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Toward the Mobile Grid: Service Provisioning in a Mobile Dynamic Virtual Organization

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March 3, 2006

Mobile Grid: Key Issues

- Move from fixed & research-oriented grid systems to mobile grids with a commercial focus.
 - Potential functional extensions needed?
 - Consequences on business models?
- Steps to find answers
 - Formal investigation in the nature of a mobile grid and related concepts
 - Concept of a Mobile Dynamic Virtual Organization (MDVO) introduced
 - Potentials illustrated by means of a business scenario

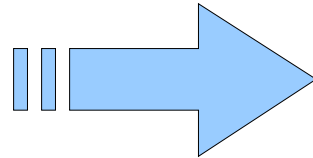
Related Concepts

- Investigation in concepts related to mobile grids
 - Service-oriented Architecture (SOA)
 - Interoperability of heterogeneous nodes by means of standardized interfaces
 - Peer-to-peer Systems (P2P)
 - Resource sharing among peers in the most decentralized form
 - Grid Systems
 - Resource coordination and aggregation in Virtual Organizations (VO)
 - 3 categories
 - Grid computing (HPC)
 - Service grids (virtualization)
 - Mobile grid (knowledge grid)

The Nature of a Mobile Grid

- Transition from Virtual Organization to the Mobile Dynamic Virtual Organization (MDVO)
 - Due to mobile grid's functional extensions
 - Support various forms of mobility
 - Dynamics, mainly imposed by mobility

VOs are considered “to allow for information and communications technology-supported, accountable and chargeable resource coordination across administrative domains, incorporating mechanisms for parameterized secure authentication and authorization.”

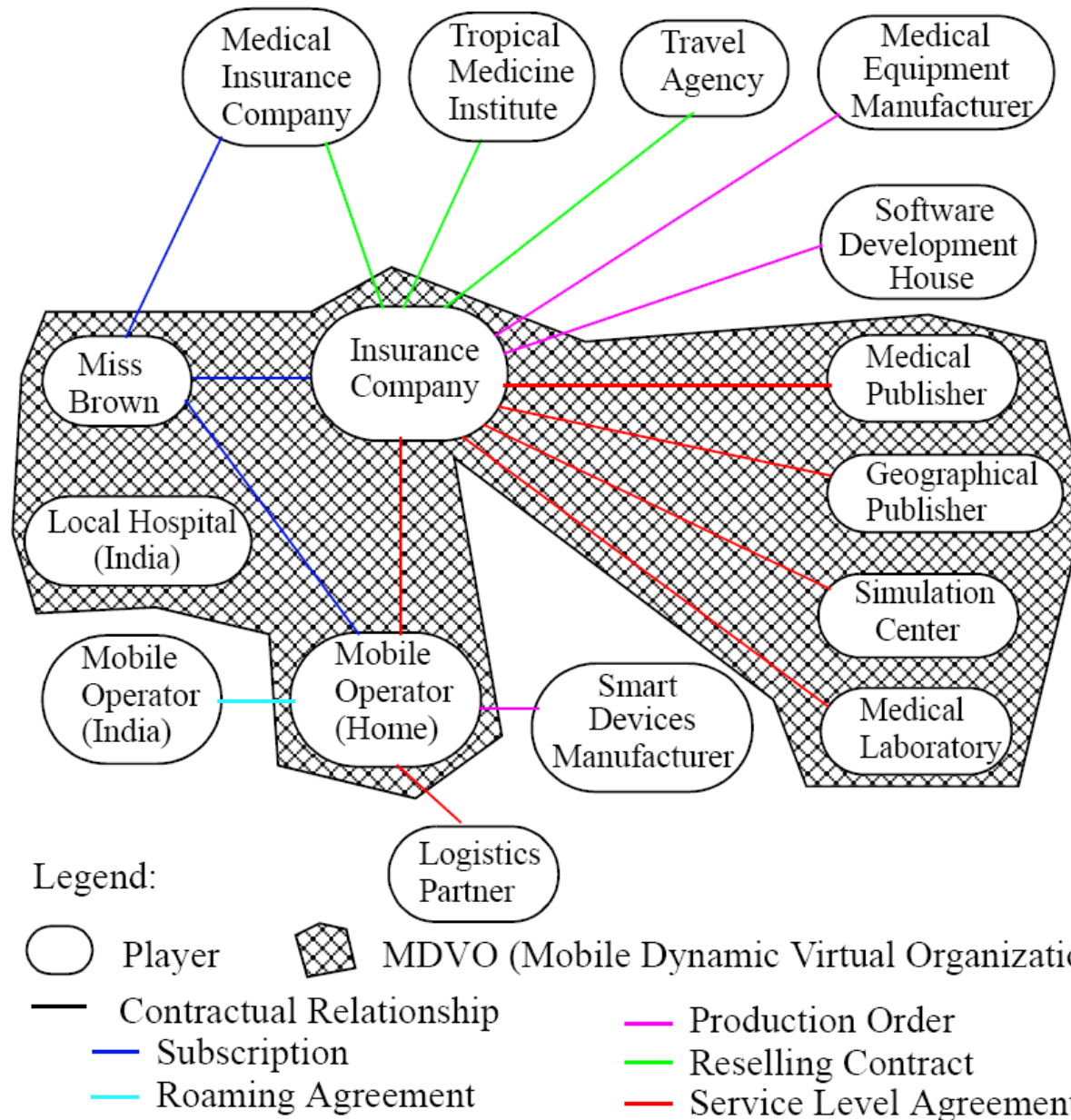


“MDVOs are virtual organizations whose members are able to change locations while provided or consumed services remain available even after temporary loss of reachability, and while running or yet to be initiated workflows adapt to changed conditions, so that MDVOs are characterized by a strong dynamic element with respect to their organizational composition and their business processes.”

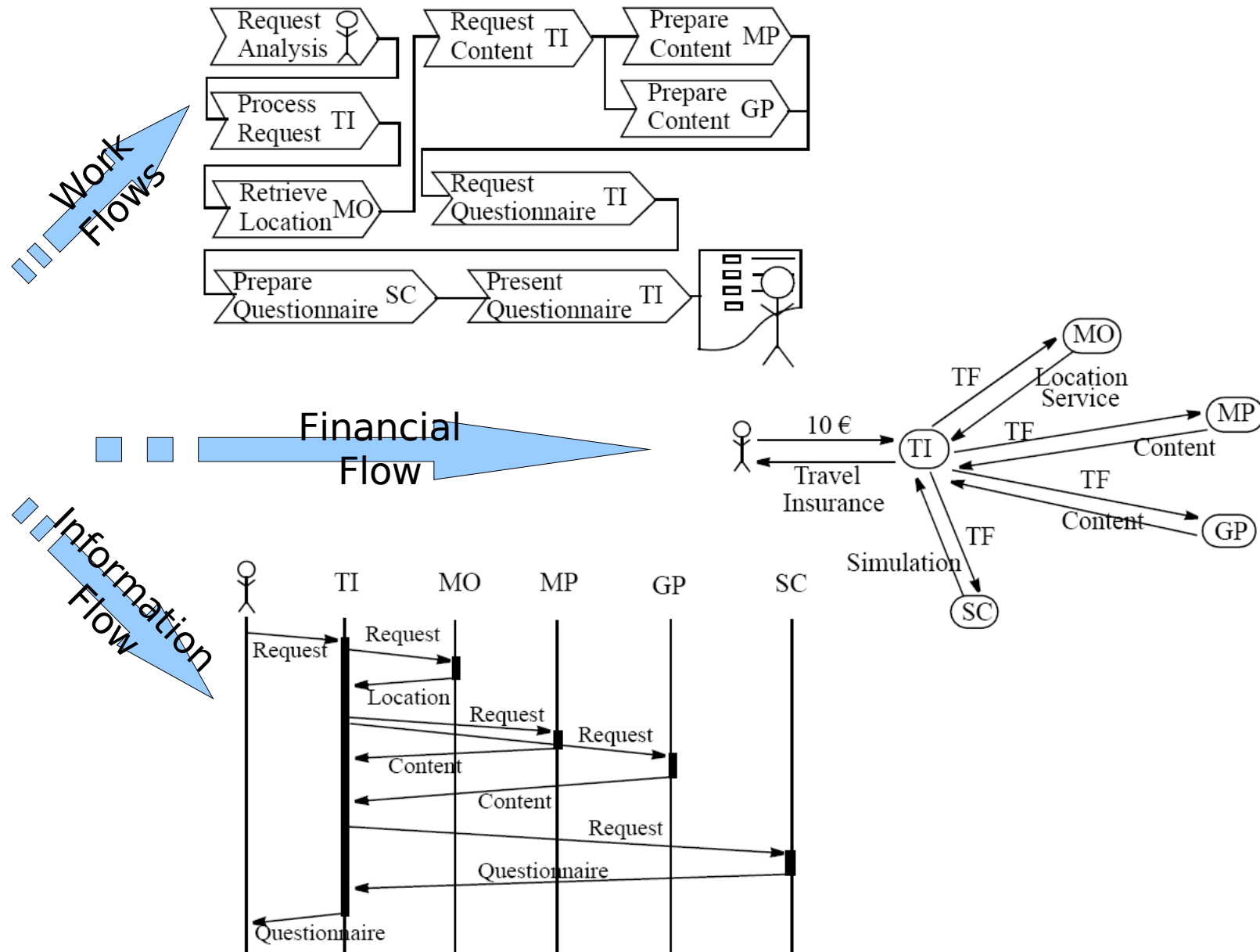
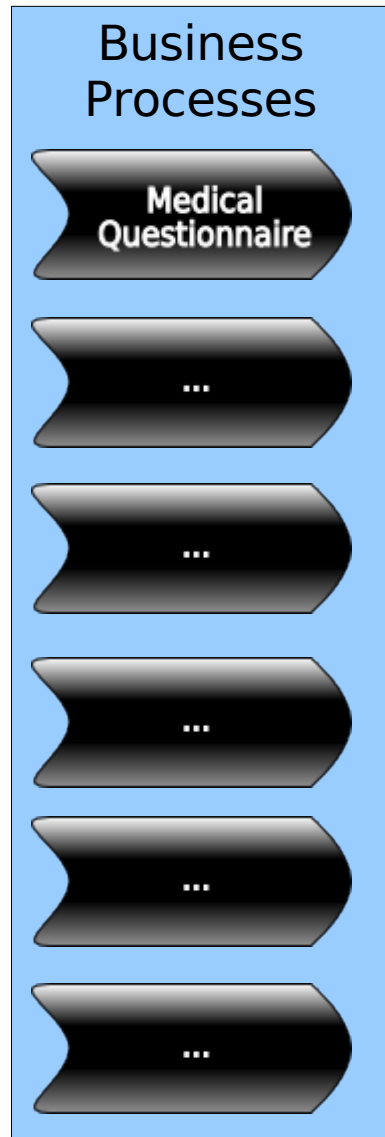
Business Scenario: Travel Insurance

- E-health & tourism domains → match requirements
 - Field of application
 - Mobile or nomadic users
 - Knowledge-intensive tasks
 - Business model
 - Legally independent companies form an MDVO (multi-domain service provision)
 - VO managing entity that aggregates services (centralized element is assumed)
 - Motivation for travelers as well as insurance company
 - Travelers know whether a medical condition requires consultation of medical facilities
 - Reduces number of unnecessary & costly consultations
 - Early diagnosis shortens illness phase & lowers total costs

Business Scenario: Organizational Alignment



Business Scenario: Business Flows Analysis



Potentials of the Mobile Grid (1)

- Major potentials
 - Integration of context (user & device) → adaptive workflows
 - Accounting (on network, grid, and content level)
 - Allow for subtle charging schemes
 - QoS-bundles
 - Distributed value chain
 - Focus on core competencies (specialization)
 - Potential for economies of scale (offer similar service in different VOs)

Potentials of the Mobile Grid (2)

- Scenario-specific potentials
 - Insurance company
 - Offer an understandable product
 - Differentiate from competitors (by aggregating services)
 - Travelers
 - Profit from a solution that reflects their individual needs (customization)
 - Medical advice in a home-like manner
 - Mobile Network Operators
 - Network access
 - Further services (customer management, billing)
 - Content Providers
 - Expose content in pieces only (keep control)

Thank you

for your attention!



Backup



Grid vs. P2P vs. SOA

- Related concepts compared by means of 8 technical and 9 business metrics
 - Both categories may show overlappings

Technical Metrics:

- CPU
- Decentralization as Design Goal
- End-to-end Connectivity
- Interoperability
- Location Transparency
- Robustness
- Standards
- Storage

Business Metrics:

- Ad-hoc Formation
- Commercial Usage
- Efficiency
- Inter-domain Service Provision
- Quality-of-Service (QoS)
- Resource Coordination
- Resource Sharing
- Scalability
- Service Aggregation

Technical Metrics Explained

<i>Metric</i>	<i>Explanation</i>
CPU	Computational power exploitable by offered services
Decentralization as Design Goal	Typically fully decentralized system architecture envisaged
End-to-end Connectivity	Peers communicate directly, irrespective of nodes in between
Interoperability	Nodes of heterogeneous nature
Location Transparency	Location information not bound to services
Robustness	Prone to failure and system attacks
Standards	Rely on open or widely accepted standards and protocols
Storage	Storage capacity exploitable by offered services

Business Metrics Explained

<i>Metric</i>	<i>Explanation</i>
Ad-hoc Formation	Administrative or financial agreements taken before system becomes operational
Commercial Usage	Typically system used in commercial environment, implementing respective business models
Efficiency	Mechanisms for optimized usage of available resources
Inter-domain Service Provision	Support of Virtual Organizations (VO)
Quality-of-Service (QoS)	Support of QoS-related parameters
Resource Coordination	Involve multiple resources in a structured way in a business process
Resource Sharing	Conjoint access to resources, such as computation or storage
Scalability	Correct behavior under high system load
Service Aggregation	Combine basic services into composite advanced services

Technical Comparison

Category		CPU	Decentralization as Design Goal	End-to-end Connectivity	Interoperability	Location Transparency	Robustness	Standards	Storage
Grid Systems	Grid Computing	Green	Grey	Grey	Green	Green	Grey	Green	Green
	Service Grid	Green	Grey	Grey	Green	Green	Grey	Green	Green
	Mobile Grid (Knowledge Grid)	Grey	Grey	Grey	Green	Grey	Orange	Green	Green
SOA		Grey	Grey	Green	Green	Green	Grey	Green	Grey
P2P Systems		Green	Green	Green	Orange	Orange	Green	Orange	Green

Legend:

- green marks an attribute that is relevant and exists in the system in question
- grey is considered as not being relevant for a system
- orange denotes an aspect being relevant, however, not existent in current designs or implementations

Business Comparison

Category		Ad-hoc Formation	Commercial Usage	Efficiency	Inter-domain Service Provision	Quality-of- Service	Resource Coordination	Resource Sharing	Scalability	Service Aggregation
Grid Systems	Grid Computing	Green	Grey	Orange	Grey	Green	Grey	Green	Grey	Grey
	Service Grid	Orange	Green	Orange	Green	Green	Green	Grey	Grey	Green
	Mobile Grid (Knowledge Grid)	Orange	Green	Green	Green	Green	Green	Grey	Green	Green
SOA		Grey	Green	Grey	Grey	Orange	Orange	Grey	Grey	Orange
P2P Systems		Green	Orange	Green	Orange	Grey	Grey	Green	Green	Grey

Legend:

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