Project	**IEEE 802.20 Working Group on Mobile Broadband Wireless Access** <**http://grouper.ieee.org/groups/802/20/**>	
Title	**France Telecom – Service Provider Requirements for 802.20**	
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Re:	MBWA Call for Contributions - Requirements	
Abstract	This document is a specification of France Télécom's requirements for an 802.20 AI. It represents service provider requirements for deploying IP based services over a mobile broadband wireless network, and as such addresses our specific service needs.	
Purpose	We would like to ensure that service provider requirements are taken into account in the specification of the 802.20 AI, and that requirements are not viewed merely from a PHY/MAC layer perspective.	
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INTRODUCTION

1.1 Purpose

The mission of IEEE 802.20 is to develop the specification for an efficient packet based air interface that is optimized for the transport of IP based services. The goal is to enable worldwide deployment of affordable, ubiquitous, always-on and interoperable multi-vendor mobile broadband wireless access networks that meet the needs of business and residential end user markets. [1]

The 802.20 working group is in the process of defining "system" level requirements. An 802.20. system "constitutes an 802.20 MAC and PHY implementation in which at least one Mobile station communicates with a base station via a radio air interface, and the interfaces to external networks, for the purpose of transporting IP packets through the MAC and PHY protocol layers." [2]

The ongoing work in 802.20, as it is focused on the PHY/MAC layers, does not take fully into account the requirements that a service provider might have in deploying solutions using 802.20. In particular, there needs to be a clearer understanding of:

- Types of services to be offered and associated quality of service requirements
- Service provisioning and monitoring considerations
- System level performance requirements
- IP Handoff
- Extension of IP quality of service mechanisms (in particular DiffServ),
- Management considerations
- Security

The purpose of this document is to examine some of the issues listed above, and to potentially collaborate with other service providers in developing a common set of operator specific functional requirements.

1.2 Scope

The requirements that are put forth in this document are intended to describe *what* capabilities, or behavior, and 802.20 system must provide, and not necessarily how they are technically implemented. These requirements affect the technical requirements placed upon the PHY/MAC layers. In particular, it is critical that such systems be able to handle the evolutions of IP as currently being defined at the IETF (and potentially influence) in areas such as handover, quality of service, MobileIP, and others.

1.3 Target markets and service offerings

The widespread use of the Internet has created a new breed of content-rich IP applications that are bandwidth intensive and delay sensitive in nature. These new applications are fueling demand for premium broadband services based on the IP protocol.

One of the stated goals of MBWA is to "enable worldwide deployment of affordable, ubiquitous, always-on and interoperable multi-vendor mobile broadband wireless access networks that meet the needs of business and residential end user markets". [1] A key distinction between 3G technology and 802.20 is that the former is bringing data services to the cellular world, whereas the latter can be viewed as providing the ability to extend broadband IP services to the mobile wireless world. 802.20 is taking a "pure IP" approach, where both the mobile terminal (MT) and mobile access node are IP enabled. This is contrary to an "all IP" approach in 3G where the BTS/BSC are not IP enabled, but participate in the transmission of IP packets to some type of packet data serving node.

The approach is quite different from both a business and technical perspective. Some key questions that need to be answered include:

- What would be the target market for 802.20 systems? Is it consumer, enterprise, or both?
- What types of services would an operator offer? Some of the possibilities that 802.20 technology would enable, include, but are not limited to:
    - Internet access
    - Videoconferencing
    - Graphic web browsing
    - VoIP
    - IP/VPN
    - Location based services
    - Video and audio streaming
    - IP multicast
- What are the advantages/ disadvantages in relationship to existing fixed line broadband access technologies such as DSL, PON, T1/E1…?
- Can SLA commitments continue to be met, or conditions improved upon?
- Given that MBWA is an access technology to some IP based infrastructure, how would FT seamlessly integrate this technology into existing IP service offerings?
- What is the impact on OSS/BSS systems?

The answer to these, and other related questions influences the requirements placed upon the underlying access infrastructure, in particular the imposed constraints and performance requirements.

2. FUNCTIONAL REQUIREMENTS

2.1 IP Level Handoff

The IETF is in the process of defining Mobility Related Terminology [3]. This document is close to reaching RFC status. As such, a full IP based system such as 802.20 should be able to support the different types of handovers defined below. The five handover types are mostly independent, and every handover should be classable according to each of these types.

The AI (air interface) shall support handovers of the following types:

2.1.1 Mobile-initiated and Network-initiated handovers:

- Mobile-initiated Handover: the Mobile Terminal is the one that makes the initial decision to initiate the handover.
- Network-initiated Handover: the network makes the initial decision to initiate the handover.

2.1.2 Mobile-controlled and Network-controlled Handover:

- Mobile-controlled Handover (MCHO): the Mobile Terminal has the primary control over the handover process.
- Network-controlled Handover (NCHO): the network has the primary control over the handover process.

2.1.3 Mobile-assisted, Network-assisted and Unassisted handovers:

- Mobile-assisted handover and measurement from the Mobile Terminal are used by the Access Router (IP Attachment point) to on the execution of a handover.
- Network-assisted handover handover where the Access Network collects information that can be used by the Mobile Terminal in a handover decision.
- Unassisted handover: a handover where no assistance is provided by the Mobile Terminal or the Access Router to each other.

2.1.4 Backward and Forward Handovers:

- Backward handover: a handover either initiated by the Old Access Router, or where the MN initiates a handover via the Old Access Router.
- Forward handover: a handover either initiated by the New Access Router, or where the MN initiates a handover via the New Access Router.

2.1.5 Planned and Unplanned handovers:

- Planned handover: a proactive (expected) handover where some signalling can be done in advance of the Mobile Terminal getting connected to the new Access Router, e.g. building a temporary tunnel from the old Access Router to the new Access Router.
- Unplanned handover: a reactive (unexpected) handover, where no signalling is done in advance of the Mobile Terminal's move of the Old Access Router to the new Access Router.

2.2 Link layer service interface

In order to support the different types of IP level handovers as required in the previous section, it is necessary to develop the necessary service interface on top of the air interface. This link layer service interface shall then permit tight coupling interaction with higher layers. Particularly, this is applicable at the Mobile Terminal side but also the Base Station side to provide the necessary means for handover control in both the Mobile and the Access Router (and Access Network).

2.2.1 The service interface shall support 2 way communications in order to:

- Report from the link layer to the network layer the necessary information about radio environment (e.g. detection of layer 2 attachment, radio measurement reports on several base stations…).
- Allow higher layers assistance to the link layer by transferring specific requests such as a list of candidate Base Stations to be monitored or the target Attachment Point identifier to handover.

2.3 IP Quality of Service

The Internet Engineering Task Force (IETF) has proposed many service models and mechanisms to meet the requirements of QoS in IP networks. Included are the Integrated Services/RSVP model, the Differentiated Services model [4], MPLS, Traffic Engineering and Constraint Based Routing. However, these mechanisms have been defined in the context of fixed networks. Free movement between different access technologies (wireless and wireline) and networks is difficult, and there are many issues that need to be tied together.

One important issue to study is the mapping of QoS requirements of the user onto the available access resources. Another one is mobility support in terms of horizontal (intra-technology) handover between networks based on the same access technology, and vertical (inter-technology) hand-over between dissimilar access networks. It is desired in either case that handover will be performed seamlessly without affecting ongoing sessions and associated quality of service.

The overall goal is to provide end-to-end IP QoS with differentiated levels of service. There are definitely inherent challenges for MBWA in achieving these goals:

- Allocation and control of resources in the access network
- Maintaining user connectivity AND quality of service while the user is on the move
- Ensuring that security, mobility, and QoS work together.

2.3.1 QoS Requirements of the User

These requirements specify the quality of service needs of the end user based upon an IP Diffserv model. DiffServ is considered a dominant QoS protocol in the network layer that supports across different network interfaces. However, in mobile broadband wireless access, DiffServ cannot function to traffic control for QoS. Instead, 802.20 must support QoS in the MAC layer. End-to-end QoS can only be provided if the different mechanisms are coordinated.

2.3.1.1 The Differentiated Services model defined by the IETF [RFC2475] must be supported by the 802.20 system

2.3.1.2 The 802.20 system must support the three different types of DiffServ classes: 1) AF – Assured Forwarding for applications that require minimal sustained throughput, 2) EF – Expedited Forwarding for applications that require short delays and reduced jitter, and 3) BE – Best Effort for all other traffic

2.3.1.3 The 802.20 MAC layer must implement a mechanism for mapping IP QoS packets based upon DiffServ code points to MAC priority schemes, such that IP level quality is maintained.

2.3.1.4 The 802.20 system must support the configuration of QoS policies

2.3.1.5 The 802.20 system shall support the use of traffic conditioning mechanisms such as meters, markers, shapers, and droppers.

2.3.1.6 Dynamic bandwidth allocation must allow for the preservation of DiffServ classes.

3. REFERENCES

[1] http://grouper.ieee.org/groups/802/20/ Mission of MBWA

[2] 802.20 Requirements Document - VersRev. 5(Dave S Mcginnis, July 23, 2003)

[3] J. Manner, M. Kojo, *"Mobility Related Terminology"*, draft-ietf-seamoby-mobility-terminology-04.txt, work in progress

[4] RFC2475 An Architecture for Differentiated Services