Modeling and Analysis of WAP Protocol Family

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Abstract

People from all over the world are more dependent nowadays on on-line services.

WAP (Wireless Application Protocol) is a protocol that makes it possible to surf the Internet from a cellular phone or other handheld wireless devices.

The WAP Forum solves the problems with the low bandwidth by introducing a gateway between the cell phone and the WWW server. The cell phone can't communicate with a WWW server directly but instead it goes through a gateway that decodes the requests from the cell phone and encodes the answers to the cell phone. The gateway talks to the WWW server and delivers the answer to the cell phone. The language the micro browsers in the cell phones understand is WML (Wireless Markup Language) so the gateway's job is to translate the HTML response from the web server to a WML response and send the answer to the phone. WML is pretty similar to HTML but with many restrictions because of the limited display and bandwidth.

The WAP architecture follows the OSI layering model and consists of five layers but authors will only discuss the two most important layers here: the Session Layer (WSP) and the Transaction Layer (WTP) (protocols abbreviations in parentheses).

WSP addresses to the unreliable connection problem by offering SAR functionality (segmentation and reassembly). WSP provides means for organized exchange of content between co-operating client/server applications. Specifically, it provides the applications means to:

a) establish a reliable session from client to server and release that session in an orderly manner;

b) agree on a common level of protocol functionality using capability negotiation;

c) exchange content between client and server using compact encoding;

d) suspend and resume the session.

The currently defined services and protocols (WSP) are mostly suited for browsing-type applications. Actually WSP defines two protocols: one provides connection-mode session services over a transaction service, and another provides non-confirmed, connectionless services over a datagram transport service. The connectionless service is most suitable when applications do not need reliable delivery of data and do not care about confirmation. It can be used without having to establish a session.

WTP is the WAP equivalent of TCP or UDP and it operates efficiently over secure or non-secure wireless datagram networks. WTP itself has no security mechanisms. WTP is responsible for packet segmentation and reassembly and for acknowledgment of packets and retransmission of lost, unacknowledged or corrupt packets. WTP numbers packets so that a retransmitted packet is not mistaken for a new packet, which would cause duplication. There are three classes of operation for this protocol; class-0, which is used to send packets to the network without acknowledgements, class-1, which requires an acknowledgement for every transmitted message and class-2, which is similar to class-1 with an additional reliable reply message. The class-2 of WTP can operate in two modes; explicit and implicit. In the first case every invocation has to be acknowledged before a result is sent, whereas in the second case (implicit mode) a result packet is considered as an acknowledgement of the invocation packet. Acknowledging the invocation message prevents the sender's timer from expiring in cases that the request requires additional time to be processed. Authors focus on the WTP class-2 operation.

The WSP layer is also taken into consideration. An idea of making these two protocols more effective and reliable is proclaimed. Authors propose a modification for Wireless Transaction Protocol which improves the original flow control algorithm. The work includes new ideas of developing and improving WAP as one of the important contemporary technologies.

INDEX TERMS: Wireless Application Protocol, Coloured Petri Nets, flow control protocol.