



Fast Ethernet Consortium

MAC Test Suite version 4.3

InterOperability Lab — 121 Technology Drive, Suite 2 — Durham, NH 03824 — (603) 862-0239

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Mr. Cao:

Enclosed are the results for MAC conformance testing performed on the Actel Platform 8051 Core10/100 MAC testing board with Actel ProASIC APA600 MAC, and VS31AL PHY. The tests are based on Clause 4 of IEEE Standard 802.3, 2002 edition. The tests performed are a subset of the MAC Conformance Test Suite available at the InterOperability Lab's web site:

ftp://ftp.iol.unh.edu/pub/ethernet/test_suites/mac/mac.pdf

As always, we welcome any comments regarding this Test Suite.

During the testing process, the following issues were uncovered:

Test	Result
4.6.2 – <i>Truncated Binary Exponential BackOff test</i>	The DUT was not observed to properly implement the standard defined collision backoff algorithm.

If you have any questions about the test procedures or results, please contact me via e-mail at mnd3@iol.unh.edu or by phone at (603) 862-0239.

Sincerely

Marc Deschenes

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The following table contains possible results and their meanings:

Result	Interpretation
PASS	The DUT was observed to exhibit conformant behavior.
FAIL	The DUT was observed to exhibit non-compliant behavior.
PASS with Comments	The DUT was observed to exhibit conformant behavior, however this behavior deviated from previous compliant results. An additional explanation of the situation is included.
Warning	The DUT was observed to exhibit behavior that is not recommended.
Refer to Comments	From the observations, a valid pass or fail could not be determined. An additional explanation of the situation is included.
Not Applicable	The DUT does not support the technology required to perform these tests.
Not Available	Due to testing station or time limitations, the tests could not be performed, or were performed in a limited capacity.
Not Tested	Not tested due to time constraint of the test period.
Borderline	The observed values of the specified parameter are valid at one extreme, and invalid at the other extreme.
Informative	Results are for informative purposes only and are not judged on a pass or fail basis.



Group 1:

Test #	Test Label	Result	
4.1.1	Reception of Frames with FCS Errors	a	PASS
		b	PASS
Comments on Test Procedure			
<p>Purpose: To verify that the device under test detects frames with FCS errors and reports a frameCheckError.</p> <p>a. The DUT shall detect and discard the frame with an invalid value in the FCS field, and, if clause 30 is implemented, log a FCS error.</p> <p>b. The reception of test frames with an invalid FCS field should not affect the reception of valid request frames preceding or following the Test Frame by a minimum InterFrameGap.</p>			
Comments on Test Results			
<p>a. The DUT was observed to properly discard a frame with an invalid CRC. The statistics of the DUT were unavailable during testing.</p> <p>b. The reception of test frames with invalid FCS fields was not observed to affect the reception of the valid request frames.</p>			

Test #	Test Label	Result		
4.1.2	Reception of Fragments and Runts	a	PASS	
		b	PASS	
		c	PASS	
Comments on Test Procedure				
<p>Purpose: To verify that the device under test discards collision fragments.</p> <p>a. The DUT should discard all fragments and runts less than 64 bytes in length.</p> <p>b. The DUT should properly discard each of the sequences listed below:</p> <ol style="list-style-type: none"> 1. 7 octets of preamble 2. 7 octets of preamble and SFD 3. 7 octets of preamble, SFD and the MAC address of the DUT 4. 7 octets of preamble, SFD, the MAC address of the DUT and an arbitrary source address <p>c. The reception of fragments or runts should not interfere with the reception of valid MAC frames.</p>				
Comments on Test Results				
<p>a. All fragments and runts were discarded by the DUT. The statistics of the DUT were unavailable during testing.</p> <p>b. The DUT was observed to behave in the following ways when receiving each of the different test fragments:</p> <ol style="list-style-type: none"> 1. The DUT discarded the fragment consisting of: 7 octets of preamble. 2. The DUT discarded the fragment consisting of: 7 octets of preamble and SFD. 3. The DUT discarded the fragment consisting of: 7 octets of preamble, SFD and the MAC address of the DUT. 4. The DUT discarded the fragment consisting of: 7 octets of preamble, SFD, the MAC address of the DUT and an arbitrary source address. <p>c. The reception of fragments or runts did not interfere with the reception of valid MAC frames.</p>				

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Test #	Test Label	Result	
4.1.3	Reception of Frames Greater than the Maximum Permitted Frame Size	a	PASS
		b	Not Applicable
		c	PASS
		d	PASS
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) discards frames greater than maxFrameSize.</p> <p>a. DUT should discard or truncate though not transmit, untagged frames greater than 1518 bytes in length</p> <p>b. DUT should discard or truncate though not transmit, tagged frames greater than 1522 bytes in length</p> <p>c. The DUT should discard or truncate and respond to the test frames containing two CRC values. The DUT shall not transmit, untagged frames greater than 1518 bytes in length. If the DUT accepted these test frames and discarded the test frames of the same size in part A, then the DUT must truncate and respond to the test frames of the same size with a valid CRC value in bytes 1515 – 1518 and an invalid CRC in the last 4 bytes of the frame. (Otherwise this would indicate that the DUT improperly checked the CRC value twice, once before truncation and once after.) The DUT may optionally log the test frames as frameTooLong errors.</p> <p>d. All valid frames preceding and following the test frames should be replied to.</p>			
Comments on Test Results			
<p>a. The DUT was observed to reply to untagged frames up to 1518 bytes in length. The DUT was observed to discard untagged frames greater than 1518 bytes in length.</p> <p>b. The DUT was not observed to support VLAN tagging.</p> <p>c. The DUT was observed to discard the untagged frames that contained a valid 1518 byte frame.</p> <p>d. The reception of the test frames did not interfere with the reception of valid MAC frames.</p>			

Test #	Test Label	Result	
4.1.4	Frames with Length Errors	a	Not Applicable
		b	Not Applicable
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) discards frames with invalid length values.</p> <p>a. The DUT should discard all frames with invalid length values.</p> <p>b. All valid frames preceding and following the test frames should be replied to.</p>			
Comments on Test Results			
<p>Note: The properly encapsulated 64-byte 802.3 SNAP frame was not replied to by the DUT. The remaining frame length tests could not be performed because the DUT did not respond to the 802.3 SNAP frame.</p>			

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Test #	Test Label	Result	
4.1.5	Receive Frames with Excess Pad	a	Not Applicable
		b	Not Applicable
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) accepts frames with excessive padding.</p> <p>a. The DUT should accept each test frame and reply with a frame that does not contain padding.</p> <p>b. The reception of test frames should not affect the reception of the valid request frames.</p>			
Comments on Test Results			
<p>Note: The properly encapsulated 64-byte 802.3 SNAP frame was not replied to by the DUT. The remaining frame length tests could not be performed because the DUT did not respond to the 802.3 SNAP frame.</p>			

Test #	Test Label	Result	
4.1.6	Jabber Frame Reception and Recovery	a	PASS
		b	PASS REFER TO COMMENTS
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) is able to withstand and recover from the reception of worst-case jabber transmissions.</p> <p>a. The DUT should discard jabber frames.</p> <p>b. All valid frames preceding and following the test frames should be replied to.</p>			
Comments on Test Results			
<p>b. When receiving a jabber frame followed by a valid frame separated by a minimum inter frame gap the DUT was observed to delay the response to the valid frame until another frame was received by the DUT. When this occurred the DUT was observed to send a reply to both the frame that was being delayed as well as the new frame.</p>			

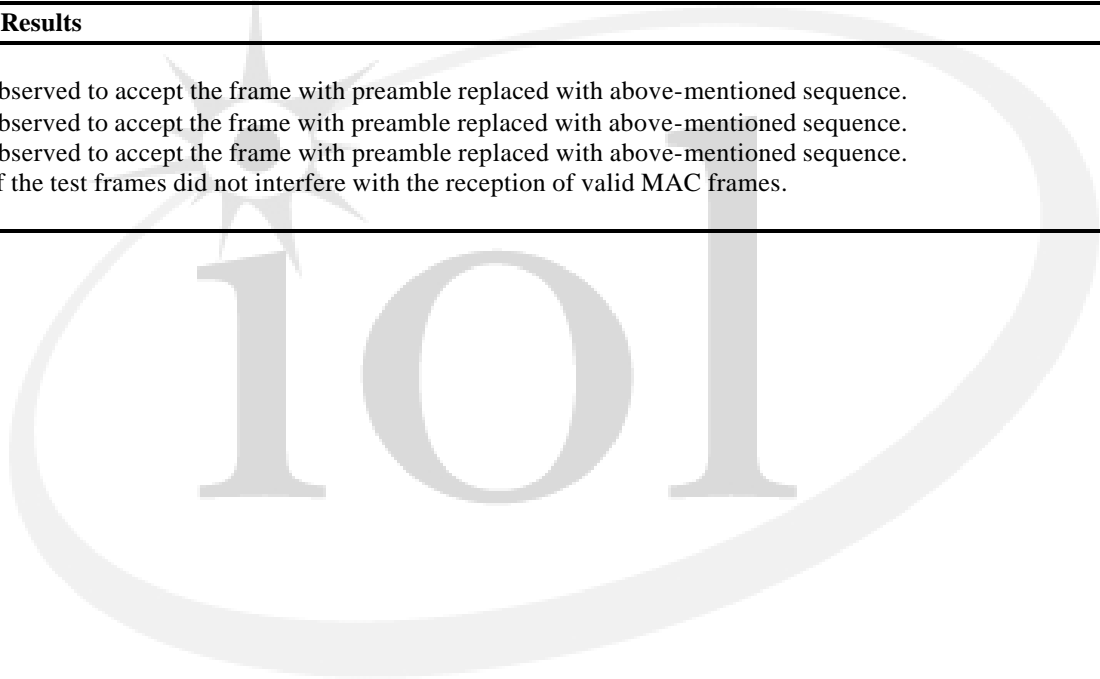
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Test #	Test Label	Result	
4.1.7	Start of Frame Delimiter Error Reception and Recovery	a	PASS
		b	PASS
		c	PASS
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) discards frames which do not contain a valid Start of Frame Delimiter (SFD).</p> <p>a. The DUT should discard a test frame where the SFD is replaced by another byte of preamble (bit pattern 10101010) in an otherwise valid frame.</p> <p>b. The DUT should discard a test frame where the bit pattern 10011011 replaces the SFD in an otherwise valid frame.</p> <p>c. All valid frames preceding and following the test frames should be replied to.</p>			
Comments on Test Results			
<p>a. The DUT was observed to discard the test frame.</p> <p>b. The DUT was observed to discard the frame with 7 bytes of preamble and 10011011 in place of an SFD.</p> <p>c. The reception of the test frames did not interfere with the reception of valid MAC frames.</p>			

Test #	Test Label	Result	
4.1.8	Frames with Alignment Errors	a	PASS
		b	PASS
		c	PASS
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) detects and discards frames with alignment errors.</p> <p>a. The DUT should truncate the test frame to the nearest octet and accept it.</p> <p>b. The DUT should truncate the test frame to the nearest octet, discard it and report an alignmentError.</p> <p>c. The reception of valid frames preceding and following the test frames separated by the minimum inter-frame gap should not be affected.</p>			
Comments on Test Results			
<p>a. The DUT was observed to accept the test frame.</p> <p>b. The DUT was observed to discard the test frame. The statistics of the DUT were unavailable during testing.</p> <p>c. The reception of the test frames did not interfere with the reception of valid MAC frames.</p>			

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Test #	Test Label	Result	
4.1.9	Preamble Error Reception and Recovery	a	PASS
		b	PASS
		c	PASS
		d	PASS
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) accepts frames which contain errors with preamble.</p> <p>a. The DUT should accept a frame, which has preamble replaced with: 10101010 00000000 00000000 00000000 00000000 00000000 00000000 10101011</p> <p>b. The DUT should accept a frame, which has preamble replaced with: 10101010 01111111 11111111 11111111 11111111 11111111 11111111 10101011</p> <p>c. The DUT should accept a frame, which has preamble replaced with: 10101010 10101010 10101010 10101010 10101010 10101000 10101111 10101011</p> <p>d. All valid frames preceding and following the test frames should be replied to.</p>			
Comments on Test Results			
<p>a. The DUT was observed to accept the frame with preamble replaced with above-mentioned sequence.</p> <p>b. The DUT was observed to accept the frame with preamble replaced with above-mentioned sequence.</p> <p>c. The DUT was observed to accept the frame with preamble replaced with above-mentioned sequence.</p> <p>d. The reception of the test frames did not interfere with the reception of valid MAC frames.</p>			



Group 2:

Test #	Test Label	Result
4.2.1	Transmit proper SFD and preamble	REFER TO COMMENTS
Comments on Test Procedure		
<p>Purpose: To verify that the device under test (DUT) properly encapsulates a frame with preamble and SFD, and that the combination of the two is 8 bytes.</p> <p>The DUT should always encapsulate frames with a combined 8 bytes of preamble and SFD.</p>		
Comments on Test Results		
<p>Note: No preamble or SFD problems were observed while testing the DUT. However this test is designed to test the DUT's transmit abilities under stressful traffic loads. When testing End Stations they will typically not transmit rapidly enough for us to determine a Pass/Fail indication.</p>		

Test #	Test Label	Result
4.2.2	Transmission of Minimum interFrameGap	REFER TO COMMENTS
Comments on Test Procedure		
<p>Purpose: To verify that the device under test (DUT) enforces the minimum interFrameGap (IFG) of 96 bit times.</p> <p>The DUT should not transmit frames separated by less than minimum IFG, even under the most stressful situations.</p>		
Comments on Test Results		
<p>Note: No inter-frame gap problems were observed while testing the DUT. However this test is designed to test the DUT's transmit abilities under stressful traffic loads. When testing End Stations they will typically not transmit rapidly enough for us to determine a Pass/Fail indication.</p>		

Test #	Test Label	Result
4.2.3	Transmit proper length within the Length/Type Field	Not Applicable
Comments on Test Procedure		
<p>Purpose: To verify that the device under test (DUT) properly calculates the length of the data in the Data/Pad field.</p> <p>The DUT should transmit 802.3 Ethernet frames with a length value equal to the amount of data in the Data/Pad field. If the frame is greater than minFrameSize that frame should not contain pad.</p>		
Comments on Test Results		
<p>Note: The properly encapsulated 64-byte 802.3 SNAP frame was not replied to by the DUT. The remaining frame length tests could not be performed because the DUT did not respond to the 802.3 SNAP frame.</p>		

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Test #	Test Label	Result
4.2.4	Compute and transmit proper CRC	PASS
Comments on Test Procedure		
<p>Purpose: To verify that the device under test (DUT) correctly calculates the CRC-32 value for the frame being transmitted and assigns it to the FCS field.</p> <p>The CRC-32 value transmitted by the DUT should match the value calculated by the testing station.</p>		
Comments on Test Results		
The CRC calculated by the DUT was verified to be correct by the testing platform.		

Test #	Test Label	Result
4.2.5	Receive variable preamble	PASS
Comments on Test Procedure		
<p>Purpose: To verify that the device under test (DUT) accepts frames with varied amounts of preamble.</p> <p>The DUT should accept frames that contain at least 1 byte of preamble followed by an SFD.</p>		
Comments on Test Results		
The DUT was observed to accept frames with 1 to 64 bytes of preamble and an SFD.		

Test #	Test Label	Result	
4.2.6	Receive all Frame Sizes	a	PASS
		b	PASS
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) accepts all valid sized frames.</p> <p>a. The DUT should accept all valid untagged frames from minFrameSize (64 bytes) to maxUntaggedFrameSize (1518 bytes).</p> <p>b. If VLAN tagging is supported, the DUT should accept all tagged frames from minFrameSize (64 bytes) to maxUntaggedFrameSize (1518 bytes). The DUT may optionally accept tagged frames 1519 bytes to maxUntaggedFrameSize + qTagPrefixSize (1522 bytes).</p>			
Comments on Test Results			
<p>a. The DUT was observed to accept all of the different untagged frame sizes.</p> <p>b. The DUT was observed to accept all of the different tagged frame sizes from 64 bytes to 1522 bytes in length.</p>			

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Test #	Test Label	Result
4.2.7	Reception of minimum interFrameGap	PASS
Comments on Test Procedure		
<p>Purpose: To verify that device under test (DUT) is capable of receiving frames separated by a minimum interFrameGap</p> <p>The DUT should accept two frames separated by minimum IFG (96 bit times).</p>		
Comments on Test Results		
<p>The DUT was observed to accept both frames that were separated by a minimum IFG.</p>		



Group 3:

Test #	Test Label	Result
4.3.1	Does not Defer	PASS
Comments on Test Procedure		
Purpose: To verify that the device under test (DUT) does not defer to carrier sense while in full duplex mode. The DUT should not defer the transmission of a frame in waiting to a long carrier event while in full duplex mode.		
Comments on Test Results		
The DUT was not observed to defer while in full duplex mode.		

Test #	Test Label	Result
4.3.2	No Collisions	PASS
Comments on Test Procedure		
Purpose: To verify that no collisions occur when the device under test (DUT) is in full duplex mode. The DUT should not detect and enforce a collision when frames are being transmitted and received simultaneously in full duplex mode.		
Comments on Test Results		
No collisions or collision fragments were observed while in full duplex mode.		

Group 4:

Test #	Test Label	Result	
4.4.1	Collisions During Preamble and SFD within slotTime	a	PASS
		b	PASS
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) properly detects and enforces collisions that occur during the transmission of preamble and SFD while within slotTime.</p> <p>a. The DUT should detect the collision, complete the transmission of preamble and SFD, and transmit a 32-bit jam pattern. b. The DUT should attempt to retransmit the frame involved in the collision.</p>			
Comments on Test Results			
<p>a. The DUT was observed to detect the collision, complete the transmission of the preamble and SFD and transmit a 32-bit jam pattern. b. The DUT was observed to retransmit the frame.</p>			

Test #	Test Label	Result	
4.4.2	Collisions in Data within slotTime	a	PASS
		b	PASS
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) properly detects and enforces collisions that occur during the transmission of data while with slotTime.</p> <p>a. The DUT should detect the collision, cease transmission of data and transmit a 32-bit jam pattern. b. The DUT should attempt to retransmit the frame involved in the collision.</p>			
Comments on Test Results			
<p>a. The DUT was observed to detect the collision, cease transmission of data and transmit a 32-bit jam pattern. b. The DUT was observed to retransmit the frame.</p>			

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Test #	Test Label	Result	
4.4.3	Collisions in Data Outside of slotTime while Not Bursting	A	PASS
		B	Informative
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) properly detects and enforces collisions that occur during the transmission of data outside of slotTime while not in burst mode.</p> <p>a. The DUT should detect the late collision, cease transmission of data and transmit a 32-bit jam pattern.</p> <p>b. The DUT may or may not attempt to retransmit a frame involved in a late collision.</p>			
Comments on Test Results			
<p>a. The DUT was observed to detect the collision, cease transmission of data and transmit a 32-bit jam pattern.</p> <p>b. The DUT was not observed to retransmit the frame.</p>			



Group 5:

Test #	Test Label	Result
4.5.1	Defer to Carrier Sense while Frame Waiting	PASS
Comments on Test Procedure		
<p>Purpose: To verify that the device under test (DUT) defers to carrier sense when it has a frame waiting to be transmitted.</p> <p>While in half duplex, the DUT should delay the transmission of a frame in waiting until the completion of a long carrier event</p>		
Comments on Test Results		
The DUT was observed to properly defer to carrier events.		

Test #	Test Label	Result
4.5.2	Deference after Collision	PASS
Comments on Test Procedure		
<p>Purpose: To verify that the device under test (DUT) continues to observe the deference process when it is attempting to retransmit after a collision.</p> <p>After a collision has occurred, in half duplex, the DUT should delay any retransmission attempts until carrier sense is no longer asserted.</p>		
Comments on Test Results		
The DUT was observed to properly defer to carrier events.		

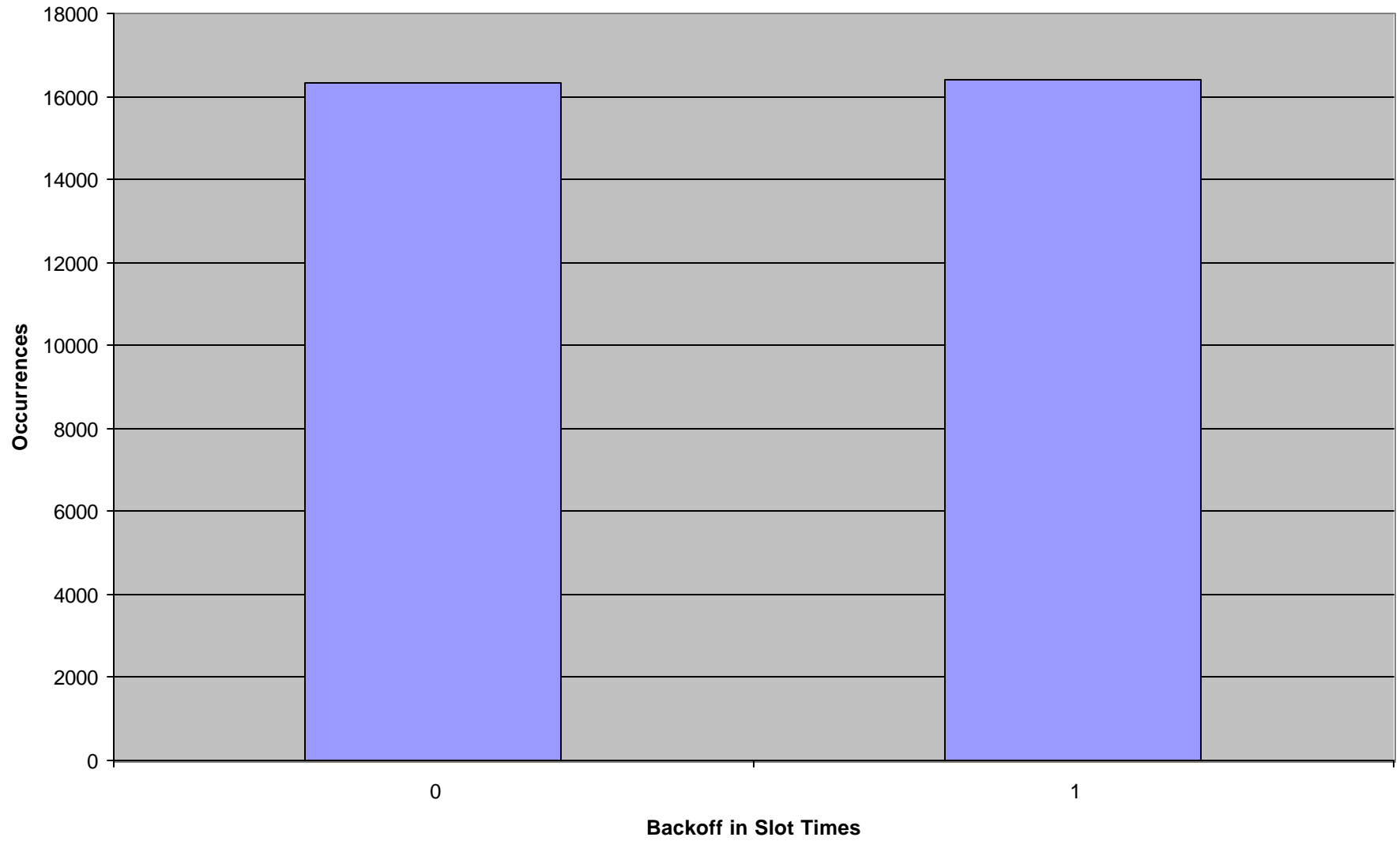
Test #	Test Label	Result
4.5.3	InterFrame Spacing	PASS
Comments on Test Procedure		
<p>Purpose: To verify that the device under test (DUT) observes the 2/3 rule for interFrameSpacing.</p> <p>While in half duplex, the DUT should cause a collision to occur if carrier sense is assert during interFrameSpacingPart2, which should be at least the last third of IFS but may be as large as IFS (96 bit times). By observing when the DUT starts causing collisions it is possible to determine the size of interFrameSpacing parts 1 and 2. The interFrameSpacingPart1 of the DUT should not be greater than 2/3 of IFS (64 bit times).</p>		
Comments on Test Results		
The value of interFrameSpacingPart1 was observed to be 56 ± 4 bit times.		

Group 6:

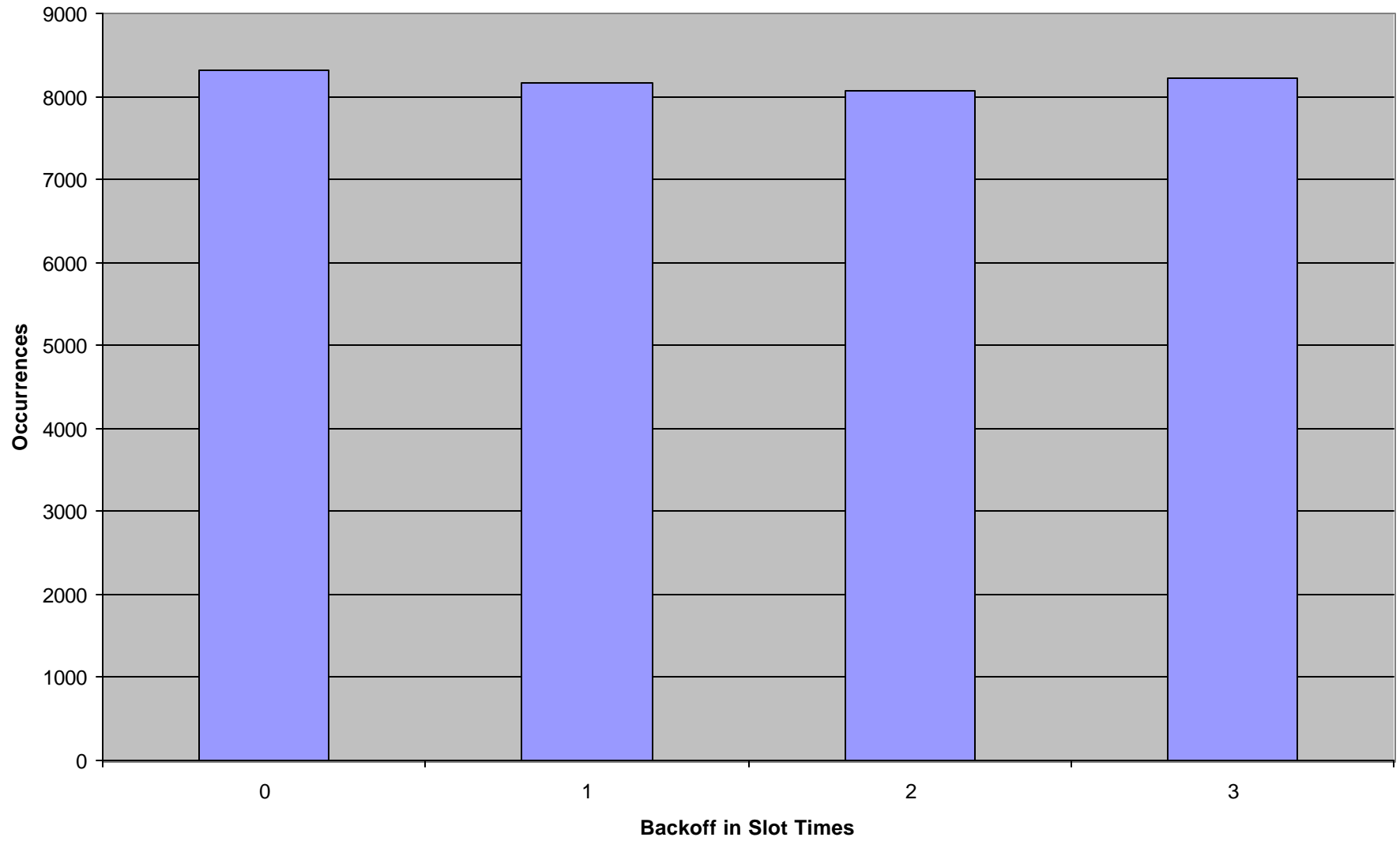
Test #	Test Label	Result
4.6.1	Retransmission Attempt Limit	PASS
Comments on Test Procedure		
<p>Purpose: To verify that the device under test (DUT) allows a maximum of 15 attempts for retransmission after a collision.</p> <p>After a collision has occurred the DUT should attempt to retransmit the frame involved in the collision. Should multiple collisions occur during the attempted transmission of a frame, the DUT should continue to attempt to retransmit the frame until the number of attempts equals attemptLimit (16). The DUT should, therefore, not attempt to transmit a frame more than 16 times (initial attempt + 15 retransmission attempts). The collision fragments should be properly formed.</p>		
Comments on Test Results		
<p>Upon multiple collisions with a frame being transmitted from the DUT, the testing station captured a total of 16 collision fragments. The collision fragments were properly formed.</p>		

Test #	Test Label	Result	
		a	PASS
4.6.2	Truncated Binary Exponential BackOff Test	b	FAIL
Comments on Test Procedure			
<p>Purpose: To verify that the device under test (DUT) correctly calculates the time to wait before attempting retransmission of a frame.</p> <p>a. The combined average backOff time for each backOff attempt should not be more aggressive than the expected average for that attempt.</p> <p>b. The variable 'r' should be a uniformly distributed random number in the range of $[0, 2^k - 1]$ where $k = \min(n, 10)$.</p>			
Comments on Test Results			
<p>a. The average backoff for the retransmission attempts was not observed to be significantly more aggressive than the allowable range to over a 99% Confidence level.</p> <p>b. According to the histogram data we can say with over a 99% Confidence level that the backoff times chosen were not uniformly distributed over the standard specified backoff ranges, specifically retry attempt 12. For further information please refer to the enclosed histograms. If you would like a copy of the gathered data please let us know.</p>			

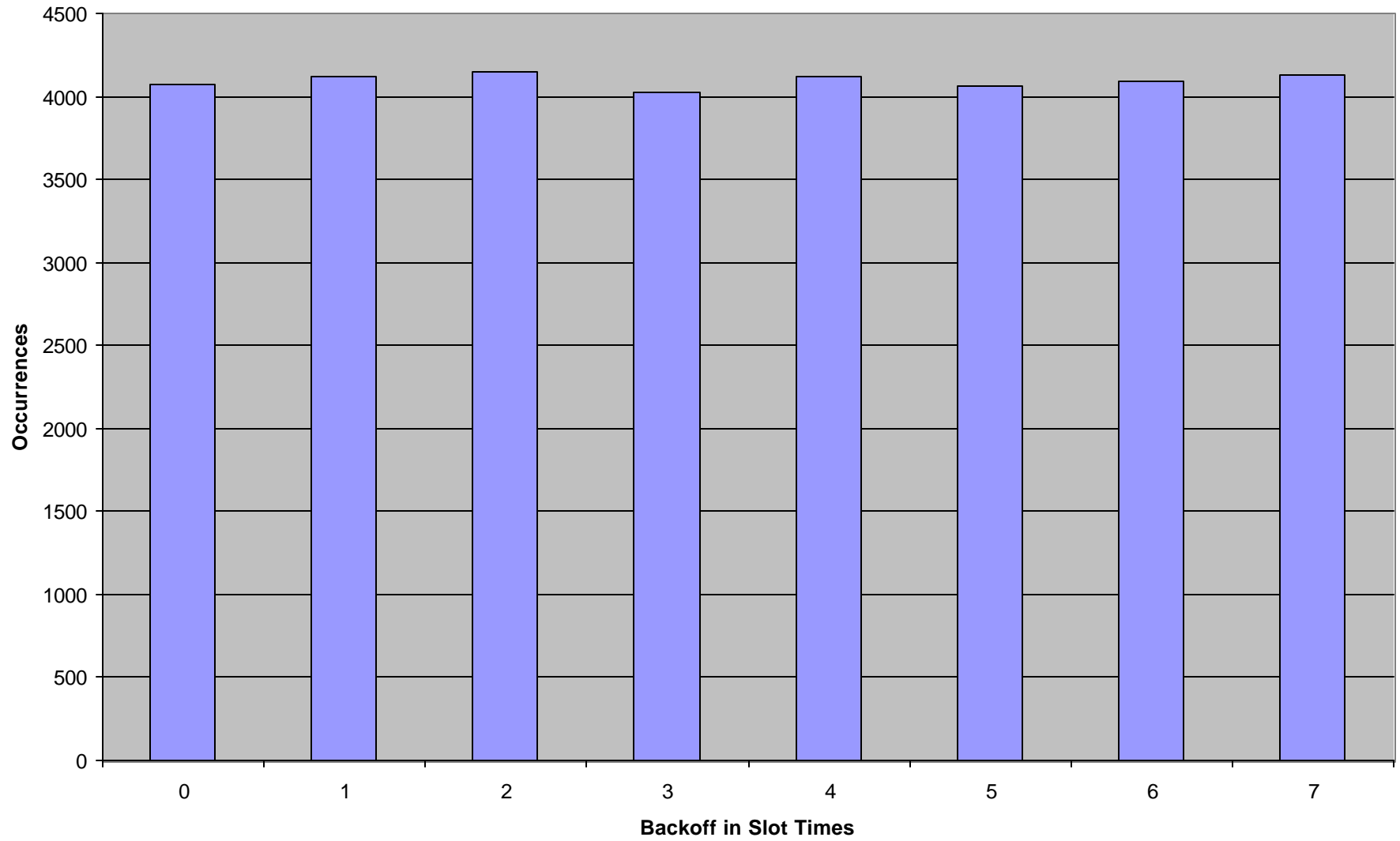
Histogram of the Backoff of the First Retransmission Attempt



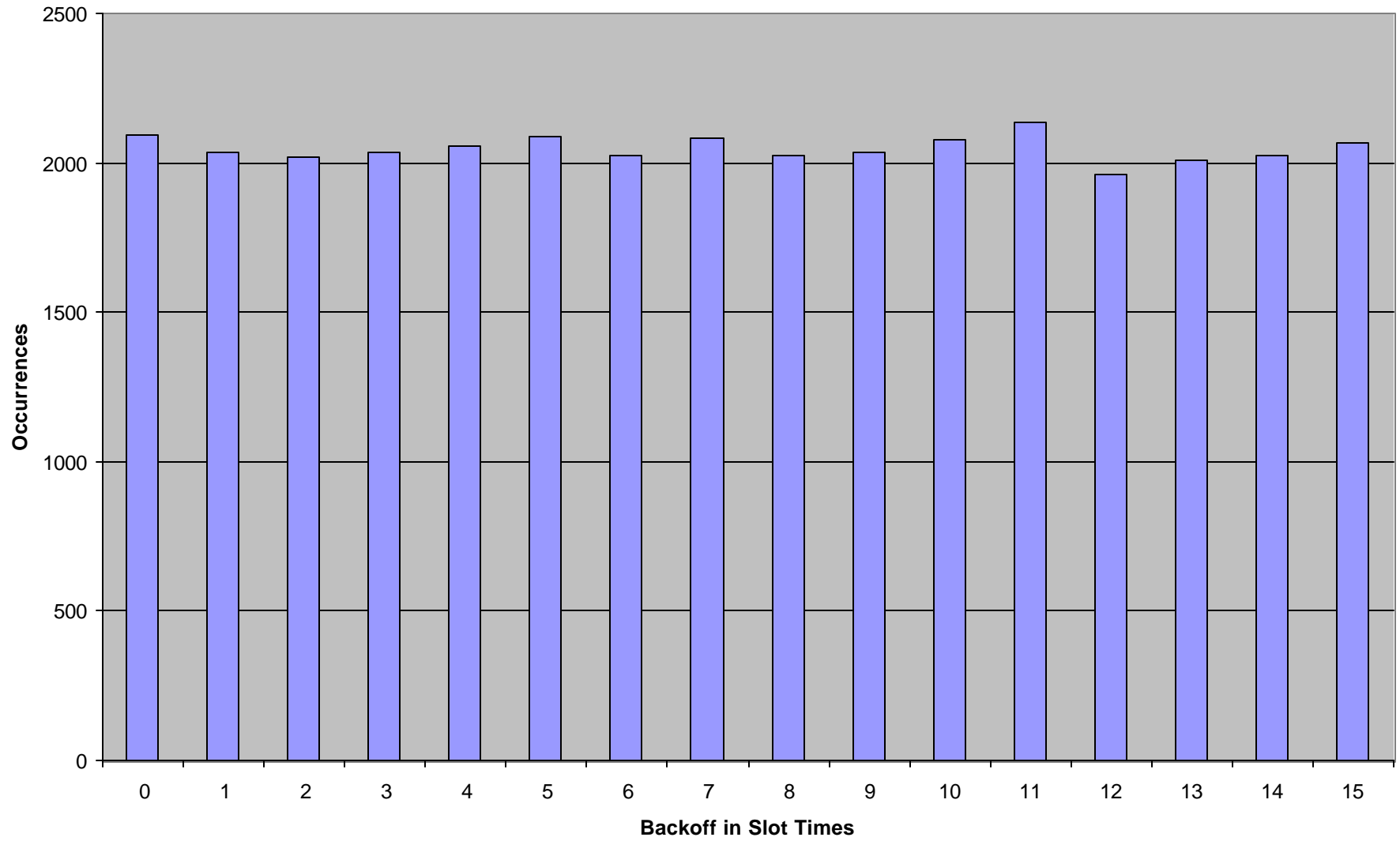
Histogram of the Backoff of the Second Retransmission Attempt



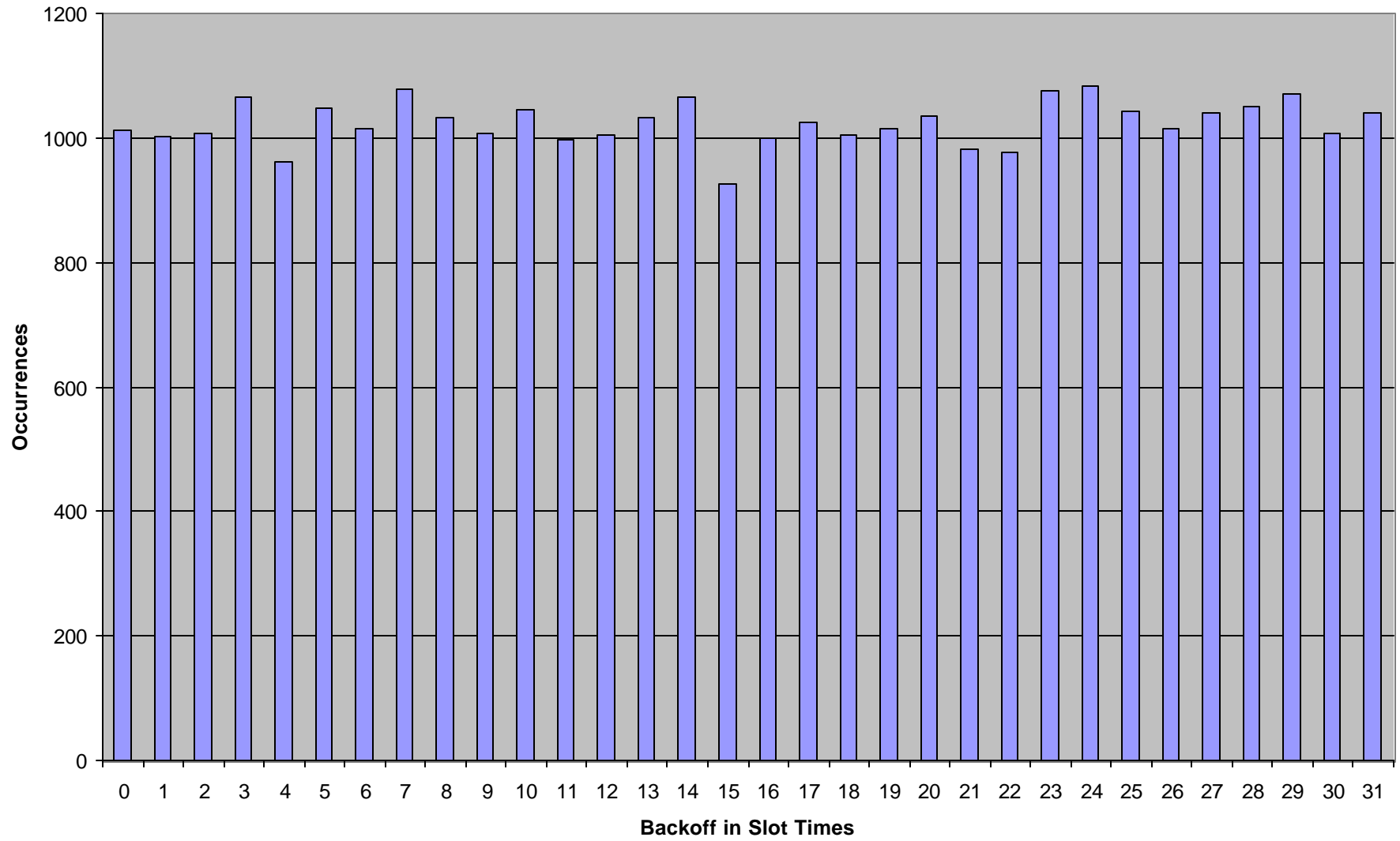
Histogram of the Backoff of the Third Retransmission Attempt



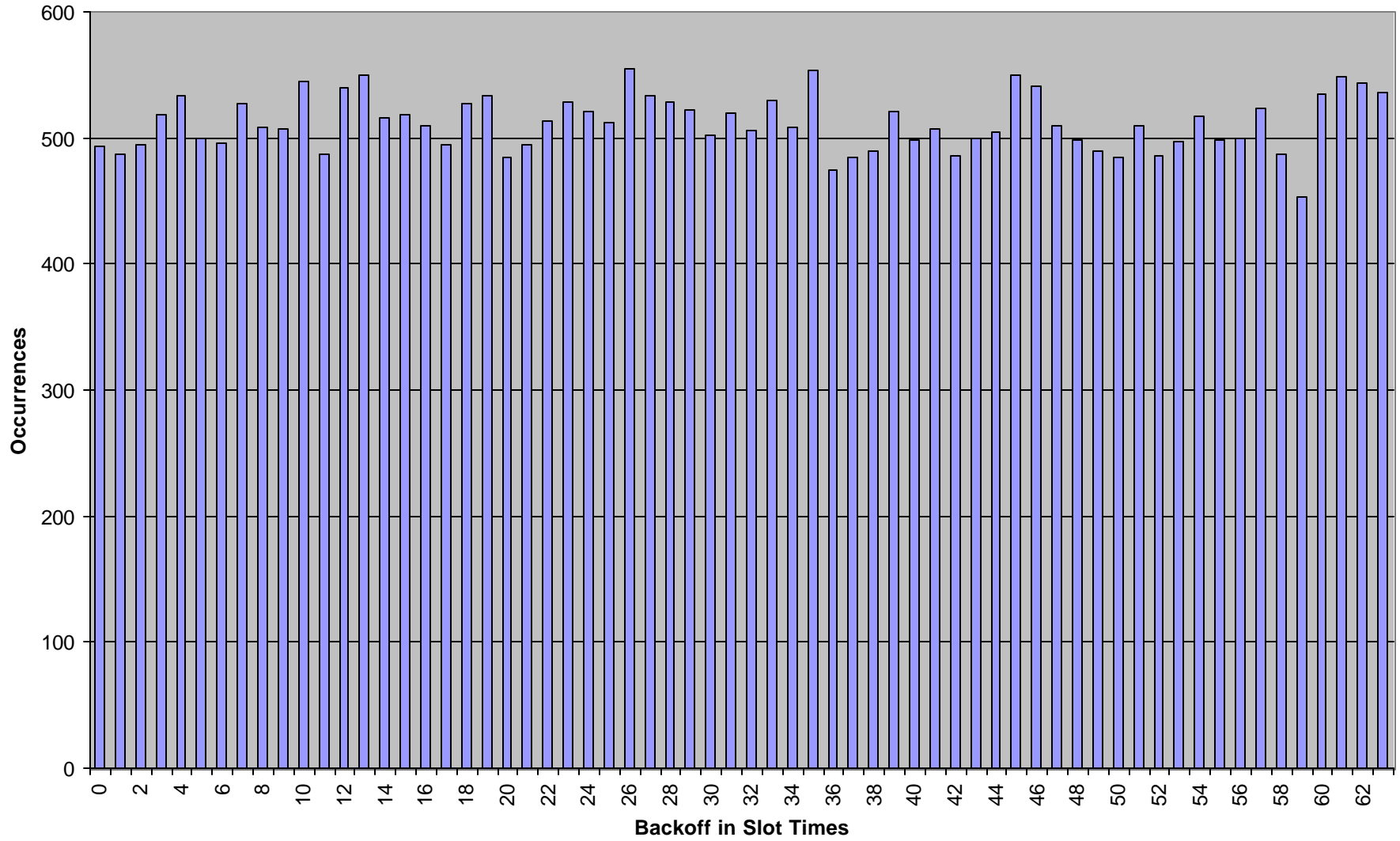
Histogram of the Backoff of the Fourth Retransmission Attempt



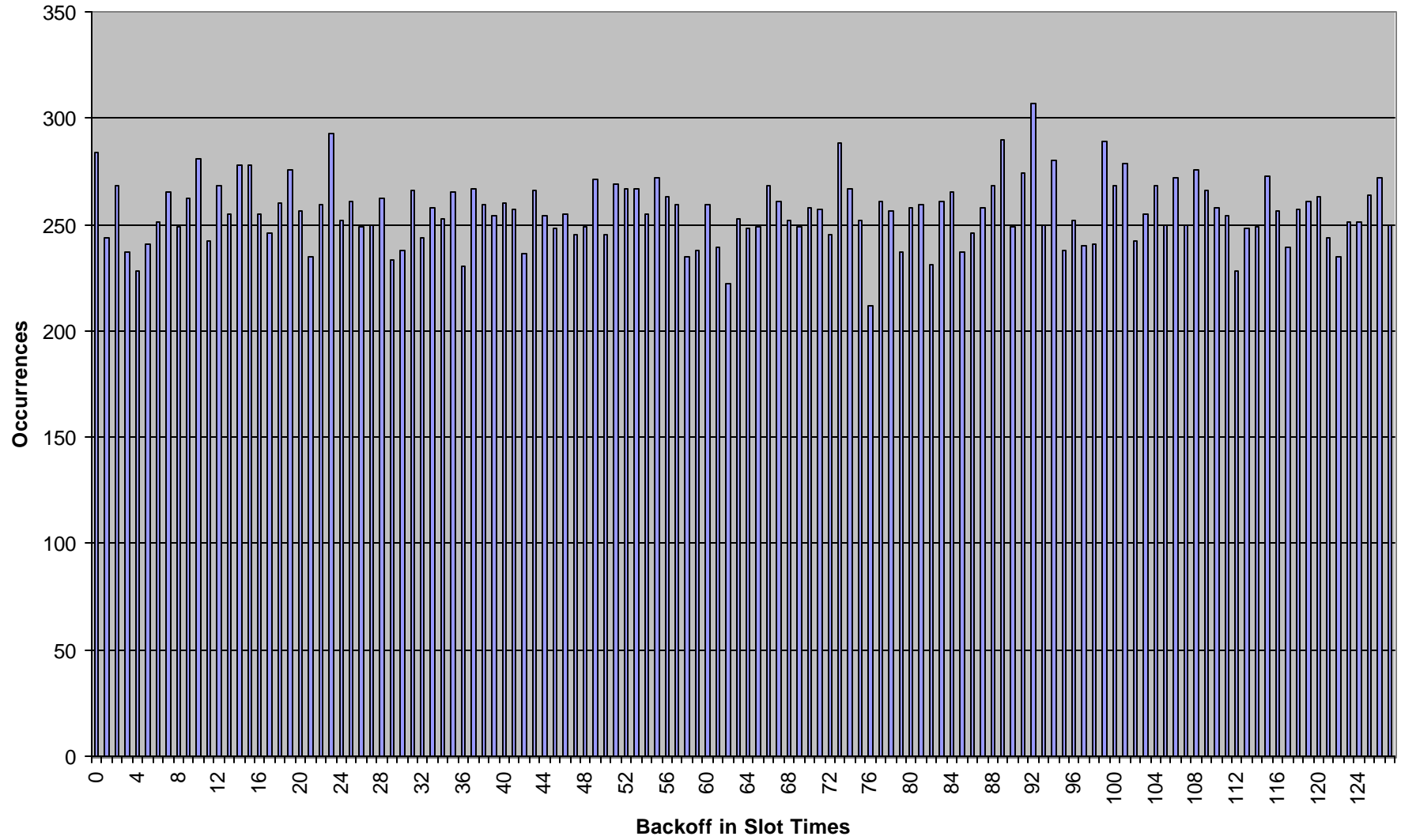
Histogram of the Backoff of the Fifth Retransmission Attempt



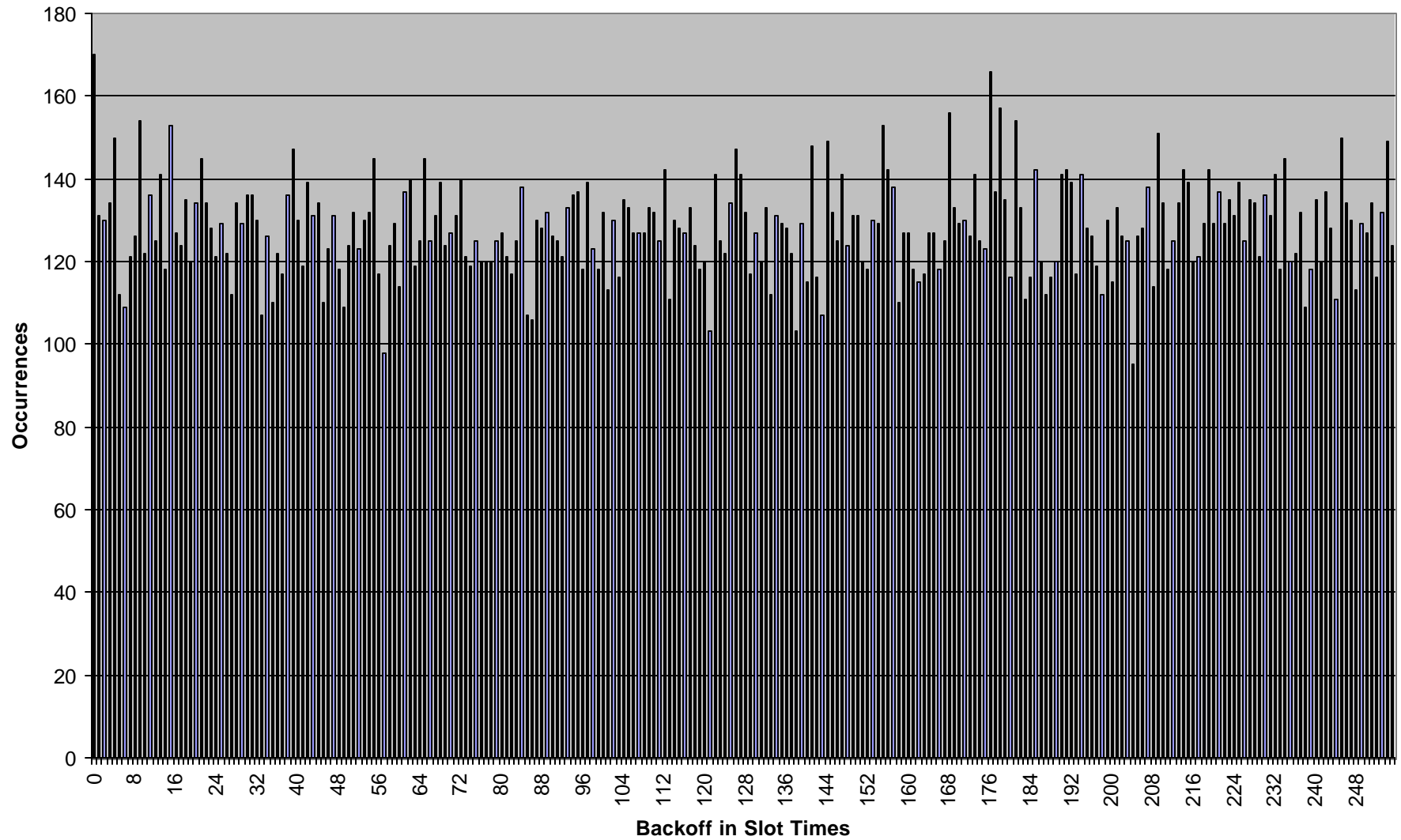
Histogram of the Backoff of the Sixth Retransmission Attempt



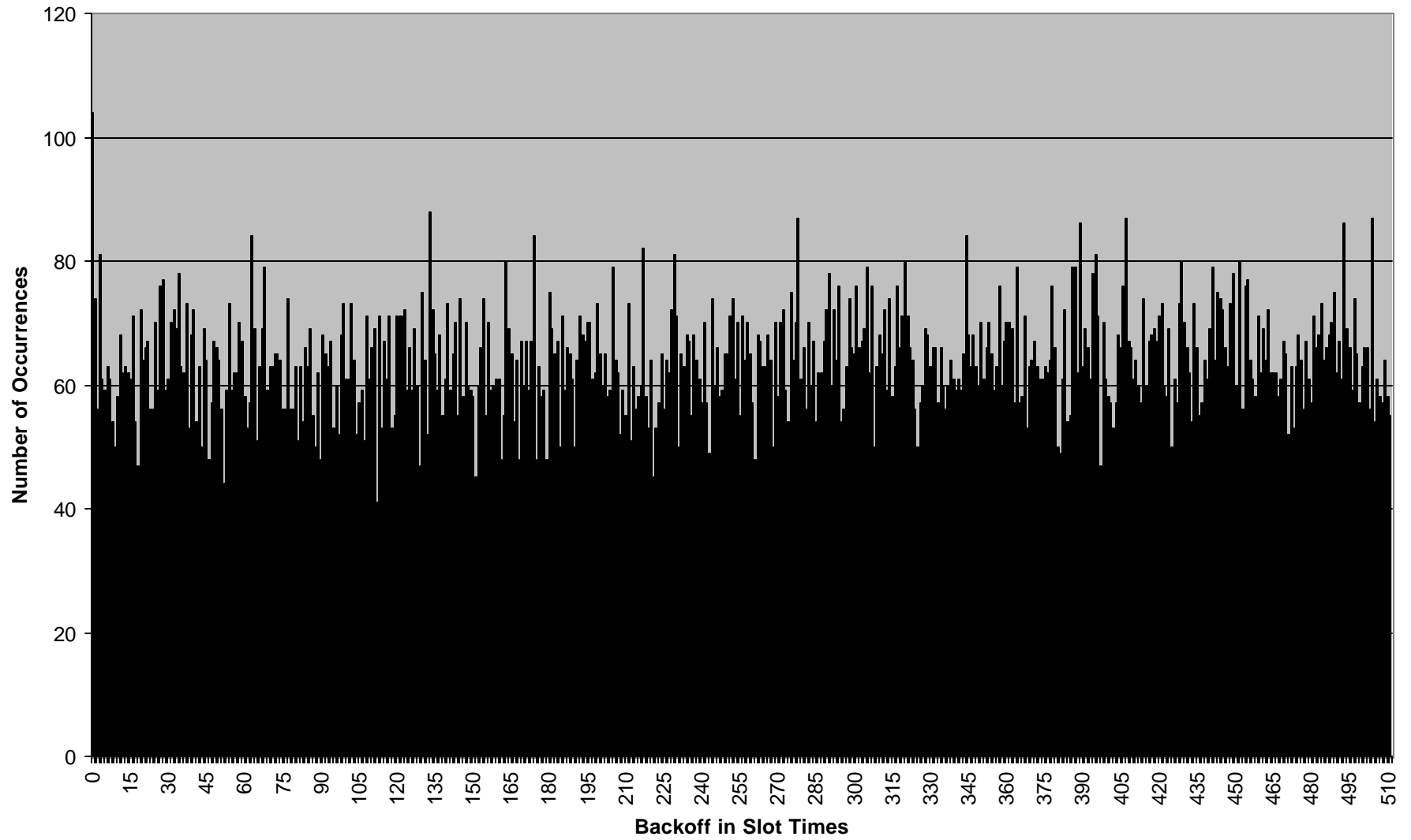
Histogram of the Backoff of the Seventh Retransmission Attempt



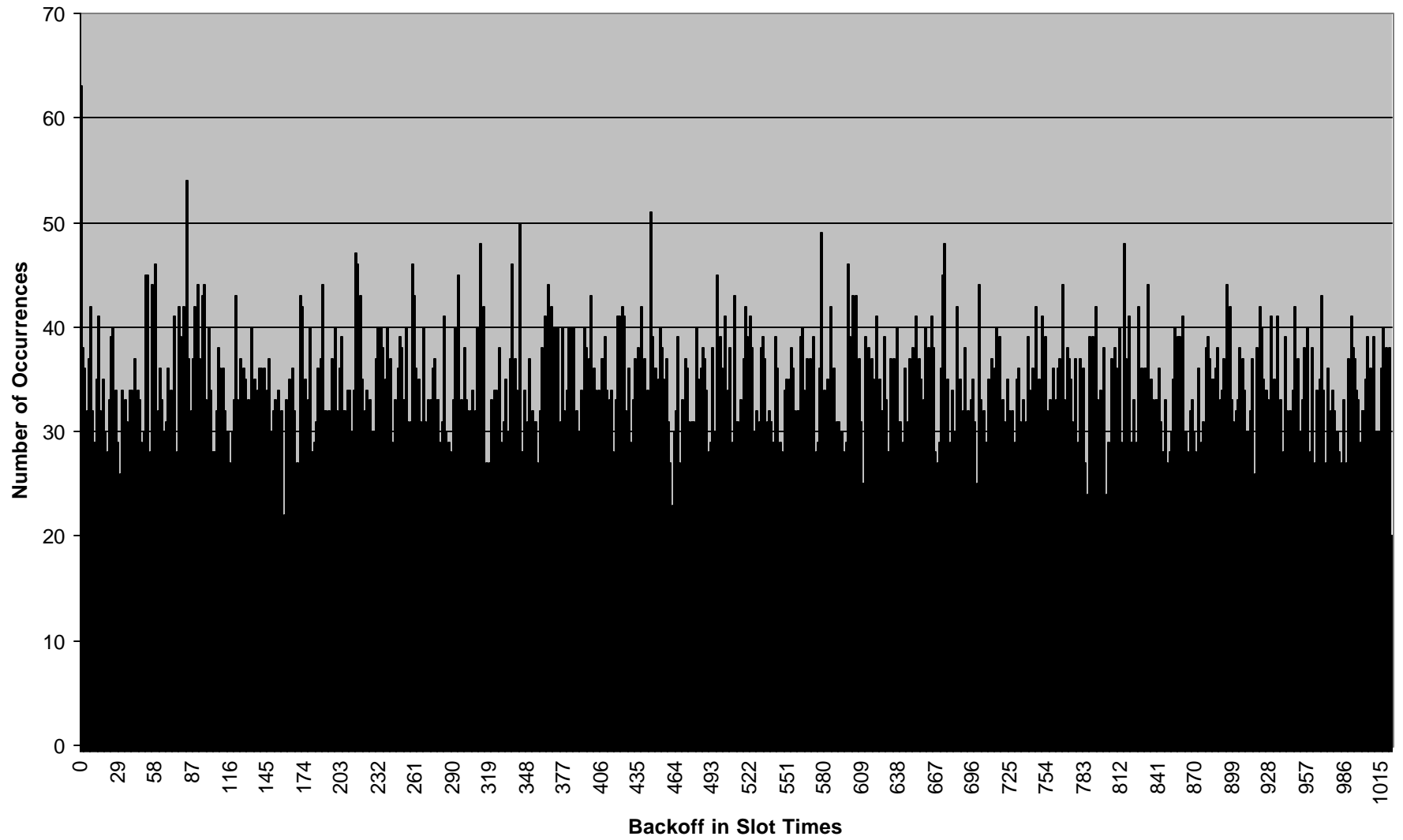
Histogram of the Backoff of the Eighth Retransmission Attempt



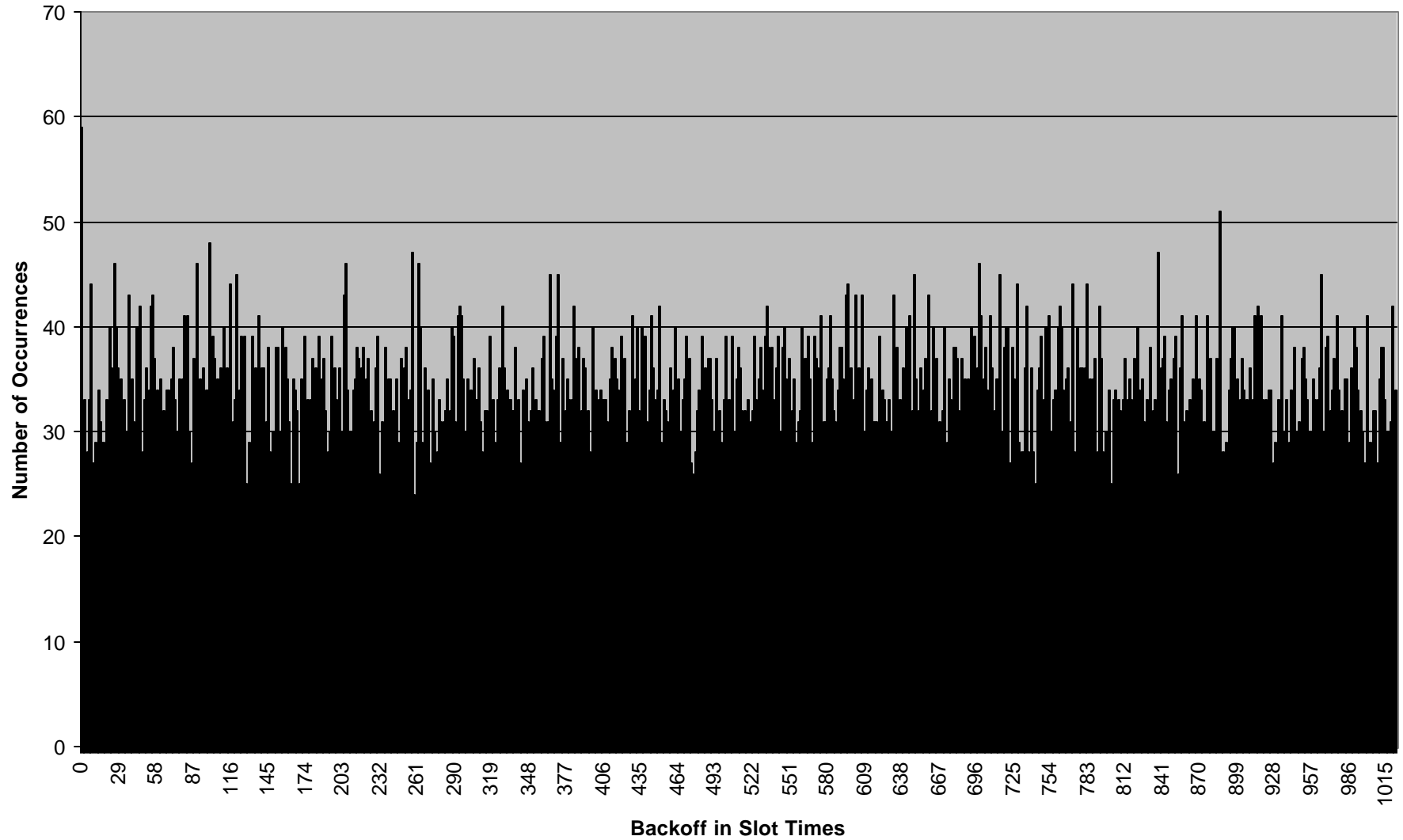
Histogram of the Backoff of the Ninth Retransmission Attempt



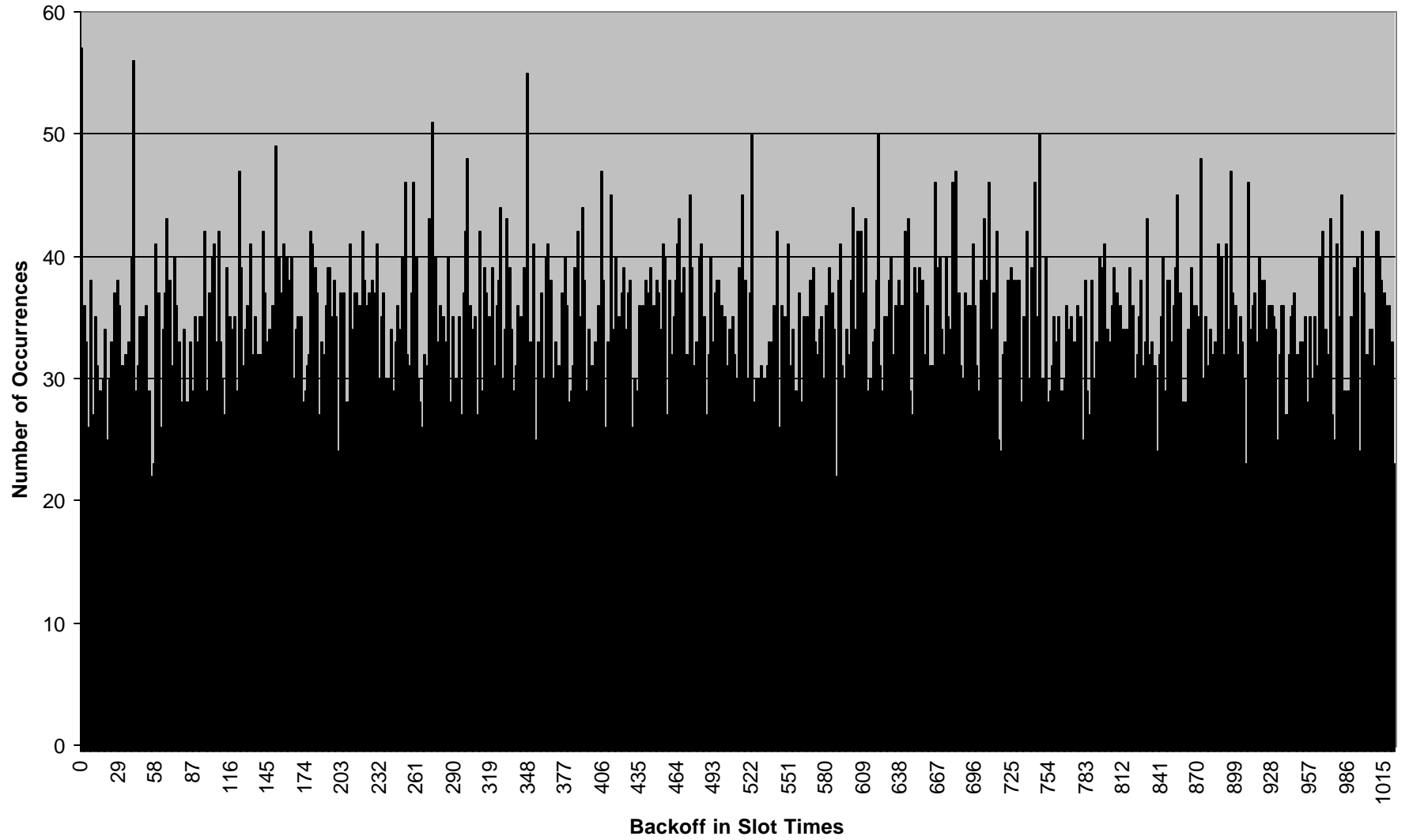
Histogram of the Backoff of the 10th Retransmission Attempt



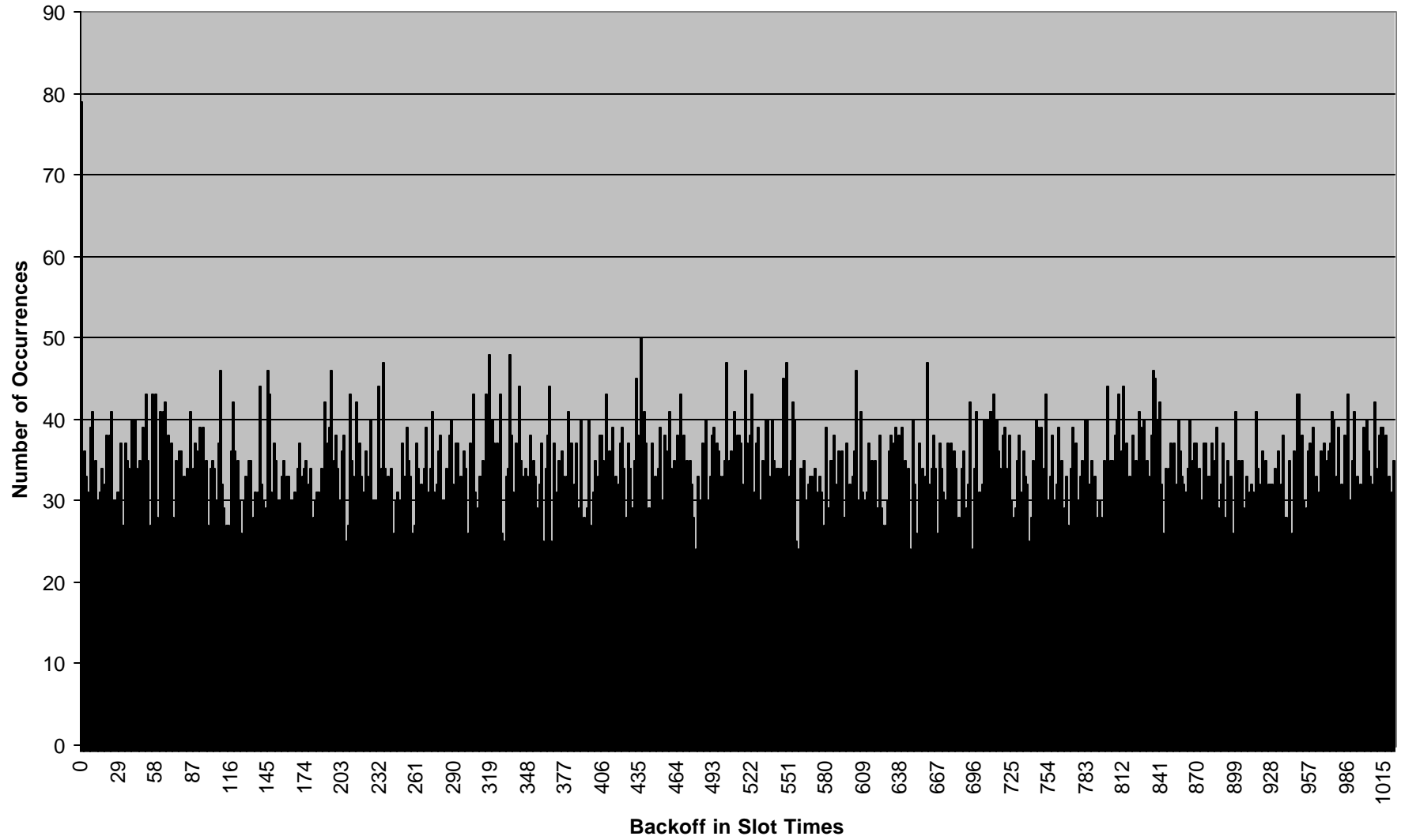
Histogram of the Backoff of the 11th Retransmission Attempt



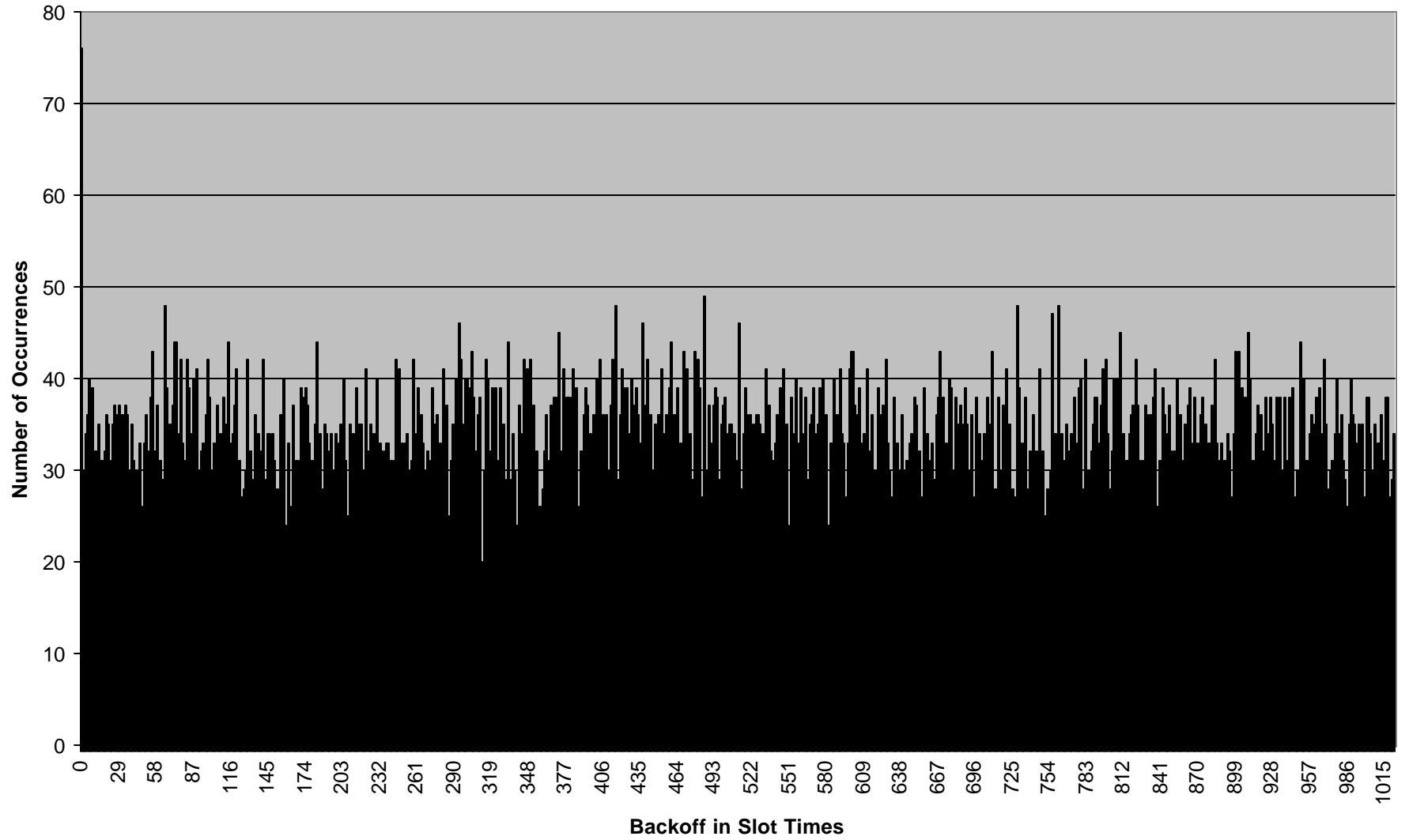
Histogram of the Backoff of the 12th Retransmission Attempt



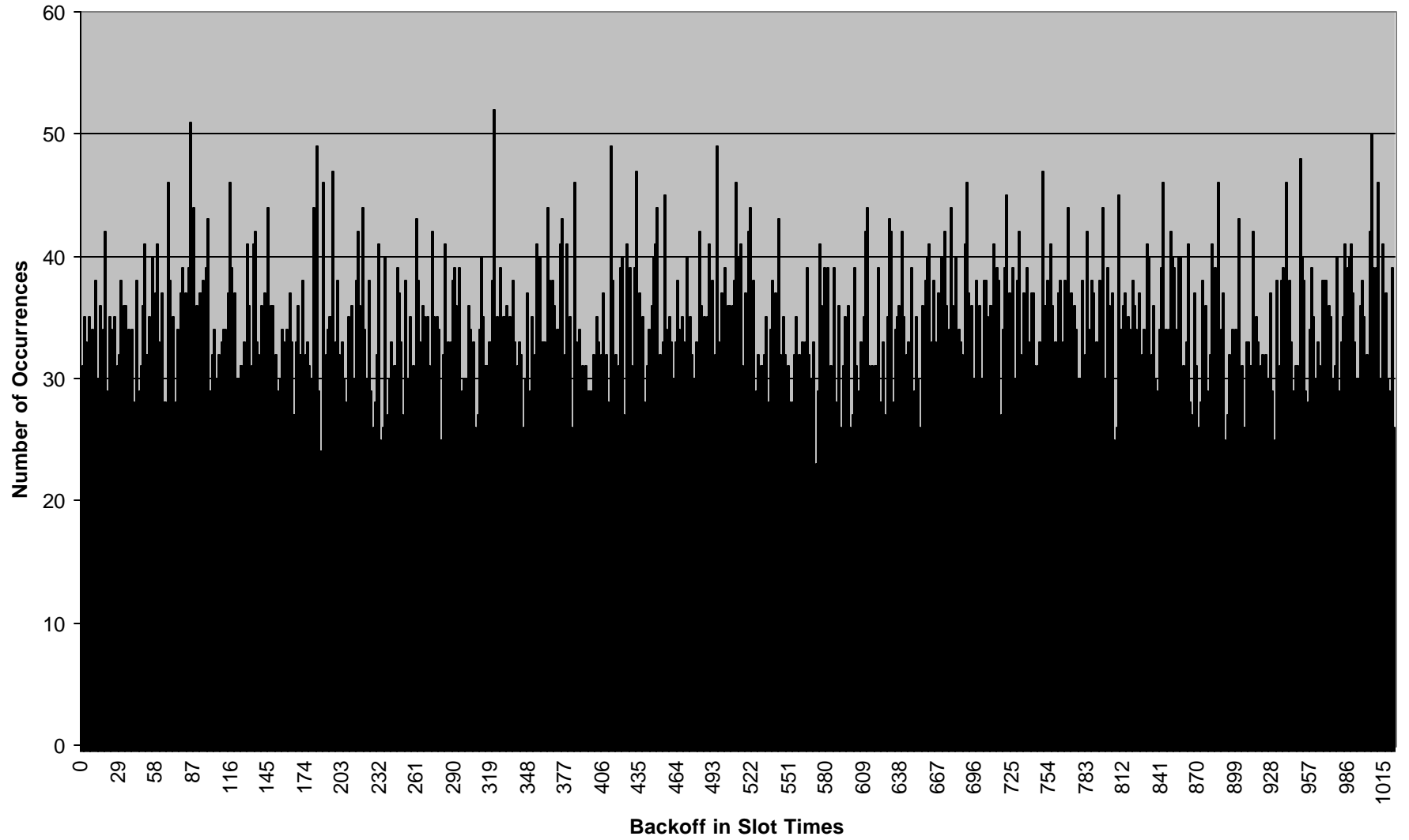
Histogram of the Backoff of the 13th Retransmission Attempt



Histogram of the Backoff of the 14th Retransmission Attempt



Histogram of the Backoff of the 15th Retransmission Attempt



Histogram of the Backoff of the Combined 10th-15th Retransmission Attempts

