

Cyber work in Energy Planning and Sustainable Development

Ricardo Alexandre Veiga Gimenes¹, Miguel Edgar Morales Udaeta², André Luiz Veiga Gimenes³, José Aquiles Baeso Grimoni⁴

Abstract - This paper presents a virtual desktop implementation process on the subject of the energy economics and planning (within the relationship energy-environment-sustainable development), named CyberWork, meaning the full application of IT for improve the performance of an energy group. CyberWork, defined as the simultaneous development of projects within a team in case the energy engineering and economics area, independent of the place and/or timing location of its members. It is necessary to have a centralized and automatic administration of the information, with distributed handling, with the due consideration of security limits. CyberWork eases the accomplishment of tasks by the team, independent of the geographical or temporary location of its members that composes it. A dedicated Server has been developed within a solid base that assures platform and technology independence. The necessary resources have been assembled and tested in available machines. An initial result is the fact that there were not rejections or restrictions by the local NET administration. Another result is the current operation of Seeds Server, restricted to the members of the team, while open to the use of the general IT tools. Those technologies have been applying for a interacting environment with specific software like L.E.A.P and Decision Lens between the whole team. It allowed working constantly in-group even the members living in different cities.

Index Terms – Cyber-work, Cyberspace, Virtual Interaction, teamwork.

INTRODUCTION

The proposal of that kind of convergence to the using IT facilities goes inside the GEPEA –Energy Group of PEA (PEA is the Department of Energy and Automation Electric Engineering of Polytechnic School at University of São Paulo). More specifically and initially in a restricted way, the CyberWork was addressed to be experimented in the staff of SEEDS (Chapter of Studies & Strategies in Energy and Sustainable Development) a team of GEPEA, guided to the energy planning and environment and sustainability.

Is good to know at this time, that the GEPEA was constituted in 1992, as an energy group of teachers, researchers and graduate students of PEA in the Polytechnic School of University of São Paulo, involved in energy and environment researches. The objective of GEPEA is to develop and to motivate the use of techniques for the application of power interrelated with the concepts of sustained development. The main goal of the group is the development of researches on the efficient use of the energy, the decentralized generation using renewable sources of energy, rural electrification, co-generation and the institutional and partner-environmental aspects related with the energy, all contained in and defined as integrated energy resources planning. In this context, the group presents multidisciplinary characteristics, should act in the global scenery in several ways of energy and their socioeconomic and environmental relationships.

Looking at the IT subject, can be said that the unrestricted access to the Internet stimulated and created needs before impossible regarding the traditional way of work. To exemplify those new needs better, the programs like MSN and Skype allows a person to communicate and change given directly with other without having to interrupt the work with phone calls.

Concisely, the Internet generated the needs, but it didn't satiate them. Then, starting from those new possibilities, it intended the development of CyberWork. As it happens in most of the software, applications developed for generic use impose a lot of limitations. In that way, the idealization of the Server appeared to break these barriers. Then the development and use of Internet to control, popularization and centralization of Information, restricted to the workgroup or open to anybody with Internet access, become possible.

For the Cyber Work's accomplishment, the following phases were generated: Base of the Project, where it was made the study of the available resources and which would be necessary to obtain; Server Seeds that is the necessary physical Base installation, considering the computer that works as Server and their peripherals; System Manager of Information, that is responsible for most of the project, where it will manage all Workgroup's Information.

The main objective of this paper is to show the work's virtualization in the energy industry fields denominating CyberWork and in this was developed within a specific case for the SEEDS team, a chapter of PEA's Energy Group

¹ ricardo.gimenes@poli.usp.br

² udaeta@pea.usp.br

³ gimenes@pea.usp.br

⁴ aquiles@pea.usp.br

Grupo de Energia do Departamento de Engenharia de Energia e Automação Elétricas da Escola Politécnica da Universidade de São Paulo

Av. Prof. Luciano Gualberto tr. 3, 158. Cidade Universitária. CEP: 05508-900. São Paulo – SP, Brasil.

Fone: 55 – 11 – 30915279. Fax: 55 – 11 – 30323595

(PEA is the Department of Energy and Automation Electric Engineering). For these a work tool –hardware & software optimized is necessary. This tool includes a Internet connected Server with own address, and own developed software, making possible the information handling (Information Manager System –SiGI). The adopted methodology has considered the necessary specification resources, an evaluation of the available physical resources, the server evaluation and the SiGI definition.

The server is in the SiGI stage development, and its operation based on freeware software. The most used services are FTP Server and WWW Server. The workgroup information storage is located in the server. One of the services is the information share using a browser, through the access to pages on the server.

In the data share procedure, the source document is recorded in the Server, in a public area, containing a directory with the addressee's name, activating the transfer process. The Addressee receives the data and after using them, he or she can send them again to the other members, with the same procedure. The main point is the work in team without geographical and time and space limits. People that don't belong to the Cyber Workgroup usually use the restricted data access, using a page Web.

When SiGI is analyzed, is observed that CyberWork assists and enhances the in-group work, even in the intermediate development stage. The information share among the workgroup is not dependent on their members, once it is 24h available in the server. The system inclusions are still controlled by the operational system resources, however this will be developed in independent modules allowing larger flexibility.

The information control using Web pages depends on the SiGI development under the hole IT facilities. Due to implementation complexity, SiGI is a stage still not concluded (perhaps it never will conclude because the IT are constantly innovating), however it will provide a better form of CyberWork. It will look for the virtual desktop, always containing all available information of the workgroup.

THE SERVER BODY BOUNDARY

After a lot of meetings and tests accomplished for the NET, the starting point was defined: Creation of facilities (computerized and automated) to activate the communication and change of information among a certain workgroup (current focus: SEEDS) making possible the complete use of the cyberspace.

The Figure 1 presents the NET's logical structure where the CyberWork is defined.

Some components are explained with more details.

Main Bus: through CCE, PEA receives Internet access. This access is distributed evenly among all computers. In other words, there is no blockade between CCE and a local computer. This model (in logical level) of Network structure is called Bus. The independence of the machines can be ended as for it access with the Internet. Therefore, if any one be turned off, as much PC's as the Servers, the connection continues working.

The connection of the Residential Computer with the server is the same used to have Internet access through providers, like America On Line (www.aol.com).

The Workgroup, to exemplify, would be as the computers of PEA, interconnected and belonging to specific groups (PEALIST, GEPEA, LMAG). They are defined to facilitate the location of a specific machine, but in logical level, all are in the same NET.

The Server receives this name because exactly it provides services, differentiating it of the other computers. The server of PEA, named PILAR, offers only two services: e-mail and Web provider. By the other side, The Server Seeds, of SEEDS, should be responsible for all services and mainly for SiGI –Information Manager System. The CyberWork is developed through tools used for accomplishment of tasks needed by the user, without he or she worries about what happens internally. Such tools are: Dialed Line Server; E-mail Server; Web Server (the whole project SiGI will be developed with interface Web, soon the pages in HTML should be stable and safe with a clean and objective look); Automatic Backup; FTP Server; SAMBA Server; Execution of Softwares Remotely.

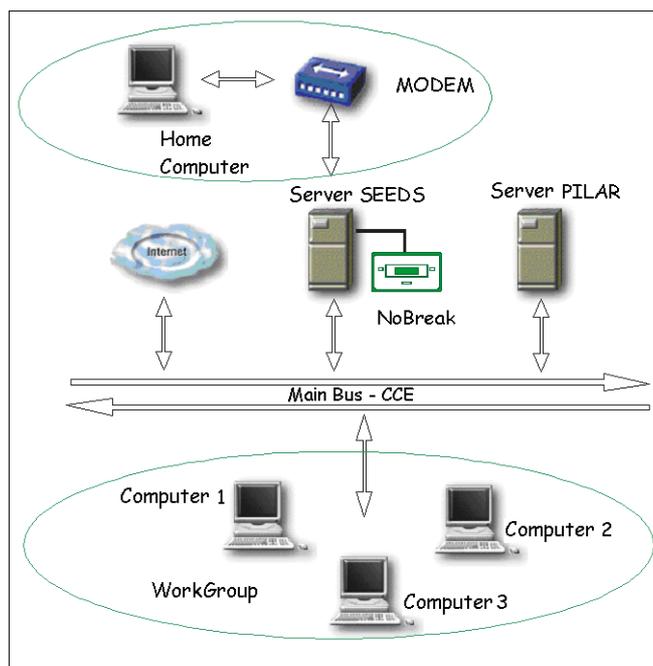


FIGURE 1
THE NET'S LOGICAL STRUCTURE FOR SEEDS

THE FRAMEWORK OF SiGI ARQHITECTURE

After defined every work platform, can be thought about the main focus of the project, that is exactly The CiberWork. That implicates in the structuring of the SiGI's body.

The development of SiGI requests a study of types of information to be manipulated: Free Access, Restricted and Dynamic Files.

The Free Access Files are any information that anyone want to publish for the largest possible number of people. In this category are classified Web pages, the researchers' publications, newspapers, study aids, etc.

The Restricted Access Files depend on special authorizations, being in specific areas of the Server, following the Intranet principle.

The Dynamic ones, usually generated in the moment that are requested, work as the electronic newspapers, that, based on a database, the pages are created for the Internet according to the need. For the case of SEEDS, it can generate documents that they are updated in pre-certain periods, resulting newspapers that they can be sent through e-mail, being every automated process.

Flexible and Fixed documents are divided in two categories, both classified and available according to its content. Like this, the flexible ones will be accepted several users' dynamic updating, making possible more efficient work of generation and creation. The Fixed ones would be Magazines, Newspapers, Papers, that could have its access, according to the content, free or restricted, however, they could not be modified.

Also, the executable files to accomplish tasks remotely are part of SiGI, using the Server's processor capability. In this item, the Server, like WWW, FTP or E-mails and Database Server, frames every available service. However the objective is to make available other programs like LEAP (Long Screeches Energy Planning) and Decision Lens, for remote execution.

User Interface's Approach

After structuring the basic organization of the information, it is due, then, to structure a communications way the most practical and friendly possible.

The web space SEEDS should work as a portal for the access information facilitating the work in team, enlarging the possibilities in relation to the change of files only saw in FTP.

The Great challenge of creating a Portal, however, is to define which development tool should be used. The market offers several options, with their respective advantages and disadvantages, where some of these options were studied.

For best to illustrate the accomplished studies, the necessary components to produce a Portal with dynamic content are described in the figure 2.

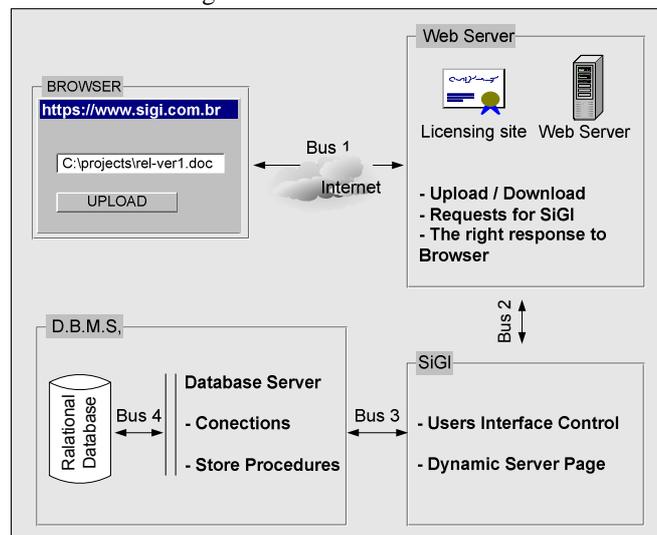


FIGURE – 2
VIRTUAL SPACE OF DYNAMIC CONTENT

CONSIDERING THE CYBER WORK CONCEPTS

Now it is observed in the companies a growing rhythm of information due to new implementations of computer systems and digital documents with the objective of reducing the paper work, to receive and to send data with maximum speed and precision, and to make available the information in a middleware that is made present more and more, day by day, the Internet. It should be emphasized that every information (it is given, images, etc.) possesses an origin, and the time used for location and organization becomes the bottle mouth of the communication process. To take as motivation, Bill Gates has written in Company in the Speed of the Thought: "Convert each paper document in a digital file and you will turn your company more competitive". The administration of digital information has a crucial point in nowadays.

In Brazil more and more the IT should follow the same world tendency observed by specialized institutes like Gartner Group that appear in their researches a high growth of the investments in data storage areas with solutions more popular such like Storage Area Network, Data-Warehouse and Data-Centers (all these, great repository of information). In general that market involves companies of medium and big load disposed to invest more than \$20.000 in treatment solution and data storage.

When there is developing projects, a methodology or a standardized coordination is not used, causing work repetition and efficiency loss. Each Manager of Project chooses his or her own road and the company's patrimony is dispersed among folders of people's computers that will never be used again.

The information is a valuable patrimony since this is properly organized and easily available for the development of new projects, analysis of productivity reports, study of products reports (it can be discovered lacking areas of investment inside of a specific section) and all of the uses that it allows. Information should be understood as any kind of document type, data, images, projects, etc. that are part of the knowledge patrimony.

Commercial solution of cheaper packages are options usually used, such as the implementation of a small based NET in Microsoft solution for companies, Windows NT/2000, connected with a database server that manages the traffic of data and guarantees its integrity. Many of those solutions don't possess appropriate devices to provide safety and security. Usually, that care type not even is taken into account.

The New World of Information

To standardize the concepts discussed in this paper, it is presented the meanings used for the most important terms in this work: Data: Any storage form, independent than there is stored; Information: Data flow, with attributed meaning, available in Media; Knowledge: The Result obtained by the Interpretation of the analyzed Information.

With the communication facilities offered by the new technologies, the society, including all means of production, with or without lucrative ends, faces conditions more and more complex of development. Today there is the need of

products with larger quality and more content, however with smaller costs and time of production. That factor is fundamental for the success (or fail) of any wanted objective, just as an improvement in the manufactured production, a technical proposal or engineering projects. All these communication facilities with the time of popularization tending to zero, do with that some products have a short life period. This volatility of the market generates needs of information always faster, updated and reliable possible.

The race for the instantaneous information generates a gap in the knowledge base on who uses it, therefore, a lot of times, there is no concern of storing, but only to use what was obtained in a certain instant of time. Like this, one of the points to explore in Internet is the lack of a storage system and appropriate flow of Information.

To describe the problems of shared information, in spite of it was never easy to accomplish such task, a model of cells is used. As first step, it should imagine an individual, employee of any company, as a cell. This employee should be the most productive possible. So, the employee should be always updated with the innovations of his or her specialty. This cell is beside other similar, where, in the course of time, there is no space for all. This logic generates a competition and consequently the break of the data flow. All Information becomes a negotiation coin in this moment. These cells are inserted in other larger ones as departments. Following the hierarchy can be observed: person → department → branch → competitive companies → competitive states → countries. The beginning is the same for any hierarchy level: all should guarantee the own survival trying to be better whenever there is competitive. This beginning should be preceded since the opponent contestant is identified correctly. However, this process promotes the break of information flow improperly among allied potentials seen as competitive.

One of the proposals for CyberWork, is to discuss work methods and productivity, in the energy planning area, that it explores all potential of information flow, always looking forward to the search of a reliable knowledge as a whole and not only the punctual and volatile knowledge.

Defining the CyberWork

To understand the foundation of Cyberspace proposal applied to the work, the study focus is information flow in a virtualization process of work in the Energy with the Environment and the Sustainable Development Area. Like this, CyberWork, defined as the simultaneous development of projects in team, independent of the geographical or temporary location of its members that composes it.

It is necessary to have a centralized and automatic administration of information, with the distributed handling and the unrestricted use of the tools open of IT, but always respecting the following requirements:

- Availability: the information should be available whenever requested
- Integrity: After the storage of the document, this should be entirely available, in the same way that was become created.
- Reliability: The documents or data should be stored so that the content has validity, the central administration

cannot allow entrance of information without pre-certain criteria

- Authenticity: the origin of the documents should be guaranteed, avoiding problems of contents.
- Safety/Security: the information should possess prevention mechanisms, as backups and also control of who and which data type can have access.

It is important to point out that these requirements are independent of the digital technology, in spite of this way is the most popular way to spreads information.

Cyber Work's Services

- Electronic mail (E-mail): most common Service used in the Internet, that allows change of written messages and the sending of files, in any format, enclosed to messages. For being an asynchronous communications form, easy to use, it allows the received messages to be analyzed carefully before they be answered, providing a type of more balanced interaction among the actors of some project, respecting the work division.
- Lists' Groups: based on the electronic mail service, therefore it possesses the same characteristics, without the need of additional resources. It facilitates the broadcast communication where a sender can send the same message for a certain group of people (the list)
- Newsgroups: A similar service with the Lists' Group, however the messages are not sent for mailboxes. Instead of that, they are stored in a special server. The messages are hierarchical stored, in agreement with discussion lines, facilitating the registration and attendance of the several subjects.
- File Transfer Protocol (FTP): This service allows the transfer of files between a server and a user's computer. The transfers can be made in the two ways: from server to user (download) or from user's computer to the server (uploading).
- World Wide Web (WWW): it almost integrates all the other services through a friendly graphical interface that it combines pages with hypertexts (linked words to other pages) with multimedia (hypermedia). It allows the visualization of pages containing formatted text, images, animations, video and sounds, besides interactive programs (Java, Javascript, plug-ins). It is an asynchronous resource, however, depending on the service that is implemented on it, can have synchronous characteristics.
- Video/Audio on Demand: they allow to watch, to videos (or only audio) previously recorded and stored in the server. The user has controls similar to the found in a cassette video. With the streaming system, the user doesn't need to carry the whole video/audio file before beginning to watch, optimizing the time of wait, mainly with slow connections.
- Chat: it is a service of synchronous communication to share written messages. It can be implemented through a specific program or to be integrated in pages web.
- Video conferencing: synchronous communications system that allows the users to communicate through audio and video. It requests use of special devices as video camera, microphone or special equipments for

compression and codification of transmission/reception protocols.

- White Board: this service implements a tool through which several users share a "White Board" one where they can draw, remotely to write, to insert images, to do annotations, etc., at the same time. It is a form of synchronous communication that uses special software, usually found integrated with other tools (chat, voice and video) like NetMeeting (distributed freely with MS Internet Explorer).
- Remote control: this service allows an user to control the sharpener and another user's mouse buttons remotely, receiving a copy of the controlled personal screen computer simultaneously.
- Internet Phone: it is a tool that allows the voice transmission through the Internet. The quality of the transmission depends on the speed connection. It requests special software, microphone and sound card (low cost).
- One Way Bus: they are systems of broadcast video that there is no interaction among participants. It can be synchronous or on demand. They demand cheaper facilities in relation to the system of bi-directional way bus.
- Bi-directional Way Bus: they are video systems that allow interaction among the located participants in distant rooms equipped with cameras, monitors, microphones etc. They are still relatively expensive and they demand connections of good speed.
- Teleconferencing: it assures communication in group, between two or more locations, sharing visual and acoustic space. The main characteristics are: System of audio/video transmission received by an or more places simultaneously; It makes possible to reach a great audience; It avoids people's displacement, reducing transport costs; The interaction can be made by internet, telephone or fax; It demands studios and investments for generation of programs in equipments and teams for production, generation, transmission and reception; The transmission uses several physical means, as satellite, optic fiber, connection of microwaves etc.
- Traditional Paper: it is the traditional text, technical report, administrative order, still very important in any work process.

Critical factors of Success in CyberWork

Considering the project as a system that will manage the whole knowledge of a team, it should offer changes in the work form. These changes define critical factors of success of CyberWork:

- Existence of Internal Sponsor and Systematic Support: the need of political and financial support is fundamental, because it happens mainly a change of work philosophy, needing a fort support of Decisions Makers.
- Technical Capacity and of Knowledge: Qualified Team for implementation and direct use, from the technical level to the human resources level.
- Incentive to the Holistic Development of Work: Generating roads to use the new middle of work and

adapting tools, the involvement with new technologies becomes less traumatic.

- Incentive for Work in Team: The work in team forces the share of information. If this share is facilitated by the system, with the time, the dependence for the digital change of data is inevitable.
- Regards of Work: regards the use of procedures, documentation patterns and process of sharing information, it increases the interest of those involved and besides of the more skeptics
- Cultural change: Knowledge / Resistance / located Personal Competences
- These changes of work style two types of reaction are observed: The ones that adapt and enjoying the new resources quickly, with some resistance for practice lack; the ones that offer resistance and they demonstrate distrust.

However, as observed in companies involved in IT, this number of people is the minority.

For the implementation of these resources, there is the need of a work tool optimized, that it includes a Server, the Seeds, with own IP address, connected to the Internet, and proprietary software, making possible the Information Manager System –SiGI.

Process of Implementation

Server Seeds is in the phase of development of SiGI, where its operation is based on freeware software. The main used services are FTP server and Web server. The members' storage information is located in server. It also happens the share of data using a browser, accessing to specific pages, directly to the specified information.

The sharing data procedure, the source document is recorded in Server, in a public area, where the folder have the addressee's name, activating the transfer process. The Addressee receives the data and after using them, he or she can send them again to the other members with the same procedure. The main point is the work in team without geographical and temporary limits. The access of data, without change, using a page Web, is usually used for people that don't belong to the workgroup.

Analyzing SiGI, it is observed that CyberWork favors the work in team, even in initial phase of development. The sharing information process among the team is not dependent of their members, once it is 24 hours available in server. The storage information is still controlled by the operational system resources, however this will be developed in independent modules allowing larger flexibility.

The information control using web pages depends on the development of SiGI. Due its implementation complexity, SiGI is a not finished stage, however it will provide a better form of CyberWork. He will look for the desktop virtualization, always containing all of the workgroup's information available.

CONCLUSIONS

CyberWork, trying to improve the flow of information and knowledge among the people, it should explore that this flow of information happens. This way, the first stages were already overcome and the area is prepared for new investments and studies. There is still a lot to do, needing that more efforts are necessary to finish whole wanted stages. The main conclusion to consider is the fact that CyberWork is completely possible. And its development is a process in real time and dynamic interaction among implementation, work tools (Software and Hardware) and the own accomplishment of CyberWork for our team.

From these results and their importance for CyberWork materialization concepts, can be concluded that CyberWork is viable, and its development is a process in real time with dynamic and virtual interaction with the implementation, the work tools and the CyberWork team.

- [1] ANDERSON, R.; FRANCIS B.; HOMER A.; HOWARD R.; SUSSMAN D.; WATSON K.; "Professional ASP.NET"; WROX Press, 2001.
- [2] DAUM, B., HORAK C.; "The XML Shockwave"; Software AG, 2000
- [3] HADDAD R.; "C# - Aplicações e Soluções"; Érica Press; 2001.
- [4] HOMER, Alex, SUSSMAN, Dave, FRANCIS, Brian; "Professional Active Server Pages 3.0"; Wrox Press, United States, 1999.
- [5] LIBERTY, J., KRALEY M.; "Aprendendo a Desenvolver Documentos XML para a Web"; Makron Press; 2001.
- [6] PRESSMAN, R. S.; "Software Engineering: A Practitioner's Approach"; McGraw-Hill Press, 5a. Edition, United States, 2000.
- [7] SOARES, L. F. G., Lemos, G., Colcher, S.; "Redes de Computadores: Das LANs MANs e WANs às Redes ATM"; Campus Press, 2a. Edition, Rio de Janeiro, 1995.
- [8] SANTOS, EDUARDO T., RODRIGUES, MARCOS; "Educação à Distância - Conceitos, Tecnologias, Constatações, Presunções e Recomendações" – FEA-USP, June 1999.
- [9] SALOMON, AUGUSTO – "Comunicação é a alma de uma empresa" - agosto@gasbrasil.com.br
- [10] PATIL, SAMIR; SAIGAL, SUNEEL - "What are Web services? Why should you care?"
The McKinsey Quarterly, 2002 Number 1, Web exclusive
- [11] O Napster nas Empresas - InfoExame Magazine
Year: 2001 Month: January, pg 118
- [12] O Java Decolou? - InfoExame Magazine
Year: 2000 Month: Agosto, pg 116
- [13] A Fase adulta do SQL - InfoExame Magazine
Year: 2001 Month: October, pg 166
- [14] Linux Documentation (How-To's, FAQ's). in
<<http://www.linuxdoc.org>>.
- [15] Cisco Networking Academy Program - Semester 1 -
Online Curriculum
Release Version 2.0, 1999

[16] Seminário Nacional Da Gestão da Informação e do Conhecimento no Setor de Energia Elétrica, abril de 2001. in
<<http://www.sinconee.com>>.