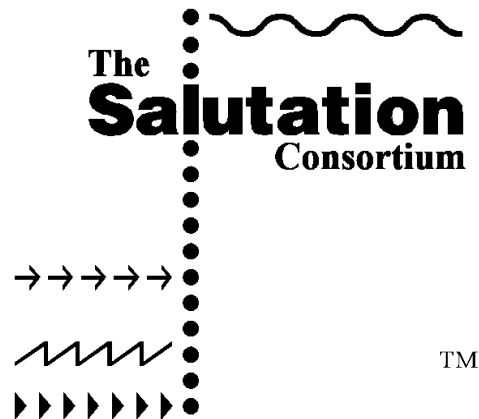


Salutation Architecture: Enabling Applications and Services



A White Paper

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Software development companies achieve market differentiation by providing the knowledge worker with comprehensive management of documents, data, and communiques through a diverse range of networked information appliances, applications, and services. These companies recognize that ubiquitous network computing will provide knowledge workers with access to information from the device-at-hand, eliminating the barriers imposed by pre-requisite devices, specific operating systems and unique data type classifications. This allows the knowledge worker to select an information appliance based on personal preference, current location, and quality/quantity requirements. **This paper describes an Information Management Service that can serve as the central distribution point to provide ubiquitous information access.**

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Information Management Service

Trends:

Software development companies achieve market differentiation by providing the knowledge worker with comprehensive management of documents, data, and communiques through a diverse range of networked information appliances, applications, and services.

These companies recognize that ubiquitous network computing will provide knowledge workers with access to information from the *device-at-hand*, eliminating the barriers imposed by pre-requisite devices, specific operating systems and unique data type classifications. This allows the knowledge worker to select an information appliance based on personal preference, current location, and quality/quantity requirements. This trend will uncouple the knowledge worker from specific applications and services that work in limited environments. The power of providing access to information from the device-at-hand will enable the knowledge worker immediate access to the information needed for business and personal decisions.

To continue to be successful, software development companies must provide information access and management from an array of networked devices, applications and services through support of open interworking technologies and standards. These companies must be committed to network-enabling the worlds information base by exploiting innovative interworking technologies and by building strategic relationships among industry leading OEMs, ISVs and software developers.

These companies must produce products that deliver real value to the knowledge worker by removing barriers imposed by proprietary implementations and by providing information access from the device-at-hand.

To achieve these goals, software developers must:

- Exploit the fullness of interworking technologies by supporting the industry leaders, defacto standards, and industry standards
- Manage the diversity of networked device, applications and services encountered in dynamic network environments by brokering necessary data transforms, routing techniques, and user visualizations
- Build on an open, non-aligned resource management protocol architecture to interface to the array of interworking technologies
- Protect original investments and ensure partner participation through a non-proprietary, open environment supporting easy integration of third party solutions

Background:

People are *information-centric*. People seek information, process information, manipulate information, store information, and destroy information.

People create knowledge from information.

Michael Dertouzos, Director of the MIT Laboratory of Computer Sciences observes in his 1997 book, *What Will Be*, "People value greatly the ability to form a community bound by the sharing of information and are willing to readily integrate new information-driven activities into their daily lives."

The *information technology* (IT) industry has provide great advances in the capture and dissemination of information, however, three distinct, mostly separate, often competing, *technology-centric domains* have developed.

- **Paper-Centric Domain:** FAX, copier and printer manufactures are paper centric, dealing with quality placement of information on, or extracting information from paper. Paper centric developers deal with terms such as pel density, columnar formats, graphics rendering, and image formats.
- **Telephony-Centric Domain:** Phone manufactures and telephone companies are telephony centric, providing ways of transporting, storing, and responding in human recognizable sound. Telephony centric developers deal with terms such as .wav formats, volume control, digital versus analogue encoding, caller ID, and voice messaging.
- **Computer-Centric Domain:** Computer manufactures are compute centric, providing ways of capturing keystrokes, viewing and storing information, and building relation between data . Compute centric developers deal with processor and operating system type, coded characters, graphics processing and viewing area.

Productive knowledge workers deal with information in forms such as documents, data and communiques. Timely access to these diverse forms of information enables the knowledge worker to make effective decisions. ***For these workers, the information itself is more important than the technique to access it.*** The technology-centric focus of the IT industry has restrained the knowledge worker, causing them to carry multiple, different devices to access information associated with a specific technology. As depicted in Figure 1, the 'well connected' knowledge worker needs a cell phone for voice messaging, a pager for text messaging, a brief case for paper documents, a computer for access to e-mail, the web, company data, etc., and a hand-held personal communicator for scheduling and contact management! Although providing information access, this multiple technology approach has the drawback of tying the user to a particular technology-centered approach



Figure 1: Plight of the Technology Centric User

of accessing necessary information. What happens if the computer breaks, the user leaves the phone in the car, or the pager is out of range of the service provider? The user loses access to a specific segment of information.

Again from Michael Dertouzos, "Major players of the 1990s who keep extolling fiber optics, real-time video, virtual reality, multimedia, and electronic commerce will discover that none of this awesome stuff will be useful unless computers and software at diverse sites can 'understand' one another, ... so they can carry out the desired transactions among them." Advances in interworking technologies are enabling a change in access techniques -- from technology centric to information centric. Rather than carry multiple devices for information access, the knowledge worker will be able to access information from the **device-at-hand**. These new technologies provide for interactions tailored to the capabilities of the accessing device. As depicted in Figure 2, with the knowledge of the capabilities of the device, an information server can prepare an image of requested information in a format suitable for rendering on the device.

As shown in the figure, a print image is sent to an online printer, copier or fax, a text-to-speech image is sent to a phone, or a display image formatted for a device's display footprint is sent to a computer. This approach aligns with the user's information-centric view; **the user is accessing information, rendered to the accessing device rather than the user finding a device that is aligned with the stored image of the information**. With information-centric access, users will be able to select their information appliances based on personal preference rather than the dictates of technology.

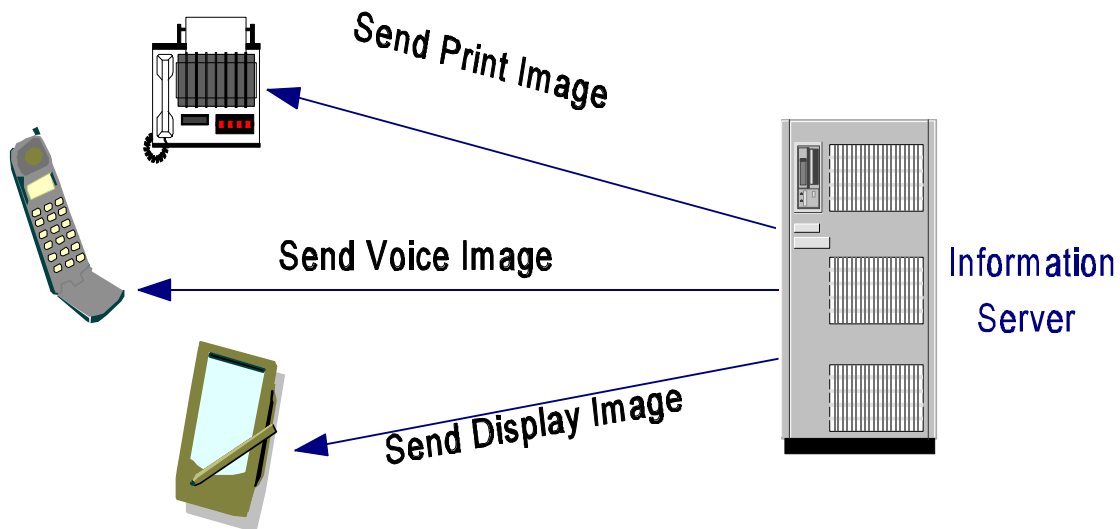


Figure 2: Information Centric Access

Technology Supporting the Trend:

Salutation Architecture

The **Salutation Architecture** was created to solve the problems of **service discovery and utilization** among a broad set of appliances and equipment and in an environment of widespread connectivity and mobility.

The architecture provides a standard method for applications, services and devices to describe and to advertise their capabilities to other applications, services and devices, and to determine the capabilities of other networked entities. The architecture also enables applications, services and devices to search other applications, services or devices for a particular capability, and to request and establish interoperable sessions with them to utilize their capabilities.

Given the diverse nature of target appliances and equipment in an environment of widespread connectivity, the architecture is processor, operating system, and communication protocol independent, and allows for scalable implementations, even in very low-price devices.

The Salutation Architecture is a standard, providing a platform and network independent means for determining the capabilities of networked devices, applications and services. The Salutation Architecture also supports basic message management and job control techniques to support information transfer in heterogeneous environments. The Salutation Architecture defines a management facility called the Salutation Manager (SLM), which shields the application and service developer from direct manipulation of the Salutation

protocols through a unique API. With a Salutation base, solution providers can offer users access to information from the device-at-hand, rather than from specialized devices designed for a specific data protocols. A Salutation base provides information to applications and services allowing adjustment of interactions for differing information access appliances. Optional components of the Salutation Architecture provide a common denominator for controlling the flow of information between uncommon networking protocols.

OEM Office Equipment and Handheld PC (HPC) manufactures will enable their products with Salutation Architecture as it provides a single network-independent and platform-independent means for determining capabilities and managing data interchange. The device manufacture is faced today with several platform-specific means for doing this task, resulting in different releases of products for each of these environments, or creation of a single product to support all environments. Each of these options adds development cost. Device manufactures see Salutation Architecture as a means to level the playing field in the emerging interworking environment.

Solutions Based On Salutation Technology:

The Information Management Service

An information broker solution can be designed to exploit the Salutation interworking technologies, enabling comprehensive information access and management. An overview is provided in Figure 3. Called ***Information Management Services***, it receives requests from attached devices, applications, and services, interprets these requests and routs requests to registered applications. The applications process these requests, retrieving requested information and passing it back to the Information Management Service. Based on the device characteristics requesting the data, the Information Management Services access *transform services*, which formats the information for transmission to the device specifications. In some cases, applications may have relinquished *information access* to the Information Management Service, allowing the Information Management Service to directly access and manage the information for the user. The Information Management Solutions will also provide workflow and workgroup information access and control as well as image document capture, store and retrieval functions. Partner applications will provide e-mail, scheduling, word precessing, and voice messaging management.

Example Scenarios:

AUTOMATED PLUG AND PLAY

The promise of getting new office equipment and simply plugging it into a network port has been documented for years, however it is not yet available. You continue

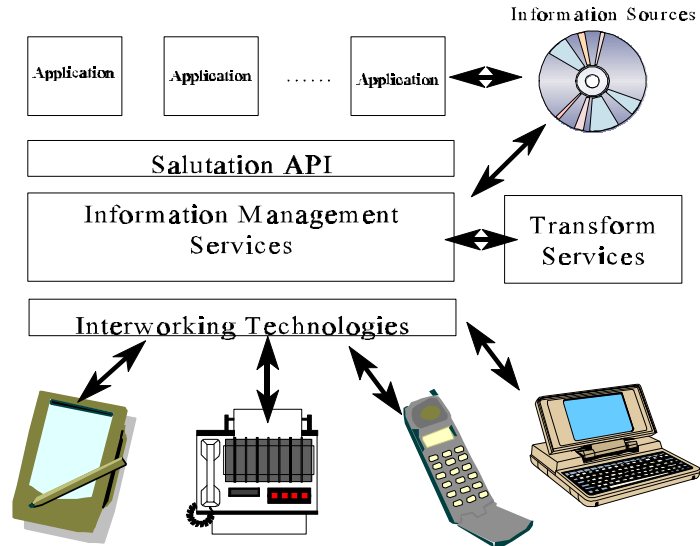


Figure 3: Information Management Solution

to need a LAN administrator to build a directory record for the device, notify all users of its existence, load device driver in user's desk top environments, assign security codes, and so on.

The objective would be to have a Getting Started manual for an office machines to simply read, "Position the unit in a convenient location and plug the power cord into the power outlet. Plug the LAN cable in to the LAN access port. Turn on the power switch."

The roll of the Information Management Service

1. When turned on, the device uses the Salutation Exchange SLM-ID protocol sequence to locate the other Salutation enabled devices, applications and services in the environment. This is also a signal to the Salutation enabled Information Management Service that a new device has been added.
2. The Information Management Service issues a Salutation protocol sequences to determine the detailed characteristics of the new device
3. The Information Management Service builds directory records associated with the new device and its functionality. (This has been demonstrate for the Novell Directory Service using existing NDS APIs.)
4. The Information Management Service determines the location of device driver for the new device. (The driver may be maintained in a LAN accessible database, in archival storage, on a Web or FTP server or maintained in storage on the device itself.) Once located, the Information Management Service readies the driver for delivery to requesting users.
5. Applications locate the new equipment through the Salutation APIs exposed by the Information Management service. For example, an application may request a

device having special characteristics. If the new device matches the requirements specified by the user's request, it will respond positively.

6. Again using the Salutation APIs, the application communicates with the device through the Information Management Service.

RESOURCE MANAGEMENT

System and distributed resources may register with the Information Management service, specifying their function, location and access protocol. The Information Management Service can then route requests for these services as appropriate. As an example, assume there is a distributed Optical Character Recognition (OCR) process within the environment monitored by the Information Management Service. Applications find and access the OCR process through the Information Management Service.

The roll of the Information Management Service

1. Salutation protocols are used to locate and register resources with the Information Management Service.
2. Applications use the Salutation APIs exposed by the Information Management Service to find and use these resources.
3. The Information Management Service will route these requests, making appropriate protocol transformations, to the service and funnel the responses back to the using application.

DEVICE PROTOCOL CONVERSION

Salutation Protocol is one of several interworking protocols. A network may support other protocols such as SNMP, NDPS, IPP, etc. The Information Management Service can isolate the application programmer from these variations at the network and transport layer.

The roll of the Information Management Service

1. The application uses the Salutation APIs exposed by the Information Management Service to locate devices and establish session.
2. Acting as the applications agent, the Information Management Service transforms these requests to appropriate lower level protocols and communicates with the devices.

Action Plan:

CONSORTIUM BUILDS FRAMEWORK IN SUPPORT OF THESE OPPORTUNITIES

The Salutation Consortium and its members are aggressively building a framework of products and development aids which will help application developers and device

manufactures provide information access and management from an array of networked devices, applications and services through support of the Salutation Architecture.

Developer ToolKits

IBM

IBM provides an implementation of the Salutation Architecture called the IBM Salutation Manager. It is a complete instance of the architecture including both client and server support at the protocol and API levels. It is available on OS/2 v 2.1 (120K bytes, Windows v 3.1 (96K bytes), Windows 95 (400K bytes) and Windows NT (400K bytes). The target market for this product is workstations and network/application servers. The product was initially developed as a prototyping tool, allowing device manufacturers to emulate Salutation functionality by attaching to a workstation containing the IBM Salutation Manager. IBM now offers the product as an SDK.

IBM has prepared a version of the IBM Salutation Manager Toolkit targeted for the embedded operating System market. This usages is intended to be market differentiators for the embedded product market. The Salutation manager product is written in ANSI-C, which improves its portability.

IBM is a potential business partner, through joint development of the Salutation Manager Netware Loadable Module (NLM), user interfaces for the IBM SLM, and Resource Manager integration with IBM's network products.

Kobe Steel

Kobelco Systems Corporation has announced a Salutation Manager and Software Developer's Toolkit, new developer tools for Windriver Systems' Tornado real-time operating system.

The Kobelco Salutation Manager conforms to the 2.0 version of the Salutation Architecture. The Toolkit contains a Basic Encoding Rule (BER) Tool, as well as a library of Functional Units. The Library provides Functional Units for Print, FaxDataSend, FaxData, DocStorage, Voice MessageStorage, and AddressBook.

Legacy Product Enablers — Port-of-Entry

XtraWorX

The Salutation Consortium has contracted with XtraWorX, LLC to provide a XtraWorX Port-of-Entry product. This Windows-based product is developed on the IBM Salutation Manager. It is intended to represent your Windows 95 and NT environments to a network in Salutation architected terms. Complete with graphical user interface, the XtraWorX Port-of-Entry provides the developer with a total

end-user control environment for specifying which local resources are assessable to other Salutation enabled devices, applications and services. The resulting software provides application developers a Window configurator for representing their products and other devices and services installed on the local platform in a Salutation network.

The XtraWorX Port-of-Entry runs on a Windows desktop and represent the capabilities of that environment to other applications, devices, and services via the Salutation Protocols. The Port-of-Entry will provide a consistent user interface and basic set of interactions with network peripherals, allowing software manufacturers to concentrate on their application without diverting resources to develop Salutation-specific technology.

XtraWorX, LLC is a potential business partner for extending the Port-of-Entry to meet specific application and platform requirements.

Reference Model

The Salutation Consortium has announced it will make a reference implementation of the Salutation Architecture available to software developers building Salutation functions into their applications. The reference implementation will provide a coded example of Salutation protocols that can be embedded within an application, speeding up design-ins and saving on development costs.

The Consortium is reviewing bids for the development of the reference implementation, to be called the Salutation Application Reference Model. The Reference Model will run on Windows 95 and Windows NT platforms. Other platforms are optional. The Consortium will fund development of the Reference Model by the successful candidate.

Additional developer support

The Salutation Consortium will continue to identify areas where it can stimulate the development and rollout of the Salutation Architecture. Additional RFIs will be issued as required. Areas currently under study are Windows NT and Java platforms and the home automation environment.

Conclusion

Building a Resource Manager on the Salutation Architecture, software development companies can provide the knowledge worker with comprehensive management of documents, data, and communiques through a diverse range of networked information appliances, applications, and services. Salutation provides a method for these diverse

applications and services to locate and interact across the ubiquitous network, thus providing knowledge workers with access to information from the device-at-hand. Barriers imposed by pre-requisite devices, specific operating systems and unique data type classifications are eliminated. The knowledge worker may select an information appliance based on personal preference, current location, and quality/quantity requirements.