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From traditional OGC Web Services to Modern Open API based Service Architectures: Introduction, Concepts and Experiences from Germany, a country in Transition

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Abstract:

The current service-oriented architecture of the standardised spatial data infrastructures in Germany is based on the OGC and ISO standards (OGC Web Services - OWS) developed since the end of the 1990s. This concerns both access to catalogue services and the provision of metadata and descriptions of data models as well as access to geospatial data and their visualisation and even processing chains. These Application Programming Interfaces (APIs) have already been defined according to the specifications of the OGC Reference Model (ORM, OGC 2011) using open, non-proprietary internet standards, in particular the World Wide Web (WWW) standards HTTP, Uniform Resource Locators (URLs), Content Types and to a large extent the Extensible Markup Language (XML). Although the use and implementation of these service concepts required a high degree of specialised knowledge, at least the Web Map Service and the Web Feature Service found widespread use. With certain extensions they are also the building blocks of INSPIRE-based spatial data infrastructures and are supported in almost every GIS.

Although these APIs follow these standards and, also in conjunction with other OGC standards such as GML, Filter Encoding and others, have found widespread use, the basic principle of HTTP-based access to resources has not been given sufficient attention. The return to HTTP-based resource use then received more and more attention starting with the dissertation by Roy Fielding (Fielding, 2000) and became known as Representational State Transfer (REST). Software products address resources via the REST interfaces via HTTP and special specifications for the Uniform Resource Locator (URL), which largely follow a uniform concept in terms of their structure.

Such REST-based APIs can only be used per se if the API provider documents the methods in detail. However, this is not implicitly given, as it was taken into account from the outset in the traditional OGC web services through metadata for accessing services and data.

This changed with the Swagger tool package (https://swagger.io/). This not only enables the automated, uniform documentation of REST-based APIs, but also the (partially) automated generation of server and client applications in different programming languages (https://editor.swagger.io/).

Parallel to this, the trend emerged to use the JavaScript Object Notation (JSON) for data models and data encoding and its structure instead of XML, which is often perceived as bulky and "chatty".

The OGC therefore decided to redesign the existing APIs, initially declaring them as new versions of the previous APIs, but then reorienting themselves conceptually. The standardisation approaches OGC API - Common, OGC API - Features, OGC API - Coverages, OGC API - Records, OGC API - Processes, OGC API - Tiles and Environmental Data Retrieval (EDR) API, OGC API - Styles, OGC API - Joins, Discrete Global Grid System (DGGS) and Routes emerged (Hobona, 2020a, Hobona, 2020b, Emde, 2021).

Even if the entry into API use is to be facilitated, the new approaches nevertheless require new knowledge and experiences from the professional community as well as from software developers and surveying agencies in order to realise the transition from the previous web service approaches into the world of Open API-based services. These include resource orientation, with access based on uniform, hierarchical and speaking URL structures, additional navigation options via hyperlinks, departure from XML and turning to HTML and JSON as encoding and uniform API documentation with Swagger and OpenAPI respectively (Open Geospatial Consortium 2017, Koren, Klamma 2018)

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The paper explains the basics of the new architectural approaches and the associated data encoding in JSON. Essential new OGC APIs are briefly introduced. Afterwards, the transition from traditional OGC APIs in the federal surveying authorities in Germany is analysed to consider the status of implementation in an industrialised country. The AdV (Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany) is already working on the introduction of profiles of a new service architecture for the use of the new OGC APIs (Retterath, 2020, AdV, 2021, Retterath, 2022). An attempt is being made to derive recommendations for further action for other national surveying authorities from these results.

References

AdV, 2021. AdV Tätigkeitsbericht 2020/2021. https://www.adv-online.de/Veroeffentlichungen/Taetigkeitsberichte-der-AdV/binarywriterservlet?imgUid=c3e70ce4-d350-5c71-f4ae-672306bbb287&uBasVariant=11111111-1111-1111-1111-111111111111&isDownload=true

Emde, A. 2021. Der neue OGC API Features Standard, wie ist der Stand und was ist mit Open Source Geospatial Software möglich. FOSSGIS Konferenz 2021: Online-Event, 06.–09. Juni 2021, FOSSGIS e.V. et al., 2021. https://doi.org/10.5446/53905

Fielding, R. T., 2000. Architectural Styles and the Design of Network-based Software Architectures. https://www.ics.uci.edu/~fielding/pubs/dissertation/top.htm

Hobona, G., 2020a. OGC APIs – An Introduction. https://inspire.ec.europa.eu/sites/default/files/ogc_apis_introduction.pdf

Hobona, G., 2020b. OGC APIs and the evolution of OGC standards - an update. FOSS4G UK Online 2020 - Sentinel, FOSS4G et al., 2020. https://doi.org/10.5446/14056

Koren, I., Klamma, R., 2018: The Exploitation of OpenAPI Documentation for the Generation of Web Frontends. https://dl.acm.org/doi/10.1145/3184558.3188740 [2023-03-14]

Open Geospatial Consortium (OGC), 2011. OGC Reference Model. https://www.ogc.org/standards/orm [2023-01-11]

Open Geospatial Consortium (OGC), 2017. OGC® Open Geospatial APIs - White Paper. https://docs.ogc.org/wp/16-019r4/16-019r4.html [2023-05-04]

Retterath, A., 2020. OGC API – Die zukünftige Architektur der OGC-Dienste. https://wiki.gdi-de.org/display/akgeod/OGC+API

Retterath, A., 2022. OGC API Features im praktischen Einsatz. https://www.tib.eu/de/suchen?tx_tibsearch_search%5Baction%5D=getDocument&tx_tibsearch_search%5Bcontroller%5D=Download&tx_tibsearch_search%5Bd%5D=00a2b95ac0671afa363c7f83eae18852&tx_tibsearch_search%5Bdocid%5D=TIBKAT%3A1796737259&cHash=5e38931ace25afcfc23c28d7dccb432d