WAP Scraps

What can be salvaged from what remains of WAP?

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1 Introduction

We first published the article *The WAP Trap: An Exposé of the Wireless Application Protocol* [**?**] in April 2000. At that time it was the most comprehensive condemnation of WAP written to date. In it we demonstrated that WAP is crippled by patents, the result of a closed design process, inappropriately controlled by the WAP Forum, and riddled with technical design errors. We exposed WAP for what it is: a fraudulent marketing construct. Our conclusion was that WAP must be rejected and replaced with a set of truly open, patent-free, technically sound, mainstream Internet protocols.

1.1 Claiming the Day

In April 2000 we were one of a relatively small number of voices sounding the WAP alarm. At that time WAP was massively over-hyped, and a major portion of the wireless industry had succumbed to the hype. To use a phrase right out of the WAP hype machine: WAP was hot.

But in September 2001, 17 months after initial publication of *The WAP Trap*, our analysis and predictions have been convincingly validated.

The message in *The WAP Trap* resonated within the industry, and it has experienced widespread distribution and readership. Partly because of this, there is now a growing awareness of the fundamental fraudulence of WAP. The engineering community was never seriously taken in by WAP in the first place, and our raising of the alarm has had the desired effect among the business and media communities. Numerous articles have been published which support our position, including:

- *WapLash*. Meg McGinity, Inter@ctive Week, July 31, 2000. [**?**]
- *WAP 2.0: Mature Enough for Flight?* Keri Schreiner, IEEE Internet Computing, November/December 2000. [**?**]
- *WAP Usability: Deja Vu: 1994 All Over Again*. Marc Ramsay and Jakob Nielsen, Nielsen Norman Group, December 2000. [**?**]

The body of published articles includes several which quote us directly or otherwise build on our work. The above articles and others are available on the Free Protocols Foundation website at `http://www.FreeProtocols.org/harmOfWap/main.html`. We will continue to augment the Free Protocols Foundation library with additional relevant articles as they appear.

In addition, *The WAP Trap* has now been translated into French, under the title *Le WAP a la Trappe*. The translation of *The WAP Trap* into French represents another step forward in our campaign to expose WAP. Both English and French versions of the paper are available in HTML, PDF and PostScript formats on the Free Protocols Foundation website at `http://www.FreeProtocols.org/wapTrap/index.html`.

Though the tide of favor has turned against it, the WAP hype machine continues to operate. And there remain many within the industry who are still unaware of the problems with WAP. We will continue to counter the WAP hype by writing and distributing articles such as *The WAP Trap* and *WAP Scraps*.

However, the primary purpose of this article is not just to say NO to WAP. This article focuses on what needs to be done after WAP.

1.2 Mobile Web Browsing: An Open Industry Model

As we discussed in *The WAP Trap*, WAP has many shortcomings. But one of the major issues from a consumer-acceptance point of view is that it represents the wrong starting-point wireless Internet application. Though wireless web browsing certainly has its place, its end-user value proposition is entirely overshadowed by that of another wireless Internet application: Mobile Messaging.

This statement is fully supported by the user experiences and market acceptance of these two applications. The extremely poor end-user experience of WAP-based web browsing is very well documented in the Nielsen Norman Group field study report *WAP Usability: Deja Vu: 1994 All Over Again* [**?**]. By contrast, the end-user value of Mobile Messaging is well evidenced by the market acceptance of BlackBerry and other messaging systems, which are enjoying widespread popularity.

BlackBerry and other Mobile Messaging solutions are experiencing this popularity despite the fact that they are all closed, proprietary systems. In order for the Mobile Messaging industry to reach its full potential, these closed systems must be replaced by an *open* industry model, based on truly open and free protocols. All the components required to enable this, including the necessary open protocols, are now in place; and the development of the open Mobile Messaging industry is now assured. For a detailed discussion of the open Mobile Messaging industry, see the Manifesto article *Operation WhiteBerry* [**?**].

As in the case of Mobile Messaging, an open industry model is essential in order for the Mobile Web Browsing industry to reach its full potential. With the open Mobile Messaging industry well on its way, it is now time to focus attention on the development of the open Mobile Web Browsing industry.

1.3 About this Document

This paper is a follow-on paper to *The WAP Trap*. Both papers are endorsed by and published by the Free Protocols Foundation (FPF). The FPF is an independent public forum dedicated to the support of patent-free protocols and software. The FPF regards protocol and software patents as being highly detrimental to the industry and the consumer, and part of the FPF mandate is to oppose exceptionally harmful patents and patented protocols when they appear. One such patented protocol is WAP.

The FPF is a U.S. non-profit organization, and is tax-exempt under Section 501(c)(3) of the Internal Revenue Service regulations. All monetary contributions made to the FPF are tax deductible in accordance with these regulations. Any organization or individual wishing to support the goals of the FPF is encouraged to participate by joining the FPF mailing list, or by making an appropriate donation. For more information see the FPF website at `http://www.freeprotocols.org`.

One of the ways in which the FPF opposes patented protocols is by supporting and endorsing patent-free alternative protocols. This paper describes how WAP can be avoided by use of patent-free alternatives, and is therefore fully consistent with this mission. The purpose of this paper is to describe the development of the open Mobile Web Browsing industry. In particular, we will:

- Show how recent developments allow Mobile Web Browsing to be implemented based on an open industry model which avoids the WAP protocols entirely.
- Describe a new set of efficient protocols that can significantly increase the efficiency of Mobile Web Browsing.
- Show how the WAP protocols have now become entirely irrelevant, and discuss whether anything useful can be salvaged from them.
- Invite others to participate in the development of the open Mobile Web Browsing industry.

1.3.1 Acknowledgments

We gratefully acknowledge the assistance of the following persons in the preparation and review of this document: Pinneke Tjandana.

1.3.2 Conflict of Interest Disclosure

The authors of this article were also the initial developers of LEAP, and therefore have a vested interest in the success of LEAP over WAP.

However, we are also active participants in the Free Protocols Foundation (FPF), under whose auspices this article is being written. As participants in the FPF, we are fully committed to its patent-free principles. As noted above, part of the FPF mandate is to provide support for patent-free alternatives to patented protocols such as WAP. It is in the spirit of this mandate that this article is being written.

2 Mobile Web Browsing: Past, Present and Future

The basic problem that WAP purports to address is very real: that of providing website access from a cell phone. (More generally, the central web browsing problem is that of providing website access from miniaturized devices in general, including PDAs, pagers, etc. WAP is heavily oriented towards the cell phone in particular; however the required industry solution must address miniaturized devices in general.) A particular website may be very full-featured, including rich content which cannot be displayed on the limited cell phone display. In order for the phone to provide meaningful presentation of this website, an appropriate subset of the website content must be extracted and downloaded to the phone.

2.1 The Past: WAP

There is nothing bogus about this problem – only about the way WAP has gone about solving it. A key architectural component of the WAP solution is the **WAP Gateway**, which stands between the cell phone and the website, and which actively participates in the data extraction/download process. The catastrophic problem with this is that it totally violates the Internet End-to-End principle – the gateway is now interposed as an active authority between the client and the website.

Clearly, the WAP Gateway exists for business reasons, not engineering ones. Control of the gateway, together with control of the cell phone WAP software which can preferentially direct end-users to one gateway rather than another, creates enormous business opportunities for the gateway operator. This is the fundamental *raison d'etre* of the WAP Gateway; and everthing else in the WAP model, including the protocols themselves, falls secondary to this.

In other words, the entire WAP construct is an attempt by the wireless network operators and phone manufacturers to hijack the Mobile Web Browsing industry. If there was ever an example of the business dog wagging the engineering tail, this surely is it.

The basic motivation behind the WAP Gateway is aptly summed up in the following e-mail, posted to the IETF public mailing list by Phil Karn, an engineer at Qualcomm (itself a longtime WAP Forum member), in response to *The WAP Trap*. Material omitted from Mr. Karn's e-mail is indicated by ellipses; otherwise, he is quoted verbatim:

```
From: Phil Karn <karn@qualcomm.com>
To: public@MOHSEN.BANAN.1.BYNAME.NET
CC: ietf@ietf.org, karn@qualcomm.com
Subject: Re: WAP Is A Trap -- Reject WAP
Date: Tue, 20 Jun 2000 12:36:47 -0700 (PDT)
Message-Id: <200006201936.MAA26742@servo.qualcomm.com>

... I also scratched my head when WAP came out. It just didn't make any
technical sense. I see I'm not the only one; bravo for writing such a
good critique.
```

```
One thing missing from most block diagrams of WAP is the chute on the
bottom of the carrier's WAP gateway pouring out money. It's safe to
say that this chute is WAP's primary reason for existence.

... The Internet end-to-end model will once again prevail, putting the
cellular service providers back into their proper place as providers
of packet pipes, nothing more. And life will be good again. :-)
```

However, the wireless industry has now created the components required to solve the central web browsing problem the right way – and without WAP. In particular, two major developments have now rendered WAP completely irrelevant:

1. The XHTML[**?**] protocol from W3C
2. The LEAP family of protocols from the LEAP Forum

2.2 The Present: XHTML

Figure 1 shows the protocol stacks for web browsing under three different implementations: the WAP architecture, an architecture based on XHTML, and an architecture based on XHTML and LEAP.

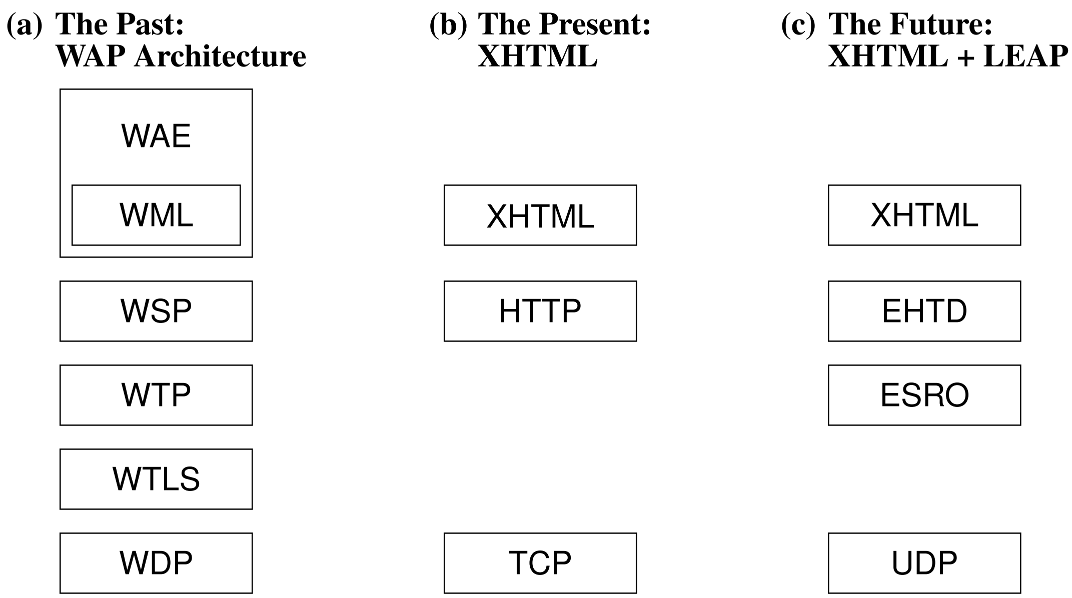

Figure 1: Mobile Web Browsing: Past, Present and Future

XHTML is a markup language from the World Wide Web Consortium (W3C) that allows an appropriate subset of web page content to be provided to a requesting device, depending on the device's display capabilities. XHTML thus provides an immediate solution to the central problem of website access from a limited-capability device such as a cell phone. As shown in Figure 1(b), XHTML can be used in combination with HTTP [**?**] and TCP [**?**] to provide a complete web browsing solution which bypasses the WAP Gateway and avoids the WAP protocols entirely.

Furthermore, XHTML is an open, Internet-mainstream protocol, and conforms fully to the Internet End-to-End principle. The model of Figure 1(b) therefore provides Mobile Web Browsing the right way – i.e. based on a truly open industry model.

(Note: The model of Figure 1(b) is essentially the basis of the popular Japanese I-Mode system.)

For complete details about XHTML visit `http://www.w3.org/MarkUp/`. For information about W3C visit their website at `http://www.w3.org/`.

A disadvantage to the implementation of Figure 1(b) is that it requires the use of HTTP and TCP, which have serious inefficiency characteristics for the limited-size data transfer implied by miniaturized handheld devices. In the following sections we will see how the LEAP protocols can provide the required efficiency.

2.3 The Importance of Efficiency

The implementation of Internet applications such as web browsing in the wireless arena places a very high premium on the efficiency of data transfer. Wide area wireless networks demand bandwidth efficiency; miniaturized devices demand power efficiency; and the end user demands reliability and minimum latency. The underlying wireless protocols must provide all the required efficiencies.

The claim is sometimes made that the need for efficiency in the wireless arena is a temporary one – that advances in wireless engineering technology (such as third generation (3G) systems and 802.11b[**?**]) will eliminate existing bandwidth limitations, obviating the need for efficient protocols. And indeed some high-speed networks have been implemented which demonstrate the capabilities of next-generation technologies.

However, thus far such implementations have been limited in scope. They have been limited to a relatively small coverage area, or they have been limited in terms of their support for active mobility – i.e. they support only static wireless devices. But the efficiency demands of wireless networks with very large coverage areas (i.e. nationwide or worldwide), and which support active, in-motion mobility, are very much greater. And despite future advances in network speed, efficiency will remain a desirable goal as long as the capacity of wide-area wireless networks remains finite.

For these reasons, efficiency will remain a crucial aspect of wireless network usage for some time to come.

2.4 The Future: XHTML + LEAP

Because of the very limited display capabilities of miniature handheld devices, Mobile Web Browsing of necessity involves the transfer of relatively small amounts of data. In other words, Mobile Web Browsing is an inherently limited data-size activity.

As connection-oriented protocols, HTTP and TCP are most efficient for large data transfers; however they provide very poor efficiency for short data transfers. This means that HTTP and TCP are sub-optimal protocols for Mobile Web Browsing, and the scenario of Figure 1(b), though open and WAP-free, is a highly inefficient implementation.

Therefore an appropriate set of protocols are required to provide the necessary efficiency; and we are proposing the LEAP protocols as candidates for this role.

The Lightweight & Efficient Application Protocols (LEAP) is a family of high-performance, efficient protocols that are ideal for mobile and wireless applications. In sharp contrast to WAP, the LEAP protocols are truly open, RFC published, and patent-free; and declarations of the patent-free nature of the protocols have been made to the Free Protocols Foundation. For a comprehensive description of the LEAP protocols see *The LEAP Manifesto*, available on-line at `http://www.LeapForum.org/leap/`.

In addition, open-source implementations of the LEAP protocols are freely available through the **MailMeAnywhere** open-source software distribution center; for details visit the MailMeAnywhere website at http://www.MailMeAnywhere.org.

The initial focus of the LEAP protocols was on efficient Mobile Messaging, and the first two members of the LEAP family, EMSD (Efficient Mail Submission and Delivery; RFC-2524 [**?**]) and ESRO (Efficient Short Remote Operations; RFC-2188 [**?**]), were designed for this purpose. These protocols are now complete and in place, and a complete framework for the development of the open Mobile Messaging industry now exists. Given that, the focus of the LEAP Forum can move on to the next challenge: efficient web browsing.

Two members of the LEAP family of protocols are relevant to the web browsing application: ESRO and EHTD. ESRO provides reliable connectionless transport services which can be used for a variety of applications. For complete details on ESRO see the Manifesto article *ESRO: A Foundation for the Development of Efficient Protocols*, or visit the ESRO website at http://www.esro.org. EHTD (Efficient Hyper Text Delivery) is a hypertext transfer protocol which is optimized for the efficient transfer of short markup pages.

All the LEAP protocols are designed with a major emphasis on efficiency, and ESRO and EHTD together bring these efficiency benefits to the web browsing application. For short data transfers, EHTD is significantly more efficient than HTML, while ESRO is significantly more efficient than TCP – for example, TCP requires a minumum of 5 packets per transaction, whereas ESRO requires 2 or 3. For a detailed analysis of the efficiency of the LEAP protocols, see the Manifesto article *Efficiency of EMSD* [**?**]. That article analyses the efficiency of EMSD and ESRO specifically; however similar efficiency results can be expected in the case of EHTD and ESRO. In particular, ESRO and EHTD are highly efficient for the transfer of limited-size data, and are therefore ideal for the Mobile Web Browsing application.

Figure 1(c) shows how these protocols may be used in combination with XHTML and UDP [**?**] to provide a Mobile Web Browsing implementation that is completely open, WAP-free **and** efficient.

Note that the implementations of Figure 1(b) and Figure 1(c) are not mutually exclusive, but rather may be considered to be complementary. The connectionless protocol stack of Figure 1(c) is highly optimized for the short data transfers inherent to Mobile Web Browsing; whereas the connection-oriented stack of Figure 1(b) may be used for large data transfers whenever necessary.

2.5 Invitation to Participate

ESRO is a complete, RFC-published protocol, for which open-source software implementations are ready and available for immediate deployment. The EHTD protocol, however, is still in its early stages of development. Those who wish to participate in the development of EHTD are invited to do so, and may do so via the LEAP Forum website at http://www.LeapForum.org.

The experience gained in the development of the WAP protocols can be of great assistance in the development of EHTD. In particular, the WAP specifications include various technical design errors, from which important lessons can be learned. In this regard the engineers who took part in the design of WAP, or who otherwise have a technical understanding of WAP, represent a particularly valuable resource. Their participation is encouraged and welcomed.

3 WAP: A Salvage Operation

The WAP Forum has responded to the availability of XHTML by announcing WAP 2.0, which provides support for both XHTML and WML in the WAP protocol stack. This diminishes, but does not eliminate, the presence of the WAP Gateway in the WAP model. In addition, the in-place WAP 1.x architecture can claim to provide significant efficiency advantages over the connection-oriented stack of Figure 1(b).

However, all the other problems with WAP, detailed exhaustively in *The WAP Trap* and elsewhere, remain. Given the availability of truly open, Internet-mainstream alternatives, there is little remaining role for either the WAP specifications or the WAP Forum. At this point, WAP has become a salvage operation. There are three aspects to this salvage: engineering, business, and psychological.

3.1 Engineering Salvage: Scrapping WAP Layer by Layer

Before throwing WAP out completely, it behooves us to examine the specifications to determine whether there is anything worthwhile that can be salvaged for incorporation or usage in the open industry models.

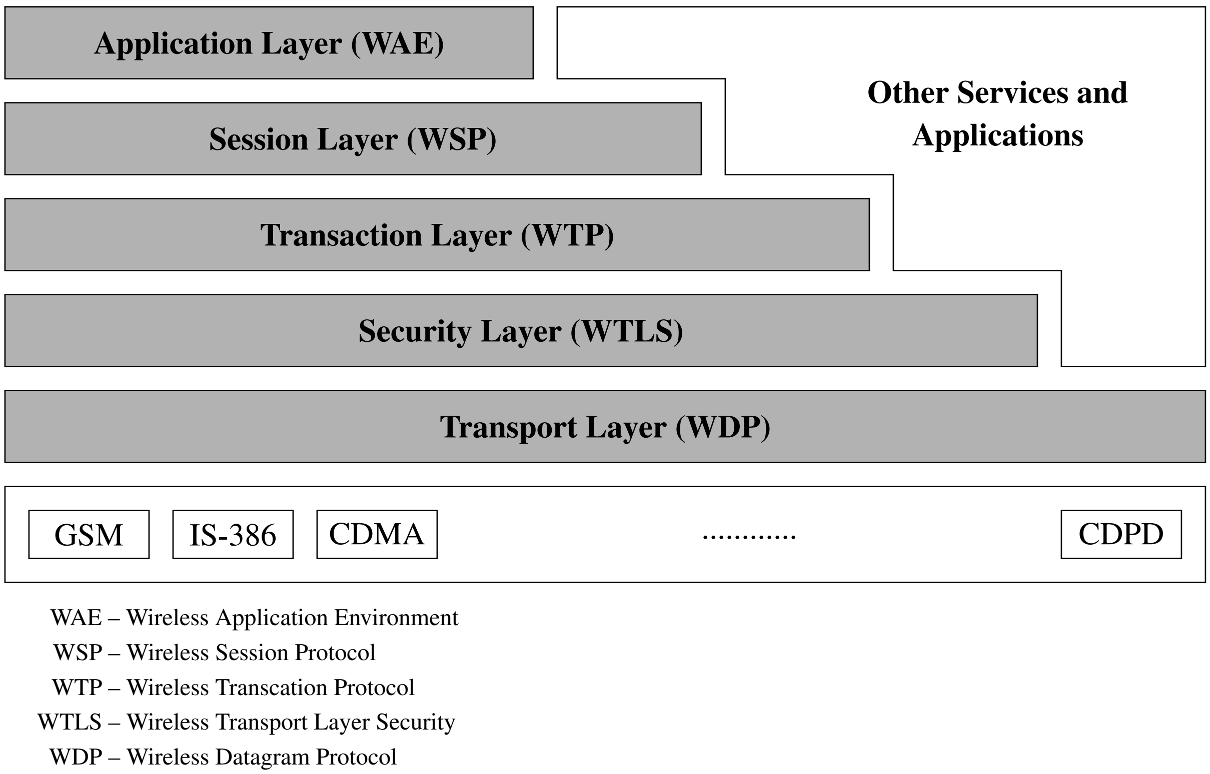

Figure 2: WAP Architecture

The general WAP architecture is shown in Figure 2. This figure is taken directly from the WAP specifications, and all nomenclature, acronyms etc. throughout this section are those of the WAP model. Starting from the bottom of the figure:

- **WDP (Wireless Datagram Protocol).** The purpose of WDP is to accommodate non-IP networks. However, the convergence of wireless networks on IP at Layer 3 is now a technological reality. Most modern networks already support native IP, and IP will eventually become standard on all wireless networks. There is therefore no need for a protocol designed to accommodate non-IP networks.

  Since IP can be assumed to be present at Layer 3, UDP is entirely adequate at Layer 4. Therefore WDP is not needed at all, and can be scrapped completely.

- **WCMP (Wireless Control Message Protocol).** The purpose of WCMP is also to accommodate non-IP networks, which, as described above, is unnecessary. Assuming IP at Layer 3, the functionality of WCMP is adequately provided by ICMP. Therefore WCMP is not needed at all, and can be scrapped completely.

- **WTLS (Wireless Transport Layer Security).** The purpose of WTLS is to provide security functionality. However, a number of major security problems have been identified in WTLS, including vulnerability to datagram truncation attack, message forgery attack, and a key-search shortcut for some exportable keys. For a detailed description of the WTLS security problems, see Saarinen's paper *Attacks against the WAP WTLS Protocol* [**?**].

Nevertheless, there may remain some worthwhile elements in WTLS. If the WAP Forum were to bring WTLS into conformity with the Internet mainstream by making patent-free declarations for it, publishing it as an RFC, and subjecting it to open review and maintenance procedures, then it may be worth examining for salvageable components.

- **WTP (Wireless Transaction Protocol).** WTP serves a genuine purpose; however, equivalent functionality to WTP is provided by ESRO. In addition ESRO predates WTP, is truly open and patent-free, is RFC published, and otherwise conforms to the Internet mainstream. Therefore WTP is not needed at all, and can be scrapped completely.
- **WSP (Wireless Session Protocol).** WSP provides a binary form of HTTP. Therefore there may be components of WSP that can be used to facilitate the development of EHTD.
- **WML (Wireless Markup Language).** In the WAP model, WML is part of a broader specification called WAE (Wireless Application Environment). The functionality of WML is entirely provided by XHTML, which therefore renders WML irrelevant. WML is no longer required at all, and can be scrapped completely.

Thus every component of the WAP protocol stack is either functionally unnecessary, made irrelevant by an open alternative, or misdesigned; with the possible exceptions of WSP and WTLS, which may have some salvage purpose.

Our analysis of the WAP stack is supported by various other studies which come to conclusions consistent with the above. A good starting point is the article *W* Effect Considered Harmful* [**?**], in which author Rohit Khare presents a detailed analysis of WAP, and demonstrates its shortcomings and ultimate non-viability.

3.2 Business Salvage: Cutting Financial Losses

A huge amount of money has been sunk into the WAP fiasco – a large number of wireless network operators placed their bets on WAP, and invested heavily. And the WAP infrastructure is now complete; all the pieces are built and in place. The problem is that it falls disastrously short of its expectations; and as a result few people need it, few want it, and few are using it [**?**]. Apart from empty hype and broken promises, the WAP Forum has little to show for its massive investment.

Under circumstances like this, people may find it difficult to halt the investment Juggernaut. WAP has a huge amount of mass and momentum – it has the mass of its enormous investment costs, and the momentum of its own hype machine. The WAP Forum members may make the mistake of believing that this investment is still worth something. They may make the mistake of believing their own hype.

But WAP is doomed, and its investment costs are now sunk costs. The only thing for the investors to do now is pull the plug on WAP and cut their losses. Continued investment in WAP represents the throwing of good money after bad, and will only result in greater bottom-line losses at the end of the day. The sooner WAP is recognized as a costly failure, the better.

3.3 Psychological Salvage: Saving Face

Just about everybody joined the WAP Forum. The WAP Forum membership list is indeed impressive, including virtually every major player in the wireless and telecommunications industry. However, as we now know, this is not a meaningful endorsement of WAP. Rather, it is a testament to herd mentality and bet-hedging.

The arrival of XHTML and LEAP on the scene means that WAP is finished, and the WAP Forum has no significant role to play in the development of the wireless Internet industry. From this point on, the important work will no longer be taking place within closed forums such as WAP.

Given all of this, it is clear that the WAP Forum has little reason for continued existence, other than as a lame-duck organization with responsibilities that do not extend beyond face-saving activities for its members.

4 In Pursuit of Integrity

Much has happened in the 17 months since we first published *The WAP Trap*. The Internet bubble has burst catastrophically, causing the Nasdaq Composite Index to collapse from its peak of 5130 in March 2000 to around 1700 today – a staggering 67% loss of market capitalization.

And the WAP bubble has also burst. The fortunes of WAP are perhaps best represented by Openwave Systems, Inc. (formerly Phone.com, Inc.), one of the principal inventors and architects of WAP. The stock price of this company reached a peak of $208 in March 2000; at the time of writing in September 2001 it is trading at around $15 – a loss of 93%. Other WAP-related companies have experienced similar losses.

Meanwhile, the consumer has yet to see anything close to the promised ease and convenience of cell phone Internet access; and we are not aware of even a single company that has made significant profits from sales of WAP services.

4.1 The WAP Hype Machine Fraud

WAP has been a colossal failure in financial terms. Its usage has not and cannot recoup its investment costs. Nevertheless, WAP has created fortunes for a privileged few.

The WAP business model is based on the traditional supply chain model, in which the financial and other needs of all potential gatekeepers are addressed throughout the supply chain. The creation of this supply chain has required the construction of a major infrastructure. Though this supply chain model cannot and will not work as intended, its construction has presented enormous profit-making opportunities for those in the right position.

These profits have derived from two major sources. The smaller of these consists of the profits associated with building the WAP infrastructure itself; in particular the huge development contracts that have been awarded, together with sales of WAP gateways and other equipment.

But it is the larger source that represents the truly spectacular opportunity. This opportunity has been based, not on building the WAP infrastructure, but on the fairy-tale promises and expectations that have been created alongside it. The enormous amount of hype surrounding WAP led to huge increases in stock prices and company valuations across the entire WAP industry – nowhere better represented than in the valuation of Phone.com itself.

Various WAP promoters were also investors and stockholders in key WAP companies. These investors/promoters participated actively and collectively in the hyping of WAP, drove valuations up to levels far beyond what was realistic or supportable, then sold their WAP-related stock to the public at vastly inflated prices. One could be forgiven for wondering whether the activities of the WAP promoters were intentionally directed towards this happy outcome. As the disappointing reality of WAP inevitably became clear, virtually all these inflated stock prices collapsed to less than 10% of their WAP-bubble peak, making fortunes for the investors, while leaving the public holding the empty WAP bag.

This type of activity is commonly referred to as a "pump-and-dump" scheme – an ugly phrase to refer to an ugly operation: the deliberate over-hyping of a stock with the intention of artificially inflating its price, then dumping it on an unsuspecting public. From the perspective of the unfortunate losers, the collective activities of the WAP insiders must be hard to distinguish from a pump-and-dump operation on a grand, industry-wide scale.

The WAP bubble was part of the more general Internet bubble, which represented the aggregate effects of a multitude of contributary bubbles similar to WAP. The WAP bubble was thus both a consequence of, and a cause of, the Internet bubble. To the extent that WAP was a consequence, the WAP promoters may shirk their responsibility for the WAP bubble. But to the extent that WAP contributed, they must then accept responsibility for the broader Internet bubble.

We have no objection to those who make fortunes on the basis of something real. Authentic entrepreneurs make fortunes by building companies which provide something of value to the consumer, and which create enduring value for their stockholders. Such people fully deserve the wealth created by their ingenuity, commitment and hard work.

Nor do we object to profitable stock trading in which no misrepresentation takes place. The stock prices of many companies were swept up and down along with the general Internet bubble; but in most cases this took place without gratuitous hyping by insiders. Those who sold near the peak made money at the expense of those who bought; but those are the breaks in the high-tech industry, and these are the risks that investors must accept.

But neither of these considerations applies to WAP. In the case of WAP little of value has been provided to the disappointed consumer, the value of company equity has been fleeting, and a minority of people have been greatly enriched at the expense of a duped majority. The WAP fortunes have been made by selling WAP-related stock at inflated prices, *not* by delivering WAP services to satisfied customers.

Furthermore, the WAP hype campaign continued, and still continues today, *despite the fact that actual WAP usage remains dismal, and no one has ever made significant profits on the basis of WAP services*. Given these facts, we find it scarcely conceivable that the WAP insiders were unaware that WAP was being hyped far beyond its reality, that stock prices were being driven to levels far beyond their sustainable value, and that they would inevitably collapse.

We are making no suggestion here that actual, prosecutable criminal fraud took place. But there can still be breach of trust, even though no law may have been broken. When we consider that the WAP model includes a gateway whose primary purpose is to generate revenue for its operator; when we consider that WAP is patented; that WAP is a shoddy engineering construction; that WAP is the pseudo-open creation of a pseudo-open forum, then we have to wonder if everything is entirely above board.

In our judgement, the activities of the WAP investors/promoters amount to fraud in all but the letter of the law. Our readers may come to their own conclusions.

4.2 Protocol Integrity

Underhanded practices are a fact of life in the business world. But when such practices involve the creation of a large-scale engineering construct, and when they are based on the exploitation of vital industry protocols, this degrades the integrity of the engineering profession.

The engineering profession traditionally carries a responsibility to protect the safety and welfare of the public. An industry protocol is an engineering construct, held in public trust by the engineering community. It is the responsibility of the engineering community to defend this trust against exploitation by narrow business self-interests.

There are three fundamental principles for maintaining the integrity of public protocols [**?**]. These are:

- Patent-freedom
- Unrestricted access, permanence and stability of the published specifications (e.g. RFC publication)
- Maintenance by truly open organizations

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 organizations ensures that development of the protocol takes place by technical engineering consensus, rather than business self-interest.

This trilogy of principles represents the most basic guarantees of the integrity of a protocol. If any one of these things is missing, then this means that some attempt is being made to control or limit access to the protocol. In the case of a public protocol, there is no valid reason for doing this.

The creation of the WAP specifications has violated every one of these principles. The use of patents and other access-control mechanisms has been a traditional way of life in the highly business-oriented, oligarchic telecommunications industry. But the Internet industry is not like that. Openness and freedom from authority lie at the heart of the Internet, and in no small measure account for its extraordinary vitality and success. Patents and other business-oriented control devices have no place in this industry. Though WAP may try to pass itself off as an "open Internet protocol," its roots in the telecommunications industry are plainly evident.

In *The WAP Trap* we challenged the WAP Forum either to provide valid reasons for their violation of the above principles, or to bring the WAP specifications into line with them. Seventeen months later, neither of these things has happened, and our challenge remains unanswered.

We now repeat our challenge. We challenge the WAP Forum to abandon their closed, members-only model of operation, make patent-free declarations regarding the WAP protocols, publish them as Internet RFCs, and subject them to genuine public review and maintenance procedures. By taking these steps, the WAP Forum will allow the possibility of what remains of WAP being incorporated into the mainstream Internet development model.

4.3 Engineering Integrity

When first published in April 2000, *The WAP Trap* was well ahead of its time. At that time it represented a distinctly minority viewpoint, and seemed radical and extreme to many. Today it seems much less so.

The same may be true of this article. To the casual observer, the WAP Forum may appear to be a healthy organism, engaged in creating something important and worthwhile. WAP has not yet been fully discredited, and it may not for some time. Meanwhile, the naive or the inexperienced may find themselves impressed by the sheer scale of financial investment and engineering effort that has gone into WAP. Such observers may find themselves puzzled by, and skeptical of, our rhetoric. It may be hard to accept that something so big can be so fallacious; nevertheless, that is the fact.

In this paper we are lobbying for a Mobile Web Browsing based on a truly open industry model. By definition, WAP in its present form can play no role in such a model. Not all the things we are lobbying for will take place, and the things that do may not take place as soon as we would like. The LEAP protocols we are proposing may become part of this model, or they may not. The WAP salvage operation we are suggesting may contribute to this model, or it may not.

But the eventual outcome is clear. WAP is non-viable, and sooner or later the rest of the wireless industry will come to this realization. And at some point it will be replaced by a truly open solution.

In the meantime, we urge those engineers who have an interest in the ethics of their profession to distance themselves from WAP, because it is specious. Given a choice between WAP and something else, we encourage the engineering men and women of the wireless industry to invest their precious talents in something that has both business and engineering integrity.