

Taxonomy for P2P Group Management Solutions

draft-kassinen-p2psip-group-taxonomy-00

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77th IETF Meeting

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- Based on a literature review of more than 50 publications about P2P group management solutions
- Taxonomy includes 6 examples representing the versatility of proposed solutions
 - Solution 1: "HIERAS: A DHT Based Hierarchical P2P Routing Algorithm"
 - Solution 2: "Trust-Based Community Formation in Peer-to-Peer File Sharing Networks"
 - Solution 3: "Service-Driven Group Management for Mobile P2P Services"
 - Solution 4: "A Utility-Aware Middleware Architecture for Decentralized Group Communication Applications"
 - Solution 5: "PP-COSE: A P2P Community Search Scheme" .
 - Solution 6: "An Interest Group Model for Content Location in Peer-to-Peer Systems"

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- Four High-Level Properties
 - **Motivation:** The reason why groups are formed.
 - **Criteria:** The criteria that are used for selecting nodes to a specific group.
 - **Methods:** The algorithms or other methods for observing and evaluating the criteria, leading to the selection of nodes to a specific group.
 - **Realization:** The kind of underlying P2P network that is used as a basis for the solution and enables the running of the specified methods.
- Various **categories** under these four properties

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- Categories of Motivation

- **Search Efficiency:** The efficiency of routing in the P2P network or (a more specific case) the efficiency of resource searching.
- **Group Communication:** The ability to communicate in a suitable group (of human users).
- **Service Provisioning:** Publishing and discovery of services on top of a P2P system.
- **Knowledge Sharing and Collaboration:** The ability to share important information and collaborate in the context of specific tasks, often in a professional setting.
- **Trust, Security and Privacy Management:** Enhance the trust, security, and/or privacy in P2P operations.

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- Categories of Criteria

- **Common Interests:** The members (humans) of a community share some common interests, related to e.g. content.
- **Node Capability:** The terminal devices' capabilities such as CPU power or memory.
- **Level of Trust:** How strong is the trust between the users (or nodes).
- **Social and Organizational Memberships:** Membership in a social group or organization.
- **Locality:**
 - **Physical:** How near the nodes are to each other, in terms of network latency or other physical network-related metric.
 - **Logical:** How near the nodes are to each other, in terms of hop-count or other logical network-related metric.
 - **Geographical:** How near the nodes are to each other, in terms of geographical distance.

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- Categories of Realization

- **Single Overlay:** The group or groups are created within a single overlay; the entire system contains only one overlay network.

- **Structured (DHT):** The organization and operation of the overlay is based on mathematical rules, usually on Distributed Hash Tables (DHT).

- **Unstructured:** The organization and operation of the overlay is based on some "less exact" rules.

- + Pure: The system is completely flat (example: Gnutella 0.4), and each node has equal responsibilities.

- + Hierarchical: There is some structuring, such as edge-peer vs. super-peer distinction (example: JXTA).

- **Multi-overlay:** The group or groups are created using multiple overlays; the entire system contains multiple overlay networks that can be either structured, unstructured, or both. Multi-overlay-based solutions can be further classified to:

- **Vertical:** A vertical system is usually described as a tree, where every layer or leaf is an independent DHT overlay network

- **Horizontal:** All the leaf overlays are connected to a single common DHT overlay that is responsible for optimizing the routing in the whole network

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- Using the Taxonomy for the Classification, example
- **Solution 1** has these **properties**
 - **Motivation:** Search Efficiency
 - **Criteria:** Locality
 - **Methods:** Analysis of Node and Network Performance
 - **Realization:** Multi-overlay, DHT
- Etc.!

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- Next steps
 - Feedback for the scope and extent
 - is it overblown, should it be simplified?
 - for example, less example solutions?
 - less categories?
 - are the naming conventions clear enough?
 - Discussion on the draft on the mailing list
 - need of this type of taxonomy as Informational RFC?
 - need to update solution/taxonomy space as other solutions emerge?
 - need for some feasibility/performance evaluation?

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- Thank you!
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