
**Trading Platform
Vision Document**

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Revision History

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1. Introduction

The purpose of this document is to collect, analyze, and define high-level needs and features of the Trading Platform. It focuses on the capabilities needed by the Business Development Team, and explores **why** these needs exist. The details of how the Trading Platform fulfills these needs are detailed in the use-case and supplementary specifications.

The purposes of this Vision document are to:

- ◆ Communicate to team members and other interested parties the basic reasons for building the Trading Platform
- ◆ Provide a high-level overview of the basic features of the Trading Platform
- ◆ Outline the schedule of deliverables that will be part of the Trading Platform development cycle.

1.1 Scope

This document applies to the Trading Platform project that has been undertaken by the Platform Development group.

1.2 Overview

This Vision document contains the following major sections:

- ◆ **Positioning** A description of the business problem the Trading Platform will solve
- ◆ **Stakeholder and User Descriptions** Information about the groups within the company that will be affected by the Trading Platform, and those who will use the Trading Platform directly
- ◆ **Product Overview** High-level information about the Trading Platform
- ◆ **Product Features** More specific information about the features of the Trading Platform
- ◆ **Constraints** Limits to the scope of the Trading Platform project
- ◆ **Quality Ranges** Specific information about desired qualities
- ◆ **Precedence and Priority** Information about the Trading Platform project's release strategy
- ◆ **Other Product Requirements** Information about protocols, throughput, etc.
- ◆ **Appendix 1: Trading Platform Technical Services** A detailed walkthrough of the technical services to be supported by the Trading Platform infrastructure.

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2. Positioning

2.1 Business Opportunity

The company has made a strategic decision to extend our wholesaling business. The Trading Platform project is being undertaken in support of this decision.

The wholesaling business has the following important requirements, which we must take into account:

- ◆ **High volume** Our current projections for the Wholesaling business call for the electronic trading system to handle 100+ trades per second and millions of limit orders per day, and help dozens of traders manage thousands of different stocks. As our wholesaling business expands, the volume requirements for the Trading Platform will be even greater.
- ◆ **Worldwide access** To compete as a wholesaler, our electronic trading system must be able to provide quotes and place orders in any exchange in the world.
- ◆ **24/7 availability** Investors will want be able to use the electronic trading system at any time (to trade in exchanges in other parts of the world, or to enter orders for some exchanges before they open).
- ◆ **Performance that meets customer expectations** Our wholesaling venture will put its electronic trading system into close contact with outside investors, who will judge the system on the quality of its quotes and executions, and the high availability of the system itself. In this sense, the performance of the electronic trading system will have a direct effect on our reputation as a whole.

To be successful in its wholesaling effort, the company will have to combine its traditional single-stock, high-touch approach with a portfolio-based, more automated trading model.

The company's current systems can perform most of the tasks required for the Wholesaling effort. However, some of these systems are operating at near capacity, due to business growth; it will be difficult to scale these systems to meet the demands of the wholesaling effort and other efforts in the future. In addition, communications among these applications (which were all developed separately) is a series of complex processes. This makes it especially difficult to integrate current applications into the overall system, and to design new applications to work with all of them. It is difficult to maintain these communication processes, and it takes a long time to train new employees to work with them.

All these factors make it more difficult and time-consuming to develop and implement new business strategies – which could lead to lost market opportunities and decreased revenues.

The Trading Platform will enhance selected elements of the present systems, and tie the rest together by acting as an infrastructure for messaging that all systems can talk to, as well as a development environment on top of which the Business Development group can create new financial applications quickly. This will increase our ability to implement new ideas and respond quickly to financial developments. The Platform will be designed for usability, availability, scalability, and security, in order to support our growth into the wholesale market and its other strategic decisions in the future.

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2.2 Problem Statement

The problem of	Current systems for analytics and decision-making that are currently operating at near capacity, yet may not be easily scaled to meet the higher levels of performance required by our Wholesaling venture (and future ventures), and are not easy to service and coordinate – all of which makes it difficult to scale and maintain the existing systems, and to integrate new applications.
affects	Financial engineers, traders, existing and potential customer, the IT (Business Development) organization
the impact of which is	to impair the performance of existing financial applications and make it more difficult for us to deploy new ones, which will decrease our market share in the wholesaling market and cause us to miss profitable opportunities – all of which will decrease our revenues.

2.3 Proposed Solution

To solve this problem, the Trading Platform team proposes the construction of a framework that:

- ◆ is designed to be easily scalable
- ◆ can support connections to disparate legacy systems, using a messaging infrastructure that is easier to maintain
- ◆ supports more rapid development and integration of new financial applications.

The Trading Platform will provide an infrastructure that will connect to price feeds, legacy applications, and other data sources, ensuring that the data provided by these sources is available to all Platform-based applications. On top of that infrastructure, the Platform will also act as an application server, providing directory services, database services, web services, etc. as well as a set of well-documented interfaces that developers can use to access these services and data feeds. The goal is to provide a complete development environment within which the Business Development team can build and test rules-based business applications that will identify advantageous trades and profitable positions.

At first, the Platform-supported business applications will function as administrative support for traders; in the future, it is envisioned that such applications will take a more active role in managing less volatile securities on the trader's pad, allowing the trader to apply his/her expertise to other securities. This will ultimately allow traders to manage a wider range of securities, applying our high-touch approach to a larger financial space.

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3. Stakeholders and User descriptions

3.1 Stakeholders

The stakeholders in the Trading Platform project are the executives that have committed to supporting the project and advocating its use by other groups in the company. Beyond these individuals, every employee has a stake in the success of this project, because it will give the company access to major new markets.

3.2 Users: The Business Development Team

3.2.1 Direct users

The direct users of the Trading Platform will be financial engineers and/or developers in the Business Development team who build rules-based or calculation-based applications that manipulate the financial data that the Platform provides. These users require that the Trading Platform has a consistent, intelligible interface, good support for modeling and testing applications and building GUIs, and exhaustive documentation.

3.2.2 Indirect users

The indirect users of the Trading Platform will be the traders who use Platform-supplied information in their daily activities, and, ultimately, the customers (“retailing” brokerage firms and individual investors) that work with the traders or directly with the electronic trading systems. Above all, these users require that the Trading Platform be reliable: they need accurate financial data 24 hours per day, 7 days per week, as well as immediate access to markets all over the world. The company’s traders must be able to trust the Trading Platform-based automated systems that help them manage their pads; outside customers must be able to trust the quotes that the Trading Platform helps to provide. The Trading Platform must be able to build and support this level of trust in order for In order for the company to succeed in the wholesaling business.

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3.3 User Summary

Name	Description
Business Application Developer	Uses the Platform's resources to develop business applications for use by traders
Trader	Uses Platform-supported applications in managing portfolios and other ongoing investment activities
Relationship Managers	Uses Platform-supplied reports to diagnose problems with financial applications and the Platform itself; uses Platform resources to fix Platform problems; augments Platform-based trading systems by adding new hardware, etc.
IT maintenance personnel	Will install and configure local instances of the Platform; after this, will use Platform tools to trace and fix problems within the Platform itself, to change configurations, and to add new resources as necessary

3.4 Business Development Environment

Each site that chooses to use the Trading Platform will get a complete instance of the Platform (hardware and software) installed by the local Business Development team (with assistance from a team sent out by the Platform Development group). The local Business Development team will configure the Platform to work with local systems, and developed business applications that work within the unique trading rules and restrictions of the local exchanges. Although each site will develop its own Platform locally, it is envisioned that, ultimately, any installation of the Trading Platform will be able to provide quotes for any security on any exchange in the world. This may involve a financial application based at one Platform installation communicating with a different Trading Platform installation communicating via our WAN.

3.5 Key Business Development Needs

The Business Development engineer will need to be able to:

Need	Priority	Concerns	Current Solution	Proposed Solutions
Develop applications quickly				
Incorporate Platform-supported data feeds (whether the data comes directly from the market or from other Platform-based applications) in their applications, without having to think about where these feeds are based and whether they will				

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fail				
Test algorithms and models in an Platform-based “sandbox” environment, using historical data or live feeds				
Develop reliable, high-performance user interfaces				
Use Platform-supported source management facilities as they develop				
Depend on Platform documentation and the local and core Platform support teams for information and help with problems				

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4. Product Overview

This section discusses how the Trading Platform will fit in with existing applications.

4.1 Product Perspective

A complete electronic trading system requires the following components:

- ◆ Analytic – Performs calculations to determine microprice, TV, etc.
- ◆ Decision – Decides what to quote or trade; serves as user interface for traders
- ◆ Trading – Executes and stores trades, orders, RFQs and positions
- ◆ Connectivity – routes data, connects to exchanges and customers
- ◆ Back End – clears trades and generates reports

The Trading Platform will be used mainly in the Analytic and Decision-making areas.

4.2 Summary of Benefits

The following table sums up the major benefits of the Trading Platform, and describes Trading Platform features that will realize each benefit.

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Customer Benefit	Supporting Features
System will be highly available	<ul style="list-style-type: none"> ○ Dual hot sites ○ Resiliency to data and service and algorithm failures <ul style="list-style-type: none"> - Fallback algorithm ○ Comprehensive support team functionality <ul style="list-style-type: none"> - load monitoring built into framework - fault logging and diagnostics ○ Automated testing of functionality, load, and faults
System will be highly scalable	<ul style="list-style-type: none"> ○ High throughput ○ Maximum latency of several seconds ○ Ability to break data keys across “servers”
Support of 24/7 operations	<ul style="list-style-type: none"> ○ Real time cutover to another site (possible via WAN) ○ Real time cutover to new software running at a second site ○ Most maintenance and data changes occur with system running <ul style="list-style-type: none"> - Some maintenance will require cutover to another site
System can be customized quickly	<ul style="list-style-type: none"> ○ Simple framework template designed for mid level staff ○ Minimal data manipulation to implement algorithms ○ Strong separation of application level functionality ○ Complete documentation ○ Training materials and instructors

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Different instances can share data & functionality over WANs	<ul style="list-style-type: none"> ○ Method invocation and data transfer will be supported over WANs ○ Application level will only know the namespace of the data
Customization and support will be done by existing business centric development and support teams	<ul style="list-style-type: none"> ○ The analytic core team provide local support for the framework ○ Existing business centric teams will develop & support product ○ In order to insure high availability business centric teams will need to adopt tools, development lifecycle and methodology of the framework
Production prototyping environment	<ul style="list-style-type: none"> ○ The development environment will possibly use the interface infrastructure

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5. Product Features

5.1 Overview

The Trading Platform will be implemented in two layers:

- ◆ **Application Architecture Layer** Provides the environment in which business applications are developed and run—includes directory, database and web services
- ◆ **Application Integration Layer** Provides messaging and connectivity that feeds market data to business applications and supports communications between business applications.

This section lists high-level features of each layer in a separate section.

5.2 Application Architecture

The Application Architecture will implement the following features:

- ◆ The Application Architecture will enable business application objects to calculate standard financial values obtained from financial data taken from various market feeds for certain securities.
- ◆ The Application Architecture layer will provide standard interfaces that will allow business applications developed by the Business Development group to access raw financial data from market data feeds as well as calculated values.
- ◆ These interfaces will make it possible for developers to make full use of the Trading Platform infrastructure without detailed knowledge of how the Platform operates. Developers will be able to develop applications quickly if necessary, and depend on the Platform to handle data feeds, fault tolerance and other basic requirements that might otherwise take up the bulk of their development time. (One of the goals of the Trading Platform is to allow developers with less expertise in low-level experience with data feeds, protocols, format translations, etc.--and less detailed knowledge of the system's data infrastructure--to work effectively on financial applications. This will ease our demand for highly "technical" people to work in its expanding wholesaling effort.)
- ◆ The Application Architecture layer will also provide a testing environment that business developers can use to test their applications, either with live financial data or by a "playback" of ticks that were recorded earlier.
- ◆ The Application Architecture layer will provide a closely integrated GUI development tool which will enable developers to create robust GUIs for their applications.
- ◆ The interfaces provided by the Application Architecture layer will insulate business applications from changes in the Platform itself, so that maintenance, expansion, and other changes in the Trading Platform will not require changes to existing business applications.
- ◆ The Application Architecture layer will provide standard interfaces to legacy applications. These interfaces will abstract Platform-based business applications from these systems, so that changes to these systems will not require changes to the business applications.
- ◆ The interfaces and other tools provided by the Application Architecture layer will be extensible, so that the Trading Platform will be able to support new business models and other requirements of new business applications without requiring changes in other business applications.

5.3 Application Integration Architecture

The Application Integration Architecture will implement the following features:

- ◆ The Application Integration Architecture will connect directly to standard market data feeds.

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- ◆ The Integration Architecture will update market data as often as necessary and make them available to business applications built on top of the Trading Platform.
- ◆ The Integration Architecture will get financial data from these financial data feeds and translate/transform the financial data into a standard format that will be usable by all business applications built on the Trading Platform.
- ◆ The Integration Architecture will filter incoming financial data according to business rules provided by the business applications.
- ◆ All installations of the Trading Platform will be able to provide financial data from any existing exchange in the world.
- ◆ The Integration Architecture will not compress “ticks” from market data feeds except as part of its process of formatting data for use by a specific business application.
- ◆ The Integration Architecture will implement “fallback” mechanisms that will compensate when a market data feed goes down.
- ◆ The Integration Architecture will abstract the mechanics of getting market data from the Application Architecture, so that changes in external data feeds can be compensated for at the Application Integration layer without affecting the Application Architecture layer or the business applications that run above it.
- ◆ The Integration Architecture will connect directly to legacy systems, and abstract these connections from the Architecture layer above it, so that changes to these applications can be compensated for at the Application Integration layer without affecting the Application Architecture layer or the business applications that run above it.
- ◆ The interfaces and other tools provided by the Integration layer will be extensible, so that the Trading Platform will be able to support new data feeds and other requirements of new business applications without requiring changes in other business applications.
- ◆ The Integration layer will provide interfaces that business applications can use to place market orders.

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6. Quality Ranges

The Trading Platform must duplicate the business-related functionality of existing systems. But it must exceed those systems in the “ilities” – system-wide qualities related to how well the Platform performs those business functions. This section lists several “ilities” and describes Trading Platform features related to each one.

6.1 User-level quality ranges

6.1.1 Usability

Usability the measure of how easily an end-user can interact with the system. It is important for the Trading Platform’s development environment to be easy to use; if it is not, the Platform will face resistance from developers.

Another aspect of Usability is the ease with which human users and other systems can use data provided by the Trading Platform.

The Trading Platform will incorporate the following features to increase its usability:

- ◆ Exhaustive documentation and training designed to acquaint business applications developers with the Platform’s interfaces to price feeds, calculated values, and the outputs from other business applications
- ◆ Source control facilities built in to the development environment
- ◆ Testing facilities built in to the development environment
- ◆ Support for a Platform user community to encourage the exchange of ideas and dissemination of best practices
- ◆ Flexible and easily configurable mechanisms for transforming inputs and outputs into formats needed by external users

6.1.2 Accessibility

This is the measure of how accessible the system is to a wide range of users. The Trading Platform will incorporate the following features to increase its accessibility:

- ◆ Support for translation of financial data to a wide variety of formats.
- ◆ Support for industry standard protocols and communication schemes.
- ◆ Support for a proprietary authoring tool which enables developers to create Java-based user interfaces that will run on any platform

6.2 Service-level quality ranges

6.2.1 Performance

The Platform must support a high level of performance in its interaction with the markets. It must be able to quickly identify advantageous trading opportunities, and quickly execute orders places automatically by business applications or manually by traders. None of the features or “ilities” described above will be valuable unless the system can deliver this high level of performance.

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6.2.2 Availability

Availability is a value that the Platform must provide to Traders and others that will use Platform-supported applications. The Platform must be able to provide prices 24 hours per day, 7 days per week; in order to do this, it must be able to recover from internal and external failures.

The Trading Platform will incorporate the following features to increase its availability:

- ◆ Support for redundant hardware, with failover mechanisms that will activate themselves automatically and transparently in the event of a system failure
- ◆ Support within the architecture for automatic instantiation of new software modules to handle increased traffic when it becomes too much for existing modules to handle effectively
- ◆ Support for “fallback” mechanisms that will provide price data immediately and transparently when the primary sources of these data become unavailable

6.3 Strategic-level quality ranges

6.3.1 Scalability

Scalability is the ability of a system to add capacity and users over time without changes to its architecture. The Trading Platform will be developed according to the company’s Scalability Guidelines.

The Trading Platform will incorporate the following features to increase its scalability:

- ◆ Design of application and infrastructure components that can be relocated to new hardware (or interfaced with new infrastructure software) without requiring changes to the applications and services that use those components
- ◆ Design of maintenance mechanisms that will allow support personnel to add more resources without taking the system out of operation

6.3.2 Flexibility

Flexibility is the measure of how easy it is to add new services and re-purpose existing components to provide different services.

The Trading Platform will incorporate the following features to increase its flexibility:

- ◆ Development of the Platform using a “container-based” paradigm, which encourages the development of functions in discrete modules that can support other modules and be used as the basis for further development
- ◆ Support for messaging middleware in the Integration layer that will allow any business object to use the data from any other business object, in addition to the standard market data feeds
- ◆ Support for an “open standard” distribution model (source code will be distributed to local Business Development teams)

6.4 System-level quality ranges

6.4.1 Security

Security is the system’s ability to prevent unauthorized users or systems from gaining access to data or resources.

The Trading Platform will incorporate the following features to increase its security:

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- ◆ Clearcase-based source control for Platform-developed business applications
- ◆ Infrastructure support for encryption that will make it easy for developers to increase the security of their business applications

6.4.2 Manageability/Maintainability

Manageability is the measure of how easy it is to monitor and configure the system; maintainability is the measure of how easy it is to replace components and perform other routine maintenance tasks. The Trading Platform will incorporate the following features to increase its manageability and maintainability:

- ◆ Use of industry-standard tools and infrastructure mechanisms that are well known and documented
- ◆ Built-in mechanisms for monitoring system performance and sending out alerts when problems occur
- ◆ Design of maintenance mechanisms that will allow support personnel to fix problems or change configurations, and/or add more resources without taking the system out of operation

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7. Other Product Requirements

7.1 Guiding Principles

The following statements define guiding principles of the of the Trading Platform architecture design:

- ◆ **Service-Oriented Architecture** - Enables reuse and standardizes architecture design by leveraging shared business logic components and data within the framework. The business rules, integrity checks and sequence of steps associated with a business function are implemented in shared business objects/algorithms that can be invoked by any of the participating applications.
- ◆ **Message-based backplane** - Uses a defined message format to exchange information between business-objects within the framework and with external applications. Messaging backbones will be used for high-performance, real-time two-way, publish/subscribe and request/reply communication.
- ◆ **Event-driven processes** - Supports processes that can be triggered by a business or system event, for automated business process workflows. Event driven application design employs real-time processing methodology, allowing rapid response to business events and proper time sequencing of event actions.

The result of adherence to these principles will be a Platform that is:

- ◆ **Loose-coupled** -
- ◆ **High Cohesion** -

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8. Appendix 1: Trading Platform Technical Services

8.1 Services provided by the Application Architecture

This section contains details about the services that will be provided by the Trading Platform's Application Architecture.

8.1.1 Application Server Services

Application Servers provide the runtime services for net-centric business-object applications, and provide an application architecture for the development and execution of common, reusable services and resources.

- ◆ Application Server services provide:
- ◆ A standards-based, open environment for developing reusable business objects (business algorithms)
- ◆ Abstraction of low-level technical services from developers
- ◆ The ability to use object-oriented technologies
- ◆ Transparent access to integration services, databases, and other application servers through a reusable and consistent application architecture

8.1.2 Directory Server services

Directory servers will act as central data repositories that simplify communication and the sharing of resources. They allow diverse applications, machines, and users (both inside and outside the framework) to access the same information and services. This simplifies such tasks as finding the physical location of business objects, naming and addressing services, maintaining computing environments, and authenticating and authorizing users.

Directory Server services provide:

- ◆ Physical location transparency of resources
- ◆ Repository for customized object behavior
- ◆ Common source of user authentication and privileges

8.1.3 Directory Server Services

Database Services will provide access to a local or a remote database, maintain integrity of the data within the database, and support the ability to store data on a single physical platform or across multiple platforms.

Database Server services provide:

- ◆ Persistent data storage for business level data objects and application internal metadata
- ◆ High-performance retrieval and storage of structured data

8.1.4 Display and Web Browser Services

Web Browser Services allow users to view and interact with applications and documents of varying data types, such as text, graphics, and audio. These services also provide support for navigation within and across documents no matter where they are located, through the use of links embedded into the document content.

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Web Browser services provide retention of the link to the document's physical location, in a way that masks the complexities of that connection from the user

8.1.5 Web Server services

Web Server Services enable the management of screen information deployed on a netcentric applications model over the Internet based technologies – Java applications and/or HTML protocols.

Web Server services provide:

- ◆ Handling of client requests for Java services or HTML pages.
- ◆ Enforcement of security and access control
- ◆ Management of documents in most formats such as HTML, Microsoft Word, etc.
- ◆ Processing of scripts such Java Server Pages (JSP)
- ◆ Performance management by caching web pages

8.2 Services provided by the Application Integration layer (Integration Bus)

This section contains details about the services that will be provided by the Trading Platform's Application Integration layer.

8.2.1 Business Process Management Services

The Business Process Management layer is responsible for the definition and management of cross-business-objects execution within the framework and across external applications/systems. These services enable applications to communicate not just data, but also the business process context of the data to other applications.

The Business Process Management component provides:

- ◆ Centralized visibility and control of multi-step business processes traversing multiple applications
- ◆ Real-time analysis capabilities
- ◆ Workflow-like coordination of multi-step processes
- ◆ Transactional control
- ◆ Processing of state information maintained to support rollback processes
- ◆ Graphical tools and metadata to define processes and rules

8.2.2 Application Connectivity Services

The Application Connectivity layer provides reusable, non-invasive connectivity with custom legacy systems, external systems/applications, third-party products, and packaged software enabled by reliable, event-driven messaging.

The Application Connectivity layer provides:

- ◆ Custom adapter development kits
- ◆ Connection managed to and from source application
- ◆ Pre-built application adapters to packaged systems and common gateways

8.2.3 Transformation and Formatting services

The Transformation and Formatting layer is responsible for the conversion of data, message content and syntax to reconcile the differing needs of multiple heterogeneous systems and data sources. This layer is

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responsible for maintaining the structure and content of the messages passed between systems in formats that can be comprehended by other applications.

The transformation and formatting layer supports:

- ◆ Message protocol and format transformation
- ◆ Syntactic translation of one data set into another
- ◆ Semantic translation of data based on underlying data definitions or meaning. (Example: conversion from the English system to the metric system)

8.2.4 Communications Middleware services

The Communications Middleware component provides the architecture that implements various messaging models and route messages according to message content and context. These services provide connections among disparate resources, as well as security, queuing, and the functionality to reconcile network protocol differences.

The communications middleware:

- ◆ Directs the flow of messages among applications
- ◆ Supports both synchronous and asynchronous communications
- ◆ Routes messages to applications based on message subject and/or content
- ◆ Provides services via message brokers, ORBs or message queues

8.2.5 Development Environment Services

A development architecture provides an environment for component-based solutions that support a team through the Analysis, Design, and Construction phases of the development process. It should also serve as a productive environment for on-going maintenance.

The development environment services of the AI Architecture provide:

- ◆ Workflow management to enforce the correct sequencing of tasks and tools
- ◆ The core of the development architecture necessary to design and build the system
- ◆ A shared common repository of development objects, design documents, source code, etc.
- ◆ Consistency and insurance between components that a given environment is maintained over time as components are changed

8.2.6 Operations Environment services

The operations environment is a combination of tools, support services, procedures, and controls required to keep a production system up and running efficiently.

The operations environment services the AI Architecture provides include:

- ◆ Considerations for deciding on common standards, platforms, protocols, interfaces, etc.
- ◆ Network and systems performance monitoring, job activity processing, and diagnosis and reporting of failures
- ◆ Interfaces between the manager(s) of the system and the management data generated by the system
- ◆ Confidentiality, integrity and availability of information system assets