

# LEAP on Linux PDAs

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## **A Component of The LEAP Manifesto**

This article is one of a series of articles describing various aspects of the Mobile Messaging industry and the LEAP protocols. For the complete collection of articles see *The LEAP Manifesto* [5], available at <http://www.LeanForum.org/LEAP/Manifesto/roadMap/index.html>. *The LEAP Manifesto* is also available at the Free Protocols Foundation website at <http://www.FreeProtocols.org/LEAP/Manifesto/roadMap/index.html>.

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# 1 Summary

Linux on PDAs is great, general purpose mobile computing platform which, among other applications, comes bundled with a simple email application called Mail.

CDPD, the premier wireless, mobile network with full Internet connectivity has reached critical mass with its large scale deployment and CDPD wireless modems becoming available in ever-shrinking form factors with improving power consumption and other characteristics. A number of CDPD wireless modems are available for use with PalmOS devices.

Interpersonal messaging is the most important and proven value proposition of the wireless medium. Existing Internet e-mail protocols have built-in assumptions, which makes them sub-optimal for use over wireless networks. The EMSD protocol fills this gap, allowing fully open, extensible (MIME) Internet e-mail connectivity over wireless networks. The advantages of EMSD over existing email protocols are described in Operation Whiteberry[1].

Given that the fundamental components outlined above (Palm OS, CDPD, EMSD) are real products and technologies, integrating them to create an end-user product is within reach. If the integration is performed properly, the availability of wireless E-mail capability can become straight forward for the end users of this system.

Any Palm Pilot user can purchase a "mobile e-mail kit", which includes a CDPD modem, CDPD account activation and the necessary software add-ons to add the EMSD capability to the palmtop. In fact, there are several channel models which can be used to deliver the wireless messaging capability to the end user, so forming a "mobile e-mail kit" is just one of them.

This paper focuses on the technical issues of the integration effort at hand as opposed to marketing and channels issues. A WinCE based EMSD/CDPD wireless messaging solution, when coupled with the back-end EMSD Message Transfer Agent (MTA) offers a strong value proposition with minimal infrastructure. The EMSD MTA can be running at a central server at the CDPD Network Operator site (example mail address: john.doe@emsd.cdPdProvider.net) or as a Customer Premise Equipment (CPE) at the Internet ISP or IS Department of an Organization (example mail address: john.doe@emsd.boeing.com).

## 2 About This Document

This paper is available in many formats. You may wish to obtain a copy of this document in a more appropriate format before proceeding further.

This paper is one of a series of white papers that introduces the "world" of Efficient Mail Submission & Delivery (EMSD).

If you are not familiar with EMSD General, you may wish to read the "Introduction to EMSD - White Paper" [4].

## 3 Background

### 3.1 Components involved

#### 3.1.1 Wireless Network

In the context of this paper, any wireless, IP based network. Several networks such as the pACT network under development by AT&T Wireless Services, as well as the widely deployed CDPD network fit this description. Also applicable are a number of other proprietary wireless networks which expose an IP interface, such as Ricochet wireless IP network from Metricom, Inc.

CDPD is a wireless, mobile two-way data network offering coverage footprint equivalent to cellular voice in many markets. CDPD exposes an IP interface and a fixed, "real" IP address to each subscriber node (End System) as assigned by the CDPD Network Service Provider at the time of end user provisioning. CDPD mobile nodes enjoy full mobile connectivity using the same IP address throughout the entire CDPD national coverage area due to inherent support of mobility built into CDPD.

### 3.1.2 EMSD

EMSD is an open, extensible and efficient message submission and delivery protocol designed specifically for the wireless network. It minimizes the network traffic required to send and receive messages, thus producing a messaging protocol that meets the needs of the mobile communicator. Fewer and smaller packets means extended battery life, efficient use of carrier bandwidth and support for marginal coverage areas. EMSD is an open specification that is an extension of the existing messaging world.

EMSD is up to 5 times more efficient than SMTP both in terms of the number of packets transmitted and in terms of number of bytes transmitted (see Efficiency Study of EMSD vs. SMTP/POP3/IMAP (PDF ;61 KB); (Postscript ;165 KB);

EMSD protocols are openly available through online RFC Library (<ftp://ftp.isi.edu/in-notes/rfc2524.txt>)

As with other open standards like SMTP, POP, etc., multiple implementations of EMSD are available and various development tools and products are emerging. Being the premier developer of the EMSD Protocols and Implementations, Neda Communications, Inc. offers several products for the mobile device manufacturers, network operators and corporate IS organizations.

### 3.1.3 Palm OS

PalmOS is an open, scalable operating system platform for a broad range of communications, entertainment and mobile-computing devices. Unlike previous PDA offerings from various vendors, PalmOS enjoys multiple implementations from various hardware vendors, a rich development environment, which leverages the large community of palm developers, and a core set of built-in Palm applications. These built-in Palm applications make PalmOS useful from the get-go not as a stand-alone PDA but as an extension of the office environment.

The built-in applications come in two categories:

1. Personal Productivity Apps: These include the compact yet capable "Pocket Word", "Pocket Excel" and the Calendar/Contact/Task manager apps.
2. Communications/Networking Apps: These include the capable "Pocket Internet Explorer" and the extensible "Inbox" e-mail front end.

All of these applications combine to provide an environment which feels "intuitive" for Windows9x and NT4.x users.

### 3.1.4 Messaging protocols

Various Internet Messaging Protocols are mentioned throughout this paper. Although all are used for messaging purposes, functions supported by these protocols do not necessarily match but in many cases complement each other. Given that these protocols came about in an evolutionary fashion over time, this makes sense. The following table illustrates this point.

In Table 1, the number of "X"es in each box denote to what extent a particular function is supported by a particular protocol.

Functions Protocols	SMTP	IMAP	POP	EMSD
Submission	XXX			XXX
Delivery	XXX			XXX
Relay	XXX			
Retrieval		XXX	XXX	XX
Mailbox Access		XXX	X	
Mailbox Sync.		XXX		

Table 1: Messaging Protocols vs. Supported Functions

It is important to note that the scope of EMSD protocols was deliberately limited to the primary requirement for mobile messaging which is: "submission and delivery of time critical important messages". EMSD is designed to complement existing mailbox access protocols such as IMAP.

Although there are proprietary implementations of messaging protocols offered by various vendor over various wireless networks, EMSD is the only open efficient messaging protocol available. The openness of EMSD is a key attribute to help expand the wireless messaging, just as SMTP and POP helped to establish and expand the (now large) Internet E-mail industry years ago.

## 4 CDPD, EMSD and PalmOS: High level architecture

### 4.1 EMSD and PalmOS Messaging

There are two different approaches to developing an email application in PalmOS. One is the application is split into two parts, one part in the PalmOS device and the other part is on a desktop machine. The part on the desktop machine performs the actual sending and receiving of email, and the part on the PalmOS device simply synchronises the data with the desktop machine.

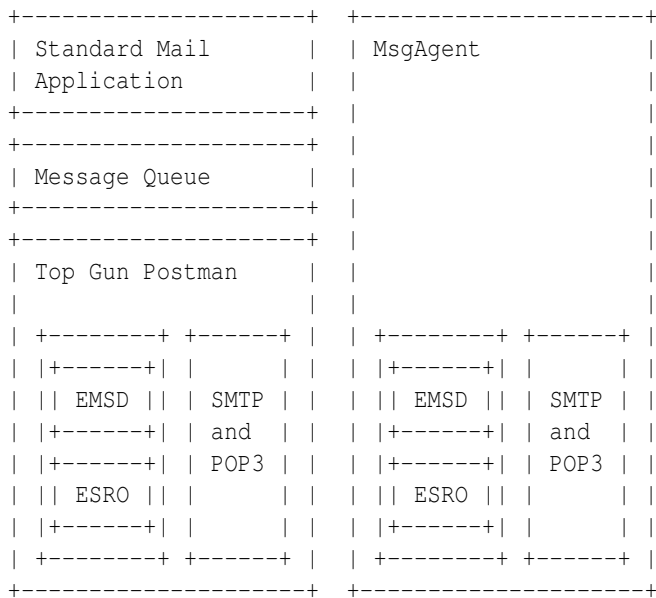
The other approach is the application completely resides within the PalmOS device. The application performs the sending and receiving of the messages through the modem connected to the device. Such approach allows user to send and receive messages from any place they happen to be.

An example of the first approach is the standard Mail application. The software installed in the PalmOS device lacks SMTP or POP3 supports. It depends on its desktop counterpart to do the actual sending and receiving. Messages written by the user is put into a queue. Upon synchronising with the desktop, the desktop counterpart sends the queued messages and also put received messages into the queue.

However there are some works, such as "Top Gun Postman"[3] that provides SMTP and POP3 supports within the PalmOS device for these softwares. This enables users of the standard Mail application to send and receive directly from their devices.

Examples of the second approach are numerous as they affords the highest mobile flexibility. In particular, "Ms-Agent"[6] and "DoodleMail"[7] are very popular clients.

EMSD is layered on top of UDP datagram service offered by the PalmOS' IP stack and as such, is oblivious to the how the IP connectivity is achieved. In other words, whether a direct serial link, a wireline modem or a CDPD modem is used is transparent to the EMSD layer. In fact, much of EMSD development and testing is done over LAN and direct serial links by simply adjusting a few tunable parameters.



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=====
Berkeley Socket API
=====

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Figure 1: Integration of EMSD Technology with Existing E-Mail Application for PalmOS

**4.1.1 Integration with Existing E-Mail Applications**

Due to the numerous number of email applications available for PalmOS, we are taking a different approach to integrate EMSD to these applications than what we did in WindowsCE case.

We encouraged the developers of the applications to integrate the EMSD technology into their softwares. Due to similarities and familiarities of previous protocols, the developers were able to integrate the EMSD technology within a short period of time.

**4.1.2 Current Integration Status**

As of the time of writing, the developers of "Top Gun Postman", "MsgAgent", and "DoodleMail" have successfully integrated the EMSD technology into their softwares. In addition, we are currently in the process of supporting a number of other developers to make the transition to the EMSD technology.

Figure 1 illustrates the components involved as well as the layering of services.

In Figure 1, boxes drawn with "===" represent published interfaces within PalmOS. Each email application contains supports for EMSD. Email applications that do not support transferring messages from within the device is enhanced through another application, like depicted in Figure 2 between the Standard Mail Application and Top Gun Postman. For applications supporting SMTP and POP3 protocols, incorporations of support for the EMSD protocol is easy and fast because the EMSD library complement the existing SMTP and POP3 library within each application.

## 4.2 PalmOS and CDPD Modem integration

PalmOS is capable of connecting to the Internet Service Provider using PPP or SLIP or CSLIP protocol. PalmOS does not distinguish the medium of the connection. A CDPD modem works as well as wire-based connection such as serial line or phone line.

## 4.3 EMSD Message Transfer Service and back end mailbox issues

There are many scenarios in which EMSD can be used to provide messaging services, but for the purposes of this paper, we will consider only the scenario where the following are true:

- Target end user already has an email mailbox.
- The mailbox mentioned is accessible via POP3/SMTP
- The end user would like to be able to access this mailbox via EMSD

In all cases, the EMSD component on each mail applications in the PalmOS communicates directly with an EMSD Message Transfer Agent (MTA) which functions as a gateway between EMSD and SMTP. In other words, messages exchanged between the PalmOS and the EMSD MTA are in the efficient EMSD format (in the airlink where EMSD's attributes are needed). The EMSD MTA handles translating EMSD format messages to the Internet format (RFC-822)[2] and sending them on, or translating incoming Internet messages destined at the EMSD PalmOS node to EMSD format and handing them over using EMSD protocols.

The EMSD MTA can reside anywhere on the Internet, including the CDPD service provider, at an ISP or as Customer Premise Equipment (CPE) at the customer site. Because EMSD MTAs maintain their own subscriber base, all of the above schemes can be deployed simultaneously. For example, [The Neda Customer Premise Message Center](#) was designed as a CPE MTA.

When a user is going mobile, s(he) can initiate forwarding of all or certain classes of messages (for example all URGENT messages) to the assigned EMSD address. A mailbox sorter scheme similar to the "Procmail" utility fits well into this model.

If the system where the user's mailbox resides is EMSD-aware or is the node where the EMSD-MTA entity is running, then a variety of features can be included. An example would be setting up the attributes of EMSD forwarding on the fly and delivering a message to a user only once...

All messages originated from the mobile PalmOS unit would simply be sent via EMSD to the EMSD-MTA without any secondary filter processing. Filter processing at the user mailbox level is relevant only for delivery of messages coming from the Internet destined to the EMSD user.

## 5 End User Experience

### 5.1 Assumptions

- User is already familiar with e-mail concepts
- User has a mailbox on an Internet host, accessible via SMTP.
- User has acquired a PalmOS device.

### 5.2 Acquisition

- The same channel user purchased the PalmOS from has "CDPD Wireless e-mail kits".

- Multiple kits can be set up by working with various CDPD modem manufacturers.
- Each kit would include modem, CDPD activation info and the EMSD-compatible mail softwares.
- Alternatively (or as an extra service) the CDPD activation info and the EMSD add-on software can be made available on-line over the Internet.

### 5.3 Installation

1. Activate the CDPD modem.
2. Verify CDPD network connectivity via the activated modem using provided program.
3. Install the EMSD Mail Service Provider
4. Verify the EMSD setup using provided program.
5. Start forwarding of urgent (or other mailbox filter criteria) messages to EMSD at the host maintaining the user's primary mailbox.
6. Use the EMSD-compatible mail software with the EMSD Mail Service Provider.

## 6 Conclusions

Integrating true Internet e-mail connectivity to the Palm OS platform using EMSD over CDPD is very feasible and is a natural fit to the WinCE's "Companion" model.

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