New York Stock Exchange

NYSE.com v2.0
Solution Outline Document

Submitted by
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Introduction to the Solution Outline

The Internet has emerged as the premier business tool in the new millennium and has redefined customer expectations of businesses. Smart, cutting-edge corporations continue to properly leverage their power, implementing successful e-business strategies and positioning themselves well ahead of their competitors.

Having coined the term for the industry, IBM understands "e-business." IBM has grown to be the market leader through vast experience assisting clients with e-business efforts. By demonstrating tangible results and consistent return on investment as a result of those efforts, and having successfully transformed its own business into an e-business, IBM is uniquely qualified to partner with the New York Stock Exchange (NYSE) to successfully and aggressively deliver a redesigned NYSE.com site.

To determine how Web-based tools and technologies can assist NYSE in executing its e-business strategy, IBM has engaged in an initiative to understand and analyze NYSE's business environment, goals, strategies and objectives.

This effort began with providing requirement questionnaires, conducting informal pre-requirements gathering discussion meetings and then completing a two day Joint Requirements Definition Session with the NYSE.com Web team, the NYSE.com Redesign Advisory Work Team, and various internal NYSE stakeholders. A document containing NYSE.com v2.0 draft requirements, future phase requirements, and an additional stakeholder ideas list was then created. This initial requirements list was validated and clarified through discussions with representatives from key NYSE constituencies and then approved by NYSE.

With an understanding of the New York Stock Exchange's business objectives and requirements in hand, IBM has engaged a team of Visual Designers, Information Designers, Content Developers, Producers, Business Analysts, and Solution Architects to develop a roadmap for the Web solution. This team applied creative design and technology to create a full solution that meets the requirements as documented and approved in the Requirements Document and detailed in this document. However, IBM has also created a phased-in Solution option that consists of parallel teams working on modified solutions to allow for a sooner site launch while meeting a large portion of the functional requirements. IBM will work with NYSE to choose the option that best meets the stakeholders' strategic, functional, and financial objectives.

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1 Executive Summary

Introduction and Solution Summary

The result of IBM's analysis, which is set forth in this document, is a plan to redesign the existing NYSE.com website, replace the content publication and management tool, and provide a technical environment conducive to ensuring changes to the website are adequately quality assured. New navigation based upon directed user constituency paths, a new look, feel, and content layout, a modified technical infrastructure, steps to address the Americans with Disabilities Act guidelines, and in-person and on-line usability testing activities are the cornerstones of IBM's recommended solution.

The development of this solution outline is the first step to be taken in order to address NYSE's business, technical, and design requirements identified in the Requirements Definition session on July 17-18, 2001. There are several other activities that must be completed for NYSE to realize the full benefit of this opportunity. Specific pricing of all mentioned services and products are outside the scope of this document, but will be addressed in the Statement of Work. These activities are discussed in the section entitled *Project Critical Success Factors*.

This Solution Outline includes requirements and recommendations from an information architecture, visual, content, and technical perspective that will frame the work to be further defined and designed in the follow-on phases. Upcoming phases include:

- Detailed Design
- Build
- Content Migration
- Test
- Deploy

The high level sections contained in this deliverable are as follows:

- Executive Summary
- Client Requirements
- Creative Outline
- Technical Outline
- Appendices

Implementation Plan

To meet the New York Stock Exchange's objectives and requirements, the IBM e-business Innovation Center team recommends implementing an interactive solution based upon the functional requirements identified in the Client Requirements section of this document. Selected future requirements and stakeholder ideas will be implemented in future phases, based upon business direction by NYSE. Implementation estimates and pricing for identified likely future enhancements will be provided in the Statement of Work.

Phase I Solution Recommendations:

- **Information Design:** The overall information architecture of NYSE.com will be reorganized to emphasize navigational units based on the main user constituencies of the site. Additionally, navigation will be streamlined to more easily locate detailed content, become dynamic, provide global data-providing functions, and improve download time of the site.
- **Visual Design:** Focusing on the main brand priority concepts, such as trust and confidence, informational transparency, stability and the global center of business, IBM will flesh out the brand priorities within the new visual space. In addition, the visual solution options will be compatible with the design directions currently being implemented by the MarkeTrac application so that the two applications may be functionally merged in the future with minimal loss or confusion of visual effect.
- **Application Design and Development:** IBM will implement the new navigation, look and feel, content management tool, quality assurance environment, application development framework, and functionality improvements including a user-controlled ticker and advanced search capabilities.
- **Content Assessment, Tagging and Migration:** Working under the guidelines and principles identified by an appointed NYSE representative, IBM will review all of the existing content and create appropriate titles and meta-tags as content is individually migrated from the existing e-Publisher to the new content management system. Additionally IBM will develop new content for the Help and FAQ sections.
- **Site Metrics:** IBM will ensure the site changes are carried forward and appropriate changes are made to ensure integrity in the SurfAid Web statistics collection and reporting processes.

Project Critical Success Factors

There are several important success factors as identified by key NYSE stakeholders. They include:

- Positive feedback from NYSE.com internal and external stakeholders
- Successful execution of a content management migration plan without impacting current production environment
- Reduced dependency on a third party maintenance team and thus significantly reduced monthly maintenance and support costs

- Ease of page-building to enable site growth to content owners outside the NYSE.com Web Team:
  - Rapid creation and deletion of pages and dependent navigational structure
  - Rapid modification of the Web page display
  - Rapid modification of the display criteria of Web pages
  - Rapid submission, modification, and removal of content
  - Rapid submission, modification, and removal of attributes and content types
  - Rapid submission, modification and removal of navigational and structural elements
- Delivery of milestones on or before agreed upon deadlines (TBD); delivery of other priority items as soon as possible, thereafter
- Implementation in a short time frame
- IBM recommends NYSE perform usability testing to ensure a successful user experience with NYSE.com v2.0

Legal Considerations

As a publication medium, legal precedent has not been set for many issues regarding the rights and responsibilities of publishers on the Web. As Internet publishing continues to expand, it is important to keep abreast of relevant legal decisions. IBM and NYSE will develop and implement NYSE.com v2.0 within legal boundaries. However, the NYSE is ultimately responsible for ensuring that the solution meets all legal requirements. Legal issues requiring further research include:

- International deployment
- Any regulatory issues that apply
- Retention periods on documents

Target Audience

In order to redesign NYSE.com to meet the needs of its visitors, it is essential to identify the profiles and needs of its target audience. The audience for the Web Application and the Publication tool include two distinct groups, with two distinct sets of needs, which the proposed solution should satisfy.

The individuals within each segment are:

Site Visitors

- The Public
    - Investors
    - Active
- Occasional
    - Students/teachers
    - Researchers
    - Public opinion leaders
    - The media
    - Security and Exchange Commission
- Federal and state government (staffers for policy, research, and compliance purposes)
    - Tourists
- Listed companies/prospective listed companies
- Member firms and institutions
- Market data vendors

Content Producers

- NYSE.com Web Team Contributors
- Distributed NYSE.com division contributors

Geographical Distribution

There is a worldwide fascination with the New York Stock Exchange. Fifty percent of the in-person visitors are international.

2 Client Requirements – NYSE.com v2.0

Overview

The functional requirement information contained in this section supersedes any previous information requirements. Because some requirements have changed over time, the information in *this* document is considered the document that will guide the development efforts of NYSE.com v2.0 forward.

This Section discusses the following, as they pertain to the development of NYSE.com v2.0 going forward:

- Overall NYSE.com Redesign Project: Goals and Objectives
- NYSE.com Overview
  - Visitor Issues
  - Content Producer Issues
- Functional Requirements

Based on the requirements outlined in this section, IBM has created a solution that provides a stable and scalable interactive environment for more efficient content publishing, improved website performance, and increased user satisfaction.

Overall NYSE.com Redesign Project: Goals and Objectives

NYSE.com is the public facing flagship site built to serve and promote relationships with New York Stock Exchange's constituency groups.

- The following major goals and objectives for the redesign of the NYSE.com site were documented during the day and a half Joint Requirements Definition session and in subsequent team discussions. These goals and objectives represent the long-term potential for e-business at NYSE, and have prompted NYSE to engage IBM in the NYSE Redesign Solution Outline activities. Together with IBM, the NYSE team identified the following strategic and tactical objectives for the NYSE.com v2.0:
- Build and expand upon the New York Stock Exchange brand image with particular focus on being seen as a global, innovative, technologically-advanced, customer-centered market of choice
- Provide access to content according to NYSE.com's constituencies in a directed and clearly navigable manner
- Provide NYSE.com operational efficiencies through electronic distribution of constituent-specific publications

- Communicate timely, complete and targeted topical information on current NYSE events and topics
- Provide a new tool to accommodate the growing content publication and management needs including personalization, advanced work-flow processes, flexible and dynamic navigation, and contribution of content from non-NYSE Web Team members

The goal of NYSE.com 2.0 is to replace and enhance the current version of NYSE.com with a version that excels in the following areas:

- Interactive branding, information architecture and design
- Content strategy and reorganization
- Content publication and management
- Download speed performance
- Search capabilities
- Portfolio development
- Help
- Ticker redesign and user control

NYSE.com Overview

The existing NYSE.com website has been operational since August 1999. The application includes an inward-facing component, and an outward-facing Web site. When referring to these two pieces of the site, "Content Management tool" describes the inward facing component, and the area behind the firewall, while "NYSE.com" describes the outward facing Web component.

The Publishing portion of this application allows analysts to publish and maintain information. The Web Application portion allows all internal and external visitors to view the site based on certain access permissions. The Web Application component of NYSE.com was originally developed and implemented to provide global accessibility to the New York Stock Exchange and its market data. It was designed to leverage the Internet to deliver targeted information in a timely, accurate manner to an extensive and diversified user base. Rapid access to key market information and information on the structure and function of the NYSE is extremely important to the users of the site.

NYSE branding, the content management needs of the site, and Internet technology have evolved and expanded over the last few years, and the needs of the NYSE.com users have become clearer. Further, several shortcomings of the existing NYSE.com site have become evident. While the NYSE.com site allows the client population to access the rich content, the site and specifically the homepage is graphically heavy and slow to download. The site is limited by the original minimum platform requirements and does not take advantage of screen real estate available on more common, current screen resolution rates. NYSE.com is complex to navigate, and maintenance of the site has also proved difficult. In short, the NYSE.com Web Team and Senior management are concerned with several issues relative to the

NYSE.com, particularly navigation, usability, promulgation of the brand and maintenance.

Visitor Issues

Visitor feedback from the NYSE.com Web team and users indicates that intuitive, logical, and directed navigation and improved web page download is a chief concern. Therefore, the visual design and information architecture must be reworked to support client's growing needs. In terms of functionality and performance, the following concerns were expressed:

- **Performance:** Web page downloads are too slow. Ticker, graphic-based navigation and image-heavy home page have made the loading speed of the home page unacceptable
- **Search Functionality:** Inconsistent retrieval of the most useful and relevant data and content are returned without title names
- **Navigation:** Navigation is conflicting and confusing and does not provide direction to users based on their constituency-specific needs

Content Producer's Issues

Content producers/providers of information for NYSE.com require an efficient, intuitive publishing environment. With the potential for distributed multi-departmental content contributors, there must be a sophisticated workflow and architecture to support their needs. Contributors request an application that is simple and targeted for publishing the content. In addition to publishing ease, contributors desire the following:

- **Content Ownership:** An increased sense of ownership and control over where their content is going
- **Reliability:** A reliable infrastructure to support their content
- **Rapid Site Updates:** The ability to update the site menus, content, and design, without the need to go through a third party. The ability to promptly provide users with the latest information without being constrained by reliance on a third party or inflexible page design limitations
- **Customization:** Improved flexibility to later incorporate site navigation and presentation based on self-selected preferences and/or visitor behaviors
- **Workflow:** A logical, intuitive approval process that can vary by content type
- **Site Metrics:** Continued delivery of detailed strategic information about which features and assets users call into service most often

Functional Requirements

The following numbered list represents the total set of functional requirements for NYSE.com v2.0 identified by the NYSE and IBM during the "pre-JRD"

Requirement gathering sessions, the day and half in-person requirement gathering session and subsequent stakeholder interviews completed by the date of delivery of this document.

NYSE seeks to upgrade the navigational and graphical look-and-feel of the application with the limitation that any improvements shall not substantially impact the overriding goals of time, stability, performance, and productivity. Future phases of NYSE may offer greater personalization capabilities, including complex content design by contributors. However, more targeted marketing and branding information, user feedback, and, potentially, usability test studies are required to achieve these personalization goals.

All requirements, except those listed under "Future Phase," shall be delivered during the Phase I performance of this project. The requirements are classified first into general design requirements and then are further divided into functional subcategories.

General Design

1. NYSE.com v2.0 shall have a minimum browser requirement of Netscape Navigator v4.73, Internet Explorer v4.01 and AOL 4.0.
2. NYSE.com v2.0 shall run on Windows 95, 98, NT 4.0, or Windows 2000 with a minimum 200 MHz Pentium processor and 32 MB of RAM. It shall also run on Apple Mac OS 8.6 or higher, with a minimum G3 processor and 32 MB of RAM.
3. The site is not required to have full functionality on any other browser or operating system other than those identified in Requirements #1 and #2 above.
4. NYSE.com v2.0 shall be designed for a video screen resolution of 800x600 pixels with a monitor color depth of 65K ("thousands" on a Macintosh).
5. The look and feel throughout NYSE.com v2.0 shall complement the new NYSE logo. IBM shall use the styleguide provided by Landor Communications (including fonts, color palette and layout grids) as a starting point for design, but NYSE recognizes that these guidelines were designed for print media and IBM is allowed to expand their meaning into a web design space. IBM understands a comprehensive review and approval process will be implemented with executive NYSE Communications management.
6. IBM shall standardize and make consistent the font styles and sizes of NYSE.com v2.0 text including all content, headers, and navigational elements.
7. IBM shall incorporate the new NYSE logo and mark standards throughout NYSE.com v2.0, where not already accomplished in previous phases.
8. All existing market data displayed on site shall be branded and presented as "NYSE MarkeTrac ". NYSE allows IBM to expand upon current MarkeTrac look and feel in order to reposition market data into NYSE.com v2.0.
9. NYSE.com shall be redesigned to significantly reduce the loading time of the current site.
10. NYSE.com v2.0 shall not incorporate the use of frames. Pages shall provide the ability to be 'book-marked' for quick access at a later date and shall maintain global navigation when search pages are returned.

11. NYSE desires that the following key market information elements should be prominently and globally viewed throughout the site: real time indices, market open/close, current time, search, and quote/symbol look-up.
12. The look and feel of NYSE.com v2.0 shall incorporate lighter and brighter colors as defined in the new color palette and should discourage the use of black as a page background color.
13. The look and feel for NYSE.com v2.0 should not be designed with graphical page elements having a beveled style.
14. IBM shall redesign the look and feel of headers and interior navigation to improve readability and usability.
15. ALT tags within NYSE.com v2.0 should be added to photos. NYSE shall provide direction on ALT tag titling by content item.
16. It is desired that the new information architecture be designed to reflect a user-centric view of functionality (based on NYSE constituencies), rather than a design based on NYSE internal organizational structure.
17. The site must clearly identify when market data is provided in real time or if it is delayed by any certain duration.
18. IBM shall provide a recommendation on what steps are required to comply with the American Disabilities Act.

Content Strategy

19. IBM shall categorize all existing content using new information architecture categories, except that content identified by NYSE in the Joint Requirements Session as allowable to be deleted.
20. IBM shall migrate all existing content defined in the previous requirement to the new content management and publication tool.
21. NYSE desires that current content must be tagged with key words to enhance search functionality, specifically page titles, keywords and content summaries. NYSE has requested IBM to tag such content and NYSE understands that NYSE must appoint an internal representative to aid and direct IBM in the definition of search tag categories.
22. NYSE.com v2.0 shall include consistent use and placement of FAQs throughout the site. IBM shall provide direction on appropriate FAQ topics and NYSE shall develop associated content.
23. NYSE desires that the homepage and global navigation be designed such that second-level and lower and, potentially, first-level navigation categories can be altered and/or added/removed.
24. All second level main pages shall include introductory language explaining to the user the purpose and scope of the section. NYSE to provide text for these elements if not already extant in the current NYSE.com.
25. NYSE desires that the redesigned NYSE.com v2.0 site shall more clearly highlight information for member firms, listed companies, the press, and technology. If such content does not already exist, NYSE shall aggregate and/or develop such information. Types of information to be added to the site include:

For Listed Companies:

- ❖ Information to benefit listed companies:

  - Benefits of listing at NYSE
  - Listing process including application and rules
  - Comprehensive listing compliance rules
  - Client representative contacts
  - Upcoming events for listed companies
  - Description of the NYSEnet.com service
  - Separate paths for international companies versus domestic companies to access listing information specific to their geographical location
- Information to promote listed companies:
  - Trading information about listed companies' stocks
  - Additional public relations information specific to each listed company. This is dependent on identifying NYSE resources to manage this content
  - Latest disclosure information specific to each listed company

For Member Firms:
- NYSE products and services (e.g. Institutional XPress)
- Regulatory postings and filings
- Weekly Bulletin
- Information Memos
- Special Membership Bulletin
- NYSE Initiatives

26. The redesigned NYSE.com v2.0 site shall no longer include rule change content.
27. The existing site map shall be replaced by a site index page, which shall contain an alphabetized list, by title of hyperlinks to all major functional pages (currently assumed to be all pages down to the third navigation level, with the exception of discrete files such as press releases).
28. The only interaction between NYSE.com and the store may be a link from NYSE.com to the store site.
29. IBM shall archive a back-up of the entire site for future referencing.

Content Management

30. The Content Management System shall comply with the requirements outlined in IBM's Content Management Tool Requirements Questionnaire deliverable to NYSE, dated August 8, 2001. (See Appendix)
31. The workflow of NYSE.com v2.0 shall include an extra approval step for the final editing prior to releasing all outgoing subscription-based emails.
32. The content management system (CMS) shall have the ability to quickly publish breaking news alerts on the web site.
33. The implemented CMS shall provide for a decrease in the time required for publishing new content (including layout or navigation changes) to NYSE.com.
34. A link management strategy shall be defined during detailed design phase, once a content management tool has been chosen.

35. The CMS shall be able to integrate with a search engine and include the ability to change titles and key words.
36. During the migration to a CMS environment, duplicate content shall be removed (such as dynamically built pages that already have static page equivalents; e.g. "Listed Company Manual").
37. A process shall be defined for creating and publishing the Weekly Bulletin using the existing requirements.
38. A "deep linking" process for accessing listing rules, fees, and process from the Listed Company Manual Domino database.

Home Page

39. The quick quote and symbol look-up elements should be redesigned to function in a similar manner to best of breed sites. In particular, users should be provided a single text box for quote entries with two radio buttons to indicate whether entered text is a company name or ticker symbol. The system shall then match the user's entry against its database and provide a symbol look-up results table of closest matches in the event of an inexact match. The user shall then select from the returned symbol look-up list, the particular stock desired, which shall then repopulate the quote box and execute the function, resulting in a quote for the stock.
40. The real time market indices shall be displayed physically separated from the quote look-up functionality.
41. Quote lookup functionality and real time indices shall be displayed globally throughout the site.
42. The Events area of the home page shall be designed to highlight two separate events with one picture each and up to two other events without pictures.
43. The home page of NYSE.com v2.0 shall include a link to an improved events calendar interface.

Login/Registration

44. NYSE.com v2.0 shall include a registration function and single sign-on to NYSE.com. Registration shall be accessible from the home page and the portfolio and the login process shall be accessible globally throughout the site.
45. In this phase, the registration process shall allow users to select subscription options. The registration process should allow users to self-select their associated constituency group. Users shall be offered a list of all subscription offerings.

    The comprehensive list of all existing electronic subscription offerings for the NYSE.com v2.0 (target: November 2001) launch include:
    - Media alerts
    - Weekly Bulletin (once a week)
    - Press Releases (categorized by topic)
    - Newsletters (12x a year)
    - NYSE Magazine (4x a year)
    - Technical Specifications

- ❖ Research Papers
- ❖ Information Memos
- ❖ Disciplinary Actions
- ❖ Arbitration Decisions
- ❖ Data Library

If the content for the above content types does not already exist, NYSE shall aggregate and or develop such information. There may be workflow requirements for each piece of content. Those requirements shall be detailed within the content management assessment matrix deliverable. The subscription and workflow processes shall be further clarified in the solution outline phase of this project.

46. Users shall have the ability to alter their subscriptions and/or unsubscribe.
47. Users who have not logged in shall be able to navigate freely throughout NYSE.com v2.0 without being required to register or log in except to access, build and save portfolio information or access their subscription rights.
48. The text of the registration form questionnaire shall be based upon specifications for the real-time registration form as defined by IBM and NYSE in December 2000.
49. The new registration process shall supercede the current method for users' defining their portfolio and shall necessitate in the future that users log on to access their portfolio.
50. The registration process shall allow users to port their current portfolio to the new system if they initially create their registration from the machine in which the cookie for their portfolio is currently stored.

Search

51. It is desired that all content including HTML text, PDF files, images, Flash, audio and digital video files should be searchable. All content shall be searchable based on keywords and/or meta-tags. Existing search indices shall be maintained. NYSE shall provide direction on content categories and IBM shall perform tagging and titling.
52. Content subject to tagging and migration by IBM shall be frozen as of the date that the NYSE.com Redesign Statement of Work is delivered. Additional content identified after this date shall be migrated on a case by case basis. IBM shall provide a plan on how to manage content migration from the freeze point.
53. All content pages must be titled and tagged with a page title so as to return the page title in a search query. NYSE shall appoint a representative to aid and review the names of the titles for the documents. Specific milestones shall be identified in the project plan.
54. The search functionality shall be globally accessible throughout the site via a text entry box.
55. Global navigation shall be visible on the search results page.

Portfolio

56. The number of user-defined portfolios does not change from the current functionality of NYSE.com.   All portfolio information shall be stored in a database so that a user can access their portfolio from multiple PCs.
57. Individual portfolios shall be displayed using the table list format only. Portfolios accessed through NYSE.com v2.0 shall be password protected using the single-login/registration process.
58. Users shall have access to their portfolio globally, including access from the Home page.

Help

59. NYSE.com v2.0 shall have help information that explains to the user how to navigate the site and perform common functions. IBM shall informationally re-architect and develop the categorization, labeling and content of the Help and Getting Started areas under the aid and direction of an internally appointed NYSE representative.
60. IBM shall draft the content for the Help Section.
61. Help content shall appear separate from glossary content.

Ticker

62. IBM shall redesign the ticker to improve load time and shall incorporate user-control for on/off speed and direction.
63. IBM shall redesign the look-and-feel of the ticker of NYSE to enhance readability.

Future Phases

The following functional components have been identified, but shall not be included in this current initiative.

64. NYSE.com v2.0 may serve as a single sign-on portal to other NYSE password-protected web services.
65. The registration process may be used to determine site look and feel and access to real time market data.
66. NYSE.com shall provide the ability to build and store up to ten portfolios.
67. NYSE.com may provide the ability to include rich media and customized content in subscription e-mails to introduce publication attachments. *
68. NYSE.com may include an interactive site tour targeted at new visitors to the site. This functionality should be accessible from the home page and available ideally within two months of launching the NYSE.com v2.0. NYSE may appoint an internal representative to aid and direct IBM with the creation of content for this tour. *

69. It is desired to incorporate customization and or personalization features of the site based upon user data. For example, potential subscription offerings may be presented in a manner reflective of a user's constituency group. *
70. The Fact Book may be tagged so that individual topics may be returned in a search. *
71. It is desired that the search results page, in addition to showing search hits, should offer a list of related categories based on the search term(s) entered. For example, a search for a company might return the companies listed company page as well as links to information about the specialist who works that company's stock, current earnings reports, historical earnings reports, order flow, etc. *
72. NYSE.com market data pages may incorporate listed company historical financial content, possibly obtaining such data through NYSEnet.
73. NYSE.com may provide market data to listed company web sites.
74. Appropriate NYSE.com personnel may be notified that subscription content has been viewed.
75. Data from the research group may be available in XML format. If so, more powerful ways of publishing content to and accessing from the web site are available and may be utilized in future phases.
76. User may have ability to use screen fonts when viewing a web page, but print fonts when printing the same page. Layouts to be defined by NYSE.
77. NYSE.com may provide registration for email notification of new content by topic or category. *
78. NYSE.com may provide an electronic media kit or sitelet for specific topics such as decimalization.
79. NYSE.com may provide "dark-site" capability for crisis communications.
80. NYSE.com may provide ability to accept video and photo requests via e-mail instead of fax.
81. The scalability of the Tradeline market data may need to be addressed to support pre-defined performance levels when real time data is introduced to NYSE.com.
82. NYSE.com may provide functionality to allow user's to import portfolios into NYSE.com from other Web applications.
83. NYSE.com may provide functionality and navigation to provide users a process to access all video content from a single location.
84. NYSE Rules may be added to the site.
85. User may be able to configure the site based on their customization/registration options selected.
86. NYSE.com may include interactive sitelet functionality for NYSE magazine information including a dynamic table of contents (with images and links), extended editorial content, amalgamated company content, live chats, subscription/feedback mechanism, online surveys, and searchability.

*IBM will provide separate estimates for these future requirements as part of the Statement of Work. Those future requirements with no asterisk require future requirement definition sessions, including NYSE business direction, as there is not enough information to provide estimates at this time.

3 Creative Outline

Overview

The following section is a high-level narrative detailing the challenges, abstract concepts and high level solution behind the new navigational structure and user interface look and feel of NYSE.com v2.0. This section includes the following topics.

- Information Architecture Outline
  - Information Architecture Overview
  - Challenges
  - Solution
  - Americans with Disabilities Act (ADA) Compliance
  - Usability Analysis
- Visual Design Outline
  - Visual Design Overview
  - Challenges
  - Solution
- Content Strategy Outline
  - Content Strategy Overview
  - Challenges
  - Solutions

As part of this narrative, reference is made to the following documents included in this Solution Outline. These documents are included in soft copy on an attached CD and as hard copies attached to appendices within this binder:

- High Level Navigational Flow
- Five User Interface Design Studies of the Home Page of NYSE.com v2.0

Information Architecture Outline

Information Architecture Overview

The work detailed in the Solution Outline is the beginning of a total Information Architectural approach to redesigning the navigational structure and usability of NYSE.com v2.0. In particular, based on the requirements discovered during the Joint Requirements Definition meeting and subsequent interviews with stakeholders, a high level navigational flow has been developed to describe the major functional pieces of the re-architected site. This high-level view enumerates the major categories and global navigation of the site, and drills down into the site to enumerate most of the major types of content to appear in NYSE.com v2.0. Please refer to the attached navigational flow document for the detailed discussion of the navigational areas below. The document enumerates a base numbering system for NYSE.com v2.0, which will begin to describe the final document titles of the content files. It also indicates where major sections of that content previously appeared in the current NYSE.com v1.0, using the numbering system from the navigational flow document delivered to the NYSE on November 6, 2000.

The high level navigational flows represent the initial solutioning of the information architecture for the site. As part of the detailed design and build to follow the current engagement, several tasks will also be completed. The primary goal of these tasks is to synthesize the content strategy and information design into a coherent document that determines how each of the components of the web site will fit and work together. This forms the complete information architectural model of the site. The other components of the model, to be completed in the detailed solution design phase include:

- **Detailed Navigational Flows:** These show the lower levels of the website. Detailed Navigational Flows are especially helpful for describing complicated application processes that require many screens.
- **Wire Frames:** Wire Frames depict the layout of the web page including the locations of text, images, buttons and links. These layouts, sometimes referred to as Functional Templates, are the "bones" upon which the visual design team will put the flesh of a graphical look and feel.

The remainder of this section continues to delve more deeply into the issues and high level information architectural solutions for NYSE.com v2.0.

Challenges

The NYSE desires that the overall information architectural structure of NYSE.com be reorganized for the new version 2.0. Previously, the consensus of stakeholders felt that the site organization, in particular the navigational structural divisions of the site, reflected the internal business operating units of the NYSE. In this new version, however, the NYSE intends that the site be navigationally organized to emphasize pathways based on the main constituencies that use the site. These constituencies have been identified as being the public (both investor and educational components), listed companies, member firms and institutions, and the press. There is also the continued need to identify the structure and history of the NYSE organization.

In addition, other navigational issues must be addressed. While the site has been described as being information rich, it has often been difficult to locate specific information due to inconsistent sub-navigation, inappropriate highlighting and cross-linking of items, and a navigational tree that is too many levels deep. The NYSE desires that any future navigation solution include a notion of scalability, so that sub-navigational divisions, as well as potentially first-level navigation divisions, could be altered and/or added and removed. These issues imply the need not only to streamline the number and width of the levels of the navigational tree, but also to provide for a more clearly defined pathway to the search function. This in turn demands a comprehensive strategy to tag and categorize site content.

Also, since a major goal of the site is to promote access to market data, it is desired that the new navigation more clearly aggregate its data-providing functions and make them available globally in a consistent manner. Ultimately, it is also desired that the structure of market data access become aligned with the developing structure of the MarkeTrac application.

Finally, the navigation must also address the login and registration functions as well as the issue of download time of the site, particularly in the use of applets to access information, such as the ticker and the market indices.
Future phases of NYSE.com may offer personalization capabilities based on user self-identified constituency alignment, including complex content design and collaborative filtering of page views. However, more targeted marketing and branding information, user feedback and potentially usability test studies are required to achieve these personalization goals.

Solutions

To accommodate these new priorities, the new navigation of the site attempts to streamline the number of first level categories, while re-titling them to indicate more clearly what constituency is best served by the information in the respective navigation division. Thus, as can be seen on the first page of the high-level navigational flows, there are now areas, available globally, that are clearly identified as being for the public, for listed companies, for the press, etc. There is also now only one area that contains all information about the history, structure and access to information about the NYSE itself. In addition, there has been a comprehensive reallocation of the content from the previous version to fit underneath these main headings to more closely align the content to the constituency that would have need of the particular information.

To this end, certain categories have been combined and streamlined, while other categories have been more specifically called out. In particular, there is now a single location for all publications and documentation produced by the NYSE that can be clearly searchable by content topic. Also, many of the elements that provided market and information data about companies, such as listed company pages and data libraries, have been aggregated under an "Investor Central" area, so as to provide the public with a single clear location to access information about the market.

Similarly, there are now main navigational areas devoted to serving the listed companies as well as the member firms and institutions. These areas now contain information specific to these constituencies, such as listing benefits to prospective new listings, and descriptions of NYSE data products to member firms and institutions.

The following detailed descriptions of the main navigational areas of the global navigation are proposed:

Home Page

The Home page will more clearly enable the distinguishing between functional and informational purposes of the site. Previously the site had mixed its market data functionality in with the areas devoted to information about the Exchange or its Listed Companies.

Now, a new navigational concept is the creation of a "console" area, represented in black as the 'quick start module' on the first page of the navigational flows, whereby all transactional and data query actions are clearly housed. Thus, this area contains user login and registration functions, as well as quote access, search functionality, portfolio access and help. Note, however, that this area is functionally deep, as well as wide, now allowing the user to directly access specific pieces of market data functionality (such as SEC listings) without having to drill down to the specific company page. This multiplicity of functionality brings nyse.com up to the level of best of breed financial sites such as finance.yahoo.com and ragingbull.com. Also, to reduce download times, the data from the existing real time indices area has been combined with the functionality of the ticker. The ticker itself has included more detailed user control, as seen in MarkeTrac, and the combination of functionality with the deletion of an additional Common Gateway Interface (CGI) call will reduce overall home page loading time. Conversely, purely information functions of the site are now located only in the constituency areas of the site.

There has also been an expansion of the events area of the home page to provide the ability to highlight more than one event at a time and the ability to modularize the presentation into different display formats. There is also a more clearly defined interface to the Events Calendar.

Investor Central

Previously, information which general investors would typically seek about a listed company had been scattered among several locations throughout the previous version of the site. In the new proposed navigation, the Investor Central area serves to provide a single access to all possible types of market data and background information about a company. To this end, and to bring the site up to the standard of best of breed financial portals, there is now proposed to be an aggregation of the previous site's market data page with the listed company page. Additionally, the user can navigate to all portions of both of these pages directly from the home page via a dropdown menu. Other areas of relevant concern to investors, such as regulation and arbitration, are now aggregated under a comprehensive Investor Security area. Under the Market Data area, new information is aggregated under the Market Internals subsection, to provide a quick view of trading history of the market. Finally, additional databases, such as the Data Library and TAQ database, are now more firmly associated with its investor constituency.

For Listed Companies

This area is now dedicated to information that would be relevant to users from a listed company already listed on the Exchange or for a company that would be interested in listing on the Exchange. There is now a more pronounced area highlighting the benefits of membership, as well as a more clearly defined access to the mechanics of listing. Also, it is proposed, based upon stakeholder interviews, that an area be dedicated not only to accessing the client listing representatives for the listed companies, but also descriptions of the specialist firms, whose relationships to the listed companies are considered critical by that constituency.

For Members and Institutions

Similarly to the For Listed Companies area, For Members and Institutions is now dedicated to information that would be relevant to users from a member firm or institutional trading organization, as well as market data vendors. It provides descriptions of NYSE products and services, as well as traditional access to member-used applications, such as the Weekly Bulletin.

About the NYSE

This area now serves as the aggregation of all content concerning the history, structure and operational mechanics of the Exchange. In the previous site, this information was scattered across several informational areas that all received relatively low traffic according to SurfAid statistics, and this warrants its aggregation as well as its streamlining. Accordingly, the history and structure of the Exchange is given its own sub-area, as well as an overarching 'learning center' which describes all educational efforts by the NYSE from the interactive education center to continuing education. Finally, stronger emphasis has been placed upon visiting the NYSE.

Press and Publications

This area, as in the previous site, continues to serve as the aggregation of all content most relevant to the media. However, in an improvement from the previous site, all forms of content representing any publications by the Exchange, from press releases to information memos to research papers, have now been more obviously aggregated into a Publications Central. This allows clear access to all the deep information rich content of the site. It is proposed that this area aggregate basic NYSE information and statistics into an electronic media kit to provide summary information to the media. In a future phase, topic-specific media kits may be developed and maintained.

It should also be noted that the structure implied by the streamlining of the top level of navigation has also been carried out on the lower levels. Each main level navigation category has been designed with its own home page. This second-level home page contains common elements across constituency categories, such as an area to indicate what is 'new' for that constituency, and a single location for the access to FAQs for that constituency. There has also been a consolidation and reduction in the number of tertiary subcategories under the secondary subcategories to further streamline and redefine the content. Where previously the site drilled down to a sixth or seventh level, all content is generally found on NYSE.com v2.0 by the third or fourth level.

Americans with Disabilities Act (ADA): Compliance

Potential Solutions

When one designs or modifies Web sites to allow access to people with disabilities, one makes the Web "accessible." New Web sites and applications, however, are introducing new problems and barriers. There are complex graphics and multimedia applications that assistive technology simply has not solved. One solution to these new problems is to put accessibility in the hands of the Web developer and content author. Creating a Web site that is accessible by people with disabilities is relatively easy as long as the Web developer and author follow some basic guidelines.

The following is a proposed checklist of issues to be addressed in any detailed design to NYSE.com v.2.0 for disability compliance. Some of these proposed items may be in conflict not only with each other, depending on the primary disability to be addressee, but also with the overall brand priorities of the NYSE, as defined in the Joint Requirements Session. Further discovery and business direction is required by NYSE to decide the prioritization of these suggestions relative to the detailed solution of NYSE.com v2.0.

- **Images and Animations.** Use the alt="text" attribute to provide text equivalents for images. Use alt="" for images that do not convey important information or convey redundant information.
- **Image Maps.** Use client-side image maps with alternative text for image map hot spots. If you use server-side maps, provide equivalent text links.

- **Graphs and Charts.** Summarize the content of each graph and chart, or use the ‘longdesc’ attribute to link to the description or data.
- **Multimedia.** Provide captions or transcripts of important audio content. Provide text or audio descriptions of important video content.
- **Scripts.** Provide content for scripts which is keyboard accessible. If the content is not accessible, provide an alternative.
- **Applets and Plug-ins.** Provide alternate content for applets or plug-ins which are not accessible.
- **Forms.** Make forms accessible to assistive technology.
- **Skip to Main Content.** Provide methods for skipping over navigation links to get to main content of page.
- **Page Titles.** Provide a title for each frame and frame page so that users can track frames by title.
- **Tables.** Use the TH element to mark up table heading cells. Use the headers attribute on cells of complex data tables.
- **Cascading Style Sheets.** Web pages should be readable without requiring style sheets.
- **Color & Contrast.** Ensure that all information conveyed with color is also conveyed in the absence of color and that the contrast is sufficient in images.
- **Blinking, Moving and Flickering Content.** Avoid causing content to blink, flicker, or move.
- **Timed Responses.** When a timed response is required, alert the user, and give sufficient time to indicate more time is needed.
- **Text-only Pages.** Provide a text-only page, with equivalent information or functionality, when compliance cannot be accomplished in any other way. Update the content of the text-only page whenever the primary page changes.
- **Verify Accessibility.** Test the accessibility using available tools.

Usability Analysis

IBM recommends a two-staged approach to gathering usability feedback from NYSE visitors.

First, during the detailed design phase, around the completion and approval of the wireframes, IBM proposes developing an interactive wireframe-only prototype of a representative portion of NYSE.com v2.0. IBM proposes conducting focus groups and usability tests using this wireframe prototype with key constituency groups to test future visitors on the completion of tasks determined by NYSE as critical to the success of the application. IBM recommends conducting a minimum of two focus groups in two different cities with members of each key constituency group as identified in the requirements document. Participants within groups will be recruited for homogeneity.

Each focus group participant will begin by exploring an interactive wireframe-only prototype of a representative portion of NYSE.com through a series of exercises for approximately 45 minutes to accomplish tasks as pre-determined by the NYSE to be critical to the success of the project. The online portion of the focus group could also include visits to other web sites and a comparison of “mock-ups”, using graphically fleshed-out versions of the wireframe prototype’s home page. This exercise may be combined with electronic tracking of individual user behavior, in order to uncover key usability sticking points and determine unaided traffic pattern difficulties.

Following a short break, the moderator will then encourage a relaxed discussion of NYSE.com and of participant views on a variety of issues that would likely include:

- Perceptions of brand
- Ease of navigation and navigation issues
- Search and find capability
- Interactive tools
- Design
- Content
- General usability
- Usability of key features

IBM moderators are experienced at encouraging relaxed discussion among the participants, ensuring that the group dynamics will bring out deeper feelings, thoughts, and perceptions about various issues. While the focus group moderators will use many direct approaches to uncover what and how participants think about the brand associations of NYSE.com v2.0, IBM has found that in brand component studies, respondents are often not able, or may even be unwilling, to articulate their attitudes, thoughts, and feelings. Therefore, IBM moderators will use a variety of “projective methods” to overcome these limitations and uncover the emotional benefits and “personality” of the brand.

The second stage of the approach would include an online survey attached to the site and would be implemented upon launching the site. This approach would provide demographic profiles. Please note there are important distinctions between what IBM is proposing and what IBM has seen being advertised as part of Nielsen//Net Ratings. The most important difference is likely to be the depth of our demographic profiling. IBM can profile not only the typical age and gender, but also capture user information on profession, Internet usage, online trading usage, investment profiles, or any other topics that the NYSE team feel are important and relevant to ask within a 5-10 minute online survey. In addition to profiling, IBM will also capture information from NYSE.com's constituents on issues of content, design, and navigation through satisfaction ratings and perceptual scores of importance, interest, and/or performance . This questions take the form of "On a scale of 1 to 7, how important would you say it is that NYSE.com maintain its scrolling ticker?” or "On a scale of 1 to 7, how interested would you be in having NYSE.com provide real-time quotes to registered users?".

IBM will also offer NYSE the opportunity to ask two to three open-end questions to probe "free form" responses from its constituents. These could be basic questions such as: "What new things would you like to see from NYSE.com in 2002?". Additionally, more in-depth questions based on quantitative scores could be developed, such as asking every person who scored a 1, 2, or 3 on satisfaction with NYSE.com's content to "Please list three new areas of content that would be necessary for NYSE.com to meet your investment information needs".

Finally, using NYSE.com's existing SurfAid visitor analytic system, IBM will overlay aggregate-level site statistics during the data collection period (seven consecutive days) against the data collected from the surveyed constituents about Internet and NYSE.com usage. This will provide NYSE the ability to assess how well the participants in the online survey reflect the overall visitor population during the seven days.

Visual Design

Visual Design Overview

Consistent with the information architecture solution, the high-level visual design solutions begin to describe the range of look and feel possibilities for the re-architected NYSE.com v2.0. The solution to this effort takes the form of “design studies”, whereby a sample wireframe of the newly redesigned homepage of NYSE.com v2.0 has several different looks and feels applied to it. This enables an investigation of the branding priorities of the site and allows the NYSE to see many different ‘takes’ on the look and feel of the site, before a final choice is made and applied to all lower level sections of the site. For this effort, IBM has delivered five different treatments of the home page. It is assumed that IBM will receive further direction from NYSE on the intended interpretation of its branding priorities and this will effect an iteration of these design treatments in the detailed solution design phase.

Thus, in a future detailed design phase additional deliverables are envisioned. In particular, these deliverables contain the results of the iterative process of developing the creative look and feel of the website using the appropriate information gathered from the detailed information architecture. The deliverables will consist of the following:

Final Design Treatments: Final design treatments are based upon the completed wireframes and incorporating agreed-upon navigational elements, ready for final approval and production. Graphical User Interface (GUI) Design proceeds once the preliminary discovery phase of a project has been completed, based on a solid understanding of business requirements, audience needs and motivations, the client’s competitive landscape, and the set of features to be included.

Graphical User Interface (GUI) NYSE v2.0 Styleguide: This is a compilation of rules and standards that govern the creation and updating of pages for a specific web site or interactive media application. It captures and documents guidelines and graphic standards established for the site or application, including supporting electronic files that specify fonts, templates, palettes, and global assets, along with design rules that apply to all pages on the site. The purpose of the GUI Styleguide is to document and support consistency in design (the application of brand guidelines and other design assets) across an existing site, and to provide parameters that apply to the development of an entirely new site or new Web pages.

The remainder of this section continues to delve more deeply into the issues and high level visual design solutions for NYSE.com v2.0.

Challenges

Since the launch of the existing site, the NYSE has undergone a comprehensive look and feel re-branding that has affected the style of NYSE collateral everywhere from fonts to color palette. However, the main brand priority concepts, such as trust and confidence, informational transparency, stability and the global center of business, have remained unchanged. Thus, the main challenge of the visual design of NYSE.com v2.0 is to flesh out the constant brand priorities within the new visual space. In addition, it is desired that the visual solution be compatible with the design directions currently being implemented by the MarkeTrac application so that the two applications may be functionally merged in the future with no loss or confusion of visual effect.

The previous site has been identified as being in a style that is not current with web-design trends of today, too heavily relying upon detailed, layered graphics to achieve a visual sense of complexity. This also contributed to the site having extremely long loading times. Thus, another challenge to the visual design is to create a solution that maintains the brand priorities but effects them in another manner besides graphical complexity. Also, the previous site's browser requirements and use of frames mandated a visual solution that compacted visual elements into pre-defined areas that poorly used screen real estate.

To aid in the development of a new visual style, the NYSE has provided IBM with visual design priorities established by Landor Communications. This document establishes a base color palette for the new brand as well as print standards that may be expanded upon in a web space.

Solutions

The five creative studies of the home page serve to provide five unique solutions of a visual treatment of the new information design. Each study, while being able to stand by itself as a complete visual solution, is not necessarily intended to be a total representation of "*the*" direction in which to take the visual design of the entire site. Rather each study should be seen as a compendium of ideas that, in the aggregate of the five studies, may be mixed and altered upon further branding direction by the NYSE for the final visual solution to the site.

More specifically, the studies address the following visual oppositions:

Visual Structural Complexity vs. Graphical Complexity

To reduce download times, there has been a concerted effort to reduce the complexity and byte size of graphical elements. However, the lack of graphical complexity mandates that another method be employed to maintain the brand priorities of stability and trustworthiness. The design studies attempt to build upon the visual grid notion established in the Landor document to recover this visual *gravitas.* The studies are based in a deliberate use of a grid structure and adhere to a suggested, repeated, complex symmetry to reinforce the visual notion of stability. Thus, by using symmetry to maintain visual seriousness, the studies can more effectively use clean simple graphical treatments without appearing visually "flimsy", which often occurs on sites that rely heavily on HTML, as opposed to graphical, textual elements. In addition, there is now the added benefit that there is a visual structure to suggest where additional navigational elements should be displayed if elements need to be added or subtracted.

Overt vs. Covert Informational Display

Since the previous version of the site was navigationally too deep and too wide, it was difficult to understand what information specific categories contained. Since minimum browser requirements are now higher for version 2.0, the studies use dHTML display strategies to make the 2nd level navigational structure visible from the first level home page. However, the use of dHTML allows the page to initially load with the sub-navigation hidden, but then can be revealed as a rollover action. The net effect of this strategy is again to make the page more streamlined, adding to the idea of translucency, while maintaining informational richness.

Motion vs. Stability

One of the new visual priorities of the brand is to enhance the technological, cutting edge feel of the NYSE. The studies attempt to explore this idea by setting up visual oppositions between movement and stillness. This is explored not only in the photographic imagery, through use of focus and blurring of individual elements, but also in the movement display of screen elements, such as the ticker, the portal element of the logo, and the shape and rendering of the dHTML rollover elements.

Above vs. Below the Fold

With the new browser requirements, as well as the abandonment of frames, the studies can now challenge the idea of displaying all the information within the fixed common display area of the browser. Thus, the content of the page can be allowed to fall "below the fold", or bottom, of the browser window, hence letting the user scroll down to access additional information. This strategy allows for a greater amount of information on the page, but can also contribute to a sense of clutter that may not be advantageous. The studies have been rendered to illustrate the effects of this strategy.

In addition to the design studies themselves, an interactive application has been created of the design studies to more clearly illustrate the rollover effects of dHTML, as well as the contribution of movement to the page.

Content Strategy Outline

Content Strategy Overview

The goal of content strategy is the disciplined identification, organization, and mapping of various elements of content found within a website. These elements consist of several different types of objects ranging from traditional .html pages (and its associate textual and pictorial content) to more complex forms of media such as jpegs, pdfs, and audio and video files. The primary role of content strategy will be to identify the elements as they exist in the current site and provide a passive migration for these elements into the new site as defined by the new information architecture. In addition, the NYSE has identified the need for a more comprehensive search capability than what already exists in the current version.

Thus, an additional element of the content strategy will be the organization of the content into high level categories that can then be applied to a taxonomy tree in order to form proper search results. To this end several tasks must be accomplished in a future, detailed design for NYSE.com v2.0:

- ❖ **Content Matrix:** A Content Matrix stores information about all the content slated to appear throughout a website or interactive media application, including descriptions, categories, links, file types, etc. This information serves as a guide and tracking device for content development, sourcing, and deployment. A Content Matrix is intended to catalog all content required by a website or interactive media application in order to define the scope of the content development effort, and to ensure that no content is missing or misplaced in the completed application. The completed Content Matrix enables developers to easily map the content sections and sources back to the validated navigational structure. In addition, a Content Matrix will be used to assist Content Management professionals in the planning and implementation of tools and systems for managing the deployment, updating and/or migration of content.

- **Search Capability Tagging:** In conjunction with the input templates as defined by the future Content Management System, a hierarchy of categories is created and the content within the site is evaluated and matched to those categories. A "tag", usually an element such as a meta-tag, is then associated with the discreet elements of content within the CMS template so as to provide an appropriate response to a search query.

The remainder of this section continues to delve more deeply into the issues of content strategy for NYSE.com v2.0.

Challenges
As noted in the Functional Requirements section of this document, NYSE is looking to IBM to:

- Provide direction regarding FAQ topics based on IBM's understanding of the typical end users' needs, with NYSE as the SME, creating the content that will "answer" the frequently asked questions.

- To draft Help information and updated content for the Getting Started area so as to assist the end user in executing common site functionality. This effort will also incorporate a redesign and development of new Help categorization and labeling to provide a more intuitive pathway to Help information.

These two content development activities are tightly linked, with the design of one impacting the design of the other due to the current organization of information in the nyse.com Help and Getting Started sections. Information that is imbedded in these sections needs to be analyzed closely to determine if some of this content would serve well as FAQs, or need to be offered as Help categories relative to the site's functionality.

Solutions

To obtain a deeper understanding of NYSE's vision for updated content for FAQs, Help and Getting Started, the IBM Content Strategist will interview NYSE-appointed Subject Matter Experts (SMEs) to specifically identify the detailed-level content requirements and that exist relative to the current content found in these sections of the site. These requirements will be mapped to the new navigational flows and NYSE-approved templates to determine the best approach for the content redesign.

While final copy for the FAQs is best tackled once the content for the redesign has been flushed out, collecting an FAQ list is an ongoing process that most likely has already been started formally or informally by NYSE. During the interview, the Content Strategist will solicit an initial list from the NYSE SMEs, which also will be mapped to the new flows and templates to ensure information remains contextually relevant and consistent based on the new design. This initial list will be updated and augmented as necessary, with the assumption that additional FAQs will present themselves as the new site emerges. Upon NYSE's approval, this updated list becomes the master form, from which a first draft of the questions will be suggested by IBM. NYSE will refine the list, if necessary, and supply answers to the questions. Final NYSE-approved FAQ content will then be incorporated into the new site.

The redesign for Help and Getting Started content will be produced in a similar manner. During the interview, the Content Editor will closely examine the Help and Getting Started sections with NYSE SMEs, paying specific attention to the voice, consistency, and usability of the text itself. Working with the IBM Information Architect, as well as other IBM team members to ensure accuracy regarding functionality descriptions, the Content Strategist will craft the initial draft of the Help and Getting Started content relative to the NYSE-approved templates and flows. This content will go through the agreed-to review cycle with NYSE and then will be incorporated into the site.

In addition, there will need to be a large-scale, concerted effort to 'tag' the existing textual, audio and visual content of the site with a succinct taxonomy of categories so the content may be appropriately returned in a search query. This effort has several components, including the determination of the actual categories and their interrelationships, the determination of where individual pieces of content fit within the categories and the physical act of 'tagging' or writing these category tags into the Content Management System. The NYSE has requested that IBM execute the above-mentioned efforts and IBM will be able to accomplish this effort with the identification of a single resource within the NYSE to provide business direction upon the taxonomy choices made by IBM.

With the exception of the writing of (a) the FAQs, Help, and Getting Started areas, and (b) the actions pertaining to content tagging and migration described above, all other content editing, merging, and creation activities involved in the transition from the existing site to NYSE.com v2.0 will be performed and managed by NYSE internally, as noted in the Requirements section. However, during the course of development, should NYSE find they require more support from IBM's content development team than was originally scoped, IBM would be delighted to explore those new requirements with NYSE and establish a plan to help NYSE as needed.

4 Technical Outline

Overview

The following is a discussion of the strategic technical solution suggested by IBM, and does not include detail related to any interim or accelerated solution options. This solution will focus on those areas that address the implementation of creative and technical architecture enhancements to the existing NYSE.com site and associated Content Management System (CMS). This redesign's architecture and associated infrastructure will be based on a combination of best of breed products and technologies. In the following sections, the general architectural approach, the design and development approach, and the specific functional areas will be addressed as they relate to the integrated solution.

This technical outline addresses the tactical technical requirements and the long-term architectural design. The areas addressed are:

- Guiding Principles
- Process
- Architectural Overview
- Guide To Technology
- Use Cases
- Implementation Focus Areas
  - Content Management
  - Home Page Redesign
  - Login and Registration
  - Search
  - Portfolio
  - Ticker
  - Security
  - QA Environment
  - Web Statistics
  - Weekly Bulletin

Thus, the goal of this section is to illustrate the technical approach in creating the NYSE.com v2.0 solution. The scope of this solution is based on the Requirements Document as delivered to NYSE.

Guiding Principles

Our approach to designing, developing, and deploying this solution consists of two areas: process and implementation. During refinement of process and implementation, guiding principles provide common direction for the synchronization with the creative, branding and information architecture competencies. Based on the Joint Requirements Definition session held with IBM and NYSE, the following technical guiding principles are appropriate:

- Content entry should be accessible to the NYSE Web Team as well as non Web Team members.
- Workflow and Approval processes should be maintainable by the NYSE Web Team.
- Content publishing should occur more quickly
- The system should scale as necessary.
- Rapid implementation implying maximum reuse of existing functionality where appropriate
- Migrate and meta-tag existing content
- Use existing technology and products deployed in NYSE where applicable.

Process

Design Approach

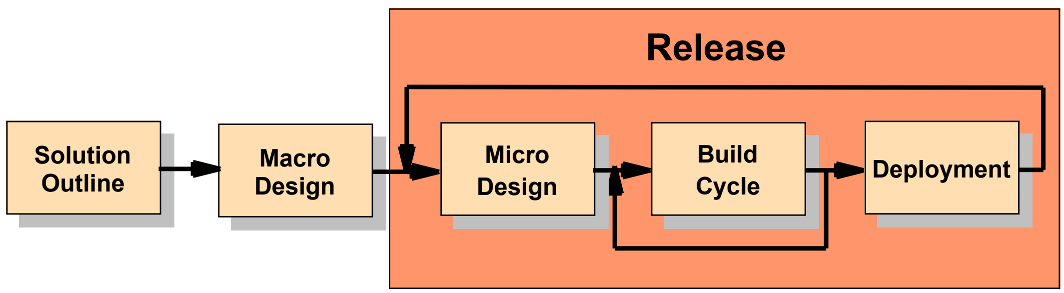
In order to integrate various components, which are based on different products and technologies, the selected components must support common mechanisms of communication and interaction. These common mechanisms (or foundations) are referred to as frameworks. Using this framework-based approach allows IBM to address the NYSE tactical functionality requirements while providing an efficient strategic environment for future functional and process enhancements. The addition of functional enhancements and modifications in later phases will focus on maximum technical reusability and minimum architectural redesign.

Development Approach

In general, the IBM e-business Engagement Model focuses on extending a company's brand and business strategy consistently to the targeted user constituencies. In doing so, the model emphasizes the importance of creating a compelling user experience and a robust application development framework. A focus on the user experience drives the functional and technical aspects of e-business solution development.

The development process for this model is built on successive iterations of design, building on previous work. Each iteration delves deeper, and enhancements are implemented where appropriate. These phases of development are:

Solution Outline
Alternatively, this is referred to as a Solution Design or Solution Concept. This is a high-level view of what the entire solution may consist of from a user and technical perspective.
Macro Design
The refinement of work done in the Solution Outline phase and the additional development necessary to design the entire solution and determine what functions, technologies, content, and user experience items will be included in phased, multiple releases.
Micro Design
The detail design of a specific release that leads to application build and deployment.



e-business Engagement Model

There are four disciplines which work together to develop a finished Web application:

- ❖ Information Architecture
- ❖ Content Strategy
- ❖ Creative (Visual) Design
- ❖ Technical Architecture and Development

The individuals representing these disciplines structure their work around activities, work products, and deliverables.

Testing Approach

Testing Stages

- ❖ **Development Testing:** The Development Testing stage is commonly referred to as Unit Testing. This occurs during the development cycle and is initiated by developers working on discrete software and hardware components.

- **Integration Testing:** The Integration Testing stage involves testing a set of logical components to determine if they interact as designed. This will occur multiple times during the development process. In addition, once all components are completed, a final 'Integration Test' will be performed to re-validate the proper functioning of the implemented solution.

- **User Acceptance Testing:** User Acceptance Testing involves users external to the development team. These users perform a set of tasks, detailed in 'Testing Scripts', to test specific functionality. The results of the tests are recorded in a testing tool (yet to be defined).

- **Operability Testing:** The 'Operability Testing' stage tests the ability for the completed system to run within the production environment. "Real-world" stress and performance testing are also performed at this time on the fully integrated solution.

Test Strategy

The creation of a *Test Strategy* provides guidance (a framework and common approach and terminology) when addressing the testing of the NYSE.com solution. All deployments of the NYSE.com solution and later phase enhancements can leverage the testing strategy as a guide. The templates and examples provided in the testing strategy document will be customized to fit the specific testing needs of each deployment. A further synchronization with any existing NYSE testing process is suggested to build the NYSE.com *Testing Plan*.

For example, Interwoven handles the transfer of content to a test environment. When an edition ("release") is ready for the next stage in the test process, an edition is created within TeamSite and deployed through OpenDeploy to the test environment.

Content and Data Migration

The migration of content will occur from both the existing NYSE.com and Weekly Bulletin content management systems. Content migration will be a two step process:

1. Users will examine each piece of content in the existing CMS and identify keywords and titles to be used for search engine tagging purposes. This keyword to content asset mapping will be recorded.
2. Once the new CMS is operational, each piece of content will be moved and tagged into the new system. The process of actually 'moving' the

data from the original to the new system can be either a manual or automated (scripted) process.

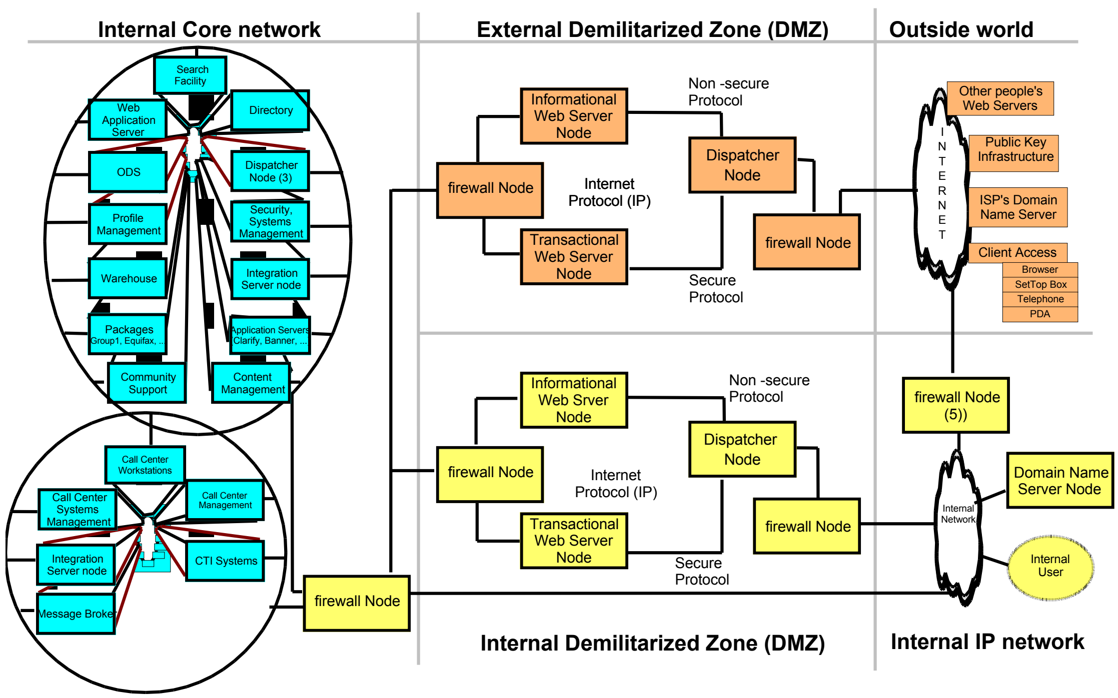
Content Migration Plan details are identified in the Content Management Topic within the Implementation Focus Areas section below.

Architectural Overview

Our proposed solution, as alluded to in the technical introduction, integrates several products and technologies to provide a complete solution for the redesigned NYSE.com site. Using a component-based architecture treats each component as a "service" (*i.e.* account directory services or security authentication services), that can be accessed by any other component. As business needs within NYSE change, this component-based system will accommodate additional "service" components.

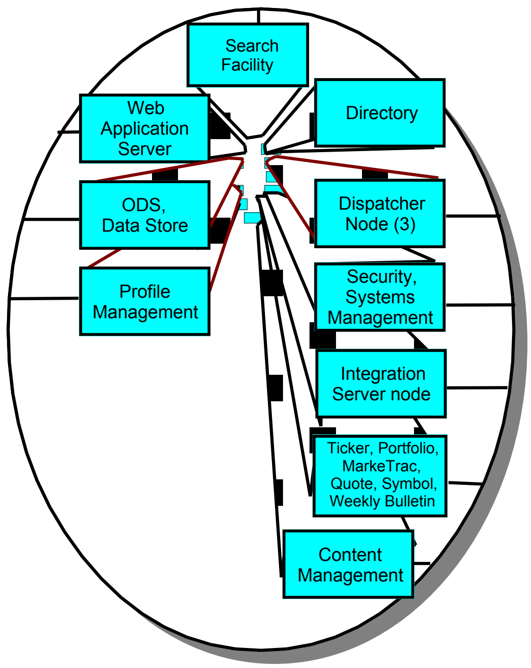
This diagram illustrates the interrelated nature of the components that are typical in an NYSE.com-type solution:

Portal/CMS Logical Component Pattern

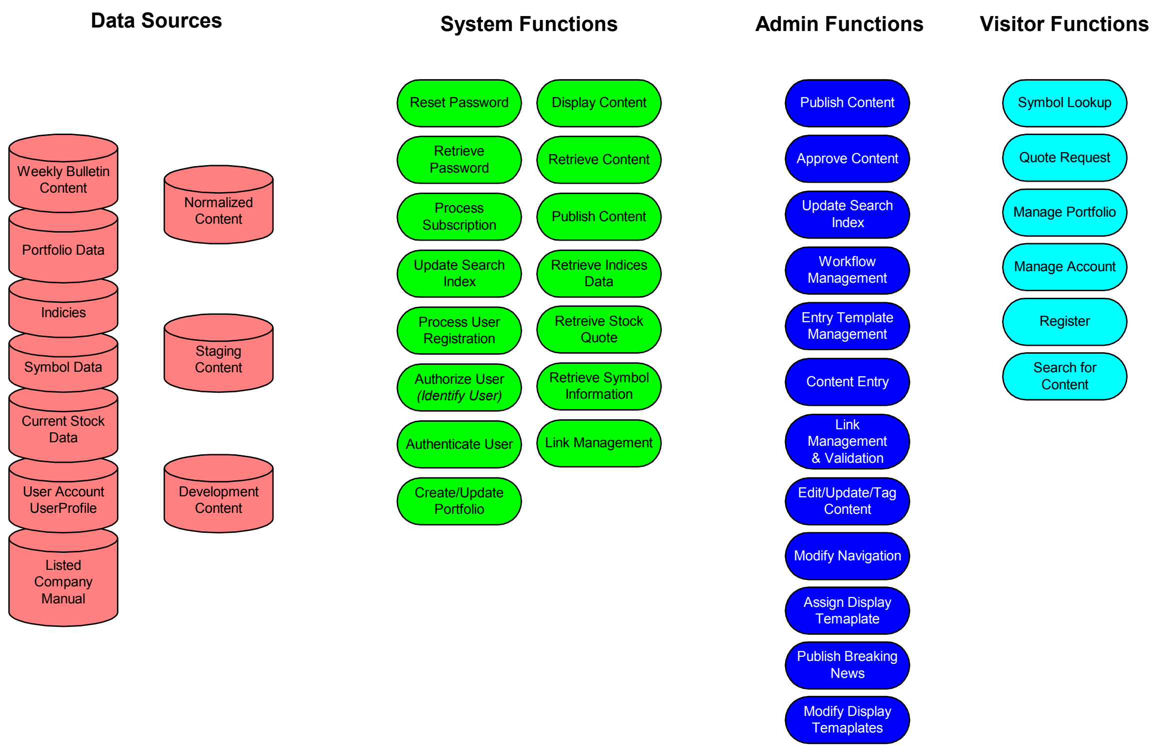


More specifically, this implementation will be focused on deploying these components:

NYSE.com v2.0 Core Components



Finally, a further decomposition of these components provides the foundation for an Architecture Overview that will lead into the detailed design phase.



Guide to Technology

Based on the existing product and technology choices within the NYSE.com enterprise, as well as the recent Joint Requirements Definition session (July 17 - 18), this table represents some of the IT infrastructure as well as suggestions for additional products where applicable:

Component	Existing?	Product/Technology
Content Management	No No	Interwoven TeamSite Interwoven OpenDeploy
Content Management	Yes	Lotus Domino
Search	Yes	Verity Information Server
Search	No	Verity K2
Portfolio	Yes	Leverage and enhance existing functionality
Ticker	Yes	Leverage and enhance existing functionality
Database	No	RDBMS
Problem Tracking	Yes	Lotus Domino
Development Environment	No No No	IBM WebSphere Studio IBM VisualAge for JAVA Interwoven TeamSite
Testing Tools	No	Mercury LoadRunner

Use Cases

The implementation of a robust application development framework and the associated solution require that specific 'Use Cases' be identified. These Use Cases contain one or more 'actors' (as identified from the NYSE.com enterprise) that interact with various system components. During the interaction with a set of components, the 'actor' performs a task or receives the result of a performed task. A representative list of those tasks (or examples of the user 'using' the system in different situations or 'cases') is described below. This list is a high-level description of the roles and activities involved and will be further refined in the Solution Design Phase:

- **AD - Site Administrator:** The Site Administrator addresses tasks such as display template modification and creation, content entry template modification and creation, business rules modification, and any software level functional modifications.

- **CA - Content Approver:** This role will include those individuals that 'approve' the final form of content before that content can be 'published' to the NYSE.com web site.

- **CC – Content Contributor:** A content contributor adds new content (of any type) into the content management system.

- **CE - Content Editor:** A content editor makes modifications to existing content assets within the content management system.

- **UR - User (often referred to as a Site Visitor):** This is representative of the users that access the NYSE.com web site via a web browser interface. This is equivalent to the 'Site Visitor' referenced in the requirements document.

- **ST – System:** The 'System' role refers to the software components that function without interaction from other 'actors'.

Use Case Descriptor	**ACTOR(S)**
Create User Profile/Account (choose group, choose subscription, etc.)	UR
Login	UR
Process Login (Authenticate)	ST
Process Subscription	ST
Process Registration	ST
Register for a subscription	UR
Cancel a subscription	UR
Generate Weekly Bulletin PDF	ST
Publish Weekly Bulletin PDF	AD
Create Content (separate for each type of content)	CC/CE
Manual tagging of content	CC/CE
Automated tagging of content based on business rules	ST
Create/Update Subscription List	AD
Store/Update Portfolio	ST
Create/Update Portfolio	UR
Display Real Time Indices Data	ST
Retrieve Real Time Indices Data	ST
Make Symbol Lookup Request	UR
Make Quote Request	UR
Approve Content	CA
Request Lost Password	UR
Reset User Password	AD
Publish Content (separate task for each type of content)	AD/CA
Update Profile/Account	AD/UR
Create/Update search index (scheduled)	ST
Create/Update search index (manual)	AD
Search Content (on production site)	UR

Search content (in CMS)	CC/CE/CA/AD
Migrate Content from Staging to Production	AD/ST

Implementation Focus Areas

This section contains focus areas identified during the Joint Requirements Definition session (July 17 - 18). The text that follows addresses each focus area and identifies those components (from the component-based architecture referenced in the 'Architecture Overview' section) that will have involvement in the implementation of each area.

Content Management

The redesign of the NYSE.com Content Management System (CMS) will reflect both technology and process enhancements. These enhancements are intended to provide increased efficiencies in time and resources.

Functional Description

At this point, IBM is recommended that Interwoven be the core of the Content Management System. This tool will be integrated with other components in the architecture (refer to the 'Architectural Overview' topic in this Technical section). For example, the NYSE has requested the ability to deep link to listing rules, listing fees, and listing process information in the Listed Company Manual database. This database is contained within the Domino environment. Interwoven does contain the capability of communication with databases in the Domino environment through the ODBC framework. In addition, this CMS has impact on how the Weekly Bulletin tool will be integrated into the new solution. Details on this tool can be found in the 'Weekly Bulletin' sub-topic later in this section.

The majority of the current NYSE.com site is managed by the IBM e-Publisher Content Management tool. This content will be managed by Interwoven's products in the new solution.

The ability to archive both content and functional components will be based on the existing NYSE archiving processes and infrastructure. For example, the functionality to archive content will be within the content management system implementation and this content will be stored using existing back up tools in the NYSE environment. Additionally, functional component archiving will be managed through the code versioning features of the selected development environment.

Associated Components

- Interwoven TeamSite, TeamSite Templating OpenDeploy, DataDeploy, and Turbo (WebSphere integration)
- Lotus Domino
- WebSphere Application Server
- RDBMS

Implementation Overview

Based on the known requirements and functional criteria as identified in the Content Tool Matrix Document, (submitted earlier as part of the CM tool assessment) IBM is recommending that the NYSE implement Interwoven TeamSite v 5.0.1 as the core content management system.
Since Interwoven manages all types of content and also is able to treat applications as content there is a huge advantage in using Interwoven in environments where focus is not only on information but also on supporting an application platform. With Interwoven the NYSE will be able to create a web development environment where application developers and content developers can work together efficiently.

Interwoven provides content developers with the ability to fully preview the look and feel as it will appear in the target environment. In addition, web developers can select one of several web-editing tools while content contributors with less web development skill can use a web-browser based entry form.

Content Management Solution for NYSE based on Interwoven

The proposed CM solution will address the following critical need areas of the NYSE:

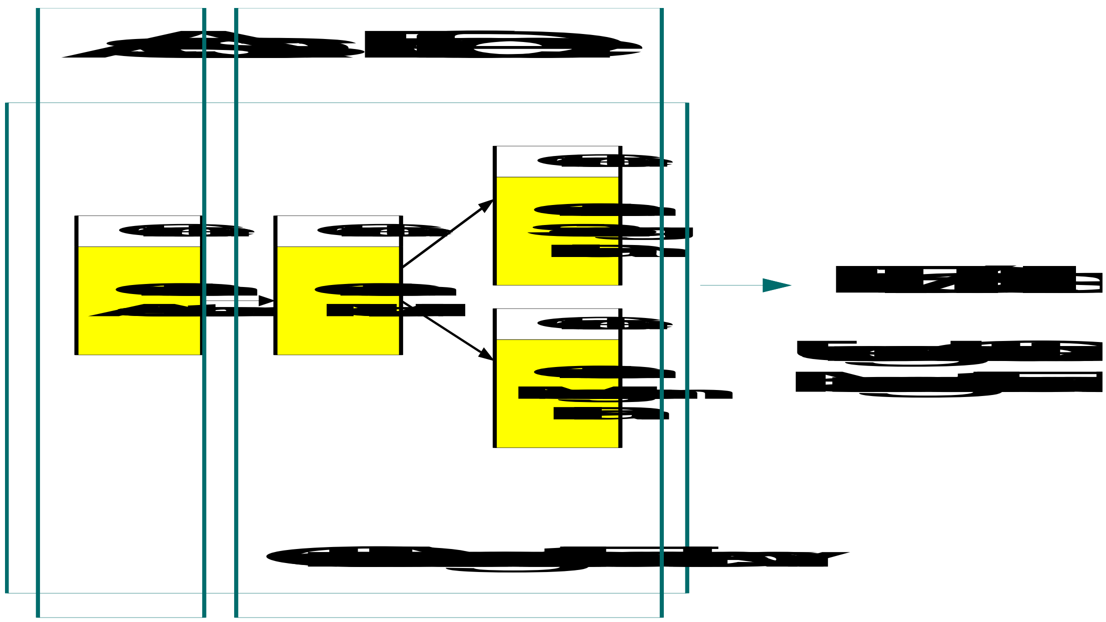
- Interwoven has a very robust and well defined workflow engine designed for a comprehensive Content Management System.
- Open Deploy (component of Interwoven) can remove all expired and deleted files from the production server through an automated process, thereby optimizing the search and overall system performance.
- Interwoven supports versioning (check-in and check out) and data archiving.
- Interwoven leverages the reliable and powerful querying capability of a backend relational database.
- Interwoven has ALT-tag and meta-tag support.
- Interwoven supports the reuse of content input and content display templates.
- Interwoven supports import of content from multiple sources in XML format
- Interwoven integrates well with the existing Verity search tool.

Apart from addressing the critical need areas of NYSE, Interwoven provides a strategic solution to NYSE as business and content management requirements continue to evolve.

Migration Plan

Recommended Approach

The Migration Plan for NYSE follows a structured approach starting with the Content Assessment.



Content Assessment

As part of the Content Management Tool Assessment, a preliminary source Content Matrix was developed. This source Content Matrix was derived from an extraction of the e-Publisher system. In moving forward to a Content Assessment phase, the source Content Matrix would be reviewed and refined in conjunction with input and guidance from the Content Strategy members of the Creative team . The source Content Matrix will be used as a tool to aid in developing the data migration from the existing system to the new Content Management Tool.

The second step in the Content Assessment phase would be the development of a target Content Matrix. The target Content Matrix provides a list of templates derived from the redesigned site. At this stage, the target Content Matrix will list the content item types, their fields and field attributes, and where the content is displayed on the site. Additional detail is added to the target Content Matrix in the definition phase by members of the creative Content Strategy team as well as the Technical Micro Design team.

Key Activities:

- ❖ Review and refine source Content Matrix
- ❖ Develop target Content Matrix
- ❖ Identify Meta Data required for the new design of the site.
- ❖ Identify keywords.

Content Model

The Content Model will be refined from the Content Matrix. It is a detailed model that usually assumes a specific content management system or tool with associated database target architecture. This is similar to developing a detailed logical data model for a business application system where all the data elements need to be defined for the business process or application. In this case the data elements are content and all associated meta-data needed to manage and control content and delivery of content to specific users.

Key Activities:

- ❖ Define and validate New Templates
- ❖ Validate move of templates to new environment
- ❖ Define Content storage schema
- ❖ Define Migration approach for existing Content
- ❖ Define integration with Verity

Content Sourcing Plan

The Content Sourcing plan is initially the migration plan defining how content will be moved into the new Content Management Framework. It will also include a plan to acquire or create new content.

Key Activities:

- ❖ Define Content Ownership
- ❖ Define Content Access
- ❖ Permission / Entitlement
- ❖ Security
- ❖ Service / support levels
- ❖ Maintenance / update of static and dynamic content and Change Management
- ❖ Define Migration approach for existing Content

Content Management Plan

The Content Management Plan will describe the overall system including procedures, policies, and guidelines for managing and delivering content in the new Content Management Framework.

Key Activities:

- Define and implement Technologies
- Implement Development Environment
- Implement QA Environment
- Implement Staging Environment
- Implement Production Environment
- Integration with other Applications
- Define and implement Processes
- Define and implement Organizational Structures

Home Page Redesign

Functional Description

The Home Page redesign focuses on several visual and layout enhancements. These enhancements indicate modifications to the navigation display functionality allowing a user of the content management system to modify the second-level, and potential first-level, navigational menus. In addition, the Content Management System will need to accommodate this flexible navigation mechanism. During the detailed design phase, the specific functional requirements associated with the visual modifications will be quantified as necessary.

Associated Components

- CSM
- WebSphere Application Server
- WebSphere Studio

Login & Registration

Functional Description

The login and registration will provide a single sign on solution to NYSE.com, allowing a Site Visitor access to all appropriate services without the system requiring re-authentication. In the initial implementation of NYSE.com v2.0, profile information about a specific user will be stored for later retrieval. In addition, during the registration process, the user will be able to:

- Choose their username
- Choose their password
- Select subscriptions (or choose to subscribe via e-mail)
- Identify their 'type' or 'user category' (*i.e.* "Active Investors" vs. "Students/Teachers")
- Access, from the current work station, any existing portfolio data for the current user

During the detailed design phase, requirements for username and password format will have to be defined so that an acceptable level of user account security can be implemented and maintained. This should be synchronized with any existing standards that NYSE has in place for user access to IT systems.

Associated Components

- Existing login and registration code that was created for MarkeTrac
- WebSphere Application Server
- RDBMS

Future Phase Considerations

- Synchronization with NYSEnet account system (further discovery will be necessary to determine feasibility).
- Synchronization with XPress account system (further discovery will be necessary to determine feasibility).
- Site usage pattern analysis (implicit personalization) for identified and anonymous users.
- Applications and features added to NYSE.com in the future will need to be able to integrate with the login and registration system in order to preserve single sign on capability.

Search

Functional Description

This mechanism will allow a search across all content (HTML, text, PDF, images, Flash, audio, and digital video) that is available on the NYSE.com site. In addition, a tagging framework and process will be designed and implemented that addresses three options:

- **Automated tagging based on business rules:** An automated tagging mechanism will use category and other identifying entries (during the content entry or editing process) to ‘meta-tag’ each piece of content as it is stored in the Content Management data store.

- **Manual tagging on an ‘as-needed’ basis:** Depending on the specific type of content, the ability to add additional ‘free-text’ meta-tags will allow the content contributor or editor to further classify and define a piece of content (i.e. based on type, category, topic, etc.)

- **Manual tagging during initial content migration:** During the initial content migration effort, a team can tag each piece of content (or groups of content) and manually copy that tagged content into the new system. The identification of content can be achieved before the completion of the Content Management System. However, to actually store the tagged content in the new CMS, the CMS must be implemented in the staging environment.

This tagging framework will identify the complete set of allowable tags, keywords and the guidelines for assigning keywords to a specific piece and type of content.

Associated Components

- **Verity Search Engine:** Currently NYSE uses Verity's Information Server. An upgrade to Verity's K2 is suggested to enhance scalability as both amount of content and tagging of content increases. Configuration of this search engine will be revisited to ensure maximum use of its inherent functionality.
- **Business rules mechanism:** From a logical perspective, this is a combination of software components on the application server, documented content entry processes, and client interface validation logic.

Future Phase Considerations

The current search mechanism is Verity's Information Server. An upgrade to Verity's K2 engine will allow the addition of additional servers to the overall search mechanism increasing scalability as the amount of content increases.

Portfolio

Functional Description

The existing portfolio functionality will be implemented in the new solution. However the re-design of the underlying mechanisms will need to be addressed so that they are compatible with the single sign-on and registration systems that will be deployed. Specifically the use of cookies will be modified or eliminated and the displayed format of the portfolio information will be limited to tabular format. The ticker format selection feature will not be included in the modified version of the portfolio component.

Associated Components

- Existing portfolio components
- Development Environment

Ticker

Functional Description

The "ticker" component will be visually redesigned and specific functional enhancements will be implemented. These enhancements are:

- Load time improvement
- The ability to turn 'off' or turn 'on' display of the ticker
- User control of the scrolling speed of the ticker display
- User control of the direction of the ticker display

The specific implementation details of these enhancements will be addressed during the detailed design phase. In addition, the implementation details will be synchronized with the visual enhancements.

Associated Components

- Existing “ticker” software components
- Services providing “ticker” update information
- Login & Registration component

Security

Functional Description

The security of a solution is both physical and logical. This Solution Outline and the later Macro and Micro (Detailed) design phases will address the logical security mechanisms. Logical security mechanisms can be classified:

- **Inter-System Security:** Inter-System security details how two logical system components secure their shared communication conduit. For example, the communication between the authentication software components and the user directory database can be encrypted to prevent the detection of traffic by users or systems outside of the intended audience. In the NYSE.com v2.0 solution, the communication conduits between services (i.e. user directory, authentication mechanisms, content management system) will be secured through a combination of encryption and secured identification as appropriate.

- **System to User (Site Visitor) Security:** In this classification, the user (Site Visitor) communicates with the System (NYSE.com). At this point the user can choose to navigate the system without providing the NYSE.com system with user credentials (username and password). The security mechanisms in place will provide only that information and access to services that are appropriate for the ‘anonymous’ user. Conversely, the user who provides identifying credentials will be given access to a superset of services and data. The rules for which types of users (anonymous or identified) are allowed to access certain services or data should be detailed in an NYSE security strategy.

The design of the security model incorporates the user types and roles that have been identified during the joint IBM and NYSE discovery process. The final security model will be synchronized, as appropriate, with any existing IT system security (authentication and authorization) models currently in use at the NYSE.

During the discovery process both Internal (Content Producers/Approvers) and External (Site visitors) user types have been identified. A list of these user roles is located under the Target Audience topic in the Executive Summary section of this document.

Associated Components

- Enterprise security policy server
- Access Control Lists
- Business Rules (associated to user types and roles) components
- Content Management System

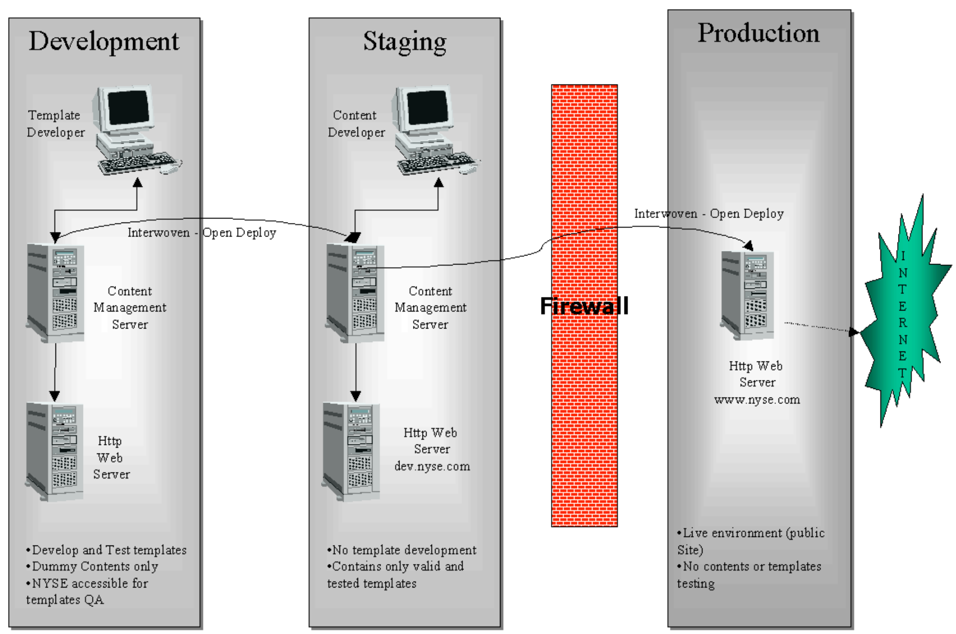
Quality Assurance/Testing (QA) Environment

Functional Description

The QA Environment is used to provide a mechanism to assure quality in the deployed solution. A development and testing environment will be described during detailed design. At a minimum, the development environment should contain the development tools, content entry and modification tools as well as development and staging ‘areas’ where functional components can undergo unit and system testing and content can be previewed before publishing. Consequently, in order to adequately test both content and functionality, a testing strategy, plan and toolset must be described and implemented. At this time, IBM has been tasked with the creation of these items. Important functionality is:

- Code component versioning
- Code release versioning
- Development Issue Tracking
- Simulated Test Environment (for load and performance testing)
- Development, Production and Staging Areas

This diagram illustrates a representative content entry, staging and production environment scenario focusing on Interwoven. Based on specific NYSE network security requirements this proposed operational architecture will be enhanced as necessary.



The above infrastructure describes the development, staging and production environments. The development environment allows for the creation of site content and functional components. The staging environment provides a previewing environment that enables:

- A logical separation of content and code under development and a test version ("release") of the content.
- A method to preview content while still creating new content in the development environment.

The production environment is the public-facing web site. In the diagram above it is shown to be "outside" of the firewall. Based on the specific security infrastructure at NYSE, this design can be modified.

Scalability

Associated Components

Key components that will be leveraged to ensure scalability are:

- Existing hosting environment and server consolidation
- Caching solution for the MarkeTrac, OrderTrac and OpenBook solutions

- Specific features of the Interwoven and WebSphere products (caching, connection pooling, minimizing dynamic page generation (static HTML), etc.)

Maintainability

Functional Description

Several maintainability concepts are highlighted in the 'Guiding Principles' topic area. However, in order to assure backward compatibility for external listed companies who link to NYSE.com, existing URL structure should be maintained as much as possible. The implementation of this will be addressed during the detailed design as the process to integrate Interwoven and the existing content is finalized. This content and the new navigational structure will have impact on the how the URLs are constructed and how they may have to be modified to accommodate the selected tools and technologies.

Associated Components

- CMS
- WebSphere Application Server
- Link Management Tools (*i.e.* Linkbot)

Web Statistics

Functional Description

Web Statistics are currently compiled by the SurfAid service. There are no plans to transition to another product or technology toolset. Based on the site navigation reorganization, specific changes to the SurfAid reporting results will have to be addressed. The specific modifications or enhancements will be addressed during the Detailed Design phase.

Associated Components

- SurfAid
- WebSphere Application Server
- Interwoven TeamSite

Weekly Bulletin

Functional Description

The Weekly Bulletin functionality is implemented in a separately customized version of the IBM e-Publisher Content Management Tool. The migration of the content and functionality to the NYSE.com v2.0 solution will be detailed in the Detailed Design phase. During this phase a primary area to address is whether this self-contained solution will be integrated into the Interwoven toolset or that the Weekly Bulletin will remain in its current form and will be treated as a discrete component in the overall solution. Based on a component-based approach to software architecture, either solution can be implemented for the NYSE.com v2.0 deployment.

Associated Components

- e-Publisher Content Management tool
- Interwoven
- Verity