

Cognitive and Social Support for Learning Java API



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Guest Lecture at Design, Learning and Collaboration

I have a dream...

In 1983, 85% of the code has been repeated by someone else in the world. (Capers Jones, 1984)

Every time when I am trying to re-invent the wheel, an agent brings me the existing wheel that I can use immediately

I have yet another dream...

All the information I need is always at my desktop, virtual or real; and the needed information only

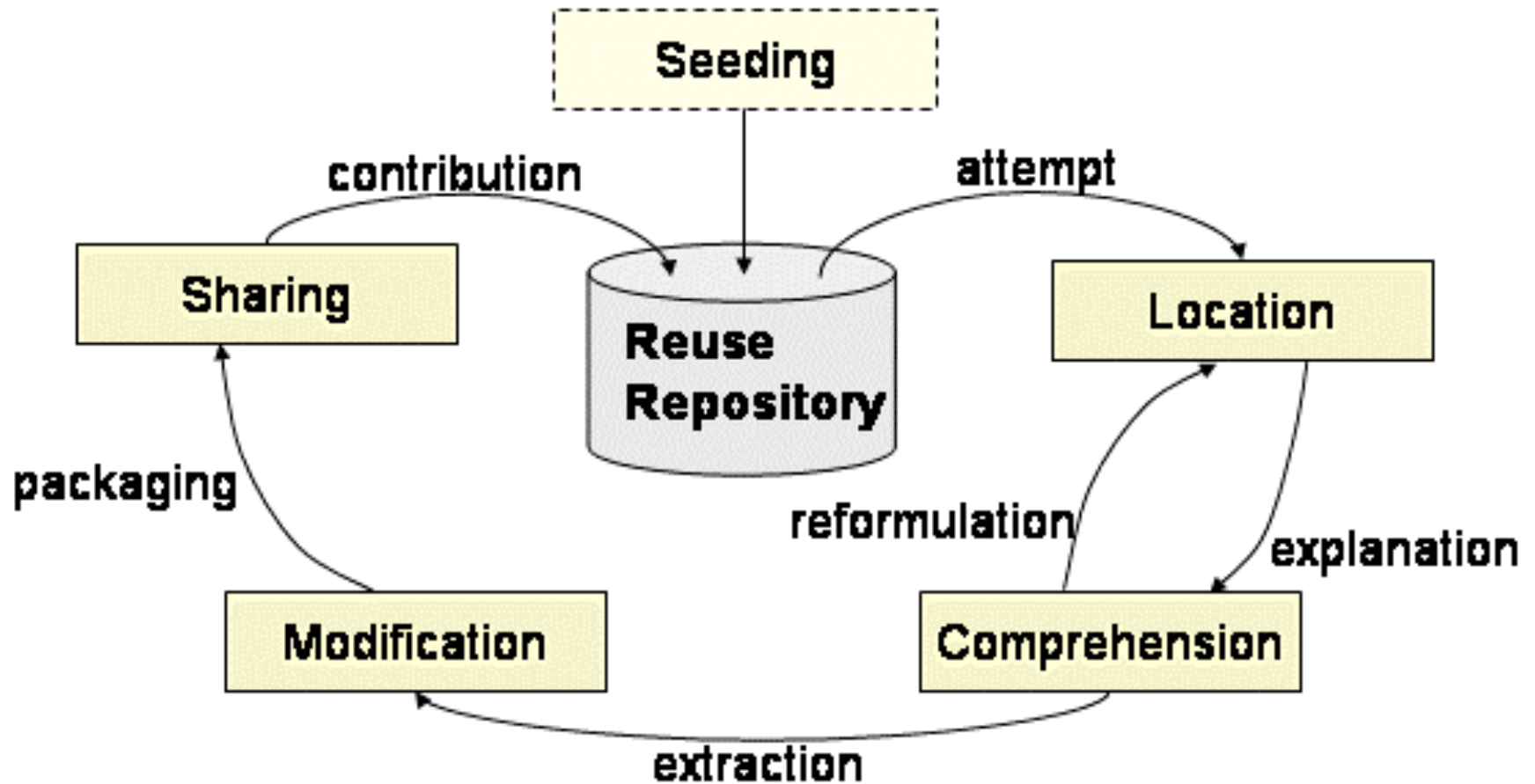
Software reuse

- Definition
 - Creating new software systems with existing artifacts
- Reusable artifacts
 - Code artifacts
 - macros, functions, **methods, classes**, subsystems, systems (Open Source Software)
 - Non-code artifacts
 - analyses, designs, test plans and cases, domain models
 - Knowledge
 - program idioms, program plans, design patterns, software architecture styles, domain knowledge
- Reuse repository systems
 - Supporting reuse activities

Why reuse?

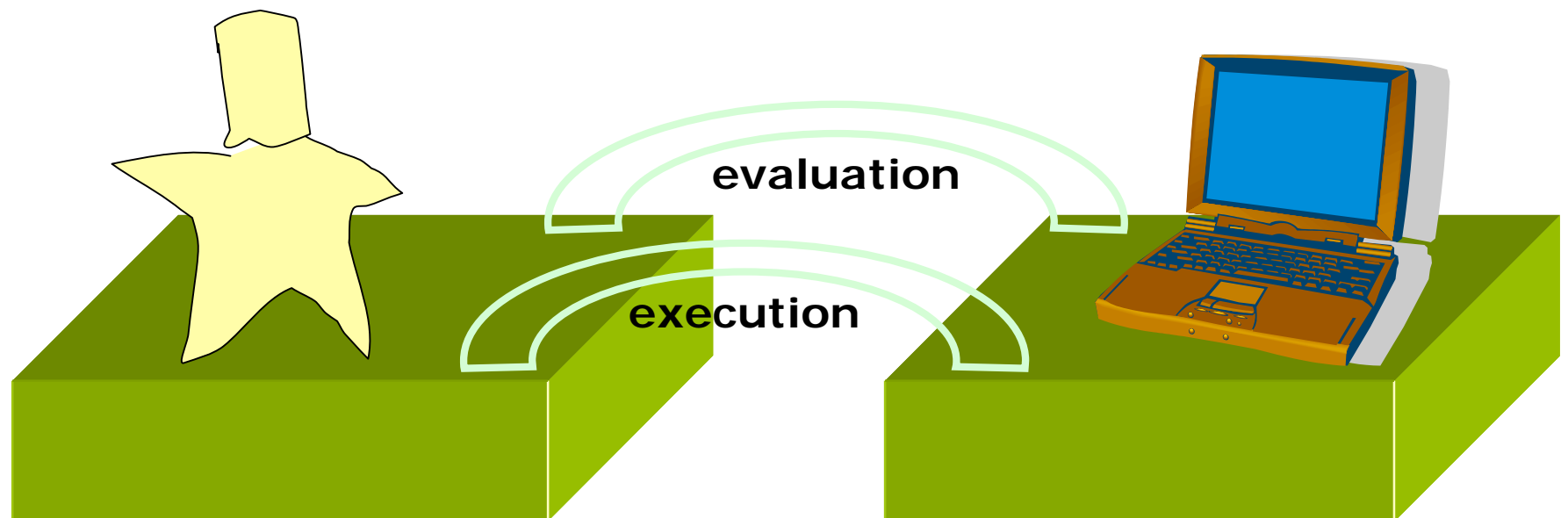
- Increased productivity
 - Reduced development time
 - Reduced cognitive load
 - Reduced testing time
- Increased quality
 - Fewer bugs
- Enhanced evolvability and maintainability

Reuse process (sLCMS)



Understanding the cognitive issues in reuse

- Cognitive engineering:
 - Apply what is known from cognitive science to the design and construction of tools that assists cognitive activities of human beings
- Bridge two gulfs between users and tools



Execution gulf

- Bridging the gap from the goal to the tool
 - Intention Formation
 - Users decide to do something with an internal specification of the task created from their goal.
 - Action Specification
 - Users externalize the internal specification into a sequence of specified actions.
 - Action Execution
 - The actions are executed with the tool.

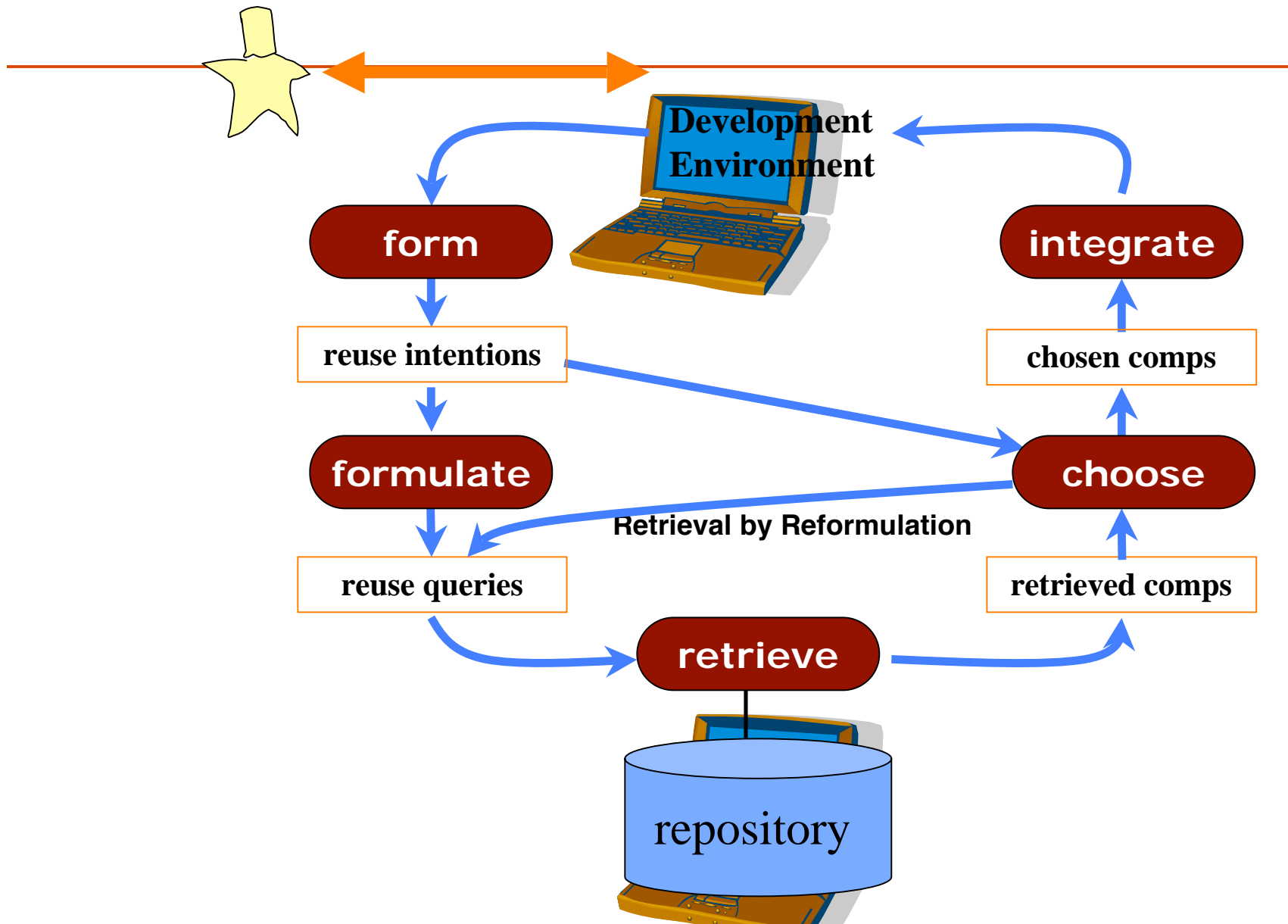


Evaluation gulf

- Bridging the gap from tool output to goal
 - System Perception
 - Users perceive the output of the tool.
 - Interpretation
 - Users interpret the perceived output.
 - Evaluation
 - Users compare the interpretation with the original goal.



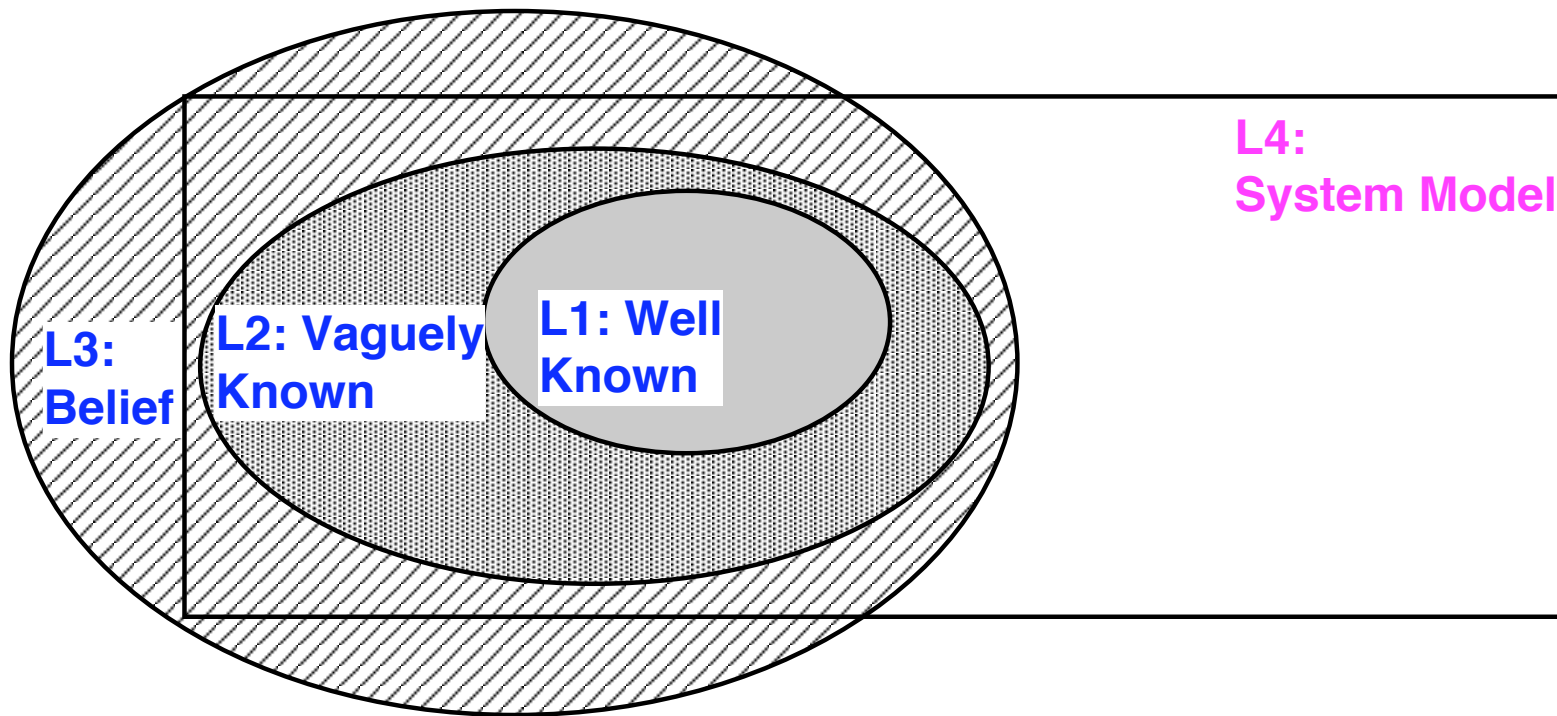
A cognitive model of reuse



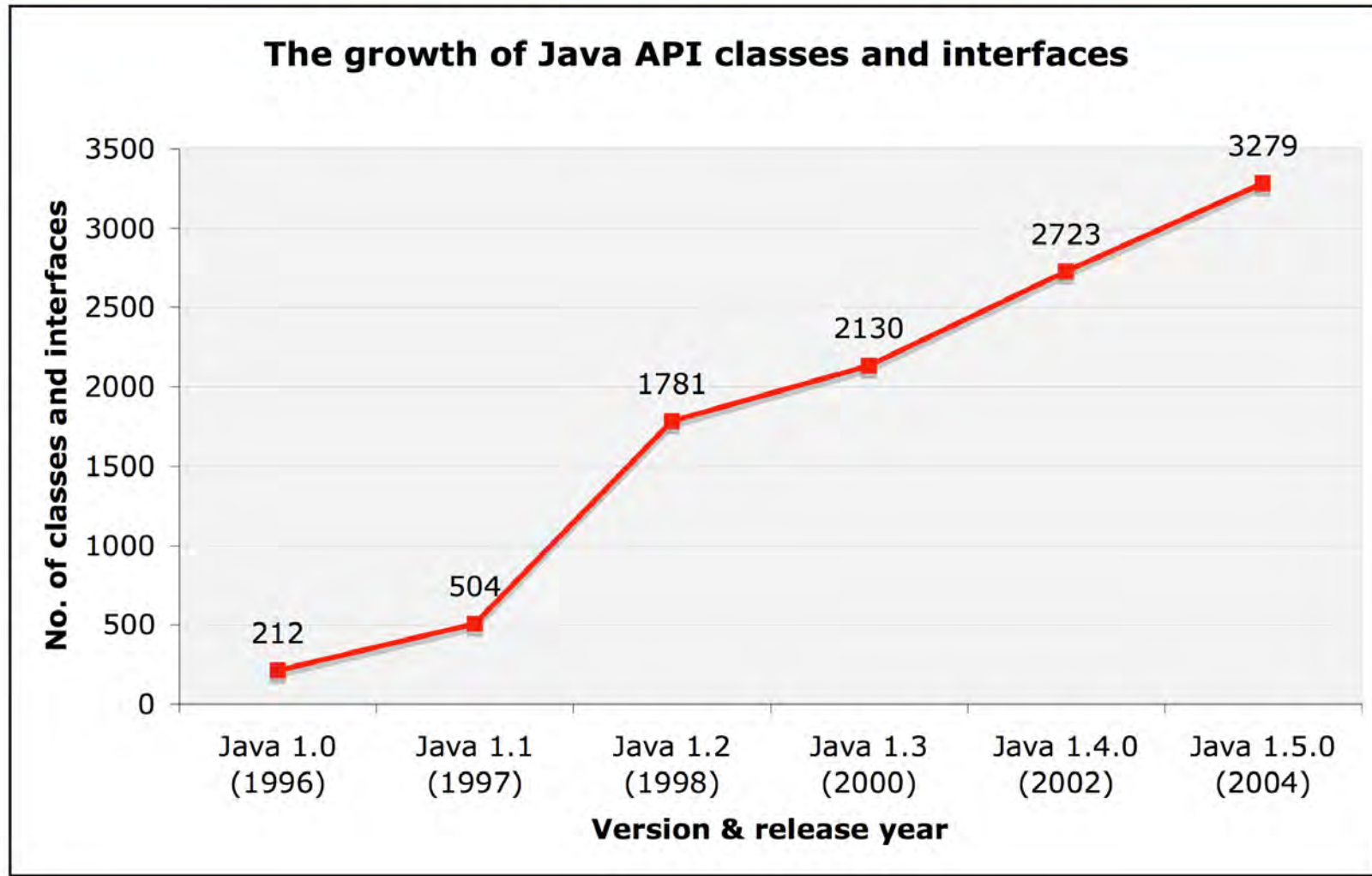
Research problems

- No attempt to reuse (*Location*)
 - Information islands
 - Not aware of the existence of reusable components
 - Perceived low reuse utility (benefits/cost)
 - High cost of locating components
- Unable to locate the component (*Location*)
 - Situation model vs. system model
- Unable to use the component (*Comprehension*)

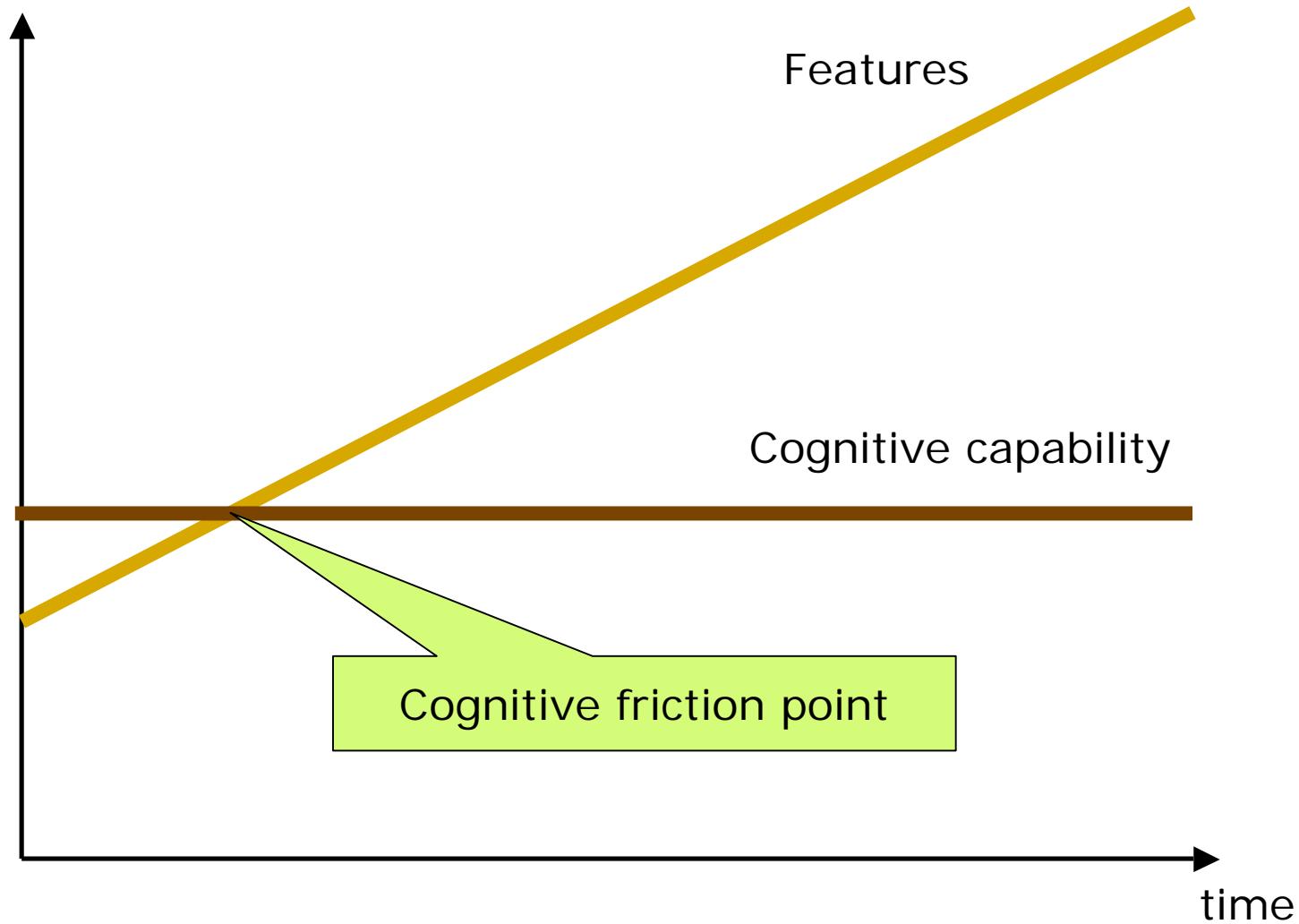
User's knowledge about a reuse repository



Growth of Java class library



Functionality of development tools

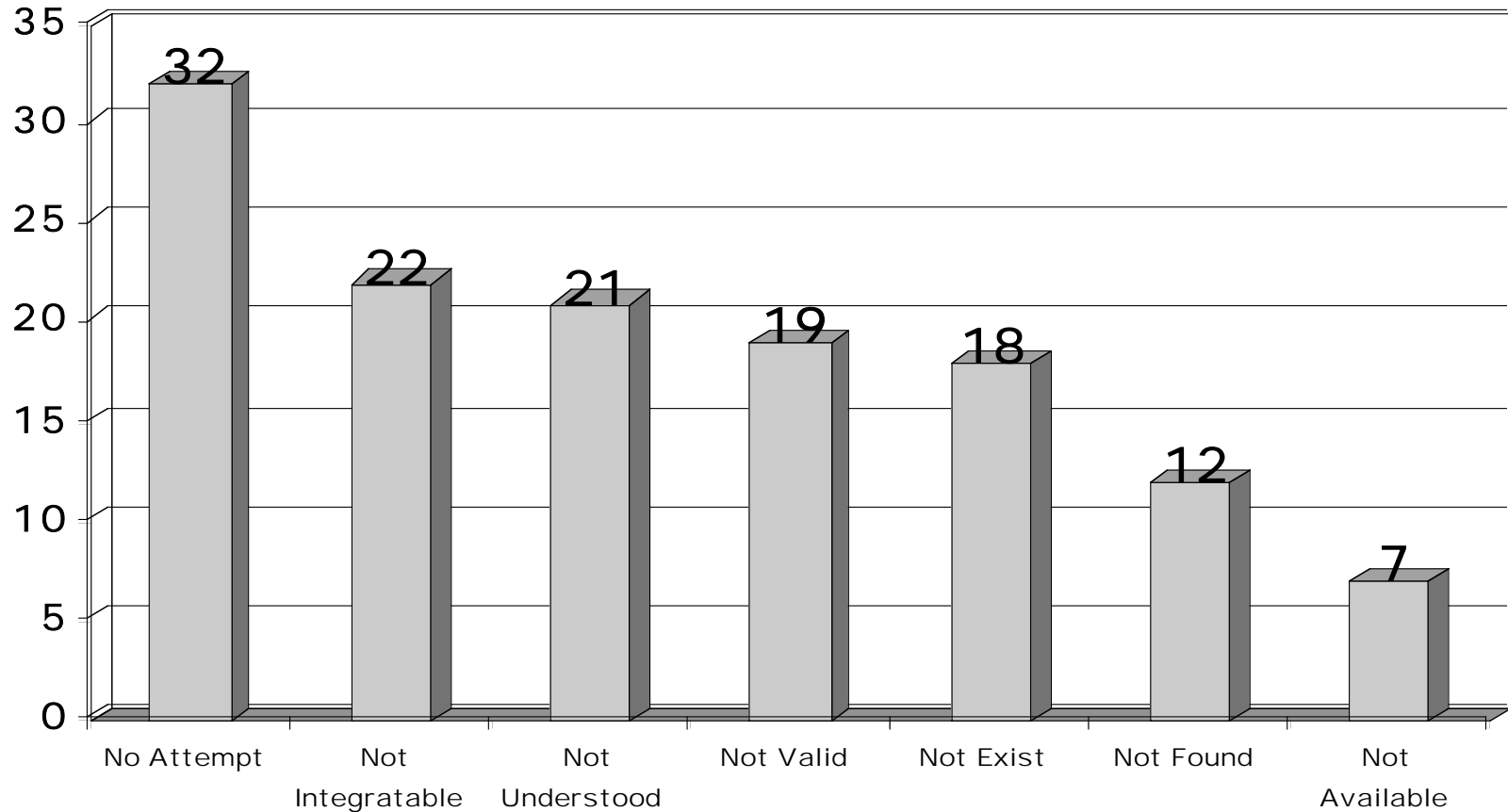


Libraries used in STeP_IN

Library Name	Class	Method
activation.jar	38	261
bcel-5.1.jar	373	3093
commons-collections-3.1.jar	446	4021
commons-dbcp-1.2.1.jar	44	935
commons-pool-1.2.jar	25	277
jun547.jar	2640	18412
mail.jar	240	1966
postgresql.jar	82	1216
resolver.jar	29	298
StPL75.jar	175	1384
xercesImpl.jar	784	7463
xml-ParserAPIs.jar	207	1748
Total	5083	41074

No attempt to reuse

- No attempt to reuse is the most significant barrier to reuse (Frakes & Fox, 1996)

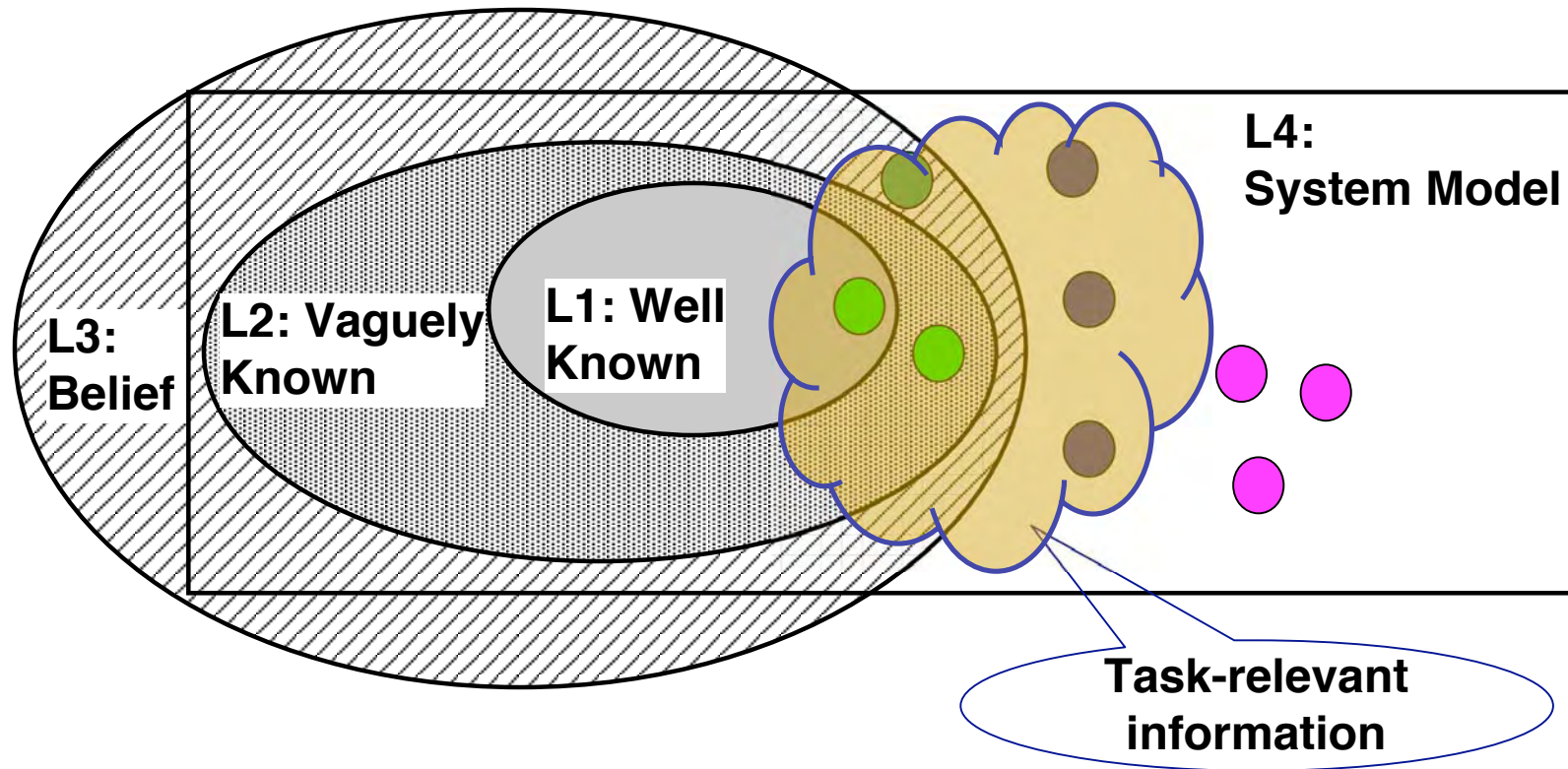


Proposed solution

- Active component repository systems
 - Overcoming the limits of browsing and searching
 - Supporting information delivery

- Benefits
 - Reusing unknown components
 - Reduced locating cost
 - Seamless integration with programming environment

Challenges in active reuse repository systems



CodeBroker

```

/** This class simulates the process of card dealing. Each card is
    represented with a number from 0 to 51. The program should produce
    a list of 52 cards, as results from a human card dealer */
public class CardDealer {
    static int [] cards=new int[52];
    static {
        for (int i=0; i<52; i++) cards[i]=i;
    }
    /** Create a random number between two limits */
    public static int getRandomNumber (int from, int to) {

```

Editing space



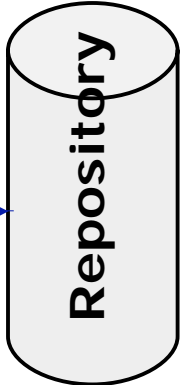
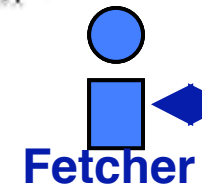
inferred queries

```

--:** CardDealer.java 10-05 02:08 PM 0.97 (JDE)--L10--All
/** An example for getInt written by yunwen "Fri Oct 5 14:00:58 2001"*/
import com.objectspace.jgl.util.*;
/** Roll a die and print the probability of each number's occurrence */
public class DiceRoller {
    final static int times=10000;
    public static void main(String args[]) {
        int[] distribution=new int[6];
        int p;
        for (int i=0; i<times; i++) {
            p = Randomizer.getInt(1, 6);
            distribution[p-1]++;
        }
        System.out.println("(Number, Occurrences, Probability)");

```

Example



retrieved components

```

*CB-Example*/home/yunwen/java/examples/DiceRoller.java) (JDE)--L10--Top
1 0.89 getInt Generate a random number using the default generat
2 0.78 getLong Generate a random number using the default generat
3 0.78 nextInt Generates an ven li s.
4 0.77 nextLong Generates a given li ts.
-1:;% *RCI-display* 10-05 02:08 PM 0.97 (ReusableCoPresenter --L1--Top
com.objectspace.jgl.util.Randomizer::int getInt(int lo, int ni)

```

Delivery buffer



CodeBroker: An active reuse repository system

```
emacs@buddy.cs.colorao.edu
Buffers Files Tools Edit Search Mule JDE Java Help

/** This class simulates the process of card dealing. Each card is
    represented with a number from 0 to 51. And the program produces
    a list of 52 cards, as it is resulted from a human card dealer */
public class CardDealer1 {
    static int [] cards=new int[52];
    static {
        for (int i=0; i<52; i++) cards[i]=i;
    }
    /** Create a random number between two limits */

--:*** CardDealer1.java (JDE)--L9--All-----
1 0.40 setMaxRow The maxRows limit is set to limit the number of ro
2 0.38 nextBytes Generates a user specified number of random bytes,
3 0.38 getInt Generate a random number using
4 0.38 getInt Generate a random number using
-1:*** *RCI-display* (ReusableComponentInfo)--L1--Top-----
com.objectspace.jgl.util.Randomizer::static int getInt(int hi)
```

Editing space

Delivery buffer

CodeBroker: An active reuse repository system

The screenshot shows an Emacs editor window titled "emacs@buddy.cs.colorao.edu". The menu bar includes "Buffers Files Tools Edit Search Mule JDE Java Help". The main editing area contains the following Java code:

```
/** This class simulates the process of card dealing. Each card is
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    }
    /** Create a random number between two limits */
    public static int getRandomNumber (int from, int to) {
```

Below the editing space is a "Delivery buffer" containing the following text:

```
--:** CardDealer1.java (JDE)--L10--All-----
1 0.69 getInt Generate a random number using the default generat
2 0.64 getLong Generate a random number using the default generat
3 0.59 getFloat Generate a random number using
4 0.59 getDouble Generate a random number using
-1:** *RCI-display* (ReusableComponentInfo)--L1--Top-----
com.objectspace.jgl.util.Randomizer::static int getInt(int lo, int hi)
```

CodeBroker: An active reuse repository system

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    public static int getRandomNumber (int from, int to) {

--:** CardDealer1.java (JDE)--L10--All-----
1 0.69 getInt Generate a random number using the default generator
2 0.64 getLong Generate a random number using the default generator
3 0.59 getFloat Generate a random number using the default generator
4 0.59 getDouble Generate a random number using the default generator
-1:;% #RCI:display# (ReusableComponentInfo)--L1--Top-----
com.objectspace.jgl.util.Randomizer::static int getInt(int lo, int hi)
```

Netscape: Class com.objectspace.jgl.util.Randomizer

File Edit View Go Communicator Help

Bookmarks Location: [file:/home/yunwen/java/jgl/doc/api/com.o

getInt

public static int getInt(int lo, int hi)

Generate a random number using the default generator.

See Also:

[nextInt](#)

getLong

public static long getLong(long hi)

Generate a random number using the default generator.

See Also:

[nextLong](#)



CodeBroker: An active reuse repository system

```
represented with a number from 0 to 51. The program should produce
a list of 52 cards, as results from a human card dealer */
public class CardDealer {
    static int [] cards=new int[52];
    static {
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        }
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Example

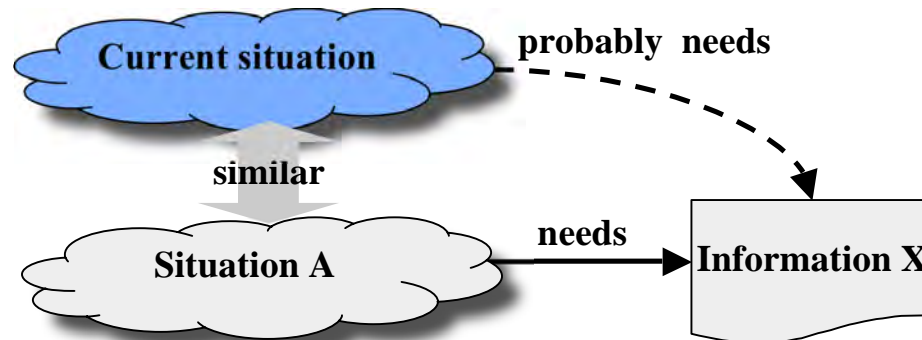
```
*CB-Example*(/home/yunwen/java/examples/DiceRoller.java) (JDE)--L10--Top--
1 0.89 getInt Generate a random number using the default generat
2 0.78 getLong Generate a random number using the default generat
3 0.78 nextInt Generates an int value betw
4 0.77 nextLong Generates a long value bet
```

Delivery buffer

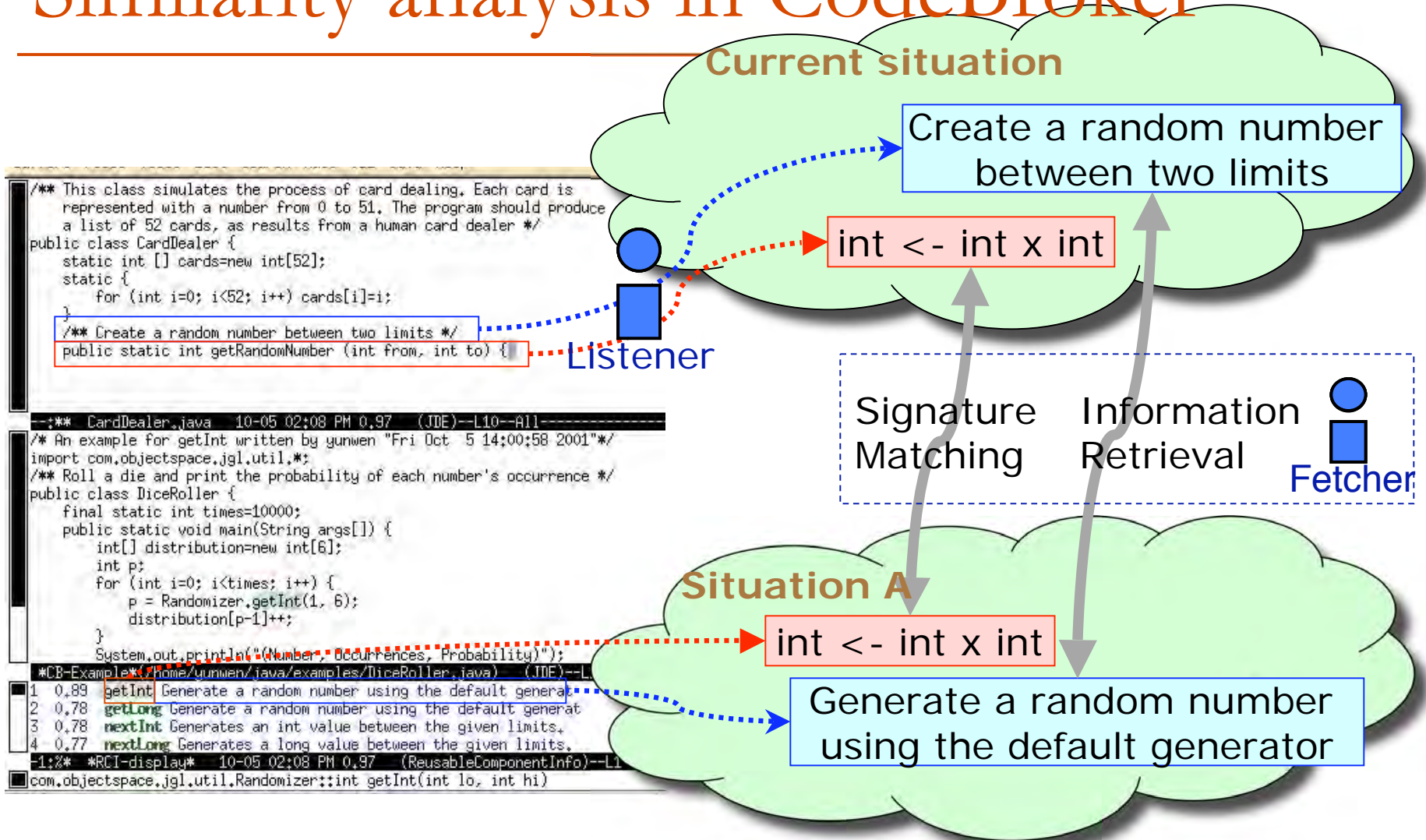
```
-1:** *RCI-display* 10-05 02:08 PM 0.97 (ReusableComponentInfo)--L1--Top
com.objectspace.jgl.util.Randomizer::int getInt(int lo, int hi)
```


Inferring the task

- Plan recognition
 - Actions → Inferred goal → Suggested actions or information
- Similarity analysis



Similarity analysis in CodeBroker



The rationale

□ Three aspects of a program

■ Concept

- The functionality of the program
- Semantic information
- Revealed in *comments*, identifiers, ...

■ Constraint

- Execution environment
- Syntactic information
- Revealed in *signatures*, protocols, ...

■ Code

- The implementation

□ The assumption

- Similar concept + compatible signature → reusable code

Basic information retrieval (IR) techniques

- Information retrieval: Finding similar documents based on the commonality of terms

- Documents and queries are represented by term vectors

$$D_j = (f_{1,j}, f_{2,j}, \dots, f_{N,j})$$

- Similarity is the distance between two vectors

$$\text{Similarity}(Q, D) = \frac{\sum_{i=1}^n Q[i] \times D[i]}{\sqrt{\sum_{i=1}^n Q[i]^2 \times \sum_{i=1}^n D[i]^2}}$$

Term space: (factor information help human operation retrieval system)

	Contents	Vector	Similarity
Q	human factors in information retrieval system	(1 1 0 1 0 1 1)	
D1	factor factor factor human human retrieval system	(3 0 0 2 0 1 1)	$7/75^{0.5}=0.80$
D2	information operation retrieval retrieval	(0 1 0 0 1 2 0)	0.55
D3	factor help help retrieval	(1 0 2 0 0 1 0)	0.37

LSA: Improved IR

Latent semantic analysis

- Addressing the vocabulary mismatch problem (people use different names to refer to the same concept)
- Creating a semantic space with a large amount of documents

$$\begin{pmatrix} w_{1,1} & w_{1,2} & \dots & w_{1,M} \\ w_{2,1} & w_{2,2} & \dots & w_{2,M} \\ \dots & \dots & \dots & \dots \\ w_{N,1} & w_{N,2} & \dots & w_{N,M} \end{pmatrix} = \begin{pmatrix} t_{1,1}^{(0)} & t_{1,2}^{(0)} & \dots & t_{1,r}^{(0)} \\ t_{2,1}^{(0)} & t_{2,2}^{(0)} & \dots & t_{2,r}^{(0)} \\ \dots & \dots & \dots & \dots \\ t_{N,1}^{(0)} & t_{N,2}^{(0)} & \dots & t_{N,r}^{(0)} \end{pmatrix} \times \begin{pmatrix} s_{1,1} & 0 & \dots & 0 \\ 0 & s_{2,2} & \dots & 0 \\ \dots & \dots & \dots & \dots \\ 0 & 0 & \dots & s_{r,r} \end{pmatrix} \times \begin{pmatrix} d_{1,1}^{(0)} & d_{1,2}^{(0)} & \dots & d_{1,M}^{(0)} \\ d_{2,1}^{(0)} & d_{2,2}^{(0)} & \dots & d_{2,M}^{(0)} \\ \dots & \dots & \dots & \dots \\ d_{r,1}^{(0)} & d_{r,2}^{(0)} & \dots & d_{r,M}^{(0)} \end{pmatrix}$$

Reducing the singular vectors

$$\hat{X} = \begin{pmatrix} t_{1,1} & t_{1,2} & \dots & t_{1,k} \\ t_{2,1} & t_{2,2} & \dots & t_{2,k} \\ \dots & \dots & \dots & \dots \\ t_{N,1} & t_{N,2} & \dots & t_{N,k} \end{pmatrix} \times \begin{pmatrix} s_{1,1} & 0 & \dots & 0 \\ 0 & s_{2,2} & \dots & 0 \\ \dots & \dots & \dots & \dots \\ 0 & 0 & \dots & s_{k,k} \end{pmatrix} \times \begin{pmatrix} d_{1,1} & d_{1,2} & \dots & d_{1,M} \\ d_{2,1} & d_{2,2} & \dots & d_{2,M} \\ \dots & \dots & \dots & \dots \\ d_{k,1} & d_{k,2} & \dots & d_{k,M} \end{pmatrix}$$

Probabilistic IR model

- Adding weights to each term

$$D_j = (t_{1,j}, t_{2,j}, \dots, t_{N,j})$$

$$t_{i,j} = \text{TRW}_i * f_{i,j}$$

- Term Relevance Weight

$$\text{TRW}_i = \log (p_i \times (1-q_i) / q_i \times (1-p_i))$$

p_i Probability of the term appearing in relevant documents

q_i Probability of the term appearing in irrelevant documents

Weighting schema in CodeBroker

$$\text{sim}(Q, D_j) = \sum_{i=1}^T \left(\log \frac{N - n_i + 0.5}{n_i + 0.5} \right) \frac{(k_1 + 1)tf_{i,j}}{K + tf_{i,j}} \frac{(k_3 + 1)qtf_i}{k_3 + qtf_i}$$

N is the number of components

n_i is the number of components whose documents contain the term ti

T is the number of terms in the component collection

$tf_{i,j}$ is the frequency of term ti in the document of the component D_j

qtf_i is the frequency of term ti in the query Q

$$K = k_1((1 - b) + b \cdot dl_j / avdl)$$

k_1, k_3, b are empirically determined parameters depending on the nature of the document collection. In *CodeBroker*, k_1 is set to 1.2, k_3 to 1.0, and b to 0.75.

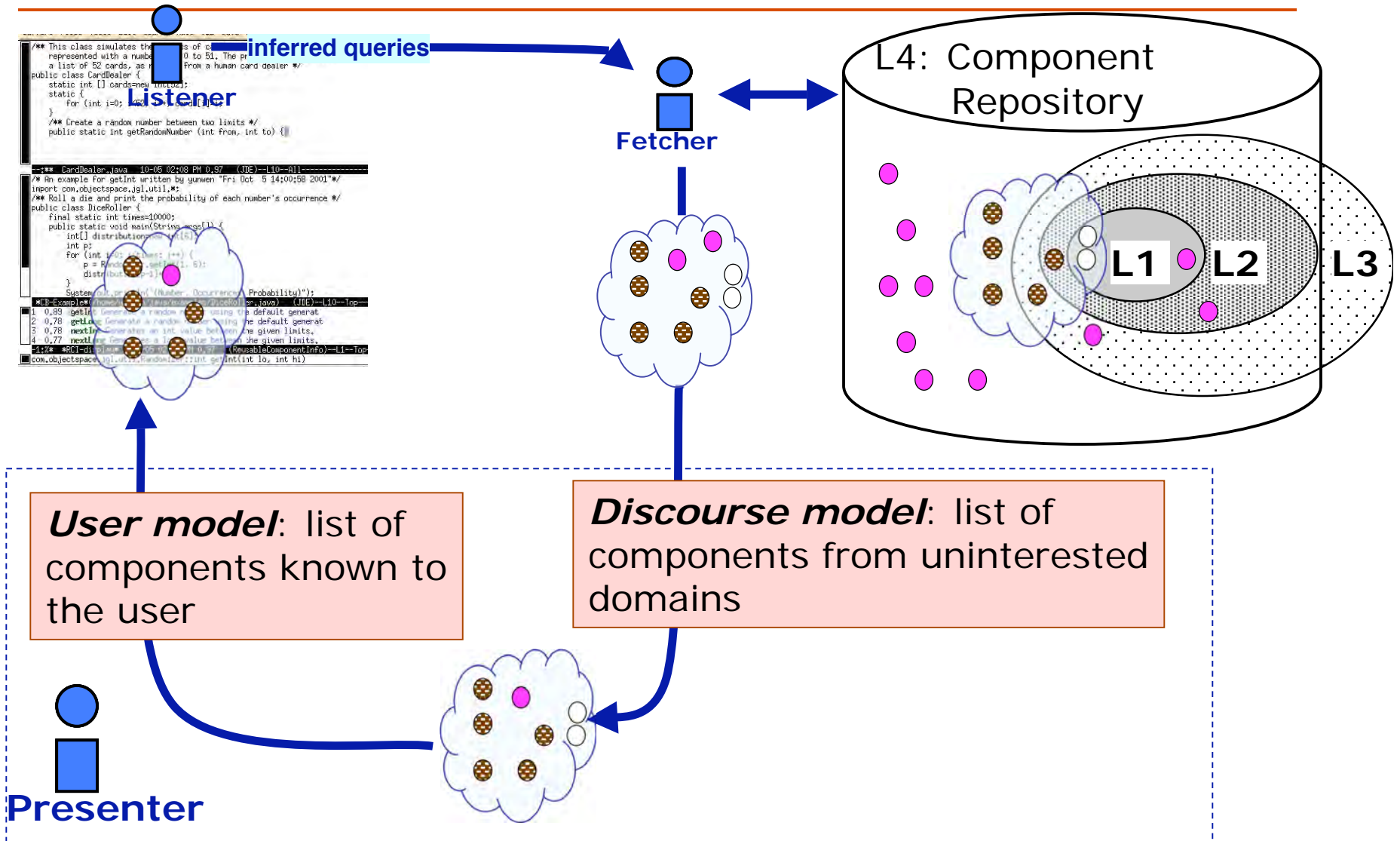
dl_j is the length of document D_j

$avdl$ is the average length of all documents in the collection

Signature matching determines the constraint compatibility

- Reusable components must be compatible in signature
 - Signature is the syntactic interface of a module (method and class)
 - Improving the precision of retrieval
- Method level match
 - Exact match
 - Type1 x Type2 -> Type3
 - TypeA x TypeB -> TypeC
 - <=> Type1=TypeA AND Type2=TypeB AND Type3=TypeC
 - Relaxed match
 - Generalization / Specialization / Reorder
 - string x int -> int **matches (relaxed)** long x string -> long

Presenter: tailoring the delivery to larger context and user



Discourse models: Improving task-relevance

- Discourse models capture the larger context of programming activities
 - Representing the interaction history between programmers and CodeBroker
 - Removing irrelevant components
 - Negative discourse models: specifying what is not of interest to programmers
 - Example:

```
(( "java.util.zip" ) ;; a package  
  ( "java.awt" ( "CardLayout" ) ) ) ;; a  
class
```

User models: User-specific delivery

- User models represent programmers' knowledge on the component repository

- A list of known components

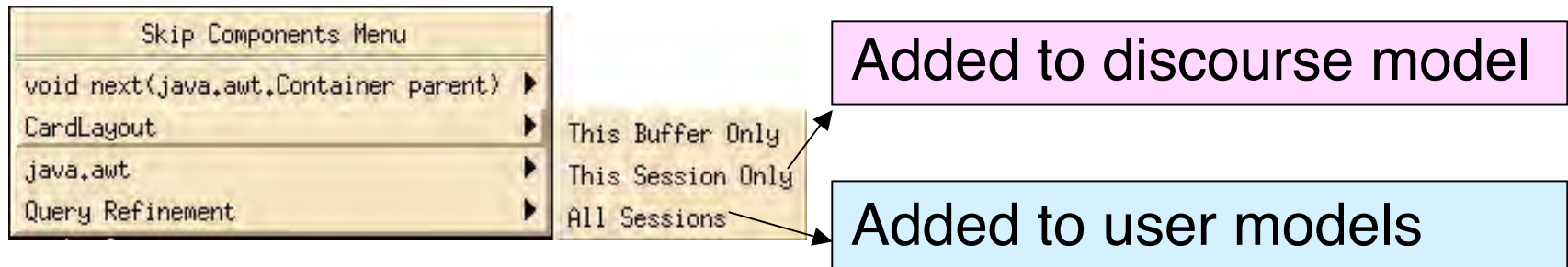
- Example:

```
(("java.applet" ("Applet" ("getParameterInfo"))  
 ("java.io" ("File" ("exists"  
                    "11/02/00" "11/10/00"  
                    "11/11/00"))  
 ("isAbsolute"  
  "11/01/00" "11/10/00"  
  "11/11/00")))))
```

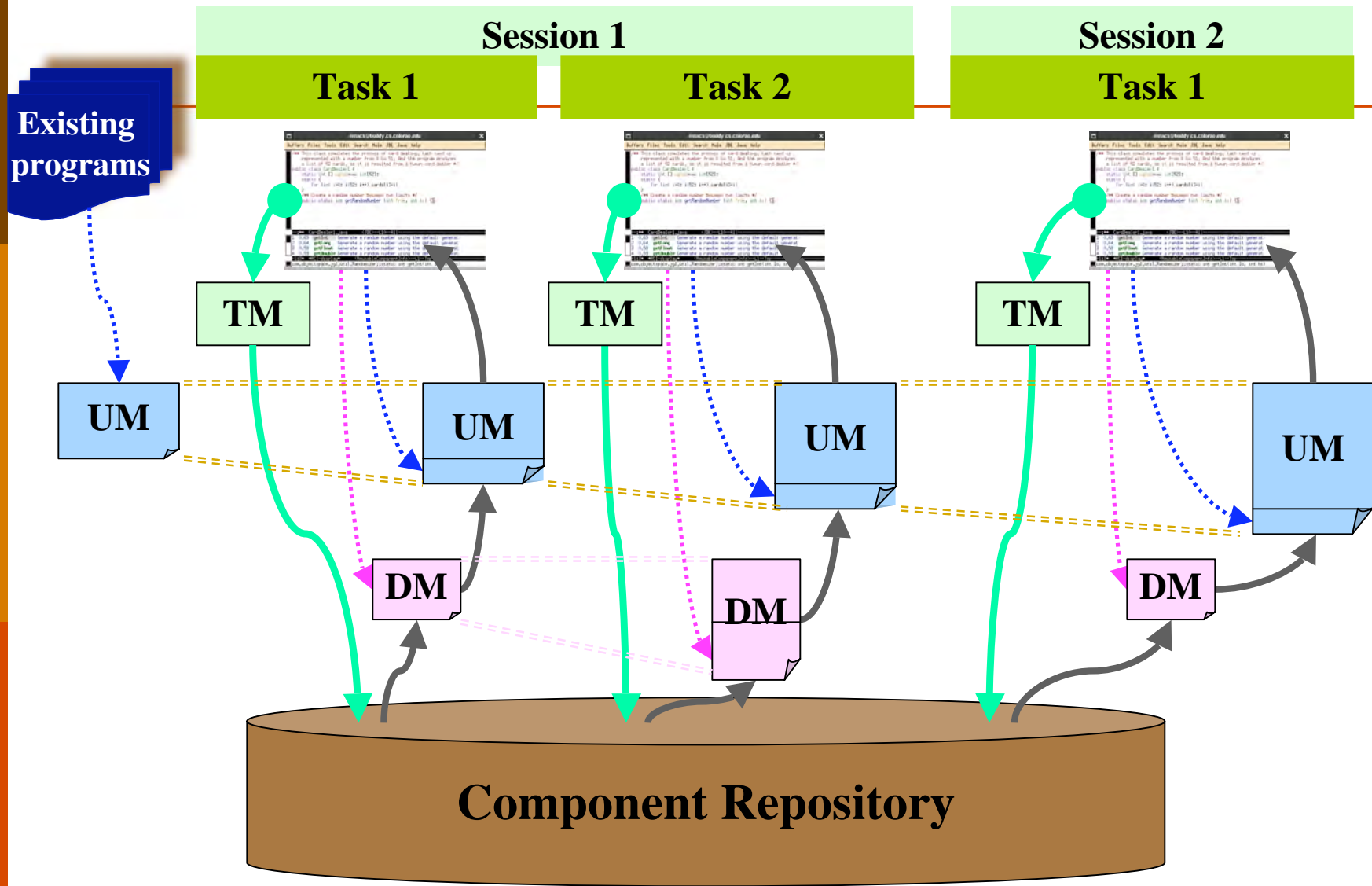
- Components contained in user models are **not** delivered

Incremental discourse modeling and user modeling

- ❑ **Initial** user models
 - Created by analyzing existing user programs
- ❑ **Adaptive** user models
 - CodeBroker updates user models automatically when it detects the use of a component in the editor
- ❑ **Adaptable** user models and discourse models
 - Using the Skip Components Menu associated with each delivered component

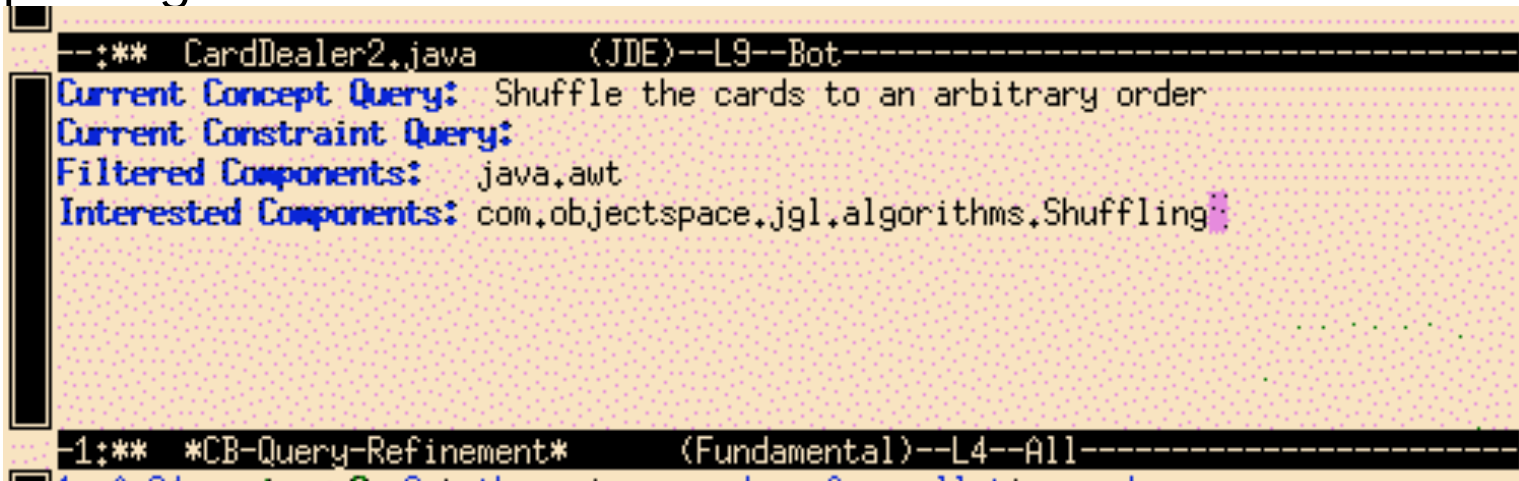


Models in CodeBroker



Retrieval-by-reformulation

- A process for software developers to incrementally develop reuse queries
- Delivered components help developers become familiar with the vocabulary and structure of the repository
 - Change the way of writing the query
 - Limit the search scope by specifying (un)interested packages and classes



```
--:** CardDealer2.java (JDE)--L9--Bot-----  
Current Concept Query: Shuffle the cards to an arbitrary order  
Current Constraint Query:  
Filtered Components: java.awt  
Interested Components: com.objectspace.jgl.algorithms.Shuffling  
  
-1:** *CB-Query-Refinement* (Fundamental)--L4--All-----
```

The cycle of delivery-browsing-searching

- Delivered components are results of information reconnaissance
- Possible actions after the delivery
 - The needed component is delivered
 - Choose the needed one through browsing
 - Too many components are delivered
 - Filter the delivered components
 - The needed one is not delivered
 - Search again through retrieval-by-reformulation

Evaluation experiments

- Experiment goals:
 - Observe the effectiveness of CodeBroker in encouraging programmers to reuse
 - Analyze the effectiveness of task inference, discourse models, and user models
- 12 experiments with 5 subjects
 - Implementing an assigned task with CodeBroker

Subjects	S1	S2	S3	S4	S5
Years of prog. in general	3-4	5-6	8	10+	10+
Java skill (self-evaluation)	4	7	7-8	10	7

System assessment

Sub	No	total	delivered	breakdown of deliveries			triggered
				unanticipated (L4-L3)	anticipated but unknown (L3)	vaguely known (L2)	
S1	1	10	4	2	2	0	0
	2	3	1	1	0	0	1
S2	3	7	1	1	0	0	0
	4	4	1	1	0	0	0
	5	5	3	0	2	1	1
S3	6	5	2	1	1	0	1
	7	4	3	1	2	0	1
	8	3	0	0	0	0	0
S4	9	4	3	0	3	0	0
	10	3	1	1	0	0	2
S5	11	4	1	1	0	0	2
	12	5	0	0	0	0	0
Sum		57	20	9	10	1	8

The STeP_IN system: a
SocioTechnical Platform
for in situ Networking



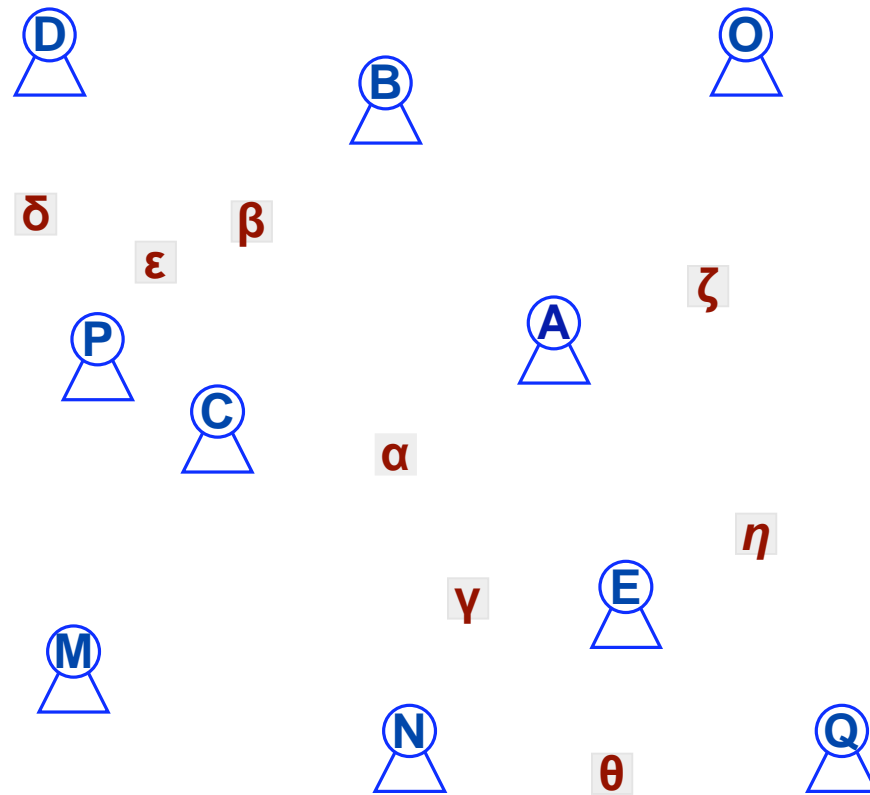
Three proximities for knowledge collaboration

- Cognitive proximity
 - Defines the transferability and combinability of knowledge
- Structural proximity
 - Provides communication channels for knowledge to flow
- Relational proximity
 - Determines the motivation to participate in knowledge collaboration

Dynamic community

- A dynamic community is a small group of knowledge workers that forms *ad hoc* in support of a particular *user* working on a particular *task*, and disassembles as the task is finished
- Dynamic communities support *situated* knowledge collaboration by mobilizing positive forces in *all three proximities*

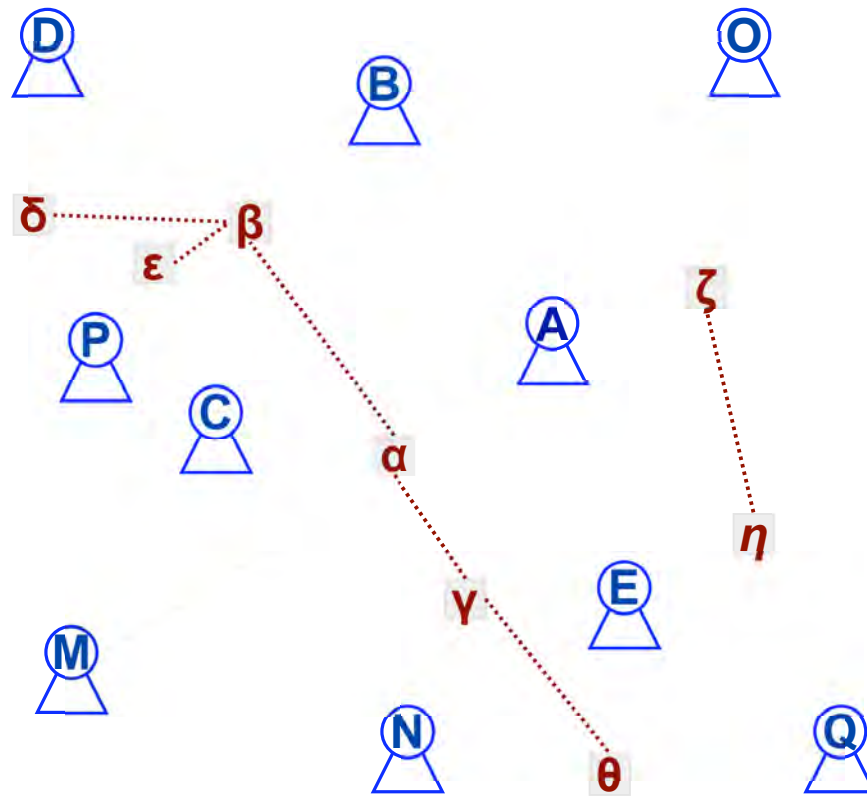
Knowledge Work Space



Set of people $\Psi = \{A, B, C, D, E, M, N, O, P, Q\}$

Set of information $\Phi = \{\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta\}$

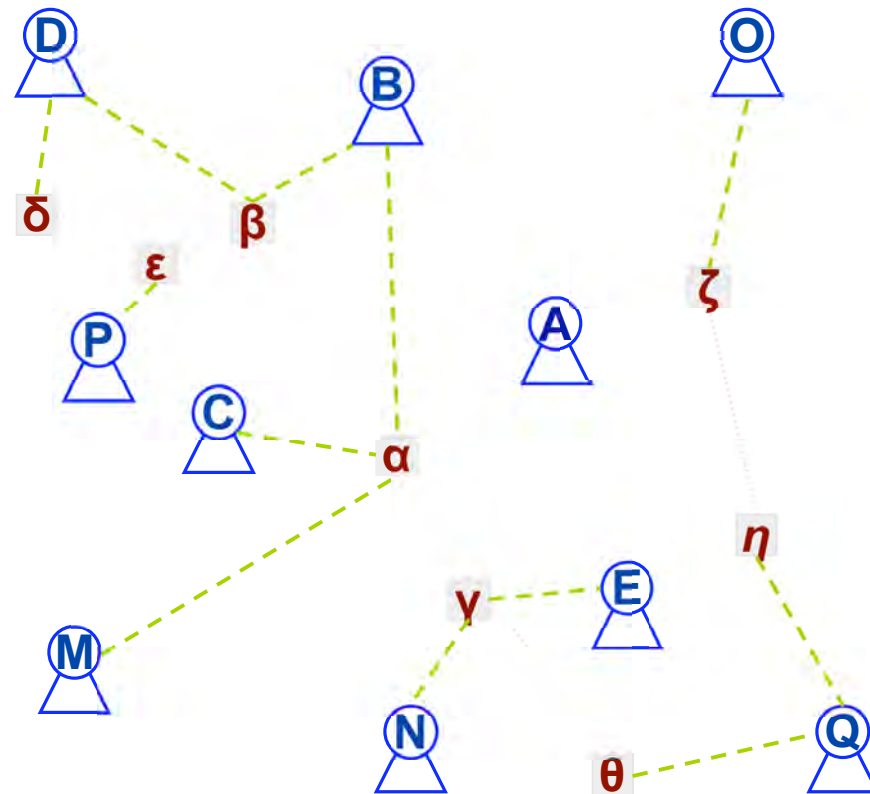
Knowledge Work Space



Relation between information

$$R = \{ (\alpha, \beta), (\alpha, \gamma), (\beta, \epsilon), (\beta, \delta), (\gamma, \theta), (\zeta, \eta) \}$$

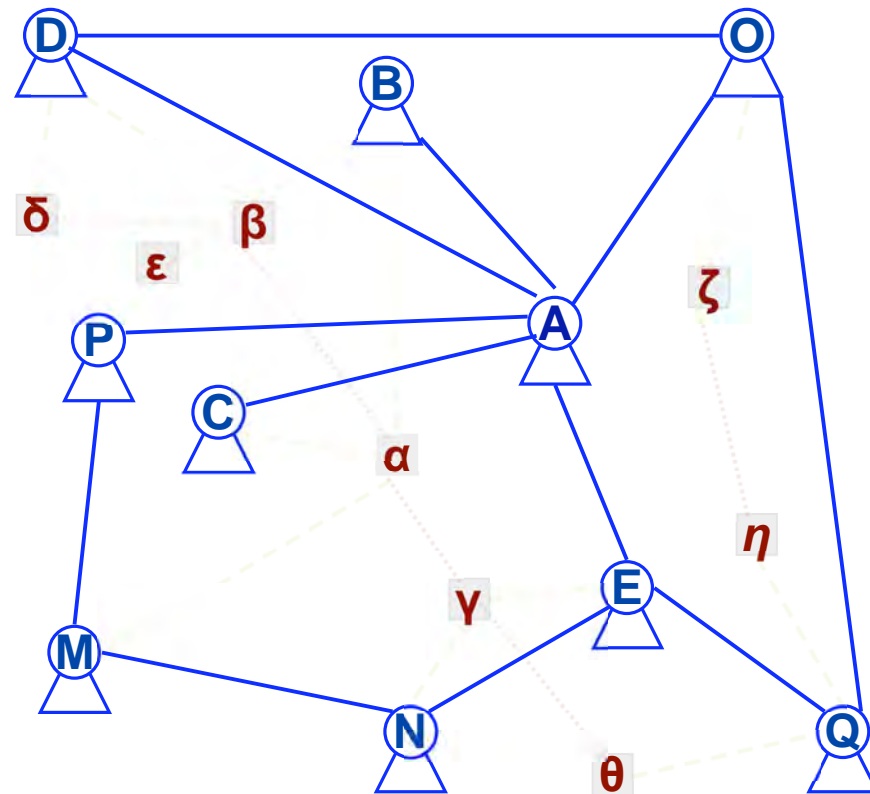
Knowledge Work Space



Relation between people and information

$$PI = \{ (B, \alpha), (C, \alpha), (M, \alpha), (B, \beta), (D, \beta), (E, \gamma), (N, \gamma), (D, \delta), (P, \epsilon), (O, \zeta), (Q, \eta), (Q, \theta) \}$$

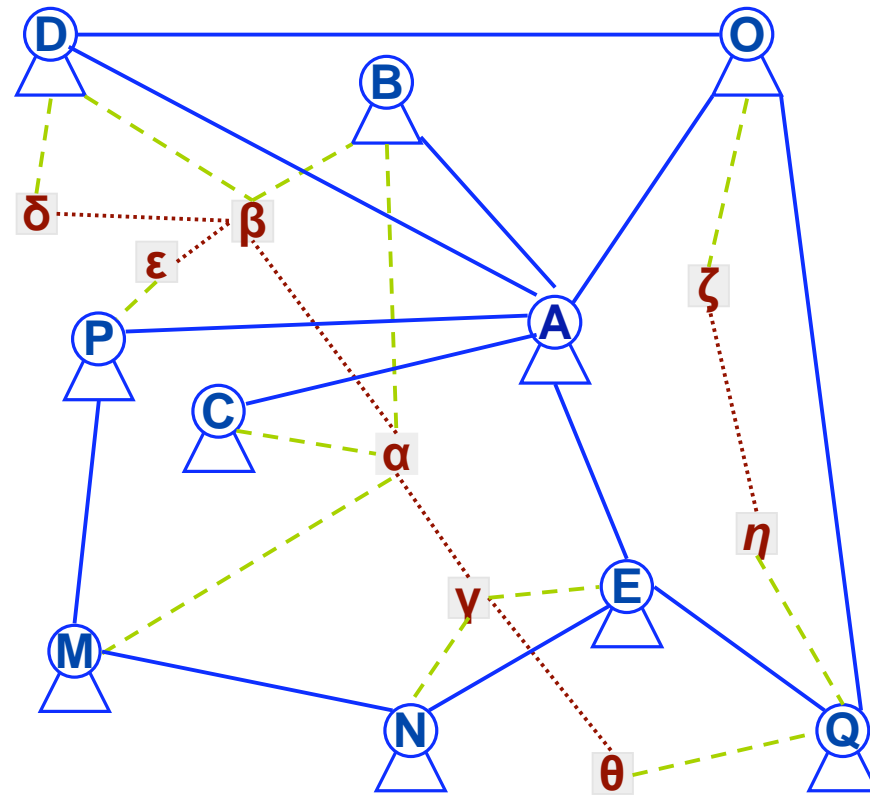
Knowledge Work Space



Relation between people

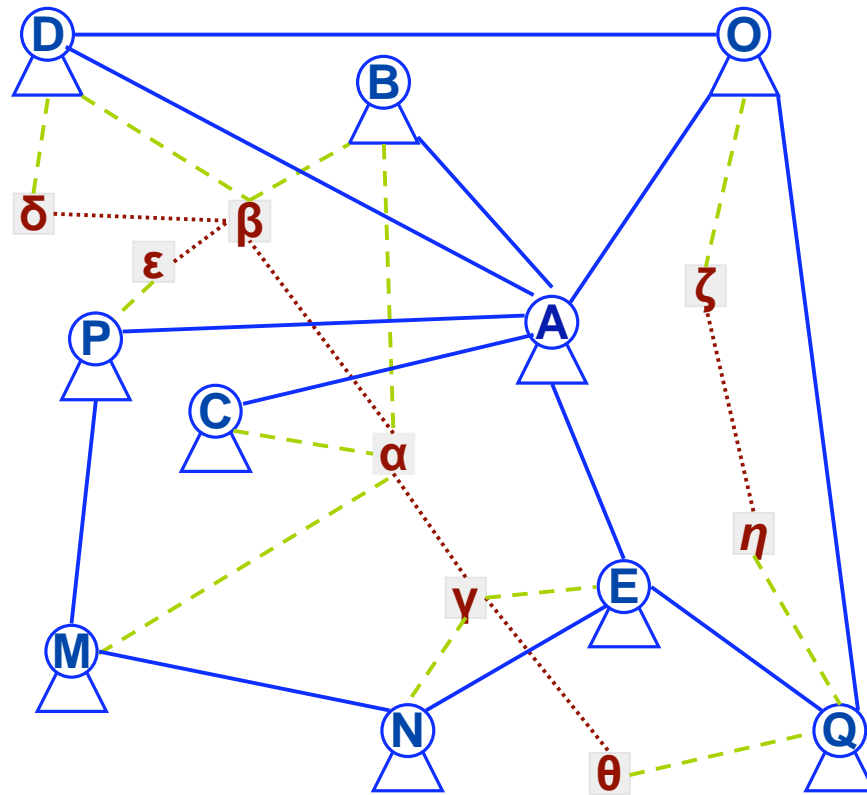
$PP = \{ (A, B), (A, C), (A, D), (A, E), (A, O), (A, P), (D, O), (E, N), (E, Q), (M, P), (M, N), (O, Q) \}$

Knowledge Work Space

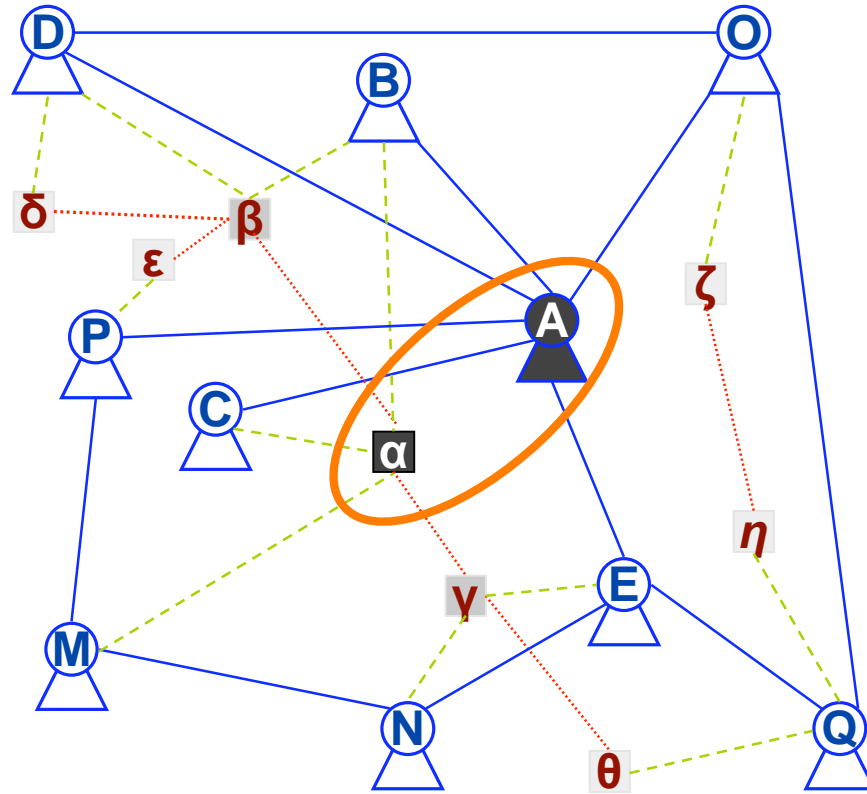


$KWS = (\{ (a, \beta), (a, \gamma), (\beta, \epsilon), (\beta, \delta), (\gamma, \theta), (\zeta, \eta) \},$
 $\{ (B, a), (C, a), (M, a), (B, \beta), (D, \beta), (E, \gamma), (N, \gamma), (D, \delta), (P, \epsilon), (O, \zeta), (Q, \eta), (Q, \theta) \},$
 $\{ (A, B), (A, C), (A, D), (A, E), (A, O), (A, P), (D, O), (E, N), (E, Q), (M, P), (M, N), (O, Q) \})$

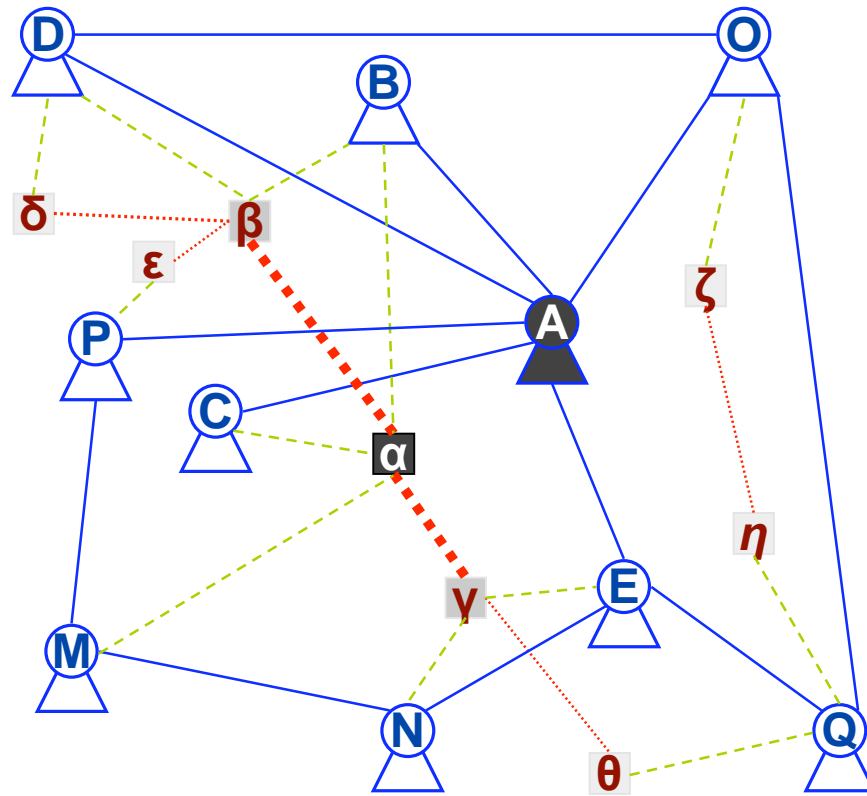
The forming process of a DynC



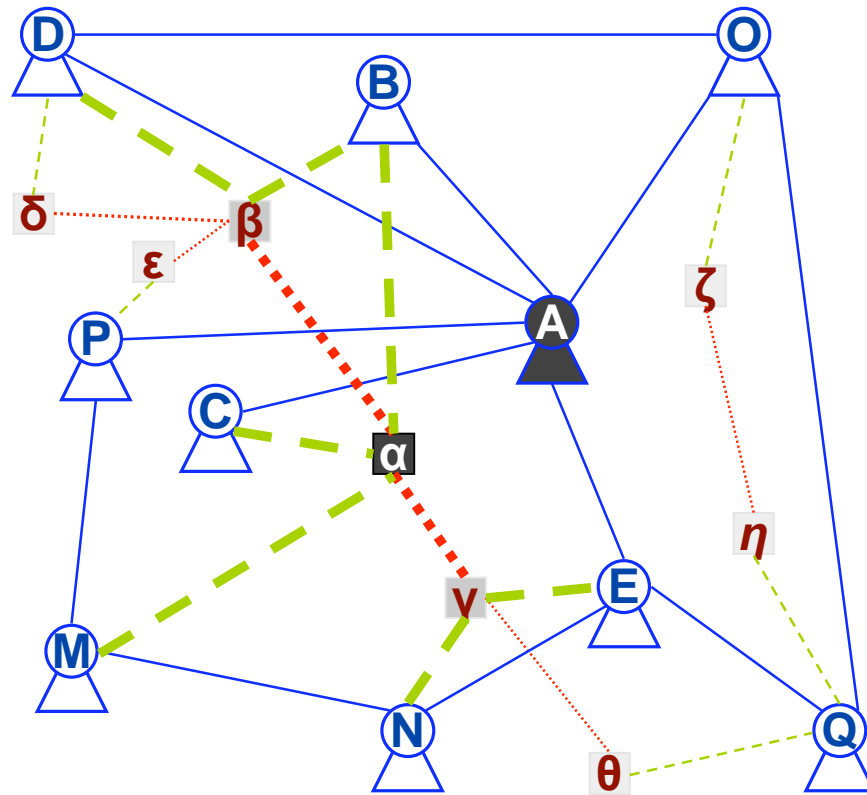
Triggering event for $Dync(A, \alpha)$



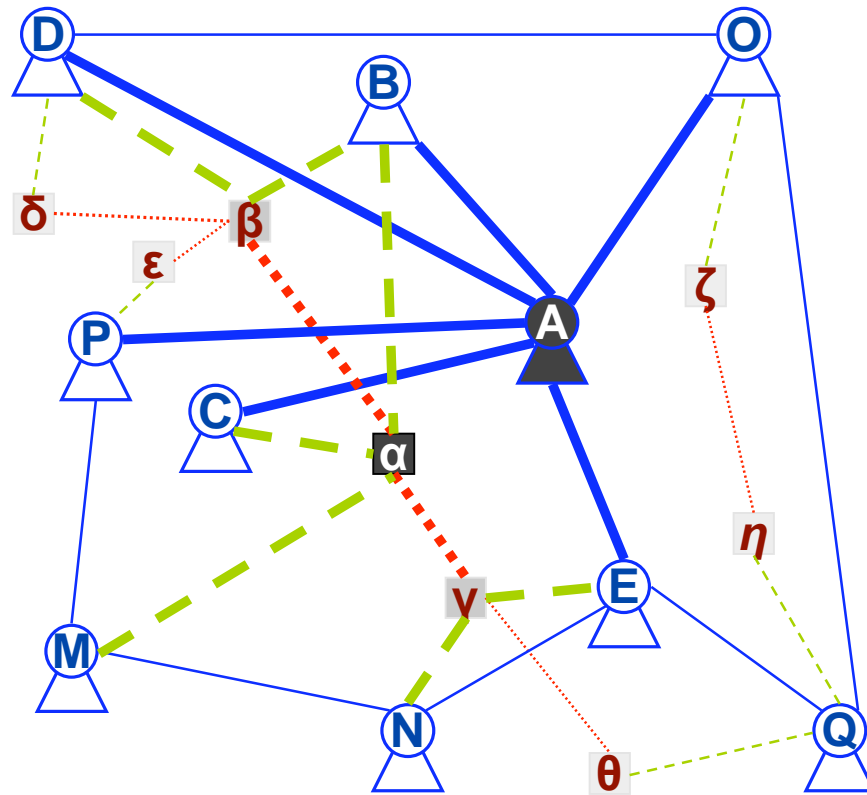
From information to information



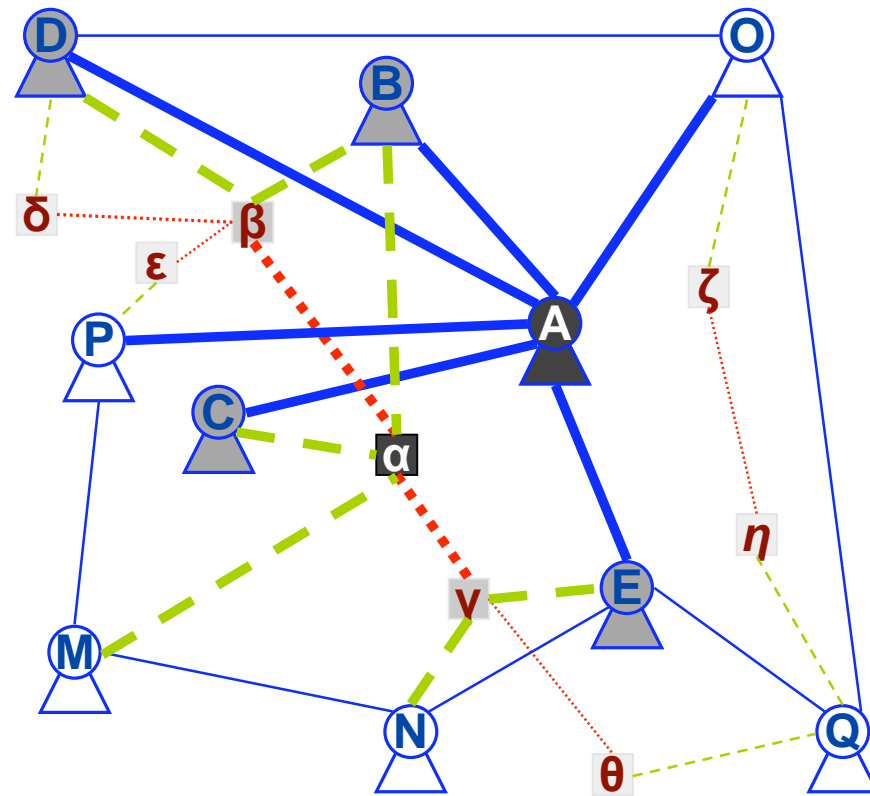
From information to people (experts)



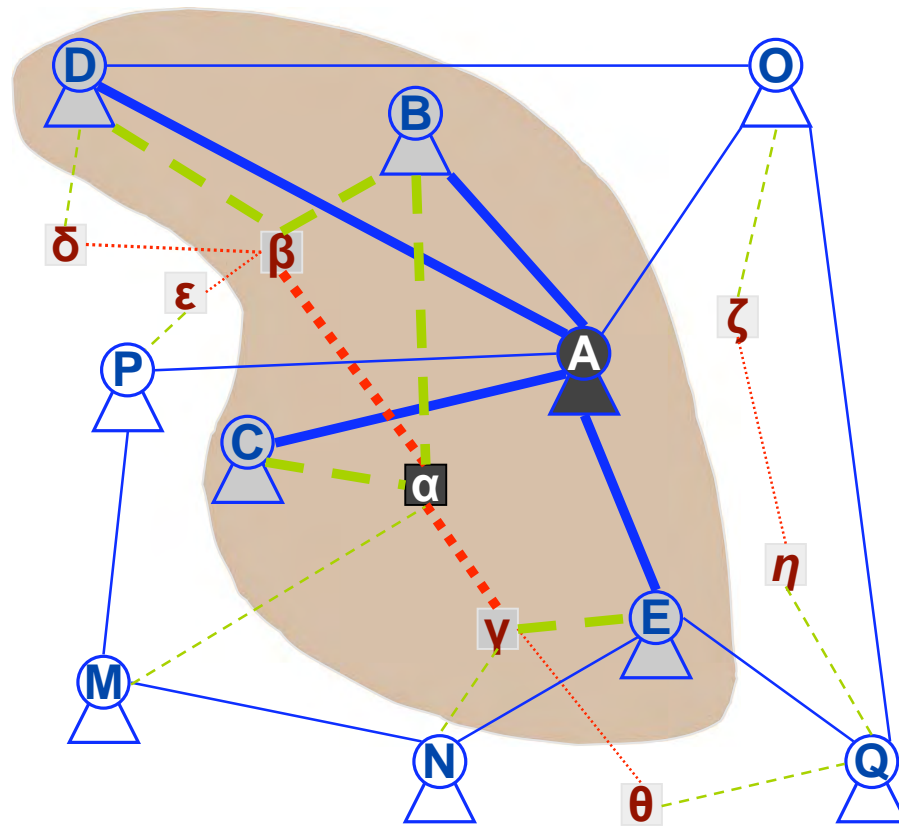
From people to people



$$\text{Dync}(A, \alpha) = \{A, B, C, D, E\}$$

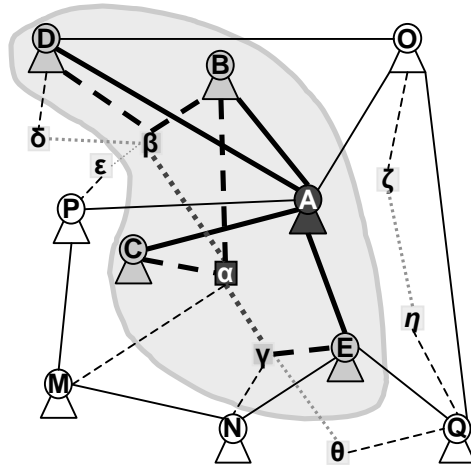


$$\text{Dync}(A, \alpha) = \{A, B, C, D, E\}$$

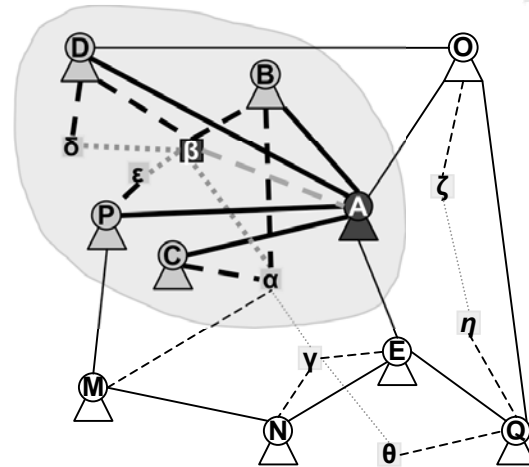


Task-specific and member-specific

Task-specific

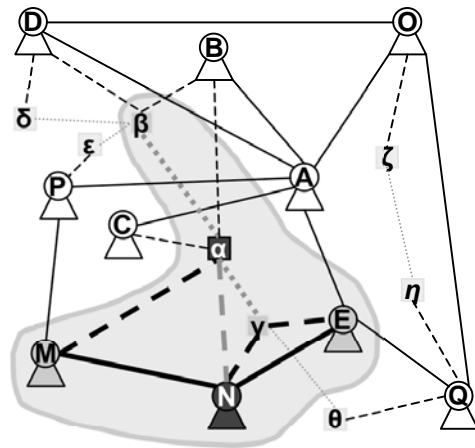


$$\text{DynC}(A, \alpha) = \{A, B, C, D, E\}$$



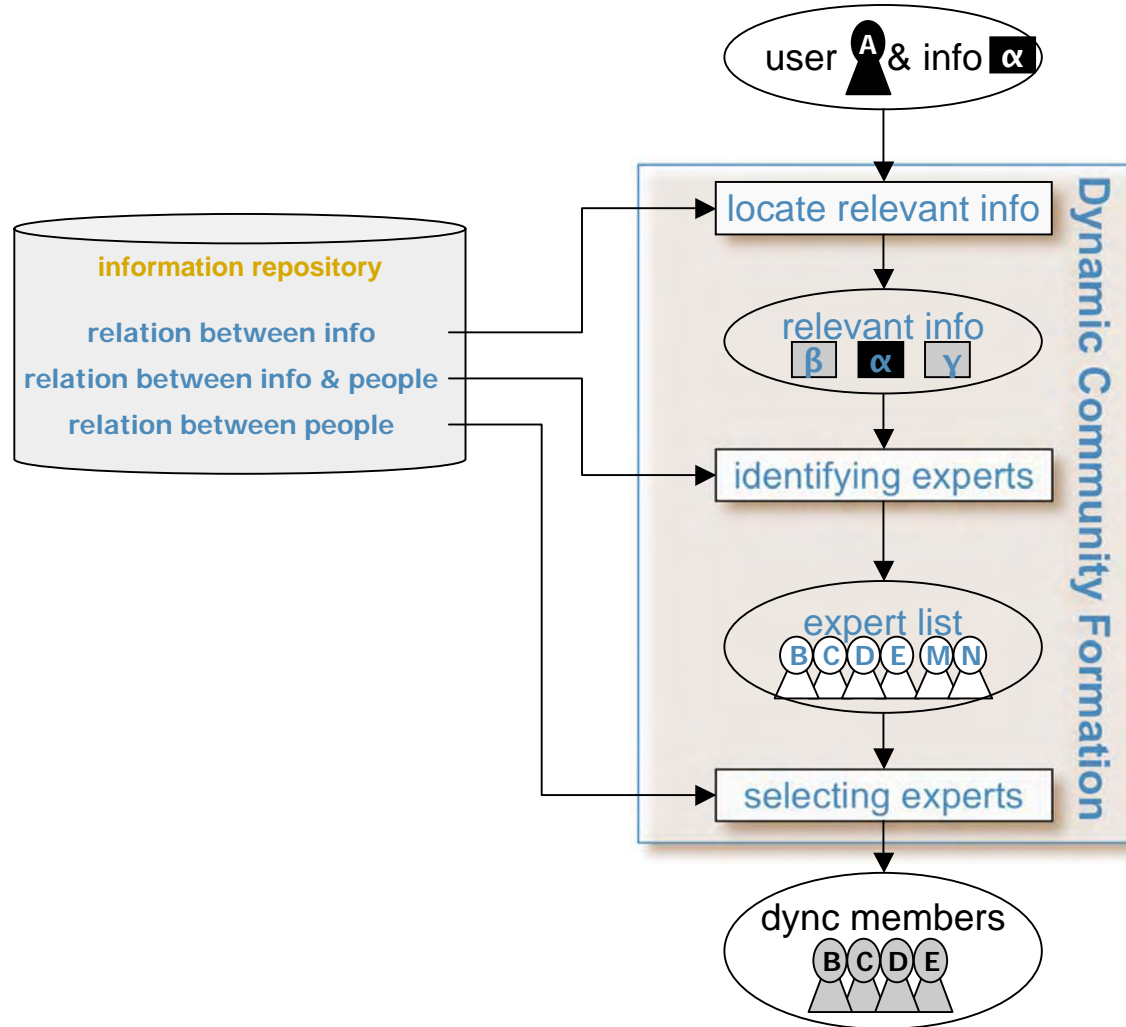
$$\text{DynC}(A, \beta) = \{A, B, C, D, P\}$$

Member-specific



$$\text{DynC}(N, \alpha) = \{E, N, M\}$$

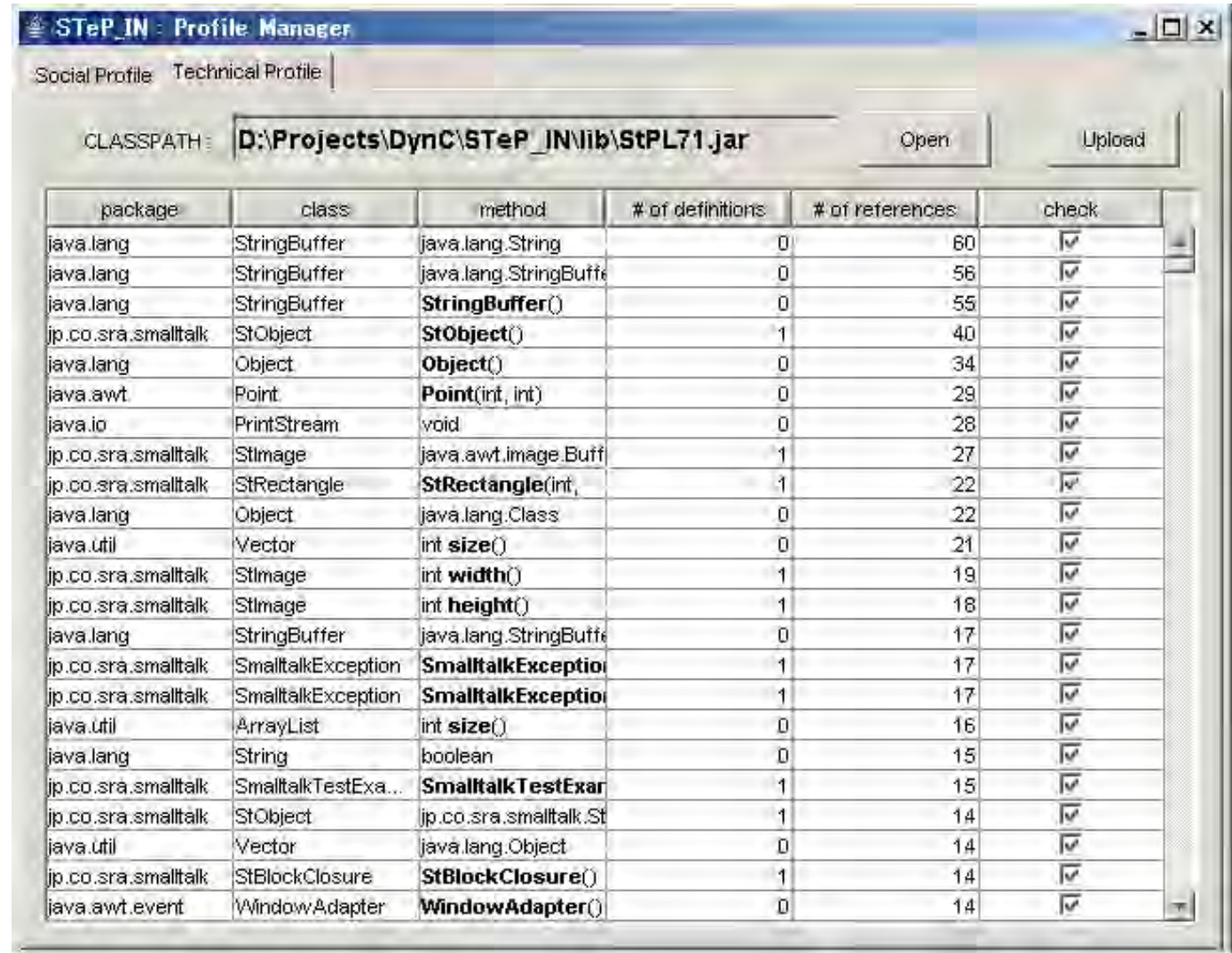
DynC formation support subsystem



STeP_IN: programming with external knowledge resources

- Individualized search for API methods
- Accumulating and showing use examples
- Getting help from peers (a DynC approach)
 - Who are the experts?
 - Experts can only be identified after task is known
 - Who is willing to help?
 - Utilizing existing social relations

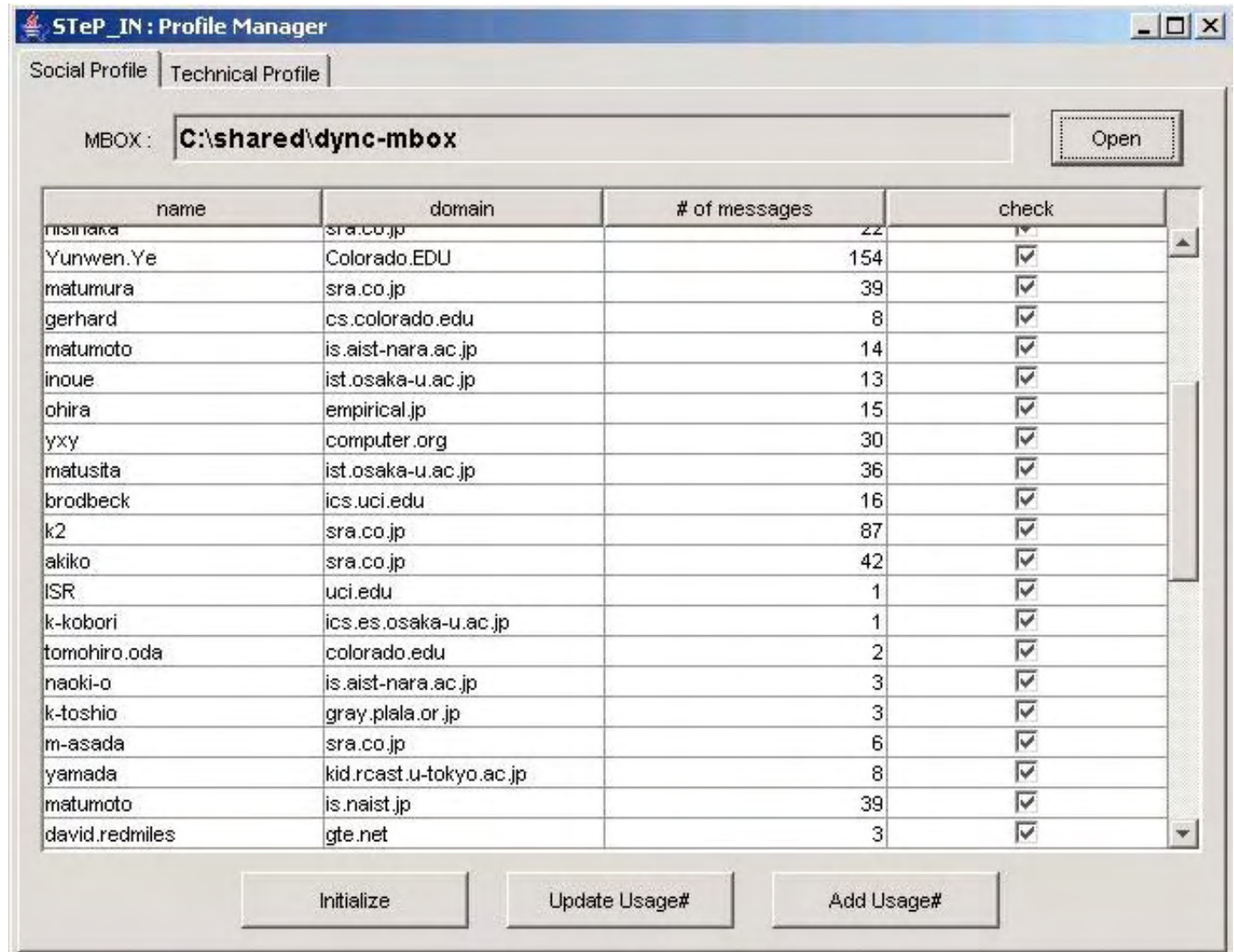
Technical Profile initialization



The screenshot shows the 'STeP_IN - Profile Manager' window. It has two tabs: 'Social Profile' and 'Technical Profile'. The 'CLASSPATH' field is set to 'D:\Projects\DynC\STeP_IN\lib\StPL71.jar'. There are 'Open' and 'Upload' buttons. Below is a table with columns: package, class, method, # of definitions, # of references, and check.

package	class	method	# of definitions	# of references	check
java.lang	StringBuffer	java.lang.String	0	60	✓
java.lang	StringBuffer	java.lang.StringBuffer	0	56	✓
java.lang	StringBuffer	StringBuffer()	0	55	✓
jp.co.sra.smalltalk	StObject	StObject()	1	40	✓
java.lang	Object	Object()	0	34	✓
java.awt	Point	Point(int, int)	0	29	✓
java.io	PrintStream	void	0	28	✓
jp.co.sra.smalltalk	StImage	java.awt.image.BufferedImage	1	27	✓
jp.co.sra.smalltalk	StRectangle	StRectangle(int, int)	1	22	✓
java.lang	Object	java.lang.Class	0	22	✓
java.util	Vector	int size()	0	21	✓
jp.co.sra.smalltalk	StImage	int width()	1	19	✓
jp.co.sra.smalltalk	StImage	int height()	1	18	✓
java.lang	StringBuffer	java.lang.StringBuffer	0	17	✓
jp.co.sra.smalltalk	SmalltalkException	SmalltalkException()	1	17	✓
jp.co.sra.smalltalk	SmalltalkException	SmalltalkException(String)	1	17	✓
java.util	ArrayList	int size()	0	16	✓
java.lang	String	boolean	0	15	✓
jp.co.sra.smalltalk	SmalltalkTestExample	SmalltalkTestExample()	1	15	✓
jp.co.sra.smalltalk	StObject	jp.co.sra.smalltalk.StObject	1	14	✓
java.util	Vector	java.lang.Object	0	14	✓
jp.co.sra.smalltalk	StBlockClosure	StBlockClosure()	1	14	✓
java.awt.event	WindowAdapter	WindowAdapter()	0	14	✓

Social Profile Initialization



Search

The screenshot shows a Mozilla Firefox browser window with the address bar displaying `http://ktslvj.sra.co.jp/STeP_IN/Home`. The page content includes a navigation menu, a welcome message, a search interface, and a table of top contributors.

Search for...
execute an external command

Options...
Scope :
Filter :
only return methods I know I dont't know Both

STeP_IN Status.
Active DynC initiated by you: 7
Active DynC you are participating: 0
Active DynC in STeP_IN: 8
Total DynC in STeP_IN: 14
You have helped other members 0 times, and you have been helped 6 by other members.

Top contributors of all time.

Rank	Point	User Name
1	2	nisinaka
2	1	user001
2	1	user005
2	1	user008
2	1	yunwen

This page was created by STeP_IN (001) on 2005/12/16 00:41:39

Applet jp.sra_ktl.stepin.profile.AdLoginApplet notinited

Individualized search

Search results

CodeBroker Search for: Model: Search

... next 20->

1	exec 0.37 java.lang.Runtime.	Executes the specified string command in a separat... public java.lang.Process exec(String command)	command, execute
2	getCommand 0.36 javax.sql.RowSet.	Retrieves this RowSet object's command property. T... public java.lang.String getCommand()	command, execute
3	exec 0.35 java.lang.Runtime.	Executes the specified command and arguments in a... public java.lang.Process exec(java.lang.String[] cmdarray)	command, execute
4	executeBatch 0.31 java.sql.Statement.	Submits a batch of commands to the database for ex... public int[] executeBatch()	command, execute
5	exec 0.31 java.lang.Runtime.	Executes the specified command and arguments in a... public java.lang.Process exec(java.lang.String[] cmdarray, java.lang.String[] envp)	command, execute
6	getUpdateCounts 0.31 java.sql.BatchUpdateException.	Retrieves the update count for each update stateme... public int[] getUpdateCounts()	command, execute
7	addBatch 0.3 java.sql.Statement.	Adds the given SQL command to the current list of... public void addBatch(String sql)	command, execute
8	augmentList 0.26 javax.swing.text.TextAction.	Takes one list of commands and augments it with an... public static final javax.swing.Action[] augmentList(javax.swing.Action[] list1, javax.swing.Action[] list2)	command
9	getDocumentTypeDeclarationPublicIdentifier 0.25 org.apache.xml.dtm.DTM.	Return the public identifier of the external subse... public java.lang.String getDocumentTypeDeclarationPublicIdentifier()	external
10	getDocumentTypeDeclarationPublicIdentifier 0.25 org.apache.xml.dtm.ref.dom2dtm.DOM2DTM.	Return the public identifier of the external subse... public java.lang.String getDocumentTypeDeclarationPublicIdentifier()	external
11	getDocumentTypeDeclarationPublicIdentifier 0.25 org.apache.xml.dtm.ref.DTMDefaultBase.	Return the public identifier of the external subse... public abstract java.lang.String getDocumentTypeDeclarationPublicIdentifier()	external

Done

Search engine for Java programs

CodeBroker Search for: generate random numbers
Model: Search
Options:

... next 20->

1	getNextValue	Generates a random value from this distribution...	random, generate
038	org.apache.commons.math.random. EmpiricalDistributi	public double getNextValue()	
2	reSeed	Reseeds the random number generator with the curre...	random, generate, numbers
039	org.apache.commons.math.random. RandomDataImpl	public void reSeed()	
3	nextSecureInt	Generate a random int value uniformly distributed...	random, generate, numbers
039	org.apache.commons.math.random. RandomDataImpl	public int nextSecureInt(int lower, int upper)	
4	nextSecureLong	Generate a random long value uniformly distributed...	random, generate, numbers
039	org.apache.commons.math.random. RandomDataImpl	public long nextSecureLong(long lower, long upper)	
5	reSeed	Reseeds the random number generator with the suppl...	random, generate, numbers
03	org.apache.commons.math.random. RandomDataImpl	public void reSeed(long seed)	
6	reSeedSecure	Reseeds the secure random number generator with th...	random, generate, numbers
028	org.apache.commons.math.random. RandomDataImpl	public void reSeedSecure(long seed)	
7	nextSample	Uses a 2-cycle permutation shuffle to generate a r...	generate, random
027	org.apache.commons.math.random. RandomDataImpl	public java.lang. Object[] nextSample(java.util. Collection c, int k)	
8	reSeedSecure	Reseeds the secure random number generator with th...	random, generate, numbers
027	org.apache.commons.math.random. RandomDataImpl	public void reSeedSecure()	
9	nextHexString	Generates a random string of hex characters of len...	generate, random
025	org.apache.commons.math.random. RandomData	public java.lang. String nextHexString(int len)	
10	getNextValue	Generates a random value from this distribution. P...	random, generate
024	org.apache.commons.math.random. EmpiricalDistributi	public double getNextValue()	
11	nextInt	Generate a random int value uniformly distributed	random

Search engine for Java programs

CodeBroker Search for: Model: Search Options:

... [next 20->](#)

1	getNextValue	Generates a random value from this distribution...	random, generate
0.38	org.apache.commons.math.random. EmpiricalDistributi	public double getNextValue()	
2	reSeed	Reseeds the random number generator with the curre...	random, generate, numbers
0.33	org.apache.commons.math.random. RandomDataImpl.	public void reSeed()	
3	nextSecureInt	Generate a random int value uniformly distributed...	random, generate, numbers
0.33	org.apache.commons.math.random. RandomDataImpl.	public int nextSecureInt(int lower, int upper)	
4	nextSecureLong	Generate a random long value uniformly distributed...	random, generate, numbers
0.33	org.apache.commons.math.random. RandomDataImpl.	public long nextSecureLong(long lower, long upper)	
5	reSeed	Reseeds the random number generator with the suppl...	random, generate, numbers
0.3	org.apache.commons.math.random. RandomDataImpl.	public void reSeed(long seed)	
6	reSeedSecure	Reseeds the secure random number generator with th...	random, generate, numbers
0.28	org.apache.commons.math.random. RandomDataImpl.	public void reSeedSecure(long seed)	
7	nextSample	Uses a 2-cycle permutation shuffle to generate a r...	generate, random
0.27	org.apache.commons.math.random. RandomDataImpl.	public java.lang. Object[] nextSample(java.util. Collection c, int k)	
8	reSeedSecure	Reseeds the secure random number generator with th...	random, generate, numbers
0.27	org.apache.commons.math.random. RandomDataImpl.	public void reSeedSecure()	
9	nextHexString	Generates a random string of hex characters of len...	generate, random
0.23	org.apache.commons.math.random. RandomData.	public java.lang. String nextHexString(int len)	
10	getNextValue	Generates a random value from this distribution. P...	random, generate
0.24	org.apache.commons.math.random. EmpiricalDistributi	public double getNextValue()	
11	nextInt	Generate a random int value uniformly distributed	random

Search engine for Java programs

CodeBroker Search for: generate random numbers
Model: Search
Options:

... next 20->

1	getNextValue	org.apache.commons.math.random. EmpiricalDistributi	Generates a random value from this distribution...	random, generate
0.38		org.apache.commons.math.random. EmpiricalDistributi	public double getNextValue()	
		+Scope	-Filter	
2	reSeed	org.apache.commons.math.random		
0.35				
3	nextSecureInt	org.apache.commons.math.random. RandomDataImpl.	Generate a random int value uniformly distributed...	random, generate, numbers
0.35			public int nextSecureInt(int lower, int upper)	
4	nextSecureLong	org.apache.commons.math.random. RandomDataImpl.	Generate a random long value uniformly distributed...	random, generate, numbers
0.35			public long nextSecureLong(long lower, long upper)	
5	reSeed	org.apache.commons.math.random. RandomDataImpl.	Reseeds the random number generator with the suppl...	random, generate, numbers
0.3			public void reSeed(long seed)	
6	reSeedSecure	org.apache.commons.math.random. RandomDataImpl.	Reseeds the secure random number generator with th...	random, generate, numbers
0.28			public void reSeedSecure(long seed)	
7	nextSample	org.apache.commons.math.random. RandomDataImpl.	Uses a 2-cycle permutation shuffle to generate a r...	generate, random
0.27			public java lang. Object[] nextSample(java util. Collection c, int k)	
8	reSeedSecure	org.apache.commons.math.random. RandomDataImpl.	Reseeds the secure random number generator with th...	random, generate, numbers
0.27			public void reSeedSecure()	
9	nextHexString	org.apache.commons.math.random. RandomData.	Generates a random string of hex characters of len...	generate, random
0.25			public java lang. String nextHexString(int len)	

Specifying packages or classes not to search

Search engine for Java programs

CodeBroker Search for: generate random numbers
Model: -org.apache.commons.math.random.EmpiricalDistributi

1	reSeed	Reseeds the random number generator with the curre...	random, generate, numbers
0.33	org.apache.commons.math.random.RandomDataImpl.	public void reSeed()	
2	nextSecureInt	Generate a random int value uniformly distributed...	random, generate, numbers
0.33	org.apache.commons.math.random.RandomDataImpl.	public int nextSecureInt(int lower, int upper)	
3	nextSecureLong	Generate a random long value uniformly distributed...	random, generate, numbers
0.33	org.apache.commons.math.random.RandomDataImpl.	public long nextSecureLong(long lower, long upper)	
4	reSeed	Reseeds the random number generator with the suppl...	random, generate, numbers
0.3	org.apache.commons.math.random.RandomDataImpl.	public void reSeed(long seed)	
5	reSeedSecure	Reseeds the secure random number generator with th...	random, generate, numbers
0.28	org.apache.commons.math.random.RandomDataImpl.	public void reSeedSecure(long seed)	
6	nextSample	Uses a 2-cycle permutation shuffle to generate a r...	generate, random
0.27	org.apache.commons.math.random.RandomDataImpl.	public java.lang.Object[] nextSample(java.util.Collection c, int k)	
7	reSeedSecure	Reseeds the secure random number generator with th...	random, generate, numbers
0.27	org.apache.commons.math.random.RandomDataImpl.	public void reSeedSecure()	
8	nextHexString	Generates a random string of hex characters of len...	generate, random
0.23	org.apache.commons.math.random.RandomData.	public java.lang.String nextHexString(int len)	
9	nextInt	Generate a random int value uniformly distributed...	random, generate
0.24	org.apache.commons.math.random.RandomDataImpl.	public int nextInt(int lower, int upper)	
10	nextLong	Generate a random long value uniformly distributed...	random, generate
0.24	org.apache.commons.math.random.RandomDataImpl.	public long nextLong(long lower, long upper)	
11	nextPermutation	Uses a 2-cycle permutation shuffle to generate a r...	random

Search engine for Java programs

The screenshot shows the CodeBroker web interface in Microsoft Internet Explorer. The search query is "generate random numbers". The results table lists several methods from the org.apache.commons.math.random package. A red circle highlights the "+Scope" button in the first result row. A red banner with white text is overlaid on the table, stating "Specifying packages or classes to search".

Method Name	Package	Description	Signature	Keywords
getNextValue	org.apache.commons.math.random. EmpiricalDistributi...	Generates a random value from this distribution...	public double getNextValue()	random, generate
reSeed	org.apac...	Reseeds the random number generator with the suppl...	public void reSeed(long seed)	random, generate, numbers
nextSecureInt	org.apache.commons.math.random. RandomDataImpl.	Generate a random int value uniformly distributed...	public int nextSecureInt(int lower, int upper)	random, generate, numbers
nextSecureLong	org.apache.commons.math.random. RandomDataImpl.	Generate a random long value uniformly distributed...	public long nextSecureLong(long lower, long upper)	random, generate, numbers
reSeed	org.apache.commons.math.random. RandomDataImpl.	Reseeds the random number generator with the suppl...	public void reSeed(long seed)	random, generate, numbers
reSeedSecure	org.apache.commons.math.random. RandomDataImpl.	Reseeds the secure random number generator with th...	public void reSeedSecure(long seed)	random, generate, numbers
nextSample	org.apache.commons.math.random. RandomDataImpl.	Uses a 2-cycle permutation shuffle to generate a r...	public java.lang.Object[] nextSample(java.util.Collection c, int k)	generate, random
reSeedSecure	org.apache.commons.math.random. RandomDataImpl.	Reseeds the secure random number generator with th...	public void reSeedSecure()	random, generate, numbers
nextHexString	org.apache.commons.math.random. RandomData.	Generates a random string of hex characters of len...	public java.lang.String nextHexString(int len)	generate, random

Search engine for Java programs

The screenshot shows the CodeBroker web interface in Microsoft Internet Explorer. The search query is "generate random numbers" and the model is "+org.apache.commons.math.random.Emperi". The search results are displayed in a table with 9 rows, each containing a method name, its signature, a brief description, and associated keywords.

Rank	Method Name	Signature	Description	Keywords
1	getNextValue	public double getNextValue()	Generates a random value from this distribution...	random, generate
2	getNextValue	public double getNextValue()	Generates a random value from this distribution. P...	random, generate
3	testNext	public void testNext()	Generate 1000 random values and make sure they loo...	random, generate
4	getBinCount	public int getBinCount()	Returns the number of bins...	numbers
5	getBinCount	public int getBinCount()	Returns the number of bins...	numbers
6	load	public void load(double[] dataArray)	Computes the empirical distribution from the provi...	numbers
7	load	public void load(double[] in)	Computes the empirical distribution from the provi...	numbers
8	getBinStats	public java.util.List getBinStats()	Returns a list of (@link org.apache.commons.math.s...	numbers
9	getBinStats	public java.util.List getBinStats()	Returns an ArrayList of (@link SummaryStatistics)...	numbers

Search engine for Java programs

Codebroker Search for: generate random numbers
Model: Search Options:

... next 20 ->

1	getNextValue	org.apache.commons.math.random. EmpiricalDistributi...	Generates a random value from this distribution...	random, generate
0.33		org.apache.commons.math.random. EmpiricalDistributi...	public double getNextValue()	
2	reSeed	org.apache.commons.math.random. RandomDataImpl.	Reseeds the random number generator with the suppl...	random, generate, numbers
0.33		org.apache.commons.math.random. RandomDataImpl.	public void reSeed(long seed)	
3	nextSecureInt	org.apache.commons.math.random. RandomDataImpl.	Generate a random int value uniformly distributed...	random, generate, numbers
0.33		org.apache.commons.math.random. RandomDataImpl.	public int nextSecureInt(int lower, int upper)	
4	nextSecureLong	org.apache.commons.math.random. RandomDataImpl.	Generate a random long value uniformly distributed...	random, generate, numbers
0.33		org.apache.commons.math.random. RandomDataImpl.	public long nextSecureLong(long lower, long upper)	
5	reSeed	org.apache.commons.math.random. RandomDataImpl.	Reseeds the random number generator with the suppl...	random, generate, numbers
0.3		org.apache.commons.math.random. RandomDataImpl.	public void reSeed(long seed)	
6	reSeedSecure	org.apache.commons.math.random. RandomDataImpl.	Reseeds the secure random number generator with th...	random, generate, numbers
0.28		org.apache.commons.math.random. RandomDataImpl.	public void reSeedSecure(long seed)	
7	nextSample	org.apache.commons.math.random. RandomDataImpl.	Uses a 2-cycle permutation shuffle to generate a r...	generate, random
0.27		org.apache.commons.math.random. RandomDataImpl.	public java.lang. Object[] nextSample(java.util. Collection c, int k)	
8	reSeedSecure	org.apache.commons.math.random. RandomDataImpl.	Reseeds the secure random number generator with th...	random, generate, numbers
0.27		org.apache.commons.math.random. RandomDataImpl.	public void reSeedSecure()	
9	nextHexString	org.apache.commons.math.random. RandomData.	Generates a random string of hex characters of len...	generate, random
0.25		org.apache.commons.math.random. RandomData.	public java.lang. String nextHexString(int len)	

Extended Java API documents

Runtime - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://ktlsvj.sra.co.jp/codebroker/javadoc/java/lang/Runtime.html#exec(java.lang.String)

The Mozilla Orga... Latest Builds

exec

```
public Process exec(String command)
    throws IOException
```

Executes the specified string command in a separate process.

Examples Discussion Archive Ask Experts Upload Example

new StringTokenizer(command)

with no further modifications of the character categories. This method has exactly the same effect as `exec(command, null)`.

Parameters:

- command - a specified system command.

Returns:

- a Process object for managing the subprocess.

Throws:

- [SecurityException](#) - if a security manager exists and its `checkExec` method doesn't allow creation of a subprocess.
- [IOException](#) - if an I/O error occurs
- [NullPointerException](#) - if command is null
- [IllegalArgumentException](#) - if command is empty

See Also:

- [exec\(java.lang.String, java.lang.String\[\]\)](#), [SecurityManager.checkExec\(java.lang.String\)](#)

Examples Discussion Archive Ask Experts Upload Example

exec

Done

Examples

[Home] [Logout] [JavaDoc] [Social Profile] [Technical Profile] [Involved DynC] [Account]

Examples for java.lang.Runtime java.lang.Process exec(java.lang.String)

[Previous] 1 [Next] [Add Example] [Discussion Archive] [Ask Expert]

This example is provided by m-asada.
0 found it helpful.
0 found it not helpful.

```
//executing an external unix command ls

try {
    String command = "ls";
    Process childprocess = Runtime.getRuntime().exec(command);
} catch (IOException e) {
}
```

This example is Helpful Not helpful

Done

Ask the experts

STeP_IN: Ask Experts - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://ktslvj.sra.co.jp/STeP_IN/Dync?method_id=61677

The Mozilla Orga... Latest Builds

[Home] [Logout] [JavaDoc] [Social Profile] [Technical Profile] [Involved DynC] [Account]

Requesting collaboration from experts on

java.lang.Runtime

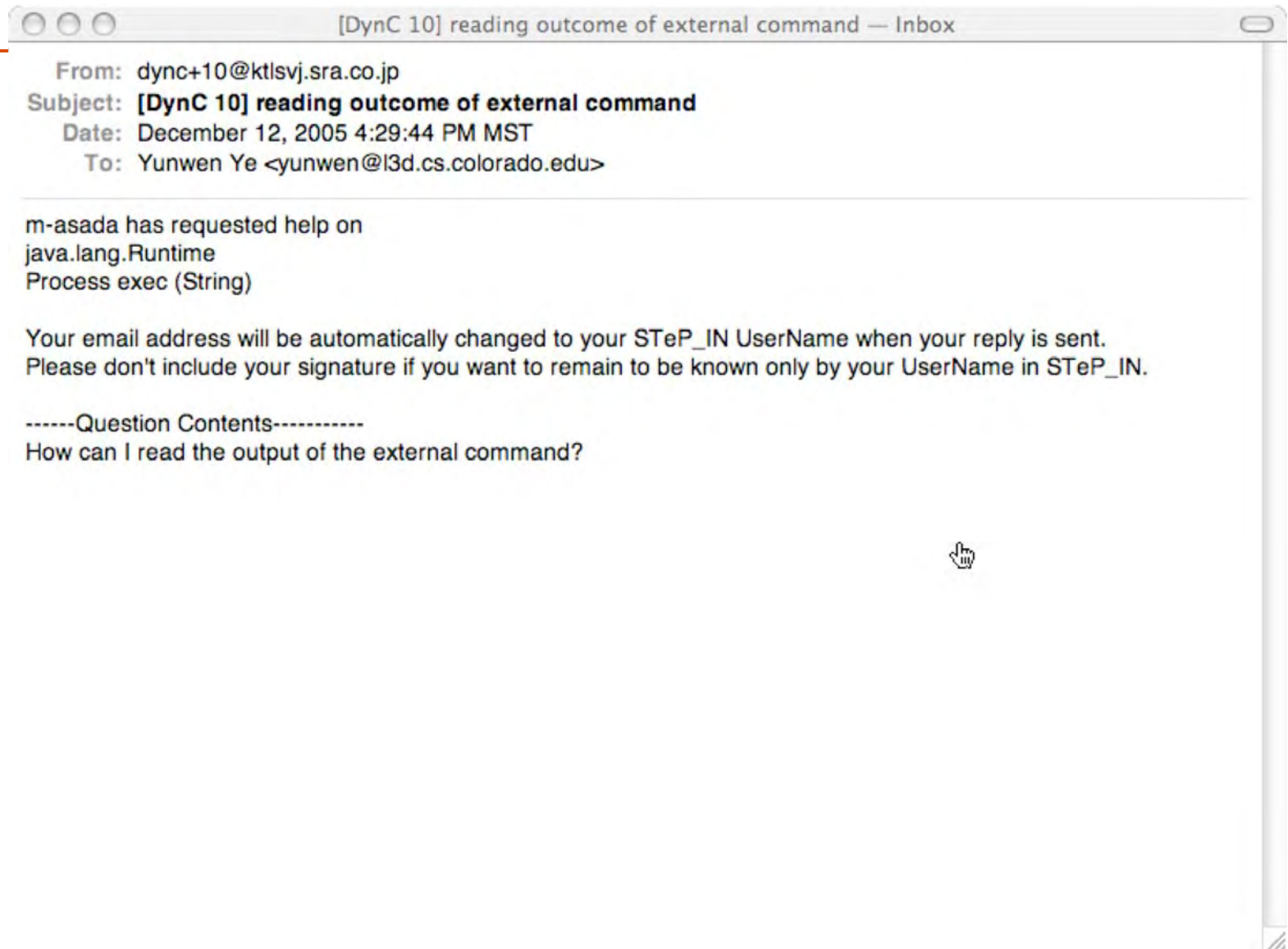
java.lang.Process exec(java.lang.String)

Subject :

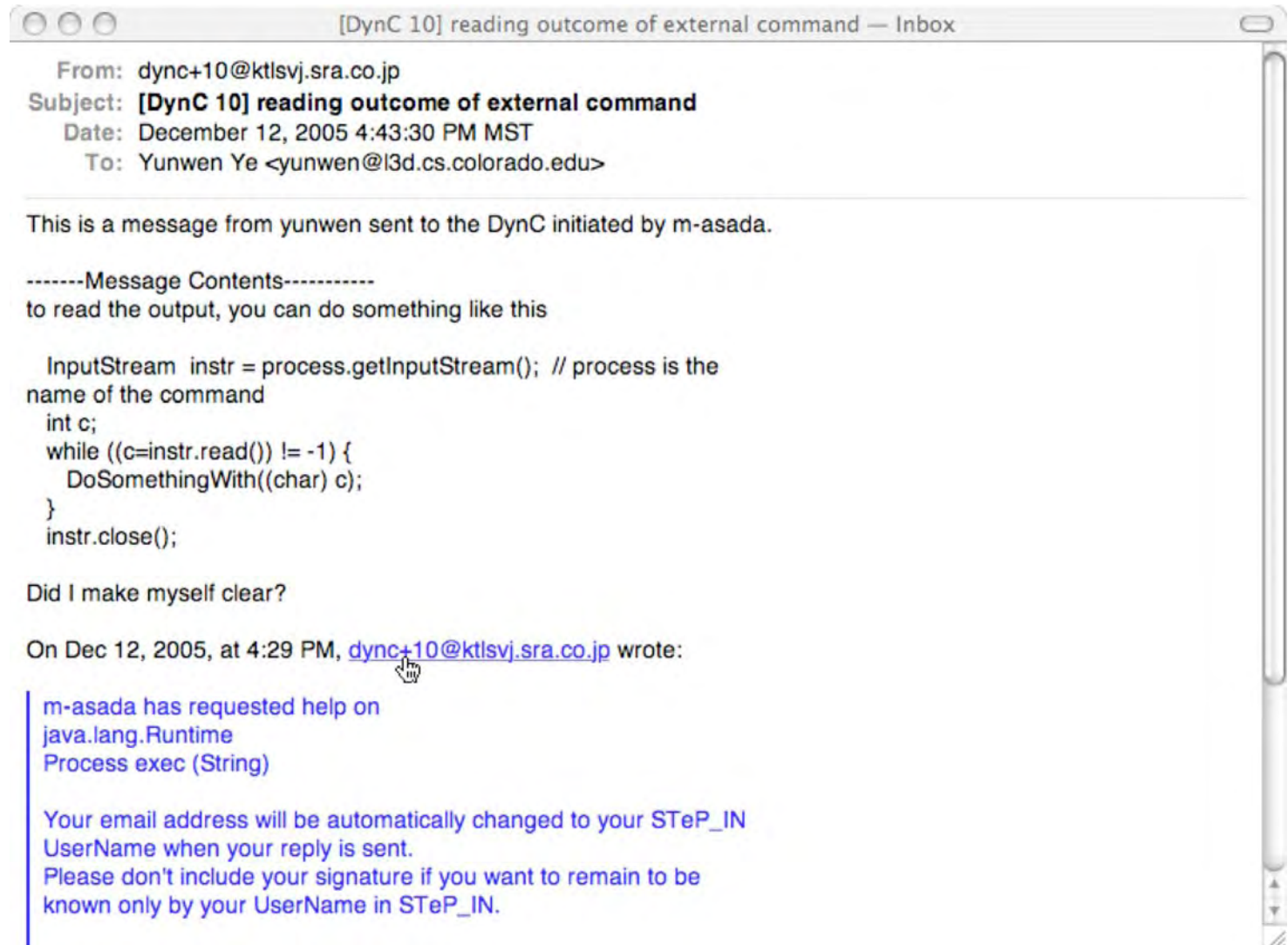
Question :

Done

Mail sent to selected experts



Reply from experts



DynC evaluation

STeP_IN: Dync Management - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://ktlsvj.sra.co.jp/STeP_IN/DyncManagement?listType=1

The Mozilla Orga... Latest Builds

[Home] [Logout] [JavaDoc] [Social Profile] [Technical Profile] [Involved Dync] [Account]

m-asada's Involved Dync

[Active Dync you initiated]
[Others' active Dync you are participating]
[Past Dync you initiated]
[Past Dync you participated]

Active Dync you initiated

[Previous] 1 [Next]

Dync ID	Subject	Method	Start Date	This Dync was helpful; thank you for your help. This Dync was not helpful; thank you for participation.
10	reading outcome of external command	Runtime java.lang.Process exec(java.lang.String)	2005/12/13 08:29:43	<input type="radio"/> helpful <input type="radio"/> not helpful
9	さぶじえくと	SecurityManager int classLoaderDepth()	2005/12/02 15:10:56	<input type="radio"/> helpful <input type="radio"/> not helpful
8	SUBJECT	SecurityManager void checkListen(int)	2005/12/02 15:09:29	<input type="radio"/> helpful <input type="radio"/> not helpful
7	SUBJECT	SecurityManager void checkWrite(java.lang.String)	2005/12/02 15:07:13	<input type="radio"/> helpful <input type="radio"/> not helpful
6	SUBJECT	SecurityManager void checkSetFactory()	2005/12/02 15:00:38	<input type="radio"/> helpful <input checked="" type="radio"/> not helpful

Update

Done

Discussion archive

STeP_IN: Discussion Archive - Mozilla Firefox

File Edit View Go Bookmarks Tools Help

http://ktlsvj.sra.co.jp/STeP_IN/DyncArchive?method_id=61677

The Mozilla Orga... Latest Builds

[Home] [Logout] [JavaDoc] [Social Profile] [Technical Profile] [Involved DynC] [Account]

Discussion Archive for: `java.lang.Runtime`
`java.lang.Process exec(java.lang.String)`

[Examples] [Ask Expert]

DynCs:
[reading outcome of external command](#)
m-asada
2005/12/13 08:29:43

Discussions:

From: m-asada
Subject: reading outcome of external command
Date: 2005/12/13 08:29:43

How can I read the output of the external command?

From: yunwen
Subject: Re: [DynC 10] reading outcome of external c
Date: 2005/12/13 08:43:30

to read the output, you can do something like this

```
InputStream instr = process.getInputStream(); // process is  
name of the command  
int c;  
while ((c=instr.read()) != -1) {  
    DoSomethingWith((char) c);  
}  
instr.close();
```

Did I make myself clear?

On Dec 12, 2005, at 4:29 PM, dync+10@ktlsvj.sra.co.jp wrote

> m-asada has requested help on
> java.lang.Runtime

Done

DynC formation

- Expert identification
- Expert selection

Identifying experts

- Expert is a relative attribute
 - Only after a question is known, experts can be identified
- Creating user profiles by analyzing programs they have developed
 - Software developers who have used the method of interest are candidate experts
 - Links from methods to software developers

Expert selection

Level1: Confirmed expertise

Level2: Claimed expertise

Level3: Inferred expertise

Level4: Future expertise

Expert identification

Level1: confirmed expertise

vincent's Involved DynC

[\[Active DynC you initiated\]](#)

[\[Others' active DynC you are participating\]](#)

[\[Past DynC you initiated\]](#)

[\[Past DynC you participated\]](#)

Send email to DynC #6

Past DynC you initiated

[\[Previous\]](#) 1 [\[Next\]](#)

DynC ID	Subject	Method	Start Date	End Date	Helpful/Not helpful
15	attributes of file after setReadOnly	File boolean setReadOnly()	2006/03/04 23:19:33	2006/03/04 23:25:06	helpful
6	help on exec	Runtime java.lang.Process exec(java.lang.String)	2006/03/02 16:02:08	2006/03/02 16:18:54	helpful
		Runtime	2006/03/02	2006/03/02	

Expert identification

Level2: claimed expertise

Methods declared as Expert: 8
Methods declared as No Knowledge: 0

Options...
Scope: java.lang
Filter:

[Previous] 1 [Next]

Method	Author	Usage #	Declare
java.lang Object void <init>()	No	1	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang Process java.io.InputStream getInputStream()	No	1	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang Process java.io.OutputStream getOutputStream()	No	1	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang Runtime java.lang.Process exec(java.lang.String)	No	1	<input checked="" type="radio"/> Expert <input type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang Runtime java.lang.Runtime getRuntime()	No	1	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang StringBuffer void <init>()	No	1	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang StringBuffer java.lang.StringBuffer append(java.lang.String)	No	1	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang StringBuffer	No	1	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge

Expert identification

Level3: inferred expertise

hermione's Technical Profile

Profile Summary
Total methods used: 197
Methods declared as Expert: 0
Methods declared as No Knowledge: 0

Display methods...
All methods used

Options...
Scope: java.lang
Filter:

[Previous] 1 2 3 [Next]

Method	Author	Usage #	Declare
java.lang Object void <init>()	No	12	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang Object java.lang.String toString()	No	2	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang Runtime java.lang.Process exec(java.lang.String)	No	2	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang String void <init>(java.lang.StringBuffer)	No	2	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang String void <init>(byte[], java.lang.String)	No	1	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang String char charAt(int)	No	4	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge
java.lang String	No	3	<input type="radio"/> Expert <input checked="" type="radio"/> Not Declared <input type="radio"/> No Knowledge

Selecting experts

- From expert candidates, select those who are most likely to help
 - Those I have helped recently
 - Those I have interacted through emails

Selecting experts

4 relations

help<A,B,t>

friend<A,B>

exclude<A,B>

email<A,B>

The screenshot shows a Mozilla Firefox browser window with the address bar displaying 'http://amigo.cs.colorado.edu/STeP_IN/SocialProfile'. The page title is 'm-asada's Social Profile'. The content includes a message 'm-asada's profiles is updated.', navigation links '[Previous] 1 2 3 [Next]', and a 'Profile Summary' section. The summary text states: 'You declared to participate in DynCs initiated by xxx members. You declared not to participate in DynCs initiated by xxx members. You have email exchanges with xxx members. You have helped other members 1 times, and you have been helped 6 by other members. You are currently No. xxx contributors to STeP_IN.' Below this is a table with columns for 'User Name', 'Participation in His/Her DynC', 'Participation in My DynC', 'Mail Exchange (From/To)', and 'Future Participation in His/Her DynC'. The table lists five users: akiko, aoki, h-asaoka, k-kondo, and k2. At the bottom of the table is an 'Update' button. The footer of the page reads 'This page was created by STeP_IN (001) on 2005/08/07 19:45:03'.

m-asada's Social Profile

m-asada's profiles is updated.

[Previous] 1 2 3 [Next]

Profile Summary

You declared to participate in DynCs initiated by xxx members.
 You declared not to participate in DynCs initiated by xxx members.
 You have email exchanges with xxx members.
 You have helped other members 1 times, and you have been helped 6 by other members.
 You are currently No. xxx contributors to STeP_IN.

User Name	Participation in His/Her DynC	Participation in My DynC	Mail Exchange		Future Participation in His/Her DynC
			From	To	
akiko	0	0	23	0	<input checked="" type="radio"/> always <input type="radio"/> neutral <input type="radio"/> never
aoki	0	0	130	0	<input type="radio"/> always <input checked="" type="radio"/> neutral <input type="radio"/> never
h-asaoka	0	0	40	0	<input type="radio"/> always <input checked="" type="radio"/> neutral <input type="radio"/> never
k-kondo	0	0	5	0	<input type="radio"/> always <input type="radio"/> neutral <input checked="" type="radio"/> never
k2	0	0	10	0	<input type="radio"/> always <input checked="" type="radio"/> neutral <input type="radio"/> never

This page was created by STeP_IN (001) on 2005/08/07 19:45:03

Done

Selecting experts

4 relations

help<A,B,t>

friend<A,B>

exclude<A,B>

email<A,B>

The screenshot shows a web browser window titled "STEP_IN: Social Profile Management - Mozilla Firefox". The address bar shows the URL "http://ktlsvj.sra.co.jp/STeP_IN/SocialProfile?option=1&scope=".

The page content includes:

- Navigation links: [Home] [Logout] [JavaDoc] [Social Profile] [Technical Profile] [Involved DynC] [Account]
- Section: **m-asada's Social Profile**
- Message: Your Social Profile is only known to you.
- Profile Summary**:
 - You declared to participate in DynCs initiated by 1 members.
 - You declared not to participate in DynCs initiated by 1 members.
 - You have email exchanges with 3 members.
 - You have helped other members 0 times, and you have been helped 6 by other members.
- Display members...**: All members related [Search]
- Options...**: Scope :
- Table of Participation Statistics**:

User Name	Participation in His/Her DynC	Participation in My DynC	Mail Exchange		Future Participation in His/Her DynC
			From	To	
nisinaka	2	1	35	0	<input checked="" type="radio"/> always <input type="radio"/> neutral <input type="radio"/> never
yunwen	0	2	53	0	<input type="radio"/> always <input checked="" type="radio"/> neutral <input type="radio"/> never
yxy	0	0	11	0	<input type="radio"/> always <input type="radio"/> neutral <input checked="" type="radio"/> never

[Previous] 1 [Next] [Update]

This page was created by STeP_IN (001) on 2005/12/16 00:47:06

Done

A (m-asada) participated in a DynC initiated by B (nisinaka) at time t

Selecting experts

4 relations

help<A,B,t>

friend<A,B>

exclude<A,B>

email<A,B>

The screenshot shows a web browser window titled "STeP_IN: Social Profile Management - Mozilla Firefox". The address bar shows the URL "http://ktslvj.sra.co.jp/STeP_IN/SocialProfile?option=1&scope=".

The page content includes:

- Navigation links: [Home] [Logout] [JavaDoc] [Social Profile] [Technical Profile] [Involved DynC] [Account]
- Section: **m-asada's Social Profile**
- Text: "Your Social Profile is only known to you."
- Profile Summary**:
 - You declared to participate in DynCs initiated by 1 members.
 - You declared not to participate in DynCs initiated by 1 members.
 - You have email exchanges with 3 members.
 - You have helped other members 0 times, and you have been helped 6 by other members.
- Display members...**: A dropdown menu set to "All members related" and a "Search" button.
- Options...**: A "Scope" field.
- Table of Members**:

User Name	Participation in His/Her DynC	Participation in My DynC	Mail Exchange		Future Participation in His/Her DynC		
			From	To	<input checked="" type="radio"/> always	<input type="radio"/> neutral	<input type="radio"/> never
nisinaka	0	1	35	0	<input checked="" type="radio"/> always	<input type="radio"/> neutral	<input type="radio"/> never
yunwen	0	2	53	0	<input type="radio"/> always	<input checked="" type="radio"/> neutral	<input type="radio"/> never
yxy	0	0	11	0	<input type="radio"/> always	<input type="radio"/> neutral	<input checked="" type="radio"/> never

Below the table is an "Update" button.

At the bottom of the page, it says: "This page was created by STeP_IN (001) on 2005/12/16 00:47:06"

A (m-asada) declares that he will always participate in B (nisinaka)'s DynC in the future

Selecting experts

4 relations

help<A,B,t>

friend<A,B>

exclude<A,B>

email<A,B>

The screenshot shows a web browser window titled "STEP_IN: Social Profile Management - Mozilla Firefox". The address bar shows the URL "http://ktsvj.sra.co.jp/STeP_IN/SocialProfile?option=1&scope=".

The page content includes:

- Navigation links: [Home] [Logout] [JavaDoc] [Social Profile] [Technical Profile] [Involved DynC] [Account]
- Section: **m-asada's Social Profile**
- Message: Your Social Profile is only known to you.
- Profile Summary:
 - You declared to participate in DynCs initiated by 1 members.
 - You declared not to participate in DynCs initiated by 1 members.
 - You have email exchanges with 3 members.
 - You have helped other members 0 times, and you have been helped 6 by other members.
- Display members...: All members related (dropdown), Search (button)
- Options...: Scope: (input field)
- Table of members:

User Name	Participation in His/Her DynC	Participation in My DynC	Mail Exchange		Future Participation in His/Her DynC		
			From	To	<input type="radio"/> always	<input type="radio"/> neutral	<input checked="" type="radio"/> never
nisinaka	0	1	35	0	<input type="radio"/> always	<input type="radio"/> neutral	<input type="radio"/> never
yunwen	0	2	53	0	<input type="radio"/> always	<input checked="" type="radio"/> neutral	<input type="radio"/> never
yxy	0	0	11	0	<input type="radio"/> always	<input type="radio"/> neutral	<input checked="" type="radio"/> never

Update (button)

This page was created by STEP_IN (001) on 2005/12/16 00:47:06

A (m-asada) declares that he will never participate in B (yxy)'s DynC in the future

Selecting experts

4 relations

help<A,B,t>

friend<A,B>

exclude<A,B>

email<A,B>

The screenshot shows a web browser window titled 'STeP_IN: Social Profile Management - Mozilla Firefox'. The address bar shows the URL 'http://ktslvj.sra.co.jp/STeP_IN/SocialProfile?option=1&scope='. The page content includes a navigation menu, a title 'm-asada's Social Profile', and a message 'Your Social Profile is only known to you.' Below this is a 'Profile Summary' section with statistics: 'You declared to participate in DynCs initiated by 1 members.', 'You declared not to participate in DynCs initiated by 1 members.', 'You have email exchanges with 3 members.', and 'You have helped other members 0 times, and you have been helped 6 by other members.' To the right is a 'Display members...' section with a dropdown menu set to 'All members related' and a search button. Below that is an 'Options...' section with a 'Scope' field. A table of members is displayed, with the 'From' value for 'nisiinaka' circled in red. The table has columns for 'User Name', 'Participation in His/Her DynC', 'Participation in My DynC', 'Mail Exchange (From/To)', and 'Future Participation in His/Her DynC'. The 'From' column for 'nisiinaka' contains the value 35, which is circled in red. The 'To' column for 'nisiinaka' contains the value 0. The 'Future Participation' column for 'nisiinaka' has radio buttons for 'always', 'neutral', and 'never', with 'neutral' selected. The table also shows data for 'yunwen' and 'yxy'. Below the table is an 'Update' button. At the bottom of the page, there is a footer: 'This page was created by STeP_IN (001) on 2005/12/16 00:47:06'. The browser status bar at the bottom shows 'Done'.

User Name	Participation in His/Her DynC	Participation in My DynC	Mail Exchange		Future Participation in His/Her DynC
			From	To	
nisiinaka	0	1	35	0	<input checked="" type="radio"/> always <input type="radio"/> neutral <input type="radio"/> never
yunwen	0	2	53	0	<input type="radio"/> always <input checked="" type="radio"/> neutral <input type="radio"/> never
yxy	0	0	11	0	<input type="radio"/> always <input type="radio"/> neutral <input checked="" type="radio"/> never

The number of emails that A (nisiinaka) has sent to B (m-asada)

Selecting experts based on 4 relations

For each person X in identified expert lists

1. If $\text{exclude}\langle X, A \rangle$, X is removed from the list
because X declared he will never participate in A's DynC
2. If $\text{friend}\langle X, A \rangle$, X is selected
because X declared he will always participated in A's DynC
3. If $|\text{help}\langle A, X, t \rangle| > |\text{help}\langle X, A, t \rangle|$, X is selected
because A has helped X more times than X did A
4. If $\text{help}\langle A, X, t \rangle$ and t is more recent than $\text{help}\langle X, A, t \rangle$, X is selected
because A has recently helped X
5. Selecting from remaining experts on the order of $\text{email}\langle X, A \rangle$
because X should have known A well if X has send many emails to A
6. Selecting from remaining experts those who got most help by other members

Social awareness communication

- Acknowledging publicly member participation to motivate
 - When experts response, members of the DynC know
 - Top contributors list

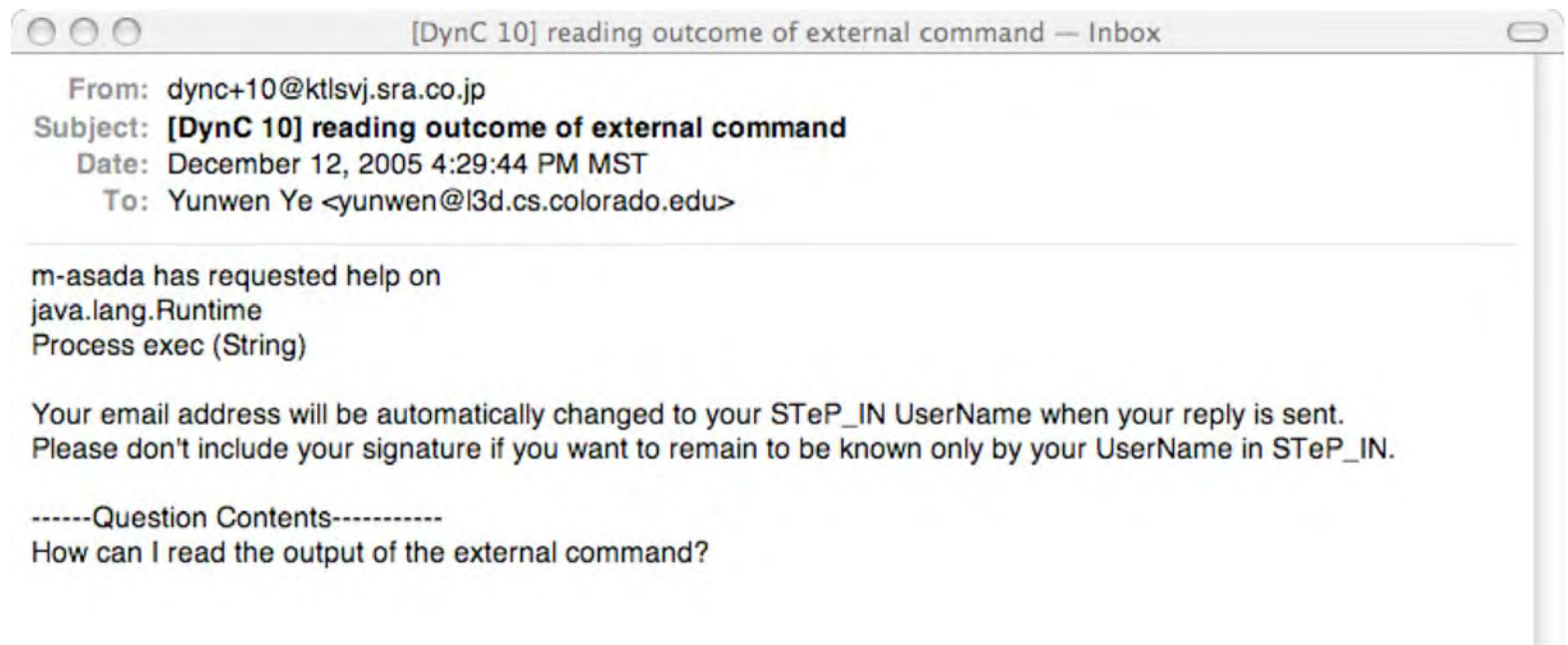
Top contributors of all time.

Rank	Point	User Name
1	2	nisinaka
2	1	user001
2	1	user005
2	1	user008
2	1	yunwen

- Avoiding forced collaboration

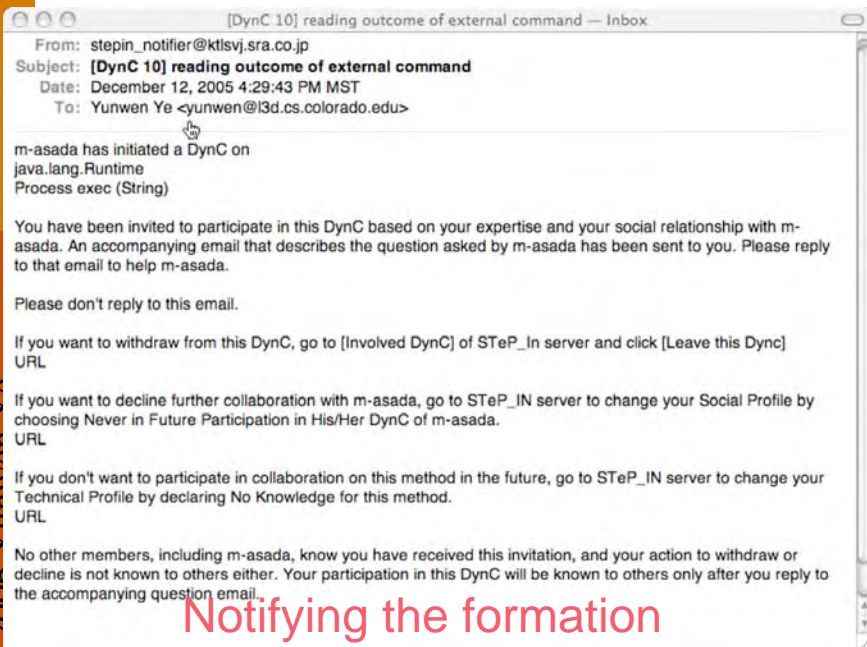
Avoiding forced collaboration

- When request for help is sent to experts, recipients are hidden from requesters and other experts



Avoiding forced collaboration

- Selected experts can quietly withdraw from the DynC without anyone noticing



Notifying the formation
of a new DynC

Avoiding forced collaboration

- Selected experts can quietly withdraw from the DynC without anyone noticing

The screenshot shows a web interface for 'yunwen's Involved Dync'. On the left, an email notification is displayed, stating that 'm-asada has initiated a DynC on java.lang.Runtime Process exec (String)'. A blue arrow points from the text 'Please don't reply to this email.' in the email to the 'Leave this DynC' column in the table below. The table lists four active DynCs, all initiated by 'm-asada'. The 'Leave this DynC' column for each entry contains a checkbox and the word 'Leave', with the first entry's checkbox circled in red. Below the table is an 'Update' button.

yunwen's Involved Dync

[Active DynC you initiated]
[Others' active DynC you are participating]
[Past DynC you initiated]
[Past DynC you participated]

Leave the current DynC

Others' active DynC you are participating

[Previous] 1 [Next]

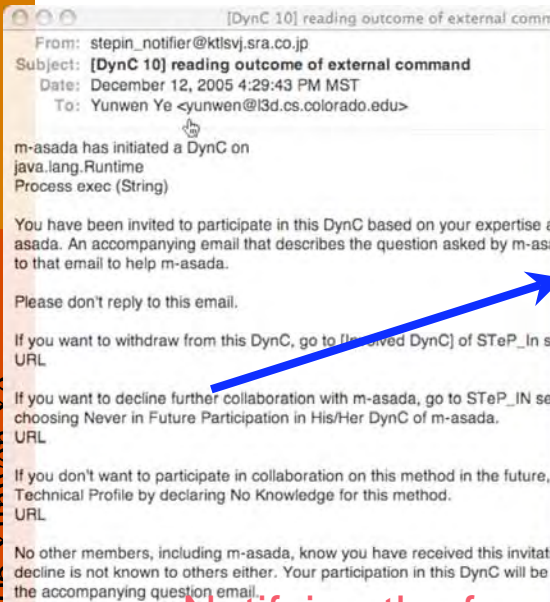
DynC ID	Subject	Method	Start Date	Initiated by	Leave this DynC
9	さぶじえくと	SecurityManager int classLoaderDepth()	2005/12/02 15:10:56	m-asada	<input type="checkbox"/> Leave
8	SUBJECT	SecurityManager void checkListen(int)	2005/12/02 15:09:29	m-asada	<input type="checkbox"/> Leave
7	SUBJECT	SecurityManager void checkWrite(java.lang.String)	2005/12/02 15:07:13	m-asada	<input type="checkbox"/> Leave
6	SUBJECT	SecurityManager void checkSetFactory()	2005/12/02 15:00:38	m-asada	<input type="checkbox"/> Leave

Update

Notifying the formation
of a new DynC

Avoiding forced collaboration

- Selected experts can quietly withdraw from the DynC without anyone noticing



m-asada's Social Profile

Your Social Profile is only known to you.

Profile Summary

You declared to participate in DynCs initiated by 1 members.
You declared not to participate in DynCs initiated by 1 members.
You have email exchanges with 3 members.
You have helped other members 0 times, and you have been helped 0 by other members.

Options: All members related

Search

[Previous] 1 [Next]

User Name	Participation in His/Her DynC	Participation in My DynC	Mail Exchange		Future Participation in His/Her DynC
			From	To	
nisinaka	0	0	35	0	<input checked="" type="radio"/> always <input type="radio"/> neutral <input type="radio"/> never
yunwen	0	1	53	0	<input type="radio"/> always <input checked="" type="radio"/> neutral <input type="radio"/> never
yxy	0	0	11	0	<input type="radio"/> always <input type="radio"/> neutral <input checked="" type="radio"/> never

Update

This page was created by STeP_IN (001) on 2005/12/13 08:34:07

Decline future participation in his/her DynC

Notifying the formation of a new DynC

Avoiding forced collaboration

- Selected experts can quietly withdraw from the DynC without anyone noticing

Decline future participation of DynC on an API component

[DynC 10] reading outcome of external command

From: stepin_notifier@ktsvj.sra.co.jp
Subject: [DynC 10] reading outcome of external command
Date: December 12, 2005 4:29:43 PM MST
To: Yunwen Ye <yunwen@i3d.cs.colorado.edu>

m-asada has initiated a DynC on
java.lang.Runtime
Process exec (String)

You have been invited to participate in this DynC based on your expertise and m-asada. An accompanying email that describes the question asked by m-asada to that email to help m-asada.

Please don't reply to this email.

If you want to withdraw from this DynC, go to [Involved DynC] of STeP_In s... URL

If you want to decline further collaboration with m-asada, go to STeP_IN serv... choosing Never in Future Participation in His/Her DynC of m-asada. URL

If you don't want to participate in collaboration on this method in the future, go to Technical Profile by declaring No Knowledge for this method. URL

No other members, including m-asada, know you have received this invitation. Your participation in this DynC will be kept private. If you decline, the accompanying question email.

Notifying the form of a new DynC

m-asada's Technical Profile

Profile Summary
Total methods used: 461
Methods declared as Expert: xxx
Methods declared as Knowledgeable: 2
Methods declared as No Knowledge: 0

Display methods...
All methods used Search

Options...
Scope:

Method	Author	Usage #	Declare
com.sun.image.codec.jpeg JPGDecoder com.sun.image.codec.jpeg.JPGImageDecoder createJPGDecoder(java.io.InputStream)	No	1	<input type="radio"/> I know <input checked="" type="radio"/> I don't know
com.sun.image.codec.jpeg JPGEncoder com.sun.image.codec.jpeg.JPGImageEncoder createJPGEncoder(java.io.OutputStream)	No	1	<input type="radio"/> I know <input type="radio"/> I don't know
com.sun.image.codec.jpeg JPGImageDecoder java.awt.image.BufferedImage decodeAsBufferedImage()	No	1	<input type="radio"/> I know <input type="radio"/> I don't know
com.sun.image.codec.jpeg JPGImageEncoder void encode(java.awt.image.BufferedImage)	No	1	<input type="radio"/> I know <input type="radio"/> I don't know
java.applet Applet void <init>()	No	1	<input type="radio"/> I know <input type="radio"/> I don't know

Done

Social awareness communication

- Sending emails to ask the experts
 - Providing excuse space
 - A dose not know who are the recipients
 - Publicly acknowledgement
 - Any experts who answered the questions are made known
 - Easy exit
 - “Don’t bother me anymore about this problem”
 - “I don’t want to have more request emails from A”—establishing *exclude*<X, A>

Summary

- Better understanding of cognitive difficulties of component reuse
 - Unknown components
 - Low reuse utility
- A new type of component repository systems
 - Active component repository systems
- Integrating technology support with social support