SmartSite: Integration Framework and Method

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Abstract

The following is a paper I wrote in 2002 for Computers and Concepts' staff. It details a way of approaching companies and simplifying networks. The paper's goal was to provide the staff a different way to architect systems; a very user-centric and service-centric way.

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What is SmartSite?

SmartSite is a combination of two components: a business framework and a method for implementing that framework. Modern businesses often have most of the necessary ingredients for a SmartSite. They have the people, business processes, and technology. What the SmartSite framework provides is the means for categorizing these components. Furthermore, the SmartSite method migrates the information technology from the current client server model toward the SmartSite framework.

This paper provides details and specifics of SmartSite. **The SmartSite Framework** section defines and classifies the SmartSite framework. The **SmartSite Method** section describes the process for evolving the business towards the SmartSite.

SmartSite Framework

Integration Framework

What Any Framework Needs To Do

A business's focus on improving customer service and employee productivity can be hampered by user and technical problems. This falls squarely on the shoulders of Network Managers, who are in charge of administering the information technology. As a tool for Network Managers, a framework is necessary to provide guidelines for the technology. To avoid complications, whatever technology a business puts in place must aim for ease of use and reliability.

Network Managers must answer two questions in order to provide ease of use: who the user is, and what is the user doing? The user is usually thought of as an employee working with the services. However, the recent explosions of the Internet, intranets, and extranets have resulted in multiple definitions of "user". Therefore, we must classify a user as any individual accessing a network service. This definition includes, but is not limited to, in-house employees, telecommuting employees, and remote employees. Users can also include the businesses' partners, vendors, suppliers, and customers. Once Network Managers determine who the users are, they must then obtain more information about what the users are doing. What the user is doing is governed by what their roles in the business are, what their business goals are, and what services they have available. With information about who and what, Network Managers can use a framework for determining the best possible arrangement of technology to provide dependable network services so that the users can accomplish their tasks.

Dependability results from Network Managers having an understanding of the network's components, services, and hardware. Moreover, this understanding does not end with the technology itself. Network Managers must also be aware of how users interact with the services, and how the services interact with each other. The framework provides a conceptual reference for understanding and planning such a distributed system.

SmartSite Framework

The SmartSite framework provides a general reference for the management of network systems and, by extension, of any distributed system. Thus, SmartSite is not limited to a small number of configurations but rather can accommodate many different technologies. The SmartSite framework plays a crucial role in improving the ability to deploy new services, making the network dependable, and improving the scalability of the network. To accomplish these tasks, the SmartSite framework clarifies the way people use, talk, learn, design, and maintain computer network services.

Ability to Deploy New Services

The SmartSite framework improves the ability to deploy and deliver new services. First, existing systems are documented and shifted into the logical framework. By strategically shifting services into the framework, Network Managers can take full accounting of the system and plan for future growth. Then, the delivery channels and interfaces are built to be extensible to make delivering new services easy. By conceptually separating the services from the hardware, in-place hardware upgrades are easier as well.

When migrating the existing network towards the framework, the existing systems are documented and laid out logically. The documentation is another tool for Network Managers in the SmartSite tool box that presents the interactions between people and services, the communications between services and sub-services, and the exchange between hosting computers. This tool provides Network Managers the means for common understanding of the existing systems. Additionally, it simplifies complex issues such as where services are running and what they depend upon. Moreover, it has a positive impact on the ability of Network Managers to troubleshoot and maintain services, because Network Managers have a clearer view into what is occurring at all levels.

Documenting and migrating systems into the SmartSite framework allows Network Managers to examine the system and design for future growth. The design is layered from how people accomplish meaningful work, how the services integrate, and how the computers communicate. At each layer, the progression of the system's development is a top design consideration. The combinations of framework, documentation, and planning form a firm foundation of understanding. This foundation enables Network Managers and business Decision Makers to make informed business goals and strategies.

SmartSite framework encourages consolidating delivery of services into a few channels: voice, visual, and web. A direct result of consolidating delivery channels is that in-place interfaces make delivering new services easy. In the past, new delivery channels had to be created individually for each service. An example would be maintaining several sales clerks at a mall for each store. Consolidating delivery channels at the mall level would lead to one central, general clerk to fulfill shared tasks for all stores. By consolidating into a handful of channels, more services can be brought into production faster and less expensively.

The framework makes adding services easy on the user and the Network Manager by clearly separating services from hardware and providing monitoring. By abstracting the services from the hosting computer, placing services onto computers that are under used or bringing additional computers online becomes easier. Users can continue accessing the services like they always have because upgrades are virtually transparent to them. By providing a framework that clearly demonstrates what the services are, Network Managers can quickly measure the performance of the network and determine the best positioning of services.

Making the Network Dependable

In order to get the most productivity from investments in computer technology, the target users must be able to rely on the services. Otherwise, the users will shy away from using the technology and adoption will be slow. Slower adoption means longer waits for returns on investment. The SmartSite framework concentrates on improving the dependability of the network by extending the abilities of Network Managers and attacking the three main problem areas where technology breaks down: people, services, and computers.

SmartSite framework extends the Network Managers' ability to do their jobs. Central to this is in improving how Network Managers view the network system; making it easier to describe the interaction of services, making it easier to learn the system, and making it easier to troubleshoot the system.

Today's network services often have a number of services that depend on them and a number of services that they depend upon. This creates a multi-layered network that has many points of communication and many potential points of failure. Therefore, when failures occur in networks without a framework, a Network Manager can have a difficult time of resolving the problem. For an example, imagine having your appendix burst and going to the doctors. No matter how skilled or intelligent the doctor is, if she does not have a map, either mental or physical, of how the body's organs interact with each other she may not be able to save you. While network problems are not a matter of life or death, serious failures can cost companies millions of dollars in lost productivity, time, and opportunities. For this reason it is imperative that the framework improves a Network Manager's understanding of the network's topology and relationships.

The SmartSite framework addresses the three main problem areas where technology breaks down: people, services, and computers. People using technology is a problem if the key people are unavailable, or if their knowledge on how to use the system is not shared. Services are a problem area if the services they depend upon are unavailable or if they themselves are broken. Computers can be a problem area if they go down (bring their hosted services down with them) or if they are performing too slowly. SmartSite addresses the people problems by defining redundant processes for accomplishing tasks and extending communication between coworkers. SmartSite takes care of the services' issues by laying them out logically, and adding intelligence to redirect themselves to use redundant dependent services. Finally, SmartSite tackles the computer problem using clustering technologies and balancing the loads over many separate, specialized computers.

Makes it Simpler to Scale Up

Growing the network in response to business growth can be a painful process. As the user and service population grow without clear ties to business processes, it can be difficult to justify the costs of seemingly continuous upgrades. Likewise, if users are accustomed to getting services from a specific computer and the service needs to be moved, the users then are confronted with learning new ways to do old tasks. Finally, where the money should be spent can be difficult for Network Managers to decide if faced with a complex, tangled system. As a business transits processes and technology from the network towards SmartSite, many of these issues are resolved.

SmartSite provides a direct cost justification for scaling up. SmartSite framework shows a clear relationship between the business process and the services that support it. This clarity sets guidelines for the business's Decision Makers and Network Managers to construct a formula that calculates how many users in each business process can be supported by the infrastructure. Each business process has several supporting services, and each service has associated hardware and software costs. Since these costs are stated, Decision Makers are better informed to plan out processes to make or save money in equal or excess to the otherwise "hidden" information technology infrastructure costs. As a side benefit, these guidelines allow businesses to start out with a modest investment, test and refine processes, and then scale successful processes up.

SmartSite framework reduces the strain on users when scaling up services. The user interacts with a few primary interfaces, which serve to deliver network services. This delivery mechanism abstracts the services from the hosting computers. If the service is moved to another computer, the user is completely oblivious to the move. In this fashion, services are free to float from computer to computer, running on whichever computer has the lowest load and offers the greatest performance. The name of the service never changes, and only the service is responsible to keep track of the hosting computer.

The floating of services over a bank of host computers leads to questions about when and where to place hardware upgrades. To address these questions, SmartSite framework provides for monitoring and performance tracking. This resource monitoring assists Network Managers in making informed decisions about when and where to invest in more technology. Much as growth in a manufacturing business would require periodic, measured purchases of better equipment, so too would a SmartSite business require periodic, measured purchases of information technology. The difference between typical businesses and SmartSite businesses is that this growth is in a sustained fashion aligned with business goals and that it is performed in a more informed fashion because of the resource monitoring technology. The money can then be better planned, better spent, and provide better returns.

What is the SmartSite Framework

The SmartSite framework that makes all of this possible is fundamentally very simple. There are three main layers: Business Processes, Logical Services, and Physical Hosts. As we move down the layers, we travel from the people, to the service, to the hosting computers. This section will look at each layer briefly to show the relationship between them. Later, we will go into more detail about each individual layer.

The Business Process Layer defines the specific process that the people will be following to accomplish the business's task. We define the layer by using the business's standard practices and incorporate two extensions. First, it is extended so that the dependent computer services required for each task are defined in the business process itself. This allows Decision Makers to identify and define what information technology is required. The second way it is extended from conventional business process is that it is overhauled to make it more fault resilient. If the primary person who fulfills this task is suddenly unavailable, who is the backup? How will the primary person's knowledge of how to use the system be shared with the backup person? Questions such as these must be asked, answered, and incorporated into this layer.

The Logical Services layer then takes the top-level services required by the Business Processes layer and defines them within the context of the computer network. In addition to the top-level services, supporting services that are necessary for the services defined in the Business Processes but not evident to the user (such as management and monitoring systems) are defined. All of these services are displayed on a logical map where they are classified into sections with the relationships between them labeled. Network Managers will use this logical map for maintaining and troubleshooting the network. The logical sections are:

- Client Section
- Interface Section
- Application Section
- Transaction Section
- Storage Section
- Management Section

Once we have defined and categorized the services, the computers that host the services are documented in the Physical Hosts layer. This layer is similar in fashion to the network diagrams that are often in use today. The layer displays the applications, operating system, and hardware platform of all computers within the SmartSite. Furthermore, the Physical Hosts layer displays the network infrastructure that supports communication between the computers. The main way the Physical Hosts layer differs

from existing network diagrams is that it directly displays the services from the Logical Services layer each computer is hosting and capable of hosting. Additionally, the Physical Hosts layer is overhauled with the intention of improving fault resilience. Questions such as what happens if this computer goes down, what are the backups, and can the services be moved without disrupting the user, all must be asked, answered, and documented in this layer.

The SmartSite framework aims to integrate people with technology, to improve the ability to deploy new services, make the network dependable, and make it simpler to scale the network up to support more users. Therefore, the framework must have three layers: one for people, one for services, and one for computers. People interact on the Business Processes layer fulfilling tasks and accomplishing work. Services interact on the Logical Services layer, enabling people to fulfill the process. Computers interact on the Physical Hosts layer, providing services to perform their function. Each layer is designed with a focus on integration and fault resilience.

SmartSite Framework In-Depth

Business Process Layer

The Business Process layer defines the business process that the users will be following to fulfill a task. We compose the Business Process layer using standard business practices. Where it differs is that the dependent computer services required for each task are defined in the business process itself. The Business Process layer is used by Decision Makers to identify and define required information technology. Moreover, the Business Process layer is designed to improve fault resilience.

The Business Process layer is created using the business's existing practices. Creating a business process to plan workflow and determine objectives has long been a part of business. Decision Makers are already in possession of the skills for creating such plans. The Business Process layer leverages what Decision Makers already know to perform the new task of integrating within SmartSite.

Where traditional business processes and SmartSite Business Processes differ is that the dependent computer services required for each task are defined in the business process itself. For instance, a traditional process may say that clerks will check the customer information and greet the customers accordingly. SmartSite Business Processes would say that the clerk would use the terminal to check the web user interface for the customer information and greet the customer.

By demonstrating the services within the processes, Network Managers and Decision Makers have a better understanding. This provides Network Managers a top level of crucial services for the process to be accomplished. These top level services are then further defined, along with supporting services, within the Logical Services layer. Decision Makers can identify and define what information technology is required. Because the rest of the SmartSite supports the business process, Decision Makers can have a simple formula for calculating the cost of any SmartSite enabled business process; x users = y servers = z dollars formula. Therefore, they can make better-informed decisions about the cost of the processes themselves.

The second way this differs from conventional business processes is that it is overhauled with the view of how to make it more fault resilient. Each function within the business process is looked at to see how it should be performed if the person becomes unavailable. Likewise, how the task can be fulfilled if the services become unavailable. In this fashion, secondary top level services can be defined. For instance, if a report is generated nightly from accounting software and the software service is unavailable, it can be created manually by reviewing daily records from a separate system. Thus, two services are required for the business process, one for the accounting package and one for the daily records reporting.

The Business Process layer specifies who completes the task, how work gets accomplished, and the services required. The Business Processes layer must at all times consider and plan for what happens if the person or service should become unavailable. At no point should it detail the services other than in a generic fashion, i.e. Accounting software. These top level services can then be detailed along with any required supporting services in the Logical Services layer.

Logical Services Layer

The Logical Services Layer then takes the top-level services required by the Business Processes and defines them within the context of the computer network. The supporting services that are necessary for the top-level services such as management and monitoring systems are also defined in the Logical Services Layer. All services are then broken out into sections, with the relationships labeled. These sections are:

- Client Section
- Interface Section
- Application Section
- Transaction Section
- Storage Section
- Management Section

The individual services in these sections all share common design themes that address how they should interact with the computers that access and host them. First, we will be looking at these themes. Next, we will be discussing each of the Logical Services sections in depth.

Common Logical Service Design Themes

There are several common themes that the individual services in the Logical Services Layer follow. All services must account for differences in the computer access and hosting devices such as performance, footprint, screen format, bandwidth capacity, and other factors. If the service cannot, then at a bare minimum the service must support the ability to separate the presentation and create multiple interfaces. Alternative services should be looked at if neither of these requirements are met.

Services should provide:

- Per-device and per-connection personalization
- Content customization
- Distributed adaptation
- Modular architecture
- Scalability
- Integration with industry-standard technologies

Services should provide personalization on a per-device and per-connection basis. Services that directly interact with computer access devices should provide content in the form and by the performance mode that best suits the access device. Services running on computer hosting devices should tune themselves around the available computing capacity and performance of their host. Ideally, services will have additional intelligence for detecting the connection's bandwidth and tailoring the service levels to fit the connection to either other services or access devices.

Likewise, content should be adaptable for each type of computer access or hosting device. For instance, services ought to have adaptation rules that lower the quality of content served to bandwidth-limited devices, and serving higher-quality content to higher-capacity devices. This would add the capability of adjusting graphic resolution according to the resolution capabilities, and the pre-set rules, of a given application and device.

More and more services will provide and be selected for distributed adaptation. Distributed adaptation permits content adaptation and processing to take place on the computer host closest to the access device. Such adaptation has the dual benefit of distributing the computing load and improving the network speed. The load is distributed to the closest host and therefore over many different computing devices. Since adaptation typically produces a slimmed-down version of the original content, the resulting network traffic is smaller, and can travel quickly to the computer access device.

Services with modular architecture are those that can separate their functions over several computer hosts. One of the design goals of SmartSite is to allow growth in the Business Process Layer to easily translate down to added servers in the Physical Hosts layer. A modular architecture fulfills this goal, enabling businesses to start with a modest SmartSite infrastructure, and then expand in an on demand fashion. Services with modular architecture are inherently scalable.

With or without a modular architecture, services must provide a level of scalability. The services must be capable of scaling quickly to take on more applications, more services, or more users. Often, these may happen at the same time, because the SmartSite, along with the many devices that populate it, forms a highly dynamic environment.

Ease of implementation and rapid development, significant success factors in the deployment of any service, is gained from having the services communicate with industry-standard protocols. By adhering to standards, the services can easily integrate with the existing infrastructure. Additionally, Network Managers will not have to learn new protocols or technologies to manage the services. The service should communicate within the existing infrastructure as cleanly as possible and be as cross-platform as possible. This way, the new services will maximize existing infrastructure investments.

Many services run on hosts with operating system level load balancing and fail over mechanisms that we can utilize to further enhance the scalability and Fault Resilience. Services are selected on the basis of load balancing, Fault Resilience, and ease-of-use.

Define Load Balancing

Load balancing is distributing the load over many hosts. Examples are round robin, weight based, and monitor based. Computers capable of hosting the services are grouped into clusters. Each computer within the cluster shares information about the services and about the status of each other.

With round robin, new requests for services are directed to the next host in a cluster, one after another. If three requests come in for a service running on two clustered computers, the first request goes to the first computer, the second to the second computer, and then the final request goes back to the first computer. The downside of round robin load balancing is that if the computers have differences in their hosting capabilities. If computer one has only a half of the capacity as computer two, then requests for services that are fulfilled by computer one will be significantly slower.

Weight based load balancing addresses this concern by assigning weights to the computers that represent their hosting capabilities. Requests for services are assigned to the computer with the lowest weighted value. This way the requests are more evenly distributed among the computing capacity of the cluster as a whole. However, neither round robin nor weight based load balancing address what happens if the request for services is uneven.

Monitor based load balance share information about the host computers capabilities as they are at the moment of the request. Similar to weight based, requests are assigned to the computer with the lowest in use capabilities. Unlike weight based or round robin, it is targeted to the actual capabilities of the host at that moment.

Define Fault Resilience

Fault Resilience is the term used to describe the service's ability to continue running in the face of one or more failures. There are two main types of Fault Resilience solutions: fail-over and fail-down.

In fail-over solutions, the service can go down on one host. When it goes down, another host will notice this and pick it up. Thus, the service is still running although on a different host computer. This is why it is referred to as fail over because it moves over to a different location.

In fail-down solutions, the service can cease working and a different service enables it to keep working. In this scenario, the service itself is unavailable however the backend information or content is still available using a secondary means. In other words, the service level is downgraded without failing altogether.

To illustrate these two points, let us use the metaphor of going to the bank. Every Friday you go to the bank to deposit your check. Then one Friday, your bank is closed. Thus, you are now in a fail mode. If you choose to drive to another branch of your bank, then you are failing over. If instead of going to another bank, you use the ATM although you know it takes longer for your deposit to post to your account, you have failed down.

Now what happens when your primary bank is open again? This is termed fail-back. When a service becomes available on it's primary host and is deemed fully functional, the service has moved back online.

To implement a fault resilience SmartSite, it is important to understand how the individual services fail and how they recover. Ideally, this understanding leads to implementation of the services with both fail-over and fail-down systems to ensure maximum up time.

Summary

Ideally, all services detailed in the Logical Services layer will support device personalization, content customization, distributed adaptation, modular architecture, scalability and industry-standard protocol technologies. Additionally, the services should have a means for load balancing and fault resilience. Frankly, most existing services will not meet all of these design theme criteria. The important thing to do when identifying the services and categorizing the services in the Logical Services layer is to look at all of these themes and see if there are other services available that can perform similar functions while meeting more of these design themes.

Client Section

The Client Section describes the software and hardware necessary to provide access to the SmartSite services. This section is primarily concerned with three aspects: who the user is, what the device is, and how the device is connecting.

On first blush, the "who the user is" question is deceptively simple. The user is typically thought of as an employee working with the services. However, with the recent explosion of the Internet, intranets, and extranets has resulted in multiple definitions of "user". In the SmartSite environment, we classify as user as an individual accessing a network

service. This definition includes but is not limited to in-house employees, telecommuting employees, and remote employees. It can include the businesses' partners, vendors, suppliers, clients, and customers. Finally, we must remember that we classify SmartSite managers as users, albeit a unique class of users.

The next aspect of the Client Section is the local access device (LAD). In traditional client-server networks, the local access device was a desktop computer. This computer and the host computer divided the network processing. This meant managers had to upgrade or replace the desktop computers as they updated or added network services. This added cost. With SmartSite, we spread the services out over the network sections. The access device requires only enough computing power to display the Interface and the Applications. The client-server model meant we were constantly replacing the desktop computers. If you have a 500 desktop environment, this is a $1,000,000 investment every 3 years if you only spend $2,000 per computer.

Therefore, we can replace standard desktop computers with computers with thinner computing power. The shape of these devices can vary dramatically. The term "thin client" refers to local access devices that mimic desktop computers but lack the ability to perform as stand alone devices. The other area of growth is in pocket and hand held computers. So called Personal Digital Assistants (PDA) have a small enough size to be carried in ones pocket while containing enough computing power to access the SmartSite services. Finally, telephones, including mobile, can provide access to SmartSite services. Therefore, the SmartSite provide service regardless of local access device differences in performance, footprint, screen format, and bandwidth capacity.

Once we have the user, and the user has an access device, the final aspect is the connection. Network software began with the sharing of files and printers within the local area network (LAN) using a client-host framework. That evolved into the wide area network (WAN) that spanned multiple buildings and campuses. The growth of the Internet led to the virtual private network (VPN) that provides a WAN-like connection by creating a private tunnel within the public Internet. LANs, WANs, and VPNs all require a wired connection. With the growth of handheld, pocket computers, and mobile phones have again extended the network to include wireless connections. Therefore, the SmartSite must provide services to one or more of the following connections: wired and wireless LAN, WAN, VPN. For more information, please refer to the Connection Sub-section section.

The Client Section is comprised of the User, the LAD, and the Connection. This section allows SmartSite to support employees, partners, and customers accessing from intranets, extranets, and the Internet. Once the user's LAD has made the connection into the SmartSite it communicates with the appropriate Interface to provide services. In the next section we will detail this process further.

Interface Section

The responsibility of the services within the Interface Section is to provide a top-level user environment. These services determine the Client Section state (i.e. who the user is, what the device is, and how the device is connecting) and tailor the delivery of pointers to the Application Section services that the user has access to, and that the device is capable of displaying over the network connection. We recommend and design Interface Section services to support as many different platforms as possible as they will interact with the largest number of operating systems and devices. It is important that services at this section detect access device capacity for performance, screen format, bandwidth, and processing. The Interface section can then provide this information to the Application Section services as needed.

Services also should allow for users to set preferences in regards to the services. Such preferences may include but are not limited to: order displayed, color and size of the display, color, background images, and font sizes for the display.

The best user interfaces have an intuitive environment that requires little training-the SmartSite user's tasks are too significant to accommodate an extensive learning curve. This includes both audio and visual interfaces.

Interface Section services provide the top-level user environment. For example of other user environments, let us look at a popular desktop operating systems. Microsoft's Windows series of operating systems all contain graphical user interfaces that provide user environments. Windows XP, for example, contains a desktop with a start menu. The start menu allows users to select from a variety of Applications. Once a user launches an Application, the user can move it around the desktop, resize it, close it, and launch others.

This is environment is what is meant by a User Interface (UI). While on a desktop UI, users are limited to the Applications contained within the desktop computer. With SmartSite, we aim to make the network the desktop. Therefore, the user interface must be capable of integrating the network services as Applications. Moreover, it must provide these based on the users rights to the system. In this fashion, a user that is a manager will see management tools while a user that is in human resources will see application services that are required for that position.

Taking it one step further, the application services must be customized around the abilities of the local access device. For example, an application service requiring a full color graphics would be available only on devices with full color screens. We may deliver a substitute Application service to support devices with black and white screens. The key to this ability is that the Application services are communicating with central data repositories, making it possible to deliver the service in multiple formats. To support the many Application service formats, the Interface service must be as cross-platform as possible. For this reason, we recommend three primary formats: graphical user interfaces (GUIs), web user interfaces (WUIs), and voice user interfaces (VUIs).

SmartSite can support graphical user interfaces (GUIs) provided they run as a terminal session on the local access device. The term "terminal session" refers to a instance of the interface running on the LAD simulating the terminal access. Having terminal access is what happens when the user is actually at the terminal or computer screen itself. The important aspect of using GUIs is they must be able be personalized around the user, customized around the device, and optimized for the connection. Another key sentence is that the UI's must all be "personalized around the user, customized around the device, and optimized for the connection."

Unfortunately, many GUIs rely too much on the operating system and device, and therefore are unsuitable for the heavy burden the SmartSite places on them. They must have the ability to be displayed on virtually any type of access device, as well as run on virtually any type of connection. The one format that is optimized for such a task is the World Wide Web. The creators of the Web designed it for graphical display of information to many devices over the Internet. The Internet is the largest and most varied network (in terms of devices and connections) in mankind's history. Therefore, it probably goes without saying that using Web technology at the Interface Section works the best.

Such Web user interfaces (WUIs) provide the best support for Interface Section services. Users connect up and have the WUI delivered to their LAD where it shares in the processing of the display. This shared processing results in decreased overhead than comparable GUIs providing terminal sessions. Once displayed, the user can click on the Application Section pointers to launch the Application services. Here too, WUIs have a definite advantage.

When a user activates an Application Section pointer, the pointer first performs a search for the service. In this fashion, Service pointers promote load balancing. Network load balancing refers a two step process. First, we spread the service processing over two or more hosts. Secondly, we balance this spread so that each host is fulfilling roughly the same amount of processing. Users can use one service pointer to access the Application service. The pointer then determines which host within the load balanced cluster will provide the best performance and then make the connection for the service on that host. Furthermore, if a host fails or is taken offline for upgrades, testing, or maintenance, it does not respond to the Service pointer. Then the pointer automatically updates the WUI and future service connections are redistributed.

After the service pointer has performed a search for the service, it queries the Application service to validate that it is operational, available, and ready. If it is, then the pointer launches the Application service and the WUI displays it for user interaction. If it is not, then the pointer can seek out the next service. This enables Application fail-over and fail-down (for more information please see SmartSite Services section). Here again, GUIs unfortunately do not allow for this level of service. Instead of cleanly failing over or down, the pointer to the Application service would provide a user with a cryptic error message.

As we have stated, using a WUI provides superior service in the Interface Section. Their use distributes services over several hosts to improve their performance and reliability. If they are unavailable, the service pointer can search out replacements allowing services to degrade gracefully rather than fail altogether. However, not all devices that we wish to provide service to are web enabled. One obvious example is the telephone. Web content is, by it's very nature, visual. Telephone calls are by nature audio. Therefore, to provide services verbally another interface is required.

Voice User Interfaces (VUIs) provide the environment that enables users to navigate Audio Application services and set preferences. VUIs have been around for many years in one format or another. A common albeit crude example is the voice menus many companies use for their directories. Clearly, VUI cannot replace the GUI or WUI, but are an important extension nonetheless. Providing and audio component clearly augments certain Application services, such as Voicemail, Email, and calendar scheduling.

An appropriate summary would be that either one GUI or WUI could take the place of the visual environment. One or more VUI could be deployed to provide audio access to services as well. To further complicate matters, certain GUIs or WUIs have device requirements. For example, Microsoft Windows Terminal Services GUI will only run on devices running the Microsoft Windows operating system. Additionally, as WUIs rely on the web browser for interpretation, some WUIs may require specific web browsers. For example, Microsoft Digital Dashboard WUI will only run on devices running Microsoft Internet Explorer. Therefore, more than one GUI or WUI may be placed in the Interface Section depending upon the devices that we wish to provide access to. We refer to LADs capable of running a GUI or WUI as Native supported devices. LADs that require a terminal session for the UI, we term Session supported.

Once you have identified the Interface Section services you then move them into the framework. The Client Connection Sub-Section plays a part in this if you are setting up different levels of service using several UIs. For example, an audio VUI must be connected to a Client Telephone Gateway to indicate that the company is supporting a gateway for telephones to call into.

The Interface Connection Sub-Section is only necessary if the Interface service does not directly route requests to the Application services over a local area network. If the Application section services are located on hosts in different buildings, we will employ a WAN or VPN Connection service. Likewise, some UIs may provide access to a limited number of Application services and require security. An example of this would be a company providing a WUI for its customers to order and track products. They would come into the Interface Section WUI, and we would route them through a Firewall service to specific Application Section services for ordering and tracking.

Also, remember that SmartSite is a distributed processing network. It leverages the desktop CPU by offloading tasks that hosts normally perform. The SmartSite Interface determines the capacity of the local access device. SmartSite's identify LADs with plenty of horse power, such as a desktop PC, send more tasks to perform. Such tasks could include performing all element requests, resolving relationships between data elements, executing business logic associated with elements and rendering tasks in real time. It would do this by performing HTTP requests to retrieve information from the Application Section services. As these services query the Transaction Section data sources, the LAD would never have access to proprietary information.

The Interface Section is comprised of one or more UIs and the Connection. This section allows SmartSite to support the various LADs connecting up for service. Once the user's LAD has made the connection into the SmartSite it communicates with the appropriate Interface, which in turn delivers pointers to Application Section services. These service pointers facilitate load balancing and Fault Resilience. In the next section we will detail what occurs when users activate these pointers.

Application Section

SmartSite Application integration is non-intrusive technology because it does not require modification of existing applications. You do not need to recode Windows programs to run in a SmartSite. You would just install them on a Citrix MetaFrame server. Application Section services must adapt their interfaces to take into account device differences in performance, footprint, screen format, bandwidth capacity, and other factors. User experiences will be negative if the service takes a one-size fits all approach. This information will often be provided by Interface Section services. Application Section services also maintain security to ensure users access only authorized content by taking advantage of the security features inherent in the respective service.

Bridge Service

Bridge Services take content from created using a proprietary device and application create a bridge to other viewers and devices. Example would be Adobe's distiller. With it, you can take an application written in just about anything and convert it into a PDF. Then, the reader installed on the device, be it PDA or desktop computer, can read that PDF without the original application. Functions of Bridge Services include:

- Retrieve content in it's native format
- Convert content into a browser readable format that can be viewed without the native application that created the content
- Display and manipulate imaged content

- Retrieve version information
- Retrieve previous versions of content
- Retrieve content state information, such as checkout status, mime type, security settings, retention periods, etc.
- Navigation of repository-managed folder hierarchies and taxonomies

Knowledge Management File Services

Knowledge Management (KM) File Services provide content and document management capabilities including: imaging, report management, product data management, and web content management. This is a subset of KM that pertains directly to files such as word documents, spreadsheets, and web pages. This is especially important when taken in the context of servicing employees, suppliers, and customers with virtually an endless number of access devices.

KM File Service displays documents without using native content applications and viewers. The service translates the content into a format the access device can display, including web and audio formats. The key features are that it can translate from one-to-many, and that it can translate on demand. This enables deployment of content-based solutions in true thin client environments without requiring vendor-specific client software or viewers.

Additional functions include:

- Update system and custom properties
- Check-out and check-in content
- View and update version information
- Delete content
- Create, update and delete hierarchical folders within a repository
- Copy and move content between repositories (including disparate repositories) preserving the native content and the content properties

Transaction Section

Services at this section receive network requests and transact those requests onto physical resources. Examples include print requests to network printers, email requests to email servers, file save requests to file storage systems, and database queries to data sources. Transaction Section services must meet two criteria; support a variety of interfaces and fault resilience.

First, support a wide variety of interfaces to the Application and Management Sections. This is crucial for establishing the fault resilience of the network. An example would be email systems with both Windows clients and web clients. If the Windows program becomes unavailable, the service can fail down to the web-based client.

Secondly, Transaction Section services need to be setup to support load distribution and fail overs. Again, this is to further fault resilience. A network attached printer with two print servers pointing to it would be an example of this. That way, if either print server fails, the SmartSite can continue the transaction on the other one.

File Storage Services

File Storage Services provide shared stores for virtually any type of data such as documents, e-mail, contacts, threaded discussions, and multimedia files. It provides this storage without the strict structural requirements of typical relational Data Sources. Without structural mandates, File Storage often relies on a complex taxonomy. This

taxonomy serves to group related files and users into ordered groups or categories, and then express these categories in folders. For example, employees with folders for their documents would have that folder be in a structure as so:

Employees
    Home Folders
        johnsmith
        jamesgreen

File Storage Service primary role, then, is to classify files into an ordered system that indicates natural relationships. Once stored, the next role of this service is to determine rights to the contents by integrating with Management Section services. The final role is to provide access to Application Section and Interface Section services. For example, a WUI at the Interface Section could launch a web browser to the file system, thus allowing users to download files to their LADs. This role is key to allowing user's files to be accessible across multiple systems. The File Storage Service can then automatically and intelligently update files are across all systems through any SmartSite connection.

Data Source Service

The primary ability that Data Sources bring to the SmartSite is the ability to collect and store massive amounts of data from a wide variety of sources in central locations. Data Sources provide storage for structured and semi-structured information. The foundations of these services are reliable, scalable, high-performance relational databases. Preferably, the databases will support industry standard interfaces to the Application Section services, such as Web based (HTTP/XML), Windows based (ODBC), and query based (SQL).

Data Sources can enable SmartSite to recognize and predict trends, make accurate decisions about key business issues, and improve supply chain and customer relations. This is achieved through analysis services, data mining, and closed loop capabilities. From a data management and analysis perspective, it is critical to turn raw data into business intelligence and take full advantage of opportunities. Additional Data Source Service requirements include:

- Performance, scalability, and reliability
- Query interfaces such as Structured Query Language (SQL)
- User and Self tuning and debugging
- Provide support for Extensible Markup Language (XML)
- Provide management and analysis tools compatible with the primary Interface Section service (i.e. web based if the Interface is a WUI)

Transformation Service

The Transformation Services provide a critical component of information integration. Data sources store records in many different formats. To implement an Application Section interaction underlying data sources require transformation into standard data types and formats. The most straightforward transformations are those applied to tables and fields such as renaming. For example, one data source may store the customer name as three fields (First_Name, Middle_Name, and Last_Name) and another two (First, Last). The Transformation Service would provide this data to the Application Section by integrating the two (First_Name = First, Middle_Name = "", Last_Name = Last). Additional Transformation Service functions include:

- Maintain a mapping table with the data source definitions mapped to the data destination definitions
- Date and measurement conversion, such as from feet into meters
- Product codes conversion into internal codes or product names
- Allow the creation of user-defined transformations
- Legacy data can be identified and transformed for use in new applications without encumbering new application
- Facilitate data migration from legacy systems to new data sources
- Foster a controlled and managed environment
- Perform data quality control and assurance
- Provide input control and error handling

Storage Section
Storage Section services provides back end storage for the services in the Interface, Application, and Transaction Section. One often confused point is the difference between File Storage Services in the Transaction Section and Storage Section services here. To clear this up, let me make use of the desktop computer for an example. The computer manufacturer installs the operating system on a logical partition that exists on a physical hard disk drive. Take the task of opening, editing, and saving a document using Word on a Windows PC. You start Explorer (Application Section) in the Windows Desktop (Interface Section: GUI), and browse the My Documents folder (Transaction Section: File Storage Services) for the file. When you double click on the file, Microsoft Word (Application Section) starts, and calls the file from the file system. The file system (Transaction Section: File Storage Services) then reads the file by assembling it from the bytes on the hard disk drive (Storage Section).

Like a hard disk drive, a Storage Section service provides the physical storage to the upper SmartSite sections. The following are all considered Storage Section services:

- Network Attached Storage (NAS)
- Storage Area Networks (SAN)
- Tape libraries and archives
- CD jukeboxes
- Backup systems

Management Section
Management systems are needed in order to guarantee reliability, availability, and performance of distributed software applications. One of the important requirements for a management system is that it should be easy to develop, so that developers do not spend an inordinate amount of time making their applications manageable. Also, management systems should be based on open management standards, providing standard interfaces to enable the development of plug and play management applications, something of utmost importance in today's multi-vendor environment.

The Management Section goals involve avoiding administrative complexity.

Directory

The Directory provides user authentication and authorization services and is the foundation for capturing, storing, organizing, and leveraging important identity information. It is a crucial variable in the "simple to administrate" goal and perhaps the most crucial service of the SmartSite.

Directory-enabled services also create secure, customized relationships between the SmartSite and customers, partners, and supplier networks. Users can securely populate customer-accessible directories. Partners can directly communicate with and update each other's directories. Suppliers can immediately know when and how much to ship.

Ideally, SmartSite employs directories based on the x.500 standard. This standard defines the use of specific objects organized in a tree structure. For instance, we can divide users into Employees, Partners, Customers, and Suppliers. If the user were a customer, his or her user object would be within the Customers container.

As you can see, SmartSite uses the Directory to directly translate the User and Role of the Business Process Partition into User Objects and Group Objects. Once this is accomplished, SmartSite administrators can set privileges, assign Application Section services, and administrate their environments.

The Directory serves as the consolidation point for isolating, migrating, centrally managing, and reducing the number of network management systems. The Directory allows administrators to centrally manage and share information on network resources and users while acting as the central authority for network security.

x.500 based directories are inherently fault resilient. Vendors design them in a distributed manner, with object and tree information replicated to many hosts. This design allows for full functionality in the face of multiple failures. Additionally, the distributed design promotes scalability. As a department grows, administrators divided and subdivided the objects into increasingly specific containers.

Monitors

To linearly scale network services, administrators require information about the performance of each service. This allows them to make critical judgments of when and where to make improvements. Monitors provide objective performance data by tracking user and service interaction in real time. All information gathered is then prepared into reports and delivered to the administrators as an Application Section service.

A derivative of overall performance, system load monitoring looks at the SmartSite from a user's point of view. These Monitors are responsible for user satisfaction by tracking the entire infrastructure to ensure optimal performance. At its most basic, the Monitors alert administrators of slow downs and overloaded hosts. In advanced SmartSite deployments, Monitors may also turn on or off physical hosts in response to user demand.

Monitors providing problem detection report failures in real-time, from the perspectives of the service and the user. Early notification of problems ensures the scalability and reliability of business-critical services and is key in guaranteeing maximum uptime. In addition, instant detection improves the Network Managers' abilities because problems are identified when they are relatively easy and inexpensive to f

Connection Sub-Section

Network software began with the sharing of files and printers within the local area network (LAN) using a client-host framework. That evolved into the wide area network (WAN) that spanned multiple buildings and campuses. The growth of the Internet led to the virtual private network (VPN) that provides a WAN-like connection by creating a private tunnel within the public Internet. LANs, WANs, and VPNs all require a wired connection. With the growth of handheld, pocket computers, and mobile phones have again extended the network to include wireless connections. Therefore, the SmartSite must provide services to one or more of the following connections: wired and wireless LAN, WAN, VPN.

In this fashion, the goal of the Connection sub-section is to connect the host section onto the next Section's local area network containing the desired service. For brevity, we leave off the local area connection service box as we know that this is the final connection between the services.

The LADs that support wired LAN connections (i.e. desktop and notebook computers, and thin clients) connect directly into the Local Area Network and therefore the next SmartSite section. The LADs that require a wireless connection (i.e. handheld and pocket computers) connect first into a wireless LAN service that routes them onto the LAN. LADs that are present in remote facilities connecting via a WAN first route to that service and then onto the LAN. Remote users that access the SmartSite via dial-up connections first dial into the Dial-up Network service and then are routed onto the LAN. Users that require a secure connection over the Internet would pass through the Internet Gateway service, onto the Virtual Private Network to establish a secure tunnel. This tunnel then allows the LAD to behave as if it is connected to the LAN. Other users, such as customers, can access services such as the public web site via the Internet Gateway directly to the LAN. Users with telephones can call specialized services by connecting first to a telephone gateway.

Physical Hosts Layer

The computers that host the services are documented in the Physical Hosts layer. The Physical Hosts layer displays the applications, operating system, and hardware platform of all computers within the SmartSite. Moreover, the Physical Hosts layer displays the network infrastructure that supports communication between the computers. In addition, the Physical Hosts layer is designed to improve fault resilience. Design concerns such as what happens if this computer goes down, what are the backups, and/or can the services be moved without disrupting the user are addressed at this layer.

Ideally, SmartSite Business Processes and Logical Services should be defined independently of specific software packages. This creates the highest level of flexibility. The Physical Hosts Layer then details the exact hardware and software required for the services. For instance, a business process may be that a clerk checks a screen for customers. The Logical Services would define an access device, a user interface, and an application to show customer information. The Physical Hosts could then define an IBM Thin Client running Microsoft Windows CE, connecting to the Computers & Concepts Checkerboard WUI and displaying information.

While on a basic level, the SmartSite Logical Services > Connection section details the requirements for connectivity, the Physical Hosts layer specifically details how that connectivity is accomplished. Revisiting the metaphor of the clerk checking the terminal, the Physical Hosts layer would show how the terminal was connected back to the central office.

Ideally, if more processing power is needed the Network Manager simply connects a new hosting computer and the performance of the system as a whole improves. This allows for a simple formula for calculating the cost of any SmartSite enabled business process: x users = y servers = z dollars formula. Decision Makers can make better informed decisions about the costs of business processes and Network Managers can have targeted funds for maintaining the equipment.

Computers & Concepts selects operating systems and programs for their ability to perform in a cluster at this level. In general, the goal of a cluster is to make it possible to share a computing load over several computers without either the Network Managers or the users needing to know that more than one computer is involved. If any computer, hardware, or software fails, the user may see degraded performance but will not lose access to the service.

The Physical Hosts layer also defines basic requirements for functional services. Consider that the Physical Hosts Layer is a working AC outlet with a suitable ambient environment for the product under test. Without that, of course, no service works. The ability to withstand environmental problems is important. The Physical Hosts layer details uninterruptible power supplies (UPS) and high-reliability infrastructure.

What happens if a computer goes down is covered in the Physical Hosts layer. Selection of operating systems, for example Microsoft Windows Clustering or Novell Clustering Services, can address these concerns. Technology such as these make it possible for services to fail over, in effect jumping from hosting computer to hosting computer. If such technology is not available, Computers & Concepts can detail Logical Services layer backup services and detail Physical Hosts layer computers for running them.

Data backup and disaster recovery procedures are also detailed in this layer. As these are related to the physical computers themselves, it makes sense to show them here. The Physical Hosts Layer shows how the backups are performed and stored, what happens if a facility is unavailable, and how to recover from emergencies.

On each computer within the Physical Hosts layer, Computers & Concepts looks at where it's services will run if it is unavailable, how those services will fail over, and fail back. We also weigh the cost of additional host computers against the cost of down time to the Business Process.

The Physical Hosts layer documents all information related to the physical computers within the SmartSite. It displays information such as operating systems, applications, and the hardware itself. The Physical Hosts also illustrates the infrastructure for the computers to communicate over. Finally, the Physical Hosts layer addresses concerns about failed hardware and provides the ability to build in more fault resilience.

SmartSite Method

Remember, SmartSite is a combination of two components: a business framework and a method for implementing that framework. The method is to migrate the information technology from the current client server model toward the framework.

The past experiences of some companies with large scale restructuring and revolutionary reorganization have led to painful lessons. The complexities of managing projects at such a large scale can lead to missed deadlines and lack of quality. Furthermore, even if the deadline was met and the quality was above average, the users' perceived value was often low because of the length of time it took to complete extensive projects.

Computers & Concepts has learned from these past lessons and developed methods for better project management. Computers & Concepts concentrates on these smaller, manageable, tactical projects. We break the entire business down into smaller projects using a systematic approach to accomplish strategic goals for the business. Deploying SmartSite technology to accomplish a specific process for the business is the tactical project. The strategic long term project is to apply SmartSite technology to all the business's processes.

Computers & Concepts breaks a business down into several smaller units and applies SmartSite technology to these units one at a time. This method for applying SmartSite technology is repeated over and over until the business completes it's transformation into the SmartSite. This is the long term strategic objective. The rest of this section outlines the SmartSite method for managing the design and deployment of SmartSite to these units.

Design Principles

When designing each piece of SmartSite integration, Computers & Concepts keeps four principals in mind. We design for overall dependability. We focus on encouraging simplicity. We design for adaptability. Finally, we strive to have the SmartSite provide as many software features and functions as possible.

If users cannot rely on the SmartSite, then acceptance and use will at best be gradual. In order to achieve maximum results, the users must be able to trust the system to be available and functionable. Every component must have redundancy and fail over in each framework layer: Business Process, Logical Services, and Physical Hosts. More than any other design principle, dependability will determine the ultimate success or failure of the SmartSite.

Basic SmartSites are easier to use, talk, learn, design, and maintain. The less complex the user and Network Manager's tasks are, the better the user and Network Manager can perform. However, Computers & Concepts recognizes that more complex SmartSites can accomplish more features. Therefore, we may need to sacrifice some simplicity to accomplish the business goals. Added complexity must be continuously weighed against added features.

SmartSites must adapt to the changes in business processes and physical hosts. Change will affect the business, changes in markets, customers, and suppliers. Likewise, changes will occur in the technology. SmartSites must be flexible enough to handle shifting business processes, different operating systems, different versions of the same operating systems, and future changes in hardware and software.

SmartSites are originally designed to meet as many functions as the business requires (and some that it does not realize). The SmartSite can then be scaled to meet the above design goals. In other words, increase reliability by removing some functions, or simplify by removing some features as necessary. The reasoning is that it is better to say that we considered that feature but did not go ahead because of this or that than to say we did not consider it at all.

These are the guidelines Computers & Concepts focuses on at all times in the SmartSite design process. We aim to improve dependability of the processes and technology. We strive for simplicity in the design. We design for adaptability in the face of business and technology changes. Finally, we attempt to provide as many functions and features as possible without jeopardizing the other guidelines.

SmartSite Method at a Top Level

Each step follows the same design and deployment process. The process starts by identifying the Target Task. This is the task that the SmartSite will automate. The Target Task includes the primary business goal and existing business processes. The selection of this Target Task is crucial to the overall success of the SmartSite. Next, Computers & Concepts decides who is on the Design Team. This step consists of gathering a cross section of everyone in the business that will be affected by the Target Task's SmartSite business process. Then, Computers & Concepts performs a business and technical analysis with the Design Team. This analysis is limited in scope to the Target Task. What this means is that Computers & Concepts analyzes the products and customers limited to only the products and people within the Target Task.

After the Target Task is selected and the analysis has been completed, Computers & Concepts and the Design Team next work on the design phase for a fixed period of time. The fixed period of time is necessary because it takes time to nail down details and solidify the SmartSite design. After the review phase people should have a sense of what they do and do not like. Likewise, it may take a while to sell some people on the ideas. Therefore it is important to have a final cut off date as well as the ability to review until everyone approves.

Having completed the design phase, Computers & Concepts builds the SmartSite in a test environment using a pilot set of users. These users will be selected from both the people who took part in the design as well as people new to the system in order to get a picture of how easy it really is and whether it really makes sense. At this point, the design has the possibility of three outcomes: 1) approval process; 2) refinement and further pilots; 3) redesigning and returning to the beginning of this Method.

Once the pilot has been refined and approved, the final step in the SmartSite method is the deployment process. Once the SmartSite services have been deployed to the target area, Computers & Concepts starts the cycle anew. We return to identifying the Target Task stage. This method is repeated over and over until all business processes that can see a return on investment are turned into SmartSites.

SmartSite Methods In-Depth

Identify Target Task

The SmartSite process begins by identifying the Target Task. The Target Task is the specific business task that would benefit most from the SmartSite integration. Often times this initial task is dictated by the business to Computers & Concepts. Subsequent tasks are selected using several criteria including the business goal, who the users are, what the current number of systems are, what the current level of integration is, how quickly the SmartSite could be deployed, and what is the return on investment. Using these criteria ensures that the SmartSite will be designed and deployed around the Target Task that will see the quickest deployment, the highest perceived value (because of quick deploy time and level of integration) and the highest returns on investment. This is key to the SmartSite process because Computers & Concepts is able to build a relationship with the business by showing a series of successful integration. Then, as we approach the more difficult integration Target Tasks, Computers & Concepts has a relationship in place and a track record of success that helps smooth out any problems.

Computers & Concepts selects the top five Target Tasks and creates several Target Task sketches based on the criteria of the business goal, users, number of systems, level of integration is, speed of deployment, and return on investment. These Target Task sketches are rough and at the macro level. The Target Task sketches document who the primary and secondary users of the SmartSite will be, what their derived benefit is, how long it will take to deploy the SmartSite, and what the return on investment is.

Computers & Concepts then takes these five SmartSite Target Task sketches to the business Decision Makers to decide which Target Task the design should focus on. Computers & Concepts selects the Target Task based on which one offers the highest balance of user, benefit, speed and return. Ideally, the Target Task selected will have users that are influential in with their peers and in their departments. That way, when the project is successful these users can recommend and tout the benefits of SmartSite. The Target Task must be the one that offers the largest amount of direct benefits for the user, the Network Managers, and the business Decision Makers. Obtaining these benefits quickly is a priority because the longer it takes the lower the perceived value. Therefore, we select the Target Task that can be quickly turned into a SmartSite. Finally, this speed of deployment means sooner returns on investment.

By repeating this process of identifying several SmartSite Target Tasks, selecting the best candidate, and deploying it, Computers & Concepts gradually evolves the business's processes and technology toward a true SmartSite environment. Computers & Concepts selects the SmartSite integration based on which Target Task will be the most successful so that we can: a) learn the people and the environment to customize the procedure; b) build a relationship between Computers & Concepts and the business so as we move toward the most challenging integration pieces we can tackle them together; c) sell the SmartSite technology to the users from the inside, i.e. users who can tell other users how much better SmartSite makes their jobs.

Having selected the Target Task, Computers & Concepts then takes the corresponding SmartSite Target Task sketch and fills in all of the details. This becomes the SmartSite Design Statement, which details what we hope to accomplish and how we plan to get there. Computers & Concepts then moves on to selecting the Design Team, designing the SmartSite, selecting the Deployment Team, and deploying the SmartSite.

SmartSite Design Process

The design process entails selecting the Design Team, performing a detailed analysis, designing, and testing. Computers & Concepts selects the Design Team from people within the Target Task. We analyze the business's existing processes and technology that is performing the Target Task. Then, the Design Team creates and refines several potential SmartSites until either a consensus is reached on the best one or until a set date is reached. Finally, we set up a test environment where the SmartSite design is built and tested.

Who is on the Design Team

Before we can begin designing SmartSite, we must identify the people in the business that are involved in the design process and assemble them into a Design Team. As SmartSite design must integrate existing business processes and technology, the team must include input from Network Managers, employees, and customers that represent a cross section of the identified "user." This cross section is then categorized into five groups:

- Computers & Concepts' consultants
- Network Managers
- Primary User (Customer)
- Employees
- Decision Makers / Management

During the design process, Network Managers work hand in hand with Computers & Concepts' consultants to perform certain roles. Computers & Concepts interviews Network Managers to understand existing technology, infrastructure, and hosting computers. Computers & Concepts interviews Primary Users, Employees, and Decision Makers to determine their business, business objectives, and their concerns. Computers & Concepts also facilitates a collaborative design process by hosting one or more focus group sessions with members from each of the five groups.

The Network Managers consists of key personnel that will be in charge of designing and administering the SmartSite. Therefore, Network Managers must have authority over the design process and act as the primary representatives to Computers & Concepts. Although the exact number of people will vary, Network Managers should consist of a member from each branch of the Information Systems department including help desk, systems administrators, infrastructure groups, and application groups. Their roles are to introduce and coordinate Computers & Concepts' consultants with the other groups. One person from the Network Managers must have the authority to approve the SmartSite Logical Services Layer design at each stage of development. This person may be a member of the application group. Approval at each stage is essential for scrutiny throughout the design process and managerial support for the finished design. One person from the Network Managers must have the authority to approve the SmartSite Physical Hosts Layer at each development stage. This person may be a member of the infrastructure group.

The Employee Group consists of people throughout the business that are responsible for carrying out the Target Task, as it exists and how it will be. The skills for this group includes the ability to understand and communicate business needs for the Target Task they represent. It is not necessary for this group to have extensive computer knowledge.

The group should contain a handful of employees that are selected by the following criteria:

- Communication abilities
- Influence over others in and out of their departments
- Willingness to try something new
- High stress tolerance
- Basic computer skills

The Employee group will contain at least one person with the authority to approve the SmartSite Logical Services Layer / Interface design. This approval comes from the Employee Group, as they are the people who will interact with the Interface the most. Approval at each stage is essential for scrutiny throughout the design process and user support for the finished design.

The Employee group is responsible for communicating, performing business tasks, and interacting with Computers & Concepts' consultants. The Employee group must communicate business practices, needs and objectives to the consultants. The Employee group must communicate and work with the other groups in the focus group sessions. The Employee group must contribute and review the Interface design decisions. Finally, they must take part in the test environment as "beta testers."

The Decision Makers group is made up of management level personnel, many of whom are directly responsible for management decisions in the Target Task. The group should contain a handful of Decision Makers that are selected by the following criteria:

- Communication Abilities
- Influence over their own and other departments
- Willingness to try something new
- High stress tolerance
- Basic computer skills

The Decision Makers group is responsible for communicating, writing business processes, and interacting with Computers & Concepts' consultants. The Decision Makers group must communicate business processes, goals and objectives to the consultants. The group must communicate and work with the other groups in the focus group sessions. The Decision Makers group must perform realistic return on investment estimates including calculating the costs (in terms of SmartSite infrastructure) of each process. At least one member of the group must be responsible and have the authority to approve the SmartSite Business Processes Layer design. Finally, the group must take part in the test environment as "beta testers."

Analyze Business Processes and Technology

Computers & Concepts' consultants then perform an analysis of the business's existing processes and technology. This analysis is limited in scope to just those processes and computers within the Target Task. What this means is that when we take analysis of the products and customers, we limit them to only the products and people within the Target Task.

Next, Computers & Concepts implements a web user interface for communicating the design. If this is the first SmartSite Target Task that Computers & Concepts has implemented for the business, this means a new web user interface for SmartSite Logical Services Interface, and a collaboration application for SmartSite Logical Services

Application; otherwise, this will be delivered using existing web user interfaces. This provides a central point for design development information including Design Team members, meeting agendas and meeting notes, and the current proposed design. This web user interface provides collaboration and a forum for open discussion to move towards the ideal design.

Analyze Business Environment

Next, Computers & Concepts' consultants analyze the existing business. We compile a listing of products, services and customers. We detail the existing business structure. We determine the in-use business processes. Then, we map down the current business strategy. Finally, we determine the IT management. . Remember that this analysis is limited to within the Target Task. We meet with Decision Maker group, Employee Group, and Network Managers group to determine the following information:

1. We compile a listing of products, services. Computers & Concepts details what is sold within the Target Task. These products have a specific development process that Computers & Concepts details. Finally, we determine the pricing, placing, and promotion process.

2. Computers & Concepts determines information about the customers. We find out how customers use the products or services. We detail customer interactions with the business including sales processes. We determine the delivery channel for the products to the customers, i.e. shipped, call, walk in, et cetera.

3. Computers & Concepts uncovers the business structure. We document existing management structures. We show geographical locations and their impact on the Target Task. We ascertain any near term changes that affect the Target Task such as acquisitions or spin offs.

4. Computers & Concepts ascertains the business processes. We document the in-place processes for accomplishing the Target Task. We determine the current uses of technology to accomplish those processes and the level to which the technology is represented within the processes. Finally, we determine the workflow, which includes the flow of: information, communication, and decision-making.

5. Computers & Concepts verifies the business strategy. We find out how human resources are being allocated to the Target Task. We confirm business priorities pertaining to the Target Task. We discover the projected growth. We find out any environmental factors such as regulatory, economic, social, and cultural factors. Finally, we document who are the direct competitors with the business for the Target Task.

6. Computers & Concepts establishes the existing Network Managers' management structure. We determine the geographical and political location. We find out if there are any future changes that would affect the Target Task such as proposed system upgrades. Finally, we determine the workflow, which includes the flow of information, communication, and decision-making.

Analyze Technology Environment

Next, Computers & Concepts analyzes the technology environment. This includes detailed information about the existing services, existing hardware and software, infrastructure architecture, internal standards and practices, and Directory Services environment.

Computers & Concepts documents applications and top-level services that reside in the SmartSite Logical Services layer. This includes all enabling services and applications that will be detailed in the SmartSite Physical Hosts layer for the Target Task.

Computers & Concepts documents the existing hardware and software. This includes all equipment that will be detailed in the SmartSite Physical Hosts layer for the Target Task. Computers, operating system, and enabling services all fall into this category. We perform this after the business analysis so that we have a clearer understanding of what is actually needed to perform the Target Task.

Computers & Concepts writes up the existing infrastructure architecture. This includes information about how computers are physically connected and what protocols they use to communicate. When doing the Business Environment, we noted any geographical locations. Here, we document how those locations are or can be connected to provide services.

Computers & Concepts identifies existing standards and practices. This includes the security standards and policies currently in place. Next, we document the naming conventions for users, equipment and services. Finally, we record the existing standards for network performance and reliability.

Finally, Computers & Concepts ascertains the existing Directory Services architecture. Even though Directory Services is a sub section of the SmartSite Logical Services layer, it requires it's own documentation, as it will be shared between virtually all SmartSite Target Tasks. Whatever design the team finalizes upon must take into account how it will interact with the Directory Services.

Design Iteration Until Freezing

It takes time to finalize the details and solidify the SmartSite design. After days of review, the Groups should have a sense of what they do and do not like. However, it may take a while to sell some people on the ideas. Therefore, it is important to have a final cut-off date as well as the ability to review until everyone approves.

Design iteration is the process of incrementally improving the design. Ideally, two or more designs should be displayed on the web user interface and discussed during focus groups. This allows for open minds and discourages narrowly focusing on just one design. The ultimate goal is to have all members of the Design Team agree on the final design.

Unfortunately, having all members agree may not always be possible and therefore Computers & Concepts sets a freeze period. A freeze period is a specific date on which the final design will be voted on if all members cannot come to an agreement. This allows for a tight schedule while moving people towards agreement.

The process is repeated until one of two things happen: everyone comes to an agreement on the design, or the freezing period is met. Computers & Concepts creates one or more sketch designs, and holds focus groups with members from all of the Design Team Groups to review, revise and improve upon these sketches. Computers &

Concepts' Consultants then take this information back and revise the sketches, improving them or removing them altogether. With these revised sketches, we update the design web user interface and get comments and feedback from Design Team members. If all members can agree on one design sketch, then we move forward; otherwise, Computers & Concepts' consultants hold more focus groups and iterate the design.

Preferably, everyone will come to an agreement on one design. If not, the design phase reaches the freezing date and the SmartSite design is voted on from the current candidates. Having selected the SmartSite design from either means, the process moves forward to review and approval.

The review period is a one week period. The final design is posted on the design web user interface for one week for final review and comments. Computers & Concepts' consultants write up the final proposed SmartSite design and submit it for approval.

The Employees Group approves of the SmartSite Logical Services layer > Interface design. The Decision Makers approve of the SmartSite Business Processes design. The Network Managers approves the designs for SmartSite Logical Services layer and the SmartSite Physical Hosts layer. If the design does not pass approval of the Employee, Decision Maker, and Network Managers group then we set a new freeze period and return to the design process; otherwise, we move to building the test environment.

Build the Test Environment

Having completed the design, Computers & Concepts now builds a pilot SmartSite in the test environment and smoothes out the SmartSite moving towards deployment. Computers & Concepts builds the SmartSite in a test environment. We get together a pilot group. We complete a 30-,60-, or 90-day pilot program to work out the bugs. We review the results and fix any issues. Finally, we move to deployment.

Build The SmartSite in a Test Environment

Computers & Concepts assembles a Build Team. This team consists of consultants, developers, and engineers. Computers & Concepts' consultants are from the original design phase, which roughly correlates to SmartSite Business Process layer. Computers & Concepts' developers are for custom coding and programming, and roughly correlates to SmartSite Logical Services layer. Computers & Concepts' engineers are for systems deployment and operating system / infrastructure layer issues, which roughly correlates to SmartSite Physical Hosts layer.

Computers & Concepts personnel collaborate with Network Managers to complete the pilot systems. This may include custom development for services, additional computer purchases, and infrastructure connections as necessary.

As there is often a separation between the cost of a project and the perceived value in the eyes of the user, Computers & Concepts deploys front-end Logical Services Interface and Application services first. These are the services that the users directly interact with. Because the user sees them in place and can use the early in the deployment, the perceived value stays consistent with the actual cost. This addresses the issue of perceived versus actual value of most integration projects.

Assemble a Pilot Group

This team is made up of members of the original Design Team and other members of the Primary Users. There can be one to three staff peers for each member of the Design Team. This is why the "Influential" is so important. The Design Team members pick

people who they know and show those people how to use the new system. This aids in long-term adoption of the SmartSite system. The idea is, if an employee's friend says "Hey look at this! This is so much easier," the employee is much more likely to use the system than if his/her supervisor says, "You have to use this."

Computers & Concepts' consultants then transits the Design web user interface into a Pilot web user interface. The interface still contains the Design Team information on the design development, who was on the team, meeting agendas and meeting notes, final proposed design, and design discussion forums. Now the web user interface contains the Pilot Team information which includes being the central point for pilot testing information, showing who is on the Pilot Team, bug Reports and fix status, forum for discussing the system and peer learning / assistance. This collection of information allows users to contact members of the original Design Team to find out why design decisions were made and ensure that the pilot system adheres to the spirit of the design. Then, Computers & Concepts' consultants gather the pilot team together and hold the launch meeting. This builds excitement, sets expectations, and creates momentum for the pilot process.

Complete the Pilot Program

Complete a 30-, 60-, or 90-day pilot program to work out the bugs. Users in the Pilot team use the SmartSite for the pre decided period. C&C consultants monitor the Pilot WUI forums and regularly meet with the users to discover how everything is working. Computers & Concepts' developers and engineers fix any minor bugs. Future design recommendations are drafted.

Review the Results

When the end of the Pilot Period is reached, the Computers & Concepts' Consultants compile results reports. The Design Team brought back for series of review meetings that discuss how the design played out in the pilot environment.

If the pilot was successful, then the Computers & Concepts' consultants create full deployment plan. At this point it should be a matter of merely adding hardware, Physical Hosts. Computers & Concepts presents the deployment plan for approval. The Employees Group approves of the SmartSite Logical Services layer Interface design. The Decision Makers approve of the SmartSite Business Processes design. The Network Managers approves the designs for SmartSite Logical Services layer and the SmartSite Physical Hosts layer.

If the pilot was not successful, then Computers & Concepts evaluates the results with the Design Team. If necessary, the process returns to the design phase and a new freeze period is set. In most cases, however, minor changes are made to the existing plan and the process returns to the build phase with Computers & Concepts' consultants, Developers and Engineers creating a new test environment. Then we return for a new pilot program.

SmartSite Deploy Process

The deployment process entails selecting the Deployment Team, deploying into the production environment and measuring the results. The Deployment Team is selected from members of the original Design Team plus a selection of "beta testing" users. The production environment can be a modified version of the test environment or a new install completed from lessons learned during the test environment. Once deployed, we measure for success and make minor changes as necessary. Finally, having completed

the SmartSite Target Task we then move back to the beginning of the process and select the next group of potential SmartSites.

Deployment Team
The Deployment Team is separated into the Implementing Group, Teaching Group, and the Maintaining Group.

The Implementing Group is made up of Computers & Concepts' engineers and Network Managers. The goal of this group is to implement the SmartSite technology onto the technology environment. By time of deployment, most business process integration has been completed and therefore it is mainly a networking task.

The Teaching Group is made up of members from the Pilot Group are maintained for peer learning and, if necessary, corporate trainers. The Teaching Group goal is to train users to minimize the learning curve and maximize returns from productivity.

The Maintaining Group is made up of Decision Makers and Network Managers who will be in charge of administering and maintaining the technology. The Maintaining Group will be ultimately responsible for the SmartSite once Computers & Concepts disengages. Decision Makers will be in charge of the SmartSite Business Processes layer while Network Managers will be in charge of the SmartSite Logical Services and Physical Hosts layers.

Production Environment
The Deployment Team is responsible for moving the SmartSite from the pilot environment into the production environment. Computers & Concepts moves the Pilot web user interface into the Production user interface. The Implementing Group deploys the SmartSite system onto production computers and servers. Full management and maintenance responsibility is transferred to the Maintaining Group. Computers & Concepts personnel stays on in whatever capacity the business requires for future support.

Computers & Concepts moves the Pilot web user interface into the Production user interface. This gives full information about the life cycle of the SmartSite technology from design, to pilot, and now to production. The web user interface stays on as a central help site for the SmartSite; central point for services information, who manages the services, help and How-to information, and a Forum for services discussions.

The Implementing Group deploys the SmartSite system onto production computers and servers. Depending on the level of the pilot and the success rate, this can be as simple as giving permissions to the production users. On the other hand, this can mean Computers & Concepts' engineers coming out and building new hosting computers and ensuring that there is enough capacity for the proposed users.

The Teaching Group provides user training for the new SmartSite services to all users. This can include any combination of peer learning, one-on-one learning, formal and presentation learning, and classroom learning.

When the SmartSite systems are online and the users have been taught, Computers & Concepts disengages. This means that full management and maintenance responsibility is transferred to the Maintaining Group. The Decision Makers are in charge of the SmartSite Business Processes layer while Network Managers are in charge of the SmartSite Logical Services and Physical Hosts layers.

The Cycle Begins Anew

Once the SmartSite services have been deployed to the Target Task, Computers & Concepts starts the cycle anew. Computers & Concepts' consultants select the next Target Task, design the SmartSite, perform a pilot, and deploy. By following the SmartSite method, the business gradually evolves into a SmartSite with the key areas (those that SmartSite offers the most promise) being affected first in order.

All too often, technology integrations are pushed as revolutions. Revolutionary thinking can lead to drastic changes in the architecture and shocks to the system. The SmartSite Method is an evolutionary approach that moves in incremental steps. If we move in incremental steps, we can learn from our mistakes and get an ever increasingly accurate picture of the business.