**Effect of Window Size (N), Maximum Segment Size and Packet Drop Probability on Transfer Rate for**

**Go Back N ARQ Protocol**

File Size: 1.2 MB

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Effect of N |  | MSS = 500 | p = 0.05 |  |  |  |
|  |  |  |  |  |  |  |
| **N** | Round 1 | Round 2 | Round 3 | Round 4 | Round 5 | Average |
| **1** | 30067 | 31044 | 33498 | 29133 | 29685 | 30685.4 |
| **2** | 20366 | 20302 | 20358 | 21566 | 19585 | 20435.4 |
| **4** | 14416 | 19592 | 17553 | 19850 | 14709 | 17224 |
| **8** | 12820 | 17602 | 12036 | 12052 | 12692 | 13440.4 |
| **16** | 11880 | 15690 | 11867 | 11280 | 12289 | 12601.2 |
| **32** | 10574 | 12847 | 9002 | 10958 | 11532 | 10982.6 |
| **64** | 10253 | 11600 | 11574 | 10326 | 10778 | 10906.2 |
| **128** | 11264 | 13457 | 14836 | 14618 | 11105 | 13056 |
| **256** | 13520 | 13533 | 14511 | 15121 | 13478 | 14032.6 |
| **512** | 15865 | 15082 | 17944 | 15123 | 14169 | 15636.6 |
| **1024** | 16650 | 17609 | 23617 | 19179 | 17096 | 18830.2 |

Explanation:

Initially as the window size(N) increases, sender can send more packets without waiting for ACKs which results in better transmission time, however after a certain point (at N=32,64), window becomes too large, and number of packets to be re-transmitted increases which result in degraded performance.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Effect of MSS | | N = 64 | p = 0.05 |  |  |  |
|  |  |  |  |  |  |  |
| **MSS** | Round 1 | Round 2 | Round 3 | Round 4 | Round 5 | Average |
| **100** | 50519 | 54965 | 56866 | 55915 | 51851 | 54023.2 |
| **200** | 24985 | 24797 | 26082 | 26945 | 26444 | 25850.6 |
| **300** | 18755 | 18346 | 18549 | 21207 | 20474 | 19466.2 |
| **400** | 13730 | 14715 | 14241 | 17295 | 14624 | 14921 |
| **500** | 10305 | 13345 | 10616 | 11639 | 12174 | 11615.8 |
| **600** | 9093 | 7715 | 8753 | 10090 | 9496 | 9029.4 |
| **700** | 8055 | 8297 | 6773 | 8321 | 6138 | 7516.8 |
| **800** | 6777 | 6645 | 6060 | 7403 | 6160 | 6609 |
| **900** | 5521 | 5520 | 6095 | 7125 | 6075 | 6067.2 |
| **1000** | 6177 | 4923 | 4692 | 4987 | 5068 | 5169.4 |

Explanation:

As the MSS increases, number of packets to be transmitted decreases. Which results in reduce overhead for protocol. That is why by increasing MSS, better transfer speed is achieved.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Effect of p |  | N = 64 | MSS = 500 |  |  |  |
|  |  |  |  |  |  |  |
| **p** | Round 1 | Round 2 | Round 3 | Round 4 | Round 5 | Average |
| **0.01** | 2658 | 3224 | 3028 | 3182 | 2763 | 2971 |
| **0.02** | 5740 | 4222 | 5033 | 5376 | 4851 | 5044.4 |
| **0.03** | 7295 | 7122 | 6500 | 7487 | 6130 | 6906.8 |
| **0.04** | 8618 | 9798 | 8680 | 7222 | 8856 | 8634.8 |
| **0.05** | 9658 | 11063 | 9626 | 12174 | 11404 | 10785 |
| **0.06** | 14105 | 11905 | 12605 | 12422 | 13894 | 12986.2 |
| **0.07** | 16454 | 15374 | 15038 | 15344 | 18142 | 16070.4 |
| **0.08** | 24115 | 17994 | 17028 | 18193 | 18348 | 19135.6 |
| **0.09** | 25070 | 19603 | 21822 | 20785 | 18685 | 21193 |
| **0.1** | 22211 | 22855 | 23839 | 23644 | 23935 | 23296.8 |

Explanation:

As more number of packets are dropped, more number of packets are to be re-transmitted. That is why, with the increase of p, transfer speed decreases.

**Effect of Window Size (N), Maximum Segment Size and Packet Drop Probability on Transfer Rate for**

**Selective Repeat ARQ Protocol**

File Size: 1.2 MB

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Effect of N |  | MSS = 500 | p = 0.05 |  |  |  |
|  |  |  |  |  |  |  |
| **N** | Round 1 | Round 2 | Round 3 | Round 4 | Round 5 | Average |
| **1** | 27164 | 27917 | 29601 | 29017 | 29845 | 28708.8 |
| **2** | 19408 | 17874 | 19080 | 18915 | 20379 | 19131.2 |
| **4** | 13143 | 12095 | 12772 | 13300 | 12676 | 12797.2 |
| **8** | 9070 | 7366 | 8075 | 7623 | 8285 | 8083.8 |
| **16** | 5369 | 5247 | 5734 | 5017 | 4792 | 5231.8 |
| **32** | 3108 | 2835 | 3488 | 3055 | 3647 | 3226.6 |
| **64** | 1635 | 1495 | 1492 | 1479 | 2017 | 1623.6 |
| **128** | 913 | 905 | 1367 | 1086 | 1621 | 1178.4 |
| **256** | 834 | 899 | 955 | 884 | 1035 | 921.4 |
| **512** | 1121 | 915 | 1026 | 880 | 1021 | 992.6 |
| **1024** | 1077 | 1033 | 1042 | 1240 | 973 | 1073 |

Explanation:

Initially as the window size(N) increases, sender can send more packets without waiting for ACKs which results in better transmission time. But unlike Go Back N, with a further increase in window size, number of packets to be re-transmitted does not increases as only dropped packets are to be re-transmitted, so further performance benefit could be achived.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Effect of MSS | | N = 64 | p = 0.05 |  |  |  |
|  |  |  |  |  |  |  |
| **MSS** | Round 1 | Round 2 | Round 3 | Round 4 | Round 5 | Average |
| **100** | 8530 | 8860 | 8049 | 8480 | 10083 | 8800.4 |
| **200** | 3528 | 4091 | 4250 | 4434 | 4771 | 4214.8 |
| **300** | 2836 | 3009 | 3098 | 2908 | 3503 | 3070.8 |
| **400** | 1996 | 1954 | 3001 | 2065 | 2646 | 2332.4 |
| **500** | 1736 | 2020 | 2010 | 1806 | 2838 | 2082 |
| **600** | 1603 | 1347 | 1600 | 1097 | 1313 | 1392 |
| **700** | 1560 | 1192 | 1766 | 1272 | 1258 | 1409.6 |
| **800** | 1261 | 1272 | 1536 | 1387 | 1181 | 1327.4 |
| **900** | 813 | 1092 | 1090 | 942 | 912 | 969.8 |
| **1000** | 673 | 751 | 847 | 784 | 1029 | 816.8 |

Explanation:

Similar to Go Back N, As the MSS increases, number of packets to be transmitted decreases. Which results in reduce overhead for protocol. That is why by increasing MSS, better transfer speed is achieved.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Effect of p |  | N = 64 | MSS = 500 |  |  |  |
|  |  |  |  |  |  |  |
| **p** | Round 1 | Round 2 | Round 3 | Round 4 | Round 5 | Average |
| **0.01** | 726 | 954 | 892 | 743 | 785 | 820 |
| **0.02** | 1020 | 1006 | 1312 | 998 | 1086 | 1084.4 |
| **0.03** | 1754 | 1760 | 1374 | 1757 | 1094 | 1547.8 |
| **0.04** | 1763 | 2104 | 1995 | 2062 | 1448 | 1874.4 |
| **0.05** | 1978 | 1415 | 1993 | 3167 | 1750 | 2060.6 |
| **0.06** | 1657 | 1702 | 1980 | 2752 | 1703 | 1958.8 |
| **0.07** | 1604 | 2106 | 2072 | 2098 | 2300 | 2036 |
| **0.08** | 1560 | 1989 | 2127 | 1798 | 2142 | 1923.2 |
| **0.09** | 1800 | 1976 | 2354 | 2638 | 2220 | 2197.6 |
| **0.1** | 1814 | 2147 | 2475 | 2642 | 2503 | 2316.2 |

Explanation:

As more number of packets are dropped, more number of packets are to be re-transmitted. That is why, with the increase of p, transfer speed decreases.