THE CASE FOR FEC-BASED RELIABLE MULTICAST IN WIRELESS MESH NETWORKS

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Plan

- Problematic
- Characteristics of wireless networks
- Evaluation metrics
- Description, Simulation & Results for each protocol
  - ARQ
  - FEC
  - NP
  - RMDP
- Conclusion
- Future work and Research
- References

Problematic

- How to assured a reliable multicast protocol in wireless mesh networks????

Wireless vs Wired Networks

- Reason of losses
- Layer of broadcast
- Asymmetry of links
- Bandwidth
- Hierarchy of topology

Evaluation Metrics

- Average Packet Delivery Ratio (PDR)
- Average Throughput
- Efficiency

ARQ Automatic Repeat reQuest

Mechanism

- Receiver initiated
- Detecting loss → Request packet → Repair packet
- Request/Repair packets are multicasts
- Suppression mechanism
- Max. 5 requests of same packet

Results

- PDR: very low
- Throughput: very low
- Burst losses

Conclusion

- Scalability (p(r,p)=1-(1-p)^r) X
- Bidirectional links X
- Control overhead (rp) X

FEC Forward Error Detection

Mechanism

- packets → Encoder → n packets
- n > k
- (n,k)FEC
- Reception any k packets → Complete Reconstruction
- Reed Solomon code RS

Results

- PDR 100%
- Throughput: acceptable
- Efficient: very low
- (127,32)RS the best

Conclusion

- Scalability √
- Eliminate feedback channel √
- Efficient X

14

NP

Mechanism

- Hybrid
- File divided into TG (Transmission Group)
- (n,k)RS for each TG
- Sender:
  - k packets of TGi→POLL(i,k)→packets of TGi+1
- Receiver: POLL(i,k) → NACK(i,l)
- Sender:
  - packets of TGm… NACK(i,l) → l packets of TGi → POLL(i,l) → packets of TGm

Results

- (255,32)RS
- NP : PDR acceptable
- Np_opt : PDR → 100%
- Throughput : acceptable
- Efficient : very low

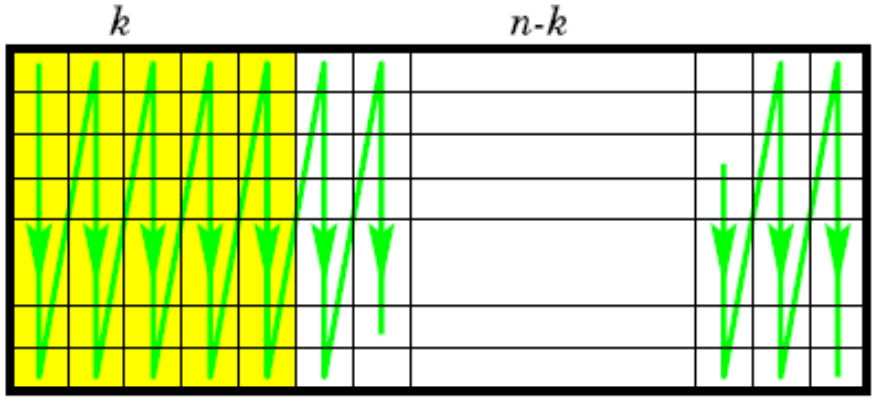
Conclusion

- Any new bonus X
- Immediate response X
- Future Response ?????

RMDP

Mechanism

- Hybrid
- File divided into TG (Transmission Group)
- (n,k)RS for each TG
- Parameters: f, D, √, Cs, Cr, Pi
- Sender:
  - Initialization: Cs ← 0; i ← 0;
  - Receive: R[f,Cr]; Cs ← max(Cs, k-Cr)
  - Send: S[f,k,Cs,i,Pi]; Cs ← Cs – 1; i ← mod(i + 1);



- Receiver:
  - Initialization: Cr ← 0
  - Send: R[f,Cr] periodically
  - Receive: S[f,k,Cs,i,Pi]; if(Pi ≠duplicate): Cr ← Cr + 1; if (Cr = k) exit;

Results

- (255,32)RS
- PDR 100%
- Throughput: acceptable
- Efficient: acceptable
- D=3 the best

Conclusion

- Redundancies packets before & after √
- Future Response √
- The Best √

General Conclusion

- ARQ
  - Poor Performance
  - Immediate Responses (Sender & Receiver)
- FEC
  - PDR 100%
  - Low efficient
- NP
  - Future Response(Receiver)
  - Immediate Response(Sender)
- RMDP
  - 100% PDR
  - Good Efficient
  - Future Response(Sender & Receiver)

Future Work & Research

- RMDP_opt
- Transmission D*k packets of TGi, …
- Receive all R[f,Cr]
- Transmission (D – 1)*(K – Cr)

Bonus:

- Diminution the amount of redundancy
- Diminution the overhead control
- Eliminate the algorithm for calculus the period of R
- Simulation ?????

References

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- [3] J. Nonnenmacher, E. Biersack, and D. Towsley, "Parity-based loss recovery for reliable multicast transmission," in *ACM SIGCOMM*, 1997.

Thanks & Questions ???