Technology

The tool is using its platform to analyze e-mail communication. The platform provides import mechanism to collect emails from user email accounts (Outlook, Thunderbird, IMAP, and Gmail) and also provides algorithms for pre-processing and analysis of the collected data.

The e-MailMap tool is using this platform to reveal hidden characteristics of teams and informal groups. In particular, answering the questions:

- Which people and which topics are important?
- With whom, when and about what a person or group of persons communicates?
- Who is important in group communication and how much, i.e. who is the leader and who is involved only passively?
- Who, in which group, when and how frequently communicates about a particular topic?
- How much does communication burden the group? Moreover, how formalized the communication within the group is?
- What kind of informal communities exist and what is the content of their communication?

The following graphical outputs were obtained from one of the two applications of e-MailMap tool that visualizes outputs of e-mail communication analysis. The application was created as part of R&D project LF13030 - Optimizing of working teams by using the SW for analysis of the social and professional relations in the company networks (2013-2015, MSM/LF) – TeamNet for short.

Security and Legal Issues

In order to protect users' privacy, only the sender and recipient of emails and message subjects are processed. For deeper analysis it is possible to connect the platform to tools for analyzing the content of emails and their attachments.

Analytical Background

The platform is based on analyzing the communication of the group of persons. The analysis is performed entirely automatically over data that are sent and received email messages. The analysis uses several principles, which should be clear before studying the outputs:

- The basic unit of all analytical measurements is a conversation. By conversations we mean a set of email messages originated from a single initial message while all other messages in the conversation are directly or indirectly linked to the initial one (as replies and forwarded messages).
- No messages that are not part of the conversation affect the analysis.
- The demandingness of each conversation is calculated. The parameters used are the number of messages in that conversation, the number of participating senders, etc.
- The analysis does not work with the people, but with e-mail accounts (addresses), hereafter denoted as users.
- The share of the conversation is calculated for each user and each conversation. The parameters used are the number of messages the user sent or received in the conversation and in what mode (recipient, in copy).

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Our software is tailored

We build on standards

We develop our own technologies

- During the analysis of the content only words from email subjects, hereafter denoted as terms, are processed.
- For the analysis is used a setting, which may contain one or more users and one or more terms. Based on this setting a related group of users and terms is automatically detected.
- The algorithm for automatic detection of groups is based on the selection of users and terms from conversations whose messages contain specified users and terms. These conversations are hereafter denoted as group conversations.
- The specified setting can be complemented with the selection of time interval when the communication took place. In this case, the same setting of users and terms at different times can result in different groups. If no interval is specified, it will be set automatically based on the setting.
- Selected users and terms together with time interval represent a group context.
- It may happen that for a group context cannot be found a non-empty group.

User Roles in Conversation

Depending on how the user behaved in the conversation, the system recognized six roles. These roles define user's profile in the group. The first three roles are active, i.e. users sent, at least, one message during the conversation. Other three roles are passive, i.e. users received, at least, one message in a conversation, but never sent one.

- **Initiator.** The sender of the first email in the conversation.
- **Solver.** The recipient of the first email who sends, at least, one mail during the conversation.
- **Co-solver.** The sender of some email in the conversation.
- **Invited.** The recipient of the first email in the conversation.
- **Co-invited.** The recipient of some email in the conversation.
- **Notified.** The recipient of some email in the conversation (only in CC field).

Analytical Outputs

Every output is always related to a selected context for selected period, thus in effect, automatically detected a group of important users and terms, respectively.

Charts This output provides a list of all users in the group, all terms of the group and users in different roles. These charts can be ordered according to two criteria:

- Intensity. It expresses in how many messages and how demanding conversations of the group was the user involved or term included. It is a recalculated share.
- Participation. It expresses, in how many group conversations (regardless of the number of messages) was the user or term included.

Intensity and participation can be understood as the importance of user/term in group communication in qualitative or quantitative sense, respectively. A user with high intensity can be interpreted as "communicates a lot" while high participation as "he knows everything."
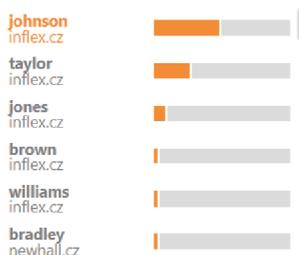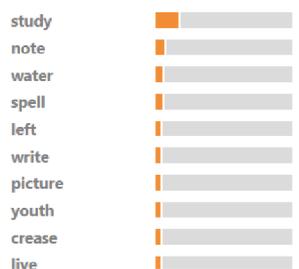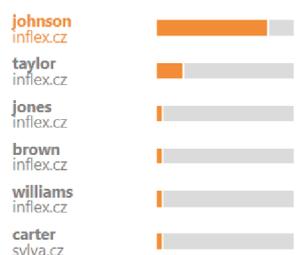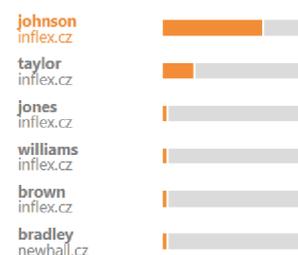
Activity   This output provides a statistical overview of the week and total long-term activity of the group, respectively. In the week's activity, all sent messages of users are counted. Activity is displayed in the form of the heat map expressing the color-varying intensity of communication activity, hour after hour in each day of the week. Long-term activity is expressed as a chart, which shows the total number of sent and received messages in the group over different periods (six months to a month). The output also provides the total number of messages sent and received in the group and estimated the time required for their processing.

|	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
MON	0x	2x	0x	0x	1x	5x	110x	100x	259x	280x	279x	142x	216x	198x	195x	255x	208x	84x	64x	43x	38x	16x	13x	5x
TUE	0x	1x	1x	0x	0x	11x	123x	143x	173x	220x	274x	145x	184x	218x	226x	288x	263x	103x	70x	55x	45x	26x	34x	5x
WED	2x	4x	1x	0x	0x	19x	110x	165x	254x	247x	227x	159x	175x	223x	248x	237x	147x	117x	49x	36x	23x	20x	12x	8x
THU	1x	0x	2x	0x	0x	9x	120x	122x	206x	231x	232x	122x	174x	222x	200x	221x	246x	140x	71x	49x	36x	20x	7x	4x
FRI	2x	4x	2x	0x	0x	15x	100x	132x	197x	302x	247x	163x	188x	203x	175x	214x	144x	73x	59x	34x	20x	14x	8x	8x
SAT	0x	2x	0x	0x	1x	14x	39x	65x	91x	80x	49x	57x	45x	41x	46x	35x	21x	17x	28x	13x	9x	3x	8x	9x
SUN	4x	0x	2x	0x	0x	7x	12x	17x	43x	48x	41x	39x	26x	14x	24x	12x	10x	11x	12x	16x	10x	14x	13x	3x

| I / 2010 | II / 2010 | I / 2011 | II / 2011 | I / 2012 | II / 2012 | I / 2013 | II / 2013 | I / 2014 | II / 2014 | I / 2015 |

ACTIVITY   ALL | SELECTED

SENT **13394** | RECEIVED **34366** | CONVERSATIONS **2937** | TIME **733h**

Groups   This output provides an overview of the most important e-mail domains in the analyzed communication. Domain usually belongs to a cooperating group of people, e.g. from another company. The analysis provides an output with up to five most intensely communicating groups, including the edges expressing the intensity of their relationship. Other groups are aggregated into a single group called "others." The number of actively communicating users (senders), the number of messages sent and, the development of communication intensity in time is provided for each group.
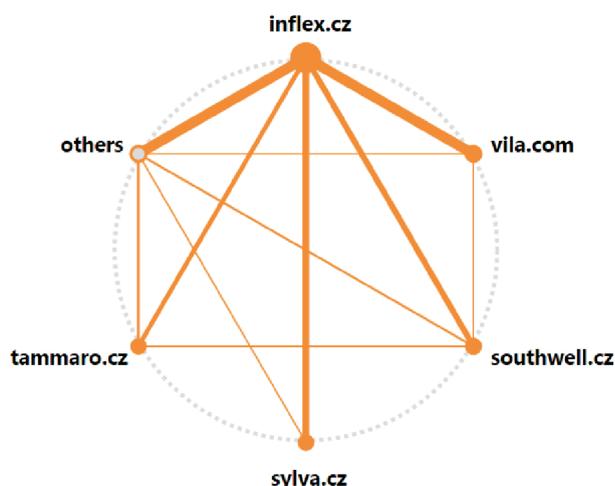
inflex.cz	9	28619
vila.com	3	3249
southwell.cz	4	2264
sylva.cz	6	930
tammaro.cz	3	606

OTHERS

tash.tv	2	715
sigmund.com	2	488
taul.cz	1	386
yagi.com	1	853

GROUPS

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Inflex, s.r.o.
Legionářská 1085/8 | 779 00 Olomouc | Czech Republic | info@inflex.cz | tel. 00 420 583 802 583 | www.inflex.cz

Users This output visualizes detected group in the form of a network. Such network can visualize not only the importance of individual users but also the importance (strength) of relationships between pairs of users, in a transparent way. One of the algorithms used in the system provides a possibility to uncover the informal internal structure of the group. The importance of each user is visualized using the so-called tag-cloud.
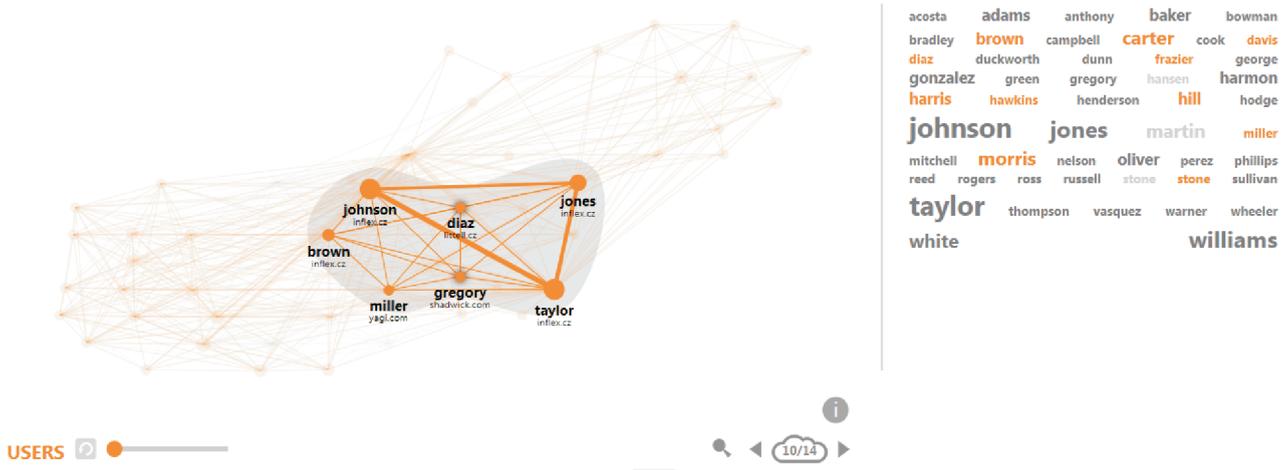
Topics The network of terms is visualized in this output in a similar fashion as the network of users. Tag-cloud is also used in the same way to demonstrate the importance of terms. Some group or a tightly connected sub-group of terms can be understood as a topic of communication of detected group. Each topic is then represented by a term of high importance.

e-mail**Map**
Management support tool
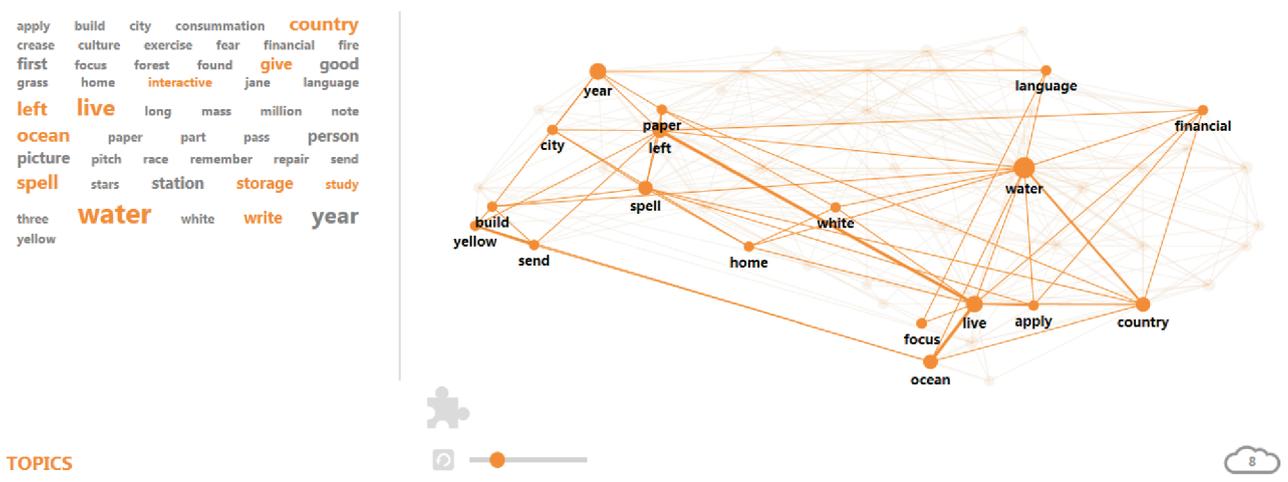
Communication Roles This output provides a well-organized view of users arranged according to their importance within the group. The arrangement can use a qualitative criterion (intensity) or a quantitative criterion (participation). All roles in which the user is participating in conversations are measured for each user. The share of individual roles in a conversation of the group can be viewed as a user's profile in that group. One user may have different profiles in various detected groups. The output also provides statistical information about how much are individual users burdened by communication.

	INVOLVEMENT	ROLES	SENT	RECEIVED	CONVERSATION	TIME	EVOLUTION
taylor inflex.cz			8473	17105	6532	425h	
johnson inflex.cz			8532	12922	4858	392h	
williams inflex.cz			5034	13245	4549	278h	
jones inflex.cz			3822	12479	4508	231h	
white vila.com			1935	4761	1405	104h	
morris southwell.cz			1881	4253	1629	98h	

COMMUNICATION ROLES INTENSITY | PARTICIPATION   ■ INITIATOR ■ SOLVER ■ CO-SOLVER ■ INVITED ■ CO-INVITED ■ NOTIFIED

Communication Flows This output provides an overview of frequently recurring typical patterns that occur in group conversations. The more frequent and longer the occurring patterns are the more formalized the communication of the group is. If there are no patterns or if they occur in small quantities in proportion to the number of conversations, it is a group with less formalized communication. In detected patterns, it is also possible to see who is active in the formalized communication of the group, and who is not.

10x johnson inflex.cz → taylor inflex.cz → johnson inflex.cz → taylor inflex.cz → jones inflex.cz → taylor inflex.cz

9x johnson inflex.cz → taylor inflex.cz → jones inflex.cz → johnson inflex.cz → taylor inflex.cz → jones inflex.cz → johnson inflex.cz → taylor inflex.cz

8x taylor inflex.cz → williams inflex.cz → johnson inflex.cz → taylor inflex.cz → williams inflex.cz → taylor inflex.cz → johnson inflex.cz

COMMUNICATION FLOWS

e-mail**Map**
Management support tool

Analysis of Communication Participants   Network properties and the most important people, such as members of multiple communities, key players, etc., detected from across the whole network of users (or the selected subset) can be viewed. Individual analysis of selected user from the network is also available. It reveals the structure of his/her relationships and resulting constraints or benefits.

Network properties

HIGH   Density

Very dense and cohesive networks allow quick diffusion of information within them which makes coordination easy.

LOW   Coherence

The strength of relations is very diversified.

14   important communities

The presence of internally densely connected sub-groups (communities) reveals that network has certain natural divisions within it.
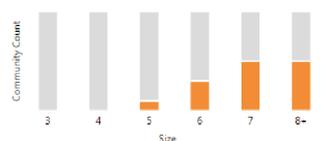
MEDIUM   Transitivity

Transitive ties promote development of consensus, cooperation and solidarity.

Prominent notes
With strong neighbors

johnson	taylor	jones
inflex.cz	inflex.cz	inflex.cz

Center position

johnson	taylor	jones
inflex.cz	inflex.cz	inflex.cz

Member of multiple communities

johnson	taylor	williams
inflex.cz	inflex.cz	inflex.cz
14	12	10

Community key players

white	morris	rogers
vila.com	southwell.cz	tash.cz

Properties of miller
yagi.com

12   neighbors
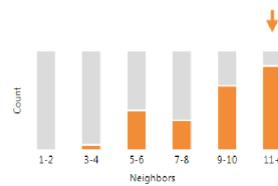
Internal to external link ratio

internal ———— external

Most of the links are with people from different groups (domains).

Social capital
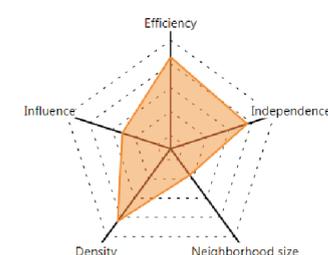
Member of 2 comunities

Key player 1 comunity

HIGH   local transitivity

High number of triads allows establishment of group norms and facilitate cooperation.