Demo: Distributed Task Execution in Mobile Ad Hoc Networks using Attributed Task Graphs

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Demo #1 : TG Instantiation

All messages shown are encapsulated as TASK_DATA packets processed by TaskApp layer only.

Detection of Disconnections

• Disconnections between instantiated nodes cause tasks to get disrupted
• These disconnections can be detected by periodic soft state HELLO messaging

Demo #2: TG Re-instantiation

• D, A, C are instantiated devices for {pollmgr, pollee, pollee} services respectively, B is the user (initiates poll/ coordinator).
• D (pollmgr / local coordinator) periodically monitors its child instances
• A (pollee) moves out of connectivity range of D (pollmgr) but A* is a device that also offers pollee service
• D (pollmgr) re-instantiates (pollee) with A*; informs B (user)
• B (user) updates its 2-hop logical neighborhood

Demo #3: TG-Patching

• D, A*, C are currently instantiated devices for {pollmgr, pollee, pollee}
• B (user) then discovers D* which offers pollmgr service also (D* is 2 hops away from B)
• B (user) is periodically monitoring its child instance D (pollmgr) and detects a disconnection
• B (user) re-instantiates pollmgr with D* and passes on its 2-hop logical neighborhood information: [A*,C] to D*
• D* (pollmgr) then TG-patches A* and C for {pollee}

Summary of Key Research Contributions

• A novel distributed framework for task based resource discovery and deployment
• Algorithms
  – Theoretical foundations: computational complexity issues in embedding TGs onto irregular networks (MANETs)
  – New algorithms and protocols for discovery/selection of devices in the network while obeying the TG structure/attributes
  – Approximation bounds for the heuristic algorithms
  – Techniques for efficient adaptation of distributed application / task to device mobility in the MANET
• Performance Evaluation
  – Metrics for analyzing performance of the above protocols
  – Performance evaluation by extensive simulation in ns-2
  – Development of a proof-of-concept prototype in a laboratory environment on off-the-shelf hardware
• Scalability Issues
  – Service composition using hierarchical task graphs
  – Focus: reuse of service instances that have been composed before by other users
• Future Work: Extending TG concepts to other application scenarios

Selected Publications


ACM MOBICOM 2003, Research Demos Session