



## **Salutation-Lite**

***Find-And-Bind™ Technologies For Mobile Devices***

A Salutation White Paper

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## Salutation Lite

The Salutation Consortium is committed to fulfilling the potential of the Salutation Architecture to provide service discovery consistent with pervasive computing requirements. Salutation is a service discovery and session management protocol developed by leading information technology companies. Our goal has been to develop an open standard for resource management and distribute it royalty-free. The resulting architecture provides a standard method for applications, services and devices to describe and to advertise their capabilities to other applications. 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 these capabilities. With products shipping in the office automation space, we are now expanding to pervasive computing.

Our first step has been to gather requirements from other industry groups working in pervasive computing. Our second step, currently ongoing, is to assure the Salutation Architecture is ready to meet these requirements. Our initial work has recognized the need for additional Functional Units describing display and operating environment capabilities. We also recognize the special requirements of low bandwidth networks and battery powered devices. Support for wireless protocols are among the opportunities needed to meet the demands of this space. Finally, given that good things come in small packages, we recognize that minimizing the footprint of our implementation is a requirement.

The Salutation-Lite project, unveiled at the June 1999 Windows CE Developer's Conference in Denver, will prototype the required architectural changes, validating that requirements are met and the resulting architecture can be implemented on multiple operating system platforms. Once successful, the Salutation Consortium intends to provide the industry with royalty-free access to the prototype code.

Lets look at the requirements and the current technical direction the Consortium is pursuing.

### ***The Salutation-Lite Technology***

#### Operating Environment Functional Unit

The Operating Environment Functional Unit will provide a means to determine the operating system, processor type, device class, amount of free memory, and input/output characteristics of a hand-held or palm-sized device. With this knowledge, a server can send and install an application designed for the environment. A list of the Operating Environment capabilities, as currently defined for Salutation-Lite, can be found in Appendix A.

## Display Functional Unit

The Display Functional Unit will enable service providers to determine the capabilities of a display on a hand-held or palm-sized computer, or other ubiquitous computing devices. The service may determine if the display supports color or graphics. The footprint and pixel density of the display may also be determined. With this information, the service may format information to the capabilities of the display. Clearly, the Display Functional Unit has applicability in other areas. For example, the capabilities of the display on a printer, FAX machine or multifunction device may be determined, providing an information server the data it needs to effectively communicate with the user of this device. A list of the Display capabilities, as currently defined for Salutation-Lite, can be found in Appendix B.

## Limited Bandwidth and Limited Power

Low bandwidth networks, such as IR and the proposed limited-distance, wireless Bluetooth network, are sensitive to the amount of data transferred between entities using that network. To assure maximum availability of the limited bandwidth for all devices in the network, data traffic must be kept to a minimum. This is essential for polling operations such as service and capability discovery, where discovery may require a client to interrogate the capabilities of each service.

Many devices targeted for this type of network will be battery powered. Here again, limiting data traffic for such functions as service and capability discovery will preserve battery life for other transactions.

Through Salutation-Lite, the Salutation Discovery Protocol can be tailored to reduce the quantity of data exchanged during the Salutation Capability Exchange protocol sequence. Specifically, a method for specifying the type of response generated to the Capability Exchange call is provided. Three types of reply to the Query Capability call are proposed.

### ***Maximum***

The maximum Query Capability reply is defined by the current architecture. That is, the reply Service Description Record contains the union of the matching requested and registered Functional Unit Description Records.

### ***Nominal***

The nominal Query Capability reply is defined as the reply Service Description Record containing a copy of the matching requested Functional Unit Description Record, where the Functional Unit Handle is set to the Handle of the registered Functional Unit.

### ***Minimum***

The minimum Query Capability reply is defined as the reply Service Description Record containing only the Functional Unit IDs and Functional Unit Handles of matching registered Functional Units.

## Wireless Protocol Support

Salutation-Lite is being modeled on the Infrared Data Associations (IrDA) infrared protocol. By using IrDA, Salutation-Lite is applicable to a host of devices including 3Com's Palm and derivative devices, WinCE hand-held PC (HPC) and palm-sized PCs (PPC), as well as many cell phones, pagers and laptops. Within the Windows environment, Salutation-Lite accesses IrDA through WinSock calls. By using this higher level interface, Salutation-Lite will be readily portable to other protocols, such as TCP/IP and the proposed Bluetooth protocol. Appendix C contains a protocol diagram for Salutation Lite on IrDA.

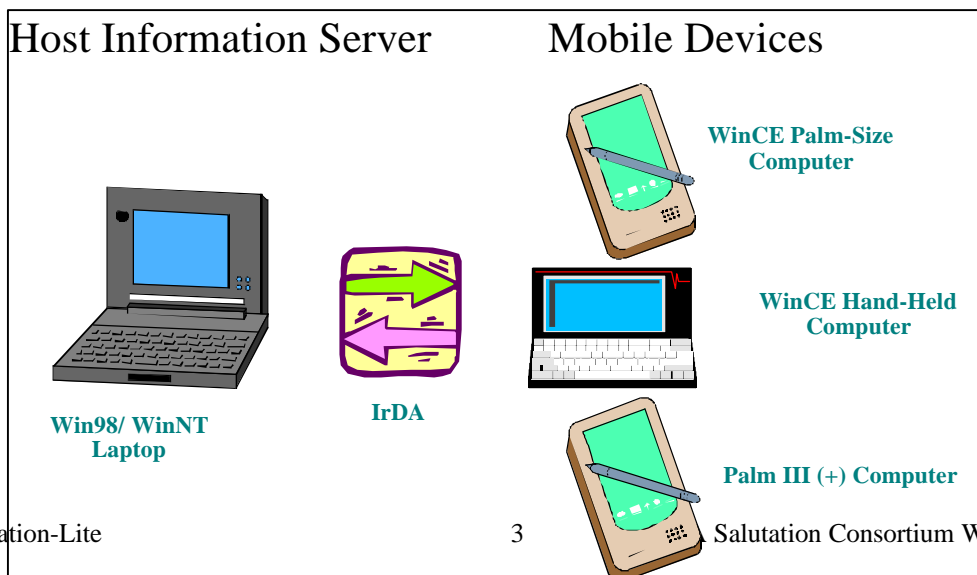
## Footprint

By limiting Salutation-Lite limits function to Service Discovery, the code size, and therefore the amount of storage utilized by a Salutation-Lite implementation, will be greatly reduced. We believe the Salutation-Lite service discovery function will be among the smallest in the industry. Coupled with operating system and protocol independence, Salutation-Lite can provide a single service discovery implementation across the pervasive computing environment.

## ***The Value of Salutation-Lite***

### Dueling Hand-helds

Today's hodgepodge of HPC and PPC form factors, application content and operating environment hampers application development for both the device and information servers -- primarily because of the varying operating systems, screen sizes, vendor/application loyalties and other environmental considerations. To invest in application/service development for today's pervasive computing environment, a developer has to define a data format and presentation application, assure that all HPC/PPC platforms can implement this definition, port an implementation to all platforms and then distribute the application to all HPC/PPC owners. Now repeat the process for each developer wishing to succeed in this space, then repeat for all other potential application/service providers. You might be successful, but the time and resources needed to negotiate with all parties would cripple the effort, to say nothing of the resulting low common denominator solution coming from committee design.



## Hodgepodge Of Mobile Devices Give Design Headaches To Information Servers

An alternative approach is to discover the capabilities of the HPC/PPC as it comes in contact with another device or information server, then automatically respond to these capabilities as necessary. An information server might use an application it discovers is installed in the HPC/PPC, or download a specialized applet to drive the user interface of the device. In this way, the information server uses the best available technologies in the HPC/PPC or supplies its own as required. It is not necessary to get agreement on a single interchange format or application, then port it across all platforms. The resulting approach is not a low common denominator. It can be as generic or specific as the local server wishes.

### Discover the Possibilities

Salutation-Lite technology provides a means for the information server to discover the capabilities of the HPC/PPC and tailor interactions accordingly. With Salutation, a server can determine the screen size and its graphics and color capabilities. Salutation technology can determine the operating environment, amount of free memory, and applications on board a particular HPC/PPC. With this knowledge, the server can download the appropriate data, applet, etc., to match these capabilities.

The Salutation-Lite technology is an open standard, providing a platform and network independent means for determining the capabilities of networked devices, applications and services. A consortium of 30+ information technology companies created the architecture to solve the problems of *service discovery and utilization* among a broad set of appliances and equipment in an environment of widespread connectivity and mobility. The technology 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. Given the diverse nature of target appliances and equipment in an environment of widespread connectivity, the technology is processor, operating system, and communication protocol independent, and allows for scaleable implementations, even in very low-price devices.

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

## Appendix A

### Proposed [OpEnvironment] Functional Unit

```
personalityProtocol ::= ENUMERATED
{
    notSpecified      (127),
}
```

```
supportedCommands ::= ENUMERATED
{
    notSpecified      (127),
}
```

```
operatingSystem ::= INTEGER
{
    Win 3.1           (0),
    Win95             (1),
    Win98             (2),
    WinNT             (3),
    WinCE             (4),
    Palm              (5),
    Unix              (6),
    Java              (7),
    other             (127)
}
```

```
processorClass ::= INTEGER
{
    x86               (0),
    ARM               (1),
    MIPS              (2),
    MIPS PF           (3),
    PPC               (4),
    SH3               (5),
    SH4               (6),
    Other             (127)
}
```

```
deviceClass ::= INTEGER
{
    DESKTOP           (0),
    LAPTOP             (1),
    HPC                (2),
}
```

```

        PPC                (3),
        SETTOP             (4),
        AUTO               (5),
        Other              (127)
    }

inputClass                ::= ENUMERATED
{
    full keyboard          (0),
    numeric keyboard      (1),
    mouse                  (2),
    touch screen          (3),
    voice                  (4),
    joy stick              (5),
    other                  (127)
}

outputClass               ::=ENUMERATED
{
    display                (0),
    audio-tone             (1),
    audio-voice           (2),
    midi                   (3),
    vibrate                (4),
    other                  (127)
}

totalMemorySize           ::=INTEGER
{
    TotalMemory            INTEGER
}

availableMemorySize       ::=INTEGER
{
    AvailableMemory        INTEGER
}

```



## Appendix B

### Proposed [Display] Functional Unit

```
personalityProtocol ::= ENUMERATED
{
    notSpecified (127),
}

supportedCommands ::= ENUMERATED
{
    notSpecified (127),
}

displayDataFormat ::= ENUMERATED
{
    notSpecified (127),
}

ImageCompAlgorithm ::= ENUMERATED
{
    raw (0),
    mh (1),
    mhb (2), -- EOL Byte Boundary
    mr (3),
    mrb (4), -- EOL Byte Boundary
    mmr (5),
    jpeg (6), -- Compression for color image
    other (127)
}

imageByteFillOrder ::=ENUMERATED
{
    LeftToRight (1),
    RightToLeft (2)
}

displayResolution ::= SEQUENCE
{
    xAxisSize [0] INTEGER,-- Unit : dot/inch
    yAxisSize [1] INTEGER -- Unit : dot/inch
}

displaySize ::= SEQUENCE
```

```

{
    xAxisSize      [0] INTEGER,-- Unit : dot
    yAxisSize      [1] INTEGER -- Unit : dot
}

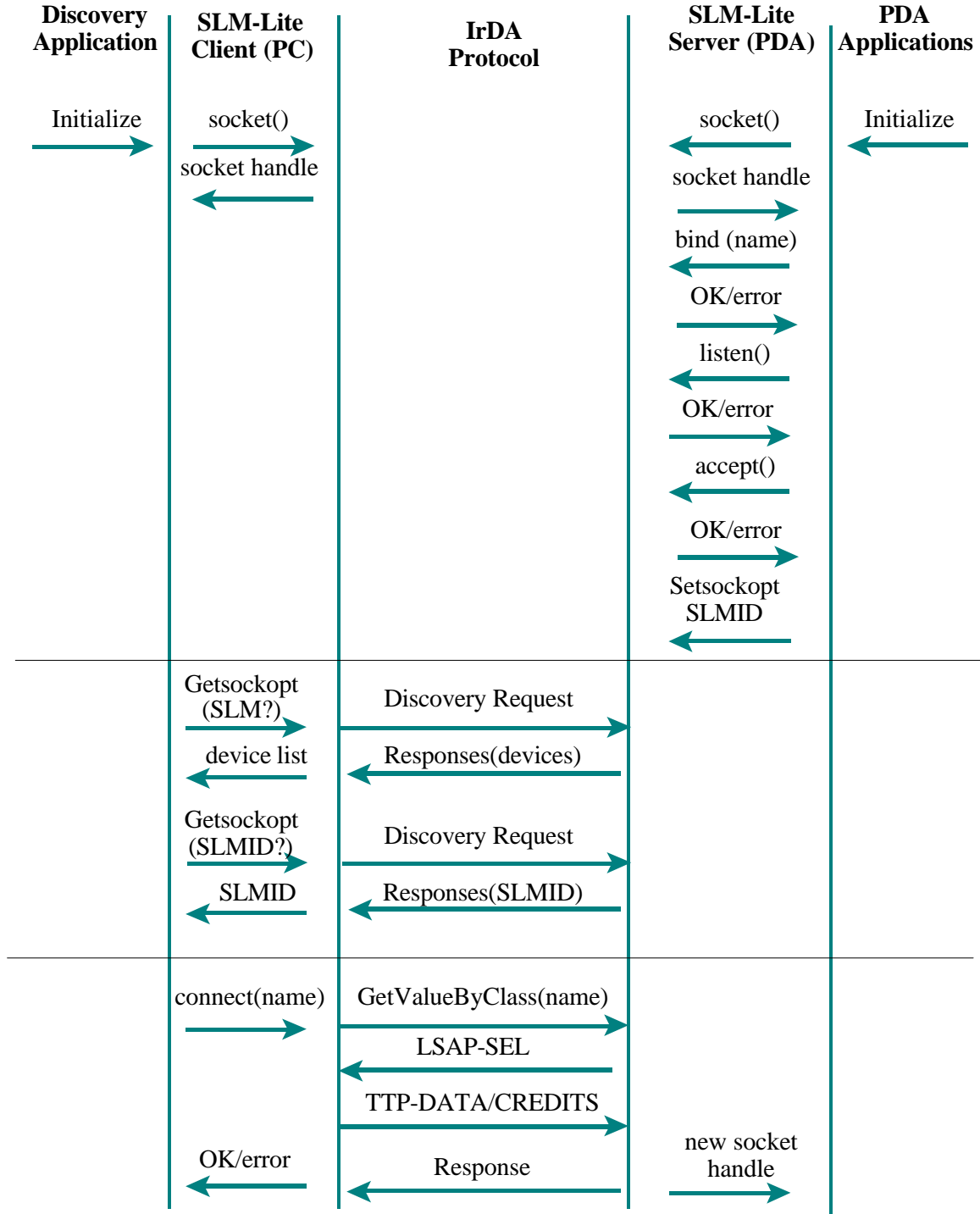
colorResolution   ::=ENUMERATED
{
    Bi-Level       (1)
    4 gray         (2)
    8 gray         (3)
    16 gray        (4)
    128 color      (5)
    256 color      (6)
    4096 color     (10)
    not specified  (127)
}

touchResolution   ::= SEQUENCE
{
    xAxisSize      [0] INTEGER,-- Unit : dot
    yAxisSize      [1] INTEGER -- Unit : dot
}

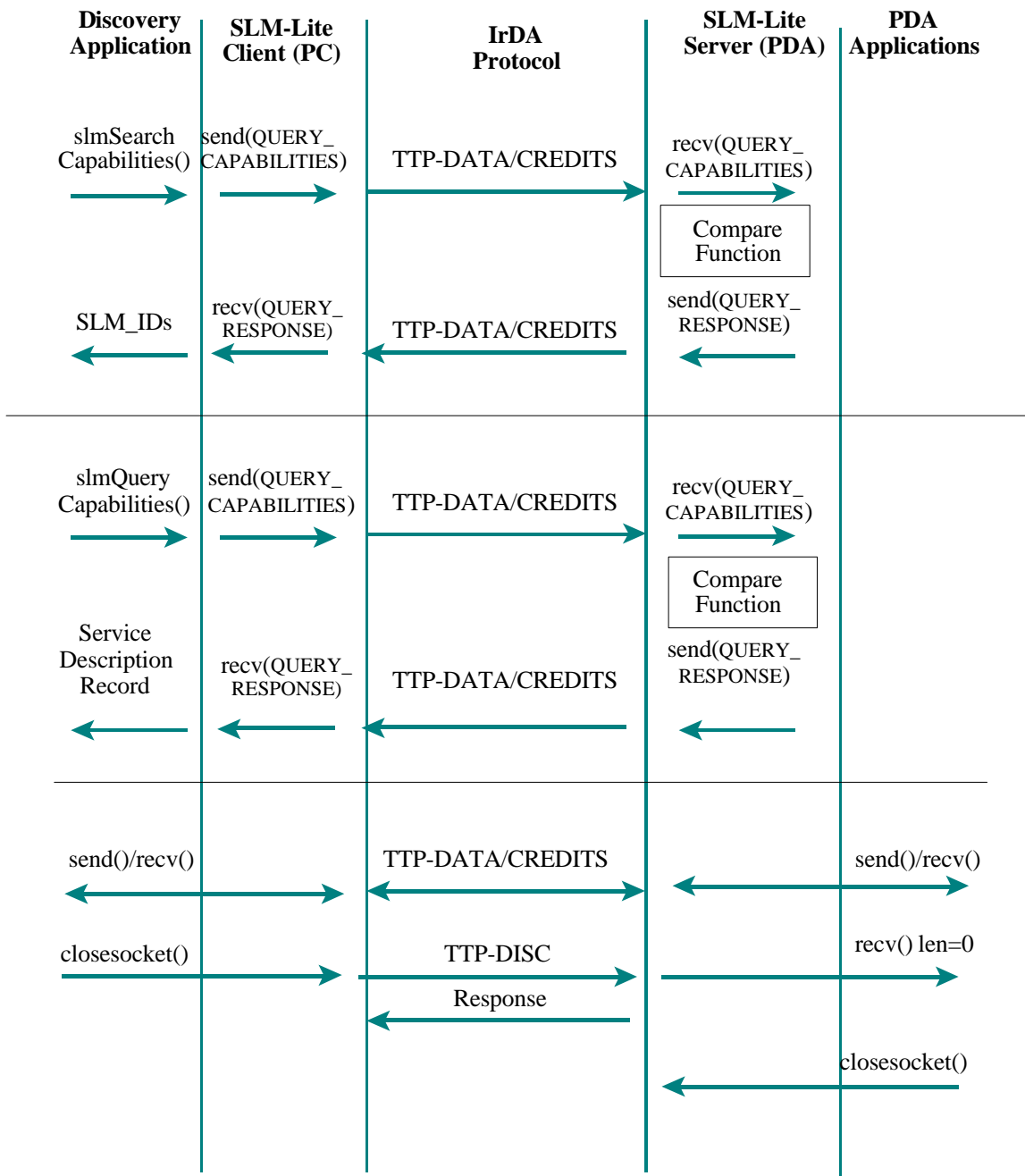
```

# Appendix C

## Salutation Lite Protocol on IrDA



Part 1: Setup IrDA Link and locate Salutation enabled portable device



Part 2: SLM-Lite Search and Query Capability Calls, data transmission.