THE A.R.T.
OF POLICY
MANAGEMENT

DELIVERING THE NEXT GENERATION
OF MOBILE BROADBAND SERVICES

TECHNOLOGY WHITE PAPER

With the explosion of mobile broadband, service providers must offer innovative, personalized subscriber services while generating new streams of revenue. A centralized policy control rules engine is essential to meeting these needs. The Alcatel-Lucent 5780 Dynamic Services Controller (DSC) is an innovative policy control solution that enables service providers to map business demands and network constraints to easy-to-manage network policy rules. Combining the benefits of general-purpose and hard-coded rules engines, Alcatel-Lucent Agile Rules Technology (A.R.T.) offers ease of use, flexibility, high performance, scalability and maintainability. Featuring powerful, GUI-driven ease of use, the Alcatel-Lucent 5780 DSC empowered with A.R.T. offers a unique approach to help service providers succeed as business models become increasingly more complex.
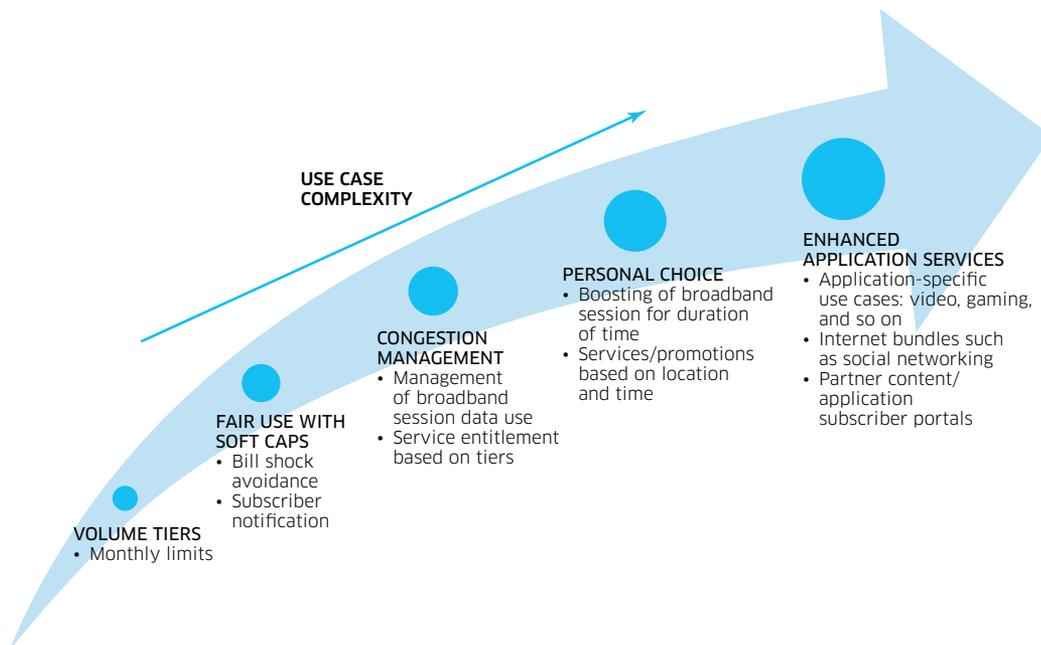
Alcatel·Lucent

AT THE SPEED OF IDEAS™

TABLE OF CONTENTS

1. THE INCREASING NEED FOR POLICY CONTROL

There is a lot of buzz about the mobile broadband explosion: service providers world-wide must generate new forms of revenue to keep pace with the resultant network and capacity upgrades. These new revenue streams must be based on services that are more personalized and ultimately much more complex. The industry is already moving in this direction, as shown in Figure 1.

Figure 1. Mobile broadband service evolution

USE CASE COMPLEXITY

ENHANCED APPLICATION SERVICES
- Application-specific use cases: video, gaming, and so on
- Internet bundles such as social networking
- Partner content/ application subscriber portals

PERSONAL CHOICE
- Boosting of broadband session for duration of time
- Services/promotions based on location and time

CONGESTION MANAGEMENT
- Management of broadband session data use
- Service entitlement based on tiers

FAIR USE WITH SOFT CAPS
- Bill shock avoidance
- Subscriber notification

VOLUME TIERS
- Monthly limits

Originally, mobile broadband services offered basic tiers based on the volume of data used in a monthly billing period. Driven by the European Union (EU) "Bill shock" legislation, fair use with soft capped services were instantiated that notified the subscriber when they exceeded certain usage volumes when roaming; this was really the beginning of the evolution of mobile personalized services.

As indicated in Figure 1, the industry is now witnessing the use of policy to control resources during times of network capacity overload or congestion, and subscribers in higher service tiers generally receive better performance. Moving forward, there is a huge appetite to leverage time, location and speed to provide a host of personalized services and promotions, augmented by the need to provide application-specific services tailored to individual subscribers.

Empowering subscribers with their own set of service options that can be dynamically tailored to personalized needs and performance requirements increases the importance of a centralized policy control engine. The previously mentioned service evolution will invariably add a significant amount of operational complexity to underlying business models and use cases.

1.1 Policy-control engine requirements

To meet the aforementioned service challenges, policy control engines have several multi-dimensional requirements.

- *Ease of use* – Service personalization should provide a new set of innovative service options that the service provider's marketing and product teams can bring to bear. These services need to be quickly created and easily modified without long lead times and consulting costs. A policy control engine must therefore be easy to use in-house so that service providers can use it to model their evolving business needs.
- *Flexibility* – The breadth of policy control use cases in this new era of service personalization is massive. The policy control engine needs to be flexible enough to be able to model all of these cases while maintaining its ease of use and performance characteristics.
- *High performance and scalability* – A high-performance policy control solution is required to meet the needs of an increasing customer base and personal requirements. The measure of performance is not only about raw transactions per second (TPS): the platform must be able to handle the burden of complex use cases, scaled across many subscriber broadband sessions that require complex policy rules and data processing.
- *Maintainability* – An essential aspect of operational efficiency is being able to maintain the policy control engine with efficient installation, upgrades, updates, version control, redundancy and recovery. Related to ease of use, maintainability is essential for service providers to operationalize a policy control engine in its current Operations Support Systems/Business Support Systems (OSS/BSS) environment.

2. RULES ENGINE APPROACHES

In the mobile broadband industry, most policy control rules engines are in two categories: general-purpose rules engine and hard-coded rules engine.

2.1 General-purpose rules engine

A general-purpose or business rules engine is based on an open source or commercial software system that executes one or more business rules in a run-time production environment. These engines have been used primarily in the financial services industry and have not been built specifically for the mobile broadband environment, but rather have been adapted to operate in this context. In addition, the engines have their own programming language that generally requires a programmer's expertise, severely impacting ease of use and restricting many non-technical employees from being able to operate them.

Following a linear step-by-step processing flow approach, a general-purpose rules engine first processes each message and evaluates it as a candidate to trigger a policy. If the engine determines that a policy is to be triggered, it invokes the rules that define that policy. At this stage, the engine collects the data needed to evaluate the policy — this information is often not available in memory. The engine then evaluates the policy conditions and initiates the associated actions.

Although a general-purpose rules engine offers flexibility, its lack of specific mobile broadband call-flow modeling hampers its performance and maintainability under scale, especially in complex use cases. In addition, ease of use is reduced because adding and modifying business rules often requires a consulting contract with the actual policy vendor.

2.2 Hard-coded rules engine

A hard-coded rules engine is specific to a few basic use cases. Within the small scope of the use cases it was written for, it generally performs well but suffers severely in terms of flexibility, ease of use and maintainability. A new software load is often needed to support additional use cases outside the scope of its basic functions, resulting in increased operational costs and lead times.

A hard-coded rules engine offers a model that is streamlined to a specific set of use cases or business policies. The engine processes messages individually and determines if they should trigger one of the policies. If one of the policies is to be triggered, specific data is available to help in the real-time processing of the rules leading to evaluation of the conditions and the execution of actions. The available data may be limited by the scope of the specific policy, and the policies themselves may not offer the breadth of control that is required in many environments. This model offers good performance and scale but limited flexibility and maintainability.

2.3 Alcatel-Lucent Agile Rules Technology

The Alcatel-Lucent Agile Rules Technology (A.R.T.) was designed to combine the benefits of general-purpose and hard-coded rules engines, without any of their drawbacks. A.R.T. specifically models the call flow and data requirements of a fundamental set of use cases that represent key business models. Examples of these requirements are usage management, application control and intelligent traffic management.

A.R.T. provides excellent run-time efficiency by anticipating and caching key data requirements of each call flow. The technology then triggers the rules engine only under specific mobile broadband conditions. This specific modeling effectively reduces the complexity of all use cases before they reach the rules engine, resulting in excellent performance that does not deteriorate under scale and complexity.

2.3.1 Increasing performance and reducing the policy engine load

A.R.T. leverages intimate knowledge of the mobile broadband environment, coupled with understanding of the key business use cases that service providers need to model. The A.R.T. model first filters — rather than processes — all incoming messages to find those messages that represent a specific event or rule set that represents a trigger for a specific policy. This important differentiator reduces the load on the rules engine because it processes only those messages that meet the filter requirement.

A.R.T. assigns each business policy or rule table one or more rule sets that define the specific triggers for that policy. If an incoming message represents a rule set that is assigned to a specific rule table, A.R.T. triggers this rule table (policy). A rule table is an A.R.T. object that represents a specific business policy and consists of several rules. Each rule has a condition and an action, and an action is executed if the condition is evaluated to be "true".

The A.R.T. data modeling capability caches all required data — for example, the subscriber's profile, service usage and location — needed to evaluate these conditions in real time. This modular approach provides a powerful rules engine that offers performance and scale across multiple complex use cases while offering excellent ease of use and maintainability.

2.4 Comparing rules engine types

Table 1 compares the ease of use, flexibility, performance, scalability and maintainability of each type of rules engine.

Table 1. DSC agile rules compared to generic and hard coded rules engines

	GENERAL-PURPOSE	HARD-CODED	AGILE RULES TECHNOLOGY
Ease of use	Detailed and complex configuration, many with own programming langauge	Configuration straight-forward but rigid	Point-and-click configuration/modification is quick and easy
Flexibility	Flexibility provides for wide range of use cases	Rigid approach provides for only a few basic use cases	Flexibility of general-purpose with performance of hard-coded
Performance	Performance suffers with weak use-case modeling	Performance is good for the few supported use cases	Performance consistent across many service provider-specific use cases
Scalability	Inefficient processing leads to limited scale	Scale is good for a limited number of use cases	Efficient, modular processing leads to large scale
Maintainability	Often requires specialized professional services to modify policy rules Rules may need reconfiguration on software upgrade	Often requires a new release to offer specific use cases	Easy, in-service software upgrades with no rule reconfiguration

3. ALCATEL-LUCENT 5780 DYNAMIC SERVICES CONTROLLER AND A.R.T.

Based on A.R.T., the Alcatel-Lucent 5780 Dynamic Services Controller (DSC) is a state-of-the-art policy control solution that enables service providers to map business demands and network constraints to easy-to-manage network policy rules. A fully converged platform, the Alcatel-Lucent 5780 DSC offers a 3GPP Policy and Charging Rules Function (PCRF) and support for a wireline Remote Authentication Dial-In User Service (RADIUS) environment.

Leveraging the basic building blocks of A.R.T., the Alcatel-Lucent 5780 DSC offers a simple and elegant model that yields a scalable, high-performing rules engine that is also conducive to providing excellent operational benefits. These operational benefits include quick and easy policy provisioning and modification as well as intuitive and powerful system maintainability.

3.1 Powerful, GUI-driven policy management

The Alcatel-Lucent 5780 DSC provides a powerful policy visualization environment that service providers can use to quickly and easily create and modify policies. Rules creation and maintenance are simplified with a point-and-click GUI. Users can create new business rules, each with its own condition and action(s), in a dedicated rule table. Users can also assign specific rule sets that define when to evaluate the rule table.

With the visualization envorinment, the user can generate a set of pseudo-code that reflects the actual policy rules (rule table) created by the service provider. This feature provides a concise summary that can be used to double-check the policy's validity and logic.

3.2 Ease of use and maintainability

The operational ease of use of the Alcatel-Lucent 5780 DSC minimizes dependency on an external agency or policy vendor to implement or modify business rules, encouraging innovation while saving time and money. Another operational benefit is maintainability: the Alcatel-Lucent 5780 DSC is quick and easy to install and upgrade. With its redundant hardware components and its high availability (HA) model, the Alcatel-Lucent 5780 DSC offers in-service upgrades with no single point of failure.

4. CONCLUSION

With the explosion of mobile broadband and shift toward subscriber personalization, the world of mobile broadband is changing rapidly. Mobile service providers have a tremendous burden: offering new, innovative personal services with scale and performance and continuing to satisfy their subscribers while generating new streams of revenue. A centralized policy control engine with performance, scale and flexibility is essential to meeting these needs. The Alcatel-Lucent 5780 DSC with A.R.T. is uniquely qualified to fill this role.

With over 40 patents pending, the Alcatel-Lucent 5780 DSC offers an elegant, purpose-built design that draws on specific knowledge of the residential mobile environment to model typical and emerging service provider use cases. A.R.T. leverages the benefits of general-purpose and hard-coded rules engines without adopting any of their weaknesses. Deploying the Alcatel-Lucent 5780 DSC with A.R.T. offers a range of benefits:

- *Powerful policy visualization GUI* — Service providers are empowered to quickly and easily create and modify policies in-house, without needing to understand detailed programming. This eliminates dependency on policy vendors or third-party agencies, reducing costs and time-to-market for new, innovative services.
- *Excellent flexibility* — Offering a wide range of service-provider specific use cases, A.R.T. provides the flexibility benefits of a general-purpose rules engine without the performance issues. Users can configure, test and deploy a new set of rules in minutes rather than days or months.
- *High performance* — The Alcatel-Lucent 5780 DSC with A.R.T. provides high performance across massive subscriber and session scale for a new breed of complex service-provider business use cases.
- *Powerful operation and maintainability*— Specifically tailored for service providers, A.R.T. reduces time and costs to operate, install, upgrade, troubleshoot and debug the system and associated policies.

5. ACRONYMS

5780 DSC   Alcatel-Lucent 5780 Dynamic Services Controller

3GPP   Third-Generation Partnership Project

A.R.T.   Agile Rules Technology

BSS   Business Support System

EU   European Union

GUI   graphical user interface

HA   high availability

OSS   Operations Support System

PCRF   Policy Charging Rules Function

RADIUS   Remote Authentication Dial-In User Service

TPS   transactions per second

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