

An die
Österreichische Forschungsförderungsgesellschaft mbH (FFG)
Bereich Thematische Programme, Empfang 4. Stock
Sensengasse 1; 1090 Wien

!



ZWISCHENBERICHT

1. Projektdaten

Akronym	eConsulting
Projekttitel	eConsulting im Umweltbereich
Projektnummer	816022
Programm	1. Ausschreibung AT:net
AntragstellerIn	DDr. Kurt Fedra
ProjektpartnerInnen	-
Fortlaufende Nummer des Zwischenberichts	1. Zwischenbericht
Berichtszeitraum	von 01.01.2008 bis 31.10.2008
Anzahl Forscher/Forscherinnen	Weiblich:3 Total: 4 (VZÄ) Position (z.B. Projektleitung, -mitarbeit): Projektmitarbeit.

2. Projektverlauf

<p>Einhaltung des Zeit- und Kostenplanes? Kostenneutrale Verlängerung?</p>	<p><input type="checkbox"/> ja, wir planen eine kostenneutrale Verlängerung auf Grund Nichteinhaltung des Zeit- und Kostenplanes <i>(HINWEIS an die FördernehmerInnen: Das Einlangen eines formlosen Ansuchen mit Begründung und einer aktuellen Kostenaufstellung bis spätestens ein Monat vor dem vertraglichen Projektende ist Voraussetzung für die Gewährung einer kostenneutralen Verlängerung)</i></p> <p><input checked="" type="checkbox"/> nein, voraussichtlich werden wir die zugesagten Fördermittel in der Projektlaufzeit zweckgewidmet verbrauchen</p>
<p>Zukünftige Kostenumschichtung erforderlich?</p>	<p>Voraussichtlich, von Reise und Investitionen zu Personalkosten.</p>

3. Zusammenfassung

The planned research and development tasks for the first project year as foreseen in the proposal work plan could be completed as scheduled. This includes primarily the software technical components: Integration of available prototypes into 7/24 on-line services with a number of support tools and functions for the real-time system monitoring and operational control; the extension and upgrade of the computation and information infrastructure (new servers for the cluster computing, upgrade of the Internet connection from 2 to 8 Mb/s band width. In parallel, the set of pilot applications could be expanded: in addition to the operational examples from EUREKA E!3266 WEBAIR for air quality assessment and management including short-term forecasts for the Republic of Cyprus and Korea (Seoul and the surrounding Gyeonggy-do) two additional test cases for urban/industrial and regional air quality: this includes Iran (Greater Tehran Area) and Croatia (City and region of Sisak), as well as an on-line Information system for marine biological data (originating from an INTERREG project, in collaboration with the universities of Split and Zadar), and first elements of a real-time operational control system for irrigation water management (rice paddy) in Malaysia (in collaboration with the local information technology company MMASTEC) and in parallel in a similar project with the Cyprus University of Technology. Yet another pilot case is an environmental management information system for industrial parks, ISO 14001 compliant, for several locations in the United Arab Emirates.

For these pilot cases (all environmental information, simulation and optimization systems) a set of integrated tools to guarantee a reliable 24/7 operation have been implemented. This is based on the real-time forward chaining and rule-based expert system RTXPS (core system developed by ESS in previous EUREKA and FP5 projects). The system ensures uninterrupted operation, availability, but also the quality of the results and coordinates the monitoring and documentation.

For documentation and dissemination, a project home page has been installed:

<http://www.ess.co.at/eConsulting>), that lead to the main test cases.

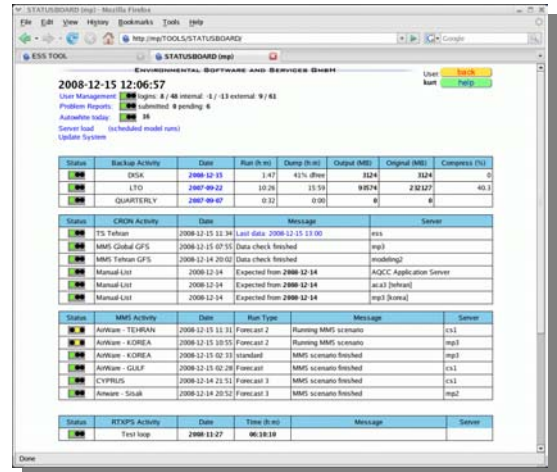
4. Technisch-wissenschaftliche Beschreibung der Arbeit

4a. Vorläufige Ergebnisse und Meilensteine

Durchgeführte Arbeiten:

1.1. Systems integration: technical and economic management tools (CRM, automatic QA/QM, error tracking und operator alerts, user management, access control) :

To support a reliable 24/7 operation of the test cases (1.3) a number of support tools and utilities have been developed and implemented (all based on Open Source Linux, Ubuntu 7.10). These tools are implemented with a web based GUI (graphical user interface, supported by any industry standard Internet browser). These tools are implemented as an on-line „statusboard“ that is updated every minute (update intervals are user configurable or event based) using the real-time forward chaining expert system RTXPS to



The screenshot shows a web browser window displaying a status board. The page title is 'STATUSBOARD (img)'. The main content area shows a date and time '2008-12-15 12:06:57'. Below this, there are several tables of data. The first table is titled 'Backup Activity' and has columns for Status, Backup Activity, Date, Run (h:m), Dump (h:m), Output (MB), Original (MB), and Compress (%). The second table is titled 'CRON Activity' and has columns for Status, CRON Activity, Date, Message, and Server. The third table is titled 'MMS Activity' and has columns for Status, MMS Activity, Date, Run Type, Message, and Server. The fourth table is titled 'RTXPS Activity' and has columns for Status, RTXPS Activity, Date, Time (h:m), Message, and Server.

coordinate the functions and scripts that perform the updates through a shared data base (blackboard architecture on a user and (Internet) session basis).

A summary of the current state of all servers and processes, is provided with a simple color coded (traffic light) symbolism. Any of the individual summary records leads to further details in separate (pop-up) pages. For several of the functions monitored can also trigger error messages, alerts and alarms that are distributed by eMail to the dedicated system operator(s) if no automatic error correction (like restarts of data transfers or model runs) seems feasible.

These software tools are not only used for the management of the overall ASP (application software provider) installation, but can be an integrated component of any one of the individual systems.

Specific support functions implemented include:

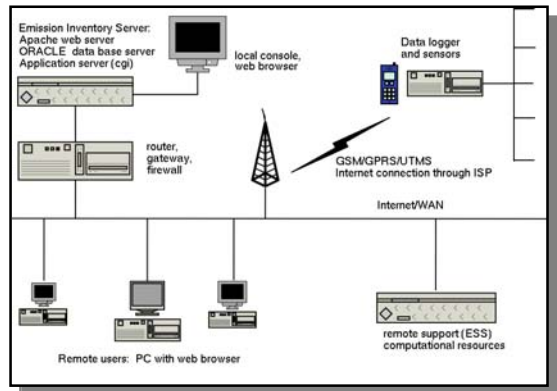
- User- and access control with a detailed logging, that supports several layers of access rights and groups; this can be based on standard user name and password authentication, but also and in addition on IP addresses, domains, or VPN (virtual private network) strategies. The guarantee of a high level of access (and thus data and application) security is an important feature to maintain user trust wherever confidential and proprietary, business critical data are involved.
- Problem- and error report logging and tracking, (again web based for external users), recorded in a data base and monitoring by RTXPS with regular reminders until a problem case can be closed.

- Processor load and scheduling, to facilitate an optimal load distribution for the scheduled tasks such as regular short- and medium term forecasts, and real-time optimization for operational control applications;
- Data import and export (also part of the remote support of distributed client-server installations) that also include model results (from computational services) used as initial or boundary conditions or downstream models. Examples are daily local weather forecasts over 72 hours (Tehran) or 120 hours (Seoul).
- Scheduling and operational control (input data requirements, output playability, completeness, consistency check, monitoring and logging) for all scheduled or event driven or interactive model runs
- RTXPS test-loop (watchdog function, that triggers system restarts when necessary due to external (network power supply) or internal error conditions.

USER	FIRSTNAME	LASTNAME	GROUP	LAST LOGIN	LOGINS	JOB
christina			ADMIN	Mon 15 Dec 2008 11:12	30	ac45
admin			ADMIN	Mon 15 Dec 2008 11:12	36	ac45
gabriele	gabriele	heimbacher	System Administrator	Mon 15 Dec 2008 11:12	57	ac45
gabriele	gabriele	heimbacher	ESS	Mon 15 Dec 2008 11:12	69	ac45
admin			System Administrator	Mon 15 Dec 2008 11:12	6	ac45
admin	admin	user	ADMIN	Mon 15 Dec 2008 11:12	2	ac45
kurt	kurt	Fredia	ESS	Mon 15 Dec 2008 09:12	62	ac45
kurt	kurt	Fredia	ESS	Mon 15 Dec 2008 09:12	51	ac45
guest	guest	account	CYPRUS	Fri 12 Dec 2008 11:12	17	ac45
guest	guest	account	GAEST	Fri 12 Dec 2008 11:12	138	ac45
guest	guest	account	CYPRUS	Thu 11 Dec 2008 09:12	108	ac45
mgk			ADMIN	Mon 08 Dec 2008 11:12	3	ac45
gabriele	gabriele	heimbacher	ESS	Tue 09 Dec 2008 11:12	30	ac45
guest	guest	account	CYPRUS	Mon 08 Dec 2008 11:12	15	ac45
hans			ADMIN	Thu 04 Dec 2008 08:12	45	ac45
guest	guest	account	GAEST	Tue 02 Dec 2008 11:12	12	ac45
hans	Hans	Kamer	ESS	Mon 01 Dec 2008 11:12	6	ac45
christina	Christina		ESS	Thu 27 Nov 2008 11:11	7	ac45
hans	Hans	Kamer	ESS	Wed 26 Nov 2008 11:11	4	ac45

1.2. Infrastructure: HPCN cluster with remote supervision to guarantee a reliable 24/7 operation for users world wide, upgrade of the Internet connection from 2 to 8 Mb/s

Within the overall client-server architecture of the project additional compute servers have been purchased and installed (dual processor, 4 core 3.0 GHz XEON processors with 16 GM RAM, charged to the project pro-rata). With the latest upgrade, this amounts to six parallel web and data base servers (running Apache) Server und well as five dedicated multi-processor compute servers with a total of 44 „cores“ largely in 64 bit architecture. In parallel, the planned upgrade from a 2 to 8Mb/s leased Internet connectivity could already be implemented in the first project year, ahead of schedule. This also involved an upgrade of the primary Internet router to a cisco 1800 series router, that also performs basic firewall functions (IP and port based filtering).



To test and evaluate the Internet connectivity, we use in addition to standard bi-directional speed tests for larger data volumes also measurements of latency from several servers or clients world wide, e.g., Korea, Malaysia, Philippines, Iran, Croatia but also nationally, based on ping and traceroute utilities and protocols.

1.3. Demonstration systems: *selected pilot- and reference applications*

Testing and evaluation in eConsulting is based on a set of pilot applications, in part from the parallel EUREKA E!3266 WEBAIR project (assessment and management of urban/industrial air quality).

The main application shared with EUREKA and as foreseen in the original proposal includes:

- WEBAIR KOREA (Seoul, Gyeonggy-do)
- WEBAIR CYPRUS (Republic of Cyprus with a local sub-domain for the city of Lemesos (Limassol); the meteorological forecasts for the Eastern Mediterranean and Cyprus are also used for a new project for irrigation management based on Waterware in an application on Cyprus in collaboration with CUT, the Cyprus University of Technology)
- In addition, new pilot applications of real-time systems have been started within the eConsulting framework, including:
 - AirWare GTA (Greater Tehran Area, Iran)
 - AirWare Sisak, Croatia
 - Waterware Cyprus (in Zusammenarbeit mit CUT, irrigation management)
 - WaterWare Malaysia (in collaboration with MMASTEC, river basin simulation and optimization and a real-time (SCADA irrigation management system for NAHRIM and MoA, respectively, in Malaysia)
 - EMIS, and ISO 14000/14001 compatible Environmental Management Information System (EMS/EMP) for industrial zones, estates or parks, with first pilot for HFZ (Hamriyah Free Economic Zone, United Arab Emirates). A special computational challenge there is the real-time adaptive optimal control of brine release from a reverse osmosis desalination plant through a small harbor basin and access channel to the open, yet shallow Arabian Gulf subject to a salinity constraint and economic targets.

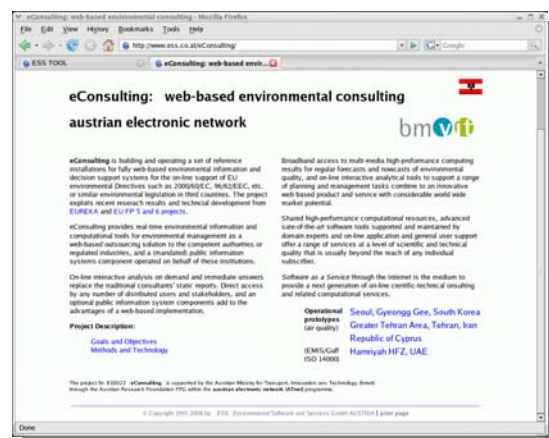


1.4. Publikation und Verbreitung: *project home page, dissemination*

As a central element for dissemination, a project home page was installed. This describes the basic project in terms of objectives and methods, but also provides links to the on-line pilot cases:

<http://www.ess.co.at/eConsulting>

A conference presentation on the applications in the air quality domain was made submitted and accepted for the international conference BAQ 2008 in Bangkok (November 2008), several presentations to potential users were also made in South Africa (water), Iran, Korea, and Croatia..



1.5. Beschreiben sie die erreichten Ziele, die vorläufigen Ergebnisse und Meilensteine.

- Sind die ursprünglichen Erwartungen an das Projekt und die Ergebnisse eingetreten?

The experience from the project so far largely corresponds to the expectation in the technical-scientific aspects. We have been able to demonstrate the technical feasibility of a 7/24 on-line operation with rather demanding and complex software for scientific-technical applications. In the individual pilot studies we often find delays due to the difficulty to obtain quality data from partners or potential clients; on the other hand, however, there are always unexpected emerging opportunities for new pilot cases. A resulting major required feature for the proposed eConsulting solution is a high degree of flexibility, that enables us to configure and implement for on-line operation and access a wide range of complex systems very fast yet reliable with assured quality – clients, once decided, always are in a hurry.

Technical performance measures (such as response time and reliability of results were found promising even with comparatively modest computational efforts. The basic concept of complex scientific-technical consulting services providing a „Software-as-a-Service“ beyond rather simple standard business applications, entertainment or gaming, seems to be feasible.

- Beschreiben Sie „Highlights“ und allfällige „Unzulänglichkeiten“ im Projektfortschritt und führen Sie – wenn möglich - Leistungsdaten an.

An obvious success has been the invitation to prepare offers for concrete pilot applications for bona fide end users, for example in the United Arab Emirates (Jebel Ali and Hamriyah industrial zones, ISO 14001 environmental management information systems) and for water resources management (river basins and irrigation systems in Malaysia, NAHRIM (National Hydraulic Research Institute) and MoA, Ministry of Agriculture).

One recurrent, yet controllable, problem is the difficulty to obtain quality data for the pilot applications when and where needed.

As a simple and aggregate measure of performance, we have been able to achieve a better than 99.9% availability of the on-line services in the first few months of pilot applications across different systems despite dependency on external data e.g., from NOAA.

4a. Arbeits- und Zeitplan

1.6. Korrespondiert der Projektfortschritt mit dem Zeitplan?

- | | |
|-------------------------------------|--------------------|
| <input type="checkbox"/> | ja |
| <input checked="" type="checkbox"/> | im weitesten Sinne |
| <input type="checkbox"/> | nein |

5. Verwertung

- **Verwertung:**

In collaboration with a number of international partners and as a consequence of site visits and local presentations and discussions, a range of proposals for concrete applications have been prepared specifically in Malaysia with MMASTEC (an information technology company) and the United Arab Emirates with ELARD (an environmental consultant group). In addition, using the concepts of eConsulting, a project

proposal under FP7 (SEC-2009-1) on technological risk management has been submitted to the EU. Additional proposals (environment and ICT) are in preparation.

➤ **Markt:**

Unchanged from the original project proposal

➤ **Publikationen/Patente:**

Fedra, K. (2008) AIR QUALITY ASSESSMENT AND MANAGEMENT: WEB-BASED TOOLS

Presented at BAQ 2008, Bangkok (on-line publication)

➤ **Dissertationen:** n/a

6. Ausblick

6a. Arbeitsplan

The emphasis of the tasks for the second project year are primarily on the completion, testing and formal quantitative evaluation of the support tools and utilities for the 7/24 operation of web- and application servers for the currently running and new, just started pilot applications.

Important components are the quantitative description, automatic monitoring and analysis of systems performance“, but also user perception on usability and usefulness based on an on-line questionnaire using a 7 grade Likkert scale to compile user feedback). This will include measurement and analysis of response times (latency and model response) as well as reliability/availability with automatically compiled metrics and their statistical analysis over longer periods as an integrated component of systems administration and quality control.

Another component is the further development of monitoring and logging of all systems functions and user activities to streamline navigation and display. This also includes extended monitoring of system state and results (including data assimilation and the comparison of model results and forecasts, system, validation) and the automatic reporting, but also error messages, alerts and alarms. There we plan to extend the current range of communication channels by a GSM/GPRS based channel with automatically generated SMS formats to mobile phones.

A third focus will be the automatic generation of reports as part of the systems results, consisting of flexibly structured natural language text together with numerical data, graphs, and topical maps. This will be based on the rule-based expert system RTXPS, to generate near natural language reports and interpretation of data for improved and reliable understanding of complex data sets.