“Modeling and analysis of WAP protocol family”

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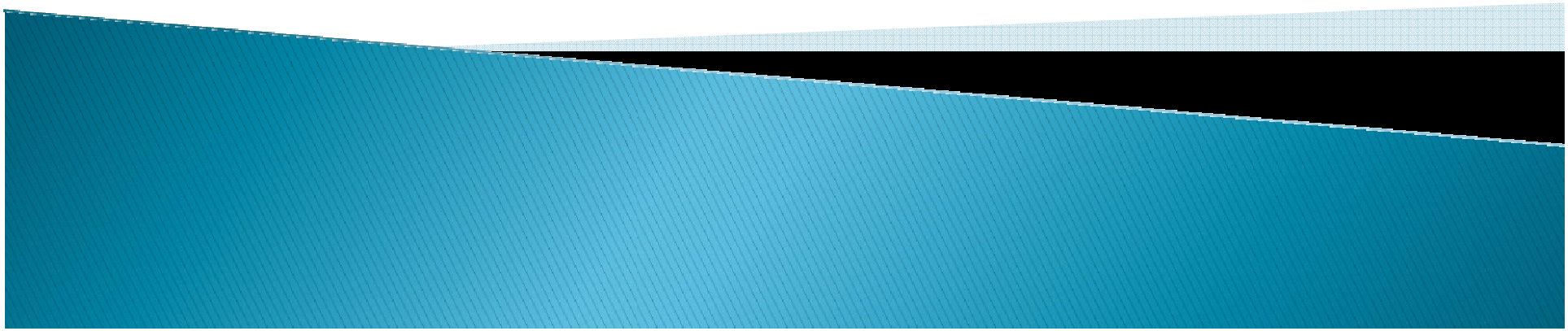
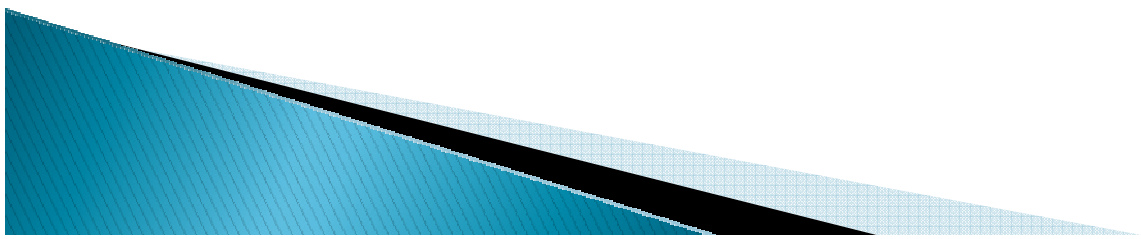


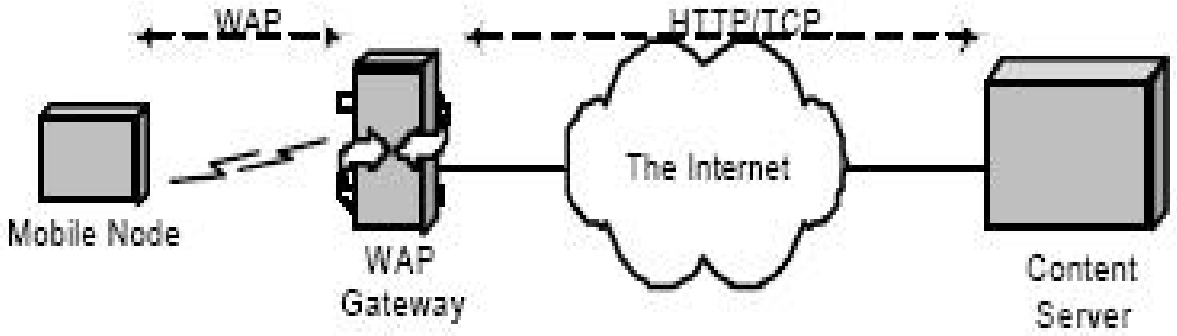
“So, what is WAP about?”

- WAP is a stack of protocols that are responsible for wireless Internet connection.
- Its history goes back to the 1997 when the WAP forum was organized by Nokia, Ericsson and Motorola.
- WAP was designed as an open standard for wireless data exchanging, independent from devices and services providers, it is a good decision for mobile hosts with a small display, little memory.



“The evolution”

- The first specification of WAP proposed a two-part connection scheme:
- split connection for accessing web content;

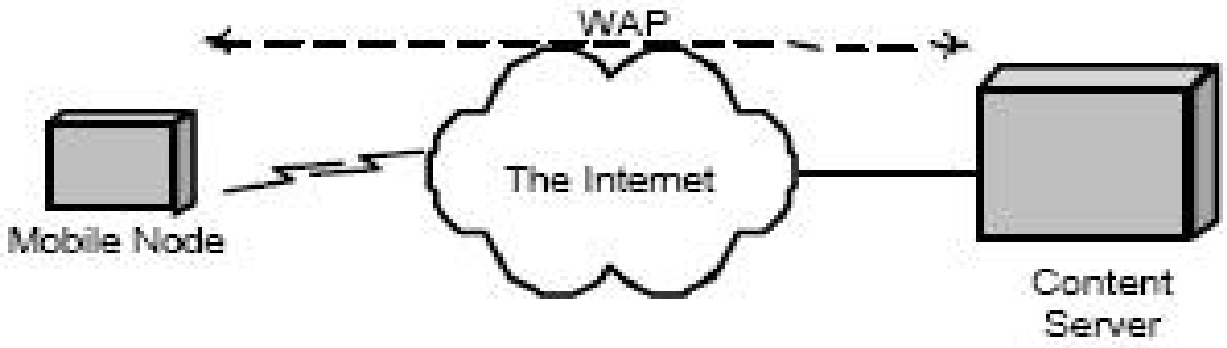


WAP browsing setup with gateway

“The evolution” (Con.)

- end-to-end connections might be required either for security reasons or for specific applications;

WAP 2.0

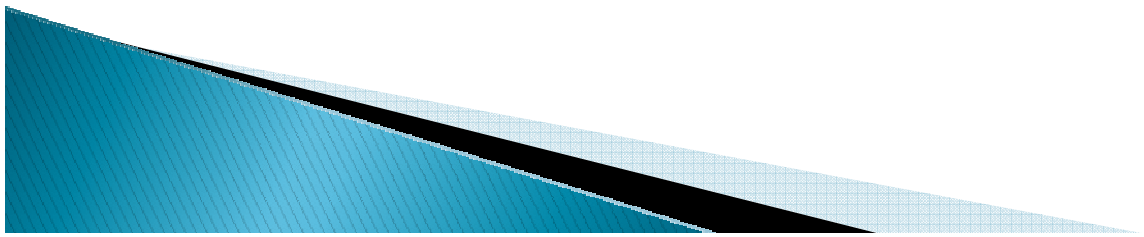


WAP browsing setup end-to-end

“The evolution” (Con.)

- Version WAP 2.0:

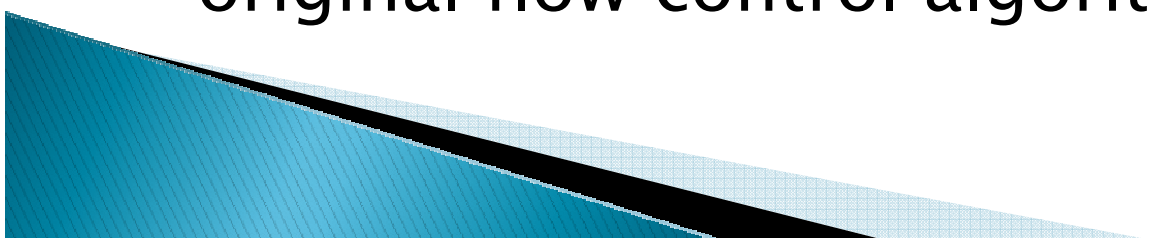
- WAP maintains TCP, IP, http, protocols, that helps mobile host to ask the content from link sources omitting the provider server.
- Long timeout
- Connection resumption from the break point.
- Push technology.



“The problem”

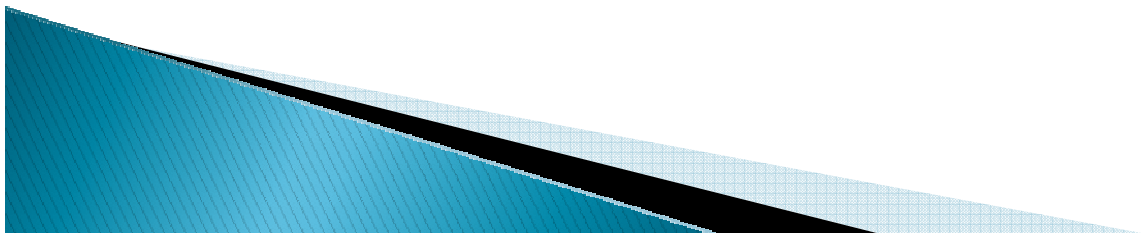
- analyze a model of the WAP specification and perspectives of research and development in this field.

- propose a modification for Wireless Transaction Protocol which improves the original flow control algorithm.



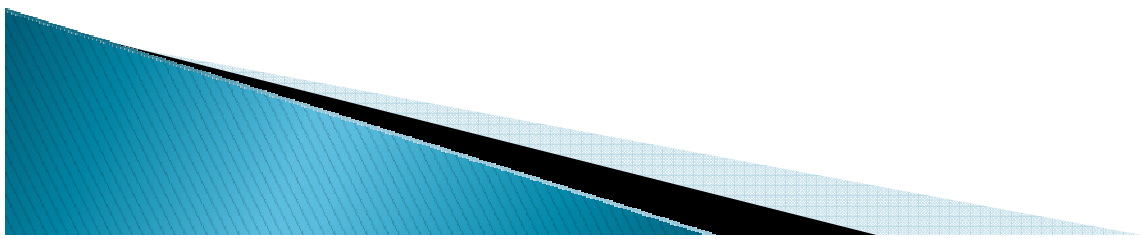
“Specification”

- Huge amount of various texts
- Difficulty in interrelating of all of these documents
- Basic features are buried under dozens of non relevant features



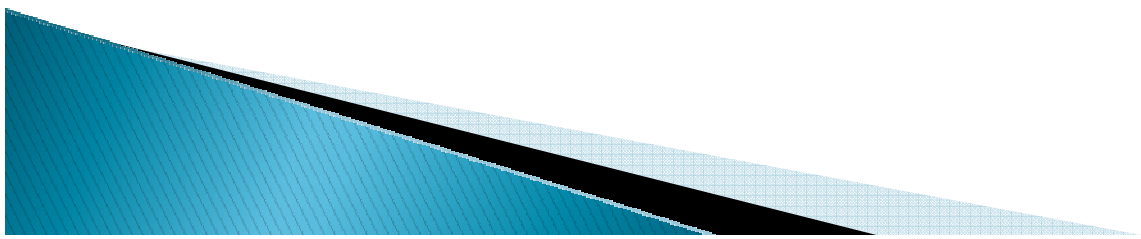
“The basis. WTP”

- WTP is responsible for packet segmentation and reassembly and for acknowledgment of packets and retransmission of lost, unacknowledged or corrupt packets.
- There are three classes of operation for this protocol:
  - class-0,
  - class-1,
  - class-2.
- WTP itself has no security mechanisms.

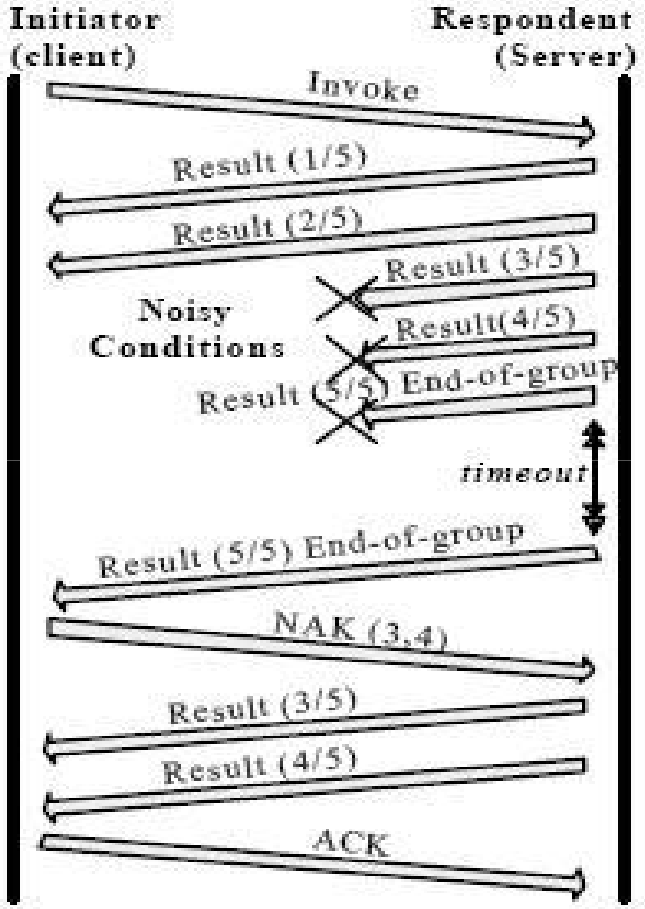


“Flow Control Algorithm”

- Prevent the receiver overload(Sliding Window);
- The sender can exercise flow control by changing the size of the packet groups depending on the characteristics of the network.

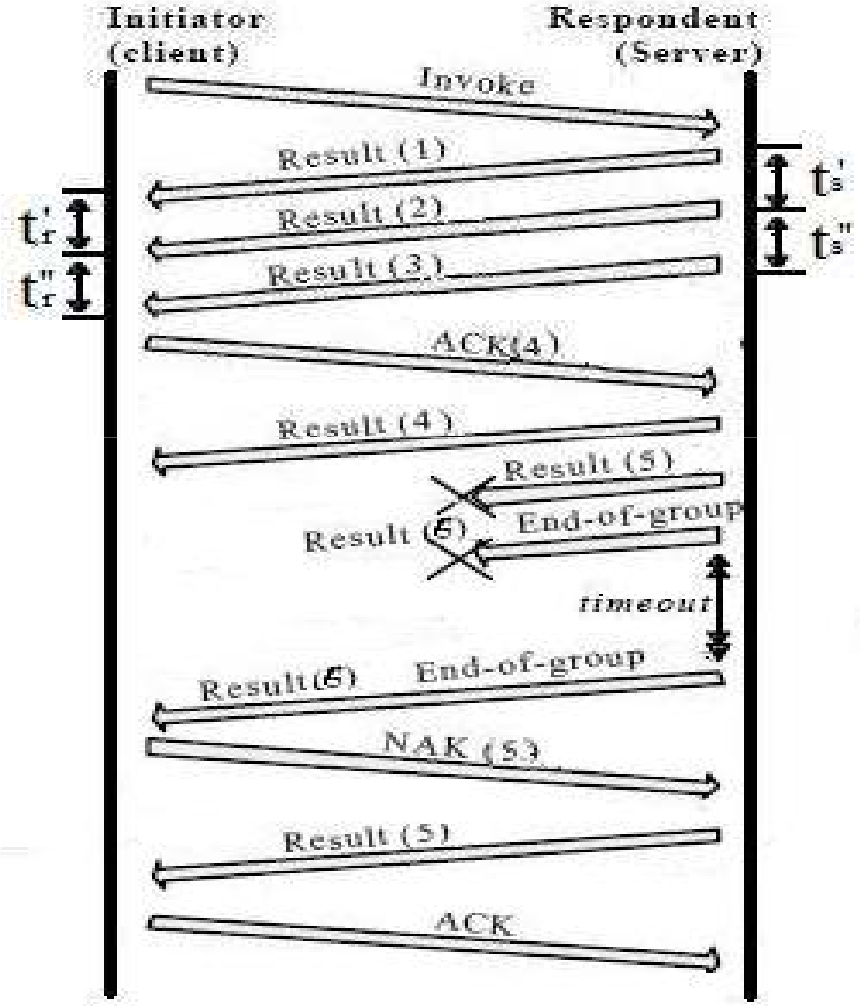


“WTP transmission model”



WTP packet loss recovery

“Our model”


Initiator
(client)
Respondent
(Server)
Invoke
Result (1)
Result (2)
Result (3)
ACK(4)
Result (4)
Result (5)
Result (6)
End-of-group
timeout
Result(5)
End-of-group
NAK (5)
Result (5)
ACK
t_r'
t_r''
t_s'
t_s''

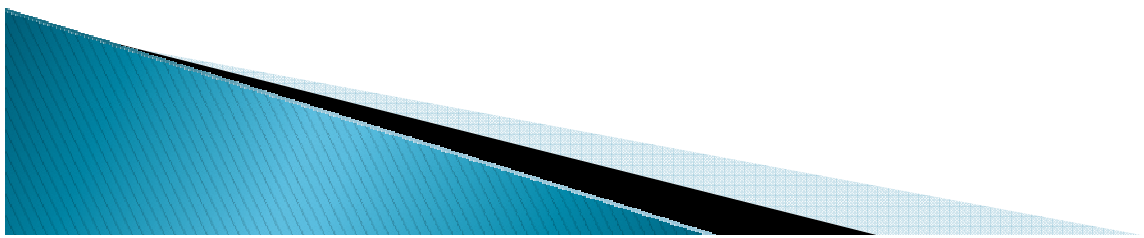
“Proposal”

- $t_s / t_r = 1$ – perfect network conditions.
- $0,85 < t_s / t_r < 1$ –increasing P_{am}, decreasing t_s and timeout (network works good).
- $0,70 < t_s / t_r < 0,85$ –there is no enough data to make a decision (conditions of a network correspond to the established parameters).
- $t_s / t_r < 0,70$ – decreasing $P_{am,}$ increasing t_s and timeout (network congestion).

Proposal $(0{,}85 < t_s / t_r < 1)$

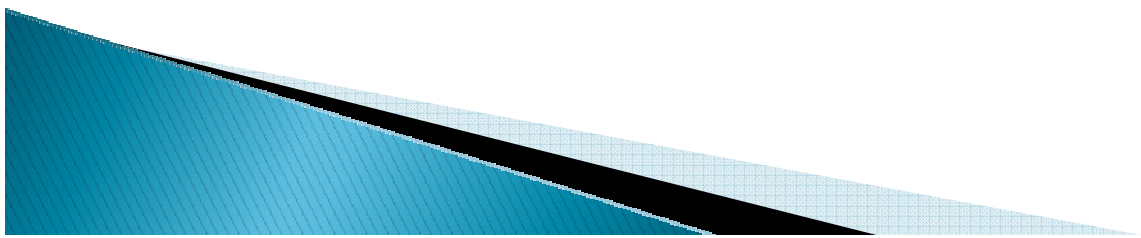
- $k = t_s / t_r$ – the parameter;
- $x = 1/(1-k)$
- $P_{am} = P_{am} + 2^x * P_{am}$;

$t_s = t_s /(2^x * t_s)$;
timeout = timeout /(2^x* timeout)
(exponentially decrease timeout);



Proposal $(0{,}7 < t_s / t_r < 0{,}85)$

Do nothing!



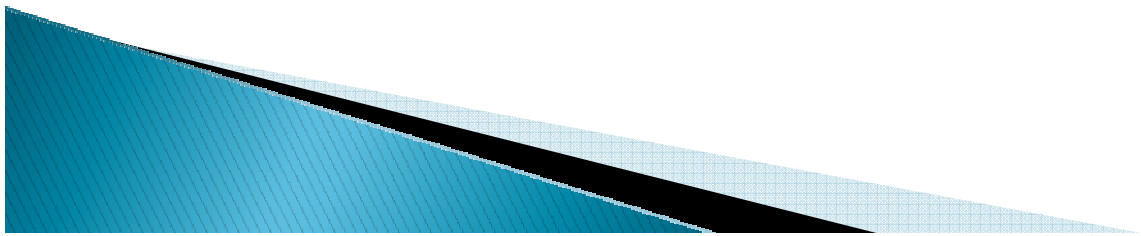
Proposal ($t_s / t_r < 0{,}70$)

Decreasing the parameters:

- $k = t_s / t_r$ – the parameter;
- $x = 1/(1-k)$
- $P_{am} = P_{am} - x * P_{am}$;

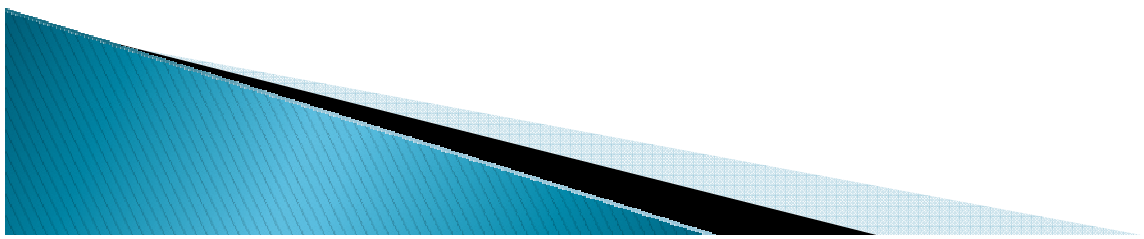
$t_s = t_s + (x/2 * t_s)$;

timeout = timeout +(x/2* timeout);



“Conclusion”

The work includes new ideas of developing and improving WAP as one of the important contemporary technologies.



Future work

- To build the model of the modified protocol (Coloured Petri Nets, ns-2 etc.)
- To perform experiments that show the ability to adopt to changing networking conditions.
- Verification of the new protocol (LTL, CTL, CTL* etc.)

Thank you for attention!