This paper describes the various deployment scenarios of the K2 [blackpearl] software, and discusses when to choose the scenario that best fits an organization’s needs.
INTRODUCTION
K2 provides the platform that enables developers and business users to assemble dynamic business applications from reusable items.

To meet the needs of multiple industries and situations, K2 is built on the Microsoft platform and gives customers and partners the ability to work together and build applications in a familiar environment.

This paper describes the various deployment scenarios of the K2 blackpearl software and discusses how to choose the scenario that best fits an organization’s needs.

CONTENTS
OVERVIEW .......................................................................................................................................................... 5
K2 ARCHITECTURE .......................................................................................................................................... 5
K2 [BLACKPEARL] COMPONENTS OVERVIEW ....................................................................................... 6
K2 [BLACKPEARL] COMPONENTS DESCRIPTION ................................................................................... 7
> K2 Designer for Visual Studio ....................................................................................................................... 7
> K2 Designer for Visio ..................................................................................................................................... 7
> Server Components ..................................................................................................................................... 7
> Web Components ......................................................................................................................................... 7
> K2 for SharePoint ....................................................................................................................................... 8
> K2 for Reporting Services ............................................................................................................................ 8
> K2 [blackpearl] Documentation .................................................................................................................... 9
> K2 [blackpearl] Configuration Manager ...................................................................................................... 9
> Summary ...................................................................................................................................................... 9
REQUIREMENTS ............................................................................................................................................. 9
> Hardware Requirements ............................................................................................................................... 9
> Software Requirements ............................................................................................................................... 10
> Software Requirements per Component ...................................................................................................... 11
> Official 64-bit K2 Platform Information ..................................................................................................... 13
CHOOSING A DEPLOYMENT SCENARIO ........................................................................................................ 14
DEPLOYMENT SCENARIOS ............................................................................................................................. 16
> Standalone Install............................................................................................................. 16
> Small Scale Install.......................................................................................................... 17
> Scaling for Data Availability............................................................................................ 18
> Scaling for Better Performance......................................................................................... 19
> Scaling for Page Rendering.............................................................................................. 20
> Scaling for Data and Performance.................................................................................... 21
> Medium Scale Install........................................................................................................ 22
> Maximum Redundancy on Six Servers............................................................................... 24
> Large Scale Install............................................................................................................ 26

DEPLOYMENT CONSIDERATIONS.......................................................................................... 28
> Network load balancing setup and configuration........................................................... 28
> Kerberos setup and configuration.................................................................................... 30
> Internet Information Service (IIS).................................................................................... 31
> Domain configuration....................................................................................................... 32
> Database Configuration.................................................................................................... 32
> SQL Server configuration................................................................................................. 32
> Remote SQL Server Installation...................................................................................... 33
> Before Installing K2 [blackpearl].................................................................................... 33

CONCLUSION....................................................................................................................... 34
OVERVIEW
Before discussing the deployment scenarios, it is important to understand the various K2 blackpearl components that are involved in a deployment.

K2 ARCHITECTURE
The overall K2 architecture includes Microsoft components and K2 blackpearl-hosted server components. Depending on the role a server plays in the deployment, all or some of these components will be installed. At a high level, the K2 blackpearl Server uses common Microsoft components, such as the .NET 3.0 Framework, which includes Windows Workflow Foundations (WF) and Windows Presentation Foundation (WPF). These components are shown logically in Figure 1 for server components and in Figure 2 for client components. The K2 blackpearl components are discussed in further detail in the following two sections.

[Figure 1: Server architectural components, Microsoft server components (black), the K2 blackpearl-hosted servers (green, horizontal) and optional server components for integration (green, vertical)]
K2 BLACKPEARL COMPONENTS OVERVIEW

The K2 blackpearl components are divided into two categories, namely server components and client components. In addition to the server components, all data is stored in the K2 databases on a SQL Server instance.

- A server component is installed on a server either sharing the resources or functioning independently.
- A client component refers to the designer tools installed on a client machine, such as the K2 Designer for Visual Studio and K2 Designer for Visio.
- Databases are installed on a SQL Server either locally or remotely.

The component name implies the role the component plays, but the install location may differ depending on the type of installation. For example, in the Single Server Install scenario, all of the components are installed on a single server. When installing in a distributed configuration the components are installed according to the resources they require to function.

<table>
<thead>
<tr>
<th>K2 [blackpearl] Components Summary</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>K2 Designer for Visual Studio</strong></td>
<td>Design environment for developing K2 applications</td>
</tr>
<tr>
<td><strong>K2 Designer for Visio</strong></td>
<td>Graphical design environment used by business application analysts</td>
</tr>
<tr>
<td><strong>Server Components</strong></td>
<td>Server-side components for management and operational requirements of the K2 blackpearl environment</td>
</tr>
<tr>
<td><strong>Workspace Components</strong></td>
<td>Web components supporting the Web client applications (e.g. Workspace)</td>
</tr>
<tr>
<td><strong>K2 for SharePoint (MOSS)</strong>*</td>
<td>Components enabling Microsoft Office SharePoint Server (MOSS) integration</td>
</tr>
<tr>
<td><strong>K2 for SharePoint (WSS)</strong>*</td>
<td>Components enabling Microsoft Windows SharePoint Services (WSS) integration</td>
</tr>
</tbody>
</table>
K2 [blackpearl] Components Summary

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2 for Reporting Services</td>
<td>Installed on the Reporting Services server, allows connectivity for reports</td>
<td>Server</td>
</tr>
<tr>
<td>K2 [blackpearl] Documentation</td>
<td>Documentation resources for the K2 blackpearl product</td>
<td>Both</td>
</tr>
<tr>
<td>K2 [blackpearl] Configuration Manager</td>
<td>Environment configuration application; requirement for all installation scenarios</td>
<td>Both</td>
</tr>
</tbody>
</table>

* Depending on SharePoint product installed, either the MOSS or WSS components will be displayed for installation.

K2 [blackpearl] COMPONENTS DESCRIPTION

Before the K2 installer will install components, they must be selected. This section will look at the various components available at this phase of the installation.

The installation components are described below as they appear during a normal installation. Each component category consists of applications and services. Certain applications run independently and do not require access to services (e.g. Studio). Workspace, however, consists of components which are interdependent and rely on a server for both to function.

K2 DESIGNER FOR VISUAL STUDIO

The K2 Designer for Visual Studio is a design environment for creating blackpearl applications. The K2 Designer is built on top of Visual Studio 2005 and is the workflow design tool for developers. The workflows created within K2 Designer for Visual Studio enable integration with Microsoft Office, Microsoft InfoPath and Microsoft SharePoint, along with a number of other third-party software packages. The K2 Designer for Visual Studio can be installed alone on a client machine without installing other K2 components; however, Microsoft Visual Studio 2005 with Service Pack 1 is required.

K2 DESIGNER FOR VISIO

The K2 Designer for Visio allows Visio diagrams to be extended with workflow design capabilities. The K2 Designer for Visio is the workflow design tool for business application analysts. Processes designed in Visio can be opened later in the K2 Studio Designer for more advanced functionality. The K2 Designer for Visio can be installed alone on a client machine without installing other K2 components; however, Microsoft Office Visio 2007 is required.

SERVER COMPONENTS

These server-side components are used for managing the operations of the K2 blackpearl environment. K2 Server is one of the principle components responsible for running the processes that are exported to it from the designers. The K2 Server requires access to its databases for the successful completion of the process instances and the successful running of the K2 Server.

WEB COMPONENTS

K2 Web components support the Web applications (e.g., Workspace). Report Design, Server Management, Workspace Security and Notification Event tasks can be accomplished in the K2 Workspace, including:

- Worklist
- Management Console (SmartObject Services, Environment Library, Workflow Server, SmartBox, Roles)
In addition to the administrative tasks, the K2 Workspace includes the Worklist for users to see what items require their attention. This enables the client to display current and completed Worklist items and reports.

K2 FOR SHAREPOINT
The K2 for SharePoint Component is split into two separate versions. Depending on what version of SharePoint you have installed, the installer will display the correct component.

*Note: Only one of the following components can be installed per server.*

- MOSS Components: Components enabling SharePoint integration with Microsoft Office SharePoint Server 2007 (Enterprise or Standard Edition), or Microsoft Office Forms Server 2007
- WSS Components: Components enabling Microsoft Windows SharePoint Services 3.0 integration

Installed on the SharePoint machine, the SharePoint components enable interaction and communication between the K2 Server and functions found in SharePoint including Microsoft InfoPath processes.

The following integration features require Microsoft Office SharePoint Server 2007:

- SmartObject and process data search
- Business Data Catalog*
- InfoPath Forms Services*
- Publishing sites and pages
- Records management

*Note: The starred (*) features are only available in the Enterprise edition of MOSS 2007. InfoPath Forms Services integration, which provides browser-enabled InfoPath forms for user interaction, requires Microsoft Office Forms Server 2007 or the Enterprise edition of MOSS 2007.

The remaining integration features are available on any edition of SharePoint, including Windows SharePoint Server v3:

- K2 Web Designer for SharePoint
- Workflow integration
- Site management
- User management
- List and library management
- Events
- Document manipulation

K2 FOR REPORTING SERVICES
This component allows K2 blackpearl to interact with the Reporting Services of Microsoft SQL Server 2005 SP2 or greater. The data provider for K2 SmartObjects allows custom applications to query SmartObject and workflow data from the K2 Server. Reports can be hosted in Reporting Services to allow for scalable reporting capabilities.
K2 [BLACKPEARL] DOCUMENTATION
The documentation for K2 blackpearl includes resources for the K2 platform. This includes installation and help guides.

K2 [BLACKPEARL] CONFIGURATION MANAGER
The K2 Configuration Manager is run by default after the K2 Installation Manager installs the selected components. The K2 Configuration Manager’s role is to configure the components installed on the local machine and it ensures that where connection to an external resource or service is required, the connection has been established and communication takes place. From an environmental perspective, the role of the K2 Configuration Manager is to ensure that all K2 components are configured and communicate correctly so that the environment functions as required.

SUMMARY
The preceding sections have enabled the installer to identify the various K2 components and to familiarize themselves with installation and architectural requirements of K2 blackpearl products. Along with understanding the various K2 components, it is important that the installer knows the organizations existing network and architecture.

REQUIREMENTS
There are several hardware and software requirements regardless of the deployment scenario you choose. These are detailed in the below sections.

HARDWARE REQUIREMENTS
The following guidelines should be followed for hardware selection.

<table>
<thead>
<tr>
<th>Component</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer and Processor</td>
<td>Server with processor speed of 2.5 gigahertz (GHz) or higher; dual processor, 3 GHz or higher recommended.</td>
</tr>
<tr>
<td>Memory</td>
<td>1 gigabyte (GB) RAM; 2 GB recommended¹</td>
</tr>
<tr>
<td>Hard disk</td>
<td>3 GB of available hard disk</td>
</tr>
<tr>
<td>Display</td>
<td>1024x768 or higher resolution monitor</td>
</tr>
<tr>
<td>Other</td>
<td>100 megabits per second (Mbps) connection speed required for farm deployment, 56 kilobits per second (Kbps) required for client to server connection. Internet Simple Mail Transfer Protocol/Post Office Protocol 3 (SMTP/POP3), Internet Message Access Protocol 4 (IMAP4), or MAPI-compliant messaging software required for e-mail notifications.</td>
</tr>
</tbody>
</table>

¹ Farm deployment requires 2 GB RAM; 4 GB recommended for SQL and Application Servers.

Note: If you are installing a single server environment, it is recommended that you have more RAM and a larger processor in order to have acceptable performance. If you are separating out the components onto multiple tiers, those tiers should be sized appropriately based on usage and performance requirements.
## Software Requirements

### Base Server Software Requirements

<table>
<thead>
<tr>
<th>Component</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating System</strong></td>
<td>Windows 2003 Server with SP2 (Standard or Enterprise)</td>
</tr>
<tr>
<td></td>
<td>Windows 2003 Server R2 with SP2 (Standard or Enterprise)</td>
</tr>
<tr>
<td></td>
<td>*Latest security patches</td>
</tr>
<tr>
<td></td>
<td>*32-bit support only</td>
</tr>
<tr>
<td><strong>Windows Components</strong></td>
<td>Internet Information Services</td>
</tr>
<tr>
<td></td>
<td>Microsoft Message Queuing (MSMQ)</td>
</tr>
<tr>
<td></td>
<td>SMTP/POP3 Server</td>
</tr>
<tr>
<td></td>
<td>Windows Support Tools</td>
</tr>
<tr>
<td></td>
<td>Framework</td>
</tr>
<tr>
<td></td>
<td>Microsoft .NET Framework 2.0 Redistributable Package:</td>
</tr>
<tr>
<td></td>
<td>Microsoft .NET Framework 3.0 Redistributable Package:</td>
</tr>
<tr>
<td><strong>Database</strong></td>
<td>Microsoft SQL Server 2005 with SP2</td>
</tr>
<tr>
<td></td>
<td>Microsoft SQL Server Reporting Services</td>
</tr>
<tr>
<td></td>
<td>Microsoft SQL Server 2005 Analysis Services ADOMD.NET</td>
</tr>
<tr>
<td></td>
<td>Microsoft Report Viewer Redistributable 2005:</td>
</tr>
<tr>
<td></td>
<td>*32-bit support only</td>
</tr>
</tbody>
</table>

### Optional Server Software Requirements

<table>
<thead>
<tr>
<th>Component</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SharePoint</strong></td>
<td>Microsoft Office SharePoint Server 2007 (Standard or Enterprise)</td>
</tr>
<tr>
<td></td>
<td>Windows SharePoint Services 3.0¹</td>
</tr>
<tr>
<td></td>
<td>*32-bit support only</td>
</tr>
</tbody>
</table>

¹These applications are available from Microsoft Office Online

### Base Client Software Requirements

<table>
<thead>
<tr>
<th>Component</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating System</strong></td>
<td>Windows XP with SP2</td>
</tr>
<tr>
<td></td>
<td>Windows Vista (Business or Ultimate)</td>
</tr>
<tr>
<td></td>
<td>*Latest security patches</td>
</tr>
</tbody>
</table>
**Base Client Software Requirements**

**Development Environment**
Microsoft Visual Studio 2005 with SP1, Professional Edition or better
Microsoft Visual Studio 2005 Team Suite Service Pack 1 (applies to all editions):
Visual Studio 2005 Web Deployment Projects:
http://download.microsoft.com/download/9/4/9/9496adc4-574e-4043-bb70-bc841e27f13c/WebDeploymentSetup.msi

**Additional Extensions**
Visual Studio 2005 extensions for .NET Framework 3.0 (Windows Workflow Foundation):
Visual Studio 2005 extensions for .NET Framework 3.0 (WCF & WPF), November 2006 CTP:

The following components are currently not supported by K2 blackpearl:
> Visual Studio 2008
> .NET 3.5 Framework "ORCAS"

**Web Browser**
Microsoft Internet Explorer 6 or higher (IE 7 is recommended)

**Business Analyst Environment**
2007 Microsoft Office System Update: Primary Interop Assemblies
Microsoft Visio 2007 (Standard or Professional)

**Optional Client Software Requirements**

**Office 2007**
Office 2007 Professional Plus, Enterprise or Ultimate

\[These applications are available from Microsoft Office Online\]

**SOFTWARE REQUIREMENTS PER COMPONENT**

If K2 blackpearl is installed in a standalone or small scale installation, the K2 Components would all be installed on the same physical machine. When scaling is applied for data availability, performance or page rendering, the K2 Components would no longer share the same physical machine as the K2 Server. When this scaling occurs, the breakaway K2 Components have their individual prerequisite requirements that enable them to function.

**Note:** The only machines not requiring a server based operating system are the developer/client systems. Otherwise all machines require a Server based operating system.

**Note:** Visual Studio 2008 or "Orcas", and .NET 3.5 are not supported at this time.
### K2 [blackpearl] Prerequisites per Component

#### K2 for Visual Studio
- Microsoft Visual Studio 2005

  - Microsoft .NET Framework 2.0 Redistributable Package:

  - Microsoft .NET Framework 3.0 Redistributable Package:

  - Visual Studio 2005 extensions for .NET Framework 3.0 (Windows Workflow Foundation):

  - Visual Studio 2005 extensions for .NET Framework 3.0 (WCF & WPF), November 2006 CTP:

#### K2 for Visio
- Microsoft Visio 2007 (Standard or Professional)

  - Primary Interop Assemblies for Office 2007:

  - Microsoft .NET Framework 2.0 Redistributable Package:

  - Microsoft .NET Framework 3.0 Redistributable Package:

#### K2 blackpearl Server
- License Key

- Microsoft Internet Explorer 6 or higher (IE 7 is recommended)

#### K2 Workspace
- Microsoft Internet Explorer 6 or higher (IE 7 is recommended)

#### K2 for Reporting Services
- Microsoft SQL Server Reporting Services

  - Microsoft Report Viewer Redistributable 2005 SP1 (Upgrade):
    - (Note: an IISRESET or reboot is recommended after installation)

  - *32-bit support only*

#### K2 for SharePoint (MOSS)
- MOSS 2007
  - Microsoft Internet Explorer 6 or higher (IE 7 is recommended)
  - Microsoft Office SharePoint Server 2007 (Standard or Enterprise)

  - *32-bit support only*
**K2 [blackpearl] Prerequisites per Component**

<table>
<thead>
<tr>
<th>Component</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2 for SharePoint (WSS)</td>
<td>WSS 3.0</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&gt; Microsoft Internet Explorer 6 or higher (IE 7 is recommended)</td>
</tr>
<tr>
<td></td>
<td>&gt; Windows SharePoint Services 3.0</td>
</tr>
<tr>
<td></td>
<td>*32-bit support only</td>
</tr>
</tbody>
</table>

**OFFICIAL 64-BIT K2 PLATFORM INFORMATION**

For customers who are evaluating or using 64-bit systems, the following information is offered for guidance on what is currently supported and what will be supported in the future for K2 blackpearl.

**K2 [blackpearl]**

- **Supported**
  - SQL Server: We DO support running the K2 databases on 64-bit SQL Server.

- **Not Supported**
  - K2 blackpearl Server: We do NOT support running K2 blackpearl server components on 64-bit Windows.
  - K2 blackpearl Clients: We do NOT support running K2 blackpearl client components on 64-bit Windows.
  - SQL Server Reporting Services: We do NOT support running the K2 blackpearl SQL Reporting Services components on 64-bit SQL Reporting Services.
  - SharePoint 2007 (WSS/MOSS/Forms Server): We do NOT support running the K2 blackpearl components for SharePoint on 64-bit SharePoint.

- **Future Support**
  - K2 blackpearl Server: We will support running K2 blackpearl server components on 64-bit Windows.
  - K2 blackpearl Clients: We will support running K2 blackpearl client components on 64-bit Windows.

  *Note: Visual Studio components will require Visual Studio 2008.*

- SQL Server Reporting Services: We will support running the K2 blackpearl SQL Reporting Services components on 64-bit SQL Reporting Services.
- SharePoint 2007 (WSS/MOSS/Forms Server): We will support running the K2 blackpearl components for SharePoint on 64-bit SharePoint.

**K2.net 2003**

- **Supported**
  - K2.net 2003 Server: We DO support running the K2.net 2003 databases on 64-bit SQL Server.

- **Not Supported**
  - K2.net 2003 Components (including MOSS Components): We do NOT support running K2.net 2003 components on 64-bit SharePoint.

- **Future Support**
**Note:** Only the portion that installs on MOSS 2007 will support 64-bit.

> There are no plans for any other K2.net 2003 components to support 64-bit. This includes K2.net 2003 Studio and the K2.net 2003 SharePoint 2003 Components.

**CHOOSING A DEPLOYMENT SCENARIO**

The preceding sections have enabled the installer to identify various K2 components and to familiarize themselves with installation and architectural requirements. The following section assists the installer to decide which scenario to pursue with regards to installing K2 blackpearl. K2 is a robust n-tiered enterprise application which can be configured by the installer to integrate with their existing environment.

This deployment planning guide offers guidance for determining the type of installation best suited to specific environments.

To decide which scenario will work for an organization, the person installing K2 blackpearl must be familiar with the network and requirements. It is important that once reviewed, the installer uses the content within this document to determine which scenario is the most suitable and how it will impact the network. A decision chart follows this section, use the chart as a guide to make the appropriate decision.

This flowchart should help in deciding which of the following types of installation is appropriate:

> **Simple Installation Scenarios:** Small scale installations, with little or no redundancy
  > Standalone Install
  > Small Scale Install
  > Scaling for Data Availability
  > Scaling for Better Performance
> **Medium Installation Scenarios:** Medium scale installations, with some redundancy
  > Scaling for Page Rendering
  > Scaling for Data and Performance
  > Medium Scale Install
  > Maximum Redundancy on Six Servers
> **Large Installation Scenarios:** Fully redundant installations
  > Large Scale Install

**Note:** The following diagram assumes that SharePoint is already installed and configured in the environment. The initial installation of K2 blackpearl can be performed without SharePoint components. After SharePoint is introduced to the environment, the SharePoint components (either MOSS or WSS) can be installed on those servers. However, this document assumes that SharePoint is already configured and used by the organization.
[Figure 3: Deployment Scenario Decision Flowchart]
DEPLOYMENT SCENARIOS
This section discusses a number of deployment scenarios and is supported by the decision flowchart in Figure 3. These scenarios are for production environments. It is important to note that many larger organizations will also have development and staging environments to test new systems and processes. It is strongly advised that the test environment (and ideally the development environment as well) are configured identically to the production environment.

STANDALONE INSTALL
Standalone installations are better suited for low-load environments such as a development or proof of concept environment. Since all components are installed on the same physical server as the K2 Server, there are no credentials passed between servers.

<table>
<thead>
<tr>
<th>Server A</th>
<th>K2 blackpearl (all components)*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Internet Information Server (IIS)</td>
</tr>
<tr>
<td></td>
<td>SharePoint (MOSS or WSS)</td>
</tr>
<tr>
<td></td>
<td>SQL Server</td>
</tr>
</tbody>
</table>

* Depending on the SharePoint product installed, either the MOSS or WSS components will be displayed for installation.

The Standalone Installation configuration for K2 blackpearl is shown below. All K2 components, IIS, SharePoint, and the database instance are installed on the same physical platform.

CONSIDERATIONS FOR THE STANDALONE INSTALL
Because all K2 components are installed on a single, standalone server, there are some items that need to be considered.

HARDWARE
If this installation scenario is used for a development or proof of concept environment, it is recommended that additional RAM or a faster processor is used in order to maintain an acceptable level of performance.
SMALL SCALE INSTALL
In many cases K2 blackpearl is installed into an existing infrastructure; therefore, the database components can be easily installed on an existing SQL server. This is true even when all K2 components are installed on an existing server which is likely running WSS. This is suitable for small usage, such as a test or training environment.

<table>
<thead>
<tr>
<th>Small Scale Install</th>
<th></th>
</tr>
</thead>
</table>
| Server A            | K2 blackpearl (all components)*  
                      | Internet Information Server (IIS)  
                      | SharePoint (MOSS or WSS) |
| Server B            | SQL Server   |

* Depending on the SharePoint product installed, either the MOSS or WSS components will be displayed for installation.

The Small Scale Install configuration for K2 blackpearl is shown below. All K2 components, IIS, and SharePoint are installed on one server, and the databases are located on a separate server.

CONSIDERATIONS FOR THE SMALL SCALE INSTALL
For small scale installations, hardware and SQL Server considerations must be taken into account.

HARDWARE
If this installation scenario is used, it performs best as a development or proof of concept environment. It is recommended that additional RAM or a faster processor is used in order to maintain acceptable levels of performance.

SQL SERVER
The location of the SQL Server is not critical for a K2 installation, as long as the network connection speed to the K2 Server meets minimum requirements. It can share physical resources or be located on an independent...
platform, such as this small scale install. Considering that in most cases K2 is being introduced into an existing environment, the K2 Databases would be installed on an independent server that runs SQL Server 2005.

**SCALING FOR DATA AVAILABILITY**

Since many business critical processes may be automated using K2 blackpearl, it may be important to have a redundant system for data availability. This scenario is the same as the Small Scale install, but with a SQL cluster as the database back end rather than a single server.

<table>
<thead>
<tr>
<th>Scaling for Data Availability Install</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Server A</strong></td>
</tr>
<tr>
<td>K2 blackpearl (all components)*</td>
</tr>
<tr>
<td>Internet Information Server (IIS)</td>
</tr>
<tr>
<td>SharePoint (MOSS or WSS)</td>
</tr>
<tr>
<td><strong>Server B, C</strong></td>
</tr>
<tr>
<td>SQL Server (Clustered)</td>
</tr>
</tbody>
</table>

* Depending on the SharePoint product installed, either the MOSS or WSS components will be displayed for installation.

The **Scaling for Data Availability** scenario is shown below. All of the IIS, K2, and SharePoint components are installed on one server, with a clustered SQL server instance for data redundancy.

![Scaling for Data Availability Install](image)

**CONSIDERATIONS FOR THE SCALING FOR DATA AVAILABILITY INSTALL**

For this installation topology, the SQL Server configuration needs to be evaluated.

**SQL SERVER**

The SQL Server can share physical resources or be located on an independent platform, such as in this install, or it can be clustered. For more information regarding SQL Server clustering, refer to the SQL planning and architecture documentation ([http://technet.microsoft.com/en-us/sqlserver/bb331768.aspx](http://technet.microsoft.com/en-us/sqlserver/bb331768.aspx)).
Considering that in most cases K2 is being introduced into an existing environment, the K2 Databases would be installed on an existing SQL Server 2005 cluster.

**SCALING FOR BETTER PERFORMANCE**

This scenario is better suited for small organizations that do not require any redundancy. Able to support an increasing load on the K2 infrastructure, the K2 Server is separated from the SharePoint server for scalability.

### Scaling for Better Performance Install

<table>
<thead>
<tr>
<th>Server A</th>
<th>SharePoint (MOSS or WSS)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server B</td>
<td>K2 blackpearl (all components)</td>
</tr>
<tr>
<td></td>
<td>IIS</td>
</tr>
<tr>
<td>Server C</td>
<td>SQL Server</td>
</tr>
</tbody>
</table>

* Depending on the SharePoint product installed, either the MOSS or WSS components will be displayed for installation.

The Scaling for Better Performance scenario is shown below. All of the K2 components are separated out from the SharePoint components, with a separate SQL server.

[Figure 7: Scaling for Better Performance Install]

**CONSIDERATIONS FOR THE SCALING FOR BETTER PERFORMANCE INSTALL**

Since this scenario deploys the various components onto multiple servers, there are some considerations around Kerberos and location of the components that should be addressed.

**KERBEROS**

Since the IIS server does not share a server with the K2 Server, the credentials will be passed as a result. Whenever credentials must pass more than one “hop” between servers, Kerberos must be configured. This is known as the “double-hop issue.”
Ensure that all Kerberos settings and necessary configuration takes place before attempting to install K2 blackpearl. To configure Kerberos, refer to the deployment considerations section on Kerberos later in this document.

**SQL SERVER**
The location of the SQL Server is not critical for a K2 installation, as long as the network connection speed to the K2 Server meets minimum requirements. It can share physical resources or be located on an independent platform, such as in this install. Considering that in most cases K2 is being introduced into an existing environment, the K2 Databases would be installed on an independent server that runs SQL Server 2005. Since this is a common occurrence, the installation documentation takes this into consideration.

**K2 WORKSPACE**
Clients access Workspace via the IIS Server operating from the K2 Server. If the user environment expands so that the performance of the K2 Server is affected by the number of users logging onto K2 Workspace, it is advised that the IIS components be relocated to a different server.

**SCALING FOR PAGE RENDERING**
Since many business-critical processes may be automated using K2 blackpearl, it may be important to have a redundant system to ensure processes are not interrupted. This scenario is the same as the Small Scale install, but with adding a Network Load Balanced (NLB) cluster to ensure failover via load balancing.

<table>
<thead>
<tr>
<th>Scaling for Page Rendering Install</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Server A, B</strong></td>
<td>NLB SharePoint (MOSS or WSS)* and IIS</td>
</tr>
<tr>
<td></td>
<td>NLB K2 blackpearl (all components)</td>
</tr>
<tr>
<td><strong>Server C</strong></td>
<td>SQL Server</td>
</tr>
</tbody>
</table>

* Depending on the SharePoint product installed, either the MOSS or WSS components will be displayed for installation.

The **Scaling for Page Rendering** scenario is shown below. All of the K2, IIS, and SharePoint components are installed on two nodes in an NLB cluster for better page rendering performance and failover via load balancing.
CONSIDERATIONS FOR THE SCALING FOR PAGE RENDERING INSTALL
This scenario introduces a NLB cluster into the installation topology; therefore, it is important to understand NLB before installing this scenario.

NETWORK LOAD BALANCING
NLB can be configured by using either the operating system or specific hardware. In either case, NLB configuration should be completed before installing K2 blackpearl.

When installing components that will be load balanced, the installation must be performed on each machine independently. In this install, all of the components are on NLB servers; therefore, all of the components need to be installed on each NLB server.

SQL SERVER
The location of the SQL Server is not critical for a K2 installation, as long as the network connection speed to the K2 Server meets minimum requirements. It can share physical resources or be located on an independent platform, such as in this install. Considering that in most cases K2 is being introduced into an existing environment, the K2 Databases would be installed on an independent server that runs SQL Server 2005. Since this is a common occurrence, the installation documentation takes this into consideration.

SCALING FOR DATA AND PERFORMANCE
Both the Scaling for Page Rendering and Scaling for Data Availability scenarios start to address redundancy into the system. This scenario addresses both the data availability, by adding a SQL cluster into the infrastructure, as well as failover via load balancing on the other components.

<table>
<thead>
<tr>
<th>Scaling for Data and Performance Install</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Server A, B</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Server C, D</strong></td>
</tr>
</tbody>
</table>

* Depending on the SharePoint product installed, either the MOSS or WSS components will be displayed for installation.

In the figure below, the Scaling for Data and Performance scenario is shown. There is a SQL cluster, and all IIS, SharePoint and K2 components are on an NLB cluster.
CONSIDERATIONS FOR THE SCALING FOR DATA AND PERFORMANCE INSTALL
This scenario introduces a NLB cluster into the installation topology; therefore, it is important to understand NLB before installing this scenario.

NETWORK LOAD BALANCING
NLB can be configured by using either the operating system or specific hardware. In either case, NLB configuration should be completed before installing K2 blackpearl.

When installing components that will be load balanced, the installation must be performed on each machine independently. In this install, all of the components are on NLB servers; therefore, all of the components need to be installed on each NLB server.

SQL SERVER
The location of the SQL Server is not critical for a K2 installation, as long as the network connection speed to the K2 Server meets minimum requirements. It can share physical resources or be located on an independent platform, such as in this install, or it can be clustered. For more information regarding SQL Server clustering, refer to the SQL planning and architecture documentation (http://technet.microsoft.com/en-us/sqlserver/bb331768.aspx).

In most cases K2 databases are installed on an established SQL Server 2005 cluster for an existing environment. Since this is a common occurrence, the installation documentation takes this into consideration.

MEDIUM SCALE INSTALL
K2 blackpearl is a scalable platform, wherein the K2 Server can be separated from the SharePoint and IIS components. This allows for a Web farm to be set up for better rendering performance, and it lessens the impact of client requests through IIS on the K2 Server.
Medium Scale Install

<table>
<thead>
<tr>
<th>Server</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B</td>
<td>NLB SharePoint (MOSS or WSS)* and IIS (Web components)</td>
</tr>
<tr>
<td>C</td>
<td>K2 blackpearl (server components)</td>
</tr>
<tr>
<td>D</td>
<td>MOSS application servers**</td>
</tr>
<tr>
<td>E, F</td>
<td>Clustered SQL Server</td>
</tr>
</tbody>
</table>

* Depending on the SharePoint product installed, either the MOSS or WSS components will be displayed for installation.

** Depending on your MOSS environment, the application servers such as Excel Services, InfoPath Server, and Indexing can be split off onto a separate server. Refer to the SharePoint installation guidance for installation options. This server will not be needed if only WSS is installed.

The figure below shows the Medium Scale Install scenario. K2 has its own dedicated server separating it from an NLB cluster set up for SharePoint and IIS. A SQL cluster is also introduced for data redundancy.

[Figure 10: Medium Scale Install]

CONSIDERATIONS FOR THE MEDIUM SCALE INSTALL

By scaling out this install, there are several considerations such as Kerberos and NLB that should be addressed.

KERBEROS

Since the IIS server does not share a server with the K2 Server, the credentials will be passed as a result. As discussed earlier, whenever credentials must pass more than one “hop” between servers, Kerberos must be configured. This is known as the “double-hop issue.”
Ensure that all Kerberos settings and necessary configuration takes place before attempting to install K2 blackpearl. To configure Kerberos, refer to the deployment considerations section on Kerberos later in this document.

**NETWORK LOAD BALANCING**

NLB can be configured by using either the operating system or specific hardware. In either case, NLB configuration should be completed before installing K2 blackpearl.

When installing components that will be load balanced, the installation must be performed on each machine independently. In this install, the SharePoint and Web components are on NLB servers, therefore, these components need to be installed on each NLB server.

**SQL SERVER**

The location of the SQL Server is not critical for a K2 installation, as long as the network connection speed to the K2 Server meets minimum requirements. It can share physical resources, be located on an independent platform, such as in this install, or it also can be clustered. For more information regarding SQL Server clustering, refer to the SQL planning and architecture documentation (http://technet.microsoft.com/en-us/sqlserver/bb331768.aspx).

In most cases K2 databases are installed on an established SQL Server 2005 cluster for an existing environment. This is a common occurrence and the installation documentation takes this into consideration.

**K2 WORKSPACE**

Clients access Workspace via the IIS Server operating from the K2 Server. If the performance of the physical server is affected by the number of users logged into K2 Workspace, it is advised that the IIS be relocated to an independent hardware platform.

**MAXIMUM REDUNDANCY ON SIX SERVERS**

This topology adds maximum availability on the fewest number of servers. This scenario is intended for organizations that require redundancy of all application server roles. Having an NLB cluster for the K2 Server and a separate NLB cluster for the Web tier maximizes its availability and performance. A SQL cluster also allows for data redundancy.

The Maximum Redundancy on Six Servers Install scenario is shown below.
Clustered or Mirrored SQL Server

User Requests

Each Load-Balanced Server includes:
- Web Server
- SharePoint (WSS or MOSS)

Load-balanced K2 Host Servers

CONSIDERATIONS FOR THE MAXIMUM REDUNDANCY ON SIX SERVERS INSTALL
This installation brings the complexity of Kerberos and NLB to the scenario.

KERBEROS
Since the IIS server does not share a server with the K2 Server, the credentials will be passed as a result. As discussed earlier, whenever credentials must pass more than one “hop” between servers, Kerberos must be configured. This is known as the “double-hop issue.”

Ensure that all Kerberos settings and necessary configuration takes place before attempting to install K2 blackpearl. To configure Kerberos, refer to the deployment considerations section on Kerberos later in this document.

NETWORK LOAD BALANCING
NLB can be configured using by using either the operating system or specific hardware. In either case, NLB configuration should be accomplished before installing K2 blackpearl.

When installing components that will be load balanced, the installation must be performed on each machine independently. In this install, the SharePoint and Web components are on NLB servers, therefore, these components need to be installed on each NLB server. Additionally, the K2 Server resides on NLB servers, therefore each NLB server needs the K2 Server installation.

SQL SERVER
The location of the SQL Server is not critical for a K2 installation, as long as the network connection speed to the K2 Server meets minimum requirements. It can share physical resources, be located on an independent platform,
such as in this install, or it can be clustered. For more information regarding SQL Server clustering, refer to the SQL planning and architecture documentation (http://technet.microsoft.com/en-us/sqlserver/bb331768.aspx).

In most cases K2 database are installed on an established SQL Server 2005 cluster for an existing environment. This is a likely occurrence and the installation documentation takes this into consideration.

LARGE SCALE INSTALL

The Large Scale Install scenario is specifically suitable for high work load environments, with components scaled to three tiers. Each component is load balanced, and multiple dedicated databases allow for maximum growth and availability. Multiple databases are dedicated to individual load-balanced components to allow for maximum growth and availability. Kerberos is mandatory for this configuration option. Both NLB and Kerberos must be configured correctly and must be able to communicate before K2 blackpearl is installed.

<table>
<thead>
<tr>
<th>Large Scale Install</th>
<th>NLB SharePoint (MOSS or WSS)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Server A, B...</strong></td>
<td>NLB IIS with K2 Workspace components</td>
</tr>
<tr>
<td><strong>Server C, D...</strong></td>
<td>NLB K2 blackpearl Servers</td>
</tr>
<tr>
<td><strong>Server E, F...</strong></td>
<td>MOSS application servers**</td>
</tr>
<tr>
<td><strong>Server G, H...</strong></td>
<td>Clustered SQL Server</td>
</tr>
</tbody>
</table>

* Depending on the SharePoint product installed, either the MOSS or WSS components will be displayed for installation.

** Depending on your MOSS environment, the application servers such as Excel Services, InfoPath Server, and Indexing can be split off onto a separate server. Refer to the SharePoint installation guidance for installation options. These servers will not be needed if only WSS is installed.

The Large Scale Install scenario is shown below. Not all of the SharePoint features are shown here. Refer to the SharePoint documentation for installation guides and options.
CONSIDERATIONS FOR THE LARGE SCALE INSTALL

While the diagram shows one topology, each tier can be scaled out depending on needs. However, Kerberos and NLB will factor into this scenario.

KERBEROS

Since the IIS server does not share a server with the K2 Server, the credentials will be passed as a result. As discussed earlier, whenever more than two hops are required, Kerberos must be configured.

Ensure that all Kerberos settings and necessary configuration takes place before attempting to install K2 blackpearl. To configure Kerberos, refer to the deployment considerations section on Kerberos later in this document.

NETWORK LOAD BALANCING

NLB can be configured by using either the operating system or specific hardware. In either case, NLB configuration should be completed before installing K2 blackpearl.

When installing components that will be load balanced, the installation must be performed on each machine independently. In this install, each load-balanced component should have the full install on each NLB node.

SQL SERVER

The location of the SQL Server is not critical for a K2 installation, as long as the network connection speed to the K2 Server meets minimum requirements. It can share physical resources, be located on an independent platform,
such as in this install, or it can be clustered. For more information regarding SQL Server clustering, refer to the SQL planning and architecture documentation (http://technet.microsoft.com/en-us/sqlserver/bb331768.aspx).

In most cases K2 databases are installed on an established SQL Server 2005 cluster for an existing environment. This is a common occurrence and the installation documentation takes this into consideration.

DEPLOYMENT CONSIDERATIONS
When deploying K2 blackpearl, there are several decisions for the infrastructure that should be made before installing K2:

- Network Load Balancing
- Kerberos
- IIS
- Domain configuration
- Database configuration

Work through the infrastructure appraisal phase methodically to ensure nothing is overlooked and all factors are considered. The hardware and software pre-requisites as detailed earlier in this paper are places to start with the appraisals.

The K2 components can be installed on one server or in a distributed server configuration. When the work load requirements necessitate that the components be installed on independent machines, the components are distributed on the network. Security is a consideration when components are distributed onto different servers. Where there would be more than one hop between servers, Kerberos authentication must be configured.

Implementing K2 on an existing network may require that changes be made to the existing infrastructure.

The following sections will describe these considerations in more detail. Additional references can be found on Microsoft’s Web site, and they have been included as links where appropriate.

NETWORK LOAD BALANCING SETUP AND CONFIGURATION
The machines residing in the individual Network Load Balancing (NLB) configurations must be configured prior to K2 installation. The following deployment consideration sections discuss NLB setup.

NETWORK LOAD BALANCING VS. CLUSTERING
NLB clusters dynamically distribute the flow of incoming TCP and UDP traffic among the cluster nodes according to a set of traffic-handling rules. NLB clusters provide a highly available and scalable platform for applications such as IIS. NLB is used for stateless applications; i.e. those that do not rely on any state as a result of a request.

NLB and server clusters complement each other in complex architectures: NLB is used for load balancing requests between front-end Web servers while server clusters provide high availability for backend database access.
A server cluster is a collection of servers that together provides a single, highly available platform for hosting applications. Applications can be failed-over to ensure high availability in the event of planned downtime due to maintenance or unplanned downtime due to hardware, Operating System or application failures. Server clusters provide a highly available platform for applications such as SQL Servers. Server clusters are used for stateful applications that rely on some state context from one request to the next.

Server clusters provide high availability and disaster tolerance for mission-critical database management, file sharing, intranet data sharing, messaging, and general business applications. With Windows Server 2003 R2 Datacenter Edition, and Windows Server 2003 R2 Enterprise Edition, the cluster service allows flexibility for adding and removing hardware in a geographically dispersed cluster environment, as well as providing improved scaling options for applications. Windows Server 2003 R2 Datacenter Edition also allows server clusters to be deployed in a variety of different configurations, in particular:

> Single cluster configurations with dedicated storage.
> Multiple clusters on a storage area network (SAN), potentially with other Windows servers or operating systems.

**Note:** The K2 Server is not supported in the Windows server cluster environment. The K2 Server is only supported on NLB clusters.

**PHYSICAL NETWORK ENVIRONMENT**

Since a large installation typically uses more than one Web server in a load-balanced configuration, setting up the local network infrastructure can be more complex than setting up a normal Web application system. This is because the Windows NLB technology causes multiple Web servers to appear as a single server. As a result, the network infrastructure must support the creation of multiple broadcast domains (virtual local area network, or VLAN) to segment incoming Web requests from the main production network.

NLB broadcasts incoming traffic destined for the servers in an NLB group to all ports within their network collision domain (in this case, VLAN). In normal Web server deployment scenarios, the incoming traffic typically consists of a small number of HTTP GET requests and this may not be an issue. However, K2 blackpearl and SharePoint network traffic may consist of large documents moving between servers.

As a result, it is imperative that the NLB adapters for the Web servers are not connected to the normal server network. A separate logical or physical network, such as a VLAN, must be created so the larger amount of incoming traffic is not flooded to the network ports of other servers, thereby causing performance degradation on all servers within the network, not just the Web servers.

Furthermore, traffic to and from a SharePoint site or the K2 Workspace involves a considerable amount of communication from the Web servers to the back-end servers running SQL Server; good connectivity between them is required. It is therefore recommended that Web servers be dual-homed:

> One network adapter handling the incoming Web requests by using NLB
> One network adapter acting as a normal server adapter to communicate to the server running SQL Server along with the other servers within the infrastructure, such as domain controllers for authentication purposes
INSTALLING COMPONENTS IN A REDUNDANT ENVIRONMENT
When installing for load balancing, the installation must be performed on each machine independently. If for example the K2 Server is being installed in a NLB cluster similar to the example below, the server components must be installed on each individual machine.

The NLB cluster is configured using the operating system and should be configured prior to installing and configuring the K2 environment.

As illustrated below, when installing the components for load balancing, the components need to be pointed to the K2 Server NLB cluster. For example, the component is pointed at the NLB name and not the individual machines within the NLB cluster.

![Cluster configuration](image)

**ADDITIONAL RESOURCES FOR NLB**

**KERBEROS SETUP AND CONFIGURATION**
When components are installed on separate servers, credentials must be passed between the services. This can be accomplished by setting up Kerberos, which should be configured prior to installing K2. Any time where more than two hops are required for user authentication, Kerberos must be configured.

**WHAT IS KERBEROS?**
The authentication model implementation is dependent on whether user credentials must be passed from one system to another. When they are passed, the system that is attempting to pass the credentials must be trusted for delegation. For this step to take place successfully, Kerberos delegation must be configured.
The rule of thumb for when Kerberos configuration is required falls to one question: Does a system need to impersonate a user? If the answer to that question is yes, then Kerberos is required. An alternative approach to the need to configure Kerberos would be to assess whether more than one hop between servers is required. In such a case, Kerberos is required. This is commonly known as the “double-hop issue.”

HOW CAN I TELL IF KERBEROS IS NOT CONFIGURED PROPERLY?
The need for Kerberos configuration may only become evident once the following errors are detected. These errors will appear as soon as one of the servers attempts to pass credentials.

> “NT AUTHORITY/ANONYMOUS LOGON”
> “401 - Access Denied”

Note: Kerberos is configured as part of the installation, some configuration happens once the components are installed. See the installation documentation for additional information.

Note: Neither Microsoft nor K2 developed the Kerberos standard. The MIT standard has been implemented in the platform and K2 relies on the implementation to successfully pass credentials between servers.

ADDITIONAL RESOURCES FOR KERBEROS
Kerberos Protocol Transition and Constrained Delegation:

Knowledge Base Articles on Kerberos:
http://kb.k2workflow.com/Search.aspx?sStr=kerberos

Information on the Double-Hop Issue:
http://support.microsoft.com/kb/329986

INTERNET INFORMATION SERVICE (IIS)
IIS requires good planning and an understanding of system and user accounts, Web sites, application pools, and permissions to folders and other environment resources. Involve the IIS administrator in planning the K2 installation, configuration, and Web application design.

HOST HEADERS AND PORTS
Understand how to use host headers and ports and how to reference them properly when setting SPNs for Kerberos implementations.

METABASE.XML
The settings contained in the MetaBase.xml file must be accurate when implementing Kerberos. Refer to the installation documentation for setting SPNs for Kerberos and editing the Metabase.xml for more information.
DOMAIN CONFIGURATION
Many variables in a network can affect how K2 blackpearl, IIS, Active Directory, Visual Studio, Exchange, Office (including Outlook), and SharePoint are installed and function. Proxy servers, multiple domain controllers, firewalls, and network policies may also affect the manner in which these applications or servers function within their environment.

Incorrect or incomplete DNS settings often cause one or more features of a K2 Server to fail, such as user authentication or Active Directory lookup. It is very important that DNS is setup and functioning correctly and reliably. DNS issues usually result in the K2 Server being unable to resolve users and/or user email addresses against Active Directory.

> **Delegation (full or constrained):** Delegation is required on Windows 2003 Servers to impersonate other servers/users/services.

**Note:** The K2 technical teams recommend that K2 be installed on the same domain.

K2 can be installed in single or multiple domain configurations. A domain in a tree configuration may have another tree domain along side with perhaps the added complexity of an external domain. K2 will support these configurations when Kerberos is configured correctly.

Windows 2000 domains are supported the same as Windows 2003 domains; using a Windows 2003 domain however has the benefit of Constrained Delegation. This feature is unavailable in Windows 2000 Server.

DOMAIN POLICIES
The following configuration settings are required on your domain group policy settings.

<table>
<thead>
<tr>
<th>System</th>
<th>Item to Configure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IIS Server</td>
<td>IIS_WPG Group</td>
<td>• The K2 Workspace account must be added to this group.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Integrated authentication must be added.</td>
</tr>
<tr>
<td>K2 Server</td>
<td>Login Account</td>
<td>The account used by the K2 Server must log in as a service on the local computer policy.</td>
</tr>
<tr>
<td>Client Machines</td>
<td>Internet Access</td>
<td>• User must have access to Internet Explorer.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• In the Internet Explorer settings for the local internet zone, the K2 Workspace Website must be added as a trusted Web site.</td>
</tr>
</tbody>
</table>

DATABASE CONFIGURATION
While the specific database sizing requirements will depend on the user base and process definitions, the K2 platform allows for the databases to be separated allowing for better performance and growth.

SQL SERVER CONFIGURATION
K2 blackpearl stores all configuration data as well as workflow definitions, workflow instance and reporting information, and SmartBox data in databases. K2 blackpearl supports Microsoft SQL Server 2005 databases only. SQL Server includes many tools for managing database processes, such as backup and restore, and allows you to use multiple back-end database servers to store as much content as you need and balance the load across the servers.
Windows authentication is more secure, because it depends on the domain credentials for an Internet Information Services (IIS) application pool to connect to the SQL Server database. The username and password are not sent between servers, but are abstracted through the IIS application pool.

SQL Server authentication is less secure, because when you connect to the database, the username and password for the database administrator account are sent from server to server in unencrypted format.

You make the database authentication choice after installation during the configuration of K2, when you specify the SQL Server settings.

For more information about authentication methods for SQL Server 2005, see the SQL Server 2005 documentation.

REMOTE SQL SERVER INSTALLATION
In order to increase performance of your K2 installation, it is recommended that you use Microsoft SQL Server on a separate server from your K2 server. Using SQL Server on its own server allows you to host all of your databases together and manage them with SQL Server management tools. Using SQL Server on its own server also allows your K2 server to devote its processor, memory, and disk resources for managing workflow instances and tasks.

BEFORE INSTALLING K2 [BLACKPEARL]
Before installing K2 blackpearl, you must prepare the database server. The database server must be running Microsoft SQL Server 2005 with the most recent service pack. The K2 configuration wizard will automatically create the necessary databases when you install and configure K2 blackpearl.

For more information, see the software and hardware requirements for K2 blackpearl.

DATABASE FUNDAMENTALS
The K2 databases are essential for storing data relevant to the operation of the entire infrastructure, and are comprised of 14 databases. There are two main databases that should be monitored for sizing:

- **K2Server**: Primary data store for all active process instances
- **K2ServerLog**: Retains records of all completed process instances

The rest of the databases are small in comparison to the process instance data contained in the two databases listed above.

MANAGING DATABASE SIZE
The size of the K2Log Database can grow to be much larger to improve database management. The K2 Archive Utility enables the administrator to export the completed processes to a K2 Archive Database.

INSTALLING THE DATABASES
The databases can be installed either locally or remotely. To install the databases remotely, the K2 Service Account must have been allocated access rights on the remote SQL Server. Refer to the security requirements document for further details.
CONCLUSION

K2 blackpearl allows for a flexible installation configuration based on an organization’s needs. This document introduces nine installation configurations. Scaling from a single server up to a large server farm, K2 blackpearl can be tuned for any architecture requirement. Because this flexibility introduces complexity, the architect of a K2 blackpearl solution should understand some basic concepts, such as Kerberos, NLB, IIS, Domain Configuration and SQL Server best practices.