ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ

Εισαγωγή στα Δίκτυα Υπηρεσιών

Διάλεξη 1η: Introduction to Service Networks

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Τμήμα Επιστήμης Υπολογιστών

Introduction to Service Networks
UC-01/CS-592

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Course Syllabus

- Service Systems (Networks)
- Metamodels & Models
- UML
- SNAPT – a Methodology and Tool to Model Service Networks
- Business Processes
- Business Process Management (BPM)
- BPMN 2.0
- SOA and Web Services
- WSDL, SOAP and UDDI
- Service composition: choreography & orchestration
- Other WS* standards
- Privacy and Trust Management
- Compliance

Service Systems (networks)

Introduction

- *Service Networks are embedded in service ecosystems*
- An *ecosystem* is a biological environment consisting of
  - all the organisms living in a particular area, as well as all the nonliving,
  - physical components of the environment with which the organisms interact, such as air, soil, water, and sunlight.

It is all the organisms in a given area, along with the nonliving (abiotic) factors with which they interact; a biological community and its physical environment. (Wikipedia).

How to define Services?

- The Economist: a service is “anything sold in trade that cannot be dropped on your foot.”
- as an **economic category**, a service is the non-material equivalent of a good – that may be used or consumed but not owned
- in a **technological sense**, a service is one or more software programs, devices and networks working together to supply an end-user a coherent application – as in service-oriented-computing concepts
- Services can be delivered by a **combination** of people and human-made artifacts and systems

What is a service?

A *service* is understood as *"the application of competences for the benefit of others"* (Vargo and Lusch 2004).

In general, a service is delivered by the service provider to the service client.

In fact, the service can act on a target different from the service client, but the service does so for the benefit of the client.

This general definition has been extended by describing the parts involved (service client, service provider and service target) and their mutual relationships and actions in the process of service provision in (Maglio *et al.* 2006).

Service systems are *"dynamic value co-creation configurations of people, technology, value propositions connecting internal and external service systems, and shared information (e.g., language, laws, measures and methods)."* (Maglio and Spohrer 2008)

What is a service? Cont.

A service system *"is a composite of agents, technology, environment, and/or organization units of agents and/or technology, functioning in space-time and cyberspace for a given period of time. There is always a lot of contexts from which the service system could be evaluated, explicated and comprehended. There exists at least one context from which the roles of Client, of Provider, and of Target could be recognized on agents or environment."* (Staníček and Winkler 2010)

What is a Service Ecosystem?

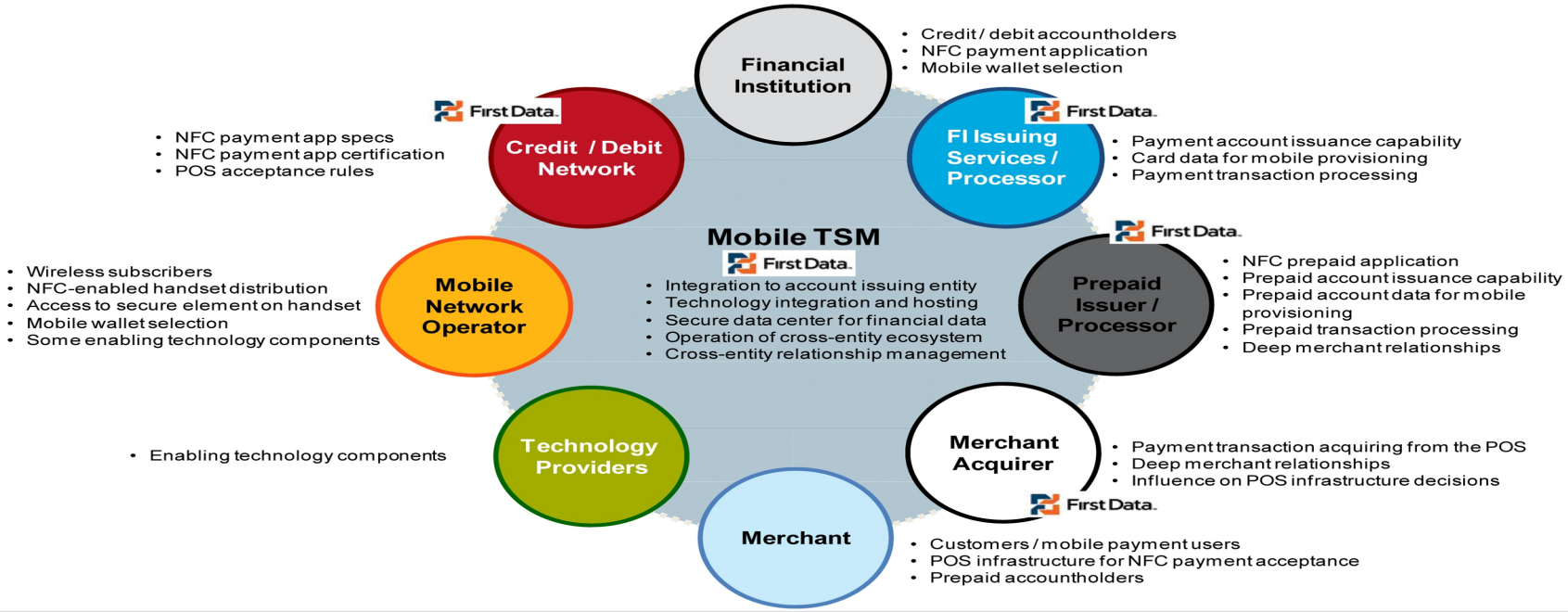
- *A Service Ecosystem* is a socio-technical environment consisting of:
  - All the services available in a particular sector of the economy (e.g. home electronics, online media, etc.)
  - All the supporting (enabling) good and services (e.g. Banking, building mainetance, power and telecom utilities, brokers, distributors, etc.)
  - All the regulating and supervising authorities

Example Service Ecosystem

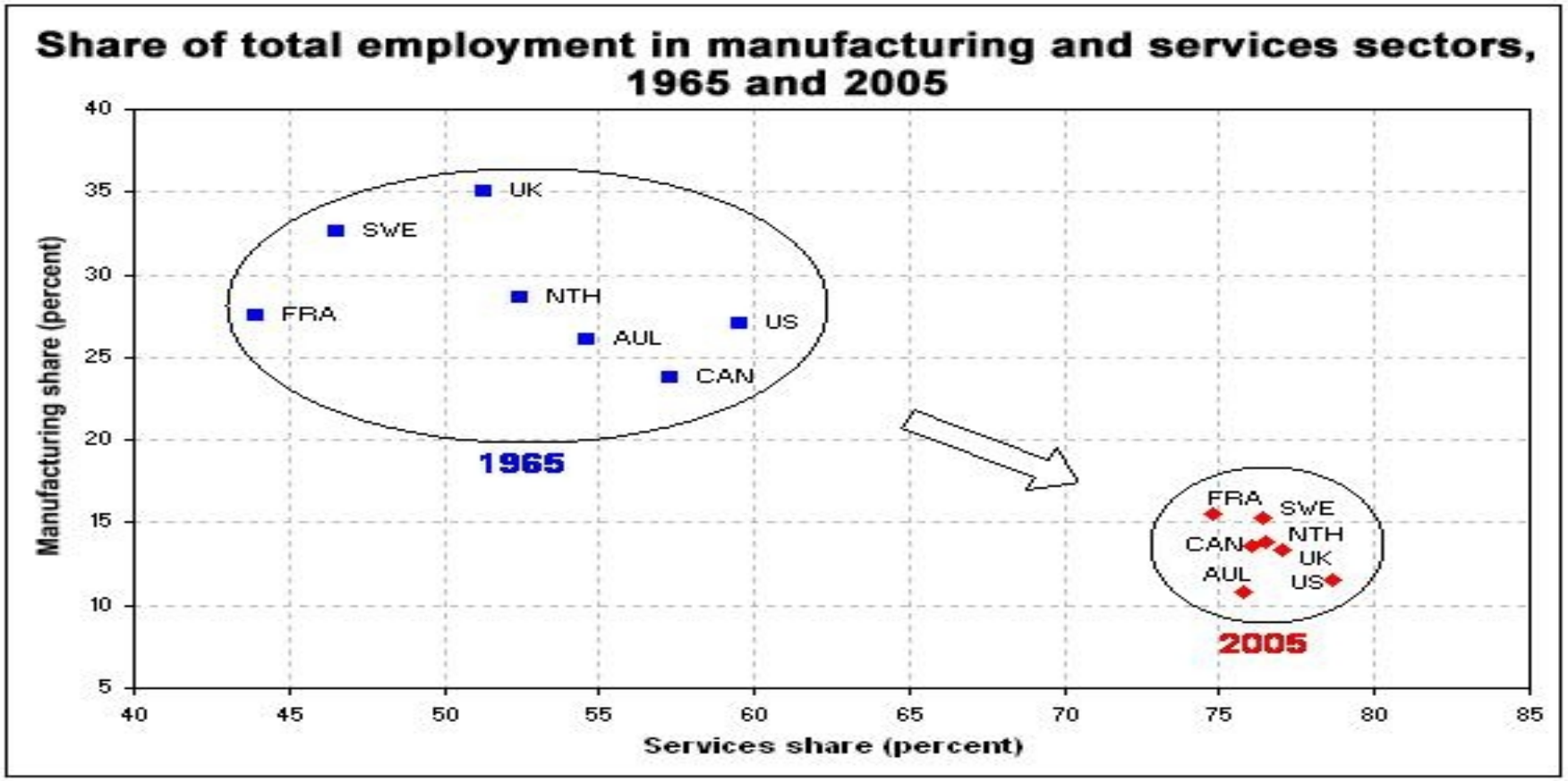
source: http://multivu.prnewswire.com/mnr/firstdata/49606/

TSM: Simplifying a Complex Ecosystem

Convergence to the handset requires active cooperation of a variety of stakeholders. The full-service TSM fills critical roles to coordinate the mobile payments ecosystem.



The Emergence of Service Economy (Percent employment in service jobs)

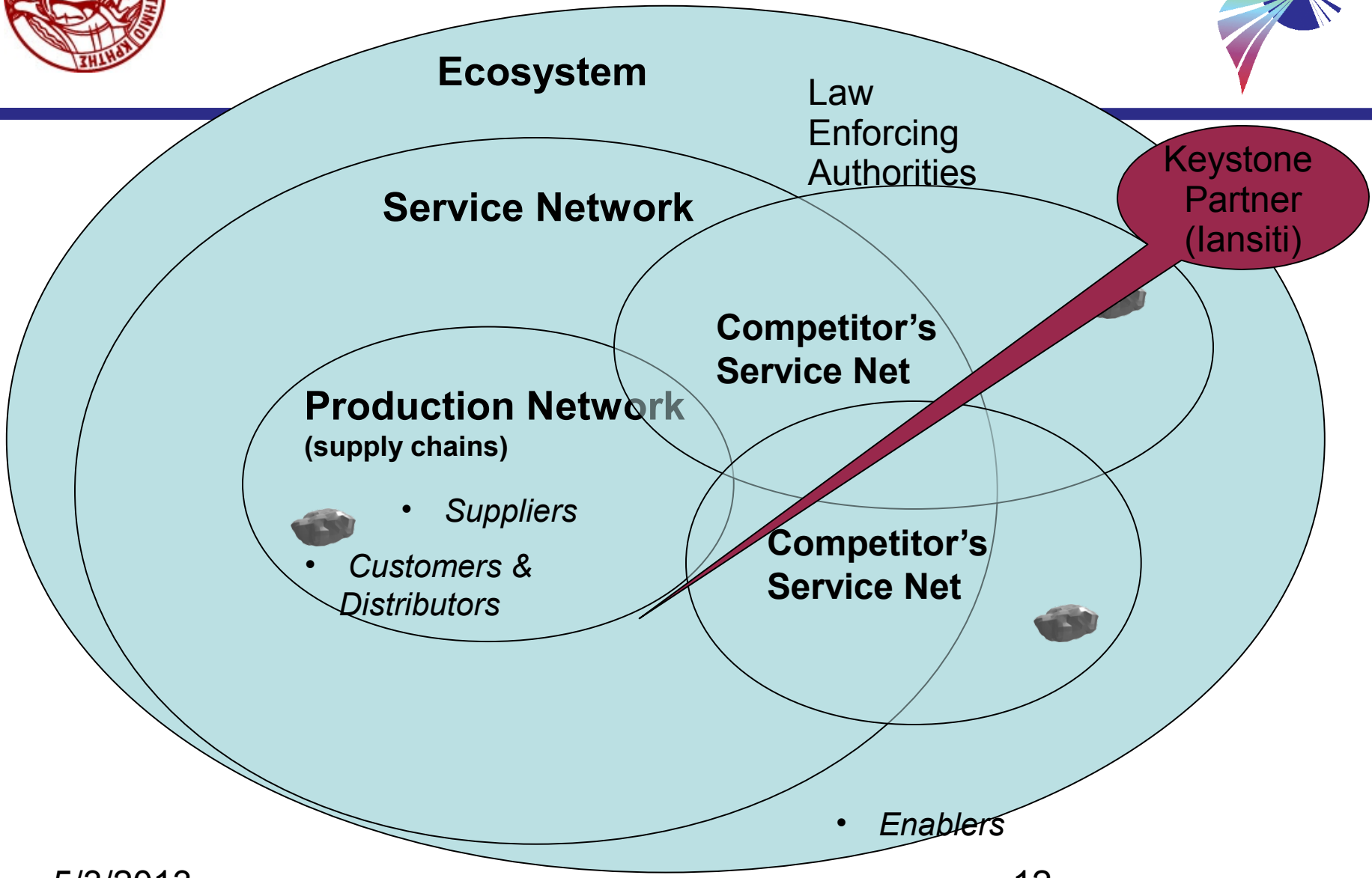


NOTE: Employment shares shown do not represent the total economy, because employment in agriculture, mining, and construction is excluded; therefore, the shares for each country do not sum to 100 percent. In chart: AUL = Australia; CAN = Canada; FRA = France; NTH = Netherlands; SWE = Sweden; UK = United Kingdom; US = United States.

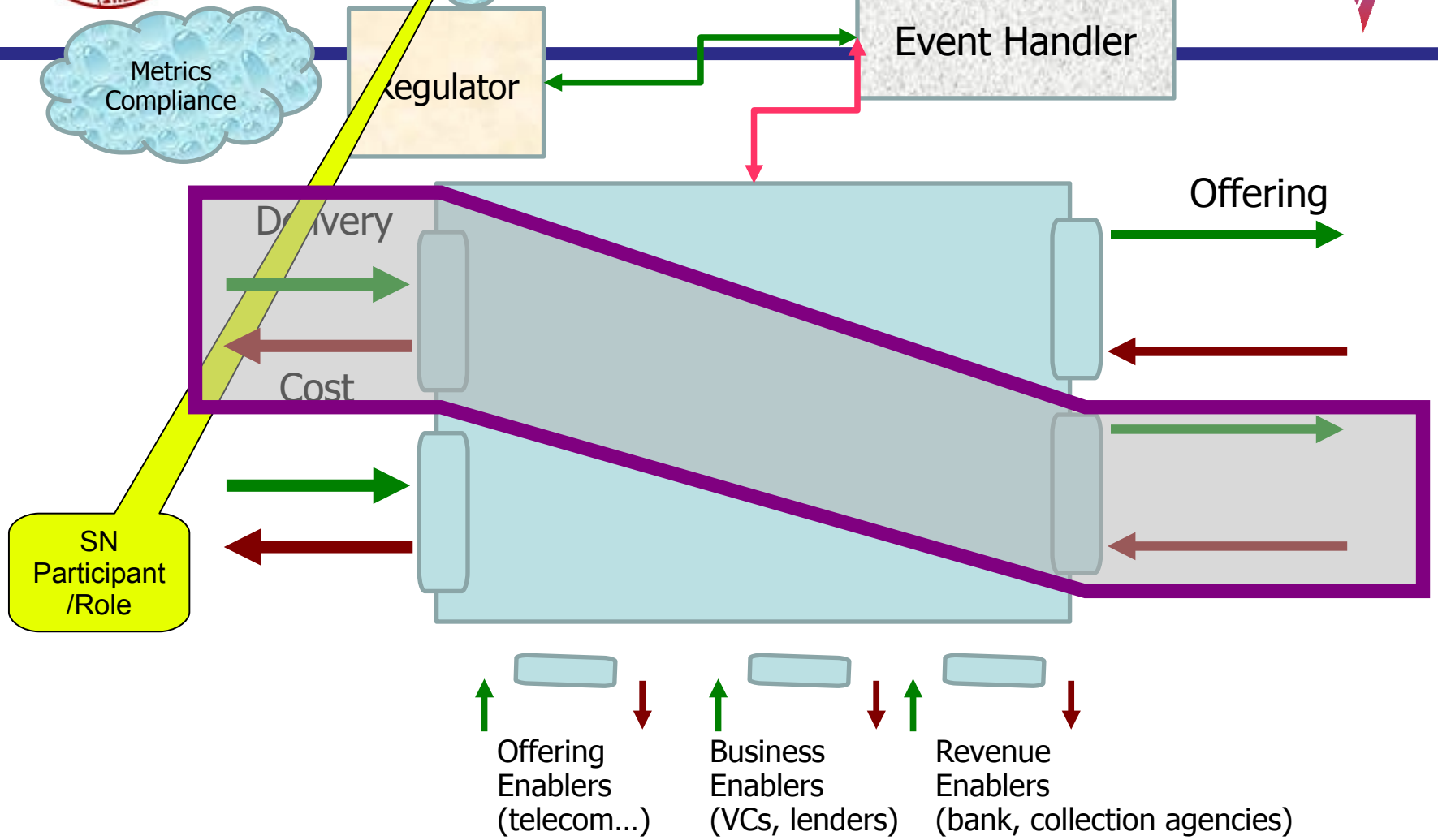
Source: US Bureau of Labor Statistics

Today: Service Economies use ICT enabled Networks

- Rural economies: mainly used market places
- Industrial economies: mainly used hierarchies + market places
- Service economies today (predominant in developed and developing countries): mainly use ICT enabled around-the-globe networks:
  - Global cheap communications (abundant bandwidth, VOIP, teleconferencing, collaborative tools, etc.);
  - ICT enabled contract management and monitoring;
  - Mechanisms for trust building in global networks (reputation/recommendation systems, third party registries, etc.)

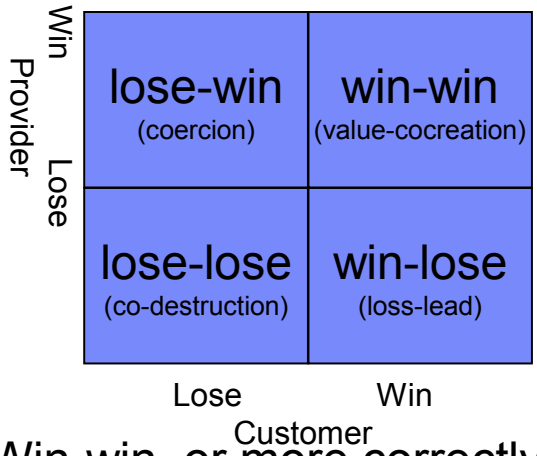

Ecosystem
Law Enforcing Authorities
Service Network
Keystone Partner (Iansiti)
Competitor's Service Net
Production Network
(supply chains)
• Suppliers
• Customers & Distributors
Competitor's Service Net
• Enablers

A Business Entity/ Service Provider

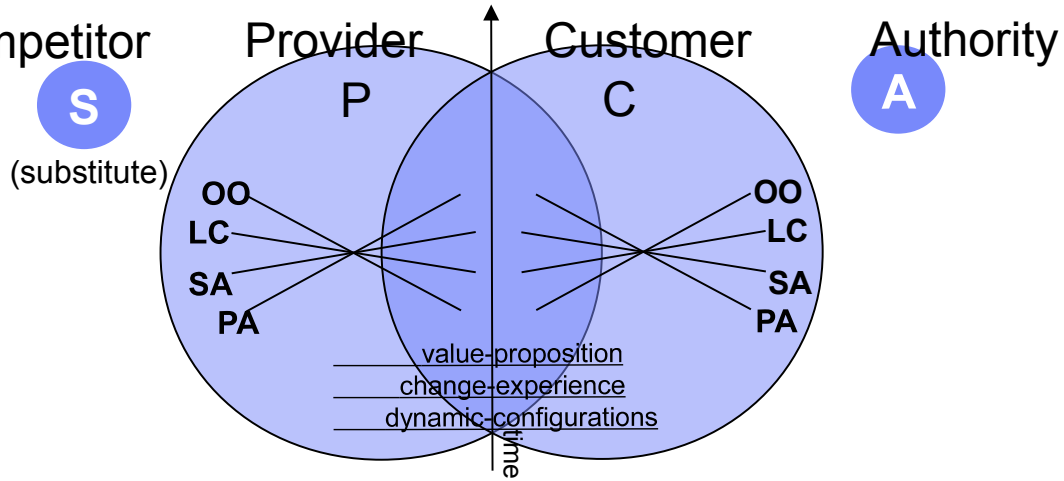


Jim Spohrer (IBM): Service = Value-Cocreation

When two entities interact, and the two are capable of reasoning about value, theirs and others



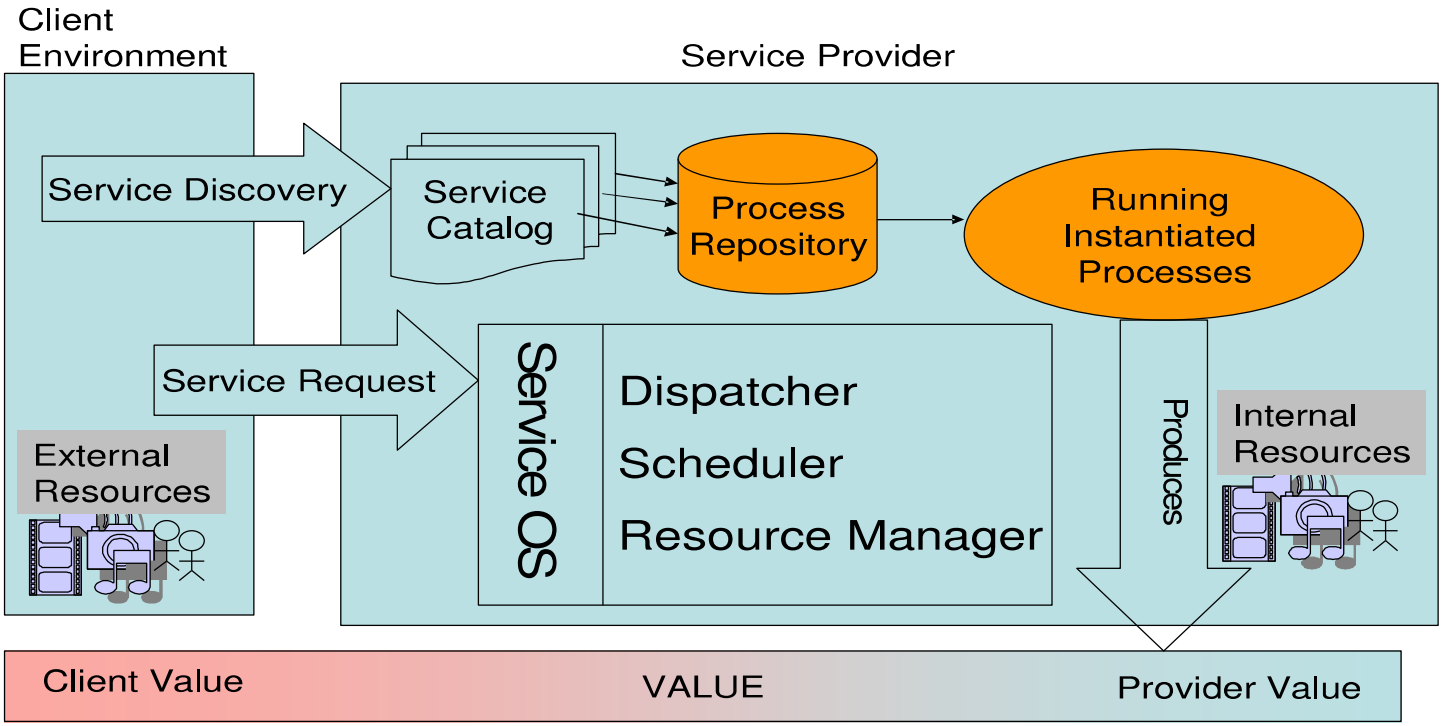
Win-win, or more correctly benefit-benefit



service = value-cocreation

provider resources		**customer resources**
Owned Outright	B2B	Owned Outright
Leased/Contract	B2C	Leased/Contract
Shared Access	B2G	Shared Access
Privileged Access	G2C	Privileged Access
	G2B	
	G2G	
	C2C	
	C2B	
	C2G	
	***	

(Software) Service System Architecture (Baravan, Hartman, et al.)



- Service providers prefer to team up and combine their services to create new and innovative ones in the market place.
    - These new combined ones form a *service system* or a *service network*
    - There may be several service networks within a service ecosystem that offer comparable or replaceable services, and which therefore compete for market share
    - There may be service providers that belongto more than one service networks, possibly competing ones.
- Why do Service Providers form networks/systems?

Service Networks or Service Systems (Banavar, Hartman, et al.)

- A *service system* has been defined as a network of providers and clients co-producing value through service performances.
- For a given (set of) service provider(s), we define a *service delivery system* as a set of interacting entities, such as people, processes, and products, that are involved in the *delivery* of one or more services.
- Examples of service delivery systems are hospitals, universities, banks, and call centers.
- The delivery of a service utilizes resources and produces outcomes that are valuable to the client.
- Outcomes are domain dependent, and eventually translate into value for the client, some of which is transferred into value for the provider.

How to define the Value of a Service?

- Value for Whom (James Teboul, "Service is Front Stage, 2006")?
  - For the Customer: credibility of result, tangible and memorable experience, attentiveness, responsiveness and speed, ease of use, consistency, willingness to pay;
  - For the Provider: cost, productivity, capacity utilization, barrier to entry
  - For the Provider's Employee: compensation and tips, working conditions, participation initiative, sense of belonging, self-esteem, challenge
- A successful Service co-creates value for both provider and consumer

Start from the value proposition!

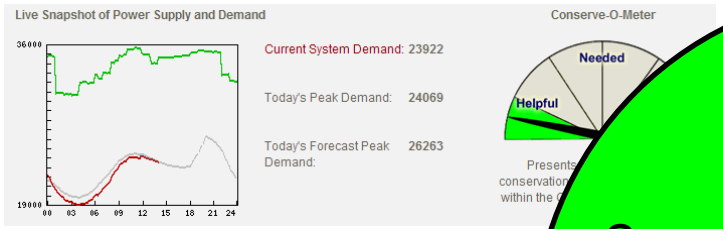
- A set of:
  - Products
  - Services
- …offered to the market by a network of providers to consumers that creates **value** for all of them.
- Examples:
  - The “ultimate coffee drinking experience” (Cinzia Parolini, Illy Café)
  - A new standard
  - A new banking service
  - The car repair service network

Research on Service Value Systems (not an exhaustive list)

- Seminal work by Verna Allee: **ValueNet Works™** analysis, using the intuitive **HoloMapping™** method, which is a methodology for analyzing the dynamics of value in value networks at the operational, tactical, and strategic level.
- The e3Value methodology and tools (Gordijn et al.) provide formal models, visualization, value estimation for value networks
- Network formation by (economic) agents has been studied in the literature, (Jackson, Bloch, Currarini, Morelli). The objective there is to form both effective and stable networks, which in general is difficult to achieve.
- Social networks work and their correlations with economic networks (Wakolbinger, Nagurney).
- Value Net research from a business administration perspective (Iansiti, Parolini).
- Research work on services at IBM Almaden Research (Spohrer, Maglio)

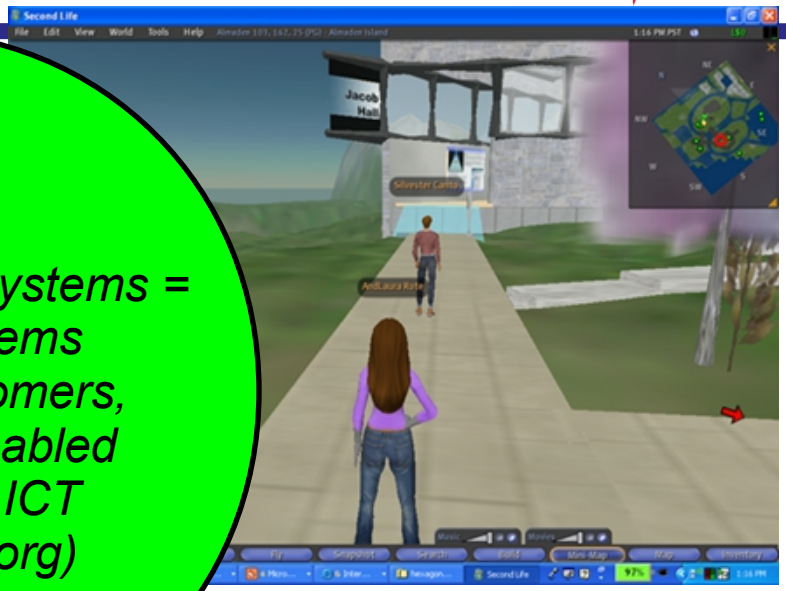
Jim Spohrer (IBM): Multiple Approaches to Study Service Systems

Real (Instrumented) World



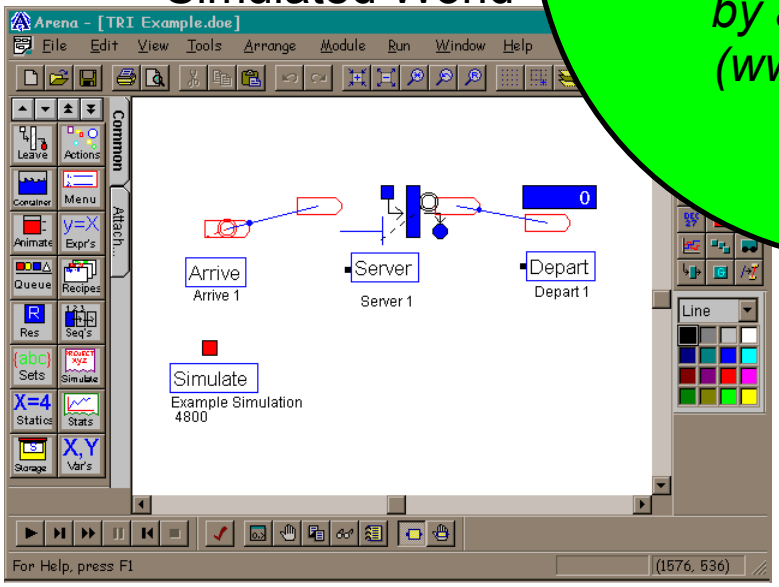
www.caiso.com

Virtual World



Focus:
Smarter Service Systems = complex systems that serve customers, increasingly enabled by advanced ICT (www.thesrii.org)

Simulated World



Mathematical World

$$P(x) = \frac{\lambda^x . e^{-\lambda}}{x!} \qquad \text{For } x = 0, 1, 2, 3, 4, \ldots$$

x = Number of arrivals in a specific period of time

λ = Average number of arrivals for the specific period of time

$e \approx 2.71828\ldots$ (Euler's number)

Graph-Theoretic Offering-Centric Definition of Service Value Networks (SVNs)

A Value network is a pair of two Directed Acyclic Graph (DAG), the **offerings DAG** and the **revenues DAG**. These two DAGs:

Have a common set of nodes

- economic entities (firms, cost centers, individuals, …)

The offerings DAG has links

- Service or goods contracts (relationships) over some pairs of economic entities

The revenues DAG has links over some pairs of economic entities denoting a revenue flow

If there is a link from node a to node b in the offerings DAG then there is a link between b and a in the revenues DAG.

There is a set of root nodes (raw materials respectively raw services nodes) that have no incoming links.

There is a set of leaf nodes (customers nodes) that have no outgoing links.

Associated with the Value network is a set of value equations that associate value to nodes, links and the whole Value network.

Service Value Subnetworks

- Service Value Sub-Network (VSN)
  - Is a Business Entity and a Value Network
  - Each offering that is offered or consumed by a VSN must by also offered or consumed by a single Business Entity inside the sub-network
- Key Performance Objectives (KPO)
  - Each Business Entity has their own business objectives for a single service
  - Map to Key Performance Indicators (KPIs)
    - KPIs indicates the actual measured value
    - KPOs describe the targeted value

A Proposal to define the "Value" of a Service Value Net

- $V(t) =$
  $\sum$ *of all the revenue flows (t)*
  $- \sum$ *of all the cost flows (t)*
  $+ \sum$ *of the value of all relationships (t)*

- **Relationship Value:** expected service (revenues-costs) of the provider over the next time period to a particular consumer
- **Expected service (revenues-costs)**: look into the recent past, modulate by customer satisfaction index
- … similarly for the value of a partner participation to an SVN – for customers, value is **utility** of service provided

Why is the above useful?

- Because value computations can be linked to KPIs - examples:
  - LOB sales to relationship values
  - Market share to charting the business ecosystem, predicting formation of new relationships (based on anticipated value), new products that fill the quality-product space, and related market research about customer requirements and their clustering in the Q-P space
- Because "business pains" can be translated to:
  - Either redesign of business processes (solution engineering),
  - and/or to redesign of the Value Net (Value Net Analysis and Engineering)
- Because value net computations can be used for value net comparisons:
  - How are my competing value nets doing (do they have higher value)?
  - What if I (a value net partner) added/removed/modified links?
  - What if I participated in another value net?
  - Are there opportunities for forming new value nets around new value propositions?

the Dynamics of Emergent Service Value Networks

- Capturing the dynamics of the SVNs (emerging markets and business models, innovation in service networks, consumer satisfaction, evolution of policies and governance, etc.) is to a large extent an open problem today.
- Special interest in **analyzing** and **predicting** how existing market interactions can give rise to emergent innovative SVNs, with possibly business sector specific patterns:
  - develop **models** of value creation and destruction in networks and of value optimization.
  - Use game theory to understand behavior, evolution of competing SVNs
  - show how the drive for **value optimization** and the **constant change of the environment** (new businesses enter the ecosystem and others die, innovative services and products appear, etc.) push the network to waves of restructuring in order to remain competitive.
  - develop **criteria and indicators of change** that can serve as input for business process and alliances redesign and realignment.

What kind of Models do we need for Service Networks?

- We need mathematical and simulation models to study and predict performance of service networks, study competition between them, winning strategies, etc.
- We need visual models to visualize their size, which ones are the important participants, etc.
- We need programming models to study the structure and behavior of service networks, to understand the interaction dynamics among participants.

Metamodels and models

- A **model** is an abstraction of phenomena in the real world;
- a **metamodel** is yet another abstraction, highlighting properties of the model itself. A model conforms to its metamodel in the way that a computer program conforms to the grammar of the programming language in which it is written (Wikipedia, 'metamodeling').
- To effectively model a system, you need one very important thing: a language with which the model can be described. And here's where UML comes in…

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ΕΣΠΑ 2007-2013
πρόγραμμα για την ανάπτυξη
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Με τη συγχρηματοδότηση της Ελλάδας και της Ευρωπαϊκής Ένωσης

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