NURSE: A Case Study. Just How Useful is a Subject Service?

Introduction

The World Wide Web (WWW) and gopher services have mushroomed in the last year, especially the former. These servers are mainly created for two reasons :−

- Campus Wide Information Services (CWIS). The aim of a CWIS is to provide an information service for an institution, which typically gives local (e.g. departmental) information, and links to other sites and information services (libraries, directories etc.).
- Subject Specific Services. Users interested in a particular knowledge domain are given access to information on the subject, and links to institutions which maintain databases or other resources are incorporated into the service.

This paper looks at the very different uses to which the two distinct types of service are put, concentrating on subject servers, and explores whether these uses are being addressed in design strategy. Potential improvements in setting up such services are suggested, based on monitoring log files and surveying users. The log−files of the servers were analysed with the help of statistics programs written in PERL GopherReport−v.2.0 written by Eric Katz and wwwstat−0.3 written by Roy Fielding. The programs available for analysing the server logs are in the public domain, but needed to be adapted for the particular purpose required. Ideally one should have a program that analyses and compares different log files from WWW and gopher, and although some such programs exist they were not found to be very robust and therefore useful.

If the servers are useful, users will access them repeatedly, and it will be instructive to determine whether this is the case. Currently user identification is not implemented at Warwick, so one can only tell that a particular host accessed the server. This is not helpful as an individual user may use several different hosts, and a host may be used by many individuals. User identification will be implemented on both servers in the future to help determine the utility of the services.

Utility of Servers

Enthusiasts of wide area network information services imagine that if one sets up a server for a subject that is important, and has not previously been adequately served, it will be useful and used. This does make certain assumptions which it is best to make explicit :−

- Need. Is the service really needed? Or are current resources able to provide the information and contacts the user requires?
- Visibility. Do the potential users know about the service?
- Access. Can the potential users gain access to the relevant service? This involves:
    - Network access. Are the users connected? Typically this means to the internet.
    - Do the users have the relevant software (servers and/or clients)?
- Ease of use. Can the potential users of the service actually run the access software?

Case Study: The NURSE Service

The NURSE service is presented as a case study to illustrate the difficulties and potential solutions to these issues. NURSE is a new service, the gopher server has been in operation only since later Summer 1993, and the WWW server appeared a few months later. NURSE was the first gopher or WWW service to specifically address nursing, so there was some difficulty in establishing what it should cover. NIGHTINGALE is the second gopher server dedicated to nursing, based at the University of Tennessee, and these currently are the only services of this type on the internet.

Other subject specific services will have similar problems, but may have some specific differences. Other services are compared and contrasted with NURSE in this paper.

The actual files and directories users accessed are logged, and these may be analysed to determine what files and directories are accessed, and how often. As explained below this does not necessarily give the appropriate information to determine the utility of the service, and a survey was needed to further investigate the requirements of the nurses using the service. A pilot survey was therefore launched to provide some ideas and concepts. While small and unrepresentative of nurses at large, it provided

valuable information which may be used to design a larger survey.

Log Files

The logs for the weeks covering February 27th to April 9th 1994 were analysed. Logs for both the WWW and gopher servers were compared.

Initially the logs were analysed week by week, but the trends were very similar so the logs were aggregated over six weeks, and unless specifically stated otherwise all the figures below are for the entire six week period aggregated (not averaged).

WWW Server Logs

The logs for the six weeks are combined, and the domains seen to have accessed the WWW server are shown in Appendix 1, from which it is seen that, if one ignores the local transfers (which are probably mostly an artifact caused by testing the server by the author) then 13.4% of the files were accessed from UK sites (other than Warwick), 43.0% from US sites, and the remainder from Australia, Canada or Europe. So large areas of the globe are not represented at all, though South America (e.g.) does have significant internet access. Looking at the individual weeks showed no great change in the frequency of domains accessing the servers.

Gopher Server Logs

If one looks at the gopher logs for the same period, again after removing local accesses, one sees that 3.5% of file accesses are from UK sites other than Warwick, and the vast bulk, 96.5% from sites outside the UK. If one looks at the number of host connections (as opposed to the files they access) then 92.1% are non UK sites, so for both gopher and WWW the vast majority of hosts accessing the system are from other countries. This is to be expected as the service is not specifically a British one, but merely happens to be located at a British site.

As in the WWW logs, almost all connections were from North America, Europe and the Pacific Rim. It is very noticeable that South America, most of Asia and Africa are not represented. This is not unexpected, as these are the areas (especially Africa) that are very poorly served by the internet, though email access is widespread in these areas, with the exception of Africa where even this cruder form of access is commonly unavailable. It is not typically remarked upon, but here we see yet another example of the rich/poor divide which affects virtually every aspect of life on the globe.

As most of the material for the NURSE service is stored on a gopher server, and the WWW clients such as mosaic will add entries in the gopher log files when these are accessed, it makes sense to further explore the gopher logs.

Time Variance of Access

Predictably more connections occured during the week as shown in Appendix 2. The hourly variation was skewed to late in the (UK) day (see Appendix 3), which is explained by the fact that a large cohort of the users are 4−8 hours behind UK time. Having peak loads after UK office hours has some obvious advantages if the service grows a lot. The individual weeks showed very similar patterns for temporal variation for both daily and hourly figures.

Files accessed

Over the six week period, consistently some files and directories were accessed very frequently. Jobs, email lists and contacts, conference proceedings are examples of such. Appendix 4 shows predictably that the main menu is the most accessed item, though this could not be assumed as one may link to any directory or file directly. Information on email lists is accessed very frequently. Individual weeks showed the same files consistently being accessed at similar levels of frequency. It is clear that particular areas of the current service are much more accessed than others. However this is not as straight−forward to interpret as one may hope.

If a lot of interest is shown in certain hierarchies of the service, then presumably one should spend a proportional amount of time building these sections up. In particular specifically nursing sites and contacts are more frequently accessed than general sites and information services. Clearly the focus of nursing is useful as more users are accessing the nursing sites than the more general sites. As only two

sites worldwide collect lists of nursing sites, many of these accesses are probably via other health sites which link directly to this item. Links to colleagues and conferences etc. are also popular, indicating that a primary use of the current service is more to facilitate contact than act as an online database.

However some very unpopular items may be only available on the server, and the occasional access may be of great benefit to the user who finds it, thus one should treat the raw statistics with caution. Clearly, however, information that is not accessed a great deal, and is available readily elsewhere, should either be pruned or greatly improved. The statistics minimally alerts one to areas that may be explored further.

Some portions of more general interest are shown to be accessed by users who have no interest in nursing, and may not even be aware they are on the NURSE service, as other institutions may place links to these sections from (e.g.) a general CWIS service. An example is the directory email−lists/lists. While certainly of use to nurses, much of the access is from the Warwick CWIS (WINFO). The file is located on NURSE, but was found to be so useful, a link was made from WINFO, and the accesses from WINFO are much heavier, as it is a busier system generally. In principle this sort of artifact may be difficult to detect as other sites may choose to link to items seen as useful from their services.

Comparison with other Servers

A straight comparison of the NURSE service may be made with the CWIS WINFO used at Warwick. Both use identical servers, which are the NCSA httpd server and the Minnesota gopherd server, both use the same clients, and both have identical logging. The difference is that WINFO is a general purpose information service for a site, and NURSE is a subject specific server. Taking a particular week, February 27 to March 5 inclusive, which is chosen as it is within term time and not affected by holidays or machine shutdowns, one may see in Appendix 5 that the traffic on WINFO is much higher. In fact there is an order of magnitude difference.

Looking at the domains (see Appendix 6) which access both servers there is a marked shift to local usage on WINFO. This is because a lot of the information is local and of limited interest to others, having said that WINFO does have many links that other institutions log in for, in particular email lists. The temporal pattern of usage was different for WINFO, peak demand being during office hours, and highest at 1500 hours, which is to be expected.

The obvious conclusion to draw is that despite the fact that the nursing service is world−wide, and there are only (currently) two such services in the world, and that nursing has a massive pool of workers, clearly only a tiny proportion are using this service. For 10 times as many users are accessing a local service in one university than the entire nursing population worldwide are accessing a specialised nursing service. Subject specific servers are however increasingly popular and get a lot of traffic, one email list devoted to such servers has 1500 members currently.

Survey of Nurses

A questionnaire (See Appendix 7) was used to further explore the use of the NURSE/NIGHTINGALE servers.

Need

This is the most basic question. If the service is not needed then the other questions are not worth addressing. It is however difficult to answer simply. A questionnaire is used in this study to reach individuals (who may not be on the internet) to ascertain :−

- Is there a perceived need for internet nursing services.
- Is that need real? I.e. can nurses needs adequately be met without such services.
- Have users actually used these services (NURSE gopher or WWW service or NIGHTINGALE gopher) and if so were they of any real use?
- Are the services addressing user's requirements, and if not how should they be improved?

Visibility and Access; Ease of use

The questionnaire addresses these additional issues :−

- Do users have access to these services?
- Do users know how to access these services.

A pilot questionnaire was sent to five email lists devoted to nursing and two newsgroups :−

- NURSENET on LISTSERV@VM.UTCC.UTORONTO.CA − A Global Forum for Nursing Issues
- SNURSE−L on LISTSERV@UBVM.CC.BUFFALO.EDU − A Global Forum for Nursing Student Issues
- NRSING−L on NIC.UMASS.EDU. The Nursing Informatics list
- NURSERES on LISTSERV@KENTVM.KENT.EDU. The Nurses Research List.
- GradNrse on LISTSERV@KENTVM.KENT.EDU. The Graduate Nurses List
- sci.med.nursing
- bit.listserv.snurse−l (which is really another instance of SNURSE−L).

36 completed questionnaires were received, which allow some general statements to be made, though clearly a larger survey needs to be undertaken at some point. A particular problem with this survey is that it only questions users who are computer literate to the extent they know how to use USESNET newsgroups or electronic mail. Thus one should assume the results are those of nurses more sophisticated than the norm with respect to online systems, and as almost all were from educational establishments, they are likely to be more highly educated than the norm. However one may use the results, bearing this in mind. The areas addressed are itemised below.

Item	Yes	No	% Yes	Did not know /did not comment
1. Perceived Need	30	5	83	1
2. Actual Need	23	5	64	8
3. Used Service	22	11	61	3
4. Has access	28	3	78	5
5. Knows How to Use Service	26	8	72	2
6. Needs Met	14	6	39	16

From the above responses it is clear that access for the nurses surveyed is not in general a problem, nor is lack of knowledge of using the clients typically lacking, however the perception of the usefulness of such a service is quite variable, and the service does not address all the users' needs, though many users are not actually sure whether the services address their needs.

Comments

Of possibly more interest than the raw figures were the comments which the respondents were encouraged to make in any section, and at any length.

The attitudes of respondents (almost all were nursing students or nursing teachers) were very varied, and demonstrated a wide range of computer literacy, which is not surprising in such a group. Comments are summarised below.

General Comments

Many respondents were unsure what the services could or should offer, and some thought it was too early to comment. Exploring the services should allow one to identify the useful components, and feedback from users should allow the servers to adapt to users' requirements. Online services are more flexible than traditional information sources in this regard, especially as one may email the administrator directly.

One can do without the services, but as one respondent stated one can do without telephones. Some users said they now feel they would not like to work without the services, even to the extent of saying their current research or teaching would not be possible if they were taken away.

Of the items currently in use, jobs, libraries and email contacts, and extensive pointers to other services were seen as useful.

However those respondents who were "converted" to the utility of the services found it difficult to persuade colleagues to see the point of the them, some see accessing such services as a clerical task best

left to secretaries (possibly because it is keyboard intensive). Most users were thought to be still trying to figure out what is useful.

The increased need for timely information in nursing was considered to be only addressable by online systems. One respondent stated perceived need is not as high as "internaughts" believe, however another thought this is a "chicken and egg" problem, as until enough people use it, others will not value it.

As a main information service, the gopher/WWW servers are not considered adequate by many, though they were generally seen as useful. Thus they complement rather than replace other existing services.

The needs of different nurses may be very different, and some specialisation of services is to be expected. E.g. midwives are interested in different issues than intensive care nurses or psychiatric nurses. It was emphasised that the accuracy of information on an online system is important.

Improvements Required

The services were thought by one respondent to need to be more user−friendly, however most respondents found little difficulty using the systems as such. However different people categorise differently, so menus are difficult to navigate, and there is a need for indexes and search capabilities.

Facilities that were seen as lacking included archives, video, graphics, on−line journals and conference proceedings, and multi−media courses.

Empty directories and failed connections were found to be irritating, and could cause one to give up using a service.

Training

A journal article or introductory book on these services was considered necessary. Nurses were thought to need more training on use of servers and informatics generally to empower them to use services effectively. Courses could require use of such services to introduce nurses to them. Currently nursing teachers were thought to be less knowledgeable than some of their students, and it may need a new generation of computer literate nurses to provide the seed for the bulk of the nursing profession who are ignorant of these facilities.

Most nurses do not have access to the internet. Most academic nurses (students and lecturers and research staff) do, at least in North America and Europe and the Pacific Rim, but few of them were thought to be currently aware of it. There was felt to be a need for some mechanism for linking those not in educational establishments.

Teaching was stated to be often undertaken by computing science staff, which was not thought appropriate, as these staff have no real feel for what nurses need. Presumably there is a shortfall of adequately skilled nursing personnel.

Advantages

Nurses stated they need to talk to each other, online systems provide one way of doing this. Nursing was stated to be experiential, and thus even more than other disciplines there is a need for more dialogue. There is an especial need for scholarly dialogue in an international environment. Email lists and newsgroups are the obvious methods to provide a forum, but gopher/WWW provide something marginally less timely than email, but more permanent, and much faster to add to than printed media.

Proposals for Further Development: Lessons for Implementors of Subject Based Services

Much progress has been made on providing an easy interface for users in both the WWW and gopher services, and generally little problem has been noted in using the clients offered by CERN and the University of Minnesota (e.g.). However nurses still note difficulty in using the services designed for them. The following may serve to ameliorate these problems in subject specific services generally.

- Participation: One respondent stated one should be able to place information useful to others on the service. Consensus conferences, and "virtual joint appointments" were separately proposed. An active participation of nurses in designing servers was seen as a way of building servers that addressed nurses needs.

- Finance: Some payment for services was seen as necessary to fund services properly.
- Ease of Access: A server could operate as a "one stop shop" to combine several services in an effective way. The NURSE service for example provides links to libraries and bibliographic data−bases.
- Navigation. As the menus/hyper−text links are not arranged in the manner the user expects, s/he has difficulty finding the information required. Although there are indexes available to ease information retrieval, few nurses seemed to know about them, or how to use them.
- Completeness. Data bases, papers, bibliographies etc. are available, but one will typically find only a tiny fraction of what is available via more traditional library searches, and indeed one of the major uses of the servers is to provide "one stop" access to other databases and library services.
- Funding. This is related to completeness. Unless staffing and other resources are identified and provided, the service one gets is as a result of the goodwill of individuals who are capable and willing to provide a service in addition to their other work. This is bound to result in erratic development, and services may stagnate after the initial flush of enthusiasm for a project.
- Relevance. Unless nurses are involved in planning and building the service, it is most unlikely that the service will address the real needs of the nurses using it. Specialities within nursing may also suffer if the implementer is not familiar with that speciality. Since dialogue with other nurses was mentioned so frequently, some conferencing facility such as CoSy (CoSy Conferencing System, Copyright (c) 1984 University of Guelph, written by the CoSy development team, University of Guelph) might be appropriate to build in, such as is done in the at the Law Technology Centre at Warwick.
- Training. Users need to know how to access the services appropriately. This is not the same thing as being able to use the client, they need to build general expertise in information retrieval and strategies for finding relevant information. As noted above some respondents stated deficiencies in the servers, for example graphics, which are in fact implemented in both gopher and WWW servers, so a more thorough knowledge of what is available would help such users.

Given the fact that the nurses sampled were likely to be better educated and more sophisticated computer users than the average nurse, problems identified by this group using services are likely to be more critical when more nurses start using the systems from (say) general hospitals. A fuller survey of nurses, more rigourously sampled, is needed, and will almost certainly identify more problematic areas.

Conclusions and Future Developments

The amount of work required to maintain a service may easily be under−estimated. Links may fail when a remote server ceases to exist, or moves without warning, neither of which are unknown occurrences. Users who find a multitude of links which fail may stop trying to use the system.

It is not trivial establishing what is useful to place on a service. One does not necessarily wish to replicate what is available on other more traditional services, and it may be the case that internet services such as the WWW and gopher servers will develop their own niche and function, rather as television did. Television did not replace books or newspapers, or even the wireless, but provided a new way of providing entertainment and information. It is likely that servers such as NURSE will be better if they enhance the inherent capabilities of the internet. One such aspect is the ability of all users to broadcast, unlike television or radio that have made listeners of most of the participants. It will also be instructive to note whether the democracy enjoyed currently on the internet is replaced by a more structured and authoritarian approach.

A potential problem with servers dedicated to one subject is that it is not properly funded by the organisations that might make best use of it. A scenario might develop whereby it is not used because the relevant information is not online or accessible.

If one is to properly fund a service to provide timely useful information, one must identify whether it is useful, and then give evidence to potential funding agencies. A plausible method of funding is via interested parties. Given these may be local to (say) the UK, or are interested in only one component e.g. psychiatric nursing, one needs statistical data split in a variety of ways, by country, by file, over time etc., all of which is currently possible using log files and current programs. Examples of gopher/WWW services funded by agencies include Institute for Child Health Policy at the University of Florida through grant support from the USPHS Maternal and Child Health Bureau.

It may be the case that as the services mature a consortium approach, whereby several agencies provide funding and resources, may be appropriate. Such a consortium is likely to be an international one as over 90% of the hosts accessing NURSE are from countries outside the UK. With this support one may build

online databases etc., without it one will be an occasional service enjoyed by the sophisticated computer user.

Acknowledgements

I wish to thank Katherine Duffy and Keith Halstead for their help and support in this study.

University of Warwick, Coventry CV4 7AL, Great Britain
Contact for NURSE (WWW/gopher service) cudma@warwick.ac.uk

Appendix 1: Domains accessing the NURSE WWW Server February 27th to April 9th 1994 inclusive

Total Transfers by Client Domain

%Reqs	%Byte	Bytes Sent	Requests	Domain	
3.18	3.32	22318	24	au	Australia
0.40	0.37	2501	3	be	Belgium
3.45	5.35	35977	26	ca	Canada
0.93	0.00	0	7	ch	Switzerland
2.79	2.18	14654	21	de	Germany
0.40	0.81	5421	3	fi	Finland
0.66	0.51	3444	5	fr	France
0.13	0.00	0	1	gb	Great Britain (UK)
1.06	3.20	21536	8	it	Italy
1.33	1.48	9941	10	nl	Netherlands
0.13	0.00	0	1	no	Norway
2.12	2.90	19491	16	se	Sweden
9.68	9.58	64385	73	uk	United Kingdom
7.29	5.97	40147	55	com	US Commercial
16.71	17.26	116015	126	edu	US Educational
6.63	3.77	25323	50	gov	US Government
0.80	1.61	10842	6	mil	US Military
2.65	2.31	15543	20	net	Network
0.53	0.81	5421	4	org	Non-Profit Organization
26.92	25.83	173649	203	localhost	
12.20	12.74	85625	92	unresolved	

Appendix 2: Daily Connections to NURSE Gopher Server February 27th to April 9th 1994 inclusive

Connections Per Week Day

Day	Connections	
Sunday	59	**********
Monday	126	**********
Tuesday	168	**********
Wednesday	172	**********
Thursday	129	**********
Friday	150	**********
Saturday	104	**********

Appendix 3: Hourly Connections to NURSE Gopher Server February 27th to April 9th 1994 inclusive

Connections Per Hour

Hour	Connections	
Midnight	41	**********
01	46	**********
02	35	**********
03	40	**********
04	29	**********
05	23	**********
06	13	**********
07	8	****

```
08            14 ********
09            11 ******
10            22 *************
11            28 ******************
Noon          32 ********************
13            30 ******************
14            32 ********************
15            50 ******************************
16            42 ************************
17            54 *********************************
20            70 ********************************************
21            50 ******************************
22            49 *****************************
23            50 ******************************
```

Appendix 4: Files and Directories Accessed from NURSE Gopher Server February 27th to April 9th 1994 inclusive

```
Main_Menu                              1385 *******************************
email-lists/lists                       739 ******************
jobs                                    524 ************
other-nursing-sites                     500 ***********
about-nurse                             500 ***********
packages                                292 *******
email-lists                             278 *******
databases                               297 *******
Main_Menu/readme.txt                    323 *******
contacts/contacts.txt                   316 *******
info-sources                            242 ******
papers                                  238 ******
info-docs                               212 *****
contacts                                169 ****
new-items                               159 ****
conferences                             152 ****
about-nurse/stats                       150 ****
related-gophers                         141 ****
email-lists/lists/readme.txt            129 ***
info-docs/health-resources              110 ***
papers/journals                         107 ***
email-lists/lists/yanoff-mail-guide     102 ***
package/cpr_211.exe                      93 ***
other-nursing-sites/nursing-network      84 **
packages/readme.txt                      72 **
jobs/bridge                              73 **
databases/readme.txt                     71 **
contacts/institutions.txt                64 **
email-lists/lists/list1                  64 **
papers/bibliographies                    62 **
email-lists/nurse-net                    62 **
info-docs/medical.resources.9-93         62 **
about-nurse/stats/readme.txt             52 **
about-nurse/stats/stats.txt              51 **
papers/journals/mid-today                49 **
jobs/readme.txt                          47 **
```

Appendix 5: Connections for WINFO and NURSE Gopher Server February 27 to March 5 inclusive

```
WINFO

Total Number of Connections:             2310
Total Number of Files Retrieved:         2356
Total Number of Directories Accessed:    11300

NURSE

Total Number of Connections:             113
Total Number of Files Retrieved:         306
Total Number of Directories Accessed:    740
```

Appendix 6: Connections by Domain for WINFO and NURSE gopher Servers February 27 to March 5 inclusive

WINFO Number of Hosts

Local	190
UK (excluding local)	106
Non UK	200
Percentage Local	38.31
Percentage UK (excluding local)	21.37
Percentage UK Total	59.68
Percentage non UK	40.32

WINFO Number of connections by hosts

Local Hosts	1734
UK (excluding local) Hosts accesses	185
Non UK	391
Percentage Local	75.06
Percentage UK (excluding local)	8.01
Percentage UK Total	83.07
Percentage non UK	16.93

NURSE Number of hosts

Local Hosts	1
UK (excluding local)	2
Non UK	67
Percentage Local	1.43
Percentage UK (excluding local)	2.86
Percentage UK Total	4.29
Percentage non UK	95.71

NURSE Number of connections by hosts

Local Hosts	7
UK (excluding local) Hosts	2
Non UK	104
Percentage Local	6.19
Percentage UK (excluding local)	1.77
Percentage UK Total	7.96
Percentage non UK	92.04

Appendix 7: Pilot Questionnaire

1. Is there a perceived need for internet nursing services.

2. Is that need real? I.e. can nurses needs adequately be met without such services.

3. Have you actually used these services (in particular the NURSE gopher/WWW or NIGHTINGALE gopher) and if so were they of any real use?

4. Do you have access to these services?

5. Do you know how to access these services.

6. Are the services addressing your requirements, and if not how should they be improved?

7. Please make any other comments you wish to make concerning online nursing information systems.