

SciGRID Gas – A Topological Open Source Model of the European Gas Transmission Network



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What is SciGRID gas?

SciGRID gas is a three year project of the DLR Institute for Networked Energy Systems, which started in mid 2018 .

- It aims at **building an open source model of the European gas transmission network** and make it available to researchers for simulation purposes.
- The created **python based software** tool will be equally published under suitable licenses and **free of charge**.
- The tool comes with a customizable packages designed to automatically **download, process and visualize gas transmission data** from different data sources and combine them to a **topological network model**.
- Networks can be subdivided to specific regions and restrained to specific open-source licenses, making them **customizable** for a brought scope of applications.

Gas Transmission Network Data

Gas accounts for about 25% primary energy consumption in Europe. The EU-28 distributes gas via a pipeline network with a approximated total length of about 120,000 kilometers[1]. Many of these pipelines are constructed underground, which makes their identification difficult.

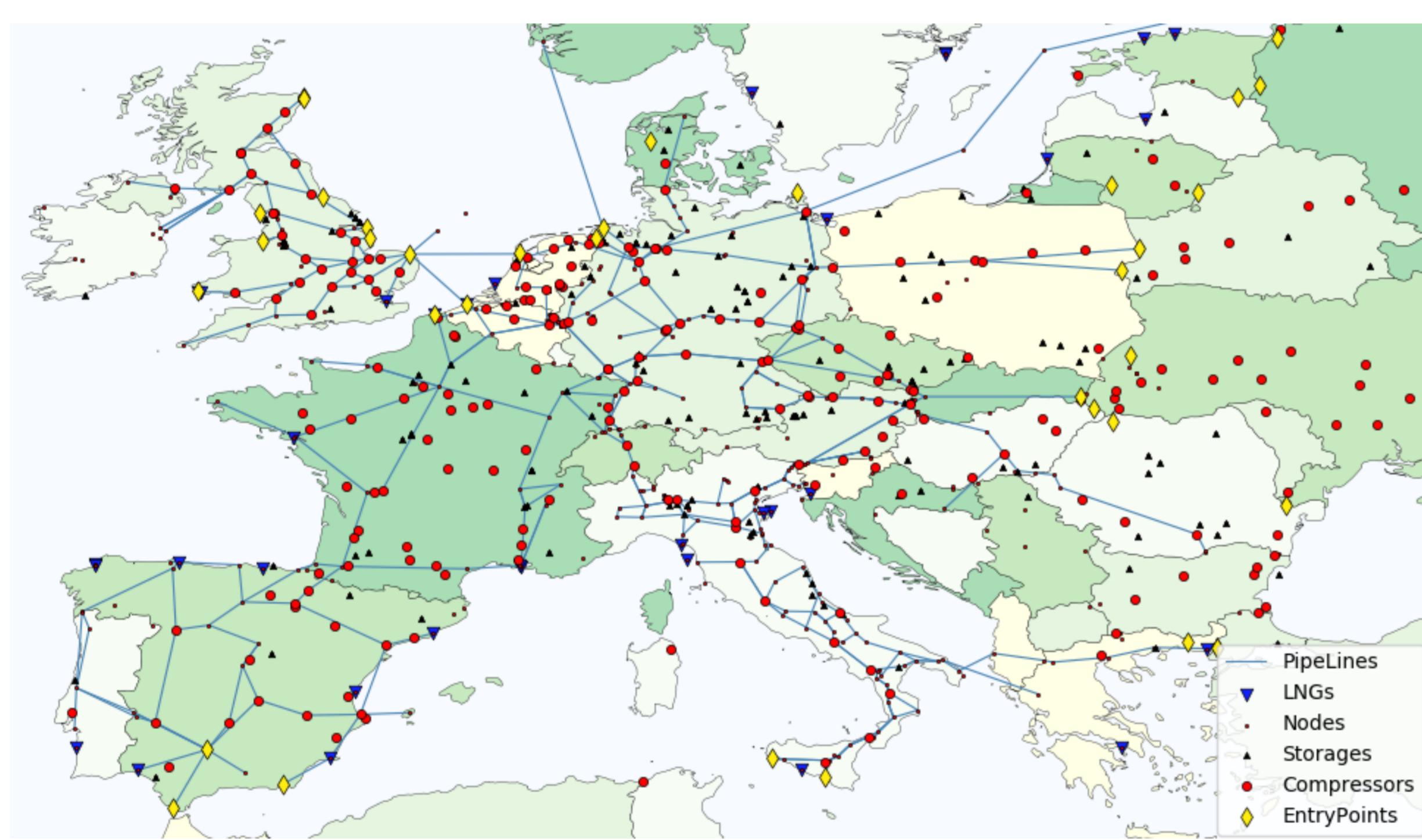


Fig. 1: Map of European gas transmission data accumulated from internet research of TSO documents and press articles.

The network itself is maintained by approximately 40 Transmission System Operators (TSOs). In most cases their data is not freely available or under copyright restrictions.

So far, we have acquired **open and non-open source data** from Entsog [1], Gas Infrastructure Europe [2], LKD-EU [3], GasLib [4], OpenStreetMap [5]. Further, we have created a dataset based on our own internet research (Fig.1).

Principal Gas Network Components

SciGRID gas classifies gas network data from different source into independent sets of network components. Each component holds relevant attribute data. The user can **choose which components of a dataset will be merged to the main network**.

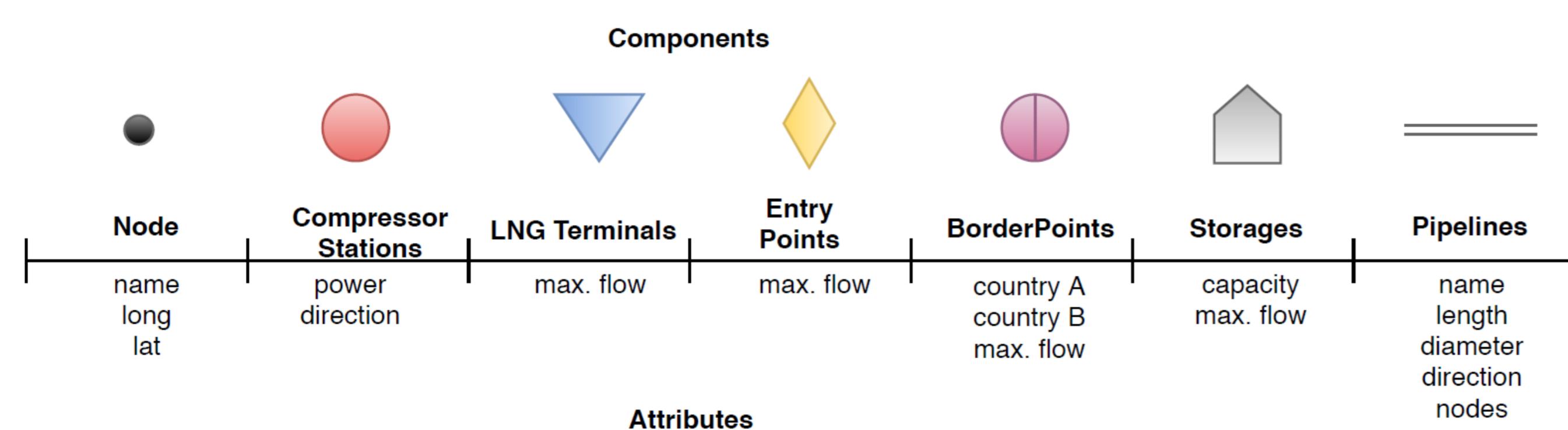


Fig. 2: Different gas network components and with examples of the most relevant attributes.

The data can be automatically matched, prioritized and combined. **Missing components and attributes** (e.g. main network directions, max. flows) **will be derivable from heuristic methods**.

OpenStreetMap: Pipeline Data

OpenStreetMap is a free, editable map of the world that is being built by volunteers mainly from scratch and released with an open content license.

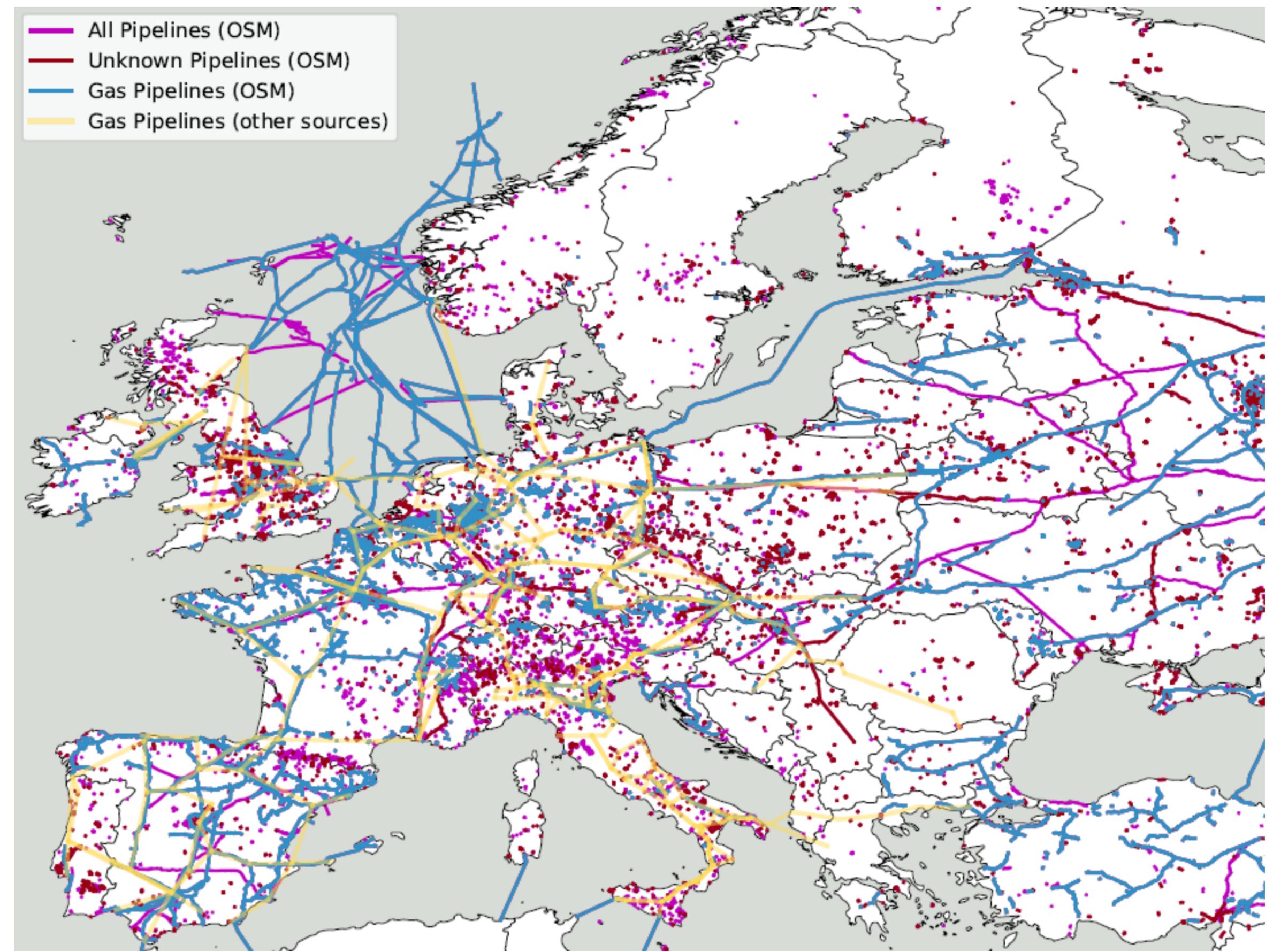


Fig. 3: Topological pipeline data from OSM compared to our pipeline data from Fig.2.

Within SciGRID gas, these data can be **downloaded and filtered for specific gas network components**.

Building a Topological Gas Network Model

The topological SciGrid gas network is **an abstracted model consisting of vertices and links** and therefore suited for a variety of simulations.

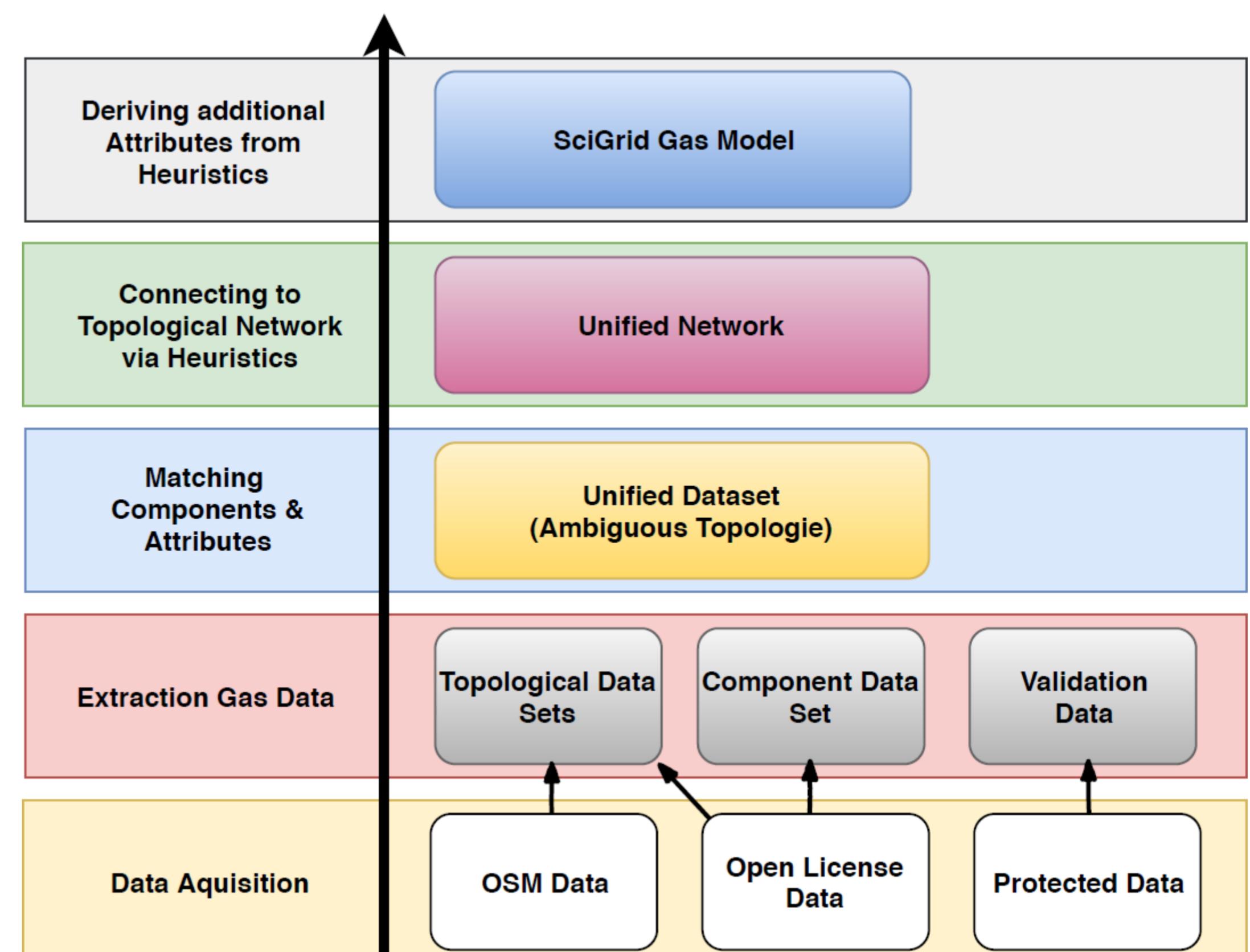


Fig. 4: Schematic of the creation of a topological data model of the European gas transmission network

The Scientific Goal & Road Ahead

The scientific goal of SciGRID gas is to improve numerical, heuristic and graph-based methods for:

- Connecting gas data to networks
- Deriving components and attributes from heuristics
- Validating gas networks against each other

Acknowledgement

Further information on the SciGRID gas project is available at <http://www.gas.scigrid.de>.
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aufgrund eines Beschlusses
des Deutschen Bundestages

[1] "Robustness of Trans-European Gas Networks" (Carvalho et al., 2009)
[2] <https://transparency.entsog.eu/>
[3] <https://www.gie.eu/>

[4] <http://gaslib.zib.de/>
[5] <https://www.openstreetmap.org>