Wireless World Research Forum (WWRF)

Business Model and Actors for End to End Reconfigurable Systems (E^2R)

(a) Title of the research item: Business Model and Actors for End to End Reconfigurable Systems (E^2R)

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(b) Subject Area: WG 6: Reconfigurability

The concept of the next generation mobile systems will be the provision of broadband access, seamless global roaming and Internet/Data/Voice everywhere, utilizing each time the most "appropriate" technology. In such a communication model multiple different access technologies such as cellular, cordless, WLAN, short range connectivity and even wired systems or satellite-based networks will interface to a common platform over the IP protocol complementing each other in an optimal way for different service requirements and radio environments. With this feature, users will have access to different services, increased coverage, one bill and more reliable wireless access even with the failure or loss of one or more networks.

The introduction of reconfigurable terminals and network equipment in communication systems will cause the appearance of new actors and will change the roles and relations between the traditional actors. The increasing demands of the subscribers, the middleware platform that are being emerged and seem to mediate between the mobile operator and the end users, and the new value added services being developed by third parties will cause furthermore changes in the marketplace of the various actors, the relations among them, the payment schemes, the regulation issues (spectrum allocation etc).

(c) Objectives of the required research

The main targets of the proposed integrated model are:

- Provide an abstraction of business entities into business domains involved in the end-to-end reconfigurability aspects.
- Present and integrate the various actors inside these domains.
- Enable the identification of business level interactions and relations between the business entities and domains (e.g., Service Level Agreements), as well as more precisely the instantiation of respective interactions between actors.
- Facilitate the mapping of actors and roles in business.

(d) State of the art in the area

The business model presented in this document (Figure 1) is to be elaborated as a result of the three scenarios developed within the E^2R project WP1. The general business model is based on the business models proposed by the MOBIVAS project and the one developed within the SCOUT project [2]. An integrated approach was followed and additional aspects elaborated inside E^2R scenarios, relevant to actors and roles, were taken into consideration as extension to the previous SOTA on this field. Moreover, SDRF business model proposals have also been considered [9].

(e) Possible approach

The business domains reflect physical business entities. A tree-based approach for the evolution of the business model is considered. This means that the model will be able to evolve in various layers of abstraction. The higher layer incorporates the business domains, which are reflecting physical business entities.

The business actors can be integrated/mapped to specific business entities. This provides the second layer of abstraction. Furthermore, the actors can be instantiated based on the scenario and value chain that will be considered as alternative. So, for each scenario, various different actors will be active inside each business domain.

The following text presents the four business domains together with the corresponding business actors consisting each of the domains.

Regulatory Domain

The Regulatory Domain includes, regulation and spectrum management authorities.

The **Regulatory Entities** set the legal environment for the mobile business growing, that is, laws and guidelines that determine the operation of the whole system. This includes aspects such as the acceptable equipment behaviour (regarding frequencies, power, etc.), and the tests that must be passed in order to place equipment in the market.

The **Spectrum Manager** can be considered integrated within the Regulatory entities but this may change as reconfigurability allows for flexible and dynamic allocation of spectrum. This actor is responsible for approving and monitoring spectrum allocation to different entities and the transfer of spectrum between them. There must be taken a special concern for the spectrum hire in case of *Mobile Virtual Network Operator* activation.

Third Trusted (T.T.) Party Domain

The Third Trusted Party Domain includes trusted actors for special actions such as security, standard conformance, equipment provision and one stop billing per service for subscriber's charging.

Security Certification Entities guarantee the integrity of the software and the authenticity of its origin. Under the supervision of a regulator this actor will be responsible for issuing, revoking and managing security credentials and public keys for data encryption and signature. These actions are needed to guarantee the security of reconfiguration processes.

Conformance Certification Entities certify the conformance of the protocol parts to respective standards.

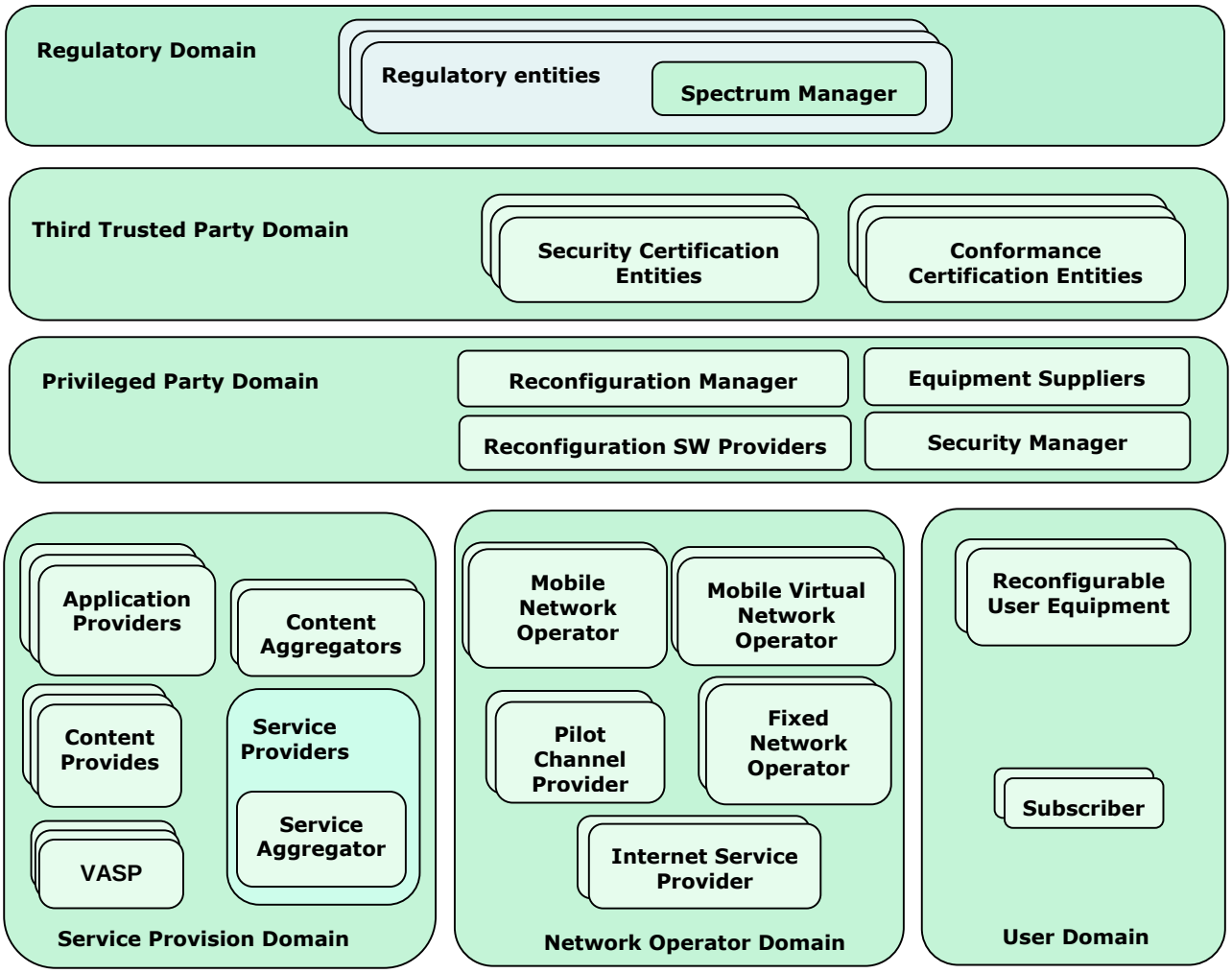

Figure 1 Generic business model domains and entities for End-to-End reconfigurability.

Privileged Party Domain

Reconfiguration Manager is responsible for the reconfiguration management and respective interactions between *Service Aggregators*, Certification Bodies, *Operators*, *and Equipment Suppliers*.

Reconfiguration SW Providers develop and/or distribute software modules to run on reconfigurable network elements and user devices.

Equipment Suppliers design and manufacture the equipment (e.g., mobile terminals, base stations) that is to be used in the *Service Provision, Network Operator* and *User* domains. They can also distribute software modules for their products. In a reconfigurable system the Suppliers' equipment must conform to the standards developed by the various bodies or rules imposed by the regulation authorities.

Security Manager in cooperation with the rest of the actors of the system, guarantee the security

of system operations by providing the security reconfiguration information and the security context for the system.

Service Provision Domain

Application Providers develop and/or provide applications that *Service Providers* offer to their subscribers.

Content Providers create and maintain multimedia repositories and make them available to Service Providers (or *Value Added Service Providers*) or Users via the Service Provider.

Content Aggregators manage the integration of the content coming from other sources into the services offered by Service Providers.

Service Providers offer a set of basic services to their subscribers.

Value Added Service Providers (VASPs) provide services other than basic telecommunications service for which additional charges may be incurred (e.g, wed-based, downloadable services).

Service Aggregators mediate between VASPs, Mobile Network Operators and Users keeping them aware of the available services. They may also provide services profiles according to their content, localization, terminal capabilities and subscriber profile. The Service Aggregators come into business level agreements with Mobile Network Operators and VASPs.

Network Operator Domain

The Network Operator Domain includes the actors that provide the subscriber the communication infrastructure for service provision and reconfiguration capabilities.

Mobile Network Operator provides radio resources, mobility management and fixed capabilities to switch, route and handle the traffic associated with the services offered to users. Network capabilities are provided on behalf of service providers. A network operator may use several radio access technologies to provide these services to end users.

A **Mobile Virtual Network Operator (MVNO)** buys network capacity, usually as close to the base level as possible, and invests in a service infrastructure of its own. The MVNO thereby establishes a more independent position and is able to compete directly with other mobile network operators in the market by offering advanced services. An MVNO has everything its own, except for the spectrum, base stations, and base station controllers.

Fixed Network Operator provides telecommunications services to fixed subscribers but its infrastructure could also be used as transport service by the other providers (ISPs).

Internet Service Providers provide access to the Internet network. They set traffic agreements with Mobile Operators and other ISPs.

Pilot Channel Provider provides access to the software for the local systems and allowing the terminal to discover the new radio interface to use.

User Domain

The user domain is formed by the individual or entity subscribed to communication services, the actual users and the reconfigurable terminal devices used to access the offered services.

A **Subscriber** being engaged in a Subscription with a Mobile Network Operator is allowed to subscribe and unsubscribe services, to register a user or a list of users authorized to enjoy the

services, and also to set the limits relative to the use that associated users make of these services.

The **Reconfigurable User Equipment** the device used to provide access to communication services and can be modified with several kinds of reconfiguration processes, regarding the installed software (programs, codecs, and protocols). Different subscribers can share for short periods the same device by exchanging their SIM cards.

Actors Relations

The various relations contracted between either the described business domains (inter-domain business relations) or between the actors that each domain (intra-domain business relations) are illustrated within the following tables (Table1, 2).

Table 1. Inter-Domain Business Relations

User	Network Operator	Connectivity Provision (Mobile Network Operator, MVNO) Reconfiguration Initiation (Operators, Pilot Channel Provider)
	Service Provision	Service Discovery (Service Aggregator) Service Provision (Service Provider, VASP)
	Privileged Party	Device Provision (Equipment Suppliers) Software modules provision (Reconfiguration SW Provider) Security (Security Manager)
	T.T. Party	Accounting, Charging, Billing (Charging/Payment)
Network Operator	Service Provision	Content Provision for Service Deployment (Content Provider/Aggregator) Application Provision for Service Deployment (Application Provider) Service Provision/Demonstration (Service Provider/VASP)
	Privileged Party	Device Provision (Equipment Supplier) Reconfiguration Actions (Reconfiguration Manager) Security (Security Manager) Software Modules Provision (Reconfiguration SW Providers)
	T.T. Party	Accounting actions Revenue Sharing (Charging/Payment)
	Regulatory	Operation guidelines provision (Regulatory Entities) Spectrum sharing/selling issues (Spectrum Manager)
Service	Privileged Party	Security (Security Manager)

	T.T. Party	Software integrity (Security Certification entities) Revenue sharing (Charging/Payment)
Privileged Party	T. T. Party	Security (Security Certification entities) Software Conformance (Security Certification entities) Revenue Sharing (Charging/Payment)

Table 2. Intra Domain Relations

Network Operator	Spectrum Sharing (Mobile Operator – Mobile Operator) Spectrum Selling (Mobile Operator – MVNO) Resources sharing (Operators – Fixed Network, ISP)
Service Provision	Content repositories management (Content Provider/Aggregator) Service Deployment (Service Provider/VASP – Content Provider/Aggregator, Application Providers

(f) Next Steps/Research

Next steps will be to identify the mapping of actors and roles to the presented business entities/domains and to identify the various technical, financial and regulatory relations between the actors/domains. Furthermore, we will elaborate on the proposed layered approach for the identification of business model aspects for end to end reconfiguration.

Acknowledgement

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