Development of a Web-Service for the DIOXIN-Database of Germany

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Abstract

1. Introduction
In 1991, the 37th Conference of Environment Ministers of Germany commissioned the DIOXIN Working Group (Federal-Länder joint working group) and issued an administrative agreement on data exchange in the environmental sector between the government and the Länder (States in Germany) to compile, document, and evaluate data from monitoring and surveillance programs at the federal and the Länder level. Substances to be included are polychlorinated dibenzo-p-dioxins (PCDD), polychlorinated dibenzofurans (PCDF), polychlorinated biphenyls (PCB) and other chlororganic substances.

The DIOXIN-database is maintained by the Federal Environment Agency (UBA) for environmental matrices including emissions and by the Federal Office of Consumer Protection and Food Safety (BVL) and the Federal Institute for and Risk Assessment (BfR).

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This data exchange on the pollution from PCDD/PCDF and other chlorinated organic substances serves primarily the following objectives as:

- to draft an overall picture of the conditions of environmental impact,
- to provide an unrenouncable basis for setting environmental policy targets and priorities,
- to provide an expert basis for deriving implementable and scientifically sufficiently secured
- to check the success of the activity in the field of environmental policy
- to inform the public about the environmental state.

The access to environmental data and information is one core content of the amended Environmental Information Act. Actually it is under discussion and will be enter into force next year. The law is drafted to provide for access to all information on the state of water resources, air, soil, flora and fauna and natural habitats and other compartments. Information should be provided in any appropriate form. Authorities may give out information, especially a grant access to electronic data bases and files.

2. Material and Methods

Data of more than 220 monitoring programmes of several environmental and human compartments are recorded and administrated in an ORACLE based Client-Server system. In 2003 there was a decision to develop a Web-Service for this database in cooperation with the Bavarian State Ministry of the Environment.

Environmental information about dioxins is collected in many fields and spheres of responsibility. Access to the data and information can be gained through meta-data. The DIOXIN-database contains meta-data with following parameters:

- **Reason and target for the investigation:** environmental monitoring programme, investigation prescribed by law, incident investigation, detection of background contamination rural an urban, agglomeration, special impact situation/cause, consideration of transfer/consideration of pathways
- **Location data:** community indicators, easting/northing values, dioxin-relevant industrial area, dioxin-relevant old plant, traffic routes site suspected of being contaminated
- **Sampling procedure:** date, sampling quantity, sampling area, area random samples, way of sampling, transport of samples
- **Laboratory data:** storage duration, storage temperature, regulation for the preparation of samples, regulation for analysing, participation in interlaboratory studies
The user of the Web-Service is able to navigate to all meta-data and the analytical results (concentrations of chemical substances with calculated and aggregated values). The downloading of the data and of requisite accompanying information is of major importance for the data evaluation.

The retrieval to the data have to be profile specific. There are three user group; the public, the provider of data and the special user. It is very important to define roles and rules for the data access. The profile specific retrieval is one the aspect for the acceptance of this system. The development of XML-interfaces supplies these functions and gives the user the opportunity to login with a special profile. An other aspect is the down- and uploading function of data for authorised user.

For the public there are some static HTML-sides about the DIOXIN-Database with information of the monitoring programmes and tips for the interactive use of the data base:

![Home-page of the application and information about the data and monitoring programmes](image)

**Figure 1**
Home-page of the application and information about the data and monitoring programmes

### 3. Technical Requirements and Architecture

In developing of the Web-Service of the DIOXIN-Database the following technical requirements, among others, played a central role:

- Networking of the Federal Länder and Federal Office of Consumer Protection and Food Safety (BVL) and the Federal Institute for and Risk Assessment (BfR) for data transfer purposes (import/export and requests)
- Platform-independent and timely access to the central database of the DIOXIN-Database at the Federal Environmental Agency (UBA)
- Feeding meta-data via XML-Stylesheets and uploading of data via interfaces of XML
• Profile specific retrieval to the dioxin-data including procedures for the quality assurance

The WEB-Service is developed under the preconditions of the W3C-Standards and of Open-Source Software. With this solution there is no middleware and the consequently use of XML allows to communicate via the DIOXIN-database for data import and export. The technical components of the application are:
- Development language Java
- Apache Webserver
- Apache TOMCAT (Servlet Engine)
- Apache Axis (Framework for the Webservices)
- Apache CASTOR (Mapping XML)
- StrutsCX (XML - supplement of the framework Apache Struts)
- Xalan / Xerces (XML-Parser)
- Log4J for applications logging
- Database-Management - System ORACLE 9i

This solution provides advantages concerning the high scalability, platform- and system independent, simply data exchange, partition of the application logic user interface and the complete integration of Java.

Figure 2
Technical architecture of the Web-Service
The concept of the application comprised a multi-level-architecture. The user accesses via the Internet - HTTPS-protocol to the application. Via the firewall the access is provided by the UBA’s central web-server, which transferred the request to the application-server. The application-server and the database-server is located in the data processing service centre of the Federal Environmental Agency. External systems like gein® get a direct access via a XML-interface to the Web-Service. The Web-Service client is be composed of the presentation level and the application level. The client software is located of the application server. The presentation level displays the application of the user-front-end. XML-Stylesheets are used for profile specific retrieval. A XML-transformer comes into operation to produce a profile specific HTML-page. The XML-Stylesheets are stored in a file system at the application server.

4. Conclusions and Outlook

The Web-Service of the DIOXIN-database is one way for a user-friendly and informative way of providing environmental information to a wide community of users. A harmonised, sound and current base of data and information which can be updated and accessed at any time constitutes the basis for the provision of information to the public. The DIOXIN-Webservice is also intended to further encourage an exchange of data with other environmental data bases. Furthermore it is an instrument to harmonised heterogenic databases in a comfortable way and to integrate and link other data bases via the Internet-technology. The Web-Service could be a part of the initiative of BundOnline 2005 as an online-service for the public.

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