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Executive Summary

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1 Introduction

The project aimed at the development of a unique software tool, based on INNOVIS' BizSmart™ workflow and Enterprise Application Integration platform and utilizing satellite communication technologies. The new tool, named **BizSmart SAT**, allows the execution of tasks and process steps anywhere in the world, irrespective of the communications device the task assignee has access to.

BizSmart SAT allows the corporate or organization user to have access to the task list allocated for him/her and to perform a set of functions relative to the specific process and to his/her role, according to the communications device he has access to.

A full set of actions has been performed with particular enhancements aimed at speed and time-processing improvements, when the user has full access through a PC connected to a satellite communications terminal.

In cases where the user is not able or does not want to carry a PC, a lesser, but still substantial, part of his/her tasks can be performed through a specific character-based interaction language and satellite messaging services.

The BizSmart SAT system targets large corporations and organizations, willing to set-up their own workflow and integration suite and will practically allow them to “satellite-enable” all of their existing software applications, that conform to certain standards, and at the same time streamline their operations. Examples of such potential customers include maritime management companies, ship owners, construction companies, disaster aid and recovery services, military and paramilitary organizations, law enforcement units, etc.

The BizSmart SAT solution targets also satellite and internet service providers, so that they can build their own service offerings, based on the platform as Added value services.

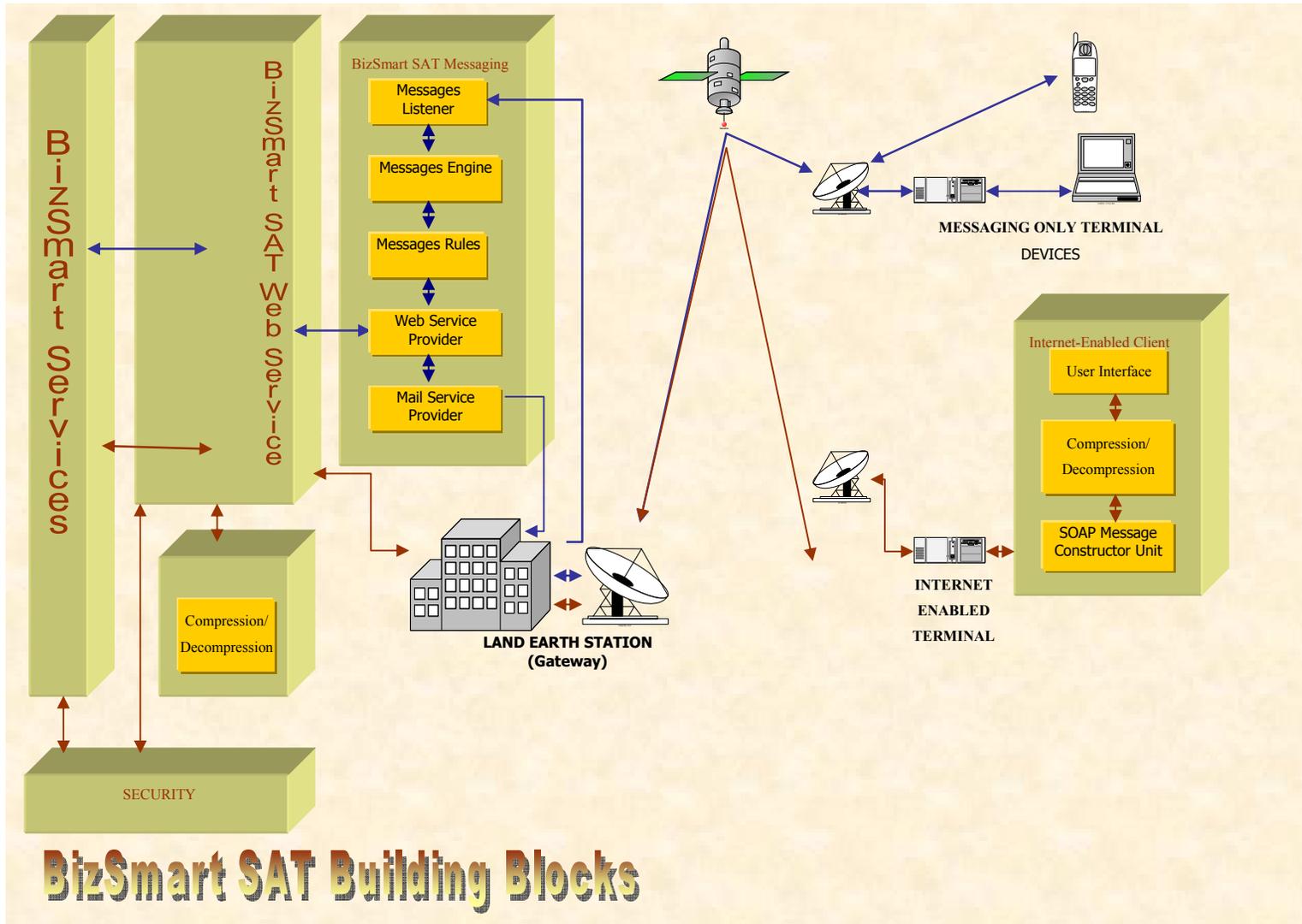
Users of the BizSmart SAT services can be located anywhere on the earth, where satellite reception allows either an Internet or data connection or a text message to be received and sent.

2 Approach for the organization and execution of the development activity

The aim of the development team was to implement a number of BizSmart™ add-on modules that allow the use of BizSmart™ applications effectively within existing satellite network infrastructures. More specifically, the implementation team focused on:

- the implementation of a messaging “protocol” that allows users to query BizSmart™ services from satellite terminal devices such as Inmarsat C, and Iridium with the use of short messages.
- the implementation of a new BizSmart™ application client, focusing on the effective use of application layer Internet protocols such as HTTP over satellite network infrastructures (e.g. Inmarsat GAN, and Iridium data links) that allow the query of BizSmart™ services.

System Architecture



In the above diagram a typical installation scenario of BizSmart SAT is presented along with the main building blocks of the System.

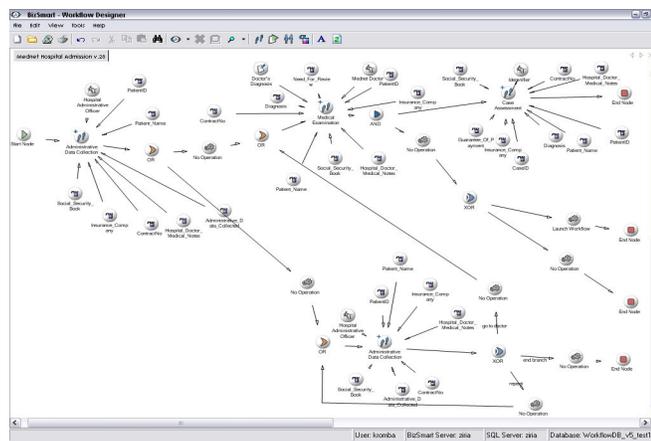
The BizSmart SAT server typically is installed at the company's headquarter, and includes BizSmart Services, Security, BizSmart Web Services, Compression/Decompression and BizSmart SAT Messaging at it is presented in the figure on the left side.

The client software (only in the case of BizSmart SAT Internet Enabled Client) is installed on PCs connected to satellite terminals (in this project Inmarsat RBGAN and Iridium). The BizSmart SAT Internet enabled client consists of three major units (a) User Interface, (b) Compression/Decompression and (c) SOAP Message Constructor Unit.

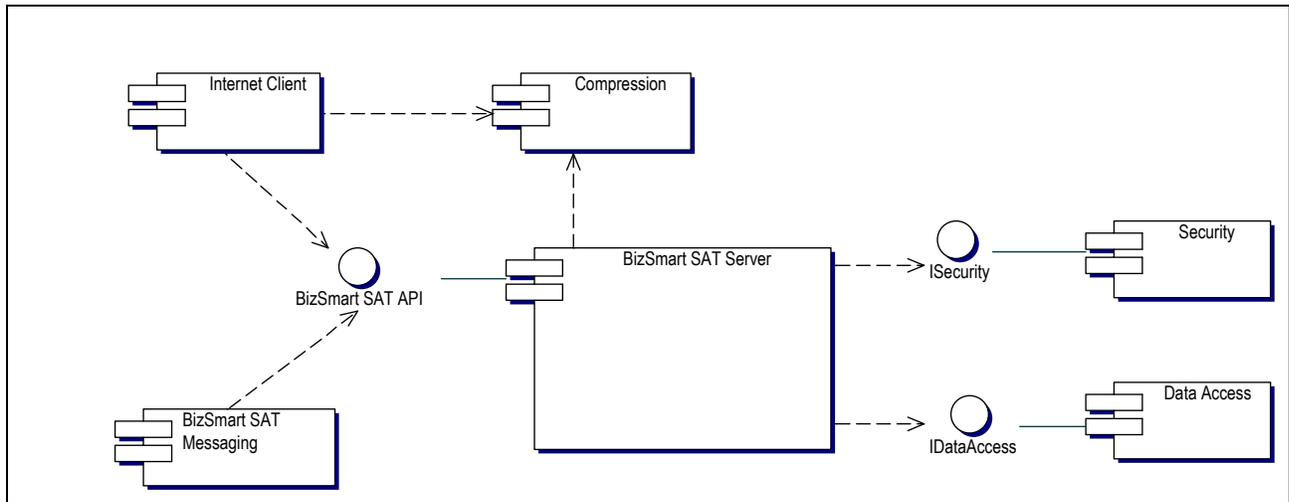
In order to use the BizSmart SAT Messaging, you need (a) a satellite device (in this project INMARSAT C and Iridium Satellite Phones, top right on the previous figure) capable of sending text messages to a specified e-mail address and (b) the knowledge of BizSmart SAT Messaging commands in order to participate in the execution of the processes supported by the BizSmart SAT Installation. No extra software installation is required in this case.

Each BizSmart SAT installation supports a number of workflow processes that their participants can be on different locations using different communication networks and all combinations of them (e.g. combination of Internet, Iridium and Inmarsat terminals).

The processes are graphically designed into the system using the BizSmart Designer. A process designed into BizSmart is presented in the following figure.



Components Diagram of BizSmart SAT



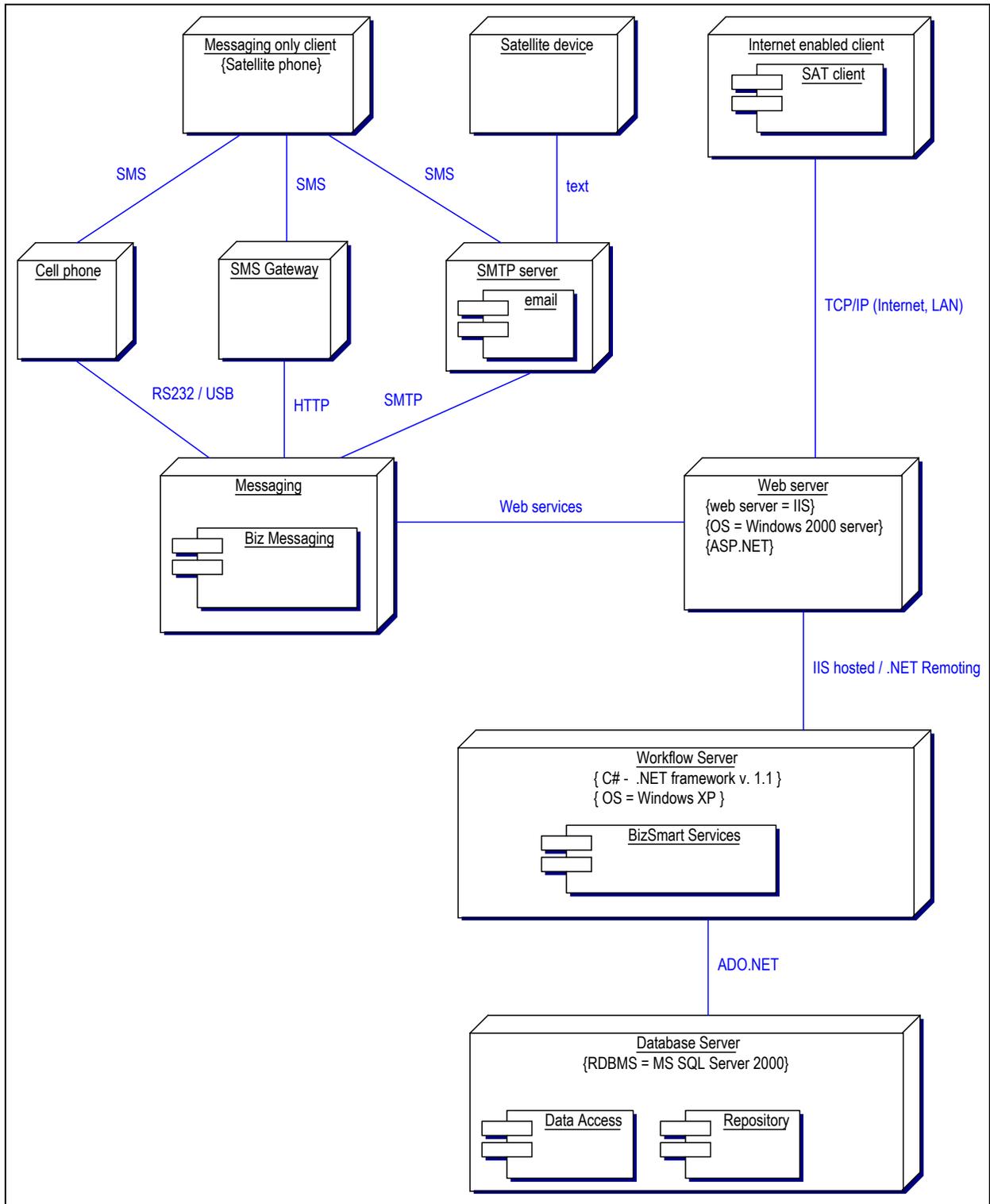
As we can see in the above component diagram, the main component of BizSmart SAT is the server. The server accepts incoming requests from the clients and makes sure they get properly processed. The server is assisted by the services of the other components. Apart from the server, there are three main components in the system.

- The Security component provides authorization services
- The Data Access component encapsulates access to the database
- The Internet client component interacts with the users and forwards their requests to the server.

Access to these services is provided through various interfaces. The interfaces provide separation of functionality and its implementation.

Noteworthy is the fact that the server provides a uniform interface to all clients. If a client has special needs, a transformation layer is required, such as the BizSmart SAT Messenger for the “messaging-only” terminal devices’ client. This keeps the server simpler and faster.

Deployment Diagram



In the previous diagram the detailed deployment diagram of BizSmart SAT is presented.

The main purpose of this diagram is to show how each module of BizSmart SAT communicates with the other modules of the BizSmart SAT platform and where exactly it is installed. For example, the communication between the Messaging and the Web Server is implemented via Web Services.

The BizSmart SAT Server runs on Microsoft Windows 2000/2003 Server with .NET framework and Internet Information Server (IIS) and requires a Microsoft SQL Server 2000 as a database server.

The Internet Enabled Client runs on any PC with Operating System Microsoft XP or Microsoft 2000 and the .NET framework installed.

3 Pilot Description

During the project three pilots were executed:

- Maritime pilot
- Health – Insurance Pilot
- Construction Pilot

In order to successfully execute the pilots, we involved the end users in the whole development process of BizSmart SAT.

The end users were also trained on the use of BizSmart SAT and on the use of the satellite terminal devices (Iridium satellite phones, Inmarsat RBGAN). No trainings have been made on INMARSAT C since the end-users of the Maritime pilot had previous experience.

The pilots apart from the acceptance tests that they carried out with the support of INNOVIS, they used the BizSmart SAT over a period of 3 months to test the usefulness of the workflow processes, the reliability of the communications network, the capabilities of the SATCom devices, the user friendliness, etc. To that purpose a number of typical workflow processes were implemented. At the end, the users had to evaluate the offered service. Their evaluation was captured via anonymous questionnaire that was made available online by INNOVIS.

MARITIME PILOT

PACIFIC & ATLANTIC is a company that has 28 vessels and belongs to Pateras family, which is one of the oldest and most known Greek ship-owner families

The main objectives of this pilot were

- to help the company to fully automate and execute their processes, even if these processes include actors that are working in their vessels travelling around the globe
- to accelerate the execution of the processes
- to utilize the existing Inmarsat C infrastructure that is available in all their vessels

Concerning the pilot configuration, the demonstration involved the use of Inmarsat C terminals on board of 3 different vessels for sending messages to the BizSmart Server located at the Pacific & Atlantic premises in Athens.

The client component used in this pilot was the “Messaging only” Terminal Devices Client.

In the Maritime Pilot ten employees participated in the execution. Seven of them were located at the headquarters (e.g. fleet manager, financial manager, procurement manager) and they used their own PCs using the BizSmart traditional Internet Client in order to participate in the processes, while the other three were on the ships (e.g. captain, first engineer) and they participated in the processes using Inmarsat- C devices installed in the ships.

During the Maritime Pilot the following processes were used:

- Vessel Positioning Process. With this process the headquarters are notified with the position of the ships. Depending on the position of the ship the responsible persons are notified in order to take the appropriate actions.
- Vessel’s Planned Maintenance Process. This process handles the maintenance of each ship and guarantees the execution of the maintenance process according to plans and procedures.
- Vessel’s Order Process. With this process any person in the company, including those on the ships, are able to procure a material or service. Before the actual procurement, the process handles all the necessary approvals from the Technical, Economic and Administration officers.

HEALTH-INSURANCE PILOT

MEDNET HELLAS SA is a managed care and third party administrator for insurance companies. The company is mainly involved in claims administration and online coverage for insured members' hospitalizations. MEDNET Greece was already taking advantage of BizSmart™'s capabilities before the BizSmart SAT project.

The main objectives of this pilot were:

- to allow MEDNET HELLAS to provide its quality services based on processes mapped to BizSmart even in cases where

their Internet based network is not available due to physical disasters (earthquakes, floods etc.)

- to extent the functionality of their BizSmart Installation

Concerning the pilot configuration, the demonstration involved the use of two INMARSAT RBGAN modems and an Iridium Satellite Phone. The first modem, connected to a client PC, had an IP address automatically assigned by the network during the period when it connected to the network and it was used at the Metropolitan Hospital. The second modem, connected to the BizSmart SAT server, had a static IP provided by TELENOR and it was installed at the MEDNET Hellas headquarters. The Iridium Satellite Phone was used as an alternative of the RBGAN modem at the Metropolitan Hospital.

The client component used in this pilot was the “Internet Enabled” Terminal Devices Client based on Iridium or Inmarsat.

In the Health-Insurance Pilot seven employees participated in the execution. Four of them (Indemnifiers) were located at the headquarters and they used their own PCs using BizSmart traditional Internet Client in order to participate in the processes, while the others three (Administrative officers, Doctors) were at the remote site (Metropolitan Hospital) and they used laptops/PCs with the “Internet Enabled” Terminal Devices Client installed.

During the Health-Insurance Pilot the following processes were used:

- Hospital Admission Announcement. This process handles the new admission of patients in the hospitals being managed by MEDNET HELLAS. With this process MEDNET HELLAS is able to accept or not accept the cost of the admission based on the parameters of the insurance contract of the patient.
- Hospital Concurrent Review. With this process MEDNET HELLAS is able to monitor what is the progress of all the admissions that have been announced with the previous process.

Construction Pilot

DODONIS Ltd is a company that focuses on the management and consulting of technical/construction projects. DODONIS specialises mainly with the construction of tunnels. Tunnels are usually constructed on mountains

where it is very difficult to have access on electrical and telecommunications networks mainly at the beginning of the construction.

The main objective of this pilot was

- to allow DODONIS to have continuous communication with Worksites that are positioned far away from the headquarters, mainly in mountains, allowing the unobstructed execution of the processes defined.

This is especially important when the Worksite is created at the beginning of the project and also in cases where physical disasters destroy the traditional telecommunication networks.

Concerning the pilot configuration the demonstration involved the use of an RBGAN modem and an Iridium Satellite phone at the Worksite located at Northwest Greece. The BizSmart SAT server was installed at the headquarters of MEDNET Hellas.

Both of the client components of BizSmart SAT were used in this pilot, “Messaging only” Terminal Devices Client and “Internet Enabled” Terminal Devices Client.

In the Construction Pilot three employees participated in the execution. Two of them (Procurement Director, Technical Director) were located at the headquarters and they used their own PCs using BizSmart traditional Internet Client in order to participate in the processes, while the other one (Worksite Supervisor and Quality Manager) was at the remote site (Worksite at EGNATIA road) and he used laptop with the “Internet Enabled” Terminal Devices Client installed (connected with RBGAN satellite IP modem or Motorola 9505) or the “Messaging only” Terminal Devices Client, based on Iridium devices (Motorola 9505).

During the Construction Pilot the following processes were used

- Worksite procurement process. This process is similar to the procurement process of the maritime pilot, but it was defined according to the specific needs of DODONIS.
- Proposal of Construction Changes Process. With this process the Worksite supervisor is able to send to the headquarters a

proposal with changes in the construction plans. This includes attached documents, drawings, parts lists etc. The Technical Supervisor after reviewing the proposal will accept or deny the proposed changes.

4 Results of Pilot Demonstrations

Health – Insurance Pilot

The measurement results on MEDNET Hellas demonstrations showed that the overall completion time (varying from two to three minutes depending on the demonstration scenario) of the workflows were acceptable. The bandwidth offered by RBGAN IP satellite modems both at a client side and server has been proved adequate for data exchange (on each run of a workflow process, an average of 100KB of data were exchanged between client and server). Users were very happy with application's performance which was considered as more than accepted, due to the fact that the response time of the BizSmart SAT application was on average less than three seconds (except from cases that they were downloading-uploading documents), resulting to a smooth execution of the process.

MEDNET users were familiar with BizSmart since they were using BizSmart prior to BizSmart SAT project. This made their training on BizSmart SAT clients easier. Regarding to satellite terminals, their involvement on BizSmart SAT was their first experience.

MEDNET management team has decided that the solution proposed can be viable and extremely useful in their business with cases where the terrestrial network due to anomalies or natural disasters is not available.

Maritime Pilot

On the PACIFIC & ATLANTIC pilot we had users that they were using workflow management systems for the first time, but they were very experienced with the use of INMARSAT-C terminal devices.

Therefore the main trading effort was put on the use of the BizSmart SAT clients.

The total session time, execution time of a process, recorded during the pilot (an average of forty eight minutes) might seem to a reader as very long one it was accepted by users accustomed with Inmarsat C satellite transmission.

It is a fact that the Inmarsat C messages are not processed in a first come first served manner. The messages are put in a queue upon reception and processed depending on their priority. It is normal for messages, like the ones

sent/received by BizSmart SAT system, to have a low priority and therefore they take a longer time to be processed.

This causes the overall workflow completion time to take longer, but less compared to the execution of the workflow without BizSmart SAT.

In order to minimise the effect that this characteristic of INMARSAT – C messages has on the workflow completion time, we have made some changes on the BizSmart SAT Messaging in order to allow the execution of a process with the submission of less messages (50% reduction).

As a result of the pilot trial, Pacific & Atlantic management has decided to implement the BizSmart SAT application. This represents the first successful installation of the product.

Construction Pilot

The results of the construction pilot executed at DODONIS were considered as acceptable by the participating users. In fact, the functions' average execution time, the workflow completion times, and bytes sent /received are comparable to the ones achieved in MEDNET pilot. This shows a stability, in terms of measurement, of BizSmart SAT application in different locations with different network configurations.

DODONIS management team thought that the solution with RBGAN could be viable in their working environment in contrast to solution offered with Iridium Internet Services. The use of an Iridium satellite phone for notifications only purposes was accepted.

DODONIS remains to decide as to whether they are going to use such a solution in one of their future projects.

The use of Iridium phone as a modem has been proven problematic when it was used in conjunction with the dial up Internet service ... as «very slow». The test results had shown very high functions' average execution times, due to limitations on data transfer speeds (2.4 Kbs), resulting in unbearable latency.

Direct data Internet services provided by Iridium achieved better data transfer rates (10Kbs) making the use of Iridium phone as a modem more acceptable. The problem of «dropped calls» though remained and made the whole process of trying to upload/download documents unacceptable. As a consequence, a «file segmentation policy» has been introduced which allowed a

process to be completed without repeating the upload/download process every time a call was dropped. The solution to the problem was welcomed by the users during the trial period, increasing their overall satisfaction from BizSmart SAT.

The results showed that the functions' average execution times are considerably higher compared to the ones measured with RBGAN. Of course this is due to lower data transfer rates compared to the ones offered by Inmarsat RBGAN network.

DODONIS believes that such a solution could have advantages over solution using Inmarsat RBGAN only if the amount of data to be exchanged is not big. For example the use of Iridium direct data Internet services for transferring simple data and not for upload/download purposes could be considered acceptable.

5 Overview of the opportunity and commercial strategy

The market analysis conducted during the project verified a number of technical and commercial trends. These include focusing on process-based software development by the large software companies, a lack of satellite-enabled workflow tools, as well as increased use and reduced costs of satellite communications. Furthermore the need for workflow utilization in military, law enforcement and disaster aid agencies, as well as in maritime operations, seems to be imperative in order for the field workers to cope with the increasing complexity of their tasks and with the information overflow.

Also, the economic recession during the previous years has clarified the need to preserve existing investments in hardware and software and has been a driving force for system integration targeted at a meaningful outcome.

The launch of Hellas SAT communications satellite is providing a further opportunity for a commercial market in its first steps.

The BizSmart SAT platform aims at government, non-government and commercial enterprises, both in Greece and abroad.

The commercial strategy implementation started in Greece with government and commercial entities in the military and maritime fields respectively. The focus of the sales effort is the purchasing of complete systems for in-house development teams to implement whichever needs can be covered by such a system.

Commercial entities without their own development capacity are targeted through service arrangements with satellite communications providers, such as TELENOR and Hellas SAT.

When we will start targeting markets outside Greece, it is intended to set up a network of collaborating partners in countries in the EU and the Middle East in order to provide product sales and services to customers in these regions.

INNOVIS intends to deploy the BizSmart SAT together with BizSmart, utilizing its resources on marketing and sales.

The promotion – distribution of BizSmart SAT to the markets will be made through the following channels:

- Sales Personnel of INNOVIS
- ITEAM, an IT company that sells to the Greek Market all Innovis's products and solutions
- THERON S.A.

The establishment of new channels and the evaluation of the existing ones is a continuous process that is taking place now and will continue in the future.

This process has already initiated a very good cooperation with a new IT company established in Greece that mainly focuses on the ERP (Enterprise Resource Planning) Systems targeting the maritime industry. The purpose of this cooperation is twofold: one to create one more distribution channel for BizSmart SAT (more sales people) and second to provide a more rich solution for the end-user (customer).

According to the business plan developed during the project six additional installations are the goal for the first year after project conclusion and we expect to justify the investment on BizSmart SAT in less than three years.

BizSmart SAT Installation Example

The costs of setting up and use of BizSmart SAT for the execution of business processes are affected by a number of parameters that were identified in the operational cost model developed during the project, e.g. number of interconnected sites, network structure and topology, number of users per site, need of acquiring new user terminals or servers, chosen satellite system and service for communication, number of processes and average number of steps per process, BizSmart SAT clients used etc.

As an example for a typical setup and the related cost, the DODONIS construction pilot is taken utilizing Inmarsat RBGAN and IRIDIUM SMS for the execution of the 3-step process "Proposal of Construction Change". The differentiation is made between investment cost which occur once to setup the service and running operational expenditures.

The investment cost consisted of

- equipment of two sites (Headquarters and Worksite): 1 server, 1 RBGAN modem, 1 Iridium phone, system software (Windows 2003, RDBMS Microsoft SQL 2000) (7.500 €),
- BizSmart Sat Licence (*One BizSmart SAT Server Licence with 20 Client*)

Access Licences) (10.000 €),

- consulting services to train people and implement the service (20.000 €)

The operational expenditures included

- monthly cost fees for RBGAN (24 € per month) and Iridium (19 € per month)

- expenditures for the satellite communication of one process execution (3 steps) per day (2,30 € per day)

- expenditures for maintenance and updates (BizSmart SAT Annual maintenance and support contract) (1.500 €).

This cost makes the solution very competitive against traditional networks, especially when the customer takes into consideration the benefits of having his processes running smoothly under any situation and environment.

6 Conclusions

We started BizSmart SAT project two years ago with the submission of the summary of our idea to ESA's start up project initiative and after hard work and the cooperation and assistance of ESA, our idea was realised and BizSmart SAT is now available to the market.

Through the successful execution of the three pilots (maritime, health-insurance and construction) it was made clear and evident that with **BizSmart SAT**

“the execution of tasks and process steps anywhere in the world, irrespective of the communications device the task assignee has access to”

is a reality.

Although only Iridium and Inmarsat were used as satellite communications networks within this project, our product can operate in any available satellite network. To provide evidence on this subject, we will continue the pilot trials and tests after the end of the project with other networks. As a first step towards that direction, we have already tested successfully BizSmart SAT with Hellas SAT.

The marketing of BizSmart SAT will start from Greece after the end of the project. During the first three years we expect to break even assuming a conservative scenario of sales.

We will monitor very closely the market in order to make all the necessary adjustments to our plans and to benefit from the versatility of our product that allows us to adapt to market changes very quickly and efficiently.

Now, all the effort will be put in the promotion of BizSmart SAT into the market through the established distribution channels and to the evolution of the BizSmart SAT in order to fulfill more requirements of our customers.

As a closing statement, we have to state that ESA's Start Up Projects initiative gave us the financial and technological opportunity to develop a product that can address a number of new and lucrative vertical markets and our status as a contractor of ESA gave us a substantial marketing advantage that will open commercial doors for a long time to come.