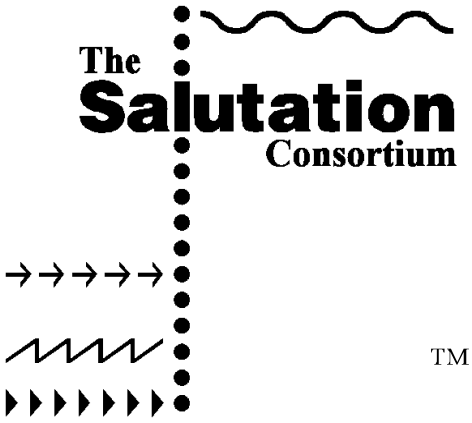
Salutation Architecture: Overview



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A White Paper

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Salutation Consortium and it Vision

On July 13, 1995, it was announced that 24 IT companies formed a consortium to improve interoperability between heterogeneous devices. This project, originally operating under the working title of SmartOffice[1], is known as the Salutation Consortium, Inc. This paper describes the vision of this team, the market trends that support this vision, and the solution this team has brought to the market place.

Salutation Vision

The Salutation vision provides a unique view of the information technology environment; one that is just beginning to be embraced by enterprise and workgroup software providers. The Salutation vision recognizes that only a subset of the population has access to PC and workstations, and even those who do will use other information machines to accomplish their daily tasks of information management. This vision sees people utilizing traditional equipment in new ways to manage information flow. Equipment such as FAX machines, printers, telephones, copiers, hand scanners, PDAs, foil projectors, and other equipment will become information appliances. All this in an environment of widespread connectivity, with the added dynamics of mobility.

The vision supports the notion of accessing information through interconnection of heterogeneous devices, independent of the manufacture, network owner and application providers, with a goal of perpetuating access to information anytime, anywhere. Salutation vision will allow users to access and manipulate print, calendar, E-mail, voice-mail, fax, data base and other information from the device-at-hand rather than from a specific type of equipment. The goal is to provide a broad range of information appliances, applications and services, making them as available and interconnectable as today's telephones.

Background and Trends

The Mobile Work force

There is a growing mobile work force. The Yankee Group estimated that 25 million Americans already work away from their offices and another 13 million are away from their offices at least 20% of the time[2]. Additionally, 9.2 million Americans work from the home today[3]. Studies have shown that, in the future, more employees will work from home, sharing minimal office space at the actual company location. IBM estimates $70 million annual real-estate expenses saving due to

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[1]The name SmartOffice is a misnomer, as this name tends to focus on the office environment. SmarOffice vision is equally applicable to environments of home, manufacturing, mobile, etc., and a new name will be applied shortly.

[2]Daly, Frank. Move over, Dick Tracy. Forbes, Sept 13, 1993

[3]Sanders, Lisa. Office of the Future.

the workplace reduction program in the New Jersey trading area alone. With the demand to be market driven and customer centered, employees are doing business where the customers and suppliers are, causing them to be away from their traditional workplace. For these persons, the automobile, airplane, hotel, etc., serve as a person's "virtual" office.

Quality of life issues is also shaping the workers environment. Urban flight to suburban bedroom communities results in long commutes. Persons are finding ways to be productive while in transit. In addition, current trends show population shifts to rural areas are increasing. Here, telecommuting will replace traditional commuting. The meaning of the term "at work" is shifting from where you are, to what you are doing[4].

Portability

Advances in portability and miniaturization support the mobile worker. Researchers at Xerox Corporation's Palo Alto Research Center describe the future office environment as one in which virtually all office tools have embedded computers. There will be intelligent notebooks, badges and badge readers, telephones, black/white boards, and so on. All devices will be able to communicate with each other and the corporate data base over a wireless link[5].

The Information Overload

We are in the midst of information overload. In addition to receiving messages electronically, most users must separately process voice mail messages and hard copy text. Amassing this data (along with electronic spread sheets, reports, images, presentations, and mission-critical data), inhibits (and intimidates) the knowledge worker from truly assimilating these separate data formats into usable information. The information overload trend will only increase in the future as more information is digitized and brought on-line. All this information is useless if it is inaccessible when and where needed.

Market Globalization

Another trend supporting mobile computing environments is market globalization. This trend emphasizes the need for around-the-clock, location-independent accessibility to information. Global marketplace will require automatic language translation via all communication mediums (for example, electronic mail, telephone/voice mail, etc.).

Technology Integration

Technology advancements are also a driving force in the changing information environment. Technologies such as video conferencing, voice recognition, text-to-speech, personal digital

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[4]Sanders, Lisa.

[5]Markoff, John. The not-so-distant future of personal computing. InfoWorld, December 13, 1993.

assistants, and wireless communications are already enabling a more productive and intelligent mobile work force. Future advances, such as the information super highway, interactive voice response systems, natural language interfaces, and expanding telephone functionality will continue to advance the linkage of the traditional office environment with the outside world, thus enhancing the productivity of the mobile information worker. The information worker desires direct, real-time contact between anybody, anytime, anywhere[6].

Multi Function Equipment

In addition to the development of new technologies, existing technologies are merging. In terms of office equipment, multi-function devices such as a combined printer, copier and FAX machine are either under development or are beginning to emerge the marketplace. The functions that are being combined include: compute, copy, fax, print, scan, OCR, telephony and voice recognition[7]. Hence, traditional office equipment is being transformed onto a new input and output devices; for example, a copier that served only as a stand alone device, may now function as a printer and scanner. The worker who carries a pager, a cell-phone and a notebook computer will find all functions integrated into one package. These advances enable the mobile worker to access information in new ways through devices found around the campus, or, with proper connectivity, around the world.

Devices supporting the mobile worker are finding their way to the consumer markets. High-volume, low-price marketing will enable these devices to become wide spread in the work force. Rather then viewing these devices as computers, they are information appliances, and be as common as toasters, radios, or electric razors.

The Users and Their Expectations

Yet with all these advances, PC s and computer workstations exist in only a select subset of homes and offices. There are many factors for this limitation. One is cost. Filing clerks need only the ability to receive paper and file it appropriately. Receptionists and/or phone operators need only access to the enterprise address book. The mail room clerk may need only a FAX machine to send and receive documents. And using computers to balancing checkbooks, prepare taxes and play computer games is not cost-effective for many home owners. Since none of these individuals needs the power of the computer to perform spread sheet analysis, type reports, check or update calendars, view multimedia presentations, the need for a computer workstation is hard to cost-justify.

There are also individuals who refuse to use a workstation. These people are usually high-touch, low-tech individuals who have computer phobia or who are comfortable and efficient performing their routine without computer assistance. For these individuals, taking pen to a week-at-a-glance, sending and receiving documentation via FAX, performing calculations on a calculator and

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[6] Intel CEO Has A Vision of The Future. Information Week, August 23, 1993.

[7] Haber, Lynn. One man business office band. MIDRANGE System, September 28, 1993.

producing copies at a public access copier are adequate. Providing these individuals with computer workstations would be an inefficient use of capital budget, and only frustrate them.

Others seldom enter or manipulate data, preferring to engage staff members to manage calendars and address books, prepare reports and memos, and update corporate information. Access to the most recent data is of primary importance to these individuals. The power of a computer workstation is not fully utilized here. The phone and some data viewing device, such as a over-head projector or keyless flat panel display is better suited.

In sum, many individuals perform their tasks with basic equipment such as FAX, copier, calculators, projector, phone, etc.

Technology Convergence

Traditional appliances and equipment are made of one or more basic input/output devices. For example, a FAX machine and a copier contain a scanner and a printer. More sophisticated copiers and printers are integrating LCD display technology for the user interface. High end copiers have storage media and accept video input. Devices found in the home also have these characteristics. For example, the phones have audio input and output as well as a limited keyboard and, in some cases, a display. Picture-phones incorporate video input/output. Most of them also contain embedded processors which, like workstations, are becoming more capable over time.

It is only a small step to build communications links into familiar devices, bringing them on-line and provide network access to the contained input/output devices. Taking this step with a copier can allow it to also serve as a printer and/or scanner. An on-line phone can also serve as an audio response unit or voice entry port. This is not a new idea. Multi-function equipment is now on the market, and there are several industry initiatives focused on defining architecture and standards to support integration of this equipment into desktop, network and home environments.

Placing home appliances and office equipment on-line provides the advantage of converging computer peripherals with traditional standalone devices, reducing foot-print requirements, sharing administration functions, and balancing usage, thus reducing costs for the customer. The appliances and equipment manufactures see on-line support as a market differentiator for the markets they serve.

Passing On The Intelligence

The next market differentiator for appliances and equipment is added intelligence. Today, high-end copiers incorporate features such as Color to gray scale and color correction processing, duplex and multiple-up, and on-board cut, copy, paste and crop operations. More advanced functions could include video input to hard copy, photographic output (for slide generation), and magnetic badge readers for user identification. Technology leaders are investigating options for adding processors, operating systems, communications technology, and enhanced user interfaces to their products to capitalize on the power, flexibility, modularity and short cycle times enjoyed by the workstation software providers. This trend is known as embedded systems. In effect, all the

components of an intelligent workstation are in there, but hidden from the end user. The system approximates a computer workstation, but the user doesn't recognize it as such.

Capitalizing On The Intelligence

Suddenly appliances and equipment begin to look like an intelligent workstation with a different face (i.e., different input/output devices). It contains powerful processors, operating systems, user interface tools and communication connections. Is it possible to 'port' applications to this new 'computer' environment? Does that make sense?

***YES*!**

Porting of applications to this environment should be no more difficult than any other port. In fact, if the embedded system is equal to, or a subset of a workstation system, with equivalent op-sys calls, APIs and user interface characteristics, the porting effort could become relatively modest.

But why port?

Application and service providers and ISVs can capitalize on the embedded system trend by providing objects, clients and servers for intelligent home and office equipment. Applications (or derivatives) running in today's workstations may be running in tomorrow's intelligent office equipment. Applications unknown today will be developed specifically for the intelligent home appliances. This will change the role of these devices. They will be designed to fill a range from special purpose information processors to general purpose data access devices.

Changing Complexion of Networking

Networks will become dynamic, as mobile devices are added, then deleted as they pass through the boundaries of the network. Ad-hock networks will spring to life and then evaporate as infrared and wireless technology allows for instant communication links between two PDAs, or a PDA and a printer, or a FAX machine and a calendar server, etc. Discussion of bandwidth and throughput will be added to functional richness, and client/server will become an integral part of home appliance and office equipment solutions.

History and Concept

Salutation Architecture

Leading office equipment and computer professionals joined forces in 1994 to review these market trends and the potential of this vision. One problem became evident. With the potential for such widespread connectivity, the broad set of appliances and equipment, and the dynamic nature of mobility, how do you know what's 'out there'. This group focused on the problem of discovery; determining the capabilities of the devices, application and services that can be encountered in a networked environment. The result is the Salutation Architecture. The first draft of the Salutation

Architecture will be published to members for review and comment when the steps to for the Consortium have been completed.

The Architecture overview is shown here.

This Architecture defines:

Abstractions of device, application and service functionality: Standard syntax and semantics for defining the function of Salutation Architecture compliant entities. These abstractions address 'functional units' such as print, FAX, document storage, etc. The abstraction of the print functional unit will define attributes such as number of source drawers, staple capability, pel density, and other print characteristics in a standard way. The print functional unit can be found in copier, FAX, and any printing equipment, and its attributes identify its 'capabilities'. Other abstractions will be added as the Salutation Architecture is developed.

Capabilities Exchange: protocol requesting a copy of another functional unit's capabilities. It is provided in a Client/Server Model. A client can determine what services are available and what protocols can be used to access services. A client can search for specific service or equipment. This protocol is to be independent of underlying communications protocols, allowing the information to flow between heterogeneous networks.

Service Request: protocol requesting a session with one or more of the functional units identified through the Capabilities Exchange. The Service Request can manage the session between client and server, and transfer application data over the session.

Salutation Personalities: standardized protocols allowing client access to services and information. Salutation Personalities are defined for selected services such as printing, FAX transmission and data access. Multi-function appliances may combine Salutation Personalities to assemble functional units. New protocols will be defined and recommended by the Consortium for new devices. In addition to architected Salutation Personalities, manufacturer specific value-added functions can be defined as 'Personality Alternatives'.

Application Programmable Interface (API): to access this capability information and to manage sessions between client and server. This API may be optionally implemented for ease of application development and application portability. It will provide transparency to the application/service programmer for underlying transports.

The architecture is designed to be independent of operating systems and communications protocols. Therefore, its implementation may be universal in scope and independent of hardware and software type. It has practical use in mobile computing, network centric computing and LAN environments.

The result is the cornerstone for negotiating the form and format of interoperations among devices, applications and services. Salutation Architecture does not itself provide interoperability, but rather provides a technique to identify necessary data transformations, formatting considerations, and service requests to structure the interoperable session.

Scope

Although the initial focus was on the potential of office equipment in the information technology arena, it was quickly determined that the promise of the Salutation vision exceeded this narrow domain. Its full potential includes a full complement of devices, applications and services, which could intercommunicate in a desktop, LAN, WAN, or value added network, independent of the operations system or hardware environment. As a result, energy was diverted from the developing office solutions to developing a fully functioning, open architecture to meet the broader vision.

Products and Schedules

The consortium has only one product, the Salutation Architecture Specification. All rights for the Specification belong to the consortium, who will be the sole owner, and the only body to cause Specification changes. The Specification is available, royalty-free, to members and non-members alike, and members and non-members alike may freely implement the specifications without royalties. The first draft of the Specification is available on-line at www.salutation.org.

Individual companies have develop supporting products under their own design and implementation schedules. A review of these products is found at www.salutation.org/products.htm

Relationships with Other Industry Initiatives

The members of the Salutation Consortium recognize that there are other initiatives focusing on device interoperability and mobile communications. These include the Desktop Management Task Force, the Infrared Data Association, HP’s JetSend, Sun’s Jini, the Multi Function Peripheral Association, Novell's Netware Embedded Systems Technology and the Versit Group. The Salutation Consortium is committed to work in harmony with these and other groups to provide a solution that builds on existing efforts, and bridges specific environments. The goal of the consortium is to manage the Salutation technology in an open industry consortium that is accessible to all interested parties, responsive to user requirements, and will provide solutions in keeping with the time to market demands of the industry. The advantages of this approach are:

- The Salutation Architecture is open. None of the interfaces, protocols or standards will be proprietary

- The Salutation Architecture Specification is to be provided at minimum cost. Consortium Membership fees will be low.

- The Salutation Architecture is one component in a modular design. It may be implemented

by anyone. All parties may integrate their Salutation Architecture implementation with components provided by themselves or other vendors.

- The Salutation Architecture is processor, operating system, and communication protocol independent. Manufactures have freedom of choice in design and implementation, providing the ability to manage product costs.

- The Salutation Architecture is robust and extensible. Abstractions have already been defined for print, storage management, and FAX-like communications. Requirements are logged for telephony, PDA and other abstractions.
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- The Salutation Architecture is designed in a client/server paradigm rather than a master/slave designs. The Salutation technique allows any device, application or service to begin a session negotiation.

Features and Benefits

Reduced Footprint and Cost:

With Salutation technology, users can access their networked information from all means of device. Selection of information appliance will be made for reasons of smaller footprint, lower cost and ease of use. The paradigm of selecting an application because it is compatible with your computer workstation will be replaced with selection of information appliances because it fits in your pocket, are consumer priced, or can be color keyed to your outfit. This change will be possible as information providers supply gateways to system services and networked data that will recognize the capabilities of the accessing device and process requests accordingly.

Shared Administrative Functions:

Salutation technology will allow a centralized administrative function to determine the status of all devices, whether they are traditionally for the computer domain, office equipment domain or home environment. The notion of having separate a service forces for office equipment and computer equipment will be replaced with a single central dispatch location that monitors for low supplies and machine outages using Salutation technology to query all devices.

Market Differentiation:

Implementors of the Salutation technology will boast of plug and play characteristics, access to traditional workstation bound information, on-line service, and geographic dependent application support. Hand-helds will move away from the vertical, industry specific application environment, to a horizontal, general data access device. This movement allow faster and deeper penetration into the consumer market.

The System Solution:

Utilization of the Salutation technologies in this emerging intelligent and networked home appliances and office equipment changes its nature from stand-alone support tools to data access device. Choice of the type of device is based on individual job need and personal preference. Traditional computer workstations occur only where they are needed

The mail room has an on-line FAX machine, accessing the on-line enterprise address book for FAX delivery.

The purchasing specialist has a computer terminal for taking orders, processing invoices and analyzing cash flow.

The data entry specialist has an on-line copier for scanning documents into an OCR process that produces coded text documents for filing and distribution.

The information analyst has a computer workstation for data entry and processing. The filing clerk has an on-line copier, with access to on-line as well as hard copy documents. The secretary has a computer workstation for manipulating calendars and generating memos.

The executive accesses current data through the on-line overhead projector.

The engineer has a computer workstation for engineering analysis, modeling and problem solving.

The homeowner may search for a roof repair specialist and schedule service through the TV.

All of these devices are electronically interconnected and, with Salutation Architecture, are enabled for data sharing and distribution. Each can function as a client to any of the network of system services. Depending on their complexity, some of the devices may also be the system service provider.

To succeed, intelligent home appliances and office equipment must be provided as part of a complete solution. Intelligent devices are not usable without aware applications, client/server support, easy access to/from anywhere in the network and administration support.

Scenarios

Consider an intelligent, on-line FAX machine with application providing access to an enterprise address book. The user may select, through the user interface at the FAX machine, one or more persons from the enterprise address book to form a distribution list for the document to be scanned. Once scanned, the FAX machine determines the least expensive distribution route for each recipient (E-mail, FAX, ...) and processes accordingly, using system services as required.

Consider an intelligent, on-line overhead projector[8] with library client. After identification to the system, the user may select a set of electronically stored charts or other document(s) for viewing. Rather than bringing foils to a meeting, the user accesses them through the LAN server.

Consider a hand-held Personal Digital Assistant with infrared communication interface. After entering the neighborhood grocery store, the user may access the store's controller via the infrared interface and display a list of weekly sales information or the shelf location of a specific item.

Consider an intelligent, on-line home controller or set-top-box with interactive access to traditional information sources. After identification to the network, selected stock quotations, encyclopedia entries, yellow page listings, or neighborhood calendar of events could be accessed and displayed on the TV.

Consider an intelligent, on-line phone that contains a text-to-speech processor. Such a device may be used to access your E-mail and 'read' it to you.

Consider the "Port-a-Desk"[9]. This portable device contains a flat-panel, color LCD display and 8mm video tape drive. It contains an ear phone for private audio reception, and an electronic 'pen' to drive the user interface through the display. It also has a wireless interface and other goodies described below.

You're commuting to work on the train. You have been viewing the wireless cable morning-news program on the LCD video display. Following the weather report, you decide to view a training video, and you insert the video tape in the drive and, using the electronic pen, select play on the display. Suddenly, an indicator is superimposed on the video indicating that you have incoming messages. You use the pen to place the video in pause mode and select the in-basket. The display indicates you have three unopened messages; one FAX, one E-mail, and one audio. Each is stored at your server in your office which you access via the wireless connection. You select the audio message and listen to it through the ear piece. You respond by speaking into Port-a-Desk microphone. Next you display the FAX message. You decide you need a printout and the FAX image is transferred to the integrated print device in the Port-a-Desk. Through the pen interface, you also store a copy in your electronic office library. Displaying the E-mail message, you decide to add a note to your calendar. Using the electronic pen, you select the calendar and the appropriate time and date. You write your message on the display; Port-a-Desk converts it to coded text, and forwards it to the calendar server. Having dealt with your incoming messages, you access the Dow Jones service before returning to the training video.

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[8]The integration of several existing technologies; foil projector, transparent LCD computer projection display, and communications hardware.

[9]We made that name up as an example, but technology leaders are probably working on something similar to it.