

Informedness in Collaborative Networks through Active Information Provisioning

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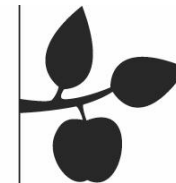
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UNIVERSITY OF SOUTHERN DENMARK

PRO-VE

PRO-VE'10

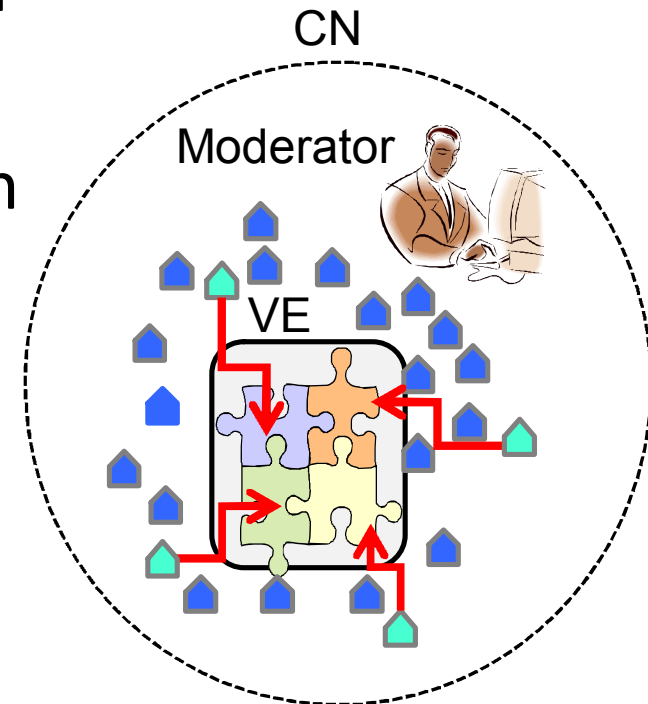
Working Conference on VIRTUAL ENTERPRISES, Saint-Etienne, 11-13 October 2010

Agenda

- Collaborative Networks
- Informedness of Network Members
- Our Information Modelling Framework
- Proposed Information Provisioning Service
- Concluding Remarks

Principles of Collaborative Networks (CN)

- CN are business networks and other forms of Virtual Organizations
- vertical and horizontal collaboration
- often members are SMEs
- Often a human moderator exists
- Often web-based collaboration platforms are used
- Members form temporary alliances
 - VE=Virtual Enterprises



Production Network Neumünster (1)



The PNW	is a...	Member Companies	References	Contact
	has at its disposal...			
	completes...			
	is based upon...	<i>intern</i>		<i>imprint</i>
	supplies you with...			

www.pnw-neumuenster.de



The Production Network Neumuenster is a composite of

- 25 producing companies
- 3000 employees
- 1500 skilled workers
- 320 engineers
- 2 facilitators



The PNW	is a...	Member Companies	References	Contact
	has at its disposal...			
	completes...			
	is based upon...	<i>intern</i>		<i>imprint</i>
	supplies you with...			

Product Overview **Completed Customer Orders** Customer Communication



Job order production of the network partners are fixed component of a wide manufacturing palette.

Foundry products, mechanical workpiece treatment, surface treatment, corrosion and wear protection, analytics, materials technology, laser technology.

Production Network Neumünster (2)



The PNW is a...	Member Companies	References	Contact
has at its disposal...			
completes...			
is based upon...	<i>intern</i>		<i>imprint</i>
supplies you with...			



The PRODUCTION NETWORK NEUMUENSTER provides its customers with

- Conventional and highly modern manufacturing technologies and equipment
- **More than 52 manufacturing processes with 70 certificates and qualifications**
- Own products
- Specialized job order production
- Service and materials technology


With competence into the future



The PNW is a...	Member Companies	References	Contact
has at its disposal...			
completes...			
is based upon...	<i>intern</i>		<i>imprint</i>
supplies you with...			

The PRODUCTION NETWORK NEUMUENSTER is based upon...

- The cooperation of network partners in combination with a sophisticated facilitation
- A database with a quick information system**
- Clear structures that guarantee peak point products today and in future



```

    graph TD
      CP[Cooperation Partners] --> PNW
      TF[Task Force] --> PNW
      OE[Organizational Elements] --> PNW
      RE[Research and Education] --> PNW
      PNW --> DB[(Database)]
      DB --> GOALS[Goals  
New Customers - New Markets]
  
```

Production Network Neumünster (3)



The PNW is a...
has at its disposal...
completes...
is based upon...
supplies you with...

Member Companies
intern

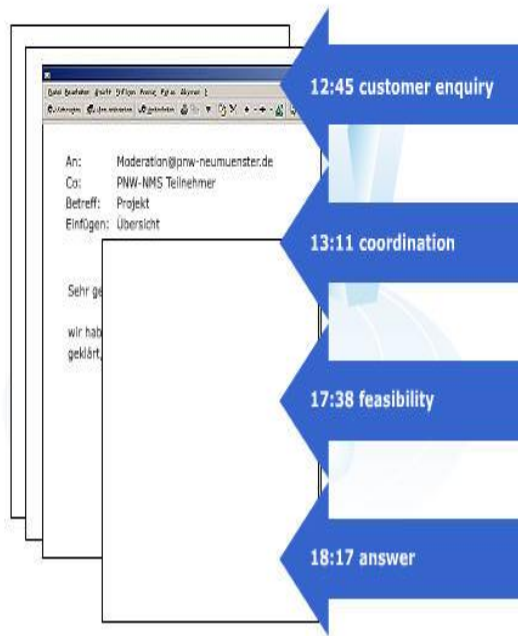
References

Contact
imprint



Product Overview Completed Customer Orders Customer Communication

For you within one day...




The PNW is a...
has at its disposal...
completes...
is based upon...
supplies you with...

Member Companies
intern

References

Contact
imprint



Product Overview Completed Customer Orders Customer Communication

Water treatment plant with dehydrating devices,
process controls, corrosion resistant steel
construction, functional parts out of corrosion
resistant steel.

From of the field of PNW
own products

Cooperation of
4 PNW partners



Navigation arrows: << >>

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Informedness of Network Members and Collaboration Success



- informedness is a success factor of CNs
 - is beneficial to members, the moderator(s), the CN
- Evidence found in research literature
 - Informedness and company profitability (Hitt & Brynjolfsson, 1996; Li, 2009)
 - Promotion of trustworthy collaboration structures (Riemer & Klein, 2003)
 - Stimulation of trust and vital collaboration climate by setting standards for communication practice in networks (Österle et al., 2001)
 - Prospering collaboration climate in network through decision downloading (Thimm & Rasmussen, 2009)

Well Informed Network Members



- Well informed members know about
 - general network strategy, rules, and regulations, CN configuration
 - current status of network - network specific indicators
 - own company specific benefits obtained from network
 - decisions such as VE configuration decisions
 - business processes
- Deficits in informedness of members can lead to
 - distrust between participating members
 - distrust to the idea of the network
 - a difficult collaboration climate in the network



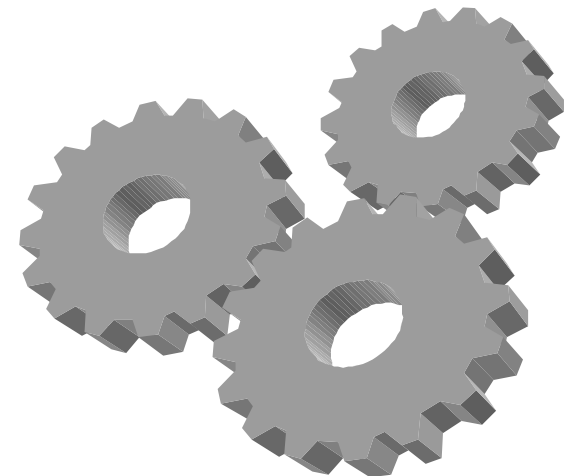
Achieving Informedness – The Typical Information Acquisition Tasks

- Searching, mining, analyzing, preparing information for understanding by humans
- Information objects
 - Stored in multiple different data sources (company specific and network specific)
 - Harmonized, merged, aggregated, anticipated ...
 - Structured, sorted, visualized
- Are tedious and time consuming tasks
- Are repetitive tasks



Why Automated Information Provisioning ?

- Maintaining informedness requires repetitive information updates
 - Frequent repetition of same information acquisition tasks
- Automation saves time for members and also the moderator(s)
- information acquisition tasks are a perfect IS domain



Our Specific Goal – An Information Provisioning Service

- Active, flexible, configurable to members' individual information needs
 - Information useful for benchmarking and adjustment of network members
- System model
 - active capabilities
 - Information push mechanism
 - shared information pool and access to other data sources within the CN
- Information modelling framework as foundation



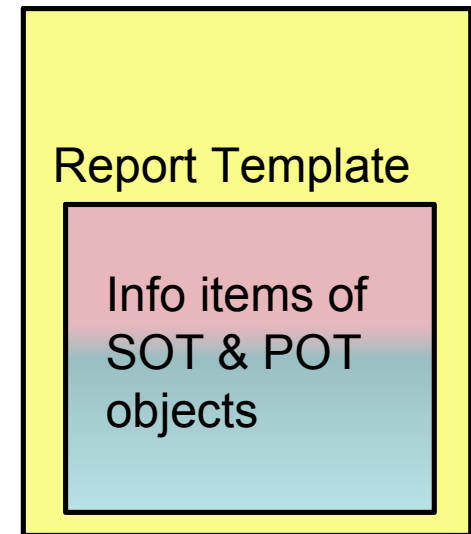
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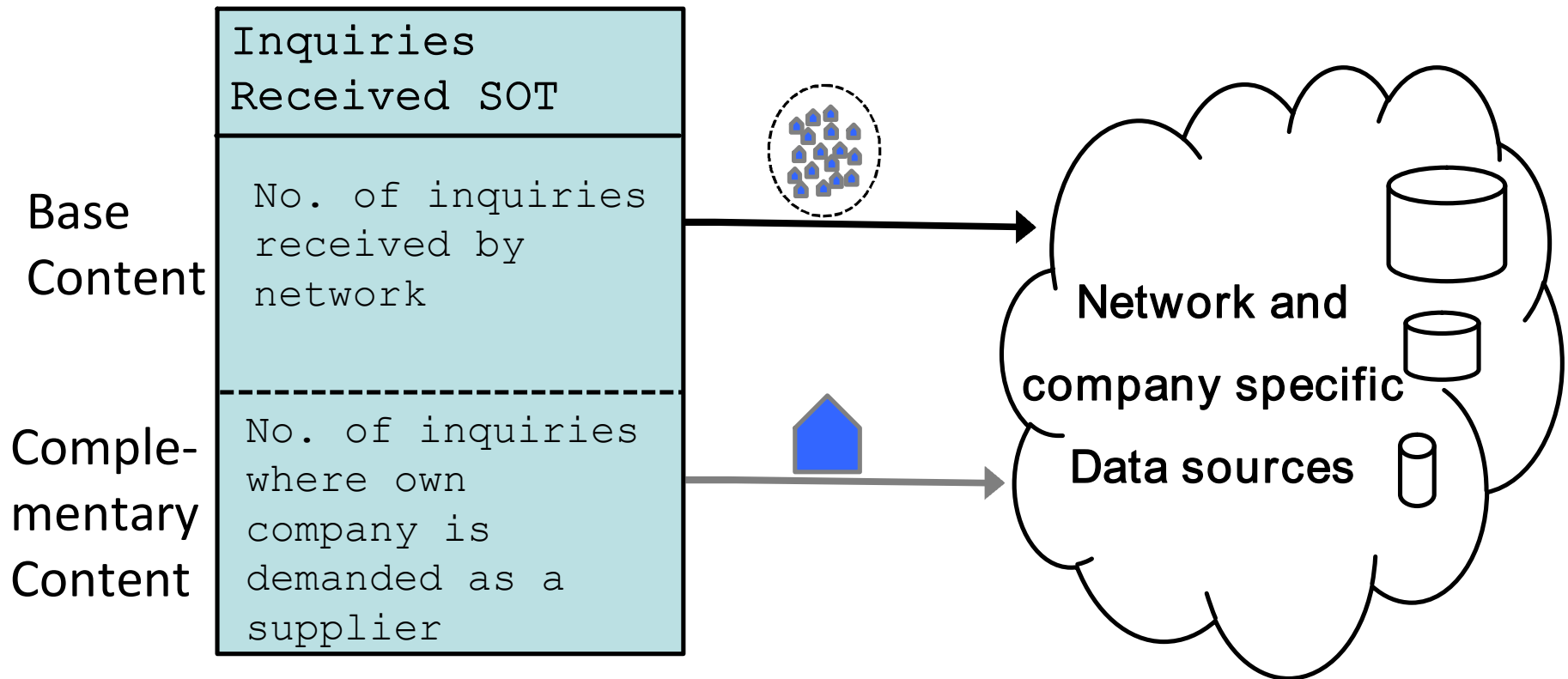
Information Modelling Approach

- Object-oriented approach
- Two application specific information object types
 - State Object Types & Process Object Types
- Predefined set for both types offered
 - can be extended by users
- Users declare requirements for information provisioning by the definition
 - Report templates
 - Information provisioning schemes

Information
Provisioning Scheme



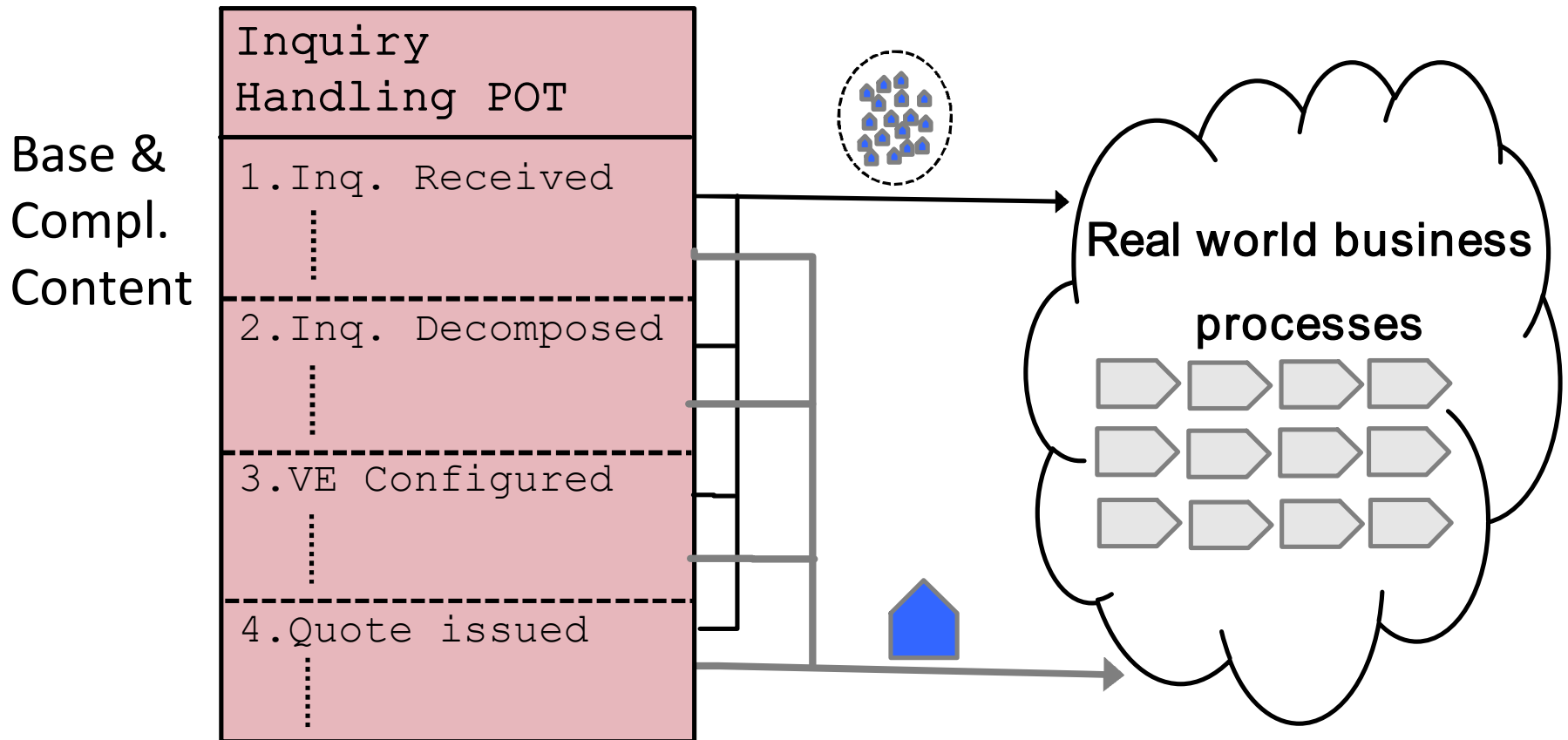
State Object Types (SOT) – “Indicators”



Skeletons of Sample SOTs

Inquiries Received SOT	Quotations Given SOT	Orders Received SOT	VEs Formed SOT
Individual objects represent			
external inquiries received	quotations given to customers	received orders	formed VEs
Base content concerns number(s) and detailed statistical information about			
inquiries received by network	quotations issued to customers	orders received	VEs formed
Complementary content concerns number(s) and detailed statistical information about			
inquiries where own company is demanded as a supplier	quotations where own company is considered as a supplier	orders where own company is considered as a supplier	formed VEs with participation by own company

Process Object Types (POT) – “Process Proxies”




Skeletons of Sample POTs

Inquiry Handling POT	Order Fulfillment POT
Individual objects represent processes within the network that concern ...	
Inquiry handling	Order fulfillment
Processing states and corresponding base content (BC) and complementary content (CC)	
<p>1. Inquiry Received</p> <p>Who issued inquiry? (BC)</p> <p>What product is demanded? (BC)</p> <p>Has the own company been requested as supplier? (CC)</p>	<p>1. Order Received</p> <p>To what offer is referred? (BC)</p> <hr/> <p>2. Suborders Issued</p> <p>Which suborders have been issued? (BC)</p>
<p>2. Inquiry Decomposed</p> <p>What are the elements of the inquiry? (BC)</p>	<p>What are the details of the suborder issued to own company? (CC)</p> <hr/> <p>3. Suborders Completed</p>
<p>3. VE Configured</p> <p>Which partners are assigned to the inquiry? (BC)</p>	<p>When were all suborders completed? (BC)</p> <p>What are the completion details of the suborder of the own company? (CC)</p>
<p>4. Quotation Issued</p> <p>...</p>	<p>4. Order Completed</p> <p>...</p>

Report Templates

- Similar to database templates
 - Materialized into concrete reports
 - under consideration of given layout and formatting instructions
- Abstract containers of information items that are of interest to the user
 - selected from SOT and POT objects
- automated replacement of SOT and POT object references by referred content

Report Template



Info items of
SOT & POT
objects

Sample Report Template

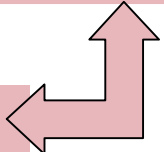
Will be automatically replaced
by referred content

	Caption	Content
1	New inquiry received:	an-Instance-of-Inquiry-Handling-POT.Inquiry-Received.base-content
2	Request elements resulting from inquiry decomposition:	an-Instance-of-Inquiry-Handling-POT.Inquiry-Decomposed.base-content
3	VE in charge of inquiry:	an-Instance-of-Inquiry-Handling-POT.VE-Configured.base-content
4	Quotation issued to customer:	an-Instance-of-Inquiry-Handling-POT.Quotation-Issued.base-content
5	Quotation result received from customer:	an-Instance-of-Inquiry-Handling-POT.Quotation-Result-Received.base-content
6	Order received:	an-Instance-of-Order-Fulfillment-POT.Order-Received.base-content
7	Suborders completed:	an-Instance-of-Order-Fulfillment-POT.Suborders-Completed.base-content
8	Order completed:	an-Instance-of-Order-Fulfillment-POT.Order-Completed.base-content
9	Order Post Processing completed:	an-Instance-of-Order-Post-Processing-POT.Order-Post-Processing-Completed.base-content
10	Order profit of all completed orders:	an-Instance-of-Orders-Completed-SOT.base-content
11	Company specific profit:	an-Instance-of-Orders-Completed-SOT.compl-content

Corresponding Report – Part 1

	Caption	Content
1	New inquiry received:	Inquiry ID: 210409-1654-59, Date inquiry was received: 21-04-09 Inquiring company: Volcano Ships Inquiry Description: 400 seats model Ocean Convenience with final assembly at customer's site, Demanded delivery date: 30.12.2009
2	Request elements resulting from inquiry decomposition:	<i>RE₁</i> (provision of metal seat frame), <i>RE₂</i> (provision of seat upholsteries), <i>RE₃</i> (provision of circuit systems), <i>RE₄</i> (provision of monitors), <i>RE₅</i> (provision of harnesses), <i>RE₆</i> (final assembly of seat)
3	VE in charge of inquiry:	<i>RE₁[M₃]</i> , <i>RE₂[M₆]</i> , <i>RE₃[M₉]</i> , <i>RE₄[M₉]</i> , <i>RE₅[M₁₂]</i> , <i>RE₆[M₇]</i>
4	Quotation issued to customer:	Quote ID: 260409-1332-16, Date quote was issued to customer: 26-04-09 Quote Description: Offer for 400 standard seats model Ocean Convenience with final assembly at customer's site. Offered Price: 880K€


an-Instance-of-Inquiry-Handling-POT.
Quotation-Issued.
base-content



Corresponding Report – Part 2

5	Quotation result received from customer:	Quote ID: 260409-1332-16, Date quote result was received: 02-05-2009 Quote result: positive Response of customer: Offer accepted without changes; will sign contract
6	Order received:	Order ID: 080509-0918-34, Date order was received: 08-05-2009 Quote ID: 260409-1332-16
7	Suborders completed:	Order ID: 080509-0918-34 Date of completion of all suborders: 10-11-2009
8	Order completed:	Order ID: 080509-0918-34 Date of completion of order: 12-11-2009
9	Order Post Processing completed:	Order ID: 080509-0918-34 Date of completion of order post processing: 16-11-2009
10	Order profit of all completed orders:	Total profit value: 8.657K€
11	Company specific profit:	Profit value: 5.356K€

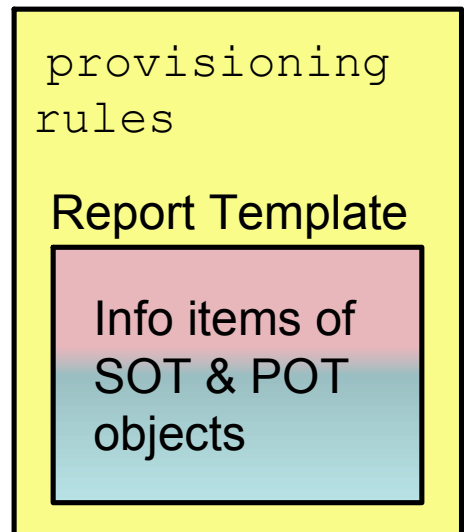
an-Instance-of-Orders-Completed-SOT.
compl-content



Information Provisioning Schemes

- determine provisioning of report instances according to provisioning rules
 - Time based
 - every day at 7 pm
 - every Monday
 - every 1st working day of a new month
 - Condition based
 - if a given indicator violates a certain threshold
 - whenever a certain business process moves into the next state
 - when exceptions occur

Information
Provisioning Scheme



Provisioning Rules based on the ECA Model

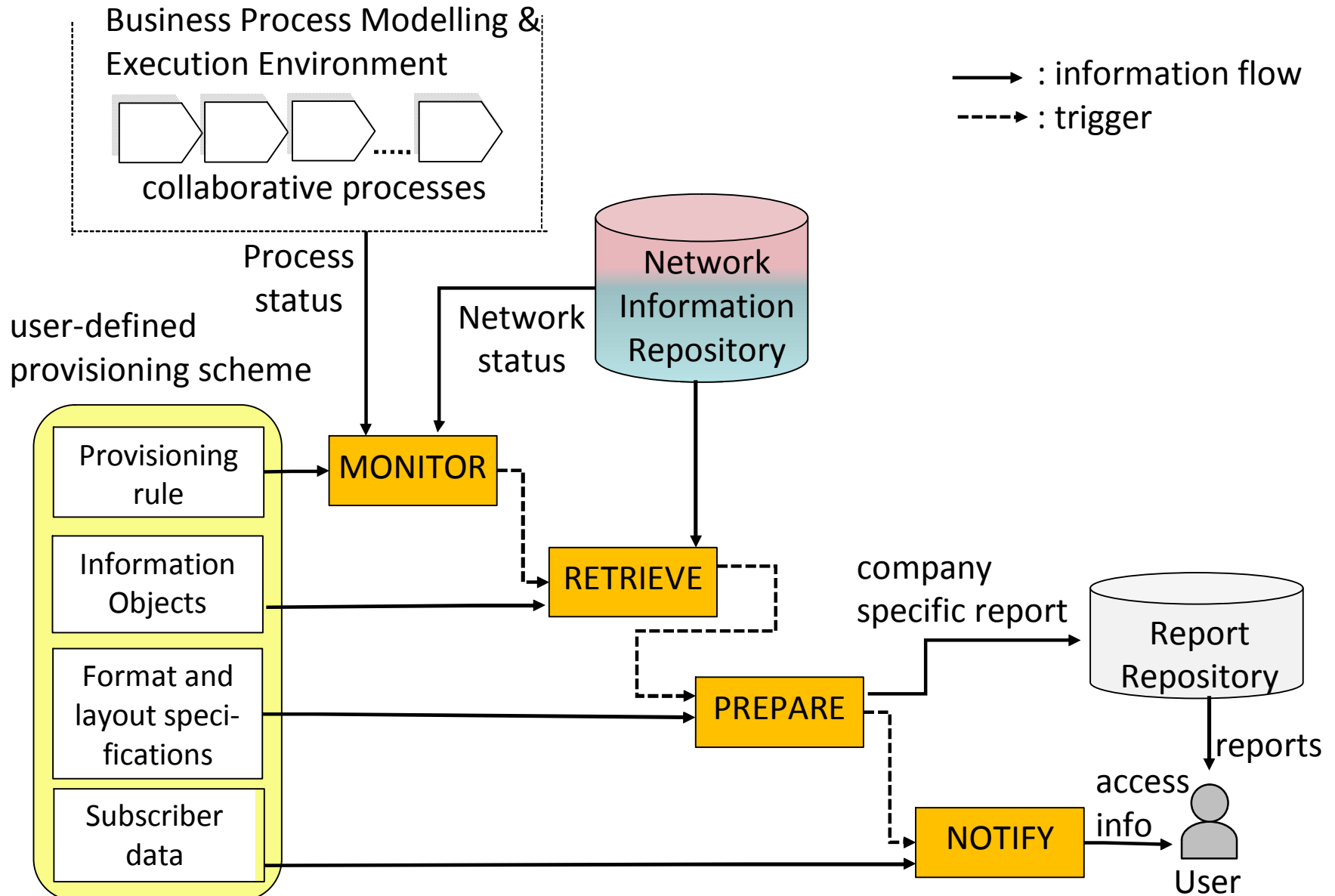
- Event Condition Action Model from Active Databases
 - Whenever the event happens, the condition is evaluated, and if satisfied then the action is taken
- ECA Based Provisioning Rules

E	Update of SOT object	Creation of new POT object	State Update of POT object	Switch into next calendar day
C	Given the database state at time t_i referred to by DB_{t_i} and given any pair of object items $OI_l, OI_k \in DB_{t_i}$ which are data values of SOT objects or POT objects, then a condition $cond$ is $cond = (cond_{single} cond_{composite})$ with $cond_{single} = OI_l (= \neq \leq \geq)(OI_k C)$ with $C \in \mathbb{R}_0$ and $cond_{composite} = cond_{single} \{(\wedge \vee) cond_{single}\}_1$			
A	Generation of individual report according to a referred user-defined report template and provision to user			

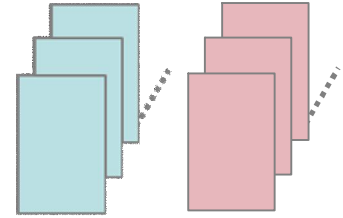
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Conceptual Model of Proposed Service

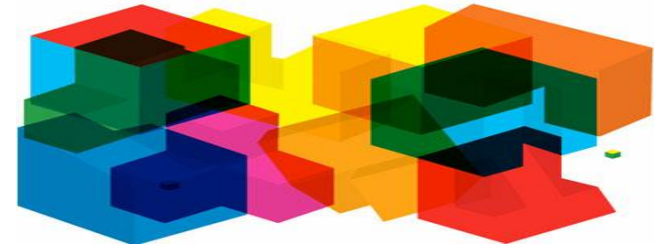


SOT and POT Objects



- Stored in the Network Information Repository
- Serve as an abstract layer that offers application specific information to achieve informedness
- hide details about obtaining the information from the corresponding data sources and also the synchronization
- linking the objects to the specific sources of a given CN is a system integration activity

Some Issues



- How to obtain the content of the SOT objects from the relevant set of internal & external data sources?
 - Data privacy?
- How to obtain the status information of the POT objects from the real world processes?
- How to keep the content of the SOT and POT objects up to date?
- How to map business processes to corresponding POT object types?
 - BPMN as standard to support?
- Information visualization in reports
 - Information dashboard approach?

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Concluding Remarks

- first standalone prototype is planned
 - extensive use of database technology
 - ECA style provisioning rules
 - process tracking by manual registration of state changes
- study of failed and successful networks planned
 - more evidence for informedness as success factor for CN
 - to obtain information for predefined object types
- Evaluation through simulation studies and by experiments with existing networks
- is work in progress - still a lot of work ahead of us

Thank you for your attention!

Questions?

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Obvious Economic Indicators



Indicator	Explanation
<i>Revenue</i>	Revenue obtained by entire network in the current business year.
<i>Member Revenue</i>	Mean revenue obtained per member in the current business year.
<i>Revenue Distribution</i>	Description of revenue distribution within the network in the form of values on an ordinal scale that ranges from unbalanced, slightly unbalanced, and balanced.
<i>Utilization</i>	Description of degree of utilization of the resources. The value domain refers to an ordinal scale that ranges from low, normal, up to high. The description of the future development is based on a separation into short term, medium term, and long term development of the utilization.
<i>Inventory</i>	Description of amount of material on stock stated through a value of an ordinal scale that ranges from low, normal, up to high. The future development is described in terms of an ordinal scale that ranges from short term, medium term, and long term.

Obvious Collaboration-Specific Indicators



Indicator	Explanation
<i>VE Size</i>	States no. of participating companies. The minimum, mean, and maximum values refer to all VEs that occurred in the network.
<i>Company VE Size</i>	States no. of participating companies for those VEs in which the company itself participated in.
<i>VE Value</i>	Overall monetary business value associated with VEs considering all VEs that occurred in the network.
<i>Company VE Value</i>	Overall monetary business value associated with VEs considering only those VEs in which the company itself participated in.
<i>Waiting Time</i>	Time span in days that participants of a terminated VE need to wait until they become again a participant of another VE. The minimum, mean, and maximum values refer to all VEs that occurred in the network.
<i>Company Waiting Time</i>	Time span in days as above but only those VEs are considered in which the company itself participated in.

Concluding Remarks

- First standalone prototype for Decision Support Service available; was part of an EU funded research project



FYNSAMT • K.E.R.N.

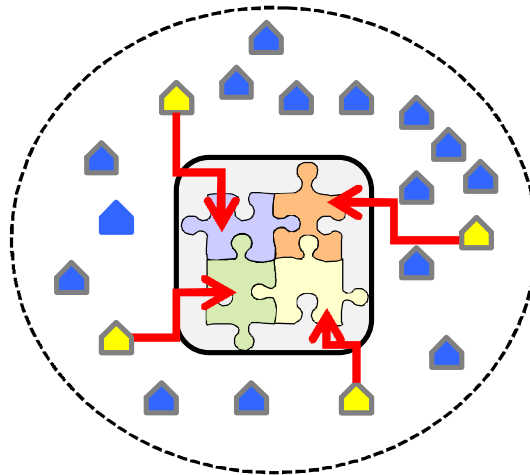
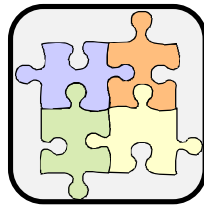
- Transparency Support Service concept finished but no prototype available yet
- Intention to address this topic in our next joint research project on moderation management in collaborative network for which we have applied for EU funding

Overview of Targeted Services

Decompose and
prepare request
for VE creation

VE creation decision

Inform network about
VE creation decision



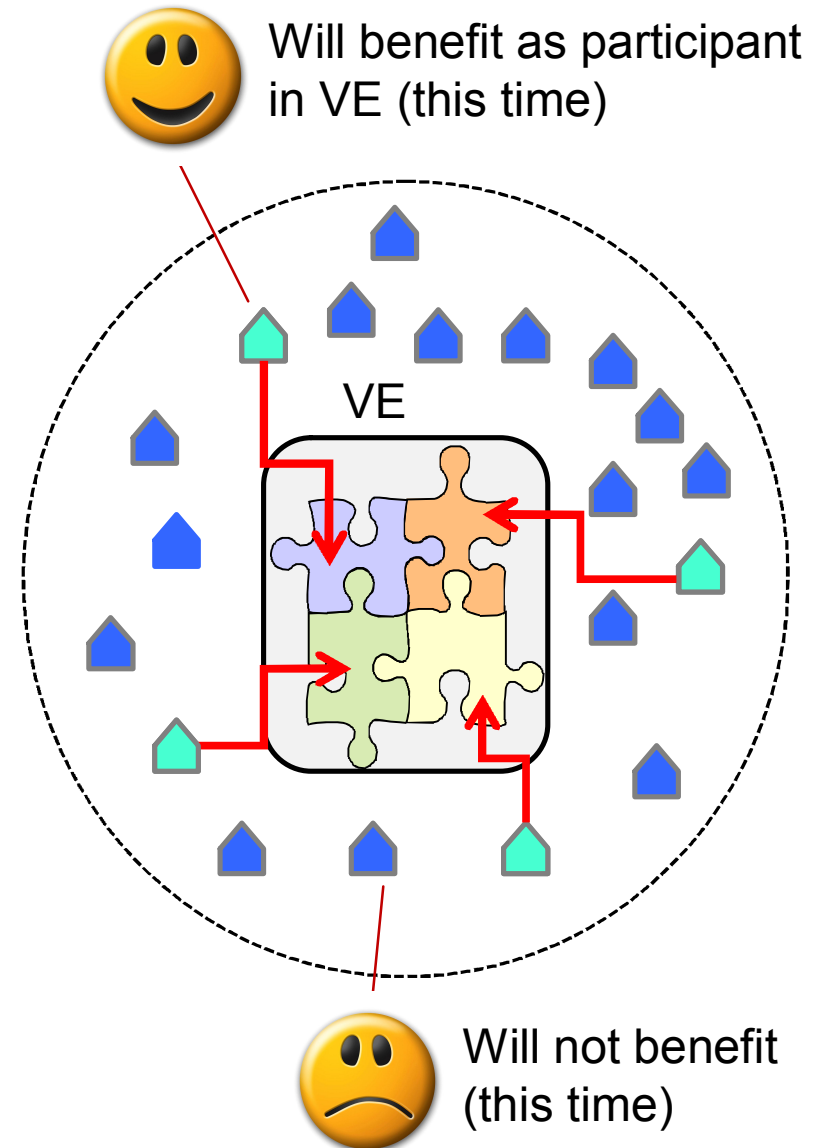
Request Management
Service (RMS)

Decision Support
Service (DSS)

Transparency Support
Service (TSS)

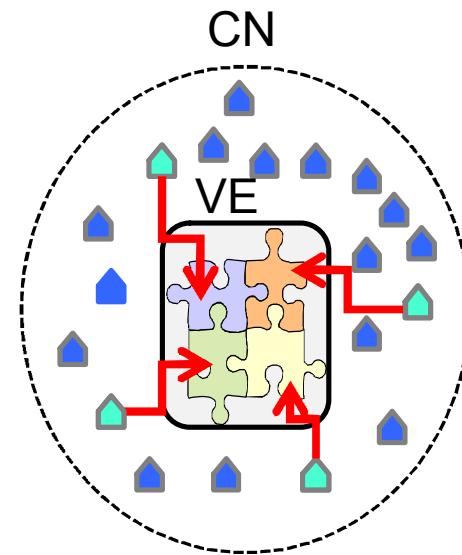
VE Creation Decisions

- separate into group of benefiterers and non-benefiterers
- influence the company's economic situation
- influence collaboration climate in network
- are sensitive decisions

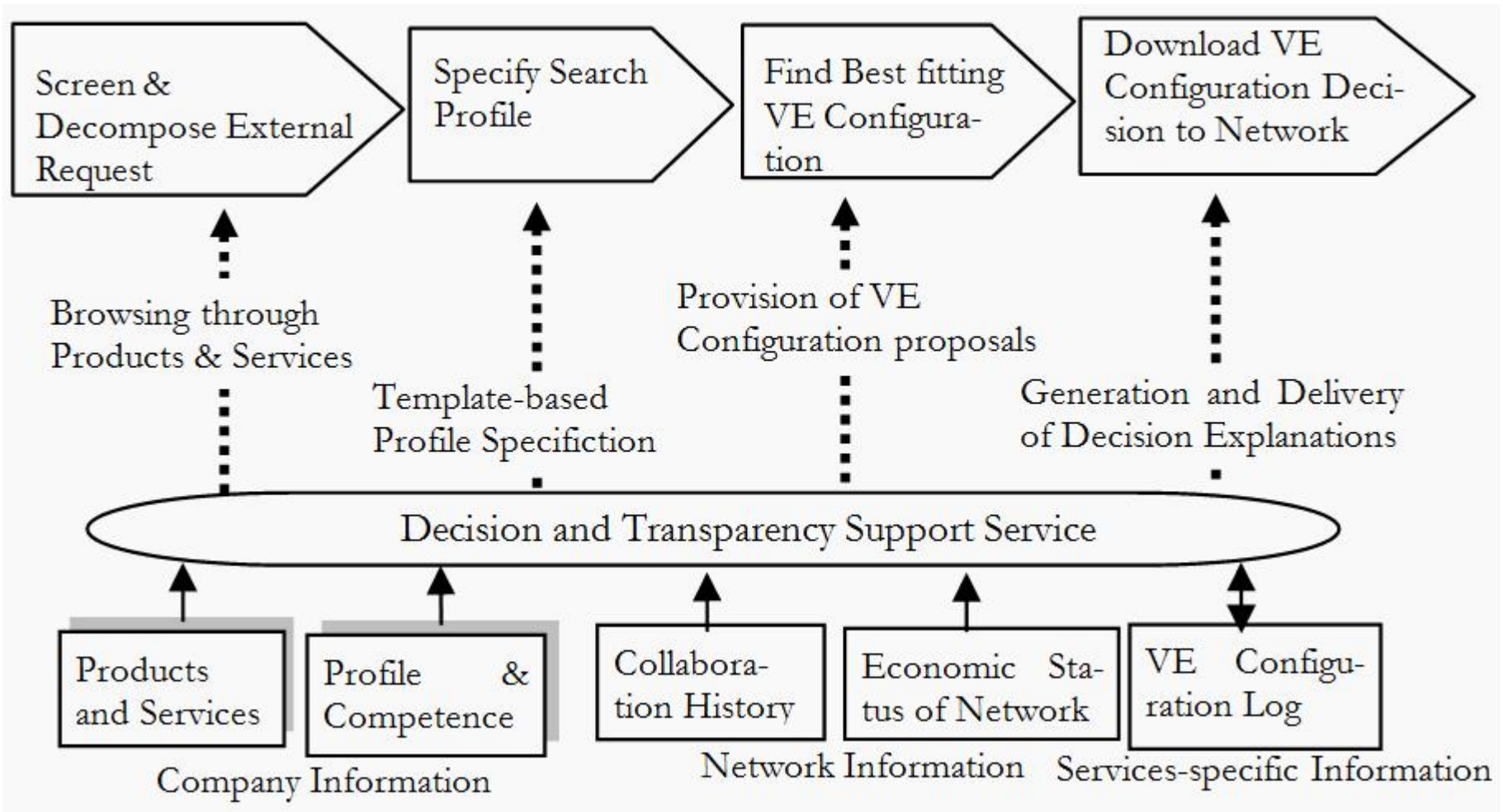


VE Creation Decisions

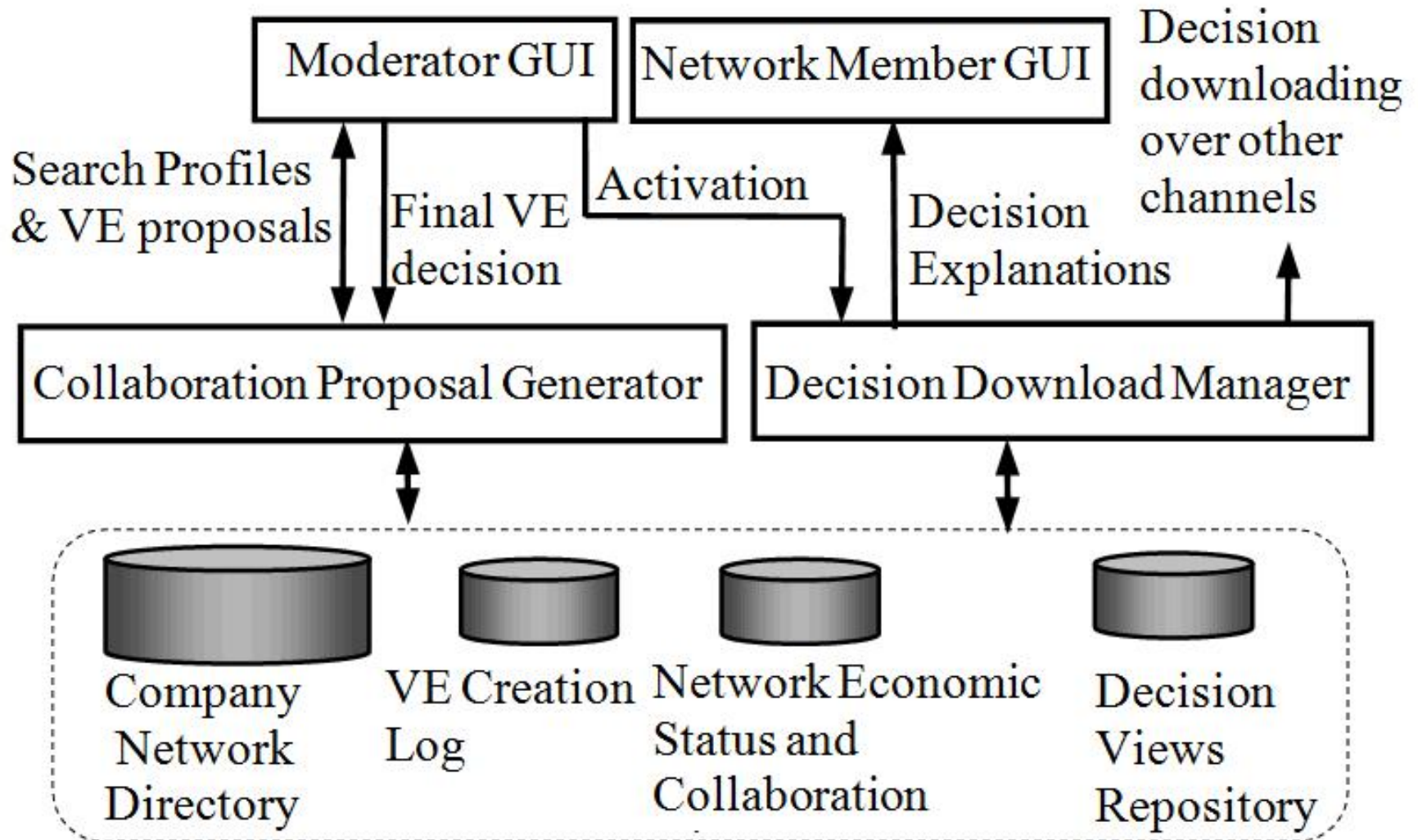
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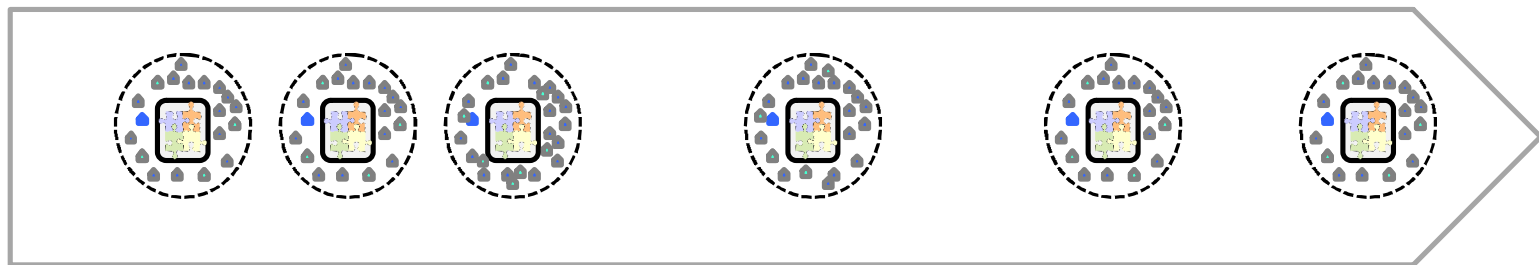
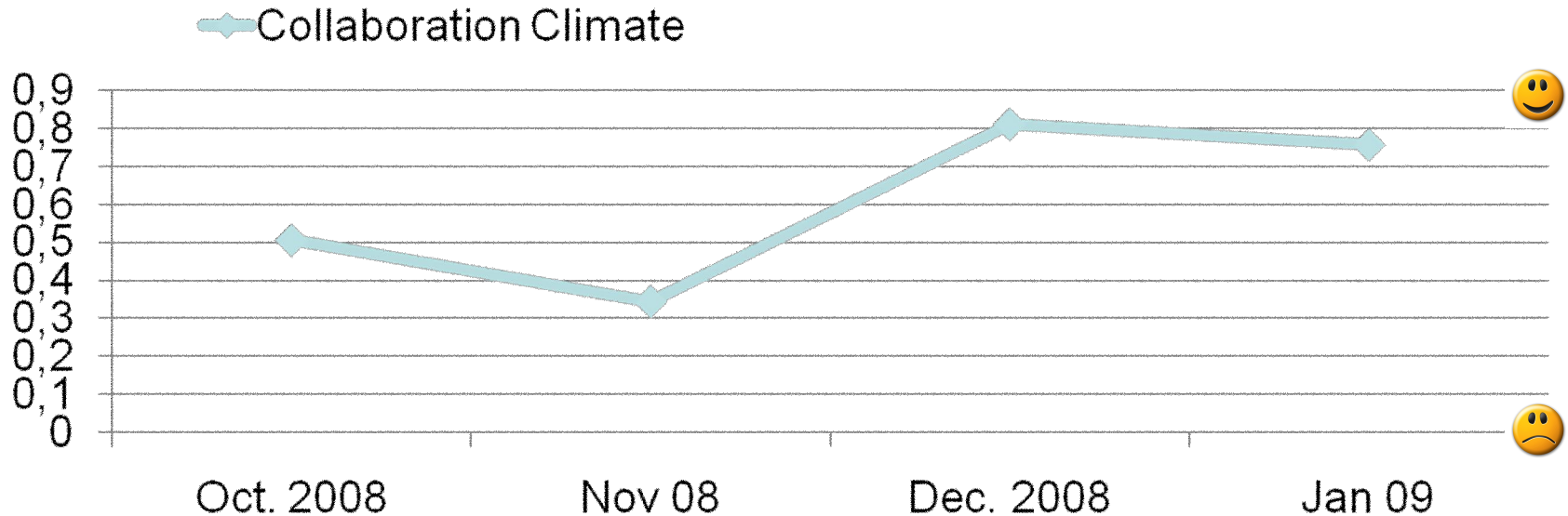
Overview of Proposed Services



Architecture of Prototype



Impact of VE Creation Decisions on Collaboration Climate



VE Creation Decisions occurred in network over time

Decision Views



Search Profile View

- Needed products and services and further decision criteria considered for the VE configuration decision

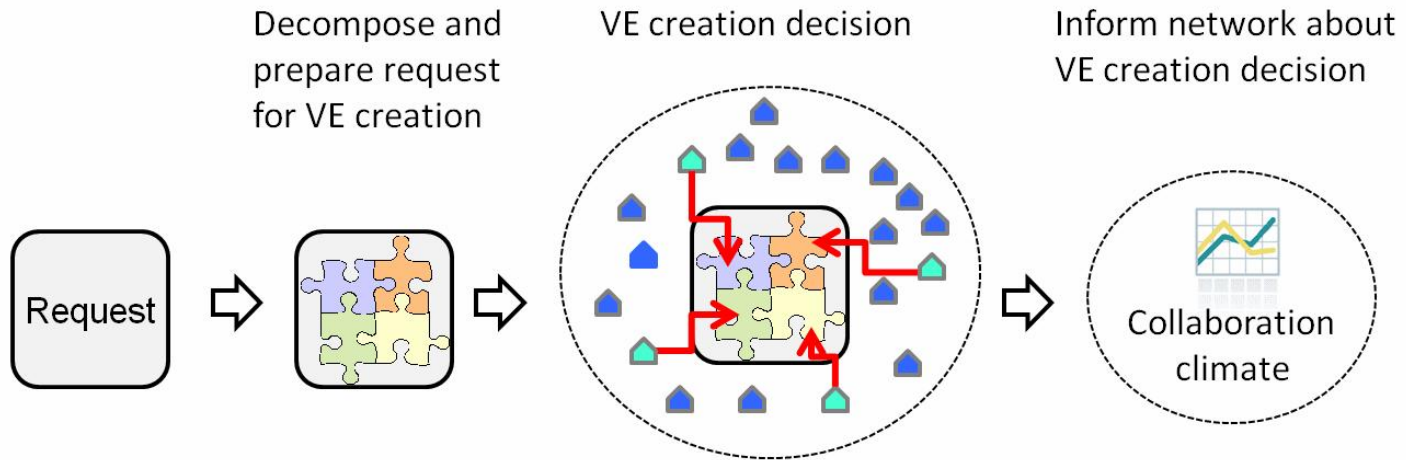
Search Result and Criteria Evaluation View

- Selected VE alternative with explanatory information for companies

Decision Impact View

- Future network states from economic and collaboration point of view as they will result from an order fulfillment by the selected VE (quantitative indicators)

Steps in Decision Downloading Service



- decision justification is derived from the global information base through corresponding data analysis
- augmentation of derived information by further context specific background information for decision diagnosis
- generation of decision explanations (data views, pre-computed views that include quantitative data) with sections that contain company specific individualized data
- disseminate explanations within the network

