Appendix for
Locating Arrays for Screening Engineered Systems
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A Appendix for Locating Arrays for Screening Engineered Systems

A.1 Factors and Levels used in the MANET Case Study

Table 1 gives the 75 controllable factors in the `ns-2` simulator identified for experimentation. The column labelled "LA" gives the column j in which the factor F_j occurs in the locating array (LA), $1 \leq j \leq 75$. They are grouped (more or less) by Application down the protocol stack. The column labelled "ℓ_j" is the number of levels for the factor F_j. The column labelled "Factor" is the variable name utilized in `ns-2`. Finally, the columns under "Levels" give the levels $L_j = \{v_{j,1}, \ldots, v_{j,\ell_j}\}$ for factor F_j. The levels in bold are the default values in the `ns-2` simulator.

Table 1: Factors and levels in the MANET.

LA	ℓ_j	Factor	Levels									
		Application										
67	10	APP_flows_	1	2	4	6	8	10	12	14	16	18
		Transport (TCP)										
47	6	TCP_window_	1	5	10	15	**20**	40				
0	2	TCP_windowInit_	**2**	5								
68	10	TCP_packetSize_	64	128	256	512	768	1024	1280	1536	1792	2048
1	2	TCP_tcpip_base_hdr_size_	20	**40**								
2	2	TCP_overhead_	**0**	0.01								
29	3	TCP_maxburst_	**0**	3	4							
		TCP timer mechanism										
4	2	TCP_srtt_init_	**0**	1								
5	2	TCP_rttvar_init_	0	**12**								
6	2	TCP_rtxcur_init_	**3**	6								
7	2	TCP_T_SRTT_BITS_	1	**3**								
8	2	TCP_T_RTTVAR_BITS_	**2**	4								
9	2	TCP_RTTvar_exp_	**2**	4								
10	2	TCP_tcpTick_	**0.01**	0.1								
49	6	TCP_min_RTO_	0.1	**0.2**	10	20	30	40				
11	2	TCP_ts_resetRTO_	**false**	true								
12	2	TCP_updated_rttvar_	false	**true**								
		TCP congestion control mechanism										
3	2	TCP_control_increase_	**0**	1								
13	2	TCP_precisionReduce_	false	**true**								
28	3	TCP_numdupacks_	2	**3**	4							

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LA	#L	Factor name	Levels									
14	2	TCP_numdupacksFrac_	**-1**	10								
30	3	TCP_decrease_num_	**0.5**	1.0	2.0							
31	3	TCP_increase_num_	0.5	**1.0**	2.0							
48	6	TCP_maxcwnd_	0	1	4	8	16	32				
15	2	TCP_noFastRetrans_	**false**	true								
16	2	TCP_slow_start_restart_	false	**true**								
		Random Waypoint (RWP) mobility Model										
62	8	RWP_Nodes_	36	51	66	81	96	111	126	141		
43	5	RWP_Area_	8	16	24	32	40					
69	10	RWP_Node_speed_	4	8	10	12	14	16	18	20	22	24
57	7	RWP_Node_pause_time_	0	1	5	10	15	20	30			
37	4	RWP_Scenario_Ratio_	1	2	3	4						
		Ad hoc on-demand distance vector (AODV)										
70	10	AODV_ACTIVE_ROUTE_TIMEOUT_	1	2	3	4	5	8	**10**	12	14	16
50	6	AODV_MY_ROUTE_TIMEOUT_	2	4	6	8	**10**	12				
71	10	AODV_RREQ_RETRIES_	1	2	**3**	4	5	6	7	8	9	10
63	8	AODV_NETWORK_DIAMETER_	3	5	7	10	15	20	**30**	35		
38	4	AODV_HELLO_INTERVAL_	0.1	0.5	**1**	10						
66	9	AODV_ALLOWED_HELLO_LOSS_	0	1	2	**3**	4	5	6	7	8	
44	5	AODV_NODE_TRAVERSAL_TIME_	0.01	0.02	**0.03**	0.04	0.05					
17	2	AODV_TTL_START_	1	**5**								
36	3	AODV_TTL_INCREMENT_	1	**2**	3							
32	3	AODV_TTL_THRESHOLD_	3	**7**	15							
		Link										
46	5	LL_delay_	2us	10us	**25us**	50us	100us					
		Queue										
72	10	Queue_ifqlen_	5	10	15	20	25	**50**	75	100	150	200
19	2	Queue_interleave_	**false**	true								
20	2	Queue_acksfirst_	**false**	true								
21	2	Queue_ackfromfront_	**false**	true								
22	2	Queue_DT_drop_front_	**false**	true								
23	2	Queue_DT_summarystats_	**false**	true								
24	2	Queue_DT_queue_in_bytes_	**false**	true								
		IEEE 802.11b DCF MAC layer										
52	6	MAC_BeaconInterval_	0.01	0.05	**0.1**	0.2	0.5	1				

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LA	#L	Factor name	Levels									
25	2	MAC_ScanType_	**PASSIVE**	ACTIVE								
53	6	MAC_ProbeDelay_	0.00001	0.00005	**0.0001**	0.0002	0.0005	0.001				
39	4	MAC_Min_Max_ChannelTime_	1	**2**	3	4						
54	6	MAC_ChannelTime_	0.012	0.06	**0.12**	0.24	0.6	1.2				
33	3	MAC_RTSThreshold_	**0**	1500	3000							
		IEEE 802.11b DSSS PHY layer										
73	10	DSSS_CWMin_CWMax_	0	1	2	**3**	4	5	6	7	8	9
26	2	PLPC_Preamble_	72	**144**								
51	6	MAC_802_11_SlotTime_	0.000005	0.000010	0.000015	**0.000020**	0.000025	0.000030				
		PHY/WirelessPhy										
40	4	PHY_Wir_bandwidth_	1e6	**2e6**	5.5e6	11e6						
74	10	PHY_Wir_RXThresh_m_	25	50	75	100	125	150	175	200	225	**250**
41	4	PHY_Wir_CPThresh_	1.59	5.98	6.99	**10.0**						
45	5	PHY_Wir_freq_	868e+06	**914e+06**	2412e+06	2437e+06	2462e+06					
59	7	PHY_Wir_L_	**1.0**	1.5	2.0	2.5	3.0	3.5	4.0			
		Radio propagation model										
35	3	Propagation_	**TwoRayGround**	FreeSpace	Shadowing							
		Energy Model										
64	8	ENER_initialEnergy_	4	7	10	13	16	20	25	50		
60	7	ENER_txPower_	0.01	**0.02**	0.03	0.04	0.05	0.06	0.07			
61	7	ENER_rxPower_	0.10	0.25	0.40	0.55	0.70	0.85	1.0			
42	4	ENER_idlePower_	0.0001	0.001	0.0055	0.01						
58	7	ENER_sleepPower_	0.001	0.002	0.003	0.004	0.005	0.01	0.015			
65	8	ENER_transitionPower_	0.001	0.005	0.01	0.05	0.1	0.15	0.2	0.3		
55	6	ENER_transitionTime_	0.0001	0.0005	0.001	0.005	0.01	0.05				
		Error Model										
18	2	ErrorModel_ranvar_	Uniform	Exponential								
34	5	ErrorModel_rate_	1.0E-07	1.0E-06	1.0E-05							
56	6	ErrorModel_FECstrength_	1	2	3	4	5	6				
27	2	ErrorModel_unit_	**pkt**	bit								

Table 2 provides a brief description of each factor. For easy reference, the factors are listed in the same order they appear in Table 1.

Table 2: Description of the factors.

Factor name	Unit	Description
Application FTP		
APP_flows_	flows	Number of flows
Transport		
TCP_window_	bytes	Upper bound on window size, RFC 1323, in 16 bits 65534
TCP_windowInit_	bytes	Initial value of window size
TCP_packetSize_	bytes	TCP packet size in bytes
TCP_tcpip_base_hdr_size_	bytes	TCP basic header size in bytes
TCP_overhead_	sec	The range of a uniform random variable used to delay each output packet
TCP_maxburst_	bytes	Maximum number of bytes that a TCP sender can transmit in one transmission
Variables related to TCP timer mechanism		
TCP_srtt_init_	tcpTick	Initial value of t_srtt_
TCP_rttvar_init_	tcpTick	Initial value of t_rttvar_
TCP_rtxcur_init_	tcpTick	Initial value of t_rtxcur_
TCP_T_SRTT_BITS_	bits	Multiplicative factor for smoothed RTT, (alpha)
TCP_T_RTTVAR_BITS_	bits	Multiplicative factor for RTT deviation (beta)
TCP_RTTvar_exp_	unit	Multiplicative factor for RTO computation
TCP_tcpTick_	secs	Timer granularity in seconds, simulation time unit
TCP_min_RTO_	secs	Lower bound on RTO
TCP_ts_resetRTO_	boolean	Set to true to un-back-off RTO after any valid RTT measurement.
TCP_updated_rttvar_	boolean	Update rttvar
TCP congestion control mechanism		
TCP_control_increase_	boolean	If set to 1, do not open the congestion window when the network is limited
TCP_precisionReduce_	boolean	Precision
TCP_numdupacks_	unit	Number of duplicated ACKs which triggers Fast Retransmit
TCP_numdupacksFrac_	boolean	If set 1, sender will transmit new packets upon receiving first few duplicated ACK packets
TCP_decrease_num_	unit	Window decreasing factor
TCP_increase_num_	unit	Window increasing factor
TCP_maxcwnd_	unit	Upper bound on cwnd_
TCP_noFastRetrans_	boolean	Fast retransmit
TCP_slow_start_restart_	boolean	Slow start restart
Random Waypoint Mobility Model		
RWP_Nodes_	unit	Number of nodes
RWP_Area_	unit	X, Y sides. Modified by scenario ratio and transmission threshold

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Factor name	Unit	Description
RWP_Node_speed_	m/sec	Speed of node movement (m/secs)
RWP_Node_pause_time_	sec	Time stopped at destination (secs)
RWP_Scenario_Ratio_	unit	1x1, 1x2, 1x3, 1x4
AODV		
AODV_ACTIVE_ROUTE_TIMEOUT_	sec	Static parameter that defines how long a route is kept in the routing table.
AODV_MY_ROUTE_TIMEOUT_	sec	[1..10]
AODV_RREQ_RETRIES_	unit	Number of times AODV will repeat expanded ring search for a destination.
AODV_NETWORK_DIAMETER_	hops	Maximum possible number of hops between two nodes in the network.
AODV_HELLO_INTERVAL_	sec	1,000 Milliseconds http://tools.ietf.org/html/rfc3561
AODV_ALLOWED_HELLO_LOSS_	packets	http://tools.ietf.org/html/rfc3561
AODV_NODE_TRAVERSAL_TIME_	sec	Estimate of the average one hop traversal time
AODV_TTL_START_	sec	[1..10]
AODV_TTL_INCREMENT_	sec	[1..20]
AODV_TTL_THRESHOLD_	sec	[1..10]
Link		
LL_delay_	us	Time needed to deliver an entire packet
Queue		
Queue_ifqlen_	packets	Interface Queue Length, max packet in ifq
Queue_interleave_	boolean	Interleave
Queue_acksfirst_	boolean	ACK first
Queue_ackfromfront_	boolean	ACK from front
Drop Tail		
Queue_DT_drop_front_	boolean	Use of drop front queue or not (Queue/DropTail)
Queue_DT_summarystats_	boolean	Summary of statistics
Queue_DT_queue_in_bytes_	boolean	Default false, meaning packets.
IEEE 802.11b DCF MAC layer		
MAC_BeaconInterval_	sec	Packet broadcast by the router to synchronize the wireless network
MAC_ScanType_	unit	Active, Passive scanning
MAC_ProbeDelay_	sec	Ensures that an empty or lightly loaded channel does not completely block the scan
MAC_Min_Max_ChannelTime_	sec	Default Min 5ms Max 11 ms
MAC_ChannelTime_	sec	120 ms default value in ns2
MAC_RTSThreshold_	bytes	ON = 0, OFF= 3000 bytes. Reduce frame collisions introduced
IEEE 802.11b DSSS PHY layer		
DSSS_CWMin_CWMax_	unit	[Minimum, Maximum] Contention Window
PLPC_Preamble_	unit	Preamble Length & Header, Short 72+48, Long 144+48 (96usecs, 192usecs respectively)
MAC_802_11_SlotTime_	secs	If channel busy during the DIFS interval, the station should defer its transmission

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Factor name	Unit	Description
PHY/WirelessPhy		
PHY_Wir_bandwidth_	Mbps	Bandwidth
PHY_Wir_RXThresh_m_	watts	Receive power threshold (W)
PHY_Wir_CPThresh_	dB	Capture threshold (db): Initialize the SharedMedia interface
PHY_Wir_freq_	Mhz	A device working frequency band, the number of channels supported are 11.
PHY_Wir_L_	unit	System-loss factor
Radio propagation model		
Propagation_	type	Radio propagation
Energy Model		
ENER_initialEnergy_	joules	Energy the node has at the beginning of the simulation
ENER_txPower_	watts	Power consumption for transmission, Energy usage for every packet it transmits
ENER_rxPower_	watts	Power consumption for reception, Energy usage for every packet it receives
ENER_idlePower_	watts	Idle power consumption (W)
ENER_sleepPower_	watts	Power consumption (Watt) in sleep state
ENER_transitionPower_	watts	power consumption (Watts) in state transition from sleep to idle (active)
ENER_transitionTime_	sec	time (sec) used in state transition from sleep to idle (active)
Error Model		
ErrorModel_ranvar_	unit	Data distribution to compare error rate
ErrorModel_rate_	%	Error probability rate
ErrorModel_FECstrength_	bits	Number of bits that can be corrected/recovered per packet
ErrorModel_unit_	unit	Unit of data in errors

A.2 The Locating Array

Table 3 gives the 421×75 $(\overline{1}, \overline{2})$-locating array $A = (a_{ij})$ used for screening, *i.e.*, it has 421 design points for the 75 factors. Entry a_{ij} contains the number of the level assigned to factor F_j in design point i, $1 \leq i \leq 421, 1 \leq j \leq 75$, *i.e.*, $a_{ij} \in \{0, 1, \dots, \ell_j - 1\}$. The first column is not part of the array; it is simply the number of the design point. The first row is also not part of the array; it is the number of levels ℓ_j for factor F_j (in column $1 \leq j \leq 75$.

Table 3: The $(\overline{1}, \overline{2})$-locating array used in experimentation.

i	**Index k, $k \in \{0, \dots, \ell_j - 1\}$ of level in L_j of factor F_j in design point i**																																																																									
	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7	8	8	8	8	9	10	10	10	10	10	10	10	10
1	0	1	1	1	0	0	0	1	1	0	0	1	0	0	1	1	1	0	1	1	0	0	1	1	1	1	0	1	1	2	2	2	0	0	1	2	0	3	2	0	0	2	2	3	3	1	0	2	1	4	0	5	2	5	3	1	1	2	3	0	4	4	5	0	1	2	3	4	5	8	1	1	1	8	2
2	1	0	0	0	1	1	1	1	1	1	0	1	1	0	1	1	0	0	1	1	1	1	0	1	1	0	0	0	1	1	2	2	2	1	1	1	2	2	0	1	2	2	3	4	4	4	4	3	1	1	2	0	4	3	5	4	5	0	1	6	4	0	6	4	0	5	3	9	4	1	0	7	1	1	7
3	1	1	0	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	2	0	1	1	0	0	1	3	3	1	1	2	0	0	4	2	0	1	0	0	5	2	2	1	3	3	2	3	5	5	1	4	1	1	1	0	1	4	2	1	7	2	2	4
4	1	1	1	0	0	1	0	1	1	1	1	0	1	0	0	1	0	1	0	1	1	1	1	1	0	1	1	0	2	1	2	2	2	1	1	0	2	2	0	0	1	2	0	2	1	0	3	3	0	3	3	5	1	5	3	5	3	1	2	0	0	3	6	2	4	1	7	2	5	4	7	6	8	1	7
5	0	1	0	0	1	0	1	1	1	0	1	1	0	1	1	0	1	0	0	1	1	1	0	1	0	0	0	1	1	1	1	1	0	0	2	2	2	0	0	3	2	2	2	1	1	4	3	3	4	4	4	2	1	3	0	1	2	2	3	0	4	1	2	6	2	1	3	1	7	7	3	4	3	8	1
6	0	1	0	1	1	1	0	1	1	0	0	1	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	2	2	1	1	2	2	0	1	2	0	3	1	0	3	1	1	1	4	3	3	0	0	3	0	1	5	3	5	0	1	3	3	6	0	2	5	1	7	5	5	5	2	4	1	9	6	2
7	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	1	1	1	0	1	0	1	0	1	1	1	1	1	2	2	2	0	2	2	2	1	3	2	2	3	1	2	4	4	1	3	2	0	3	5	2	1	0	4	0	5	6	2	5	6	4	6	0	4	2	7	6	0	1	6	6	8	6	9
8	1	0	1	0	1	1	1	0	1	1	1	1	1	0	0	1	1	1	1	1	0	0	1	0	1	0	0	0	1	1	2	2	0	1	0	0	1	1	0	3	1	0	2	2	4	2	1	3	4	4	2	3	0	5	3	1	2	4	5	4	1	1	4	0	1	2	4	5	1	5	5	2	1	6	6
9	1	1	0	1	1	1	1	1	1	1	1	1	0	0	1	0	1	1	0	1	1	1	0	1	1	1	0	0	0	2	2	2	2	2	0	1	2	3	3	2	0	2	0	4	0	0	4	3	5	2	0	1	5	1	0	3	1	1	2	5	1	4	0	0	0	1	1	3	3	2	3	5	9	3	9
10	0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	0	1	1	1	0	1	0	0	1	0	0	1	1	2	1	2	0	1	0	2	1	1	2	0	2	0	1	0	4	4	2	4	0	3	3	3	4	0	5	0	4	3	2	6	0	5	1	7	1	6	5	5	5	6	5	0	1	8	1	5
11	1	0	0	0	1	1	1	1	0	0	0	0	0	1	1	1	0	0	1	0	1	0	1	1	0	0	0	0	1	0	2	2	0	0	1	2	1	2	2	0	2	1	2	2	0	1	4	1	2	1	3	0	3	0	2	1	3	1	2	1	0	1	0	4	1	2	1	2	7	1	8	2	3	9	7
12	1	0	1	1	1	0	1	0	1	0	0	1	0	0	0	1	1	0	1	1	1	1	0	0	0	0	1	1	2	0	2	1	0	1	2	1	2	3	0	2	0	0	3	2	1	4	2	0	0	0	1	4	3	2	3	5	5	1	5	4	0	6	3	1	1	2	1	1	2	1	0	8	5	9	2
13	0	1	0	0	0	1	0	0	1	0	0	1	0	0	1	1	1	1	0	1	0	0	0	0	0	0	1	0	2	0	0	2	0	1	1	0	1	3	3	2	0	3	2	0	2	1	1	4	3	3	0	1	3	3	1	4	5	0	5	6	2	3	2	3	0	6	6	9	1	6	3	7	6	5	2
14	1	0	1	1	1	1	0	0	1	1	0	1	0	1	0	0	1	1	0	1	0	1	1	0	0	1	1	1	2	0	0	0	1	1	2	0	2	0	1	0	1	0	0	4	1	2	4	1	0	5	5	0	0	5	2	5	0	5	0	3	3	0	4	5	1	3	6	0	4	7	9	1	2	4	3
15	0	1	0	1	0	0	1	0	0	0	0	1	1	1	1	1	1	1	0	1	0	0	1	0	0	1	1	1	1	0	2	1	1	1	1	0	0	3	3	3	1	0	3	2	4	1	1	4	3	4	4	3	4	1	4	0	5	6	2	3	3	4	0	5	4	4	2	3	9	9	5	7	8	6	6
16	1	1	1	0	0	0	0	1	0	1	0	0	0	1	1	1	0	1	1	0	0	1	1	1	1	0	0	0	1	1	2	0	2	1	2	0	1	2	0	0	3	2	0	1	4	1	1	2	3	0	2	0	3	3	1	0	0	5	0	3	2	3	1	5	4	1	2	7	8	2	9	9	4	1	7
17	0	1	1	1	1	0	1	0	0	1	0	1	0	0	1	1	0	0	1	0	1	1	0	1	0	0	0	0	1	2	0	2	0	0	2	1	1	1	2	0	2	2	0	1	3	2	4	4	3	5	1	2	0	1	4	0	2	2	3	3	6	5	1	5	4	5	3	6	3	1	8	9	4	6	1
18	0	0	0	1	1	1	1	0	1	1	0	0	1	0	0	1	1	1	0	1	0	0	1	0	1	1	1	0	2	0	1	2	0	0	2	1	0	1	3	2	0	3	0	0	1	4	3	4	2	0	1	2	5	3	4	4	1	1	6	2	5	3	7	2	4	4	1	4	8	0	6	8	9	8	1
19	1	0	0	0	1	1	1	1	1	1	1	0	1	0	1	1	1	0	0	1	0	0	1	0	1	1	1	1	2	1	2	2	0	1	1	1	2	2	1	1	0	3	0	4	0	0	0	0	1	4	0	1	3	2	2	3	0	5	2	5	3	3	0	6	1	2	5	7	7	3	2	3	2	5	9
20	1	1	0	1	0	1	1	0	1	1	1	0	0	0	1	1	0	0	0	0	1	0	1	1	0	1	1	0	1	1	0	1	1	1	2	0	1	1	2	1	1	1	1	0	3	3	2	2	2	4	2	0	4	1	2	3	1	0	0	4	0	5	0	3	7	6	4	5	2	3	7	5	9	1	7
21	0	1	1	1	0	1	1	0	1	0	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	2	0	2	0	1	1	2	1	1	2	3	3	3	3	0	2	2	3	3	4	2	2	1	1	4	0	0	5	2	2	6	1	6	0	3	4	1	6	0	3	1	4	9	3	3	8	5
22	1	1	1	0	1	0	0	0	1	0	0	1	0	0	1	1	0	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1	1	2	2	0	1	1	0	2	1	3	2	0	2	3	2	3	3	4	5	5	0	4	1	1	0	5	3	2	4	5	7	7	1	0	8	3	2	8	7	7	1	3	9
23	0	1	1	0	1	1	1	1	0	0	0	0	0	0	1	1	1	0	1	0	1	0	1	1	0	1	0	1	1	0	0	0	0	1	1	0	0	0	1	2	0	2	1	4	0	3	1	2	3	1	4	5	3	4	5	2	4	4	5	3	3	1	0	1	4	4	7	2	7	7	0	3	6	4	9
24	1	0	1	0	0	1	1	0	1	1	1	0	1	0	0	0	1	1	0	1	1	1	0	1	1	0	1	0	2	1	1	1	2	1	2	0	2	1	2	2	1	0	1	1	4	1	1	5	4	2	5	0	1	1	4	5	3	1	6	4	6	3	1	5	7	1	3	0	2	5	8	2	1	2	9
25	1	1	0	1	1	1	1	1	0	0	0	0	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	0	2	2	1	0	1	2	2	1	1	0	2	3	3	3	0	2	4	1	5	4	5	1	3	4	2	4	2	5	2	4	0	3	2	7	1	0	1	0	8	5	3	0	4	5	4	8
26	0	1	0	1	1	0	1	0	1	1	1	1	1	0	1	0	0	1	1	0	1	1	0	0	1	1	0	0	1	2	0	0	0	0	1	0	1	0	3	1	0	1	3	4	3	2	0	3	2	5	0	2	2	3	4	2	3	1	1	0	6	6	6	3	2	2	0	7	4	2	9	3	5	7	2
27	1	0	1	1	0	1	1	0	0	0	0	1	1	1	0	1	1	1	0	1	0	0	0	1	1	1	0	0	0	0	1	1	2	1	2	2	0	1	3	1	1	2	3	2	1	1	1	4	0	2	4	4	1	4	1	2	2	6	1	1	1	2	5	6	2	1	2	5	9	1	7	9	0	5	2

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Table 3 – continued from previous page

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29	1 1 0 1 1 1 1 0 1 0 0 1 1 1 0 1 1 0 1 1 1 1 1 0 0 1 0 1 0 1 1 2 2 2 2 1 2 2 0 0 2 2 3 1 2 0 0 2 3 2 1 3 1 4 0 0 0 5 0 1 3 2 2 6 6 4 7 4 4 4 6 5 8 4 0 0 4
30	0 0 1 1 0 0 0 1 1 0 1 0 1 1 1 0 1 1 0 1 0 0 1 0 0 1 0 0 2 2 2 1 1 0 2 2 1 0 0 1 2 3 1 1 1 3 4 1 1 2 0 2 3 5 5 5 4 5 3 3 2 4 7 3 3 5 6 3 7 4 6 3 5 1 4
31	0 0 0 1 1 1 0 1 0 1 0 1 0 0 0 0 0 0 1 0 0 0 0 1 0 1 0 1 2 1 2 1 1 1 0 2 1 1 3 3 1 3 2 3 3 4 1 2 5 2 4 2 5 0 1 2 0 1 5 6 2 6 1 1 7 0 8 2 5 9 8 2 2 0 4
32	1 1 1 1 0 0 0 1 1 1 1 1 0 0 0 0 0 0 0 0 1 0 0 1 1 1 1 0 0 0 0 0 0 2 2 2 1 1 0 2 1 3 2 3 1 3 3 3 0 4 3 3 2 5 1 4 0 0 2 6 4 3 4 6 4 2 3 0 5 1 2 8 7 7 4 0 6
33	0 1 1 1 0 0 0 1 0 0 0 0 1 1 1 0 1 0 0 0 0 1 0 0 1 0 0 0 1 2 0 2 2 1 1 0 2 3 1 1 0 1 1 4 0 4 4 0 4 4 2 5 3 0 0 0 2 0 5 2 3 2 0 2 6 0 8 7 4 5 6 6 3 3 2
34	0 0 0 1 1 1 0 1 1 1 1 1 1 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 1 0 0 2 0 0 1 2 1 1 1 2 1 2 2 2 3 3 1 2 4 1 5 0 5 3 1 3 1 3 3 5 2 6 3 0 4 4 5 0 0 3 1 7 5 9 6 8
35	1 1 0 0 1 1 0 1 0 0 1 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 2 1 1 2 2 0 2 1 2 1 2 1 3 0 2 0 2 0 5 4 3 1 1 1 4 4 1 1 2 1 0 2 1 7 3 0 5 4 9 8 0 6 1 9 6 8
36	0 0 0 1 0 1 1 0 1 1 0 0 0 0 1 1 1 0 0 1 1 1 0 1 1 0 1 1 1 2 1 1 1 1 1 1 0 1 3 2 1 3 2 1 0 1 0 1 4 3 1 4 5 2 5 0 2 2 5 0 5 4 3 0 0 7 7 7 6 9 2 9 4 9 8
37	0 0 0 1 1 0 0 1 1 1 0 1 1 0 1 1 0 0 1 0 1 1 1 0 0 1 1 0 1 1 1 2 0 1 2 2 1 1 3 3 3 3 0 3 3 3 3 4 2 4 0 0 5 4 3 5 4 6 0 5 2 3 5 5 3 5 8 6 1 4 6 9 3 2 0
38	0 0 1 0 0 1 1 1 1 0 1 0 1 0 1 0 0 0 1 1 0 0 1 1 1 0 1 0 0 1 2 0 2 2 0 2 1 1 2 2 2 3 3 0 2 1 4 2 5 5 2 1 5 4 1 2 2 1 5 5 4 0 7 7 1 5 6 6 9 2 1 5 8 3 0
39	1 1 1 0 0 0 0 1 1 0 0 1 1 0 0 0 1 1 0 0 0 0 0 1 0 0 0 1 1 1 0 0 1 2 2 2 0 3 0 3 3 0 3 0 2 4 0 2 0 0 4 0 2 0 5 0 4 5 0 3 0 2 3 6 0 7 7 2 5 0 5 4 4 7 3
40	1 1 0 1 1 1 0 0 0 1 1 1 0 1 0 1 1 1 0 1 0 0 0 1 0 0 1 1 0 0 0 0 1 2 1 0 2 0 3 3 0 2 2 1 2 1 1 3 4 1 4 5 0 4 3 3 0 3 1 1 6 5 1 2 2 2 2 6 0 5 3 3 7 6 5
41	1 1 0 0 1 0 0 0 0 1 1 1 0 0 0 1 0 1 1 0 1 0 0 0 0 0 1 0 0 2 2 1 2 0 0 1 1 0 3 0 2 2 0 3 3 2 3 0 5 3 4 4 2 2 2 3 1 4 6 6 4 6 3 0 6 2 5 4 8 4 5 1 9 3 7
42	0 0 0 0 1 1 0 1 0 0 0 0 1 1 0 1 1 1 1 0 0 0 0 1 0 1 1 0 2 1 2 0 1 2 2 2 2 0 3 2 0 1 1 0 2 2 0 1 1 4 3 4 0 5 5 0 0 6 3 4 5 2 3 7 2 1 4 8 3 3 4 7 9 3 7
43	1 1 0 1 0 1 0 1 0 0 0 1 0 0 0 1 0 0 1 0 1 1 0 1 0 1 1 1 2 1 2 0 0 0 2 1 0 3 1 2 2 2 0 3 4 0 2 1 4 3 5 1 4 5 1 0 3 1 2 4 5 0 5 5 1 7 6 0 8 2 2 6 4 9 7
44	1 1 0 0 0 0 0 1 1 1 1 0 0 1 1 0 0 0 0 0 0 1 0 0 0 1 0 0 0 1 0 1 0 1 2 2 1 2 0 2 0 2 2 1 3 2 2 4 0 5 4 1 3 1 4 3 5 5 4 4 0 3 4 1 3 1 0 0 2 6 3 7 9 0 2 9 4
45	0 1 0 1 0 1 1 1 1 0 1 1 0 0 0 0 0 0 0 1 0 1 1 1 0 0 1 1 0 2 0 0 0 1 2 1 1 1 1 1 0 0 3 2 1 3 0 0 5 1 0 2 4 5 0 4 4 5 6 0 6 2 7 3 2 3 2 1 8 6 5 2 2 8 3
46	0 0 1 1 0 0 0 0 1 1 1 1 1 0 0 1 0 0 0 1 1 1 0 0 0 1 0 0 0 0 0 0 0 0 1 0 2 1 3 0 3 3 0 2 4 0 0 2 5 0 2 1 3 1 0 4 0 2 1 3 3 1 5 2 6 1 7 8 8 3 5 3 5 7 6 4
47	0 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 1 0 1 0 1 1 0 0 1 2 0 1 2 1 0 0 2 1 1 2 0 2 1 3 4 3 2 5 2 3 1 1 5 3 0 2 6 1 1 5 4 2 2 7 7 0 3 6 3 1 9 4 5 8
48	1 0 1 0 0 1 0 0 0 0 0 1 0 1 1 0 1 0 1 0 1 0 0 1 0 1 0 0 2 2 0 1 2 0 0 0 2 1 0 1 1 0 0 1 3 4 4 4 4 0 3 2 5 2 4 0 4 3 0 0 5 1 6 1 2 4 7 8 1 2 8 5 4 5 6
49	0 1 1 1 1 1 1 1 0 1 0 1 1 1 0 1 1 0 1 1 1 1 1 1 1 1 0 1 0 2 2 0 2 2 1 1 2 0 3 1 1 3 0 3 4 3 2 4 5 4 5 4 5 5 2 2 5 4 4 3 2 3 5 7 4 1 4 5 6 6 1 8 4 9 3 8
50	1 0 1 0 0 0 1 0 1 1 1 1 0 0 0 1 0 1 0 0 0 0 0 0 1 1 1 0 1 0 2 1 1 0 1 0 1 3 1 2 3 2 1 3 1 2 0 5 4 1 3 3 3 0 4 5 0 6 6 2 5 5 5 7 4 5 4 8 9 0 7 8 6 2 1
51	1 0 1 0 1 1 1 1 0 1 1 1 0 0 0 1 1 0 1 1 0 1 1 1 1 0 0 0 1 0 1 1 1 2 0 2 2 2 2 1 3 3 1 1 2 0 3 1 3 2 0 3 5 4 5 0 1 4 1 6 5 4 3 3 2 2 2 5 4 9 6 4 6 2 1
52	1 1 1 1 1 0 0 0 0 1 0 0 1 1 1 0 1 1 1 0 1 1 0 1 1 0 0 0 0 0 0 1 2 2 1 2 0 1 3 1 3 0 1 2 1 3 3 0 1 1 0 4 3 2 0 1 5 5 2 6 3 1 6 4 6 2 2 1 7 9 6 6 6 1 8 3
53	1 0 1 0 1 1 1 0 1 1 1 1 0 0 0 0 0 1 0 0 1 1 1 0 0 1 0 1 1 1 2 1 2 1 1 2 0 2 0 1 2 3 3 1 4 0 2 2 2 2 4 4 0 0 1 4 3 6 3 5 0 5 5 7 2 3 8 1 6 6 2 7 8 0 3
54	0 1 1 0 0 0 0 1 0 0 1 0 1 1 1 0 0 0 1 1 1 0 1 0 0 1 1 1 1 1 0 1 0 1 2 0 1 0 3 3 0 3 1 0 0 2 0 4 2 4 0 2 4 1 5 1 0 4 0 3 1 6 6 6 4 5 7 3 9 6 5 1 3 8 0 5
55	0 0 0 1 1 0 0 0 0 0 1 0 0 1 1 0 1 0 0 0 1 0 1 0 1 0 1 1 1 1 0 2 0 0 2 0 0 2 0 2 3 0 2 0 1 2 0 0 4 2 3 4 0 5 0 2 4 4 4 2 3 5 6 5 7 6 1 3 9 6 4 1 7 8 0
56	0 0 1 1 0 1 0 1 0 1 1 0 0 1 0 1 0 1 1 0 0 0 0 1 0 0 1 1 0 0 1 0 1 0 2 2 1 1 3 0 2 0 2 4 1 0 0 0 1 1 5 4 0 1 5 1 5 1 6 6 2 5 2 2 2 2 2 3 9 4 2 8 6 0 7 9
57	1 1 0 1 1 1 1 1 0 0 1 1 0 0 1 0 1 0 0 1 0 1 1 1 0 1 1 0 2 0 0 0 2 2 0 0 0 0 3 3 0 1 1 4 0 4 4 3 3 5 1 3 4 5 3 3 4 0 4 1 2 0 1 4 2 0 1 4 9 1 7 2 0 1 9
58	1 1 0 0 0 0 0 0 1 1 1 0 0 1 0 1 1 0 0 0 1 0 1 0 1 1 1 0 1 1 2 0 0 2 2 1 1 1 1 3 1 0 1 3 0 2 4 4 2 2 1 1 1 0 0 5 5 4 1 2 5 4 1 4 1 6 6 5 4 0 5 2 5 5 9
59	0 0 1 0 0 1 1 0 1 1 1 1 1 1 0 0 0 0 1 0 1 0 0 1 0 1 1 0 1 1 2 2 2 2 2 2 1 2 1 1 2 3 3 1 0 2 3 2 5 4 3 3 1 2 2 3 2 4 5 6 6 5 6 3 6 2 3 8 8 7 9 3 6 1 1 2
60	0 1 0 0 0 0 1 0 1 0 0 0 1 0 0 1 0 0 0 0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 2 1 2 3 1 1 3 3 2 0 0 0 0 4 0 2 3 0 1 4 1 1 6 0 1 4 5 0 5 5 6 7 2 8 2 1 1 4 6
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Table 3 – continued from previous page

i	**Index k, $k \in \{0, \ldots, \ell_j - 1\}$ of level in L_j of factor F_j in design point i**
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65	1 0 1 1 1 0 1 1 1 0 0 0 1 1 1 0 1 1 0 1 1 1 1 1 0 0 0 0 1 1 1 2 1 1 2 0 2 1 0 3 3 1 3 2 3 4 3 1 1 0 4 3 0 3 4 1 3 5 2 3 6 2 1 2 3 5 7 4 0 9 0 8 0 3 1 0
66	0 0 0 0 1 1 0 1 0 0 1 0 1 0 1 1 0 1 1 1 0 1 1 1 1 1 1 1 0 0 2 0 2 0 0 0 2 2 0 3 3 3 2 0 3 3 1 3 2 0 5 0 2 2 3 1 5 4 5 6 4 4 6 0 0 6 3 7 0 7 0 3 9 5 9 1
67	1 0 1 1 1 0 0 1 0 0 0 0 0 1 0 0 1 0 1 1 0 1 1 1 1 1 0 1 2 0 1 0 1 0 2 1 2 0 1 3 1 2 0 0 4 1 2 4 2 4 0 3 2 1 5 4 4 1 2 3 5 5 1 3 2 3 5 9 2 9 1 8 5 7 2
68	0 0 0 0 1 1 1 1 0 0 0 0 0 1 1 0 1 1 1 1 1 1 1 0 0 1 1 0 1 0 1 0 2 2 0 2 1 0 1 2 2 1 0 2 3 4 0 0 3 1 4 4 1 0 5 0 1 1 2 0 3 1 2 5 3 1 5 4 8 8 4 4 2 7 6 3
69	0 1 1 0 1 0 1 0 0 0 0 0 1 0 1 0 0 0 1 0 1 0 0 1 1 0 0 0 2 2 0 2 2 2 0 2 0 3 2 0 2 1 0 2 4 1 0 5 5 3 1 0 0 1 3 0 0 4 1 1 0 3 7 4 0 6 8 3 4 7 3 8 7 6 3
70	1 0 1 0 0 0 1 1 1 0 1 0 1 0 1 0 0 0 1 0 1 1 1 1 1 0 0 0 0 1 0 1 0 2 0 2 1 0 3 3 1 0 0 3 1 1 0 5 0 5 2 0 2 2 4 1 2 6 6 4 2 2 7 6 6 1 6 3 5 6 7 4 3 9 3
71	1 0 1 0 0 0 1 1 0 0 1 0 1 1 0 0 0 1 1 0 0 1 0 0 0 0 1 1 0 2 0 0 0 2 0 1 2 2 3 0 1 0 3 0 0 1 4 0 3 4 3 0 5 0 0 2 5 5 5 6 1 0 3 0 3 3 3 4 6 2 7 9 7 8 6
72	0 0 0 0 0 0 1 1 0 0 0 0 1 1 1 1 1 0 0 0 1 1 0 0 0 1 0 0 0 2 0 1 2 2 0 0 2 1 2 2 0 1 3 2 0 4 1 4 4 2 5 2 0 1 3 3 5 6 1 4 5 6 5 2 3 6 5 3 4 1 2 5 8 8 9
73	1 1 1 1 0 1 1 0 0 1 0 0 0 0 1 0 1 1 0 1 1 0 0 1 0 1 0 1 0 1 1 2 0 1 1 2 2 0 3 0 2 1 0 3 1 1 2 4 2 0 0 2 5 5 2 2 2 3 6 6 0 4 4 5 2 7 6 1 8 0 4 4 0 6 6
74	1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 1 1 1 1 1 0 0 1 0 0 1 0 0 0 0 0 1 3 0 1 0 3 3 0 0 4 1 0 2 3 5 1 3 0 5 5 4 1 4 6 4 2 6 6 0 7 4 7 7 9 4 2 3 3 1
75	1 1 0 1 0 1 0 1 0 1 0 1 1 1 0 0 0 1 0 0 0 1 0 0 0 0 0 1 0 1 2 1 0 0 1 1 2 2 1 0 1 1 0 0 1 1 0 0 0 3 0 4 1 1 0 2 1 4 1 1 0 0 6 0 0 3 5 6 8 8 8 3 4 6 3 5
76	0 0 1 0 0 0 0 0 1 0 0 0 0 1 1 0 1 1 1 0 0 0 1 0 0 0 1 1 0 0 1 0 0 0 2 1 1 1 3 3 0 0 3 0 4 3 3 2 4 5 1 3 1 4 3 3 2 1 6 2 4 4 1 6 2 2 7 4 8 7 2 7 1 1 4
77	0 0 1 1 0 0 1 0 0 1 1 0 1 0 1 1 0 1 0 0 0 0 0 1 0 1 0 0 0 0 2 2 1 2 1 1 2 2 2 1 1 2 0 3 1 2 2 3 3 0 0 1 1 1 5 2 4 1 4 2 2 2 2 2 0 5 5 3 6 7 8 4 1 6 0
78	1 1 0 0 0 0 1 1 1 1 1 1 0 0 0 1 1 1 0 0 1 0 1 0 1 0 1 1 2 1 2 1 0 1 1 1 1 1 2 1 3 2 3 0 1 3 0 0 0 3 5 5 4 3 4 3 4 3 1 5 0 0 3 7 6 2 3 2 2 6 7 0 1 6 0
79	0 0 0 1 0 0 0 0 0 0 0 1 0 1 1 1 0 0 1 0 0 0 0 0 1 1 0 0 2 2 1 2 2 0 0 0 2 0 0 2 2 3 0 1 0 0 2 3 4 4 2 4 2 0 4 1 0 6 3 5 3 2 5 7 2 4 4 0 8 5 5 9 6 4 0
80	1 0 1 0 1 1 1 0 0 0 0 0 1 1 1 1 0 0 1 0 0 0 1 0 1 0 1 1 0 0 0 1 2 0 0 1 2 0 1 0 0 2 0 2 3 3 0 3 5 1 1 5 5 4 1 0 2 3 3 1 2 4 3 3 2 2 8 0 0 5 9 6 7 9 4
81	0 0 1 0 0 0 0 0 0 0 0 1 1 0 0 0 1 1 0 0 1 0 1 0 0 1 0 1 0 0 0 1 1 2 0 0 2 0 0 0 1 1 1 0 3 2 0 3 3 4 5 5 4 3 4 5 3 3 3 2 6 4 4 5 2 1 6 9 2 4 0 2 7 9 4
82	0 1 0 0 0 1 0 1 0 1 0 0 0 0 0 1 0 0 0 0 1 0 1 0 0 1 1 0 2 0 2 2 0 2 2 0 0 3 1 0 3 2 0 2 1 2 1 4 5 5 5 1 3 1 5 2 5 1 3 4 0 1 7 0 2 7 4 7 1 3 8 1 2 7 4
83	1 1 0 0 0 0 1 1 0 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0 1 0 2 0 1 2 2 0 1 1 1 3 0 4 1 1 3 3 1 2 3 0 2 1 1 1 1 3 2 1 3 0 5 2 3 0 7 6 3 9 5 8 2 2 4
84	0 0 1 0 0 0 1 0 0 0 0 1 1 1 0 1 0 1 1 0 0 1 0 0 1 0 0 1 0 1 0 0 0 0 1 0 0 1 1 0 2 0 0 0 2 3 0 1 5 4 1 5 1 1 1 4 3 3 3 4 5 3 7 7 3 5 5 5 7 2 4 4 2 1 9
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86	0 0 0 0 1 0 0 0 0 1 1 0 1 1 1 1 1 1 1 0 1 0 0 0 0 1 0 1 0 0 1 1 1 0 0 0 1 0 2 0 0 0 0 3 1 0 0 1 5 2 1 1 3 1 2 1 5 0 3 2 5 3 1 2 5 7 5 6 2 1 1 2 2 8 4 2
87	1 0 1 1 1 0 1 1 1 0 0 1 0 1 1 0 1 0 1 1 0 1 1 0 1 1 1 0 0 2 2 2 1 1 1 0 0 2 2 0 0 0 1 3 1 2 3 4 4 0 1 5 5 1 5 5 4 5 0 2 1 4 3 4 3 4 4 3 0 9 3 5 8 4 5
88	0 0 0 1 0 0 0 0 0 1 1 0 1 1 1 1 0 1 0 1 0 1 1 0 0 1 1 0 0 2 1 2 2 0 0 0 2 1 0 3 0 3 0 3 2 0 3 4 1 4 5 0 0 2 1 0 4 2 3 1 2 2 4 2 0 4 3 9 2 9 0 2 3 1 3
89	0 1 0 0 1 0 1 1 0 1 0 1 0 1 1 0 0 0 0 1 1 1 0 1 1 0 0 1 2 0 0 2 0 1 1 0 2 1 0 1 0 1 1 3 0 0 0 0 5 4 1 5 1 3 0 0 0 5 3 6 0 5 1 1 3 2 1 9 1 0 2 1 3 7 8
90	1 0 0 0 1 1 0 0 1 0 1 0 1 0 1 1 1 0 0 0 0 0 0 0 0 0 1 0 1 1 2 0 0 2 0 2 2 2 3 2 1 0 2 3 1 2 3 4 1 0 2 0 5 1 0 5 5 1 4 1 3 4 3 4 5 7 1 3 8 1 9 1 7 3 7 8
91	0 0 1 0 0 0 0 0 1 0 1 0 1 0 0 0 0 0 1 0 0 0 1 0 1 0 0 1 2 1 0 0 1 0 1 2 1 0 1 0 1 2 1 0 4 3 4 0 2 3 0 1 2 1 0 0 5 3 6 4 6 1 5 3 2 1 1 0 3 1 9 2 8 5 8
92	1 0 1 0 0 0 1 0 1 0 0 0 0 1 0 1 1 0 0 1 1 1 0 0 1 0 1 1 0 0 0 0 2 0 1 1 2 0 3 3 0 1 1 4 1 1 0 1 5 4 3 5 0 4 0 1 0 1 0 2 3 4 4 7 3 1 1 5 5 8 6 3 9 0 2
93	0 0 1 0 0 1 0 1 0 1 1 0 0 0 1 0 0 0 0 0 0 0 1 1 0 1 1 0 0 2 0 0 1 0 0 0 0 1 1 0 2 0 2 3 3 0 0 4 0 4 0 2 1 4 3 2 0 1 3 5 0 4 0 6 7 0 6 2 3 0 7 5 9 9 0 2
94	0 0 1 1 0 1 0 1 1 1 0 0 1 1 1 1 1 1 1 0 0 0 0 0 0 1 0 1 0 0 1 1 0 0 0 1 2 0 2 3 1 1 0 2 4 0 3 5 0 4 4 1 3 0 2 1 2 1 0 1 6 0 7 1 2 0 0 2 6 6 3 8 4 8 2
95	1 0 0 1 0 1 0 1 0 0 1 0 0 1 0 0 0 0 0 1 1 0 1 0 0 1 0 1 0 0 1 0 0 2 0 1 0 0 3 1 3 1 3 2 0 4 0 3 1 1 4 0 0 1 5 2 2 1 6 5 5 1 0 7 4 2 6 1 0 6 0 5 4 2 7
96	0 1 1 1 0 0 1 0 1 1 0 1 1 1 1 0 1 1 0 1 0 1 1 1 1 1 0 0 0 0 0 1 1 2 0 0 0 1 0 1 0 3 0 4 1 0 2 1 3 2 2 2 4 4 2 2 1 6 0 6 6 0 2 4 3 0 1 0 0 5 9 1 4 2 7
97	0 1 0 0 0 0 1 0 0 0 0 0 1 0 1 0 1 0 0 0 0 0 0 0 1 0 1 1 1 0 1 0 1 0 0 0 0 3 1 3 1 0 2 2 1 0 1 3 1 0 3 2 4 0 3 4 1 2 1 5 1 1 1 0 2 7 8 8 0 4 7 0 9 0 7
98	0 1 0 0 0 1 0 1 1 1 0 0 0 1 0 0 0 0 0 0 1 1 0 0 0 0 0 1 2 2 0 0 0 1 0 1 0 2 1 0 2 2 0 4 0 0 2 1 4 0 2 5 1 0 0 2 3 2 3 0 3 2 7 3 3 3 2 8 9 4 3 7 0 5 1
99	0 0 0 1 0 0 0 1 0 1 0 0 1 1 0 0 1 0 0 1 1 0 0 0 1 0 1 0 2 2 0 1 1 0 2 2 2 2 2 2 3 2 1 1 1 2 3 3 5 1 5 3 0 1 4 2 2 1 4 0 1 2 7 3 3 2 3 9 3 6 1 4 1 9 7

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Table 3 – continued from previous page

i	**Index k, $k \in \{0, \ldots, \ell_j - 1\}$ of level in L_j of factor F_j in design point i**
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101	0 0 1 0 0 0 0 0 0 0 1 1 0 0 1 0 0 1 0 1 1 0 1 1 1 0 0 0 0 1 0 0 2 0 1 1 1 3 2 2 1 0 2 0 4 2 1 1 2 2 5 0 3 2 2 0 4 3 3 2 4 5 6 3 0 4 2 2 3 3 9 8 1 2 1
102	1 1 0 1 1 1 0 1 0 0 0 1 1 1 1 1 0 0 1 0 1 1 1 0 0 0 1 0 1 1 1 0 2 2 2 2 0 3 3 0 0 0 1 0 2 0 2 5 0 1 5 0 4 3 1 3 3 6 1 5 1 1 2 1 4 0 5 3 8 4 6 2 1 2 5
103	1 0 0 1 1 0 0 1 0 0 1 0 1 1 0 0 1 0 1 1 0 0 1 0 1 1 0 1 1 2 1 2 1 1 2 0 0 3 3 1 2 3 2 2 0 0 3 3 0 5 0 0 2 1 2 4 2 0 1 1 4 4 0 5 6 1 3 5 3 8 6 7 6 0 5
104	1 1 0 1 1 0 1 0 1 0 0 0 1 0 0 0 1 0 0 1 0 1 1 0 0 0 0 1 0 0 0 2 1 2 0 1 2 0 0 2 3 2 1 2 1 1 2 5 2 0 0 4 2 2 4 3 5 2 4 0 2 6 5 5 4 7 4 3 8 2 2 5 0 9 6
105	1 0 1 1 0 1 0 0 1 0 1 0 1 1 0 0 0 1 1 1 0 0 1 0 0 1 1 1 0 1 1 1 2 1 2 0 2 2 0 2 2 0 0 0 2 0 0 1 1 4 1 5 2 0 3 0 2 3 4 6 2 4 7 0 4 4 2 2 4 1 1 1 3 9 6
106	1 0 0 1 1 0 0 0 1 0 0 0 1 1 1 1 1 1 1 1 0 1 1 1 0 0 1 0 0 0 1 0 1 1 0 0 2 2 2 2 1 3 1 3 4 0 2 5 1 0 4 3 1 5 5 4 5 4 5 2 0 3 6 3 4 6 0 0 8 0 9 0 2 7 2
107	0 1 1 1 0 1 1 0 0 0 1 1 0 0 0 0 1 0 0 1 1 0 1 1 1 1 1 1 0 2 0 2 0 0 1 1 0 2 0 2 3 2 0 0 1 1 1 3 3 4 1 0 0 4 1 1 0 2 1 0 0 5 6 0 2 4 3 8 3 5 1 4 0 3 7 0
108	1 0 0 0 1 1 1 1 0 1 1 1 1 0 0 0 0 1 1 1 1 1 1 1 0 1 0 1 0 1 1 1 1 2 2 0 1 0 0 0 2 3 0 2 0 3 1 1 3 3 2 3 5 3 5 3 4 2 0 6 1 3 6 2 0 4 0 6 5 0 0 3 6 9 7 4
109	0 0 0 0 1 1 1 0 0 1 1 1 1 1 1 0 1 1 0 1 1 1 0 0 1 0 1 1 2 1 2 2 0 1 1 1 2 0 0 0 0 1 3 0 1 1 1 0 3 1 2 0 3 0 0 5 3 0 5 4 2 3 4 5 2 0 4 3 5 8 1 1 4 5 1
110	0 1 1 0 1 1 1 1 1 0 0 0 0 1 0 0 0 1 1 0 0 1 0 0 0 0 0 0 1 1 2 1 2 0 2 0 2 1 0 1 3 3 0 3 1 0 1 0 4 3 3 0 0 2 3 2 4 2 6 4 5 5 2 5 1 7 1 1 9 2 9 6 4 8 5 7
111	0 0 0 1 1 0 0 0 1 1 1 0 1 0 0 0 1 1 1 1 0 1 1 1 0 0 1 1 2 2 1 1 1 1 0 1 2 3 2 0 1 0 0 0 3 2 1 2 3 5 5 3 2 4 5 0 0 0 5 0 2 0 2 6 1 5 8 8 7 4 5 0 8 5 7
112	0 0 0 0 0 0 1 1 0 0 1 0 0 1 0 0 0 1 1 0 1 0 0 1 0 0 1 0 1 2 2 2 2 1 0 0 1 0 2 1 1 3 0 0 1 2 2 3 4 3 0 3 3 0 4 5 4 0 4 4 3 1 4 4 1 4 3 7 0 6 2 2 3 9 3 3 7
113	0 0 0 1 1 0 1 1 1 0 0 0 0 1 0 1 1 0 1 0 0 0 0 1 0 1 1 0 1 1 2 2 0 1 2 1 2 1 3 0 2 1 0 1 0 1 0 0 5 1 0 4 5 2 5 4 2 3 0 3 1 4 5 1 4 6 6 5 1 0 7 8 9 7 3 2
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117	1 1 1 0 1 0 1 0 1 0 1 0 1 0 0 1 0 0 0 0 1 0 0 0 0 1 0 1 1 0 2 2 2 0 1 2 1 2 0 0 1 0 1 3 2 0 1 2 5 5 5 4 5 1 2 2 5 3 4 4 3 2 1 0 4 2 1 3 2 5 9 9 6 8 8
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121	1 1 0 0 0 0 1 1 0 1 1 0 1 1 1 0 0 1 0 1 1 0 1 1 0 1 0 0 2 1 0 0 0 2 2 2 2 0 0 1 0 2 1 1 2 2 1 3 0 3 2 2 3 1 4 1 0 3 5 3 4 6 5 3 3 3 7 4 4 8 8 5 3 8 3
122	1 0 1 1 0 0 1 1 0 0 1 1 0 1 0 0 0 1 0 1 1 0 0 0 0 1 0 0 1 2 1 2 1 0 2 2 0 2 1 0 1 0 1 1 2 4 4 5 0 0 2 4 2 0 2 2 3 3 2 0 2 2 3 7 4 5 6 0 1 3 3 2 4 8 9
123	1 0 1 1 0 1 0 0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 1 0 0 1 0 0 2 2 1 2 2 1 2 2 0 0 2 1 2 2 1 3 2 2 0 5 4 5 3 0 5 3 2 4 2 2 3 5 2 4 5 6 5 2 4 9 6 0 6 8 4 8 9
124	0 0 1 1 0 1 0 1 1 0 1 1 0 0 0 0 1 0 1 1 0 1 1 0 0 1 1 1 0 1 2 1 2 0 0 0 0 0 1 2 3 0 1 0 3 2 0 3 4 3 3 4 0 2 1 3 4 1 3 3 5 1 6 4 3 4 2 7 1 4 0 7 9 6 9
125	1 1 0 0 1 1 1 1 1 1 0 1 0 1 0 0 0 0 1 1 0 1 0 1 0 1 1 0 2 2 0 2 1 2 2 2 2 2 2 1 3 1 3 1 3 2 2 1 0 5 5 3 1 2 2 4 2 0 2 4 6 1 3 2 6 2 6 2 9 4 5 3 3 6 4
126	1 0 1 1 1 0 1 1 0 0 0 1 0 0 1 1 1 0 0 1 0 1 1 0 1 0 0 0 0 0 0 1 1 1 0 1 0 0 1 0 3 3 2 1 3 3 2 1 2 2 2 5 4 1 3 0 0 4 0 1 5 2 2 5 4 1 4 7 1 4 1 4 3 3 6 4
127	1 1 1 0 1 0 1 0 0 0 1 0 1 1 1 1 1 1 1 1 0 1 0 1 1 1 1 0 1 2 2 0 0 0 0 0 1 1 0 2 3 2 1 3 0 1 2 2 4 3 2 4 1 3 2 2 4 4 6 0 4 2 6 3 3 6 5 9 9 6 2 2 2 9 4
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Table 3 – continued from previous page

i	**Index** k**,** $k \in \{0, \ldots, \ell_j - 1\}$ **of level in** L_j **of factor** F_j **in design point** i
136	1 0 0 0 1 0 0 1 1 0 1 1 1 1 1 1 1 0 0 1 0 0 0 0 0 1 0 1 0 2 1 1 1 0 0 0 0 0 1 2 0 3 2 2 3 3 0 0 4 5 2 1 1 3 1 2 0 5 2 1 2 4 7 6 4 3 5 7 5 0 8 3 8 2 7
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144	1 1 0 1 1 1 0 1 0 0 1 1 1 1 0 1 1 0 0 0 0 0 1 0 0 0 1 1 2 2 2 1 1 0 0 2 0 0 1 3 0 0 3 2 3 0 2 4 1 0 0 5 4 5 2 2 0 5 1 0 0 5 7 2 5 7 1 6 4 7 0 6 1 5 6
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154	0 1 0 0 0 1 1 0 0 1 0 1 1 1 1 0 0 0 0 0 0 1 1 1 0 0 1 0 0 1 1 2 2 0 1 1 0 2 3 0 2 0 2 4 4 4 3 0 2 3 0 2 3 2 1 0 4 3 5 1 1 0 4 4 4 1 4 1 2 1 9 6 5 4 5
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165	0 0 1 1 0 1 0 0 0 0 1 1 1 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 1 0 1 1 2 1 1 0 1 1 1 3 2 2 1 3 0 0 4 2 5 3 0 5 1 1 3 1 5 4 4 2 0 4 0 5 0 6 2 1 5 7 3 8 6 7 1 8
166	1 1 1 0 1 1 1 1 1 1 0 1 0 0 0 1 0 1 1 0 1 1 1 1 1 1 0 1 0 1 1 1 0 2 0 1 1 0 0 2 1 1 3 3 0 3 0 1 5 0 5 0 1 0 0 2 5 3 6 6 6 6 0 6 6 5 1 8 3 2 2 6 5 2 8 8
167	1 0 1 0 1 1 1 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 0 1 0 1 0 0 1 0 0 1 1 1 2 1 1 3 3 2 0 2 0 4 4 0 2 2 1 1 4 1 5 2 1 4 5 5 2 4 1 5 3 2 6 1 2 1 4 8 7 1 3 9 5
168	1 1 1 0 0 1 1 1 1 1 0 1 0 0 1 1 1 1 1 1 1 1 0 1 0 1 0 0 1 2 2 0 2 0 2 1 1 2 0 0 0 0 0 1 4 1 3 2 0 1 3 5 5 0 2 3 4 1 1 4 5 0 3 5 3 7 5 4 0 9 7 6 9 3 9 5
169	1 1 1 0 0 0 1 1 1 0 0 0 1 1 1 0 0 0 0 1 0 1 1 0 0 1 1 0 1 1 1 0 0 2 1 2 0 2 3 0 0 1 2 4 3 1 0 5 3 0 5 0 0 4 2 3 5 3 1 0 6 1 1 7 5 0 2 8 4 6 4 8 8 7 5
170	1 0 1 0 0 1 1 0 0 1 1 0 1 1 1 0 0 1 0 1 1 0 1 1 0 1 1 1 2 1 0 1 0 2 0 1 1 0 3 0 2 2 0 3 2 0 2 3 4 0 2 3 0 2 0 1 1 4 0 5 0 1 0 3 6 4 7 7 6 1 5 6 6 8 2
171	0 1 0 1 0 1 0 1 0 1 0 1 1 0 0 0 0 0 0 0 1 0 0 1 1 0 0 0 2 1 0 2 0 0 1 2 1 3 0 2 1 0 3 1 0 3 3 2 1 2 4 3 1 1 4 3 4 4 4 2 1 0 2 2 5 1 4 6 1 0 4 3 0 8 2

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i	**Index k, $k \in \{0, \ldots, \ell_j - 1\}$ of level in L_j of factor F_j in design point i**
172	0 0 0 1 0 1 1 0 0 0 0 0 1 0 0 1 0 0 0 1 0 1 1 1 0 0 1 0 2 1 1 1 1 0 0 0 2 2 0 2 1 3 1 4 0 2 2 0 1 2 1 0 0 4 0 0 2 2 3 0 6 2 0 3 5 1 0 4 5 9 2 0 5 6 0
173	1 0 0 1 1 0 1 0 0 1 0 0 0 0 0 1 1 0 1 0 0 0 1 1 1 1 1 1 2 1 2 0 1 0 2 2 1 0 0 2 0 3 0 0 3 4 0 5 0 4 3 1 0 2 5 5 3 2 6 0 5 5 4 4 6 5 1 2 8 5 3 3 5 7 0
174	1 1 0 1 0 1 0 0 1 0 0 1 0 0 1 0 1 1 1 1 1 0 0 0 0 0 1 1 0 0 1 2 2 1 0 2 2 0 0 2 0 1 3 3 0 0 1 0 1 0 0 0 4 3 1 3 0 5 0 1 4 4 6 3 2 1 8 1 3 4 1 9 6 7 0
175	0 1 0 1 0 0 1 1 1 1 1 1 1 0 0 0 0 1 1 1 1 1 1 0 1 0 0 1 1 2 0 2 2 2 0 0 0 0 1 3 1 3 1 0 0 3 0 3 5 2 0 2 4 3 0 2 0 2 2 1 2 0 0 5 1 7 9 8 3 0 8 1 5 0
176	1 1 1 1 1 1 0 0 1 1 1 1 0 1 1 0 0 1 1 1 1 1 1 1 1 1 1 0 0 2 0 2 0 0 1 2 1 0 2 3 1 1 3 2 2 4 3 4 5 0 0 0 2 3 4 1 5 5 5 2 6 6 5 7 6 3 4 8 0 9 1 6 2 6 7
177	0 1 0 0 1 1 1 0 1 1 1 1 0 1 0 1 0 1 1 1 0 1 0 0 1 1 0 1 2 2 2 0 0 1 1 1 2 1 2 2 0 1 1 4 1 0 2 2 0 1 1 0 5 1 3 3 3 4 1 4 3 0 3 4 6 1 2 7 5 8 0 2 2 6 7
178	0 0 1 1 1 0 1 0 0 1 0 1 0 0 1 1 0 1 0 1 1 0 1 1 0 1 1 0 1 2 0 0 2 2 2 2 2 1 1 3 3 1 0 3 2 0 0 3 2 1 1 1 2 2 0 2 1 3 4 0 4 2 3 2 5 0 7 5 0 7 8 7 7 4 7
179	0 1 1 0 0 0 1 1 1 0 1 0 0 0 1 0 1 1 1 1 1 0 1 1 1 1 1 1 2 2 1 0 1 1 1 2 2 2 1 0 2 3 0 2 1 3 1 5 4 0 2 2 5 2 1 4 3 0 0 4 1 6 6 6 7 3 7 3 1 2 0 2 9 5 4
180	1 1 1 1 0 0 1 1 0 1 0 1 1 0 1 1 1 1 1 1 1 0 1 0 0 0 0 0 0 0 0 0 0 2 2 1 0 2 2 0 3 0 1 0 2 2 0 4 4 0 3 0 0 4 3 2 4 5 1 6 4 5 2 3 5 7 7 5 2 6 1 9 9 9 5 4
181	0 0 0 1 1 0 0 0 0 1 1 0 0 1 1 0 1 1 1 0 0 1 1 0 0 0 0 1 2 2 2 2 2 0 0 0 2 0 1 3 0 1 3 4 3 1 4 4 4 3 0 0 4 2 4 4 1 5 3 6 6 4 1 1 5 5 0 1 1 0 7 6 0 8 4
182	1 0 1 0 1 1 0 0 1 1 1 1 1 0 0 1 0 1 1 0 1 0 0 1 0 0 0 0 0 0 2 1 1 1 0 2 0 1 3 0 1 2 3 1 0 1 1 2 4 0 1 3 0 0 3 0 2 3 2 1 4 6 2 5 7 1 2 0 9 3 6 8 1 5 4 9
183	1 0 1 1 0 1 0 1 0 0 0 0 1 1 1 1 1 0 1 1 0 0 0 0 0 1 0 1 0 1 2 0 0 1 0 0 0 0 0 1 3 2 0 2 1 0 2 1 1 3 2 1 0 5 5 4 3 5 0 3 1 5 4 7 6 5 6 7 8 8 5 7 6 5 4 1
184	1 0 1 1 1 0 0 1 0 0 0 0 1 0 1 1 1 1 1 0 1 0 0 1 1 1 1 0 2 0 2 1 0 2 0 0 0 1 1 0 0 2 1 2 4 1 0 1 2 3 5 2 0 4 2 1 2 4 5 6 3 6 4 4 5 7 5 6 3 4 5 4 0 2 1
185	1 1 1 1 1 0 1 0 1 1 1 1 1 1 1 0 0 0 1 1 1 0 0 0 0 1 0 1 0 2 0 2 0 0 0 1 0 0 2 3 1 0 1 1 3 1 4 0 4 3 0 4 0 2 4 4 3 5 2 3 3 5 4 5 6 1 2 4 5 0 6 5 1 3 9
186	1 0 1 0 1 0 1 1 0 0 1 1 1 0 0 1 0 0 1 1 1 0 1 0 1 0 0 1 2 0 0 1 0 1 2 1 0 1 1 2 1 1 0 1 2 4 1 0 1 5 5 1 1 4 1 1 0 1 0 3 0 1 7 3 6 1 0 3 0 9 9 9 1 4 9
187	1 1 0 1 1 0 0 0 0 0 0 1 1 0 0 1 1 0 1 0 0 0 0 1 1 1 0 0 1 1 0 0 0 0 2 0 2 2 1 1 2 1 0 1 0 1 4 4 4 4 0 3 2 1 1 1 1 0 2 2 1 2 6 3 2 6 2 5 4 7 1 5 8 3 0 6 1 9
188	0 1 1 1 0 1 1 0 0 1 1 0 0 0 1 0 0 1 0 0 1 0 1 1 1 0 1 0 0 2 0 0 0 0 2 2 2 2 2 1 2 1 2 2 1 0 1 3 1 5 5 5 2 0 3 1 1 5 4 3 2 5 1 4 2 1 5 0 7 3 4 5 8 2 0
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190	1 0 0 0 1 1 0 0 1 0 1 1 0 0 0 1 1 1 0 1 0 1 1 0 0 1 0 0 2 2 1 1 0 1 0 1 2 0 1 2 0 2 1 1 0 1 4 3 2 1 4 1 2 2 1 2 3 4 3 5 0 2 5 1 0 6 1 6 7 3 1 4 3 0 6
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194	0 1 0 1 1 1 1 1 1 1 0 0 1 0 0 1 1 0 1 1 1 1 0 0 1 0 0 1 0 1 1 2 0 0 1 1 1 2 3 2 2 3 1 3 4 1 2 5 4 0 1 4 4 3 3 1 0 3 0 6 6 6 5 3 7 4 8 2 0 6 7 3 2 5 9
195	0 1 0 1 0 0 1 0 0 0 1 0 1 1 0 1 0 1 0 0 0 0 1 1 1 0 1 1 1 1 2 2 1 2 1 0 2 2 2 0 0 3 3 0 4 2 2 4 1 4 3 3 0 2 2 1 3 4 5 3 5 0 4 0 7 2 6 1 5 5 6 9 4 5 9
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197	0 0 1 0 0 0 0 1 1 1 1 1 0 1 0 1 0 0 0 0 1 1 0 1 1 0 0 1 0 0 1 0 1 1 1 2 1 0 3 0 2 3 3 3 4 4 4 1 5 5 2 1 4 4 4 1 1 3 1 3 4 2 5 2 7 0 5 4 9 0 3 6 3 0 7
198	0 1 0 1 0 1 0 0 0 0 0 1 0 0 1 0 1 1 1 1 0 0 0 1 1 1 0 1 2 1 2 0 2 2 2 1 2 3 3 0 3 3 1 0 3 0 3 0 0 2 4 3 2 3 5 0 5 3 0 1 2 0 3 3 6 5 3 3 4 0 2 2 0 0 7
199	1 1 0 0 0 0 1 1 1 0 1 1 1 1 1 1 0 1 0 1 0 1 0 0 0 1 0 0 0 0 0 1 1 2 0 2 1 1 2 0 3 0 2 0 0 0 0 5 2 3 0 3 5 2 5 4 4 1 1 5 2 3 0 5 6 3 1 1 9 9 0 1 5 8 7
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203	0 1 0 1 0 0 1 1 1 1 1 1 0 1 0 1 1 0 1 1 0 0 1 0 1 1 1 1 1 0 1 0 1 1 1 2 0 0 3 3 0 3 2 2 0 0 0 4 1 1 4 3 5 1 0 1 0 4 2 4 0 0 6 4 7 5 6 8 7 2 6 1 1 9 1
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205	0 0 1 0 0 1 0 0 0 1 1 1 1 1 1 1 0 1 1 0 0 1 0 0 1 0 0 0 1 1 2 1 2 2 0 0 2 2 0 1 3 0 1 4 2 0 1 5 2 3 5 0 0 0 2 0 5 1 5 5 0 1 0 5 6 2 5 5 7 0 3 6 9 7 3
206	1 0 0 0 0 1 0 1 1 0 1 1 0 1 0 0 1 0 1 0 1 1 1 1 0 0 1 1 1 1 1 1 2 2 2 2 0 2 3 2 2 0 1 0 3 3 0 0 0 0 3 3 1 5 1 3 1 2 4 6 6 1 3 4 0 1 2 0 0 8 2 4 1 3 1
207	1 0 0 0 0 1 0 0 1 0 1 1 1 0 0 0 0 1 0 0 1 1 0 0 1 0 0 1 1 1 1 1 1 1 2 2 2 0 0 0 2 0 0 0 2 4 1 1 1 1 0 1 2 1 0 1 5 0 3 2 5 3 0 4 5 4 0 2 5 9 1 7 1 0 7 3 1

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Table 3 – continued from previous page

i	**Index** k**,** $k \in \{0, \ldots, \ell_j - 1\}$ **of level in** L_j **of factor** F_j **in design point** i
208	1 0 0 0 1 1 0 1 1 0 0 1 0 0 0 0 1 1 0 1 0 0 0 1 0 1 1 0 0 2 2 2 0 2 2 2 0 0 0 0 3 3 3 0 1 1 1 1 1 2 1 2 2 1 1 3 3 0 1 5 6 2 4 2 6 3 2 7 6 6 9 9 3 1 1
209	1 0 1 1 1 0 0 1 0 1 1 0 1 1 1 0 1 1 1 1 0 0 1 1 1 0 1 1 1 2 2 0 0 2 0 1 0 1 2 3 1 0 0 1 2 1 1 0 0 3 5 2 4 4 1 0 3 0 1 0 4 0 6 6 7 2 4 1 5 3 9 7 6 8 0
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211	1 0 1 0 0 0 0 1 0 0 1 1 0 1 0 0 0 0 0 0 0 1 1 0 1 0 0 0 0 2 1 0 0 1 0 2 0 1 2 0 1 3 0 3 0 1 1 2 2 3 0 3 5 3 1 1 2 0 3 0 6 1 3 1 4 0 3 0 8 5 1 6 2 6 6 3
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Table 3 – continued from previous page

i	**Index k, $k \in \{0, \ldots, \ell_j - 1\}$ of level in L_j of factor F_j in design point i**
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i	**Index** k**,** $k \in \{0, \ldots, \ell_j - 1\}$ **of level in** L_j **of factor** F_j **in design point** i
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Table 3 – continued from previous page

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Table 3 – continued from previous page

i	**Index k, $k \in \{0, \ldots, \ell_j - 1\}$ of level in L_j of factor F_j in design point i**
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Table 3 – continued from previous page

i	**Index k, $k \in \{0, \ldots, \ell_j - 1\}$ of level in L_j of factor F_j in design point i**
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408	0 0 0 1 0 1 0 0 1 0 1 0 1 1 1 0 1 0 1 1 0 0 1 0 1 1 0 1 1 2 1 1 0 2 1 1 0 3 1 0 1 1 3 2 0 3 2 0 4 4 3 5 2 3 2 1 4 5 0 3 4 6 4 2 1 7 1 1 7 1 2 0 1 6 9
409	1 1 1 1 1 0 0 1 1 1 0 1 0 0 0 1 1 1 1 1 0 1 1 1 1 0 1 0 0 0 0 0 0 2 2 0 0 3 2 0 0 2 1 0 3 0 0 3 1 5 4 3 2 5 3 1 1 2 1 0 2 1 6 2 1 2 4 0 2 3 1 6 5 6 9
410	0 1 0 1 1 0 1 0 1 1 0 0 1 1 0 0 0 0 1 1 1 1 1 1 1 0 1 1 1 1 0 2 2 0 1 2 2 1 1 1 2 2 1 0 2 0 0 2 1 0 4 3 3 0 0 5 3 1 5 3 5 3 0 2 0 0 1 8 8 7 2 9 5 9 4 9
411	0 1 0 0 0 0 0 0 0 0 0 1 1 0 1 1 1 0 0 1 0 0 0 1 1 0 0 1 1 1 0 2 1 1 0 1 0 3 0 3 3 1 3 4 1 4 4 4 1 4 1 5 4 1 1 2 5 0 2 5 0 0 6 2 1 7 3 5 2 9 0 5 3 8 1
412	1 1 1 0 1 1 1 1 1 1 0 1 0 0 1 0 1 1 0 0 0 1 1 0 0 1 0 1 1 0 1 1 0 2 1 2 2 2 0 3 2 0 3 4 4 4 3 0 4 1 0 5 5 3 4 5 5 6 0 4 3 4 4 0 1 4 3 4 7 8 9 2 3 8 0
413	0 1 1 1 1 1 1 0 1 0 1 0 0 0 0 0 0 0 1 0 1 1 1 0 0 1 1 1 0 2 2 0 2 1 2 2 2 1 3 3 3 3 1 1 3 4 3 5 1 1 2 3 3 0 0 5 3 1 3 6 6 0 2 5 3 4 2 2 2 7 7 6 8 6 1
414	1 0 1 0 0 0 1 1 0 1 0 1 1 1 1 1 1 1 0 0 0 0 1 1 1 1 0 0 1 0 1 0 2 2 1 0 0 1 1 0 0 3 3 0 1 2 3 4 0 2 0 5 2 1 5 5 1 0 1 4 0 0 5 2 5 1 6 2 9 8 3 7 2 1 0 4
415	0 1 0 0 1 1 1 0 0 0 0 0 0 1 1 1 0 1 0 1 1 0 0 1 0 1 1 0 1 2 2 2 0 0 2 0 2 1 1 1 1 2 3 0 4 2 3 0 2 0 1 3 4 5 3 1 2 2 1 6 5 6 3 4 4 2 3 3 3 9 6 6 8 0 4
416	1 1 1 1 1 0 0 1 1 0 0 1 0 0 0 0 0 0 1 0 0 0 0 1 1 0 0 0 2 0 0 1 1 0 0 0 1 0 2 0 3 2 1 4 0 4 0 0 4 4 1 0 1 5 5 0 3 5 2 3 6 6 0 0 0 5 5 6 8 1 4 7 6 8 4
417	1 0 0 1 1 1 0 1 0 1 0 1 0 0 0 1 0 0 1 0 1 1 1 1 0 1 0 0 0 2 1 2 0 2 0 2 1 1 3 1 2 2 0 4 4 1 4 1 0 0 0 0 2 4 0 5 5 5 1 0 1 6 6 4 1 5 0 2 3 8 4 9 9 1 7
418	1 1 0 0 0 1 0 1 1 1 1 0 1 1 1 1 0 1 0 1 1 0 0 1 0 0 1 0 1 1 0 1 0 0 1 0 0 0 2 1 2 2 0 4 1 1 0 3 3 0 1 2 0 2 0 3 1 4 1 1 5 1 6 6 1 1 3 1 8 7 3 5 0 1 7
419	1 0 0 1 1 1 1 0 1 0 1 0 0 1 1 0 1 0 0 1 1 0 1 1 1 1 1 0 1 0 2 1 0 0 2 0 2 1 2 3 2 3 1 3 4 2 1 3 2 3 5 1 4 4 3 0 3 1 4 4 6 1 1 2 6 3 1 6 3 4 5 0 8 5 3 3
420	1 1 1 1 1 1 0 1 0 1 1 1 1 1 1 1 0 1 0 1 0 0 1 0 0 1 0 0 2 0 2 1 0 2 1 1 2 3 0 1 2 0 3 2 0 4 0 2 3 2 2 4 0 3 1 4 5 1 2 0 3 0 4 6 0 0 5 6 2 5 7 0 0 1 8
421	1 0 0 0 1 0 1 0 1 1 0 0 1 0 0 0 1 1 1 1 1 1 0 0 1 0 1 1 0 0 1 1 2 0 0 1 2 0 0 1 0 2 3 0 4 4 3 4 2 4 4 3 4 3 5 4 3 2 3 0 2 1 5 0 7 7 2 6 3 4 9 7 0 6 1 8

A.3 Grouping of Factors

The locating array is designed for 75 factors of mixed levels, *i.e.*, the number of levels of factors is unequal. As a result, the locating array covers (factor, level) combinations (main effects) and pairs of (factor, level) combinations (two-way interactions) different numbers of times. This resulted in the sets S and $\overline{S}$ in the screening algorithm having high variance making direct comparison impossible. As a consequence, we decided to group factors and two-way interactions into groups covered about the same number of times.

The factors with i levels are expected to be covered about $\lfloor 421/i \rfloor$ times in the locating array, $2 \leq i \leq 10$. Figure 1 shows the coverage for (factor, level) combinations. The x-axis gives the number of times each (factor, level) combination is covered, and the y-axis gives the frequency of such coverage. On the left side of the figure are the (factor, level) combinations for factors with the largest number of levels (*i.e.*, 10 levels); on in the right side are the (factor, level) combinations for factors with the lowest number of levels (*i.e.*, 2 levels). We choose the midpoint $\left\lfloor \frac{421(\frac{1}{i}+\frac{1}{i+1})}{2} \right\rfloor$, and midpoint minus one, to define the lower bound on the range of group G_i, and the upper bound on the range of group G_{i+1}, for $2 \leq i \leq 9$. The extremes are special cases. For group G_2 the upper bound on the range is simply the largest number of times a (factor, level) combination is covered. For group G_{10} the lower bound on the range is the smallest number of times one is covered. The groups $G_2, \ldots, G_{10}$ formed in this way are indicated in Figure 1. Table 4 summarizes the resulting ranges of coverage for main effects.

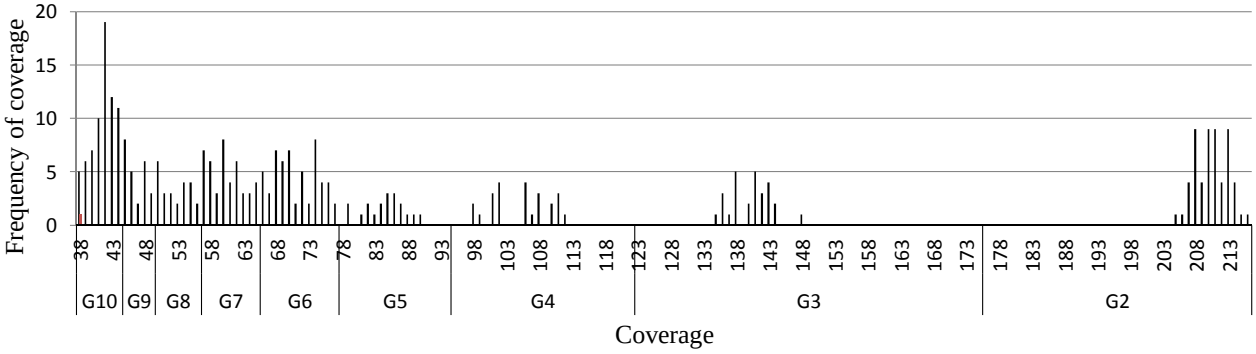

Figure 1: Coverage of main effects and groups constructed.

Table 4: Range $[\text{low}, \text{high}]$ of coverage for groups of main effects.

Group	G_2	G_3	G_4	G_5	G_6	G_7	G_8	G_9	G_{10}
Low	176	123	95	78	66	57	50	45	41
High	216	175	122	94	77	65	56	49	44

For pairs of (factor, level) combinations, *i.e.*, two-way interactions, we group differently. (There are a many more two-way interactions than main effects!) While a few of the two-way interactions are covered the same number of times as main effects, most are covered fewer times (some as few as three times). We form an additional seven groups by dividing the coverage into about equal sizes. As Figure 2 extends Figure 1, adding coverage for the two-way interactions. Table 5 summarizes the resulting ranges of coverage for two-way interactions.

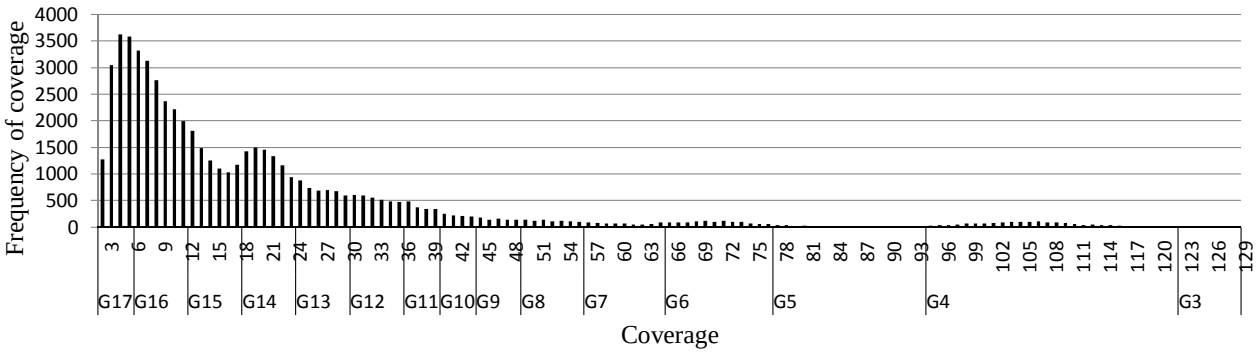

Figure 2: Set size of 2-way factor interactions and groups constructed.

Table 5: Groups added to account for two-way interactions.

Group	G_{11}	G_{12}	G_{13}	G_{14}	G_{15}	G_{16}	G_{17}
Low	37	31	25	19	13	7	1
High	40	36	30	24	18	12	6

A.4 Predictive Model produced in JMP

Table 6 repeats the nine unique factors present in the twelve terms in the screening model.

Table 6: Unique factors in the screening model in Table 5.

	Level	
Factor	**Minimum**	**Maximum**
`TCP_RTTvar_exp_`	2	4
`ErrorModel_ranvar_`	$Uniform$	$Exponential$
`ErrorModel_unit_`	pkt	bit
`MAC_RTSThreshold_`	0	3000
`ErrorModel_rate_`	$1.0E$-07	$1.0E$-05
`RWP_Area_`	8	40
`TCP_min_max_RTO_`	0.1	40
`APP_flows_`	1	18
`TCP_packetSize_`	64	2048

Table 7 show the model constructed by JMP 11.0 using the 2^9 full-factorial design in Table 6. The model contains only the main effects and two-factor interactions from screening for TCP throughput. The R^2 of the model in JMP is 0.96, and the adjusted R^2 is 0.95. The F-test statistic of the model is 328.6 on 35 and 476 df with a p-Value $< 0.0001*$.

Table 7: Partial model of the 2^9 full-factorial screening experiment using JMP 11.0 on the nine factors in Table 6.

Term	**Estimate**	**Prob>|t|**
Intercept	8.700	<.0001*
`ErrorModel_ranvar_`[$Uniform$]*`ErrorModel_unit_`[pkt]	-1.279	<.0001*
`ErrorModel_ranvar_`[$Uniform$]	1.267	<.0001*

Continued on next page

Term	Estimate	Prob>|t|
ErrorModel_unit_[pkt]	1.052	<.0001*
TCP_packetSize_[64]	-0.712	<.0001*
APP_flows_[1]	0.590	<.0001*
TCP_min_max_rto_[0.1]	0.411	<.0001*
RWP_Area_[8]	0.395	<.0001*
MAC_RTSThreshold_[0]	-0.392	<.0001*
ErrorModel_unit_[pkt]*TCP_packetSize_[64]	0.304	<.0001*
ErrorModel_rate_[1.0E-07]	0.234	<.0001*
ErrorModel_ranvar_[$Uniform$]*MAC_RTSThreshold_[0]	0.228	<.0001*
APP_flows_[1]*RWP_Area_[8]	0.228	<.0001*
ErrorModel_unit_[pkt]*ErrorModel_rate_[1.0E-07]	0.220	<.0001*
TCP_packetSize_[64]*ErrorModel_rate_[1.0E-07]	-0.209	<.0001*
ErrorModel_unit_[pkt]*MAC_RTSThreshold_[0]	0.188	<.0001*
ErrorModel_ranvar_[$Uniform$]*APP_flows_[1]	0.178	<.0001*
APP_flows_[1]*TCP_min_max_rto_[0.1]	0.169	<.0001*
ErrorModel_unit_[pkt]*APP_flows_[1]	0.134	<.0001*
ErrorModel_ranvar_[$Uniform$]*TCP_min_max_rto_[0.1]	-0.094	<.0001*
ErrorModel_ranvar_[$Uniform$]*TCP_packetSize_[64]	0.093	<.0001*
TCP_packetSize_[64]*APP_flows_[1]	0.083	0.0004
TCP_min_max_rto_[0.1]*RWP_Area_[8]	-0.071	0.0025
ErrorModel_ranvar_[$Uniform$]*RWP_Area_[8]	-0.066	0.0049
MAC_RTSThreshold_[0]*ErrorModel_rate_[1.0E-07]	0.055	0.0173
TCP_min_max_rto_[0.1]*ErrorModel_rate_[1.0E-07]	-0.055	0.0191
TCP_min_max_rto_[0.1]*TCP_rttvar_exp_[2]	0.047	0.0413
ErrorModel_unit_[pkt]*TCP_min_max_rto_[0.1]	-0.047	0.0426
APP_flows_[1]*ErrorModel_rate_[1.0E-07]	0.044	0.0614
RWP_Area_[8]*MAC_RTSThreshold_[0]	0.041	0.0771
ErrorModel_unit_[pkt]*RWP_Area_[8]	-0.040	0.0861
TCP_rttvar_exp_[2]	0.039	0.0909
TCP_packetSize_[64]*RWP_Area_[8]	-0.037	0.1158
APP_flows_[1]*MAC_RTSThreshold_[0]	-0.028	0.2266
RWP_Area_[8]*ErrorModel_rate_[1.0E-07]	-0.023	0.3237
ErrorModel_ranvar_[$Uniform$]*TCP_rttvar_exp_[2]	-0.022	0.3416

Table 8 gives the 2^9 full factorial design for the nine factors in Table 6. The last column, TCP_throughput, contains the average TCP throughput for 10 replicates of the design point run in the ns-2 simulator. All remaining $75 - 9 = 66$ factors are set to their default values.

Table 8: 2^9 full-factorial design and TCP throughput.

Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
1	2	Uniform	pkt	0	1.0E-07	8	0.1	1	64	11.0316843713
2	4	Uniform	pkt	0	1.0E-07	8	0.1	1	64	10.9371238911
3	2	Exponential	pkt	0	1.0E-07	8	0.1	1	64	10.9998658477
4	4	Exponential	pkt	0	1.0E-07	8	0.1	1	64	10.9348292358
5	2	Uniform	bit	0	1.0E-07	8	0.1	1	64	10.9987728128
6	4	Uniform	bit	0	1.0E-07	8	0.1	1	64	11.008528301
7	2	Exponential	bit	0	1.0E-07	8	0.1	1	64	4.3090257418
8	4	Exponential	bit	0	1.0E-07	8	0.1	1	64	3.8331529433
9	2	Uniform	pkt	3000	1.0E-07	8	0.1	1	64	11.3542864108
10	4	Uniform	pkt	3000	1.0E-07	8	0.1	1	64	11.313459377
11	2	Exponential	pkt	3000	1.0E-07	8	0.1	1	64	11.2389970426
12	4	Exponential	pkt	3000	1.0E-07	8	0.1	1	64	11.3191688565
13	2	Uniform	bit	3000	1.0E-07	8	0.1	1	64	11.3858949529
14	4	Uniform	bit	3000	1.0E-07	8	0.1	1	64	11.2640881376
15	2	Exponential	bit	3000	1.0E-07	8	0.1	1	64	7.6993205321
16	4	Exponential	bit	3000	1.0E-07	8	0.1	1	64	6.5746182743
17	2	Uniform	pkt	0	1.0E-05	8	0.1	1	64	10.9736058835
18	4	Uniform	pkt	0	1.0E-05	8	0.1	1	64	10.9843887551
19	2	Exponential	pkt	0	1.0E-05	8	0.1	1	64	10.9565556033
20	4	Exponential	pkt	0	1.0E-05	8	0.1	1	64	10.9357048423
21	2	Uniform	bit	0	1.0E-05	8	0.1	1	64	10.9800082763
22	4	Uniform	bit	0	1.0E-05	8	0.1	1	64	10.9799535797
23	2	Exponential	bit	0	1.0E-05	8	0.1	1	64	4.4041794393
24	4	Exponential	bit	0	1.0E-05	8	0.1	1	64	4.4181656813
25	2	Uniform	pkt	3000	1.0E-05	8	0.1	1	64	11.2885860739
26	4	Uniform	pkt	3000	1.0E-05	8	0.1	1	64	11.3329423319
27	2	Exponential	pkt	3000	1.0E-05	8	0.1	1	64	11.2718003347
28	4	Exponential	pkt	3000	1.0E-05	8	0.1	1	64	11.2894213487
29	2	Uniform	bit	3000	1.0E-05	8	0.1	1	64	11.3093397806
30	4	Uniform	bit	3000	1.0E-05	8	0.1	1	64	11.2840067696
31	2	Exponential	bit	3000	1.0E-05	8	0.1	1	64	7.8350824843
32	4	Exponential	bit	3000	1.0E-05	8	0.1	1	64	6.5670886582
33	2	Uniform	pkt	0	1.0E-07	40	0.1	1	64	10.026109086
34	4	Uniform	pkt	0	1.0E-07	40	0.1	1	64	9.8032544249
35	2	Exponential	pkt	0	1.0E-07	40	0.1	1	64	9.9745525424
36	4	Exponential	pkt	0	1.0E-07	40	0.1	1	64	9.9163386227
37	2	Uniform	bit	0	1.0E-07	40	0.1	1	64	10.0189973397
38	4	Uniform	bit	0	1.0E-07	40	0.1	1	64	10.0331622677
39	2	Exponential	bit	0	1.0E-07	40	0.1	1	64	3.787819402
40	4	Exponential	bit	0	1.0E-07	40	0.1	1	64	3.3055671506
41	2	Uniform	pkt	3000	1.0E-07	40	0.1	1	64	10.3900176149
42	4	Uniform	pkt	3000	1.0E-07	40	0.1	1	64	10.335190745

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Table 8 – continued from previous page

Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
43	2	Exponential	pkt	3000	1.0E-07	40	0.1	1	64	10.3511308551
44	4	Exponential	pkt	3000	1.0E-07	40	0.1	1	64	10.3816658033
45	2	Uniform	bit	3000	1.0E-07	40	0.1	1	64	10.3962816816
46	4	Uniform	bit	3000	1.0E-07	40	0.1	1	64	10.2093013718
47	2	Exponential	bit	3000	1.0E-07	40	0.1	1	64	6.4225194262
48	4	Exponential	bit	3000	1.0E-07	40	0.1	1	64	5.1528753229
49	2	Uniform	pkt	0	1.0E-05	40	0.1	1	64	10.0437363329
50	4	Uniform	pkt	0	1.0E-05	40	0.1	1	64	9.7760614844
51	2	Exponential	pkt	0	1.0E-05	40	0.1	1	64	9.8327152416
52	4	Exponential	pkt	0	1.0E-05	40	0.1	1	64	9.9355074016
53	2	Uniform	bit	0	1.0E-05	40	0.1	1	64	10.0218544177
54	4	Uniform	bit	0	1.0E-05	40	0.1	1	64	9.7794798085
55	2	Exponential	bit	0	1.0E-05	40	0.1	1	64	3.0622687974
56	4	Exponential	bit	0	1.0E-05	40	0.1	1	64	2.0874097113
57	2	Uniform	pkt	3000	1.0E-05	40	0.1	1	64	10.3465804391
58	4	Uniform	pkt	3000	1.0E-05	40	0.1	1	64	10.1378293686
59	2	Exponential	pkt	3000	1.0E-05	40	0.1	1	64	10.3335028241
60	4	Exponential	pkt	3000	1.0E-05	40	0.1	1	64	10.3077272435
61	2	Uniform	bit	3000	1.0E-05	40	0.1	1	64	10.3692785712
62	4	Uniform	bit	3000	1.0E-05	40	0.1	1	64	10.1782355898
63	2	Exponential	bit	3000	1.0E-05	40	0.1	1	64	5.3062855362
64	4	Exponential	bit	3000	1.0E-05	40	0.1	1	64	5.5496673498
65	2	Uniform	pkt	0	1.0E-07	8	40	1	64	10.1427792184
66	4	Uniform	pkt	0	1.0E-07	8	40	1	64	10.1925731396
67	2	Exponential	pkt	0	1.0E-07	8	40	1	64	10.3657613837
68	4	Exponential	pkt	0	1.0E-07	8	40	1	64	10.2859272658
69	2	Uniform	bit	0	1.0E-07	8	40	1	64	10.2539141159
70	4	Uniform	bit	0	1.0E-07	8	40	1	64	10.2498627356
71	2	Exponential	bit	0	1.0E-07	8	40	1	64	2.4768744781
72	4	Exponential	bit	0	1.0E-07	8	40	1	64	2.9615548218
73	2	Uniform	pkt	3000	1.0E-07	8	40	1	64	10.5061215045
74	4	Uniform	pkt	3000	1.0E-07	8	40	1	64	10.7354975758
75	2	Exponential	pkt	3000	1.0E-07	8	40	1	64	10.6415990165
76	4	Exponential	pkt	3000	1.0E-07	8	40	1	64	10.5935677848
77	2	Uniform	bit	3000	1.0E-07	8	40	1	64	10.4972546324
78	4	Uniform	bit	3000	1.0E-07	8	40	1	64	10.6585982229
79	2	Exponential	bit	3000	1.0E-07	8	40	1	64	4.1054823066
80	4	Exponential	bit	3000	1.0E-07	8	40	1	64	4.5179551519
81	2	Uniform	pkt	0	1.0E-05	8	40	1	64	10.3006065956
82	4	Uniform	pkt	0	1.0E-05	8	40	1	64	10.2121946666
83	2	Exponential	pkt	0	1.0E-05	8	40	1	64	10.2255529356
84	4	Exponential	pkt	0	1.0E-05	8	40	1	64	10.2642652188
85	2	Uniform	bit	0	1.0E-05	8	40	1	64	10.2684462413

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Table 8 – continued from previous page

Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
86	4	Uniform	bit	0	1.0E-05	8	40	1	64	10.1618808663
87	2	Exponential	bit	0	1.0E-05	8	40	1	64	2.9681555058
88	4	Exponential	bit	0	1.0E-05	8	40	1	64	2.9001020425
89	2	Uniform	pkt	3000	1.0E-05	8	40	1	64	10.4873836032
90	4	Uniform	pkt	3000	1.0E-05	8	40	1	64	10.496108624
91	2	Exponential	pkt	3000	1.0E-05	8	40	1	64	10.5305528883
92	4	Exponential	pkt	3000	1.0E-05	8	40	1	64	10.520993201
93	2	Uniform	bit	3000	1.0E-05	8	40	1	64	10.6327426739
94	4	Uniform	bit	3000	1.0E-05	8	40	1	64	10.5683242464
95	2	Exponential	bit	3000	1.0E-05	8	40	1	64	4.1747564325
96	4	Exponential	bit	3000	1.0E-05	8	40	1	64	4.4824148087
97	2	Uniform	pkt	0	1.0E-07	40	40	1	64	8.8162851232
98	4	Uniform	pkt	0	1.0E-07	40	40	1	64	9.2427676775
99	2	Exponential	pkt	0	1.0E-07	40	40	1	64	9.1154424872
100	4	Exponential	pkt	0	1.0E-07	40	40	1	64	9.0759251603
101	2	Uniform	bit	0	1.0E-07	40	40	1	64	8.5632329099
102	4	Uniform	bit	0	1.0E-07	40	40	1	64	9.3392284511
103	2	Exponential	bit	0	1.0E-07	40	40	1	64	2.1186622548
104	4	Exponential	bit	0	1.0E-07	40	40	1	64	1.7054751006
105	2	Uniform	pkt	3000	1.0E-07	40	40	1	64	9.7171544804
106	4	Uniform	pkt	3000	1.0E-07	40	40	1	64	9.6284532916
107	2	Exponential	pkt	3000	1.0E-07	40	40	1	64	9.3263290877
108	4	Exponential	pkt	3000	1.0E-07	40	40	1	64	9.0204294487
109	2	Uniform	bit	3000	1.0E-07	40	40	1	64	9.4342696945
110	4	Uniform	bit	3000	1.0E-07	40	40	1	64	9.1659129273
111	2	Exponential	bit	3000	1.0E-07	40	40	1	64	3.3603753871
112	4	Exponential	bit	3000	1.0E-07	40	40	1	64	3.3149130131
113	2	Uniform	pkt	0	1.0E-05	40	40	1	64	8.83669016
114	4	Uniform	pkt	0	1.0E-05	40	40	1	64	8.6168061012
115	2	Exponential	pkt	0	1.0E-05	40	40	1	64	9.0124746278
116	4	Exponential	pkt	0	1.0E-05	40	40	1	64	8.7380162926
117	2	Uniform	bit	0	1.0E-05	40	40	1	64	8.9131626919
118	4	Uniform	bit	0	1.0E-05	40	40	1	64	8.7233357616
119	2	Exponential	bit	0	1.0E-05	40	40	1	64	1.8761006177
120	4	Exponential	bit	0	1.0E-05	40	40	1	64	1.8154759958
121	2	Uniform	pkt	3000	1.0E-05	40	40	1	64	9.0276931622
122	4	Uniform	pkt	3000	1.0E-05	40	40	1	64	9.1299176421
123	2	Exponential	pkt	3000	1.0E-05	40	40	1	64	9.2334936541
124	4	Exponential	pkt	3000	1.0E-05	40	40	1	64	9.2825253965
125	2	Uniform	bit	3000	1.0E-05	40	40	1	64	9.0726265308
126	4	Uniform	bit	3000	1.0E-05	40	40	1	64	9.536852312
127	2	Exponential	bit	3000	1.0E-05	40	40	1	64	3.2069651738
128	4	Exponential	bit	3000	1.0E-05	40	40	1	64	3.504956616

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Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
129	2	Uniform	pkt	0	1.0E-07	8	0.1	18	64	8.2658037889
130	4	Uniform	pkt	0	1.0E-07	8	0.1	18	64	8.3323999158
131	2	Exponential	pkt	0	1.0E-07	8	0.1	18	64	8.263291648
132	4	Exponential	pkt	0	1.0E-07	8	0.1	18	64	8.3406091701
133	2	Uniform	bit	0	1.0E-07	8	0.1	18	64	8.2608852879
134	4	Uniform	bit	0	1.0E-07	8	0.1	18	64	8.3335421112
135	2	Exponential	bit	0	1.0E-07	8	0.1	18	64	4.1203732286
136	4	Exponential	bit	0	1.0E-07	8	0.1	18	64	3.7979132151
137	2	Uniform	pkt	3000	1.0E-07	8	0.1	18	64	8.5861817755
138	4	Uniform	pkt	3000	1.0E-07	8	0.1	18	64	8.6525891142
139	2	Exponential	pkt	3000	1.0E-07	8	0.1	18	64	8.5962959087
140	4	Exponential	pkt	3000	1.0E-07	8	0.1	18	64	8.6385743485
141	2	Uniform	bit	3000	1.0E-07	8	0.1	18	64	8.5831027306
142	4	Uniform	bit	3000	1.0E-07	8	0.1	18	64	8.6456062438
143	2	Exponential	bit	3000	1.0E-07	8	0.1	18	64	5.7809081113
144	4	Exponential	bit	3000	1.0E-07	8	0.1	18	64	5.8748008847
145	2	Uniform	pkt	0	1.0E-05	8	0.1	18	64	8.2269863344
146	4	Uniform	pkt	0	1.0E-05	8	0.1	18	64	8.2972799725
147	2	Exponential	pkt	0	1.0E-05	8	0.1	18	64	8.2122783281
148	4	Exponential	pkt	0	1.0E-05	8	0.1	18	64	8.3041988511
149	2	Uniform	bit	0	1.0E-05	8	0.1	18	64	8.2778028168
150	4	Uniform	bit	0	1.0E-05	8	0.1	18	64	8.3356793883
151	2	Exponential	bit	0	1.0E-05	8	0.1	18	64	4.0944038197
152	4	Exponential	bit	0	1.0E-05	8	0.1	18	64	3.8493340321
153	2	Uniform	pkt	3000	1.0E-05	8	0.1	18	64	8.4975947459
154	4	Uniform	pkt	3000	1.0E-05	8	0.1	18	64	8.6001935926
155	2	Exponential	pkt	3000	1.0E-05	8	0.1	18	64	8.5182223505
156	4	Exponential	pkt	3000	1.0E-05	8	0.1	18	64	8.5983844495
157	2	Uniform	bit	3000	1.0E-05	8	0.1	18	64	8.5634469352
158	4	Uniform	bit	3000	1.0E-05	8	0.1	18	64	8.6468975369
159	2	Exponential	bit	3000	1.0E-05	8	0.1	18	64	5.8979057217
160	4	Exponential	bit	3000	1.0E-05	8	0.1	18	64	5.8328386834
161	2	Uniform	pkt	0	1.0E-07	40	0.1	18	64	8.506963917
162	4	Uniform	pkt	0	1.0E-07	40	0.1	18	64	8.5364847077
163	2	Exponential	pkt	0	1.0E-07	40	0.1	18	64	8.5266488565
164	4	Exponential	pkt	0	1.0E-07	40	0.1	18	64	8.4633910918
165	2	Uniform	bit	0	1.0E-07	40	0.1	18	64	8.5182721869
166	4	Uniform	bit	0	1.0E-07	40	0.1	18	64	8.5685774906
167	2	Exponential	bit	0	1.0E-07	40	0.1	18	64	2.8312768297
168	4	Exponential	bit	0	1.0E-07	40	0.1	18	64	2.4852029022
169	2	Uniform	pkt	3000	1.0E-07	40	0.1	18	64	8.9581586534
170	4	Uniform	pkt	3000	1.0E-07	40	0.1	18	64	8.9497330698
171	2	Exponential	pkt	3000	1.0E-07	40	0.1	18	64	8.8999594636

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Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
172	4	Exponential	pkt	3000	1.0E-07	40	0.1	18	64	8.885119705
173	2	Uniform	bit	3000	1.0E-07	40	0.1	18	64	8.9116711838
174	4	Uniform	bit	3000	1.0E-07	40	0.1	18	64	8.8810170498
175	2	Exponential	bit	3000	1.0E-07	40	0.1	18	64	5.7798102958
176	4	Exponential	bit	3000	1.0E-07	40	0.1	18	64	5.0169324623
177	2	Uniform	pkt	0	1.0E-05	40	0.1	18	64	8.5156403642
178	4	Uniform	pkt	0	1.0E-05	40	0.1	18	64	8.5002788809
179	2	Exponential	pkt	0	1.0E-05	40	0.1	18	64	8.5422284228
180	4	Exponential	pkt	0	1.0E-05	40	0.1	18	64	8.4960765745
181	2	Uniform	bit	0	1.0E-05	40	0.1	18	64	8.5228798583
182	4	Uniform	bit	0	1.0E-05	40	0.1	18	64	8.4690273057
183	2	Exponential	bit	0	1.0E-05	40	0.1	18	64	2.9489667251
184	4	Exponential	bit	0	1.0E-05	40	0.1	18	64	2.4581823451
185	2	Uniform	pkt	3000	1.0E-05	40	0.1	18	64	8.8978466047
186	4	Uniform	pkt	3000	1.0E-05	40	0.1	18	64	8.917154053
187	2	Exponential	pkt	3000	1.0E-05	40	0.1	18	64	8.9087428907
188	4	Exponential	pkt	3000	1.0E-05	40	0.1	18	64	8.8947823276
189	2	Uniform	bit	3000	1.0E-05	40	0.1	18	64	8.9329697093
190	4	Uniform	bit	3000	1.0E-05	40	0.1	18	64	8.9104735063
191	2	Exponential	bit	3000	1.0E-05	40	0.1	18	64	5.9651844529
192	4	Exponential	bit	3000	1.0E-05	40	0.1	18	64	5.1657455134
193	2	Uniform	pkt	0	1.0E-07	8	40	18	64	8.4050008735
194	4	Uniform	pkt	0	1.0E-07	8	40	18	64	8.4315319571
195	2	Exponential	pkt	0	1.0E-07	8	40	18	64	8.3921260913
196	4	Exponential	pkt	0	1.0E-07	8	40	18	64	8.4443621063
197	2	Uniform	bit	0	1.0E-07	8	40	18	64	8.4277193426
198	4	Uniform	bit	0	1.0E-07	8	40	18	64	8.4316821913
199	2	Exponential	bit	0	1.0E-07	8	40	18	64	2.8614132693
200	4	Exponential	bit	0	1.0E-07	8	40	18	64	2.9063423124
201	2	Uniform	pkt	3000	1.0E-07	8	40	18	64	8.7720477559
202	4	Uniform	pkt	3000	1.0E-07	8	40	18	64	8.7837328975
203	2	Exponential	pkt	3000	1.0E-07	8	40	18	64	8.7647885372
204	4	Exponential	pkt	3000	1.0E-07	8	40	18	64	8.7579959504
205	2	Uniform	bit	3000	1.0E-07	8	40	18	64	8.7619932497
206	4	Uniform	bit	3000	1.0E-07	8	40	18	64	8.7529708179
207	2	Exponential	bit	3000	1.0E-07	8	40	18	64	4.3326496317
208	4	Exponential	bit	3000	1.0E-07	8	40	18	64	4.3708533341
209	2	Uniform	pkt	0	1.0E-05	8	40	18	64	8.4102456393
210	4	Uniform	pkt	0	1.0E-05	8	40	18	64	8.405843865
211	2	Exponential	pkt	0	1.0E-05	8	40	18	64	8.4072877707
212	4	Exponential	pkt	0	1.0E-05	8	40	18	64	8.3760775554
213	2	Uniform	bit	0	1.0E-05	8	40	18	64	8.4121479594
214	4	Uniform	bit	0	1.0E-05	8	40	18	64	8.4171244275

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Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
215	2	Exponential	bit	0	1.0E-05	8	40	18	64	2.9710752159
216	4	Exponential	bit	0	1.0E-05	8	40	18	64	2.8358764615
217	2	Uniform	pkt	3000	1.0E-05	8	40	18	64	8.7456223051
218	4	Uniform	pkt	3000	1.0E-05	8	40	18	64	8.7315576972
219	2	Exponential	pkt	3000	1.0E-05	8	40	18	64	8.7293465624
220	4	Exponential	pkt	3000	1.0E-05	8	40	18	64	8.7414418208
221	2	Uniform	bit	3000	1.0E-05	8	40	18	64	8.7416943452
222	4	Uniform	bit	3000	1.0E-05	8	40	18	64	8.7819618792
223	2	Exponential	bit	3000	1.0E-05	8	40	18	64	4.3768577434
224	4	Exponential	bit	3000	1.0E-05	8	40	18	64	4.3752481571
225	2	Uniform	pkt	0	1.0E-07	40	40	18	64	8.0215335728
226	4	Uniform	pkt	0	1.0E-07	40	40	18	64	7.9846289876
227	2	Exponential	pkt	0	1.0E-07	40	40	18	64	8.0382131455
228	4	Exponential	pkt	0	1.0E-07	40	40	18	64	8.1114787189
229	2	Uniform	bit	0	1.0E-07	40	40	18	64	8.0124244101
230	4	Uniform	bit	0	1.0E-07	40	40	18	64	8.0275949239
231	2	Exponential	bit	0	1.0E-07	40	40	18	64	1.7015916006
232	4	Exponential	bit	0	1.0E-07	40	40	18	64	1.562672364
233	2	Uniform	pkt	3000	1.0E-07	40	40	18	64	8.4885513464
234	4	Uniform	pkt	3000	1.0E-07	40	40	18	64	8.5377758194
235	2	Exponential	pkt	3000	1.0E-07	40	40	18	64	8.4709597527
236	4	Exponential	pkt	3000	1.0E-07	40	40	18	64	8.5496009843
237	2	Uniform	bit	3000	1.0E-07	40	40	18	64	8.5819167996
238	4	Uniform	bit	3000	1.0E-07	40	40	18	64	8.5063599229
239	2	Exponential	bit	3000	1.0E-07	40	40	18	64	3.3187814898
240	4	Exponential	bit	3000	1.0E-07	40	40	18	64	3.4088127554
241	2	Uniform	pkt	0	1.0E-05	40	40	18	64	7.9519473623
242	4	Uniform	pkt	0	1.0E-05	40	40	18	64	8.0330959026
243	2	Exponential	pkt	0	1.0E-05	40	40	18	64	8.0345187994
244	4	Exponential	pkt	0	1.0E-05	40	40	18	64	7.9516745045
245	2	Uniform	bit	0	1.0E-05	40	40	18	64	7.945279915
246	4	Uniform	bit	0	1.0E-05	40	40	18	64	8.0820877501
247	2	Exponential	bit	0	1.0E-05	40	40	18	64	1.4738981552
248	4	Exponential	bit	0	1.0E-05	40	40	18	64	1.4948497677
249	2	Uniform	pkt	3000	1.0E-05	40	40	18	64	8.3502197277
250	4	Uniform	pkt	3000	1.0E-05	40	40	18	64	8.4724851839
251	2	Exponential	pkt	3000	1.0E-05	40	40	18	64	8.4804917236
252	4	Exponential	pkt	3000	1.0E-05	40	40	18	64	8.3672307841
253	2	Uniform	bit	3000	1.0E-05	40	40	18	64	8.4972408382
254	4	Uniform	bit	3000	1.0E-05	40	40	18	64	8.4745041077
255	2	Exponential	bit	3000	1.0E-05	40	40	18	64	3.3376499741
256	4	Exponential	bit	3000	1.0E-05	40	40	18	64	3.346451741
257	2	Uniform	pkt	0	1.0E-07	8	0.1	1	2048	12.9653254

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Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
258	4	Uniform	pkt	0	1.0E-07	8	0.1	1	2048	12.8360049619
259	2	Exponential	pkt	0	1.0E-07	8	0.1	1	2048	12.8920441423
260	4	Exponential	pkt	0	1.0E-07	8	0.1	1	2048	12.8751945158
261	2	Uniform	bit	0	1.0E-07	8	0.1	1	2048	12.9337379127
262	4	Uniform	bit	0	1.0E-07	8	0.1	1	2048	12.7743086014
263	2	Exponential	bit	0	1.0E-07	8	0.1	1	2048	6.5219986761
264	4	Exponential	bit	0	1.0E-07	8	0.1	1	2048	6.2462927947
265	2	Uniform	pkt	3000	1.0E-07	8	0.1	1	2048	12.9006295819
266	4	Uniform	pkt	3000	1.0E-07	8	0.1	1	2048	12.8361463646
267	2	Exponential	pkt	3000	1.0E-07	8	0.1	1	2048	12.8518485673
268	4	Exponential	pkt	3000	1.0E-07	8	0.1	1	2048	12.8629424371
269	2	Uniform	bit	3000	1.0E-07	8	0.1	1	2048	12.8885311552
270	4	Uniform	bit	3000	1.0E-07	8	0.1	1	2048	12.885577187
271	2	Exponential	bit	3000	1.0E-07	8	0.1	1	2048	9.1025816496
272	4	Exponential	bit	3000	1.0E-07	8	0.1	1	2048	8.2965425303
273	2	Uniform	pkt	0	1.0E-05	8	0.1	1	2048	11.3315837879
274	4	Uniform	pkt	0	1.0E-05	8	0.1	1	2048	10.5858634303
275	2	Exponential	pkt	0	1.0E-05	8	0.1	1	2048	11.5507024441
276	4	Exponential	pkt	0	1.0E-05	8	0.1	1	2048	10.9020656709
277	2	Uniform	bit	0	1.0E-05	8	0.1	1	2048	12.8349572669
278	4	Uniform	bit	0	1.0E-05	8	0.1	1	2048	12.7708448307
279	2	Exponential	bit	0	1.0E-05	8	0.1	1	2048	5.7004703289
280	4	Exponential	bit	0	1.0E-05	8	0.1	1	2048	6.3372645729
281	2	Uniform	pkt	3000	1.0E-05	8	0.1	1	2048	11.8807701841
282	4	Uniform	pkt	3000	1.0E-05	8	0.1	1	2048	11.4452276117
283	2	Exponential	pkt	3000	1.0E-05	8	0.1	1	2048	12.1172922502
284	4	Exponential	pkt	3000	1.0E-05	8	0.1	1	2048	11.580736158
285	2	Uniform	bit	3000	1.0E-05	8	0.1	1	2048	13.0057785486
286	4	Uniform	bit	3000	1.0E-05	8	0.1	1	2048	12.9219458721
287	2	Exponential	bit	3000	1.0E-05	8	0.1	1	2048	9.2060676569
288	4	Exponential	bit	3000	1.0E-05	8	0.1	1	2048	8.7770870223
289	2	Uniform	pkt	0	1.0E-07	40	0.1	1	2048	11.8693066258
290	4	Uniform	pkt	0	1.0E-07	40	0.1	1	2048	11.4954045665
291	2	Exponential	pkt	0	1.0E-07	40	0.1	1	2048	11.8271909467
292	4	Exponential	pkt	0	1.0E-07	40	0.1	1	2048	11.4915184614
293	2	Uniform	bit	0	1.0E-07	40	0.1	1	2048	12.0333117991
294	4	Uniform	bit	0	1.0E-07	40	0.1	1	2048	11.5584426598
295	2	Exponential	bit	0	1.0E-07	40	0.1	1	2048	5.417344073
296	4	Exponential	bit	0	1.0E-07	40	0.1	1	2048	3.8949175375
297	2	Uniform	pkt	3000	1.0E-07	40	0.1	1	2048	11.9475596554
298	4	Uniform	pkt	3000	1.0E-07	40	0.1	1	2048	11.6730950519
299	2	Exponential	pkt	3000	1.0E-07	40	0.1	1	2048	11.7053374418
300	4	Exponential	pkt	3000	1.0E-07	40	0.1	1	2048	11.6318782162

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Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
301	2	Uniform	bit	3000	1.0E-07	40	0.1	1	2048	11.8814513088
302	4	Uniform	bit	3000	1.0E-07	40	0.1	1	2048	11.7899811266
303	2	Exponential	bit	3000	1.0E-07	40	0.1	1	2048	6.6517579028
304	4	Exponential	bit	3000	1.0E-07	40	0.1	1	2048	7.2679440422
305	2	Uniform	pkt	0	1.0E-05	40	0.1	1	2048	9.3907188756
306	4	Uniform	pkt	0	1.0E-05	40	0.1	1	2048	8.8898744678
307	2	Exponential	pkt	0	1.0E-05	40	0.1	1	2048	9.6970359129
308	4	Exponential	pkt	0	1.0E-05	40	0.1	1	2048	9.1911491937
309	2	Uniform	bit	0	1.0E-05	40	0.1	1	2048	11.8503424694
310	4	Uniform	bit	0	1.0E-05	40	0.1	1	2048	11.3206729591
311	2	Exponential	bit	0	1.0E-05	40	0.1	1	2048	5.2812118986
312	4	Exponential	bit	0	1.0E-05	40	0.1	1	2048	5.0735725339
313	2	Uniform	pkt	3000	1.0E-05	40	0.1	1	2048	10.5365347736
314	4	Uniform	pkt	3000	1.0E-05	40	0.1	1	2048	10.1381129346
315	2	Exponential	pkt	3000	1.0E-05	40	0.1	1	2048	10.5740978241
316	4	Exponential	pkt	3000	1.0E-05	40	0.1	1	2048	9.9440615803
317	2	Uniform	bit	3000	1.0E-05	40	0.1	1	2048	11.7986674817
318	4	Uniform	bit	3000	1.0E-05	40	0.1	1	2048	11.250133319
319	2	Exponential	bit	3000	1.0E-05	40	0.1	1	2048	7.939429726
320	4	Exponential	bit	3000	1.0E-05	40	0.1	1	2048	8.0044243475
321	2	Uniform	pkt	0	1.0E-07	8	40	1	2048	11.7959853968
322	4	Uniform	pkt	0	1.0E-07	8	40	1	2048	11.8655145532
323	2	Exponential	pkt	0	1.0E-07	8	40	1	2048	12.0614656297
324	4	Exponential	pkt	0	1.0E-07	8	40	1	2048	12.2817168941
325	2	Uniform	bit	0	1.0E-07	8	40	1	2048	12.0266439005
326	4	Uniform	bit	0	1.0E-07	8	40	1	2048	11.8749977769
327	2	Exponential	bit	0	1.0E-07	8	40	1	2048	5.7140759809
328	4	Exponential	bit	0	1.0E-07	8	40	1	2048	5.864358184
329	2	Uniform	pkt	3000	1.0E-07	8	40	1	2048	12.0708399207
330	4	Uniform	pkt	3000	1.0E-07	8	40	1	2048	12.1027054752
331	2	Exponential	pkt	3000	1.0E-07	8	40	1	2048	12.1268479282
332	4	Exponential	pkt	3000	1.0E-07	8	40	1	2048	11.9494927145
333	2	Uniform	bit	3000	1.0E-07	8	40	1	2048	12.0206474775
334	4	Uniform	bit	3000	1.0E-07	8	40	1	2048	12.106061408
335	2	Exponential	bit	3000	1.0E-07	8	40	1	2048	7.241893365
336	4	Exponential	bit	3000	1.0E-07	8	40	1	2048	7.575428742
337	2	Uniform	pkt	0	1.0E-05	8	40	1	2048	8.7777191519
338	4	Uniform	pkt	0	1.0E-05	8	40	1	2048	8.403943863
339	2	Exponential	pkt	0	1.0E-05	8	40	1	2048	8.8618339744
340	4	Exponential	pkt	0	1.0E-05	8	40	1	2048	8.9638225075
341	2	Uniform	bit	0	1.0E-05	8	40	1	2048	11.950789739
342	4	Uniform	bit	0	1.0E-05	8	40	1	2048	11.844832583
343	2	Exponential	bit	0	1.0E-05	8	40	1	2048	5.5996656298

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Table 8 – continued from previous page

Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
344	4	Exponential	bit	0	1.0E-05	8	40	1	2048	5.2386522842
345	2	Uniform	pkt	3000	1.0E-05	8	40	1	2048	10.0480051255
346	4	Uniform	pkt	3000	1.0E-05	8	40	1	2048	10.1153416167
347	2	Exponential	pkt	3000	1.0E-05	8	40	1	2048	10.1682657473
348	4	Exponential	pkt	3000	1.0E-05	8	40	1	2048	10.2352770565
349	2	Uniform	bit	3000	1.0E-05	8	40	1	2048	12.0755652475
350	4	Uniform	bit	3000	1.0E-05	8	40	1	2048	12.1440354202
351	2	Exponential	bit	3000	1.0E-05	8	40	1	2048	7.3475470928
352	4	Exponential	bit	3000	1.0E-05	8	40	1	2048	7.4138979548
353	2	Uniform	pkt	0	1.0E-07	40	40	1	2048	10.5876214351
354	4	Uniform	pkt	0	1.0E-07	40	40	1	2048	10.9734703677
355	2	Exponential	pkt	0	1.0E-07	40	40	1	2048	10.5463816869
356	4	Exponential	pkt	0	1.0E-07	40	40	1	2048	10.3064618278
357	2	Uniform	bit	0	1.0E-07	40	40	1	2048	10.3632627998
358	4	Uniform	bit	0	1.0E-07	40	40	1	2048	10.4676654895
359	2	Exponential	bit	0	1.0E-07	40	40	1	2048	4.6288867126
360	4	Exponential	bit	0	1.0E-07	40	40	1	2048	3.6072354651
361	2	Uniform	pkt	3000	1.0E-07	40	40	1	2048	10.5831682659
362	4	Uniform	pkt	3000	1.0E-07	40	40	1	2048	10.4288273147
363	2	Exponential	pkt	3000	1.0E-07	40	40	1	2048	10.5087491377
364	4	Exponential	pkt	3000	1.0E-07	40	40	1	2048	10.6256383327
365	2	Uniform	bit	3000	1.0E-07	40	40	1	2048	10.7776116362
366	4	Uniform	bit	3000	1.0E-07	40	40	1	2048	11.0178512997
367	2	Exponential	bit	3000	1.0E-07	40	40	1	2048	5.7667197144
368	4	Exponential	bit	3000	1.0E-07	40	40	1	2048	7.015812954
369	2	Uniform	pkt	0	1.0E-05	40	40	1	2048	7.6385218913
370	4	Uniform	pkt	0	1.0E-05	40	40	1	2048	7.6084896042
371	2	Exponential	pkt	0	1.0E-05	40	40	1	2048	7.2707971112
372	4	Exponential	pkt	0	1.0E-05	40	40	1	2048	7.6246189862
373	2	Uniform	bit	0	1.0E-05	40	40	1	2048	10.8187105946
374	4	Uniform	bit	0	1.0E-05	40	40	1	2048	10.967621744
375	2	Exponential	bit	0	1.0E-05	40	40	1	2048	4.18259961
376	4	Exponential	bit	0	1.0E-05	40	40	1	2048	3.3559210368
377	2	Uniform	pkt	3000	1.0E-05	40	40	1	2048	8.7643744678
378	4	Uniform	pkt	3000	1.0E-05	40	40	1	2048	8.9133005184
379	2	Exponential	pkt	3000	1.0E-05	40	40	1	2048	9.1388677857
380	4	Exponential	pkt	3000	1.0E-05	40	40	1	2048	8.6606463996
381	2	Uniform	bit	3000	1.0E-05	40	40	1	2048	10.5014551598
382	4	Uniform	bit	3000	1.0E-05	40	40	1	2048	10.7315342207
383	2	Exponential	bit	3000	1.0E-05	40	40	1	2048	6.3936175094
384	4	Exponential	bit	3000	1.0E-05	40	40	1	2048	6.4004434745
385	2	Uniform	pkt	0	1.0E-07	8	0.1	18	2048	10.2997862214
386	4	Uniform	pkt	0	1.0E-07	8	0.1	18	2048	10.3650072041

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Table 8 – continued from previous page

Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
387	2	Exponential	pkt	0	1.0E-07	8	0.1	18	2048	10.2993958244
388	4	Exponential	pkt	0	1.0E-07	8	0.1	18	2048	10.3460094602
389	2	Uniform	bit	0	1.0E-07	8	0.1	18	2048	10.3200417012
390	4	Uniform	bit	0	1.0E-07	8	0.1	18	2048	10.3633707607
391	2	Exponential	bit	0	1.0E-07	8	0.1	18	2048	6.1993527698
392	4	Exponential	bit	0	1.0E-07	8	0.1	18	2048	5.9892933028
393	2	Uniform	pkt	3000	1.0E-07	8	0.1	18	2048	10.2245723809
394	4	Uniform	pkt	3000	1.0E-07	8	0.1	18	2048	10.2795027565
395	2	Exponential	pkt	3000	1.0E-07	8	0.1	18	2048	10.2190775305
396	4	Exponential	pkt	3000	1.0E-07	8	0.1	18	2048	10.2909209208
397	2	Uniform	bit	3000	1.0E-07	8	0.1	18	2048	10.2700684171
398	4	Uniform	bit	3000	1.0E-07	8	0.1	18	2048	10.3354432043
399	2	Exponential	bit	3000	1.0E-07	8	0.1	18	2048	7.9335732736
400	4	Exponential	bit	3000	1.0E-07	8	0.1	18	2048	7.8185396788
401	2	Uniform	pkt	0	1.0E-05	8	0.1	18	2048	9.3561173279
402	4	Uniform	pkt	0	1.0E-05	8	0.1	18	2048	9.2021764712
403	2	Exponential	pkt	0	1.0E-05	8	0.1	18	2048	9.4326343447
404	4	Exponential	pkt	0	1.0E-05	8	0.1	18	2048	9.3104621996
405	2	Uniform	bit	0	1.0E-05	8	0.1	18	2048	10.2574985736
406	4	Uniform	bit	0	1.0E-05	8	0.1	18	2048	10.319666477
407	2	Exponential	bit	0	1.0E-05	8	0.1	18	2048	6.2131207707
408	4	Exponential	bit	0	1.0E-05	8	0.1	18	2048	6.1515556429
409	2	Uniform	pkt	3000	1.0E-05	8	0.1	18	2048	9.2704102046
410	4	Uniform	pkt	3000	1.0E-05	8	0.1	18	2048	9.2929543966
411	2	Exponential	pkt	3000	1.0E-05	8	0.1	18	2048	9.329750784
412	4	Exponential	pkt	3000	1.0E-05	8	0.1	18	2048	9.4282154202
413	2	Uniform	bit	3000	1.0E-05	8	0.1	18	2048	10.1128719324
414	4	Uniform	bit	3000	1.0E-05	8	0.1	18	2048	10.1932027194
415	2	Exponential	bit	3000	1.0E-05	8	0.1	18	2048	7.976370758
416	4	Exponential	bit	3000	1.0E-05	8	0.1	18	2048	7.8254714833
417	2	Uniform	pkt	0	1.0E-07	40	0.1	18	2048	10.4340683515
418	4	Uniform	pkt	0	1.0E-07	40	0.1	18	2048	10.3098171461
419	2	Exponential	pkt	0	1.0E-07	40	0.1	18	2048	10.4563476067
420	4	Exponential	pkt	0	1.0E-07	40	0.1	18	2048	10.2676920823
421	2	Uniform	bit	0	1.0E-07	40	0.1	18	2048	10.4722442695
422	4	Uniform	bit	0	1.0E-07	40	0.1	18	2048	10.3161631837
423	2	Exponential	bit	0	1.0E-07	40	0.1	18	2048	5.2386522842
424	4	Exponential	bit	0	1.0E-07	40	0.1	18	2048	4.9748376932
425	2	Uniform	pkt	3000	1.0E-07	40	0.1	18	2048	10.4946871799
426	4	Uniform	pkt	3000	1.0E-07	40	0.1	18	2048	10.4981335304
427	2	Exponential	pkt	3000	1.0E-07	40	0.1	18	2048	10.4309985087
428	4	Exponential	pkt	3000	1.0E-07	40	0.1	18	2048	10.3809090113
429	2	Uniform	bit	3000	1.0E-07	40	0.1	18	2048	10.506778325

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Table 8 – continued from previous page

Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
430	4	Uniform	bit	3000	1.0E-07	40	0.1	18	2048	10.4939817494
431	2	Exponential	bit	3000	1.0E-07	40	0.1	18	2048	7.6437677518
432	4	Exponential	bit	3000	1.0E-07	40	0.1	18	2048	7.2572521666
433	2	Uniform	pkt	0	1.0E-05	40	0.1	18	2048	9.0046436114
434	4	Uniform	pkt	0	1.0E-05	40	0.1	18	2048	8.6615136747
435	2	Exponential	pkt	0	1.0E-05	40	0.1	18	2048	9.2633134686
436	4	Exponential	pkt	0	1.0E-05	40	0.1	18	2048	8.7792614292
437	2	Uniform	bit	0	1.0E-05	40	0.1	18	2048	10.3523337175
438	4	Uniform	bit	0	1.0E-05	40	0.1	18	2048	10.2978400324
439	2	Exponential	bit	0	1.0E-05	40	0.1	18	2048	4.9811073062
440	4	Exponential	bit	0	1.0E-05	40	0.1	18	2048	4.9115562432
441	2	Uniform	pkt	3000	1.0E-05	40	0.1	18	2048	9.6090166958
442	4	Uniform	pkt	3000	1.0E-05	40	0.1	18	2048	9.342392866
443	2	Exponential	pkt	3000	1.0E-05	40	0.1	18	2048	9.7347512765
444	4	Exponential	pkt	3000	1.0E-05	40	0.1	18	2048	9.3170900124
445	2	Uniform	bit	3000	1.0E-05	40	0.1	18	2048	10.4675302668
446	4	Uniform	bit	3000	1.0E-05	40	0.1	18	2048	10.4438662957
447	2	Exponential	bit	3000	1.0E-05	40	0.1	18	2048	7.7087559651
448	4	Exponential	bit	3000	1.0E-05	40	0.1	18	2048	7.1544375633
449	2	Uniform	pkt	0	1.0E-07	8	40	18	2048	10.3783080101
450	4	Uniform	pkt	0	1.0E-07	8	40	18	2048	10.3493660063
451	2	Exponential	pkt	0	1.0E-07	8	40	18	2048	10.3633062093
452	4	Exponential	pkt	0	1.0E-07	8	40	18	2048	10.376551245
453	2	Uniform	bit	0	1.0E-07	8	40	18	2048	10.3644692556
454	4	Uniform	bit	0	1.0E-07	8	40	18	2048	10.3798848342
455	2	Exponential	bit	0	1.0E-07	8	40	18	2048	5.5353515503
456	4	Exponential	bit	0	1.0E-07	8	40	18	2048	5.5912124941
457	2	Uniform	pkt	3000	1.0E-07	8	40	18	2048	10.3764308152
458	4	Uniform	pkt	3000	1.0E-07	8	40	18	2048	10.3933043959
459	2	Exponential	pkt	3000	1.0E-07	8	40	18	2048	10.3809229939
460	4	Exponential	pkt	3000	1.0E-07	8	40	18	2048	10.3615516994
461	2	Uniform	bit	3000	1.0E-07	8	40	18	2048	10.4006393509
462	4	Uniform	bit	3000	1.0E-07	8	40	18	2048	10.4036521254
463	2	Exponential	bit	3000	1.0E-07	8	40	18	2048	7.2269566901
464	4	Exponential	bit	3000	1.0E-07	8	40	18	2048	7.2677852995
465	2	Uniform	pkt	0	1.0E-05	8	40	18	2048	8.3144830325
466	4	Uniform	pkt	0	1.0E-05	8	40	18	2048	8.3536159243
467	2	Exponential	pkt	0	1.0E-05	8	40	18	2048	8.5766197939
468	4	Exponential	pkt	0	1.0E-05	8	40	18	2048	8.5088454681
469	2	Uniform	bit	0	1.0E-05	8	40	18	2048	10.3031411733
470	4	Uniform	bit	0	1.0E-05	8	40	18	2048	10.3368088096
471	2	Exponential	bit	0	1.0E-05	8	40	18	2048	5.5671563512
472	4	Exponential	bit	0	1.0E-05	8	40	18	2048	5.5154052861

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Table 8 – continued from previous page

Design Point	TCP_rttvar_exp_	ErrorModel_ranvar_	ErrorModel_unit_	MAC_RTSThreshold_	ErrorModel_rate_	RWP_Area_	TCP_min_max_rto_	APP_flows_	TCP_packetSize_	TCP_throughput
473	2	Uniform	pkt	3000	1.0E-05	8	40	18	2048	9.1275104224
474	4	Uniform	pkt	3000	1.0E-05	8	40	18	2048	9.1765925786
475	2	Exponential	pkt	3000	1.0E-05	8	40	18	2048	9.2775633285
476	4	Exponential	pkt	3000	1.0E-05	8	40	18	2048	9.2858055521
477	2	Uniform	bit	3000	1.0E-05	8	40	18	2048	10.2518525667
478	4	Uniform	bit	3000	1.0E-05	8	40	18	2048	10.2444207568
479	2	Exponential	bit	3000	1.0E-05	8	40	18	2048	7.2226477673
480	4	Exponential	bit	3000	1.0E-05	8	40	18	2048	7.0877155316
481	2	Uniform	pkt	0	1.0E-07	40	40	18	2048	9.9340030329
482	4	Uniform	pkt	0	1.0E-07	40	40	18	2048	9.8403138714
483	2	Exponential	pkt	0	1.0E-07	40	40	18	2048	9.842420693
484	4	Exponential	pkt	0	1.0E-07	40	40	18	2048	9.8045592257
485	2	Uniform	bit	0	1.0E-07	40	40	18	2048	9.8095459686
486	4	Uniform	bit	0	1.0E-07	40	40	18	2048	10.0190032098
487	2	Exponential	bit	0	1.0E-07	40	40	18	2048	4.2848302326
488	4	Exponential	bit	0	1.0E-07	40	40	18	2048	4.4571753349
489	2	Uniform	pkt	3000	1.0E-07	40	40	18	2048	10.3154627867
490	4	Uniform	pkt	3000	1.0E-07	40	40	18	2048	10.1710559868
491	2	Exponential	pkt	3000	1.0E-07	40	40	18	2048	10.0670146032
492	4	Exponential	pkt	3000	1.0E-07	40	40	18	2048	10.2001361346
493	2	Uniform	bit	3000	1.0E-07	40	40	18	2048	10.2123662598
494	4	Uniform	bit	3000	1.0E-07	40	40	18	2048	10.1572217748
495	2	Exponential	bit	3000	1.0E-07	40	40	18	2048	6.3061909363
496	4	Exponential	bit	3000	1.0E-07	40	40	18	2048	6.3388735837
497	2	Uniform	pkt	0	1.0E-05	40	40	18	2048	7.4437630215
498	4	Uniform	pkt	0	1.0E-05	40	40	18	2048	7.3794286246
499	2	Exponential	pkt	0	1.0E-05	40	40	18	2048	7.5553879911
500	4	Exponential	pkt	0	1.0E-05	40	40	18	2048	7.6451838501
501	2	Uniform	bit	0	1.0E-05	40	40	18	2048	9.8562569009
502	4	Uniform	bit	0	1.0E-05	40	40	18	2048	9.8523009367
503	2	Exponential	bit	0	1.0E-05	40	40	18	2048	4.2753813434
504	4	Exponential	bit	0	1.0E-05	40	40	18	2048	4.2722117687
505	2	Uniform	pkt	3000	1.0E-05	40	40	18	2048	8.5133330172
506	4	Uniform	pkt	3000	1.0E-05	40	40	18	2048	8.60089633
507	2	Exponential	pkt	3000	1.0E-05	40	40	18	2048	8.6670917772
508	4	Exponential	pkt	3000	1.0E-05	40	40	18	2048	8.5889376043
509	2	Uniform	bit	3000	1.0E-05	40	40	18	2048	10.0833908729
510	4	Uniform	bit	3000	1.0E-05	40	40	18	2048	9.9792798606
511	2	Exponential	bit	3000	1.0E-05	40	40	18	2048	6.2915493863
512	4	Exponential	bit	3000	1.0E-05	40	40	18	2048	6.2813841145

A.5 Predictive capability of the screening model.

Figure 3 shows the results of evaluating the JMP predictive model as a function of the TCP packet size, for the three levels of error rate.

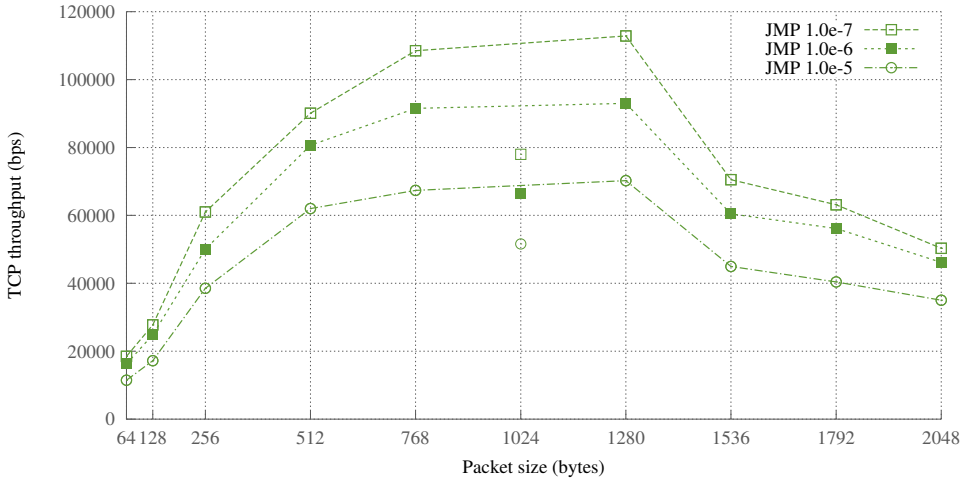

Figure 3: TCP throughput as a function of packet size as predicted the by JMP model; all other factors are at their default levels.

Figure 4 shows the TCP throughput predicted by Mathis et al. [1].

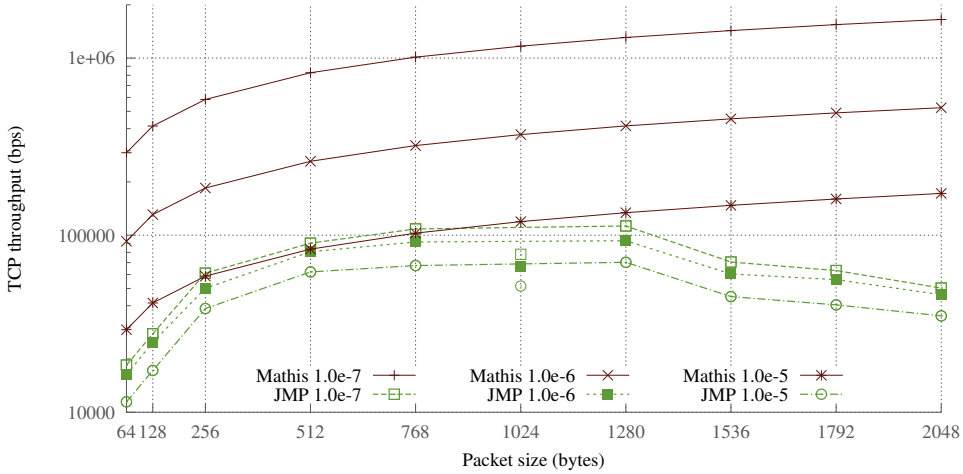

Figure 4: JMP model vs. model proposed by Mathis et al. [1].

Figure 5 shows the TCP throughput predicted by Padhye et al. [2].

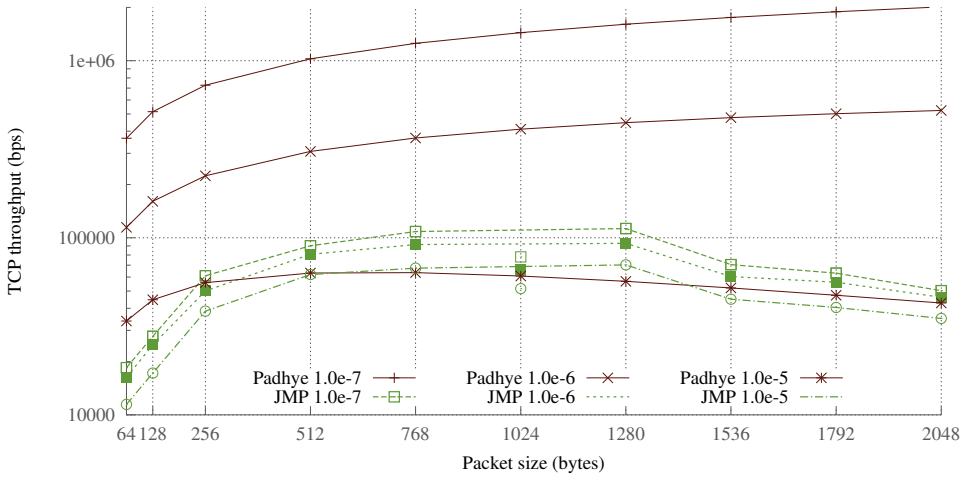

Figure 5: JMP model vs. model proposed by Padhye et al. [2].

Figure 6 shows the average TCP throughput from simulation, and the fitted of the model from JMP corresponding to a new experimental design of one hundred random design points.

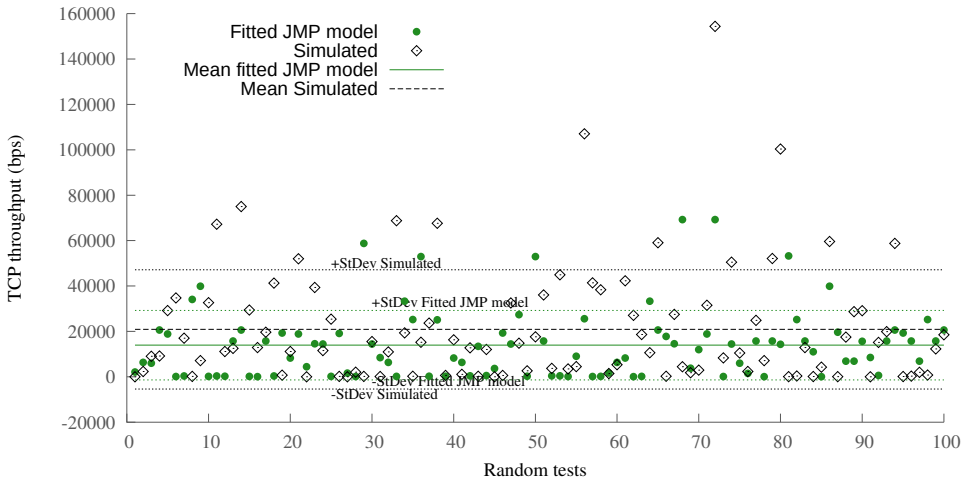

Figure 6: Predictions by JMP model and simulation results for random design points.

References

[1] Matthew Mathis, Jeffrey Semke, Jamshid Mahdavi, and Teunis Ott. The macroscopic behavior of the TCP congestion avoidance algorithm. *SIGCOMM Comput. Commun. Rev.*, 27(3):67–82, July 1997.

[2] Jitendra Padhye, Victor Firoiu, Donald F. Towsley, and James F. Kurose. Modeling TCP Reno Performance: A Simple Model and Its Empirical Validation. *IEEE/ACM Transactions on Networking*, 8:133–145, 2000.