ICC Inventing Communities of Communications: Conviviality in a Digital City

3th MINE Research Day

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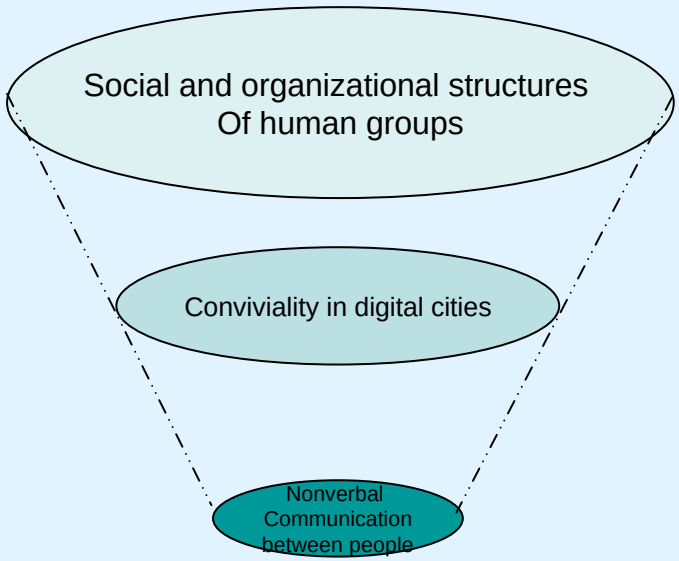
Introduction

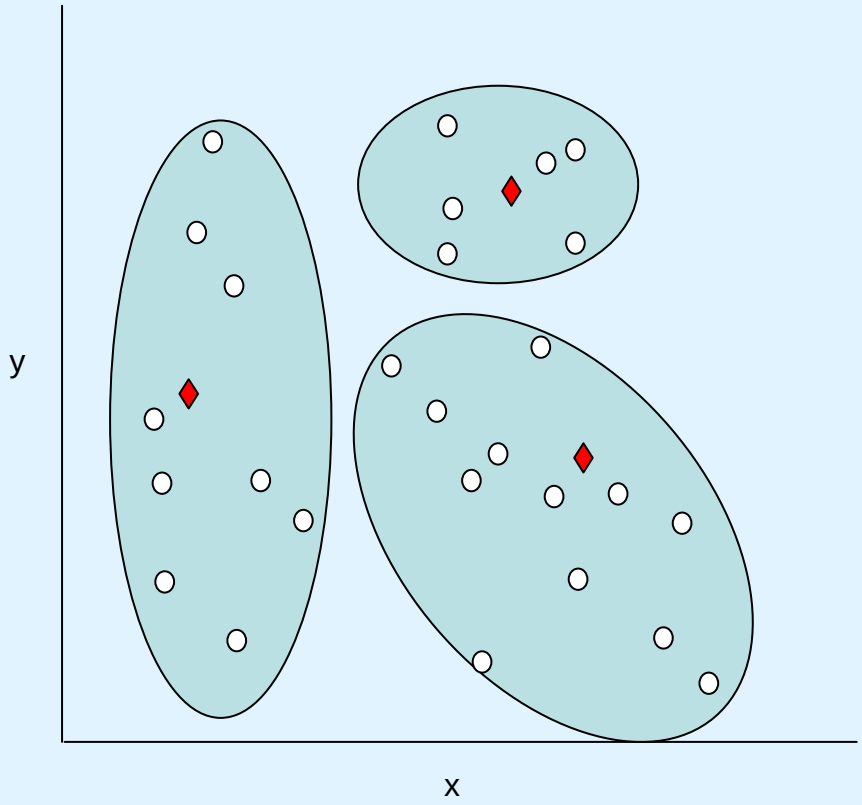
- People have needs and to fulfill these needs they get together with other people.
  - Organizations and services (social security, information centers) communities (scientific, gaming), etc.
- Detecting these processes would give the opportunity to intervene.
  - For example in creating new services and optimizing existing ones.

ICC Update:
Communications between Communities



- Macro level:
  - Model the dynamic and temporal process of human organizations to communicate and interact.
- Micro level:
  - Model nonverbal communication systems between people.
- In-between:
  - Model a convivial digital city (e-City Luxembourg) e.g. a web space where citizens want to come and stay.

Approaches Considered and Rejected:
Modeling Conviviality with Clustering techniques



1. ***Define the parameters*** *that characterize conviviality (relevance, security, etc.)*
2. ***Give quantifying or qualifying values*** *to the selected parameters (relevance [1…10], color [Red, Green, Blue].*
3. *Develop and/or apply formulas to* ***find the centers of classes*** *by evaluating how close (dissimilarity, frequency, etc.) these "points" are to each user profile.*
4. *Find methods to* ***classify all users*** *so that each fits in a group (implementing existing methods or creating new methods).*

- Main objections:
  - Model lacked generality.
  - Problematic characterization of the key concept of conviviality.

Approaches Considered and Rejected:

Modeling Users' Memberships to Groups with Matrices and Graphs

1. *Let m be the number of users, n the number of communities, x a variable such that:*

$$x_{ij} = 1 \;\; if \;\; user\; i \in community\; j$$

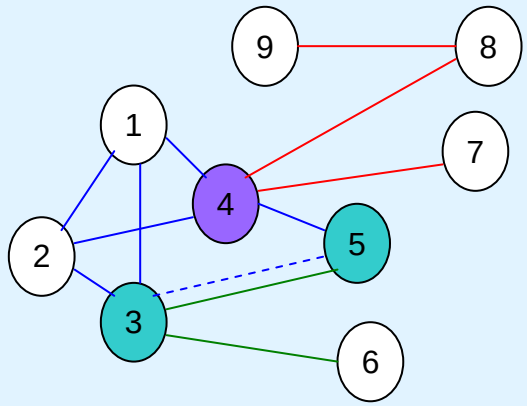
$$0 \;\; otherwise$$

2. *We then can write:* $\sum_{i=1}^{m} x_{ij} = 1; \quad j = 1,...,n;$ *to denote that there is exactly one user in the j-th community.*

3. *And similarly there is at least* α *user(s) in the j-th. community:*

$$\sum_{i=1}^{m} x_{ij} \geq \alpha; \quad j = 1,...,n; \;\; \alpha \in \{0,...,m\}$$

- *Alternatively, communication can be represented by the edges of a graph,* ***users as nodes*** *and communities by sub-graphs.*

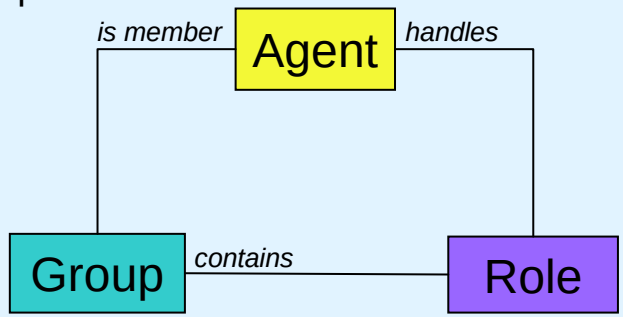


Sub-graph A = {1,2,3,4,5} is defined by blue edges
Sub-graph B = {3,5,6} is defined by green edges
Sub-graph C = {4,7,8,9} is defined by red edges

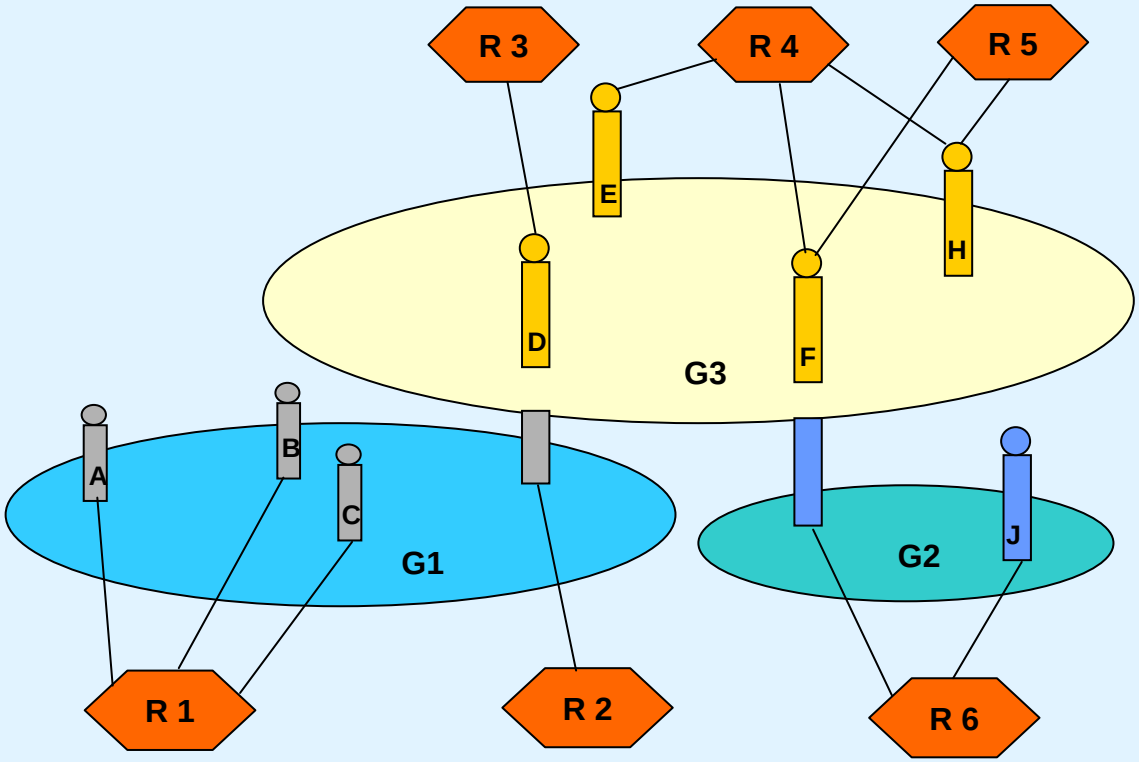
The Agent, Group, Role (AGR) Model

- Proposed in 2004 by Ferber and Gutknecht as the evolution of their Aalaadin model (1998), AGR describes multi-agent systems in an organizational perspective.

- Main characteristic: Its very simple structure-based view of organizations. Three primitives:
  - **Agent**:
    - Active, communicating entity playing roles within groups.
    - No constraints on its mental capabilities.
    - Can only communicate within group.
  - **Group**:
    - Set of agents sharing common characteristics
    - Context for activities
    - Used to partition organizations
  - **Role**:
    - Abstract representation of an agent's functional position in a group.
    - Roles are local to groups and must be requested by an agent



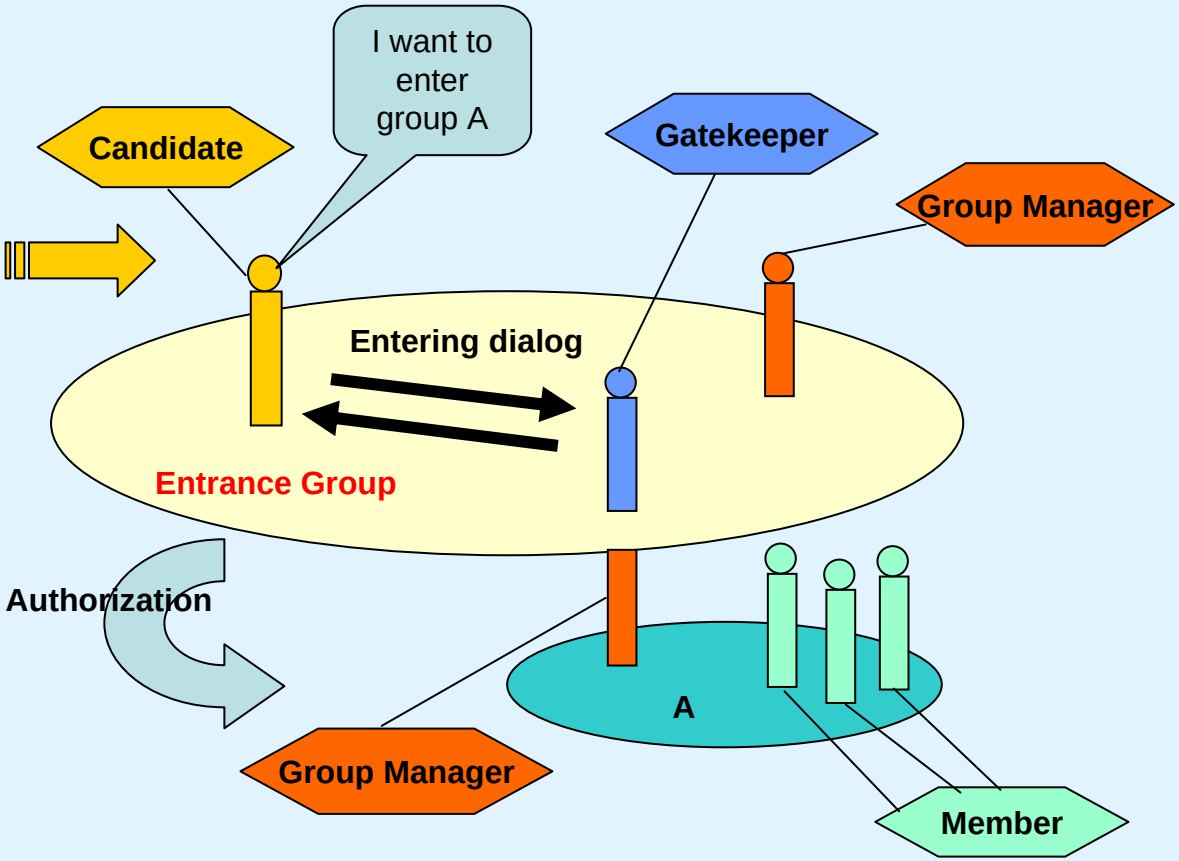
AGR: The “Cheeseboard” Diagram



[Diagram adapted from Ferber & Al.]

- Notation for describing concrete organizations
  - Agent F is a member of both G3 and G2 and
  - Playing roles R4 and R5 in G2 and R6 in G3

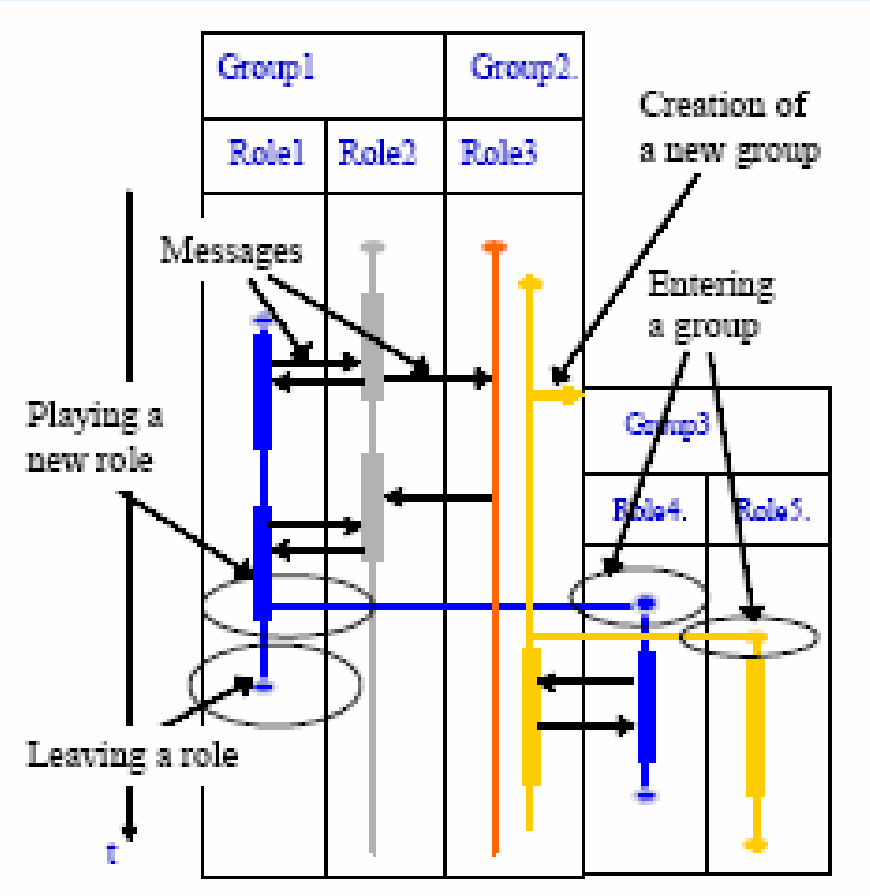
AGR: The “Cheeseboard” Diagram



[Diagram adapted from Ferber & Al.]

- Representation of a group adhesion process
- An entrance group associated to A acts as an “air lock” between group A and its outside
- There is no authorization for A to get candidate role into entrance group
- Gatekeeper checks conformity of candidate to group rules and specs

AGR Organizational sequence diagram



[Ferber & Al.]

AGR Model as it Applies to Digital Cities

User / Agent	Individual (entity) that is active, communicates and functions (has a role) within a group. • Users must have a function (role) • Users can belong to several groups
Function/role	Local within groups • Several users can have the same function • A function must be requested by a user
Communication	Tasks, activities, services, common objects (documents, tools, etc)
Community/group	Set of users that share common characteristics. • Users may communicate only if they are members of the same group

Next Steps

- Test our model by implementing simple scenarios with MadKit (AGR platform)
  - Ex: In an environment with one group G and a default user/agent D. User A logs into G and:
    - If there is another user B already in G. A sees B and starts a conversation with B (how to get form x) A gets what he/she needs and exits.
    - If there is no one in G, the default user D asks A how it could help, then same as above.
- Potential scenarios for students:
  - Model more complex scenarios combining several groups, roles, users and Conviviality in digital cities, ex: model trust between groups.
- Potential scenarios for collaborations:
  - Model groups in which people are expressed through the knowledge (FAQ) they have on various topics. People interact through their FAQ exchanges (ADAM).
  - Detecting liars or fraudulent users in groups (SANA).

Next Steps

- Write a survey of Organization-Centered Multi-Agent System
- Investigate conferences such as AAMAS, OCMAS, ACM SIGART.
- Visualization course for the fall semester, in collaboration with Michael Hilker .

Review of Activities up to Now

- E-city luxembourg project
  - Kick off meeting April 6, presentation on Digital cities and monthly meetings with e-city and eLuxembourg to review case studies.
  - Goal: Model conviviality for Luxembourg digital city.
- Student supervision: Conny Uhde preparation to diploma thesis from November 11, 2005 until June 6, 2006.
  - Topic: Analyze the situation of users waiting on line (with reasons other that hardware/network)
  - worked performed: User questionnaires and state diagrams.
- Attended CAiSE Conference on Advanced Information Systems Engineering – Trusted Information Systems (June 5-9, Luxembourg)
  - Review of tools and methodologies (web information systems)
  - Sample of problems (workflow, requirements managements, process mining)

Presentations

- “Inventing Communities of Communication: Waiting in the Digital City” 2nd MINE Research Days, March 9, 06
- “Digital Cities: Then, Now & Beyond” presentation to Luxembourg e-City representatives, May 3, 06
- “Inventing Communities of Communication: Digital Cities” Computer Sciences Seminar Series, May 30, 06

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  - Prof. Dr. Catherine Pelachaud, Paris 8 University (Informal advisor) will be giving a talk on Sep.18th at the Luxembourg University.

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