service-oriented approaches for Web cartography. The work showed that decentralized Web services are suitable for thematic map production and can enhance automated mapping and networking between cartographers for the creation of maps and the exchange of functionalities. Further work has to consider the specification of the map description and map symbology. For further research, the conceptual model provides an elementary model for thematic map production on the Web.

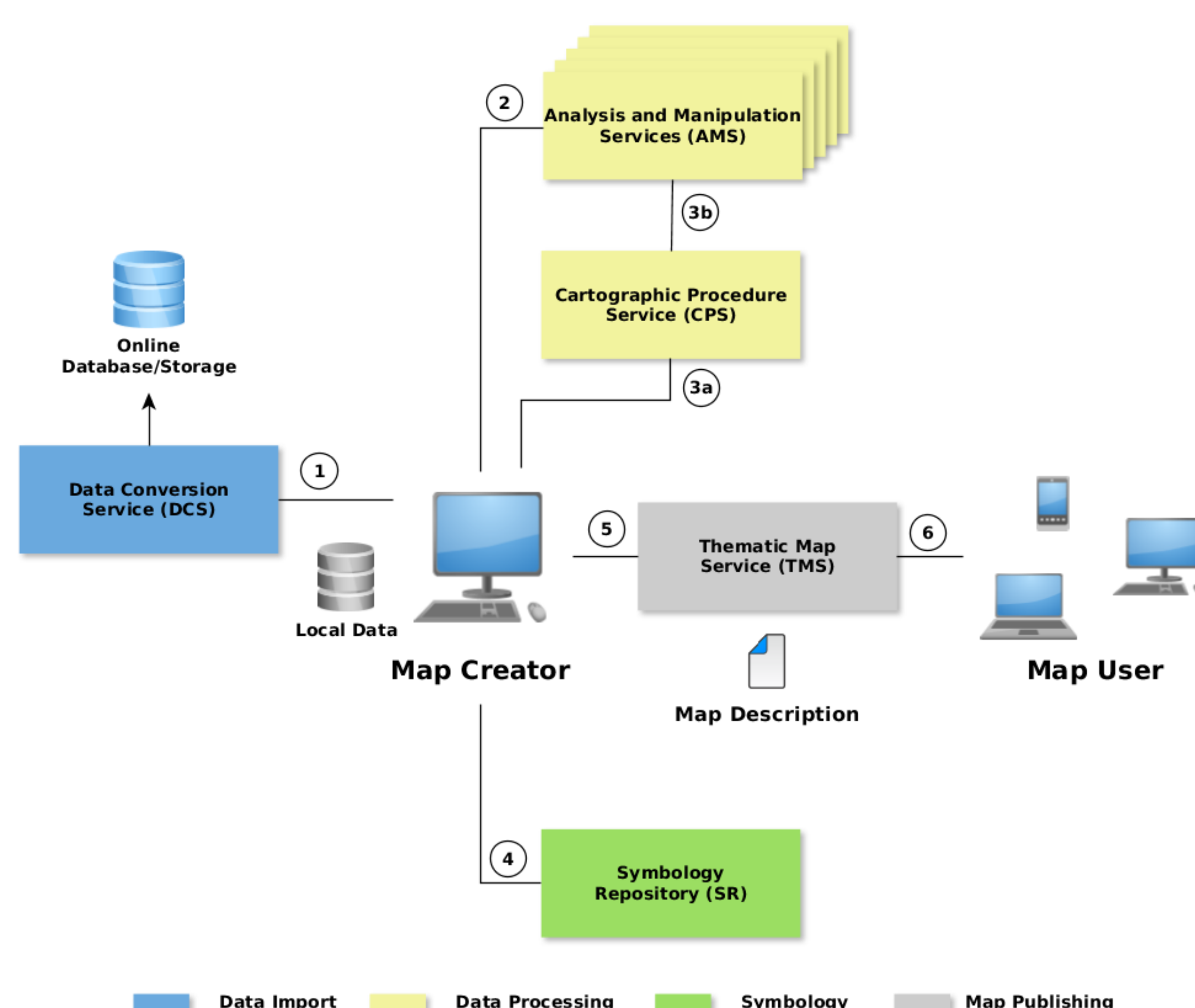


Figure 1: SOA of the Conceptual Model

which is defined in a repository. The components of the conceptual model are the Data Conversion Service to import online and local resources (1), five Analysis and Manipulation Services (AMS) to perform basic data processing (2), the Cartographic Procedure Service, which implements specific mapping techniques (3a) and can utilize the functionalities of the AMS (3b), the symbology repository to integrate the symbology description, and the Thematic Map Service (TMS), which is

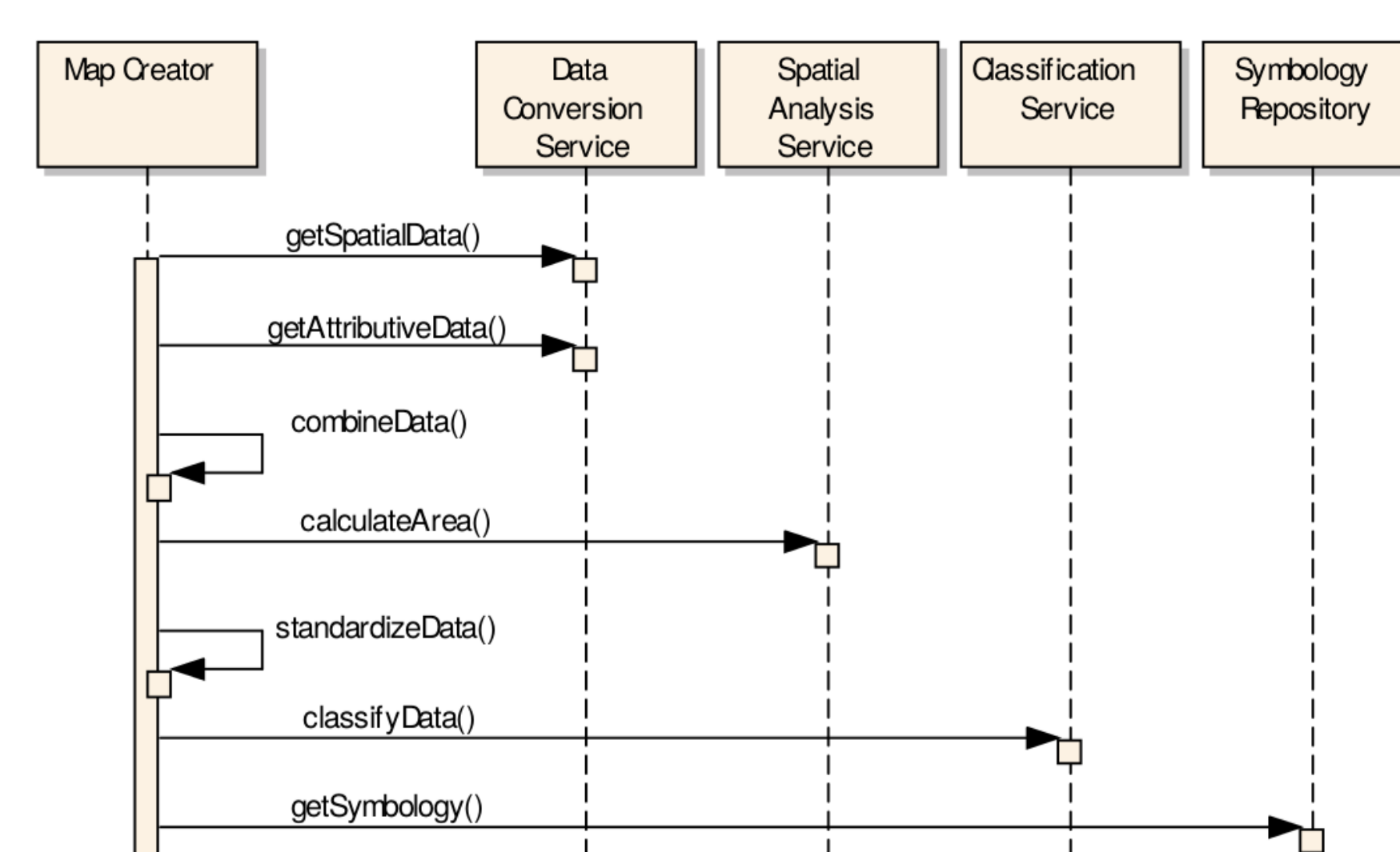


Figure 2: Choropleth Map Sequence Diagram