LEAP: One Alternative to WAP

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Version 0.7
December 6, 2000

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 Lightweight & Efficient Application Protocols (LEAP) protocols. For the complete collection of articles see *The LEAP Manifesto* [**?**], available at
`http://www.LeapForum.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 Introduction

Over the last few years, data communications has expanded dramatically and forcefully into the wireless environment. A major new Internet reality is that of wireless networks, providing service to legions of miniaturized, hand-held mobile devices. This reality has placed an entirely new set of requirements on the underlying communications protocols: they must now provide the power efficiency demanded by hand-held wireless devices, together with the bandwidth efficiency demanded by wide area wireless networks.

Existing Internet protocols do not adequately meet these requirements. Therefore a new generation of efficient protocols is needed, to satisfy the demands of wireless applications. At some point, the wireless data communications industry must agree on a single set of protocols that satisfies its requirements.

1.1 The WAP Trap

In April 1998, a business association called the WAP Forum published the **Wireless Application Protocol**, or **WAP**. WAP is a set of specifications for wireless data communications using hand-held devices such as mobile phones and palmtop computers. The WAP specification provides the users of these devices with mobile data communications capabilities such as web-browsing and e-mail.

The WAP specification purports to be an open, license-free protocol that will unify and promote the growth of the wireless industry. The WAP Forum claims that the WAP specification satisfies all the requirements necessary to become the industry standard, and is aggressively promoting it as such.

In a previous article entitled *The WAP Trap* [**?**], however, we have argued that WAP is utterly unfit for its claimed purpose. In that article we described the desirable characteristics of enduring, industry-building protocols, and we demonstrated that the WAP protocols lack all of them.

Among other things we showed that WAP is the result of a closed design process within a members-only club, that it remains tightly controlled by the WAP Forum, is crippled by patent restrictions, and is riddled with technical design errors.

Our conclusion was that the WAP specification is not a genuine engineering construct; it is a bogus marketing one. Its purpose is to create unfair market advantage and bring short-term financial gain to its developers, rather than to provide long-term benefit to the industry at large and the consumer. Far from being an enabling force in the wireless industry, WAP is a poorly-designed red herring created by narrow business self-interests.

In the long run WAP cannot survive as a viable solution. In the short run, however, it can do considerable harm to the industry and the consumer.

In *The WAP Trap* we went on to discuss the steps that can be taken to prevent this harm. A crucial step will be for the industry to adopt an alternative to WAP as soon as possible. We concluded the article by presenting one alternative: LEAP, the Lightweight & Efficient Application Protocols.

1.2 About this Document

In the present article, we will carry on where the previous article left off. The scope of *The WAP Trap* was limited to a critique of WAP, without actively promoting any particular alternative. The present article, on the other hand, is frankly partisan; our purpose here is to promote LEAP as an open alternative to WAP.

The authors of this article are participants in Free Protocols Foundation (FPF) activities, under whose auspices this article is being written. The mission of the FPF is to provide support for the development, maintenance, and promotion of patent-free protocols and software. It provides a forum in which developers can declare publicly that the protocols and/or software they have developed are intended to be patent-free, and that it is their intention to keep them permanently patent-free.

In addition, where the existence of patented components within protocols and/or software threatens their unrestricted usage and implementation, the FPF supports the promotion of patent-free alternative protocols and/or software. It is for this purpose that the current article is being written: to promote LEAP as a patent-free alternative to WAP.

In this article we will describe LEAP from both a technical and a procedural point of view. We will compare it to WAP, and will demonstrate that it has all the desired protocol characteristics that WAP lacks. Our conclusion will be that LEAP is destined to play a key role in the growth of the Mobile Messaging industry.

This article is one of several we have written that analyze the current status of the wireless data communications industry, criticize WAP, and present our view of what is truly needed to promote the growth of the industry. Related articles are:

- *The WAP Trap* [**?**]. Provides a critique of the WAP specification, and sets the stage for the current paper. Available at http://www.freeProtocols.org/wapTrap.
- *The LEAP Manifesto* [**?**]. Provides a complete analysis of the industry, and a detailed description of the LEAP protocols. *The LEAP Manifesto* is available at http://www.LeapForum.org/LEAP/Manifesto/roadMap/index. html.

2 The Need for Efficiency

Engineering is the art of making intelligent trade-offs between conflicting requirements. A perennial engineering trade-off is that which must be made between the need for *simplicity*, and the need for *performance*. In the case of wireless data communications, performance means such things as data transfer speed, power efficiency, and bandwidth efficiency.

The 1980s and 1990s were the decades of simple protocols - protocols such as the very aptly named Simple Mail Transfer Protocol (SMTP), and Simple Network Management Protocol (SNMP). A great deal of the success of these and other Internet protocols can be attributed to their simplicity.

The first generation of network engineers and network operators were only able to view network communications in relatively simple terms. It was appropriate to cater to that simplicity with simple protocols. A key reason for the success of these early protocols is the lack of technical sophistication on the part of first-generation network engineers and operators.

Simple protocols are easier to make widespread than "good" protocols (meaning those which have better capabilities and performance), for the basic reason that network engineers and operators are able to adopt and implement simple protocols much more easily than "good" protocols.

However, things have changed. Network communications has now expanded into the wireless and mobile data communications arena, and *wireless applications demand efficiency*. The move to wide-area wireless has significantly shifted the location of the ideal engineering balance between simplicity and performance - moving it away from simplicity, and towards performance.

We therefore need a new generation of high-performance, efficient protocols, to cater to the demands of wireless applications. The point is sometimes made that the need for efficiency in the wireless arena is a temporary one – that advances in wireless engineering technology in the form of third generation (3G) systems will eliminate existing bandwidth limitations, obviating the need for efficient protocols. As long as the capacity of wireless networks remains finite, however, the need for efficiency will persist. Efficient usage is an inherent requirement for any finite resource, therefore the requirement for efficient bandwidth usage and battery longevity will remain.

Thus far, professional protocol and standards producing associations, most notably represented by the IETF, have failed to produce an acceptable specification. The IETF continues to represent the tradition of simple protocols, a tradition which wireless communications has now made obsolete. Unfortunately, the IETF remains rooted in this tradition, and has not adapted to the new realities of wireless communications. Until it does so, the IETF will remain ineffective as a protocols and standards body. In the area of efficient protocols, the IETF is simply bankrupt.

3 LEAP: The Lightweight & Efficient Application Protocols

It is now time for a new generation of protocols to be implemented, designed to address the need for *performance*, rather than simplicity.

The **Lightweight & Efficient Application Protocols**, or **LEAP**, are designed precisely to address this need. LEAP is the general framework for a set of high-performance, efficient protocols which are ideal for mobile and wireless applications. LEAP is designed to address the technical requirements of the wireless data communications industry, and is oriented towards providing the greatest benefit to the industry and the consumer.

The LEAP protocols are patent-free, and open-source implementations of the protocols are being made available for a variety of devices and message-center platforms. The protocols are thus ready and available, and can be quickly distributed and implemented as a viable alternative to WAP.

3.1 A Brief History of LEAP

LEAP originated in 1994 as part of the research and development initiatives of McCaw Cellular's wireless data group (now AT&T Wireless). The development work that would eventually lead to LEAP was initially undertaken in the context of the CDPD network; its scope was later expanded to include the Narrowband PCS network also.

By 1996 McCaw Cellular was fully committed to paging, had recently purchased two nationwide narrowband wireless PCS licenses, and wished to develop an efficient wireless message transport and delivery system. Neda Communications, Inc., an independent consulting company working under contract to McCaw Cellular, played a significant role in the development of the required system. Neda Communications had also been involved from the outset in the development of the CDPD specification.

In 1997 however, soon after the purchase of McCaw Cellular by AT&T, the company abandoned narrowband PCS paging altogether. Prior to this event, Neda Communications had secured from AT&T the necessary rights to continue independent development of the protocols. Therefore, recognizing the eventual future need for these protocols, Neda then undertook to continue development of the protocols independently of AT&T. They were eventually completed by Neda, published as RFCs, and now form the cornerstone of the LEAP protocols.

3.2 Technical Overview of LEAP

In this section we will provide a brief technical overview of the LEAP protocols. For a detailed description of LEAP, refer to *The LEAP Manifesto* [**?**], available at
http://www.LeapForum.org/LEAP/Manifesto/roadMap/index. html.

LEAP is a set of wireless application protocols that are optimized for delivering small messages over wireless networks. Wireless networks are constrained by bandwidth limitations, and the hand-held devices they serve are constrained by limitations such as display size, battery capacity, and memory capacity. These constraints place a high premium on the efficiency of data transfer.

The LEAP protocols are up to five time more efficient than the ubiquitous SMTP e-mail messaging protocols. This increased efficiency translates into longer battery life for mobile phones, PDAs and other wireless Internet devices.

3.2.1 Layering of LEAP

The LEAP protocols are layered. The lower layer, called Efficient Short Remote Operations (ESRO), provides reliable connectionless transport services which can be used for a variety of applications. For example, in addition to mobile messaging services, ESRO can be used as a transport service for credit card verification applications and efficient micro browsers. On top of ESRO is the layer called EMSD. EMSD is a messaging protocol that is highly optimized for the submission and delivery of short Internet e-mail messages.

Various other LEAP protocol components are in the process of being designed and implemented. See *The Future of LEAP* article in *The LEAP Manifesto* for more details.

3.2.2 ESRO, Efficient Short Remote Operations

All efficient applications have the requirement for an efficient transport mechanism. For this reason, the initial focus of the protocol development effort has been on creating a general efficient transport mechanism. The resulting protocol is referred to as Efficient Short Remote Operations, or ESRO. ESRO is a reliable connectionless transport mechanism, forming the foundation for the development of efficient protocols when TCP is too much and UDP is too little.

ESRO was published in September 1997 as Internet RFC-2188 [**?**]. Additional information about ESRO is available at http://www.esro.org/

3.2.3 EMSD, Efficient Mail Submission and Delivery

The Efficient Mail Submission and Delivery (EMSD) protocol is built on top of ESRO, and is designed to address the Mobile Messaging application. EMSD provides for the submission and delivery of short (4 kilobytes or less) Internet e-mail messages. EMSD meets or exceeds the level of functionality, reliability and security provided by the existing SMTP protocols. EMSD is a great deal more efficient than existing Internet e-mail protocols.

EMSD was published in March 1999 as Internet RFC-2524 [**?**]. Additional information about EMSD is available at http://www.emsd.org/

3.2.4 Initial Focus: Mobile Messaging

The need for efficient protocols extends across all aspects of wireless data communications, including e-mail, web browsing, and other applications. The LEAP architecture accommodates all of these applications. The initial LEAP protocols, however, are designed to support the Mobile Messaging application, since this is the dominant application for wide-area wireless networks. Subsequent LEAP protocols are expected to address other applications as necessary.

3.3 Processes and Procedures

We believe that a public protocol must conform to each of the following basic, fundamental principles:

- Patent-freedom
- RFC publication
- Maintenance by open Working Groups

Each of these provides a vital assurance of protocol integrity. Patent-freedom ensures that a patent-holder cannot subvert free-market competition among products and services based on the protocol. RFC publication ensures that the protocol is freely available to anyone who wishes to use it. And maintenance by open Working Groups ensures that development of the protocol takes place by democratic, rather than oligarchic, processes.

This trilogy of principles represent the most basic guarantees of the integrity of a protocol.

The LEAP protocols are intended to be open in the fullest sense of the word; they are intended to be freely and permanently available, subject to public review and revision, and without usage restrictions of any kind. Therefore the processes and procedures used throughout the development and maintenance of the LEAP protocols have been such as to endow them with these characteristics, and to ensure their integrity as public protocols.

Complete details of the LEAP development process are provided in a separate article within *The LEAP Manifesto* entitled *The LEAP Protocol Development Model*. The major aspects of the development process are summarized in the following sections.

3.3.1 Freedom from Patents

As discussed in *The WAP Trap*, a highly desirable attribute of an industry standard protocol is that it be free from patents. The presence of patented components within a protocol undermines the ultimate purpose of the protocol: its unrestricted adoption and usage.

The development and maintenance of the LEAP protocols conforms fully to the policies and procedures of the Free Protocols Foundation. In particular, Neda has declared to the Free Protocols Foundation that the LEAP protocols are patent-free to the best of its knowledge, and that it intends to keep them patent-free permanently. For more information see `http://www.FreeProtocols.org`.

3.3.2 RFC Publication

Both protocols have been published as Internet RFCs; ESRO in September 1997 as RFC-2188 [**?**], and EMSD in March 1999 as RFC-2524 [**?**]. RFC publication is the mainstream Internet publishing procedure, ensuring that the protocols are freely, easily and permanently accessible to anyone who wishes to use them.

3.3.3 Open Maintenance Organizations

To provide an open forum for the continued development and maintenance of the LEAP protocols, Neda has established a public organization for each protocol.

The ESRO and EMSD protocols are maintained, respectively, by ESRO.org at http://www.esro.org/, and by EMSD.org at http://www.emsd.org/.

Each of these organizations allows public review of the respective protocol, and provides mechanisms for enhancement of the protocol as a result of collective experience.

Any interested person may participate in the further development of the protocols. Participation in the development process is entirely open and non-exclusive; there are no membership fees. The only requirement is that participants must adhere to the principles and procedures of the Free Protocols Foundation, thus ensuring that the protocols remain permanently patent-free.

4 Comparison of LEAP to WAP

In *The WAP Trap*, we enumerated the characteristics of the WAP specifications that make them wholly unfit to play the role of an enabling industry protocol. These characteristics are summarized in Table 1, along with the corresponding characteristics of the LEAP protocols.

WAP	LEAP
Subject to known patent restrictions	Patent-free
Self-published by the WAP Forum	Published as Internet RFCs
Revisions subject to change without notice	All revisions permanently fixed
Maintained by the WAP Forum	Maintained by open working groups
Re-invention of existing protocols	Efficiency-optimizing extensions to existing protocols
Tailored to mobile phone user interface characteristics	User interface independent
Inherent security vulnerability	Imposes no security assumptions
Inconsistent protocol number assignment	Consistent protocol number assignment
Initial focus: web browsing	Initial focus: messaging

Table 1: WAP versus LEAP

4.1 Patent Restrictions

As noted in *The WAP Trap*, the WAP specifications include patented components. Unlike WAP, the LEAP protocols are entirely patent-free.

4.2 Openness of Publication

As noted previously, the LEAP protocols are published as Internet RFCs, ensuring permanent, unrestricted availability of the protocols. The WAP specifications, on the other hand, are self-published by the WAP Forum, and therefore do not carry the same assurances of unrestricted availability. The availability and permanence of the WAP specifications is only as good as that of the WAP Forum itself.

Furthermore, in order to download any particular WAP specification, a user must agree to a license agreement. By contrast, the LEAP protocols may be downloaded and distributed without any restrictions.

In addition, the WAP Forum's publishing philosophy carries no guarantee of stability. As of February 2000, each WAP specification carries on its title page the disclaimer, "This document is subject to change without notice." By virtue of the RFC publication process, on the other hand, individual revisions of the LEAP protocols are permanently fixed.

4.3 Openness of Maintenance

LEAP's open maintenance processes are also in sharp contrast to WAP. Participation in the development of the WAP specifications requires payment of the $27,000 WAP Forum membership fee (as of February 2000), and takes place entirely behind closed doors. Unlike WAP, the LEAP protocols are maintained by public maintenance organizations in which anyone is free to participate.

4.4 Technical Deficiencies

The WAP protocols also include numerous technical deficiencies. For example, WAP is a broad-scope re-invention of existing protocols. The LEAP protocols, by contrast, consist of a small number of independent protocols that complement existing Internet protocols. Other WAP deficiencies are listed in Table 1; for a detailed discussion, see *The WAP Trap*.

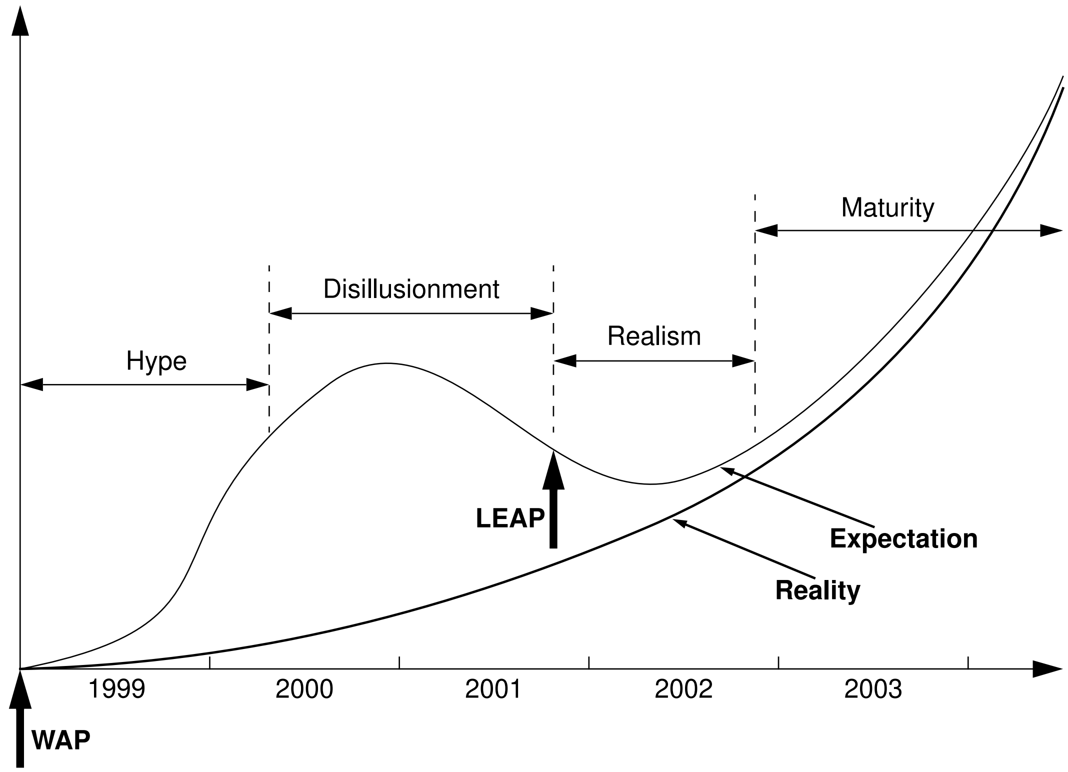

Figure 1: Wireless Internet Hype vs. Reality

4.5 Initial Focus

There are also significant conceptual differences between LEAP and WAP, of which we will mention two here. First, LEAP is primarily oriented towards the mobile messaging (i.e. e-mail) application, whereas WAP is primarily oriented towards mobile web browsing. We believe that this represents a serious misunderstanding of the mobile data communications industry on the part of the WAP Forum. Hand-held mobile devices are extremely well-suited to the e-mail application, whereas their severe user interface limitations render them highly ill-suited to web browsing.

Second, LEAP and WAP take very different approaches to the messaging application. The LEAP approach, embodied in the EMSD protocol, is a complete and efficient submission and delivery model. The WAP approach, on the other hand, is a mailbox access and selective message retrieval model.

A consequence of this is that the WAP protocol has several unresolved issues relating to message delivery. For example, the WAP protocol does not support the "push" model of message delivery, in which time-critical messages are actively delivered to the recipient. The LEAP protocol, by contrast, fully supports the "push" model.

4.6 Hype versus Reality

Our view of the evolution of the wireless Internet industry is illustrated in Figure 1. The early history of this industry is already known to us; in recent years the industry has undergone extremely rapid growth. And in the long term, there is general consensus among analysts that the industry is destined for continued strong and sustained growth.

So the early history is known, and the eventual history we can predict with confidence. But what about the more immediate future? Our view is that, largely thanks to the WAP Forum, the industry has been significantly over-hyped, with the result that expectations now greatly exceed realities. Our prediction is that this period of soaring expectation will be followed by a period of general disillusionment and frustration, as these expectations are inevitably disappointed.

Sooner or later the industry must adopt a more realistic understanding of its technological and business challenges. Part of this understanding will consist of the recognition that the wireless industry must adopt a single set of truly open protocols. Only then will the industry be able to undergo stable and sustained growth.

WAP represents the era of hype and disillusionment. LEAP represents the era of realism and maturity.

5 Making LEAP Widespread

Thus far our discussion has been entirely theoretical; we have demonstrated on paper that WAP is not viable, and that LEAP has all the characteristics necessary to be considered a viable alternative. However this is all academic until the protocols are implemented as software and deployed in real world systems.

In order for the LEAP protocols to become widely used, they must be implemented in the form of software solutions that are readily available for deployment by end-users. To this end, we have created software implementations of the protocols for most common platforms. Protocol engines have been implemented in the form of portable code which has been ported to a variety of platforms. On the device side, software has been implemented for pagers and cell-phones; for hand-held PCs and Palm Pilot (Palm OS, Windows CE, Palm PC); for Windows 98, Windows 95, and Windows NT; and for Pine (UNIX, Windows, DOS). On the message center side, software has been implemented for Solaris, Linux and NT.

All of this software will be made publicly available in the form of free software in open-source format. At present, we have created the structures necessary to allow ready access and downloading of the software in binary form. Foundation libraries of LEAP protocol engines called the "Open C Platform (OCP)" are subject to the GNU Library General Public License and are available as open-source software.

The software is being made available at http://www.MailMeAnywhere.org/.

We expect to have the ESRO protocol engine software components subject to the GNU General Public License available at this location by September 2000. We expect the availability of the entire suite of open-source software implementations described above to be completed by December 2000.

As noted above, the initial emphasis of LEAP is on the mobile messaging application. Protocol engines are only a single component of a bigger picture; in order to provide complete solutions to the user it is necessary to integrate these protocols into other existing pieces of software. Fully-integrated solutions which combine LEAP with other open-source and free software packages such as qmail, sendmail, fetchmail will also be made available.

We invite those interested in using, enhancing, porting and integrating this software to join the relevant mailing lists at http://www.MailMeAnywhere.org/

We will also initially "prime the pump" by providing free subscriber services through ByNumber.net and ByName.net. This will provide initial support for the implementation of the protocols in end-user devices. Usage of the protocols among a sufficient number of user devices will then provide the motivation for usage among the message center systems.

6 Other Alternatives to WAP

In this article we have promoted LEAP as one alternative to WAP. An obvious question is: Are there any other alternatives?

A traditional source of Internet protocols is the Internet Engineering Task Force, or IETF. To our knowledge, however, the IETF does not currently have a working group assigned to this task, and so no protocol specification which addresses the requirements for efficient Mobile Messaging can be expected from them in the near future. Even if the IETF were to assign a working group to this immediately, it typically takes 18 months to achieve a workable first-draft protocol. This time frame is far too long to address the industry's immediately pressing need.

Other traditional sources of protocols are private industry, and the academic community. However, thus far a suitable protocol has been forthcoming from neither of these sources. There is general consensus within the industry that an alternative protocol to WAP is required. Apart from LEAP, however, no such protocol has yet been publicly proposed.

To the best of our knowledge, therefore, LEAP is the only viable open and patent-free alternative to WAP.

7 Summary

All of the basic components that are needed to launch LEAP are complete, in place, and ready to go. These components are:

The Protocols Themselves. The protocols are well-designed, meet all the technical requirements of the industry, and are published as RFC-2188 and RFC-2524. The complete text of the RFCs is available at `http://www.rfc-editor.org`.

Freedom from Patents. The protocols have been declared to the Free Protocols Foundation as patent-free. For more information see `http://www.FreeProtocols.org`.

Open Maintenance Organizations. The protocols are maintained by open and public organizations at `http://www.esro.org`, `http://www.emsd.org`, and `http://www.LeapForum.org`.

Open-Source Software Implementations. These are in the process of being made available for all major platforms and end-user devices. For details see `http://www.MailMeAnywhere.org`.

Free Subscriber Services. Provided to support initial deployment of the protocols in end-user devices. For details see `http://www.ByNumber.net` and `http://www.ByName.net`.

Together, these components represent a complete recipe for the success of LEAP. The protocols themselves are open and immediately available, and open-source implementations of the protocols are in the process of being made available as free software.

The combination of free protocols and open-source software is something which has enormous power. It is this combination of factors which has driven the overwhelming success of other industry standards such as Linux and the Web (HTTP/HTML). We believe that this same combination of factors will drive the acceptance of LEAP in the wireless data communications industry.

Finally, we do not claim that LEAP is technically ideal – like all engineering solutions it includes compromises. What we do claim is that LEAP is a good solution, and that its processes have integrity. Where the LEAP protocols fall short of the industry needs, the open maintenance processes will provide a mechanism by which they can evolve into a better solution.

7.1 The LEAP Manifesto

Every aspect of LEAP is described in *The LEAP Manifesto* [**?**], available at http://www.LeapForum.org/LEAP/Manifesto/roadMap/index. html. *The LEAP Manifesto* includes a technical description of the LEAP protocols themselves, and a description of all the components required to encourage their widespread usage. *The LEAP Manifesto* consists of the following articles:

Executive Summary. An overview summary of the entire LEAP Manifesto.

Overview of the LEAP Protocols. A general overview description of the LEAP protocols.

The LEAP Protocol Development Model. A description of the processes used to develop the LEAP protocols, and how and why these processes differ from the conventional development process. This article also includes a criticism of the IETF protocol development processes.

EMSD: The LEAP E-Mail Component. A technical description of EMSD, the e-mail component of LEAP.

ESRO: A Foundation for the Development of Efficient Protocols. A technical description of ESRO, the transport mechanism component of LEAP.

Efficiency of EMSD. A technical paper analyzing the efficiency characteristics of EMSD and comparing its efficiency to other e-mail protocols.

EMSD on Windows CE. A technical paper describing the architecture and implementation of EMSD on Windows CE devices.

EMSD on Palm OS. A technical paper describing the architecture and implementation of EMSD on Palm OS devices.

A Brief History of LEAP. A summary of the major events in the evolution of the LEAP protocols.

The Future of LEAP. A description of the planned future development of LEAP, including descriptions of several LEAP-based products and services which are currently under development.

The WAP Trap. A detailed criticism of a set of specifications called the Wireless Application Protocol, or WAP. This article demonstrates that WAP is entirely inappropriate to play the role of a Mobile Messaging industry standard.

LEAP: One Alternative to WAP. A point-by-point comparison of the LEAP protocols to the WAP specifications. This article compares and contrasts LEAP with WAP, and demonstrates that LEAP has all the desired characteristics of an industry-enabling protocol that WAP lacks.

Operation WhiteBerry. A description of how all the capabilities of the closed RIM BlackBerry mobile messaging solution can be duplicated using existing software implementations of LEAP, and existing off-the-shelf hardware components.

Strategy for Making LEAP Widespread. A description of our strategy for encouraging widespread usage of the LEAP protocols, including the distribution of open-source software implementations of the protocols, and the availability of free subscriber services.

Trying Out LEAP. A step-by-step, hands-on demonstration of how the LEAP protocols can be used to turn any Windows CE device into a fully functional Mobile Messaging device.

Lessons from History: Comparitive Case Studies. An analysis of the factors which lead to the success or failure of protocols, including discussions of several historical case studies.

The Mobile Messaging Industry. An overview of the Mobile Messaging industry, and a description of the essential factors that are required for its long term success and growth.