TCP RENO PERFORMANCE ANALYSIS

Comparison: DropTail vs RED Queue Management

QUEUE MANAGEMENT MECHANISMS

DropTail (Tail Drop)

- Accepts packets until buffer is full
- Drops new packets when buffer reaches capacity
- Simple FIFO (First In First Out) implementation
- May cause "global synchronization" problem

RED (Random Early Detection)

- Monitors average queue length continuously
- Randomly drops packets BEFORE queue is full
- Provides early congestion warning to TCP
- Prevents global synchronization effectively

KEY PERFORMANCE METRICS

Metric	DropTail	RED	Winner
Throughput (Mbps)	0.643	0.665	□ RED
Packet Loss Rate (%)	4.98	4.85	□ RED
Average Delay (ms)	30.09	30.23	□ DT
Timeout Events	2	1	□ RED
Fast Retransmits	10	15	□ DT

ADVANTAGES & DISADVANTAGES

DropTail PROS

- ✓ Simple implementation
- ✓ Minimal CPU overhead
- ✓ Predictable behavior

DropTail CONS

- ✗ Global synchronization
- ✗ Buffer bloat issues
- ✗ Higher latency spikes

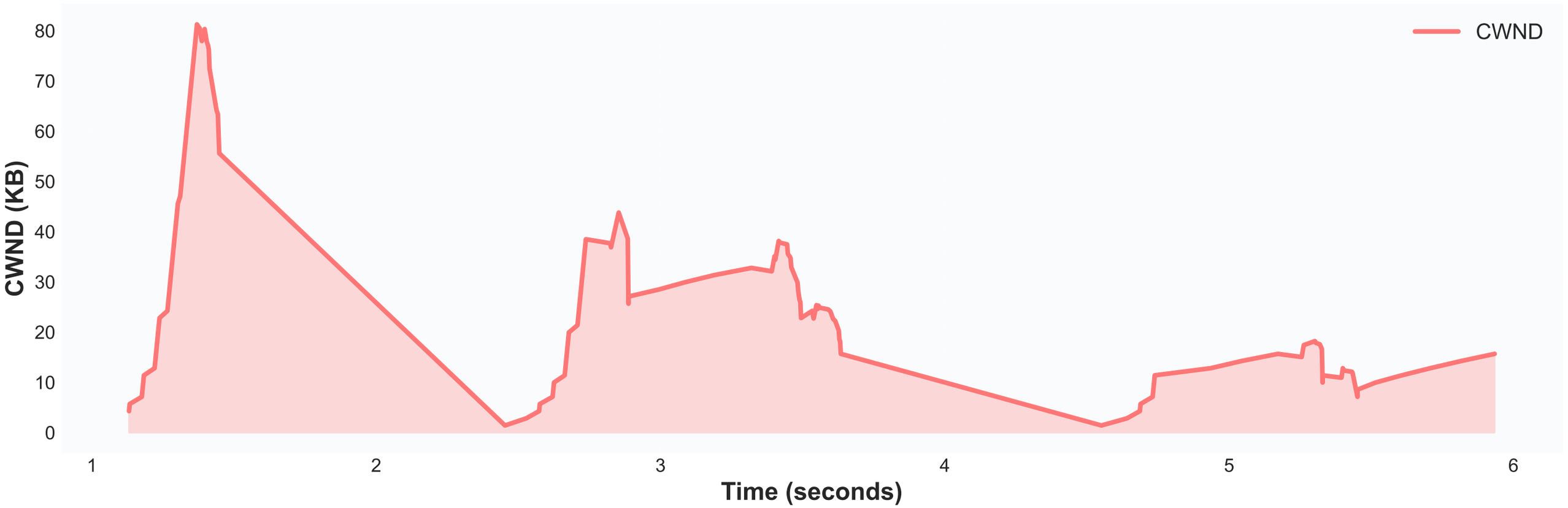
RED PROS

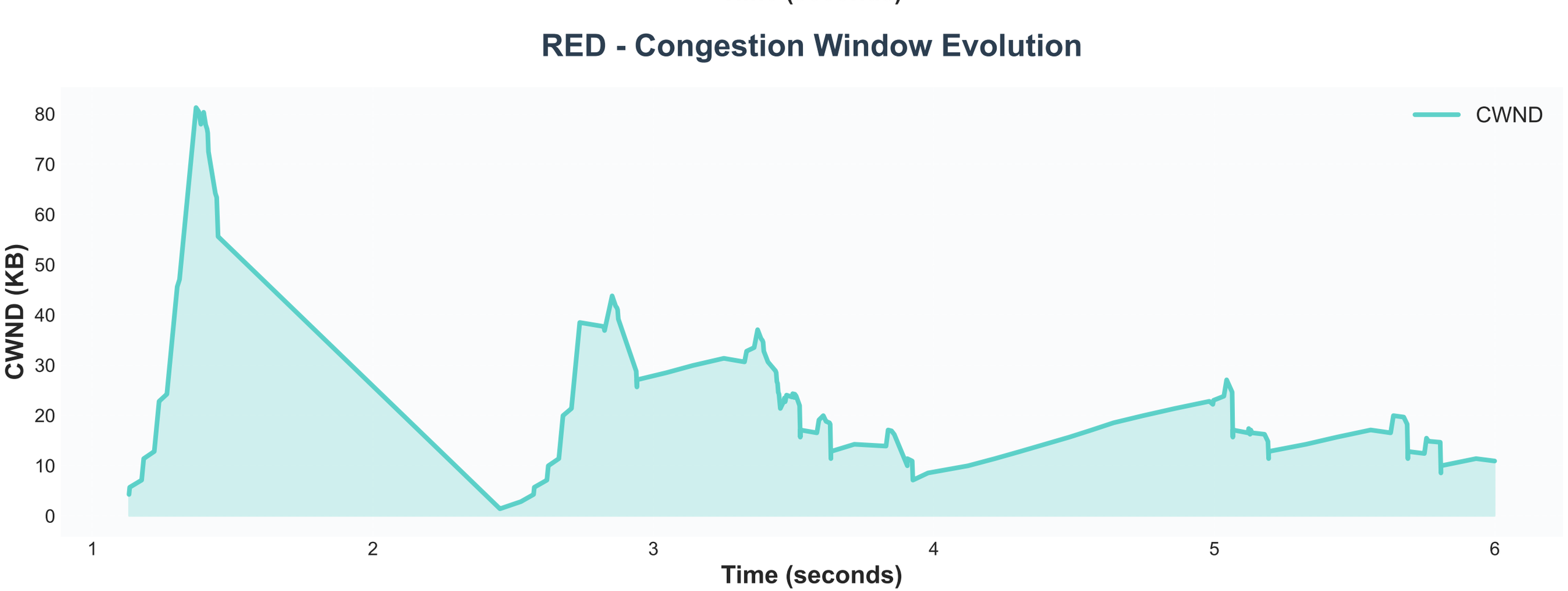
- ✓ Prevents global sync
- ✓ Lower average delay
- ✓ Better flow fairness

RED CONS

- ✗ Complex configuration
- ✗ Parameter sensitivity
- ✗ Higher CPU overhead

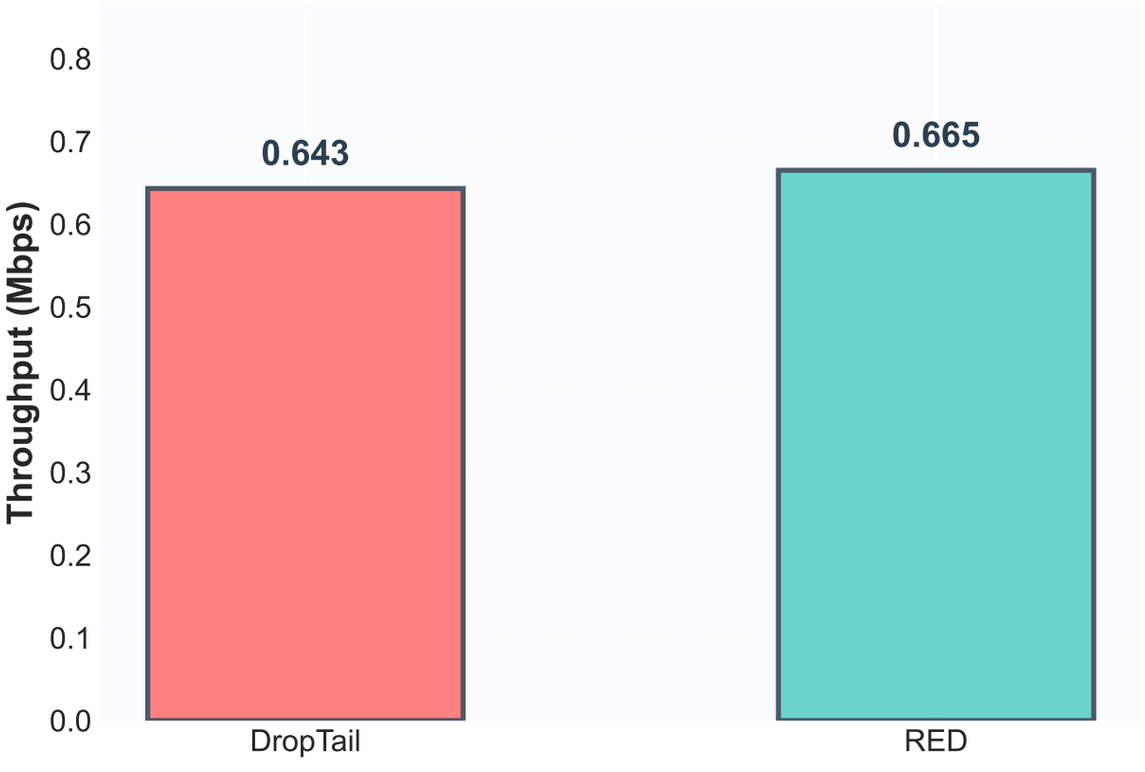
CONGESTION WINDOW EVOLUTION



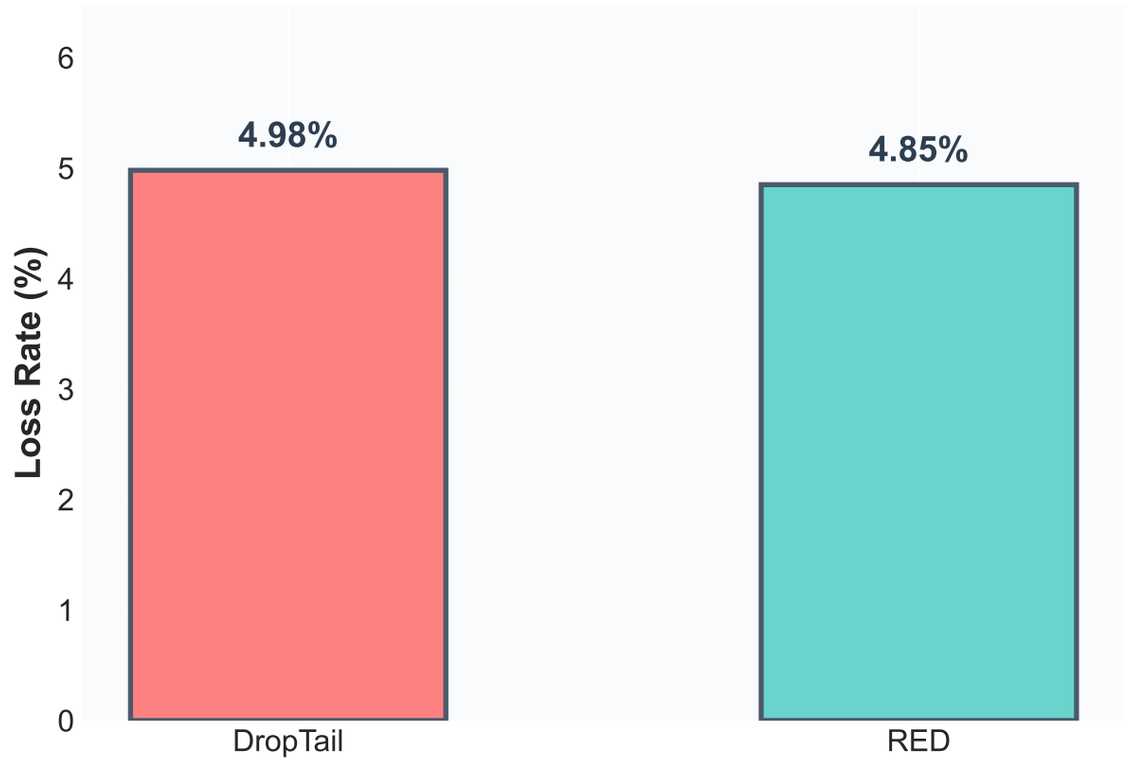


PERFORMANCE COMPARISON

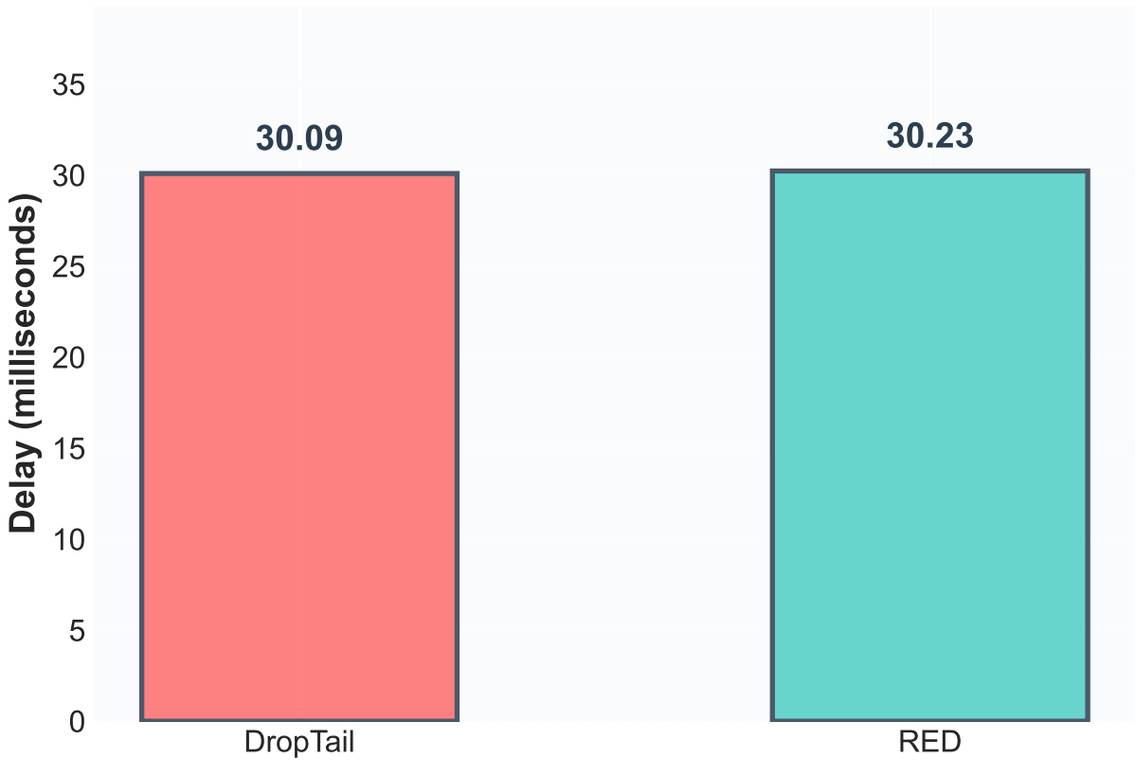
Throughput Comparison



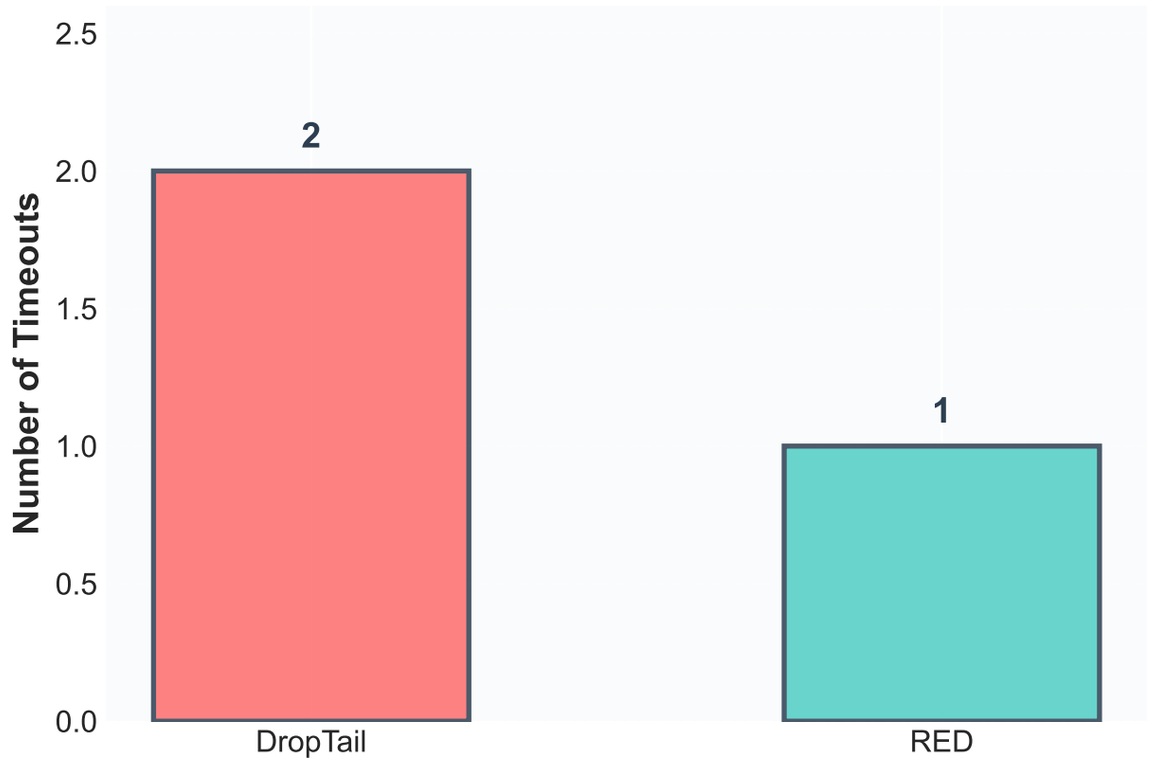
Packet Loss Rate



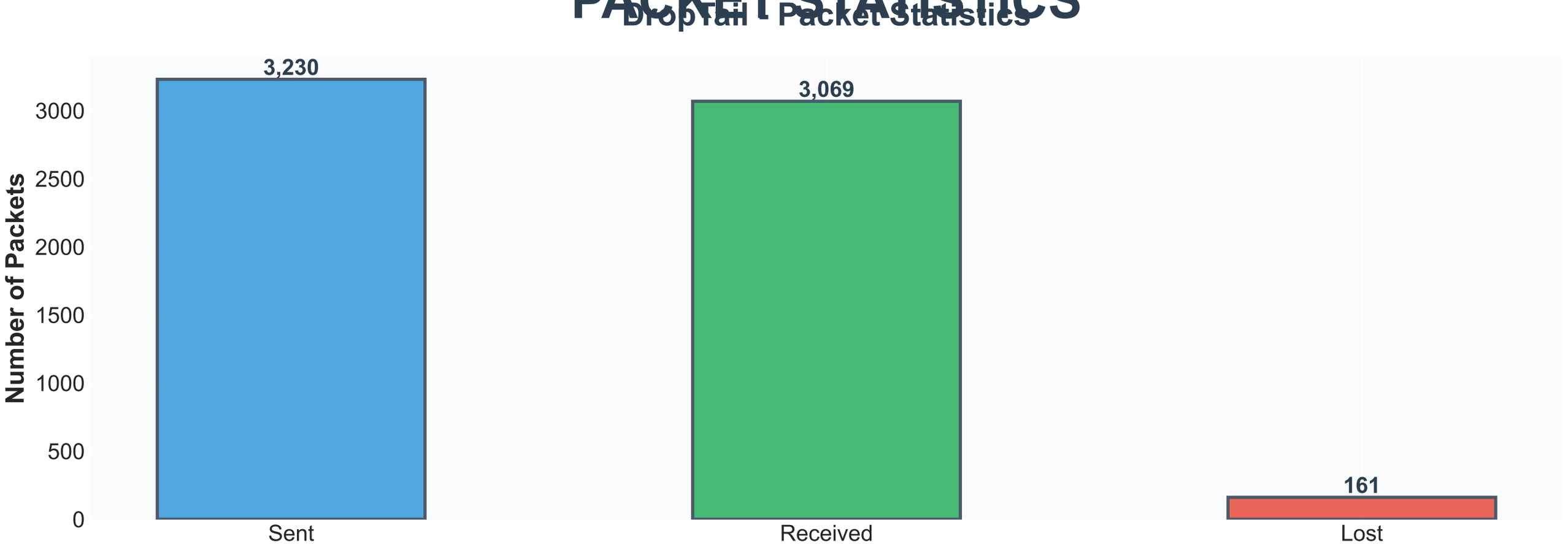
Average Delay

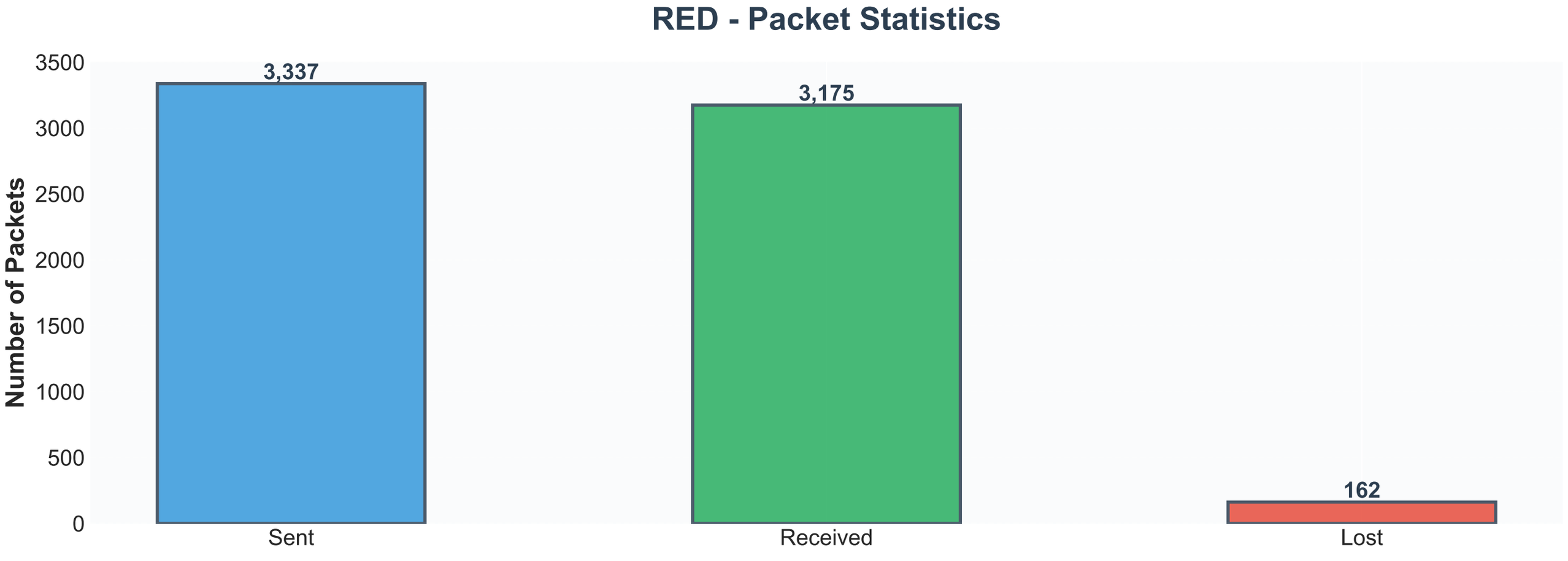


Timeout Events



PACKET STATISTICS





PERFORMANCE SUMMARY

FINAL RECOMMENDATION

Winners:

□□ Lower Delay: DropTail

□ Lower Loss: RED

Choose DropTail When:

- Simplicity and ease of implementation are top priorities
- CPU and memory resources are limited
- Network load is light to moderate
- Basic queue management is sufficient
- Low maintenance overhead is needed

Choose RED When:

- Minimizing latency is critical for applications
- Handling high traffic with multiple concurrent flows
- Preventing global synchronization is important
- Better fairness among flows is required
- Advanced congestion control is beneficial