Ivanti Service Desk and Asset Manager

Technical Specifications and Architecture Guidelines

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Contents

1 General 5

2 Software Components 6

2.1 General 6

2.2 Server Components 6

2.2.1 Database Server 6

2.2.2 Knowledge Base Data Files 6

2.2.3 Microsoft Windows Server Operating System 6

2.2.4 Microsoft Internet Information Server (IIS) 7

2.2.5 Microsoft Terminal Services 7

2.2.6 Service Desk Framework 7

2.2.7 Ivanti Web Desk and Ivanti Self Service (Web Access) 8

2.2.8 Ivanti Workspaces (BridgeIT) 9

2.2.9 Ivanti Event Manager Web Interface 10

2.2.10 Ivanti RSS Server 11

2.2.11 Ivanti REST Web Services 12

2.2.12 Ivanti Open Touch Web Services 13

2.2.13 Ivanti Configuration Center 13

2.2.14 Ivanti Application Services 14

2.2.15 Xtraction 15

2.3 Client Components 15

2.3.1 Console 15

2.3.2 Browser (Desktop and Mobile) 15

2.3.3 Terminal Services 16

2.4 Data Requirements 16

2.5 Overview Software Components 17

3 Deployment 18

3.1 General 18

3.2 Scale Out and Load Balancing 20

3.3 High Availability 20

3.3.1 Database Server 20

3.3.2 Application Services 20

3.3.3 Xtraction Server 20

3.4 Multiple Instances of Service Desk or Asset Manager 20
4 Hardware and Operating System Software Recommendations 21
4.1 General 21
4.2 Recommended Server Specifications 21
4.2.1 Database Server (SQL Server) 21
4.2.2 Web Server 21
4.2.3 Terminal Services Server 21
4.2.4 Application Services Server 22
4.2.5 Xtraction Server 22
4.2.6 Data Storage Requirements 22
4.3 Minimum Desktop Specification 23
5 Sizing 24
5.1 General 24
5.2 Metrics 24
5.3 Failover and High Availability 25
5.4 Consolidating Server Roles 25
5.5 Small, Test and Development Deployment 25
5.6 Medium Scale Deployment 27
5.7 Large Scale Deployment 29
5.8 The Network 31
5.9 Server to Server Communications 32
5.10 Environmental and Business Considerations 32
5.10.1 Globally Distributed Workforce / Remote Access Workforce 32
5.10.2 Terminal Services Access 32
5.10.3 The Transaction Rate and Process Volume 33
5.10.4 Virtualization and Cloud Services 33
6 Appendices 34
6.1 Ports 34

1 General

This document describes the software components that make up a complete Ivanti Service Desk or Asset Manager installation. It provides an overview of the features provided by each software component and how to deploy each component. Also recommended are typical hardware specifications for different deployment models and the typical sizes of such deployments.

2 Software Components

2.1 General

This section describes all the software components that are part of Ivanti Service Desk and Ivanti Asset Manager.

2.2 Server Components

The components described in this section are applications that run on a server computer within the Ivanti Service Desk/Asset Manager model. The n-tier nature of the model means that these server components not only provide services to desktop (or client) components but also provide services to other server components themselves.

2.2.1 Database Server

Service Desk and Asset Manager support Microsoft SQL Server Relational Database Management Systems (RDBMS). The database server software is not provided as part of the Ivanti software. The database server runs the chosen RDBMS and holds the Service Desk and Asset Manager database schema and data. The server operating system running the RDBMS can be any server operating system supported by the RDBMS. So, for Microsoft SQL Server, this is any appropriate Microsoft operating system.

The database schema is used to hold the Ivanti data and is accessed by the Ivanti application server (Service Desk Framework) and Xtraction, the Ivanti reporting and dashboard tool. No business functionality is implemented as part of the database schema, there are no stored procedures, triggers or other RDBMS features installed as part of the Ivanti database.

Communication between the Ivanti application servers (Service Desk Framework) is typically over a TCP/IP network using ADO.NET.

The storage mechanism can be any mechanism supported by the RDBMS. For example, a local disk or a SAN are supported by the RDBMS.

2.2.2 Knowledge Base Data Files

The knowledge base features of Service Desk deliver free text search capabilities to Service Desk applications. As such, some of the data held in the Ivanti RDBMS is also held in free text data files. These files are held in a location that can be accessed by the Service Desk Framework. This may be a local disk, a network file share or some other file storage mechanism, such as a SAN. There are no Service Desk server components other than the Service Desk Framework controlling access to these data files.

2.2.3 Microsoft Windows Server Operating System

All server components of Service Desk and Asset Manager are developed using Microsoft .NET and are supported on 64-bit architectures. The Supported Platforms guide details the Microsoft operating systems supported.

2.2.4 Microsoft Internet Information Server (IIS)

A core component of the Ivanti server software is Microsoft IIS. Many of the server applications delivered are delivered as Microsoft ASP.NET applications. All servers running Service Desk or Asset Manager software also run Microsoft IIS.

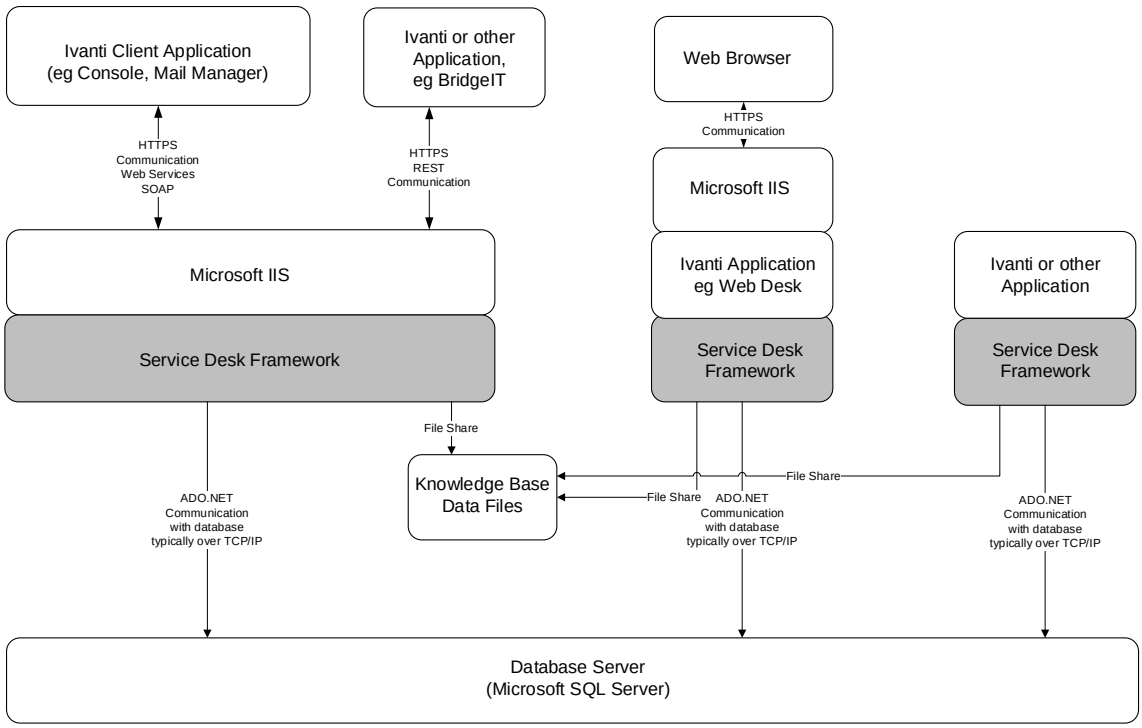
2.2.5 Microsoft Terminal Services

One of the deployment models described later in this document is the capability of delivering the Ivanti Console application in a terminal services environment. As such a server running Microsoft Terminal Services and other presentation services such as Citrix may also form part of the server architecture.

2.2.6 Service Desk Framework

The Service Desk Framework is the core application server of the Ivanti Service Desk and Asset Manager applications. It provides services in the way of programming interfaces in order to develop client applications that deliver Ivanti functionality to users. The Services application server is deployed as either a web application hosted on Microsoft Internet Information Server (IIS) or as a set of DLLs as part of another server component. It provides a Web Services programming interface and a .NET programming interface for the development of applications. All Ivanti Service Desk and Asset Manager applications use the features of the Service Desk Framework. Access to the Ivanti database is provided through the Service Desk Framework.

Multiple instances of the Service Desk Framework can be installed and run as part of a Service Desk or Asset Manager deployment model to provide application load-balancing and scale-out features. One instance of the Service Desk Framework is used to provide application server features for a number of different client applications.

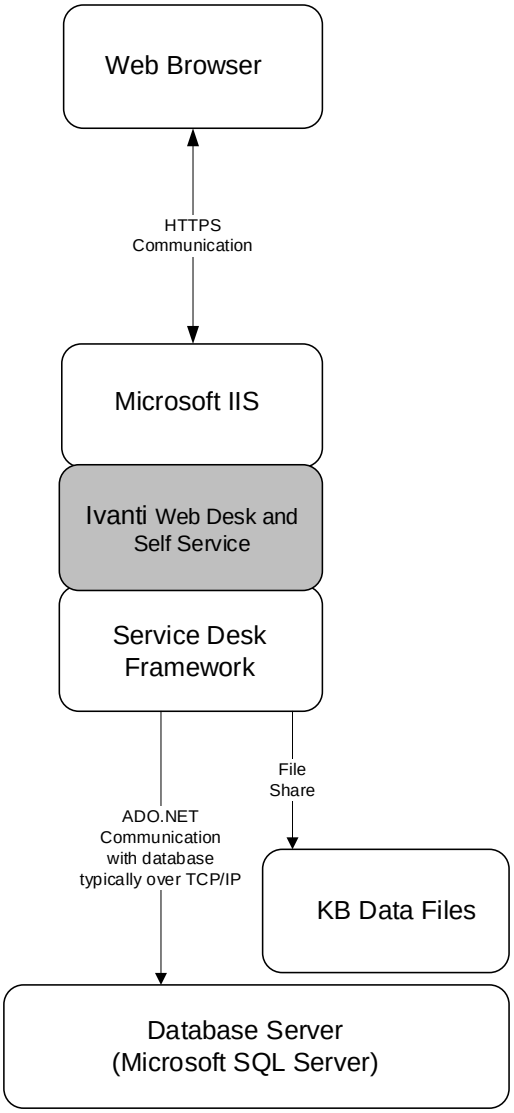


2.2.7 Ivanti Web Desk and Ivanti Self Service (Web Access)

Ivanti Web Desk and Ivanti Self Service applications are a web server application hosted on Microsoft IIS that provides a browser-based interface for Ivanti analysts, end users and customers. It uses the Service Desk Framework built in-process to deliver application server features.

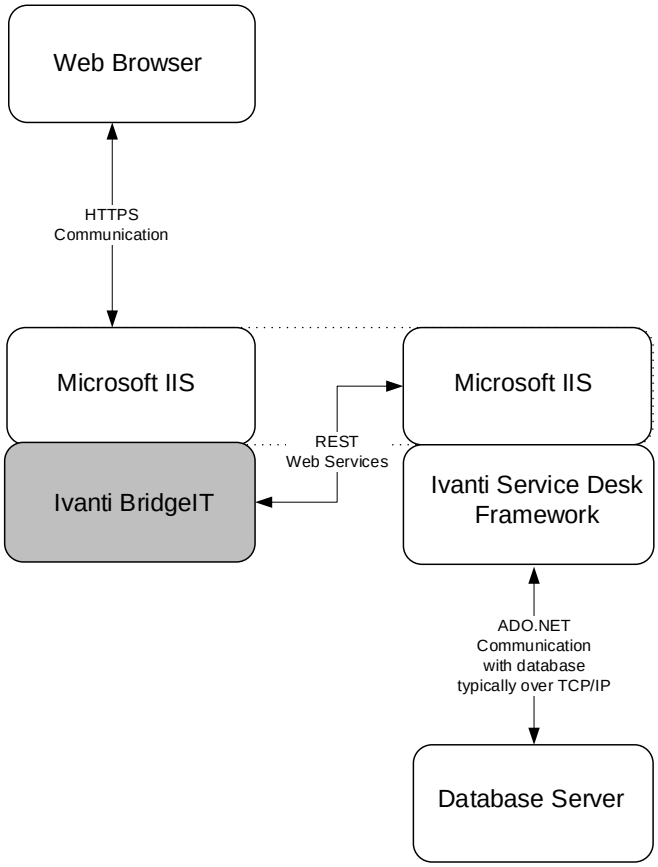
These applications are delivered as one software component; the features delivered to the user are driven by how the user accesses the application. A user who logs on as an analyst will be delivered the Ivanti Web Desk application features. A user who logs on as a customer or end user will be delivered the Ivanti Self Service features.

Multiple instances of Ivanti Web Access can be installed and run as part of a Service Desk or Asset Manager deployment model to provide application load balancing and scale out features.



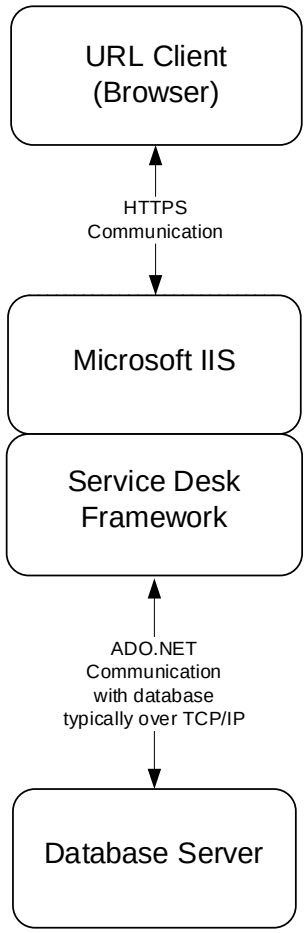
2.2.8 Ivanti Workspaces (BridgeIT)

Ivanti BridgeIT is the responsive, cross-portfolio web platform that provides Ivanti customers with a single user interface across mobile web-app and desktop platforms as Ivanti Workspaces. Access to this application is through a browser running on a mobile or desktop device.



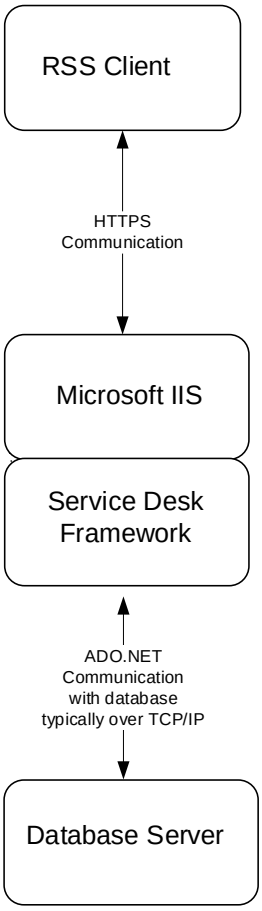
2.2.9 Ivanti Event Manager Web Interface

The Event Manager Web Interface is the part of the Service Desk Framework that provides an integration point with third party applications. Another application can be configured to 'call' an Ivanti URL to perform an action in the Service Desk or Asset Manager application. The interface is typically used to link network management tools to Service Desk or Asset Manager. An event is detected by an event management tool, which is then configured to call this interface via a URL to create an incident in Service Desk or Asset Manager with data collected from the network management tool.



2.2.10 Ivanti RSS Server

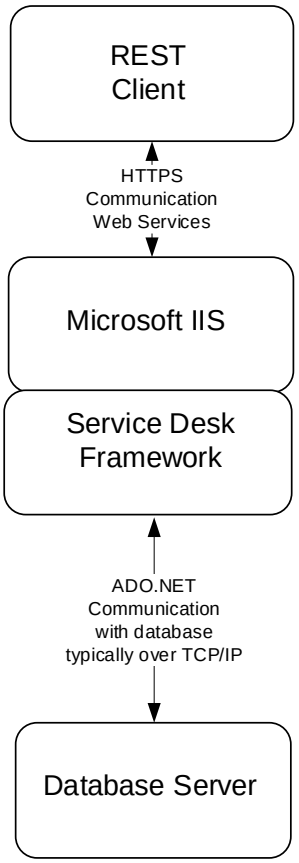
The Service Desk Framework delivers Ivanti data to RSS clients via RSS feeds in a similar manner to any other RSS feed. RSS data feeds can be configured to deliver any data from the Service Desk or Asset Manager application.



2.2.11 Ivanti REST Web Services

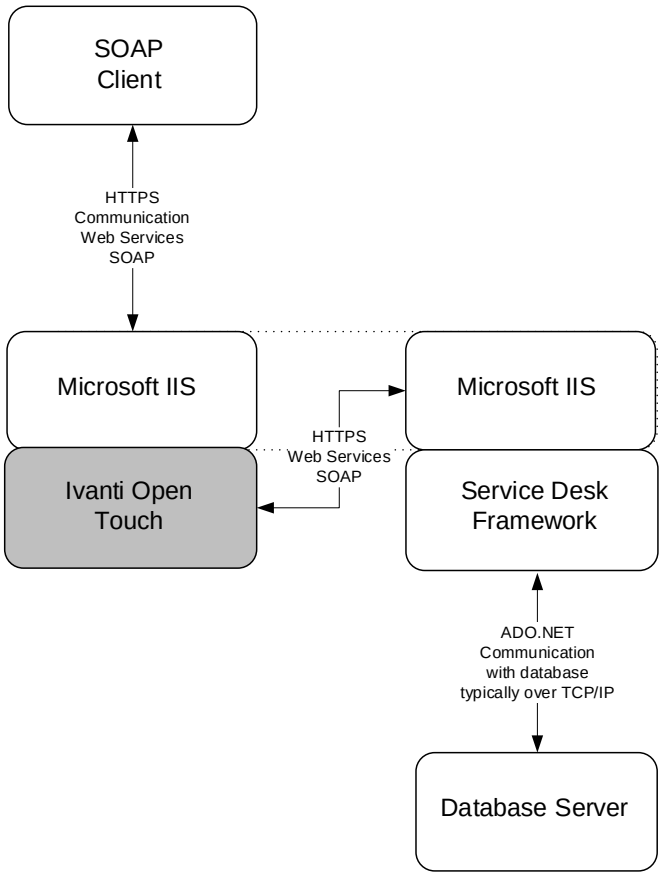
The Ivanti REST Web Services interface provides a restful web services interface that can be used by application developers to develop client applications which perform actions or read information from the Service Desk or Asset Manager application. For example, a developer may wish to integrate Service Desk or Asset Manager data into their own portal through this mechanism.

The REST Web Service interface is provided as part of the Service Desk Framework application.



2.2.12 Ivanti Open Touch Web Services

The Open Touch interface provides a SOAP web services interface used by application developers to develop client applications which perform actions or read information from the Service Desk or Asset Manager application. For example, a developer may wish to integrate Service Desk data into their own portal through this mechanism.



2.2.13 Ivanti Configuration Center

Configuration Center is a web application that is used by administrators of the Service Desk or Asset Manager installation. It has a browser interface that administrators use to configure multiple instances of Service Desk or Asset Manager components running on a server.

An instance of Service Desk or Asset Manager is defined as a collection of Ivanti applications running on multiple computers. Configuration Center is used to manage the applications on the same server on which Configuration Center is running. As such, each server running Service Desk or Asset Manager applications will have one instance of Configuration Center.

Service Desk and Asset Manager support the capability of hosting and running many instances of Service Desk or Asset Manager per computer. So for example, a server can be configured to run three instances of Service Desk, one used for development, one used for testing, and one as the live production environment (although this would typically be on its own infrastructure).

Another example would be a managed service provider running multiple Service Desk instances for multiple customers.

One Configuration Center application is used to manage all of these instances.

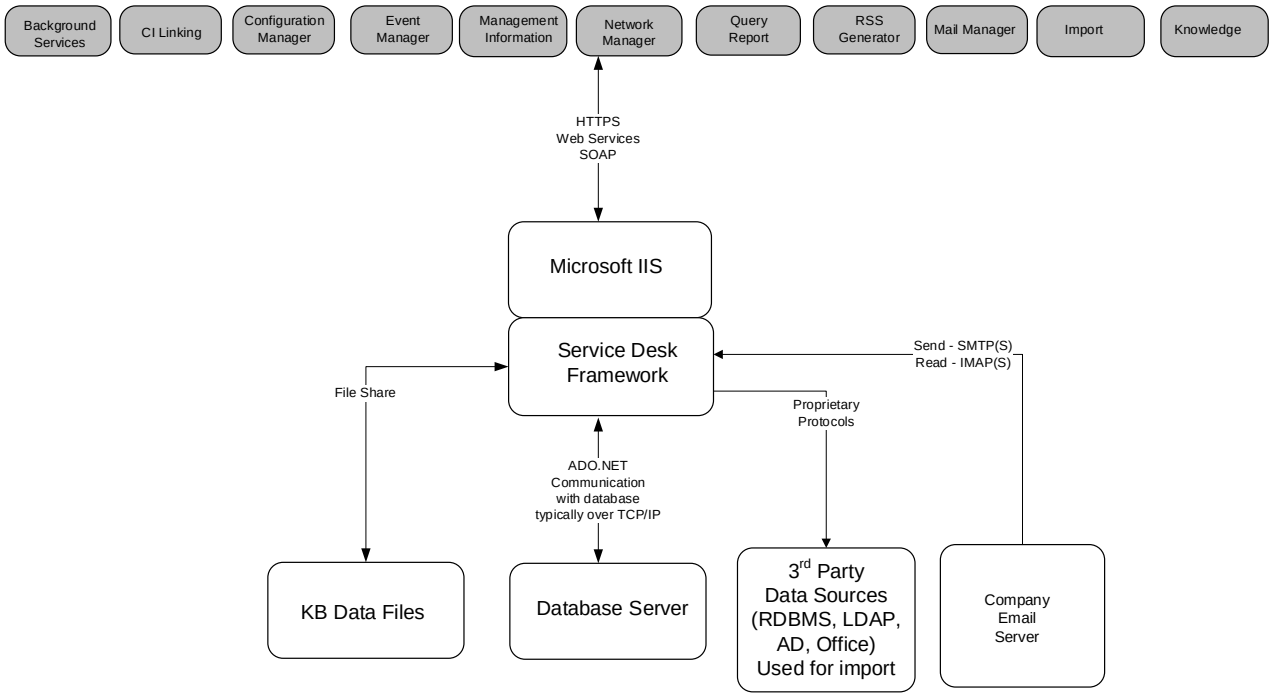
2.2.14 Ivanti Application Services

2.2.14.1 General

Ivanti application services are applications that run as Windows Services. They run on the Ivanti Application Services Server and perform background tasks. These tasks are varied and typically are used to maintain data within the Service Desk or Asset Manager application, act on events occurring externally or internally, or notify people of the occurrence of events. All application services communicate with the Service Desk Framework.

These services are installed and run on the Ivanti Application Services server. The following application services are delivered as part of the Service Desk or Asset Manager application. Which services are used depends on the functionality delivered as part of a specific installation.

- Background Service
- CI Linking Service
- Configuration Manager
- Data Import Service
- Event Manager Service
- Knowledge Management Engine
- Mail Manager
- Management Information
- Query Report Scheduling Service



2.2.15 Xtraction

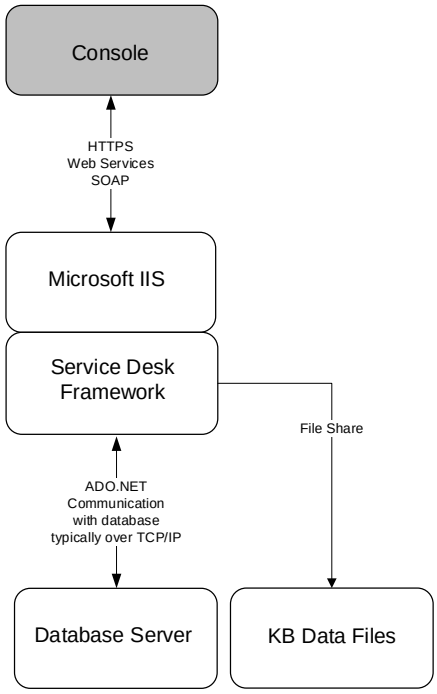
Reporting capabilities are delivered through Xtraction, the Ivanti reporting and dashboard tool. Xtraction is a Microsoft IIS application that delivers reporting capabilities through a browser interface. It also includes application services that can be used to provide features such as automatic scheduling of report generation. A report designer component is also provided.

2.3 Client Components

This section describes the client software components that make up a Service Desk or Asset Manager installation. Client components in this sense can be described as components that run on computers that are not controlled as part of the server environment described above. For example, although Web Desk delivers a client interface through a browser, it is not treated as a client component as it runs in the server environment. The browser makes up the client component in this case.

2.3.1 Console

When the Ivanti Console is installed and run on a client computer, it runs as a client component. It communicates with the Service Desk Framework via HTTPS using SOAP and Web Services.

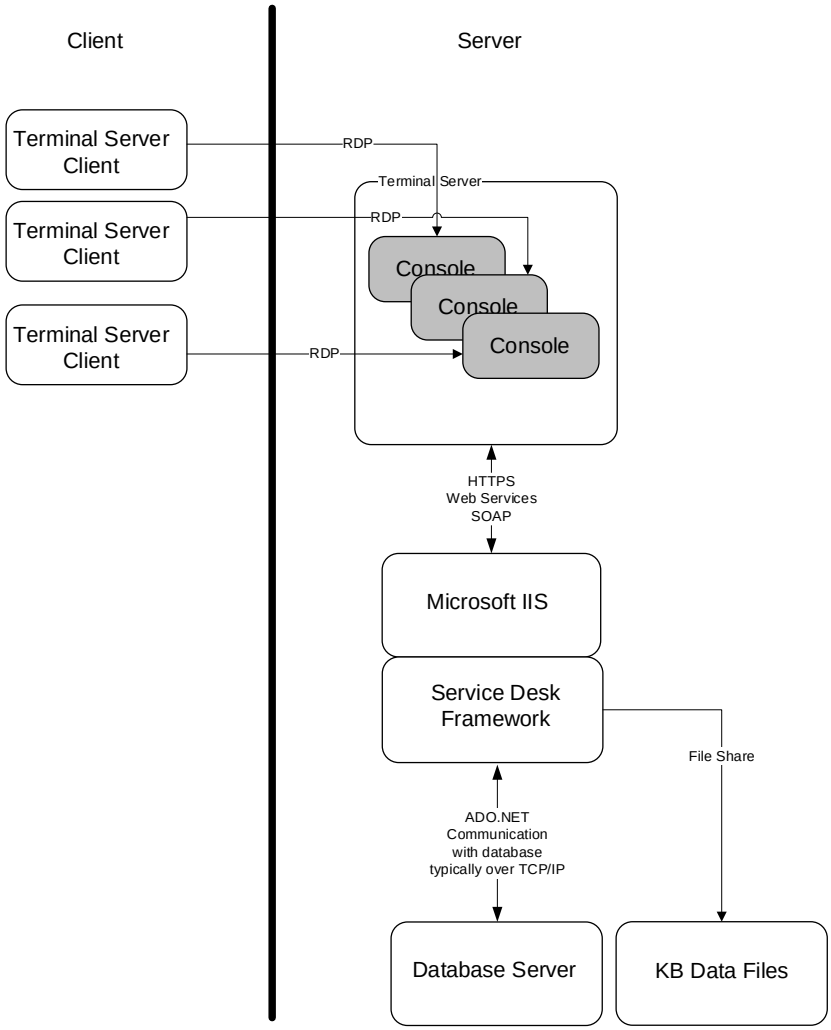


2.3.2 Browser (Desktop and Mobile)

An internet browser is used to access all the browser interfaces provided by Service Desk and Asset Manager, including Self Service, Web Desk, and Workspaces (BridgeIT). A number of different browsers (and therefore client operating systems) are supported. The supported browsers and devices are defined in the supported platforms documentation.

2.3.3 Terminal Services

When the Ivanti Console is delivered using terminal services, the terminal server and Console sessions are running as part of the server architecture described above in the server components section. In this scenario, the client component running is the terminal services client such as the Citrix client or RDP client.



2.4 Data Requirements

Data is held in two data stores:

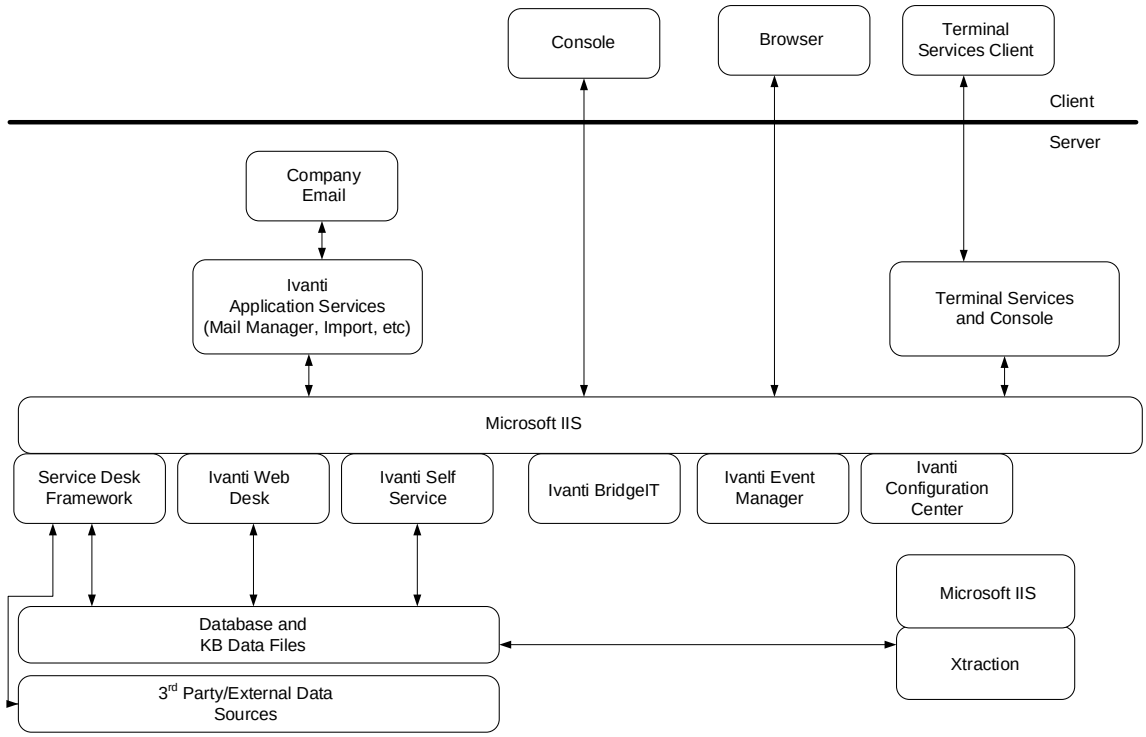
- A relational database (RDBMS)
- A Free Text Search data store (File System)

The RDBMS (Microsoft SQL Server) is the main repository for all data. All applications access this data via the application server software (Service Desk Framework). The only exception to this data access is access via Xtraction as described above.

The free text search data store is a set of files holding data extracted from the RDBMS and used to perform free text searching techniques rather than RDBMS-type searching. This data is used to deliver knowledge base features within the application. The data store and technology used to deliver the free text searching features is provided by Lucene.

2.5 Overview Software Components

The following diagram shows a logical view of all the software components that make up the application.



3 Deployment

3.1 General

This section describes the recommended deployment model for the software components described above. This deployment model is described in terms of on overall deployment taking into account scale out, load balancing and high availability features. A physical deployment model is described; however, a virtual environment can be used to deploy all software components.

The following server types are used to describe in summary the role of that particular server.

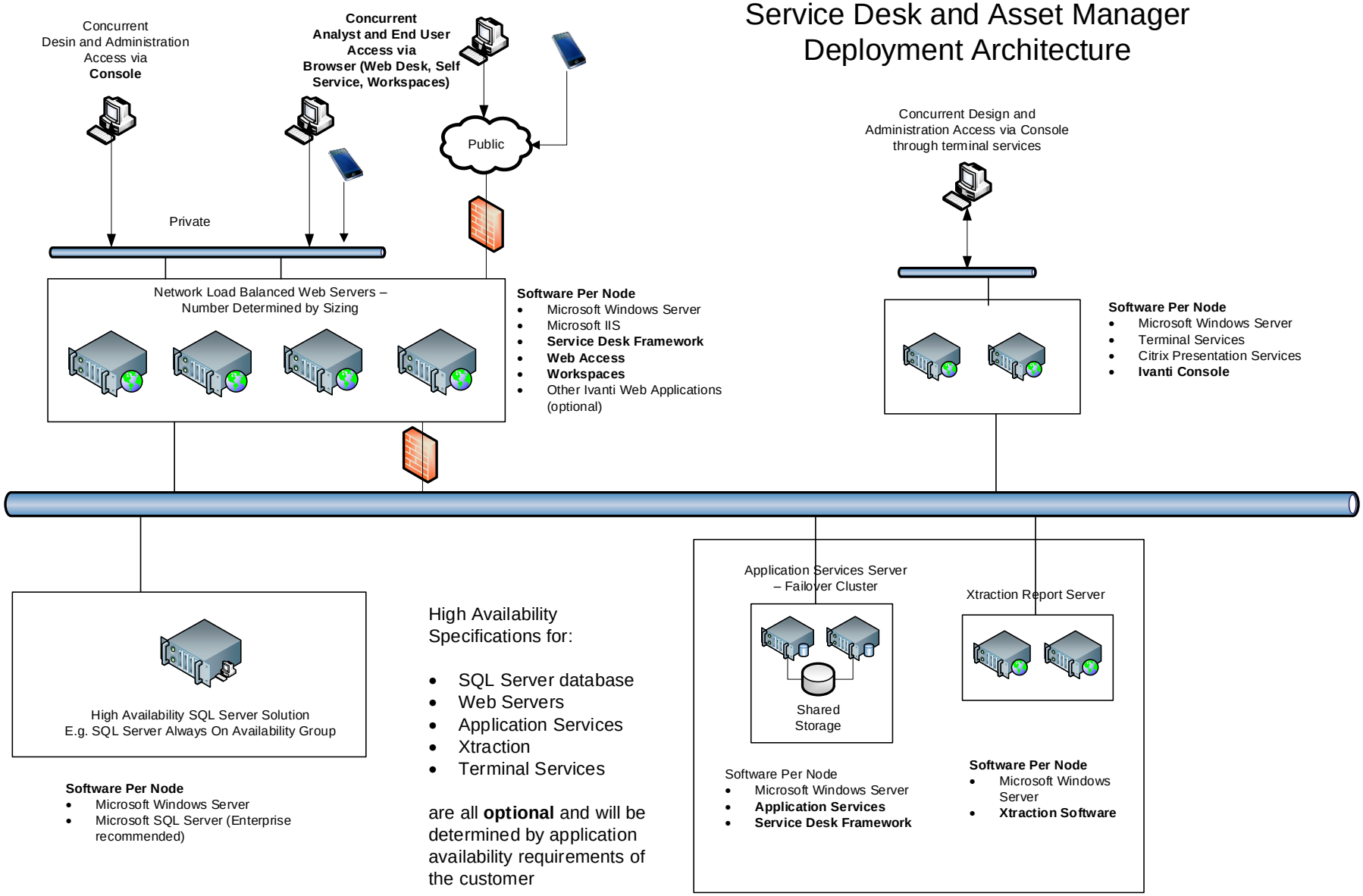
- **Database Server –** The server running the RDBMS software (Microsoft SQL Server) and associated database schema (data storage)
- **Web Server –** The server running the web applications components, these being:
    - Service Desk Framework
    - Ivanti Web Access
    - Ivanti BridgeIT (Workspaces)
    - Ivanti Open Touch
- **Application Services Server –** The server running the Ivanti application services, these being:
    - Background Services
    - CI Linking
    - Configuration Manager
    - Data Import
    - Event Manager Service
    - Knowledge Management Engine
    - Mail Manager
    - Management Information
    - Query Report Scheduling Service

If heavy load is expected (or experienced) for certain application services, these services can be split across a number of servers. For example, knowledge services (with accompanying Service Desk Framework) could be installed and run on their own server if high usage in terms of creating and updating the knowledge base is envisaged.

- **Xtraction Server –** The server running the Xtraction server software.
- **Terminal Services Server –** The server running terminal services and multiple instances of the Ivanti Console application.

The following diagram describes a recommended deployment model for Service Desk or Asset Manager software.

Service Desk and Asset Manager Deployment Architecture



3.2 Scale Out and Load Balancing

To ensure the application performs to an acceptable level, scale out and load balancing features are supported by the application, specifically for the user interface components of the application, those being Console, Web Access, and BridgeIT. Additional Web Servers can be added to the deployment to handle increased load.

If a terminal server farm is used to deploy the Console application, this again can be deployed using load balancing to provide scale out and high availability features. However, as the Console application is primarily used for Design and Administration tasks, use of the Console application will be low in terms of the number of users using this application.

The number of servers required per deployment is described later in this document.

3.3 High Availability

The load balancing features described above also provide high availability scenarios in case of web server or terminal server failure. Other servers can also be configured to deliver a high availability system. In particular:

3.3.1 Database Server

Any high availability technology supported by the underlying RDBMS (Microsoft SQL Server) can be used to deliver a high availability database server deployment.

3.3.2 Application Services

There is only ever one running instance of all application services at any one time running on the application services server. In case of server failure, a failover cluster configuration can be deployed.

3.3.3 Xtraction Server

The Xtraction server runs the Xtraction Web Server application. A network load balanced environment can be used to deliver high availability.

3.4 Multiple Instances of Service Desk or Asset Manager

Service Desk and Asset Manager are designed to allow multiple instances of the application to run on the same server. Typical scenarios where this may be required are: running development and test environments on the same servers, or hosting multiple Service Desk instances for customers where the host is managed by an application service provider.

Ivanti Service Desk as a Service (SDaaS) is delivered in this way. One platform resource is used to host and run many instances of Service Desk, each one being used by a different customer.

4 Hardware and Operating System Software Recommendations

4.1 General

This section describes the recommended hardware specifications for the different server types described above for a new implementation in a Microsoft 2016 environment. For later versions, you need to make appropriate changes to the specifications. For a concise list of all supported software platforms, refer to the supported platforms documentation. How many of each of these servers is required is described later in this document.

4.2 Recommended Server Specifications

4.2.1 Database Server (SQL Server)

- Microsoft Windows Server 2016
- Quad-core 2.66 GHz CPU
- 8 GB RAM
- Capacity and growth requirements will depend on the type of deployment. See *Data Storage Requirements* on page 22 for growth and capacity recommendations
- RAID Level 1, Level 5 or Level 10 (1+0) drive. (Any RAID specification is supported; however, these are typically the configurations used)
- Redundancy and failover technologies implemented by the relevant RDBMS and customer specific policies for RDBMS choice and architecture will typically determine the specification and operation of the RDBMS platform. No specific Service Desk or Asset Manager dependencies exist.

4.2.2 Web Server

- Microsoft Windows Server 2016
- Quad-core 2.66 GHz CPU
- 8 GB RAM
- 12 GB of available disk space (required for installation of software only, no data requirements)

4.2.3 Terminal Services Server

- Microsoft Windows Server 2016
- Quad-core 2.66 GHz CPU
- 16 GB RAM
- 12 GB of available disk space (required for installation of software only, no data requirements)

4.2.4 Application Services Server

- Microsoft Windows Server 2016
- Dual core 2.66 GHz CPU
- 8 GB RAM
- Software - 12 GB of available disk space (required for installation of software)
- Data Files - Capacity and growth requirements will depend on the type of deployment. See *Data Storage Requirements* on page 22 for growth and capacity recommendations. This disk capacity is required to hold the knowledge base data store.
- RAID Level 1, Level 5 or Level 10 (1+0) drive. (Any RAID specification is supported; however, these are typically the configurations used).

4.2.5 Xtraction Server

- Microsoft Windows Server 2016
- Dual core 2.66 GHz CPU
- 4 GB RAM
- 12 GB of available disk space (required for installation of software only, no data requirements other than report files)

4.2.6 Data Storage Requirements

The following data storage requirements are recommended:

4.2.6.1 Software Files

Each computer where the software is installed must have local disk capacity available to store the software files. A full install of the Service Desk or Asset Manager software takes up less than 1GB disk space.

4.2.6.2 RDBMS

The storage requirements of the database depend on the usage of the application. A delivered database for a new install is no bigger than 1GB.

The database will grow at a rate of between 0.1-0.3 MB per new incident (process) created. This figure is variable based on the design and usage of the application; however, the suggested rate has been extrapolated based on existing real installations. This data growth takes into account all data held within the database.

4.2.6.3 Knowledge Data Files

A similar data growth value of between 0.1 – 0.3 MB is also estimated for the free text search data files. This assumes all data is selected for inclusion in this data store and so is seen as a conservative over estimate.

We recommend that these files are local to the application services server installed with the services responsible for creating and updating this data store. However, as the data store is accessed from

multiple different applications (Console, Web Access, BridgeIT), network access to the files is a requirement.

4.3 Minimum Desktop Specification

This desktop specification relates to any desktop running the Ivanti Console application. The minimum specification is not a requirement for users accessing the Service Desk or Asset Manager application through a browser or via a terminal services client from a desktop.

- Dual 2.0 GHz CPU
- 2 GB RAM
- 1 GB of available disk space

5 Sizing

5.1 General

Sizing is used to determine the number of servers that will be required to deploy a system that will cater for the expected or estimated usage of the application. These figures should be taken as recommended guidelines. Each individual customer will have their own set of requirements and metrics used to determine the deployment scenario. The following deployment scenarios are provided as examples.

5.2 Metrics

The following metrics are used to estimate the size of a particular deployment.

- Number of Analysts
- Concurrent Number of Analysts
- Number of End Users
- Concurrent Number of End Users
- Number of concurrent Analysts using Console via Desktop installation
- Number of concurrent Analysts using Console via Terminal Services
- Number of concurrent Analysts using Web Desk
- Number of incidents, problems and changes raised per day
- Number of incidents, problems and changes updated per day

Some fixed parameters are also used in determining sizing, these are:

- Maximum number of concurrent analysts per web server
- Maximum number of concurrent end users per web server
- Maximum number of concurrent Console analysts per web server
- A maximum of 40 analysts per terminal server for Console access. This figure is based on industry recommendations for a small to medium business application running as many sessions in a terminal server environment for the hardware specification described above (for the terminal server).

Using these figures, three different deployment models are provided as examples based on the size of the deployment. For a more detailed analysis and breakdown of sizing please refer to Ivanti professional services.

Each of the following scenarios also delivers different options in terms of load balancing and server availability scenarios.

5.3 Failover and High Availability

A number of the following deployment examples define a high degree of redundancy to cater for failover and high availability scenarios. The decision as to whether this level of deployment is required will be different for different customers. For example, a high redundancy database configuration may be replaced with a simple backup strategy so reducing the number of servers required.

In particular, the high availability and failover features provided by the RDBMS will be specific to the RDBMS chosen. Any such feature supported by the RDBMS can be used in conjunction with Service Desk or Asset Manager.

5.4 Consolidating Server Roles

The following example deployment models keep server roles separate. For example, there is always a database server that is separate from the web server role. These roles can be consolidated to reduce the number of servers deployed. This decision is made on a per customer basis, based on a number of factors including cost and usage.

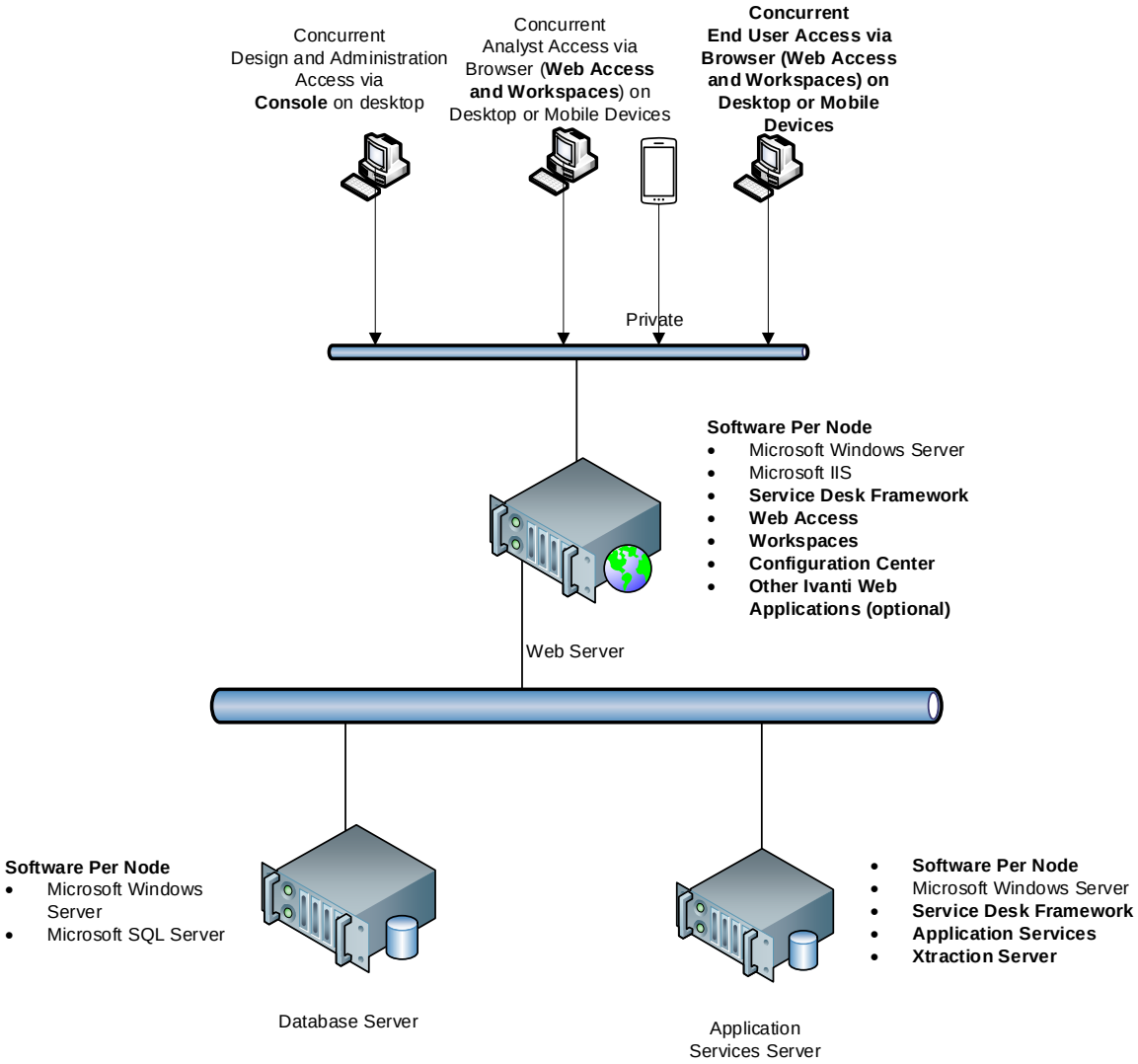
5.5 Small, Test and Development Deployment

The following figures determine this type of deployment.

Max. Number of Analysts	10	This is the number of analyst licenses
Max. Number of Concurrent Analysts	10	Assumes that all analysts work at the same time
Max. Number of End Users	1000	This is the number of end user licenses
Max. Number of Concurrent End Users	10	Assume 1% of end users are connected at the same time
Concurrent Analysts using Console desktop	1	Assume all analysts use Console installed on a desktop
Concurrent Analysts using Console via terminal services	0	No terminal services access
Concurrent Analysts using Web Desk	10	Assume analysts switch between Web Desk and Console
Number of incidents, problems, changes (processes) raised per day	100	Maximum of 10 new processes created per analysts. (Some may be raised by end users via Self Service)
Number of incidents, problems, changes (processes) updated per day	100	Maximum of 10 processes updated per analysts. (Some may be raised by end users via Self Service)

The following deployment model is recommended for this scenario:

Number of Web Servers	1	
Number of Application Services Servers	1	This server consolidates Ivanti application Services, and Xtraction Server
Database Server – Disk Capacity (Growth)	5GB per year	Assume 0.2 MB of database disk capacity required for each new process created. Assume 250 working days per year. 0.2*100*250 = 5000MB
Knowledge Base – Disk Capacity (Growth)	5GB per year	As above, assuming all process data is configured as knowledgeable.
Additional Comments		No load balancing or failover features are provided.

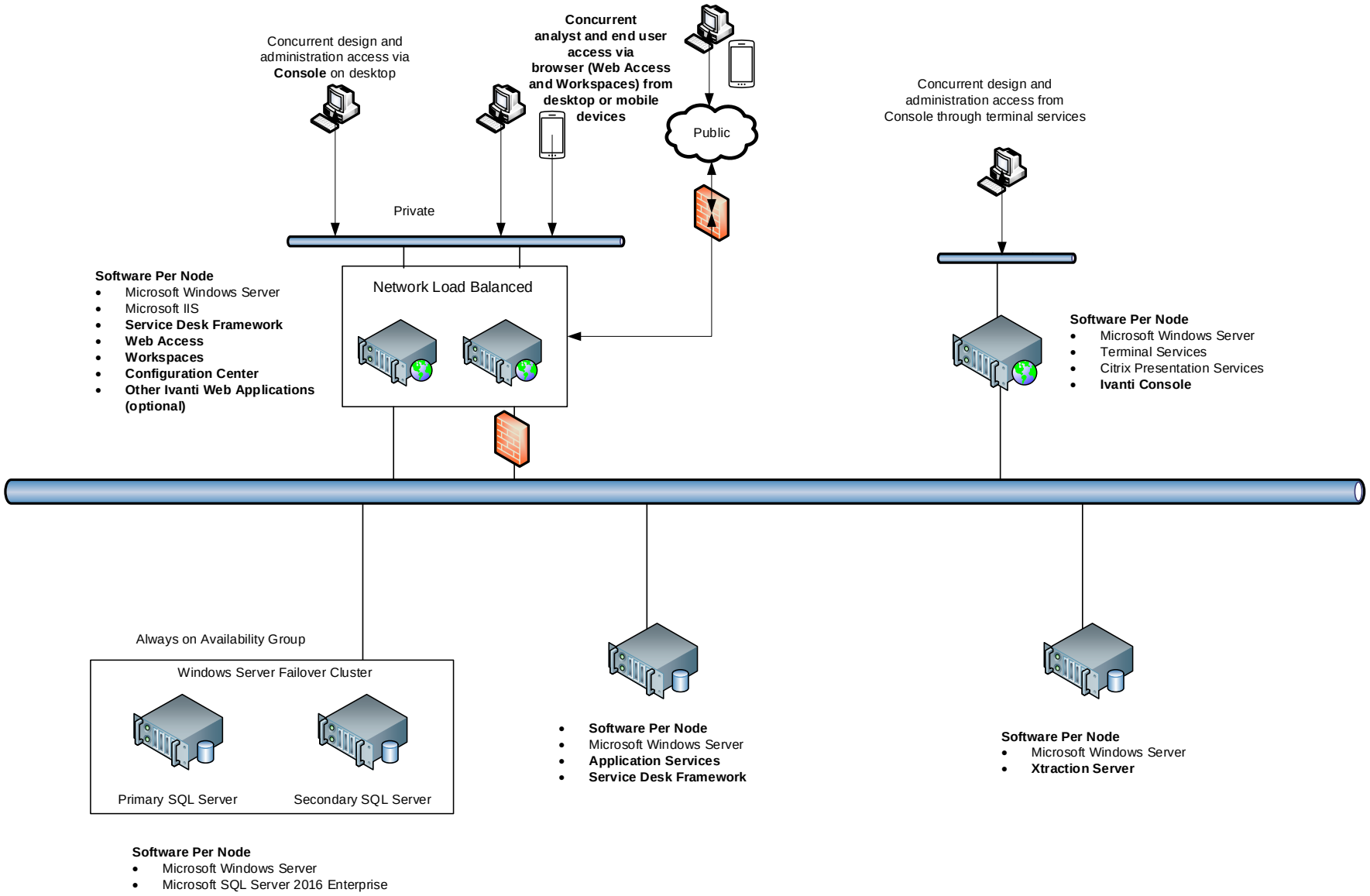


5.6 Medium Scale Deployment

Max. Number of Analysts	100	This is the number of analyst licenses
Max. Number of Concurrent Analysts	100	Assumption is that all analysts work at the same time
Max. Number of End Users	10000	This is the number of end user licenses
Max. Number of Concurrent End Users	100	Assume 1% of end users are connected at the same time using Web Access or Workspaces
Concurrent Analysts using Console desktop	2	Assume Console is used only for infrequent Design and Administration tasks
Concurrent Analysts using Console via terminal services	2	Assume Console is used only for infrequent Design and Administration tasks
Concurrent Analysts using Web Desk or Workspaces	100	Assume all Analysts use Web Desk or Workspaces
Number of incidents, problems, changes (IPC) raised per day	1000	Maximum of 10 new IPCs created per analysts. (Some may be raised by end users via Self Service)
Number of incidents, problems, changes (IPC) updated per day	1000	Maximum of 10 IPCs updated per analysts. (Some may be raised by end users via Self Service)

The following deployment model is recommended for this scenario:

Number of Database Servers	2	Always on Availability Group for failover.
Number of Web Servers	2	Load Balanced
Number of Terminal Servers	1	The assumed infrequent use of Console means that a terminal services deployment solely for Console use is probably not a practical solution. In practice it is assumed that the built-in terminal services (RDP) features of existing Windows Servers can provide this access or if an existing Terminal Services farm is available, then this can be used as a shared service.
Number of Application Services Servers	1	No failover clustering
Number of Xtraction Servers	1	No load balancing
Database Server – Disk Specification	2 Disk Raid 1	
Database Server – Disk Capacity (Growth)	73GB per year	Assume 0.2 MB of database disk capacity required for each new IPC created. Assume 365 working days per year. 0.2*1000*365 = 73000MB
Knowledge Data – Disk Capacity (Growth)	73GB per year	As above, assuming all IPC data is configured as knowledgeable.
Additional Comments		• Application Services and Xtraction are separated onto their own servers. • Only the database server is configured as a failover cluster.

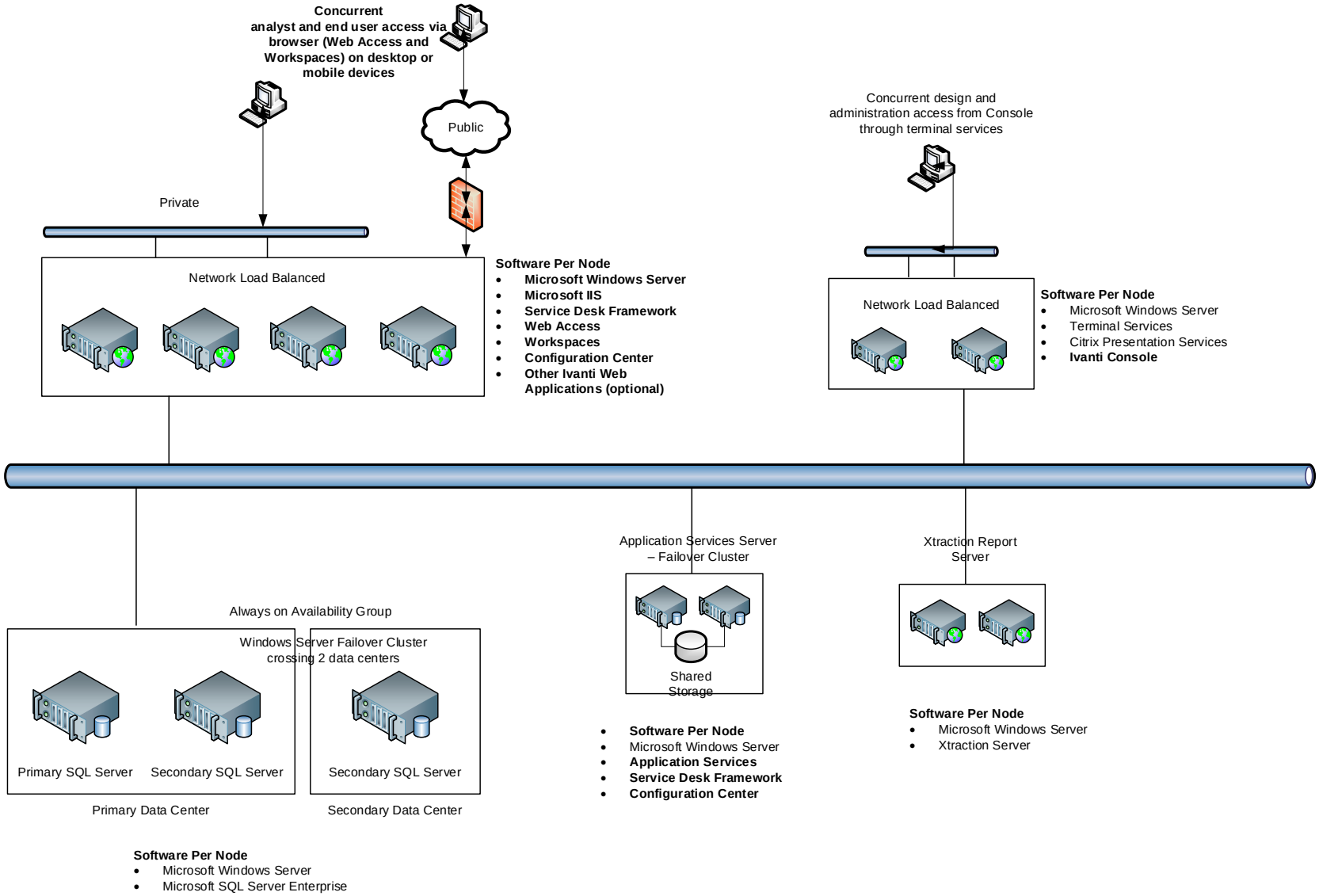

Concurrent design and administration access via **Console** on desktop
Concurrent analyst and end user access via browser (Web Access and Workspaces) from desktop or mobile devices
Public
Private
Concurrent design and administration access from Console through terminal services
Network Load Balanced
Software Per Node
Microsoft Windows Server
Microsoft IIS
Service Desk Framework
Web Access
Workspaces
Configuration Center
Other Ivanti Web Applications (optional)
Software Per Node
Microsoft Windows Server
Terminal Services
Citrix Presentation Services
Ivanti Console
Always on Availability Group
Windows Server Failover Cluster
Primary SQL Server
Secondary SQL Server
Software Per Node
Microsoft Windows Server
Microsoft SQL Server 2016 Enterprise
Software Per Node
Microsoft Windows Server
Application Services
Service Desk Framework
Software Per Node
Microsoft Windows Server
Xtraction Server

5.7 Large Scale Deployment

Max. Number of Analysts	500	This is the number of analyst licenses
Max. Number of Concurrent Analysts	500	Assumption is that all analysts work at the same time
Max. Number of End Users	50000	This is the number of end user licenses
Max. Number of Concurrent End Users	500	Assume 1% of end users are connected at the same time
Concurrent Analysts using Console desktop	0	Assume a global service with software installed at a central site. 4 Analysts use Console via terminal services for design and administration or use Web Access and Workspaces for daily workflow.
Concurrent Analysts using Console via terminal services	4	Assume a global service with software installed at a central site. 4 Analysts use Console via terminal services for design and administration or use Web Access and Workspaces for daily workflow
Concurrent Analysts using Web Access or Workspaces	500	Assume the majority of analysts use Web Desk for their daily work (IPC progression)
Number of incidents, problems, changes (IPC) raised per day	5000	Maximum of 10 new IPCs created per analysts. (Some may be raised by end users via Self Service)
Number of incidents, problems, changes (IPC) updated per day	5000	Maximum of 10 IPCs updated per analysts. (Some may be raised by end users via Self Service)

The following deployment model is recommended for this scenario:

Number of Servers as part of database service	3	Always on Availability Group with Disaster Recovery.
Number of Web Servers	4	Load Balanced
Number of Terminal Servers	1	Load Balanced
Number of Application Services Servers	2	Failover clustering
Number of Xtraction Servers	2	Load Balanced
Database Server – Disk Specification		4 Disk Raid 1+0 (Data) 2 Disk Raid 1 (Log)
Database Server – Disk Capacity (Growth)	365GB per year	Assume 0.2 MB of database disk capacity required for each new IPC created. Assume 365 working days per year. 0.2*5000*365 = 365000MB
Knowledge Data – Disk Capacity (Growth)	365GB per year	As above, assuming all IPC data is configured as knowledgeable.
Additional Comments		• Application Services and Xtraction are separated onto their own servers. • All servers are configured as failover clusters.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Network Load Balanced
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Terminal Services
Citrix Presentation Services
Ivanti Console
Application Services Server – Failover Cluster
Shared Storage
Xtraction Report Server
Always on Availability Group
Windows Server Failover Cluster crossing 2 data centers
Primary SQL Server
Secondary SQL Server
Secondary SQL Server
Primary Data Center
Secondary Data Center
Software Per Node
Microsoft Windows Server
Microsoft SQL Server Enterprise
Software Per Node
Microsoft Windows Server
Application Services
Service Desk Framework
Configuration Center
Software Per Node
Microsoft Windows Server
Xtraction Server

5.8 The Network

One shared resource used by the client applications is the network. Network performance should be taken into account for client access to the Service Desk or Asset Manager application, i.e. Console and Browser clients. Network communication between the servers making up the Service Desk or Asset Manager installation is not considered here as it is assumed this communication is controlled within the data center type environment. The following factors may have an effect on performance of client applications and how they are used.

- Bandwidth including upstream as well as downstream capacity
- Latency
- Quality of Service (QoS) Parameters
- Other applications sharing the same resource
- The number and transaction rates of users and applications on this shared resource

The following figure has been determined based on load testing. The load tests represented 100 concurrent users using the application with a transaction rate which can be expressed in terms of approximately 22,000 new incidents being created (per client application) per 15-hour day. Detailed load test results are available on request if required. These are recommended figures for the whole client user base for a Service Desk installation (i.e. they are not per client figures). These figures should be taken as guidance based on typical usage, but will vary for different application installations. The following figures are recommended for the different client applications:

Application	Recommended Bandwidth	Maximum latency times based on ping times from client to server	Comments
Console installed on desktop	6 MBits/sec – Total for all concurrent connections at the transaction rates described above.	25 ms	These figures should be considered when attempting to use Console in a WAN type environment where bandwidth and specifically latency become an influencing factor. Upstream data rates are equivalent to downstream rates for Console, so an ADSL type connection where upstream rates can be significantly less than downstream rates will have an adverse effect on Console performance.
Console via terminal services	2 MBits/sec - Total for all concurrent connections at the transaction rates described above	200 ms	The figures are the figures for communication between the terminal services client running on the desktop and the terminal server. Communication between the Console running on the terminal server and the Service Desk Framework will be within the data center.

Web Access and Workspaces	2 MBits/sec – Total for all concurrent connections at the transaction rates described above.	300 ms	Mobile latency is typically greater especially when using mobile networks. The applications have been designed to work over these greater latencies.

5.9 Server to Server Communications

We recommend that the server components of the application are located and maintained within a server room or data center environment. In this environment, it is assumed that networking between servers is isolated from the client network described above.

5.10 Environmental and Business Considerations

The above scenarios are examples of typical deployments; however, variations from above will occur. Specifically, the following variations may affect the deployment model.

5.10.1 Globally Distributed Workforce / Remote Access Workforce

We recommend that one deployment is used to deliver Ivanti Service Desk or Asset Manager to all analysts and end users. This will typically be deployed in a data center or at one geographical location within an organization (e.g. the US office). The only software installed 'remotely' being the Ivanti Console application on the analyst's desktop. In this model, all data is held centrally on one database. It removes the need to implement different Service Desk or Asset Manager systems running in different locations.

The application provides a number of different interfaces to allow this to be the correct deployment including terminal services support for Console, and browser interfaces for analysts (Web Access and Workspaces) and end users (Web Access and Workspaces).

Data partitioning features provided by the application can be used to provide a level of partitioning of data for different groups of end users and analysts if required again removing the need for multiple deployments in many cases.

5.10.2 Terminal Services Access

The number of analysts who use the Console through the terminal services will be minimal as this application will be used for Design and Administration purposes only. As a maximum of 40 users per terminal server is recommended (industry recommendations), then the more concurrent terminal server sessions required will increase the number of terminal servers required. Additionally, there is an inherent cost on terminal server/Citrix client licenses required to deliver this solution.

In a globally distributed workforce environment using one deployment of Service Desk or Asset Manager as described above, the majority of analysts and all end users will use the browser-based Web Access and Workspaces applications for their primary daily activities wherever possible. Access to the Console application will only be used for Design and Administration purposes.

As such terminal services access should be minimal and in most cases a dedicated terminal services environment for Console will not be required. Built in RDP services on existing servers can be used to provide access to Console in most cases or use of a corporate shared terminal services environment should be considered.

5.10.3 The Transaction Rate and Process Volume

The number of processes created per day described in the previous scenarios estimate a high volume per day so that conservative high estimates can be given. These volumes are primarily to determine data storage capacity (i.e. disk size) rather than the scale of the deployment (i.e. the number of servers). The scale of the deployment is primarily determined by concurrent usage of analysts and end users using the client application software (Console, Web Access and Workspaces).

5.10.4 Virtualization and Cloud Services

5.10.4.1 Virtualization

The recommended server specifications provided previously in this document are based on physical hardware. Virtualization technologies are supported as detailed in the supported platforms documentation. If a physical server is replaced by a virtual server, the following recommendations should be taken:

- 8GB or 4GB RAM per virtual server (as per physical server recommendations)
- 2 virtual CPUs per virtual server

From experience, the database and terminal servers are typically deployed as physical servers, although this is not a requirement. There are many factors that would influence this decision by a customer, including factors such as:

- Physical servers are not competing with any resources that they may do in a virtual environment so may provide better performance and provide more capacity
- These servers may typically be shared with other applications, i.e. the database server is used for many applications and so resources become more of an issue.

5.10.4.2 Cloud Services

A Service Desk or Asset Manager instance can be deployed using cloud services such as Azure or Amazon Web Services. There is no inherent difference between deployment in this environment to an on premise virtual (or physical) deployment. In all cases, provisioning of servers and installation and configuration of software on those servers is equivalent.

6 Appendices

6.1 Ports

The following ports are used by application software components. The communication mechanism (protocol) used by each individual component is described previously in this document. All port numbers are configurable and can be changed to match a particular implementation.

Application	TCP Port	Description
Internet		
HTTP	80	World Wide Web HTTP Do not use HTTP, always use HTTPS
HTTPS	443	HTTP protocol over SSL
Email		
SMTP(S)	25/587	Simple Mail Transfer Protocol
IMAP4(S)	143/993	Internet Message Access Protocol 4
Databases		
Microsoft SQL Server	1433	Default Microsoft SQL Server Port
Ivanti LDMS		
Ivanti-cba	38037	
Ivanti-cba	38292	
LDAP		
LDAP	389	Lightweight Directory Access Protocol
LDAP	636	636
Terminal Services		
RDP		