Project	**IEEE 802.20 Working Group on Mobile Broadband Wireless Access** <http://grouper.ieee.org/groups/802/20/>
Title	**Market Requirements for IEEE 802.20**
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Re:	MBWA Call for Contributions
Abstract	To be successful, 802.20 must provide higher performance than existing alternatives. Existing systems and techniques we can incorporate into the standard to achieve high performance will be discussed.
Purpose	To facilitate discussion of the 802.20 requirements document.
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Patent Policy	The contributor is familiar with IEEE patent policy, as outlined in Section 6.3 of the IEEE-SA Standards Board Operations Manual <http://standards.ieee.org/guides/opman/sect6.html#6.3> and in *Understanding Patent Issues During IEEE Standards Development* <http://standards.ieee.org/board/pat/guide.html>

Market Requirements for IEEE 802.20

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The Most Effective Requirements...

….Are simply stated

Emperor Nero, to his banquet entertainers

"Astonish me"

President Kennedy, to NASA

"A man on the moon by the end of the decade"

Goal for 802.20

To be the technology of choice for mobile data

to achieve this, we must:

- **Go beyond what 3G or 3G enhanced can do**
  - Higher in data rate
  - Better in dealing with high-speed mobility
  - Simpler in interfacing with IP land-line networks
  - Faster in handoff
- **Also, be better than 802.16e**

Otherwise, why bother?

The Classic Mistake

- **Assuming that our next-generation system will be better than the competition**
  - Just because it's better than their last one
  - They are working on their next generation, too

> Consider ATM vs. Ethernet: 25 & 155 Mbps vs. 10 Mbps--
> Ethernet moved to 100 Mbps and wiped out premises ATM

- **To succeed, we need to be have higher throughput than existing systems**
  - And higher than their next (enhanced) version

The Current State of the Art

We need to beat these numbers by a significant margin:

TD-CDMA (Rel. '99 in 5 MHz)	**FWD**	**REV**	
Peak rate (no split)	4.5	-	Mbps
Peak rate (9:3 TDD split)	~3.4	~1.1	Mbps
Avg throughput	~1.5	~0.9	Mbps
TD-CDMA (Rel. 5 in 5 MHz)	**FWD**	**REV**	
Sector throughput	~1.9		Mbps
EVDO	**FWD**	**REV**	
Peak	2.4	0.153	Mbps
Throughput	0.7		Mbps
Throughput @ 3 km/h, 1 Rayleigh path	1.2		Mbps
Enhanced DO (proposed)	**FWD**	**REV**	
Peak	~3	~1.2	Mbps
S-CDMA (in 5 MHz)			
Peak rate	2.1	1.0	Mbps
IEEE 802.16a (non-mobile in 20 MHz)			
Peak (3:1 TDD split)	60	10	Mbps

What is our Sustainable Technical Edge?

- **Packets?**
  - Most new systems use packets
- **More complex modulation ?**
  - All current systems have discovered the laws of physics
- **CDMA?**
  - 2G, 2.5G, and 3G have CDMA
- **OFDM?**
  - 802.16a has that
- **Narrow channels to fit existing allocations?**
  - New spectrum is unlikely to require narrow channels

- **Maybe it's complex antennas**
  - 802.16 and even 802.11 are thinking about smart antennas
- **Maybe it's our simple IP-based protocol stack**
  - Nothing prevents 802.16 from using the same stack

Bottom line: if there is no single "killer" advantage, then we have to tune our system better. The devil is in the details.

The Tools We Have

- **Simple protocol stack**
  - Conformance to normal data practice
  - Voice and video support via QoS scheduling
- **Smart antennas**
  - Great improvements in rate are possible
  - But the competition can add this to existing standards
- **Targeted primarily at mobile users**
  - Not an add-on
  - Power consumption considered from the start
- **Consistency across different channel sizes**
  - Easy roaming for the user and system migration for the operator
- **Adaptive modulation and coding**
  - Optimize for varying signal strength and different multipath environments
- **Smart scheduling**
  - Predict user's nulls and avoid them
  - Identify user clustering