

CADENUS

Creation and Deployment of End-User Services in Premium IP Networks

- **Project Overview** (M. Potts – Martel)
 - Partners
 - Objectives
 - Current work
 - Outline of the following presentations
- **The Operator Business Case for the CADENUS Architecture** (G. Morgan - Eircom)
- **The CADENUS Mediation Components**
 - Access Mediator (S.P. Romano - UoN)
 - Service Mediator (R. Fiutem - Sodalia)
 - Resource Mediator (A. Diacones – Teltec)
- **Service Creation at the Network Level** (M. Smirnov - FHI Fokus)

Operators:

France Telecom R&D

Eircom

Telecom Italia (Sodalìa)



Manufacturers:

Flextel

TieSse



Consultancies:

Telscom

Martel



Universities & Research Institutes:

University of Naples

Dublin City University

EPFL

FHI-Fokus



Fraunhofer
Institute for Open
Communication Systems

+ 2 institutes from the Newly Associated States:

ITTI (Poland):

Business Procedures (links to TeleManagement Forum
and Poland Telecom)

SETCCE (Slovenia):

Security



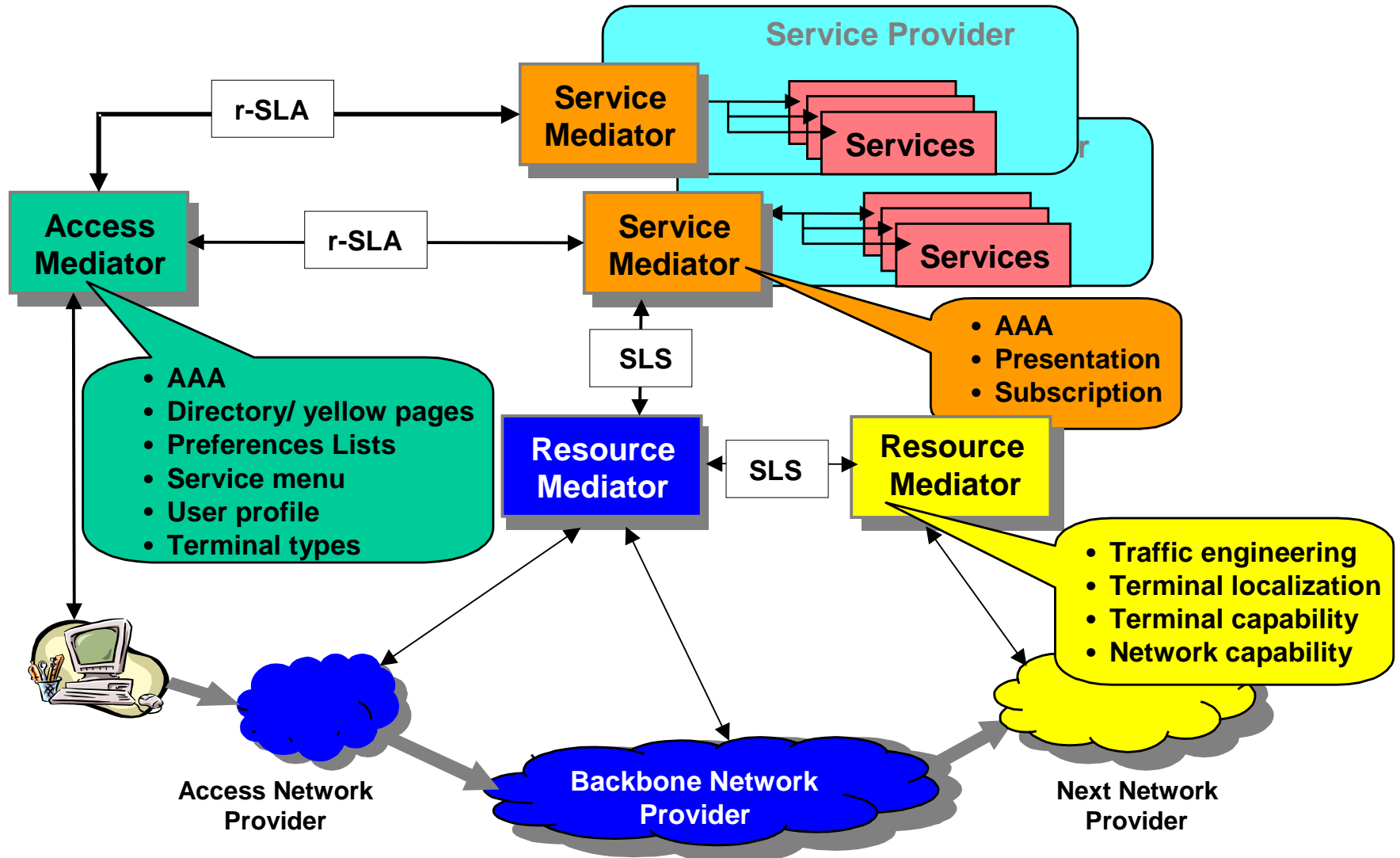
Objectives of CADENUS (1)

To propose an integrated solution for the creation, configuration and provisioning of end user services with QoS guarantees in Premium IP networks.

In detail:

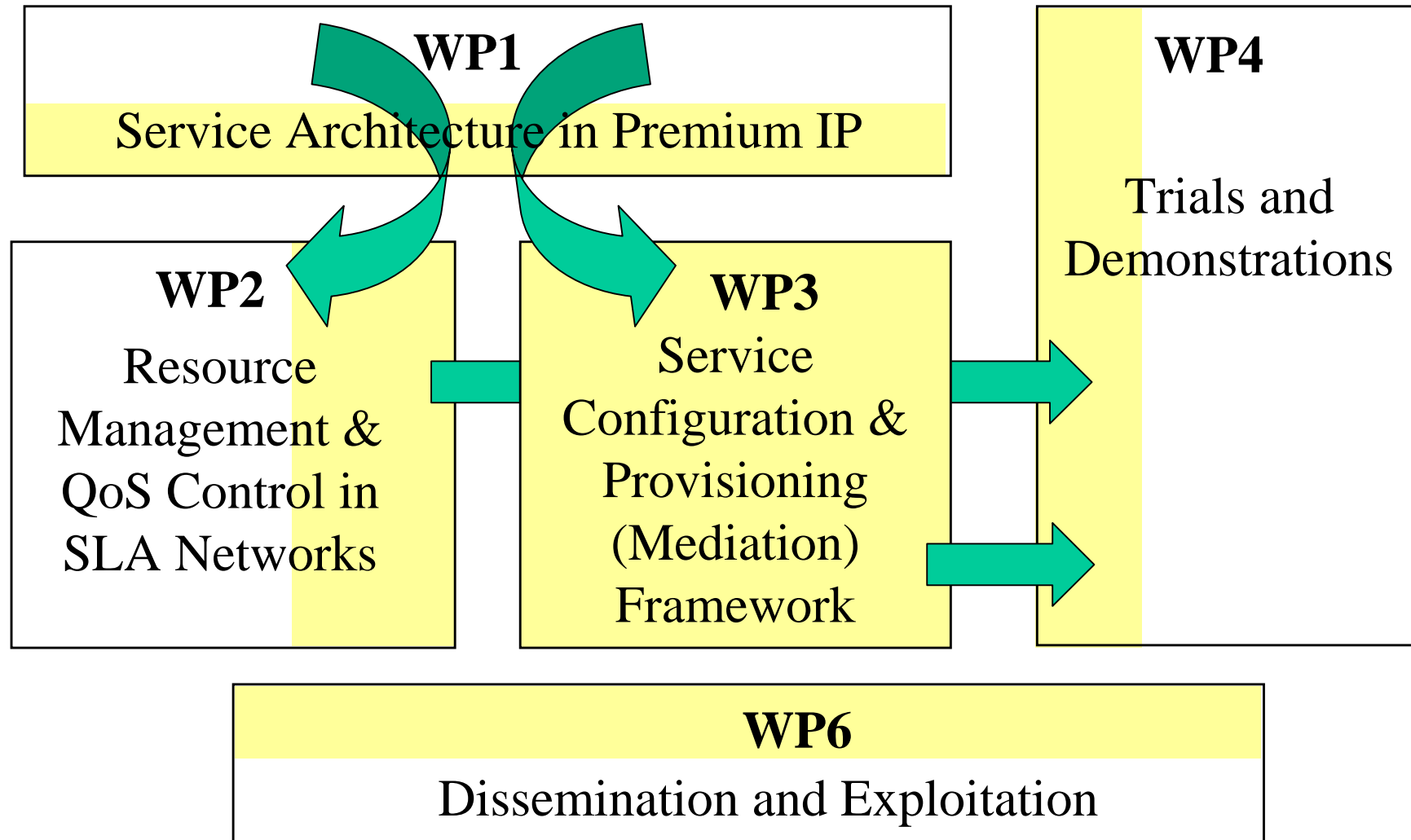
- **Define an architecture** in which the relationship can be seen between end-user services requiring QoS, and the Premium IP network transport services, and to deliver these services

CADENUS Architecture



Objectives of CADENUS (2)

- Relate the architecture to current **business processes**, including especially the management of more flexible and dynamic SLAs and SLSs, trading agreements, etc (ebXML)
- **Trial and demonstrate** the efficient delivery of end-user services with QoS guarantees via this architecture
- Show how the **service creation and configuration** processes within the architecture have generic functionalities
- **Disseminate** the results in standards bodies and to the industry in general



Outline of the following presentations

To show how the CADENUS architecture provides support for:

- Independence of service provision and network provision
- A Service Provider adding a new service
- A customer requesting information on all available services
- A customer subscribing to a new service
- A customer using/invoking a new instance of a service, and getting the QoS
- Network services being created/provisioned according to the demands of an application

.... and to relate these to the needs and procedures of network and service providers

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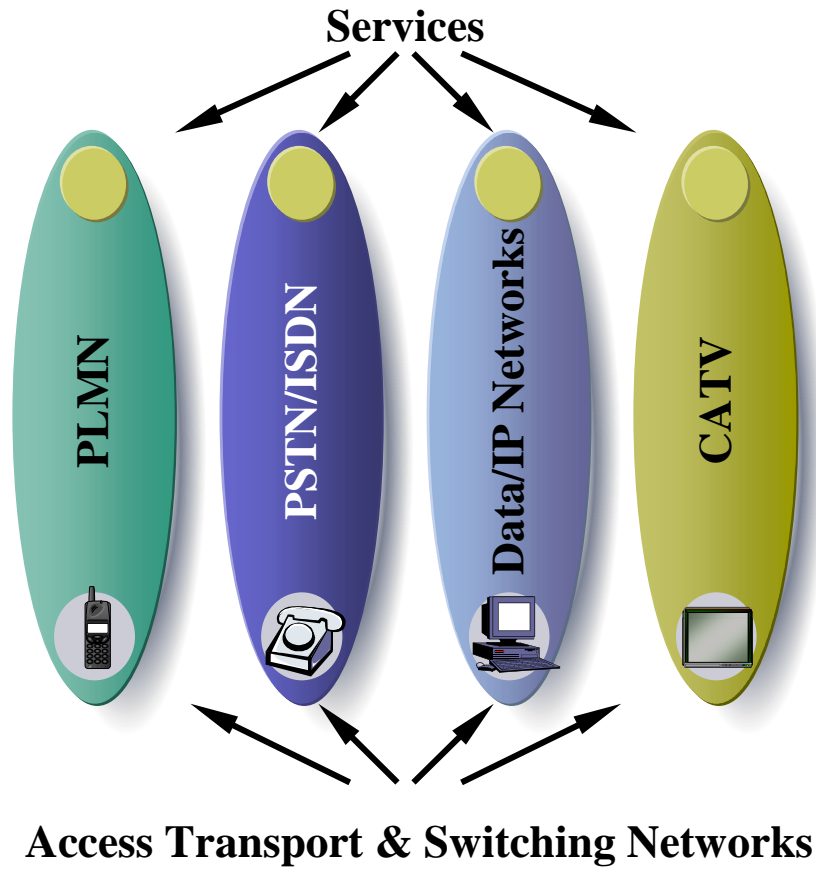
CADENUS Business Case

G. Morgan (Eircom)
& O. Dugeon (FTR&D)

Why NGN & Why CADENUS?

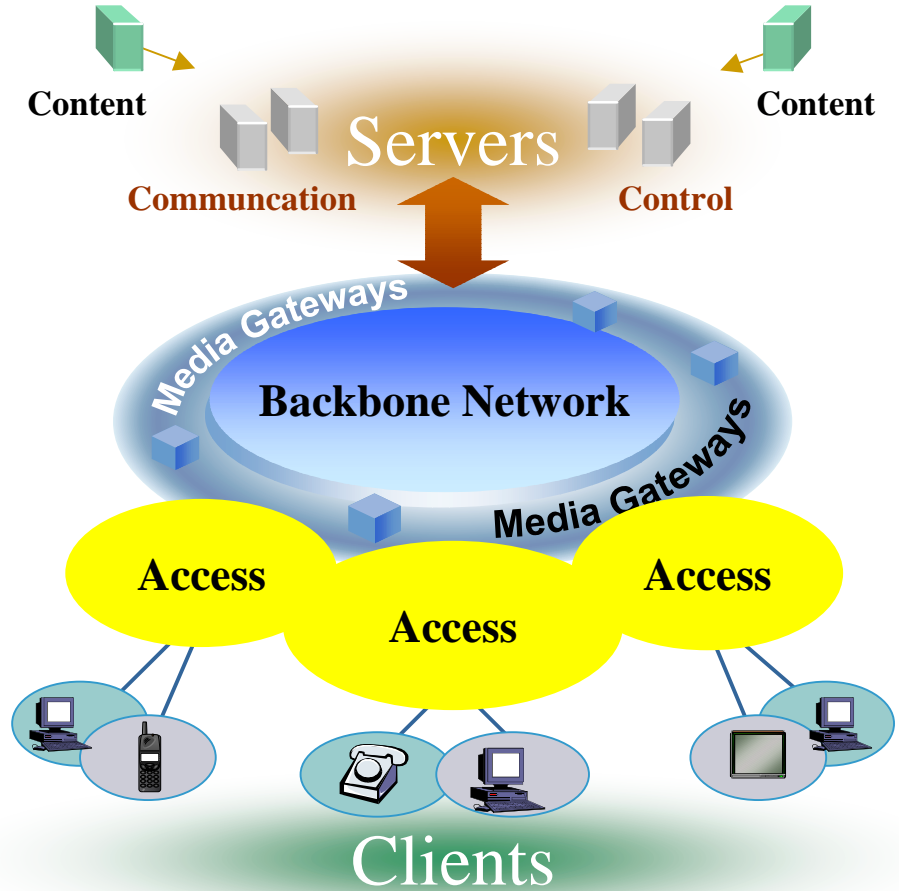
Today

Single-service networks



Future

Multi-service networks/client-server





What will NGN mean for Telcos?

- **Network operators will attempt to capture a huge slice of overall economic activity from proven conventional solutions to unproven online alternatives.**

- **Online alternatives must have the following characteristics:**
 - They must provide at least the same level of service (incl. ease of use, flexibility, security, quality etc.) as conventional alternatives.
 - They must deliver service at an acceptable cost that is comparable to conventional alternatives.
 - They must confer unique advantages that will overcome natural customer resistance to change from proven conventional solutions and justify initial cost premiums.

- **The single most attractive feature of network based implementation of services is the prospect of portability and mobility.**

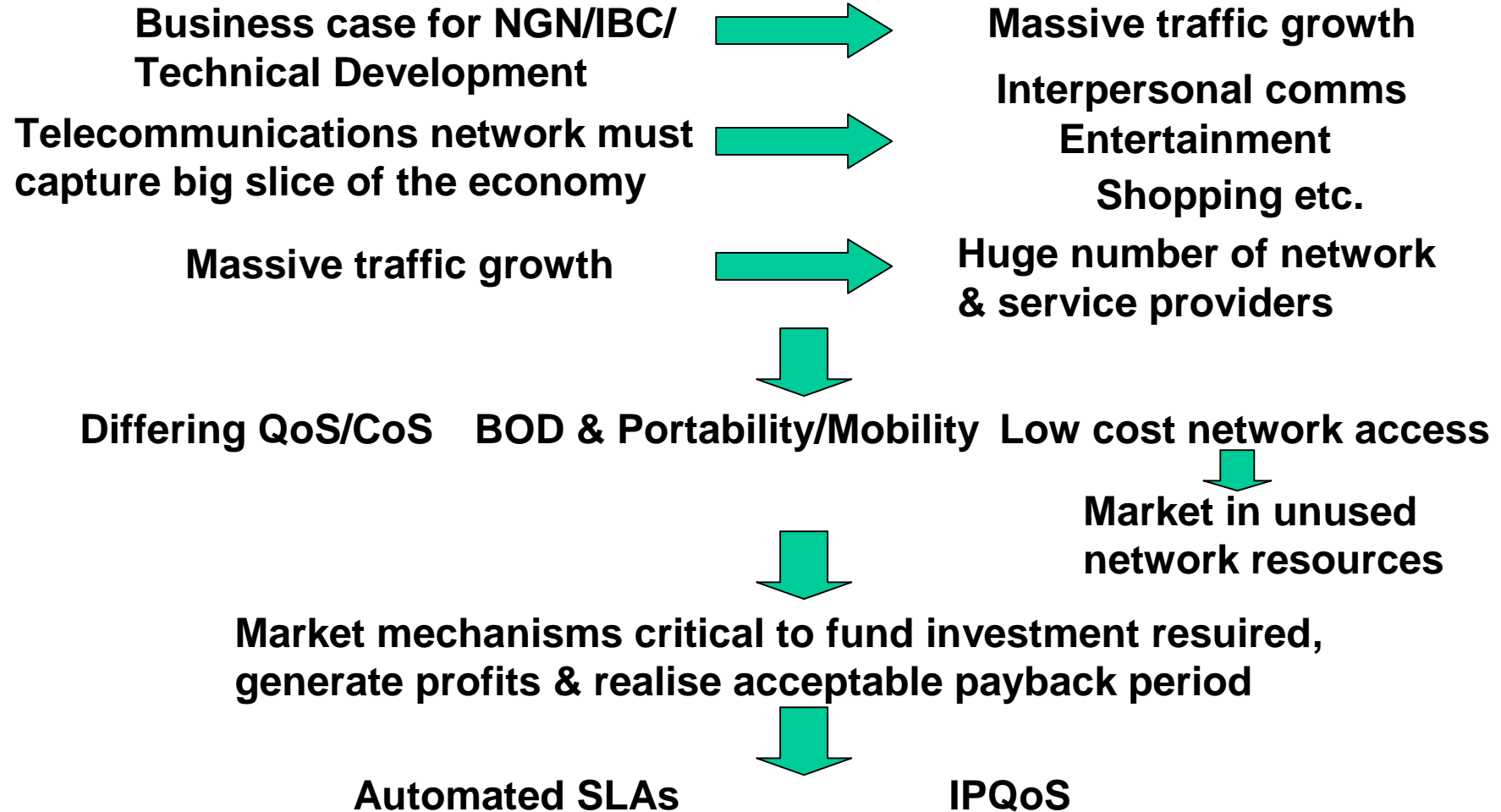
Essential Characteristics of NGNs

- **BOD will be an essential characteristic on which the business case for investing in NGNs rests.**
- **In order that customers will be attracted to use new network alternatives the availability of good quality online services will also be essential.**
- **A further essential characteristic will be the ability to offer different classes of network services from low to high.**
- **Thus in the case of many services the ability to deliver Broadband BOD**
- **No single network operator can single handedly deliver BBOD in a cost effective manner.**
- **The emergence of dynamic markets in network resources will be a necessary ingredient**
- **A market enabling mechanism will be essential that will facilitate the various actors in transacting business**

The Importance of SLAs

- **An automated SLA framework will be important in ensuring the co-operation of business partners and rivals alike in the deliver of services to each other's customers.**
- **It will not be possible for each have a formal business relationship such as that which pertains today.**
- **Similarly it will be impractical to seek to connect each provider's management systems**
- **Logically the market enabling mechanism must dynamically ensure compliance.**
- **Therefore that end to end management will for the most part be effected by means of an interlocking hierarchy of SLAs**

Business case & CADENUS



How do we do it?

- It is also necessary to make provision for likely business behaviours which will feature in the industry of the future
- It is important not to hinder the development of future markets in network based services by unknowingly building in technical obstacles to innovative business processes.
- Identify relevant analogous existing business behaviours from other industries which may be applicable to the ICT industry in the future.
 - Travel industry
 - Financial industry
- Having identified the elements essential to the business and investment cases for re-equipping conventional networks with NGN technologies, it is necessary to map these requirements onto the implementation of the CADENUS vision

- **Consider relationships between various actors.**
- **Allow for fact that various actors in the chain will require parameters passed in automated transaction.**
- **List of various actors information requirements.**
- **Identify internal processes of network providers which will be involved and effected in the context of automated SLA management.**
- **Define service negotiation process, service invocation process, service termination process in the context of multiple network & service providers.**
- **Specify role of third party services which will be required to ensure confidence between correspondent parties.**
- **Identify likely extreme customer behaviours to stress test processes**
- **Map on to CADENUS architecture onto the service delivery mechanisms envisaged.**

- **In the context of the NGN architecture**
 - Mediation at each level gives a unique entry point and opens the architecture to different actors.

- **CADENUS Business Model defined roles**
 - Access Mediator, Service Mediator & Service logic, Resource Mediator & Network Controller,
 - the different actors may assumed one or many of these roles.

- **Each network & service provider recognises the importance of QoS to the future of their business, it is unclear**
 - But don't know how provide this QoS
 - Don't know what sort of QoS
 - And for what sort of services

- **Network providers have another paradigm**
 - QoS is key to making money from value-added network services

- **Widest possible range of QoS options should be offered to end users and ISPs**
 - Starting from Best-Effort
 - DiffServ class for relative QoS
 - Up to Bandwidth on Demand (based on IntServ or MPLS) for absolute QoS

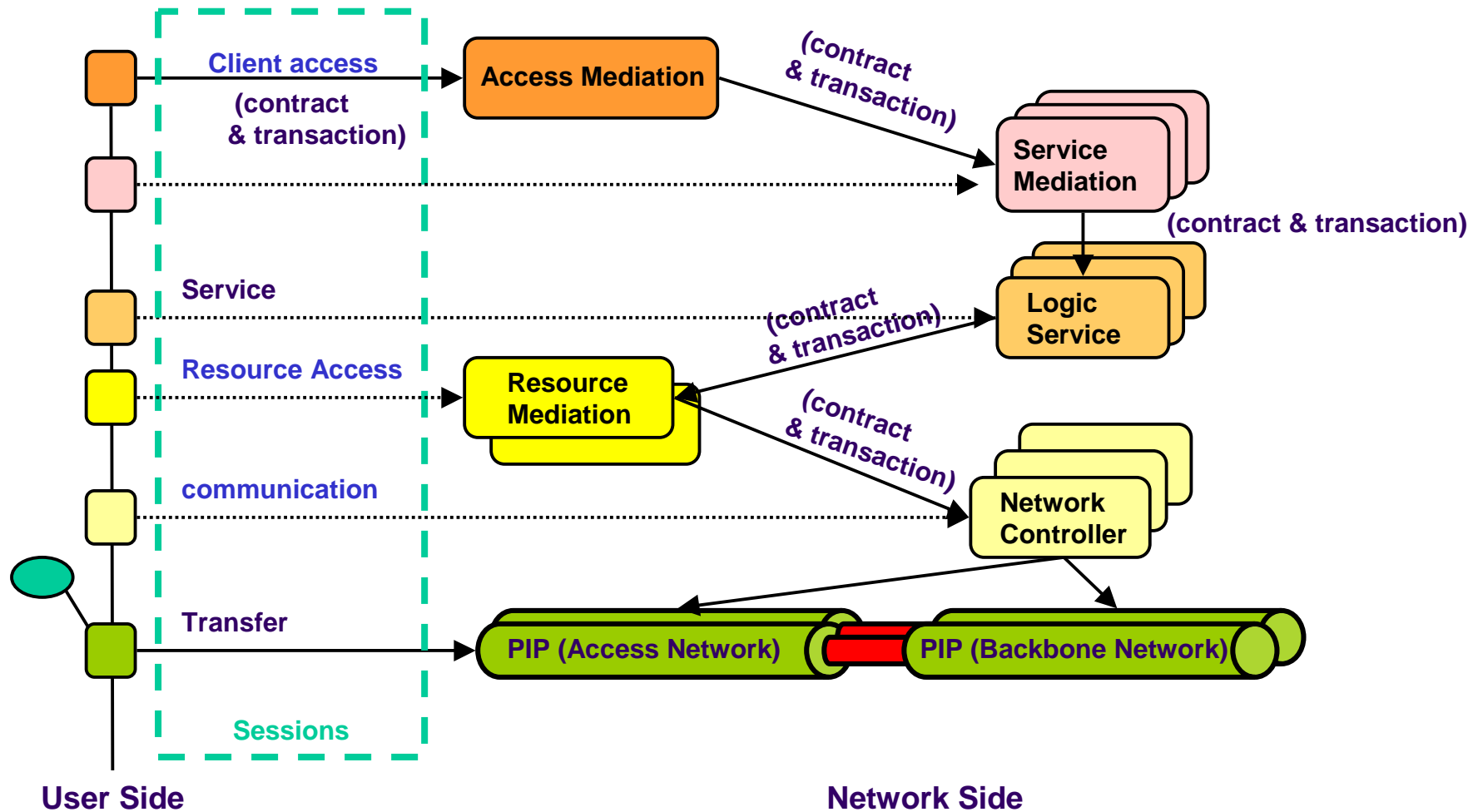
- **Admission Control may solve both scalability and QoS guarantee issue**
 - Like in PSTN, the memory context is a resource
 - Traffic engineering and dimensioning bound call rejection to small value ie. < 0.005 %

- **Because some services need relative QoS and others absolute Operators must provide Technology independent solutions:**
 - IntServ can provide individual and absolute QoS but it's not very scalable
 - DiffServ is scalable but provide only aggregate relative QoS
 - MPLS?
 - Other techniques?

- **For CADENUS development work it is not possible to take into account all service possibilities**

- **Focus on “generic services”**
 - VoIP (include p2m, m2p, visio)
 - VPN (include lease line)
 - VoD (all streaming application include audio only)
 - Internet basic access (Web, email, ...)

Likely Full Functional Architecture



Questions & Answers ?

AM-SM interaction as a Business Process

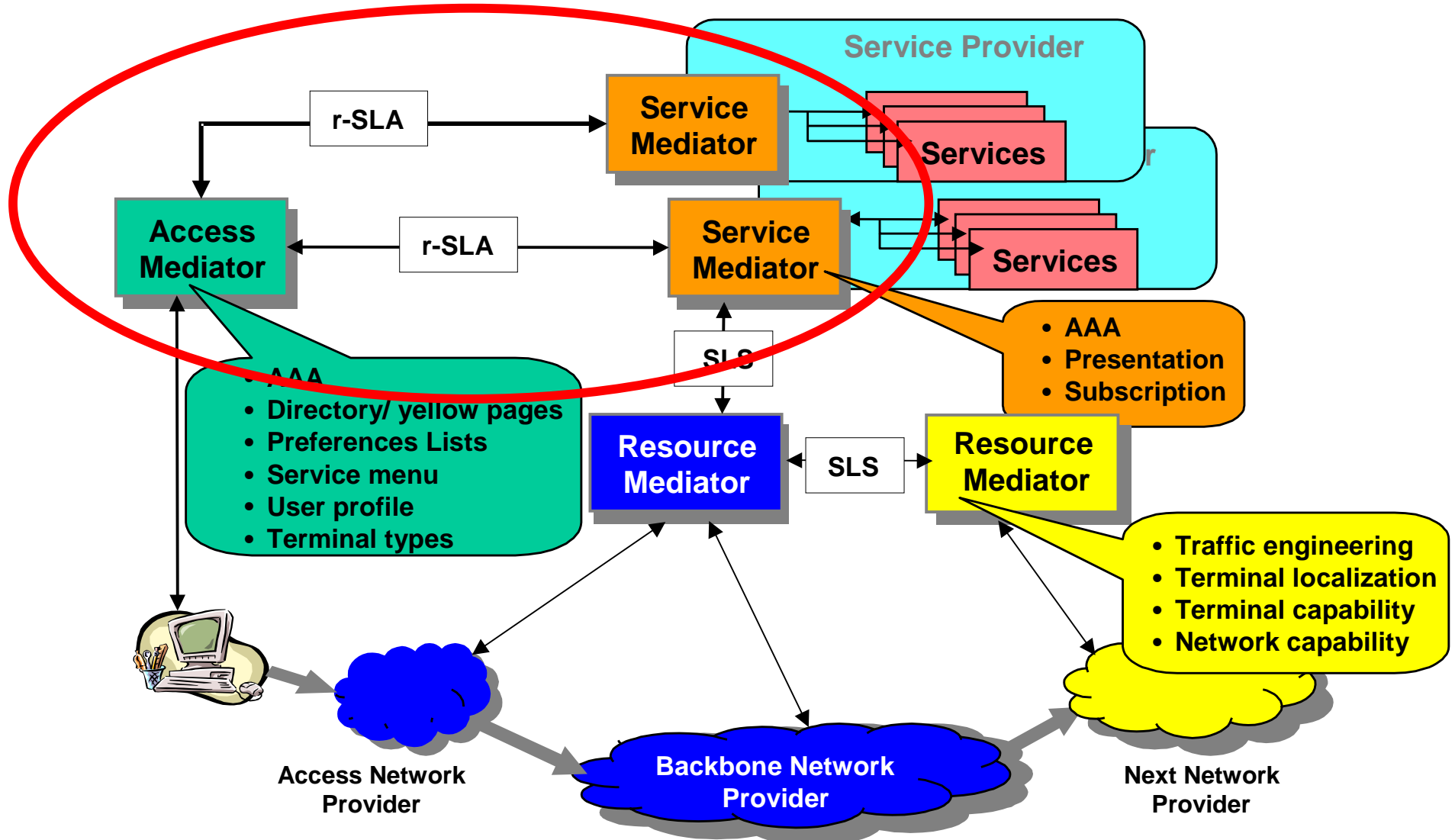
S.P. Romano, S. D'Antonio
& G. Ventre (UoN)

- Exploiting the Unified Modelling Methodology
 - Business Model

- Representing the Business Model in the ebXML framework

- Demo about implementation strategies
 - focus on the VPN example...

Work positioning



➤ Objective

- an innovative EDI (Electronic Data Interchange) solution to the creation, offering and negotiation of new services

➤ Scope

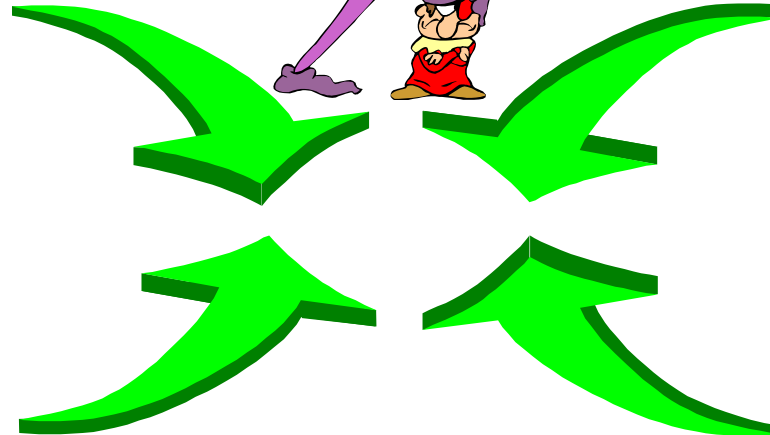
- specify services
- source/select potential suppliers
- request quotation and analyse quotes
- negotiate prices
- place and confirm a purchase order

Business Actors

Access Mediator



Service Mediator



Service Directory



Service Authority



- A project of the United Nations

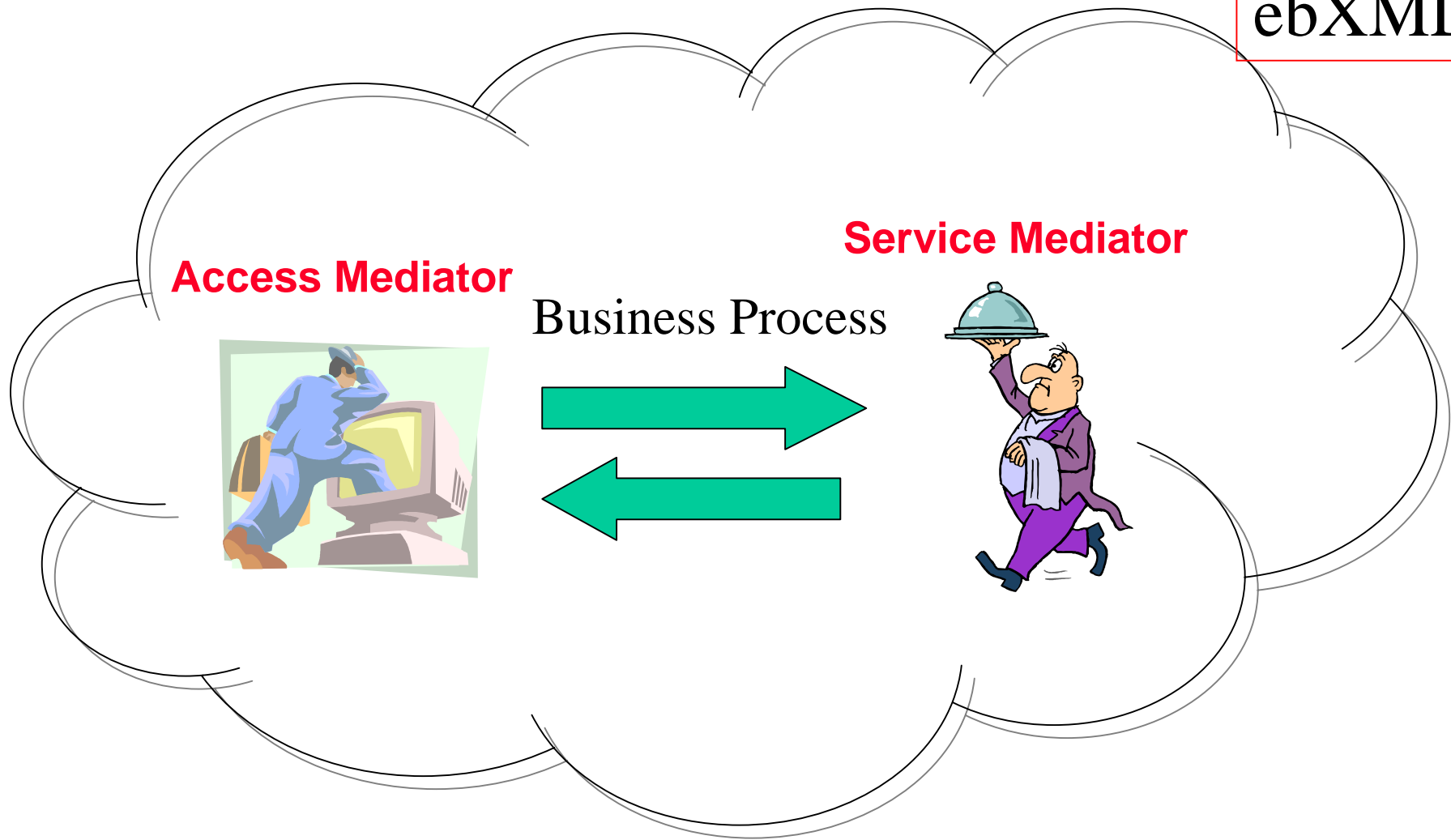
- Putting together the efforts coming from:
 - the most popular enterprises in the IT scenario
 - lots of universities and research centres

- The creation of a world-wide electronic marketplace

- A bridge between e-business process modeling and specification of e-business software components
 - allowing business partners to collaborate through the exchanging of xml-based messages

ebXML inside Cadenus

ebXML



Service Directory

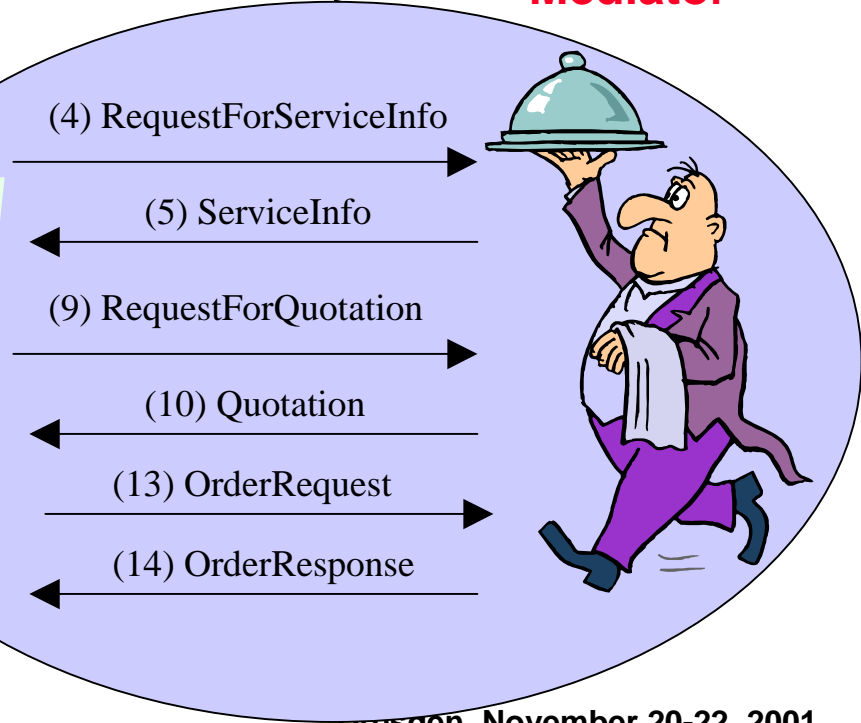


ebXML platform

Service Mediator

Access Mediator

User



(1) VPN

(6) Tool

(8) VPNDescription

(11) Quotation

(12) OrderRequest

(7) Draw

(15) OrderResponse

(4) RequestForServiceInfo

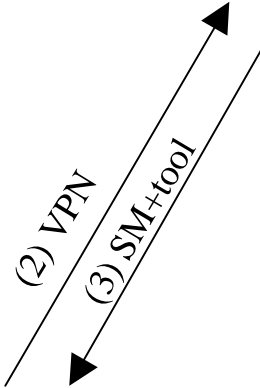
(5) ServiceInfo

(9) RequestForQuotation

(10) Quotation

(13) OrderRequest

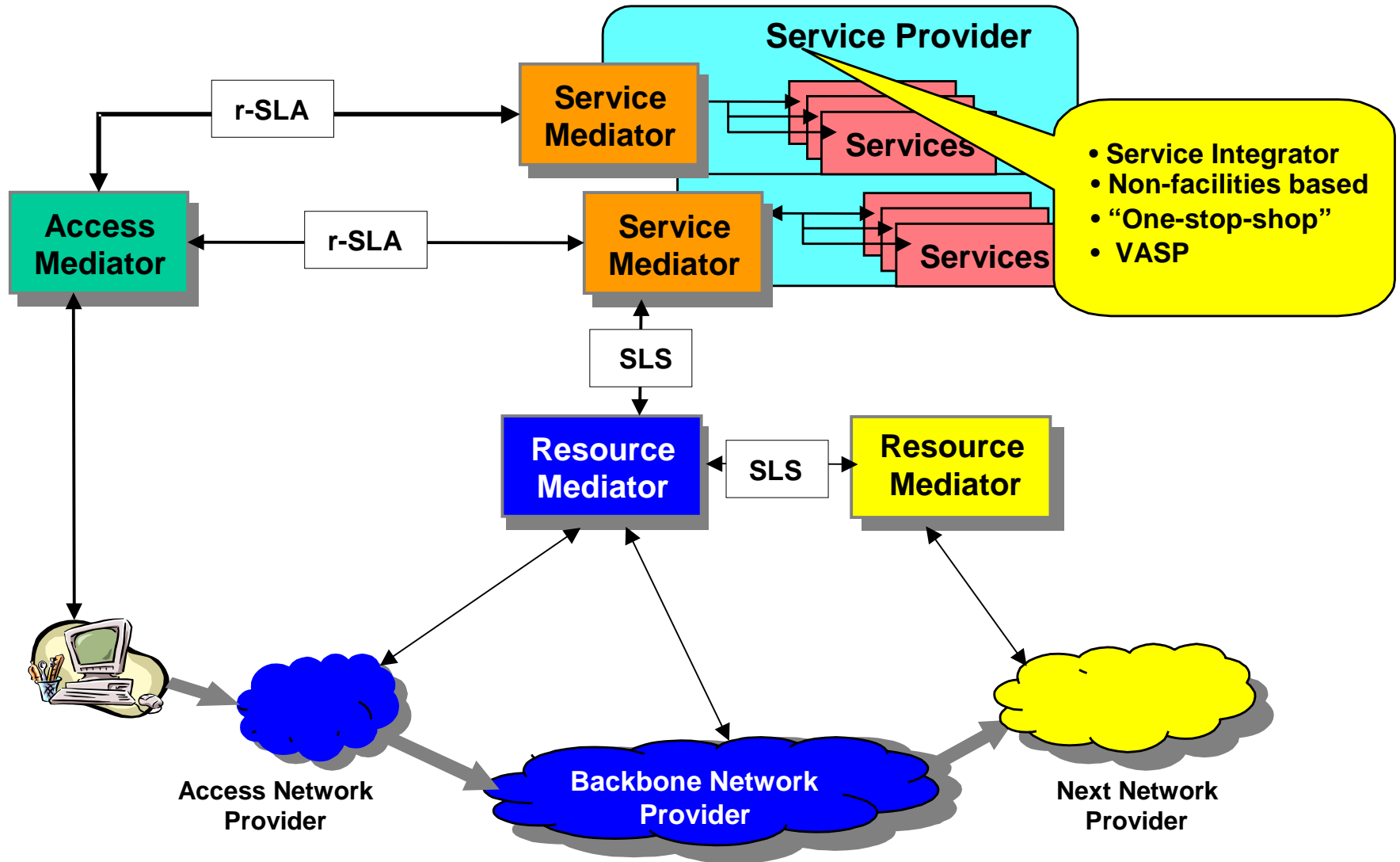
(14) OrderResponse



Service Mediator: Functionality, Architecture and Example Scenario

R. Fiutem (Sodalía)

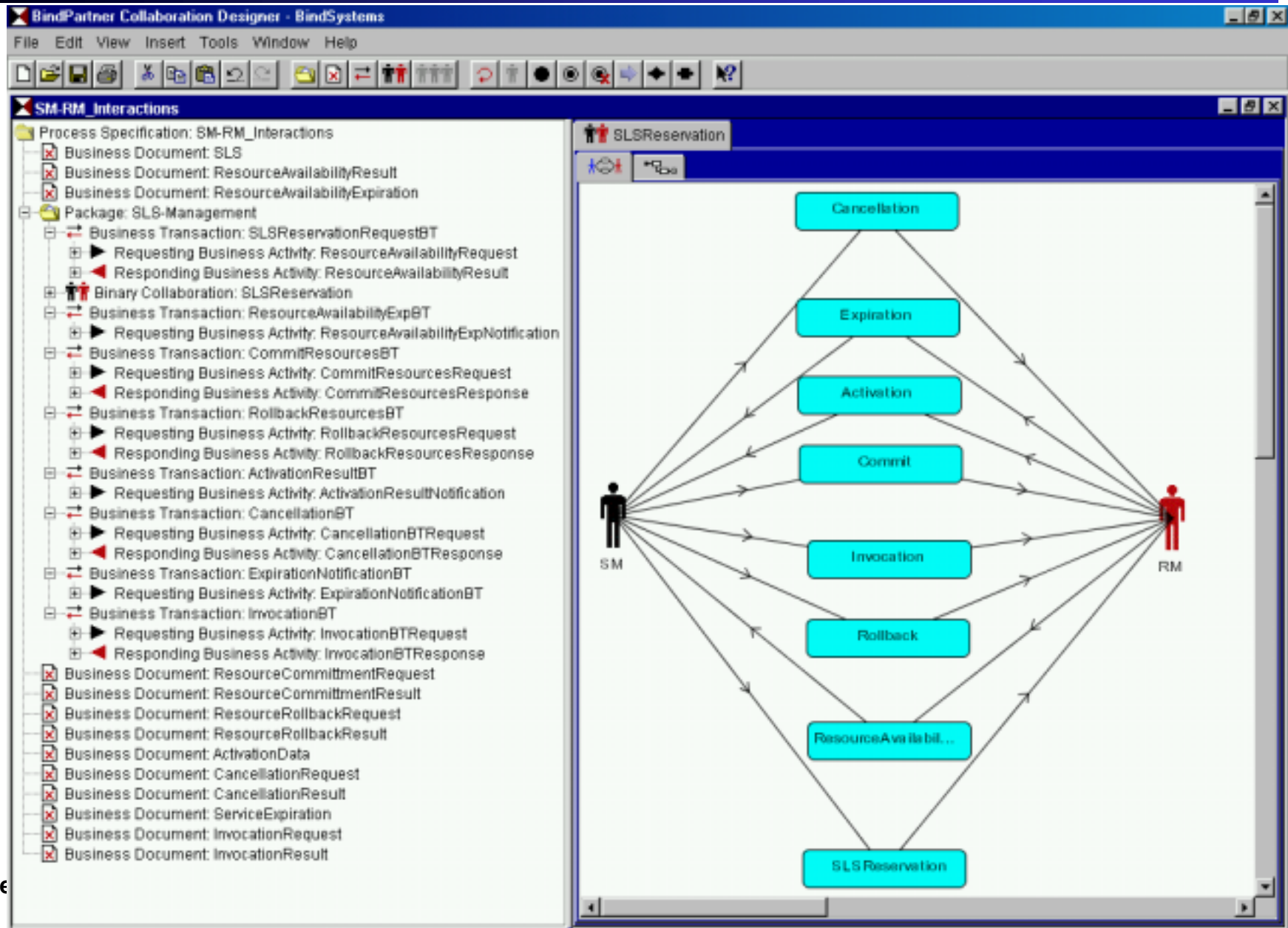
Service Mediator: Context



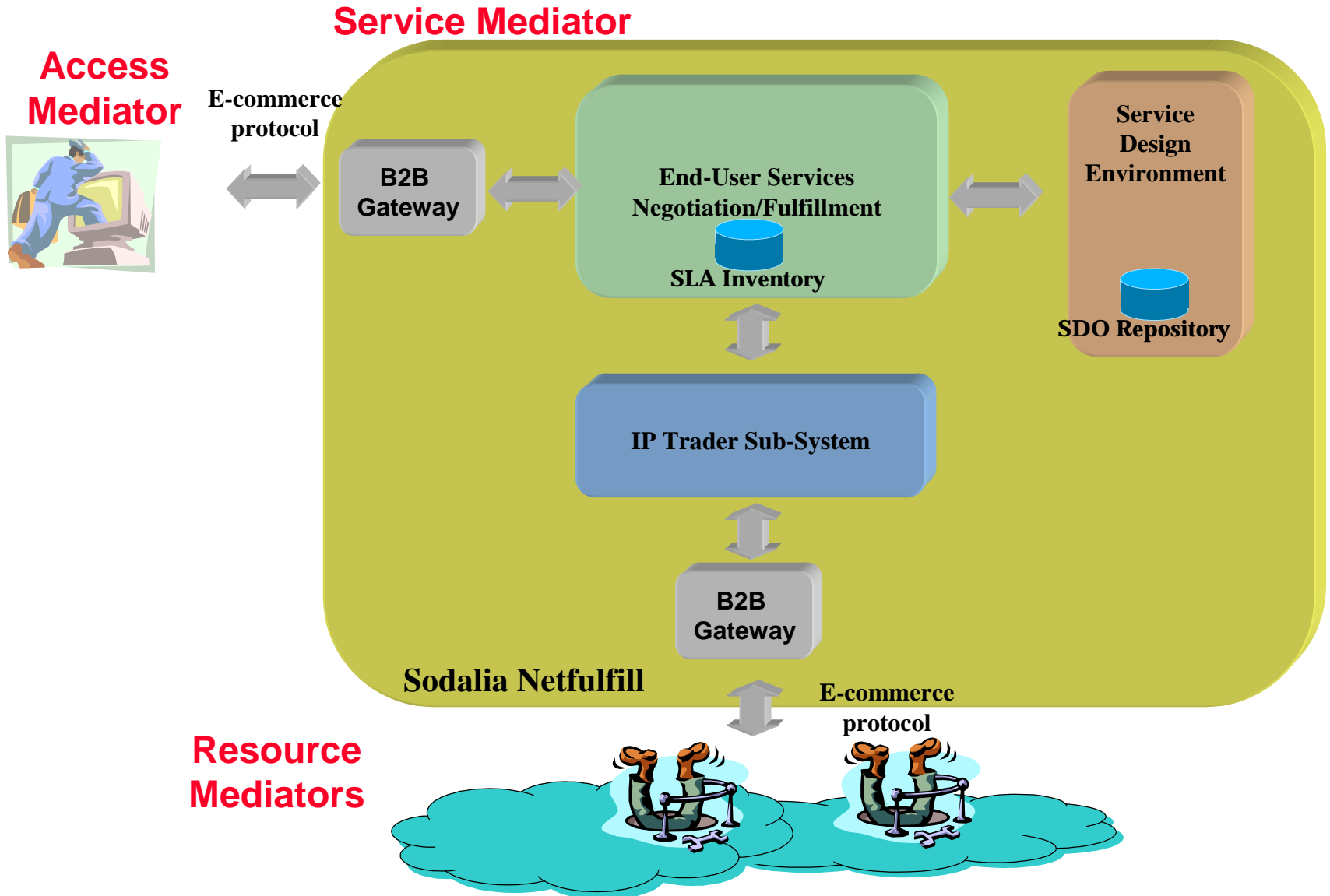
- The SM basically supports three processes of a Service Provider:
 - service design
 - IP QoS resource negotiation
 - service fulfillment
- Such processes are typically executed independently of each other (though in certain scenarios, they might be executed in a synchronous way)

- B2B interfaces for coordinating different providers in the value-chain
 - based on ecommerce frameworks/technologies (e.g. ebXML)
- AM-SM: retailer-provider interface
- SM-RM interface:
 - trading of IP QoS Connectivity
 - Setting up trading relationships
 - Exchange of Catalogue Data with Network Providers
 - Exchange Pricing and Availability information
 - Negotiation and ordering of IP QoS Connectivity
 - based on EURESCOM P1008 negotiation model
 - implemented on commercial e-commerce platform

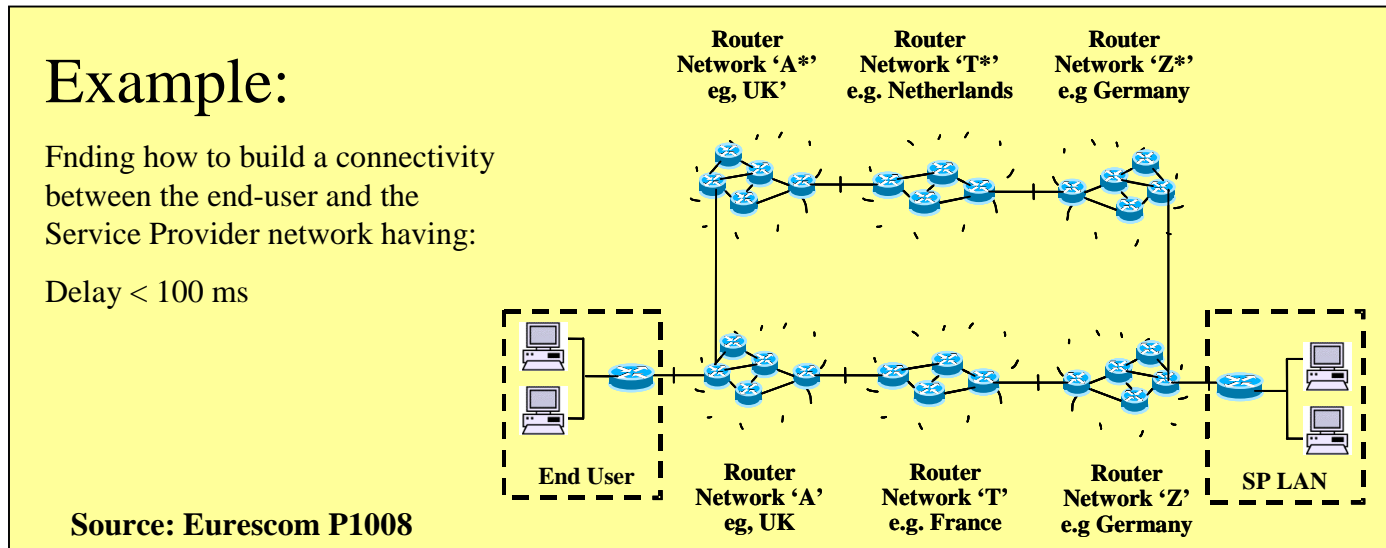
SM-RM Business Process



SM Architecture



- Decision support system within the SM, helping the SP in the task of connecting any 2 locations across several interconnected domains:
 - analyse services advertised by trading partners
 - identify suitable offerings for the delivery of an e2e connectivity
 - rank them according to desired criteria



- Maintains a model of logical connectivity on SDs:
 - describing all SAPs and logical interconnections between SAPs
- Uses algorithms for reasoning about graphs will generate and recommend alternatives
 - Example: (A, T, Z) or (A*, T*, Z*)
- Criteria used to filter/rank offerings include:
 - QoS requirements
 - Advertised pricing
 - Number of hops
 - Custom policies (e.g. 'prefer domains belonging to provider 'X')

filters may be extended



E2E Analyzer Composition Rules

The E2E Analyzer uses “composition rules” to compute the e2e parameters and verify constraints:

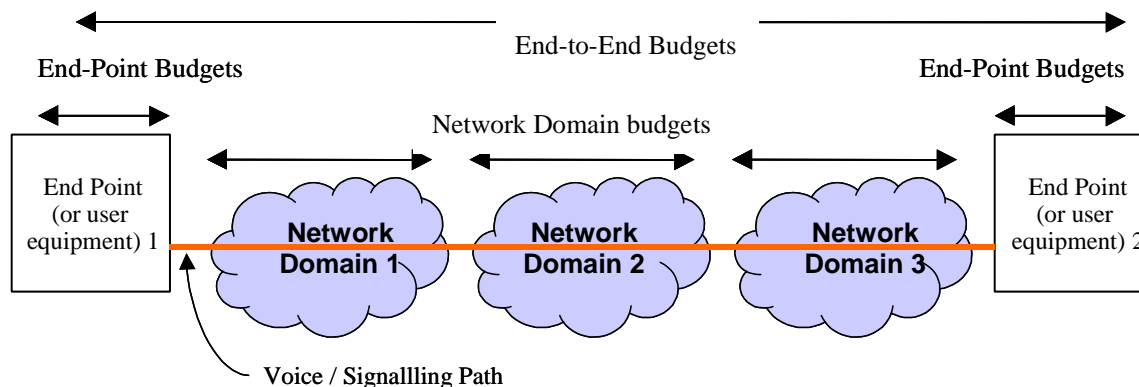
QoS Composition Rules for Transport service in the Multi-Domain case:

- *delay is additive, i.e. $D_{tot} = D_1 + D_2 + \dots + D_n$;*
- *packet loss accumulates on a probabilistic basis, i.e. $P_{tot} = 1 - [(1 - P_1) * (1 - P_2) * \dots * (1 - P_n)]$;*
- *delay variation accumulates on an RMS basis, i.e. $DV_{tot} = \sqrt{DV_1^2 + DV_2^2 + \dots + DV_n^2}$;*

where D_n is the mean one-way delay of Domain n ;

P_n is the packet loss probability of Domain n ; and

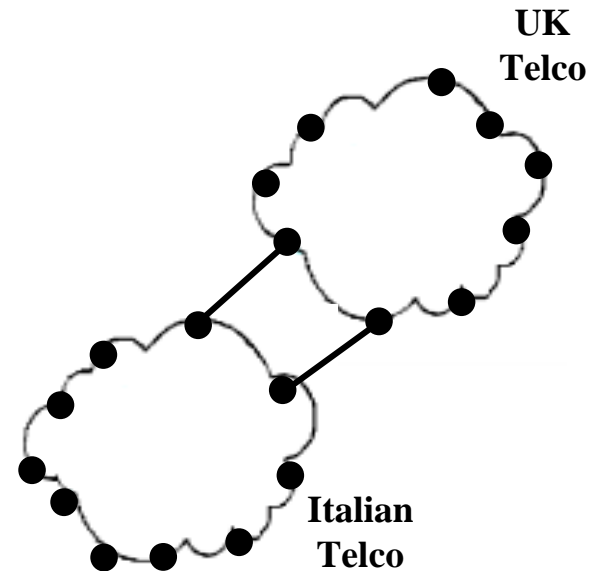
DV_n is the standard deviation of the delay variation of Domain n



Service Mediator: example scenario

➤ Actors:

- A retailer
- A Service Provider acting as Service Integrator
- Two Network Providers:
 - Italian Telco
 - UK Telco
- The Service Provider buys IP QoS Connectivity services from NPs and delivers e2e connectivity to its customers
- The Service Provider has B2B agreements with NPs
- The retailer resells Service Provider services



Service Descriptions:

Provided services have similar features:

- **POPs:** differentiated on access speed
- **QoS:** different CoSes for MC and RT traffic
- **Bandwidth:** different values depending on access type

- Continuation of AM demo example
- Browse the IP QoS resource negotiation functionality:
 - trading partner management
 - catalogue data management
- Follow the steps for end-user service fulfillment:
 - SLA/Contract instantiation
 - SLA-SLS translation with the use of the E2E Analyzer



Service Description Browser

Sorting Criteria

Type

Filtering Criteria

By Type: all

By Vendor: all

By Name: all

Apply

Type	Service Name	Seller	Version
IPConnection	IP Connectivity Service	UK Telco	1
IPConnection	IP Connectivity Service	Italian Telco	1

Tools

- Service Design Environment
- Agenda
- Process Design Environment
- Demo Summary View
- News

Details Trading Agreements SLS

Operazione completata Intranet locale

Service Description Details

The screenshot shows a web application interface for service details. At the top, there are navigation tabs: General, Traffic, SAPs, Graphs, QoS, and Reliability. The 'General' tab is selected. Below the tabs, there are two sections: 'Identification' and 'Validity'. The 'Identification' section contains fields for Service Name, Version Number, Service Type, Service Description Id, and Seller Id. The 'Validity' section contains fields for Start Date and End Date. At the bottom of the main content area, there are 'Details' and 'Close' buttons. On the right side of the screen, there is a 'Tools' sidebar with icons for Service Design Environment, Agenda, Process Design Environment, Demo Summary View, and News. The status bar at the bottom shows 'Operazione completata' and 'Intranet locale'.

Identification:

Service Name:	IP Connectivity Service	Service Description Id:	30208
Version Number:	1	Seller Id:	UK Telco
Service Type:	IPConnection		
Service Details:	National IP Connectivity Service with QoS		

Validity:

Start Date:	17-NOV-01	End Date:	
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Tools:

- Service Design Environment
- Agenda
- Process Design Environment
- Demo Summary View
- News

Operazione completata | Intranet locale

Service Description SAPs

The screenshot shows a web application interface with a navigation bar at the top containing tabs for General, Traffic, SAPs, Graphs, QoS, and Reliability. The 'SAPs' tab is selected. Below the navigation bar, there is a 'SAP List' section with a table of identifiers. The identifier 'Gg2' is highlighted in orange. To the right of the table, there are several input fields for configuration details for the selected SAP:

- Identifier: Gg2
- Geographical Location: Glasgow SauchiehallSt
- IP Address: 167.65.32.2
- Layer 2 Address: 00001FFFAREE
- Layer 2 Technology: ATM

At the bottom of the configuration area, there are 'Details' and 'Close' buttons. On the right side of the application, there is a 'Tools' section with several icons and labels: Service Design Environment, Agenda, Process Design Environment, Demo Summary View, and News. The bottom status bar shows 'Operazione completata' on the left and 'Intranet locale' on the right.

Service Description Topology

The screenshot shows the Cadenus web application interface. At the top, there are navigation tabs: General, Traffic, SAPs, Graphs, QoS, and Reliability. The 'Graphs' tab is active. Below the tabs is a 'Graph List' table with the following data:

Identifier
Gg2-Ld1
Gg2-Ld2
Gg2-Le
Gg2-Lp1
Gg2-MB
Gg2-Mc1
Gg2-RM1
Ld1-Gg2
Ld1-Ld2
Ld1-Le
Ld1-Lp1
Ld1-MB
Ld1-Mc1
Ld1-RM1
Ld2-Gg2

Below the table is a 'Details' button. To the right of the table are configuration fields for the selected graph (Gg2-Ld1):

- Identifier: Gg2-Ld1
- Type: PIPE
- Ingress: Glasgow2
- Egress: London1
- Qos: Qos_2

There is a 'Qos Details' button next to the Qos field. At the bottom right of the configuration area is a 'Close' button. On the right side of the interface, there is a 'Tools' section with icons for Service Design Environment, Agenda, Process Design Environment, Demo Summary View, and News. The status bar at the bottom shows 'Operazione completata' and 'Intranet locale'.

Service Description QoS

QoS List

Quality
Gold_2
Gold_5
Silver_2
Silver_5

Type:

Traffic Profile Entry ID:

Graph Entry List:

Delay Descriptor:
 Mean Delay (ms)

Loss Descriptor:
 Mean Loss (%)

Jitter Descriptor:
 Mean Jitter (ms)

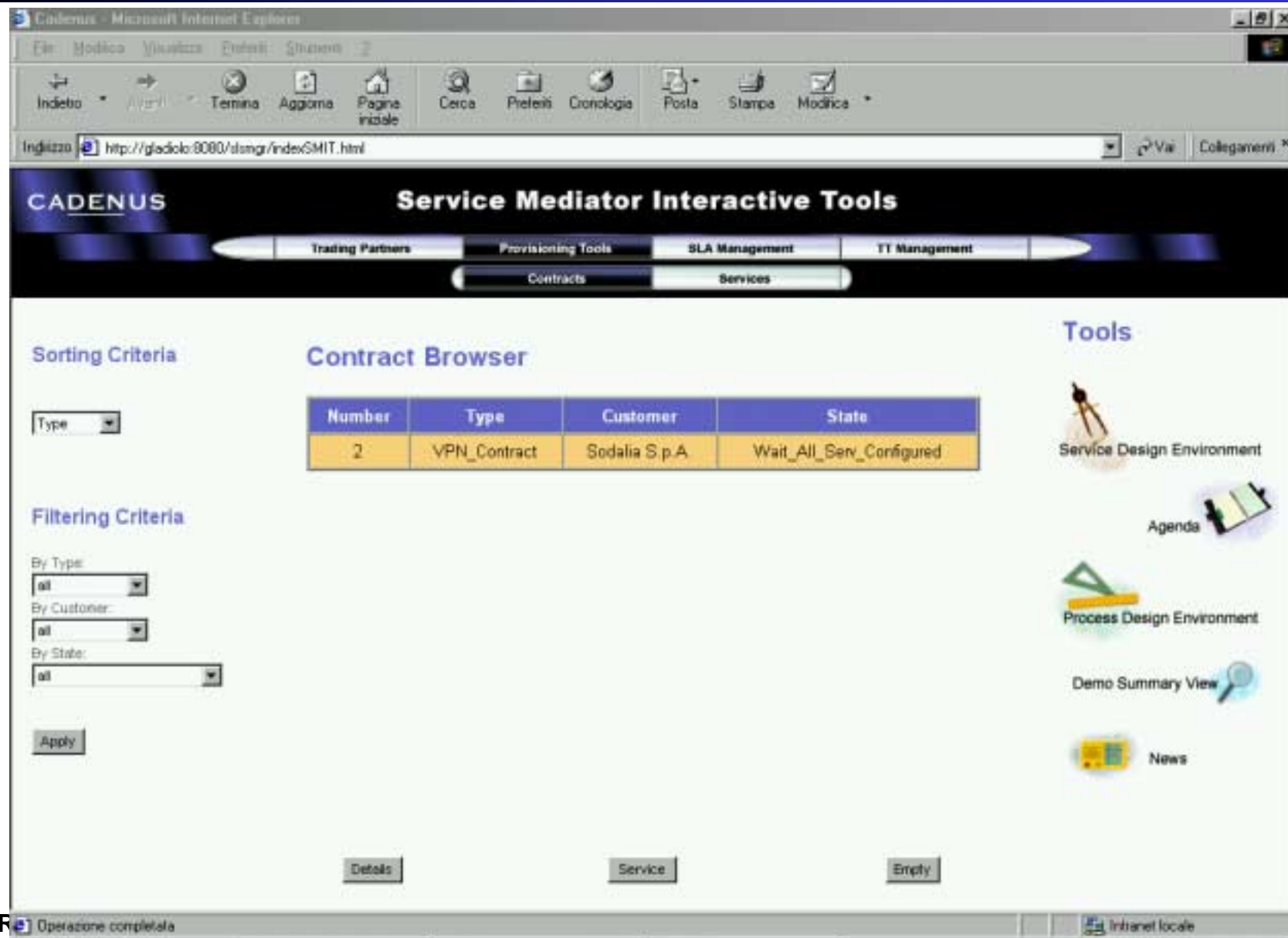
Throughput Descriptor:
 Mean Throughput (Mbps)

Tools:

- Service Design Environment
- Agenda
- Process Design Environment
- Demo Summary View
- News

Operazione completata

Intranet locale



The screenshot shows a web browser window displaying the CADENUS Service Mediator Interactive Tools interface. The main navigation bar includes: Trading Partners, Provisioning Tools, SLA Management, TT Management, Contracts, and Services. The 'Contracts' section is active.

Contract Browser

Sorting Criteria: Type (dropdown)

Filtering Criteria:

- By Type: all
- By Customer: all
- By State: all

 Apply

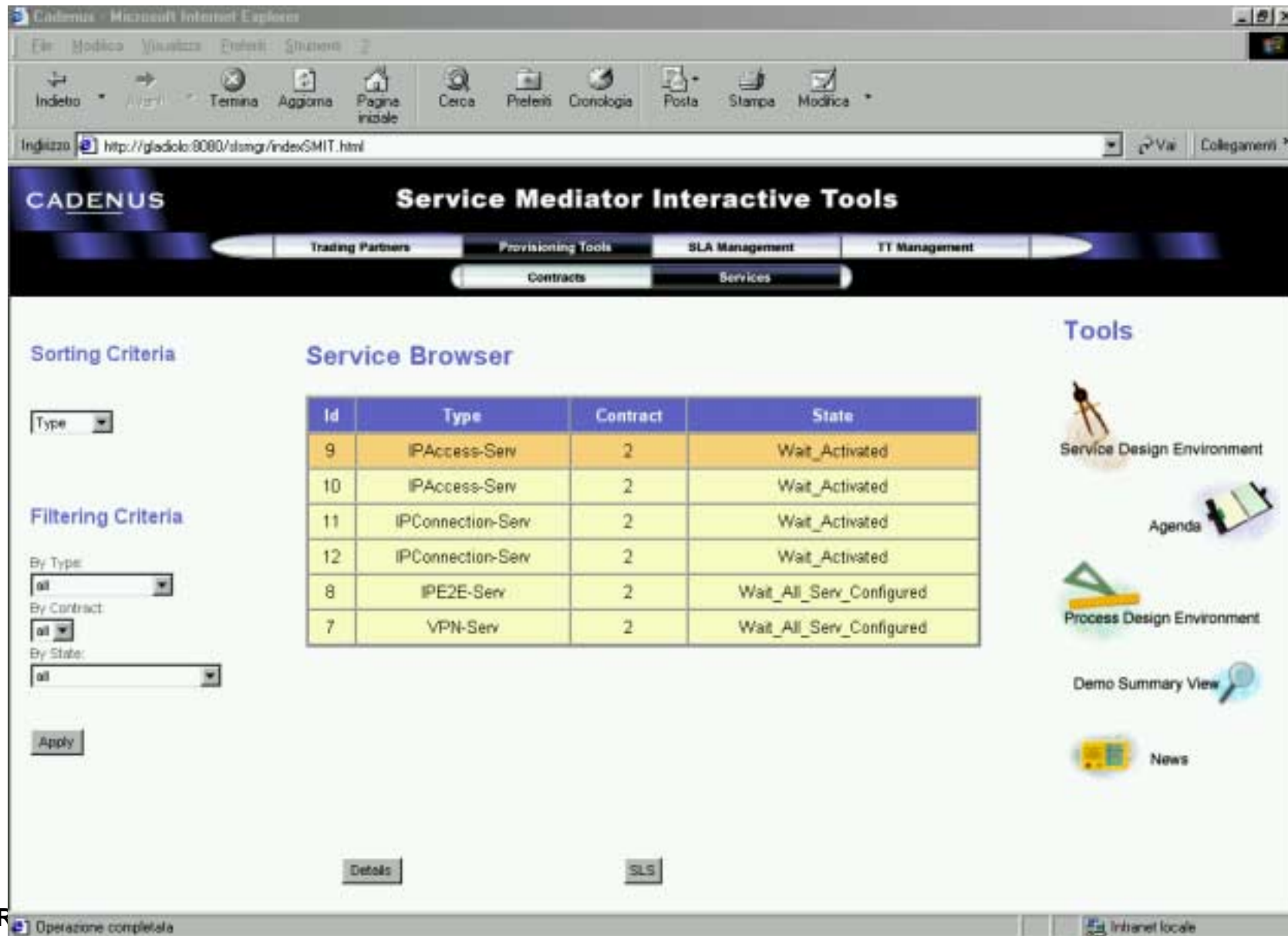
Number	Type	Customer	State
2	VPN_Contract	Sodalia S.p.A	Wait_All_Serv_Configured

Tools:

- Service Design Environment
- Agenda
- Process Design Environment
- Demo Summary View
- News

Buttons: Details, Service, Empty

Status bar: Operazione completata | Intranet locale



Service Browser

Id	Type	Contract	State
9	IPAccess-Serv	2	Wait_Activated
10	IPAccess-Serv	2	Wait_Activated
11	IPConnection-Serv	2	Wait_Activated
12	IPConnection-Serv	2	Wait_Activated
8	IP2E-Serv	2	Wait_All_Serv_Configured
7	VPN-Serv	2	Wait_All_Serv_Configured

Sorting Criteria
 Type:

Filtering Criteria
 By Type:
 By Contract:
 By State:
 Apply

Tools
 Service Design Environment
 Agenda
 Process Design Environment
 Demo Summary View
 News

Details SLS

Operazione completata Intranet locale

Identification SAPs Supporting Services Service Data

Ingress:

SAP Identifier: Milano1 IP Address: 193.33.20.1

Egress:

SAP Identifier: Manchester1 IP Address: 167.23.21.1

Tools

- Service Design Environment
- Agenda
- Process Design Environment
- Demo Summary View
- News

Details SLS Empty

Operazione completata Intranet locale

The screenshot shows a web browser window displaying a configuration page for service data. The browser's address bar shows the URL 'http://...'. The page has a navigation menu with tabs for 'Identification', 'SAPs', 'Supporting Services', and 'Service Data'. The 'Service Data' tab is active.

Identification **SAPs** **Supporting Services** **Service Data**

IP-VPN Id: Expected Provisioning Date:

Features:

Class Of Service: Bandwidth:

Bidirectional:

Traffic Descriptors:

Identification Modality: Flow Descriptors:

Traffic Profile:

Mean Data Rate:

Max Burst Duration: Max Burst Size:

Buttons:

Tools

- Service Design Environment
- Agenda
- Process Design Environment
- Demo Summary View
- News

By Type:
By Contract:
By State:

Operazione completata Intranet locale



E2E Agenda Tool

Indirizzo <http://gladiolo:8080/slmgr/indexAgenda.html> Vai Collegamenti

CADENUS **Agenda Tool**

Activity List

Activity	Service ID	Type	Contract ID	Customer	Provisioning Date
prepare_quotation	89	IPConnection-Serv	2	Sodalia S.p.A.	21-NOV-01
prepare_quotation	91	IPConnection-Serv	2	Sodalia S.p.A.	21-NOV-01

Process

3rd R 001



E2E Analyzer

Cadenus - Microsoft Internet Explorer

CADENUS **End to End Fulfillment Tool**

File Edit View Tools Help

Sorting Criteria

throughput ascending

Filtering Criteria

Ingress: Milanot Egress: Manchester1

Throughput (Mb): 1

Cost (Euro):

Provisioning Time (Days):

Max Items:

QoS:

- Delay: 1000
- Loss:
- Jitter:

Apply

Details Process Close

E2E Analyzer Results

CADENUS End to End Fulfillment Tool

File Edit View Tools Help

Sorting Criteria
 throughput ascending

Filtering Criteria
 Ingress: Milano Egress: Manchester1
 Throughput (Mb): 1
 Cost (Euro):
 Provisioning Time (Days):
 Max Items:
 Apply

Path List

Id	Throughput (Mb)	Qos			Cost (Euro)	Provisioning Time (Days)
		Delay	Loss	Jitter		
5174	2000	100	0.02	0.1	-	-
5181	2000	150	0.0	-	-	-
5279	2000	100	0.02	0.14	-	-
5286	2000	150	0.01	0.1	-	-
5359	2000	100	0.02	0.14	-	-
5366	2000	150	0.01	0.1	-	-
5502	2000	100	0.02	0.1	-	-
5509	2000	150	0.0	-	-	-
5582	2000	100	0.02	0.1	-	-
5589	2000	150	0.0	-	-	-
5684	2000	100	0.02	0.14	-	-
5691	2000	150	0.01	0.1	-	-

Details Process Close

Details of a selected alternative

Linka - Microsoft Internet Explorer

Subpath List

Id	Provider	Ingress	Egress	Throughput (Mb)	Qos			Cost (Euro)	Provisioning Time (Days)
					Delay	Loss	Jitter		
14715	Italian Telco	M1	RM1	4000	50	0.0	-	-	
14945	UK Telco	RM1	Mc1	2000	50	0.02	0.1	-	

Close

ing Time (Days)

Close

Details Process Close

SLAs sent to Resource Mediator

CADENUS End to End Fulfillment Tool

File Edit View Tools Help

Sorting Criteria
 throughput ascending

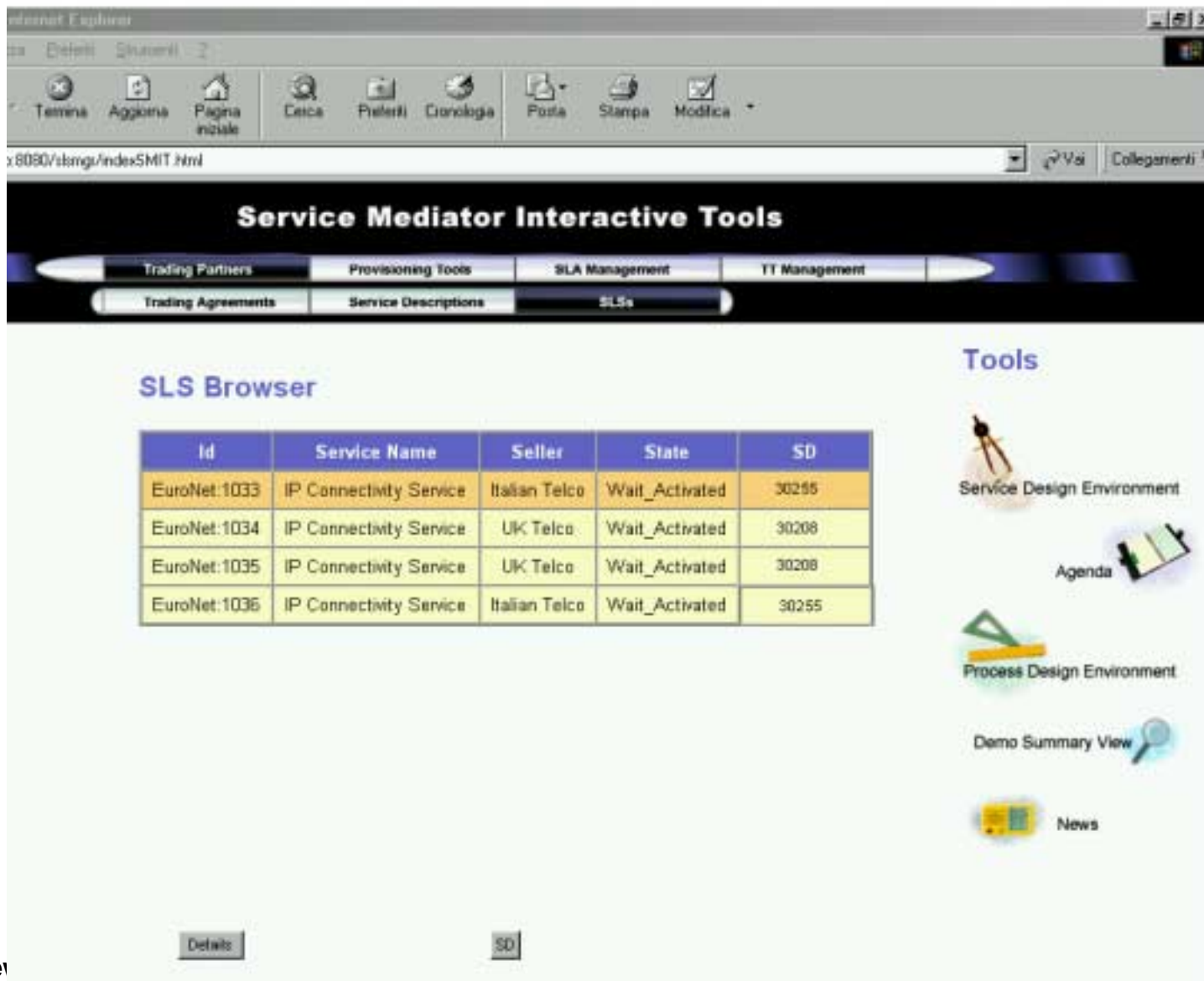
Filtering Criteria
 Ingress: Milano Egress: Manchester1
 Throughput (Mb): []
 Cost (Euro): []
 Provisioning Time (Days): []
 Max bits: []
 Qos: Delay: 1000, Loss: [], Jitter: []

Path List

Id	Throughput (Mb)	Qos			Cost (Euro)	Provisioning Time (Days)
		Delay	Loss	Jitter		
5174	2000	100	0.02	0.1	-	-
5181	2000	150	0.0	-	-	-
5279	2000	100	0.02	0.14	-	-
5286					-	-
5359					-	-
5366					-	-
5502					-	-
5509	2000	150	0.0	-	-	-
5582	2000	100	0.02	0.1	-	-
5589	2000	150	0.0	-	-	-
5684	2000	100	0.02	0.14	-	-
5691	2000	150	0.01	0.1	-	-

Microsoft Internet Explorer
 Request sent to Resource Mediator
 OK

Details Process Close



Service Mediator Interactive Tools

Trading Partners | Provisioning Tools | SLA Management | IT Management

Trading Agreements | Service Descriptions | **SLSs**

SLS Browser

Id	Service Name	Seller	State	SD
EuroNet:1033	IP Connectivity Service	Italian Telco	Wait_Activated	30255
EuroNet:1034	IP Connectivity Service	UK Telco	Wait_Activated	30208
EuroNet:1035	IP Connectivity Service	UK Telco	Wait_Activated	30208
EuroNet:1036	IP Connectivity Service	Italian Telco	Wait_Activated	30255

Tools

- Service Design Environment
- Agenda
- Process Design Environment
- Demo Summary View
- News

Details | SD

Graph Id:

Type:

Ingress:

Egress:

By Vendor:

By State:

By SD:

Apply

Close

Tools

- Service Design Environment
- Agenda
- Process Design Environment
- Demo Summary View
- News

Operazione completata

Internet locale



SLS Traffic Identification

Microsoft Internet Explorer window showing the CADENUS SLS Traffic Identification configuration interface. The interface includes tabs for General, Validity, Scope, Traffic Identification (selected), Traffic Profile, QoS, and Reliability. The Traffic Identification tab contains the following fields:

- Identification Header Field:
- BA:
- DSCP Range Start: DSCP Range End:
- Multifield:
- Priority:
- Source Address Range: Source Address: 192.168.213.17, Source Address Mask:
- Destination Address Range: Destination Address: , Destination Address Mask:
- Traffic Id: TF1
- Protocol Port Range:
- Protocol:
- Source Port:
- Destination Port:

On the left side, there are sections for Sorting Criteria (Service name) and Filtering Criteria (By Vendor: all, By State: all, By SD: all). At the bottom, there are buttons for Details, SD, Empty, and Close. The status bar at the bottom shows "Operazione completata" and "Intranet locale".

General Validity Scope Traffic Identification Traffic Profile **QoS** Reliability

Quality
Type
Traffic Profile Entry ID
Delay Descriptor:
Mean Delay (ms)
Loss Descriptor:
Mean Loss (%)
Jitter Descriptor:
Mean Jitter (ms)
Throughput Descriptor:
Mean Throughput (Mbps)

Close

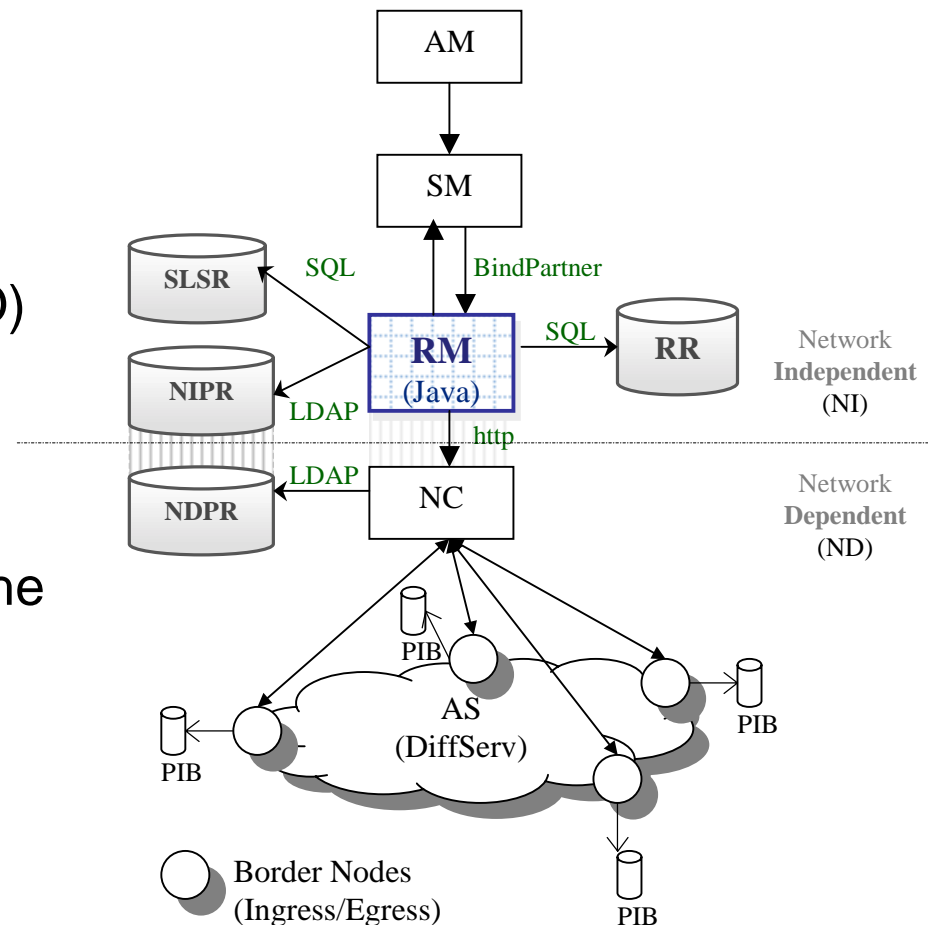
Operazione completata Intranet locale

Resource Mediator

A. Diacones (Teltec)

- Responsibilities, characteristics and integration in the Cadenus architecture
- Involvement in the SLS creation process:
 - Submission phase: check, commit/rollback
 - Activation phase
 - **Invocation phase**
 - **Operation & Assessment phase**
 - Deactivation, Expiration and Cancellation phases
- Design and implementation

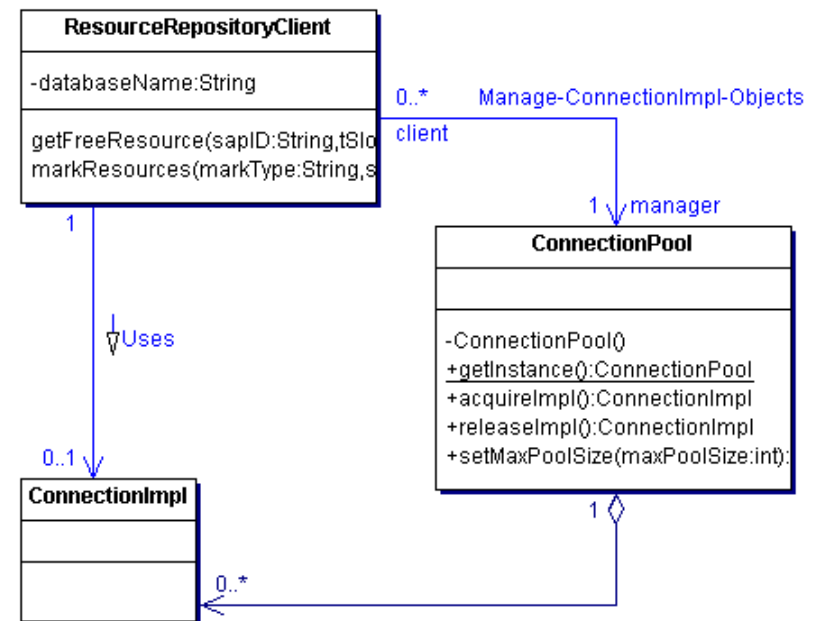
- Main role: managing network resources
- Belongs to a Network Operator (NO)
- Network independent
 - Does not depend on the underlying network or means of providing QoS
- The RR provides a logical view of the network domain



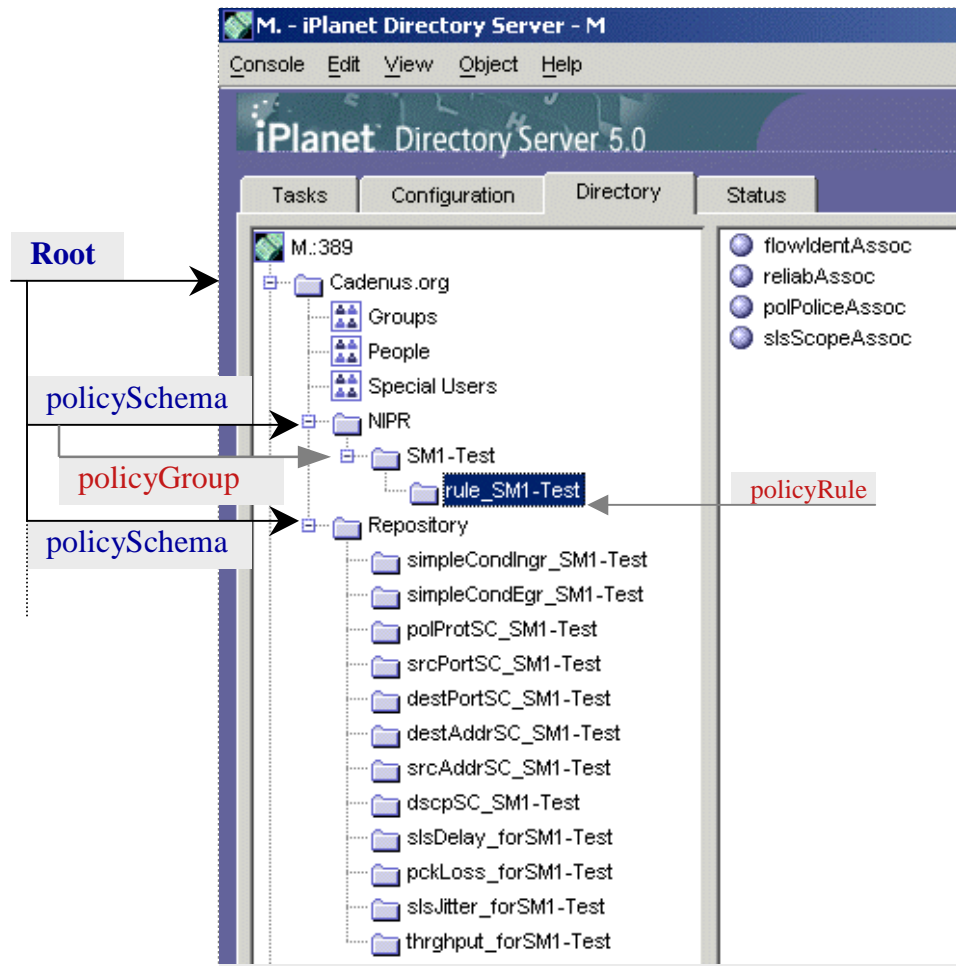
Resource Repository

- Provides a logical image of the network domain
- Stored information:
 - For border nodes only
 - On total available and already reserved resources as a function of time
 - Only bandwidth is considered as a network resource
- Relational DB
- Manually populated with initial information

the ObjectPool Pattern for managing DB Connections

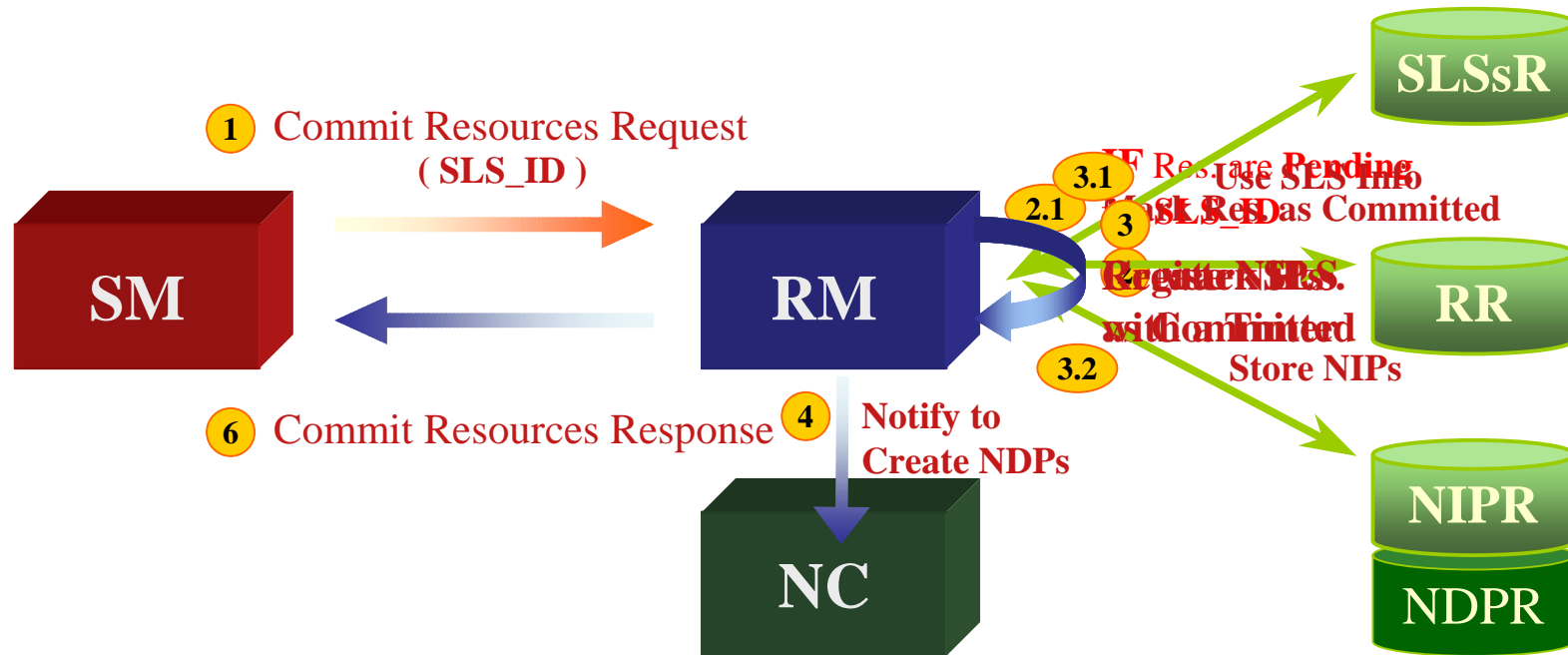


Network Independent Policy Repository

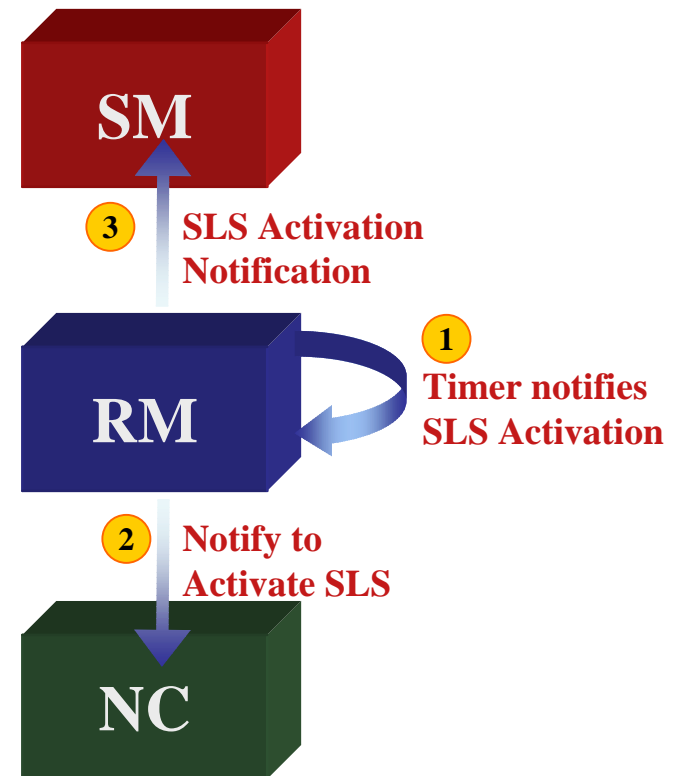


- Stores policies for all committed SLSs
- Each SLS is translated into one policy rule:
 - Scope condition
 - Flow Ident. condition
 - Reliability condition
 - Schedule condition
 - Policy Police action:
 - Excess Treatment
 - Performance Guarantees
 - Traffic Conformance
- LDAP Directory: tree structure

Commit/Rollback Resources

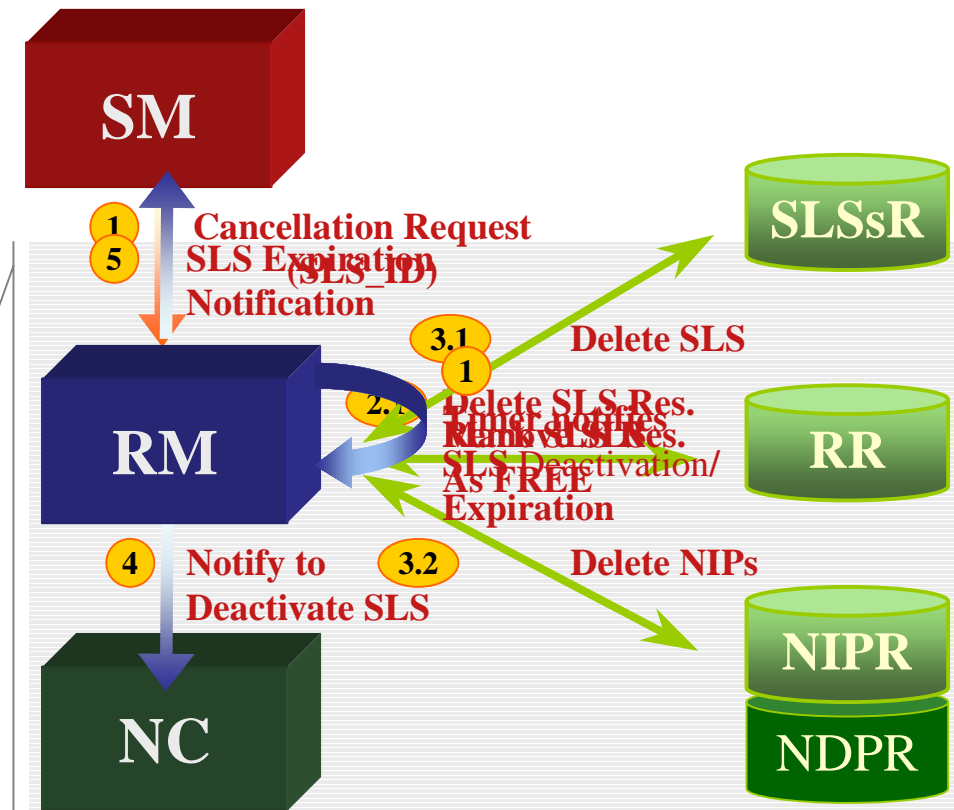


- The moment when the NC configures the underlying network and the service becomes available
- The RM notifies the NC to activate the service:
 - SLS start time is due
 - Invocation request accepted



Deactivation, Expiration and Cancellation

- **SLS Cancellation:**
 - Initiated by the SM
 - All SLS info/Res. are deleted
 - If SLS is active, the NC is notified to deactivate it
- **SLS Deactivation:**
 - Initiated by the SLSs Timer
 - NC is notified to deactivate SLS
 - SM is notified
- **SLS Expiration:**
 - Initiated by the SLSs Timer
 - All SLS info/Res. are deleted
 - NC is notified to deactivate SLS



RM Main Components

Access to Stored Info:

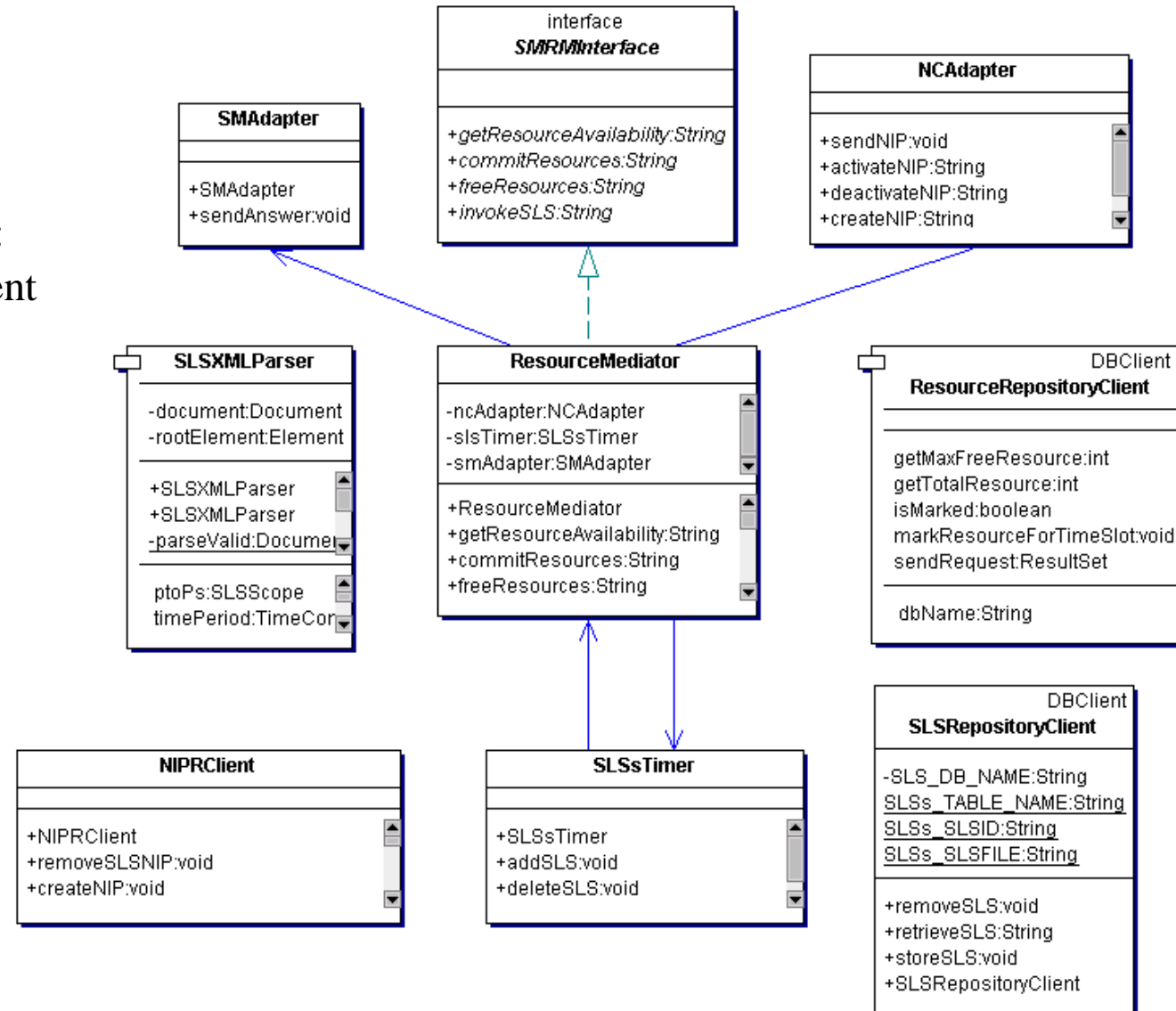
- ResourceRepositoryClient
- SLSRepositoryClient
- NIPRClient

Communication with Other Components:

- RMProxy
- SMAdapter
- NCAdapter

Time tracking:

- SLSsTimer

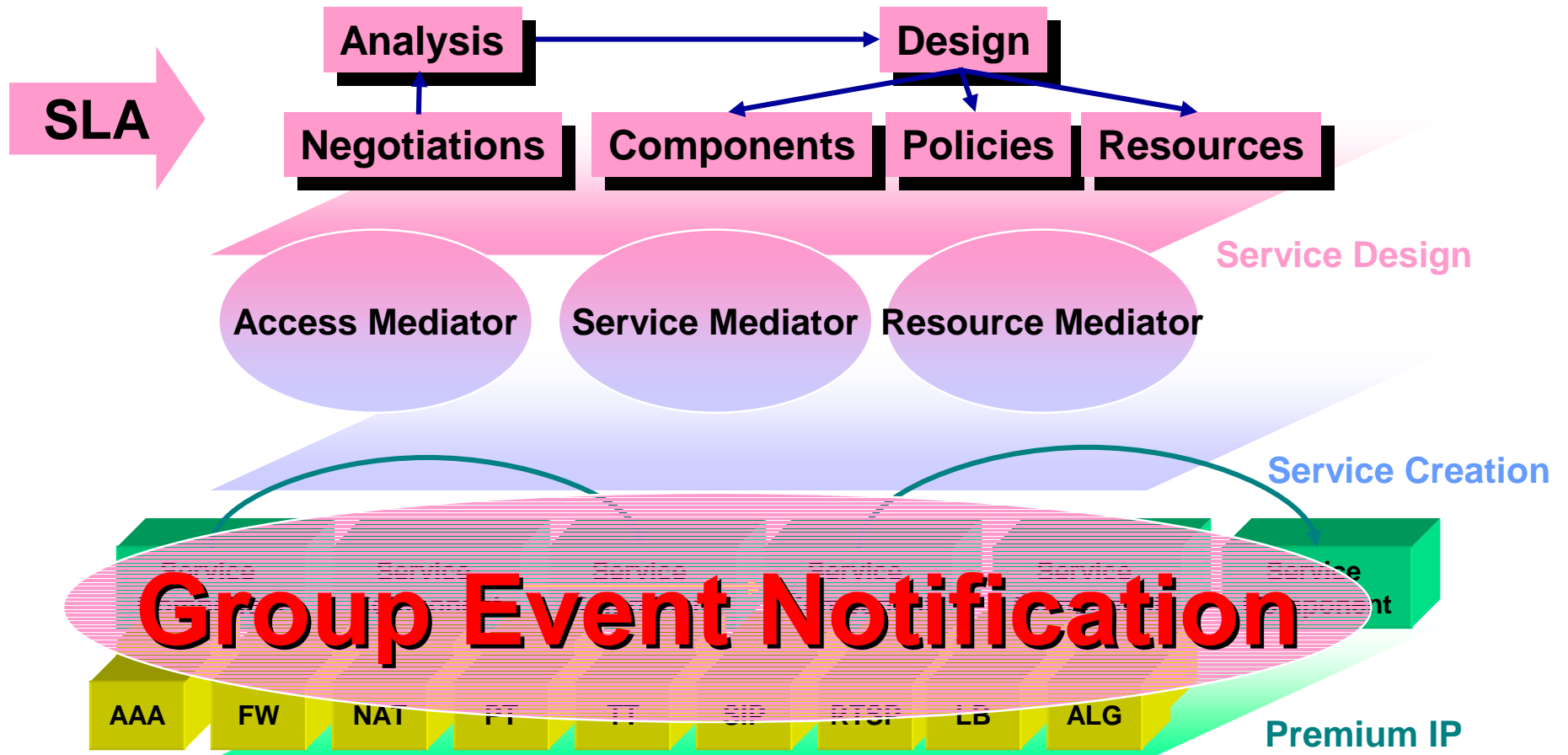


Questions & Answers ?

Service Creation in Premium IP with Group Event Notification: network side

M. Smirnov &
C. Reichert (FHI-Fokus)

Service Creation with GEN



- Given: Middle Boxes providing atomic network services (like AAA, SIP, RTSP, Meters, BBs...)
- Goal: Compose at run-time MBs into a system which provides required end-user service
- Solution: Group Event Notification (GEN) orchestrates communication between Middle Boxes

- Service Group
 - set of MBs necessary to provide a composed service
- GEN-Agent is CATCH
 - CATCH runs at each **service creation aware** MB
 - interprets a language based on rules
 - when triggered by events executes MB-specific actions
- Group Communication
 - CATCH communicate
 - via group channel (=IP multicast group)
 - listen/send EVENTS
 - per service

CATCH – CADENUS Transaction CHorus

Phases of Service Creation

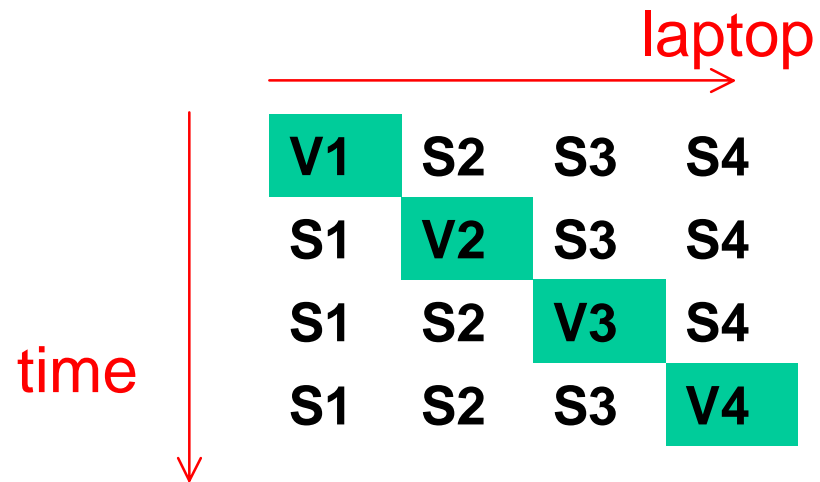
- Off-line: make Service Design Object (SDO)
 - **prefixed** set of RULES
 - RULE: event → action
 - PREFIX: defines group members by e.g. ONEOF(condition)
- On-line: Service Configuration
 - send SDO to the service group
 - **self-organisation** of the group
 - leader election
 - conflict resolution
- Run-time: Service Invocation
 - send START event to the group

How to demonstrate?

- Visualise GEN → straight-forward approach:
MB action = {show movie | image}
- Self organisation in case of failures
- Complex enough



- 5 laptops **as** MBs (displaying video/images)
- 4 images and 4 video clips are replicated to all 5 laptops
 - video content explains the concept
- Play Schedule:



- During Execution
 - If a CATCH module crashes (ctrl-C), the service group **reconfigures itself automatically** and repeats the last step.

- GEN scales
 - events → service independence
 - groups → network independence
- GEN is robust
 - redundancy is easy
 - self-organisation
- GEN meets nearly all midcom requirements

Questions & Answers ?