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# SUMMARY OF THE XANADU™ HYPERTEXT SYSTEM

## SHORTEST DESCRIPTION

It is a fast linking repository with windows and criss-crossing superdocuments.

## MEDIUM-LENGTH DESCRIPTION

The Xanadu™ Hypertext System is a fast linking electronic repository for the storage and publication of text, graphics and other digital information; permitting promiscuous linkage and windowing among all materials; with special features for alternative versions, historical backtrack and arbitrary collaging; with royalties for copyright holders and capable of indefinite growth.

## EXTENDED DESCRIPTION

The Xanadu™ Hypertext System will be an unusual and probably unique repository in which all forms of material-- text, pictures, musical notations, even photographs and recordings-- may be digitally stored, at prices comparable to storage on other computer systems, and accessible from any port at any time.

Basically it is a system for the rapid delivery of linked and windowing documents and the assimilation and storage of changes. It is based on new technicalities which are of no concern to the user, and materials are stored in locations unknown to him. There are simple categories of publication (private and public) and a flat cost of usage.

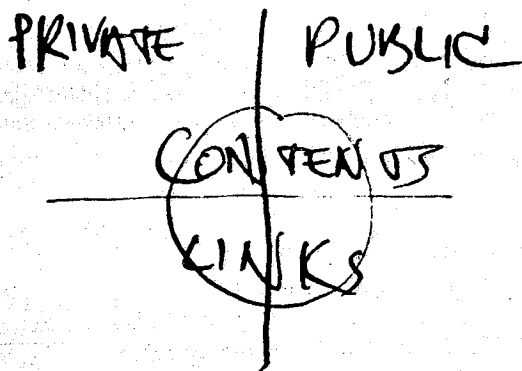
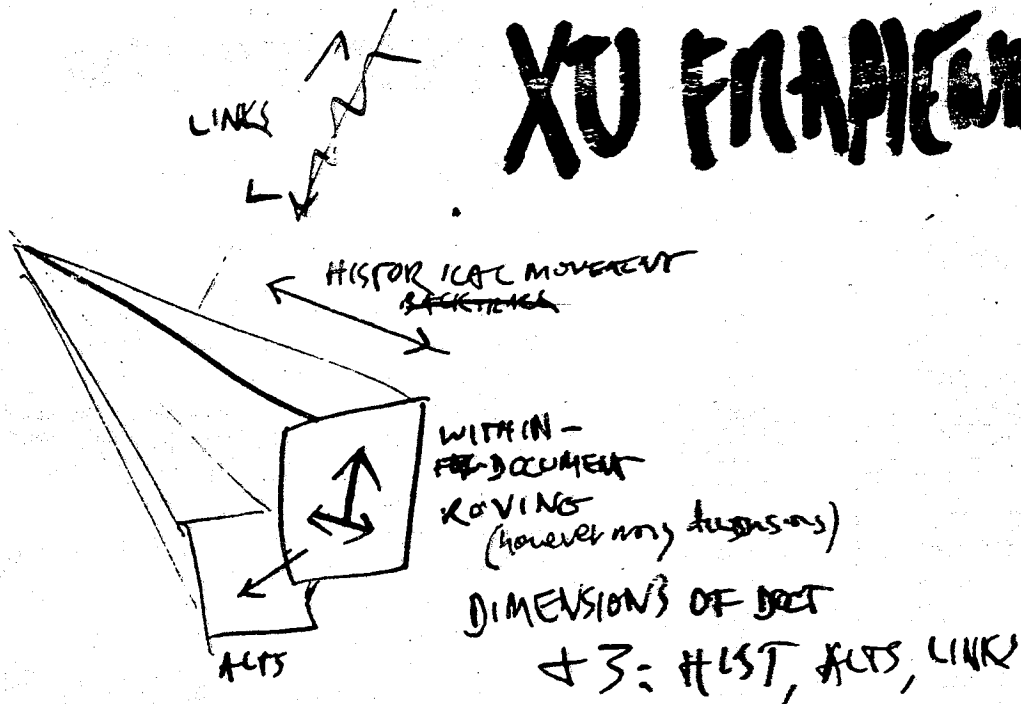
Its unique facilities of backtrack, linkage and windowing will allow the creation of new forms of multi-level, explorable collections and collages of material-- without losing the well-defined authorship and ownership of all parts.

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# XU FRAMEWORK



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There are four kinds of movement in a document: within the document's own topology (forward and back for simple text), plus historical forward and back, corresponding part in alternative versions, follow link.

Bit-map graphics are stored in such a way as to allow scrolling and zoom.

The objective is to build a powerful and fair system of storage and publication that will enhance our lives, gives us a start toward safeguarding our freedoms and heritage, and conceivably stand-- and expand-- for centuries.

Anyone may publish collaged and windowing documents having finely-divided ownership. It is believed that this will make possible a whole new universe of knowledge and understanding.

The actual code of the system is a medium-sized program in the C language, currently running under the Unix Operating System but expected to migrate to standalone. This software will not be made available in the currently-planned future, except in object form at a high monthly price, for Unix machines; VAX under Berkeley Unix preferred.

It's exactly one system, a back-end storage feeder with huge capacity and arbitrary topology. It's customizable at the front end only. It is not adapted for binary-riffle data bases of the card-catalog type.

The intended public operation of the system will be in a chain of suburban or roadside stations, called Silverstands<sup>tm</sup>. New users will learn the operation of the system at such stands, and local users may dial into their nearest Silverstand.

Silverstand personnel ("Conductors") will include both local people and an itinerant corps of circulating smarties.

While any sort of terminal may be connected to the system, best operation requires a full computer in the user's terminal, programmed to handle display functions, interchange protocol, stacking and other work. Users may connect their home or office computers of any kind to the system, whether by dialup, GTE Telenet, leased line, twisted pair, or nearby wink-laser.

Xanadu service will be differentiated only with respect to speed of terminal (300 baud the minimum). No users will be restricted as to acces-

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sibility of materials. Anticipated initial price for 300-baud service is \$20/hour prime time, \$5/hour night, not counting communications or front-end costs, but including all feed and character input.

All users will have access to all public documents instantaneously.

Later prices in the Silverstands will aim lower, to prices like \$5/hour (not counting terminal rental; a user may bring his own).

Disk storage prices will begin in the order of \$200 per megabyte-month and drift downward as disk prices go down.

A variety of other services will be provided, including printout.

Publishing requires an up-front cost of one year's disk rental. A secondary publisher using windowed material need only pay the cost of pointer storage.

Materials no longer paying disk storage rates will be swung into tape storage for archival purposes, on some self-supporting generalized economic basis. Thus for slight extra cost and delay, earlier materials will be rapidly available.

Private documents are available only to the owner and the owner's designees. Published documents are

available to anyone, and yield a royalty to the owner; they may be updated at will, but the earlier contents remain available. They may not be withdrawn from publication without six months' notice except by court order. "Privashed" documents are available to anyone, and may be changed at will, but yield no royalty.

The system's contents will be supplied by customers only. There will be no participation by the Xanadu enterprise in the publishing process itself; neither contents nor indexing will be provided by the system, these being rightful endeavors of the customers.

The system will exert no supervision or censorship on stored or published materials, and court orders will be required for the removal of any material held in a stable account.

There are no special rules governing particular kinds of document (such as the "teleconference"). In all cases of functions which "require special rules" in other systems, we have found them to map clearly into our document structure or be movable into front-end functions.

In later phases it is contemplated that the full mechanism-- the actual program-- may be made available for the expansion of the standardized network.

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# THE SILVERSTANDS™

The Xanadu stations, or Stands, will be the local outposts of the network. Your Xanadu stand is where you'll start your account (even if you plan to be an at-home or office user), and learn to use the system. A cheery young person in futuristic garb will sit you down at a screen, and show you through an area of material of interest to you-- text or pictures. Then, at the moment of Xanadu Shock, when you get it, when you cry "Holy ----!"-- the kid grasps your forearm and says, "Mr. Jones, Welcome to Xanadu!"

The stand is what you dial up from your home computer; it is where you sign publication chits, change your password.

Perhaps you have business meetings there, or drop by to explore hyper-art while you have lunch. (You order from your screen, and a Conductor (or "Bystander") brings your food on a cart. Gracious.

There are no coin slots. Addfares devices, like those in the D.C. metro, recharge your use of the machines. Xanadu credit cards allow services to be charged. The silver allows you to charge meals as well, the gold Xanadu card charges anything.

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The Xanadu Station is not impersonal; people stand face-to-face, without counters. It is installed throughout with quality video monitors and doubleseats. You may rent a computer or bring in your own Apple, GIGI, or what have you, with your own encoding devices embedded to taste.

There is a comparatively noisy social area near the front where the true Xanies hang out, with high-power E&S equipment. Quieter carrels are to be found in the rest of the building.

The buildings are designed for expansion. The foundations are overbuilt; the central area will be permanent; the rest will be built from a modular hexagonal building-kit system with furniture and monitors built into wall panels.

The outer angles of the castle-like exterior will therefore be hexagonal pleatings. They will be faced with semisilvered twin glass, allowing external view without bringing in too much light. The building will expand simply by adding uprights and interchanging panels.

A geodesic dome, starting as a very small arc, grows and is rearranged as the whole configuration expands. There is a large central room with a terraced cone-shape under the dome, growing with it. On its terraces are caré and lounge areas, as well as more and more screen areas.

The raucous, brainless atmosphere of the videogame parlor is not here. People typically come for an hour or more, relax and concentrate here, often in pairs.

Every stand has of course a main feeder machine (VAX 780, BBN C machine, or cost-effective alternatives). It is visible through glass, starkly lit. But the disks don't have to be seen, and should probably be underground to save space.

#### THE UNIFORMS

The uniforms have Nift. Jeans are standard, the rest changes periodically, as at McDonald's. The motif is silver, but with other colors changing seasonally. The outfit is slightly wiggly and "futuristic," with a changing assortment of sashes, flyer's helmets, sommelier's chains, lightsabres, blasters and so on.

# BUSINESS PLAN

Our system has many so-called "practical" applications within conventional business. We will be happy to find some conventional corporate partner to handle "word processing" markets and the like.

We are deeply committed to this system, and have already fought off a variety of shallow creeps who did not share our vision or the sense of its importance. But we are willing to talk business in a number of areas.

The stands are another matter. We are interested in talking to potential corporate collaborators, perhaps to set up a consortium to build them with us. We would not mind working with Sony, Xerox, Disney, Cromemco, Storage Technology, Apple, Datapoint, BBN, Lucasfilms, American Zoetrope, Whole Earth Catalog, Rolling Stone, Playboy, McDonald's or Holiday Inn, to name a few. But you can tell pretty much what kind of say we want in how this runs.

## CURRENT OFFERING

We of Project Xanadu hereby offer the Xanadu Hypertext System, as described, in interstate commerce. We offer to install it on a VAX/780 for in-house use at prices not far from the usual (on the order of \$25,000 installation fee, \$250/terminal port/month). Consulting on front-end design is additional. This must be under non-disclosure agreement with a compatible firm that understands the vicissitudes of software installation.

We hope to offer a small-scale Silverstand, without the frills, in late calendar 1981.

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# TOWARD A SUBCULTURE OF INTELLECT

Intellectualism is not a body of knowledge or a subculture, but a questioning, observing, hypothesizing outlook.

There are no intellectual subjects. For someone used to learning, to grabbing vocabulary and ideas, the elements of a new subject can come quickly. The more diagrams you have seen, the more words you know, the more theories you have heard, the more easily you can grasp the next one and assimilate it to the snowball of ideas already rolling through your head.

In an era of school-induced stupor, punch-and-judy news and video narcosis, we hope the Xanadu System will encourage depth and a never-ending procession of new insights. It will not be just for the pompous Establishment test-takers of Mensa or Magister Ludi-style nexocrats, but for whoop-te-do enthusiasts who enjoy sharing their sophistications. It's a fast lane for Zips, a picture-book for Bozos, and for night people as well as day.

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## \* CHANGING THE SABBATH

It is important and customary for a cult to change the sabbath. That way the followers see proportionately more of each other and feel set apart.

Well, the week is sinking toward uniformity no matter what, and a lot of these will be Night People, so our approach is a little different: to change the time-system.

When LaGrange and others created the metric system, that triumph of rationality scorned by yokels two centuries later, the day was of course also divided in ten. But after the French Revolution there was a squabbling as to whether it should be 10 units for the former 24 hours or 10 for the AM and 10 for the PM, and the whole thing fell apart, to our everlasting loss; we are stuck with the Babylonian time system and ungodly conversions between such things as frame-rates and minutes.

Well, the Xanadu system will undoubtedly be used for international teleconferencing, and so the time-zone problems (unfortunately also built around a system of 24) will come in. So we intend to adopt a timing-system to facilitate global and off-planet chitchat, which at the same time provides fun and games and a zippy sense of participation. (cont. next page)

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We think we can build a new subculture of intellect, intellect in a new and enthusiastic style-- more like the sci-fi subculture than Academia.

Here is a bunch of people who are paid to sit around and make things interesting for you. A national corps of peripatetic smarties plus the local bright kids are the Xanadu Conductors. The local kids (and others) run the stand; the national Xanadu Corps moves around, shares insights and explorations, do demos constantly for each other and for the local kids at a given stand, showing them what's new and what they've recently discovered in different subject realms on the system.

The people who hang around the stands will be an active subculture -- bright, verbal, interested in everything. Just as in music circles it is customary to know about symphonies and in sports circles it is customary to know about scores, in Xanadu circles it is customary to know about everything: to exchange interesting anecdotes, remarkable facts, extraordinary interconnections-- and converse with a Xanadu screen near at hand for reference. They'll be like trivia freaks or D&D players-- but with a more generalist outlook.

There'll be festivals and events: Hypercons, Kublacons and Front-End Functions, Footnote Festivals and Intertwingularity Expos. There'll probably be an argot; perhaps Porlock and Rosebud codes, something like the ten-codes of CB radio.

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(cont. from prev. page)

Begin with the time in Greenwich, England. Midnight=0, noon=.5, 9 PM=.75. and so on. This notation we may call GAD, Greenwich Absolute Decimal. Prefix this with the day of the year (e.g. 1 Feb=32), and you have absolute day and date, such as 364.99, New Year's Tooting. This is Xanadu Universal Time or XUT (alors). It is the same everywhere. Including (uh-oh) the date as of Greenwich.

That last part does throw a pall on things, so it must be adjusted with a time-zone offset. That is a number, positive or negative, permanent to your location, which gives you the correct date and sun time where you are, in decimal. Conversion is of course a front-end function.

This is the time as most prominently shown at the Silverstands. (Normal Babylonian time may be read from a cuckoo clock here and there.) Anyone wishing to market watches, clocks, etc., embracing these principles will get the use of our trademarks, etc., for a nominal consideration.

Please note that specifications are not finalized and do not represent a studied or unanimous decision by the Xanadu group.

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A CULT?

Yes, call it a cult if that makes the idea clearer; but a secular cult of fascination with ideas, ready to wrap itself around the new or the old.

Cults do not just happen. They are constructed. If they become successful, it is through careful planning and insight about what works.\*

WHAT WORKS?

This cult offers a social system with its own status ladder (highest are the travelling generalists), a promise of "education" to reassure parents with-- it's better than pinball, right? (And cheaper per hour.)

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# FREEDOM IN OUR TIME AND BEYOND

## NEW FORMS OF IMPRISONMENT

With the best inventions, new forms of restriction and imprisonment involving computer screens are turning up.

A reader can close a book or skip to the ending. In some new environments, such as Computer-Assisted Instruction, it is possible to fully trap the user so that he has no options whatever except what the planner intended. I submit that this is not our free tradition.

A whole new set of rules is about to be generated. You may be supposing you have freedoms that aren't there anymore. Consider wiretapping. Time was when a wiretapper sat in the basement with earphones under his fedora. No more.

Your phone now can be tapped by a person thousands of miles away who simply gives the proper commands, as beeps, to your ESS switching station. Or so I am told by my telephone-knowedgeable friends, and I believe them.

So in principle, if we ever get the Wrong Sort of Government, they can study your life from your telephone use like an open book. So that avenue is closed.

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What, then, about your computer transmissions?-- and we know they will be a basic form of communication for individuals soon.

An ominous situation has already arisen. The U.S. government has given its approval to a system of encoding that you can buy on a chip. This system is called DES, Data Encryption Standard. Since you can prime it with a secret 56-bit "key," it is thought that running your transmissions through it acts like an electronic shredder, hopelessly garbling your transmissions except to the other party, who presumably knows the key you are transmitting with.

There is only one problem. The DES system stands impeached. Researchers on both coasts have accused this method of being easily breakable by the National Security Agency, the government's decoding arm.

Another system of codes has been proposed that supposedly can't be broken by any extant computer in less than millions of years. This is the RSA code, developed by Rivest, Shamir and Adelman of MIT. It has several remarkable properties, among them being the ability to exchange unbreakable messages between strangers who have not had a chance to swap code keys; the ability to co-sign electronic documents that anyone can read and know you signed; and more.

This may seem faroff to the average reader-- perhaps as faroff as television seemed in the nineteen-thirties. Then consider the following:

If you are not careful, some government may be able to read your private computer documents in the future at any time.

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THE MINISTRY OF TRUTH,  
THE THOUGHT POLICE,  
AND YOU

1. The MOT

In Orwell's 1984 the Ministry of Truth told lies and changed history. This was done by judicious snipping, disposal and replacement of paper.

As documents go electronic, however, no longer need paper be involved. A reference article, say, in an encyclopedia can be changed simply by storing another one in its place-- and poof! history is changed.

There is no typography or watermark to check. Characters sent on the wire are all alike. But if the right sort of encoding is used it will be some sort of deterrent to the nefariousness of governments of the future.

2. The TP

The Thought Police couldn't really read your mind, but they knew enough psychology to have good suspicions.

Tomorrow's real-life Thought Police will have detailed access to a huge number of incidental records about your life, from banks and auto registration and so on-- instantly investigable.

But I don't think you want them to know what you store, or what you read. So let's talk about it.

Strong codes are available for storage (like RSA). That takes care of making your private documents safe (-- except where do you hide the code? -- another problem).

But let's assume that a dictatorship of stealth is seizing the stations, one at a time. That essentially gives the TP access to what you've asked for as it passes through, with you as the designated recipient.

A good deal of concerned research is going into this problem from many points of view, and we can't really get into it here; but many solutions might be possible. One would be to somehow reveal at each station only what its next pass-through station would be, with your final name only unwrapped in the last station.

THINK FAST

These problems are real and present. I did not create them. They were here waiting for us. They will come to be very important. The way to approach these issues, I believe, is not sit in a corner and tremble, like a rabbit in a tiger cage hoping it won't be eaten, but to run between the legs of the beast before it fully wakes up.

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# CIVILIZATION AND ITS DISK-CONTENTS

There are many bombs and fires to come, and Deep Digital-- deep rock, deep space-- is really the only long-haul solution.

The system this book proposes is a generalized and self-networking structure that can eventually be put in deep rock and deep space-- not the unique solution, but a method. We seek to provide a general method of storage and access that can be put in Iron Mountain or the asteroid belt.

Digital archiving can include text, paintings (stored as detailed photographs), sculpture, architecture, whatever.

We do not propose to be the guardians. Just to try to help.

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THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT

PHYSICS 311

PROBLEM SET 1

PROBLEM 1

PROBLEM 2

PHYSICS 311

