

As We Do Write: Hyper-terms for Hypertext

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Introduction

Coined in the mid-1960's by Ted Nelson, the term *hypertext* conjoins *hyper* and *text*. *Hyper*, used as a prefix, derives from the Greek *hypér*, originally meaning over, or above, but whose meaning typically implies excess or exaggeration. A synonymous prefix is *super* [43]. There is also the independent meaning of *hyper* used as a noun to mean, "a person who promotes or publicizes events, people, etc., esp. one who uses flamboyant or questionable methods; promoter; publicist" [43]. *Text* has the original meaning of words woven together [43], and so combined with *hyper*, *hypertext* implies both a super text, a text that, due to interlinking, is greater than the original texts, and a super weaving of words, creating new texts from old.

Given the struggle Nelson encountered in disseminating the idea of hypertext, it is possible to view the word hypertext acting as a promoter and publicist, carrier of the linked text meme. Nelson writes:

I coined the term "hypertext" over twenty years ago, and in the ensuing decades have given many speeches and written numerous articles preaching the hypertext revolution: telling people hypertext would be the wave of the future, the next stage of civilization, the next stage of literature and a clarifying force in education and the technical fields, as well as art and culture. [35], p. 0/2

In fact, the flamboyant promotion of hypertext was such an integral part of the initial culture of the hypertext community that by 1987 Jeff Raskin's paper at the Hypertext'87 conference is titled, "The Hype in Hypertext: A Critique" [44] where he claims Nelson, "writes with the messianic verve characteristic of visionaries," and in 1989 Norm Meyrowitz's Hypertext'89 conference keynote is titled, "Hypertext—Does It Reduce Cholesterol, Too?" [31]. Clearly the notion of the interlinked text as super text is inseparable from hypertext as hyped concept.

Since this synthetic term "hypertext" has come to define an entire research discipline, it is fitting that we should pay close scrutiny to the terminology used by hypertext systems to describe their major abstractions: the link, the things being linked, and the endpoints of the link. By examining these terms from the beginnings of the field up to today, we find that there is a wide diversity of terms used to describe intellectual works (the things being linked together) within hypertext systems. The term "link" has long been agreed upon, and consistently used, while the term for link endpoints initially had wide variation, but has recently converged on the approximately 15-year old term, "anchor."

Documents, Objects, Nodes, Cards: Works by Another Name

As shown in Table 1, some of the greatest variation in hypertext system terminology occurs when describing the information being linked. Some systems simply use the term *document* for linkable information, with Xanadu [35], Intermedia [67], and Microcosm [21] being examples. In the case of Intermedia, the use of document encompasses text, two and three-dimensional graphics displays, as well as timelines, and in Microcosm, it has a similarly broad range, spanning word processing documents, spreadsheets, CAD drawings, images, and many other content types. However, interactive graphical displays do not typically come to mind for the term document, which carries with it static connotations. This leads to a search for alternate terms that are more appropriate and encompassing.

Other systems name the linkable information after their user interface metaphor. Both HyperCard [4] and NoteCards [58] use the term *card*, or *notecard*, consistent with their card-based user interfaces. KMS [1] uses the term *frame* to represent the information that fits onto a single screen, with the metaphor being that KMS acts as a "frame" around that information. The Virtual Notebook System (VNS), uses a notebook

metaphor, with information subdivided into *pages*, and the Hyperties system uses an encyclopedia metaphor, organizing information into *articles*.

Early on, hypertext researchers recognized that mathematical networks could model a set of linked documents [19], and hence hypertext systems such as Neptune [14], Sun's Link Service [41], HyperProp/NCM [55], and CoVer [24] (to name just a few) employ the terminology of networks by calling their information items *nodes*. This is a useful abstraction for hypermedia systems, since the term node carries neutral connotations about the kind of information within the node, and hence it can equally model documents, images, movies, CAD drawings, or any other kind of content. Another term that has similarly broad connotations is *object*, employed, for example, by Aquanet [29], PROXHY [27], HyperForm [65], and Chimera [3]. For Aquanet, PROXHY, and HyperForm, the use of object accompanies object inheritance and/or message passing to objects within the system, while Chimera just uses the term abstractly to refer to any data item, without object-oriented programming semantics. Avoiding node and object, the Dexter model [26], and hence the DHM system [22], uses the term *component*.

Outside the realm of hypertext systems, a variety of terms are used to describe the representation of intellectual works within the system. The Document Management Alliance 1.0 [16] specification uses the term *document version object*, which contains a *rendition object*, which in turn contains a *content element object*. The Portable Common Tool Environment (PCTE) [62] uses the term *object*. Within versioning and configuration management systems, SCCS [46] uses the term *module*, containing multiple *revisions*, while CVS uses the term *file* [6], Adele [20] uses *object*, and NUCM [61] uses *artifact*. In their configuration management systems survey, Conradi and Westfechtel use the term *software object* [13].

One possibility for common ground here is the term "work," as is used in copyright law [57]. Copyright law and hypertext research have both struggled with the same problem, that of finding a suitably broad term that encompasses the wide variety of artifacts that, when viewed, read, heard, or watched, communicate ideas. While hypertext researchers have struggled to abstract away from their early focus on text and documents, copyright law has long used the term "work" to signify a broad range of intellectual communicative artifacts, irrespective of medium. Though the term "work" has the drawback that its primary parsing for most English speakers is as a verb, and not a noun, it avoids the problems with other terms, and adds new meaning to related terms, such as a "workspace".

System	Date	Term for intellectual work	Term for link endpoint
NLS [19]	1968	file, statement (a file is a collection of statements)	location or name of a statement
Xanadu [35]	1981	document, span (a document is a collection of spans)	span
TEXTNET [59]	1986 (1983)	chunk (also toc, for table of contents node). Also uses term node.	none (link is to an entire chunk)
Neptune [14]	1986	node (a document is a collection of nodes)	character position, or span
NoteCards [58]	1986	node, notecard	link icon
Hyperties [51]	1987 (1983)	article (uses encyclopedia metaphor)	embedded menu
KMS [1]	1987	frame (screen-sized)	linked item, link source
WE [53]	1987	(hypertext) document, node (a document is a collection of nodes)	N/A (links go to/from entire nodes)
HyperCard [4]	1988	card (each card is associated with a background)	button
Intermedia [67]	1988	document	block (but also discusses anchoring)
Sun's Link Service [41]	1989	node, linkable object	link indicator (an icon, or glyph)
Virtual Notebook System (VNS) [48]	1989	page	link (the term link is used for both the link, and its endpoint, depicted by a small icon)

HOT/eggs [42]	1990	node	link endpoint, hotspot
Microcosm [21]	1990	document	selection
Dexter model [26]	1990	component, atomic component	anchor
World Wide Web [7]	1990/2	resource, Web page	anchor
HyperProp/NCM [11]	1991	node	anchor
ABC/Artifact-Based Collaboration [52]	1991	node, data object, artifact	anchor, position in data
Aquanet [29]	1991	basic object	graphic element (describes layout of a relation, not linking within text)
PROXHY [27]	1991	object, node (nodes contain objects)	anchor
HyperPro [40]	1992	node	anchor is used in the paper, but HyperPro does not support anchors.
CoVer [24]	1992	node	link anchor
Multicard [45]	1992	node	anchor
DHM [22]	1992	component	anchor
Hyperform [65]	1992	object	N/A (framework could be specialized to include an anchor object)
Chimera [3]	1994	object	anchor
Dolphin [25]	1994	node (which contains as contents links, scribbles, text, images, and other nodes)	none (“Links present themselves as arrows with a handle.” p. 7)
HyperDisco [66]	1996	node (composites can also be linked; a node inherits from the component type)	anchor
HyperStorM [5]	1996	node (AtomicNode, CompositeNode, VirtualCompositeNode; nodes are specialized objects)	none (basic link types are only node to node)
Fluid Links [68]	1998	source text, source material,	anchor (link anchor, anchor site)
OvalTine [54]	2000	video stream	anchor
Manufaktur [33]	2000	object (document object, implantation, grouping)	endpoint, link anchor
Construct [64]	2001	object, file, item, piece of information (varies with each integrated third-party application)	anchor
Visual Knowledge Builder (VKB) [50]	2001	object	none (links are between objects, collections, or locations within a collection)
Queries in Context (QuIC) [17]	2001	document, Web page	anchor, link rendering
CardShark [9]	2001	card, node	none (connections are made between whole cards)

Table 1 – Hypertext systems, and their term for linkable information, and link endpoint. In cases where there were multiple references for a system, or the system underwent several revisions during its

development, this table uses the earliest reference. Systems chosen are representative, and do not constitute an exhaustive list.

Anchors

Early hypertext systems used a variety of terms to describe a link endpoint. Some systems use the term for the address or location of the endpoint, such as *location* or *statement name* in NLS [19], and *character position* in Neptune [14]. Others emphasize the user interface element that was used to activate a link traversal, as with *link icon* in NoteCards [58], *embedded menu* in Hyperties [51], *button* in HyperCard [4], *link indicator* in Sun's Link Service [41], and *selection* in Microcosm [21].

While systems such as TEXTNET [59], WE [53] and HyperStorM [5] only support links that connect an entire object to another whole object, most provide for attaching the link to a specific endpoint within the object contents. Anchors typically exist in relationship to a work. That is, an anchor acts as a handle for a specific subset of a work's symbols. For example, in a text, anchors are rendered as either underlined words, highlighted words (such as coloring, or box-outlining), an icon embedded in the text, or by turning the text itself into a button [63]. This pictorially represents that the anchor is acting as a proxy, or handle for the specially presented words (symbols). Defining an anchor as a handle for specific symbols of a work allows the anchor to exist independent of any particular symbolic rendition of the work, and hence the same anchor can exist across multiple renditions, and can be depicted in multiple ways within a given rendition.

Coined by Norm Meyrowitz [32] in the mid to late 1980's, and initially used by the Intermedia group, the term *anchor* came to represent both the endpoint reference as well as the user interface representation of a link endpoint. The motivation for developing the term anchor was similar to that for node and object: generality of the abstract concept of a link endpoint across multiple content types. In the case of Intermedia, the term *block* was initially used, as in a block of text. However, once images were introduced, it was reasonable to consider non-square, and hence non-block-like link endpoints, and thus this led to a desire for a more abstract term. One coined, the term anchor spread first to other researchers in contact with the Intermedia group. At the initial Dexter workshop, the need for anchors was strongly debated, with the Dexter group in the end agreeing for its need and adopting the term [28]. From the Dexter participants, the term spread to the wider hypertext community at the Hypertext'89 conference, with Norm Meyrowitz using the term in his keynote address [31], and with Frank Halasz using the term in two separate sessions on NoteCards, and the Dexter model [37]. As is visible in Table 1, by 1991 the term anchor was almost universally adopted by the hypertext community, an indication of the strength of the term, and the fact it was introduced via the Dexter working group, comprised of many leading hypertext researchers.

The term anchor also serves as a clear indication of the impact of the hypertext community on Berners-Lee's development of the World Wide Web. Since the term anchor was coined only one or two years prior to the initial development of the Web, Berners-Lee must have picked up the term, and the concept, from the hypertext community, either at the ECHT'90 conference, or by direct conversation with a hypertext researcher who had adopted this term. After adopting the term, it was a short step to abbreviating it in the "A" tag in common use in HTML.

Links

In his 1945 essay, "As We May Think," Vannevar Bush described the Memex, a machine that would allow its user to capture arbitrary *associations* between documents stored within the system, though in all examples used in the paper, associated documents always share a related subject [10]. Bush used several wordings for these associations, describing them as "*tying* two items together," "two items to be *joined*," and "*binding* items together into a new book." Joining items together forms a "trail," or "associative trail," and items can be "*linked* into the main trail," and thus a trail can be viewed as a collection of associations (emphasis added, all quotes from p. 107-108 of [10]). In Bush's article, the items being associated are not in question: they are all documents. However, the terminology of association was clearly in flux, as any of the terms association, tie, joint, binding, or link could equally be used, though only association was ever used in its noun form, all others being used as verbs.

The early pioneers of hypertext were all directly influenced by Bush's vision, but reinterpreted it to employ digital computers instead of microfilm to represent the documents and their associations. Indeed, Engelbart directly acknowledges Bush in a 1962 letter to him seeking permission to quote from "As We May Think" for an early report for the NLS project [18], and a 1972 paper by Nelson titled, "As We Will Think," is a

detailed retrospective on Memex, as interpreted by the Xanadu system [36]. Early on, there was agreement that the computer representation of an association is called a *link*, with NLS using the term in 1968 [19], and Xanadu in 1972 (and probably earlier) [36], and from these beginnings there has been broad acceptance and use of the term link. The alternative terms tie, joint, and binding were never adopted, though the term “association” is still used today. The notion of a guided trail has also survived to the present, and continues to be an active area of research (e.g., the work on Walden’s Paths in [49]).

Grønbaek and Trigg describe four classes of link styles in hypertext systems [23], p. 70-73:

- **Links as addresses:** The address of the link destination is embedded within the work. Examples include NLS, HyperCard [4], and the World Wide Web.
- **Links as associations:** Links are first-class objects that express an association between works. Link traversal is two-way, and can be initiated from either endpoint. Examples include Intermedia [67], Chimera [3], SEPIA [56], and many others.
- **Links as structural elements:** Links are used to represent hierarchical, or other organization of materials. When used to represent hierarchical containment structure, this use of links is one of several possible representations of containment relationships. The fileboxes in NoteCards [58] are an example of this use of links.
- **Links for rhetorical representation:** Links represent the structure of an argument. gIBIS [12], Aquanet [29], and the Author’s Argumentation Assistant [47] all use links to represent argumentation structure.

To these link styles can be added:

- **Links as semantic network:** Link types are used to represent semantic relationships between works, and may not be intended for link navigation. MacWeb [34], and recent work on the Semantic Web [8] are examples of this style.

Across all these styles of link types, the link expresses the existence of a relationship between the linked works. Even when the link is simply an address, the link was created on purpose, to express that the works are connected in some way. Papers have described possible kinds of link relationships [59], and taxonomies of link relationships [15].

Traditionally, the primary notion of a link has been a navigable relationship between works, with a link traversal causing a transition to one or more anchors of destination works. However, different notions of relationship have been explored, including the spatial hypertext notion of inferred relationships among physically proximate nodes (as in Viki [30] and VKB [50]), and the use of hypertext to model botanical taxonomies [39]. Launched by the provocative paper, “As We Should Have Thought” [38], the field of Structural Computing views navigational links as one of a set of structural services that may be offered by a hypertext system. Thus, after many years of basic agreement on the term “link,” it is entering a period of reflection and extension through the Structural Computing workshop series [2,60].

Conclusion

We surveyed over 35 systems to develop a history of terms used to describe the notions of work, anchor, and link in hypertext systems. Even after three and a half decades of research on hypertext systems, there is still no agreement on what to call intellectual works. In the most recent hypertext conference, established researchers still use a variety of terms. Due to this lack of convergence, we suggest borrowing the term “work” from copyright law, since it can represent a wide variety of communicative experiences, and avoids errors of being too specific (text, document), and too general (node, object).

Surprising for relative newcomers to the hypertext field, the term “anchor” is a recent addition to the hypertext lexicon, having been coined in the late 1980’s. While many systems still do not support within-work link endpoints, those that do invariably call them anchors. “Link” is one of the oldest terms on which we have convergence, and so perhaps it is fitting that this term in coming under significant re-examination within the Structural Computing research theme.

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