

1 Basics

In all environmental administrations and ministries the implementation of the EU environmental noise directive (directive 2002/49/EC *relating to the assessment and management of environmental noise*) is an urgent topic. Noise mapping on a first level has to be completed since the end of June 2007. Noise action plans with substantial involvement of the population concerned have to be developed until July 2008. Both noise mapping and compilation of noise action plans then have to be repeated periodically every five years.

Directive on the internet: <http://ec.europa.eu/environment/noise/directive.htm>

1.1 Challenge

Noise mapping is done. Data should be inserted into a database based GIS to be managed. This way of data management guarantees that following activities as reporting, presentation through the web and compiling of thematic maps can – as far as possible - take place automatically. At the same time the noise mapping results have to be provided to the responsible planning departments and respectively external planning offices as a base for their noise action planning. Compiling of noise action plans constitutes a big challenge for the enforcement authorities. Solving this task means considering all relevant noise sources, i.e. roads and railways. The impact on other topics (urban renewal, traffic development, air pollution prevention, land use, etc.) has to be considered. Therefore data is made available in digital form to all divisions involved in this process.

The further data processing begins to be problematic as soon as processes (i.e. during noise abatement planning and air pollution prevention planning) happen in a parallel way over longer project phases, maybe also outsourced with reverse delivery of result data sets that have to be managed and compared... During the same period of time there is an update of the geographical base data. Obviously with “traditional” data management the creation of a so called “data mess” is inevitable or only avoidable with an enormous organisational and restrictive effort.

A management system that allows parallel processing of long-term transactions as well as administration of multiple planning scenarios is absolutely essential.

1.2 Solution

envVision is a GIS based data management and planning system that is tailored for the achievement of these tasks. It is based on the world market leading products from ESRI and Oracle. You will be working with homogenised data and you will be supported with compact and easy to use functions and transparent processes while executing your daily work. Cost-effectiveness and efficiency becomes apparent from the continuous use of data already collected and the resulting synergetic effects, e.g. during the periodically repetition of these jobs or by extension to other branches. Traceability of

processes, a high degree of legal security and transparency, a high level of automation are secured through the use of the GIS software's extended versioning functionality. As a result you will get a system with a considerable sustainability factor.

Data management:

GIS know how and professional competence are bundled. envVision accumulates all the necessary data that describes our environment. The use of envVision means:

- import and export of any data format and data structure
- data processing and homogenisation of results
- data interfaces to all popular noise calculation programs as well as to selected software packages in the fields of noise pollution prevention and traffic planning
- multiple use of once collected data for other purposes
- traceability of processes
- reports and analyses
- public-oriented presentation on the internet

Planning management:

The link-up with other specific planning processes is a fundamental success factor of the usage of modern information systems. Harmonised planning strategies are better argued by public relations and enhance public acceptance. envVision supports your planning process via:

- controlled administration and parallel development of arbitrary planning variants
- keeping of a homogeneous data inventory for different applications
- coordination for public relations
- further use of generated data
- simulation of planning measures impacts
- cost-benefit analyses, result assessments

With envVision you will get a multidisciplinary environmental management and planning system. The modular software package can be easily adapted to your individual requirements by selecting the appropriate standard modules. envVision is the integral solution concept for environmental data infrastructures, realised on the basis of world market leading systems from Oracle and ESRI.

With our versioning concept (see section 2.1) we introduce an entirely new technology approach for mastering long-time transactions. Data is managed in versions to which the according data users are granted access. By this way planning processes can be conducted respectively with a data basis precisely fixed for this purpose in their own version. Parallel processes are stored independently in parallel versions. Thus all versions are available self-contained (but always comprising the used geographical base data as well as the specialist sector data) and planning variants and recording of development tendencies become possible. Meanwhile the geographical base data can be updated independently of the planning processes under way.

2 System overview

The solution envVision is modular. The single components are illustrated in the following diagram. All possible separate components are listed.

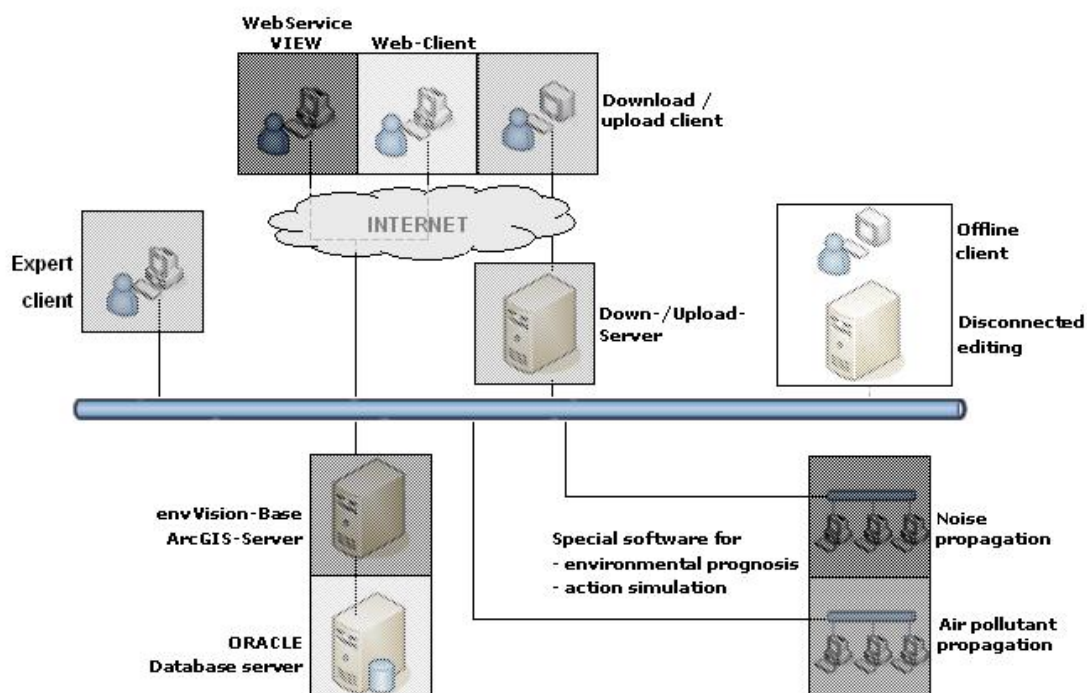


Figure 1: System overview

Source data: all ESRI compatible formats can be imported. Pre-processing programs can support further formats.

Base data: geographical and attribute data set up-to-date at a particular point in time.

Specific data: fixed, revised and completed base data with corresponding calculation results.

Main focus of this model approach:

1. on the one hand: administration of mapping and planning results in one single database, their provision for “export handling” and through the WEB as WebClient VIEW (e.g. as a portal for citizens)
2. on the other hand: data distribution to single (also external) authorised users via:
 - active web components (WebClient EDIT)
 - download for further processing
for the use of
 - interface services, e.g. for noise abatement planning
 - processing in a GIS (disconnected editing)

All data users, in this case planners, can use the data, no matter what kind of technical environment they might have. Furthermore at any time they can save the data in “their” (!) version into the system and present it. By the means of versioning every data editor has his own version at his disposal. Even more: he can create his own versions, e.g. for testing planning variants.

2.1 Funtionality overview

Time slice administration

Capturing and administration of data is carried out based on the so called time slice concept, i.e. data is assimilated and administred at the respective "import point of time". At any time changes are traceable, a fact that again underlines the sustainability of such a system.

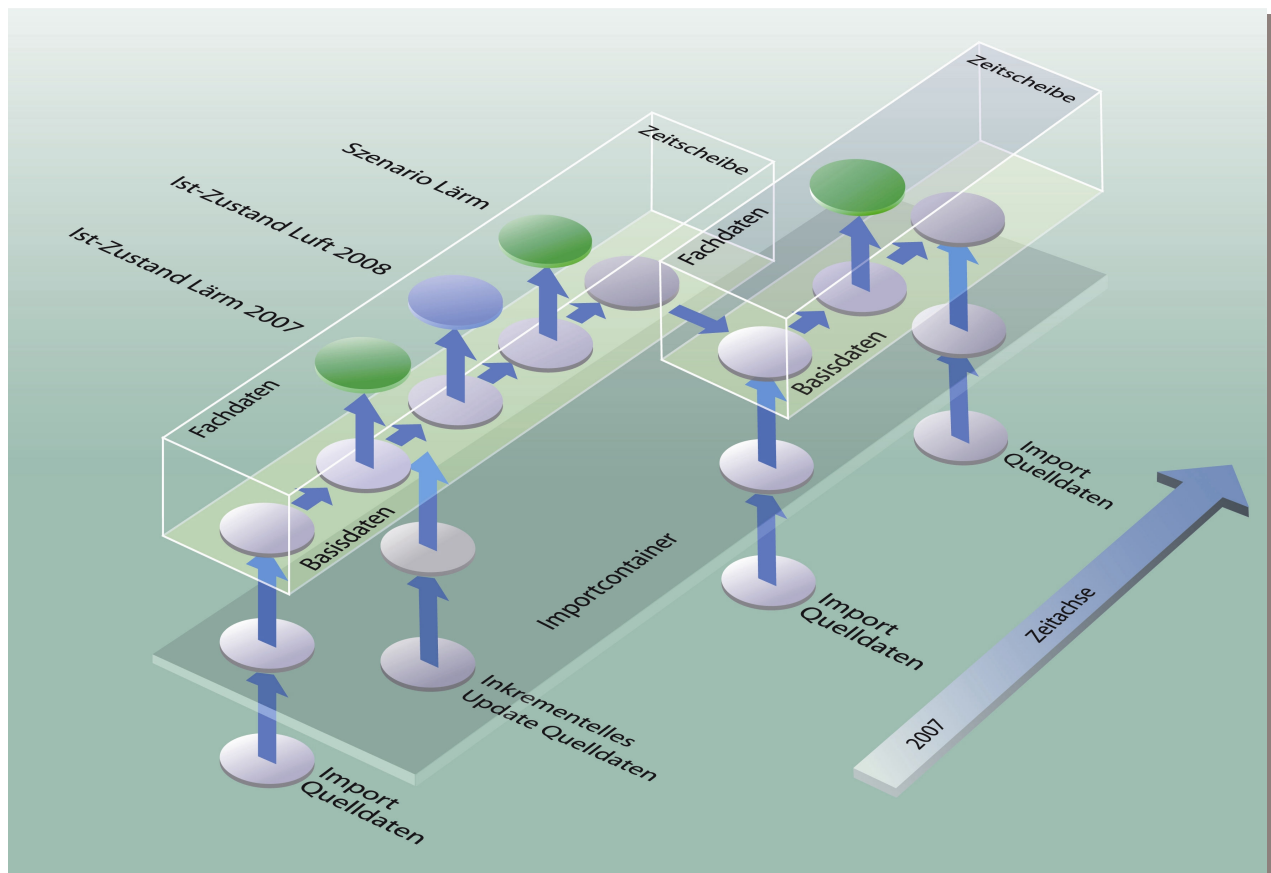


Figure 2: Versioning and time slice concept, Source: LCC Consulting AG

Version administration

Additionally to the standard functions of GIS and relational databases, (geo) data sets can be saved in different states. More functions result from the introduction of version types such as base version, processing version and calculation version.

This extension in combination with a version administration, granting of role based access permissions and a well thought-out work flow lead to the versioning concept. It provides the solution for:

- keeping data sets related to different data capturing times
- regulated updates of existing base data with new source data
- creating data pools for noise abatement planning
- generating arbitrary scenarios
- securing consistency between base data and application specific data

Scenarios

With the versioning concept it is now possible to create scenarios based on any version. All functions of the software solution are available within a scenario: from update of the (geo) base data up to a thematic calculation. For instance with scenarios you can calculate prognoses and forecasts or perform action planning.

Import

Any kind of geographical or attribute data, including 3D and routing information can be maintained by means of customisable and re-usable object / attribute allocations within the superposed import container. First data plausibility tests take place at this point. The second step is an automated data check in form and content before transferring it into the relational data model.

Not imported data and data that has not passed the validation testing and has been marked as not suitable for import can be written into a Shape or dBase file with the reason for its rejection. The system allows incremental updates due to the included administration of data sources and object numbering.

Manual data capture

Functions for capturing attribute data and geographical data – if needed – through the interactive GUI have been implemented as well. When saved, these are subject to the same checking mechanisms as those available during data import.

Data correction and completion

To assure data integrity checking functions for topologic and topic specific aspects are integrated. Identified, erroneous objects, that do not comply to the defined criteria are marked. Possibilities for partially automated correction are available as well as algorithms for data completion that calculate values according to existing attribute values or that set default values depending on domain values.

Homogenisation

For an error-free Für eine fehlerfreie combination of geographical and attribute data from different sources functions are available for indentifying conflicts between objects. Indexed conflicts are highlighted.

Calculation

The application NOISE contains emission calculations for street segments.

Noise propagation calculations are performed with special software. Data transfer uses the QSI interface (as defined in DIN 45687), export to QSI is included in envVisionNOISE.

Interfaces

Interfaces to external applications have been developed to allow the calculation of application specific attribute data. Besides an automated export of the relevant data and re-import of the results services for a monitoring of the calculation process have been implemented. The architecture is open, so that a version update of the specific application does normally not require an adaptation of the interface.

Reporting

The required reports are generated with Crystal Reports and executed with envVision.

Export

Base data and related results can be imported either into a flat or into a relational data structure. The primary export has to be executed into a Shape file, in dBase or as GeoTIFF. More formats can be handled with according converting tools.

User administration

A user administration has be included to ensure safe working with the stored data. There is support for interactive allocation of read and write permissions on geographical and attribute data. The user permissions can be set role based for single versions and version types.

Database

ORACLE is used as central database for the storage of geographical and attribute data.

2.2 envVision components

envVision is a Client-Server solution, that comprises server components (envVision Services) and client components (envVision ExpertClients).

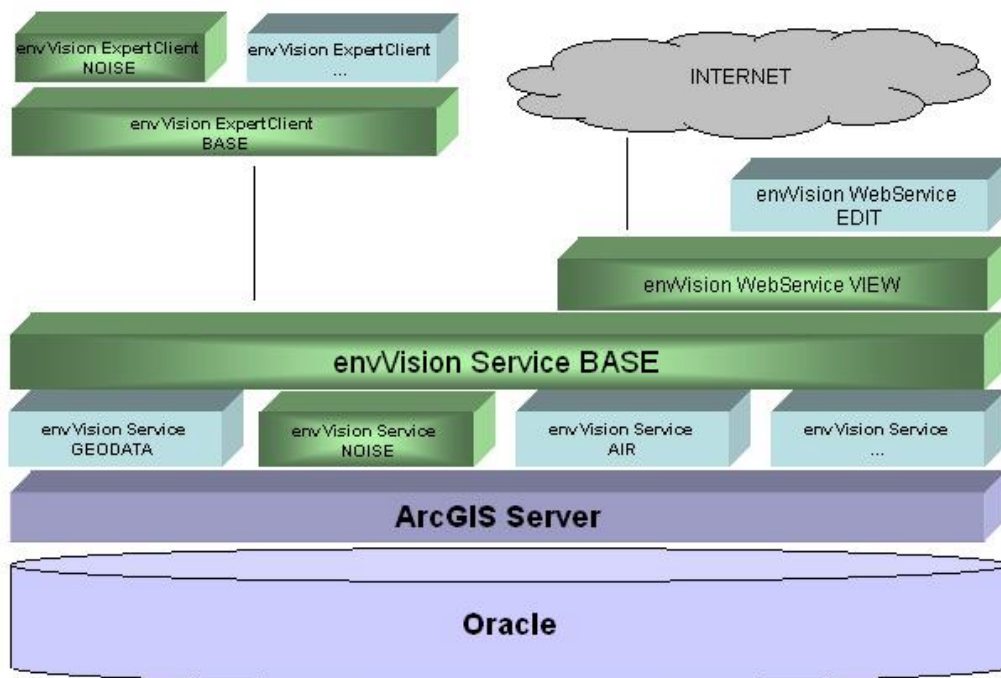


Figure 3: envVision components

envVision BASE and envVision WebService always need an application containing the data model, the data contents and the GUI specifications.

The services of envVision WebService (in combination with envVision Service NOISE) can be included in an internet portal.

2.2.1 envVision Services

The envVision Service Enterprise version contains the following modules:

- envVision Service BASE
- envVision Webservice VIEW
- envVision Service NOISE

envVision Service BASE:

complete base functionality for linking to generically created technical modules. With envVision BASE it is already possible to modify structures of attribute data: adding and deleting of data fields, correcting formats, domain values, default values. These changes become valid for all versions in on time slice.

envVision Webservice VIEW:

complete server functionality for displaying (viewing) data on the web, in this case provision of the services via ArcIMS®.

envVision Webservice EDIT is in development phase and will support active manipulation of data and versions through internet or intranet.

envVision Service NOISE:

the server-side noise application contains the specific data model with corresponding GUI for display and update of attribute data, specific functions (e.g. noise propagation calculation) and services.

2.2.2 envVision ExpertClients

The available envVision ExpertClient version contains the following licenses for concurrent users:

- envVision ExpertClient BASE
- envVision ExpertClient NOISE

Concurrent User (CU) is a licensing model, that defines the maximum number of users to be allowed to access a common resource (envVision Service) at the same time.

envVision ExpertClient BASE:

license for one CU access, independent of the application

envVision ExpertClient NOISE:

license for one CU access to the application NOISE

envVision DeveloperKit:

Prerequisites for the envVision DeveloperKit: Microsoft Visio, Microsoft Visual Studio and ESRI-SDK. envVision DeveloperKit contains a module for converting Visio structures into envVision ClassExtensions.

Rough description of the work flow for creating a new application:

- Design of the data model in Visio
- Export of data structures to XML
- Conversion with envVision DeveloperKit into ESRI-ClassExtensions
- Compilation with Visual Studio
- Installation of database schema and tablespaces
- Connection to desktop in registry

The available envVision DeveloperKit contains one envVision ExpertClient BASE that you need to handle the updated and newly created applications.

Use of the envVision DeveloperKit requires adequate training for which basic knowledge in Microsoft Visual Studio-, Microsoft Visio and ESRI-SDK-usage is assumed. Also important is the awareness of possibilities and consequences of structural data changes (mainly with already imported data and effected changes on it) that will be pointed out during our trainings.

Your own applications:

Using the envVision DeveloperKit you are able to create and modify the data model and adapt the GUIs. Your own applications can be created based on BASE functionality and web services.

Basically you do not need new service components for your own applications. For use with an ExpertClient you only need a CU license for BASE and no further license for an application.

envVision Service AIR:

Of course it is possible to order more applications. Using the example of the application AIR, the optional extension possibilities are lined out; more applications are actually being developed:

You need one envVision Service AIR and an according number of CU licenses envVision ExpertClient AIR for the clients. The increase of CU licenses for envVision ExpertClient BASE depends on the way of operating the application: if, for instance, you use AIR and NOISE alternatively, you can use one BASE license alternately.

3 Technical requirements

The requirements and the system environment for envVision conforms to those of ArcGIS® Server (ArcGIS 9.2®, Oracle 10g):

- operating system Windows XP
- More details on system requirements for ArcGIS® are to be found in the ESRI Support Center: <http://support.esri.com/index.cfm?fa=knowledgebase.systemRequirements.gateway>