ACME

QuickPlace Architecture Plan

Example

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Executive Summary

This document constitutes the primary deliverable of the QuickPlace component of the Statement of Work "ACME Sametime and QuickPlace Architecture Review and Plan" and provides the following:

- A model for scaling server hardware as the use of QuickPlace grows.
- Options available for providing high availability of QuickPlace services.
- Considerations and a recommended method for providing QuickPlace services to external users, on the internet and from Business Partner organizations.
- An overview and considerations for using LDAP with QuickPlace, monitoring QuickPlace, archiving data and QuickPlace security.

IBM appreciates the time and access provided by ACME staff on the project.

ACME QuickPlace Architecture Plan

Introduction

ACME has invested in QuickPlace technology. ACME wish to plan a scalable architecture to expand QuickPlace services to the various Business Units in the organisation.

IBM Software Group Services have been engaged to assist in providing a scalable plan for this architecture for ACME. This document contains the architecture plan for QuickPlace and forms part of the deliverables from the Statement of Work.

ACME Current Standards and Infrastructure

Existing Configuration

ACME currently have one QuickPlace server in their environment. This server will initially service approximately 1000 users.

This server has been configured on top of a Domino server (Domino overlay), in a ACME Collaboration Domain.

Hardware Standards

QuickPlace will run on the Windows NT 4.0 SP6a or Windows 2000 platform in ACME. The server hardware to be used for QuickPlace consists of:

Server:

Compaq ML370R G2 Server
- Dual P1266 processor
- 1.2 GB RAM
- Smart Array 5302/32 Controller
- 3 x 18.2 GB 10k Hard Disks
- 20/40 DLT Drive
- Redundant fan and power supply

Client PCs:

ACME has a variety of PC hardware in the environment.

Minimum specification:	Pentium 133 Mhz processor, 64 MB RAM
Maximum specification:	Pentium 4, 1.6 Ghz processor, 256 MB RAM.
Most common specification:	Pentium II, 350Mhz with 64 MB RAM

Currently all clients use Windows NT 4.0 with Service Pack 4 or 6a. ACME have tested QuickPlace against their current and previous SOE versions and found no operational issues.

Wide Area Network & Utilisation

The Wide Area Network (WAN) for ACME consists of the following:

- A major central CBD site
- a number of smaller sites located in the CBD
- a number of sites located in the Metropolitan area and throughout the state.

The network features of these locations are:

Primary CBD Site

100MB LANs (for server communication)
10MB connections to desktops
2 Routers with 1GB link between them
Routers are IP Multicast enabled

Other CBD Sites

All CBD sites have network links to Primary CBD site
Most links are 2MB switched connections.

Metropolitan and Regional sites

All metropolitan and country sites are linked to primary CBD site.
Most links use hubs and vary from 64Kbps to 512Kbps connections.

Network Utilisation

Network utilization for all locations appears to be low to medium. No connections appear to be saturated.

The use of Citrix for accessing some applications from locations with smaller connections minimizes bandwidth consumption.

Information on ACME locations and the distribution of users across these locations was provided to IBM. Reviewing this information and approximating values for average daily (business hours) bandwidth usage, enabled it to be determined that the connections are not saturated.

Server Capacity & Scaling

Server Hardware Capacities

The information used to determine these estimates was obtained from the benchmark tests reported in the QuickPlace Performance White Paper available on the Lotus Developer Domain website, QuickPlace DevZone.

Performance Test Environment Conditions

The benchmark tests conducted for estimating server capacity were based on the following characteristics for the environment.

- **QuickPlace Usage patterns**
  Users were categorized as "Light Publishing" or "Active Publishing" users
  Light Publishing: Users read different page types (simple text, imported page, calendar page). Each user creates approximately one page request every minute. Some users publish text pages once every 10 minutes.
  Active Publishing: In addition to reading different page types, and publishing simple text pages, users publish more complex documents, such as word processing and spreadsheet documents, as well as creating calendar pages. Users publish documents at least every 10 minutes.

- **Response Time Requirements**
  Acceptable average response times were assumed to be:
  Less than 5 seconds for LAN reading users
  Less than 20 seconds for 56 Kbps modem reading users
  Less than 20 seconds for LAN publishing users
  Less than 40 seconds for 56 Kbps modem users
  This is used specifically for server performance and excludes other influences that may affect network performance, such as network congestion.

- **Number of Concurrent Users**
  The number of concurrent users is the number of users that are logged in and using the QuickPlace server at any one time. Typically, the maximum number of concurrent users is 20% - 50% of the total user population.

- **Size of QuickPlace views**
  Performance tests indicate that QuickPlace server processing is sensitive to the number of documents in a view or folder. If the server contains many QuickPlaces with more than 100 documents per view, then the estimated number of concurrent users the server can support should be reduced by 50%.

Performance Test Environment Conditions, cont.

- **Number of QuickPlaces**
  The number of QuickPlaces on a server has not been found to affect server performance.

- **Server CPU Scaling**
  Server CPU scales approximately linearly with number of QuickPlaces users. Servers with multiple CPUs and faster CPUs can support more requests simultaneously.

- **Servers with SSL Enabled**
  The Quickplace server and browser have encryption and decryption costs associated with using SSL. If SSL is enabled, the number of concurrent users the server can support is reduced by approximately 50%.

- **Proxy Servers**
  Proxy servers will not increase the concurrent number of users because most QuickPlace pages are not cached at the proxy level. Caching is done within QuickPlace servers and browsers.

Assumptions for Calculating Server Capacity at ACME

To be able to translate the results of the performance tests into estimates of server capacity for the ACME environment, some assumptions need to be made for the environment.

- Server is a Dual 1266 Mhz CPU, 1.2 GB RAM
- Usage pattern: Approximately 80% of users are light publishing users, 20% are active publishing
- It is estimated that the maximum number of users logged in and using QuickPlace at any one time is 50% of the user population.
- Most QuickPlace rooms and folders are large, containing more than 100 documents.
- SSL is not enabled

Calculating Server Capacity

Using ACME's server specifications, the conditions outlined above, and the results of the Benchmark Performance tests, the estimated number of users that this QuickPlace server could support can be calculated.

The Benchmark Performance Results for a similar system are as follows:

*

QuickPlace Version*	Server	No. Light Publishing Users	No. Active Publishing Users
2.0.6, 2.0.7	Dual Intel 733 Mhz CPU, 523 MB RAM	1600	1400

Performance Test results are not yet available for 2.0.8, however, it is assumed that results are comparable to QuickPlace 2.0.6 and 2.0.7.

1. Calculate the maximum number of concurrent users based on a usage pattern that assumes 80% light publishing and 20% active publishing:

(0.80 * 1600 + 0.20 * 1400) = 1560

2. Calculate the maximum number of concurrent users based on the faster 1266 Mhz CPU server (since memory is also scaled in proportion for the faster system to 1.2 GB)

1560 * (1266/733) = 2694

3. Divide this number by 2 since ACME anticipate that the majority of their QuickPlaces are likely to contain large numbers of documents in folders and views (eg more than 100).

2694 / 2 = 1347

This estimation is based on the presumption that QuickPlace at ACME is more likely to be used as a knowledge repository, rather than for temporary forums. Therefore, it is likely that folder and room sizes may grow very large.

One server could support 1347 concurrent QuickPlace users.

This estimate is based on the environment conditions used for the benchmark performance tests. Given that conditions in the ACME environment are likely to differ from these conditions, a more conservative estimate is appropriate.

A more conservative estimate of the maximum concurrent users a QuickPlace server at ACME could support, is approximately **1200** users.

Calculating Server Capacity, cont.

If the expected maximum concurrency is 50% of the user population, this server could support an estimate user population of 2400.

Since ACME has a maximum of 4000 users, two QuickPlace servers will be required to service the ACME user population, based on the environment outlined above.

It is important to consider that the way QuickPlace is used will affect the performance of the server and, therefore, the number of users the server can support. For example, the following table shows how the maximum number of concurrent users the server can support varies with the ratio of light to active users, based in the conditions outlined above.

Ratio of Light to Active users (%)	Maximum Concurrent Users
100% light, 0 active	1382
80% light, 20% active	1347
50% light, 50% active	1295
20% light, 80% active	1243
0 light, 100% active	1209

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ACME may consider implementing subsequent QuickPlace servers based on the following:

- One server cannot provide a solution for high availability
- One server may not be sufficient to service the entire user population if any of the variables outlined in the assumptions change in the ACME environment.
  For example, if the concurrent use is greater than 30% - 50%, or if SSL is enabled, or if many QuickPlaces grow to contain more than 100 documents per view.

IBM recommends that ACME implement a second, QuickPlace servers as the use of QuickPlace grows within the organisation, to provide a solution for high availability and adequate capacity for growth.

The section entitled “Options for High Availability of QuickPlace”, describes how an additional clustered server can provide failover for high availability of QuickPlace.

QuickPlace Server Scaling

As described in the previous section, the performance of a QuickPlace server will vary depending on the usage characteristics in the environment. Based on the assumptions and calculations outlined above, the following table contains estimated server capacities for different usage scenarios.

This information is provided as estimates and should only be used as a guide. ACME should monitor their own QuickPlace server performance to more accurately determine the usage characteristics of their environment.

No. Concurrent Users	**No. servers required for usage scenarios**		
	A **Light Usage** -majority light users - majority small QPs (< 100 documents per view) - no SSL	**B** **Medium Usage** - half light & heavy users - some small and large QPs - no SSL	**C** **Heavy Usage** - Majority heavy users - majority large QPs - SSL
1000	1	1	2
2000	1	2	3
3000	2	3	4
4000	2	3-4	4

It is estimated that ACME QuickPlace usage patterns is likely to fall within the shaded sections of the table.

Structuring QuickPlaces to Optimise Performance

Performance of a particular QuickPlace will degrade depending upon the number of documents that are contained in any one folder. Performance testing conducted by IBM has indicated that performance will begin to degrade once more than 100 documents are added to any folder within a particular QuickPlace room.

This is an issue faced by all Notes applications due to the way view indexing works. In a Notes application, a document can appear in a number of views. For instance, in a given notes application such as Team Room, a document will appear in a view categorised by date, another view categorised by subject and also another view based on author. Every time a change is made to this document the view index for all views selecting this document must be updated. The greater number of times a particular document is selected by a set of views, more indexes need to be updated, which in turn leads to a greater workload on the server.

The speed of view indexing is also slowed when there are a large number of documents in a view. In general the more documents in a view, the larger the index and therefore the longer the update to this index takes.

View indexing speed also depends on how often documents in a particular view or folder are updated.

With this in mind there are two options open to alleviate this problem. The first option is to structure a QuickPlace so that the number of documents in a given folder can be minimised. This will result in an increase in the number of folders that exist in a given QuickPlace, however accessing each folder will be much quicker as the amount of documents in a given folder will be minimised. The structuring option will require a QuickPlace moderator to move documents between folders in order to minimise the total number of documents in each folder of the QuickPlace.

Another option is to write a placebot that moves documents out of a folder and into a given target folder based on configurable threshold levels such as, date last accessed, number of documents in a given folder and the creation date. These documents could be stored in a subroom of the QuickPlace that just contains documents for that particular folder. The documents located in the subroom would still be searchable via QuickPlace search and users would also be able to navigate to them.

IBM would recommend that ACME monitor user response times on their QuickPlace infrastructure prior to investing in Placebot development.

Increasing Server Resources

QuickPlace scales with CPU, the higher the CPU capacity, the greater the capacity of the server to process QuickPlace requests.

Increasing CPU capacity of a server (adding CPUs or replacing the CPUs with a faster CPUs), should improve the capacity of the server, providing that other resources, such as memory are also increased in proportion.

This may be an alternative to increasing the number of servers. Since the number of concurrent users has been shown, in performance testing, to scale approximately linearly with CPU, calculations can be performed to *estimate* the benefit of increasing CPU capacity. This should be considered with other characteristics of the environment, such as size of QuickPlace rooms and folders etc.

For example, if two equivalent CPUs are added to an existing dual CPU server, and memory is also increased proportionately, the server would have an estimated capacity of *approximately* twice the capacity of the dual system.

CPU scaling should be considered as approximately linear. For example, increasing a single CPU from 450 Mhz to 900 Mhz (and scaling memory proportionately, may result in doubled capacity. However, increasing the system from 2 CPUs to 8 CPUs (equivalent speed and also increasing memory) is likely to result in less than 4 times the capacity.

Increasing Server Resources, cont.

The following table presents the results from Benchmark testing, reported in the Performance Paper, "QuickPlace Server Performance Characteristics Release 2.07 – 2.06 – 2.05 – 2.0", available on the QuickPlace DevZone website: https://extranet.lotus.com/QuickPlace/qpdevzone

This table indicates the scaling of users to CPU. This table can be used to assist in estimating the increased capacity resulting from increasing CPU.

Results from Benchmark Tests – Maximum Number of Concurrent Users

QuickPlace Version*	Server	No. Light Publishing Users	No. Active Publishing Users
2.0.6, 2.0.7	Single Intel 450 Mhz CPU, 512 MB RAM	360	336
2.0.6, 2.0.7	Sun Ultra60, dual 450 Mhz, 512 MB RAM	510	448
2.0.6, 2.0.7	Dual Intel 733 Mhz CPU, 523 MB RAM	1600	1400
2.0.6, 2.0.7	8 Intel Zeon 700 Mhz CPU, 3.4 GB RAM	3000	2800

* *Performance Test results are not yet available for 2.0.8, however, it can be assumed that results are comparable to QuickPlace 2.0.6 and 2.0.7.*
* *These results apply to the environment conditioned defined in the Performance Paper.*

Applying this to the ACME environment, assuming the operating conditions defined earlier in this section, adding two 1.2 Ghz CPUs to the existing dual 1.2 Ghz CPU system, and adding 1.2 GB memory, would result in a server capacity to support approximately 2400 users. (This is consistent with benchmark testing results shown above).

- Estimated capacity of server, determine in section "Calculating Server Capacity" = 1200
- 1200 multiplied by 2 when 2 equivalent CPUs & memory added = 2400

This is an estimated capacity, and conditions which vary from those defined in this document, for example, the size of QuickPlaces, may result in server performance which is different to that estimated here.

Client PC Requirements

Since QuickPlace is accessed using a web browser, users will be able to access QuickPlace from a PC, which is configured with an Internet Explorer browser (version 4 with SP2 or above, or version 5.x).

All of the PCs used at ACME (as outlined in the previous section) are adequate for accessing QuickPlace.

Options for High Availability of QuickPlace

Clustering

Clustering multiple servers for failover and load balancing can help provide high availability of QuickPlace in the environment.

A cluster is a group of servers treated as a single computing resource that provides services to network users. When a server in a cluster fails, its workload is passed to one or more other members of the cluster until the failed server is returned to normal operation. This is known as “failover”.

Clustering can also divide the total computing resource requirements of the system over several servers, which is known as “load balancing”.

QuickPlace 2.0.8 supports clustering by combining the native clustering capabilities of Domino Enterprise Server with the load balancing and failover capabilities of either IBM WebSphere Edge Server software (using the Network Dispatcher component) or Cisco LocalDirector Hardware.

A clustering solution involving both failover and load balancing make optimal use of the server hardware by sharing the workload across the servers while providing capacity for failover in the event of a server failure.
A clustered server pair in which one server is dedicated to failover (does not normally contain active users), has the capacity equivalent to one non-clustered server.
Two clustered servers, which are load balanced, have a capacity, which is approximately twice that of one single server. However care must be taken to not overload the cluster to enable adequate capacity in a failover situation.

How QuickPlace Clustering works

Domino Clustering

The Domino Cluster Replicator ensures that all QuickPlace databases in common are kept up to date on each server. QuickPlace uses Notes databases (NSF files) to store the contents of the QuickPlace. The cluster replicator is event driven and when changes are made to a database (QuickPlace) on one server, the changes are immediately distributed to other servers in the cluster. The cluster replicator keeps existing database up to date, it does not create new replicas on other servers for new QuickPlaces.

QuickPlace Replica Manager

The QuickPlace Administration Utility contains a program called the QuickPlace Replica Manager, which runs at specified intervals to create new replicas of new databases for new QuickPlaces (or new QuickPlace rooms) created on other servers in the cluster.
The Replica Manager program can be run at a specified interval (eg. every 10 minutes) from a program document in the Domino Directory on the QuickPlace server. Replica Manager should only be run on one server in a two server cluster, since it is bi-directional, that is, it can create replicas on either server when it runs.

User Access

Access to the QuickPlace clustered servers is balanced and managed by the third party HTTP sprayer application such as IBM WebSphere Edge Server's Network Dispatcher. This application directs users to the most available QuickPlace server for load balancing and failover.

IBM WebSphere Edge server contains a Network Dispatcher component for distributing HTTP request traffic to a QuickPlace cluster. This application needs to be configured on a server that resides between the users and the QuickPlace servers.

The DNS entry for the QuickPlace cluster (eg quickplace.acme.com) would connect users to the Network Dispatcher. This would then direct the user to one of the QuickPlace servers in the cluster.

Currently, this is the only certified tool for load balancing and failover of QuickPlace.

Hardware Considerations

Hardware requirements for clustered server QuickPlace installations are similar to non-clustered QuickPlace installations.

With ACME's standard server hardware, one QuickPlace server may be adequate to provide QuickPlace services to the user population. However, a second server may need to be added as the QuickPlace environment grows. The server can be configured to create a cluster for high availability.

As ACME's current hardware may not support their current user population in a non-clustered manner without failover, they will need to purchase an additional server of the same specifications for inclusion in a cluster.

If IBM WebSphere Edge Server is to be used for load balancing and failover, the hardware requirements are minimal. WebSphere Edge server requires it's own server, it cannot be installed on the QuickPlace servers. The server requires 64 MB RAM, approximately 50 MB of disk space and a JRE 1.3 installation. It can run on several platforms, including Windows NT/2000 and Sun Solaris.

Distributing HTTP Request Traffic

Several options exist for distributing workload across a number of servers in a cluster. QuickPlace requires that the network redirection solution send HTTP requests to one node in the cluster continuously for a predetermined amount of time. This is sometimes referred to as "sticky time".

Network Dispatcher Component of IBM WebSphere Edge Server
Currently, the Network Dispatcher in IBM WebSphere Edge Server is the only software solution certified for use with QuickPlace for load balancing and failover.

Domino's Internet Cluster Manager (ICM)
The ICM can be used for load balancing with QuickPlace, however, it has some limitations in addressing server availability:

- Failover with ICM is not completely seamless, users see an error in the browser when the server fails
- Bookmarks and notifications are fixed to one server and are not load balanced through the ICM (ICM does not provide "Sticky Time")
- Automatic load balancing only happens the first visit to the QuickPlace server.
- While the Clustered Servers provide redundancy, the actual ICM server that is distributing the IP packets and managing the redundancy is not itself clustered. It provides a single point of failure that needs to be managed.

Recommended Cluster Configuration for ACME

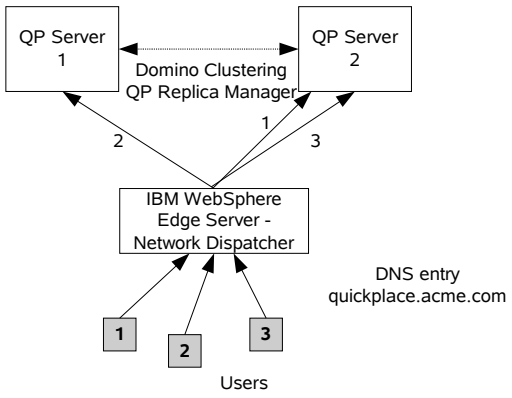
To provide a high availability solution for QuickPlace at ACME, it is recommended that ACME establish a QuickPlace cluster containing two servers, with a solution such as IBM Network Dispatcher to manage load balancing and failover.

One QuickPlace server can support up to approximately 2000 concurrent users.
Two clustered QuickPlace servers can support up to approximately 4000 concurrent users with load balancing (without considering capacity reserved for failover).
Since 50% concurrency (2000 users) is more likely, two clustered servers should provide adequate capacity for failover.

Based on the capacity calculations for the ACME servers, this configuration will provide adequate capacity with room to accommodate future QuickPlace growth, as well as providing a solution for load balancing and failover.

The following diagram illustrates this configuration.

Diagram representing Clustered QuickPlace servers



- QuickPlace servers 1 and 2 are clustered using Domino Clustering and the Replica Manager in the QuickPlace Admin Utility.
- Users 1, 2 & 3 connect to the QuickPlace cluster using the URL specified in the DNS for the cluster (eg quickplace.acme.com). This DNS entry connects the users to the Network Dispatcher, which directs the user to the most available QuickPlace server.

Alternative Options

If ACME would prefer not to use a third party solution for distributing HTTP requests across clustered servers for load balancing, servers can still be clustered for failover, and for a disaster recovery solution. However this solution is not as elegant or as seamless as an option that uses the IBM Network Dispatcher.

Using a QuickPlace Server for "Manual" Failover Only

Without the use of a solution to direct HTTP requests to different servers in a cluster, the QuickPlace cluster cannot be load balanced. Without load balancing, QuickPlace servers can still be clustered for failover or a disaster recovery solution.

In this configuration, one server would be the primary QuickPlace server, containing all active users. The other server would not normally contain active users, but would contain all updated data. All user HTTP requests would be directed to the primary server since the DNS entry would direct users to this server.

In the event of a failure of the primary server, the DNS entry could be changed (manually) and users would be directed to the secondary QuickPlace server.

This configuration does not provide load balancing, or a seamless failover solution.

Using Internet Cluster Manger (ICM)

The use of Domino's ICM for managing the distribution of HTTP requests across clustered QuickPlace servers is not certified since it contains several limitations. However, ICM can still be used, with its limitations. If ACME is considering using ICM with QuickPlace, it should be thoroughly tested to ensure ACME is completely aware of the limitations and how they may affect the environment.

Network Bandwidth Capacity

Network Bandwidth

Network bandwidth should be considered separately to server capacity. In a similar way to web browsing, network bandwidth sizes can affect the experience the user receives when using QuickPlace. Slower, more heavily utilized connections, will result in slower response times when using QuickPlace.

Network Bandwidth utilization by QuickPlace users can vary considerably, depending on many factors. Performance tests indicated that bandwidth utilization by web browsing is approximately 5 Kbps per user.(source: White Paper "Bandwidth Requirements for Lotus Notes and Domino" by John Lamb) . Since QuickPlace is a web application, accessed by a web browser, this figure can also be used as an estimate for bandwidth utilization by QuickPlace users.

This value should also be considered as an average. As with other web browser application, there will be peaks in network bandwidth usage. Activities such as downloading or uploading large attachments from/to a QuickPlace will use more bandwidth, and will lead to slower performance over a slower connection. Enabling SSL will also increase the network bandwidth usage.

For ACME to more accurately predict the bandwidth used by QuickPlace users, it is recommended that a network analysis tool be used to monitor QuickPlace activity over the network.

Scaling Network Architecture

The following table provides estimated performance for a number of users of different Network Connection speeds. This is based on the average network consumption of 4 Kbps per user (as shown in the section "Estimating Network Bandwidth Utilisation), and the assumption that the network connection is 50% utilized by other applications.

This should only be used as a guide, and depending on the QuickPlace usage patterns, and the size of QuickPlace pages and/or attachments, actual performance may be different to that estimated here.

Estimated performance for users over WAN connections, showing estimated average bandwidth consumption by those users.

Connection Speed	Estimated Performance for Number of Users (Average Usage*)				
	1	**2 (1 concurrent)**	**5 (2.5 concurrent)**	**10 (5 concurrent)**	**20 (10 concurrent)**
64 Kbps (32 Kbps available)	Good Ave: N/A	Good Ave: 4Kbps	Good Ave: 10 Kbps	Marginal Ave: 20 Kbps	Poor Ave: 40 Kbps
128 Kbps (64 Kbps available)	Good Ave: N/A	Good Ave: 4 Kbps	Good Ave: 10 Kbps	Good Ave: 20 Kbps	Marginal Ave: 40 Kbps
256 Kbps (128 Kbps available)	Good Ave: N/A	Good Ave: 4 Kbps	Good Ave: 10 Kbps	Good Ave: 20 Kbps	Good Ave: 40 Kbps
512 Kbps (256 Kbps available)	Good Ave: N/A	Good Ave: 4 Kbps	Good Ave: 10 Kbps	Good Ave: 20 Kbps	Good Ave: 40 Kbps
2 Mbps (1 Mbps available)	Good Ave: N/A	Good Ave: 4 Kbps	Good Ave: 10 Kbps	Good Ave: 20 Kbps	Good Ave: 40 Kbps

- Average usage is defined as 50% user concurrency of users on the WAN link each utilisiing an average of 4kbps (see table in the section "Estimating Network Bandwidth Utilisation). 4kbps is determined based on average daily usage.
- Average for one user is N/A since 50% concurrency does not apply
- The nominal concurrency of 50% is conservative in a HTTP environment such as Quickplace. Likely concurrency usage is less than this value.

Average use represents users browsing QuickPlace pages, reading, and occasionally publishing small pages. Peaks in bandwidth utilization will occur when users download or publish large pages containing attachments or complex pages with embedded objects etc. These peaks will be dependent on the size of the pages being downloaded or published. Over some connections, these activities may saturate the connection, which will then revert to a pro-rata allocation of bandwidth based on the number of users and available bandwidth.

Peak use can also be defined as all users over a connection accessing QuickPlace at the same time. In this situation, the available bandwidth is divided across the users.

The table below provides an indication of the estimated performance for users over WAN connections, showing peak bandwidth consumption available or allocated to each user.

Estimated performance for users over WAN connections, showing estimated peak bandwidth consumption available to each user.

Connection Speed	Estimated Performance for Number of Users (Peak Usage per user**)				
	1	**2**	**5**	**10**	**20**
64 Kbps (32 Kbps available)	Marginal Peak: 32Kbps	Poor Peak: 16Kbps	Poor Peak: 6.4 Kbps	Poor Peak: 3.2 Kbps	Poor Peak: 1.6 Kbps
128 Kbps (64 Kbps available)	Good Peak: 64Kbps	Marginal Peak: 32Kbps	Poor Peak: 12.8 Kbps	Poor Peak: 6.4 Kbps	Poor Peak: 3.2 Kbps
256 Kbps (128 Kbps available)	Good Peak: 128 Kbps	Good Peak: 64 Kbps	Marginal Peak: 32 Kbps	Poor Peak: 12.8 Kbps	Poor Peak: 6.4 Kbps
512 Kbps (256 Kbps available)	Good Peak: 256 Kbps	Good Peak: 128 Kbps	Good Peak: 64 Kbps	Poor Peak: 25.6 Kbps	Poor Peak: 12.8 Kbps
2 Mbps (1 Mbps available)	Good Peak: 1 Mbps	Good Peak: 512 Kbps	Good Peak: 200 Kbps	Good Peak: 100 Kbps	Marginal Peak: 50 Kbps

Peak usage is defined as all users on the WAN link each utilisiing the maximum available bandwidth allocated (pro-rate). (E.g. for 10 users on a 64 Kbps link, with 32 Kbps available bandwidth, each user is allocated 3.2 Kbps).

Download example:

- Available WAN bandwidth per user – 64Kbps
- Attachment download – 150Kbytes
- Download time ~ 19 seconds

Assumption Notes:

1. All users are fully utilizing their bandwidth allocation of available bandwidth.
2. Network overhead (errors, collisions, acknowledgement etc.) have not been taken into account.

Estimating Network Bandwidth utilisation

Given the nature of QuickPlace as a repository of application data of various formats, determining the likely network bandwidth utilization is problematic. QuickPlaces can be used for anything from a collaboration repository for discussion threads (primarily text and therefore low bandwidth utilization) through to a document library that may require frequent downloads of very large file attachments or objects (resulting in network spikes or higher average bandwidth utilization).

Given these caveats, it is possible to make certain assumptions to generate a model for likely bandwidth utilization. (IBM would recommend that ACME replace the assumed values below and recalculate the totals as more empirical local information comes to hand.)

Active QuickPlace users:

Network traffic element	**Iterations per day**	**Approx size**
ActiveX and Java applets	N/A*	N/A*
QuickPlace pages (Code, Text and Images)	50	150Kb
Attachments downloaded to Client	30	150Kb
Attachments uploaded to QuickPlace Server	10	150Kb
Total (per day usage)		9Mb
Bandwidth utlisation per user (9Mb across an 8 hour day)	~0.5 KBytes per sec ~4 kbps	

* Pre-delivered to desktop client

Note 1: Browser and HTTP server caching will further reduce this usage.

Note 2: The method above averages the bandwidth utilization per user across a working day. This is not the practical experience of the user however who will generally use the network bandwidth in a spasmodic fashion throughout the day. For example, they will click on a link and expect a page to appear. They may then read that page for an extended period followed by clicking on a new link. The user reaction to network availability will be the perception of how quickly the pages appear. In this light, the method above is sound only for larger numbers of users where the usage is spread.

Note 3: Experience shows that a single user with 32Kb of dedicated bandwidth will experience reasonable ‘modem like’ response times. Should multiple users share this level of bandwidth, the response times will quickly degrade.

Improving Performance to users with low speed WAN connections

Offline

Using QuickPlace offline and synchronizing regularly with the server works in a similar way to operating with a local replica of a mail file on a Notes client. Performance will be improved for the user since they are essentially operating locally. However QuickPlace offline will not work behind a restrictive firewall as port 1352 must be open for the offline client to function correctly.

When the Offline function is enabled, the user is allowed to configure their Browser for Offline function. This 'once only' process downloads about 25 Mbytes of data from the server to the client machine. The 25Mbyte installation files can be preloaded or distributed to client machines.

Citrix

Many users in regional locations, and smaller metropolitan sites with low speed network connections, use a Thinclient (Citrix) to with some client-server applications such as Lotus Notes.

Since ACME are using Citrix to improve performance for remote users, ACME have requested information regarding the use of QuickPlace from a browser in Citrix. Currently, the use of QuickPlace with Citrix is not a supported configuration, and may not function properly.

Using QuickPlace Offline

QuickPlace Offline

If users choose to take their QuickPlaces offline, a copy of the QuickPlace is created on their local PC. With an offline QuickPlace, users are able to use QuickPlace when not connected to the QuickPlace server, as well as experience faster performance when working over a WAN connection to the server.

Changes made locally to the QuickPlace are synchronized automatically with the server at regular intervals, when the user is connected to the server. Likewise, changes to the QuickPlace server are synchronized with the offline copy.

When using the QuickPlace Offline feature the following should be considered:

- When installing a QuickPlace offline, users need to download the QuickPlace-Sync software (ActiveX Control) to enable the QuickPlace to be taken offline and synchronized with the QuickPlace server. This download is significant in size and may not be appropriate for download over a low speed WAN connection. This ActiveX control can be installed from a CD, or deployed to workstations using a remote software installation package.
- QuickPlace Offline requires a minimum of 66MB on the local hard disk of the workstation.
- Port 1352 is used for synchronization with the QuickPlace server. This is a consideration when accessing the QuickPlace server through a firewall.
- QuickPlace server's name in DNS needs to be the same as the server's host name to enable the QuickPlace-Sync software to be downloaded

Providing QuickPlace Services to External Users

Functionality Requirements

Business Units have a requirement to use collaboration technologies to communicate with parties outside of the organisation, such as other Business Partners and members of the public. QuickPlace services will be required as part of this collaboration technology.

The recommended QuickPlace architecture presented here for providing services to external users is based on the following functionality requirements:

1. Internal users can request QuickPlaces be created for access by external users (from the internet, or Business Partners).
2. External users invited to external QuickPlaces can connect to external QuickPlace servers for collaboration with internal users.

It is assumed that anonymous access to QuickPlace will not be an initial requirement. However, it should be recognized that there might be a future requirement for this functionality, such as a public QuickPlace.

ACME External Network

ACME currently have a Demilitarized Zone (DMZ) between their internal network and external parties. Within this zone, there are essentially two channels, one controls connectivity to Business Partners, and the other controls connectivity to external parties through the internet. The two different external parties do not connect to the same infrastructure. Servers in one “channel” cannot connect to servers in the other “channel”.

Access to QuickPlaces in the DMZ

Internal users sharing QuickPlaces with external users will need to request the QuickPlace to be set up on an external QuickPlace server in the DMZ. Internal users will need to access the server directly in the DMZ to visit this QuickPlace. Therefore, internal users will need outbound access through the internal firewall.

This configuration for QuickPlace varies from that of Sametime. Sametime servers in different domains can be synchronized in the same community to allow users to access the local server on the appropriate side of the firewall. Due to the nature of QuickPlace, users need to connect to the server containing the QuickPlace.

Internal servers cannot be clustered with External servers since they belong to different Domino Domains. However, QuickPlaces can be replicated between servers. If security policies prevent users from accessing servers through the firewall, QuickPlaces could be replicated between the external and internal servers. However, replication would not be immediate and users may experience delays in seeing updates to QuickPlaces. Also, it is possible that replication and save conflicts may result. This configuration of replicating QuickPlaces should be thoroughly tested before being considered for implementation.

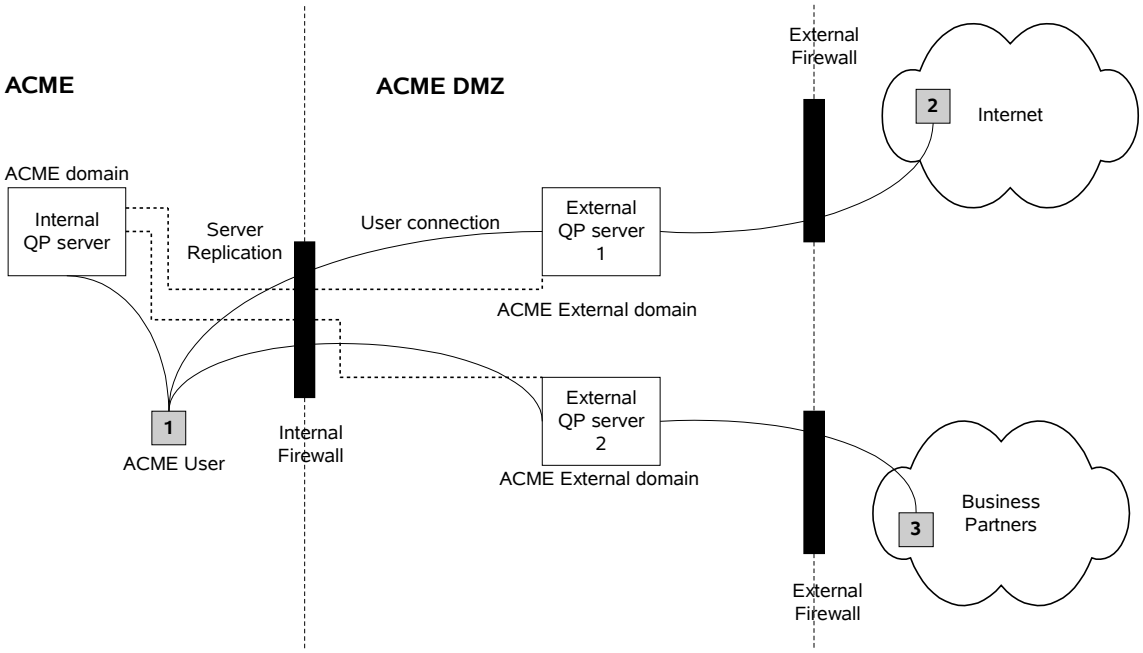
Options for QuickPlace Architecture in DMZ

Option 1 - Two QuickPlace Servers in the DMZ

Based on ACME's current DMZ configuration, the solution for extending QuickPlace to external users involves placing two QuickPlace servers in the Demilitarized Zone. One server would accept connections from external users from the internet, the other server would accept connections from external users in Business Partner organisations. These servers would not be connected.

The external QuickPlace servers would be located in a separate Domino domain from the internal QuickPlace server, and therefore use their own Domino Directory to contain groups for the QuickPlaces.
Directory Assistance could be used to authenticate internal users in the ACME Directory, as well as external users in other Directories.

Option 1 for QuickPlace Server Architecture in DMZ



Notes for Option 1 diagram:

- User 1 is an internal ACME user, can connect to:
  - Internal QuickPlace server for collaboration with other internal users
  - External QuickPlace server 1 for collaboration with user 2 from the internet
  - External QuickPlace server 2 for collaboration with user 3 from Business Partners
- User 2 from the internet can connect to External QP server 1 for collaboration with internal ACME users, but cannot connect to QuickPlaces on External QP server 2 for collaboration with users from Business Partners
- User 3 from a Business Partner organisation can connect to External server 2 for collaboration with internal ACME users, but cannot connect to External QP server 1 for collaboration with users from the internet.
- There is no connection between External QP servers 1 & 2, so QuickPlaces can only be made available to both internet and Business Partner users by placing them on each server an replicating them from the internal QP server (this would not be efficient since the servers cannot be clustered across domains)

Options for QuickPlace Architecture in DMZ, cont.

This solution has been suggested on the basis that it fits with ACME's current DMZ configuration. While this configuration can function appropriately for Sametime, using Sametime Communities, it creates some limitations with QuickPlace.

Limitations of this Configuration

- The same QuickPlaces cannot be accessed by both internet users and users from Business Partners, since these users connect to different servers. The servers are not connected, so the QuickPlace cannot be replicated between servers.
- Internal Users will need to decide which QuickPlace external server will host their QuickPlace for access by different types of external users.
- Managing more than one QuickPlace server in the DMZ will result in greater complexity for administration and for internal users requiring QuickPlaces to be set up for access by external users.

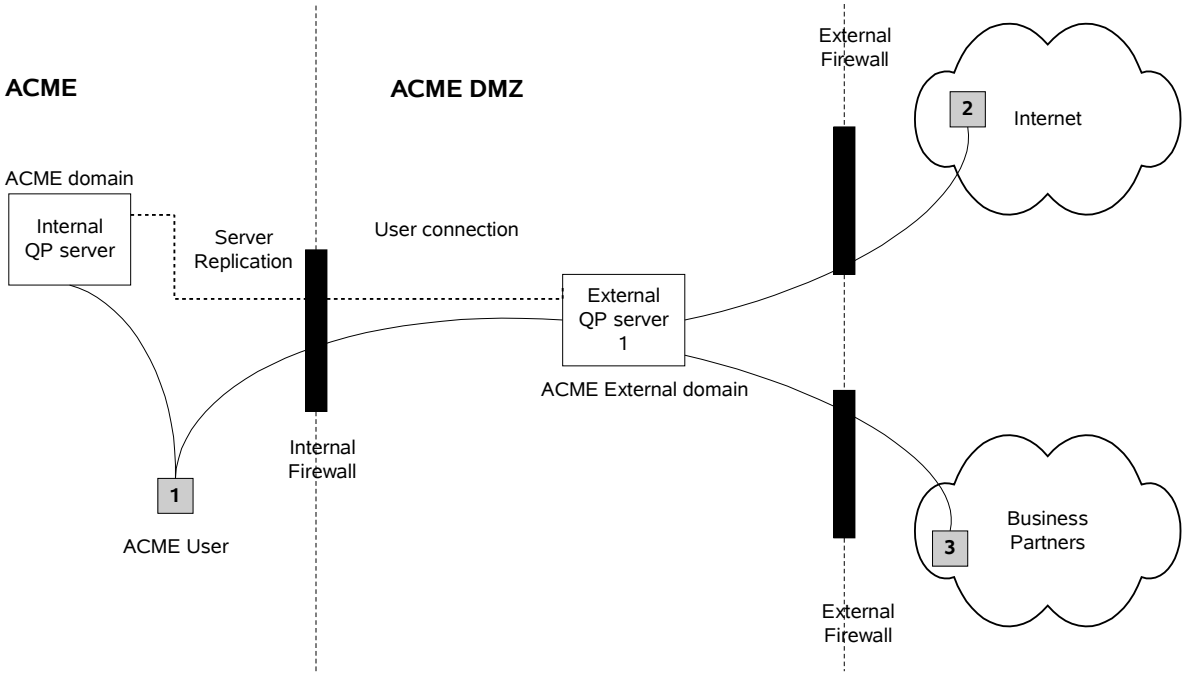
If the servers in each channel were connected to each other and clustered, external users from the internet and Business Partners could still access separate infrastructure, but see the same QuickPlaces if required.

Option 2 - One QuickPlace Server in the DMZ

Implementing one QuickPlace server in the DMZ and allowing both internet users and users from Business Partners to connect to the same server would require modification to ACME's security and DMZ strategy.
However, it would allow both types of external users, and internal users to access the same QuickPlaces where required.

This would simplify the administration of the external QuickPlace servers and reduce the complexity for internal users, as they would not have to be aware of two QuickPlace services for external users.

Option 2 for QuickPlace Server Architecture in DMZ



Notes for option 2 diagram:

- User 1 can connect to internal QP server for collaboration with internal users and can connect to External QP server 1 for collaboration with users from the internet and Business Partners.
- User 2 from the internet can connect to the External QP server for collaboration with Internal users and users from Business Partners
- User 3 from Business Partners can connect to the External QP server for collaboration with internal ACME users and users from the internet
- QuickPlaces to be shared with both external users from the internet and Business Partners only need to reside on one External server
- This configuration requires alteration to ACME's current DMZ policies to allow external internet users and users from Business Partners to connect to the same server.

Given the complexities of configuring this functionality, and the security implications of providing QuickPlace Services to external users, careful consideration and planning is required.

This suggested architecture for providing external access to QuickPlace is based on information provided to IBM by ACME. This architecture is provided as a suggested approach. This needs to be reviewed against the current detailed ACME security policies (current and proposed).

Directories & Authentication

If QuickPlace Services are provided to known external users, details for these users needs to be maintained, such as usernames and passwords for authentication.

Since Domino Directories are being used in the ACME internal QuickPlace environment, Domino Directories can also be used to manage external users.

Providing QuickPlace Services to external users via external QuickPlace servers located in the DMZ will require that directory information is available to these external QuickPlace servers. This information is required for activities such as:

- Authentication of external users when accessing a QuickPlace
- Adding members to a QuickPlace

There are many considerations that need to be made when managing user information in directories and providing access to external users:

- **Maintaining information separately for different types of users**
  ACME may wish to create a separate directory to contain known internet users, for example, an "External Internet Users" directory.
  Business processes would need to be created for registering and maintaining users in this directory.
- **Managing multiple Domino Directories with Directory Assistance**
  The external QuickPlace servers will be part of a separate Domino Domain to the internal user, so Directory Assistance can be used to manage multiple Domino Directories.
- **Restricting information in Directories from external users**
  Consideration needs to be given to which directories need to be made available to users on each external server. For example, it may only be appropriate for internet users to have access to the "External Internet" directory and not he ACME directory. Likewise, the external QuickPlace server for Business Partners might need to have access to the Business Partner directory, but not the directory containing internet users.
- **Storing Directory information in the DMZ**
  If security policies prevent some directory information being stored in the DMZ, options need to be considered for accessing this information in the internal network (for example, using Directory Assistance) or for creating a version of the Directory containing only a selection of information.

Ports Required to be Opened

To allow QuickPlace to function between the internal network, the DMZ and with users access from the internet or Business Partners, some ports need to be open on the firewall devices.

Internal Firewall Device

The ports that are required to be open on the internal firewall device, between QuickPlace Servers on the internal network and External QuickPlace Server in the DMZ, are presented in the following table.

Ports to be Opened on Internal Firewall Device

Port Number	Direction Open	Purpose
80	Outbound	To enable internal users to access QuickPlaces on external servers.
443	Outbound	To enable internal users to access QuickPlaces on external servers with SSL enabled.
1352	Inbound/ Outbound	To enable Notes/Domino replication to occur between the servers. This is required to replicate Directories and other Domino databases between the environments.

Ports Required to be Opened, cont.

External Firewall Device(s)

The ports that are required to be open on the external firewall devices, between External QuickPlace servers in the DMZ and external users on the Internet or from Business Partners, are presented in the following table.

Ports to be Opened on External Firewall Device

Port Number	Direction Open	Purpose
80	Inbound	To enable external users to access QuickPlaces on external servers.
443	Inbound	To enable external users to access QuickPlaces on external servers with SSL enabled.
8082	Inbound	To enable online presence and chat (Sametime Community Services – All over 80 solution)
1352*	Inbound	To enable Offline use of QuickPlace

* Security Policies may prevent this port from being opened

Other Issues & Considerations

When designing a solution for deploying QuickPlace servers for access by external users, the following needs to be considered, in addition to the considerations outlined in the previous sections:

- **Integration with Sametime**
  Appropriate configurations need to be in place to allow this functionality.
- **Configuration settings**
  Different configuration settings may be requirements on the external servers, than on the internal servers, for security or functionality reasons. For example, enabling SSL with a commercial certificate may be required for security on the external servers.
- **User Awareness**
  Internal users will need to be made aware of the processes for managing QuickPlaces on the External servers. For example, which server to use when collaborating with internet users, or which server to use for collaboration with users in Business Partners.

Once the strategy for deploying QuickPlace for external users has been fully designed and planned, it needs to be thoroughly tested to ensure appropriate functionality.

Alternative Option for Providing QuickPlace Services to External Users

External QuickPlace server hosted within ACME internal network
An external QuickPlace server use could be located within the ACME internal network. This option would result in no data being stored in the DMZ, but would require external users to have access to the internal network through both the internal and external firewall devices. This option does not fit with ACME's security strategy and is therefore not recommended.

Installing Sametime and QuickPlace on the Same Server
If the expected load on the Sametime and QuickPlace servers from the External environment (internet or Business Partners) is small, QuickPlace and Sametime could be installed on the same physical servers. This would reduce the number of physical servers to be managed.

Integrating QuickPlace with Domino and Sametime

QuickPlace and the Domino Directory

QuickPlace installed in a Domino overlay configuration allows many Domino features to be used with the QuickPlace server. This includes the Domino Directory, Directory Assistance, Domino Security, Domino Administration tools, and Domino Clustering.

When installing QuickPlace into a Domino environment, it can be installed into an existing Domino domain, or into a separate Domino domain, depending on the requirements of the organization.

Installing QuickPlace into an existing Domino Domain results in only having to manage one directory, but is also means that all QuickPlace groups (eg h_members) are located in the organization's primary Directory. QuickPlace requires access to the Directory to create these groups, and to a number of views, and this may not conform to the security policy for the primary Directory.

Installing QuickPlace into a separate directory results in the increased administration of managing another domain, but also means that QuickPlace can function without compromising the primary Directory. Users can be authenticated and added to member lists from the organization's primary Directory using Directory Assistance, and QuickPlace groups are created in the QuickPlace domain's Directory.

ACME have configured their existing QuickPlace server in a separate domain to the primary Domino domain (ACME). This is the recommended configuration for an enterprise environment such as ACME.

Integrating QuickPlace with Sametime

QuickPlace can be configured to use a Sametime server as the provider of Sametime Community Services, rather than using the QuickPlace server to provide chat functionality. This can be set by the QuickPlace server administrator, in the QuickPlace server configuration settings.

This can be configured for the internal QuickPlace servers, as well as the external servers in the DMZ. Internal QuickPlace servers could be set to use an internal Sametime server for Community Services, and the External QuickPlace server could be set to use an external Sametime server for Community Services. This would allow all Sametime users to be in the same Sametime Community.

Multi Server Single Sign On (MSSSO) can be configured on Sametime and QuickPlace servers in the same domain to allow users to log into one server and access the other without re-authenticating. MSSSO is configured on the Domino server.

When a user logs into the first server, a session cookie is created and encrypted in the browser. The user then logs onto the other server, the cookie is presented and trusted by the second server. This reduces the number of times users need to enter usernames and passwords.

In addition, QuickPlace applications can be further Sametime enabled by integrating a Sametime chat applet into a QuickPlace page.

Using an LDAP Directory with QuickPlace

ACME's QuickPlace environment will be initially configured to operate using a Domino Directory, or series of Domino Directories using Directory Assistance.

The Domino Directory contains a Person Document for each QuickPlace user. From these person documents, QuickPlace uses the Username and Internet Password information for authentication and searching.

Managing multiple directories involves an amount of administrative overhead, and may result in users having multiple passwords for different internet/intranet applications. To reduce this overhead, ACME may implement a directory service, such as an industry standard LDAP Directory, and may wish to use this directory with QuickPlace.

QuickPlace servers can be configured to use LDAP, by either configuring the server to use the LDAP server directly, or by using Directory Assistance.

Configuring QuickPlace to use LDAP via Directory Assistance is the preferred method as it provides more flexibility where additional directories need to be used as well (eg an external directory) and it's the only method that supports SSL with LDAP.

QuickPlace does not support encrypted communication directly to an LDAP server over SSL. A secure encrypted connection is only available using Directory Assistance. For LDAP to work successfully with SSL, the Domino server that hosts the Directory Assistance database must have an SSL certificate in common with the LDAP server.

Detailed instructions for configuring the QuickPlace server to use LDAP can be found in the IBM Redbook "Deploying QuickPlace", chapter 3.

Monitoring & Logging

QuickPlace Monitoring

QuickPlace can be monitored in the same way as a Domino Web server. The server can be monitored using the Domino Administrator client, or the Web Administrator.

A tool such as Webtrends or similar standard HTTP log analyzer can be used to present statistics and graphs of QuickPlace Activity.

ACME can apply the same monitoring practices that are used for monitoring Domino server to QuickPlace servers.

For further information on Webtrends refer to www.webtrends.com.

Logging QuickPlace Activity

Domino Web server activity on the QuickPlace server can be logged by enabling logging in the HTTP section of the server document. Logging can be done to a database (domlog.nsf), or a text file.

For further information on monitoring or enabling logging on the Domino server, refer to the Domino 5 Administration Help databases.

Archiving

Archiving QuickPlaces

The QuickPlace Admin Utility in QuickPlace 2.0.8 contains an Archiving feature, which can be used to archive QuickPlaces.

This archiving feature allows a QuickPlace administrator to copy the QuickPlace from the QuickPlace data directory to another location for backup or archival purposes.

This feature allows specified QuickPlaces to be copied, or copied and then deleted from the original location.

The QuickPlace Admin Utility also contains tools to assist QuickPlace Server Administrators manage QuickPlaces. These include, the ability to send mail to QuickPlace Managers, enforcing QuickPlace size and Days-Not-Used Limits and creating a Super User.

Security

QuickPlace Security

QuickPlace Security is based on Domino Web security. However there are some subtle differences depending upon the way the QuickPlace server has been configured. If users in the Domino directory are granted access to the Quickplace their details are referenced from the Domino Directory, but users that are created locally in the Quickplace details are stored in the Contacts1.nsf database and these users are added to the ACL of the room they have been granted access to.

Users are required to provide a username and an internet password to authenticate when accessing a QuickPlace server. Users do not require a Notes ID file. The username and internet password are stored in the directory being used for authentication (eg Domino Directory).

Encryption using Secure Sockets Layer (SSL)

A QuickPlace server supports SSL for Web browser connections in the same way that a Domino server does.

The SSL protocol is a public/private key RSA cryptographic system that secures private communications operating over the internet or private intranet. Web browsers use the HTTPS protocol to communicate with the QuickPlace server over the SSL port (443 by default). SSL protects the data link between a web browser and the server, so that data cannot be intercepted during transmission.

If SSL is to be implemented on the QuickPlace servers, this should be done in the same way as it has been implemented on other Domino servers. If SSL is not used on other Domino servers, a strategy for implementing SSL should be devised to enable SSL to be configured consistently on servers in the Domino environment, including the QuickPlace servers. The strategy would include the Certificate Authority to be used (eg. internal or external) as well as the level of encryption required.

If ACME implement a QuickPlace server in the DMZ to provide access to external users, it is recommended that SSL is enabled to secure the connections from server to browsers.

Further information for configuring SSL on Domino and QuickPlace, refer to the IBM Redbook, “Deploying QuickPlace” chapter 4, and Domino 5 Administration Help.

Encryption using Secure Sockets Layer (SSL), cont.

SSL can be enabled on different levels:

1. **Entire Domino Server**
   Enabling on the Domino/QuickPlace server to use SSL for all requests, including non-QuickPlace requests (if any). SSL is configured at the Domino level for this option.
2. **All QuickPlaces**
   SSL can be configured for use with QuickPlace requests only (ie not Domino requests) however, this option creates a self signed certificate with is not trusted by browsers. For this reason, this option is not recommended.
3. **Individual QuickPlaces**
   Individual QuickPlaces can be enabled to use SSL in the same way the Domino databases can be selectively enabled to use SSL. A setting in the database properties "Web Access: Require SSL connection" can be set by the QuickPlace administrator on the main.nsf database of the QuickPlace. (The Domino server must be configured with an SSL certificate)

Logging Users Off QuickPlace

Standard QuickPlace themes do not include the ability to log users off. Many browsers cache logon credentials and private data, which are not removed until the browser is closed. Users can either clear their browser cache manually, or a QuickPlace developer can customize a QuickPlace theme to include a logout button.

Other Considerations

Test Environment

ACME has invested in server infrastructure for testing and development of QuickPlace. This consists of a server for testing (crash and burn machine) and a server for development.

These servers will be used for testing of the applications, such as different versions and configuration changes, and testing of applications developed with QuickPlace technologies.

Certifier ID used with QuickPlace

During the installation of QuickPlace, the Administrator must specify a certifier to be used by the QuickPlace server. This certifier will be used to provide a canonical name for the QuickPlaces.

This certifier forms the base of the certification hierarchy and can be a certificate used in the existing Domino environment to certify application developers signing the databases. This will prevent security violations on the QuickPlace server. If another certificate is used (eg a certificate from a different organization or domain) for the QuickPlace certification hierarchy, then cross certificates need to be created to prevent security violations.

The certifier specified as the base for the QuickPlace certification hierarchy cannot contain more than two organizational units (OUs), since QuickPlace uses two additional OUs and the maximum is four. QuickPlace uses one named "QP" and another with the same name as the QuickPlace.

Disaster Recovery

The following options could be considered when creating a Disaster Recovery strategy for QuickPlace.

Where an off-site Disaster Recovery solution is required for a situation in which a disaster affects the central location hosting QuickPlace services:

- Configure a spare QuickPlace server in a separate location and ensure that this is replicating all appropriate databases with a production QuickPlace server, this would be a "warm" spare – operating but does not contain a user load under normal circumstances. In the event of a disaster, this server could be renamed, it's IP address changed, and implemented as the production server.

- If a spare machine is not an option, ensure that the QuickPlace server is fully backed up and detailed procedures exist in order to re-build a QuickPlace server in the event of a disaster and total loss of the existing QuickPlace infrastructure.

A Disaster Recovery solution for QuickPlace can be closely aligned with a Disaster Recovery solution for Domino servers.

Service Level Guidelines

Response times for QuickPlace in an organisation will vary depending on the usage patterns of QuickPlace, such as light or heavy publishing and the size of QuickPlace folders and rooms. The conditions of the network will also affect performance.

Expectations for QuickPlace performance can be set in a similar fashion to other browser based applications.

The following can be used as an indication of response times that are acceptable to users. It is recommended that ACME conduct some testing to more accurately determine what can be expected as reasonable response times over different connections in the ACME environment.

In a local area network, without performance issues resulting from bandwidth limitations, the following response times may be acceptable:

Reading QuickPlace pages: 5-10 seconds
Publishing QuickPlace pages: 20 seconds

Over a slow WAN connection, response times will be affected by many influences, however, acceptable times may be:

Reading QuickPlace pages: 20 seconds
Publishing QuickPlace pages: 40 seconds

Performance of QuickPlace over a slow WAN connection will vary significantly depending on many influences, including the size of attachments, and the complexity of pages. Where large attachments need to be downloaded, significantly increased response times may be experienced.

References

The following sources of information were used in preparing this architecture plan for QuickPlace at ACME.

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