

DESIGN AND EVALUATION OF A CUSTOM IOT TELEMETRY PROTOCOL

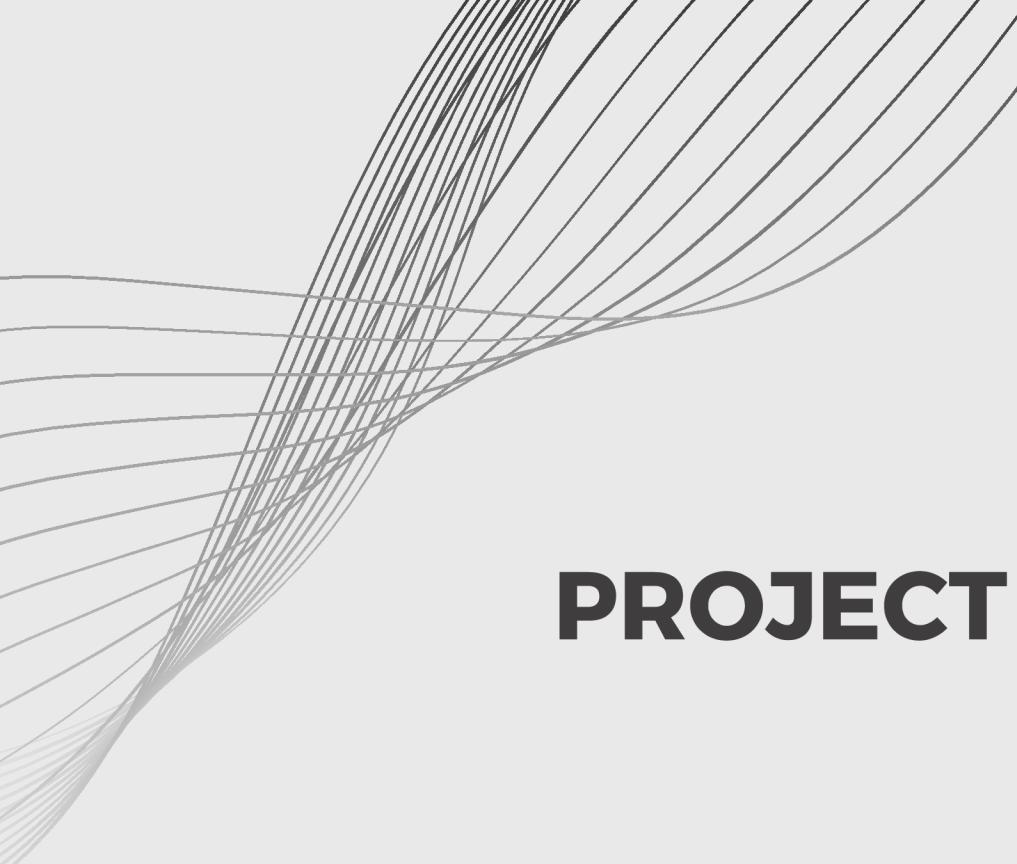
Team 18

| | |
|----------------------------------|----------------|
| <i>feras ahmed Mostafa</i> | <i>23P0304</i> |
| <i>Ahmed Sadek Mubarak</i> | <i>23P0140</i> |
| <i>Abdulrahman Mustafa Sayed</i> | <i>23P0226</i> |
| <i>Ahmed Mohamed elsayed</i> | <i>23P0035</i> |
| <i>Ahmed hesham Mohamed</i> | <i>23p0167</i> |
| <i>Kareem nasrat abdelsattar</i> | <i>1990002</i> |

MOTIVATION & PROBLEM STATEMENT

- Rapid growth of IoT systems with constrained devices
- Telemetry applications require:
 - Low overhead
 - Predictable timing
 - Robustness to network impairments
- Existing protocols may introduce unnecessary complexity

Goal: Evaluate whether a lightweight custom protocol improves telemetry performance



PROJECT OBJECTIVES

- Design a lightweight IoT telemetry protocol
- Implement sender and receiver over UDP
- Evaluate performance under:
 - Baseline conditions
 - Network jitter
 - Packet loss
- Compare behavior against a baseline implementation

SYSTEM ARCHITECTURE & PROTOCOL DESIGN

- Sender transmits telemetry every 1 second
- Receiver logs arrival time and processing duration
- UDP used to minimize transport overhead

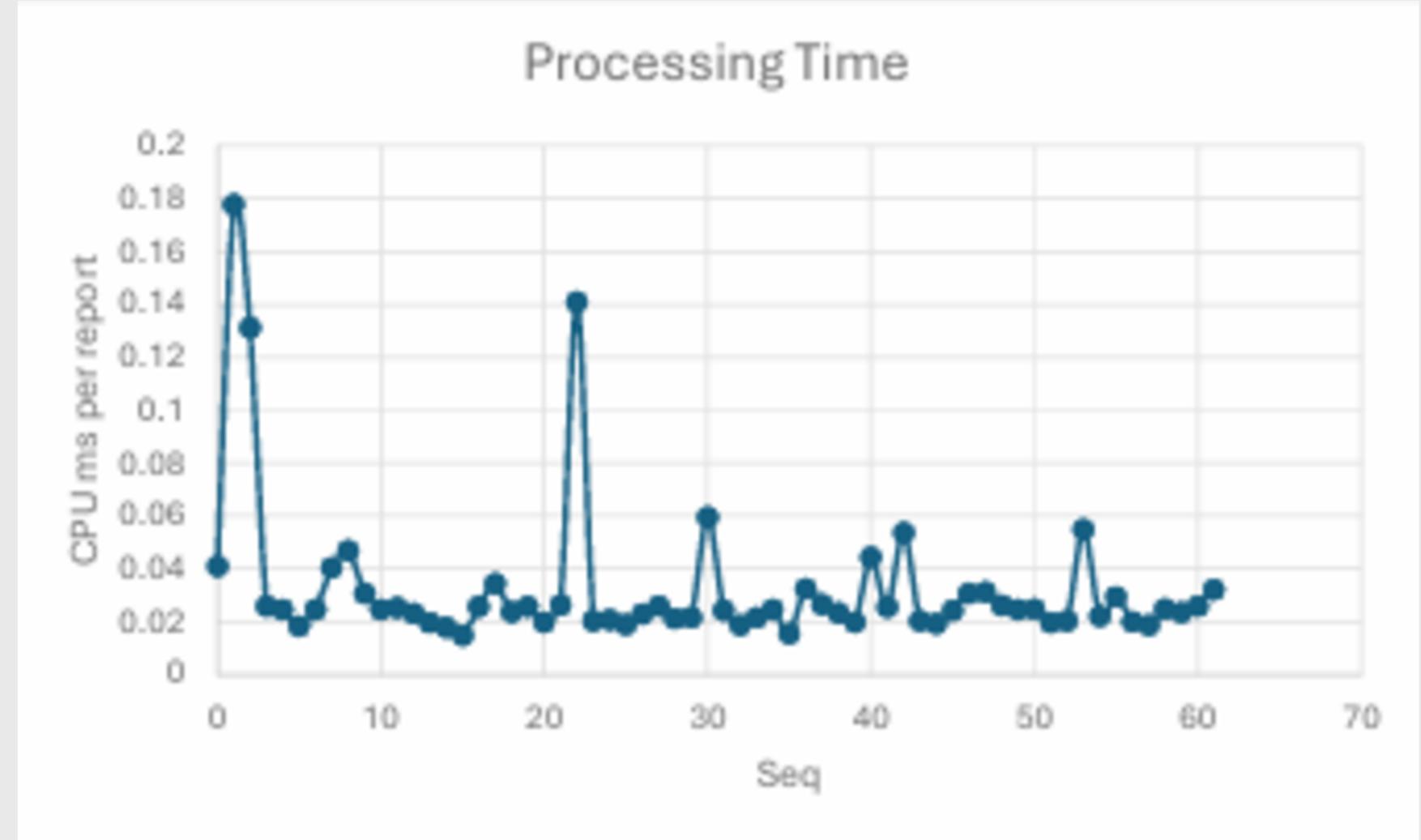
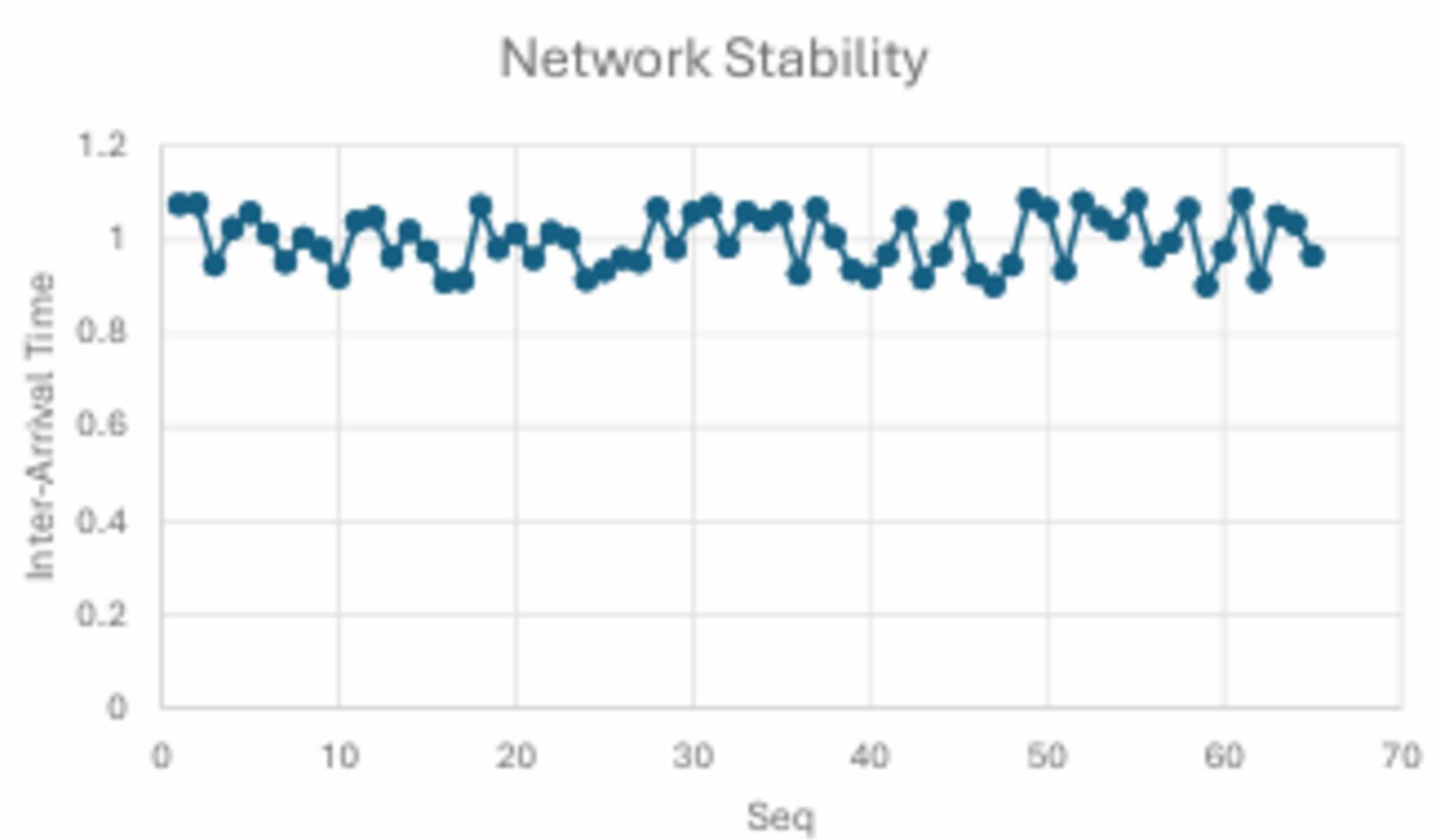
Protocol fields:

- Sequence number
- Timestamp
- Telemetry payload

EXPERIMENTAL SETUP

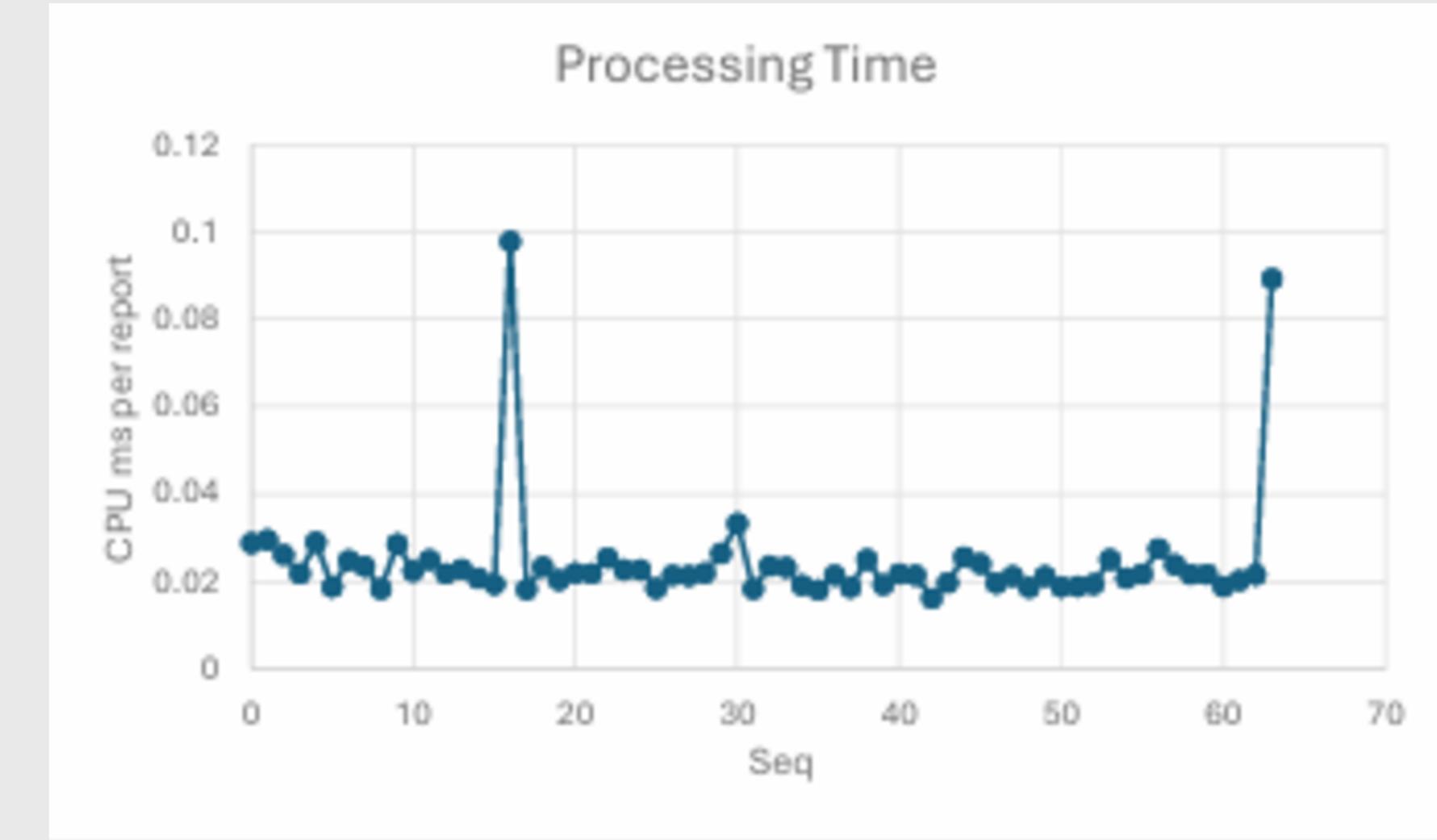
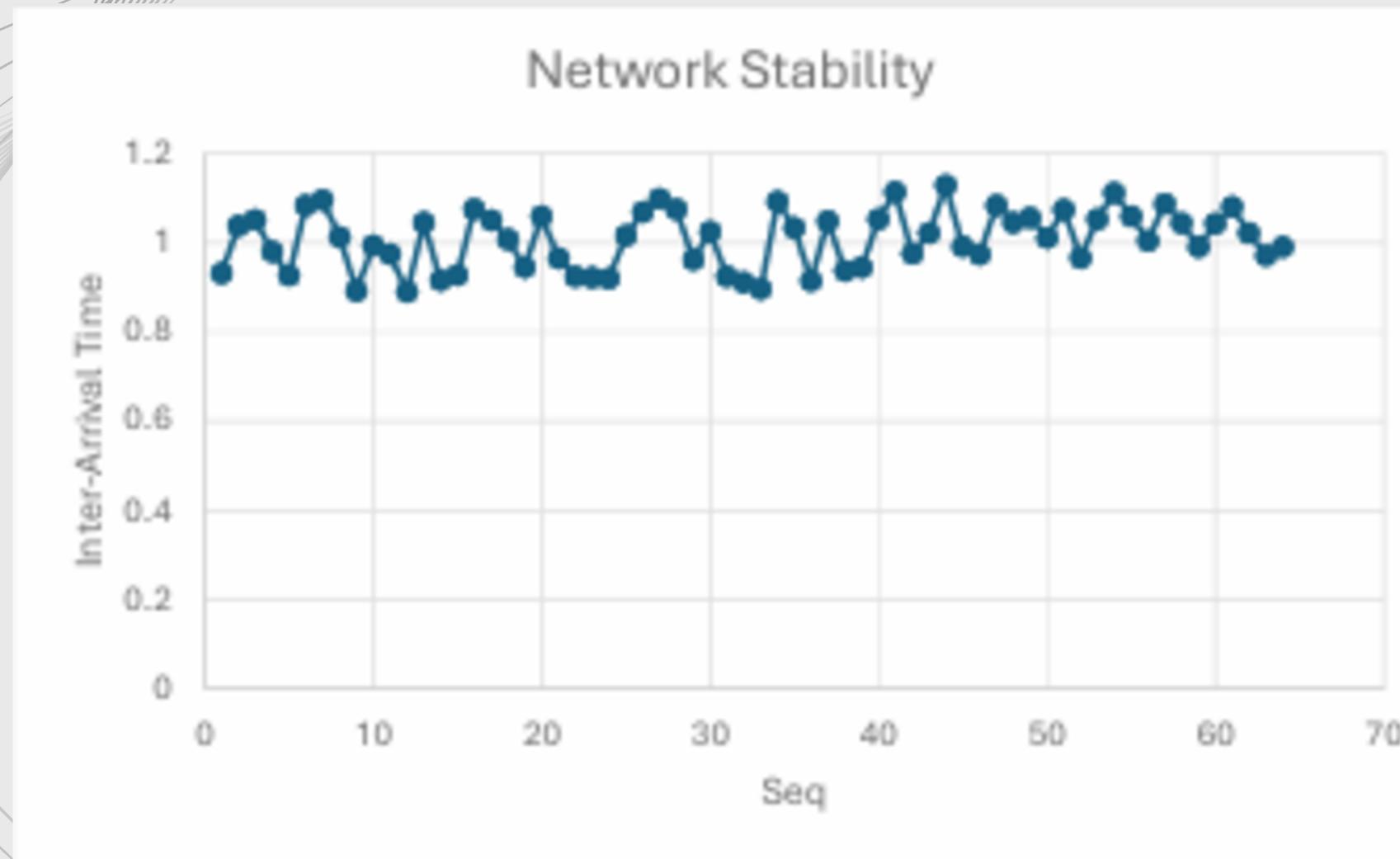
- Fixed transmission interval: 1 second
- Three experiment scenarios:
 - Baseline (no impairment)
 - Jitter
 - Packet loss
- Metrics collected:
 - Network stability
 - Processing time
- PCAP and CSV logs used for analysis

BASELINE RESULTS



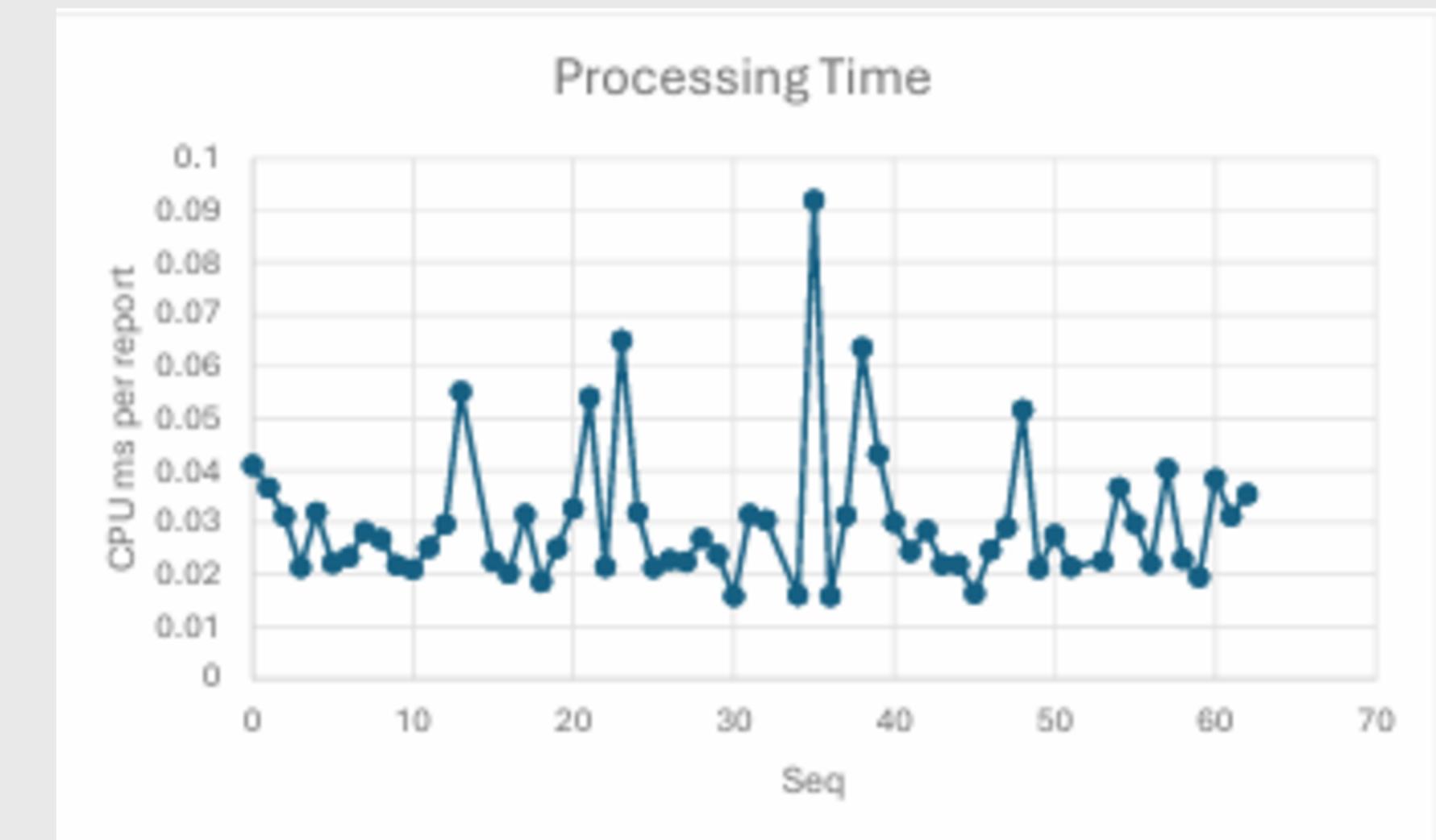
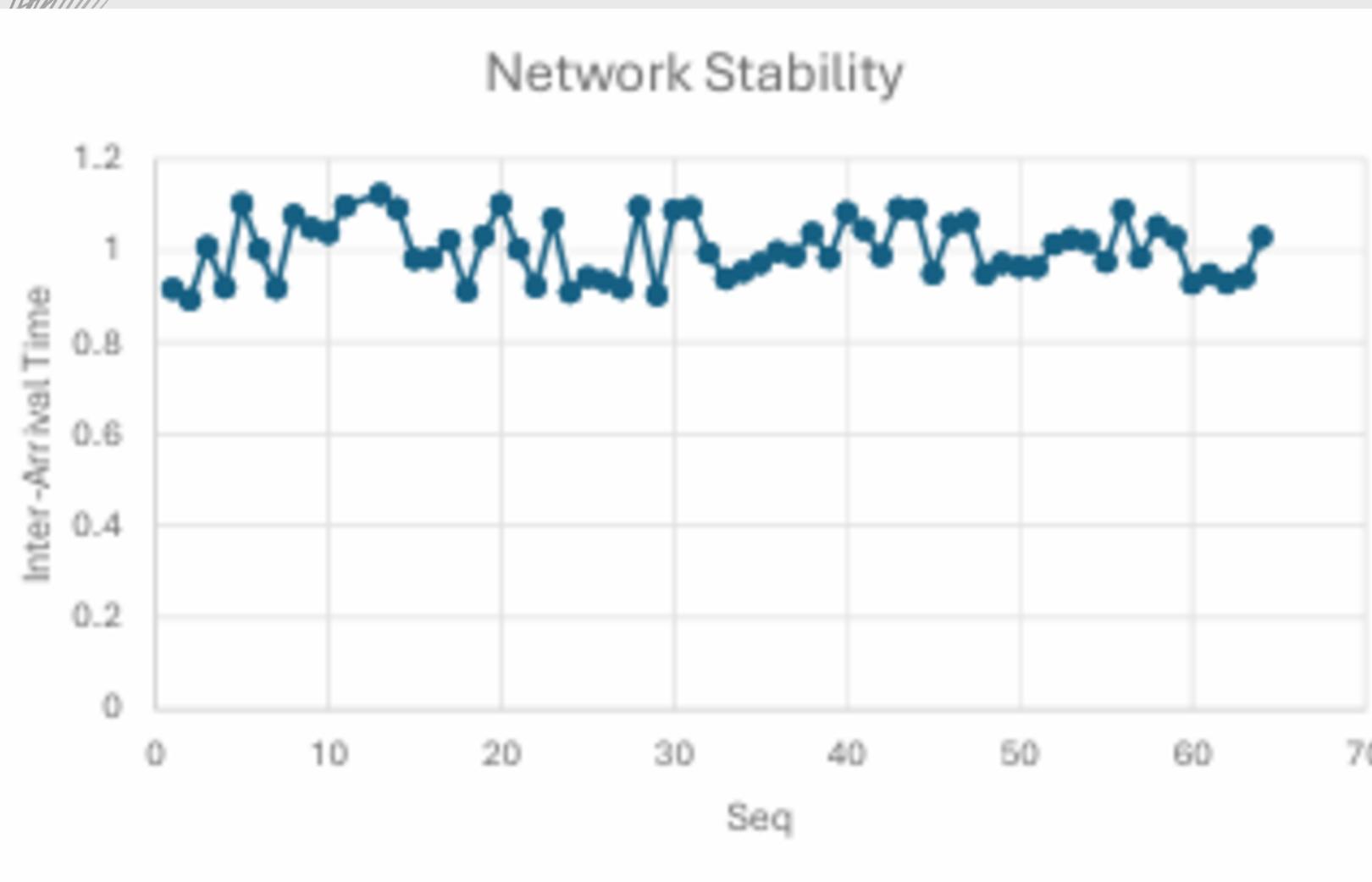
- Stable packet arrival patterns
- Consistent processing time
- Serves as reference for comparison

JITTER RESULTS



- Increased variability in packet arrival
- No packet loss, but reduced stability
- Processing time fluctuates due to irregular arrivals

PACKET LOSS RESULTS



- Missing packets cause visible gaps
- Highest impact on stability
- Increased processing overhead for loss handling

COMPARISON & KEY OBSERVATIONS

- Baseline: stable and predictable
- Jitter: affects timing predictability
- Packet loss: most severe impact on reliability

Key insight: Lightweight protocol design improves observability and robustness for telemetry

LIMITATIONS & CONCLUSION

Limitations:

- Controlled environment only
- No security mechanisms
- Scalability not evaluated

Conclusion:

- Custom protocol performs well under baseline conditions
- Network impairments significantly affect telemetry systems
- Packet loss is more damaging than jitter



THANK YOU