

Learning Networks for Lifelong Learning

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Content

- Background: Learning Networks Programme
- More in detail:
Model and Simulation of a LN:

“Increasing Learner Retention in a Simulated Learning Network using Indirect Social Interaction”
(draft article)

Programme Learning Networks for Lifelong Learning

- Internal OUNL/OTEC programme 2003-2008, with additional external funded projects
- Aim: development of new learning technologies to support lifelong learning
- Major outcome types:
 - models and theories
 - specifications of learning technologies
 - prototypes of new technologies
- Dissimination via: publications, open source channels (sourceforge), specification bodies

Programme

Theme 2: Make & Use Activity Nodes

project project project
project project

Theme 3: Learner Positioning

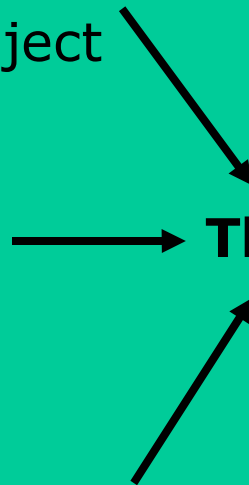
project project project
project

Theme 4: Navigation

project project project
project

Theme 1: Integration

project project
project project



Learning Networks for Lifelong Learning

A learning network is a *group of persons* who *create, share, support* and *study* learning resources ('*units of learning*') in a specific knowledge *domain*.

So, a network in the following sense

A group of persons:

- connected to each other in a **social** sense
- connected to each other in a **technical** sense
- connected to relevant **learning resources**
- connected to each other in order to **learn** from & with each other
(also producing new learning resources)
- ✓ as independent as possible of constraints like:
location, institution, job, time, specific technologies
- ✓ persistent over time to support lifelong learning in a certain field

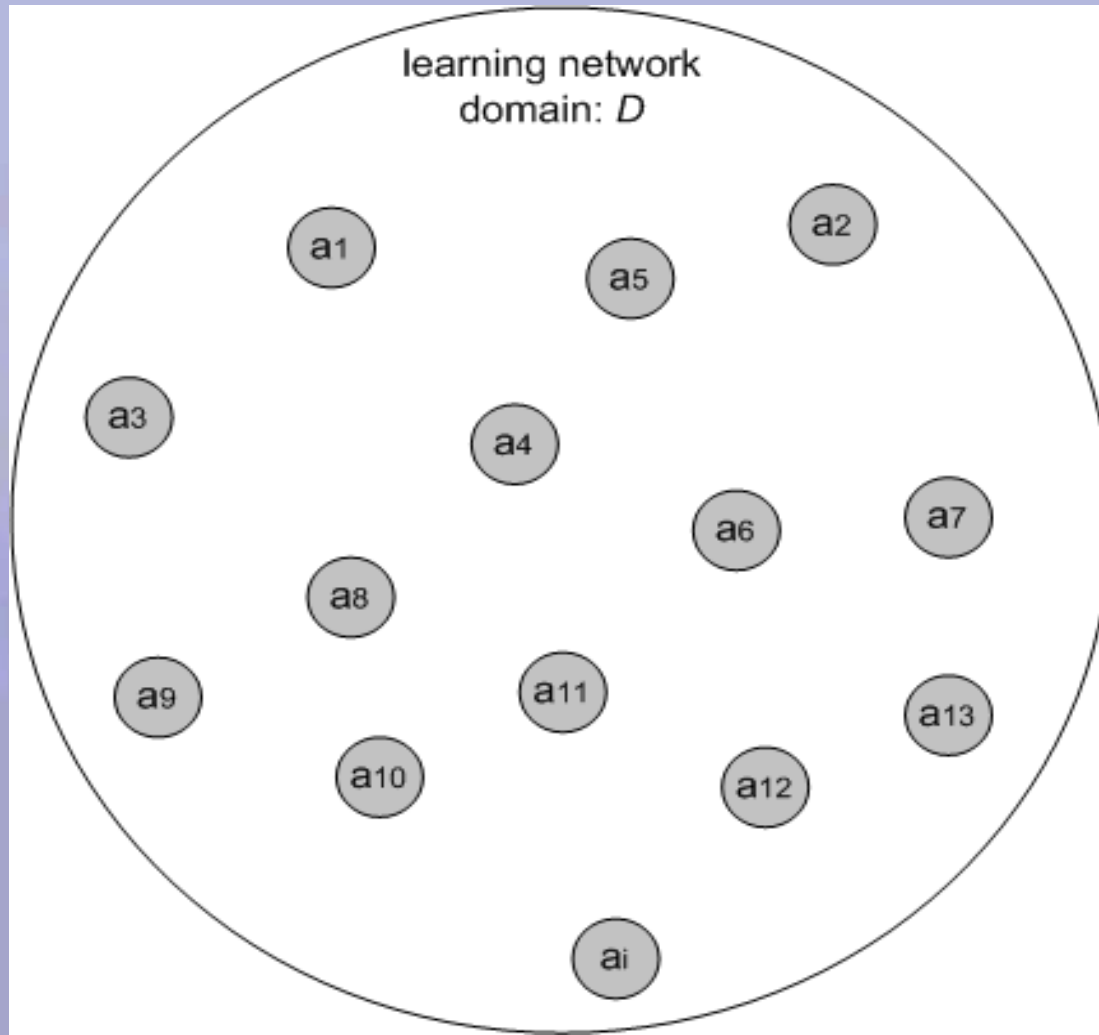
How to realise Learning Networks for Lifelong Learning?

Several views of a Model of a Learning Network

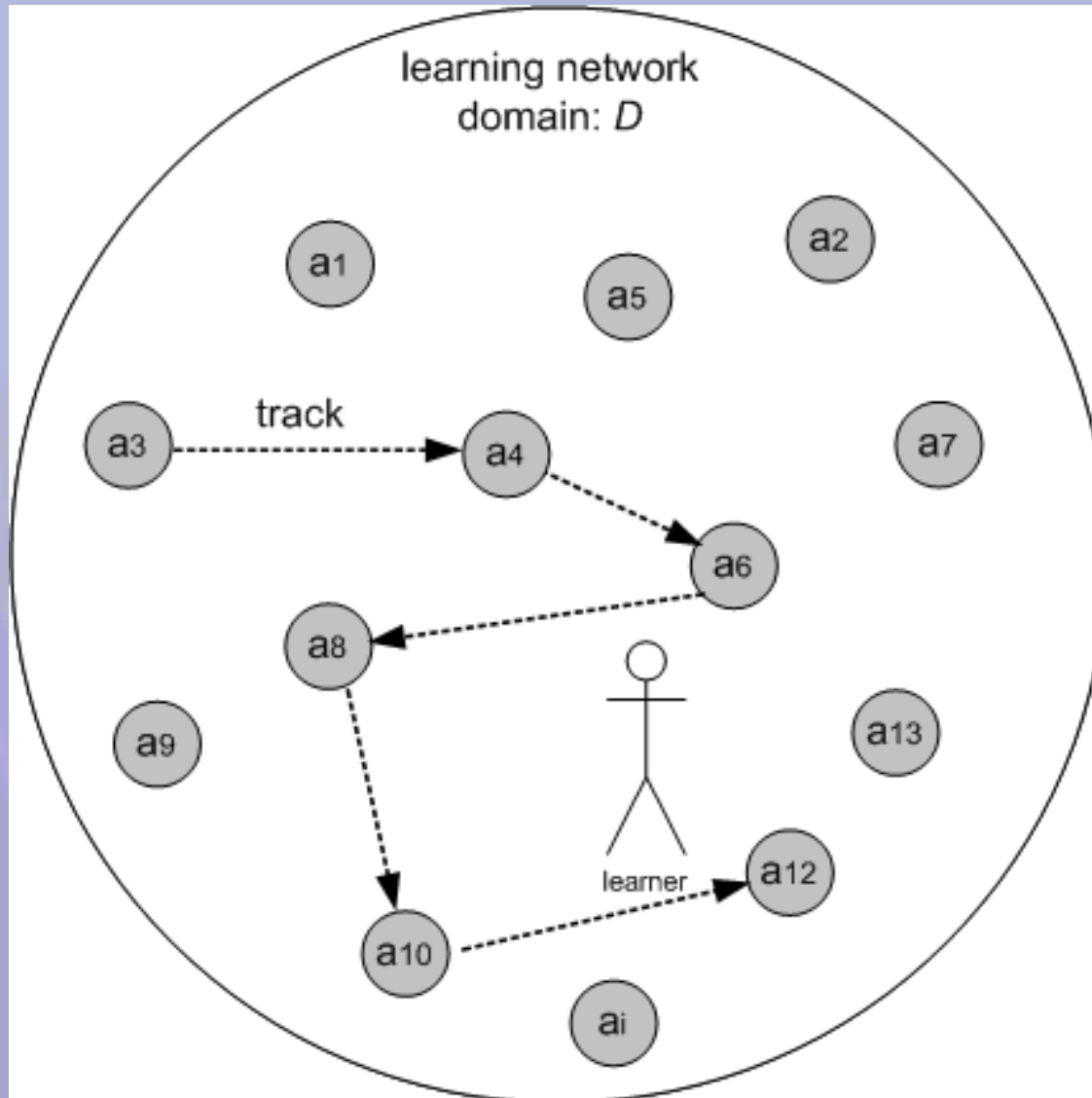
- Learning Network modelled as a Graph
- Use Case Model
- Architectural Model

Graph Representation of a LN

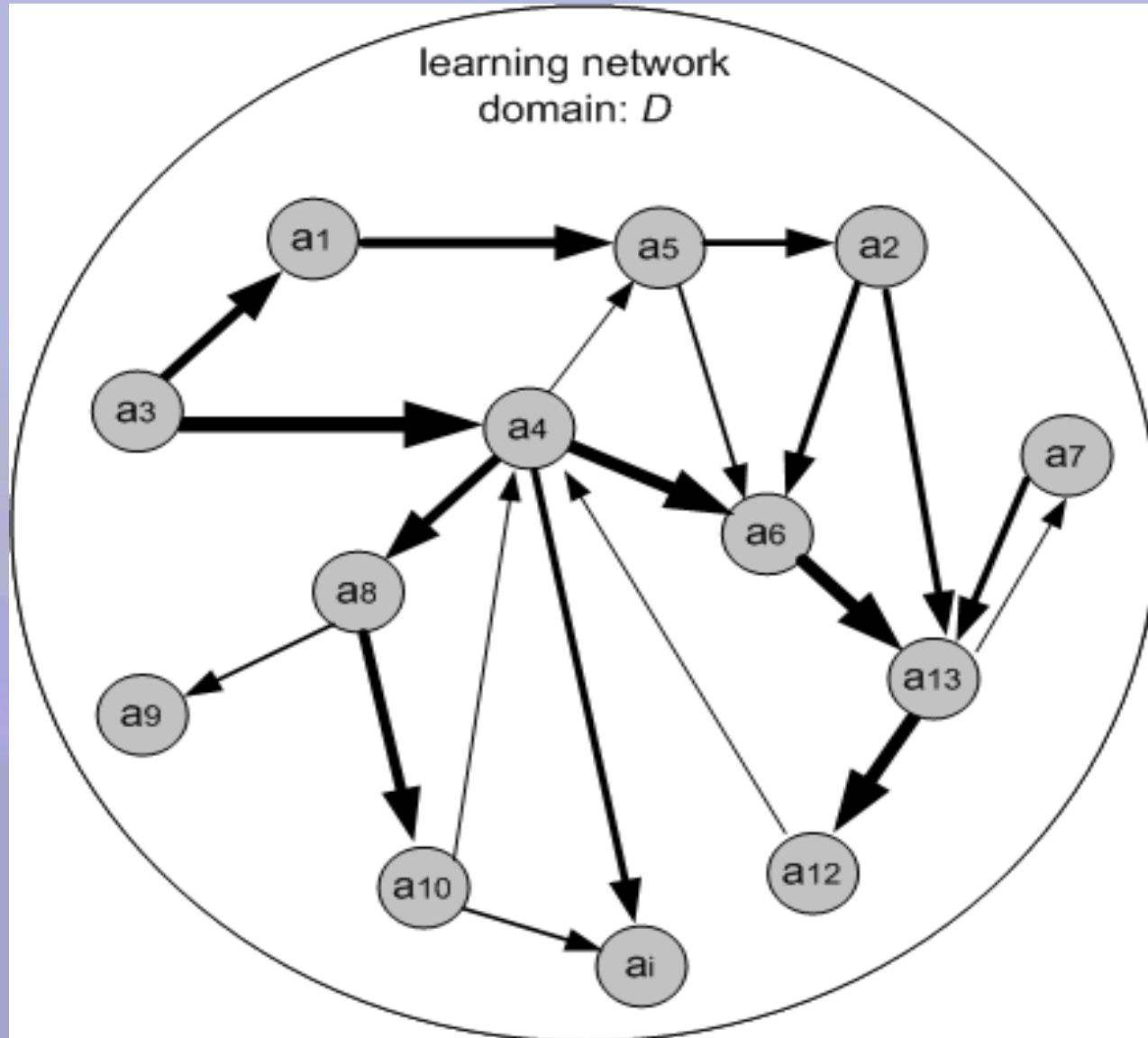
A *learning network* can be represented as a graph of '**activity nodes**' (runs of units of learning) within some knowledge domain



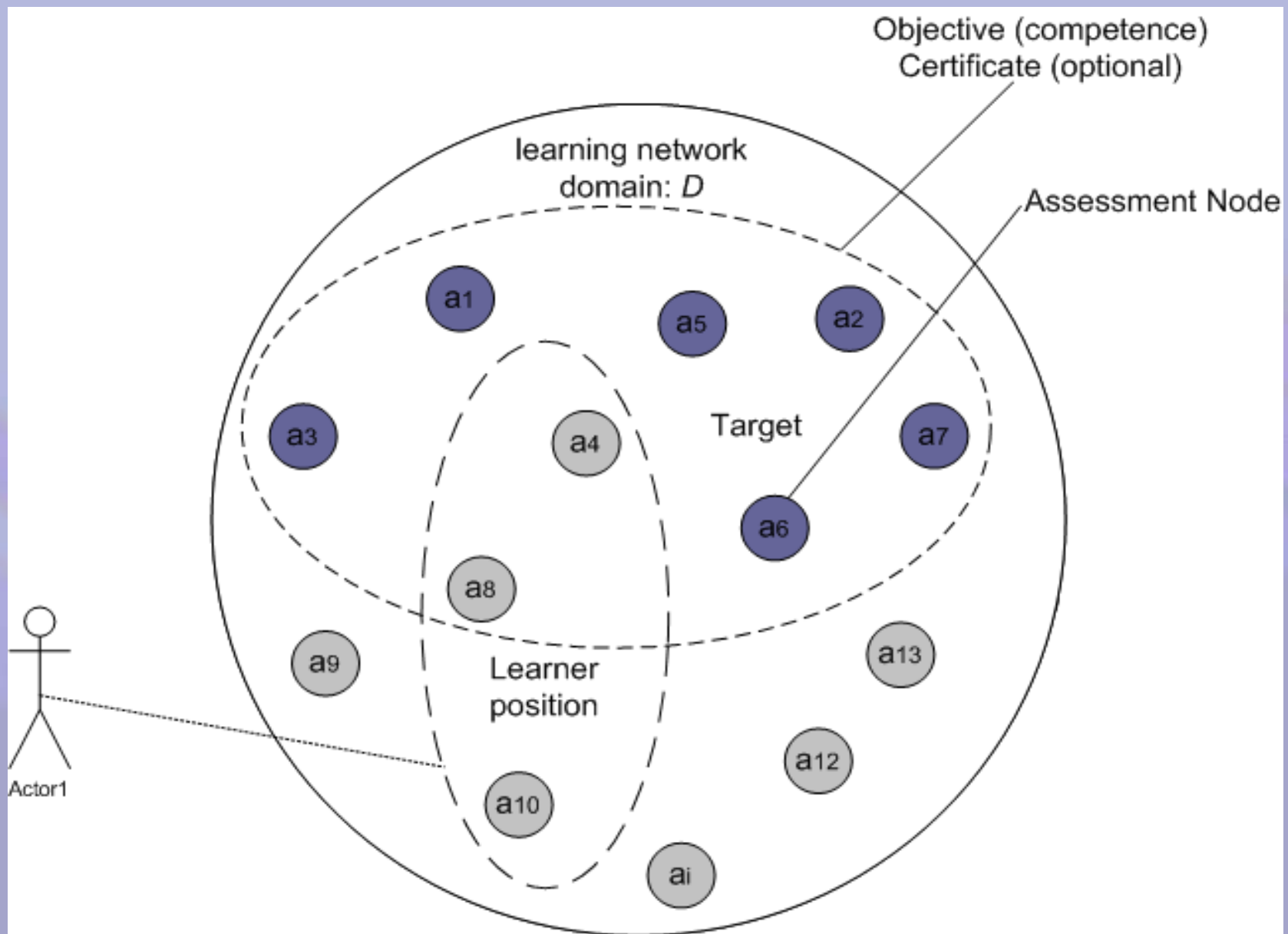
LN Graph with a learner track



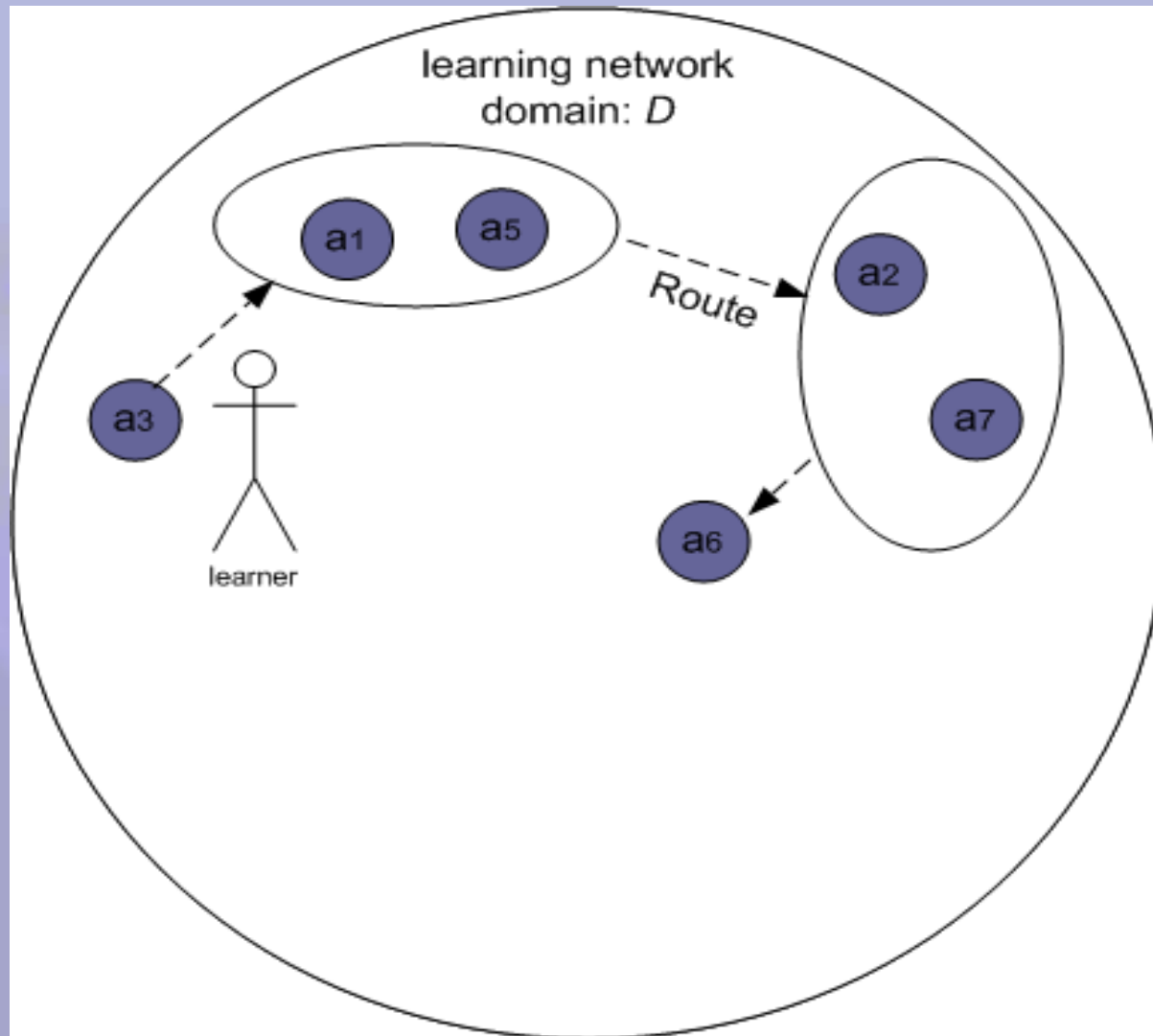
Patterns of Collective Tracks Emerge



Learner Positions and Objectives



Planned Learner Routes ("curriculum")

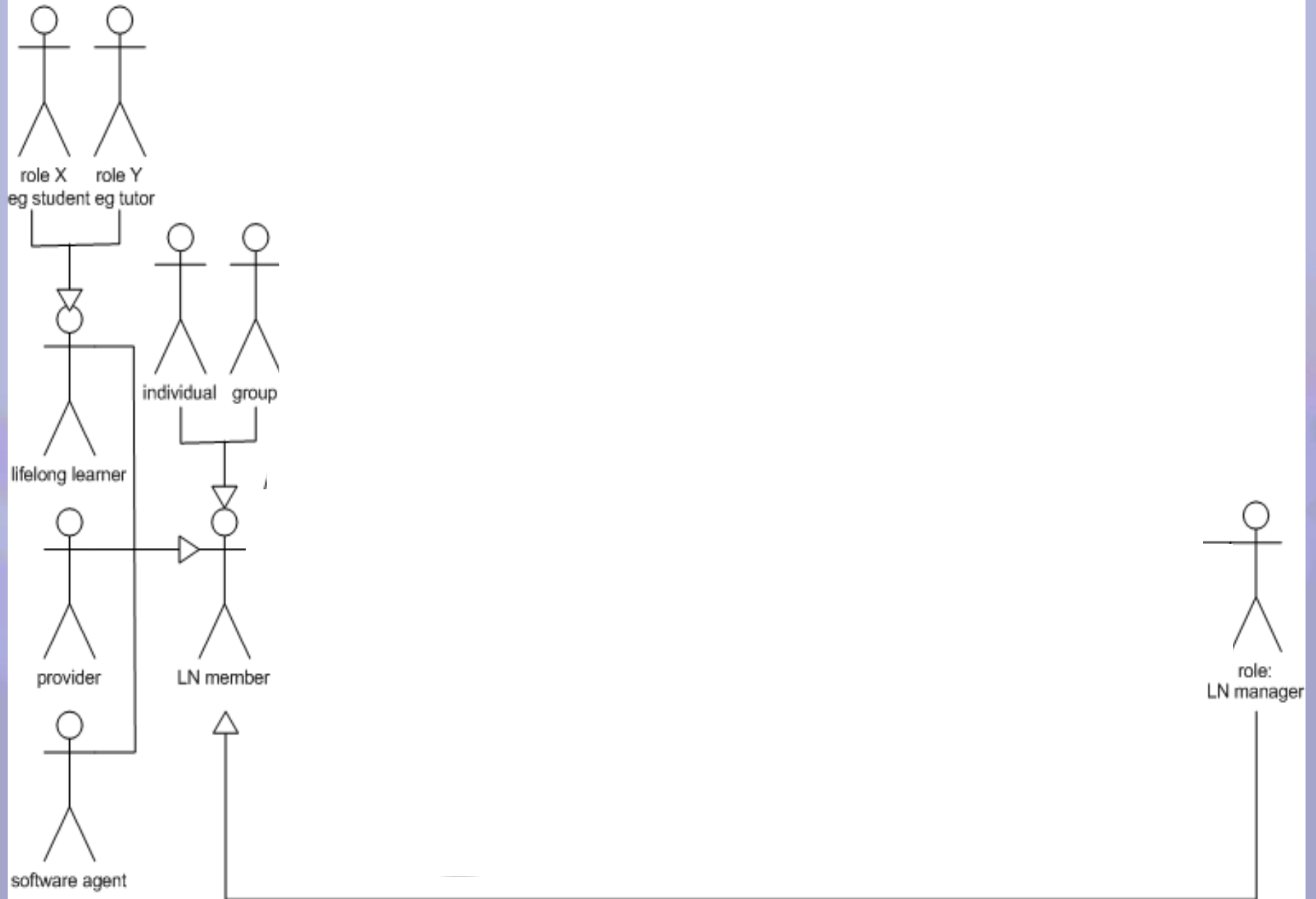


What activities do users perform in
a Learning Network?

=> Use Case Model

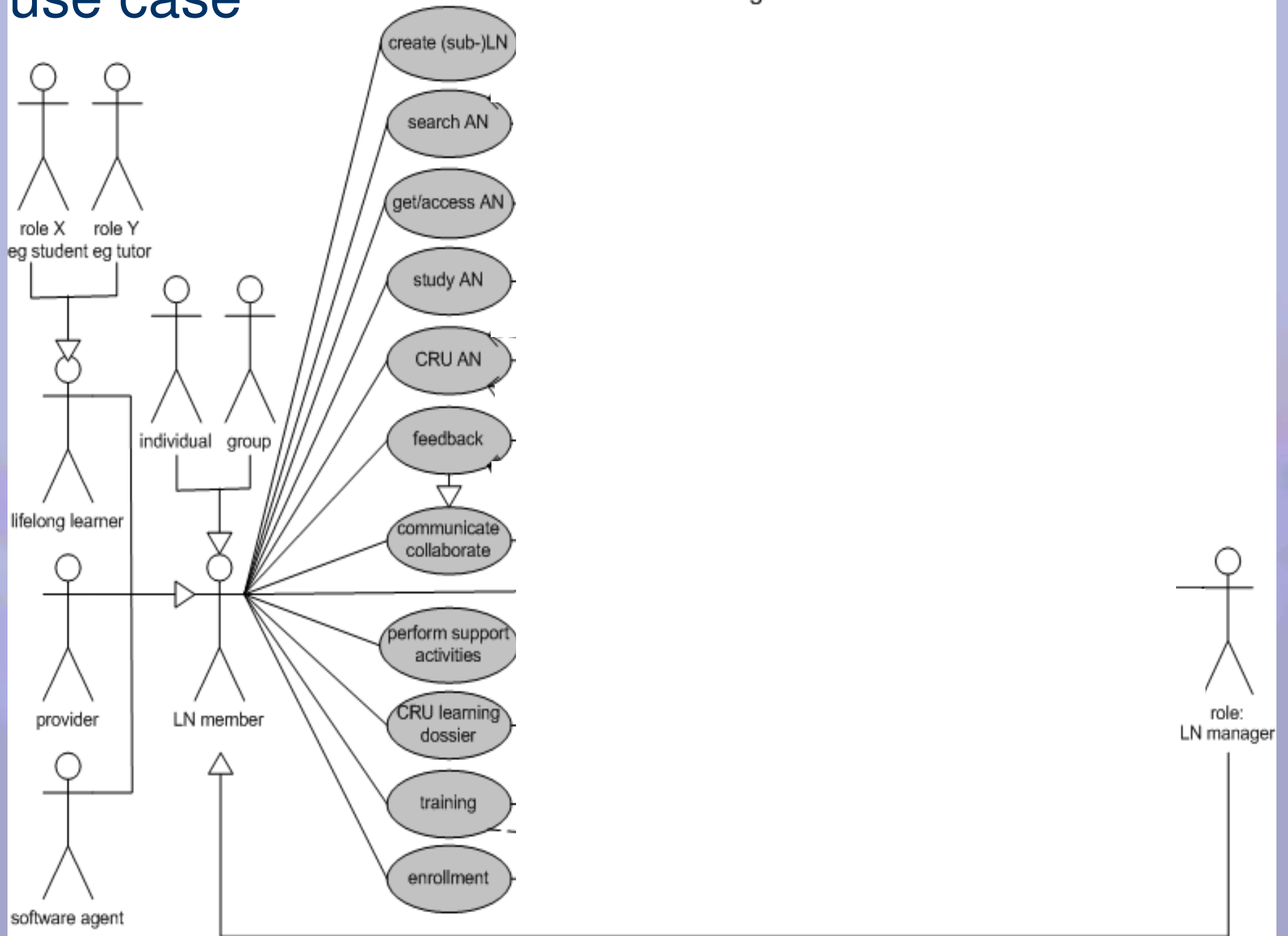
use case

Learning Network



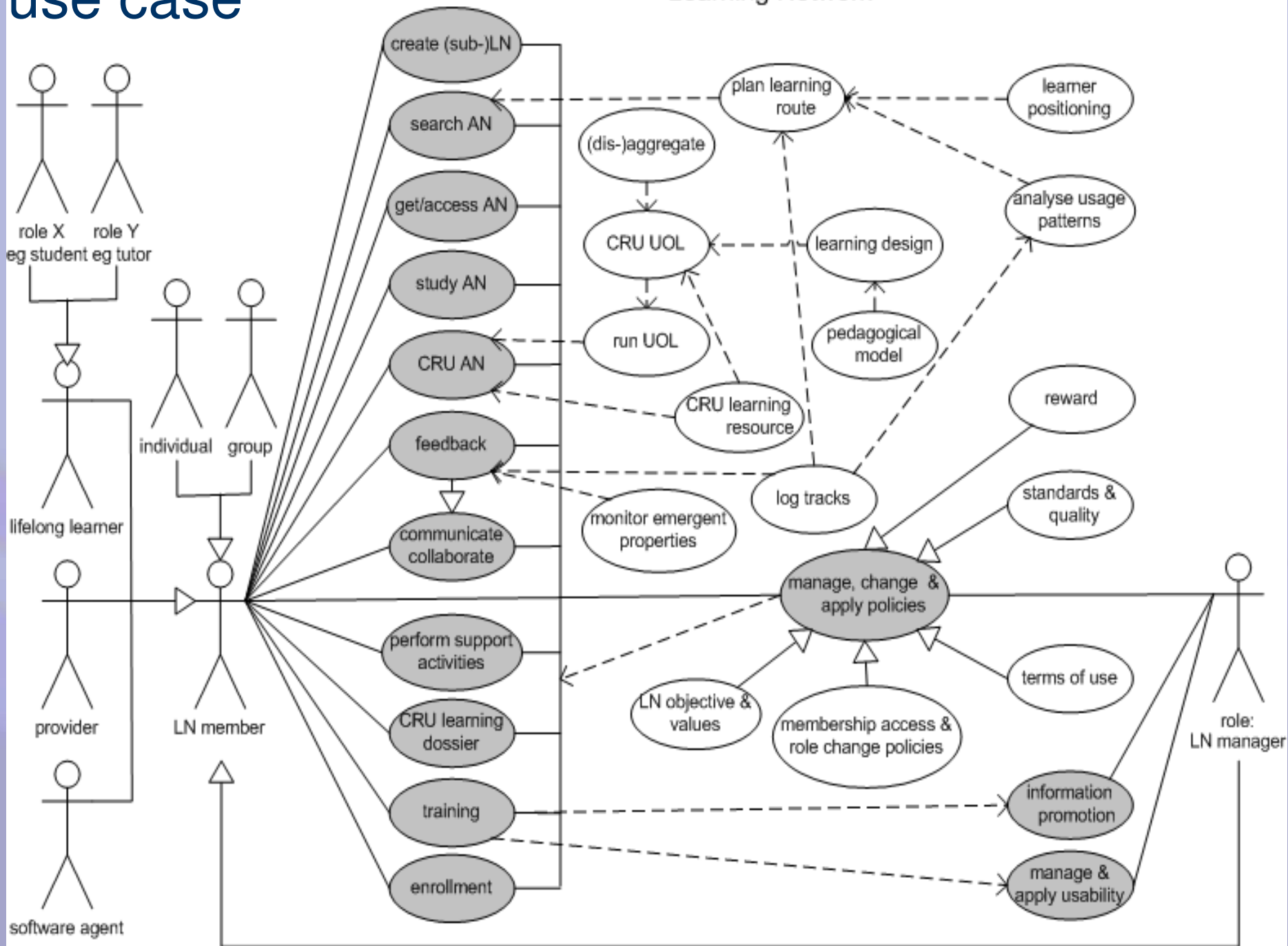
use case

Learning Network



use case

Learning Network

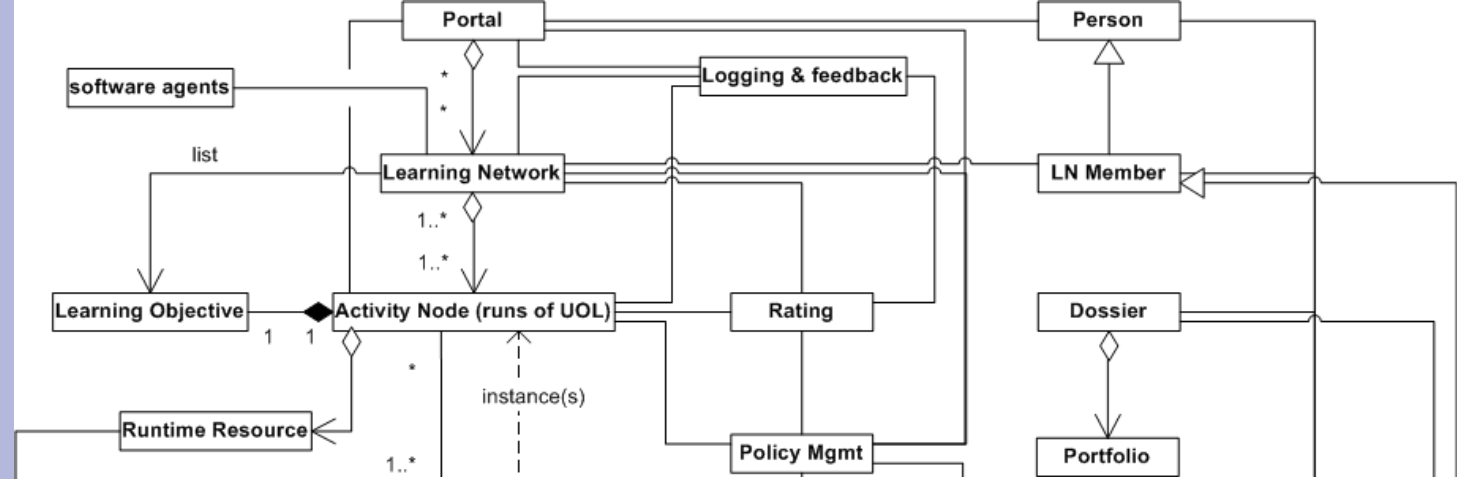


What are the functional components that can be identified in a Learning Network Infrastructure?

=> Architectural Model

Architecture

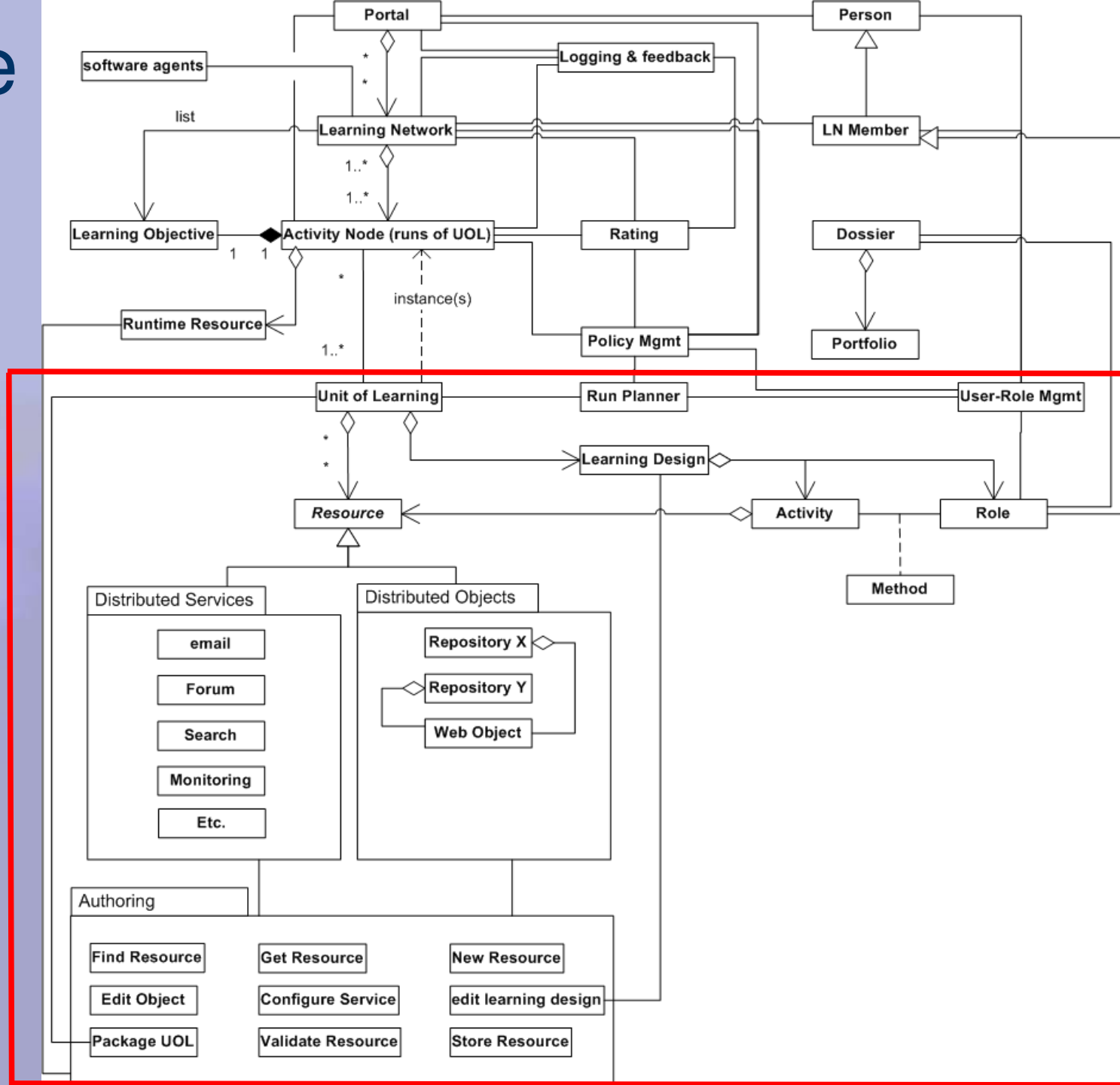
(see:
special issue
BJET
Technology
& Lifelong
Learning
Nov. 2004)



Architecture

(see:
special issue
BJET
Technology
& Lifelong
Learning
Nov. 2004)

LD tools



Three Core Issues in a Learning Network

1. How to **make & use** pedagogical well designed, interoperable and reusable units of learning in the LN?
2. How to **position** learners in a LN?
3. How to help learners to **navigate** in the LN?

ad 1. Make & Use Units of Learning

- **IMS Learning Design** is used to model the units of learning within the LN
- **User-friendly Tools** editing, cm, runtime
- **Quality mechanisms** to support the building and identification of high quality units of learning
- **Community Policies** to stimulate authoring, use and reuse
- ...

Variety of Projects in the Programme (ASA, Alfabet, CopperCore, Unfold, Telcert, Jisc/open framework project)

ad 2. Learner Positioning

- Interoperable, secure **ePortfolios**
- **Assessment** issues (e.g. of informal required competences)
- **Mapping** of competences of individuals between different, but comparable learning networks
- Formal **accreditation** and examination issues
- **We are looking at:** integrative test framework, renewal, extension of QTI, LSA to support positioning

Projects: testing framework, revision QTI in IMS

ad 3. Now in more detail:
How to setup **Navigational** support
within a Learning Network

Navigation questions within LNs

- I want to know something more about topic X, is there an adequate unit of learning available?
- What is, for me, the best route to attain a certain learning objective (or certificate, diploma, ...)?
- I have done X and Y, what would you advise me to do next?
- ...

Problems with navigation in LNs

- In any field per definition a *very large number* of possible units of learning,
- of a *variable quality*
- The number of units of learning *change* rapidly over time
- Nobody has a real *overview* of actual quality, number of possibilities, ...

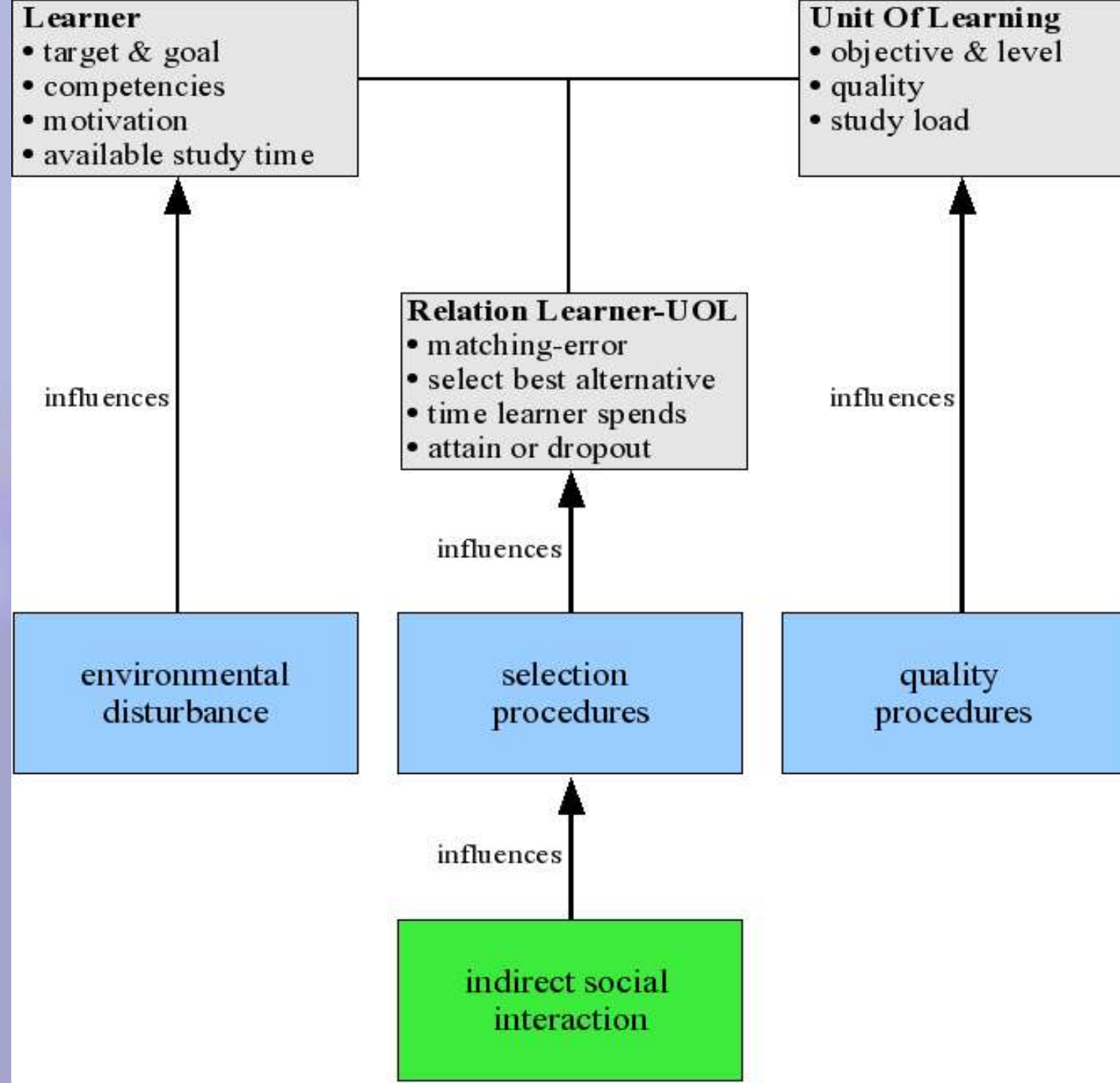
So,

How to Organize a Learning Network
under such constraints?

Our Approach

- Use of self-organisation principles from complexity theory, specifically principles of indirect social feedback ('stigmercy')
- Use of bio-inspired theories ('pheromones')
The paths of successful predecessors are used for advice

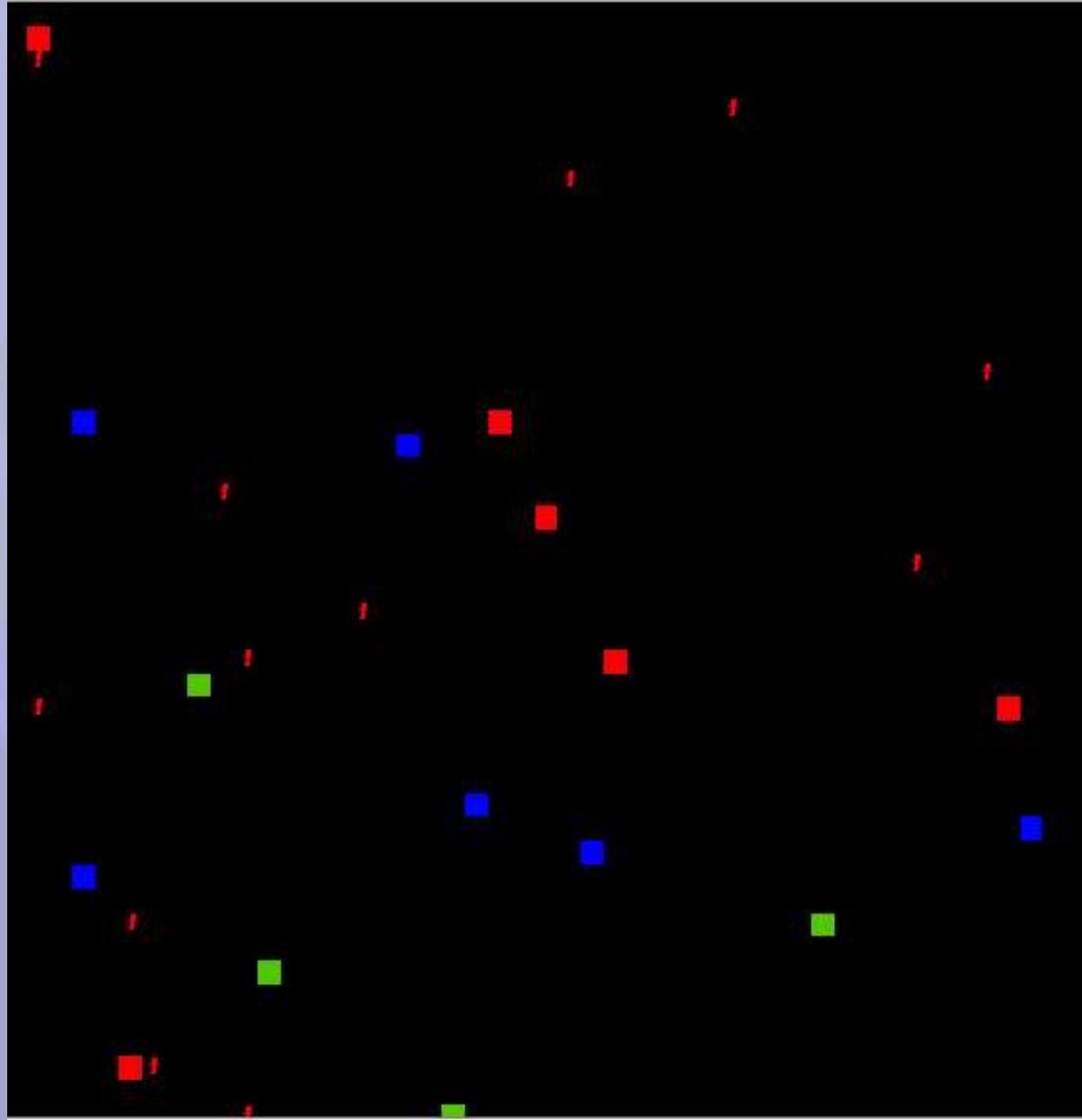
Model



Netlogo Simulation of a LN

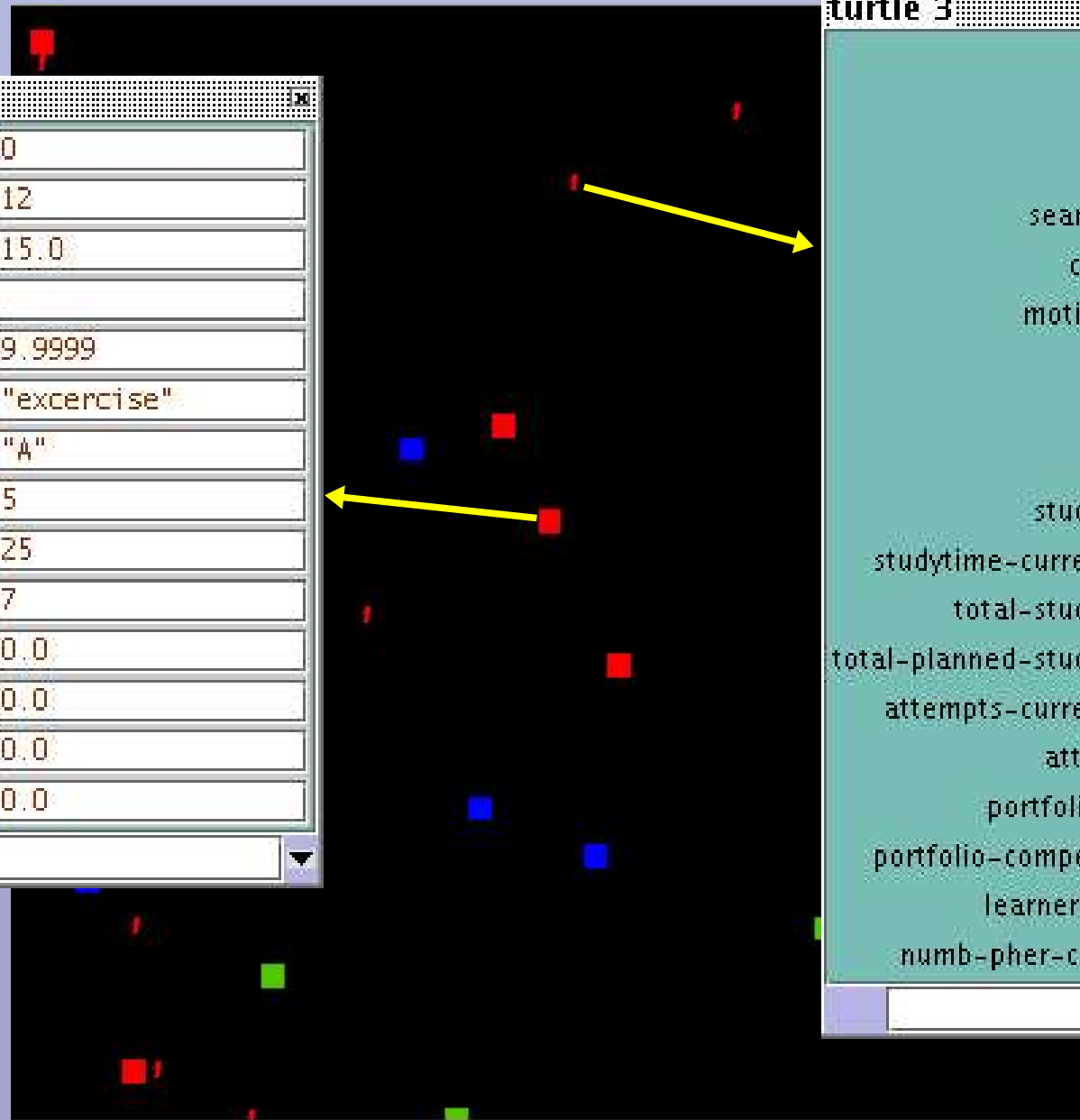
- Multi-agent simulation environment for research
- See Draft publication in handouts

Learners + Units of Learning in a LN



Properties

| patch 0 12 | |
|-------------------------|------------|
| pxcor | 0 |
| pycor | 12 |
| pcolor | 15.0 |
| plabel | |
| plabel-color | 9.9999 |
| an-type | "exercice" |
| an-objective | "A" |
| an-level | 5 |
| an-studytime | 25 |
| an-quality | 7 |
| an-student-contribution | 0.0 |
| an-number-started | 0.0 |
| an-number-succeeded | 0.0 |
| an-avg-studytime | 0.0 |



| turtle 3 | |
|-------------------------|-------------------|
| goal | [["B" 2]] |
| target | ["B" 2] |
| to-do | 0.0 |
| search-an | ["B" 2] |
| current | "searching" |
| motivation | .4727094179075353 |
| cl-a | 0 |
| cl-b | 1 |
| cl-c | 1 |
| studytime | 15 |
| studytime-current-an | 0 |
| total-studytime | 4.681044239829234 |
| total-planned-studytime | 45.0 |
| attempts-current-an | 0 |
| attempts | 1.0 |
| portfolio-ans | [[-12 -7]] |
| portfolio-competence | [["B" 1]] |
| learner-costs | 209.0 |
| numb-pher-choices | 0.0 |

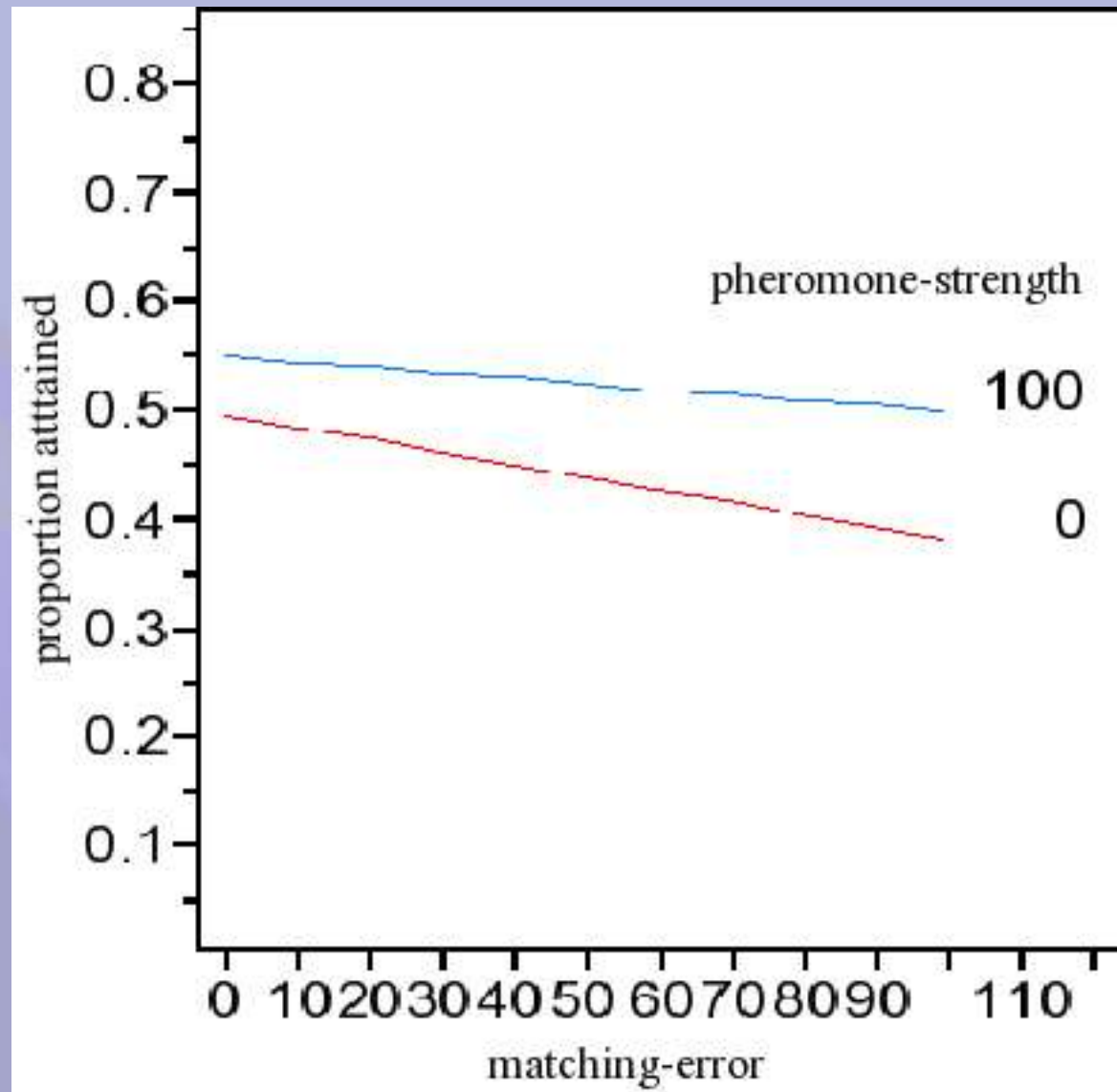
One of the Experiments with the Simulation

- Problem: what is the effect of indirect navigational feedback on study success (number of students that attained objective)?
- 2^4 factorial design:
 - pheromone strength (0 or 100%)
 - matching error (0 or 100%)
 - disturbance in learner environment (0 or 100%)
 - quality of the unit of learning (0-100% or 100%)
- N=12 replications in every condition
- Every replication runs 260 simulation weeks (5 years). In total 49920 week cycles (runs about 10 hours on fast computer)

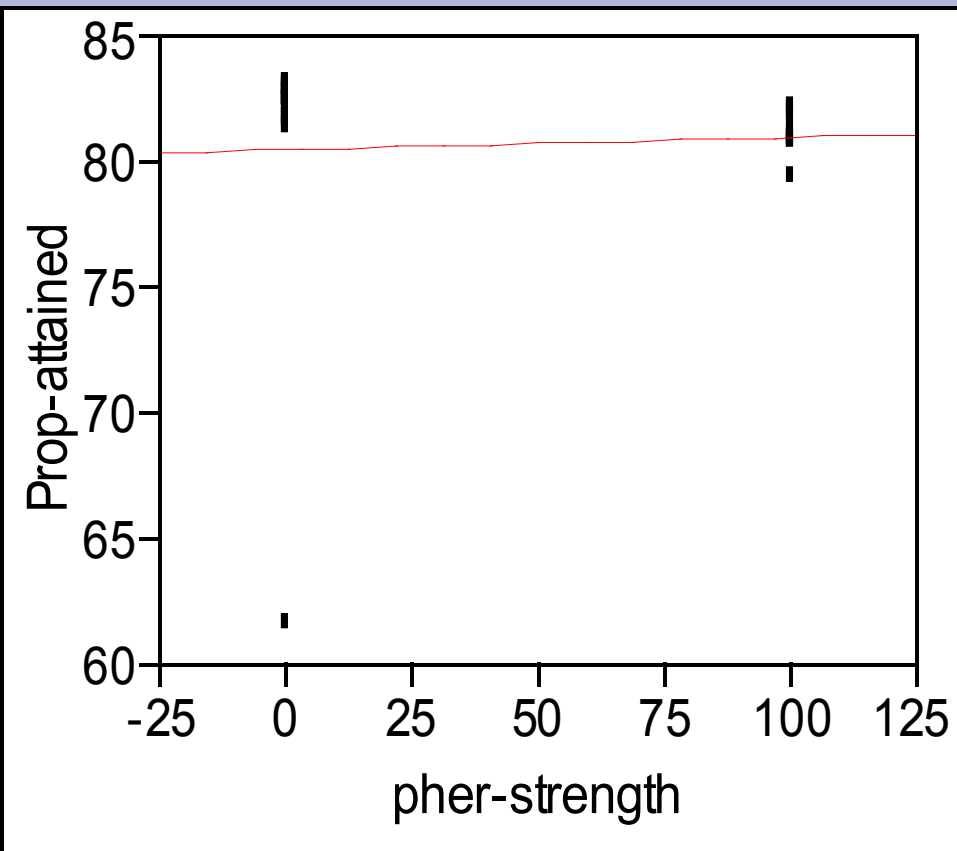
Outcome

- All main effects significant + interactions:
pher-strength * matching error
pher-strength * quality of unit of learning

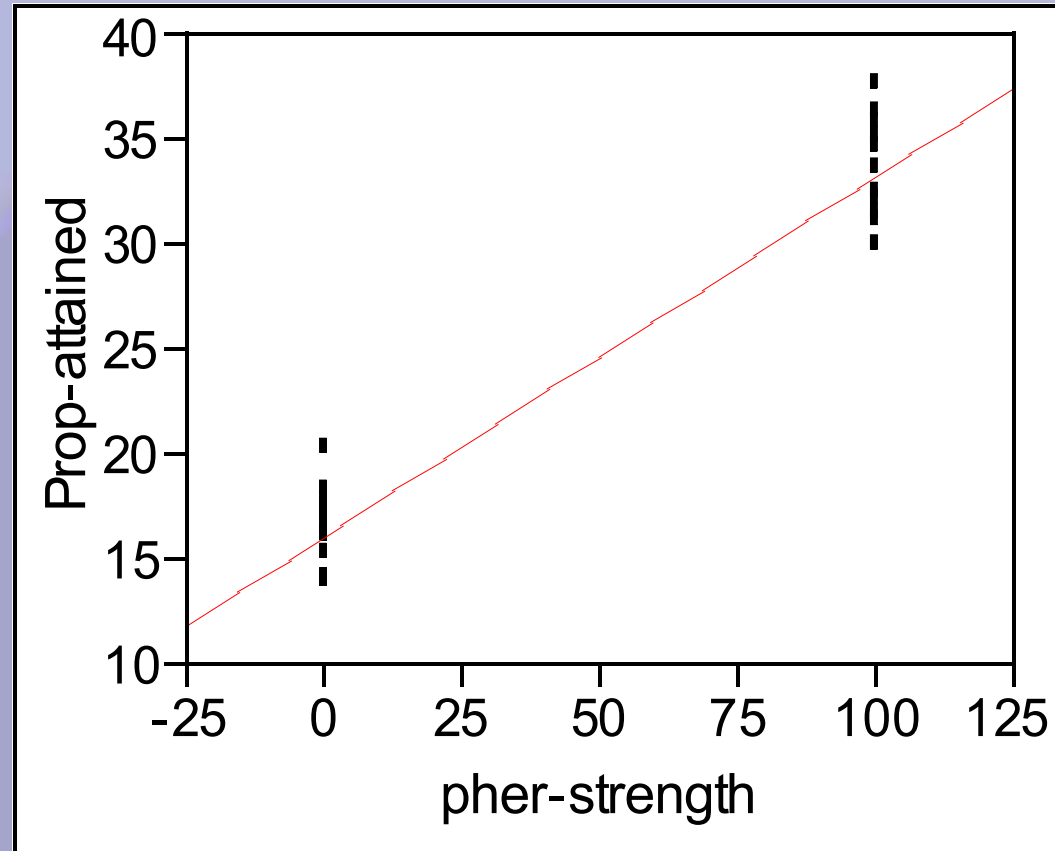
Interaction Pher * Matching-error



best versus worst case



no matching error, 100% quality
and no disturbance ($F = 0.7816$)



100% matching error, 0% quality
and 100% disturbance ($F = <.0001$)

Outcome

- Overall influence Pheromones: 9% increase in proportion of students who attained their objective
- Matching-errors are compensated by pheromones
- Some quality variance is compensated by pheromones

(more details: see draft paper)

Thank You

More info:

www.learningnetworks.org

dspace.ou.nl