

## eJDS: Free On-line Access to Scientific Knowledge

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### **Abstract**

This paper discusses a concrete attempt to bridge the digital divide by applying low-cost open source information technologies to allow developing-world scientists to search and download selected scientific articles using e-mail only and/or via Web/e-mail gateways. The free eJournals Delivery Service (eJDS) of the Abdus Salam ICTP is introduced ([www.ejds.org](http://www.ejds.org)), which is made possible through agreements with several important scientific publishing companies and societies who provide the eContents for free. This successful model could well be adopted for the alternative delivery of eBooks and expanded to other disciplines beyond physics.

### **Introduction<sup>1</sup>**

The exchange and transfer of knowledge and technology available on the Web is also possible using e-mail only -*still the most popular communication media*. For example, the recent implementation of the eJDS- *eJournals Delivery Service* [1] is geared to facilitate access to current on-line scientific literature based on the *www4mail* open source software [2] which allows the user to navigate and search the whole Web via e-mail only. The eJDS is being developed for scientists in institutions of least developed countries, where low bandwidth Internet facilities do not allow the researchers to download scholarly material in a timely manner and/or is cost prohibitive. The implementation of eJDS is a concrete example of using low-cost information technologies to reach a global community.

Scientific competitiveness and presence in a globalized world - especially from rural areas - requires infrastructure, access to the Internet at low cost, and targeted, free services like the eJDS. We believe this successful model could be expanded to other disciplines beyond physics, and could also have a positive impact on the alternative delivery of eBooks.

### **Browsing by e-Mail**

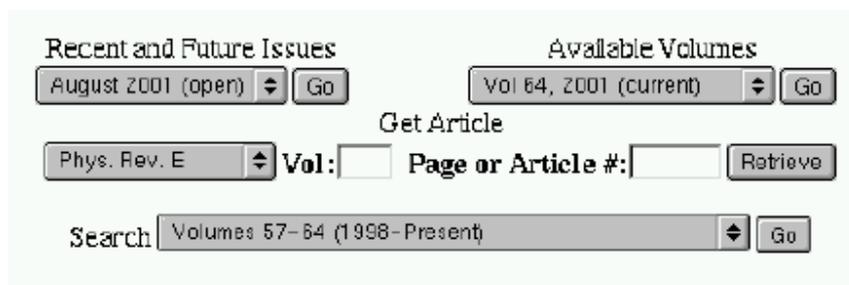
A *www4mail* server can deliver fully functional Web pages -without graphics or with buttons that link to images/graphics upon e-mail requests [2]. It can return a plain text version of an HTML page, if a user so requests, but it is best suited when used in conjunction with a Web browser working in off-line mode.

Access to the *www4mail* servers can be controlled by parameters such as maximum quota per user, maximum file size, and so on. It also provides access control lists (ACL) under which certain file types can be denied. Dynamic content filters can scan Web pages for keywords and phrases associated with inappropriate material before delivery to the end user via e-mail

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<sup>1</sup> Paper based on presentation at EURASLIC 10, Kiel, Germany, May 2003.

eJDS is an actual application of www4mail. Within eJDS, subscribers can send e-mails to a dedicated www4mail server in order to retrieve current published scientific literature. Users simply write in the body of the e-mail message a single URL that points to a Web page listing the eJournals from one of the publishers participating in the programme or just write down a simple option like 'MYPUBS' if they have direct access to Internet. The eJDS automatically replies with the requested information as an e-mail attachment (as in Fig.1).



The screenshot shows a web interface for a search engine. At the top, there are two sections: 'Recent and Future Issues' and 'Available Volumes'. Under 'Recent and Future Issues', there is a dropdown menu showing 'August 2001 (open)' and a 'Go' button. Under 'Available Volumes', there is a dropdown menu showing 'Vol 64, 2001 (current)' and a 'Go' button. Below these is a section titled 'Get Article' with a dropdown menu showing 'Phys. Rev. E', two input fields labeled 'Vol:' and 'Page or Article #:', and a 'Retrieve' button. At the bottom, there is a search bar with the text 'Volumes 57-64 (1998-Present)' and a 'Go' button.

Fig.1: eJDS example reply by e-mail attachment of the search engine of a Physics eJournal

The eJDS procedure to follow is similar to that used when connected in real time to any Web server but the protocol used is SMTP. The user fills in the appropriate search fields within the publishers' search engine and then select their GO search button or simply download any on-line article (usually in PDF format). All sessions are logged by the server.

The eJDS has been operational since January 2002. Several publishing companies have joined the eJDS programme, including *Academic Press, Elsevier, the American Physical Society and World Scientific*, with rules defined by each publishing company. Other publishers are being considered for inclusion in the project. Under the present arrangement between eJDS and the participating publishers,

- developing world scientists have access to a much wider range of current scientific information and findings than ever before.
- Publishers are able to reach researchers who would otherwise not have either the technical or financial means to access information from their journals in a timely fashion.

To subscribe to eJDS subscribers need to

- Obtain a copy of the eJDS application form via e-mail (available in different on-line formats) or in printed form included in the eJDS Manual given to scientists upon request.
- Complete and sign such application form (own signature and e-mail address is required). This is a one-time process.
- FAX or post the signed application form to the ICTP/TWAS Donation Programme. After receiving the approval via e-mail and full instructions, the

scientist is then invited to use the service freely.

The few IT tools that a subscriber needs include

- Any e-mail client program to handle received file attachments, such as Eudora, MS Outlook Express and Pine.
- Any standard Web Browser, (such as MS Internet Explorer, Netscape, Mozilla, Opera or Lynx) via a e-mail client that pass 'Subject:' and/or body contents to an e-mail program working in off-line mode with the ability to send e-mail in addition to the e-mail address. Alternative options are available for Yahoo-like users.
- A PDF (Portable Document Format) or PS (PostScript) Viewer, such as the free 'Adobe Acrobat Reader' and 'xpdf'. PDF files are usually used for articles, to preserve the original printing appearance on-line. Alternatively, for PostScript versions of an on-line article, a PS viewer such as 'Ghostview' is needed.

### Restrictions and Options

Although eJDS is a free service, it will not give access to Web sites or on-line documents that are not in the list of allowed eJournals or to those eJournals in which an eJDS user has not been granted access. The configurable *Access Control Lists* (ACL) consist of 2 levels of control, one to deny/allow access to some particular copyrighted Web sites, and a second to give access to authorized e-mail addresses only (subscribers list).

There is no limit to the number of scientists from a given institution that can apply to eJDS. However, there are limits to the usage per week. The assigned *User Quotas by Publisher* sets limits to the number of articles per e-Journal that can be accessed each day (3), month (12) and year (100).

If a user exceeds the (daily, monthly, yearly) quota, the eJDS server will inform them with a '503 Error Message - Service Unavailable (quota finished)' and will stop answering requests. It is possible to check at any time the given quota via e-mail using, *e.g.*, the 'XMYQUOTA' option.

There are many other specialized options for optimizing the use of eJDS via e-mail, *e.g.*, setting the language and character set, allowing links for images, *etc.* A complete list is discussed in the *eJDS - User's Manual* [1]. Main options include: Message Splitting Upon Request, Retrieving Any Part of a Split Message, Uuencode Messages, Graphical Snapshots of Web Pages, Retrieving HTML Sources dealing with Long URLs, *etc.*

Within the first year of the eJDS programme, the number of individual scientists subscribed to the service was over one thousand, from which about 48% access the Internet via free e-mails accounts like Yahoo and Hotmail services. Of this total, the effective users today count for 25%. As an example of usage, in Fig.2 the number of requests from the most active eJDS users are displayed by country.

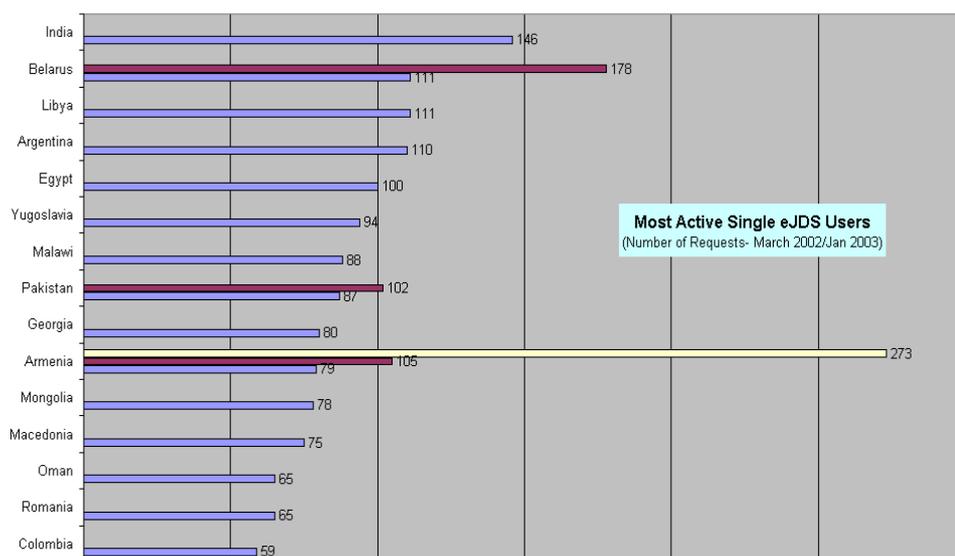


Fig.2: Most active eJDS users

## Closing the Digital Gap

The www4mail software has evolved rapidly thanks largely to extensive user feedback, which has led to many enhancements and new features. Since 1998, the goal of www4mail has been to help bridge the digital divide and transfer knowledge and technologies to remote regions for free. This gap is actually being quantified by the eJDS Team in collaboration with the PingER-SLAC project using recent real time network monitoring measurements [4].

The eJournals, Web pages and articles retrieved or the search results obtained using eJDS (as attachments) can be stored in the computer and re-used at a later time; this includes tables of contents, articles retrieved, or the search results. In this way, both **time** and **bandwidth** can be **saved** by re-using the same Web documents and making selections of articles anew and off-line from anywhere in the Internet.

It is possible to configure a www4mail server to permit or deny access to some pages based on URLs or to entire sites based on domain names and IP addresses. Also, the servers can be configured to answer only to a closed set of users (a private server), which may be used by organizations or to set up private eJDS services. The configuration of a www4mail server is so flexible that it permits the variation of configuration parameters on a user-by-user or resource-by-resource basis.

In addition, www4mail can handle cookies, redirections, refresh, frames and also preserves Web contents, language, and style. Its future success lies in its proven ability to meet the demands of an ever-more complex operating environment –such as dynamic (one-time) content, multimedia elements, secure servers, or XML.

A key idea in implementing www4mail is to preserve as much of the layout of a Web page as possible - as originally written by the Web authors. It is designed to replicate, as

closely as possible, the experience of browsing the Web via a full Internet connection - including the search of on-line and secure transactions via https.

Interestingly, www4mail has also options to set file size limits (*e.g.*, of less than 300kB). Hence a user can request to split messages into files of smaller sizes by using the 'GETSIZE' command. When the server replies to this command, the requested Web document is sent in different e-mail attachments which can be combined to put back all chunks together (*e.g.*, with Unix 'cat' or DOS 'copy' commands). This allows the user to retrieve large documents in conjunction with the 'GETPART' alternative option for retrieving any single part.

This opens the way for new and challenging applications of www4mail. Because of these important features, it is feasible to expand the present eJDS ideas to other subjects besides Physics and Mathematics and to apply it to the world-wide delivery of eBooks. Most recently, eJDS also offers to scientists in developing countries a Web/e-mail gateway to retrieve PDF sources via e-mail upon request while navigating Internet eJournals with any standard Web browser connected to the Internet.

## References

- [1] eJDS – *eJournals Delivery Service* at <http://www.ejds.org>
- [2] www4mail – Web for e-Mail Project at <http://www4mail.org>
- [3] Cerdeira H.A., *eJournals Delivery Service: an email to Internet experiment*, Learned Publishing **15**, 175 (2002).
- [4] Canessa, E., H.A. Cerdeira, W. Mathews and L. Cottrell, *Monitoring the Digital Divide*, at <http://www.ejds.org/smr/lajolla>