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# An **overlay solution** to support **multimedia services** over **sparse MANETs**

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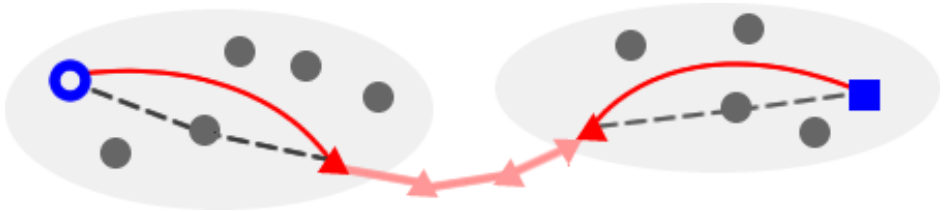
# Motivation

- Emergencies, disasters...
- No infrastructure (destroyed or not deployed)

- Rescue personnel with small devices could deploy a **sparse** MANET...
- ...and send audio/video over it
- **Problems**: disconnections, partitions, scarce resources, shared medium, protocols performance, etc.

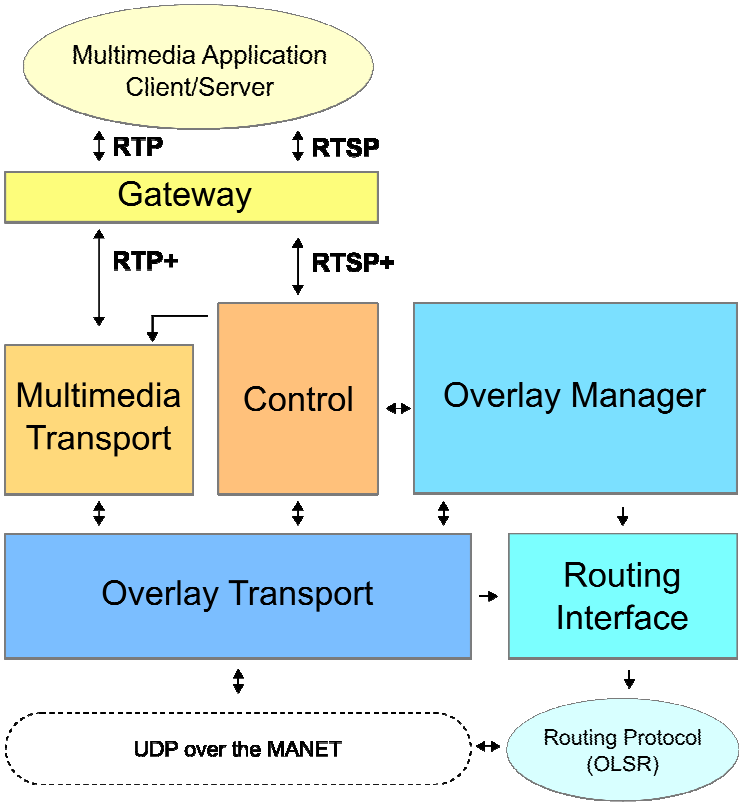
# Design guidelines

- Off-the-self applications: RTSP/RTP
- Use existent transport and routing protocols
  - UDP and OLSR



- Overlay network
  - Resource management
  - Session nodes: store-carry-forward,  add reliability
  - Overlay routes
- Put resources on important content
  - Control messages, important frames…
- Real prototype: emulation and real devices

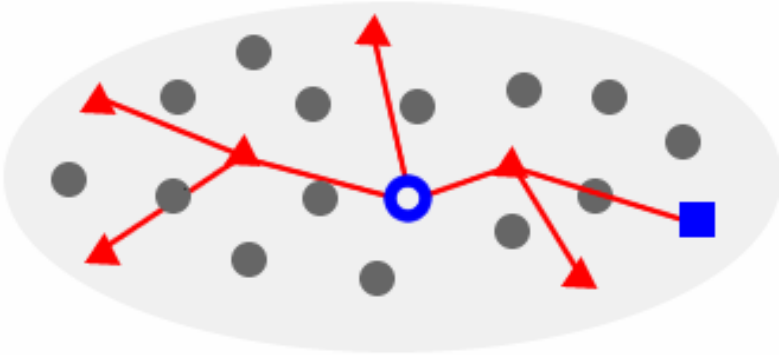
# Architecture



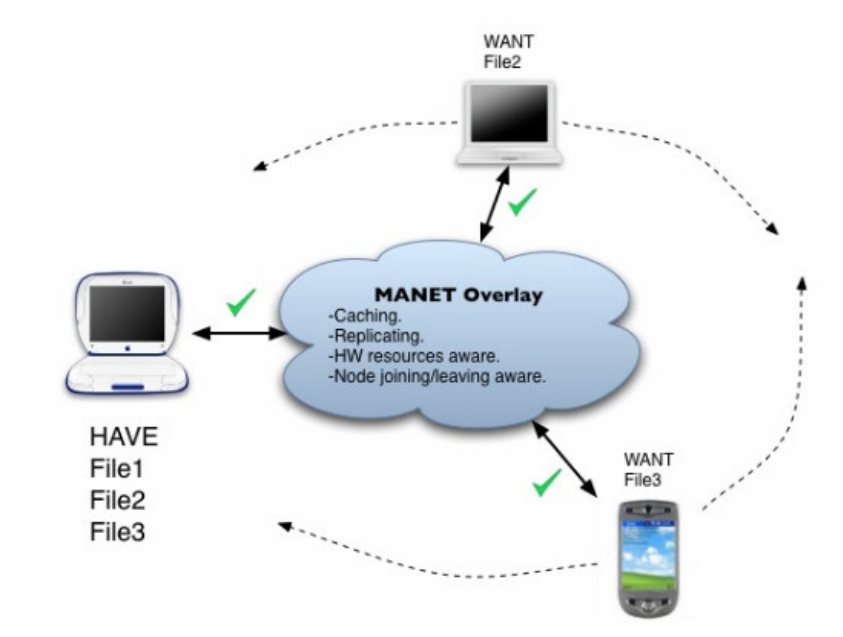

- Middleware architecture
  - Client/Server above
  - Network below
- Division in components
  - Independent evolution
  - Flexibility
- Cross-layer communication

# Overlay transport & routing

- Over UDP
  - Bad performance of TCP over MANETs
- Store-carry-forward
  - Overcome disconnections, partitions…
- Reliability: ACKs, checks connectivity, controls flow
- Priority classes: heterogeneous messages (Control, audio, video, overlay management)
  - Important messages are sent first
- Overlay Routes: efficient message sending to several nodes
  - Use network topology
  - E.g. send a control message



# Overlay network management




- A permanent overlay
  - Share status/resources
  - Global system's view
    - Support many sessions
    - Avoid overloading

- Sessions are established in the Overlay Network
  - **Session nodes** are selected using resources, topology, predictions…

# Multimedia Transport & Control

- Tasks directly related with multimedia
  - Adaptation, caching, proxy...
- Control: inspired in RTSP, but distributed
  - Manages sessions
  - Session nodes also need control
  - Messages: Setup, Play, Pause, Stop...
- Multimedia Transport: inspired in RTP, but distributed
  - Manages streams
  - Assigns priorities to the multimedia content

# Gateway and routing interface

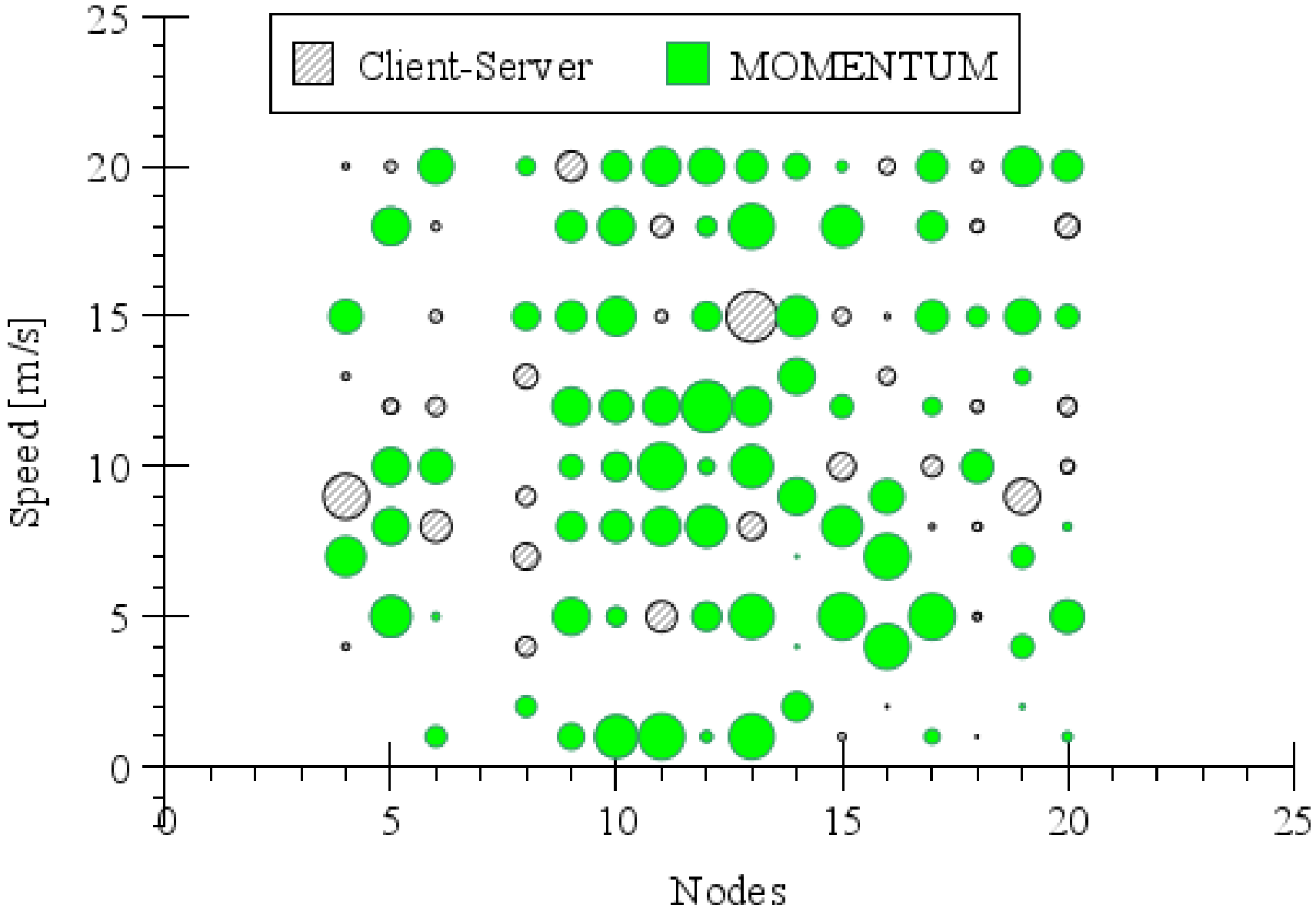
- Gateway
  - shields applications
    - Connected  to Delay tolerant
  - Translate protocols

- Routing Interface
  - Connects with the network routing protocol
  - Extracts topology information
    - Topology, neighbors…
  - Adapts to multiple protocols

# Evaluation

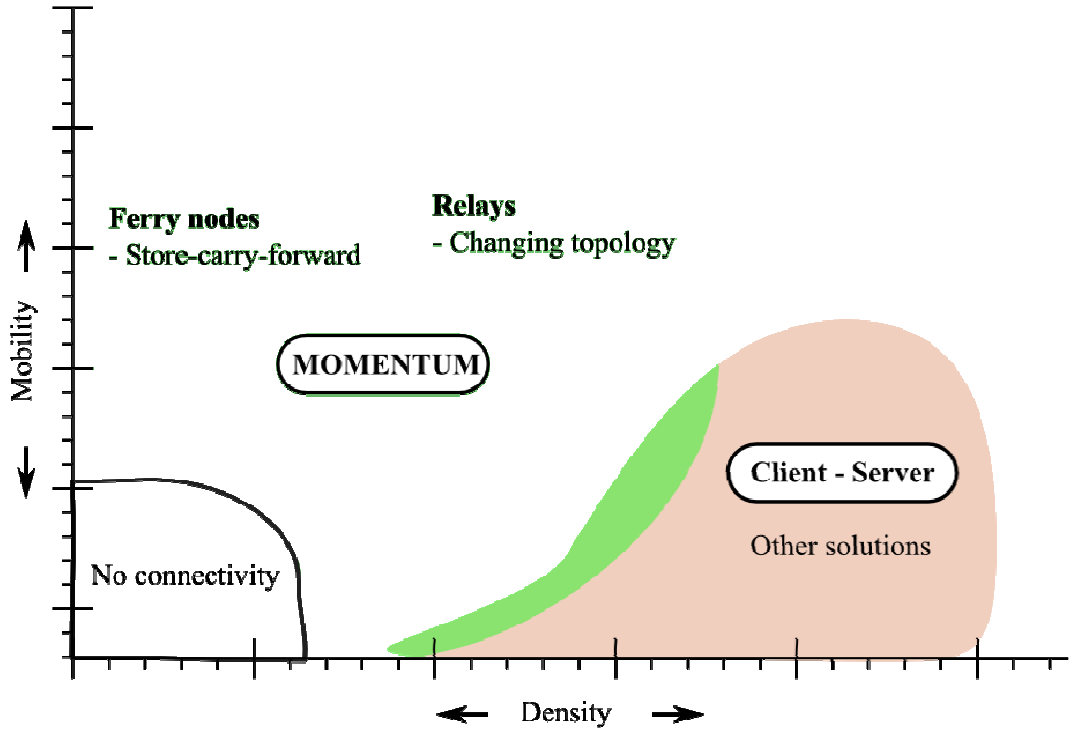
- MOMENTUM: A real prototype with the core ideas
- NEMAN as emulation tool
- Compare it with raw client-server solution
- Scenarios:
  - Live video | 1000 x 600 $m^2$ | 1000 seconds
  - # nodes: 2 to 20 nodes | Range: 250 m
  - Avg. Speed: 0 to 20 m/s | Random Waypoint
  - Without background traffic, collisions, physical layer, etc.

# Results: video received



# Conclusions

- Just with the core ideas, our solution delivers more video on **sparse MANETs**
  - Delay Tolerant ideas can be applied for video distribution
  - An overlay with session nodes helps in the distribution
- The architecture is valid for further stages
- We have detected our weak points and know how to solve them
- Our solution works where no others can



# Future work

- Full implementation and evaluation of our ideas
- Improve some key aspects:
  - Session node selection
  - Multimedia protocols
- Include other routing protocols (reactive)
- Other evaluation environments and real test-beds
- Heterogeneous networks
  - Stream from/to a sparse MANET to/from Internet
- Other network technologies

# Thank you

Questions?